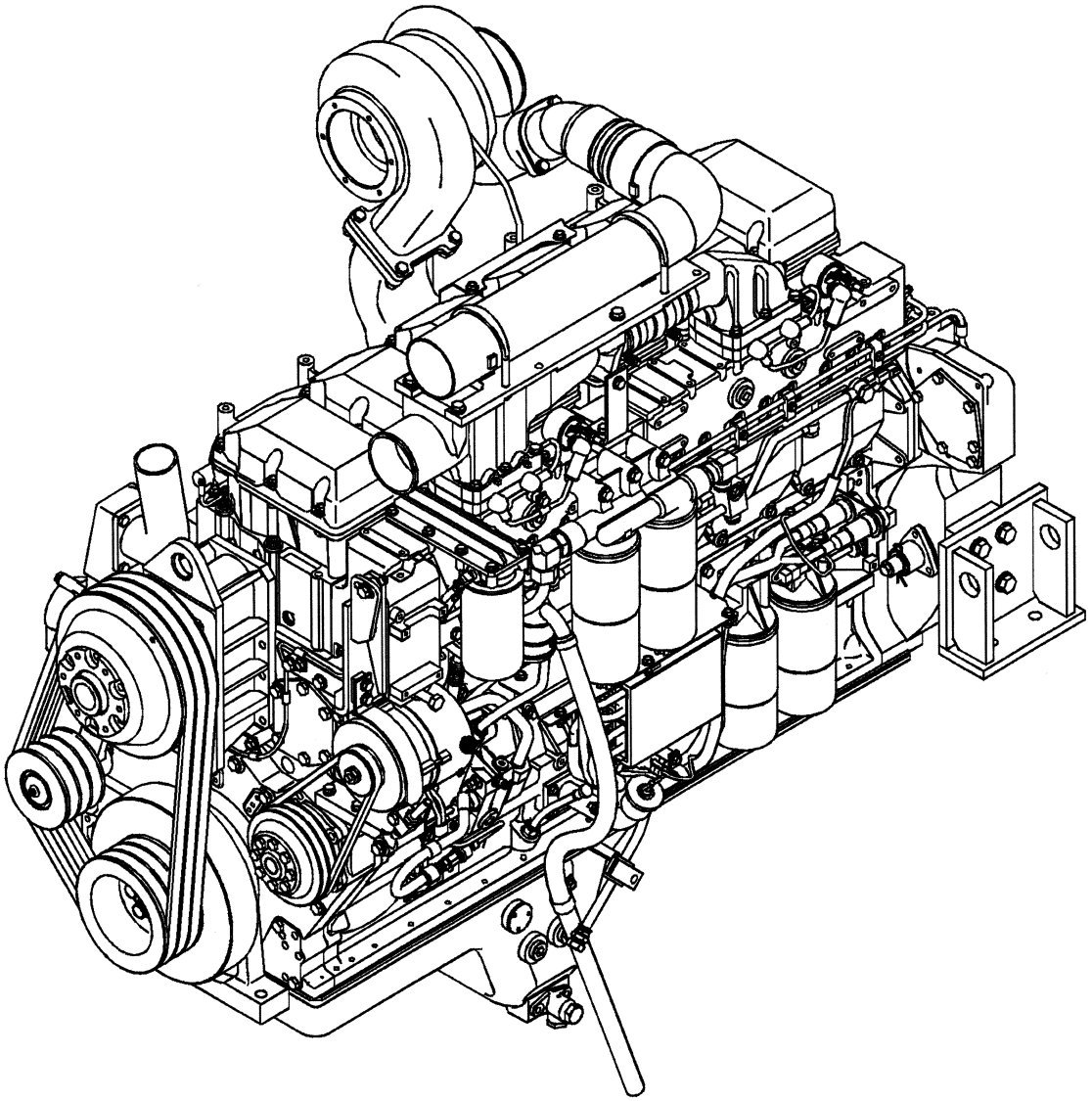
Operation and Maintenance Manual
QSK23 Series Engines



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Foreword

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

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

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

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

The latest technology and the highest quality components were used to produce this engine. When replacement parts are needed, we recommend using only genuine Cummins or ReCon® exchange parts. These parts can be identified by the following trademarks:

NOTE: 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.

Name	Number	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		
• Fuel		
• Fuel-Water Separator		
• Coolant		
• Crankcase Ventilation		
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		

(refno)

Section i - Introduction

Section Contents

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To the Owner and Operator

General Information

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

Keep records of regularly scheduled maintenance.

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

Cummins Inc. uses the latest technology and the highest quality components to produce its engines. Cummins Inc. recommends using genuine Cummins new parts and ReCon® exchange parts.

Personnel at Cummins Authorized Repair Locations have been trained to provide expert service and parts support. If you have a problem that can **not** be resolved by a Cummins Authorized Repair Location, follow the steps outlined in the Service Assistance (Section S).

Product coverage, warranty limitations and owner responsibilities are available in Warranty (Section W).

△ CAUTION △

Disconnect both the positive (+) and negative (-) battery cables from the battery before welding on the vehicle. Attach the welder ground cable no more than 0.61 meters [2 feet] from the part being welded. Do not connect the ground cable of the welder to the ECM cooling plate or ECM. Welding on the engine or engine mounted components is not recommended.

About the Manual

General Information

This manual contains information needed to correctly operate and maintain your engine as recommended by Cummins Inc. For additional service literature and ordering locations, refer to Service Literature (Section L).

This manual does not cover vehicle, vessel, or equipment maintenance procedures. Consult the original vehicle, vessel, or equipment manufacturer 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 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 listing of symbols and their definitions.

Each section of the manual is preceded by a Section Contents to aid in locating information.

How to Use the Manual

General Information

This manual is organized according to intervals at which maintenance on your engine is to be performed. A maintenance schedule, that states the required intervals and maintenance checks, is located in Maintenance Guidelines (Section 2). Locate the interval at which you are performing maintenance; then follow the steps given in that section for all the procedures to be performed.

Keep a record of all the checks and inspections made. A maintenance record form is located in Maintenance Guidelines (Section 2).

Engine troubleshooting procedures for your engine are located in Troubleshooting Symptoms (Section TS).

Specifications for your engine are located in Maintenance Specifications (Section V).

Symbols

General Information

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.**

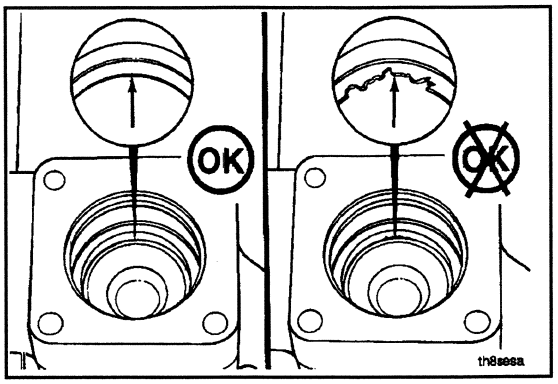
Refer to another location in this manual or another publication for additional information.

The component weighs 23 kg [50 lbs] or more. To reduce the possibility of personal injury, use a hoist or get assistance to lift the component. 17800009

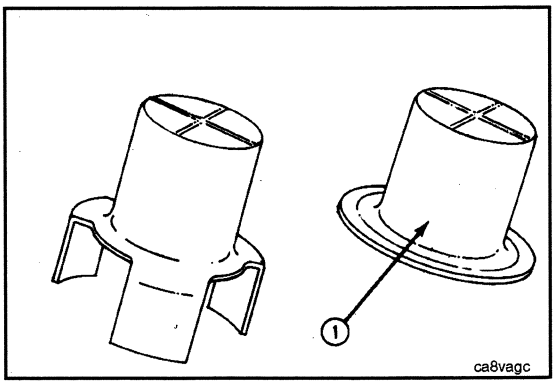
Illustrations

General Information

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, carelessness, or ignoring the warnings can cause burns, cuts, mutilation, asphyxiation or other personal 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.

- Work in an area surrounding the product that 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 slowly loosening the filler cap to relieve the pressure from the cooling system.
- **Always** use blocks or proper stands to support the product before performing any service work. Do **not** work on anything that is supported ONLY by lifting jacks or a hoist.
- Relieve all pressure in the air, oil, fuel, and 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 reduce the possibility of suffocation and frostbite, wear protective clothing and ONLY disconnect 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 reduce the possibility of 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 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 reduce the possibility of 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 the tools 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.
- Liquified petroleum gas is heavier than air and can accumulate near the floor, in sumps, and low-lying areas.
- Natural gas is lighter than air and can accumulate under hood and awnings.
- To reduce the possibility of suffocation and frostbite, wear protective clothing and ONLY disconnect natural gas and liquified petroleum gas lines in a well ventilated area.
- Coolant is toxic. If **not** reused, dispose of in accordance with local environmental regulations.

General Repair Instructions

General Information

This engine incorporates the latest technology at the time it was manufactured; yet, it is designed to be repaired using normal repair practices performed to quality standards.

- **Cummins Inc. does not recommend or authorize any modifications or repairs to engines or components except for those detailed in Cummins Service Information. In particular, unauthorized repair to safety-related components can cause personal injury or death. Below is a partial listing of components classified as safety-related:**
  - **Air Compressor**
  - **Air Controls**
  - **Air Shutoff Assemblies**
  - **Balance Weights**
  - **Cooling Fan**
  - **Fan Hub Assembly**
  - **Fan Mounting Bracket(s)**
  - **Fan Mounting Capscrews**
  - **Fan Hub Spindle**
  - **Flywheel**
  - **Flywheel Crankshaft Adapter**
  - **Flywheel Mounting Capscrews**
  - **Fuel Shutoff Assemblies**
  - **Fuel Supply Tubes**
  - **Lifting Brackets**
  - **Throttle Controls**
  - **Turbocharger Compressor Casing**
  - **Turbocharger Oil Drain Line(s)**
  - **Turbocharger Oil Supply Line(s)**
  - **Turbocharger Turbine Casing**
  - **Vibration Damper Mounting Capscrews**

- **Follow all safety instructions noted in the procedures**
  - — Follow the manufacturer's recommendations for cleaning solvents and other substances used during the repair of the engine. Some solvents and used engine oil have been identified by government agencies as toxic or carcinogenic. Avoid excessive breathing, ingestion and contact with such substances. **Always** use good safety practices with tools and equipment.
- **Provide a clean environment and follow the cleaning instructions specified in the procedures**
  - — The engine and its components **must** be kept clean during any repair. Contamination of the engine or components will cause premature wear.
- **Perform the inspections specified in the procedures**
- **Replace all components or assemblies which are damaged or worn beyond the specifications**
- **Use genuine Cummins new or ReCon® service parts and assemblies**
  - — The assembly instructions have been written to use again as many components and assemblies as possible. When it is necessary to replace a component or assembly, the procedure is based on the use of new Cummins or Cummins ReCon® components. All of the repair services described in this manual are available from all Cummins Distributors and most Dealer locations.
- **Follow the specified disassembly and assembly procedures to reduce the possibility of damage to the components**

Complete rebuild instructions are available in the shop manual which can be ordered or purchased from a Cummins Authorized Repair Location. Refer to Section L — Service Literature for ordering instructions.

Welding on a Vehicle with an Electronic Controlled Fuel System

△ CAUTION △

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

General Cleaning Instructions

Solvent and Acid Cleaning

Several solvent and acid-type cleaners can be used to clean the engine parts. Experience has shown that the best results can be obtained using a cleaner that can be heated to 90 to 95 degrees Celsius [180 to 200 degrees Fahrenheit]. A cleaning tank that provides a constant mixing and filtering of the cleaning solution will give the best results. **Cummins Inc. does not recommend any specific cleaners. Always** follow the cleaner manufacturer's instructions.

Remove all the gasket material, o-rings, and the deposits of sludge, carbon, etc., with a wire brush or scraper before putting the parts in a cleaning tank. Be careful **not** to damage any gasket surfaces. When possible, steam clean the parts before putting them in the cleaning tank.

⚠ WARNING ⚠

Acid is extremely dangerous and can cause personal injury and damage the machinery. Always provide a tank of strong soda water as a neutralizing agent. Wear goggles and protective clothing to reduce the possibility of serious personal injury.

Rinse all of the parts in hot water after cleaning. Dry completely with compressed air. Blow the rinse water from all of the capscrew holes and the oil drillings.

If the parts are **not** to be used immediately after cleaning, dip them in a suitable rustproofing compound. The rustproofing compound **must** be removed from the parts before installation on the engine.

Steam Cleaning

Steam cleaning can be used to remove all types of dirt that can contaminate the cleaning tank. It is a good way to clean the oil drillings.

⚠ WARNING ⚠

When using a steam cleaner, wear safety glasses or a face shield, as well as protective clothing. Hot steam can cause serious personal injury.

Do **not** steam clean the following parts:

1. Electrical Components
2. Wiring
3. Injectors
4. Fuel Pump
5. Belts and Hoses
6. Bearings
7. Electronic Control Module (ECM)
8. ECM Connectors

Glass or Plastic Bead Cleaning

Glass or plastic bead cleaning can be used on many engine components to remove carbon deposits. The cleaning process is controlled by the size of the glass or plastic beads, the operating pressure, and the cleaning time.

△ CAUTION △

Do not use glass or plastic bead cleaning on aluminum piston skirts. Do not use glass bead cleaning on aluminum ring grooves. Small particles of glass or plastic will embed in the aluminum and result in premature wear. Valves, turbocharger shafts, etc., can also be damaged. Follow the cleaning directions listed in the procedures.

NOTE: Plastic bead blasting media, Part No. 3822735, can be used to clean aluminum ring grooves. Do **not** use any bead blasting media on pin bores or aluminum skirts.

Follow the equipment manufacturer's cleaning instructions. The following guidelines can be used to adapt to manufacturer's instructions:

1. Bead size:
   a. Use U.S. size No. 16-20 for piston cleaning with plastic bead media, Part No. 3822735.
   b. Use U.S. size No. 70 for piston domes with glass media.
   c. Use U.S. size No. 60 for general purpose cleaning with glass media.
2. Operating Pressure:
   a. Glass: Use 620 kPa [90 psi] for general purpose cleaning.
   b. Plastic: Use 270 kPa [40 psi] for piston cleaning.
3. Steam clean or wash the parts with solvent to remove all of the foreign material and glass or plastic beads after cleaning. Rinse with hot water. Dry with compressed air.
4. Do **not** contaminate the wash tanks with glass or plastic beads.

Acronyms and Abbreviations

General Information

The following list contains some of the acronyms and abbreviations used in this manual.

API	American Petroleum Institute
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
EGR	Exhaust Gas Recirculation
EPA	Environmental Protection Agency
°F	Fahrenheit
FMI	Failure Mode Indentifier
GVW	Gross Vehicle Weight
LPG	Liquified Petroleum Gas
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
MPa	Megapascal
mph	Miles Per Hour
mpq	Miles Per Quart
N•m	Newton-meter
NG	Natural Gas
OEM	Original Equipment Manufacturer
PID	Parameter Identification Descriptions
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
SID	Subsystem Identification Descriptions
VS	Variable Speed
VSS	Vehicle Speed Sensor

NOTES

Section E - Engine and System Identification

Section Contents

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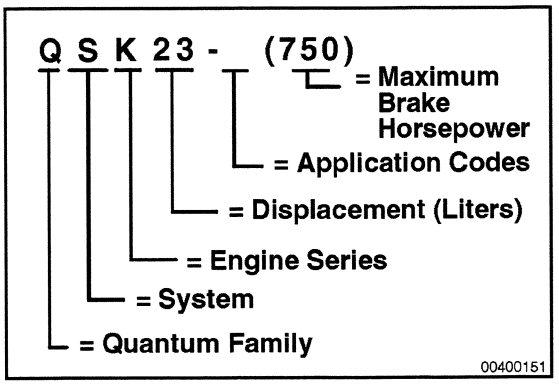
Engine Identification

Cummins Engine Nomenclature

The model name provides identification data for the engine. Refer to the illustration for the model name identification.



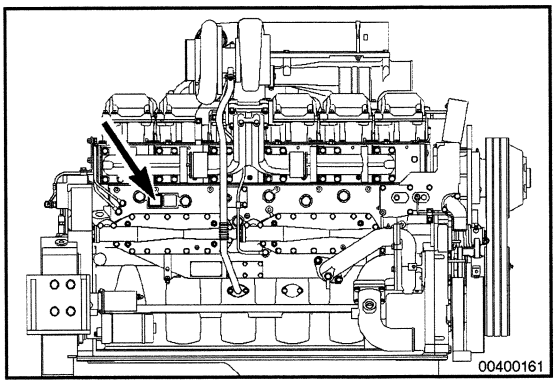
The applications codes are:

- A = Agricultural
- C = Construction
- D = Generator drive
- F = Fire pump
- G = Generator set
- L = Locomotive
- M = Marine
- P = Power unit
- R = Railcar
- T = Tactical military.

Engine Dataplate

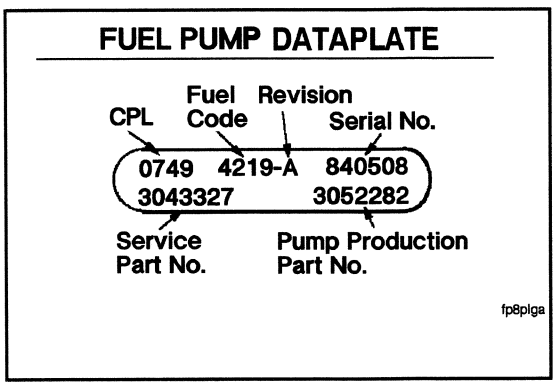
The engine dataplate shows specific information about the engine. The engine serial number (ESN), Control Parts List (CPL), model, horsepower and rpm ratings , and Environmental Protection Agency (EPA) information provide information for ordering parts and service needs.

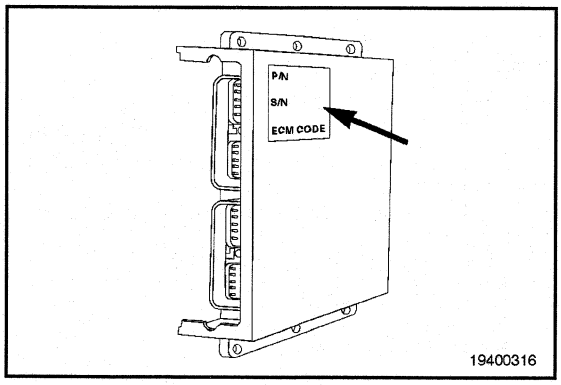
The engine dataplate **must not** be changed unless approved by Cummins Inc.



Fuel Pump Dataplate

The fuel pump dataplate is located on the top of the fuel pump. It provides information for fuel pump calibration.





ECM Dataplate

The external ECM dataplate is located on top of the ECM.

The dataplate contains the following:

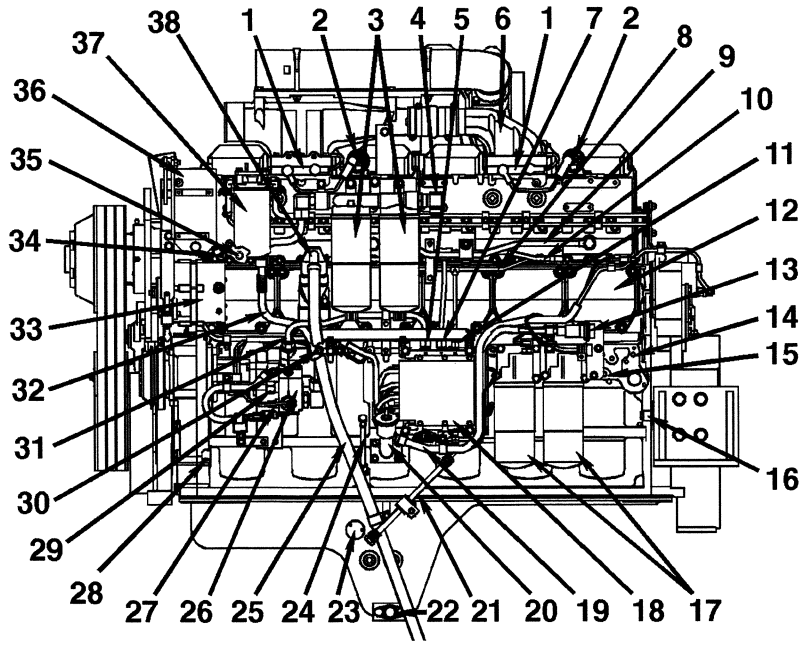
- ECM part number (P/N)
- ECM serial number (S/N)
- Manufacturer date code (D/C)
- Supplier identifier (S/I)
- Input voltage rating of the ECM (V/R).

The dataplate on the right contains engine and calibration information. This includes the engine serial number (ESN), ECM calibration date (Date), and ECM calibration code.

Engine Diagrams

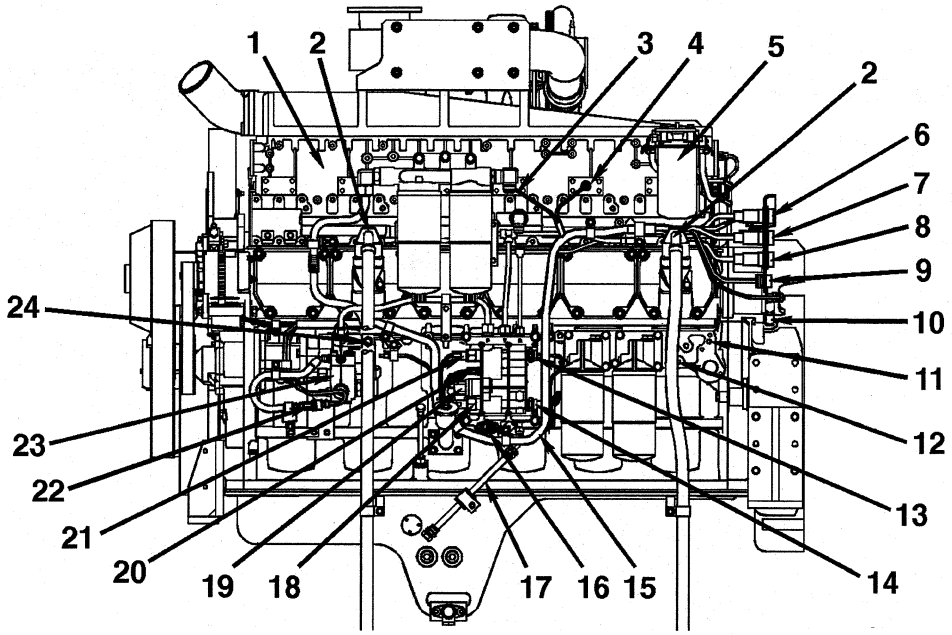
Engine Views

The illustrations show 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.



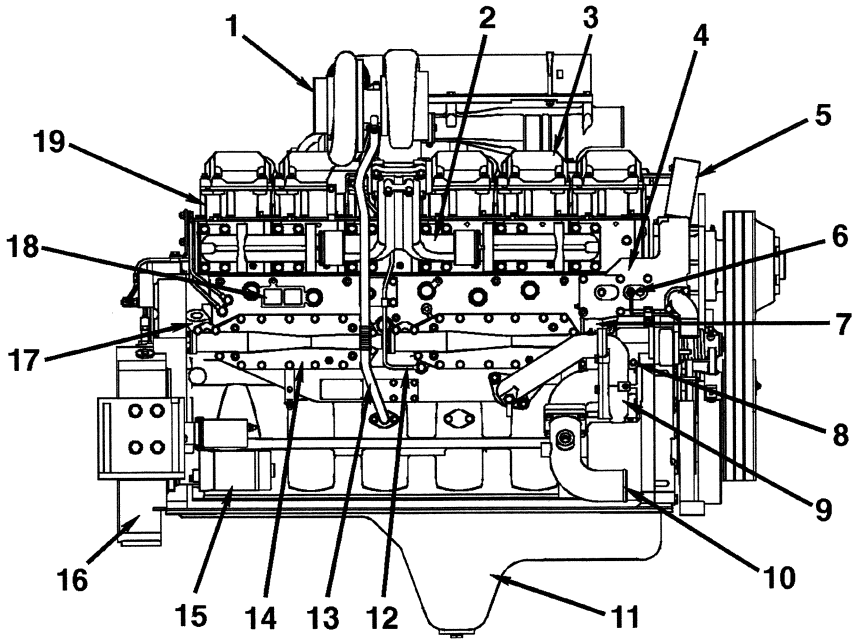
Left Side - Industrial

1. Grid heaters (Industrial **only**)
2. Grid heater relays (Industrial **only**)
3. Fuel filters
4. Fuel inlet (to filters)
5. Fuel inlet (to ECVA)
6. Air intake connection (Industrial **only**)
7. Fuel timing supply
8. Fuel pipe (to fuel rail)
9. Fuel pipe (return)
10. Fuel pipe (for injection timing)
11. Fuel rail supply
12. Cam follower cover
13. OEM electrical connections (Industrial **only**)
14. Oil pressure checkpoint (after filters)
15. Oil pressure checkpoint (before filters)
16. Engine barring device
17. Oil filters
18. ECVA/ECM
19. Wiring harness
20. Oil fill port
21. Fuel rail dampening hose
22. Engine oil drain valve
23. Oil level sensor (optional)
24. Dipstick
25. Blowby tube
26. Fuel pump
27. Fuel pump pressure sensor
28. Oil pressure check point (to front idler gears)
29. Fuel pump actuator
30. Oil pressure sensor
31. Fuel pipe (pump to ECVA)
32. Fuel pipe (filters to pump)
33. Alternator
34. Intake manifold pressure sensor (Industrial **only**)
35. Intake manifold temperature sensor (Industrial **only**)
36. Refrigerant compressor mounting location
37. Coolant filter (Industrial **only**)
38. Crankcase breather assembly.



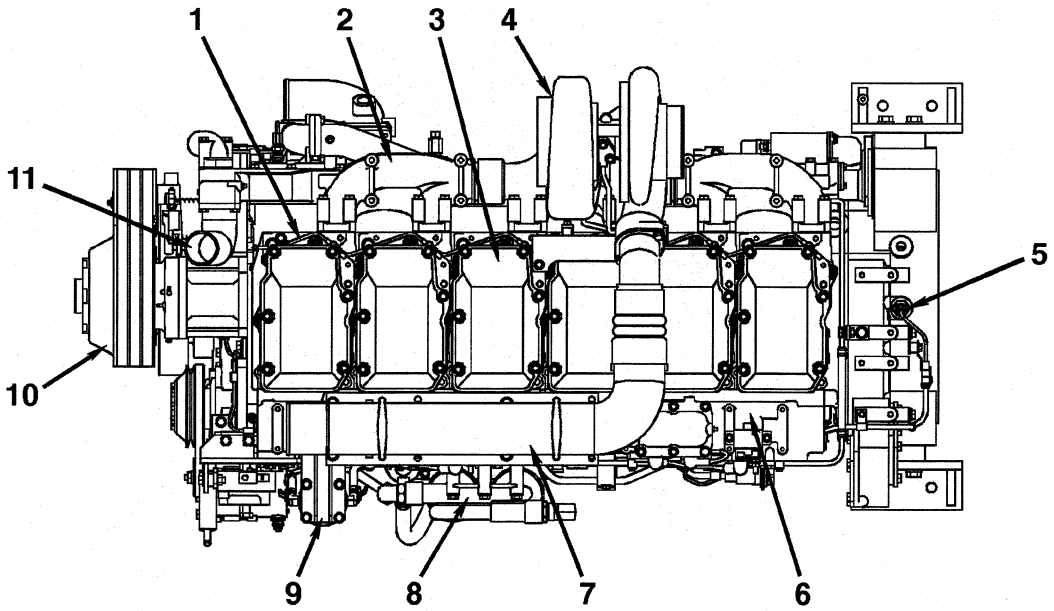
Left Side - Power Generation

1. Intake manifold (Power Generation **only**)
2. Crankcase breathers
3. Intake manifold pressure sensor (Power Generation **only**)
4. Intake manifold temperature sensor (Power Generation **only**)
5. Coolant filter (Power Generation **only**)
6. Inline B connector (Power Generation **only**)
7. Inline A connector (Power Generation **only**)
8. Inline C connector (Power Generation **only**)
9. Datalink connector (Power Generation **only**)
10. Engine speed sensor (Power Generation **only**)
11. Oil pressure checkpoint (after filters)
12. Oil pressure checkpoint (before filters)
13. Fuel timing pressure sensor
14. Fuel rail pressure sensor
15. Wiring harness
16. Barometric pressure sensor
17. Fuel rail dampening hose
18. Fuel rail actuator
19. Fuel shutoff valve
20. Fuel temperature sensor
21. Fuel timing actuator
22. Fuel pump pressure sensor
23. Fuel pump actuator
24. Oil pressure sensor.



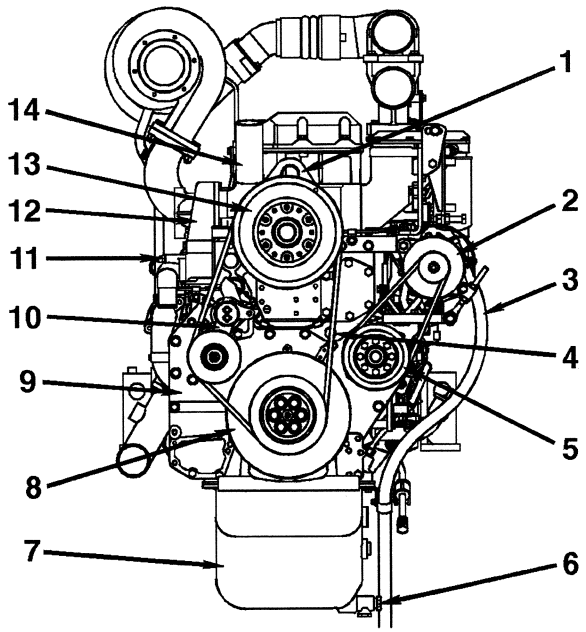
Right Side - Industrial and Power Generation

1. Turbocharger
2. Exhaust manifold (3-piece)
3. Rocker lever cover
4. Thermostat housing
5. Engine coolant outlet
6. Coolant temperature sensor
7. Coolant bypass tube
8. Oil pressure checkpoint (piston cooling nozzle gallery)
9. Water pump
10. Engine coolant inlet
11. Oil pan
12. Turbocharger oil supply line
13. Turbocharger oil drain line
14. Oil cooler housing
15. Starter
16. Flywheel housing
17. Oil pressure checkpoint (after oil coolers)
18. Engine dataplate
19. Rocker lever housing.



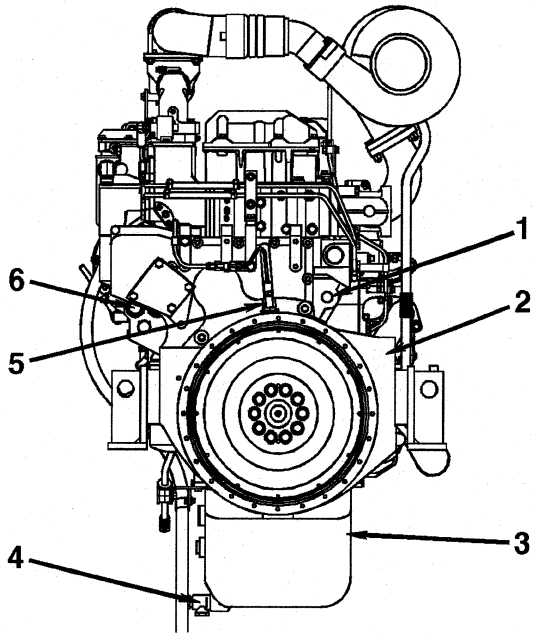
Top View - Industrial and Power Generation

1. Coolant vent tube
2. Exhaust manifold
3. Rocker lever cover
4. Turbocharger
5. Engine speed sensor (Industrial **only**)
6. Intake manifold
7. Charge air piping (turbocharger to CAC)
8. Fuel filter head
9. Coolant filter head (Industrial **only**)
10. Fan hub assembly
11. Engine coolant outlet.



Front View - Industrial and Power Generation

1. Front engine lifting bracket
2. Alternator
3. Blowby tube
4. Cooling fan drive belt
5. Drive pulley (for alternator and refrigerant compressor)
6. Oil drain valve
7. Oil pan
8. Vibration damper
9. Front gear cover
10. Cooling fan belt tensioner (Industrial **only**)
11. Coolant temperature sensor
12. Thermostat housing
13. Fan hub assembly
14. Engine coolant outlet.



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Rear View - Industrial and Power Generation

1. Oil pressure checkpoint (after oil coolers)
2. Flywheel housing
3. Oil pan
4. Engine oil drain valve
5. Engine speed sensor (Industrial **only**)
6. OEM electrical connections (Industrial **only**).

Section FB - Industrial Features

Section Contents

Page

Intermediate Speed Control (ISC)

Feature Description

Industrial applications use an engine speed control feature called Intermediate Speed Control.

Up to three Intermediate Speed Control Set Speeds (1, 2, or 3) can be selected depending on Original Equipment Manufacturer (OEM) availability. To support this feature, a multi-position switch, or three toggle switches **must** be installed by the OEM.

Additionally, up to five Variable Intermediate Speed Control Set speeds (1, 2, 3, 4, or 5) can be selected and the operator can select these speeds using an OEM installed accelerator lever.

The Intermediate Speed Control set speeds will interact with the accelerator pedal in one of three different ways (modes A, B and C); the interaction between Intermediate Speed Control set speeds and the accelerator pedal is **not** adjustable, this interaction is determined by the OEM and built into the ECM calibration.

Mode A - Intermediate Speed Control set speed acts as low speed governor. In this mode, the Intermediate Speed Control set speed becomes the Minimum Engine Speed. The operator can use the accelerator pedal to increase the speed above the Intermediate Speed Control set speed.

Mode B - Intermediate Speed Control set speed acts as high speed governor. In this mode, the Intermediate Speed Control set speed becomes the Maximum Engine Speed. The operator can use the accelerator pedal to control engine speed up to the Intermediate Speed Control set speed.

Mode C - Intermediate Speed Control Constant Speed. In this mode, the Intermediate Speed Control runs at constant speed and accelerator pedal input is ignored.

The three Preset Intermediate Speed Control speeds can be adjusted with an increment or decrement switch and are INSITE™ service tool adjustable, but can **not** exceed the low or high idle governor engine speed limits.

The five Intermediate Speed Control Variable Speed Control set speeds are **not** adjustable with the increment or decrement switch, but are adjustable with the INSITE™ service tool.

Only one droop setting is available for all Intermediate Speed Control speeds.

One of the switch inputs can be used as a validation input (if used, the ECM pin for Intermediate Speed Control 3 will be used). If this is the case, the ECM calibration will use the ECM pin used for Intermediate Speed Control 3 as a validation input and **only** 2 Intermediate Speed Control speeds will be available while the five variable Intermediate Speed Control inputs will **not** be available.

If more than one Intermediate Speed Control switches is turned ON; the lowest speed turned ON will take priority.

Adjustable Parameters

Name: Intermediate Speed Control Droop
Range: Varies for engine platforms (typically 0 to 17 percent)
Description: A smaller value results in a governor droop with steeper slope.
Name: Switched Set Speed 1
Range: Idle Speed - Maximum Governor Speed (Varies by Calibration)
Description: Engine Speed corresponding to the first Intermediate Speed Control set switch.
Name: Switched Set Speed 2
Range: Idle Speed - Maximum Governor Speed (Varies by Calibration)
Description: Engine Speed corresponding to the second Intermediate Speed Control set switch.
Name: Switched Set Speed 3
Range: Idle Speed - Maximum Governor Speed (Varies by Calibration)
Description: Engine Speed corresponding to the third Intermediate Speed Control set switch.
Name: Variable Speed Set Point 1
Range: Idle Speed - Maximum Governor Speed (Varies by Calibration)
Description: This is the first variable set speed that can be set by the operator using the Accelerator Lever supplied by the OEM.
Name: Variable Speed Set Point 2
Range: Idle Speed - Maximum Governor Speed (Varies by Calibration)
Description: This is the second variable set speed that can be set by the operator using the Accelerator Lever supplied by the OEM.
Name: Variable Speed Set Point 3
Range: Idle Speed - Maximum Governor Speed (Varies by Calibration)
Description: This is the third variable set speed that can be set by the operator using the Accelerator Lever supplied by the OEM.
Name: Variable Speed Set Point 4
Range: Idle Speed - Maximum Governor Speed (Varies by Calibration)
Description: This is the fourth variable set speed that can be set by the operator using the Accelerator Lever supplied by the OEM.
Name: Variable Speed Set Point 5
Range: Idle Speed - Maximum Governor Speed (Varies by Calibration)

Description: This is the fifth variable set speed that can be set by the operator using the Accelerator Lever supplied by the OEM.

Driver Activation/Deactivation

Using the Intermediate Speed Control Switched Set Speeds

The operator can operate the engine using the Intermediate Speed Control Set Speeds with OEM installed Intermediate Speed Control Switches, or an equivalent OEM installed device. Activating Intermediate Speed Control can or can **not** cause Accelerator Pedal inputs to be ignored.

Using the Intermediate Speed Control Variable Speed Set Points

The operator can operate the engine using the Intermediate Speed Control Variable Speeds; Intermediate Speed Control Variable Speeds are selected with an Accelerator Lever or an equivalent switching device that is installed by the OEM. This device can contain a potentiometer that sends a variable signal to the ECM. Based on the output of the potentiometer, the engine will be controlled to one of five Intermediate Speed Control Variable Speeds. Refer to the figure below for visual reference. It is recommended that all five speeds be chosen and entered in a sequential order so that as the operator increases the position of the hand throttle, the engine speed will change accordingly.

Interaction with other Features and Parameters

Intermediate Speed Control and Cruise Control can **not** be active at the same time. If the cruise control on/off switch is on, then Intermediate Speed Control is disabled. If the cruise on/off switch is off then Intermediate Speed Control will remain off until an Intermediate Speed Control switch transitions from off to on.

Remote Throttle and Variable Speed Intermediate Speed Control **must not** both be used on the same engine.

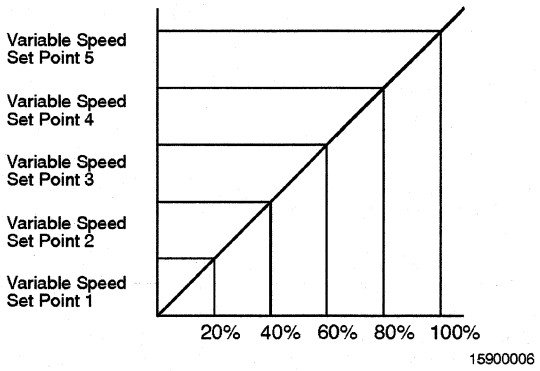
Special Instructions

If the engine surges under load while using Intermediate Speed Control, try increasing the droop of the Intermediate Speed Control.

Disadvantages

Using the service tool, it is **not** possible to display the interaction between Intermediate Speed Control and the throttle pedal.

Visual Aids



Percent Throttle

Alternate Droop

Feature Description

Alternate Droop allows the droop characteristics to be changed for the automotive (minimum or maximum) and for Variable Speed (VS) governor or All Speed Governor. In general less governor droop (lower percentage) provides a more responsive governor for more precise engine control. More governor droop (higher percentage) provides smoother shifting and smoother mechanical clutch engagement. This feature, depending on Original Equipment Manufacturer (OEM) availability, provides the user the ability to select multiple breakpoint speeds and the droops associated with those speeds by way of an OEM-provided switch.

Adjustable Parameters

Name: Alternate Droop (CELECT™ Plus **Only**)
Range: Enable

Description: Allows the user to enable the use of two additional droop settings to control engine speed more precisely with changing engine loads. Typically there is a multi-position switch and the user can specify alternate droop settings for switch positions 2 and 3. If a user adjustable switch is **not** used the switch positions are controlled by an external devise on the vehicle.
Name: Alternate Droop Switch Type
Range: 1 to 3
Description: This value indicates the number of positions the Alternate Droop Switch has.
Name: Breakpoint 1 Speed
Range: 1400 to 1900 rpm (Varies by engine calibration)
Description: The engine speed at which Droop at Breakpoint 1 activates during normal engine operating condition.
Name: Droop at Breakpoint 1
Range: 0 to 5 Percent
Description: The percentage of droop at Breakpoint 1 Speed. The lower the value the more precise engine speed control the operator will have and the more isochronous the droop. A higher value will provide smoother shifting and mechanical clutch engagement and less isochronous droop.
Name: Droop Slope 1
Range: 0 to 100 Percent
Description: The slope value that defines the droop line for the High Speed Governor reference speed. Your Cummins Service representative **must** be contacted before adjusting this parameter.
Name: Isochronous Breakpoint Speed
Range: 1400 to 1900 rpm (Varies by engine calibration)
Description: QSM11, QSX15, and CELECT™ Plus Industrial support this adjustable parameter. Sets the isochronous breakpoint speed in terms of rpm. When the engine reaches this rpm while on the droop curve the governor will act as an isochronous governor or a governor without droop.
Name: Droop at Maximum Throttle
Range: 0 to 5 Percent
Description: The percentage of droop at maximum throttle position.
Name: Droop at Minimum Throttle
Range: 0 to 5 Percent
Description: The percentage of droop at minimum throttle position.
Name: Breakpoint 2 Speed
Range: 1400 to 1900 rpm (Varies by engine calibration)
Description: The engine speed at which Droop at Breakpoint 2 activates during normal engine operating condition. Alternate Droop Switch **must** be in the correct (depending on type of switch) position for this droop setting to activate.
Name: Droop at Breakpoint 2 (Percent Droop at Breakpoint 2, CELECT™ Plus **Only**)
Range: 0 to 5 Percent
Description: The percentage of droop at Breakpoint 2 Speed. The lower the value the more precise engine speed control the operator will have and the more isochronous the droop. A higher value will provide smoother shifting and mechanical clutch engagement and less isochronous droop. Alternate Droop Switch **must** be in the correct (depending on type of switch) position for this droop setting to activate.
Name: Droop Slope 2
Range: 0 to 100 Percent
Description: The slope value that defines the droop line for the High Speed Governor reference speed. Your Cummins Service representative **must** be contacted before adjusting this parameter.
Name: Isochronous Breakpoint Speed 2
Range: 1400 to 1900 rpm (Varies by engine calibration)
Description: QSM11, QSX15, and CELECT™ Plus Industrial support this adjustable parameter. Sets the isochronous breakpoint speed in terms of rpm. When the engine reaches this rpm while on the droop curve the governor will act as an isochronous governor or a governor without droop. Alternate Droop Switch **must** be in the correct (depending on type of switch) position for this droop setting to activate.
Name: Alternate Droop 2 Isochronous High Idle (CELECT™ Plus **Only**)
Range: 1400 to 1900 rpm (Varies by engine calibration)
Description: Sets the Isochronous high idle breakpoint speed in terms of rpm. When the engine reaches this rpm while on the droop curve the governor will act as an Isochronous governor or a governor without droop.
Name: Droop at Maximum Throttle 2 (Alternate Droop 2 Maximum Throttle, CELECT™ Plus **Only**)
Range: 0 to 5 Percent
Description: The percentage of droop at maximum throttle position.
Name: Droop at Minimum Throttle 2 (Alternate Droop 2 Minimum Throttle, CELECT™ Plus **Only**)
Range: 0 to 5 Percent
Description: The percentage of droop at minimum throttle position.
Name: Breakpoint 3 Speed
Range: 1400 to 1900 rpm (Varies by engine calibration)
Description: The engine speed at which Droop at Breakpoint 3 activates during normal engine operating condition. Alternate Droop Switch **must** be in the correct (depending on type of switch) position for this droop setting to activate.
Name: Droop at Breakpoint 3 (Percent Droop at Breakpoint 3, CELECT™ Plus **Only**)
Range: 0 to 5 Percent

Description: The percentage of droop at Breakpoint 3 Speed. The lower the value the more precise engine speed control the operator will have and the more isochronous the droop. A higher value will provide smoother shifting and mechanical clutch engagement and less isochronous droop. Alternate Droop Switch **must** be in the correct (depending on type of switch) position for this droop setting to activate.
Name: Droop Slope 3
Range: 0 to 100 Percent
Description: The slope value that defines the droop line for the High Speed Governor reference speed. Your Cummins Service representative **must** be contacted before adjusting this parameter.
Name: Isochronous Breakpoint Speed 3
Range: 1400 to 1900 rpm (Varies by engine calibration)
Description: QSM11, QSX15, and CELECT™ Plus Industrial support this adjustable parameter. Sets the isochronous breakpoint speed in terms of rpm. When the engine reaches this rpm while on the droop curve the governor will act as an isochronous governor or a governor without droop. Alternate Droop Switch **must** be in the correct (depending on type of switch) position for this droop setting to activate.
Name: Alternate Droop 3 Isochronous High Idle (CELECT™ Plus **Only**)
Range: 1400 to 1900 rpm (Varies by engine calibration)
Description: Sets the Isochronous high idle breakpoint speed in terms of rpm. When the engine reaches this rpm while on the droop curve the governor will act as an Isochronous governor or a governor without droop.
Name: Droop at Maximum Throttle 3 (Alternate Droop 3 Maximum Throttle, CELECT™ Plus **Only**)
Range: 0 to 5 Percent
Description: The percentage of droop at maximum throttle position.
Name: Droop at Minimum Throttle 3 (Alternate Droop 3 Minimum Throttle, CELECT™ Plus **Only**)
Range: 0 to 5 Percent
Description: The percentage of droop at minimum throttle position.
Name: Jcomm Droop
Range: 0 to 30 Percent
Description: Jcomm Droop is a droop that is used by the engine while the engine is controlled by another device like the transmission or an external electronic control unit.

Driver Activation/Deactivation

Alternate Droop is calibration activated (except for CELECT™ Plus), but uses a switch to toggle between the alternate droop settings. Depending on the application the alternate droop switch can be a 2 or 3 position switch. Toggling the switch into the 2nd and 3rd positions will activate the 2nd and 3rd droop settings accordingly.

Interaction with other Features and Parameters

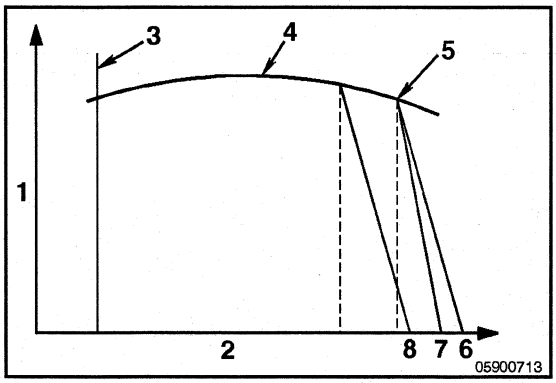
The Vehicle Speed Droop feature uses the droop settings for this feature.

Special Instructions

An Original Equipment Manufacturer (OEM) provided switch **must** be available for this feature to work properly.

Disadvantages

- Driver complains of low power.
- Driver complains of poor or unexpected throttle reaction.



Visual Aids

1. Torque
2. Engine Speed (RPM)
3. Low Idle Speed
4. Maximum Torque Curve
5. High speed Break Point
6. Normal Droop
7. Alternate Droop
8. Alternate Droop (available)

Switchable (Alternate) Torque

Feature Description

Switchable (Alternate) Torque provides derated torque curves other than the 100 percent torque curve. These torque curves are normally used to help limit the torque output of the engine and helps to protect driveline components such as axles and transmissions and in some cases can help protect the engine from damage.

Adjustable Parameters

Name: Switchable (Alternate) Torque
Range: Enable
Description: Enables the feature and the Electronic Control Module (ECM) will accept a switch to toggle between the torque curves.

Driver Activation/Deactivation

The operator can activate or deactivate the alternate torque curves through an OEM supplied switch.

Interaction with other Features and Parameters

None

Special Instructions

Once the feature is enabled a switch **must** be wired into the module for the feature to work properly.

Disadvantages

Possible operator complaints of low power

Visual Aids

None

Auxiliary Governor

Feature Description

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

The auxiliary governor uses a throttle input that is scaled to the auxiliary speed governor minimum rpm (0 percent throttle) and the auxiliary speed governor maximum rpm (100 percent throttle). The auxiliary speed governor reference speed/auxiliary speed governor reference pressure, determined by the throttle position, is the desired auxiliary speed/pressure. The auxiliary governor algorithm will then control engine speed to match the actual auxiliary speed/ pressure from the auxiliary device to the auxiliary speed governor reference speed/pressure.

INSITE™ can be used to monitor the auxiliary governor switch position, the auxiliary governor type (speed or pressure), and the auxiliary governor reference speed or the auxiliary governor reference pressure.

Adjustable Parameters

Name: Number of Teeth
Range: N/A
Description: Number of teeth per revolution of the shaft
Name: Ramp Rate
Range: N/A
Description: RPM rate at which the output shaft increases after the auxiliary governor is engaged.
Name: Maximum RPM
Range: N/A
Description: The maximum governed rpm of the output shaft.
Name: Minimum RPM
Range: N/A
Description: The minimum governed rpm of the output shaft.
Name: Upper Threshold RPM
Range: N/A
Description: RPM threshold above which a fault is logged.
Name: Lower Threshold RPM
Range: N/A
Description: RPM threshold below which a fault is logged.
Name: Low Speed Fault Ignore Timer
Range: N/A
Description: Time which **must** expire before logging low rpm faults.

Driver Activation/Deactivation

When the auxiliary governor is enabled and the auxiliary governor switch is moved to the ON position, the fueling of the engine will be based upon the governed speed of the output shaft, **not** of the engine speed.

Interaction with other Features and Parameters

None

Special Instructions

None

Disadvantages

None

Visual Aids

None

Automatic Boost Power

Feature Description

Boost Power is a torque curve that is calibrated for a higher torque/horsepower than the normal engine rating and is available on QSB, QSC, CELECT™ Plus, QSM11, QSX15, QSK19, QSK45, and QSK60 industrial engines. The Electronic Control Module (ECM) will monitor engine speed, intake manifold temperature, and coolant temperature to determine if Boost Power can be activated. If Boost Power is available, the operator can activate Boost Power using a dash-mounted switch. The engine will switch to the higher torque curve or power rating for a limited period of time. The higher torque curve or power rating is calibrated for an intermittent or non-continuous torque or power rating which is higher than the normal torque or power rating for the engine. Boost power is **not** available if coolant temperature or intake manifold temperatures are above calibrated thresholds. If engine speed is below a calibrated threshold, then Boost Power will **not** be time limited.

