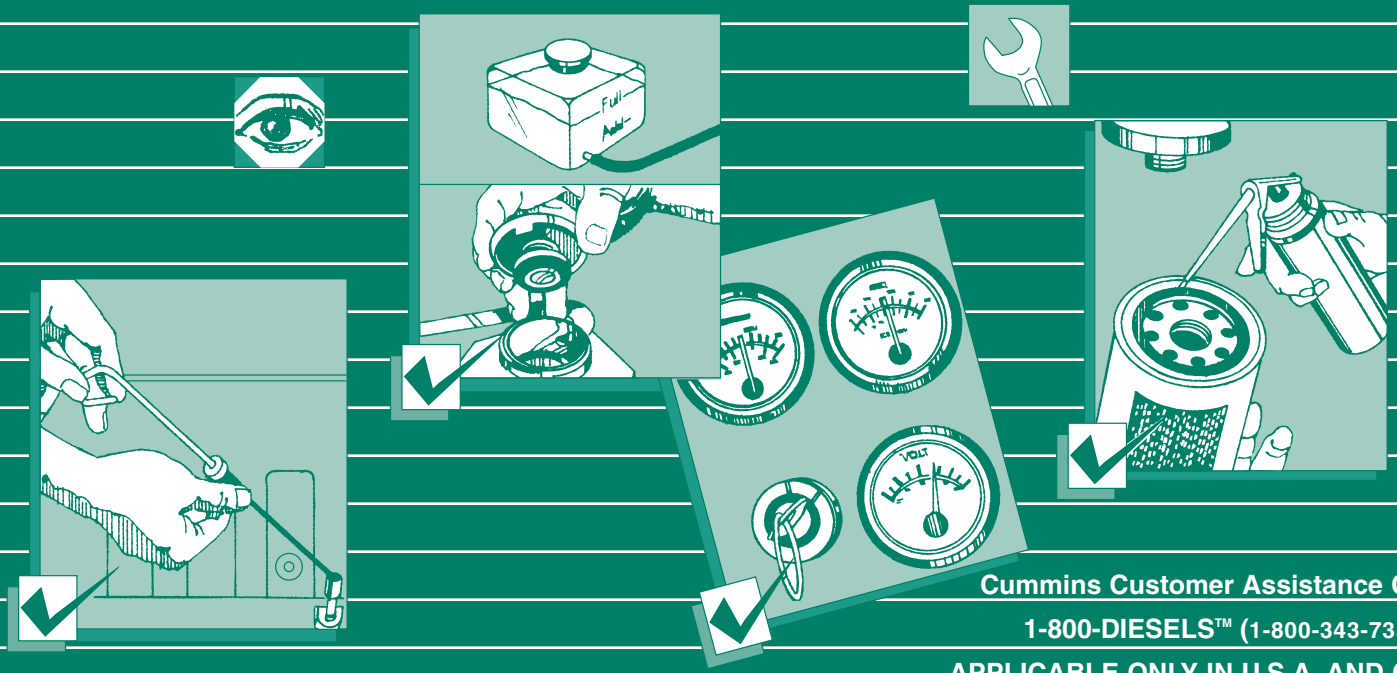
Owners Manual
QSB6.7 CM2250 (174 HP and Above)

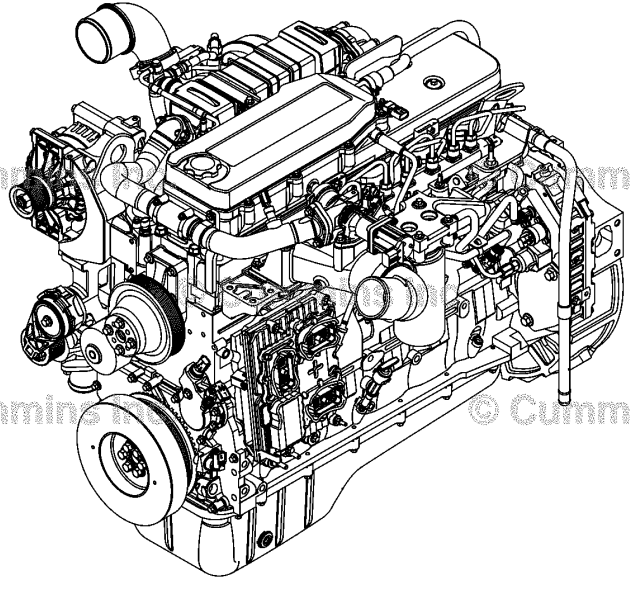


Cummins Customer Assistance Center

1-800-DIESELS™ (1-800-343-7357)

APPLICABLE ONLY IN U.S.A. AND CANADA

Owners Manual
QSB6.7 CM2250 (174 HP and Above)



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Bulletin 4022264
Printed 23-MAY-2014

Foreword

This manual contains information for the correct operation and maintenance of your Cummins® Product.

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 product 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 product. When replacement parts are needed, we recommend using only genuine Cummins® or ReCon® exchange parts.

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

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		
• Cummins Particulate Filter		
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		

Section i - Introduction

Section Contents

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Symbols

General Information

The 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.

NOTE: It is possible to have four symbols for each text and graphic combination.

⚠ 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, and assembly, or the engine can be damaged if the caution instructions are not followed.