Automatic Boost Power will provide the operator with enhanced torque or power for a fraction of the operating period. The ECM will monitor engine speed, intake manifold temperature, percent load, and coolant temperature to determine if automatic Boost Power can be activated. If automatic Boost Power is available, the engine will switch to the enhanced torque or power rating for a limited period of time. The Original Equipment Manufacturer (OEM) equipment users manual will document the time periods that automatic Boost Power is available, since it is application specific. Automatic Boost Power is **not** available if coolant temperature or intake manifold temperatures are above calibrated thresholds. If engine speed or percent load is below a calibrated threshold, automatic Boost Power will **not** be available. If coolant temperature or intake manifold temperature rise above calibrated threshold, then automatic Boost Power will be deactivated. Automatic Boost Power is available on QSB, QSC, QSM11, and QSX15 industrial engines.

Adjustable Parameters

Name: Boost Power
Range: Enable
Description: This enables the Boost Power feature and makes Boost Power available for the operator.
Name: Automatic Boost Power
Range: Enable
Description: This enables the automatic Boost Power feature and makes automatic Boost Power available for the operator.

Driver Activation/Deactivation

To activate Boost Power, the operator **must** turn on a dash-mounted switch. To deactivate Boost Power, the operator **must** turn the switch off. Boost power will engage if the engine operating conditions are There is no operator interaction to activate or deactivate automatic Boost Power.

Interaction with other Features and Parameters

Boost power **must** be enabled in order to enable automatic Boost Power.

Special Instructions

Some OEM applications will have a Boost Power lamp that comes on while Boost Power is active and will flash as Boost Power nears the time limit that it is available. The availability of this feature is dependent on the individual OEM application.

Disadvantages

A possible customer complaint associated with this feature will be intermittent low power.

Boost Power **must not** engage due to the Boost Power load threshold is set above the highest load experienced during normal engine operation

Visual Aids

None

Fan Control

Feature Description

Various fan control features are available and while **not** all aspects of fan control are available on all engines, most (but **not** all) electronic controlled engines have some Electronic Control Module (ECM) fan control capability.

Fan control capability means that the ECM is able to turn the fan on or off in response to any of the following inputs:

Engine operating conditions (coolant temperature, intake manifold temperature, etc.)

Control of fan overspeed

Air conditioner operation

Manual fan switch

Engine performance requirements (Example: engine braking)

NOTE: Many Industrial engines have fan controls as part of the ECM calibration that can **not** be adjusted using the service tool.

Adjustable Parameters

Name: Fan Control
Range: Enable or Disable
Enables the fan clutch to be controlled electronically, reducing fuel consumption by minimizing fan on time and lengthening belt life by eliminating belt hop and slippage.
Name: Fan Type
Range: ON/Off or High/Low/Off or Variable Speed
Description: The ECM will send a signal to the fan actuator according to the type of fan that is selected using Cummins INSITE™ Service Tool. If the fan controls are installed by the OEM and are **not** controlled by the engine ECM, then the fan will **not** respond to any of these choices.

- On/Off: Most ECM controlled fans are classified as On/Off fans. Many of these fans have a clutch that is air actuated. The fan clutch is either completely engaged or completely disengaged. These fans can also be called two-speed fans.
- High/Low/Off: This type fan can also be called a three-speed fan. Its purpose is to run at a low speed when possible for lower noise and power loss.
- Variable Speed: This type fan can vary the speed as required in an attempt to have lowest noise and power loss.

Some engines such as the ISB and ISC will **not** be able to utilize a variable speed fan if the Pulse Width Modulation pin is being used to send a kick-down signal to an automatic transmission. Contact your Cummins Customer Support representative for help with this interaction. **Not** all ECMs support Pulse Width Modulation control so this aspect of the fan control feature is **not** supported. Refer to special instructions for more information.

Name: Drive Ratio
Range: Varies with engine product
Description: This is the ratio of the fan pulley revolutions in comparison to crankshaft pulley revolutions (Example: a drive ratio of 1.2 designates a fan pulley that is smaller than the crankshaft pulley resulting in 1.2 fan revolutions for every crankshaft revolution). The reason for entering a drive ratio is to allow the ECM to calculate fan speed. Next, the ECM can turn the fan off if the maximum fan speed is exceeded (refer to the vehicle manufacturer or fan manufacturer recommendations).
Name: Maximum Fan Speed
Range: Varies with engine product
Description: This value is entered by the vehicle manufacturer (refer to the vehicle manufacturer or fan manufacturer recommendations). This is the maximum speed for the fan. The ECM will **not** allow the fan to remain engaged above this fan speed. It is necessary that the correct fan drive ratio be entered (entered separately) for this aspect of the fan control to work properly.
Name: Air Conditioner Speed Control
Range: Enable or Disable
Description: This feature enables the fan to run continuously when vehicle speed is between zero and six miles per hour with the air conditioner pressure switch requesting the fan be turned on. If this feature is enabled and the air conditioner pressure switch causes the fan to turn on, the fan will remain engaged until vehicle speed exceeds six miles per hour. When the vehicle speed is between six and 30 miles per hour, the fan will run for at least the time specified by minimum fan on time for air conditioner in response to the air conditioner pressure switch. Above 30 mile per hour the fan will turn on for the minimum fan on time for air conditioner regardless of the request from the air conditioner pressure switch.

Name: Fan on During Engine Brake
Range: Enable or Disable
Description: With this feature enabled, the ECM will turn on the fan with the engine brakes. This is typically calibrated to occur with extended brake operation **only**. (Example: Most ISX calibrations will activate the fan if the engine brakes are held on for more than 15 seconds). The purpose of this feature is to provide extra parasitic load during periods of extended engine braking.

NOTE: With this feature enabled, some engine families like the ISB and ISC will cause the engine fan to come on immediately when the exhaust brake is enabled, while heavy duty engines have a built in delay that causes the fan to come on sometime after the engine brakes are activated.

Name: Minimum Fan On Time for Air Conditioner Pressure Switch
Range: Varies with engine product
Description: This parameter defines the minimum time that the fan will operate in response to the air conditioner pressure switch. The purpose of this parameter is to reduce fan cycling.
Name: Manual Fan Switch
Range: Enable or Disable
Description: This allows the ECM to respond to a manual fan switch installed in the cab by the vehicle manufacturer. With this feature enabled a vehicle operator can turn the fan on regardless of operating conditions.
Name: Air Conditioner Pressure Switch Controls Fan
Range: Enable or Disable
Description: Enabling this parameter allows the ECM to respond to an air conditioner pressure switch installed by the vehicle manufacturer. With this feature enabled the ECM will turn on the fan in response to signals from the air conditioner pressure switch.
Name: Pulse Width Modulation Frequency
Range: Varies with engine product
Description: This value **must** be entered by the vehicle manufacturer and describes the Pulse Width Modulation frequency required by the fan. This value is used by Variable Speed Fans. **Not** all ECMs support Pulse Width Modulation control so this aspect of the fan control feature is **not** supported. Refer to special instructions for more information.
Name: Fan Clutch Logic
Range: 12 Volts Fan ON or Zero Volts Fan ON
Description: This value is chosen by the vehicle manufacturer and customizes the ECM fan output signal to work with Zero Volt ON or 12 Volt ON fan solenoids.

NOTE: Most electronic Cummins Engines operate Zero Volts = Fan ON and do **not** have this parameter available. This parameter is intended to be used with ON/OFF fans.

△ CAUTION △

If the fan clutch logic is not set correctly, the ECM will not be able to engage the fan for engine cooling and engine protection. Engine can over heat and damage is possible.

- 12 Volts Fan ON - The ECM Fan Output will be 12 Volts whenever the ECM detects that the fan **must** be ON
- 0 Volts Fan ON - The ECM Fan Output will be 0 Volts whenever the ECM detects that the fan **must** be ON

Name: Fan Clutch 2 Enable
Range: Enable or Disable
Description: Some engines have the capability to support two fans with separate fan drivers in the ECM. The vehicle manufacturer can enable this parameter.
Name: Electronic Fan Clutch (QSM **Only**)
Range: Enable or Disable
Description: Enables the fan clutch to be controlled electronically, reducing fuel consumption by minimizing fan on time and lengthening belt life by eliminating belt hop and slippage.

Driver Activation/Deactivation

The driver can override the ECM to turn the fan on, using the manual fan switch installed in the cab by the vehicle manufacturer. When the driver places the manual fan switch in the ON position, the fan will be on regardless of other engine operating conditions. When the manual fan switch is in the OFF position, the fan will operate according to engine operating conditions and according to how the fan control parameters are configured.

Interaction with other Features and Parameters

ISB and ISC have a single pin on the ECM that provides Pulse Width Modulation. This pin can be used to send a kick-down signal to an automatic transmission, in which case it **must not** be used to operate a variable speed fan.

Special Instructions

△ CAUTION △

If the fan clutch logic is not set correctly, the ECM will not be able to engage the fan for engine cooling and engine protection. Engine can over heat and damage is possible.

When troubleshooting a fan that will **not** come on. First make sure that the correct type fan is selected.

Most heavy-duty trucks utilize ON/OFF air actuated fans.
Many Bus and Recreation Vehicles utilize hydraulically driven fans that are **not** controlled by the engine ECM. Verify system wiring.
Does the fan clutch require 12 Volts or 0 Volts to turn ON
Is the ECM fan clutch driver wired directly to the fan clutch or is there a relay in-between?
If the fan is on all the time, make sure that the OEM installed air conditioner pressure switch or manual fan switch is **not** failed.
Make sure that the OEM installed fan clutch solenoid is grounded. If the solenoid grounds through the body of the fan solenoid, it will be necessary to remove the solenoid and clean the mounting surface of any paint or corrosion.

ISB: First ECM part number to support variable speed fan was 3944124

ISC: First ECM part number to support variable speed fan was 3944125

Disadvantages

Due to heat rejection, the fan on during engine braking feature will appear inconsistent to some vehicle operators (Example: Consider an ISX calibration setting that the fan will engage 15 seconds after engine braking starts. It will be possible for the fan to sometimes come on sooner in response to air intake temperatures, coolant temperatures, or the air conditioner pressure switch).

Visual Aids

1. Fan Type
2. Drive Ratio
3. Maximum Fan Speed
4. Air Conditioner Speed Control
5. Fan On During Engine Braking
6. Minimum Fan On Time for Air Conditioner Pressure Switch
7. Manual Fan Switch
8. Air Conditioner Pressure Switch
9. Pulse Width Modulation Frequency
10. Clutch Logic
11. Fan Clutch 2 Enable

Hot Shutdown Monitor

Feature Description

The Hot Shutdown Monitor will log a fault in the Electronic Control Module (ECM) if the engine is shutdown, either by the key switch or by the engine protection feature or other Original Equipment Manufacturer (OEM) devices, while still hot. The engine is considered hot if the load on the engine is above the hot shutdown minimum load set by Cummins INSITE™ service tool. Hot shutdown monitor is available on QSB, QSC, QS9, QSM11, QSX15, QST30, QSK19, QSK45, and QSK60 industrial engines.

For example: If the hot shutdown load percent is set at 60 percent, every time the engine is shut down when the calculated engine load is over 60 percent, a hot shutdown fault will be logged. There are two fault codes associated with hot shut down monitor.

Fault Code 299 will be logged if the engine is shutdown while hot by the engine protection feature or other OEM devices. Fault Code 611 will be logged if the engine is shut down while hot by the key switch. The hot shutdown load percent is based on the duty cycle load factor that is determined from engine fueling levels.

Adjustable Parameters

Name: Hot Shutdown Load Percent
Range: 50 to 150 Percent
Description: Setting this parameter will determine at what load percent a hot shutdown fault will be logged. Setting it to 150 percent will effectively disable logging any faults, since it is very unlikely that engine loads up to 150 percent will ever be seen. Setting it lower than 100 percent will indicate when the engine is shutdown when engine load is above the set point.

Driver Activation/Deactivation

There is no operator activation or deactivation for hot shutdown monitor.

Interaction with other Features and Parameters

The engine protection shutdown **must** be enabled for hot shutdown monitor to log Fault Code 299 as a result of engine protection shutting the engine down. Fault Code 299 will still be logged if the engine is shut down by an OEM device and engine protection is **not** enabled.

Special Instructions

None

Disadvantages

None

Visual Aids

None

Idle Shutdown

Feature Description

The idle shutdown feature reduces the amount of fuel burned and increases engine life by shutting down the engine after a period of engine idling with no driver activity. Before the shutdown will occur a flashing warning lamp will warn the driver of an impending shutdown. The driver can override the shutdown by depressing the service brake, clutch or accelerator pedal during the warning period. This activity will override the idle shutdown. Idle shutdown operates when the engine is in the Power TakeOff (PTO) mode unless a specific load threshold is exceeded. Idle shutdown can be automatically overridden during cold ambient temperatures if equipped with an OEM supplied ambient air temperature sensor.

The following table indicates when manual and automatic overrides are available.

Adjustable Parameters

Name: Idle Shutdown
Range: Enable or Disable
Description: This parameter turns the feature on in the ECM.
Name: Manual Override
Range: Enable or Disable
Description: This parameter allows the idle shutdown to be overridden during a pending shutdown period. If an OEM supplied ambient air temperature sensor is available this parameter will **not** allow manual override during outside air temperatures where heating or cooling is **not** required. To override the automatic shutdown the driver will need to activate the service brake, clutch or accelerator pedal during the 30 second period prior to shutdown. 30 seconds prior to shutdown a flashing warning lamp will notify the driver of the impending shutdown. This action will override idle shutdown. If the override is successful the warning lamp will flash every half-second for two minutes. If this parameter is disabled the operator can still reset the idle shutdown timer by activating the service brake, clutch or accelerator pedal during the idle shutdown time period. This action will cause the idle shutdown time period to be reset to zero. Once the idle condition is detected the idle shutdown time period will began again.
Name: In PTO (**Not** used by Gas Plus)
Range: Enable or Disable
Description: This parameter allows idle shutdown when PTO mode is engaged and the percent loading on the engine is below a threshold set by the Idle Shutdown Percent Load parameter.
Name: Time Before Shutdown
Range: 1 to 1,440 Minutes (Default 60 Minutes) for ISX, ISM and Signature and 1 to 100 Minutes for Midrange
Description: The number of minutes allowed before the engine is shutdown. The idle shutdown time begins once the engine reaches idle speed with or without PTO (or remote PTO) mode turned on. The ISB and ISC engines allow a range from 1 to 110 minutes.
Name: Shutdown Percent Engine Load (**Not** used by Gas Plus)
Range: 1 to 100 Percent
Description: The percent engine load threshold that is required when in PTO mode to keep the engine from being shutdown by the idle shutdown feature. If this threshold is **not** exceeded the engine will be shutdown.
Name: Ambient Temperature Override (**Not** used by Gas Plus)
Range: Enable or Disable
Description: This parameter overrides the automatic idle shutdown when the outside air temperature is below the cold air temperature threshold. This allows for heating of the vehicle cab during cold temperatures. An OEM supplied ambient air temperature sensor is required to use this parameter.
Name: Cold Ambient Air Temperature (**Not** used by Gas Plus)
Range: -18° to 71°C [0° to 160° F]
Description: Below this threshold the idle shutdown will be automatically overridden to allow for heating the cab. This parameter is **only** available if the air temperature override is enabled. This parameter can be set to any value between -18° to 71°C [0° and 160°F], but **must** be equal to or less than the Intermediate Air Temperature parameter. An OEM supplied ambient air temperature sensor is required to use this parameter.

Name: Intermediate Ambient Air Temperature (**Not** used by Gas Plus)
Range: -18° to 71°C [0° to 160°F]
Description: Below this temperature the driver can manually override the idle shutdown. Above this temperature and below the hot air temperature manual shutdown will be disabled because vehicle cab heating or cooling will **not** be required. This parameter can be set to any value between -18° and 71°C [0° and 160°F], but **must** be equal to or less than the Hot Air Temperature. This parameter is **only** available if the manual override parameter is enabled. An OEM supplied ambient air temperature sensor is required to use this parameter.
Name: Hot Ambient Air Temperature (**Not** used by Gas Plus)
Range: -18° to 71°C [0° to 160°F]
Description: Above this temperature the driver can manually override idle shutdown during the shutdown period. This will allow for cooling of the vehicle cab during high outside air temperatures. This parameter can be set to any value between -18° and 71°C [0° and 160°F], but **must** be equal to or greater than the Intermediate Air Temperature. This parameter is **only** available if the manual override parameter is enabled. An OEM supplied ambient air temperature sensor is required to use this parameter.
Name: Shutdown Accessory Relay (**Not** used by Gas Plus)
Range: Installed or **Not** Installed
Description: This parameter specifies whether the vehicle is equipped with an optional OEM shutdown accessory relay. This relay is used to disconnect power from electrical accessories such as heater or air conditioner blower motors and dashboard power, when the engine is shutdown automatically by the Idle Shutdown feature.

Driver Activation/Deactivation

The driver can **not** activate or deactivate the idle shutdown feature. This feature can **only** be activated or deactivated by the Cummins INSITE™ service tool.

To override the automatic idle shutdown the driver will need to activate the brake, clutch or accelerator pedal during the 30 second period prior to shutdown. 30 seconds prior to the shutdown a flashing warning lamp will notify the driver that engine shutdown is pending. This action will override idle shutdown. If the override is successful the warning lamp will flash every one half second for two minutes.

Interaction with other Features and Parameters

Idle shutdown can interact with the PTO feature. Idle shutdown can cause the engine to shutdown when in PTO mode. If the idle shutdown percent load threshold is **not** exceeded the engine will be shutdown.

It is required that this feature be enabled with the ICON™ product and the ambient air temperature override **must** be disabled.

Special Instructions

The idle shutdown feature will shut the engine off, but will **not** turn off power to accessories powered by the key switch. Vehicle accessories that are left on can drain the batteries. An optional idle shutdown relay is available on Signature, ISX, and ISM engines that will turn off power to accessories powered by the key switch.

Idle Shutdown Percent Load, Air Temperature Override, Cold Air temperature, Intermediate Air Temperature, and Hot Air Temperature are **not** available on the Industrial products.

Idle shutdown Air Temperature Override, Cold Air temperature, Intermediate Air Temperature, and Hot Air Temperature is **only** available on Signature, ISX, and ISM if the OEM supplied ambient air temperature sensor is used.

Bus Engine Calibrations - Holding and keeping the brake pedal depressed will override idle shutdown in city traffic jams until vehicle speed is sensed by the ECM.

On Signature, ISX, and ISM manual override will reset the idle timer. In addition when the ECM senses vehicle speed after an idle period the idle timer will be reset.

On ISB and ISC manual override will override the idle timer. The override will **not** be reset until the vehicle key switch is cycled.

Disadvantages

The idle shutdown feature will **not** activate if Fault Code 241 is active.

When stopped in traffic for extended periods the engine will be shutdown.

Visual Aids

The chart below indicates when manual and automatic overrides are available.

	Manual Override	Automatic Override
Below Cold Air Temperature	No	Yew
Between Cold Air and Intermediate Air Temperature	Yes	No

(Continued)

	Manual Override	Automatic Override
Between Intermediate Air and Hot Air Temperature	No	Yes
Above Hot Air Temperature	Yes	No

Duty Cycle Monitor

Feature Description

The Duty Cycle Monitor tracks the time the engine speeds in 50 different operating regions. These operating regions are based on engine speed and engine torque. This feature provides two short term 500 hour resettable data blocks and one long term 100,000 hour non-resettable data block.

This feature can be enabled or disabled and the two short term data blocks can be reset by INSITE™.

The long term data block can **only** be reset by recalibration.

When both short term blocks are filled, the duty cycle monitor data will continue to be calculated, but this data will **not** be stored in the short term data blocks. A 100,000 hour map will be used to store long term data. The long term data can **not** be cleared by an electronic service tool. Both long term and short term data will be saved on powerdown, but cleared on a recalibration.

Adjustable Parameters

None

Driver Activation/Deactivation

None

Interaction with other Features and Parameters

None

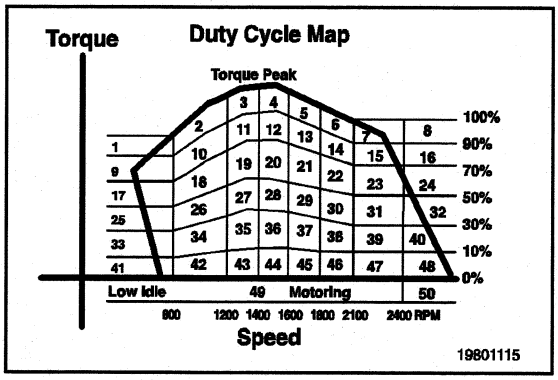
Special Instructions

None

Disadvantages

None

Visual Aids



Multiple Unit Synchronization

Feature Description

The multi unit synchronization feature allows two or more engines (up to a maximum of 11) to be controlled by a single throttle signal and run at a similar speed (Refer to visual aids section). There is three engine configurations available with this feature: soft-coupled, hard-coupled, and soft-coupled marine.

The soft-coupled configuration has all secondary engines in parallel with each other. The primary engine outputs a throttle signal to all secondary engines. This setup allows all engines to remain running if a secondary engine stops running.

The hard-coupled configuration has the primary and all secondary engines in series with each other (Refer to visual aids section). The primary engine outputs a throttle signal, which is received by the first secondary engine. This secondary engine then outputs the throttle signal to the next secondary engine in the series. This process repeats until the primary engine receives the throttle signal.

The soft-coupled marine configuration has all secondary engines in parallel with each other (Refer to visual aids section) The primary engine outputs a throttle signal on the J1939 datalink to all secondary engines.

Adjustable Parameters

Name: Multi Unit Synchronization
Range: Enable
Description: Allows the user to enable the Multi Unit Synchronization feature.

Driver Activation/Deactivation

This feature can **not** be activated or deactivated by the driver except in the case of the soft-coupled marine configuration. In this case, Multi Unit Synchronization is turned on or off by a user activated switch.

Interaction with other Features and Parameters

None

Special Instructions

The soft-coupled marine configuration allows the primary and secondary engines to be configured via wiring harness jumpers instead of specific calibrations for each individual primary or secondary engine.

The electronic service tool can monitor the following parameters associated with this feature: Multi Unit Synchronization Couple Type, Multi Unit Synchronization Engine Type, Multi Unit Synchronization ON/OFF Switch, Percent Pulse-Width Modulate Output (throttle signal).

Multi Unit Synchronization Couple Type indicates if soft-coupled, hard-coupled, or soft-coupled marine is being used.

Multi Unit Synchronization Engine Type indicates whether an engine is a primary or secondary engine.

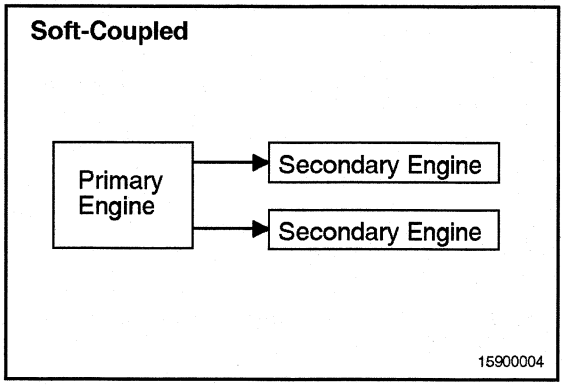
Multi Unit Synchronization determines if Multi Unit Synchronization is turned on or off by a user activated switch.

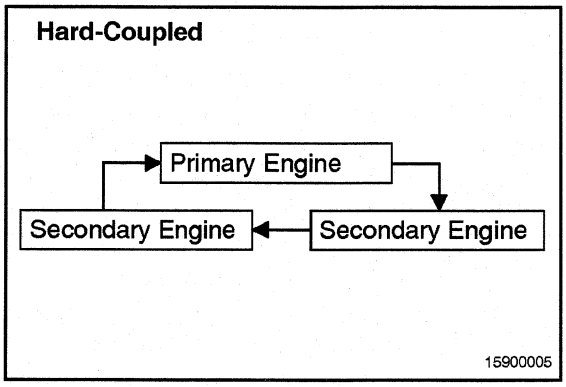
Percent Pulse-Width Modulate Output determines what percent throttle output is being sent to the secondary engines.

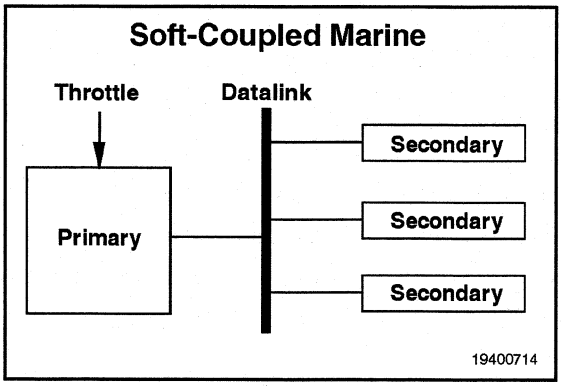
Disadvantages

In the hard-coupled configuration, if one engine in the series stops running, then the remaining engines in the circuit will also stop running.

Visual Aids







Maintenance Monitor

Feature Description

This feature, when enabled, will cause the engine control module to illuminate a maintenance lamp alerting the operator when it is time to service the engine. This feature is intended to illuminate a maintenance lamp in conjunction with engine oil and oil filter service. This feature can be adjusted to illuminate the maintenance lamp based on ECM measured distance or engine running time. Once the ECM determines the maintenance interval has expired, it will illuminate the maintenance lamp following the very next key-on.

NOTE: Not all engines (example: CELECT™) are equipped with a separate maintenance lamp. In these cases, the engine can utilize another method (Example: CELECT™ engines alert the operator by flashing the engine protection lamp through five, three-flash cycles approximately 12 seconds after key-on). Refer to the engine Operation and Maintenance manual for a description of how the operator is alerted when this feature is enabled.

Further, the feature can be customized (using Cummins INSITE™) to illuminate the lamp at some time prior to the end of the maintenance interval (Example: The feature can be adjusted to illuminate the lamp at any point when 50 to 100 percent of the maintenance interval has expired. This is accomplished by selecting an appropriate value for Alert Percentage.).

Finally, some applications (specifically ISM and ISX) can have the ECM determine the maintenance interval using the Auto mode of the Maintenance Monitor. In these instances, the user **must** enter an Interval Factor (using Cummins INSITE™). The Interval Factor will be based on the trucks duty cycle and engine oil grade. Afterwards, the ECM will calculate the end of the maintenance interval based on engine operating conditions.

Adjustable Parameters

Name: Maintenance Monitor
Range: Enable/Disable
Description: Allows the user to enable the maintenance monitor feature.
Name: Mode
Range: Auto, Distance, Time (or Manual)
Description: Choosing Auto, Distance, Time (or Manual) mode will determine how the ECM enacts the Maintenance Monitor Feature.
Auto - If the Auto mode of maintenance monitor is available, it is necessary that an interval factor be entered (see Interval Factor Below), and the maintenance interval will be based on an ECM determination of oil life.
Distance - If the Distance mode is chosen, it is necessary that a distance be entered, and the maintenance interval will be based on ECM measured distance traveled. It is necessary that the vehicle have a working vehicle speed sensor for this mode of Maintenance Monitor to work properly.
Time (or Manual) - If the Time mode is chosen, it is necessary that a time be entered, and the maintenance interval will be based on ECM measured engine run time.

NOTE: In some Industrial Applications, the Time mode is labeled Manual mode on Cummins INSITE™.
Name: Distance
Range: Varies for different engines (KM/Mi)
Description: When operating the in Distance mode, the distance entered defines the maintenance interval. Refer to the engine Operation and Maintenance Manual for the correct oil drain interval.
Name: Time
Range: Varies for different engines (Hours)
Description: When operating the in Time mode (also called Manual mode in some industrial engines), the time entered defines the maintenance interval. Refer to the engine Operation and Maintenance Manual for the correct oil drain interval.
Name: Alert Percentage
Range: 50 Percent to 100 Percent
Description: This value **must** be entered. The ECM uses the Alert Percentage to determine when to illuminate the maintenance lamp. For example: If the Alert Percentage is entered as 90 percent, the ECM will illuminate the maintenance lamp at a time or distance corresponding to 90 percent of the total maintenance interval.
Name: Warn While Running
Range: Enable or Disable
Description: Some engines will have this component of the maintenance monitor feature available. When Warning While Running is enabled, the maintenance lamp will illuminate as soon as the mileage or time threshold is reached. Otherwise, the maintenance lamp will **only** illuminate at key on. This component of the Maintenance Monitor feature is useful in some industrial applications where the engines are **not** turned off on a daily basis.
Name: Interval Factor
Range: Varies for different engines (a unit-less number that is used by the ECM to calculate the trucks duty-cycle and oil grade).
Description: This value is used when operating in the Auto mode. Some engines have calibrations that will base the maintenance interval on duty-cycle and engine operating conditions. In this mode, the engine will allow the maximum oil life if the engine is lightly loaded and at the same time alert the driver to change the oil sooner if a more severe duty cycle is detected.
Name: Reset
Range: Reset
Description: Resets the maintenance monitor interval data. Refer to the following tables to properly select an Interval Factor for various engine types. If the engine type is **not** specifically listed below, it is recommended that Maintenance Monitor be run in either the Distance or Time mode **only**.

ISX/Signature

First, use the table below to select a duty cycle. Evaluate the vehicles duty cycle based on all three Operational Criteria. The correct duty cycle for the vehicle is the worst case duty cycle based on the three Operational Criteria (Example: A dump truck that averages 6.5 MPG and GVW is 68,000 will be considered as a Severe Duty cycle if the vehicle is operated in dusty environments).

Operational Criteria	Severe Duty	Normal Duty	Light Duty
Average Fuel Consumption	Less than 5.5 MPG	5.5 to 6.5 MPG	Above 6.5 MPG
Gross Vehicle Weight (GVW)	Above 80,000 lbs	70,000 to 80,000 lbs	Below 70,000 lbs
Does the vehicle operate in dusty environments?	Yes	No	No

Next, pick the correct interval factor based on the following table.

NOTE: The correct interval factor is based on both the duty cycle and the grade of oil used by the customer, if the grade of oil used by the customer changes, the interval factor **must** be evaluated again).

Oil Grade	Severe Duty	Normal Duty	Light Duty
Standard CG-4	Interval Factor 1.0	Interval Factor 1.5	Interval Factor 2.0
CES 20071 (CH-4)	Interval Factor 1.25	Interval Factor 2.71	Interval Factor 3.43
CES 20076	Interval Factor 1.5	Interval Factor 3.07	Interval Factor 3.79

ISM

First, use the table below to select a duty cycle. Evaluate the vehicles duty cycle based on all three Operational Criteria. The correct duty cycle for the vehicle is the worse case duty cycle based on the three Operational Criteria (Example: A dump truck that averages 7.0 MPG and GVW is 68,000 will be considered as a Severe Duty cycle if the vehicle is operated in dusty environments).

Operational Criteria	Severe Duty	Normal Duty	Light Duty
Average Fuel Consumption	Less than 6.0 MPG	6.0 - 7.0 MPG	Above 7.0 MPG
Gross Vehicle Weight (GVW)	Above 80,000 lbs	70,000 - 80,000 lbs	Below 70,000 lbs
Does vehicle operate in dusty environments?	Yes	No	No

Pick the correct interval factor based on the following tables.

NOTE: The correct interval factor is based on both the duty cycle and the grade of oil used by the customer, if the grade of oil used by the customer changes, the interval factor **must** be evaluated again).

Vehicle accumulates 13,000 km [8000 mi] (or more) per month, engine has non-wastegate turbocharger.

Oil Grade	Severe Duty	Normal Duty	Light Duty
Standard CG-4	Interval Factor 0.67	Interval Factor 1.33	Interval Factor 1.67
CES 20071 (CH-4)	Interval Factor 1.00	Interval Factor 2.00	Interval Factor 2.67
CES 20076	Interval Factor 1.33	Interval Factor 2.33	Interval Factor 3.00

Vehicle Accumulates 13,000 km [8000 mi] (or more) per month, engine has wastegate turbocharger

Oil Grade	Severe Duty	Normal Duty	Light Duty
Standard CG-4	Interval Factor 0.33	Interval Factor 0.53	Interval Factor 0.80
CES 20071 (CH-4)	Interval Factor 0.67	Interval Factor 1.00	Interval Factor 1.67
CES 20076	Interval Factor 0.83	Interval Factor 1.33	Interval Factor 2.00

Vehicle Accumulates less than 13,000 km [8000 mi] (or more) per month

Oil Grade	Wastegate Turbocharger	Non-Wastegate Turbocharger	N/A
Standard CG-4	Interval Factor 0.17	Interval Factor 0.30	N/A
CES 20071 (CH-4)	Interval Factor 0.30	Interval Factor 0.47	N/A
CES 20076 7	Interval Factor 0.4	Interval Factor 0.60	N/A

Vehicle is an recreation vehicle or firetruck

Oil Grade	450 HP	500 HP
Standard CG-4	Interval Factor 0.40	Interval Factor 0.20
CES 20071 (CH-4)	Interval Factor 0.60	Interval Factor 0.30
CES 20076	Interval Factor 0.80	Interval Factor 0.40

Driver Activation/Deactivation

This feature is enabled using Cummins INSITE™.

The **only** driver or user interaction is to reset the warning lamp manually. Refer to the engine Operation and Maintenance manual for proper manual lamp reset methods. Otherwise, Cummins INSITE™ can be used to reset the maintenance lamp.

Interaction with other Features and Parameters

Not all engines (example: CELECT™ are equipped with a separate maintenance lamp. In these cases, the engine can utilize another method (Example: CELECT™ engines alert the operator by flashing the engine protection lamp through five, three-flash cycles approximately 12 seconds after key-on). Refer to the engine Operation and Maintenance manual for a how the operator is alerted when this feature is enabled.

Maintenance Monitor will **not** be enabled if Centinel™ is installed on the vehicle.

Special Instructions

Do **not** enable the Auto mode of maintenance monitor without referring first to the operation and maintenance manual and correctly evaluating the vehicle's duty cycle. It is necessary that a correct Interval Factor be chosen if using the Auto mode.

Disadvantages

Applications that do **not** utilize a separate maintenance lamp can illuminate engine warning lamps which result in false service complaints if drivers are **not** trained to use the maintenance monitor feature.

Visual Aids

None

NOTES

Section 1 - Operating Instructions

Section Contents

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Operating Instructions - Overview

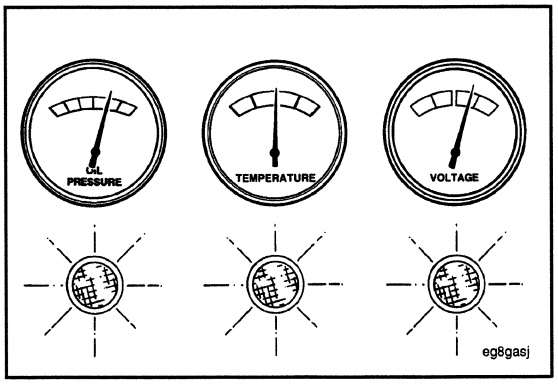
General Information

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

Follow the daily maintenance checks listed in Maintenance Guidelines (Section 2).

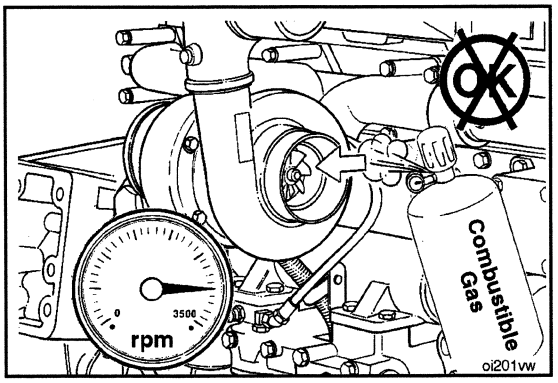
The **new** Cummins engine associated with this manual does **not** require a "break-in" procedure. This section of the manual provides all of the necessary information required for proper engine operation.

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

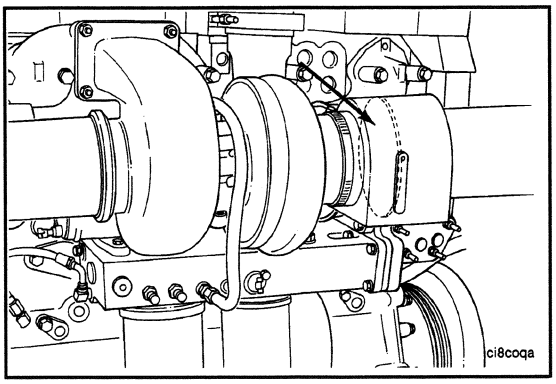


⚠ WARNING ⚠

DO NOT OPERATE A DIESEL ENGINE WHERE THERE ARE OR CAN BE COMBUSTIBLE VAPORS. The vapors can be sucked through the air intake system and cause engine acceleration and overspeeding that can result in a fire, an explosion, and extensive property damage. Numerous safety devices are available, such as air intake shutoff devices, to minimize the risk of overspeeding where an engine, due to its application, due to a fuel spill or gas leak. Remember, Cummins has no way of knowing the use you have for your engine. THE EQUIPMENT OWNER AND OPERATOR ARE RESPONSIBLE FOR SAFE OPERATION IN A HOSTILE ENVIRONMENT. CONSULT YOUR CUMMINS AUTHORIZED REPAIR LOCATION FOR FURTHER INFORMATION.

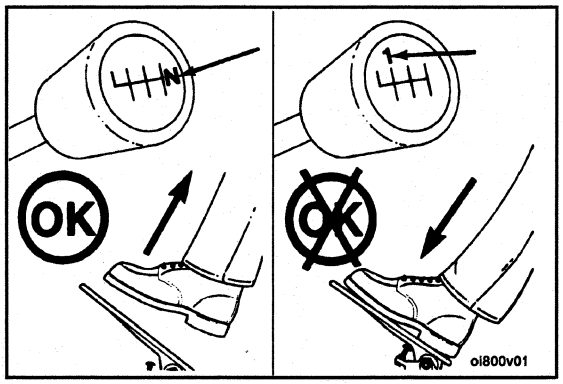


Cummins recommends the installation of an air intake shutoff device or a similar safety device to minimize the risk of overspeeding where an engine, due to the vehicle, vessel or equipment being operated in a combustible environment, such as due to a fuel spill or gas leak.



⚠ CAUTION ⚠

Do not expose the engine to corrosive chemicals. Corrosive chemicals can damage the engine.



Normal Starting Procedure

General Information

⚠ WARNING ⚠

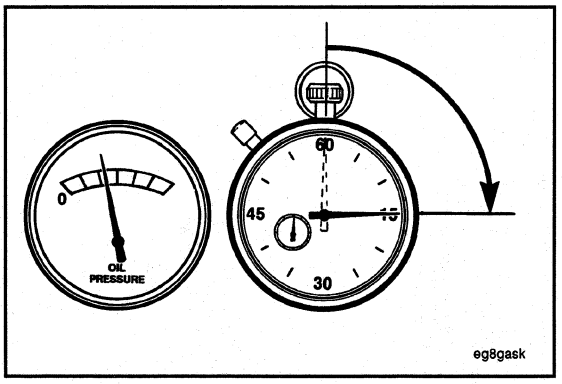
Do not depress the accelerator pedal or move the accelerator lever from the idle position while cranking the engine. This can result in engine overspeed and severe damage to the engine.

⚠ 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).

NOTE: Engines equipped with air starting motors require a minimum of 480 kPa [70 PSI].

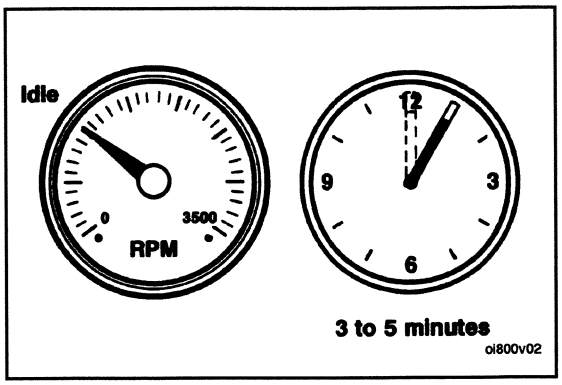
- Disengage the driven unit, or if equipped, put the transmission in neutral.
- With the accelerator pedal or lever in the idle position, turn the key switch to the ON position, and wait for the WAIT-TO-START lamp to go out; then, turn the key to the START position.
- If the engine does **not** start after three attempts, check the fuel supply system. Absence of blue or white exhaust smoke during cranking indicates no fuel is being delivered.



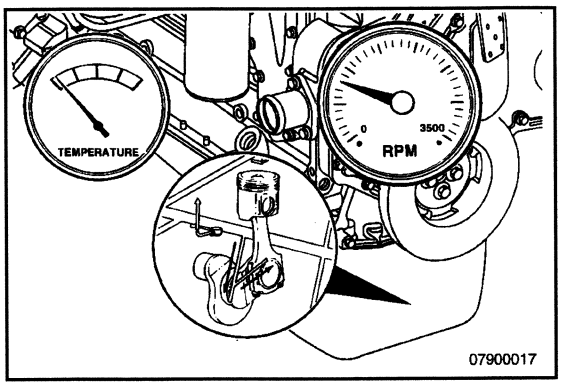
⚠ CAUTION ⚠

The engine must have adequate oil pressure within 15 seconds after starting. If the WARNING lamp indicating low oil pressure has not gone out or there is no oil pressure indicated on a gauge within 15 seconds, shut off the engine immediately to avoid engine damage. The low oil pressure troubleshooting procedure is located in Troubleshooting Symptoms (Section TS).

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



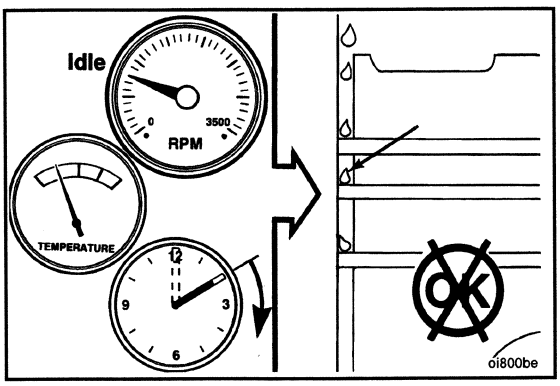
After starting a cold engine, increase the engine speed (rpm) slowly to provide adequate lubrication to the bearings and to allow the oil pressure to stabilize.



⚠ CAUTION ⚠

Do not operate engine at low idle for long periods with engine coolant temperature below the minimum specification in Maintenance Specifications (Section V). This can result in the following:

- Fuel Dilution of the lubricating oil
- Carbon build up in the cylinder
- Cylinder head valve sticking
- Reduced performance



Jump Starting

⚠ 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.

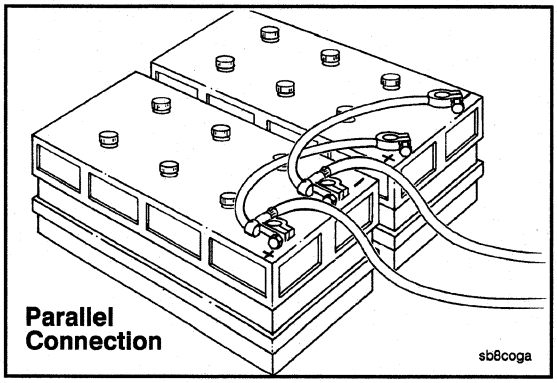
⚠ CAUTION ⚠

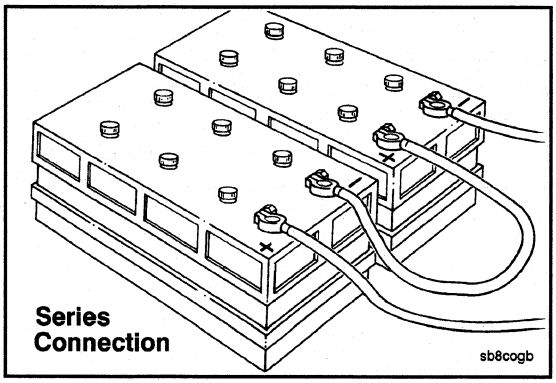
When using jumper cables to start the engine, make sure to connect the cables in parallel: Positive (+) to positive (+) and negative (-) to negative (-). When using an external electrical source to start the engine, turn the disconnect switch to the OFF position. Remove the key before attaching the jumper cables.

⚠ CAUTION ⚠

To avoid damage to engine parts, do not connect jumper starting or battery charging cable to any fuel system or electronic component.

The accompanying illustration shows a typical parallel battery connection. This arrangement doubles the cranking amperage.





This illustration shows a typical series battery connection. This arrangement, positive (+) to negative (-), doubles the voltage.

Cold Weather Starting

General Information

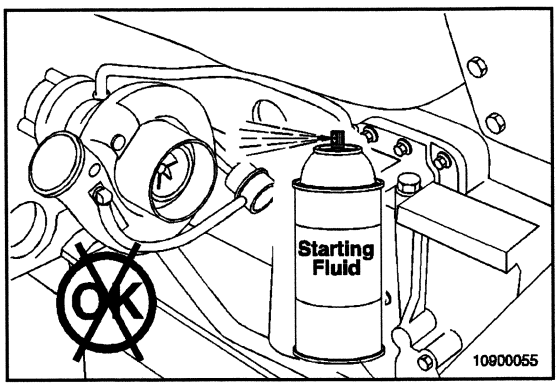
Follow the Normal Starting Procedures in this section. In cold weather, the Wait-To-Start lamp will stay on longer.

Using Starting Aids

⚠ WARNING ⚠

Do not use starting fluids with this engine. This engine is equipped with an intake air heater; use of starting fluid can cause an explosion, fire, personal injury, severe damage to the engine and property damage.

Cold weather starting aids are available for your engine. Contact the local Cummins Authorized Repair Location for more information.



Starting Procedure After Extended Shutdown or Oil Change

General Information

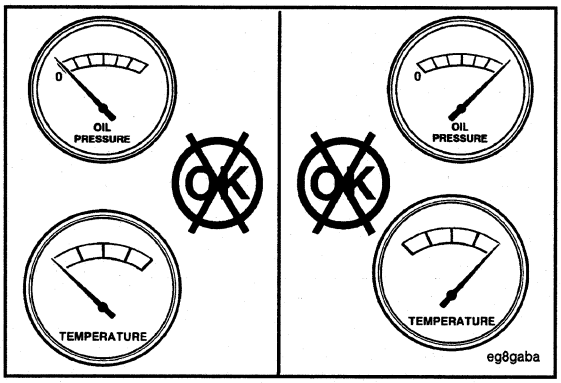
Complete the following steps after each oil change, or after the engine has been shut down for longer than five days, to make sure the engine components are lubricated.

- Disconnect the electrical wire from the fuel shutoff valve.
- Rotate the crankshaft using the starter motor until oil pressure is indicated on the gauge or the warning light goes out.
- Connect the electrical wire to the fuel shutoff valve.
- Start the engine.

NOTE: Emergency Standby Genset engines are exempt from the requirement provided they are fitted with coolant heaters and are exercised at least once every thirty days for a minimum of thirty days.

Prior to starting the engine, all three of the following requirements **must** be met before the engine is exempt from disconnecting the fuel pump and cranking the engine until oil pressure is indicated on the gauge.

- The engine is used as an Emergency Standby Genset.
- The engine is fitted with coolant heaters.
- The engine **must** follow the Cummins procedure for exercising at least once every thirty days.



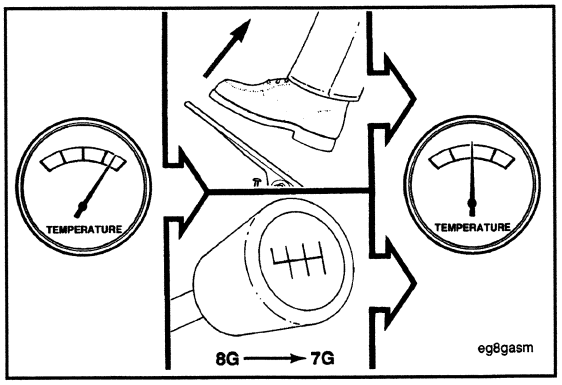
Operating the Engine

Normal

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

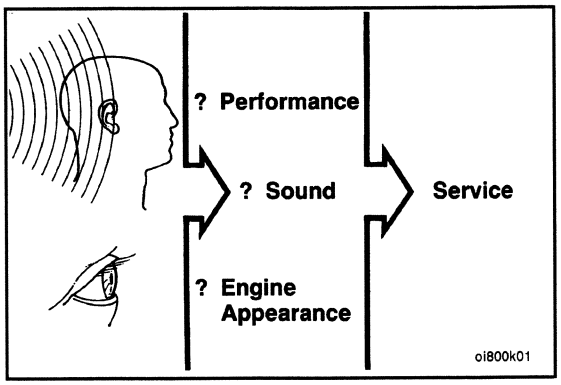
Continuous operation with engine coolant temperature above or below the engine coolant temperature specifications listed in Maintenance Specifications (Section V) can damage the engine.

If an overheating condition starts to occur, reduce the power output of the engine by releasing the accelerator pedal or lever 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 Location.



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:

- 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.



Cold Weather

It is possible to operate engines in extremely cold environments if they are properly prepared and maintained. Satisfactory performance of an engine in low ambient temperature conditions requires modification of the engine, surrounding equipment, operating practices and maintenance procedures.

The correct engine coolant lubricating oil and fuels **must** be used for the cold weather range in which the engine is being operated. Below are the recommendations for these critical engine fluids:

Ambient Temperature

0 to -32°C [32 to -25°F]

Use 50-percent ethylene glycol antifreeze and 50-percent water for the engine coolant mixture.

Refer to Maintenance Specifications (Section V) Lubricating Oil recommendations for the correct specifications.

The Diesel fuel must have maximum cloud and pour points 6°C [10°F] lower than the ambient temperature in which the engine operates.

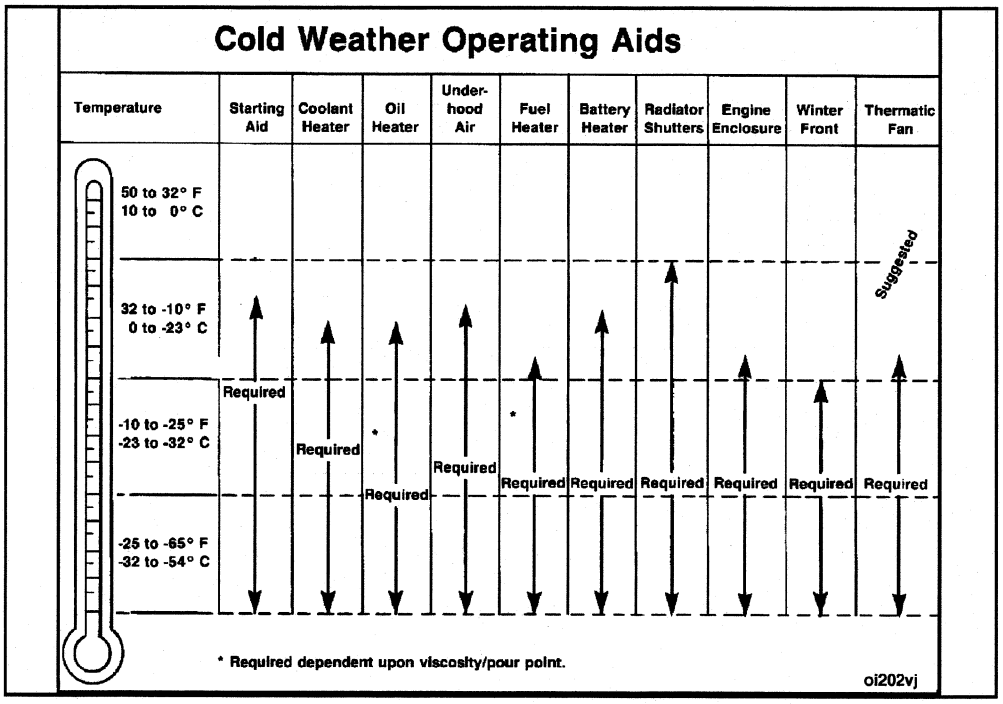
-32 to -54°C [-25 to -65°F]

Use 60-percent ethylene glycol antifreeze and 40-percent water for the engine coolant mixture.

Refer to Maintenance Specifications (Section V) Lubricating Oil recommendations for the correct specifications.

The Diesel fuel must have maximum cloud and pour points 6°C [10°F] lower than the ambient temperature in which the engine operates.

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



Winterfronts and Shutters

Winterfronts and shutters can be used on a vehicle or equipment to reduce air flow through the radiator core into the engine compartment. This can reduce the time required to warm the engine and help maintain the engine coolant temperature. The engine coolant temperature specifications are in the Maintenance Specification (Section V).

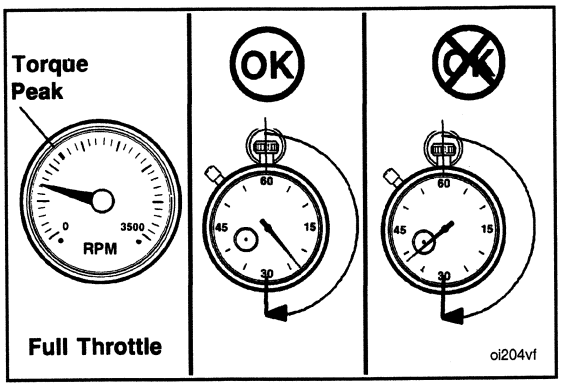
Engine Operating Range

General Information

⚠ CAUTION ⚠

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

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



⚠ CAUTION ⚠

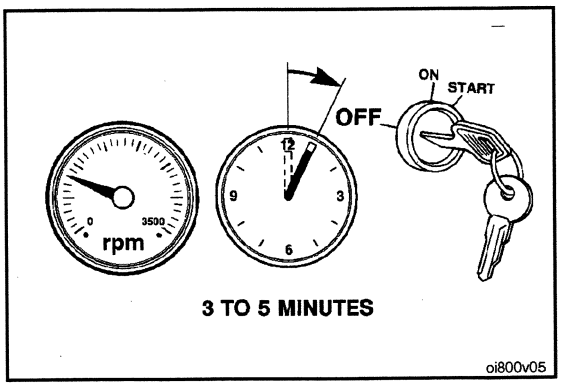
Do not operate the engine beyond the maximum engine speed. Operating the engine beyond the maximum engine speed can cause severe engine damage. Use proper operating techniques for the vehicle, vessel, or equipment to prevent engine overspeed. The maximum engine speed specification is listed in Maintenance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

Engine Shutdown

General Information

Allow the engine to idle 3 to 5 minutes before shutting it off after a full-load operation. This allows adequate cool down of pistons, cylinders, bearings, and turbocharger components.

Turn the ignition switch to the OFF position. If the engine does not shut down, refer to Troubleshooting Symptom (Section TS).



Electromagnetic Interference (EMI)

General Information

Some engine applications utilize accessories (CB radios, mobile transmitters, etc.) 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 Cummins electronic controlled fuel system. Cummins is **not** liable for any performance problems with either the 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

Your 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 fuel system EMI susceptibility level will protect your engine from most, if **not** all, electromagnetic energy-emitting devices that meet the Federal Communications Commission legal requirements.

System EMI Radiation Levels

Your Cummins product has been designed to emit minimum electromagnetic energy. Electronic components are required to pass various Cummins and industry EMI specifications. Testing has shown that when the engine is properly installed, it will not interfere with onboard communication equipment or with the vehicle's, equipment's, or vessel's ability to meet any applicable EMI standards and regulated specifications.

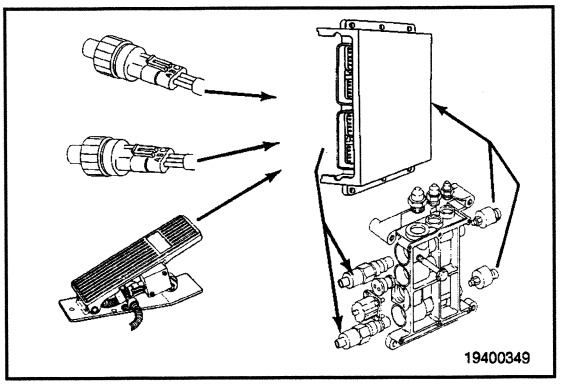
If an interference condition is observed, follow the suggestions below to reduce the amount of interference:

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 (e.g., exhaust stacks)
3. Consult a representative of the accessory supplier in your area to:
   - — Calibrate accurately 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 your application
   - — Make sure your accessory equipment model is built for maximum filtering to reject incoming electromagnetic noise.

Electronic Controlled Fuel System

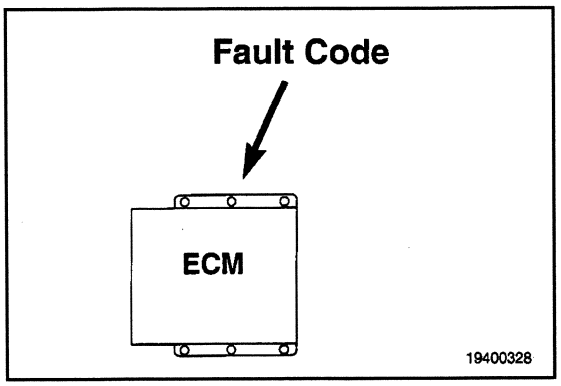
QSK System Description

The QSK fuel system is an electronic engine control system designed to optimize engine control and reduce exhaust emissions. The QSK fuel system controls engine speed and fuel pressure based on input from the electric throttle and other equipment-specific and/or model-specific features.



Diagnostic Fault Codes

The QSK fuel system can display and record certain detectable fault conditions. These failures are displayed as fault codes, which makes troubleshooting easier. The fault codes are retained in the electronic control module (ECM).

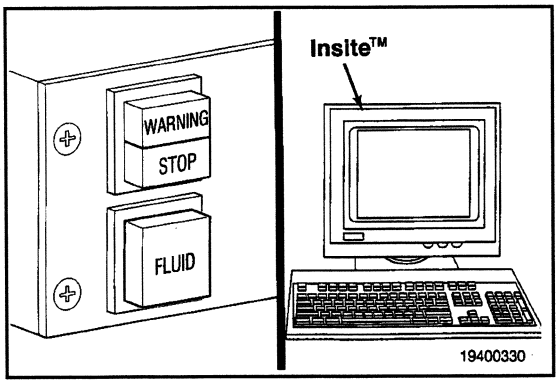


There are two types of fault codes: engine electronic fuel system fault codes and engine protection system fault codes.

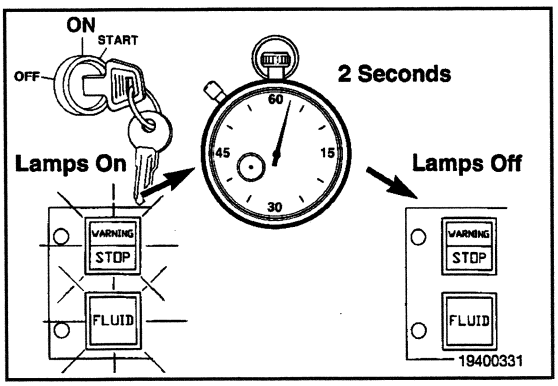
All fault codes recorded will either be active (fault code is presently active on the engine) or inactive (fault code was active at one time, but **not** at the moment).

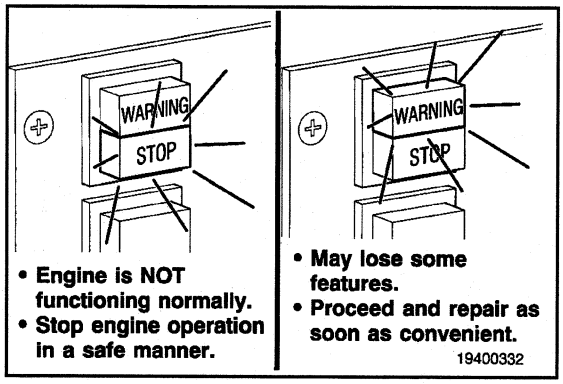
Active fault codes can be read using the warning (amber) and stop lamps (red) in the cab panel or INSITE™.

Inactive fault codes can **only** be viewed with INSITE™.



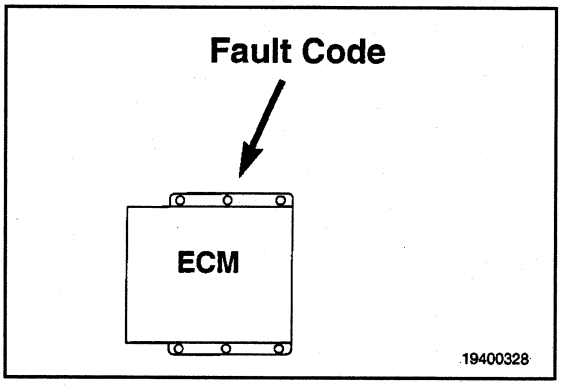
When the vehicle keyswitch is turned on and the diagnostic switch off, the fault code lamps (red, amber, and engine protection) will illuminate for approximately two seconds, one after another, to check their operation.





The lights will remain off until a fault code is recorded. If a stop (red) light comes on while the engine is in operation, the fault can disable the engine. Stop the engine in a safe manner as soon as possible.

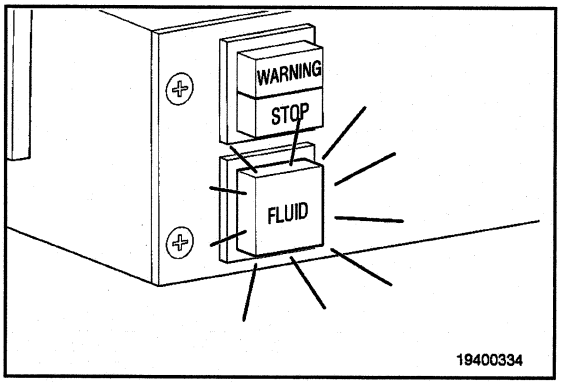
If the warning (amber) light illuminates, the engine can still be operated, but it can lose some system features that can sometimes result in a power loss. The failure **must** be repaired as soon as possible.



The engine protection system records separate fault codes when an out-of-range condition is found for any of the sensors in the engine protection system.

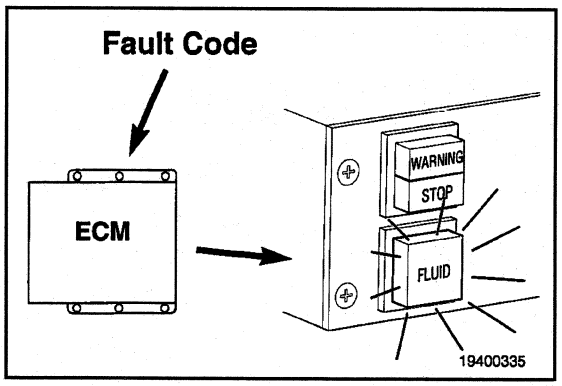
The following are engine protection system out-of-range fault codes:

1. Coolant temperature
2. Coolant level (optional)
3. Oil pressure.



The engine protection system will light the maintenance lamp (orange) when an out-of-range condition occurs.

NOTE: Lamp colors and labels vary by Original Equipment Manufacturer (OEM).

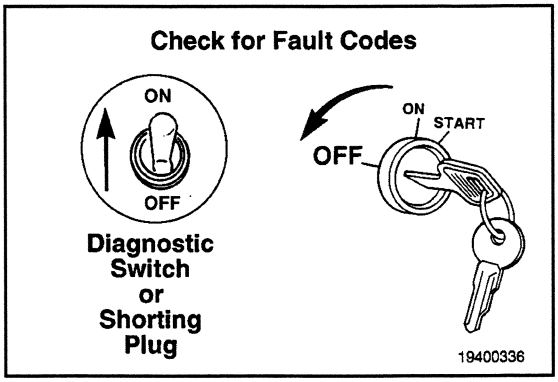


If the engine protection system fluid lamp comes on while driving, it means a fault code has been recorded. The light will remain on as long as the fault is occurring.

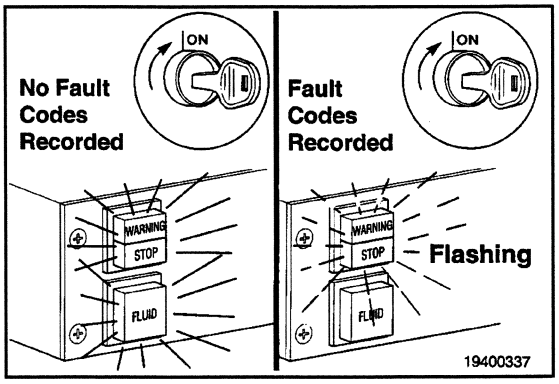
The light will begin to flash if the condition continues to get worse. The engine power and/or speed will gradually reduce. If the engine protection shutdown feature is enabled, the engine will shut down to prevent engine damage.

To check for active fault codes, turn the vehicle keyswitch to the OFF position and move the diagnostic switch to the ON position.

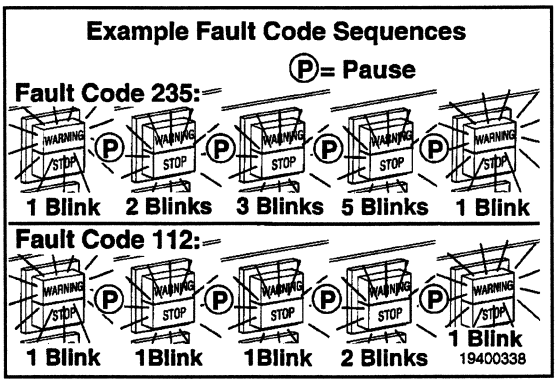
NOTE: Some OEMs use a shorting plug.



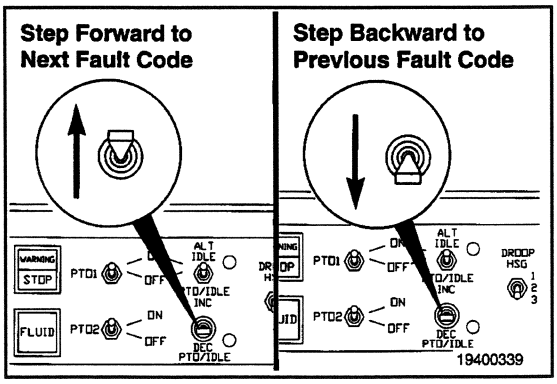
Turn the vehicle keyswitch to the ON position. If no active fault codes are recorded, all three lights will come on and stay on. If active fault codes are recorded, all three lights will come on momentarily. The amber (warning) and red (stop) lights will begin to flash the code of the recorded fault.

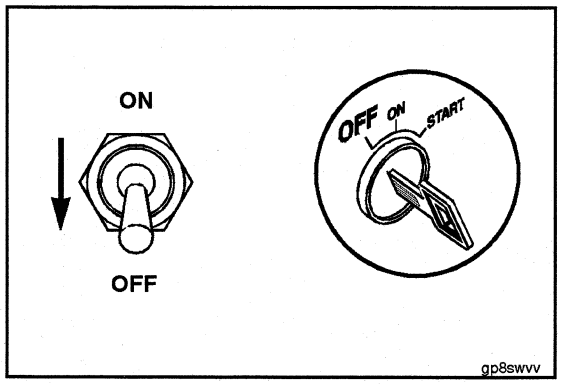


The fault code will flash in the following sequence: First, the amber (warning) lamp will flash. Then there will be a short, one-second pause when both the yellow and red lights are off. The numbers of the recorded fault code will then flash in red. There will be a one-second pause between each number. When the number is done flashing, an amber light will appear again. The number will repeat in the same sequence.



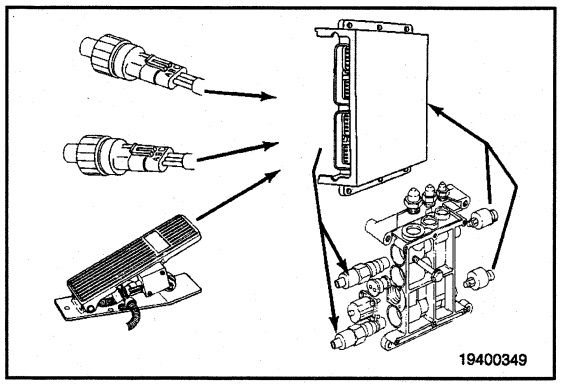
The lights will continue to flash the same fault code until the system is advanced to the next active fault code. To go to the second fault code, move the idle speed adjust switch to "+", then release. You can also go back to the previous fault code by moving the switch to "-", then releasing. To check the third or fourth fault code, move the switch to "+", then release it when all active fault codes have been viewed. Moving the switch to "+" will go back to the first fault code. A brief explanation of all of the fault codes is in Section TF of this manual.





To stop the diagnostic system, move the diagnostic switch to the OFF position or remove the shorting plug. Turn the vehicle keyswitch to the OFF position.

NOTE: Some OEMs use a shorting plug.



Fault Code Snapshot Data

When a diagnostic fault code is recorded in the ECM, ECM input and output data are recorded from all sensors and switches. Snapshot data allow the relationships between ECM inputs and outputs to be viewed and used during troubleshooting.

Fault code snapshot data can **only** be viewed with INSITE™.

Engine Protection System

QSK fuel system engines are equipped with an engine protection system. The system monitors critical engine temperatures, fluid level, switch position, and pressure and will log diagnostic faults when an over or under normal operating range condition occurs. If an out-of-range condition exists, engine derate action can be initiated. The operator will be alerted by the illumination of the in-cab maintenance lamp. The warning lamp will start to flash when out-of-range condition continues to get worse and engine shutdown will occur. The operator **must** pull to the side of the road when it is safe to do so, to reduce the possibility of engine damage.

Engine protection system monitors:

- Coolant temperature
- Coolant level (optional)
- Intake manifold temperature
- Oil pressure.

Engine protection system monitors for:

- High coolant temperature
- Low coolant level (optional)
- High intake manifold temperature
- Low/very low oil pressure.

The engine protection system can have two selectable features: Engine protection enable and engine protection shutdown. If the engine protection enable feature is selected, engine power and speed are gradually reduced, depending on the level of severity of the observed condition. If engine protection shutdown feature is selected, the engine will shut down. The engine can be restarted by turning the keyswitch off and then back on.

Engine protection features:

- Engine protection enable
- Engine protection shutdown.

NOTES

Section 2 - Maintenance Guidelines

Section Contents

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Maintenance Guidelines - Overview

General Information

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

If the engine is operating in ambient temperatures 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. Contact your local Cummins Authorized Repair Location for recommended maintenance intervals.

Some of these maintenance procedures require special tools or must be completed by qualified personnel. Contact your local Cummins Authorized Repair Location for detailed information.

If your engine is equipped with a component or accessory not manufactured by Cummins Inc., refer to the component manufacturer's maintenance recommendations.

Use the chart provided in this section as a convenient way to record maintenance performed.

Tool Requirements

General Information

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

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

Tool Part Number	Description
3163569	Belt tension gauge (v-belts)
3375049	Oil filter wrench
3376807	Water/fuel filter wrench
3822524	Belt tension gauge (click type)
3822525	Belt tension gauge (click type)
3824783	Inch-pound torque wrench (dial type)
3824901	Valve lash gauge kit

- Refer to the appropriate sections for a description of the tools and how to use them.
- Contact the nearest Cummins Authorized Repair Location for the required service tools.

Maintenance Schedule

General Information

All maintenance procedures listed for previous intervals **must** also be performed.

Listed below are the section numbers that contain specific instructions for performing the maintenance.

Daily - Maintenance Checks ..... **Section 3**

- Air Cleaner Element - Check
- Air Cleaner Precleaner - Check
- Air Cleaner Restriction - Check
- Air Intake Hoses, Pipes, and Clamps - Check
- Air Tanks - Drain
- Coolant Level - Check
- Drive Belts - Check
- Engine Operation Report
- Fuel-Water Separator - Drain
- Lubricating Oil Level - Check

Every 250 Hours or 6 Months - Maintenance Checks ..... Section 4

- Belt Tension - Measure
- Belt Tensioner - Lubricate
- Fan Hub, Belt-Driven - Lubricate
- Coolant Filter - Replace
- Air Cleaner Element - Check/Replace
- Cooling Fan - Check
- Crankcase Breather Tube - Check/Clean
- Engine Wiring - Inspect
- Fuel Filters - Replace (1)
- Lubricating Oil and Oil Filter - Change/Replace (2)
- Supplemental Coolant Additive - Maintenance Check

Every 1500 Hours or 1 Year - Maintenance Checks ..... Section 5

- Batteries - Check
- Cold Start Aids (Seasonal) - Check
- Crankcase Breather (External) - Clean
- Crankshaft End Clearance - Inspect
- Engine Mounting Bolts - Maintenance Check
- Hoses, Engine - Check/Replace
- Overhead Set - Adjust/Check
- Steam Clean Engine

Every 6000 Hours or 2 Years - Maintenance Checks ..... Section 6

- Cooling System - Clean
- Fan Hub, Belt-Driven - Inspect
- Fan Idler Pulley Assembly - Inspect
- Vibration Damper - Inspect
- Water Pump - Inspect

Other (follow manufacturer's recommended maintenance procedures on these components) ..... Section 7

- Alternator
- Batteries
- Clutch and Fan Drives
- Electrical Connections
- Engine Storage - Long-Term
- Engine Storage - Short-Term
- Refrigerant Compressor
- Generator (Main Power)
- Hydraulic Pumps
- Starter

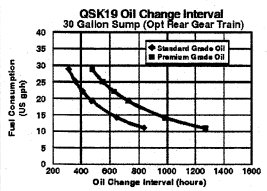
Notes:

1. The replacement of the fuel filters can be extended to 500 hours as long as the fuel inlet restriction does **not** exceed the maximum limit located in Section V.

(Continued)

Notes:

2. The lubricating oil and filter change intervals can be extended based on the engine's horsepower rating, oil pan capacity, and fuel consumption rate. Refer to the Oil Drain Intervals information in this section for specific details. Replacement of the oil filters **must not** be extended beyond 500 hours.

Chart Method	Fixed Mileage Method
	Kilometers Miles Hours Months

07400147

Oil Drain Intervals

There are two recommended methods to determine the proper oil and filter change interval:

- Fixed Mileage Method (based on fixed kilometers, miles, hours, or months; whichever occurs first)
- Chart Method (based on known fuel consumption rates).

Fixed Mileage Method:

Table 2, Fixed Mileage Method						
	52 liters [13.7 gal] pan			135 liters [35.6 gal] pan		
QSK23 Engine Rating	CF-4, CES 20075 Grade Oil	CG-4, CES 20075 Grade Oil	CH-4/CH-4+, CES 20071/ CES 20076 Grade Oil	CF-4, CES 20075 Grade Oil	CG-4, CES 20075 Grade Oil	CH-4/CH-4+, CES 20071/ CES 20076 Grade Oil
Up to 800 hp	250 hours	250 hours	500 hours	500 hours	500 hours	500 hours
Above 800 hp	250 hours	250 hours	250 hours	500 hours	500 hours	500 hours
Note: Use the chart method and/or periodic oil sampling to determine if longer drain intervals are possible.						
Note: Standard oils will meet the requirements of CES 20075 (API CG-4 and CF-4). Premium oils will meet the requirements of CES 20071 (API CH-4) or CES 20076 (API CH-4+). Refer to Section V for oil specifications.						

Chart Method:

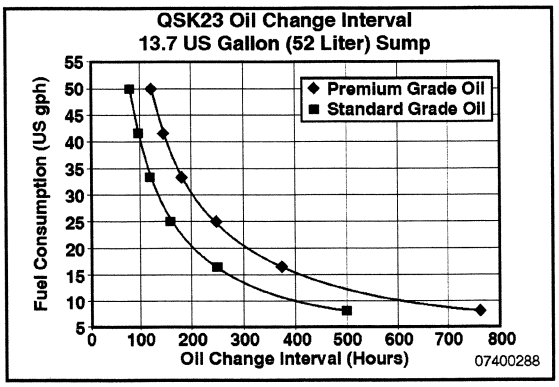
Determine fuel and oil consumption rates:

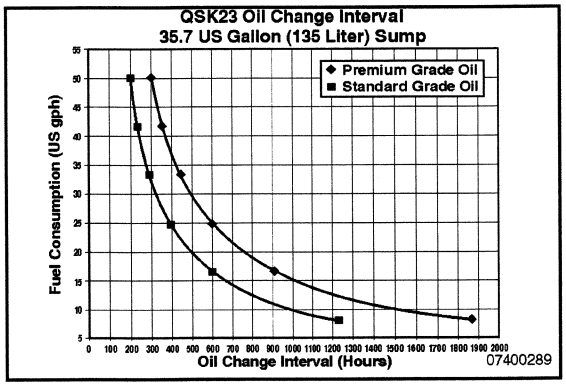
- To use the Chart Method, accurate fuel consumption records **must** be kept and maintained.
- As fuel consumption rates change as a result of a change in operation or duty cycle of a particular engine, the oil change interval established by the Chart Method **must** be reevaluated based on the change in fuel consumption.

Determine total lubricating oil system capacity:

- Total lubricating oil system capacity can be determined by adding the high level of the oil in the oil pan, plus the capacity of the two combination full-flow/bypass oil filters. Refer to the chart below.

Table 3, QSK23 Sump Capacities			
Rated Sump Capacity	Sump Capacity at Low Level Mark on Dipstick in Liters [Gal]	Sump Capacity at High Level Mark on Dipstick in Liters [Gal]	Total System Capacity (Sump and Two Combo Oil Filters) in Liters [Gal]
52 liters [13.7 gal]	42 liters [11.1 gal]	52 liters [13.7 gal]	57 liters [15.1 gal]
135 liters [35.7 gal]	66 liters [17.4 gal]	135 liters [35.7 gal]	140 liters [37 gal]

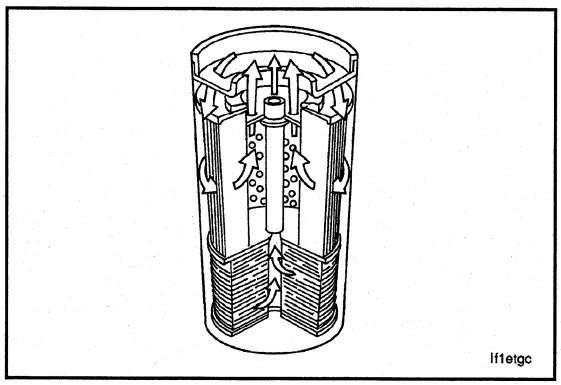




To read the chart for premium grade oil:

Assume the engine has a 13.7-gallon sump capacity and the engine consumes 15 gallons of fuel per hour.

- Select the chart titled 13.7 gallons.
- The left vertical axis of the chart represents fuel consumption in gallons per hour.
- Determine the location of 15 gallons on the left vertical axis and draw a horizontal line across the chart until it intersects the curve with the diamonds.
- At the point of intersection, draw a straight vertical line down to the bottom of the graph.
- The point at which the vertical line intersects the bottom horizontal axis of the graph indicates the oil change interval (approximately 420 hours in this example).



Premium oil filters should be used in conjunction with premium-grade oils when using the premium-graded oil curves to determine oil change intervals. Refer to Section V for lubricating oil filter specifications.

Premium filters contain synthetic media materials to provide more efficient filtration for the entire service life and extend the media life over conventional cellulose media.

Premium combination filters are made with synthetic media and have StrataPore™ designation on the outside of the filter.

StrataPore™ filters have the efficiency, capacity, and strength needed for extended service intervals.

The filter service intervals **must not** exceed 500 hours.

Maintenance Record Form

Maintenance Data

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

NOTES

Section 3 - Maintenance Procedures at Daily Interval

Section Contents

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Daily Maintenance Procedures - Overview

General Information

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

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

Engine Operation Report

The engine **must** be maintained in top mechanical condition if the operator is to get optimum satisfaction from its use. The maintenance department needs daily running reports from the operator to make necessary adjustments in the time allocated. The daily running report also helps to make provisions for more extensive maintenance work as the reports indicate the necessity.

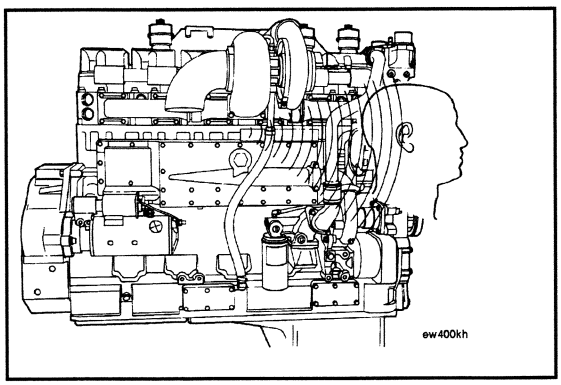
Comparison and intelligent interpretation of the daily report, along with a practical follow-up action, will eliminate most failures and emergency repairs.

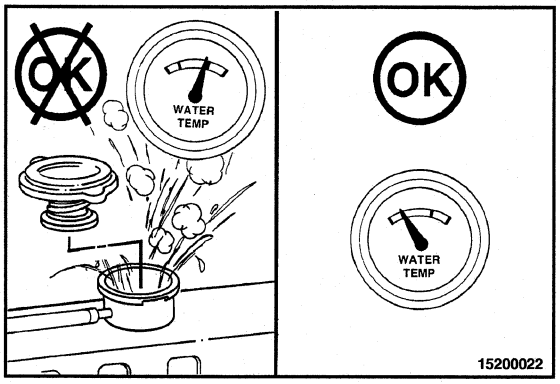
Report to the maintenance department any of the following conditions:

- Low lubricating oil pressure
- Low power
- Power increases or engine surge
- Erratic or no accelerator control or response
- Any warning lights flashing or staying on
- Abnormal water or oil temperature
- Unusual engine noise
- Excessive smoke
- Excessive use of coolant, fuel, or lubricating oil
- Any fuel, coolant, or lubricating oil leaks
- Loose or damaged parts
- Worn or damaged belts

Unusual Engine Noise

During daily maintenance checks, listen for any unusual engine noise that can indicate that service is required.





Coolant Level

Maintenance Check

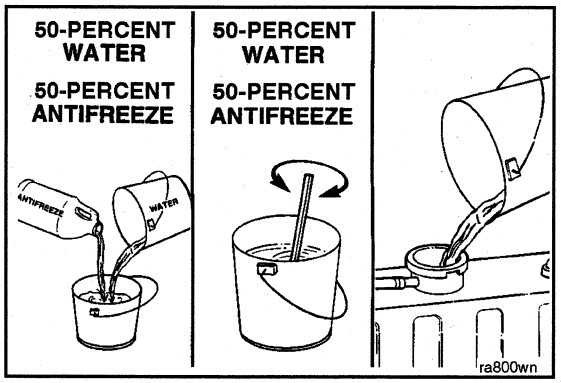
⚠ WARNING ⚠

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

△ 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.

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

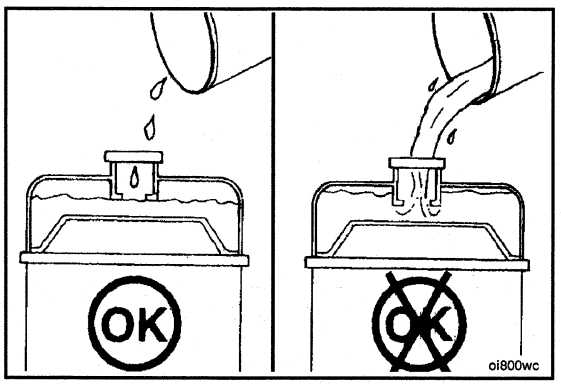


△ CAUTION △

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

Make up coolant added to the engine **must** be mixed with the correct proportions of antifreeze, supplemental coolant additive, and water to avoid engine damage.

Coolant recommendations and specification details on correct mixing of coolant can be found in Maintenance Specifications (Section V).



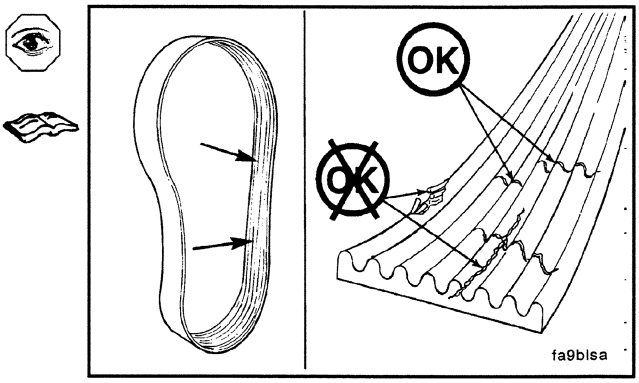
Fill the cooling system with coolant to the bottom of the fill neck in the radiator fill or expansion tank.

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

Drive Belts

Maintenance Check

Poly-Vee Belt

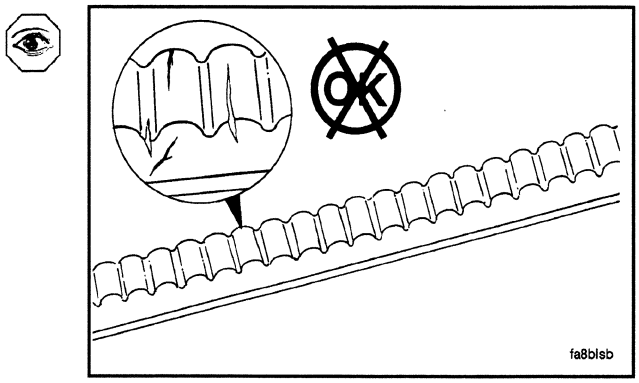


Inspect the belts daily. Check the belt for intersecting cracks. Traverse (across the belt width) cracks are acceptable. Longitudinal (direction of belt length) cracks that intersect with transverse cracks are **not** acceptable. Replace the belt if it is frayed or has pieces of material missing. Refer 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 or grease on the side of belts.

Cogged Belt

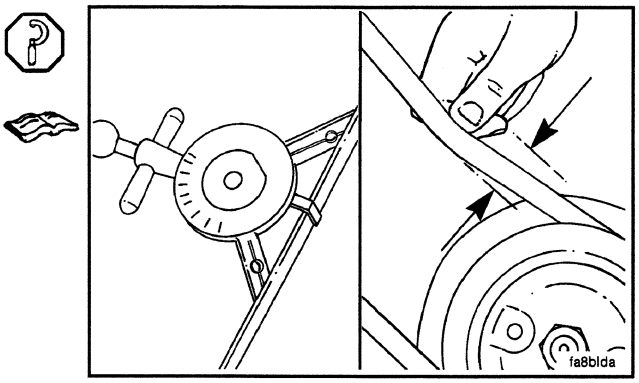


Inspect the belts daily. Replace the belts if they are cracked, frayed, or have chunks of material missing. Small cracks are acceptable.

Adjust the belts that have a glazed or shiny surface, which indicates belt slippage. Correctly installed and tensioned belts will show even pulley and belt wear. 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 or grease on the belts

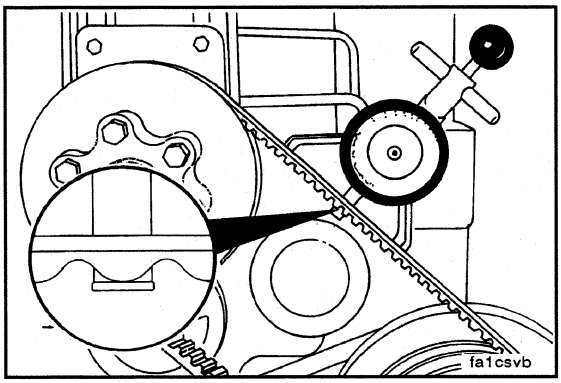


Measure the belt tension in the center span of the pulleys.

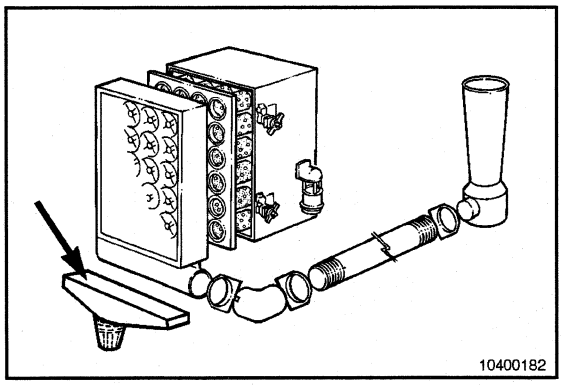
Refer to the Belt Tension Chart in Section V for the correct gauge and tension value for the belt width used.

An alternate method (deflection method) can be used to check belt tension by applying 110 N [25 lbf] force between the pulleys on v-belts. If the deflection is more than one belt thickness per foot of pulley center distance, the belt tension **must** be adjusted.

Refer to Section A for adjustment procedures.



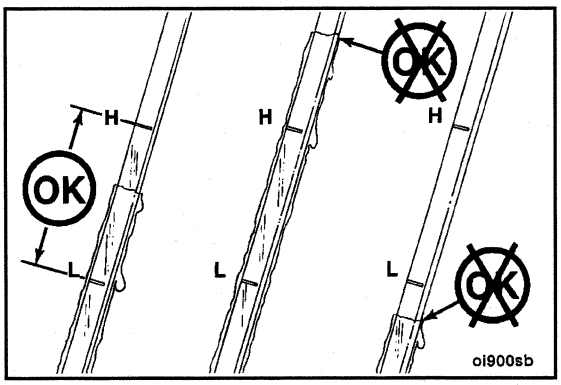
For cogged belts, **make sure** that the belt tension gauge is positioned so that the center tensioning leg is placed directly over the high point (hump) of a cog. Other positioning will result in incorrect measurement.



Air Cleaner Precleaner

Maintenance Check

Under extremely dirty conditions, an air precleaner can be used. Clean the precleaner jar and dry-type air cleaner dust pans daily or, if necessary, more often, depending on operating conditions.



Lubricating Oil Level

Maintenance Check

△ CAUTION △

Never operate the engine with oil level below the L (low) mark or above the H (high) mark. Poor engine performance or engine damage can occur.

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

Shut off the engine for an accurate reading.

Wait at least 15 minutes after shutting off the engine to check the oil level. This allows time for the oil to drain into the oil pan.

For additional lubricating oil recommendations and oil pan capacity information, refer to Maintenance Specifications (Section V).

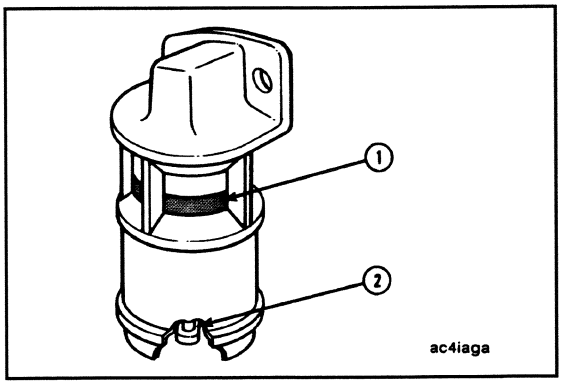
Air Cleaner Restriction

Maintenance Check

Mechanical Indicator

NOTE: Do **not** remove the felt washer from the indicator. The felt washer absorbs moisture.

A mechanical restriction indicator is available to indicate excessive air restriction through a dry-type air cleaner. This instrument can be mounted in the air cleaner outlet or on the instrument panel. The red flag (1) in the window gradually rises as the cartridge loads with dirt. After changing or replacing the cartridge, reset the indicator by pushing the reset button (2).



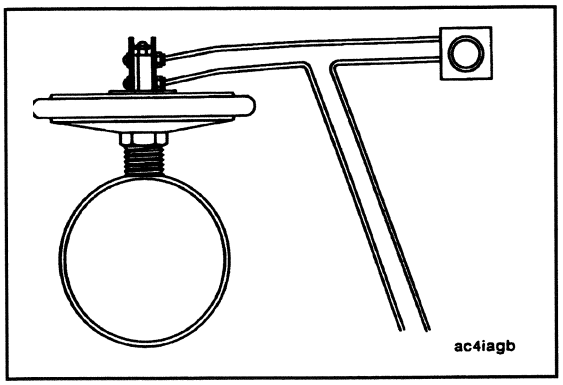
Restriction or vacuum indicators need to be installed as close as possible to the turbocharger air inlet in order to obtain a true indication of restrictions.

⚠ 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.

Vacuum Indicator

Vacuum switches actuate a warning light on the instrument panel when the air restriction becomes excessive.



Air Intake Piping

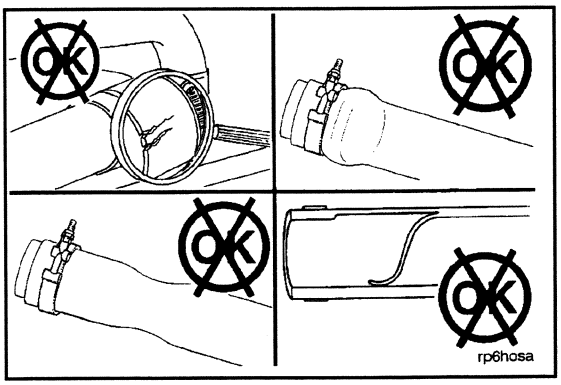
Maintenance Check

Visually inspect the intake piping daily for wear points and damage to piping, loose clamps, or 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 [72 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. Disassemble and clean, as required.



Fuel-Water Separator

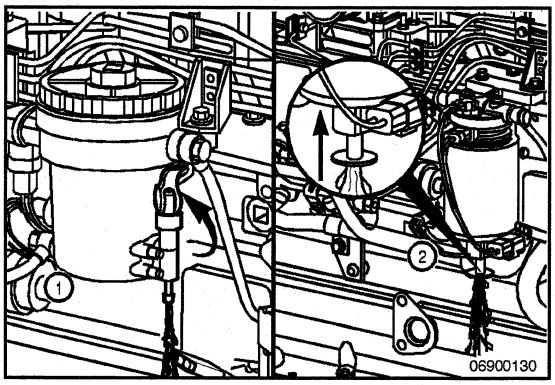
Drain

⚠ WARNING ⚠

Drain the water-fuel separator into a container and dispose of in accordance with local environmental regulations.

Cummins Inc. requires a fuel-water separator or fuel filter be installed in the fuel supply system.

Drain the water and sediment from the separator daily.

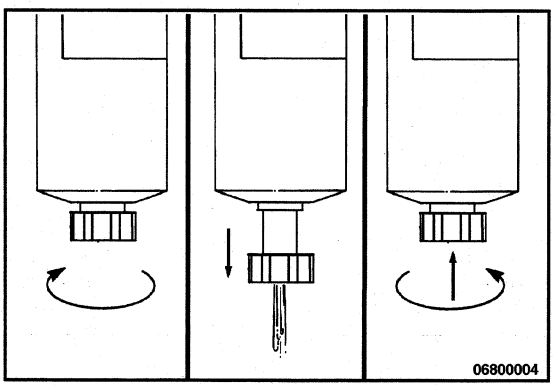


Canister Type

Shut off the engine.

Pull up on the drain valve lever until fluid drains out of the drain tube. Drain the filter sump until clear fuel is visible.

Push up on the drain valve until fluid drains out of the drain tube.



Spin-on Type

Shut off the engine.

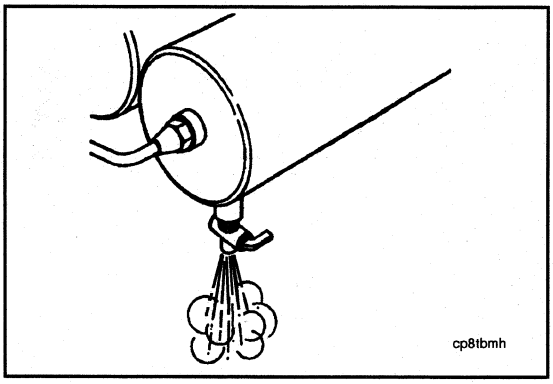
Use your hand to open the drain valve. Turn the valve **counterclockwise** approximately 3½ turns until the valve drops down 25.4mm [1 in] and draining occurs.

Drain the filter sump until clear fuel is visible.

△ CAUTION △

When closing the drain valve, do not overtighten the valve. Overtightening can damage the threads.

To close the valve, lift the valve and turn **clockwise** until it is hand-tight.



Air Tanks and Reservoirs

Drain

If automatic purging or spitter valves are used, confirm the valves are operating correctly. If a manual drain valve is used on the wet tank, open the draincock on the wet tank to drain any moisture accumulated in the air system. If oil is present, the air compressor system **must** be checked. Contact your Cummins Authorized Repair Location.

Maintenance Procedures at 250 Hours or 6 Months

Section Contents

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Maintenance Procedures - Overview

General Information

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

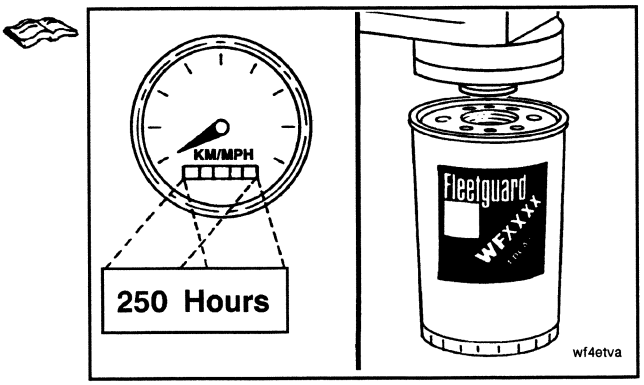
Coolant Filter

General Information

Use the correct Fleetguard® coolant filter to maintain the correct SCA concentration in the system.

Maintain the correct concentration by changing the service coolant filter at each oil drain interval.

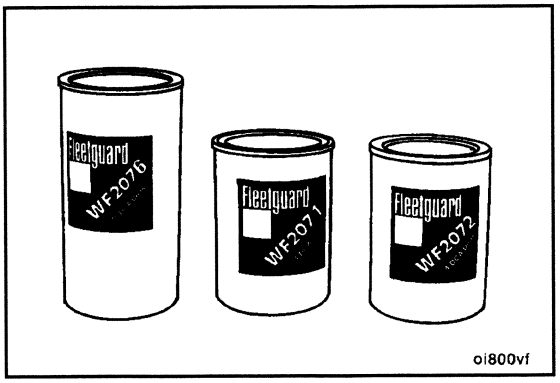
Refer to Fleetguard® DCA4 Service Filters and Liquid Precharge in Section V of the Operation and Maintenance Manual, QSK23 Engine, Bulletin 4021374.



Change the service coolant filter at every oil and filter change interval.

The correct service coolant filter to be used is determined by the total coolant system capacity and other operational factors.

Refer to the Fleetguard® Service Filter Guide in Section V for the correct SCA precharge filter selection in the Operation and Maintenance Manual, QSK23 Engine, Bulletin 4021374.

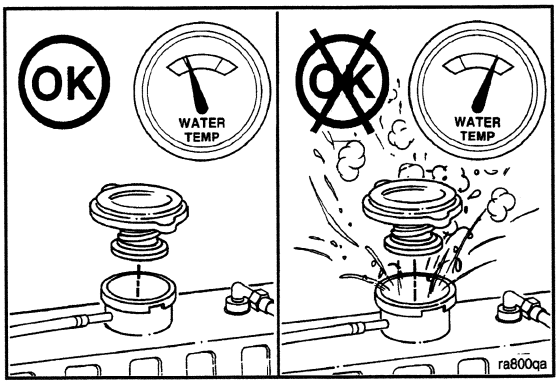


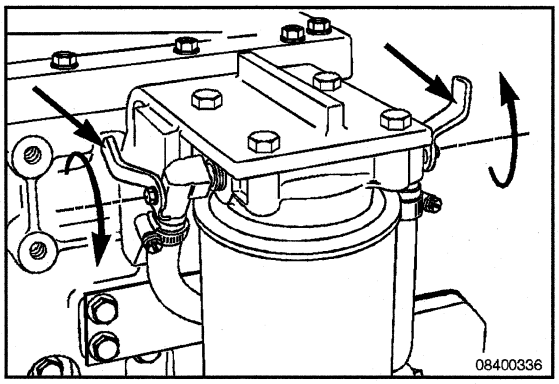
Remove

⚠ WARNING ⚠

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

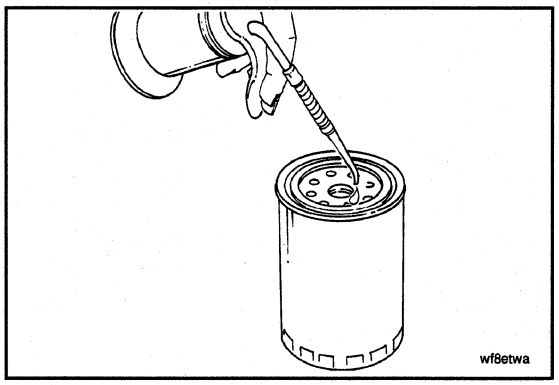
Remove the pressure cap.





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

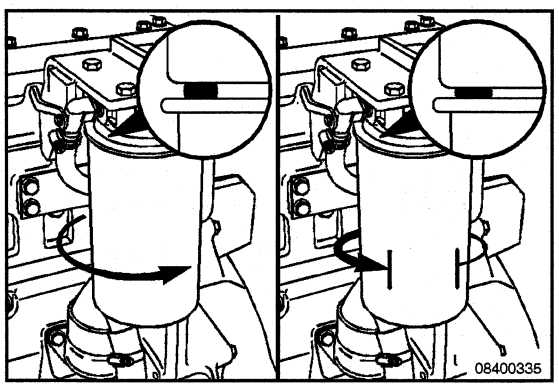
Remove and discard the coolant filter.