Indicates a **REMOVAL** or **Dissassembly** 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.

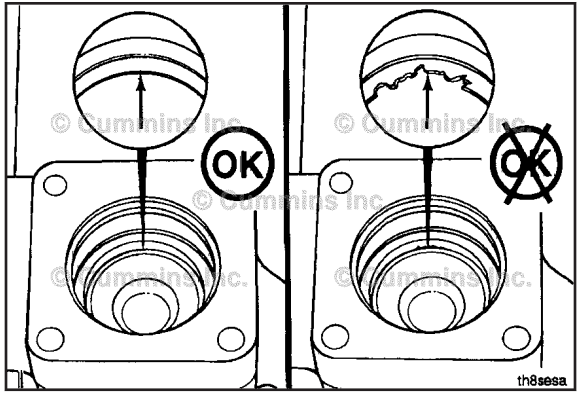
Indicates that a **WRENCH** or **TOOL SIZE** will be given.

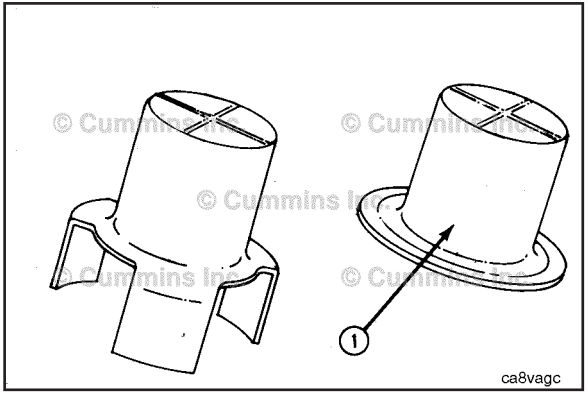
TIGHTEN to a specific torque.

PERFORM an electrical **MEASUREMENT**.

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

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





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, exhaust gas flow, 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.
- When necessary, the removal and replacement of any guards covering rotating components, drives, and/or belts should only be carried out be a trained technician. Before removing any guards the engine **must** be turned off and any starting mechanisms **must** be isolated. All fasteners **must** be replaced on re-fitting the guards.
- 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.
- Do **not** connect the jumper starting or battery charging cables to any ignition or governor control wiring. This can cause electrical damage to the ignition or governor.
- **Always** torque fasteners and fuel connections to the required specifications. Overtightening or undertightening can allow leakage. This is critical to the natural gas and liquefied petroleum gas fuel and air systems.
- **Always** test for fuel leaks as instructed, as odorant can fade.
- Close the manual fuel valves prior to performing maintenance and repairs, and when storing the vehicle inside.
- Coolant is toxic. If **not** reused, dispose of in accordance with local environmental regulations.
- The catalyst reagent contains urea. Do **not** get the substance in your eyes. In case of contact, immediately flood eyes with large amounts of water for a minimum of 15 minutes. Avoid prolonged contact with skin. In case of contact, immediately wash skin with soap and water. Do **not** swallow internally. In the event the catalyst reagent is ingested, contact a physician immediately.
- The catalyst substrate contains Vanadium Pentoxide. Vanadium Pentoxide has been determined by the State of California to cause cancer. Always wear protective gloves and eye protection when handling the catalyst assembly. Do not get the catalyst material in your eyes. In Case of contact, immediately flood eyes with large amounts of

water for a minimum of 15 minutes. Avoid prolonged contact with skin. In case of contact, immediately wash skin with soap and water.

- The Catalyst substrate contains Vanadium Pentoxide. Vanadium Pentoxide has been determined by the State of California to cause cancer. In the event the catalyst is being replaced, dispose of in accordance with local regulations.
- California Proposition 65 Warning - Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

Acronyms and Abbreviations

General Information

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

ANSI	American National Standards Institute
API	American Petroleum Institute
ASTM	American Society of Testing and Materials
ATDC	After Top Dead Center
BTU	British Thermal Unit
BTDC	Before Top Dead Center
°C	Celsius
CAN	Controller Area Network
CO	Carbon Monoxide
CCA	Cold Cranking Amperes
CARB	California Air Resources Board
C.I.B.	Customer Interface Box
C.I.D.	Cubic Inch Displacement
CNG	Compressed Natural Gas
CPL	Control Parts List
cSt	Centistokes
DEF	Diesel Exhaust Fluid

DOC	Diesel Oxidation Catalyst
DPF	Diesel Particulate Filter
ECM	Engine Control Module
EFC	Electronic Fuel Control
EGR	Exhaust Gas Recirculation
EPA	Environmental Protection Agency
°F	Fahrenheit
ft-lb	Foot-Pound Force
FMI	Failure Mode Indentifier
GVW	Gross Vehicle Weight
Hg	Mercury
hp	Horsepower
H_2O	Water
inHg	Inches of Mercury
in H_20	Inches of Water
ICM	Ignition Control Module
IEC	International Electrotechnical Commission
km/l	Kilometers per Liter
kPa	Kilopascal
LNG	Liquid Natural Gas
LPG	Liquified Petroleum Gas