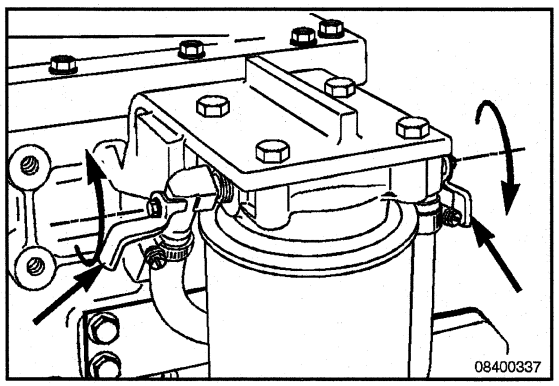
Install

Lubricate the seal on the filter with clean 15W-40 engine oil.

Do **not** allow oil to get in the filter. It will break down the SCA.



Install the coolant filter. Turn the filter until the seal touches the filter head. Turn an additional 1/2 to 3/4 of a turn after contact.



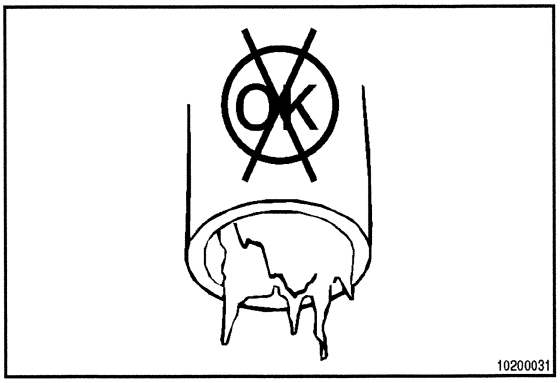
Turn the valve to the ON position.

Crankcase Breather Tube

Maintenance Check

Inspect the breather tube for sludge, debris, or ice in the tube.

Inspect the tube more frequently in icy conditions.



Drive Belts

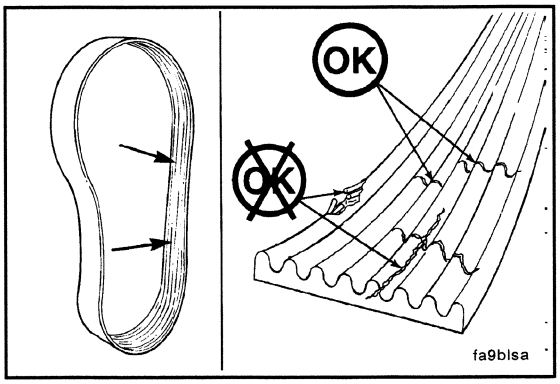
Maintenance Check

Poly-Vee Belt

Inspect the belts daily. Check the belt for intersecting cracks. Traverse (across the belt width) cracks are acceptable. Longitudinal (direction of belt length) cracks that intersect with transverse cracks are **not** acceptable. Replace the 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 or grease on the side of belts.



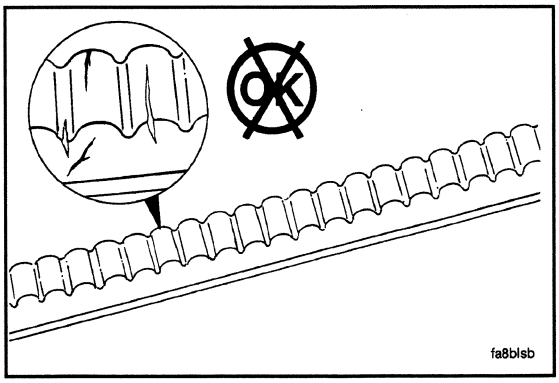
Cogged Belt

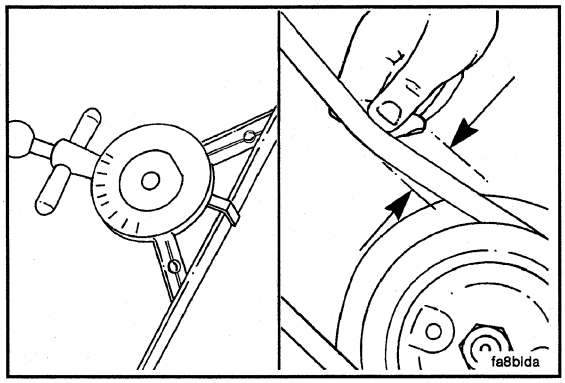
Inspect the belts daily. Replace the belts if they are cracked, frayed, or have chunks of material missing. Small cracks are acceptable.

Adjust the belts that have a glazed or shiny surface, which indicates belt slippage. Correctly installed and tensioned belts will show even pulley and belt wear. 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 or grease on the belts



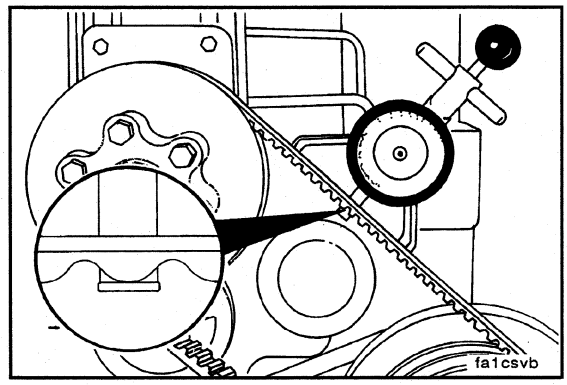


Measure the belt tension in the center span of the pulleys.

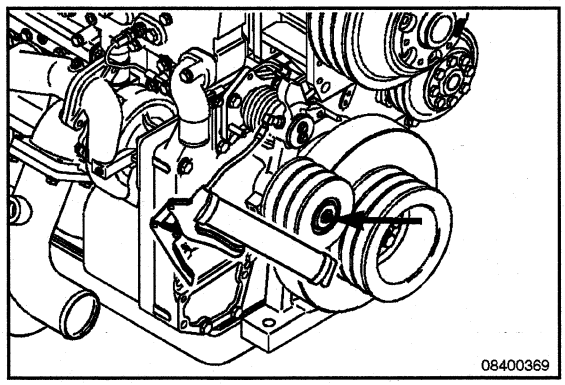
Refer to the Belt Tension Chart in Section V for the correct gauge and tension value for the belt width used.

An alternate method (deflection method) can be used to check belt tension by applying 110 N [25 lbf] force between the pulleys on v-belts. If the deflection is more than one belt thickness per foot of pulley center distance, the belt tension **must** be adjusted.

Refer to Section A for adjustment procedures.



For cogged belts, **make sure** that the belt tension gauge is positioned so that the center tensioning leg is placed directly over the high point (hump) of a cog. Other positioning will result in incorrect measurement.



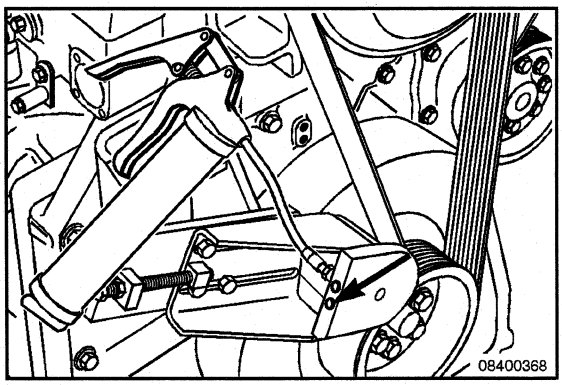
Cooling Fan Belt Tensioner

Maintenance Check

Industrial Applications

Use an appropriate grease to lubricate the cooling fan belt tensioner.

Apply grease to the fitting on the tensioner until grease appears at the overflow valve.



Power Generation

Use an appropriate grease to lubricate the cooling fan belt tensioner.

Apply grease to the fitting on the tensioner until grease appears at the overflow valve.

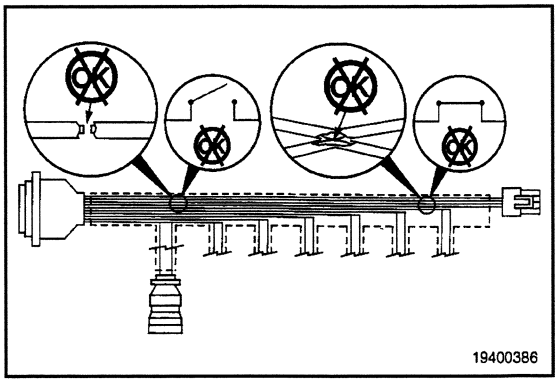
Engine Wiring Harness

Maintenance Check

⚠ WARNING ⚠

To reduce the possibility of personal injury, never touch the wiring connections when the start, stop, run switch or keyswitch is turned on or in the run position. Electrical shock can result.

Inspect all wiring connections and wiring harnesses for damage. Faulty wiring can cause improper engine operation and poor performance.

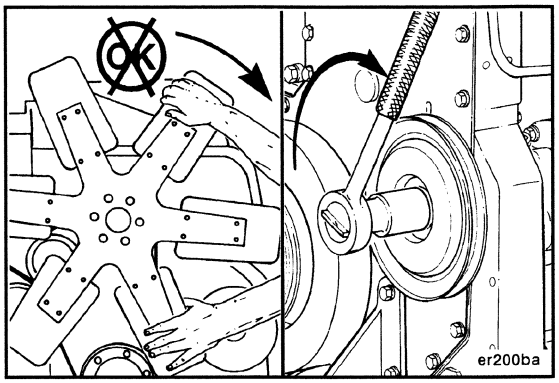


Fan, Cooling

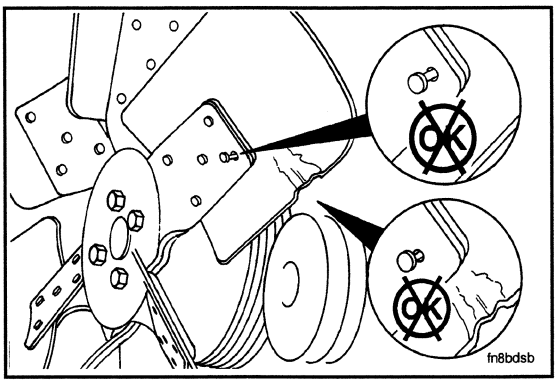
Inspect for Reuse

⚠ WARNING ⚠

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

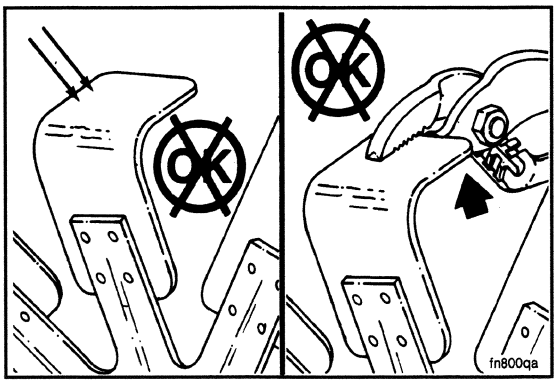


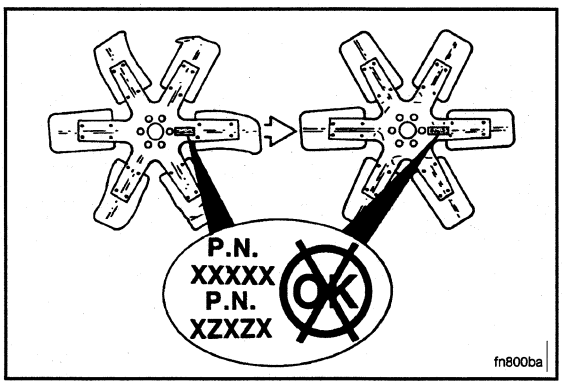
A visual inspection of the cooling fan is required daily. Check for cracks, loose rivets, and bent or loose blades. Check the fan to make sure it is securely mounted. Tighten the capscrews, if necessary.



⚠ WARNING ⚠

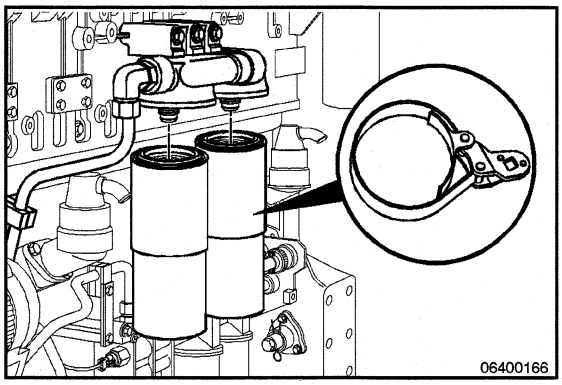
Do not straighten a bent fan blade or continue to use a damaged fan. A bent or damaged fan blade can fail during operation and cause personal injury or property damage.





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

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



Fuel Filter (Spin-On Type)

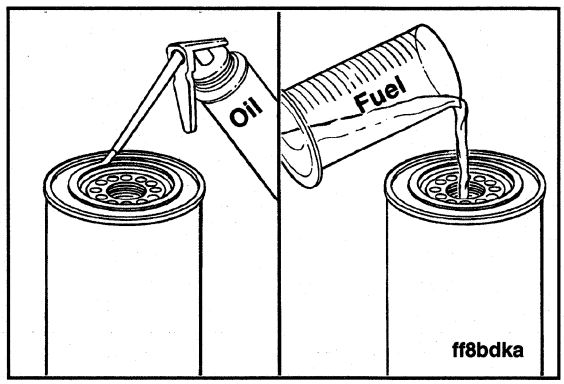
Remove

⚠ WARNING ⚠

Fuel is flammable. Keep all cigarettes, flames, pilot lights, arcing equipment, and switches out of the work area and areas sharing ventilation to reduce the possibility of severe personal injury or death when working on the fuel system.

Close the fuel line shutoff valve before changing the fuel filters. The overhead tank can drain, causing a fuel leak.

Remove the fuel filter with a filter wrench, Part Number 3376807.



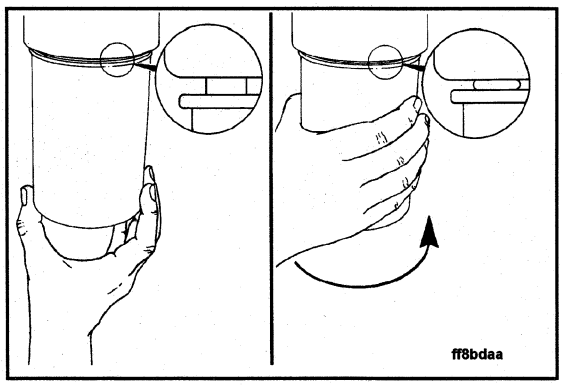
Install

Use a clean lint-free towel to clean the sealing surface on the filter head.

A fuel-water separator or fuel filter and water separator combination filter **must** be installed. Refer to Section V for fuel filter specifications.

Apply a light coating of clean engine oil to the surface of the filter gasket.

Fill the filter with clean fuel.



Install the filter on the filter head. Turn the filter until the gasket touches the surface of the filter head.

Tighten the filter an additional 1/2 to 3/4 of a turn after the gasket touches the filter head surface.

Open the fuel line shutoff valve and check for leaks.

Lubricating Oil and Filters

Drain

⚠ WARNING ⚠

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

⚠ WARNING ⚠

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

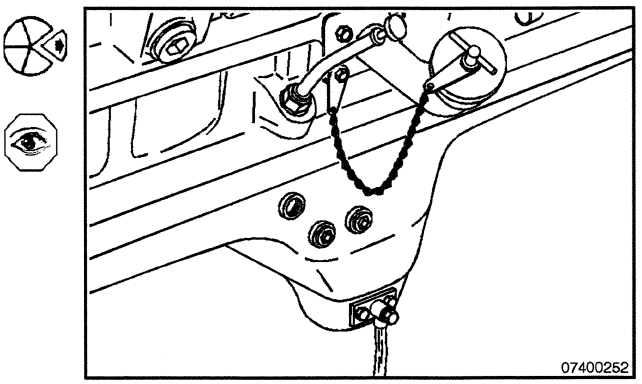
Do not extend oil change intervals past 250 hours or 6 months, whichever comes first, unless the chart method is being used.

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

Turn the engine off.

Remove the oil drain plug and open the drain valve.

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



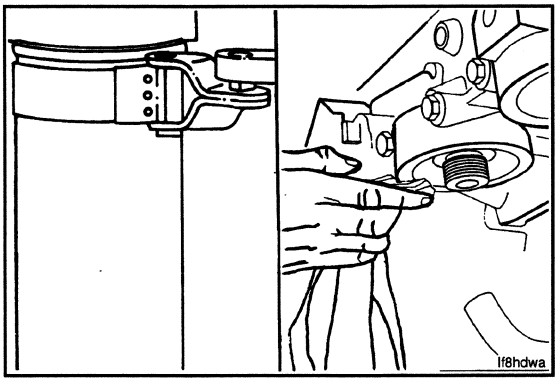
Remove

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

Use an oil filter wrench, Part Number 3375049, or equivalent, to remove the oil filters.

Be sure the o-ring is removed as it can stick on the filter head.

Discard the filters if they are **not** needed for a failure analysis.



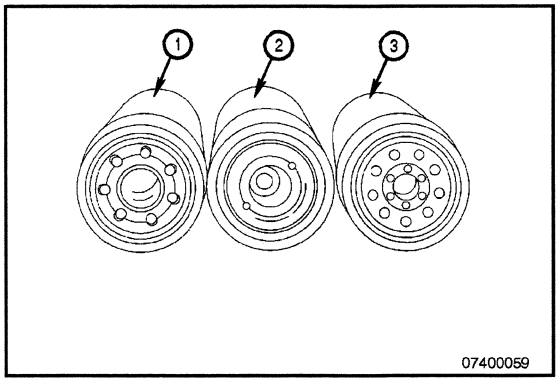
Install

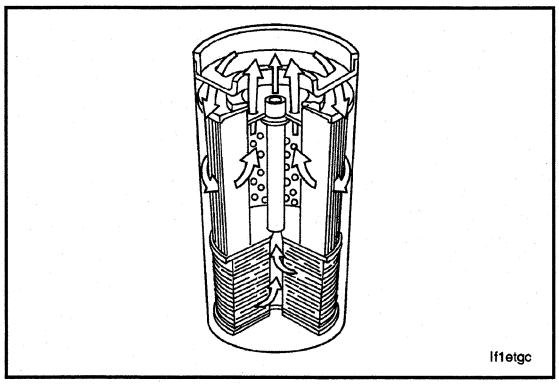
⚠ CAUTION ⚠

The bypass and combination filters have the same threads. Verify the correct filter is used for replacement to avoid damage to the engine.

The external appearance of the full-flow (1), the bypass (2), and the combination (3) filters are the same. The accompanying picture identifies the differences among the three filters.

The combination filter contains 1 1/2 12-inch threads. The bypass and combination filters contain 1 1/2 12-inch threads.



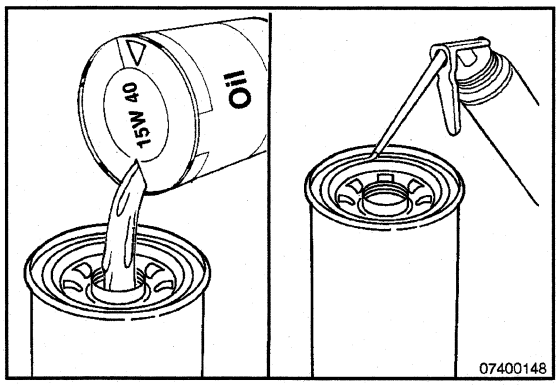


A combination oil filter is used on most engines. The upper section of the filter contains the full-flow filter element while the lower section contains the bypass element.

Be sure to use the correct oil filters for the engine.

Two combination full-flow/bypass filters are required.

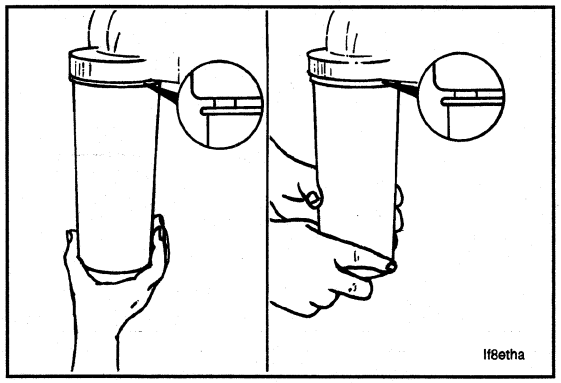
Refer to Section V for oil filter specifications.



△ CAUTION △

Fill the oil filters with clean lubricating oil. The lack of lubricating during the delay until the filters are pumped full of oil is harmful to the engine.

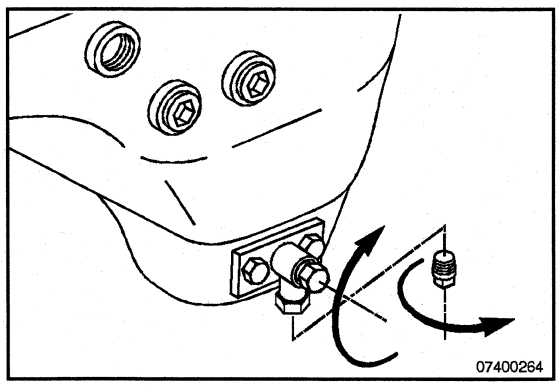
Apply a light film of lubricating oil to the gasket sealing surface before installing the new filters.



△ CAUTION △

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

Install the filter as specified by the filter manufacturer. The tightening instructions are normally printed on the outside of the filter.



Fill

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

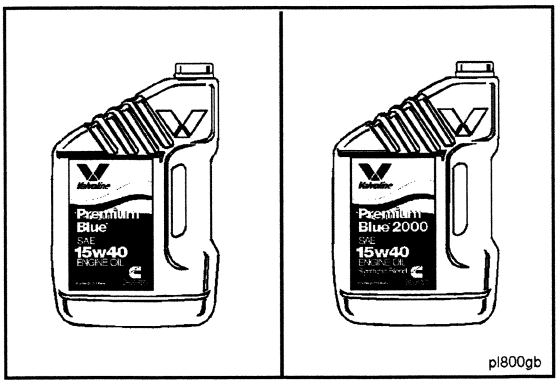
Close and tighten the oil drain valve.

Torque Value: 68 N•m [50 ft-lb]

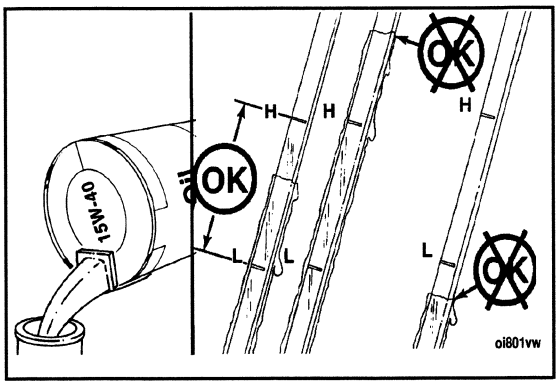
Install and tighten the oil drain plug.

Torque Value: 68 N•m [50 ft-lb]

Use a high-quality 15W-40 multiviscosity oil such as Valvoline® Premium Blue®, or equivalent, in Cummins engines. Choose the correct oil for your operating climate as outlined in Section V of this manual.



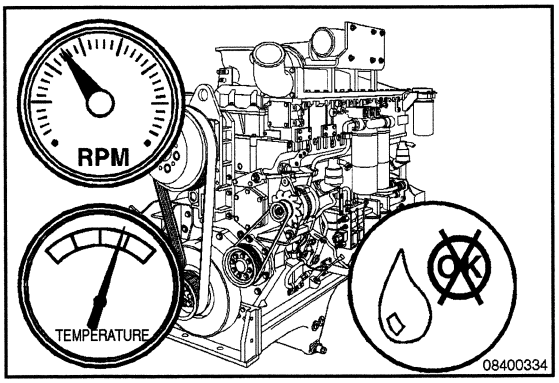
Fill the engine with clean engine oil to the correct level. Total system capacity, including filters, is listed in Section V of this manual.



⚠ CAUTION ⚠

Before starting the engine, complete the steps given in Starting Procedure after Extended Shutdown in Section 1 to be sure the engine receives correct lubrication. Lack of lubrication will damage the engine.

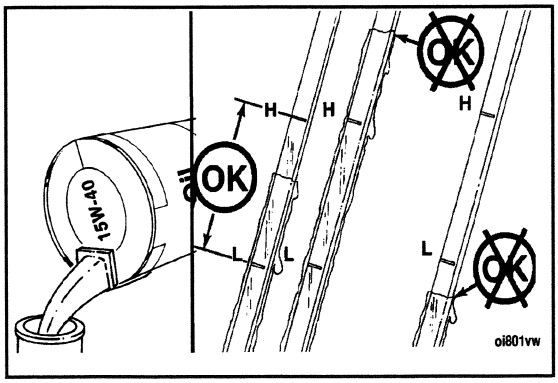
Operate the engine at idle speed to inspect for leaks at the filters and the drain plug.

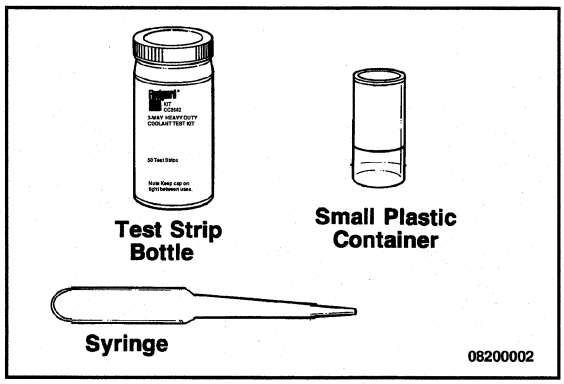


Turn the engine off.

Wait approximately five minutes to let the oil drain from the upper parts of the engine and check the oil level again.

Add oil as necessary to bring the oil level to the high mark (H) on the dipstick.





Supplemental Coolant Additive (SCA) and Antifreeze Concentration

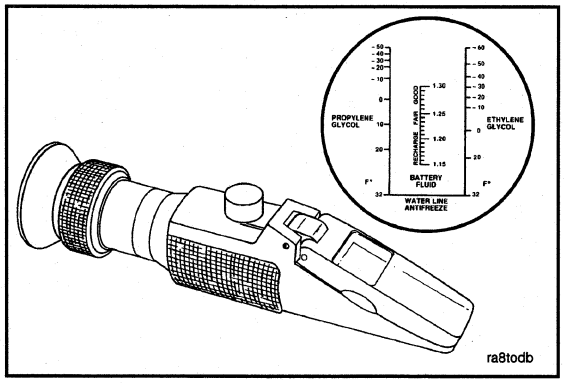
Maintenance Check

Supplemental Coolant Additive (SCA)

Check the SCA concentration level:

- At least twice a year
- At every subsequent oil drain interval if the concentration is above 3 units
- Whenever coolant is added to the cooling system between filter changes.

Use Fleetguard® coolant test kit, Part No. CC2602, to check the SCA concentration level. Instructions are included with the test kit. Refer to Coolant Recommendations and Specifications in Maintenance Specifications (Section V) for the correct SCA and antifreeze level.



Antifreeze

△ CAUTION △

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

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 Number C2800, provides a reliable, easy-to-read, and accurate measurement of freezing point protection and glycol (antifreeze) concentration.

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.

Maintenance Procedures at 1500 Hours or 1 Year

Section Contents

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Maintenance Procedures - Overview

General Information

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

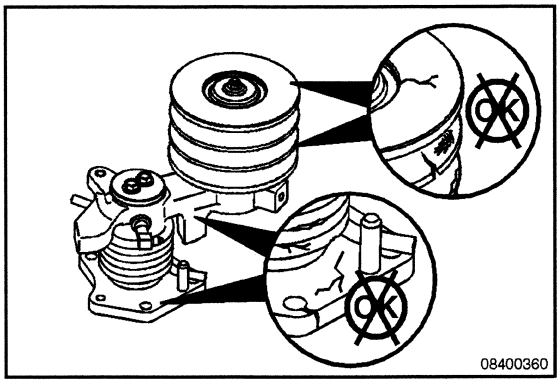
Cooling Fan Belt Tensioner

Maintenance Check

Industrial Applications

Check the cooling fan belt tensioner arm, spring, and pulley for cracks and other damage.

Rotate the pulley to check for rough bearings.

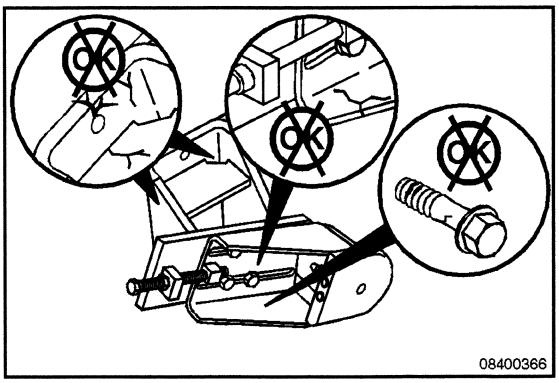


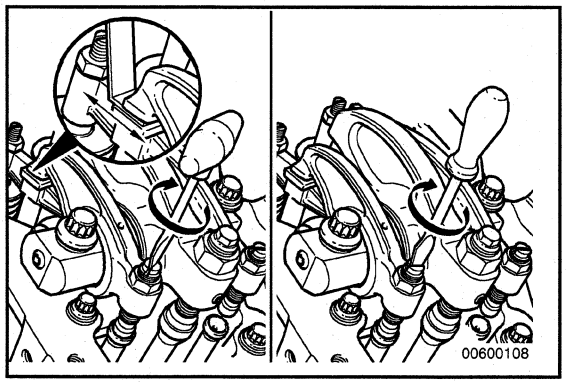
Power Generation

Check the cooling fan belt tensioner damage or deterioration.

Check the adjustable tensioner for cracks and broken bolts.

Rotate the pulley to check for rough bearings.



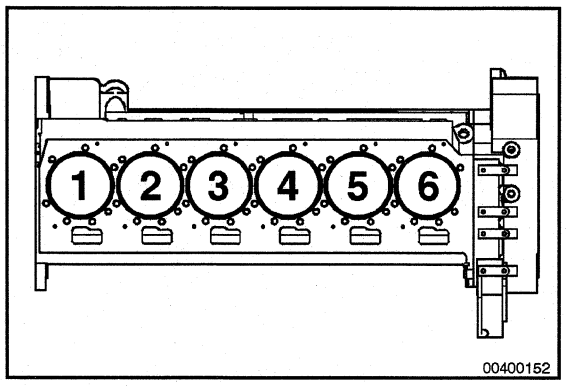


Overhead Set (OBC)

General Information

Cummins, Inc. has found that engines in most applications will **not** experience significant valve/injector train wear after an initial adjustment is performed at 1500 hours. After this adjustment, it is recommended that the valves and injectors **not** be adjusted again unless disturbed by repair or rebuild work. Because injector train hardware is typically mixed between cylinders during repairs, it is recommended that valves and injectors be adjusted again 1500 hours after any and all service work that involves the valve or injector train.

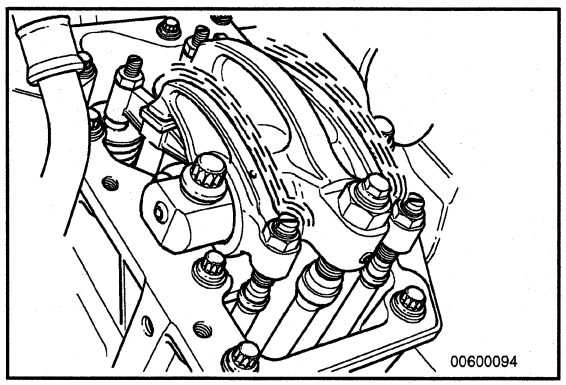
Valves and injectors **must** be correctly adjusted for the engine to operate efficiently. Valve and injector adjustment **must** be performed using the values listed in this section.



The cylinders are numbered from the front of the engine.

Firing order for the QSK23 engine is 1-5-3-6-2-4.

The crankshaft rotation is **clockwise** when viewed from the front of the engine.



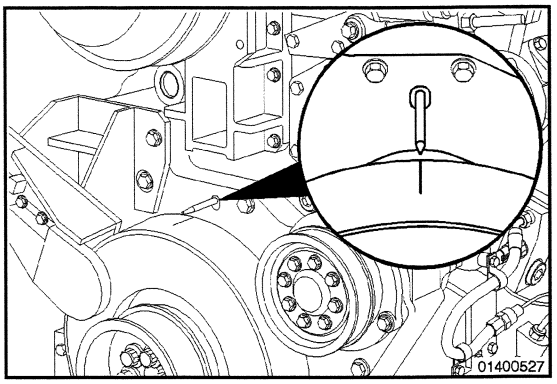
Each cylinder has three rocker levers. When facing the cylinder head from the intake side of the engine, the lever on the left is the intake rocker lever, and the lever on the right is the exhaust rocker lever. The center rocker lever is for the injector.

The engine has valve and injector adjustment marks on the vibration damper.

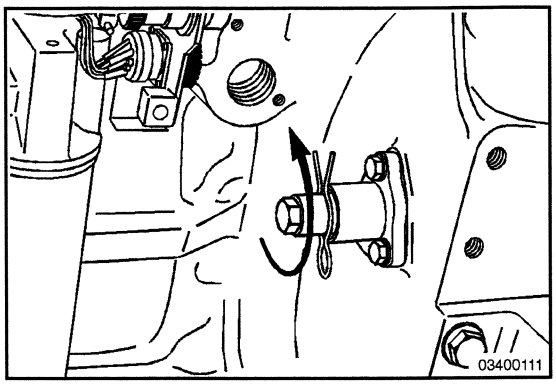
Valve and injector marks **must** be aligned with the pointer or a false adjustment can occur.

One pair of valves and one injector are adjusted at each vibration damper index mark.

Two crankshaft revolutions are required to adjust all of the valves and injectors.

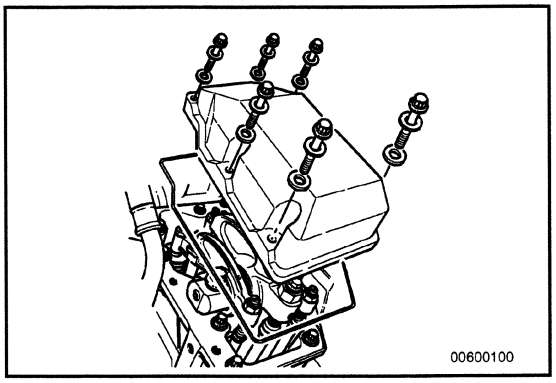


This illustration shows the engine barring device. To use the device, remove the clip and push the device towards the flywheel. The barring device **must** be rotated **counter-clockwise** to turn the flywheel and crankshaft in the direction of normal rotation.



Preparatory Steps

- Remove the rocker lever cover. Refer to Procedure 003-011.



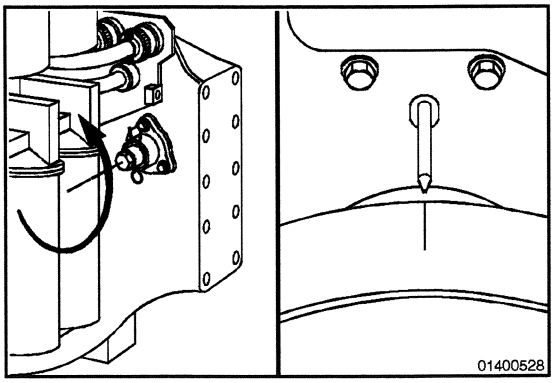
Adjust

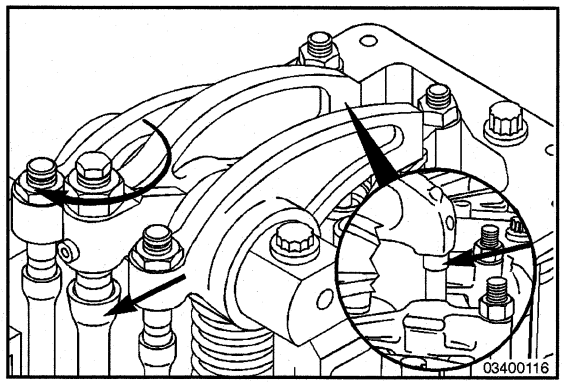
If the rocker lever assemblies were removed for this repair, use this step to determine the correct cylinder to set.

Lubricate the adjusting screw threads with clean engine oil prior to making valve and injector adjustments.

All adjusting screws **must** be loose on all cylinders and the push rods **must** remain in alignment.

Bar the engine to the next valve set mark on the damper. Setting can begin on any valve set mark.



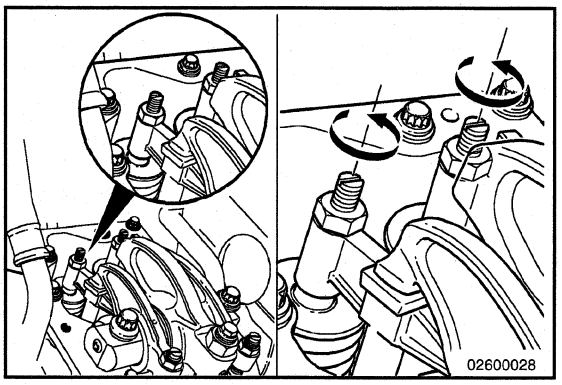


To determine which cylinder is ready for setting, identify the cylinders that would be in position for injector setting, refer to the chart in this procedure. For example, if the engine was barred to the "1.6 TOP" mark, cylinder 2 or 5 would be in position for injector setting.

For these two cylinders, turn the injector adjusting screws and locknuts down until the injector rocker is in contact with the push rod and injector link. Perform the injector setting on the cylinder which has the most visible threads above the locknut on the injector adjusting screw.

Prior to barring the engine the injector which had less visible threads and was **not** set in the previous step **must** have the injector adjusting screw backed out until there are at least as many threads above the adjusting nut as the injector that was set.

To determine which cylinder is ready for valve setting, refer to the chart in this section and identify the cylinder which corresponds to the injector set cylinder from the previous step. For example, if cylinder 2 injector was set, then cylinder 1 would be ready for valve setting.

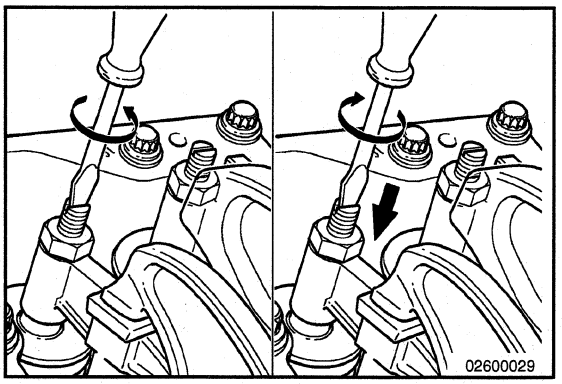


NOTE: The engine **must** be cold to perform the overhead set procedure.

Crosshead adjustment **must always** be made before attempting to adjust the valves.

Adjust the crossheads on the cylinder that is ready for valve setting.

Loosen the crosshead adjusting screw locknuts on the intake and exhaust valve crossheads.



Use the following procedure to adjust both the intake and exhaust crossheads.

Turn the adjusting screw **counterclockwise** at least one turn.

Hold the crosshead down against the guide.

Turn the adjusting screw **clockwise** until it touches the top of the valve stem but does **not** raise the crosshead.

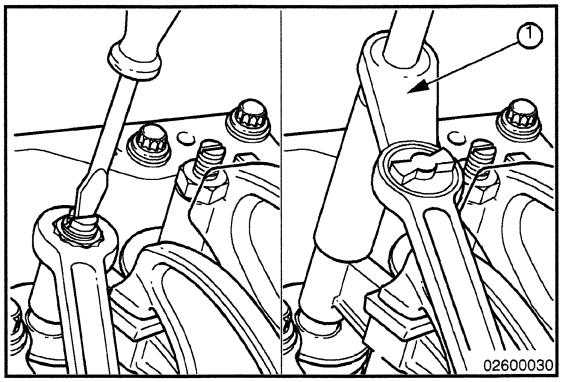
Hold the adjusting screw in this position. The adjusting screw **must not** turn when the locknut is tightened to its torque value.

Tighten the locknut.

The following torque values are given with and without a torque wrench adapter, Part Number 3163196.

Torque Value:

With adapter	60 N•m	[44 ft-lb]
Without adapter	65 N•m	[48 ft-lb]

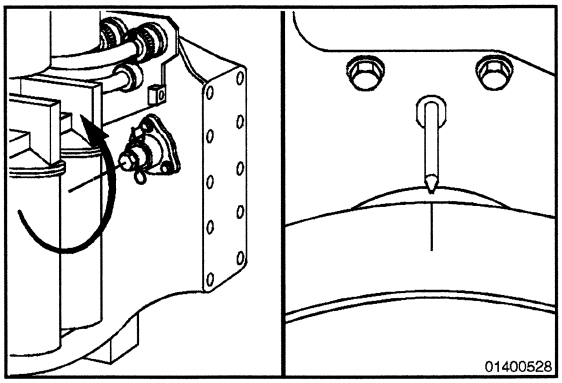


Bar the engine to the next damper timing mark and (refer to the chart in this procedure) to determine the next injector cylinder and valve cylinder to set.

If the rocker lever assemblies were **not** removed, identify the cylinders that are in position for injector setting.

On these two cylinders, identify the injector push rod which is higher in relation to the top of the rocker lever housing, this the cylinder ready for injector setting.

Refer to the chart in this section to determine the corresponding valve set cylinder.

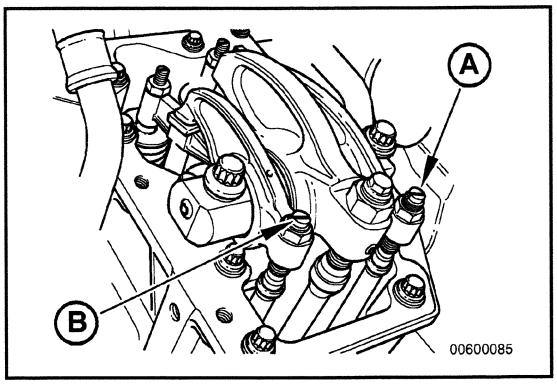


Valve and Injector Adjustment Determination		
Vibration Damper Mark	**Valve Adjustment on Cylinder Number**	**Injector Adjustment on Cylinder Number**
1.6 TOP	1	2
2.5 TOP	5	4
3.4 TOP	3	1
1.6 TOP	6	5
2.5 TOP	2	3
3.4 TOP	4	6

Valve Adjustment

Valve Clearances – Initial Set			
	mm		in
Exhaust valves (A)	0.62	MAX	0.024
Intake valves (B)	0.32	MAX	0.013

Valve Clearances – Check			
	mm		in
Exhaust valves (A)	0.60	MIN	0.023
	0.64	MAX	0.025
Intake valves (B)	0.30	MIN	0.012
	0.34	MAX	0.013



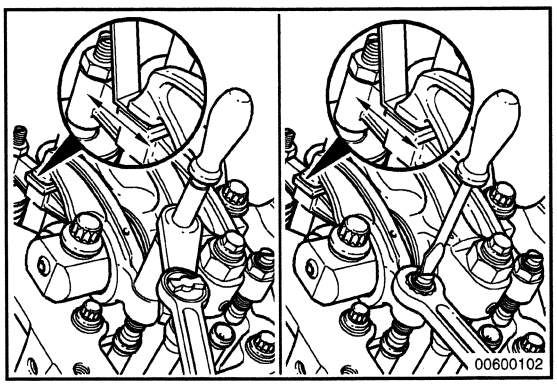
The Torque Wrench Method and Screwdriver Method are used to set valve lash clearance. Both are described below. Either method can be used; however, the Torque Wrench Method has proven to be the most consistent.

Make sure the crossheads have been adjusted and are firmly in place on the valve stems.

Make sure the feeler gauge is under the center of the rocker lever or incorrect adjustment can result.

The adjustment screws **must** turn freely or a false reading or setting can occur.

Select the proper feeler gauge for the valves being set. Use feeler gauge set, Part Number 3823557, or equivalent.



Valve Adjustment – Torque Wrench Method

Make sure parts are aligned and squeeze the oil out of the valve train by tightening the adjusting screw.

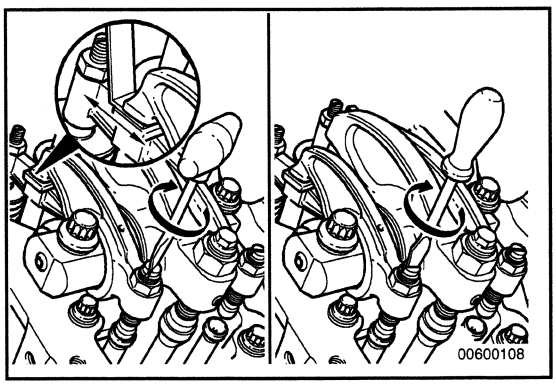
Loosen the adjusting screw at least one revolution.

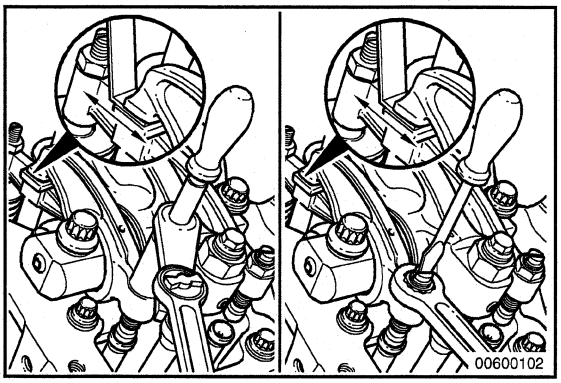
Insert the feeler gauge between the rocker lever and the crosshead.

Use torque wrench, Part Number 3376592, to tighten the adjusting screw.

Torque Value: 0.68 N•m [6 in-lb]

Remove the feeler gauge.





The adjusting screw **must not** turn when the locknut is tightened. Locknut torque can be applied with or without the torque wrench adapter, Part Number 3163196.

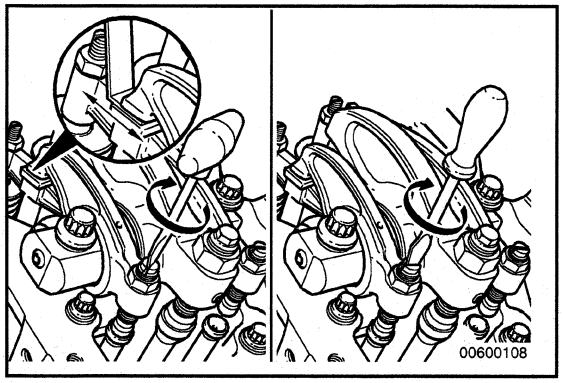
Tighten the locknut.

Torque Value:

With adapter	48 N•m	[35 ft-lb]
Without adapter	68 N•m	[50 ft-lb]

Attempt to insert a feeler gauge that is 0.03 mm [0.001 in] thicker. The valve lash is **not** correct if the thicker feeler gauge will fit.

Repeat the adjustment process until the proper lash is obtained.



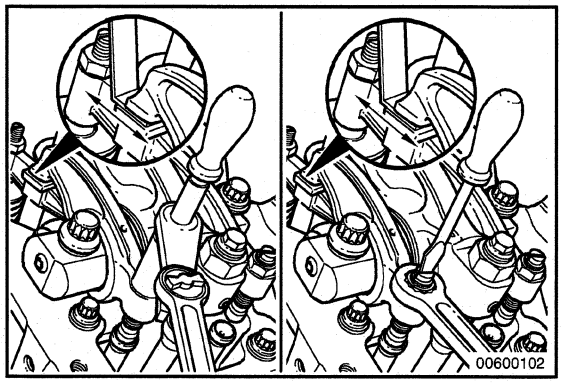
Valve Adjustment – Screwdriver Method

Make sure parts are aligned and squeeze the oil out of the valve train by tightening the adjusting screw.

Loosen the adjusting screw at least one revolution.

Insert the feeler gauge between the rocker lever and the crosshead.

Tighten the adjusting screw until the rocker lever touches the feeler gauge.



The adjusting screw **must not** turn when the locknut is tightened. Locknut torque can be applied with or without a torque wrench adapter, Part Number 3163196.

Tighten the locknut.

Torque Value:

With Adapter	48 N•m	[35 ft-lb]
Without Adapter	68 N•m	[50 ft-lb]

Attempt to insert a feeler gauge that is 0.03 mm [0.001 in] thicker. The valve lash is **not** correct if the thicker feeler gauge will fit.

Repeat the adjustment process until the proper lash is obtained.

Injector Lever Adjustment

Either a click type or a dial type torque wrench can be used to tighten the injector rocker lever adjusting screw. The specified adjusting screw torque **must** fall near the center of the operating range for the torque wrench used. If the screw chatters during setting, repair the screw and lever as required.

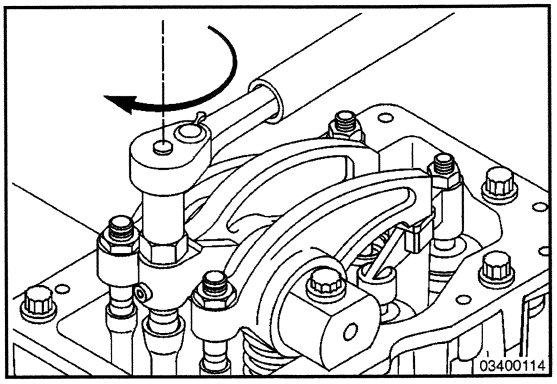
Tighten the adjusting screw.

Torque Value: 32 N•m [24 ft-lb]

Loosen the adjusting screw at least one revolution.

Tighten the adjusting screw again.

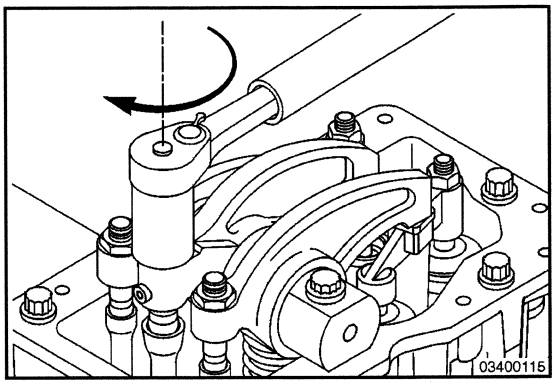
Torque Value: 32 N•m [24 ft-lb]



When tightening the adjusting screw locknut, do **not** hold the adjusting screw in position.

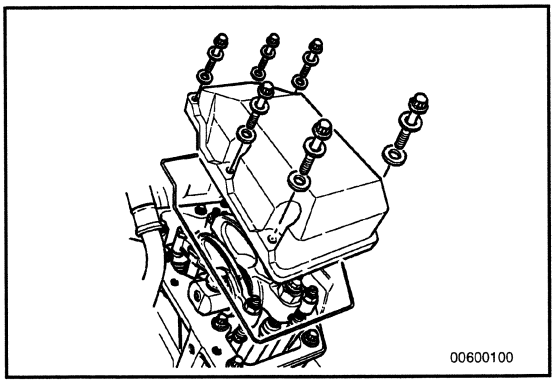
Tighten the injector adjusting screw locknut.

Torque Value: 225 N•m [165 ft-lb]



Finishing Steps

- Install the rocker lever cover. Refer to Procedure 003-011.

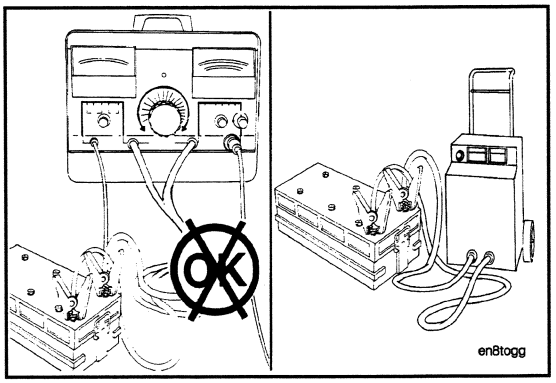


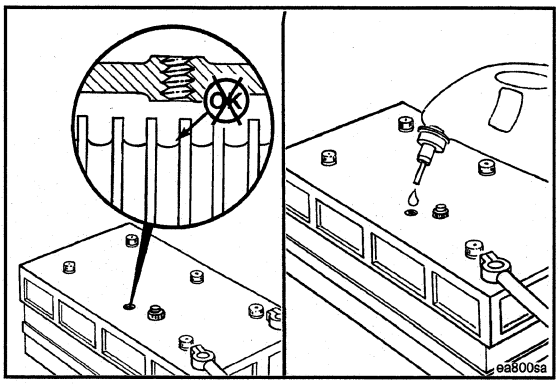
Batteries

Inspect

Use an inductive charging and cranking system analyzer to load-test the state of charge of maintenance-free batteries. If the state of charge is low, use a battery charger to charge the battery. Refer to the manufacturer's instructions.

Replace the battery if it will **not** charge to the manufacturer's specifications or the battery will **not** maintain a charge.





If conventional batteries are used, remove the cell caps or covers and check the electrolyte (water and sulfuric acid solution) level.

⚠ WARNING ⚠

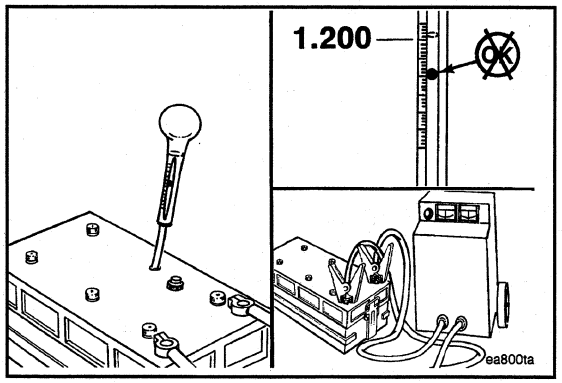
Batteries emit hydrogen gas. To avoid explosion and personal injury, do not smoke or allow ignition sources in the area when servicing batteries.

NOTE: Maintenance-free batteries are sealed and do **not** require the addition of water.

Fill each battery cell with water. Refer to the manufacturer's specifications.

Refer to the accompanying table to determine the battery state of charge based on the specific-gravity readings.

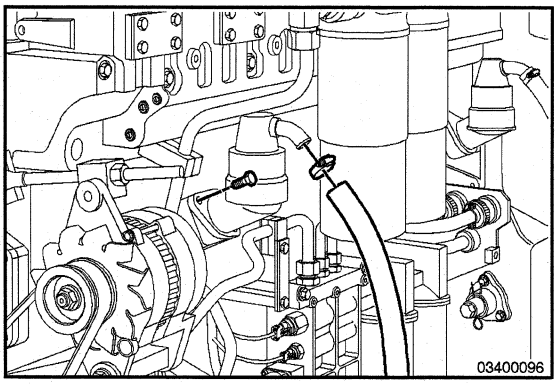
Battery State of Charge	Specific Gravity @ 27°C [80°F]
100%	1.260 to 1.280
75%	1.230 to 1.250
50%	1.200 to 1.220
25%	1.170 to 1.190
Discharged	1.110 to 1.130



Use a hydrometer to measure the specific gravity of each cell.

NOTE: If the specific gravity of any cell is below 1.200, the battery **must** be charged.

NOTE: Do **not** attempt to check the specific gravity of a battery immediately after adding water. If it is necessary to add water to allow use of the hydrometer, charge the battery several minutes at a high rate to mix the electrolyte.



Crankcase Breather (External)

Remove

Remove the breather tube and breather from the engine.

Check the tube and breather for obstructions and sludge buildup which can cause excess crankcase pressure buildup.

Clean

⚠ WARNING ⚠

When using solvents, acids, or alkaline materials for cleaning, follow the manufacturer's recommendations for use. Wear goggles and protective clothing to reduce the possibility of personal injury.

⚠ WARNING ⚠

Wear appropriate eye and face protection when using compressed air. Flying debris and dirt can cause personal injury.

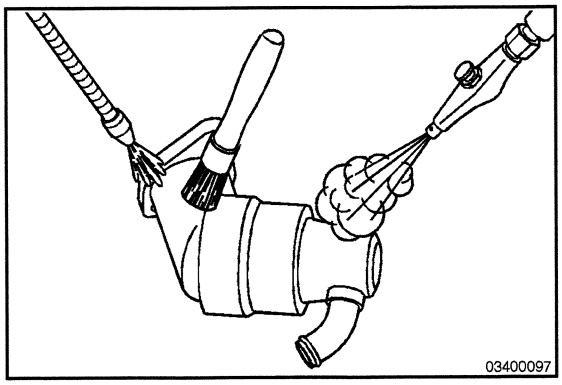
⚠ WARNING ⚠

When using a steam cleaner, wear safety glasses or a face shield, as well as protective clothing. Hot steam can cause serious personal injury.

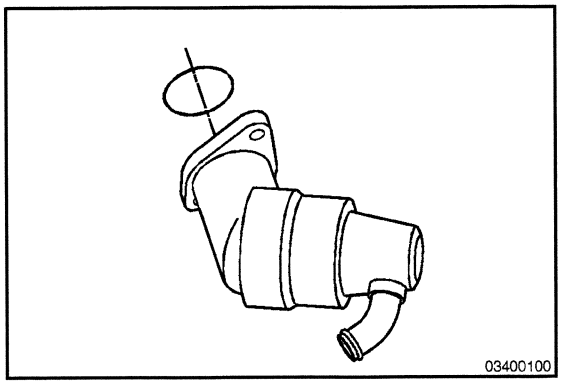
Soak the breather in solvent or clean with steam.

Dry the breather assembly with compressed air.

The air **must** flow freely through the breather. If the breather is blocked or restricted, it **must** be replaced.



Install an o-ring in the crankcase breather o-ring groove.



Install the crankcase breather onto the cam follower cover with two capscrews.

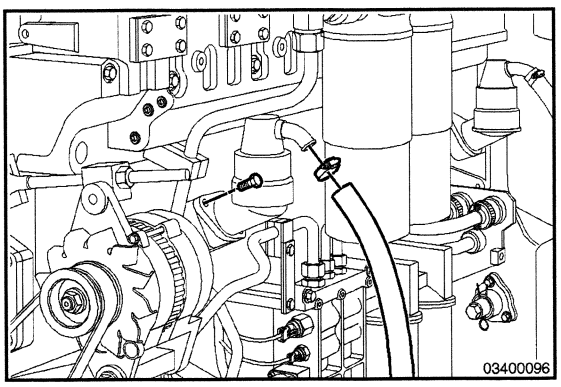
Tighten the capscrews.

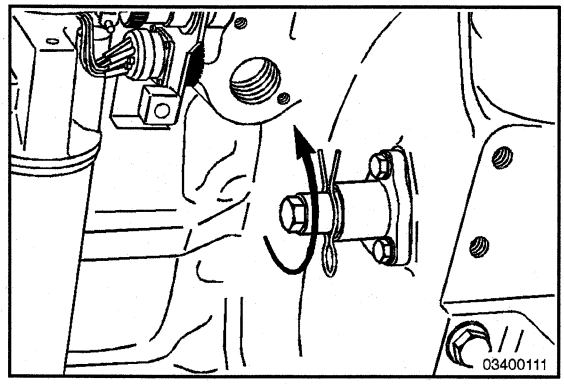
Torque Value: 66 N•m [48 ft-lb]

Install the hose and clamp onto the breather assembly.

Tighten the hose clamp.

Torque Value: 5 N•m [44 in-lb]





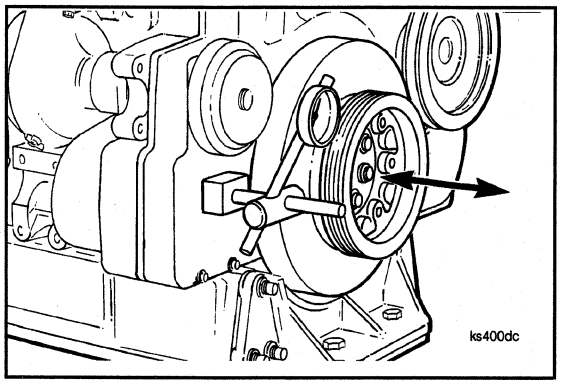
Crankshaft

Maintenance Check

To rotate the engine crankshaft **clockwise**, push in on the engine barring device and rotate **counterclockwise**.

Rotate the crankshaft through two complete revolutions.

If the engine does **not** turn freely, the equipment can have a malfunction. Refer to the manufacturer's instructions. The engine can have internal problems.



⚠ CAUTION ⚠

Extreme care must be used in prying against the viscous damper. Sharp pry bars can damage the damper casing, resulting in a leak of the viscous fluid and ultimate failure of the damper.

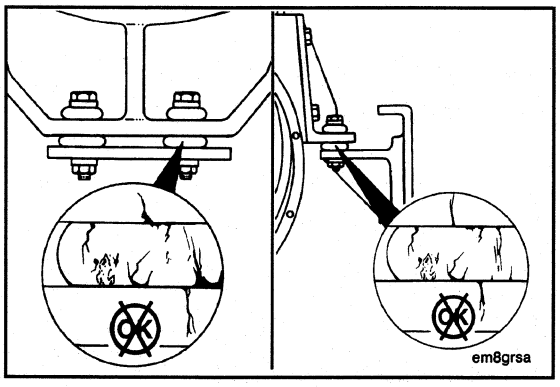
Measure the crankshaft end clearance with a dial indicator.

Crankshaft End Clearance

New Minimum	New Maximum	Worn Limit
0.14 mm [0.006 in]	0.32 mm [0.013 in]	0.60 mm [0.024 in]

The check can be made by attaching a dial indicator resting against the damper or pulley while prying against the front cover and inner part of the pulley or damper. End clearance **must** be in specification with the engine mounted in the unit and assembled to the transmission or converter.

If the clearance is **not** within specifications, contact a local Cummins authorized repair location.



Engine Mounts

Maintenance Check

Engine mounts that act as isolators are not supplied by Cummins Inc. Refer to the equipment manual for maintenance or contact the OEM.

Check the torque on the nuts and bolts. Tighten any that are loose. Inspect the rubber for deterioration and age hardening. Replace any broken or lost bolts, capscrews, or damaged rubber.

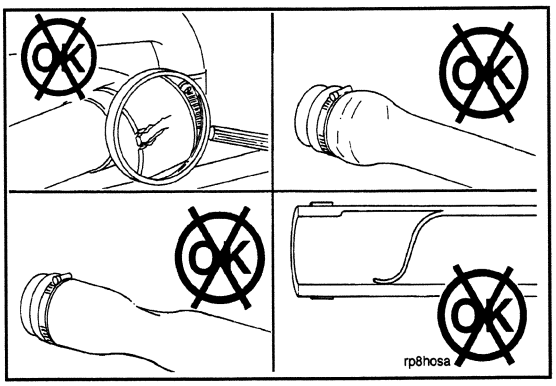
Capscrew size and grade vary with the flywheel housing and mounting arrangement. Determine the size and grade of the mounting bolts. Refer to the capscrew torque values in Section V of this manual.

Radiator Hoses

Maintenance Check

Check all hoses for cracks, cuts, or collapsing.

NOTE: The silicone engine coolant hose will exhibit swelling due to the elasticity of the hose.



NOTES

Maintenance Procedures at 6000 Hours or 2 Years

Section Contents

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Maintenance Procedures - Overview

General Information

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

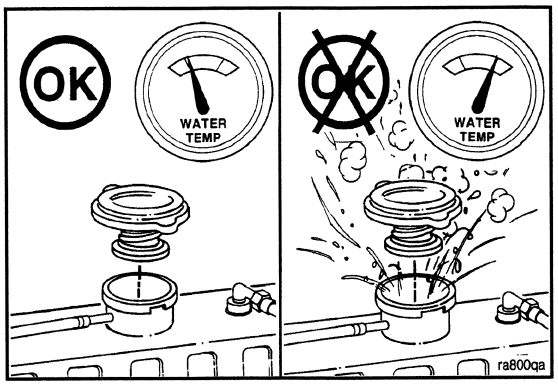
Cooling System

Drain

⚠ WARNING ⚠

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

Remove the radiator cap after the engine is cool.

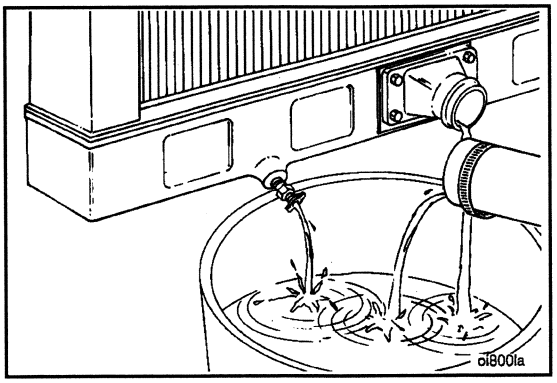


⚠ WARNING ⚠

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

Position the vehicle on level ground. Open the draincock at the bottom of the radiator. Remove the lower radiator hose. Drain the cooling system.

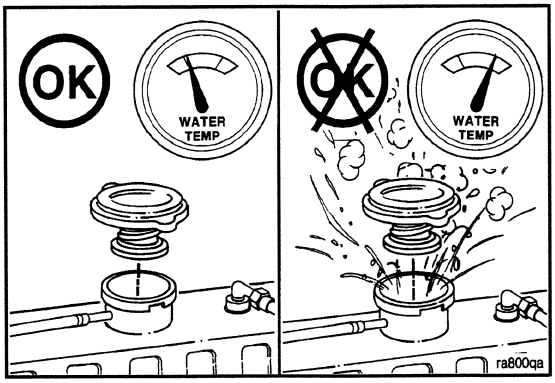
Do **not** remove the coolant filter.



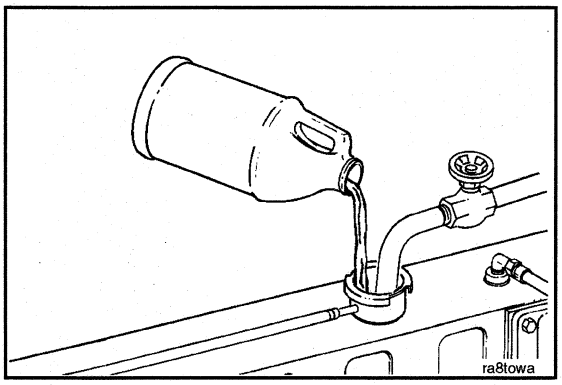
Flush

⚠ WARNING ⚠

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



The performance of RESTORE® is dependent on time, temperature, and concentration levels. An extremely scaled or flow restricted system, for example, can require higher concentrations of cleaners, higher temperatures, or longer cleaning time. RESTORE® can be safely used up to twice the recommended concentration levels. Extremely scaled or fouled systems can require more than one cleaning.

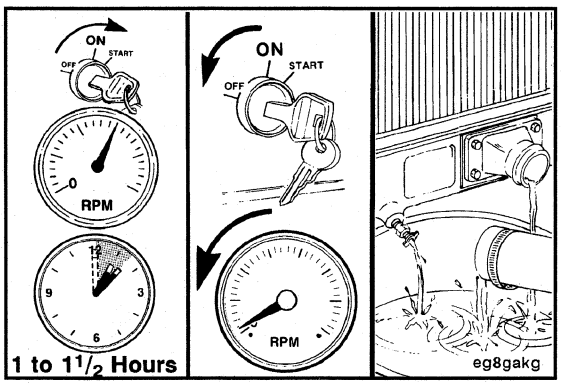


⚠ CAUTION ⚠

Fleetguard RESTORE® contains no antifreeze. Do not allow the cooling system to freeze during the cleaning operation.

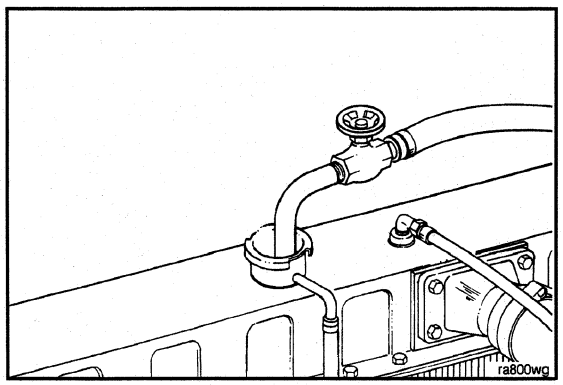
Immediately add 3.8 liters [1 gal] of Fleetguard RESTORE®, or equivalent, for each 38 to 57 liters [10 gal] of cooling system capacity, and fill the system with plain water.

Turn the heater temperature switch to HIGH to allow maximum coolant flow through the heater core. The blower does **not** have to be in the ON position.



Operate the engine at a coolant temperature of at least 85°C [185°F] for 1 to 1-1/2 hours.

Shut the engine OFF and drain the cooling system.

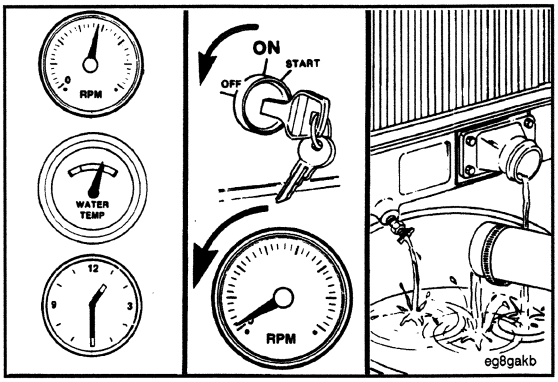


Fill the cooling system with clean water.

Operate the engine at high idle for five minutes with the coolant temperature above 85°C [185°F].

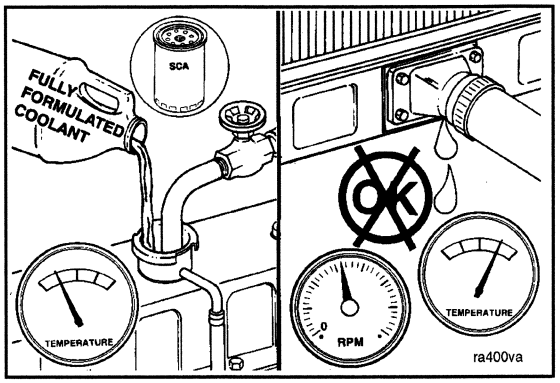
Shut the engine OFF and drain the cooling system.

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

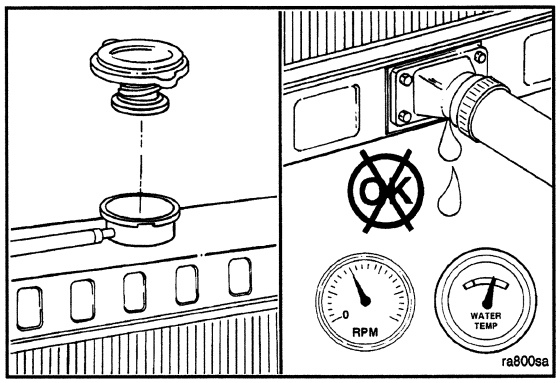


Install a new coolant filter and fill the cooling system with fully formulated coolant.

Use additional SCA to bring the coolant to the correct SCA concentration level. Refer to the specifications in this section.



Install the radiator cap. Operate the engine until the coolant reaches a temperature of 70°C [160°F], and check for coolant leaks.

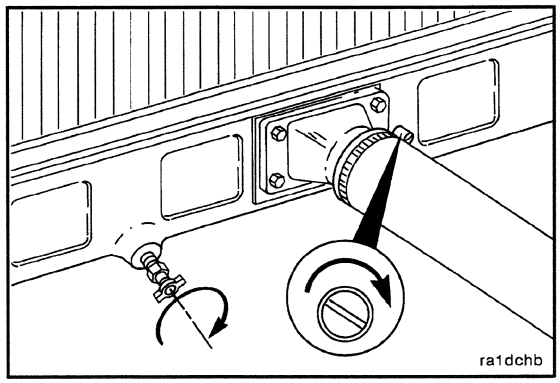


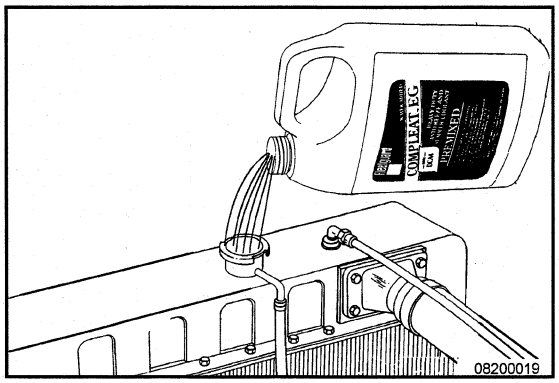
Fill

Close the radiator draincocks.

Install the lower radiator hose(s). Tighten the hose clamps.

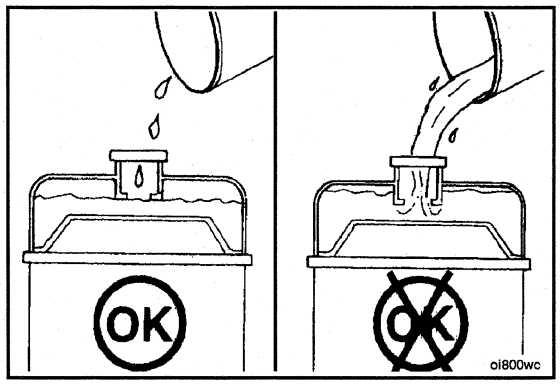
Torque Value: 5 N•m [40 in-lb]



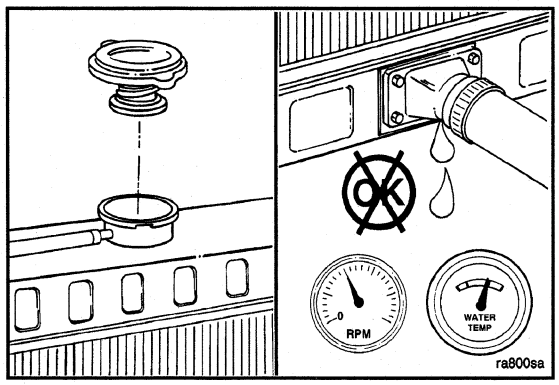


Cummins Inc. recommends using either a 50/50 mixture of good quality water and fully formulated antifreeze, or fully formulated coolant when filling the cooling system.

Use the correct units of SCA to obtain the correct cooling system protection.

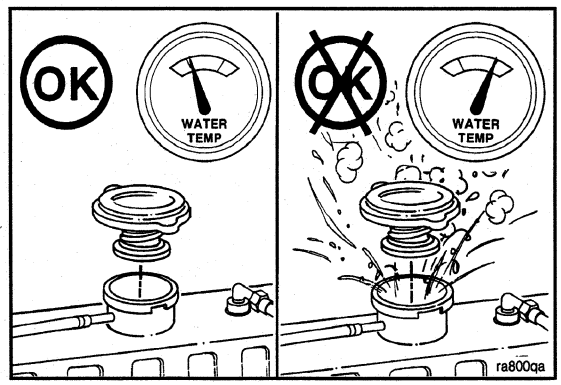


Fill the cooling system with coolant to the bottom of the fill neck in the radiator fill (or expansion) tank.



Replace the radiator cap.

Operate the engine until the coolant reaches a temperature of 70°C [160°F]. Check for leaks.



⚠ WARNING ⚠

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

Shut the engine OFF and allow it to cool.

Check the coolant level and fill if necessary.

Clean

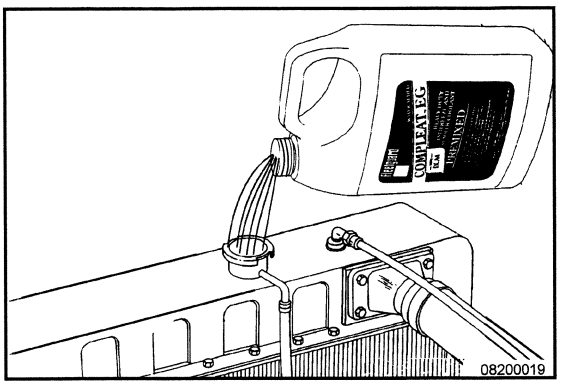
⚠ CAUTION ⚠

Do not use caustic cleaners in the cooling system. Aluminum components can be damaged.

Change the coolant and antifreeze every 6000 hours or two years. Refer to Cummins Requirements for Cooling System Extended Requirements for Cooling System Extended Service Intervals, Bulletin 3666286.

The cooling system **must** be clean to work correctly. Drain the system and flush with clean water. If the system shows mineral buildup, scale, rust, or oil, clean with a heavy-duty engine coolant cleaner and follow manufacturer's instructions.

Fill the cooling system with the correct mixture of antifreeze and water, and the correct SCA, or equivalent units, as outlined in Section V in the Operation and Maintenance Manual, QSK23 Series Engines, Bulletin 4021374.

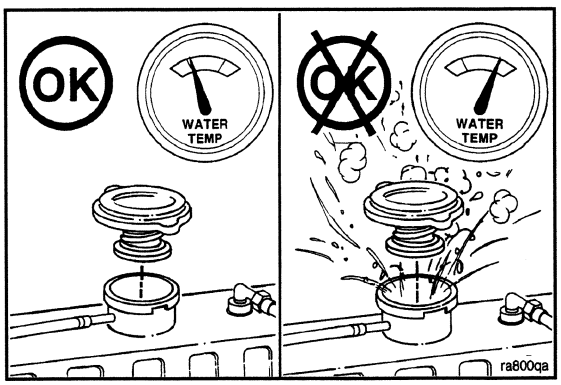


⚠ WARNING ⚠

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

Operate the engine and check for coolant leaks.

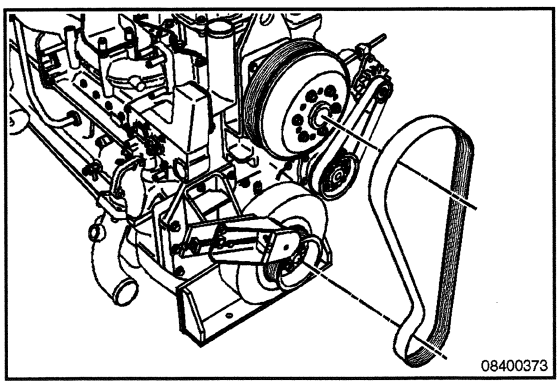
After the air has been purged from the system, check the coolant level again.

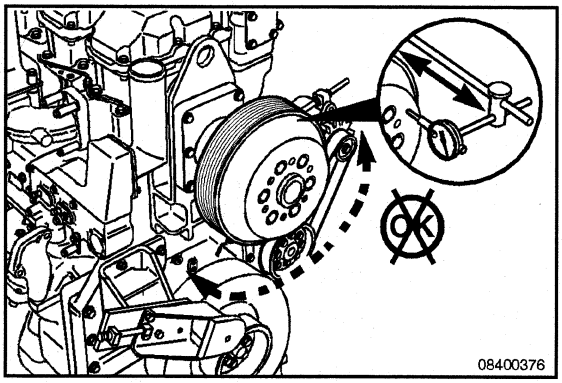


Fan Hub, Belt Driven

Maintenance Check

Remove the fan belt. Refer to Section A.





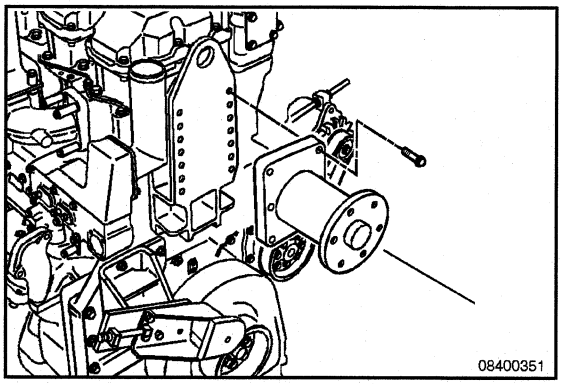
Rotate the fan hub pulley to check for rough or damaged bearings.

Inspect the pulley grooves for excessive wear.

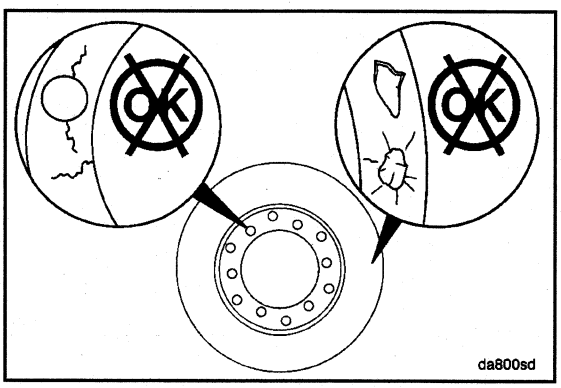
Inspect the fan hub for grease leakage.

Use a dial indicator to measure bearing end clearance.

Fan Hub End Clearance		
mm		in
0.03	MIN	0.001
0.25	MAX	0.010



If the above mentioned inspection results in a faulty condition, replace with a new or rebuilt unit as necessary. Contact a Cummins Authorized Repair Facility.



Vibration Damper, Viscous

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 of these conditions are identified, contact your local Cummins Authorized Repair Location to replace the vibration damper.

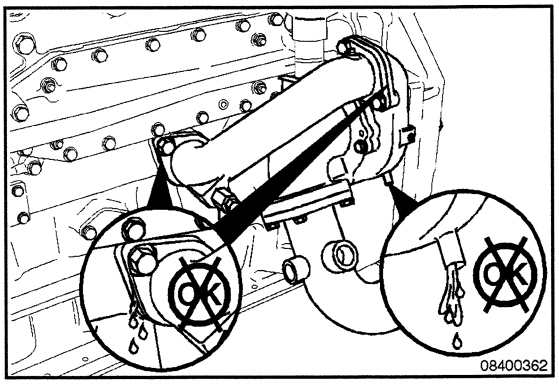
Viscous dampers have a limited life. The maximum damper life specifications are located in Maintenance Specifications (Section V).

For vibration damper location, refer to Engine Diagrams in Engine Identification (Section E).

Water Pump

Inspect

Inspect the water pump for leakage. Inspect the water pump and bypass tube for coolant or oil leakage. Check the water pump weep hole for excessive leakage. A minor chemical buildup or streaking at the water pump weep hole is normal. Do **not** repair or replace the water pump unless an actual leak is confirmed. If a leak is confirmed, contact a Cummins Authorized Repair Facility.

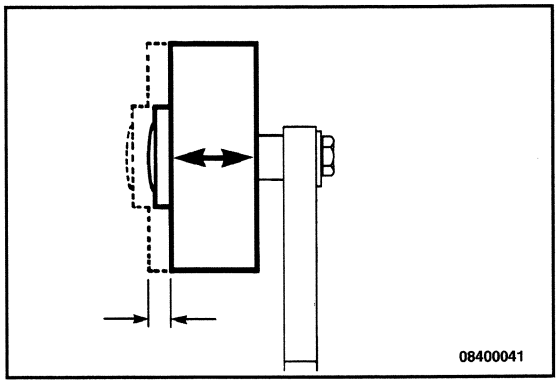


Fan Drive Idler Pulley Assembly

Maintenance Check

Inspect the fan drive idler pulley assembly. Rebuild or replace the assembly as necessary.

Contact a Local Cummins Authorized Repair Facility to schedule this maintenance.



NOTES

Other Maintenance

Section Contents

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Maintenance Procedures - Overview

General Information

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

Engine Storage - Long Term

General Information

If the engine will be out of service longer than 6 months, take special precautions to prevent rust. Contact the nearest Cummins Authorized Repair Location for information concerning engine storage procedures.

Section A - Adjustment, Repair, and Replacement

Section Contents

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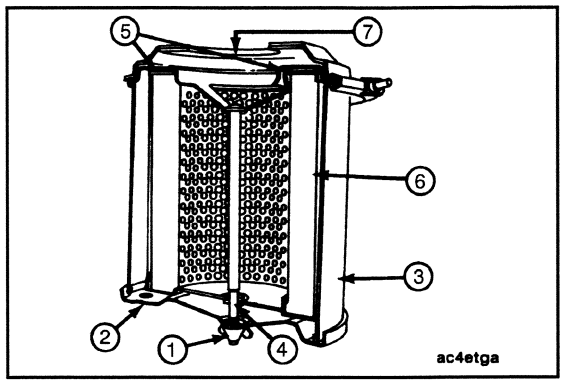
Air Cleaner Element, Paper Type

Maintenance Check

NOTE: The illustrations in this section show typical dry-type air cleaner parts. The particular engine parts can vary.

Replace the element if the inlet restriction or vacuum at full power exceeds 635 mm H_2O [25 in H_2O]. Changing filters or breaking the seal on the intake system more than necessary will result in excess dirt in the engine and **must** be avoided.

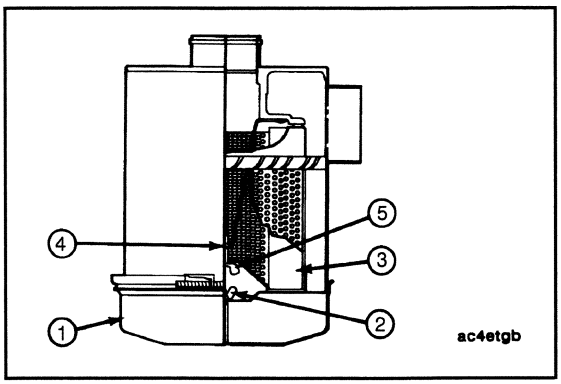


⚠ CAUTION ⚠

Holes, loose-end seals, dented sealing surfaces, and other forms of damage render the cleaner inoperative and require immediate element replacement.

NOTE: Cummins Inc. does **not** recommend cleaning paper-type air cleaner elements.

Elements that have been cleaned several times will finally clog and airflow to the engine will be restricted. After cleaning, check the restriction as previously described. Replace the element, if necessary.



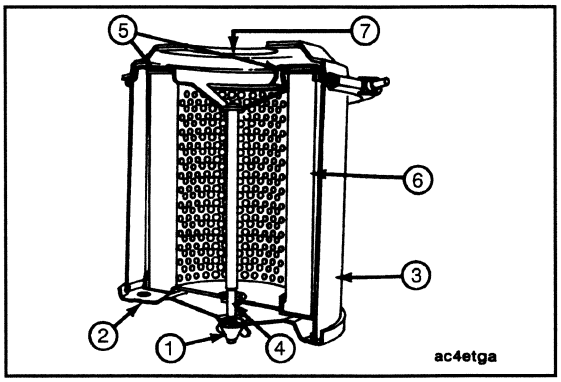
⚠ CAUTION ⚠

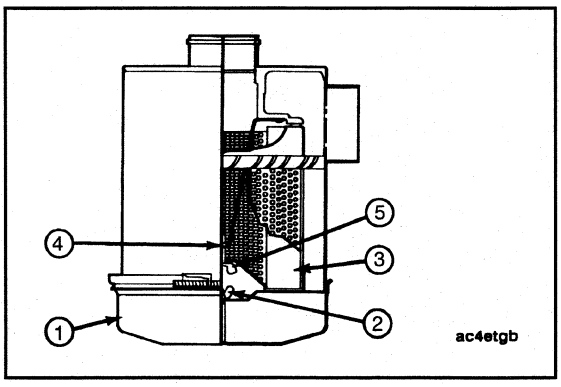
Pull the cover and the element straight out during removal from the housing to reduce the possibility of damage to the element.

Remove the wing nut (1) that secures the bottom cover (2) to the cleaner housing (3). Remove the cover.

Pull the element (6) down from the center bolt (4).

Remove the gasket (5) from the outlet end (7) of the housing.





Air Cleaner Element, Single Heavy Duty Dry Type

Maintenance Check

NOTE: The illustrations in this section show typical dry-type air cleaner parts. The particular engine parts can vary.

Heavy-duty air cleaners combine centrifugal cleaning with element filtering before air enters the engines.

Before disassembly, wipe dirt from the cover and the upper portion of the air cleaner.

△ CAUTION △

Holes, loose-end seals, dented sealing surfaces, and other forms of damage render the cleaner inoperative and require immediate element replacement.

NOTE: Cummins Inc. does **not** recommend cleaning paper-type air cleaner elements.

To clean the single types:

Loosen the wing nut (2) and remove the band securing the dust pan (1).

Loosen the wing nut (2). Remove the dust shield (3) from the dust pan (1). Clean the dust pan and shield.

△ CAUTION △

Pull the cover and the element straight out during removal from the housing to reduce the possibility of damage to the element.

Remove the wing nut (5) that secures the air cleaner primary element in the air cleaner housing. Inspect the rubber sealing washer on the wing nut (4).

Install the new primary element.

Be sure the gasket washer is in position under the wing nut before tightening.

Assemble the dust shield and dust pan. Position them to the air cleaner housing and secure with the band.

Air Cleaner Element, Dual Heavy Duty Dry Type

Maintenance Check

NOTE: The illustrations in this section show typical dry-type air cleaner parts. The particular engine parts can vary.

Heavy-duty air cleaners combine centrifugal cleaning with element filtering before air enters the engines.

Before disassembly, wipe dirt from the cover and the upper portion of the air cleaner.

⚠ CAUTION ⚠

Holes, loose-end seals, dented sealing surfaces, and other forms of damage render the cleaner inoperative and require immediate element replacement.

NOTE: Cummins Inc. does **not** recommend cleaning paper-type air cleaner elements.

To clean the dual types:

Loosen the wing bolt (1) and remove the band securing the dust pan (2).

Loosen the wing nut (3). Remove the dust shield (4) from the dust pan (2). Clean the dust pan and shield.

⚠ CAUTION ⚠

Pull the cover and the element straight out during removal from the housing to reduce the possibility of damage to the element.

Remove the wing nut (5) that secures the air cleaner first-stage element (6) in the air cleaner housing. Inspect the rubber sealing washer on the wing nut.

Install the new air element.

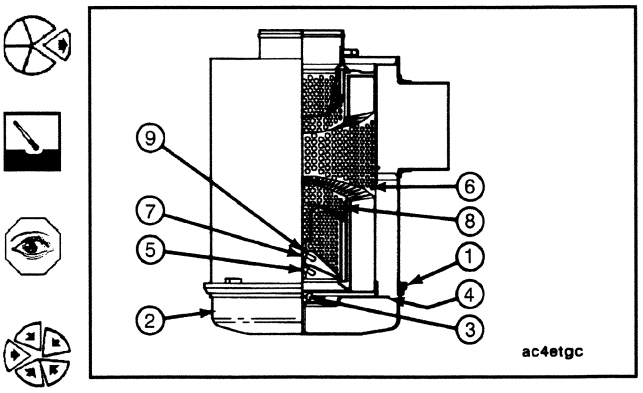
Be sure the gasket washer is in position under the wing nut before tightening.

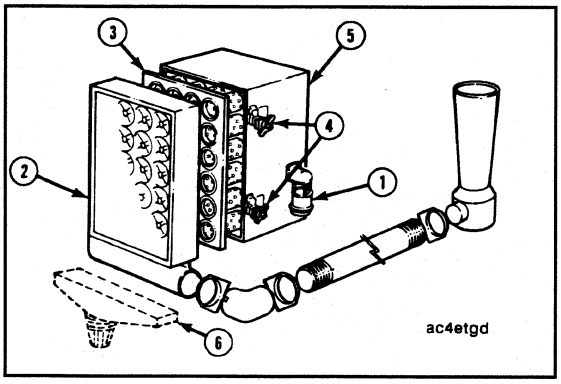
Assemble the dust shield and dust pan. Position them to the air cleaner housing and secure with the band.

On the dual-element type of Cyclopac cleaner:

Check the air restriction indicator. If the air restriction is excessive, disassemble the air cleaner, remove the wing nut (7), and replace the safety element (8).

Assemble the air cleaner as described above.





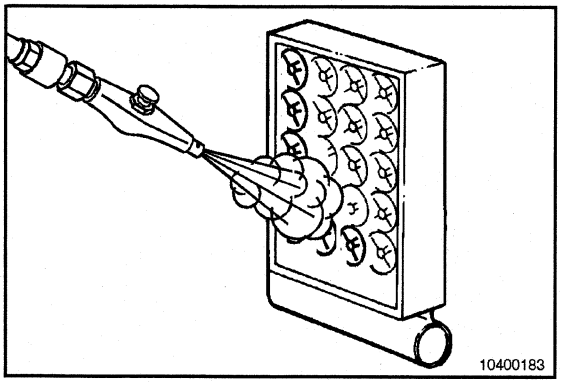
Air Cleaner Element, Cartridge Type

Maintenance Check

Loosen the wing nuts (4) on the air cleaner housing (5) to remove the precleaner panel with the dust bin (6). To remove the precleaner panel (2) equipped with an exhaust aspirator, loosen the u-bolt clamp securing the precleaner to the aspirator tubing.

Remove the dirty Pamic cartridge (3) by inserting your fingers in the cartridge opening (loosen all four corners of the cartridge one at a time) and pulling it straight out.

With larger cartridge, it is often necessary to break the seal along the edges of the cartridge. After the seal has been broken, pull the cartridge straight out and slightly up so the cartridge will clear the sealing frame and edges of the air cleaner housing.



Clean and Inspect for Reuse

Clean the precleaner openings (2) of all soot, oil film, and any other objects that can become lodged in the openings. Remove any dust or dirt in the lower portion of the precleaner and aspirator tubing. Inspect the inside of the air cleaner housing for foreign material.

Inspect the dirty cartridge for soot or oil. If there is soot inside the Pamic tubes, check for leaks in the engine exhaust system, exhaust blow-back into the air intake, and exhaust from other equipment. If the cartridge appears oily, check for fumes escaping from the crankcase breather. Excessive oil mist shortens the life of any dry-type cartridge. Troubleshooting at this point can appreciably lengthen new cartridge life.

It is **not** recommended to clean and reuse the cartridge. When returned to service, life expectancy of a cleaned cartridge will be **only** a fraction of the original service life.

Inspect clamps and flexible hose or tubing to be sure all fittings are air tight on cleaners with exhaust aspirators.

The precleaner dust bin (6) is self-cleaning.

Install

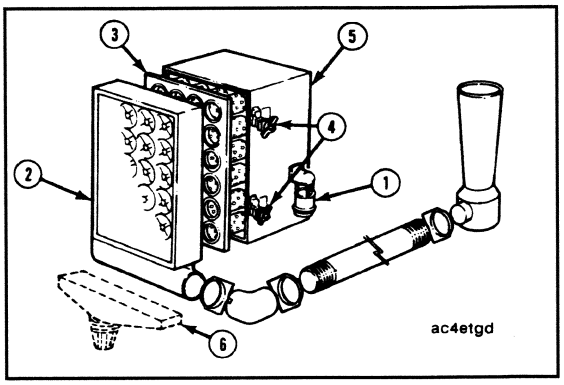
Inspect the new filter cartridge for shipping damage before installation.

To install a new cartridge, hold the cartridge (3) in the same manner as when removing it from the housing. Insert the clean cartridge into the housing: avoid hitting the cartridge tubes against the sealing flange on the edges of the air cleaner housing.

As the cleaner requires no separate gaskets for seals, care **must** be exercised when inserting the cartridge to secure a proper seat within the cleaner housing. Firmly press all edges and corners of the cartridge with your fingers to effect a positive air seal against the sealing flange of the housing. The cartridge **must not** be pounded or pressed in the center to seal.

Replace the precleaner panel (2) and tighten the wing nuts (4) by hand. For final tightness, turn the wing nuts 1 to 1-1/2 turns with a small adjustable wrench. Do **not** tighten too much. On a precleaner with an exhaust aspirator, assemble the aspirator tube to the precleaner panel and tighten the u-bolt.

Care **must** be exercised to keep the cleaner face unobstructed.



Lubricating Oil Dipstick

Calibrate

⚠ WARNING ⚠

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

⚠ WARNING ⚠

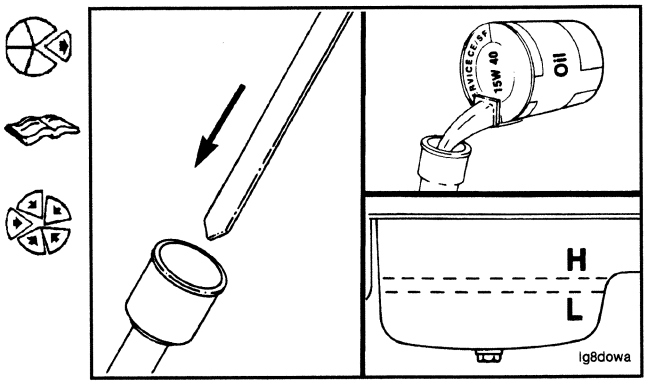
Some state and federal agencies have determined that used engine oil can be carcinogenic and cause reproductive toxicity. Avoid inhalation of vapors, ingestion, and prolonged contact with used engine oil. If not used, dispose of in accordance with local environmental regulations.

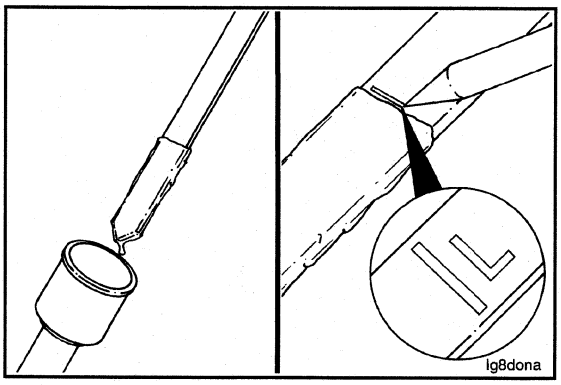
Drain the lubricating oil pan. Refer to Procedure 007-025.

The vehicle **must** be on a level surface.

Install the dipstick into the dipstick tube housing.

Use the correct volume of clean 15W-40 oil to fill the oil pan to the specified LOW oil level. Refer to Lubricating Oil System - Specifications in Section V for the correct engine oil capacity for your application.



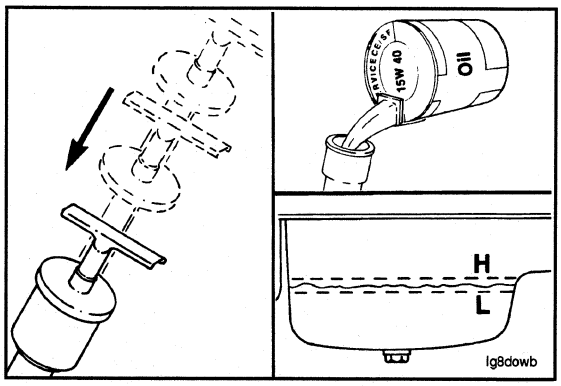


⚠ CAUTION ⚠

Use care when marking the dipstick, or the dipstick will break if the scribe mark is too deep.

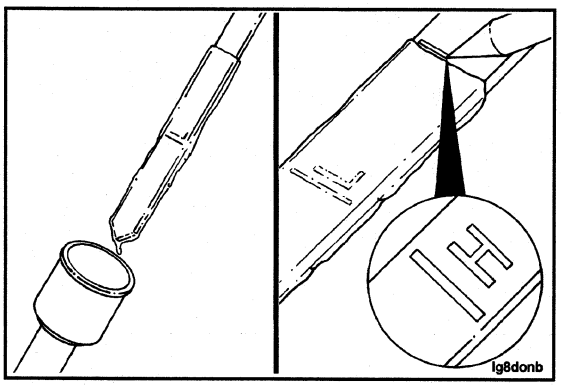
Remove the dipstick, and scribe a mark across the dipstick at the oil level. Label the mark with an L to indicate the LOW oil level.

If a new blank dipstick is being used, cut the dipstick off approximately 38 mm [1.5 in] below the LOW oil level mark.

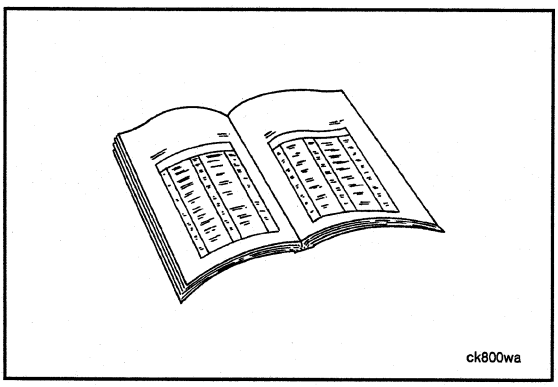


Wipe the excess oil from the dipstick, and install it into the dipstick tube housing.

Use the correct volume of oil to fill the oil pan to the specified high or H oil level. Refer to Lubricating Oil System - Specifications in Section V for engine oil capacity.



Remove the dipstick and scribe a mark across the stick at the oil level. Label the mark with an H to indicate the high oil level.



Air Starting Motor

General Information

The air starting motor system (tanks, line sizes, and valves) is designed and installed by the original equipment manufacturer and the starting motor supplier. Refer any questions about the air starting systems to the manufacturer.