LTA	Low Temperature Aftercooling
MCRS	Modular Common Rail System
MIL	Malfunction Indicator Lamp
MPa	Megapascal
mph	Miles Per Hour
mpq	Miles Per Quart
N•m	Newton-meter
NOx	Mono-Nitrogen Oxides
NG	Natural Gas
O2	Oxygen
OBD	On-Board Diagnostics
OEM	Original Equipment Manufacturer
OSHA	Occupational Safety and Health Administration
PID	Parameter Identification Descriptions
ppm	Parts Per Million
psi	Pounds Per Square Inch
PTO	Power Takeoff
REPTO	Rear Power Take Off
RGT	Rear Gear Train
rpm	Revolutions Per Minute
SAE	Society of Automotive Engineers

SCA	Supplemental Coolant Additive
SCR	Selective Catalytic Reduction
STC	Step Timing Control
SID	Subsystem Identification Descriptions
TDC	Top Dead Center
VDC	Volts of Direct Current
VGT	Variable Geometry Turbocharger
VS	Variable Speed
VSS	Vehicle Speed Sensor

Section E - Engine and System Identification

Section Contents

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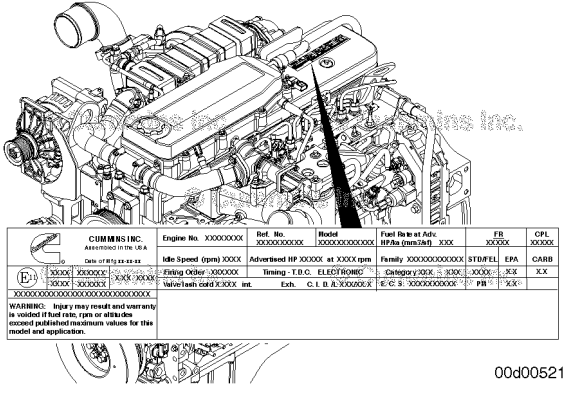
Engine Identification

Engine Dataplate



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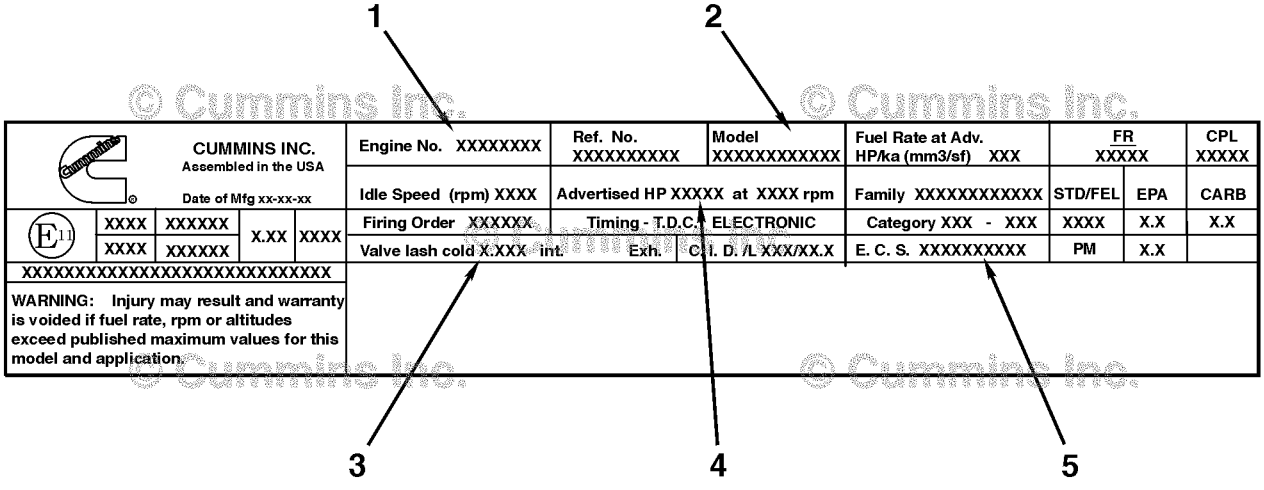
The engine dataplate provides important information about the engine. The engine serial number (ESN) and control part list (CPL) provide information for service and for ordering parts. The engine dataplate **must not** be changed unless approved by Cummins Inc.

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



00100001

1 Engine serial number

2 Engine model information

3 Valve lash (overhead) setting

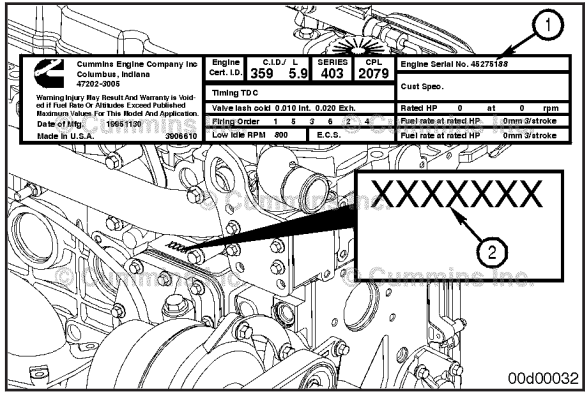
4 Horsepower and rpm rating

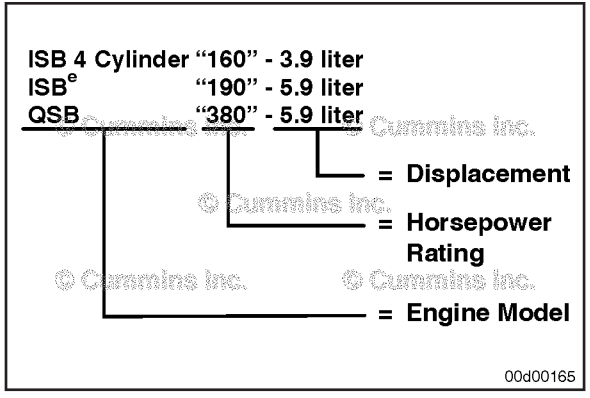
5 Emission control system (E.C.S.).