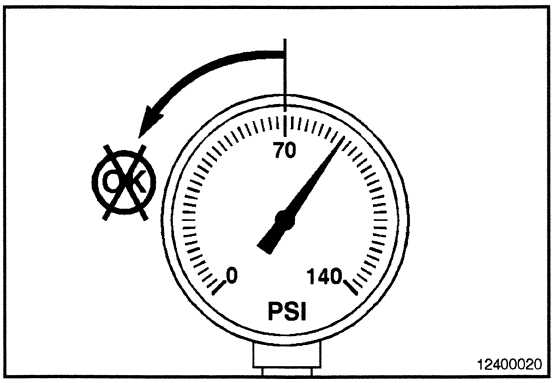
Maintenance Check

Do **not** operate the air starting motor with air pressure lower than 480 kPa [70 psi].

Maintain the air compressor according to the recommendations outlined in the manual.

For maximum efficiency, the hoses, tubes, and lines **must not** leak.

Refer to the original equipment manufacturer and starting motor manufacturer manuals for specific information regarding the starting motors, valves, and systems.

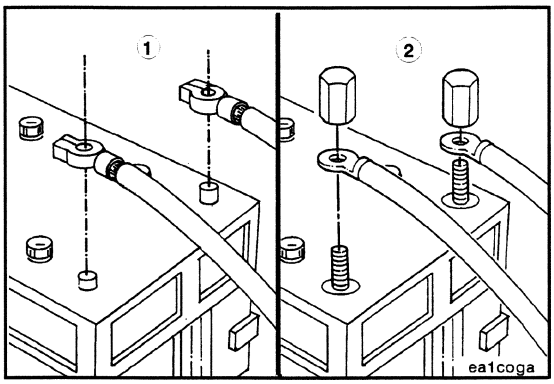


Battery Cables and Connections

Initial Check

There are two possible heavy-duty battery connections:

- Battery terminal and clamp (1)
- Threated battery terminal and nut (2).

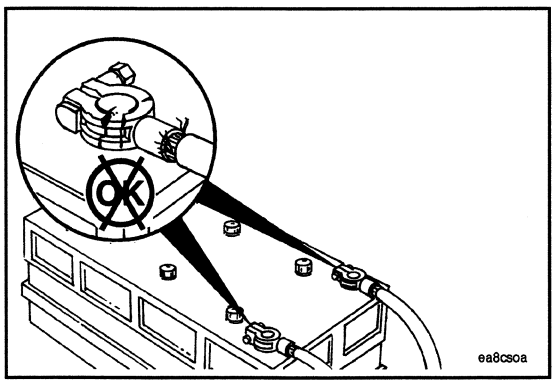


⚠ WARNING ⚠

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.

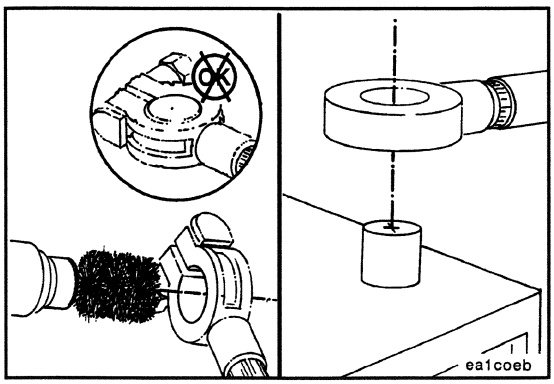
Remove and inspect the battery cables and connections for cracks or corrosion.

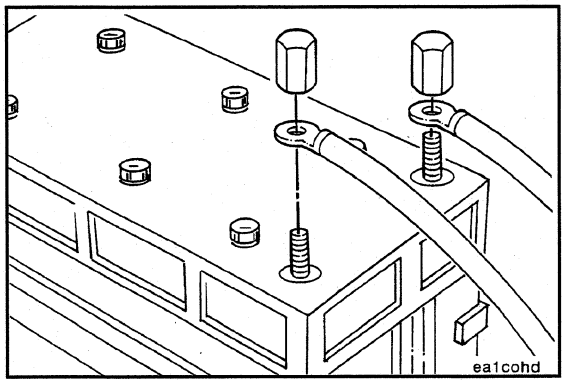
Replace broken terminals, connectors, or cables.



If the connections are corroded, use a battery brush or wire brush to clean the connections until shiny.

Make sure all debris is removed from the connecting surfaces.



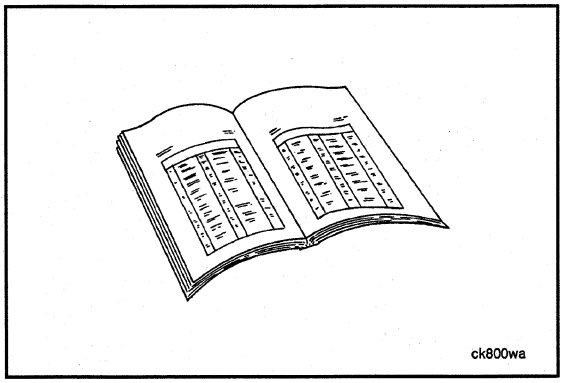


⚠ WARNING ⚠

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 the cables and tighten the battery connections.

Coat the terminals with grease to prevent corrosion.



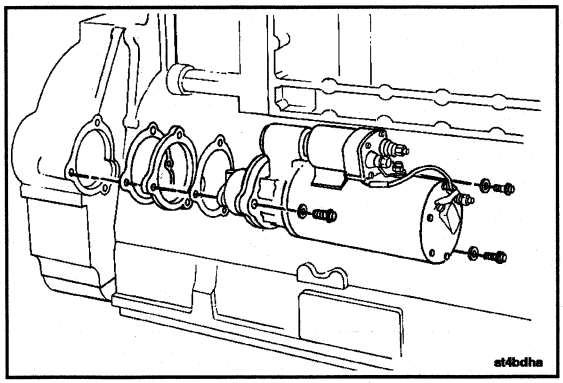
Starting Motor

Preparatory Steps

⚠ WARNING ⚠

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

- Disconnect the battery. Refer to Procedure 013-007.
- Disconnect the electrical connections from the starting motor.



Remove

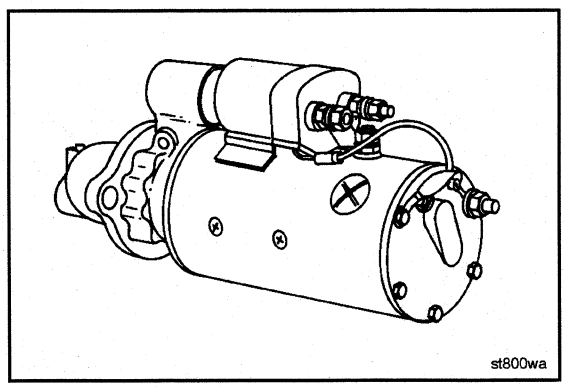
⚠ WARNING ⚠

This assembly weighs 23 kg [50 lb] or more. To reduce the possibility of personal injury, use a hoist or get assistance to lift this assembly.

Remove the starting motor capscrews, the starter, spacers, and gaskets.

Discard the gaskets.

NOTE: Some engines do **not** use spacers and gaskets.



Clean and Inspect for Reuse

Powerpack

⚠ WARNING ⚠

When using a steam cleaner, wear safety glasses or a face shield, as well as protective clothing. Hot steam can cause serious personal injury.

Clean the exterior of the starting motor with steam.

Inspect the gear, shaft, and the bushing for wear or damage.

Lubricate the bushing with clean engine oil.

NOTE: A pipe plug **must** be removed to lubricate the bushing on some starter motors.

Install

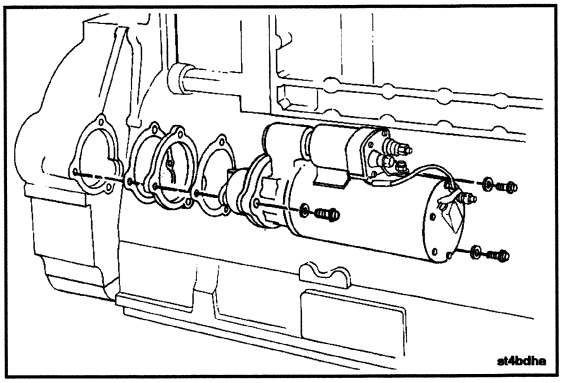
NOTE: Some engines do **not** use spacers.

Install any spacers or gaskets.

Install the starting motor and capscrews.

Tighten the capscrews.

Torque Value: 279 N•m [206 ft-lb]

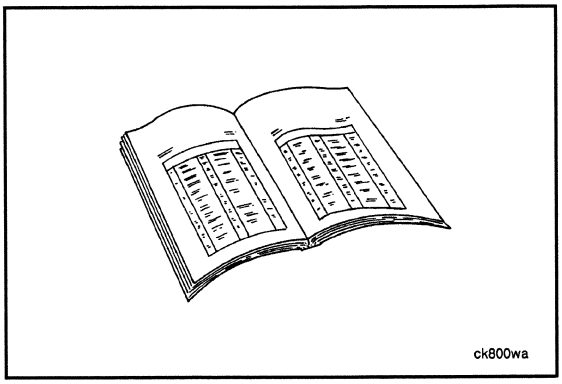


Finishing Steps

⚠ WARNING ⚠

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

- Install the electrical connections to the starting motor.
- Connect the batteries. Refer to Procedure 013-007.



Drive Belt, Cooling Fan

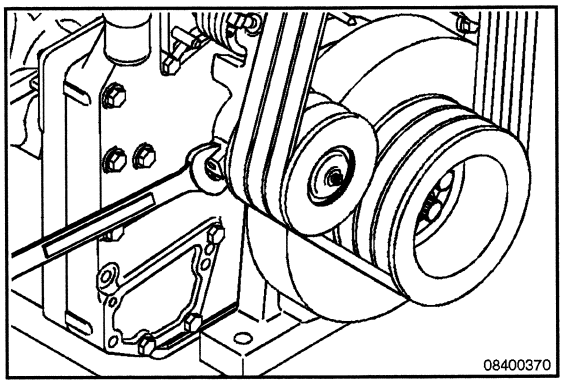
Remove

Industrial Applications

⚠ WARNING ⚠

The belt tensioner is under pressure. Relieve and restore belt tension slowly to reduce the possibility of personal injury.

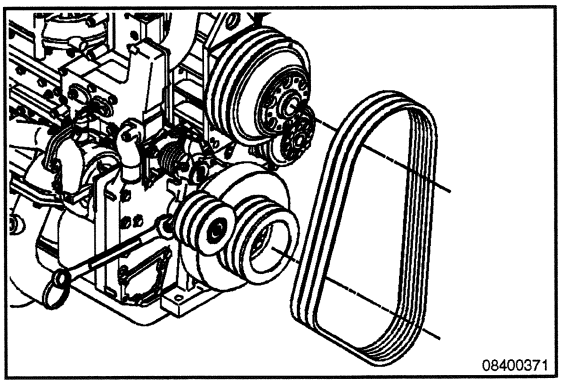
Place an open-ended wrench on the tensioner lug, as shown.

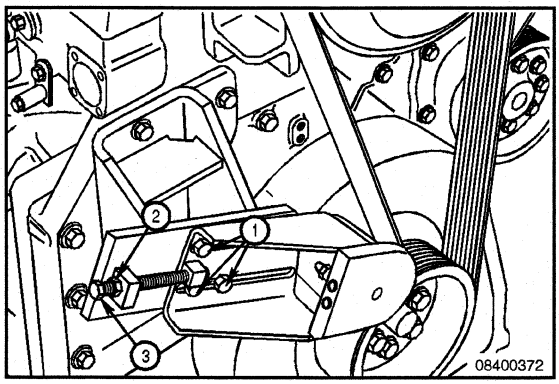


Turn the wrench to relieve the tension on the belt.

Remove the belt(s).

Slowly release pressure on the wrench until the tensioner stops.



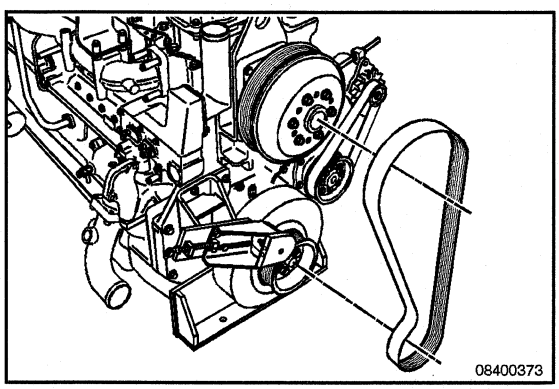


Power Generation

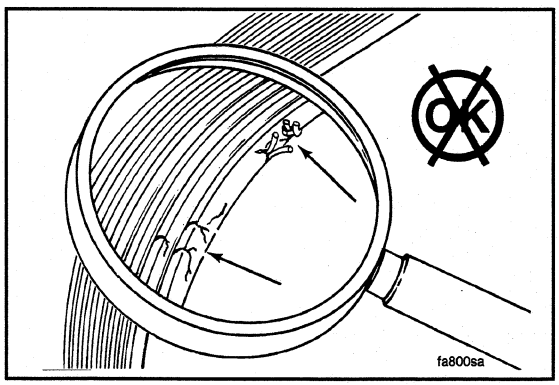
Loosen the three clamping bolts (1).

Loosen the adjusting screw locknut (2).

Turn the adjusting screw (3) **counterclockwise** to relieve the tension on the belt.



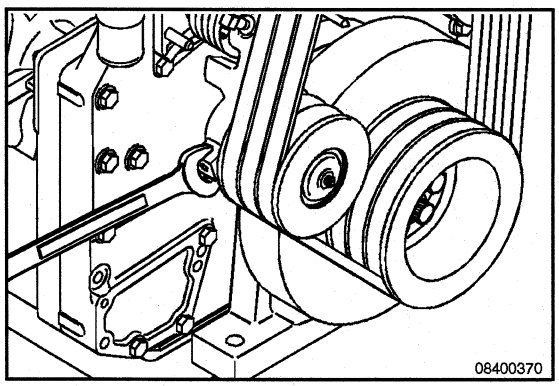
Remove the belt.



Inspect for Reuse

Inspect the belt for:

- Cracks
- Glazing
- Tears or cuts.



Install

Industrial Applications

⚠ WARNING ⚠

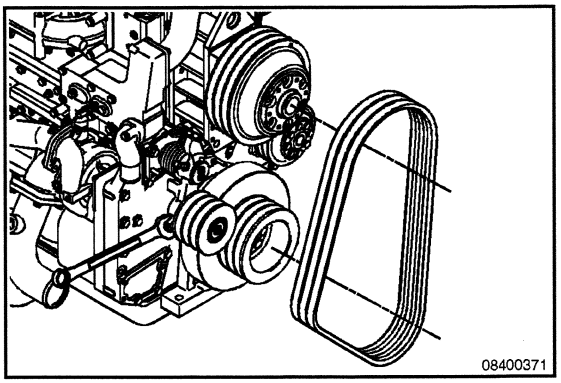
The belt tensioner is under pressure. Relieve and restore belt tension slowly to reduce the possibility of personal injury.

Place a wrench on the tensioner lug, as shown.

Turn the wrench to position the tensioner for belt installation.

Install the belt(s).

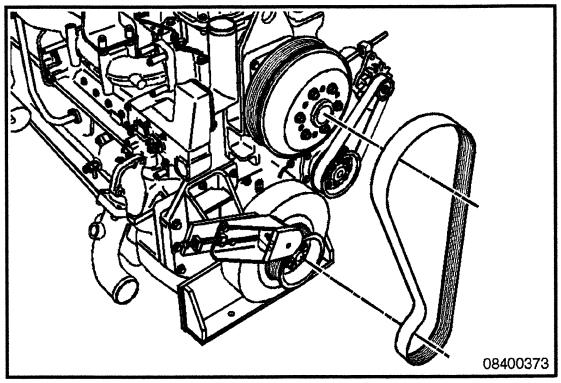
Slowly release pressure on the wrench until the tensioner is in position.



Power Generation

If necessary, loosen the adjusting screw (2) and clamping bolts (1) to allow belt installation.

Install the belt.



Adjust

Power Generation

Loosen the tensioner clamping bolts (1).

Loosen the adjusting screw locknut (2).

Turn the adjusting screw (3) **clockwise** to increase belt tension and **counterclockwise** to decrease belt tension.

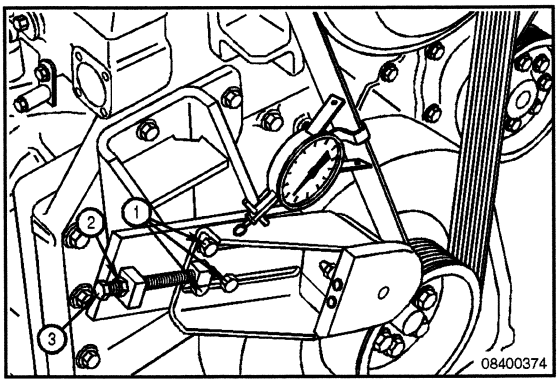
Refer to Section V for appropriate belt tension.

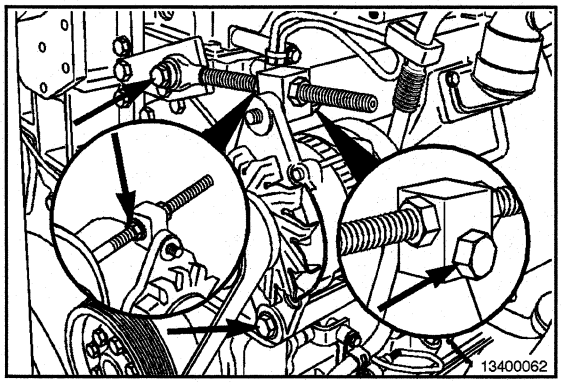
Once the desired tension is obtained, tighten the locknut against the tensioner bracket.

Torque Value: 196 N•m [125 ft-lb] 20.0 Kgf·m

Tighten the clamping bolts (1).

Torque Value: 66 N•m [49 ft-lb] 6.7





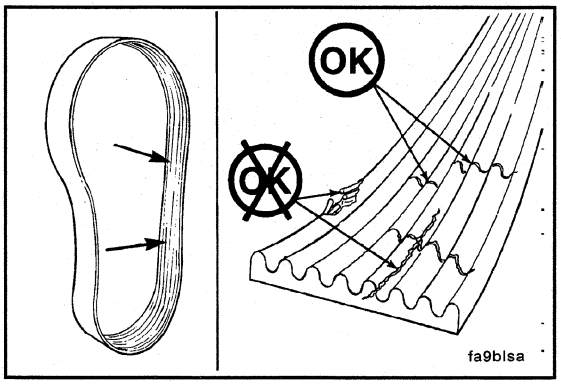
Drive Belt, Alternator

Remove

Loosen the adjusting link and the alternator mounting capscrews.

Loosen the adjusting nut to relieve tension on the alternator belt.

Remove the belt.



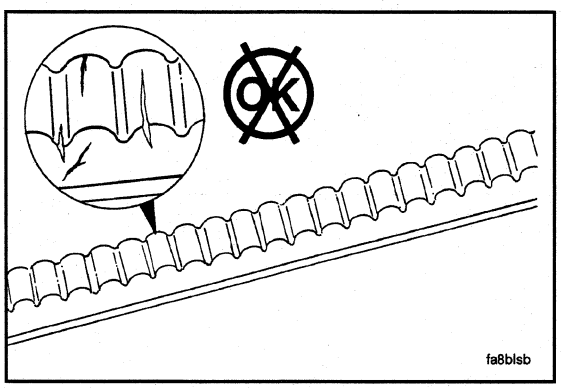
Inspect for Reuse

Poly-Vee Belt

Inspect the belts daily. Check the belt for intersecting cracks. Traverse (across the belt width) cracks are acceptable. Longitudinal (direction of belt length) cracks that intersect with transverse cracks are **not** acceptable. Replace the 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 or grease on the side of belts.



Cogged Belt

Inspect the belts daily. Replace the belts if they are cracked, frayed, or have chunks of material missing. Small cracks are acceptable.

Adjust the belts that have a glazed or shiny surface, which indicates belt slippage. Correctly installed and tensioned belts will show even pulley and belt wear. Refer to Section A for belt adjustment and replacement procedures.

Belt damage can be caused by:

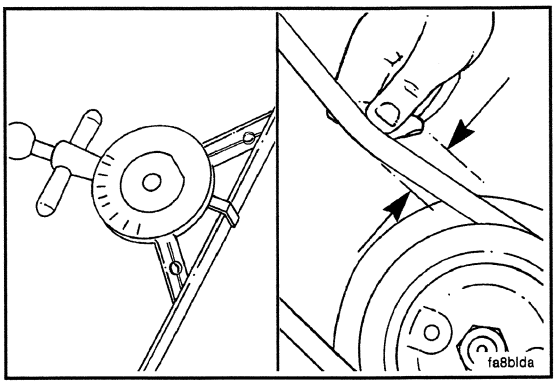
- Incorrect tension
- Incorrect size or length
- Pulley misalignment
- Incorrect installation
- Severe operating environment
- Oil or grease on the belts

Measure the belt tension in the center span of the pulleys.

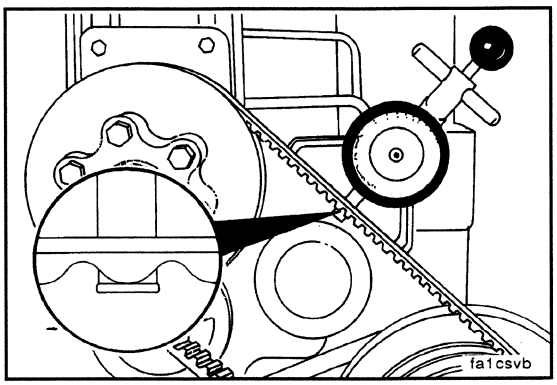
Refer to the Belt Tension Chart in Section V for the correct gauge and tension value for the belt width used.

An alternate method (deflection method) can be used to check belt tension by applying 110 N [25 lbf] force between the pulleys on v-belts. If the deflection is more than one belt thickness per foot of pulley center distance, the belt tension **must** be adjusted.

Refer to Section A for adjustment procedures.

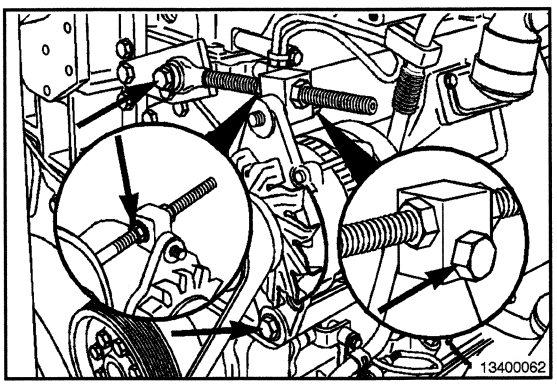


For cogged belts, make sure that the belt tension gauge is positioned so that the center tensioning leg is placed directly over the high point (hump) of a cog. Other positioning will result in incorrect measurement.



Install

Do **not** attempt to pry the belt onto the pulley. Turn the adjusting nut **counterclockwise** to shorten the link if necessary. Install the alternator belt.



Tighten the jam nuts on the adjusting link.

Tighten the adjusting link and alternator mounting capscrews.

Jam nuts:

Torque Value: 196 N•m [125 ft-lb]

Alternator mounting capscrew (top):

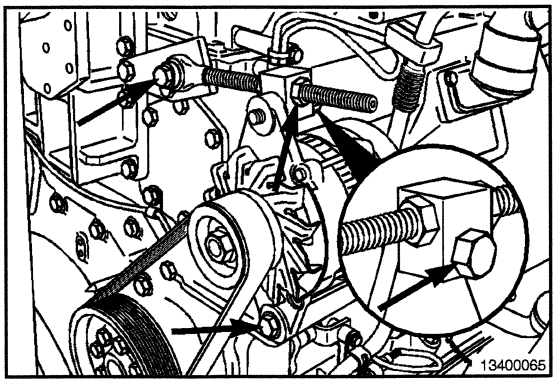
Torque Value: 75 N•m [55 ft-lb]

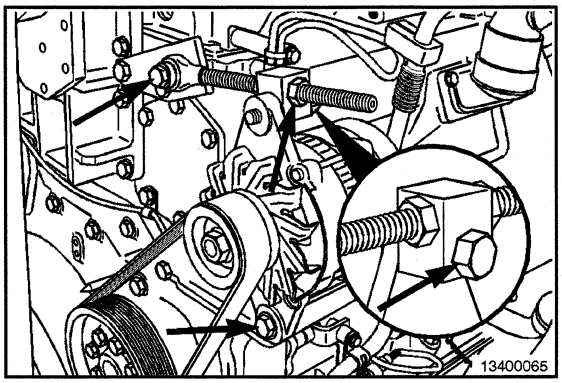
Alternator mounting capscrew (bottom):

Torque Value: 120 N•m [89 ft-lb]

Alternator adjusting link mounting capscrew:

Torque Value: 75 N•m [55 ft-lb]

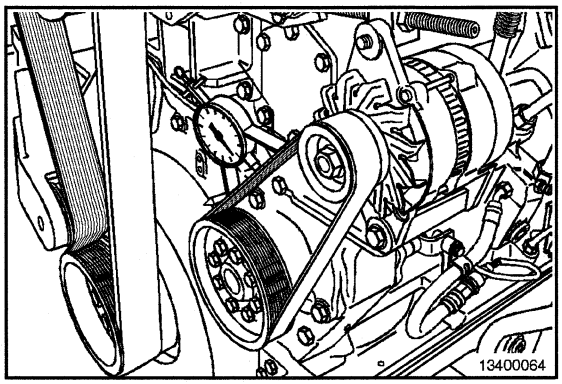




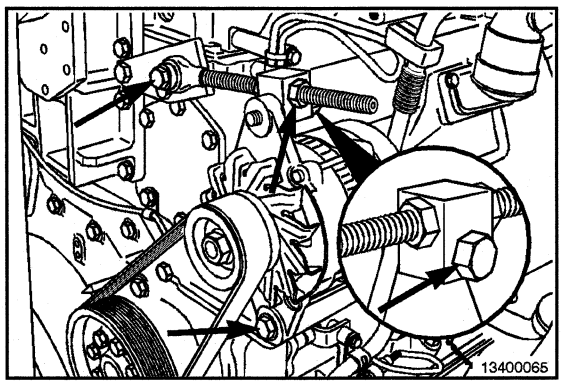
Adjust

Loosen the alternator and adjusting link mounting capscrews.

Loosen the jam nut on the adjusting link.



Turn the adjusting screw **clockwise** to tighten the belt tension.



Tighten the jam nuts on the adjusting screw.

Tighten the adjusting link and alternator mounting capscrews.

Jam nuts:

Torque Value: 196 N•m [125 ft-lb]

Alternator mounting capscrew (top):

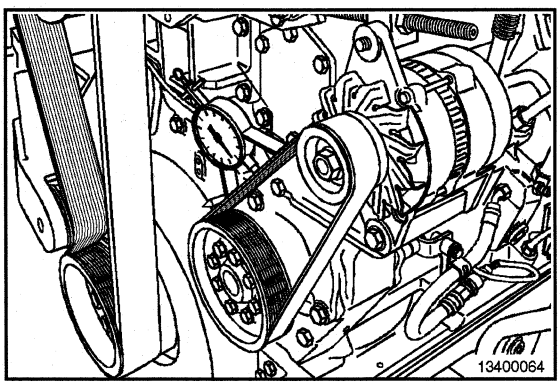
Torque Value: 75 N•m [55 ft-lb]

Alternator mounting capscrew (bottom):

Torque Value: 120 N•m [89 ft-lb]

Alternator adjusting link mounting capscrew:

Torque Value: 75 N•m [55 ft-lb]



Check the belt tension again to be sure it is correct.

The belt tension **must** be:

Belt Tension 670 N [150 lbf]

Section D - System Diagrams

Section Contents

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System Diagrams - Overview

General Information

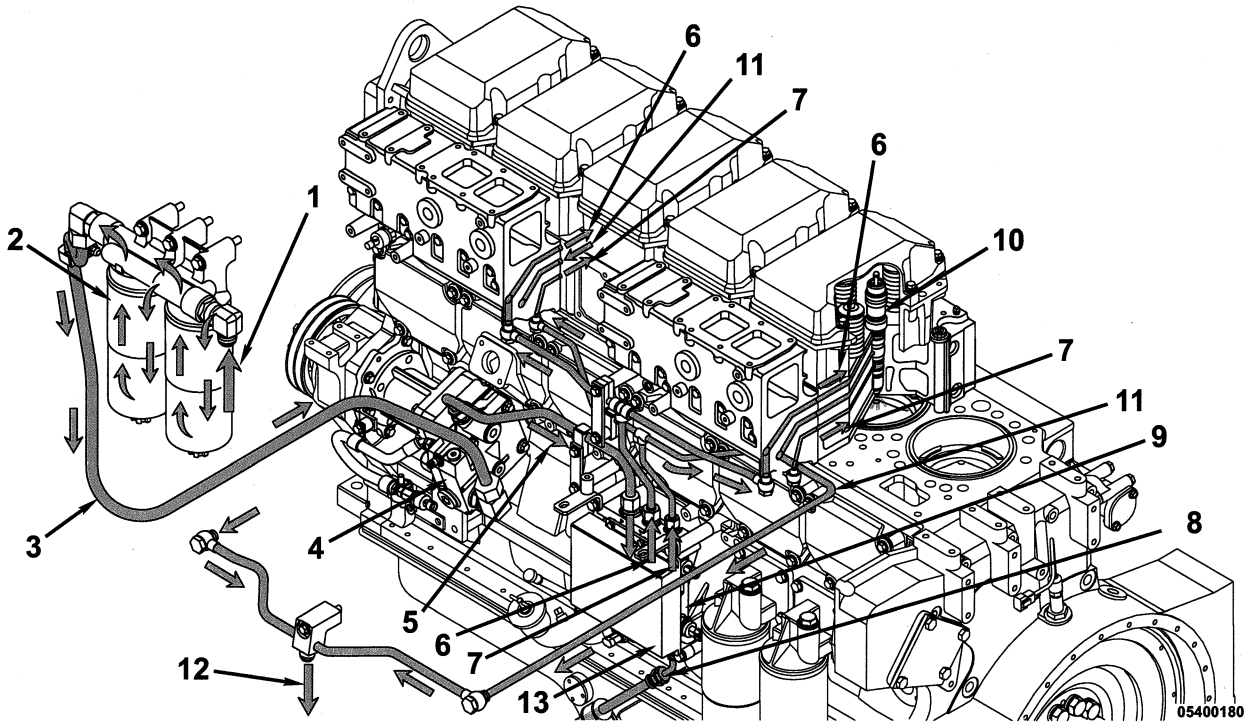
The following drawings show the flow through the engine systems. Although parts can change between different applications and installations, the flow remains the same. The systems shown are:

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

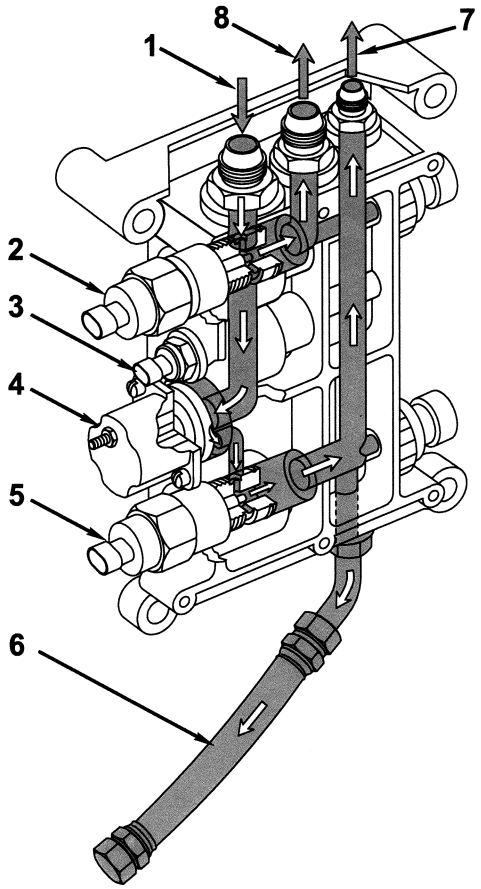
Knowledge of the engine systems can help you in troubleshooting, service, and general maintenance of your engine.

Flow Diagram, Fuel System

Fuel System



1. Fuel inlet from tank
2. Fuel filters with water separation
3. Fuel pump inlet tube
4. Fuel pump
5. Fuel control valve supply tube
6. Fuel timing supply tube
7. Fuel rail supply tube
8. Fuel rail dampening hose
9. Electronic fuel control valve assembly
10. Injector
11. Fuel return tube
12. Fuel drain (engine to fuel tank)
13. ECM.

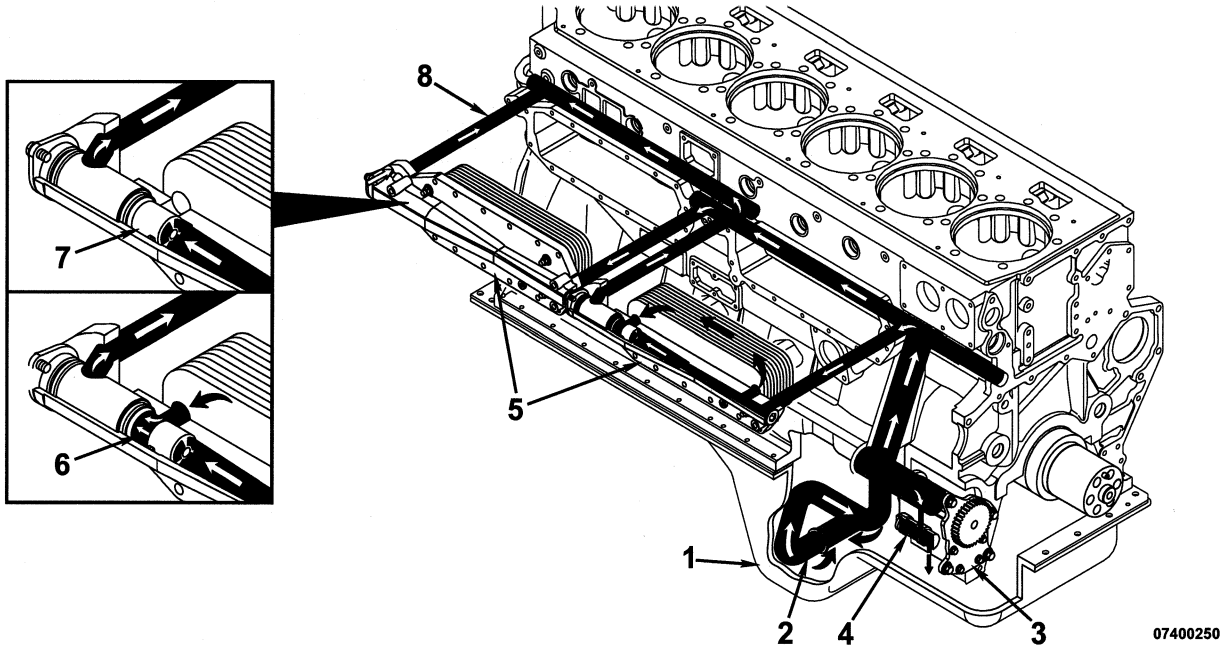


05400184

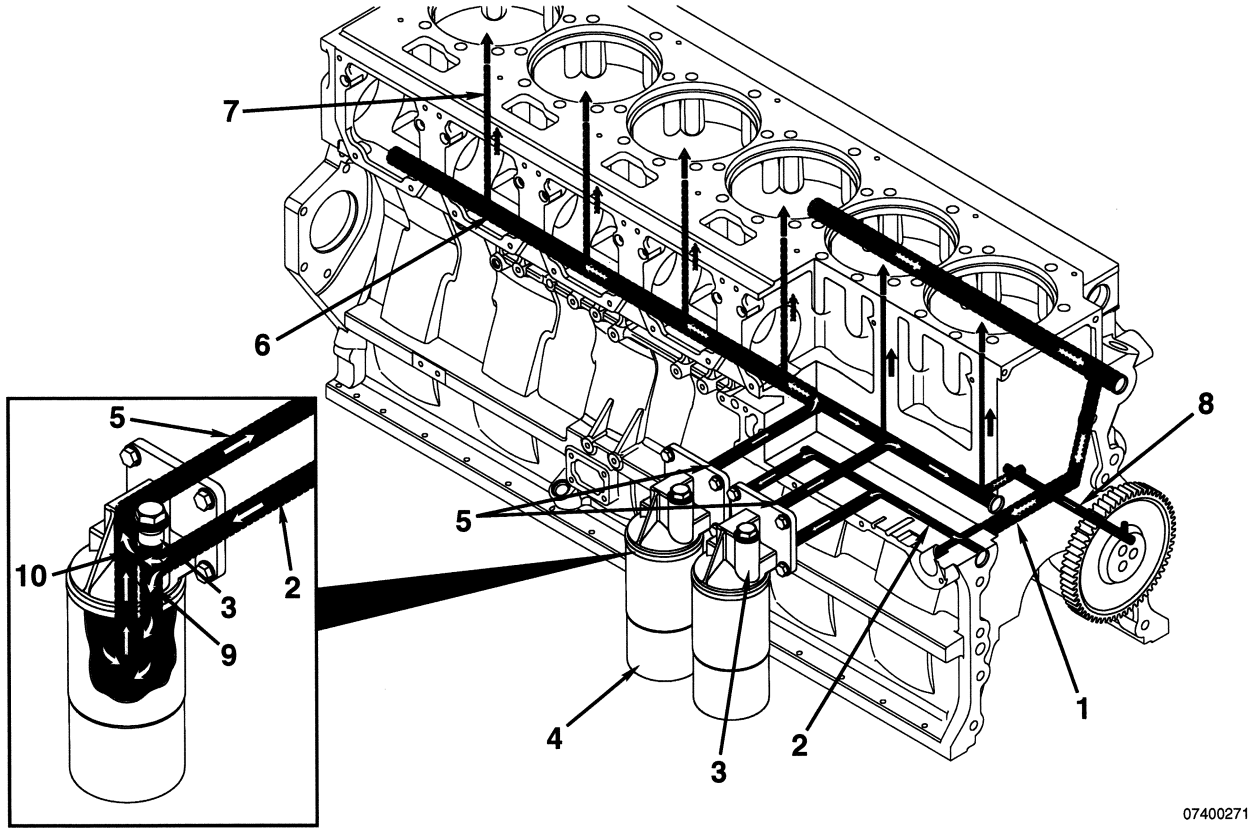
1. Fuel inlet from pump
2. Fuel timing actuator
3. Fuel temperature sensor
4. Fuel shutoff valve
5. Fuel rail actuator
6. Fuel rail dampening hose
7. Fuel to fuel rail
8. Fuel to fuel timing.

Flow Diagram, Lubricating Oil System

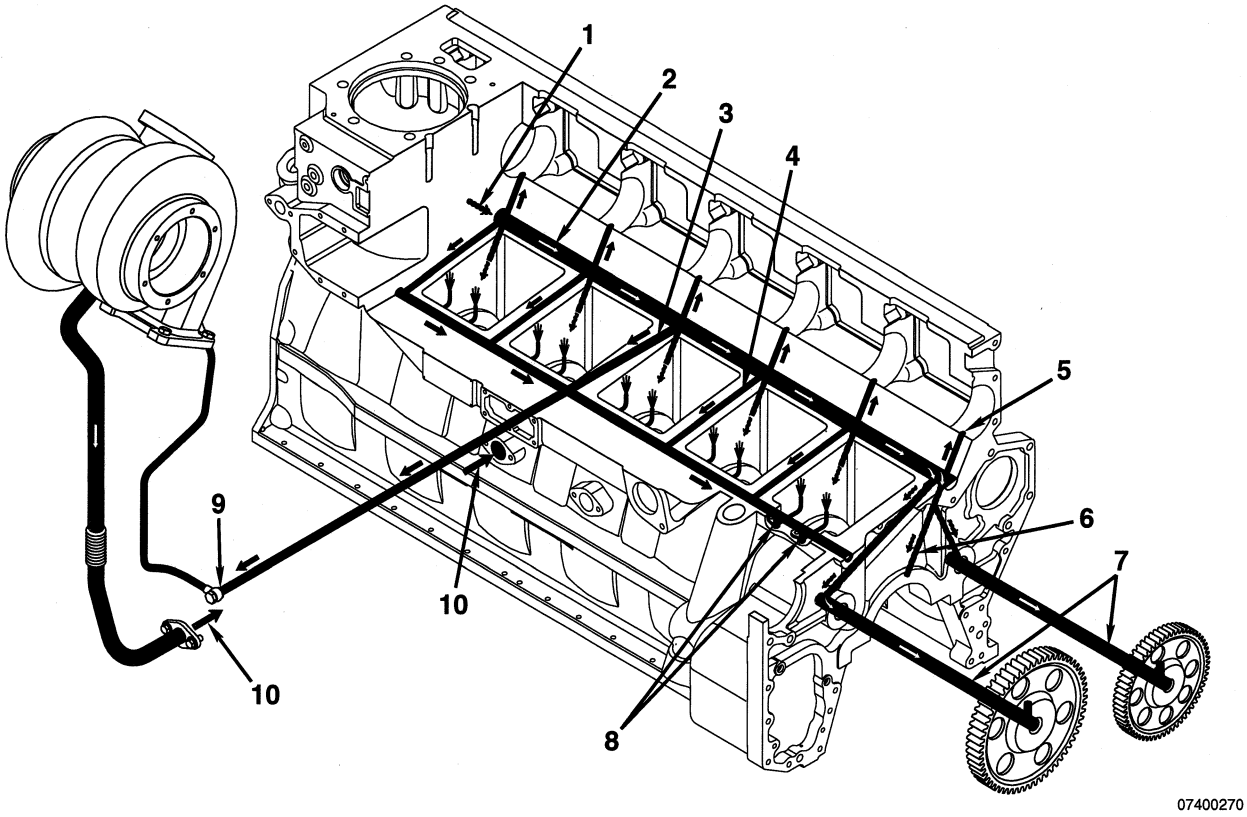
Flow Diagram



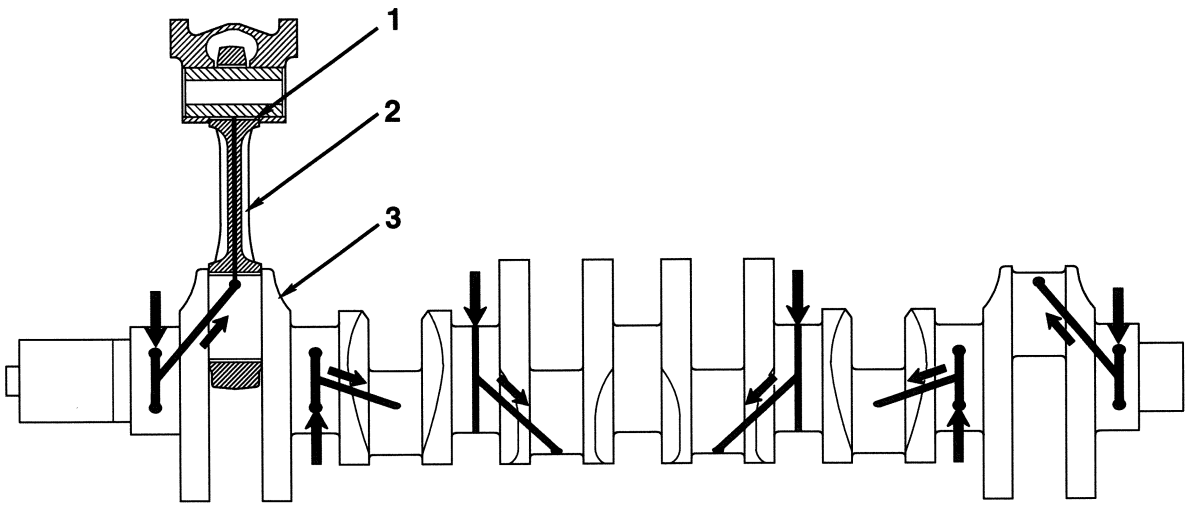
1. Lubricating oil pan
2. Lubricating oil suction tube
3. Lubricating oil pump
4. Lubricating oil pressure regulator valve
5. Lubricating oil coolers
6. Lubricating oil cooler thermostat (open)
7. Lubricating oil cooler thermostat (closed).



1. Lubricating oil flow from oil coolers
2. Lubricating oil flow to filters
3. Lubricating oil filter bypass valve(s)
4. Lubricating oil filter(s)
5. Lubricating oil from filters
6. Main lubricating oil rifle
7. Lubricating oil flow to cylinder head
8. Lubricating oil flow to rear idler gear
9. Normal lubricating oil flow through filter
10. Bypass lubricating oil flow.



1. Lubricating oil flow from filters
2. Main lubricating oil rifle
3. Lubricating oil drilling to turbocharger supply
4. Lubricating oil drilling to piston cooling nozzle oil rifle
5. Lubricating oil flow to camshaft bushings and cylinder head
6. Lubricating oil flow to main bearings and crankshaft
7. Lubricating oil flow to front idler gears
8. Lubricating oil flow to piston cooling nozzles
9. Turbocharger oil supply tube
10. Turbocharger oil drain to crankcase.



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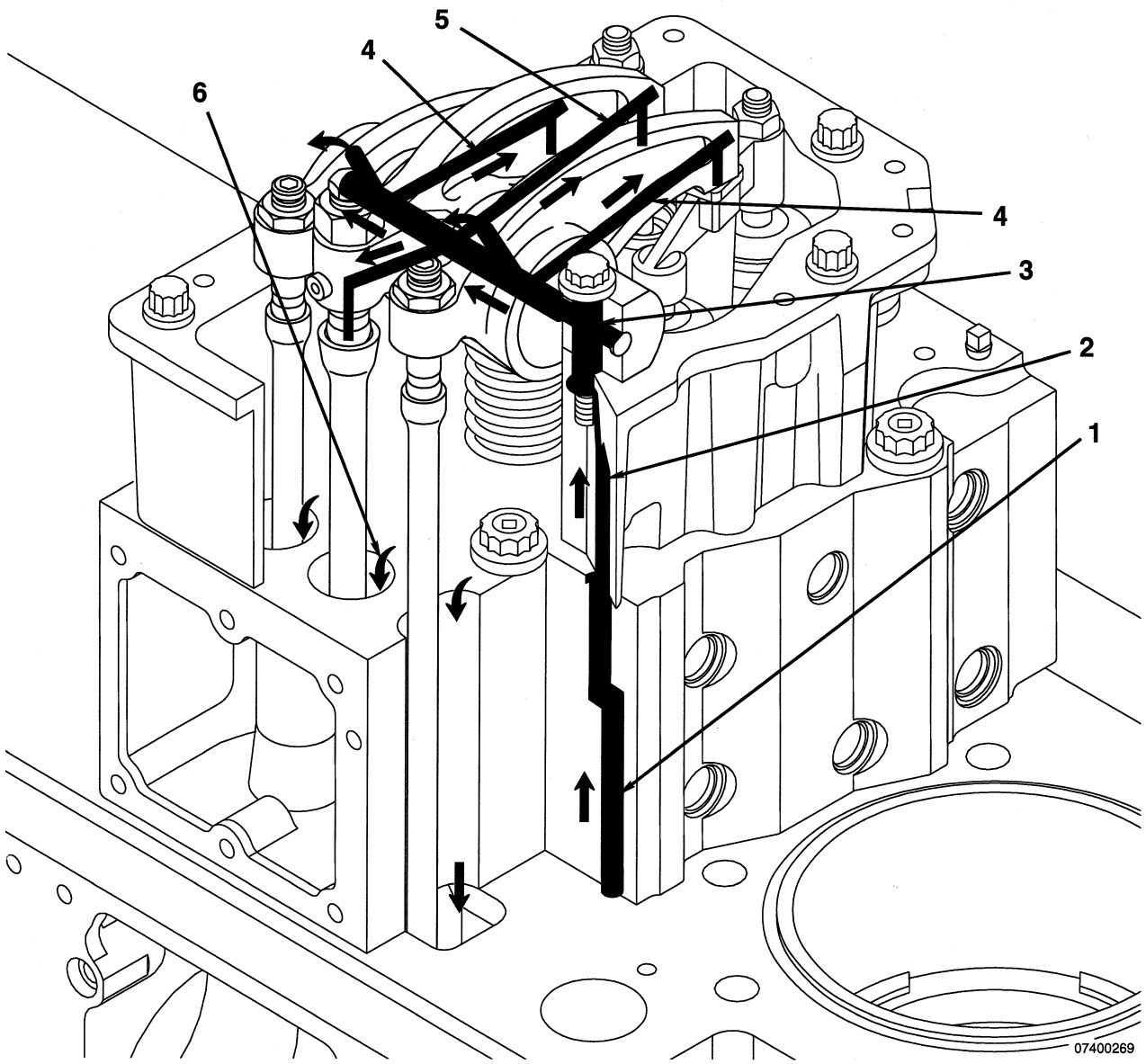
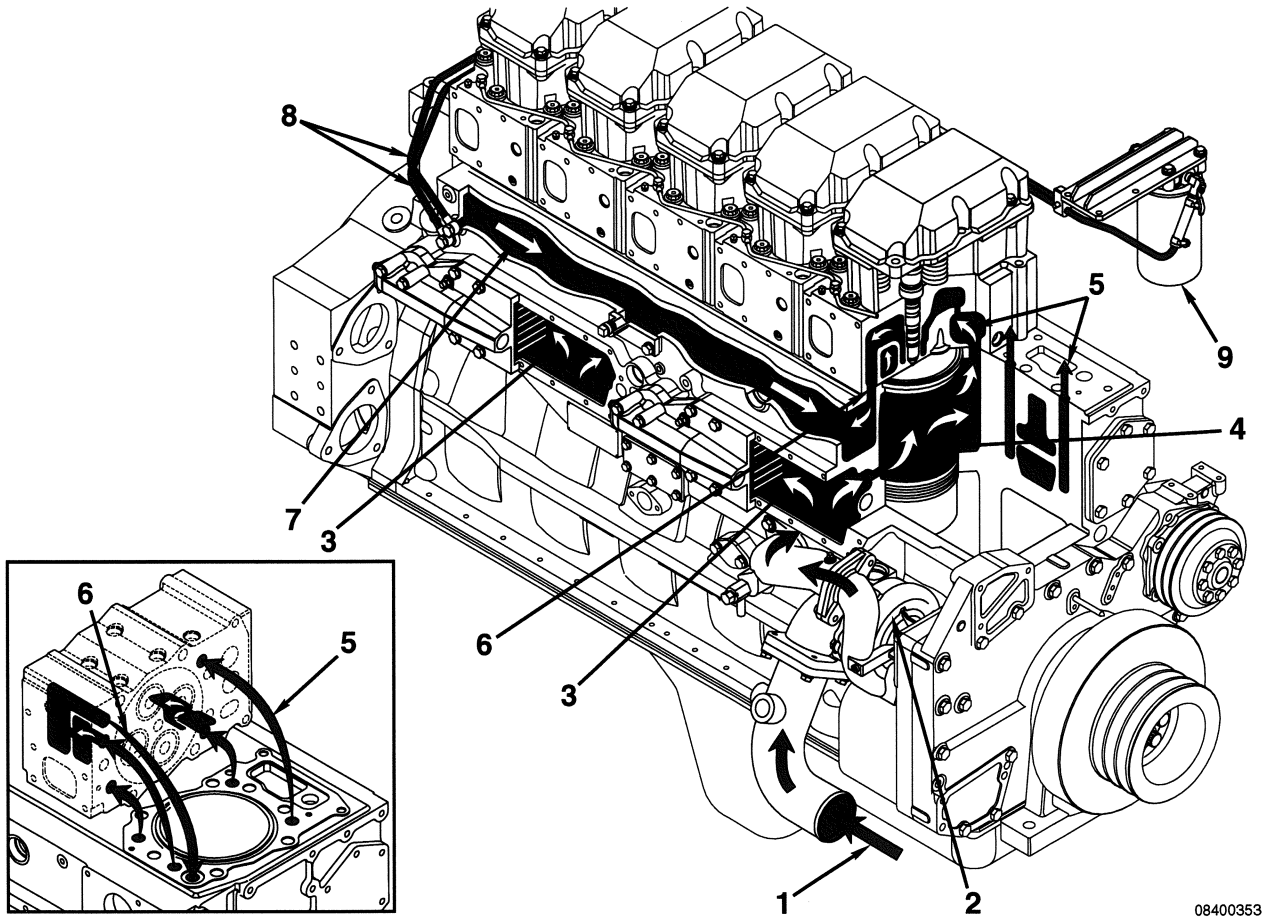
1. Piston pin bushing
2. Connecting rod
3. Crankshaft.



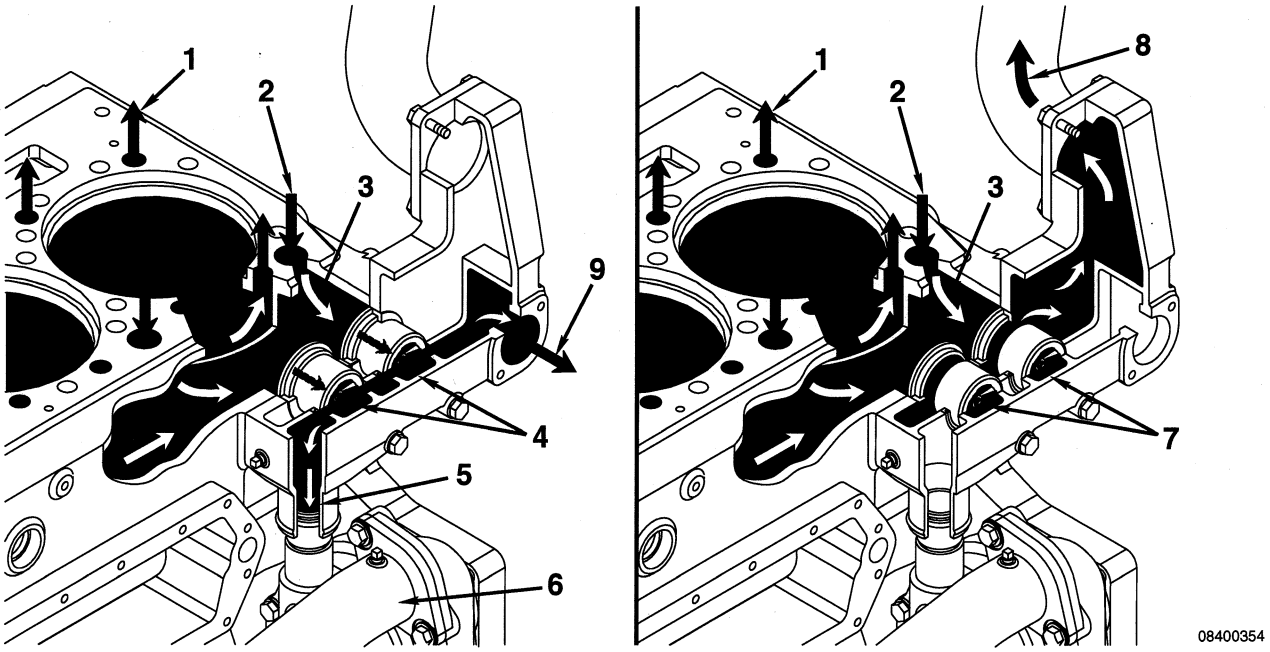
1. Lubricating oil flow through cylinder head
2. Lubricating oil flow through rocker housing
3. Lubricating oil flow around rocker shaft capscrew and through rocker shaft
4. Lubricating oil flow through rocker levers
5. Lubricating oil flow through injector lever
6. Lubricating oil return to pan.

Flow Diagram, Cooling System

Cooling System



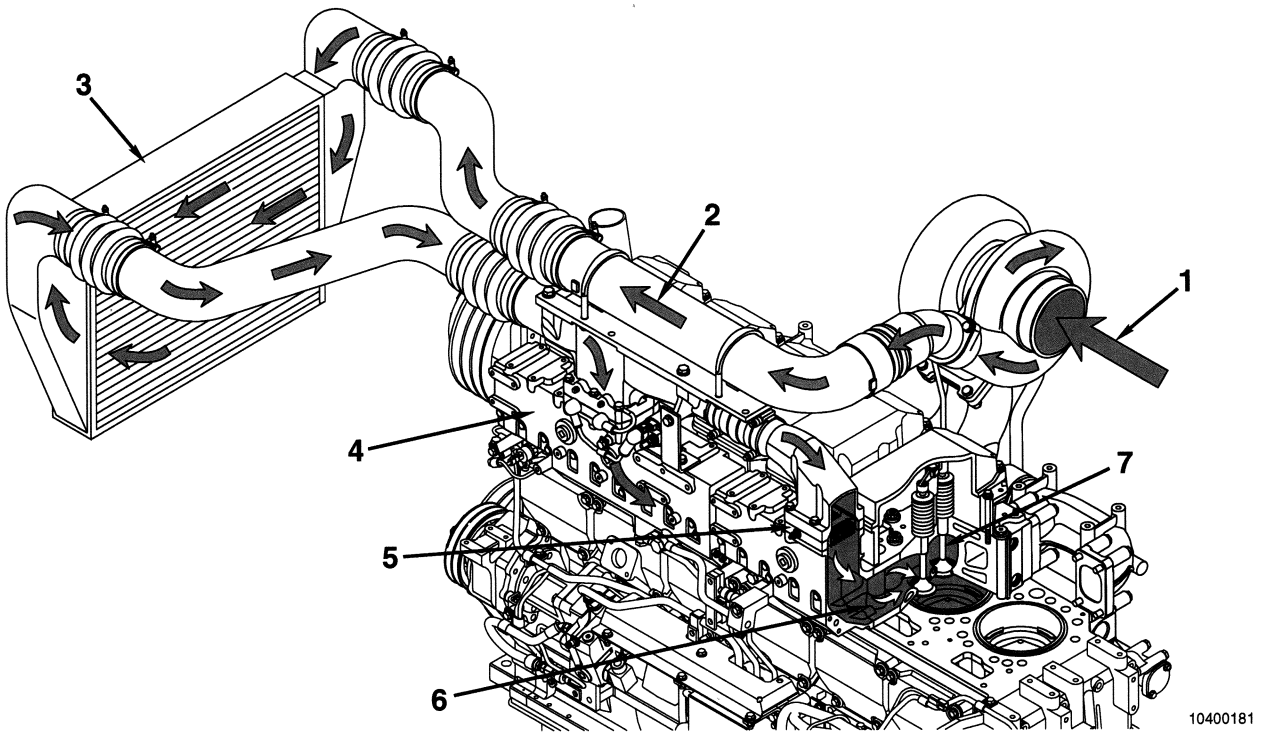
1. Coolant inlet from radiator
2. Water pump
3. Coolant flow through lubricating oil cooler
4. Coolant flow around cylinder liners
5. Coolant flow to cylinder head
6. Coolant flow from cylinder head to coolant manifold
7. Coolant manifold to thermostat housing
8. Coolant filter supply and return tubes
9. Coolant filter.



1. Coolant flow to cylinder head (four ports per cylinder head)
2. Coolant flow to water manifold (one port per cylinder head)
3. Coolant flow to thermostat housing
4. Radiator bypass open
5. Coolant flow to water pump
6. Coolant flow to oil coolers
7. Radiator bypass closed
8. Coolant flow to radiator
9. Coolant flow for optional torque converter (normally plugged)

Flow Diagram, Air Intake System

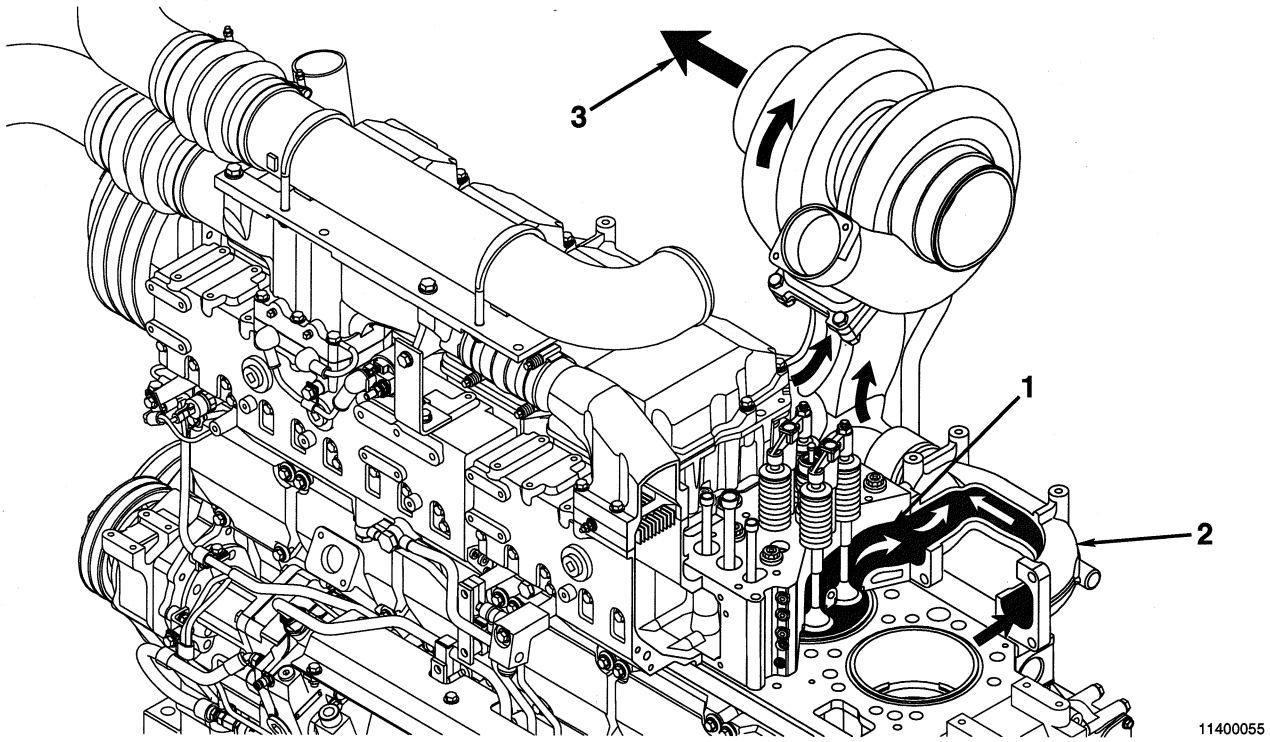
Air Intake System



1. Intake air inlet to turbocharger
2. Turbocharged air to charge air cooler
3. Charge air cooler
4. Intake manifold
5. Grid heater (Industrial **only**)
6. Cylinder head intake air port
7. Intake valve.

Flow Diagram, Exhaust System

Exhaust System



1. Cylinder head exhaust port
2. Exhaust manifold
3. Turbocharger exhaust outlet.

Section L - Service Literature

Section Contents

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Additional Service Literature

General Information

The following publications can be purchased.

Bulletin	Title of Publication
4021375	Troubleshooting and Repair Manual, QSK23 Series Engines
3666113	Troubleshooting and Repair Manual, Electronic Control System, QSK19, QSK23, QSK45, QSK60, and QSK78 Engines
3666286	Cummins Requirements for Cooling System Extended Service Intervals
3810340	Cummins Engine Oil Recommendations
3666132	Cummins Coolant Requirements and Maintenance
3666209	Extended Service Interval, Cooling System Maintenance
3379084	Fuel Pump Rebuild Manual

Service Literature Ordering Location

Contact Information

Region	Ordering Location
United States and Canada	Cummins Distributors or Credit Cards at 1-800-646-5609 or Order online at www.powerstore.cummins.com
U.K., Europe, Mid-East, Africa, and Eastern European Countries	Cummins Engine Co., Ltd. Royal Oak Way South Daventry Northants, NN11 5NU, England
South and Central America (excluding Brazil and Mexico)	Cummins Americas, Inc. 16085 N.W. 52nd Avenue Hialeah, FL 33104
Brazil and Mexico	Cummins Inc. International Parts Order Dept., MC 40931 Box 3005 Columbus, IN 47202-3005
Far East (excluding Australia and New Zealand)	Cummins Diesel Sales Corp. Literature Center 8 Tanjong Penjuru Jurong Industrial Estate Singapore
Australia and New Zealand	Cummins Diesel Australia Maroondah Highway, P.O.B. 139 Ringwood 3134 Victoria, Australia

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: (0)1895-838383

Prestolite Electrics
Cleveland Road
Leyland
PR5 1XB
England
Telephone: (0)1772-421663

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

T.B.A. Belting Ltd.
P.O. Box 77
Wigan
Lancashire
WN2 4XQ
England
Telephone: (0)1942-259221

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

Prestolite Electrics
Cleveland Road
Leyland
PR5 1XB
England
Telephone: 01772-421663

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
Sunbury on Thames
Middlesex
TW16 7HF
England
Telephone: (0)9327-85500

Fan Clutches

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

Holset Engineering Co. Ltd.
ST Andrews Road
Huddersfield, West Yorkshire
England HD1 6RA
Telephone: (0)1484-22244

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: (0)121-3283041

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: 01327-341313

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: (0)1207-560-505

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

Grasslin U.K. Ltd.
Vale Rise
Tonbridge
Kent
TN9 1TB
England
Telephone: (0)1732-359888

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 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

Honeywell Control Systems Ltd.
Honeywell House
Arlington Business Place
Bracknell
Berks RG12 1EB
Telephone: (0)1344-656000

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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Routine Service and Parts

General Information

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

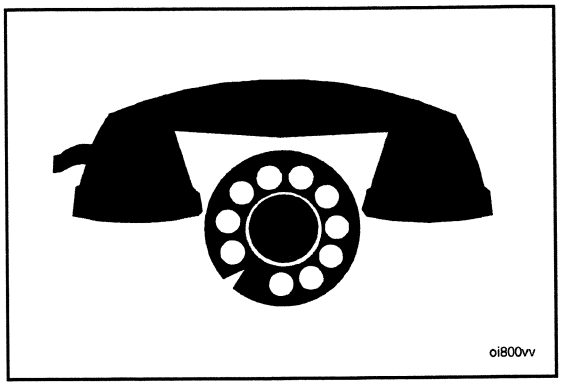
General Information

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

General Information

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 Inc., Box 3005, Columbus, IN 47202-3005

Division and Regional Offices

Locations

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. Commerce Parkway
MPC #14, Building A
Miramar, FL 33025
Telephone: (305) 621-1300

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

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

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

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

New Zealand

Auckland

Cummins Engine Company, Pty. Ltd.
Private Bag 92804
Penrose, Auckland, New Zealand
Location:
440 Church Street
Penrose
Telephone: (64-9) 579-0085

Branches:

Auckland

Cummins Engine Company, Pty. Ltd.
Private Bag 92804
Penrose, Auckland, New Zealand
Location:
440 Church Street
Penrose
Telephone: (64-9) 579-0085

Christchurch

Cummins Engine Company, Pty. Ltd.
P.O. Box 16-149
Hornby, Christchurch, New Zealand
Location:
35 Parkhouse Road
Sockburn, Christchurch
Telephone: (64-3) 348-8170

Dunedin

Cummins Engine Company, Pty. Ltd.
P.O. Box 2333
South Dunedin, New Zealand
Location:
8 Devon Street
Dunedin
Telephone: (643) 477-8818

Palmerston North

Cummins Engine Company, Pty. Ltd.
P.O. Box 9024
Palmerston North, New Zealand
Location:
852-860 Tremaine Avenue
Telephone: (64-6) 356-2209

Rotorua

Cummins Engine Company, Pty. Ltd.
P.O. Box 934
Rotorua, New Zealand
Location:
328 Te Ngae Road
Rotorua
Telephone: (647) 345-6699

Regional Offices - International

Locations

European Regional Office - Mechelen

Cummins Diesel N.V.
Blarenberglaan 4
Industriepark Noord 2
2800 Mechelen
Brussels
Telephone: (32-15) 89000

Countries Covered:

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

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) 6505-1658
Fax: (88-10) 6505-4211

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	Ecuador
Bolivia	Paraguay
Chile	Peru
Colombia	Uruguay

Gross-Gerau Regional Office - Germany

Cummins Diesel Deutschland GmbH
Odenwaldstr. 23
D-4521 Gross-Gerau
Germany
Telephone: (49-6152) 174-0

Countries Covered:

Albania	Poland
Bulgaria	Romania
Latvia	Lithuania
Germany	Estonia
Luxembourg	Croatia
Slovenia	Bosnia
Macedonia	

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) 2606-5678
Fax: (852) 2691-1641, 2687-3552

Country Covered: Hong Kong, Macau

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: (+39-02) 98-83-111

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 117198
Telephone: (7-502) 256-5122 or 256-5123

Countries Covered:

Armenia	
Azerbaijan	Moldova
Belarus	Russia
Tajikistan	
Georgia	Turkmenistan
Kyrgyzstan	Ukranie
Kazakhstar	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
	Sri Lanka
Indonesia	Thailand
Laos	Vietnam

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) 2503-8441

Country Covered: Taiwan

Middle East Regional Office

Cummins Diesel FZE
Units ZF 5 & 6, Jebel Ali Free Zone
Dubai
United Arab Emirates
Telephone: (971) 4 883-8998
Fax: (971) 4 883-8997
E-mail: cdfze@emirates.net.ae)

Countries Covered:

MIDEAST

Afghanistan	Jordan	Saudi Arabia
Bahrain	Kuwait	Sudan
Cyprus	Lebanon	Syria
Djibouti	Oman	U.A.E.
Egypt	Pakistan	United Kingdom
Iraq	Qatar	Yemen
Iran	Turkey	

North/West/East and Central Africa Regional Office - Daventry (U.K.)

Cummins Engine Company Ltd.
Royal Oak Way South
Daventry, Northants NN11 5NU
England
Telephone: (44-1327) 886000

Countries Covered:

NORTH/WEST/EAST AND CENTRAL AFRICA

Benin (from Togo)	Gabon	Mauritania
Burkina-Paso	Gambia	Morocco
Burundi		
Cameroon	Ghana	Niger
Cape Verde	Guinea	Nigeria
Central African Republic	Guinea-Bissau	Sao Tome & Principe
	Ivory Coast	
Chad	Liberia	Senegal
Congo (D.R.)		Seychelles
Congo (P.R.)		
	Libya	Siera Leone
Djibouti		Somalia
Equatorial Guinea	Mali	Togo
	Malta	Tunisia
		Uganda

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

Southern Africa Regional Office

Cummins Diesel South Africa (Pty) Ltd
13 Eastern Service Road
Kelvin View 2054
South Africa
Telephone: (00 27 11) 321 8700 (from U.K.)
Fax: (00 27 11 444 1899)

Mailing Address:
Wendywood 2144
Gauteng
South Africa

Countries Covered:

- Angola
- Botswana
- Comoros Island
- Lesotho
- Madagascar
- Malawi
- Mauritius
- Mozambique
- Nambia
- Swaziland
- South Africa
- ST. Helena
- Tanzania
- Zambia
- Zimbabwe

Distributors - International

Locations

ABU DHABI
- See United Arab Emirates

AFGHANISTAN
- See Middle East Regional Office

ALBANIA
- See Germany Regional Office - Gross-Gerau

ALGERIA
- See Cummins Diesel S.A. - Lyon

AMERICAN SAMOA
- See South Pacific Regional Office

ANDORRA
- See European Regional Office - Mechelen

ANGOLA

Luanda
Hull Blyth (Angola) Ltd
Casa Inglesa
Rua Major Kahangulo, 134/140
Luanda
Republic of Angola
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310026
Fax: (244-2) 335602

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ARGENTINA

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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
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Yusuf Bin Ahmed Kanoo W.L.L.
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Bahrain
Telephone: (973) 738200

BALEARIC ISLANDS

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Cummins Ventas y Servicio, S.A.
Torrelaguna, 56
28027 Madrid, Spain
Telephone: (34-91) 367-2000
376-2404

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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

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Cummins Southeastern Power, Inc.
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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 Southern Africa Regional Office - Kelvin

BRAZIL

Ananindeua
Marcos Marcelino & Companhia
Ltda.
Rodovia BR-316, Km 9
67020-010 Ananindeua, Para,
Brazil
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4143/4012

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Distribuidora Cummins
Minas S.A.
31950-640 Olhos D'Agua Norte
Belo Horizonte, MG
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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
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Av. da Abolicao, 3882,
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Goianian
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Centro Oeste Ltda.
Av. Caiapo 777 - Setor Sta. Genoveva
74672-400 Goiania, Goias
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Manaus
Distribuidora Cummins
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Estrada da Ponta Negra, 6080 - Sao Jorge
69037 Manaus, Amazonas,
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Distribuidora Cummins
Meridional S.A.
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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
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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/East and Central 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
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16 Jalan Chan Sow Lin
55200 Kuala Lumpur
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Telephone: (60-3) 2211033

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Bia, S.A.
Rameistraat, 123
B-3090 - Overijse, Belgium
Telephone: (32-2) 6892811

CAMBODIA
- See South & East Asia Regional Office
- Singapore

CANARY ISLANDS

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Cummins Ventas y
Servicio, S.A.
Torrelaquna, 56
28027 Madrid, Spain
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CAPE VERDE
- See ECV Portugal

CENTRAL AFRICAN REPUBLIC
- See North/West Africa Regional Office
- Daventry

CEYLON
- See Sri Lanka

CHAD
- See North/West/East and Central Africa Regional Office - Daventry

CHILE

Santiago
Distribuidora Cummins Diesel
S.A.C.I.
Casilla Postal 1230
Calle Bulnes 1203
Santiago, Chile
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Santiago, Chile
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697-3566/7/8,
697-2709

CHINA, PEOPLE'S REPUBLIC

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Beijing Economic and Technology Development Zone
Beijing, 100176
People's Republic of China
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Fax: (86-10) 67882285

Shenyang
Cummins Engine (China) Investment
Co., Ltd. - Shenyang
No. 198, Lianhe Rd., Dadong District
Shenyang, 110044
People's Republic of China
Telephone: (86-24) 88094014, 88905794
Fax: (86-24) 88905970

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Cummins Engine (China) Investment
Co., Ltd. - Kunming
Suite A4, A5 No. 114 East 2nd Ring Rd.
Kunming, 650224
People's Republic of China
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Fax: (86-871) 5632210

Urumqi
Cummins Engine (China) Investment
Co., Ltd. - Urumqi
No. 275, A Le Tai Rd., Urumqi, 830011
Xinjiang, People's Republic of China
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Fax: (86-991) 3849232

Shanghai
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Shanghai, 200032
People's Republic of China
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Fax: (86-21) 64033111

Wuhan
Cummins Engine (China) Investment
Co., Ltd. - Wuhan
No. 198, Jianshe Rd., Jianghan District
Wuhan, 430030
People's Republic of China
Telephone: (86-27) 83330180, 83330182
Fax: (86-27) 83330180 ext. 812

Guangzhou - South China Regional Office
Cummins Engine (China) Investment
Co., Ltd. - Guangzhou
Rm. 211, Bai Yun Hotel, 367 Huan Shi Dong Rd.
Guangzhou, 510065
People's Republic of China
Telephone: (86-20) 83313136, 83313137
Fax: (86-20) 83313135

Shenzhen (JV)
Shenzhen Chongfa Cummins Engine Co., Ltd.
Unit D2-F2.6
Tian An Che Gong Miao Industrial Estate
Shen Nan Rd.,
Shenzhen, 518040
People's Republic of China
Telephone: (86-755) 3415479
Fax: (86-755) 3415480

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 Southern Africa Regional Office - Kelvin

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 21932
Nicosia, Cyprus
CY-1515
Location:
4 Salamis Avenue
Telephone: (357-2) 349450

CZECH REPUBLIC

- See Austrian Distributor

DENMARK

Glostrup
Cummins Diesel Salg & Service A/S
Hovedvejen 233B
Osted
DK-4000 Roskilde
Denmark
Telephone: (45-46) 423 552

DJIBOUTI

- See North/West/East and Central Africa

DOMINICA

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Cummins Southeastern Power, Inc.
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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) 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/East and Central Africa Regional Office - Daventry

ESTONIA

- See Gross Gerau Regional Office - Germany

FAROE ISLANDS

Wellingborough (Office in United Kingdom)
Cummins Diesel
Rutherford Drive
Park Farm South
Wellingborough
Northants NN8 2QH,
England
Telephone: (44-1933) 334200

FERNANDO PO

- See Spain

FIJI

- See Cummins Diesel Sales & Service New Zealand Ltd.

FINLAND

Helsinki
Machinery OY
P.O. Box 560
FIN 01741 Varta Finland
Telephone: Int: (358-9) 8955 2215

FRANCE

Lyon
Cummins Diesel S.A.
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/East and Central Africa Regional Office - Daventry

GAMBIA

- See Matforce Senegal

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
J&D Diesels and Systems
P.O. Box c2381
Cantonments
Accra, Ghana
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GREECE

Athens
Ergotrak
Box 51528
14 Km. National Rd.
Athens-Lamia
14510 Kifissia, Greece
Telephone: (30-1) 6293400/41

GREENLAND

- See Denmark

GRENADA

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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
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GUINEA

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BIA s.a.
Rameistraat, 123
B-3090 - Overijse, Belgium
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GUINEA BISSAU

- See North/West/East and Central Africa Regional Office - Daventry

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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) 2606-5678
Fax: (852) 2691-1641, 2687-3552

ICELAND

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121 Reykjavik
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Telephone: (354) 5526122

INDIA

Pune
Cummins Diesel Sales &
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India
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331635, 330066,
330166, 330356,
331703

Bombay
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298, Perin Nariman Street, Fort,
Bombay 400001, India
Telephone: (91-22) 2863566/2862247

Calcutta
Cummins Diesel Sales &
Service (I) Ltd.
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Circular Road
Calcutta 700 019 (West Bengal), India
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2470774

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Service (I) Ltd.
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6452817

Raipur
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Service (I) Ltd.
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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
- See Middle East Regional Office - United Arab Emirates

IRAQ
- See Middle East Regional Office or United Arab Emirates

IRELAND

Wellingborough (Office in England)
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Wellingborough
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Israel Engines &
Trailers Co. Ltd.
Levinson Brothers Engineers
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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

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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
Soberma (Groupe Auto Hall)
Société Soberma
Chamin Ain Borja
Quartier Beausite
Ain Sebaâ
Casablanca, Morocco
Telephone: (212-22) 66 66 40-43
Fax: (212-22) 66 66 45-46

MOZAMBIQUE
- See Southern Africa Regional Office - Kelvin

NAMIBIA (Southwest Africa)

Walvis Bay
Namib Diesel
P.O. Box 2449, Walvis Bay, Namibia
Location:
210, 2nd Street
Walvis Bay, Namibia
Telephone: 064-203971

NEPAL

Pune (Office in India)
Cummins Diesel Sales & Service (India) Ltd.
35A/1/2, Erandawana
Pune, - 411 038, (State of Maharashtra) India
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NETHERLANDS

Dordrecht
Cummins Diesel Sales & Service, B.C.
Galvanistraat 35
3316 GH Dordrecht
Netherlands
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NETHERLANDS ANTILLES

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Cummins Southeastern Power, Inc.
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NEW CALEDONIA
- See South Pacific Regional Office - Melbourne

NEW GUINEA
- See Papua New Guinea

NICARAGUA

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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
SCOA TRAC
P.M.B. 21108
Ikeja, Lagos
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Location:
Apapa-Oshodi Expressway
Isolo Industrial Estate,
Isolo
Telephone: (234-1) 45-21-539/45-21-803

Paris (Office in France)
SCOA INTER
Immeuble Marie-Joseph
Rue du Maréchal de Lattre de Tassigny
78990 Elancourt
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Telephone: (33-1) 30-68-82-68

NORTHERN IRELAND
- See United Kingdom

NORWAY

Oslo
Cummins Diesel Salg & Service A/S
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Postboks 151
N-1441 DR0BAK
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OMAN

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Universal Engineering Services L.L.C.
P.O. Box 2688
Ruwi
Sultanate of Oman
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PAKISTAN

Karachi
Diesel Power Systems
2 Bangalore Town
Main Shahrah-e-Faisal
Karachi 75350
Pakistan
Telephone: (92) 21-453 9603/4/5

PANAMA

Panama City
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Apartado Postal #55-0549
Partillo, Panama
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PAPUA NEW GUINEA

Sydney (Office in Australia)
Cummins Diesel Sales & Service
P.O. Box 150
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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
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5311945, 5315448,
5311934, 5312531,
53414513

POLAND

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PORTUGAL

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Electro Central
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1302 Lisbon, Portugal
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Rua Conselheiro
Martins de Carvalho
Lote 1480
1400 Lisboa (Restelo)
Telephone: (351-2) 303 4800

QATAR

Doha
Jaidah Motors & Trading Co.
P.O. Box 150
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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

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Bia, S.A.
Rameistraat, 123
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ST. VINCENT

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SAN MARINO

- See Italy

SAO TOME AND PRINCIPE

- See North/West/East and Central Africa Regional Office - Daventry

SAUDI ARABIA

Al-Khobar
GCC Olayan
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Al-Khobar 31952
Saudi Arabia
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SCOTLAND

- See United Kingdom

SENEGAL

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B.P. 397
Dakar, Senegal
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10 Avenue Faidherbe
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Equipements et Services (Mining Only)
BP 15372-Fann
Dakar
Senegal
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Tel: (221-8) 60 77 76 & 24 73 62
Fax: (221-8) 60 95 98

SEYCHELLES

- See North/West/East & Central Regional Office - Daventry

SIERRA LEONE

- See North/West/East and Central Africa Regional Office - Daventry

SINGAPORE

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Applied Diesel Sales & Service Pte Ltd
8 Tanjong Penjuru
Jurong Industrial Estate
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SLOVAKIA

- See European Regional Office - Gross-Gerau

SOLOMON ISLANDS

- See South Pacific Regional Office - Melbourne

SOMALIA

- See East and Southern Africa Regional Office - Harare

SOUTH AFRICA

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Kelvin View 2054
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SOUTHWEST AFRICA
- See Namibia

SPAIN

Madrid
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SPANISH GUINEA
- See Spain

SRI LANKA

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Trade Promoters Ltd
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Colombo 3
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SUDAN
- See Middle East Regional Office - United Arab Emirates

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SWAZILAND
- See South Africa

SWEDEN

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SWITZERLAND

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Riedhofstrasse 100
8105 Regensdorf
Switzerland
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SYRIA

Damascus
Puzant Yacoubian & Sons
P.O. Box 3617
Damascus, Syria
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Abou Baker El Saddik Street
Kafar Sousse Square
Telephone: (963-11) 212-8600

TAHITI, ISLAND OF
- See French Polynesia

TAIWAN

Taipei (JV)
Cummins Power Service & Parts Corp.
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Taipei, Taiwan, R.O.C.
Telephone: (886-2) 2290-0331
Fax: (886-2) 2290-0393

TANZANIA
- See South African Regional Office - Kelvin

THAILAND

Bangkok
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1696 New Petchburi Road
Bangkok 10310, Thailand
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TOGO (and BENIN)

Lome
Togomat
B.P. 1641
Lome, Togo
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TONGA, ISLAND OF
- See South Pacific Regional Office - Melbourne

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Istanbul, Turkey
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UKRAINE
- See Moscow Regional Office - Moscow

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Dhabi,
United Arab Emirates
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Rutherford Drive
Park Farm South
Wellingborough
Northants NN8 2QH, England
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Montevideo
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VATICAN CITY
- See Italy

VENEZUELA

Caracas
Sudimat
Apartado Postal 1322
Carmelitas
Caracas 1010
Venezuela
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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
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Ho Chi Minh City
Diethelm & Co. Ltd. Engineering
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Ho Chi Minh City, Vietnam
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WESTERN SAMOA
- See South Pacific Regional Office - Melbourne

YEMEN

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Sana'a, Yemen Arab Republic
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11080 Zemun
Beograd
F.R. Yugoslavia
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ZAMBIA

Ndola

Cummins Diesel Services (Zambia) Ltd.
P.O. Box 71501
Ndola, Zambia
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ZIMBABWE

Harare

Cummins Zimbabwe (Pvt) Ltd.
P.O. Box ST363
Southerton
Harare, Zimbabwe
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72 Birmingham Road
Southerton, Harare
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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 charts on the following pages of this section to aid in diagnosing specific engine symptoms. Read each row of blocks from top to bottom. Follow through the chart to identify the corrective action.

⚠ WARNING ⚠

Troubleshooting presents the risk of equipment damage, personal injury or death. Troubleshooting must be performed by trained, experienced technicians.

Coolant Temperature Above Normal – Gradual Overheat

Cause	Correction
Coolant temperature gauge is malfunctioning	Test the temperature gauge. Repair or replace the gauge, if necessary.
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 [122 in^2] or approximately 28 x 28 cm [11 x 11 in] of opening at all times. Refer to the OEM service manual.
OK ↓	
Coolant level is below specification	Inspect the engine and cooling system for external coolant leaks. Repair if necessary. Add coolant. Refer to an Authorized Cummins Repair Facility.
OK ↓	
Radiator fins or air conditioner condenser fins are damaged or obstructed with debris	Inspect the radiator fins and air conditioner condenser fins. Clean if necessary. Refer to the OEM service manual.
OK ↓	
Cooling system hose is collapsed, restricted, or leaking	Inspect the hoses. Refer to Section 5.
OK ↓	
Fan drive belt is loose	Check the belt tension and tighten if necessary.
OK ↓	
Lubricating oil level is above or below specification	Check the oil level. Add or drain oil, if necessary. Refer to Section 3.
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 ↓	

(Continued)

Coolant Temperature Above Normal – Gradual Overheat (Continued)

Cause	Correction
Pressure cap is **not** correct or is malfunctioning	Replace pressure cap with the correct rating for the cooling system. Refer to the manufacturer's specifications.
OK ↓	
Supplemental coolant additive (SCA) level is above specification or the coolant is overconcentrated with antifreeze	Check the SCA level. Verify the antifreeze concentration. Refer to Cooling Recommendations and Specifications in Section V.
OK ↓	
Fill line or vent lines are restricted, obstructed, or **not** routed correctly	Check the vent lines and the fill line for correct routing and for restriction. Refer to the manufacturer's instructions.
OK ↓	
Contact a Cummins Authorized Repair Facility	

Coolant Temperature Above Normal – Sudden Overheat

Cause	Correction
Electronic fault codes active or high counts of inactive fault codes	Refer to an Authorized Cummins Repair Facility.
OK ⬇	
Fan drive belt is broken	Check the fan drive belt. Replace the belt, if necessary. Refer to Section A.
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 ⬇	
External coolant leak	Inspect the engine for coolant leaking from hoses, draincocks, water manifold, jumper tubes, expansion and pipe plugs, fittings, radiator core, air compressor and cylinder head gaskets, lubricating oil cooler, water pump seal, cylinder block, and OEM-mounted components that have coolant flow. Refer to an Authorized Cummins Repair Facility.
OK ⬇	
Fan drive or fan controls are malfunctioning	Check the fan drive and controls. Refer to the OEM service manual.
OK ⬇	
Radiator fins or air conditioner condenser fins are damaged or obstructed with debris	Inspect the radiator fins and air conditioner condenser fins. Clean if necessary. Refer to the OEM service manual.
OK ⬇	
Cooling system hose is collapsed, restricted, or leaking	Inspect the hoses. Refer to Section 5.
OK ⬇	
Pressure cap is **not** correct or is malfunctioning	Replace pressure cap with the correct rating for the cooling system. Refer to the manufacturer's specifications.
OK ⬇	

(Continued)

Coolant Temperature Above Normal – Sudden Overheat (Continued)

Cause	Correction
Fill line or vent lines are restricted, obstructed, or **not** routed correctly	Check the vent lines and the fill line for correct routing and for restriction. Refer to the OEM specifications.

OK

Contact a Cummins Authorized Repair Facility

Coolant Temperature Below Normal

Cause	Correction
Electronic fault codes active or high counts of inactive fault codes	Refer to an Authorized Cummins Repair Facility.
OK ⬇	
Engine is operating at low ambient temperature	Check the winterfront, shutters, and under-the-hood air. Use under-the-hood intake air in cold weather. Refer to the OEM service manual.
OK ⬇	
Coolant temperature gauge is malfunctioning	Test the temperature gauge. Repair or replace the gauge, if necessary.
OK ⬇	
Coolant temperature sensor is malfunctioning	Use an electronic service tool to check the coolant temperature sensor. Refer to an Authorized Cummins Repair Facility.
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 ⬇	
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 ⬇	
Vessel is malfunctioning or parasitics are excessive	Check the vessel bottom, propeller, transmission, and driven accessories. Refer to the manufacturer's instructions and specifications.
OK ⬇	
Starting aid is necessary for cold weather, or starting aid is malfunctioning	Check for correct operation of cold starting aid. Refer to an Authorized Cummins Repair Facility.
OK ⬇	
Electronic fault codes active or high counts of inactive fault codes	Refer to an Authorized Cummins Repair Facility.
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 Starter) symptom tree.
OK ⬇	
Air in the fuel system	Check for air in the fuel system. Tighten or replace the fuel connections, fuel lines, fuel tank standpipe, and fuel filters as necessary.
OK ⬇	
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 ⬇	

(Continued)

Engine Difficult to Start or Will Not Start (Exhaust Smoke) (Continued)

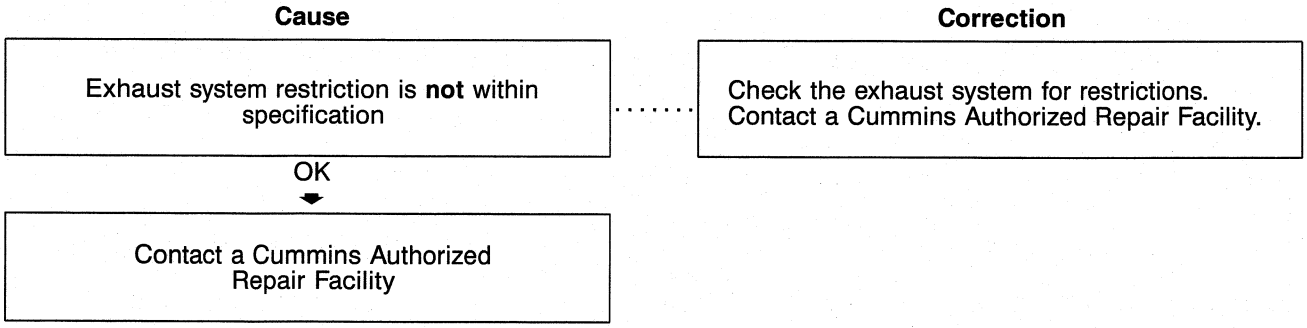
Cause	Correction
Air intake system restriction is above specification	Check the air intake system for restriction. Clean or replace the air filter and inlet piping as necessary. Refer to Section 3 or an Authorized Cummins Repair Facility.
OK ▼	
Contact a Cummins Authorized Repair Facility	

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 ⬇	
Fuse(s) malfunctioning	Replace the fuse(s) in the OEM interface harness. Refer to the OEM's wiring instructions.
OK ⬇	
Fuel shutoff valve solenoid or circuit is malfunctioning (electronic controlled fuel systems)	Check the fuel shutoff valve solenoid and circuit. Refer to an Authorized Cummins Repair Facility.
OK ⬇	
Electronic fault codes active or high counts of inactive fault codes	Refer to an Authorized Cummins Repair Facility.
OK ⬇	
Battery voltage supply to the electronic control module (ECM) is low, interrupted, or open	Check the battery connections, the fuses, and the unswitched battery supply circuit. Refer to Section 5 or A.
OK ⬇	
Fuel inlet restriction	Check for fuel inlet restriction. Contact a Cummins Authorized Repair Facility.
OK ⬇	
In-line check valve(s) are installed backwards or have incorrect part number	Inspect the check valve(s) for correct installation and part number.
OK ⬇	
Air in the fuel system	Check for air in the fuel system. Tighten or replace the fuel connections, fuel lines, fuel tank standpipe, and fuel filters as necessary.
OK ⬇	
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 3 or an Authorized Cummins Repair Facility.
OK ⬇	

(Continued)

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



Engine Power Output Low

Cause	Correction
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 ↓	
Drivetrain is **not** correctly matched to the engine	Check for correct gearing and drivetrain components. Refer to the OEM vehicle specifications.
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 ↓	
Fuel level is low in the tank	Fill the supply tank. Refer to the OEM service manual.
OK ↓	
Electronic fault codes active or high counts of inactive fault codes	Refer to Section 1 or an Authorized Cummins Repair Facility.
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 3 or an Authorized Cummins Repair Facility.
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 ↓	
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 ↓	

(Continued)

Engine Power Output Low (Continued)

Cause	Correction
Fuel inlet restriction	Check for fuel inlet restriction. Contact a Cummins Authorized Repair Facility.
OK ↓	
Fuel drain line restriction	Check the fuel drain lines for restriction. Clear or replace the fuel lines, check valves, or tank vents as necessary. Refer to an Authorized Cummins 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 standpipe, and fuel filters as necessary.
OK ↓	
Air intake or exhaust leaks	Check for loose or damaged piping connections and missing pipe plugs. Check the turbocharger and exhaust manifold mounting. Refer to Section 3 or an Authorized Cummins 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 ↓	
Fuel inlet temperature to pump is above specification	Fill the fuel tank, turn off or bypass the fuel heaters, and check the fuel cooler. Refer to the OEM service manual.
OK ↓	
Debris in the fuel passages	Check the fuel tubes and fuel manifold for debris. Refer to an Authorized Cummins Repair Facility.
OK ↓	
Engine is operating above recommended altitude	Engine power decreases above recommended altitude. Refer to the Engine Data Sheet for specifications.
OK ↓	

(Continued)

Engine Power Output Low (Continued)

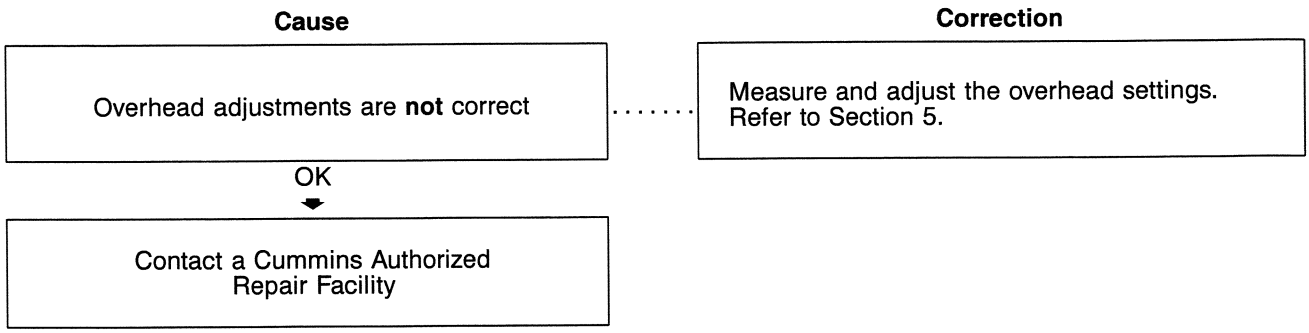
Cause	Correction
Vessel is malfunctioning or parasitics are excessive	Check the vessel bottom, propeller, transmission, and driven accessories. Refer to the manufacturer's instructions and specifications.
OK ↓	
Drivetrain or propeller is damaged or is **not** correctly matched to the engine	Check for the correct gearing, drivetrain components, or propeller. Refer to the manufacturer's instructions and specifications.
OK ↓	
Overhead adjustments are **not** correct	Measure and adjust the overhead settings. Refer to Section 5.
OK ↓	
Contact a Cummins Authorized Repair Facility	

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 Below Normal symptom tree.
OK ⬇	
Idle characteristics of the HPI system are different than characteristics of the PT system	Normal performance. No corrections are necessary.
OK ⬇	
Air in the fuel system	Check for air in the fuel system. Tighten or replace the fuel connections, fuel lines, fuel tank standpipe, and fuel filters as necessary.
OK ⬇	
Fuel inlet restriction	Check for fuel inlet restriction. Contact a Cummins Authorized Repair Facility.
OK ⬇	
Fuel drain line restriction	Check the fuel drain lines for restriction. Clear or replace the fuel lines, check valves, or tank vents as necessary. Refer to an Authorized Cummins 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 ⬇	
Electronic fault codes active or high counts of inactive fault codes	Refer to Section 1 or an Authorized Cummins Repair Facility.
OK ⬇	
Engine mounts are worn, damaged, or **not** correct	Check the engine mounts. Refer to an Authorized Cummins Repair Facility.
OK ⬇	
Debris in the fuel passages	Check the fuel tubes and fuel manifold for debris. Refer to an Authorized Cummins Repair Facility.
OK ⬇	

(Continued)

Engine Runs Rough at Idle (Continued)

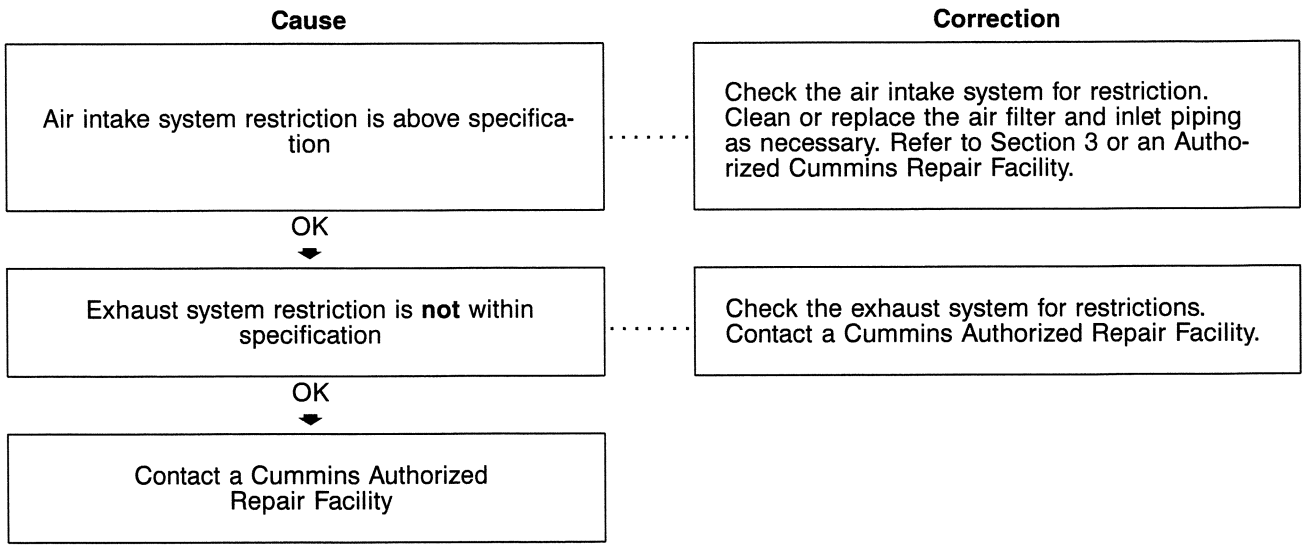


Engine Starts But Will Not Keep Running

Cause	Correction
Electronic fault codes active or high counts of inactive fault codes	Refer to Section 1 or an Authorized Cummins 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 standpipe, and fuel filters as necessary.
OK ⬇	
Fuel level is low in the tank	Fill the supply tank. Refer to the OEM service manual.
OK ⬇	
Engine-driven units are engaged	Disengage engine-driven units.
OK ⬇	
Fuel is waxing due to cold weather	Check the fuel heater, if installed. Weather conditions sometimes require a fuel heater.
OK ⬇	
Fuel inlet restriction	Check for fuel inlet restriction. Contact a Cummins Authorized Repair Facility.
OK ⬇	
Fuel drain line is bent	Check the fuel drain line. Repair if necessary.
OK ⬇	
Fuel shutoff valve (FSOV) solenoid or circuit is malfunctioning (electronically controlled fuel systems)	Check the fuel shutoff valve solenoid and circuit.
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 ⬇	

(Continued)

Engine Starts But Will Not Keep Running (Continued)



Engine Will Not Crank or Cranks Slowly (Electric Starter)

Cause	Correction
Neutral safety switch engaged or malfunctioning	Put gear lever in neutral or check for faulty switch. Refer to boat or component manufacturer.
OK ⬇	
Batteries have malfunctioned	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 ⬇	
Battery switch undersize or terminals are corroded	Replace the switch and/or clean the terminals. Refer to an Authorized Cummins Repair Facility.
OK ⬇	
Engine-driven units are engaged	Disengage engine-driven units.
OK ⬇	
Battery temperature is below specification	Check the battery heater (if equipped) for correct operation. Refer to the manufacturer's instructions and specifications.
OK ⬇	
Lubricating oil temperature is below specification	Install an oil pan heater, or drain the oil and fill the system with warm oil.
OK ⬇	
Lubricating oil does **not** meet specifications for operating conditions	Change the oil and filters. Refer to Lubricating Oil Recommendations and Specifications in Section V. Use the oil recommended in Section V.
OK ⬇	
Crankshaft rotation is impaired	Check the crankshaft for ease of rotation. Refer to an Authorized Cummins Repair Facility.
OK ⬇	

(Continued)

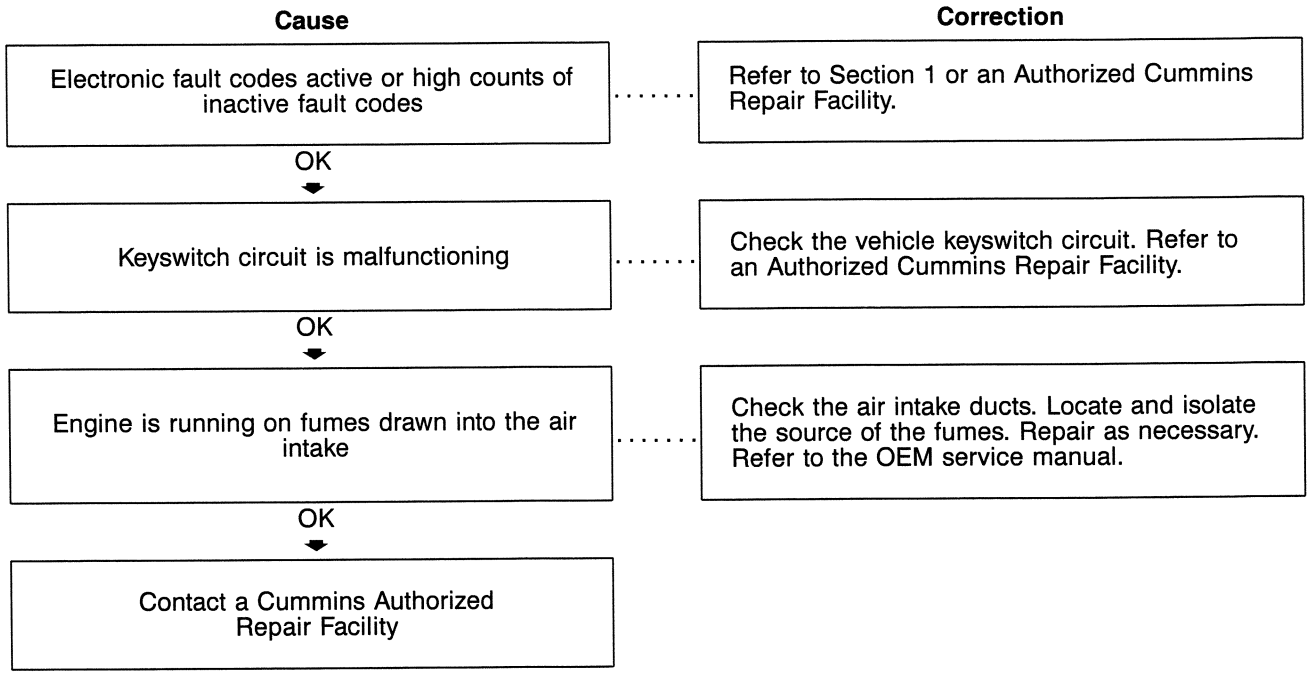
Engine Will Not Crank or Cranks Slowly (Electric Starter) (Continued)

Cause	Correction
Battery capacity is below specification	Refer to Section V. Replace the batteries if necessary.
OK ⬇	
Battery cables are **not** the correct gauge or length	Replace the battery cables with larger gauge or shorter length cables. Refer to the OEM instructions and specifications.
OK ⬇	
Starting circuit component is malfunctioning	Check the starting circuit components. Refer to the OEM service manual.
OK ⬇	
Starting motor pinion or ring gear is damaged	Remove the starting motor and inspect the pinion gear and flywheel ring gear.
OK ⬇	
Contact a Cummins Authorized Repair Facility	

Engine Will Not Reach Rated Speed (RPM)

Cause	Correction
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 ⬇	
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 ⬇	
Vessel is malfunctioning or parasitics are excessive	Check the vessel bottom, propeller, transmission, and driven accessories. Refer to the manufacturer's instruction and specifications.
OK ⬇	
Fuel inlet restriction	Check for fuel inlet restriction. Contact a Cummins Authorized Repair Facility.
OK ⬇	
Electronic fault codes active or high counts of inactive fault codes	Refer to Section 1 or an Authorized Cummins 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 ⬇	
Drivetrain or propeller is damaged or is **not** correctly matched to the engine	Check for the correct gearing, drivetrain components, or propeller. Refer to the manufacturer's instructions and specifications.
OK ⬇	
Overhead adjustments are **not** correct	Measure and adjust the overhead settings. Refer to Section 5.
OK ⬇	
Contact a Cummins Authorized Repair Facility	

Engine Will Not Shut Off

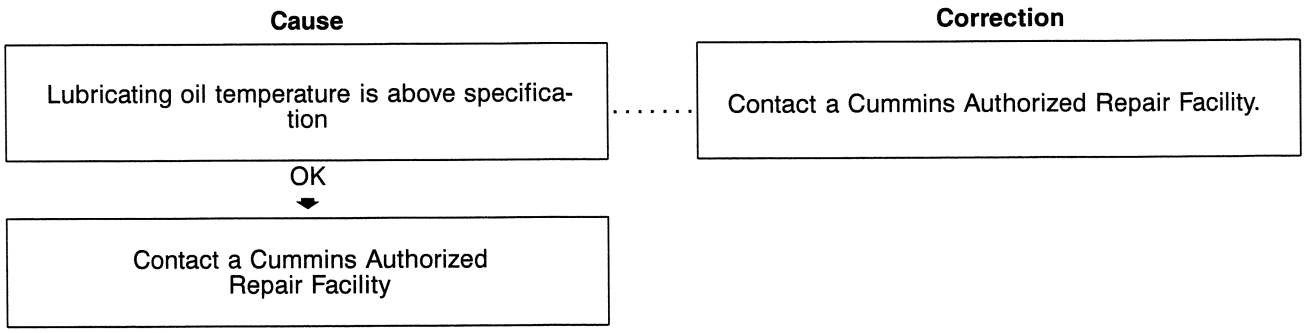


Lubricating Oil Pressure Low

Cause	Correction
Electronic fault codes active or high counts of inactive fault codes	Refer to Section 1 or an Authorized Cummins Repair Facility.
OK ▼	
Lubricating oil level is below specification	Check the oil level. Refer to Section 3.
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 Section V for specifications.
OK ▼	
Engine angularity during operation exceeds specification	Refer to the engine specification data sheet.
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 an Authorized Cummins Repair Facility.
OK ▼	
Lubricating oil does **not** meet specifications for operating conditions	Change the oil and filters. Refer to Section 4. Use the oil recommended in Section V.
OK ▼	
Lubricating oil is contaminated with coolant or fuel	Contact a Cummins Authorized Repair Facility.
OK ▼	
Lubricating oil filter is plugged	Change the oil and filter. Refer to Section Section 4. Review the oil change interval. Refer to Section V.
OK ▼	

(Continued)

Lubricating Oil Pressure Low (Continued)



NOTES

Section V - Maintenance Specifications

Section Contents

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General Engine

General Specifications

For performance and fuel rate values, refer to the engine data sheet or the fuel pump code for the particular model involved.