NOTE: Engine dataplates vary by manufacturing plant. The dataplate may **not** contain all of the emission control systems for the engine.

NOTE: Depending on the manufacturing plant, calibration data may also be be found on the engine dataplate.

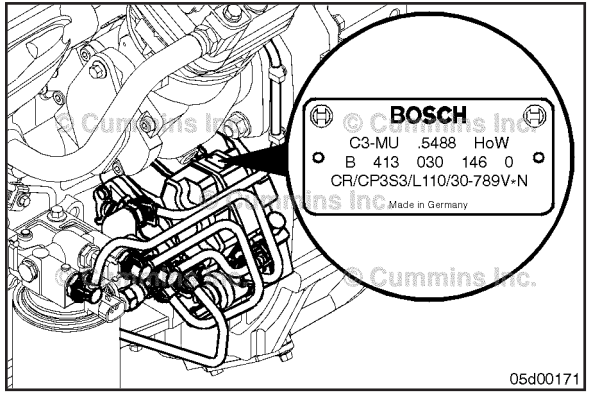
NOTE: If the engine dataplate (1) is **not** legible, the engine serial number (2) can be found on the engine block, on top of the lubricating oil cooler housing. Additional engine information is available by reading the ECM dataplate.





Cummins® Engine Nomenclature

The Cummins® engine nomenclature provides the data as shown in the illustration.



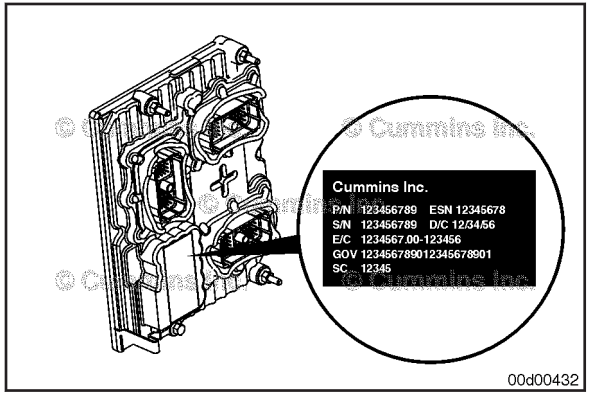
Fuel Injection Pump Dataplate

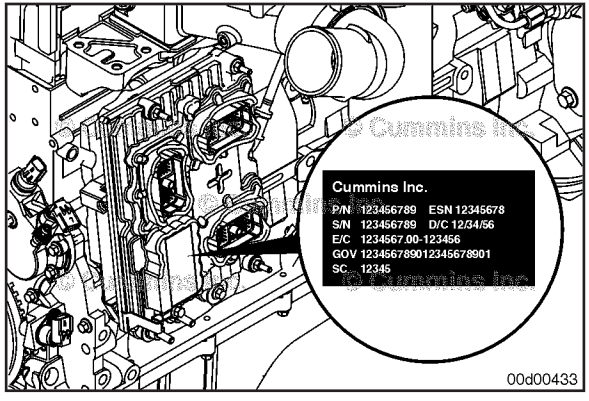
The Bosch™ fuel injection pump dataplate is located on the fuel pump.

The dataplate contains the following information to assist in servicing or replacement:

- Pump serial number
- Cummins® part number
- Factory code
- Bosch™ part number
- Date code.

ECM Dataplate



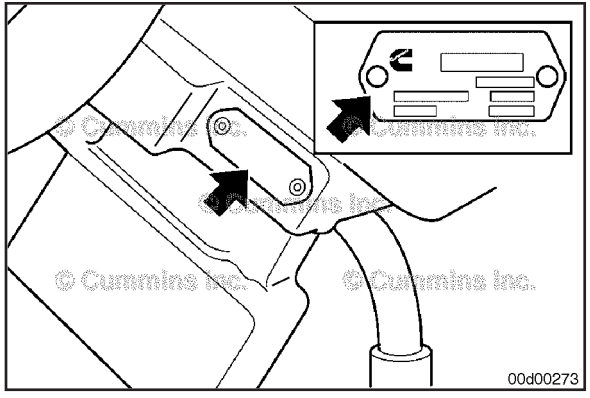


NOTE: Not all engines will have ECM dataplates.

Engines covered by this manual are equipped with a CM2250 electronic control module (ECM). A CM2250 ECM has three 60-pin connectors. Two ECM 60-pin connectors are for inputs and outputs **only**, while the third 60-pin connector is for aftertreatment and vehicle inputs and outputs.

The engine harness utilizes a 24-pin breakout connector for vehicle inputs and outputs.

NOTE: The presence of an ECM dataplate depends on the manufacturing plant and the date the engine was manufactured. If an ECM dataplate was **not** installed by the manufacturing plant, calibration data can be found on the engine dataplate.