Engine speed ..... Refer to the fuel pump calibration data for optional speed rating.

Displacement ..... 23 liters [1404 cu in]

Bore and stroke ..... 170 mm x 170 mm [6.69 in x 6.69 in]

Engine weight:
- Dry ..... 2590 kg [5709 lb]
- Wet ..... 2800 kg [6172 lb]

Firing order 1-5-3-6-2-4

Valve and injector settings (cold):
- Intake valve adjustment ..... 0.32 mm [0.013 in]
- Intake valve limits ..... 0.30 to 0.34 mm [0.012 to 0.013 in]
- Exhaust valve adjustment ..... 0.62 mm [0.024 in]
- Exhaust valve limits ..... 0.60 to 0.64 mm [0.024 to 0.025 in]
- Injector OBC method adjustment (in engine) ..... 32 N•m [24 ft-lb]

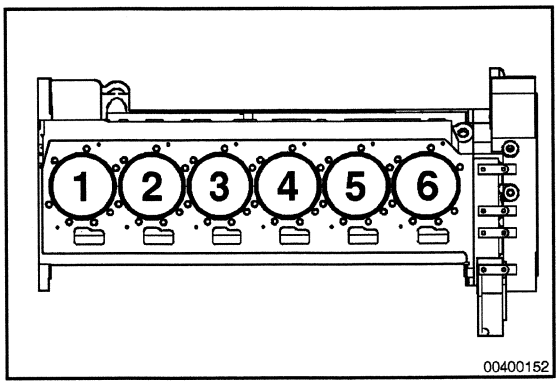
Compression ratio 16.0:1

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

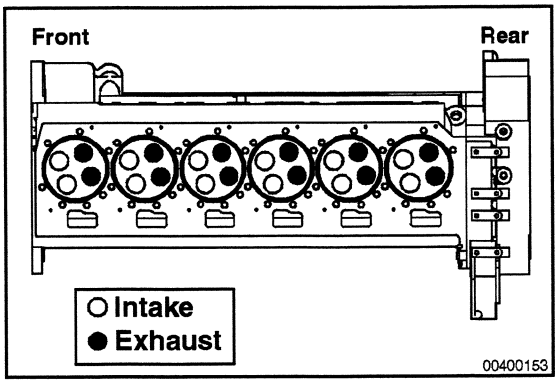
General Engine Data

Refer to the graphic for the cylinder locations.

The cylinder firing order is: 1-5-3-6-2-4.



Refer to the graphic for the intake and exhaust valve locations.



Fuel System

Specifications

For performance and fuel rate values, refer to the Engine Data Sheet or the fuel pump code for the particular rating involved.

Engine Idle Speed ..... 700 ± 25 rpm

Fuel Inlet Maximum Restriction:
- Clean Fuel Filter ..... 100 mm Hg [4.0 in Hg]
- Dirty Fuel Filter ..... 229 mm Hg [9.0 in Hg]

Fuel Drain Line Restriction:
- With Check Valves ..... 0 to 21 kPa [0 to 3 psi]
- With Check Valves Removed ..... 14 to 34 kPa [2 to 5 psi]

Fuel Check Valve Between Fuel Pump and Cylinder Head (integral to fuel pump):
- Opening Pressure ..... 21 to 35 kPa [3 to 5 psi]

Engine Minimum Cranking Speed ..... 130 rpm

Fuel Check Valve in Fuel Drain Line:
- Opening Pressure ..... 13 to 25 mm Hg [1/4 to 1/2 psi]

Derate Engine Fuel Rate for High Altitude ..... 4 percent per 300 m [1000 ft] above 3600 m [12,000 ft]

Derate Engine Fuel Rate for Hot Weather ..... 2 percent per 11°C above 38°C [1 percent per 10°F above 100°F]

Shutoff Valve Solenoid Coil Resistance in ohms 24 VDC ..... 28 to 32 ohms

Fuel Pump Cranking Pressure - Minimum ..... 172 kPa [25 psi] @ 150 rpm

Fuel Pump Pressure - Minimum (on engine measurement):
- 1500 rpm ..... 1779 kPa [258 psi]
- 1800 rpm ..... 2117 kPa [307 psi]
- 2100 rpm ..... 2344 kPa [340 psi]

Fuel Filter Specifications:
- Efficiency98.7 percent at 10 microns/96.0 percent at 8 microns/86.0 percent at 5 microns
- Water Removal ..... Free = 95 percent/Emulsified = 95 percent

Lubricating Oil System

Specifications

Oil Pressure (with 15W-40 oil at 107°C [225°F]):
- At Idle (minimum allowable) ..... 70 kPa [10 psi]
- At Rated Speed (minimum allowable) ..... 210 kPa [30 psi]

Oil Temperature:
- Maximum ..... 120°C [250°F]

Oil Filter Capacity:
- Combination Filter (two LF9325 Fleetguard®) ..... 5.3 liters [1.4 gal]

Oil Sump Capacity:
- High ..... 52 liters [13.7 gal]
- Low ..... 42 liters [11.1 gal]

Cooling System

Specifications

Coolant Capacity (engine **only**) ..... 46.6 liters [49 qt]

Standard Modulating Thermostat Range ..... 82° to 94°C [180° to 202°F]

Maximum Coolant Pressure (exclusive of pressure cap) ..... 241 kPa [35 psi]

Maximum Allowable Top Tank Temperature ..... 100°C [212°F]

Minimum Recommended Top Tank Temperature ..... 70°C [160°F]

Maximum Allowable Deaeration Time ..... 25 minutes

Minimum Allowable Drawdown or 10% of System Capacity (whichever is greater) ..... 4.7 liters [4.9 qt]

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

Air Intake System

Specifications

Maximum Allowable Intake Restriction (at rated speed and load):
- With Clean Filter Element ..... 380 mm H_2O [15 in H_2O]
- With Dirty Filter Element ..... 635 mm H_2O [25 in H_2O]

Maximum Allowable Charge Air Cooling System Restriction (including piping):
- Maximum (at rated speed) ..... 100 mm Hg [4.0 in Hg]

Exhaust System

Specifications

Back Pressure - Maximum (at rated speed and load) ..... 75 mm Hg [3.0 in Hg]

Exhaust Pipe Size (normally acceptable inside diameter):
- All Ratings ..... 152 mm [6.0 in]

Electrical System

Specifications

Maximum Starting Circuit Resistance:
- 24-VDC starter ..... 0.00200 ohm

Battery Cable Sizes - American Wire Gauge (maximum length in cranking motor circuit)

24 to 32-VDC
- Number 00 ..... 6.1 m [20 ft]
- Number 000 ..... 8.2 m [27 ft]
- Number 0000 or two Number 0* ..... 10.7 m [35 ft]
- Two Number 0013.7 m [45 ft]

Minimum Cranking Speed without Starting Aid ..... 130 rpm

* Two strands of Number 0 cable can be used instead of one Number 0000 cable, provided that all connections are carefully made to provide equal current flow in each parallel cable.

NOTE: Starting aids, such as block heaters, lubricating oil pan heaters, and so forth, are available to aid in cold weather starting.

System Voltage	Ambient Temperatures			
	-18°C [0°F]		0°C [32°F]	
	Cold Cranking Amperes	Reserve Capacity* Amperes	Cold Cranking Amperes	Reserve Capacity* Amperes
24 VDC**	900	320	640	240

* The number of plates within a given battery size determines reserve capacity. Reserve capacity is the length of time sustained cranking can occur.

** CCA ratings are based on two 12-VDC batteries in series.

Battery State of Charge	Specific Gravity @ 27°C [80°F]
100%	1.260 to 1.280
75%	1.230 to 1.250
50%	1.200 to 1.220
25%	1.170 to 1.190
Discharged	1.110 to 1.130

Cummins/Fleetguard® Filter Specifications

Specifications

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

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

Cummins Inc. can **not** be responsible for problems caused by non-genuine filters that do **not** meet Cummins Inc. performance or durability requirements.

Filter Type	
Lubricating Oil Filter (Venturi Combo)	
Cummins Part Number	
Fleetguard® Part Number	LF9325
Fuel Filter (10 micron, with water separation)	
Cummins Part Number	3089916*
Fleetguard® Part Number	FS1006
Coolant Filter	
Cummins Part Number	3100308*
Fleetguard® Part Number	WF2075 (15 SCA units)

* Filters with Cummins part numbers are available from distributors.

Fuel Recommendations and Specifications

General Information

⚠ WARNING ⚠

Do not mix gasoline or alcohol with diesel fuel. These mixtures can cause explosions.

△ 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 injectors.

Cummins Inc. recommends the use of ASTM number 2 D fuel. The use of number 2 diesel fuel will result in optimum engine performance.

At operating temperatures below 0°C [32°F], acceptable performance can be obtained by using blends of number 2 D and number 1 D.

NOTE: Lighter fuels can reduce fuel economy.

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 QSK23 engines.

Acceptable Substitute Fuels - Cummins Fuel System

No. 1D Diesel	No. 2D Diesel	No. 1K Kerosene	Jet-A	Jet-A1	JP-5	JP-8	Jet-B	JP-4	CITE
1	OK	1	1	1	OK	OK	**NOT** OK	**NOT** OK	**NOT** OK

1. OK - **ONLY** if fuel lubricity is adequate. Refer to Fuel for Cummins Engines, Bulletin 3379001.
2. Acceptable **ONLY** if
   - chrome plated injector plated injector plungers fuel additive AND the heavy duty carbon graphite bushed gear pump are used, or
   - the fuel is blended with enough fuel additive to increase the lubricity above the minimum level. Refer to Fuel for Cummins Engines, Bulletin 3379001.

Note: Any adjustment to compensate for reduced performance with a fuel system using substitute fuel is **not** warrantable.

Additional information for fuel recommendations and specifications can be found in Fuel for Cummins Engines, Bulletin 3379001. See ordering information in the Section L.

Lubricating Oil Recommendations and Specifications

General Information

The use of quality engine lubricating oils and appropriate oil drain and filter change intervals are critical factors in maintaining engine performance and durability.

Cummins Inc. recommends the use of oil that meets the American Petroleum Institute (API) performance categories of CF-4, CG-4, CF-4/SG, or CG-4/SH. Oil with an older API classification of CD or CE can be used in areas of the world outside North America where oils meeting the current API categories are **not** available. However, if using CD or CE

classification oil, the oil **must** be changed at the standard service interval and **only** extended if scheduled oil sampling is used for close monitoring of oil condition. Oil with an API classification of CC can be used in areas of the world outside North America where oils meeting the current API categories are **not** available. If used, they **must** be changed at one half the normal recommended service intervals. Oil with an API classification of CA or CB **must not** be used.

The oil supplier is responsible for the quality and performance of their product.

Cummins Inc. recommends engine oil with a nominal ash content of 1 to 1.5 percent mass. Oils with higher ash content, up to 1.85 percent ash, can be used in areas where the sulfur content of the fuel is normally 1 to 1.5 percent mass. Limiting ash content is critical to the prevention of valve and piston deposit formation.

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

New Engine Break-in Oils

Special break-in engine lubricating oils are **not** recommended for new or rebuilt Cummins engines. Use the same type of oil during the break-in as is used in normal operation.

Synthetic or partially synthetic engine oils, however, can **not** be used in a new or rebuilt engine during break-in. Use a standard petroleum-based oil for the first drain interval.

Additional information regarding lubricating oil availability throughout the world is available in the Engine Manufacturer's Association Lubricating Oils Data Book for Heavy-Duty Automotive and Industrial Engines. The data book can be ordered from the address below:

Engine Manufacturer's Association

Two North LaSalle Street

Chicago, IL U.S.A. 60602

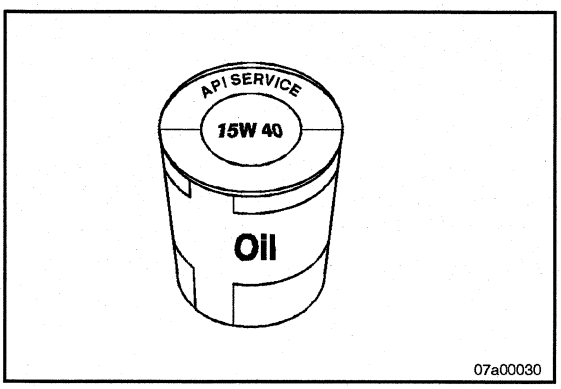
Phone: (312) 827–8733

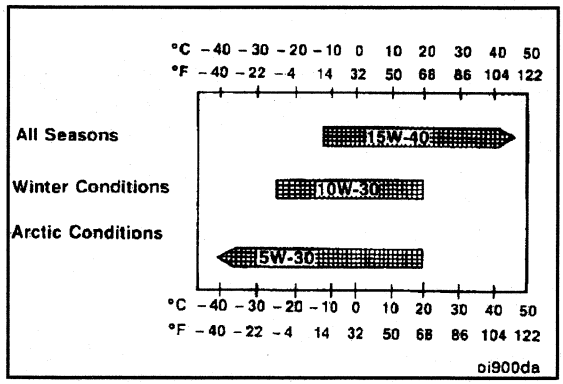
The oil performance classifications represented in the following chart as standard or premium have been determined through field experience and engine testing. Engine component wear and deposits are limiting factors in evaluating useful oil life. Contact a Cummins representative or oil supplier representative(s) for further assistance, if needed.

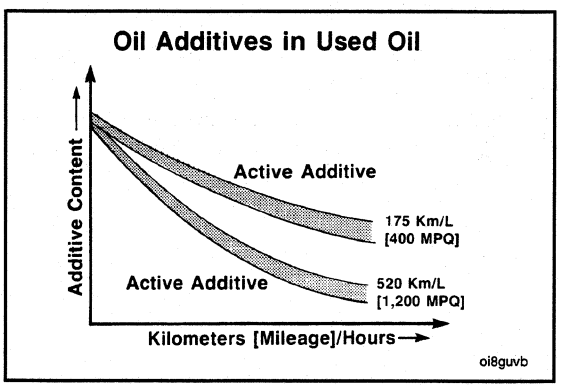
Cummins Inc. recommends the use of a high-quality 15W-40 multiviscosity, heavy-duty engine oil that meets the requirements of Cummins Engineering Standard (CES) 20071, 22072, 20075, 20076, and 20077. The oil categories CC, CD, and CE have been obsoleted by API and are **not** to be used as their specifications are no longer controlled. Engine oils that meet CES 20076 and 20077 are also considered premium oils when using the Chart Method. ACEA and API designations have **not** been assigned to CES 20076 and 20077 as of yet.

Oil Performance Classification			
API Category	**Cummins Engine Standard (CES)**	**ACEA**	**Classification of Oil Charts**
CC, CD, CE	N/A	N/A	N/A
CF-4/SG, CG-4SH	20075	E2, E3	Standard
CH-4	20072, 20071	E5	Premium
N/A	20076, 20077	N/A	Premium

ACEA = European Automobile Manufacturers Association







Viscosity Recommendations

The viscosity of an oil is a measure of its resistance to flow. The Society of Automotive Engineers has classified engine oils into viscosity grades. Oils that meet the low temperature (-18°C [0°F]) requirement carry a grade designation with a W suffix. Oils that meet both the low and high temperature requirements are referred to as multigrade or multiviscosity grade oils.

Cummins Inc. has found that the use of multigrade lubricating oil improves oil consumption control and engine cranking in cold conditions while maintaining lubrication at high operating temperatures and can contribute to improved fuel consumption.

△ CAUTION △

When single-grade oil is used, make sure the oil will be operating within the temperature ranges, as shown.

Cummins Inc. recommends the use of multigrade lubricating oils with the viscosity grades for the ambient temperatures indicated. This picture shows **only** the preferred oil grades.

Single-grade oils can be substituted for short durations until the recommended multigrade is procured. Arctic condition oils are available commercially with better low temperature properties. Consult your supplier.

The primary criterion for selecting an oil viscosity grade is the lowest temperature the oil will experience while in the engine oil sump. Bearing problems can be caused by the lack of lubrication during the cranking and start up of a cold engine when the oil being used is too viscous to flow properly. Change to a lower viscosity grade of oil as the temperature of the oil in the engine oil sump reaches the lower end of the ranges shown in the picture.

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 of the oil between oil and filter change intervals is normal. The amount of contamination will vary depending on the operation of the engine, hours or miles on the oil, fuel consumed, and new oil added.

Arctic Operation

⚠ CAUTION ⚠

The use of a synthetic base oil does not justify extended oil change intervals. Extended oil change intervals can cause engine damage.

If an engine is operated in ambient temperatures consistently below -23°C [-10°F] and there are no provisions to keep the engine warm when it is **not** in operation, use a synthetic engine oil with adequate low temperature properties.

The oil supplier **must** be responsible for meeting the performance service specifications.

Refer to Section 2 for the use of the Chart Method to allow extended oil change intervals.

Coolant Recommendations and Specifications

General Information

Cummins Inc. recommends the use of fully formulated antifreeze or coolant containing a precharge of Supplemental Coolant Additive (SCA). The antifreeze or coolant **must** meet the specifications outlined in The Maintenance Council (TMC) Recommended Practice (RP) 329 (ethylene glycol) or RP 330 (propylene glycol). The use of fully formulated antifreeze or coolant significantly simplifies cooling system maintenance.

Copies of TMC specifications can be obtained through Cummins Inc., or by contacting:

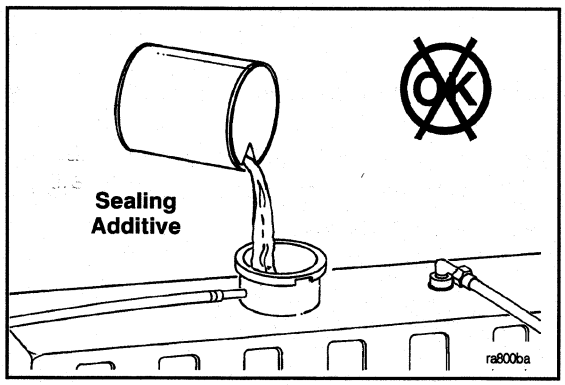
The Maintenance Council
American Trucking Association
2200 Mill Road
Alexandria, VA 22314-5388
Phone (703) 833-1763
Fax (703) 836-6070

Fully–formulated antifreeze contains balanced amounts of antifreeze, SCA, and buffering compounds, but does **not** contain 50% percent water. Fully–formulated coolant contains balanced amounts of antifreeze, SCA, and buffering compounds already premixed 50/50 with deionized water.

The following pages give an explanation of water, antifreeze, and SCA's. They also explain how to test antifreeze and SCA levels.

This section also contains information on cooling system maintenance and a coolant treatment chart used to determine the correct SCA service filter.

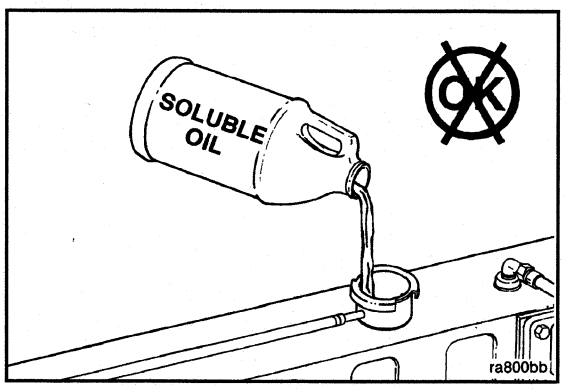
Alternative maintenance practices for cooling systems can be found in Cummins Coolant Requirements and Maintenance, Bulletin 3666132.



Cooling System Sealing Additives

Do **not** use sealing additives in the cooling systems. The use of sealing additives will:

- Build up in coolant low flow areas
- Clog coolant filters
- Plug radiator and oil cooler.



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.

Fleetguard® DCA4 Service Filters and Liquid Precharge

DCA4 Service Filters		DCA (Fleetcool) Service Filters	
Part Number	**SCA Units**	**Part Number**	**SCA Units**
WF2070	2	WF2050	2
WF2071	4	WF2051	4
WF2072	6	WF2052	6
WF2073	8	WF2053	8
WF2074	12	**Not** Available	12
WF2075	15	WF2054	15
WF2076	23	WF2055	23
WF2077	(blank filter without SCAs)	WF2077	(blank filter without SCAs)

DCA4 Liquid			DCA (Fleetcool) Liquid		
Part Number	**Size**	**SCA Units**	**Part Number**	**Size**	**SCA Units**
DCA60L	0.47 liters [1 pt.]	5	DCA30L	0.47 liters [1 pt.]	5
DCA65L	1.89 liters [2 qt.]	20	DCA35L	1.89 liters [2 qt.]	20
DCA70L	3.78 liters [1 gal]	40	DCA40L	3.78 liters [1 gal]	40
DCA75L	18.9 liters [5 gal]	200	DCA45L	18.9 liters [5 gal]	200
DCA80L	208 liters [55 gal]	2200	DCA50L	208 liters [55 gal]	2200

Maintenance Intervals for Cooling Systems up to 76 Liters [20 Gallons]						
Service Interval			**System Size in Liters [Gallons]**			
Kilometers	[Miles]	Hours	4 to 19 [1 to 5]	19 to 38 [6 to 10]	42 to 57 [11 to 15]	60 to 76 [16 to 20]
72001 to 80000	[45001 to 50000]	1126 to 1250	8	12	23	30
64001 to 72000	[40001 to 45000]	1001 to 1125	4	12	15	26
56001 to 64000	[35001 to 40000]	876 to 1000	4	8	12	23
48001 to 56000	[30001 to 35000]	751 to 875	4	6	12	20
40001 to 48000	[25001 to 30000]	626 to 750	4	6	10	18
32001 to 40000	[20001 to 25000]	501 to 625	2	6	8	15
24001 to 32000	[15001 to 20000]	376 to 500	2	4	6	12
16001 to 24000	[10001 to 15000]	251 to 375	2	4	6	8
0 to 16000	[0 to 10000]	0 to 250	2	2	4	6
			Install service filter(s) and/or liquid containing number of SCA units listed above.			

Maintenance Intervals for Cooling Systems up to 1514 Liters [400 Gallons]										
Service Interval [Hours]	**System Size in Liters [Gallons]**									
	79 to 144 [21 to 30]	117 to 189 [31 to 50]	193 to 284 [51 to 75]	288 to 378 [76 to 100]	382 to 568 [101 to 150]	572 to 757 [151 to 200]	761 to 946 [201 to 250]	950 to 1135 [251 to 300]	1139 to 1325 [301 to 350]	1329 to 1574 [351 to 400]
751 to 1000	25	50	80	100	150	200	250	300	350	400
501 to 750	20	35	60	75	110	150	190	225	260	300
251 to 500	15	25	40	50	75	100	125	150	175	200
0 to 250	10	15	20	25	40	50	65	75	90	100
	Install service filter(s) and/or liquid containing number of SCA units above.									

Notes:

A. Consult the vehicle equipment manufacturer's maintenance information for total cooling system capacity.

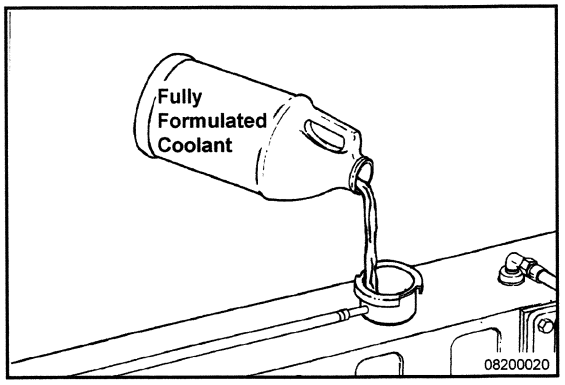
B. When draining and replacing the coolant, **always** pre-charge the cooling system to a SCA level of 1.5 units per gallon. This concentration level **must not** be allowed to go below 1.2 units and **must** be controlled when the level is greater than 3 units. Action needed when the level goes below 1.2 is a filter and liquid pre-charge; from 1.2 to 3.0 units, filter **only**; above 3.0, test at every oil change until level falls to 3.0 or below.

When performing service which requires draining the cooling system, take special precautions to collect it in a clean container, seal it to prevent contamination, and save for reuse.

C. Change coolant filters at each oil change to protect the cooling system. Consult the coolant capacity chart to determine the correct coolant filter for a given cooling system capacity and oil drain interval.

Supplemental Coolant Additive (SCA)

Fully–formulated products contain SCA's and are required to protect the cooling system from fouling, solder blooming, and general corrosion. The cooling filter is required to protect the coolant system from abrasive materials, debris, and precipitated coolant additives.

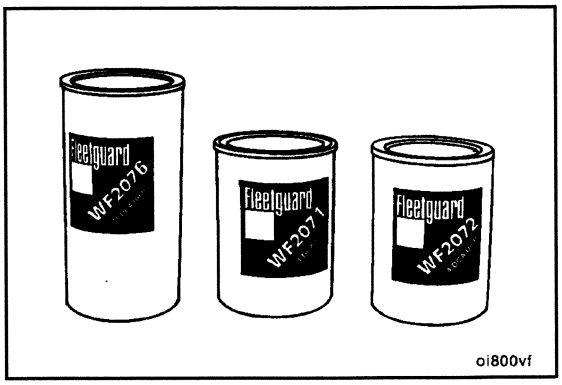


Supplemental coolant additives, or equivalent, are used to prevent liner pitting, corrosion, and scale deposits in the cooling system.

Use the correct Fleetguard® coolant filter to maintain the recommended SCA concentration in the system.

Maintain the correct concentration by changing the service filter at each oil drain interval.

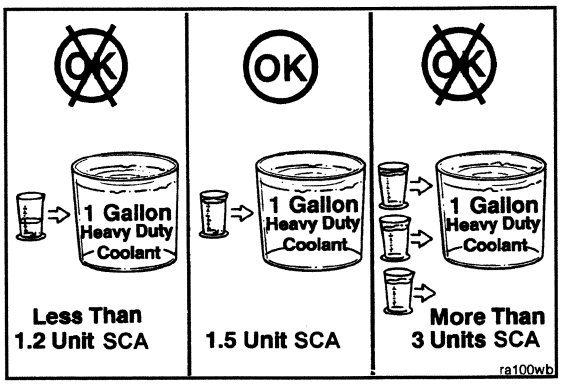
The correct filter is determined by the total cooling system capacity and oil drain interval. Refer to the Coolant Capacity Charts.



⚠ CAUTION ⚠

Insufficient concentration of the coolant additives will result in liner pitting and engine failure.

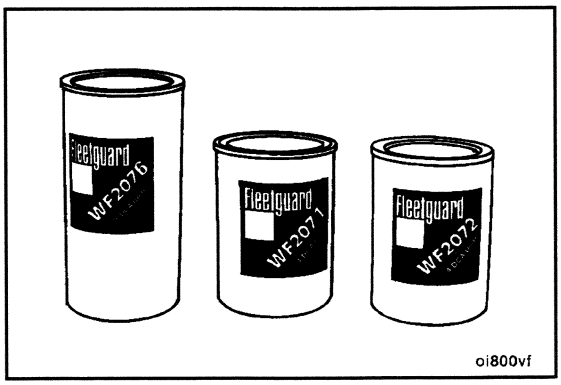
The SCA concentration **must not** fall below 1.2 units or exceed 3 units per gallon of cooling system capacity.



Use the correct Fleetguard® coolant filter to maintain the recommended SCA concentration in the system.

Maintain the correct concentration by changing the service coolant filter at each oil drain interval.

The correct filter is determined by the total cooling system capacity and oil drain interval.



Testing SCA Concentration Level CC-2602 Test Kit

Carefully follow the instructions to test the coolant and take the appropriate action recommended by the kit.

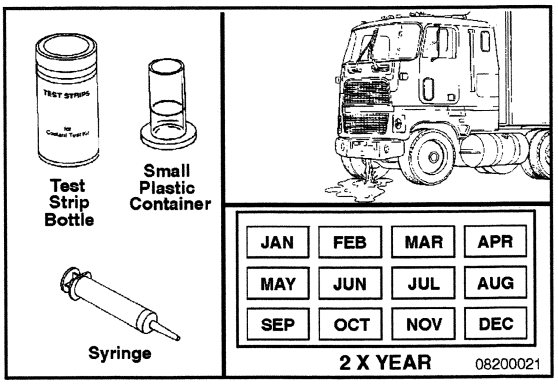
Precautions and Instructions for Proper Kit Use

- The coolant sample to be tested **must** be between 10 and 54°C [50 and 130°F]. If the sample is too cold or too hot, you will get incorrect results.
- To get the best color match results, compare test strip pads to the color chart in daylight or under cool white fluorescent lighting. If unsure about a specific color match when a test does fall between two colors on the color chart, choose the lower numbered block. It is safer to underestimate your results than to overestimate.
- The test strips do have a limited shelf life and are sensitive to humidity and extreme heat. Proper handling and storage is necessary to protect the life of the strips.
- Keep the cap tightly sealed on the test strip bottle except when removing a strip. Store away from direct sunlight and in an area where the temperature will generally stay below 32°C [90°F].
- Do **not** use the test strips after the expiration date stamped on the bottle.
- Discard the kit if any of the pads on the unused strips have turned light brown or pink.
- Use one strip at a time and take care **not** to touch any of the pads on the strip. Doing so will contaminate the pads and affect the test results.
- If the strip container is left uncapped for 24 hours, moisture in the air will render the strips useless, although no discoloration will be evident.
- **Only** use the color chart supplied with the kit.
- Clean and dry the sample cup and syringe after each use. This will prevent contaminating future samples.
- Following the correct test times is very important. Use a clock or stopwatch.

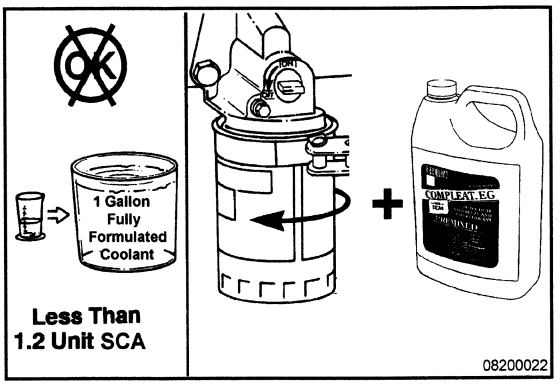
Test Intervals

Testing is recommended if the operator is **not** sure of cooling system condition due to leaks, uncontrolled topping off of the system, or major coolant loss.

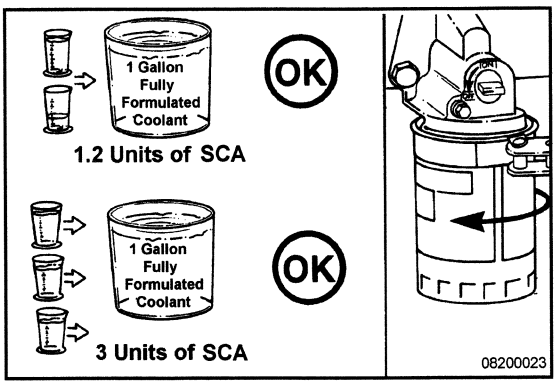
Testing is also recommended twice a year to monitor the SCA level. If the SCA level is above 3 units, test at subsequent oil drain intervals until the concentration is back under 3 units. When the concentration is back under 3 units, start installing the correct service filters at each drain interval.



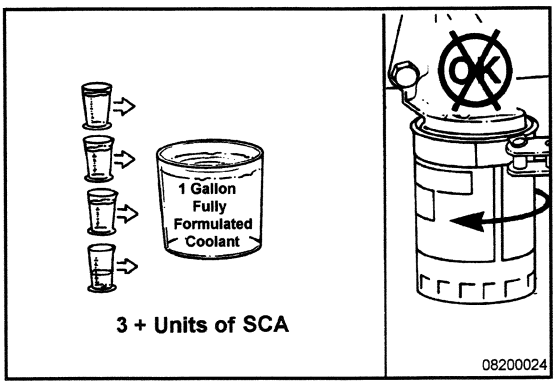
If the concentration is below 1.2 units per gallon, replace the filter and precharge with liquid.

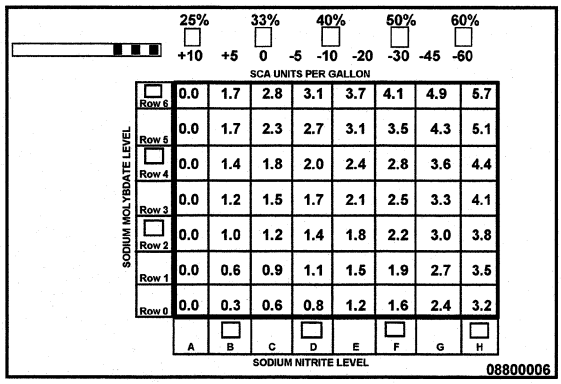


If the concentration is 1.2 to 3 units per gallon, replace the filter.



If the concentration is above 3 units per gallon, do **not** replace the service filter. Test the coolant at subsequent oil drain intervals until the concentration is back under 3 units. When the concentration is back under 3 units, start installing service filters at each oil change interval.





Do **not** use the test kit to maintain minimum SCA concentration levels (i.e., 1.5 units).

NOTE: In some instances the A or B reading can be high. However, it is the combined reading that is important. Therefore, always follow the chart.

The CC2602 Coolant Test Kit works with any SCA formulation (Call 1-800-521-4005 if you have this test kit and the color chart does **not** show the number of units of SCA per gallon of coolant.)

3318169S Plug ..... Installs on the engine for easy coolant sampling

3318168S Cap ..... Use with Monitor C bottle to sample coolant

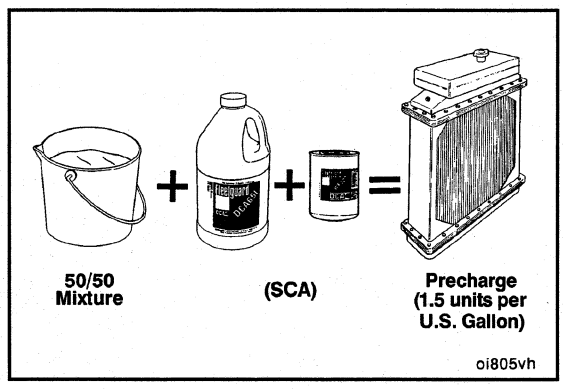
CC2700 Monitor C ..... Lab analysis of coolant samples

Call the following numbers to get answers to any questions you may have about cooling system maintenance.

Cummins: 1-800-DIESELS
1-800-521-4005

1-800-22-FILTERS
1 - 800 - 223 - 4583

00200003



Coolant Replacement Requirements

Drain and flush the cooling system after 6,000 hours, or 2 years of service. Refill with either new fully-formulated coolant or a 50/50 mixture of good quality water and fully–formulated antifreeze, and install the correct service coolant filter.

If the coolant is **not** going to be reused, dispose of used coolant/antifreeze in accordance with federal, state, and local laws and regulations.

Drive Belt Tension

Tension Chart

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

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

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

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

Engine Component Torque Values

General Information

Component	Wrench Size	Torque Value	
		N•m	ft-lb
Oil pan drain plug	32 mm	68	50
Crosshead adjusting screw locknut (with / without adapter)	17 mm	60/65	44/48
Rocker cover capscrews	12 mm	10	89 in-lb
Injector adjusting screw locknut	27 mm	225	165
Injector adjusting screw	13 mm	32	24
Valve adjusting screw locknut (with / without adapter)	19 mm	48/68	35/50
Turbocharger oil drain line capscrews	14 mm	66	49
Turbocharger oil supply line fitting (Industrial) (turbocharger side)	12 mm	31	23
Turbocharger oil supply line fitting (Power Generation) (turbocharger side)	12 mm	29	22
Turbocharger oil supply line fitting (cylinder block side)	19 mm	29	22
Cooling fan automatic belt tensioner (Industrial)	19 mm	113	83
Cooling fan belt tensioner (Power Generation) (3 clamping bolts)	14 mm	66	49
Cooling fan belt tensioner (Power Generation) (mounting bolt)	19 mm	113	83
Cooling fan belt tensioner (Power Generation) locknut	19 mm	196	125
Alternator adjusting link mounting capscrew	19 mm	75	55
Alternator belt adjustment locknuts	22 mm	196	125
Crankcase breather mounting capscrews	17 mm	66	48

Capscrew Markings and Torque Values

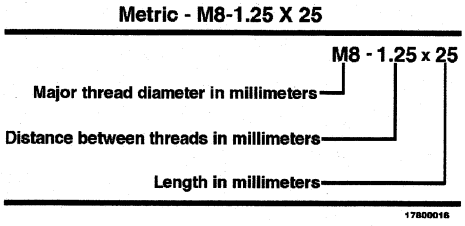
General Information

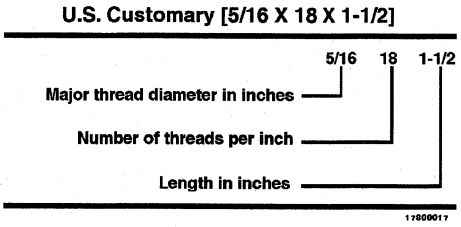
⚠ CAUTION ⚠

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:

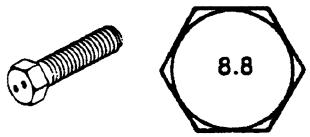
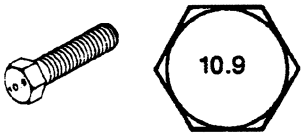
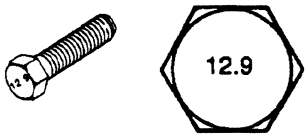




NOTES:

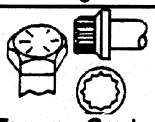
1. **Always** use the torque values listed in the following tables when specific torque values are **not** available.
2. Do **not** use the torque values in place of those specified in other sections of this manual.
3. The torque values in the table are based on the use of lubricated threads.
4. When 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		
These are all SAE Grade 5 (3 line)		
		

Capscrew Body Size	Capscrew Torque - Grade 5 Capscrew				Capscrew Torque - Grade 8 Capscrew			
	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

Section W - Warranty

Section Contents

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Worldwide Generator Drive

Engines 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 generator drive application anywhere in the world where Cummins approved service is available. These Engines will have the following rating designations:

Standby Power Rating

Engines of this rating are applicable for supplying emergency power for the duration of the utility power outage. No overload capability is available for this rating. Under no condition is an Engine allowed to operate in parallel with the public utility at the Standby Power rating. This rating should be applied where reliable utility power is available. A standby rated engine is to be sized for a maximum of an 80 percent average load factor and 200 hours of operation per year. This includes less than 25 hours per year at the Standby Power rating. Standby rating should never be applied except in true emergency power outages. Negotiated power outages contracted with a utility company are not considered an emergency.

Unlimited Time Running Prime Power Rating

Engines with this rating are available for an unlimited number of hours per year in a variable load application. Variable load is not to exceed a 70 percent average of the Prime Power Rating during any operating period of 250 hours. Total operating time at 100 percent Prime Power shall not exceed 500 hours per year.

A 10 percent overload capability is available for a period of one hour within a twelve hour period of operation. Total operating time at the 10 percent overload power shall not exceed 25 hours per year.

Limited Time Running Prime Power Rating

Engines of this rating are available for a limited number of hours in a non-variable load application. It is intended for use in situations where power outages are contracted, such as in utility power curtailment. Engines may be operated in parallel to the public utility up to 750 hours per year at power levels never to exceed the Prime Power rating.

Limited Time Running Prime Power ratings differ from Unlimited Time Running in that even though the maximum power output of the engines are the same, the Limited Time Running allows the Engine to be parallel to Public Utility and run at the full Prime Power rating and must never exceed the Prime Power rating.

Continuous/Base Power Rating

Engines with this rating are available for supplying utility power at a constant 100 percent load for an unlimited number of hours per year. No overload capability is available for this rating.

Continuous/Base Power ratings differ from Unlimited Time Running Prime Power ratings in that the Continuous/Base Load ratings are significantly reduced from the Prime Power ratings. Continuous/Base Load ratings have no load factor or application restrictions.

Coverage

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 and continues for the Duration stated below. The Duration commences either on the date of delivery of the Engine to the first user, or on the date the Engine is first leased, rented or loaned, or when the Engine has been operated for 50 hours, whichever occurs first.

Base Engine Warranty

	Duration Whichever Occurs First	
Rating	**Months**	**Hours**
Standby Power	24	400
Unlimited Prime Power	12	Unlimited
Limited Prime Power	12	750
Continuous/Base Power	12	Unlimited

Extended Major Components Warranty

The Extended Major Components Warranty applies to Engines other than B and C series and 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 continues for the following stated Duration. The Duration commences either on the date of delivery of the Engine to the first user, or on the date the Engine is first leased, rented or loaned, or when the Engine has been operated for 50 hours, whichever occurs first.

Extended Major Components Warranty

	Duration Whichever Occurs First	
Rating	**Months**	**Hours**
Standby Power	36	600
Unlimited Prime Power	36	10,000
Limited Prime Power	36	2,250
Continuous/Base Power	36	10,000

Consumer Products

This 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 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 Base Engine Warranty

Cummins will pay for all parts and labor needed to repair the damage to the Engine resulting from a Warrantable Failure when performed during normal business hours. All labor costs will be paid in accordance with Cummins published Standard Repair Time guidelines.

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 travel expenses for mechanics to travel to and from the Engine 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 cost for Engine removal and reinstallation. When Cummins elects to repair a part instead of replacing it, the 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 United States and Canada Sales and Service Directory; other 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, fines, all applicable taxes, all business costs and other losses resulting from a Warrantable Failure.

Owner is responsible for providing sufficient access to and reasonable ability to remove the Engine from the installation in the event of a Warrantable Failure.

Owner is responsible for maintaining an operating Engine hourmeter. If the hourmeter is not operational, engine usage will be estimated at 400 hours per month.

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 to the Engine. Cummins is also not responsible for Engine performance problems or failures caused by incorrect oil or fuel, or by water, dirt or other contaminants in the fuel or oil.

This warranty does not apply to accessories supplied by Cummins 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, air cleaners and safety shutdown switches.

Before a claim for excessive oil consumption will be considered, Owner must submit adequate documentation to show that consumption exceeds Cummins published standards.

Failure of belts and hoses supplied by Cummins are not covered beyond the first 500 hours or one year of operation, whichever occurs first after the warranty start date.

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 is not responsible for Engine performance problems or failures resulting from:

1. Use or application of the Engine inconsistent with its rating designation as set forth above.
2. Inadequate or incorrect installations deviating from Cummins Generator Drive Installation Guidelines.

CUMMINS IS NOT RESPONSIBLE FOR WEAR OR WEAROUT OF COVERED PARTS.

CUMMINS IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

THE 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 the United States* and Canada, this warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Outside the United States* and Canada, 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.

* 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 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.

*3,000 hours for A series engines.

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 A series and 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.

*3,000 hours for A series engines.

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 A series and 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 QSK emission control parts:

Fuel Pump
- Timing and Metering Supply Tubes

Injectors
- Cup
- Nozzle Flow Calibration
- Barrel Flow Calibration
- Top Stop Setting

Turbocharger
- Compressor Wheel
- Turbine Wheel
- Oil Seal

Intake Manifold
- Aftercooler Core

Exhaust Manifold

Electronic Control System
- Control Module
- Timing and Rail Pressure Sensor
- Boost Pressure Sensor
- Ambient Air Pressure Sensor
- Coolant Temperature 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.

Cummins Customized Parts Catalog

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

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

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

Additional Features of the Customized Catalog include:

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

ORDERING THE CUSTOMIZED PARTS CATALOG

Ordering by Telephone:

North American customers can contact their Cummins Distributor or call Gannett Direct Marketing Services at 800-646-5609 and order by credit card. Outside North America order on-line or make an International call to Gannett at +-+-502-454-6660

Ordering On-Line

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

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

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

- Customer Name
- Street Address
- Company Name (optional)
- Telephone No.
- Credit Card No.
- Cummins Engine Serial Number (located on the engine data plate)

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

Customized Parts Catalogs are produced specifically for a single customer. This means they are not returnable for a refund. If we make an error and your catalog is not useable, we will correct that error by sending you a new catalog.