Air Compressor

NOTE: Not all engines are equipped with an air compressor.

The Cummins® branded air compressor dataplate, identified by the Cummins Inc. logo, is typically located on the side of the air compressor. The dataplate contains the following information to assist in servicing or replacement:

- Cummins® part number
- Serial number
- Date code.

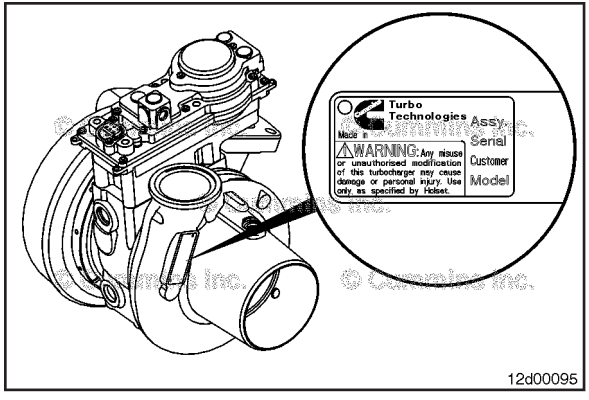
Variable Geometry Turbocharger

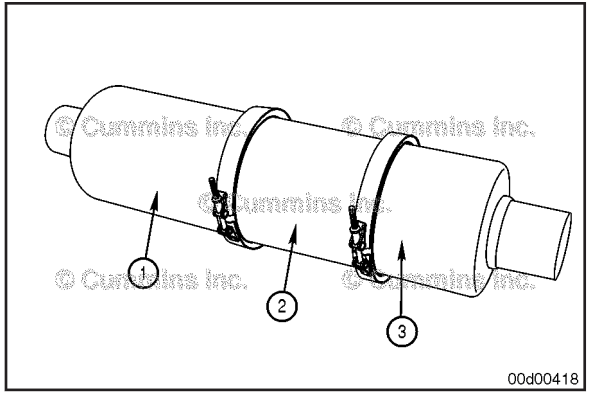
The Holset® Variable Geometry Turbocharger (VGT) dataplate is located on the turbocharger inlet compressor housing.

The dataplate contains the following information to assist in servicing or replacement:

- Cummins® assembly part number
- Serial number
- Customer number
- Model number.

NOTE: The electronic actuator on the VGT is a serviceable component and has a separate dataplate that contains information to assist in servicing or replacement.





Exhaust System

The exhaust aftertreatment assembly has information stamped into the canister. This information is important for servicing or replacement.

There are three important information stampings in three different locations on the aftertreatment assembly:

1 Aftertreatment diesel oxidation inlet/catalyst part number and serial number (located on the inlet/ catalyst section).

2 Aftertreatment diesel particulate filter part number and serial number (located on the filter section).

3 Aftertreatment assembly and outlet section part number (located on the outlet of the aftertreatment system).

A typical aftertreatment assembly stamping provides the following information, as shown in the illustration:

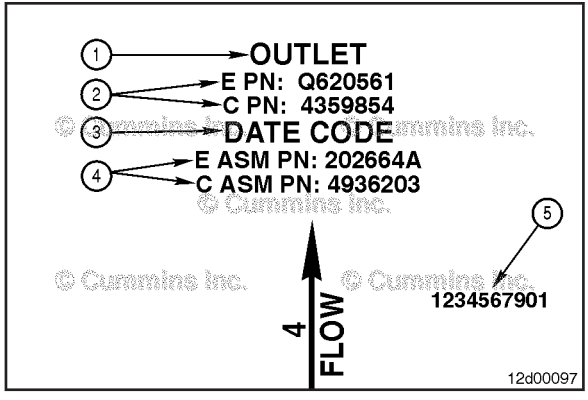
1 Section name

2 Part numbers

3 Date code

4 Aftertreatment system assembly part numbers

5 Serial number.



Emission Control System

General Information

The Emission Control System information is located on the engine dataplate. It identifies the engine components in acronyms that make up the emission control system.

NOTE: Engine dataplates vary by manufacturing plant. The dataplate may **not** contain all of the emission control systems for the engine.

QSB6.7 CM2250 EF engines above 174 horsepower, certified for EPA Tier4 Interim emissions levels, are equipped with the following emission control systems:

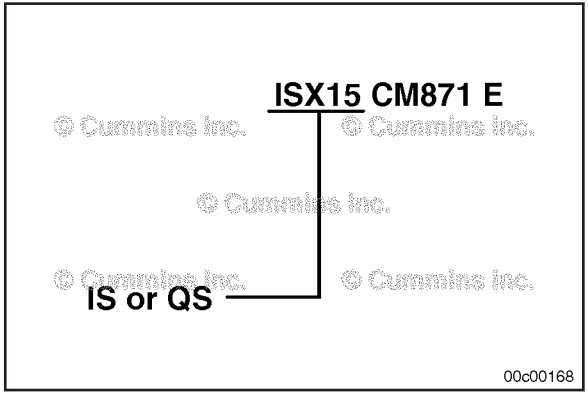
- DDI - direct diesel injection
- ECM - electronic control module
- TC - turbocharger
- CAC - charge-air cooler
- EGR - exhaust gas recirculation
- PTOX - periodic trap oxidizer (diesel particulate filter)
- DOC - diesel oxidation catalyst.

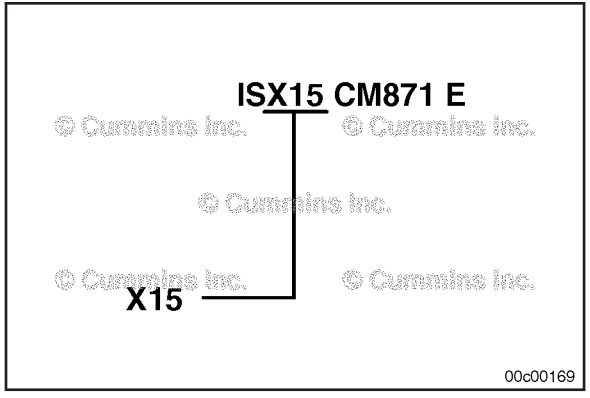
Cummins® Service Engine Model Product Identification

General Information

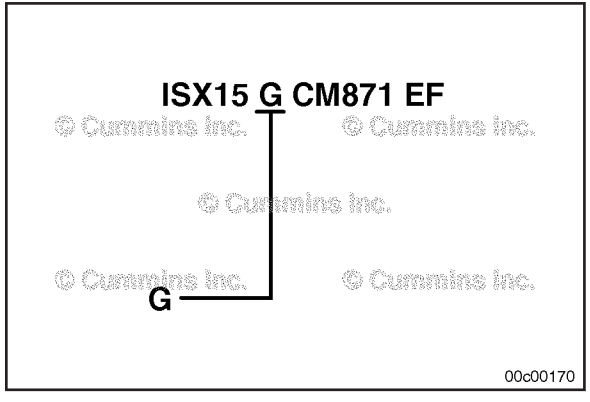
The Cummins® Service Engine Model Nomenclature procedure describes how engines are identified within Cummins service organization. This method was introduced for models after and including manufacture year 2007.

Electronic engines are identified by the first two letters, either an "IS" for On-Highway automotive or "QS" for Off-Highway industrial market applications.



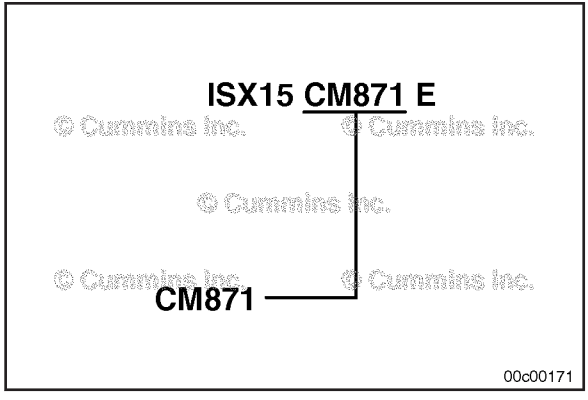


The third letter is the engine platform designation followed by the engine liter size.

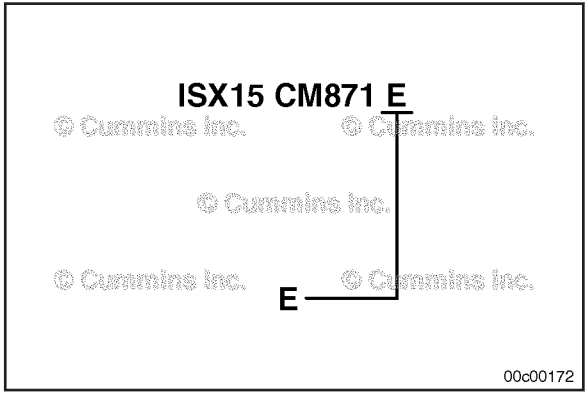


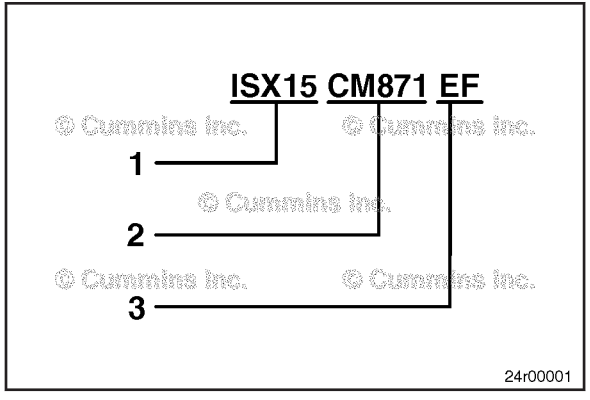
If the engine operates on a fuel type other than diesel, the type will be identified after the liter size.

The control system is identified with the letters "CM" followed by the control system model number.



The technology identifier after the control system designates the prevailing technology used with the engine. (See table in this procedure for letter designations.)





Example:

1 On-Highway automotive "X" 15 liter engine

2 Control system number 871

3 Technology supported; Electric EGR and Diesel Particulate Filter

Technology	Name	Suffix
Exhaust Gas Recirculation	Not used	None
	Pneumatic	P
	Electric	E
Diesel Particulate Filter (DPF)	Not used	None
	Full Flow DPF	F
	Partial Flow DPF	F2
Diesel Oxidation Catalyst	Not used	None
	DOC	C
3-Way Oxidation Catalytic Converter	Not used	None
	3-Way Catalyst	J
Selective Catalytic Reduction System	Not used	None
	Air Driven	S
	Airless	A
Nox Sensor	Not used	None
	Nox Sensor	N
Modular Common Rail System	Used only on QSK19, 38, 50 , 60 HHP Engines	MCRS
Integrated Dosing Control Unit	Not Used	None
	Integrated	I

Notes

Section 1 - Operating Instructions

Section Contents

Operating Instructions - Overview

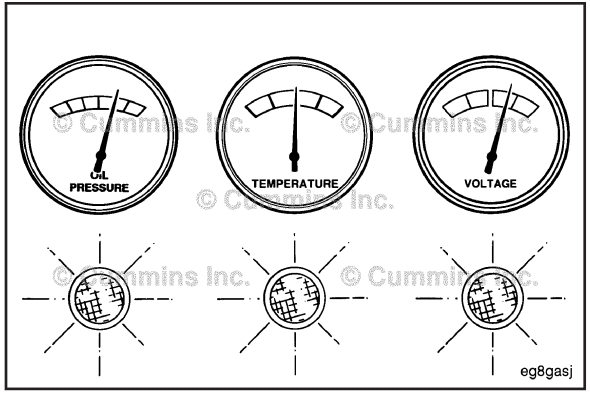
General Information

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.

U.S. legislation requires that stationary compression ignition internal combustion engines designated for emergency use are limited to emergency operations and required maintenance and testing.



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

Check the oil pressure, coolant temperatures DEF level, and other engine parameters daily via the OEM front panel to make sure they are operational. Check the panel regularly for any alarm messages. Take appropriate action to rectify the alarm condition or contact your nearest Authorized Cummins® Distributor.

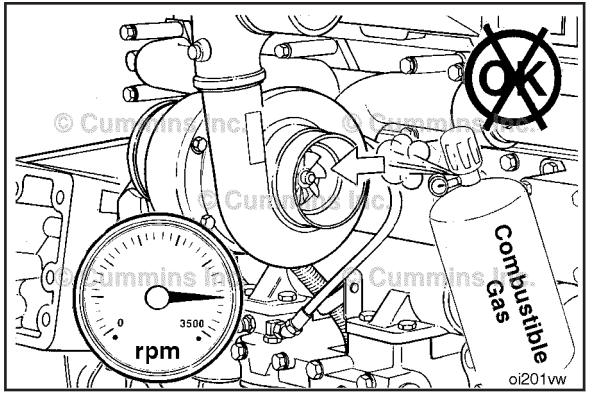
⚠ WARNING ⚠

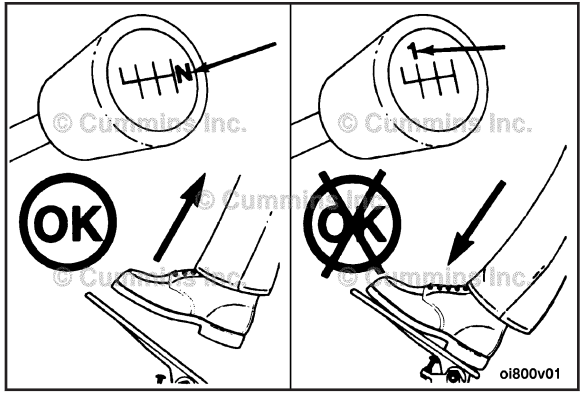
Do not operate a diesel engine where there are or can BE COMBUSTIBLE vapors. These vapors can be sucked through the air intake system and cause engine acceleration and over speeding that can result in a fire, an explosion, and extensive property damage. Numerous safety devices are available, such as air intake shutoff devices, to minimize the risk of over speeding where an engine, due to its application, is operating in a combustible environment, such as due to a fuel spill or gas leak. Remember, Cummins Inc. 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 A Cummins® Authorized Repair Location for further information.

△ CAUTION △

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

Cummins recommends the installation of an air intake shutoff device or a similar safety device to minimize the risk of overspeeding when an engine is operating in a combustible environment, such as due to a fuel spill or gas leak.





Normal Starting Procedure

Starting

Disengage the driven unit, or if equipped, put the transmission in neutral.

With the accelerator pedal or lever in the idle position, turn the keyswitch to the ON position.

With the keyswitch in the ON position, the engine indicator lamps will come on momentarily and then go out. The engine indicator lamps include:

1 WARNING (or CHECK ENGINE) lamp, amber in color

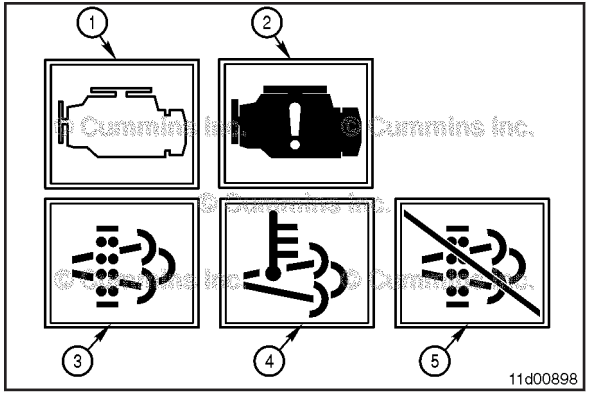
2 STOP (or STOP ENGINE) lamp, red in color

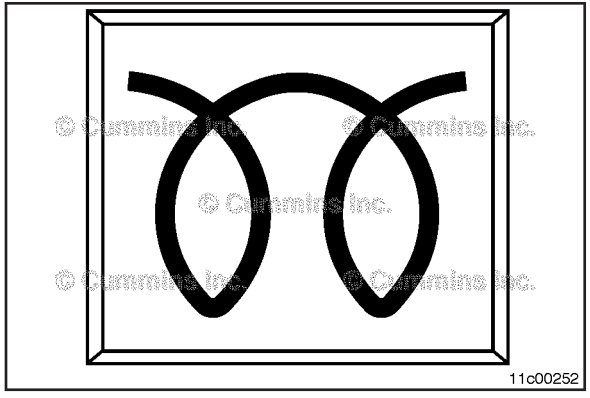
3 AFTERTREATMENT DIESEL PARTICULATE FILTER lamp, amber in color

4 HIGH EXHAUST SYSTEM TEMPERATURE lamp, amber in color

5 REGENERATION DISABLED lamp, amber in color.

If any of the lamps remain on or begin to flash, refer to Engine Indicator Lamps in Section 1. Refer to Procedure 101-048 in Section 1.





⚠CAUTION⚠

Do not engage the starting motor for more than 30 seconds or damage to the starting motor can result. Wait 2 minutes between each attempt to start (electrical starting motors only).

Under cold conditions, the Wait-to-Start lamp (generally a yellow lamp using a symbol similar to the graphic, or the words WAIT TO START) will also illuminate at key ON, and will stay on for a period of up to 30 seconds.

NOTE: The length of time the Wait-to-Start lamp remains illuminated depends on the ambient temperature. The lower the ambient temperature, the longer the lamp will be illuminated.

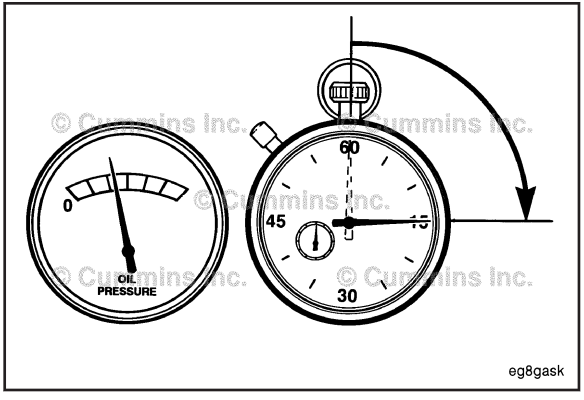
Once the Wait-to-Start lamp turns off, turn the key to the start position to start the engine.

NOTE: Some engines are equipped with an engine starting motor protection feature. If the starting motor is engaged for 30 or more seconds, without the engine starting, the starter will be locked out from operating, allowing for proper cooling of the starting motor. During this time, the WAIT TO START lamp will flash for 2 minutes. Once the lamp discontinues flashing, the starting motor will be allowed to function.

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

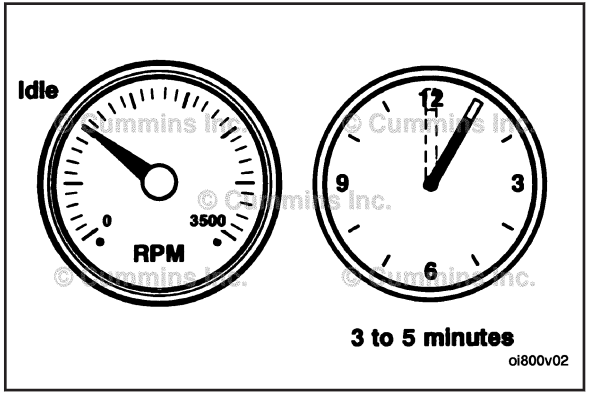
⚠CAUTION⚠

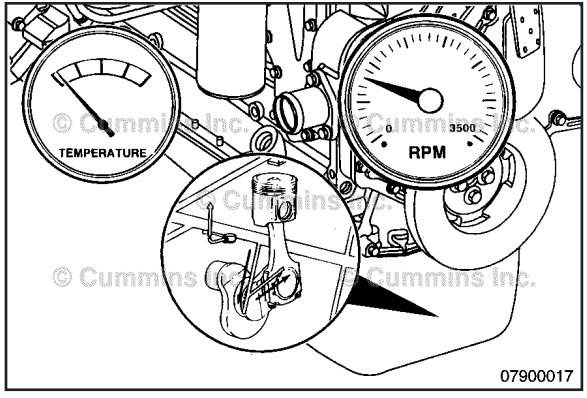
The engine must have adequate oil pressure within 15 seconds after starting. If the WARNING lamp indicating low oil pressure has not gone out or there is no oil pressure indicated on a gauge within 15 seconds, shut the engine OFF immediately to reduce the possibility of engine damage.



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

NOTE: After the engine is started, the voltmeter, if equipped, may show a gauge fluctuation under certain engine temperature conditions (both warm and cold). This cycling operation is caused by the post-heat cycle of the intake manifold heater system. The number of cycles and the length of the cycling operation is controlled by the engine control module. The cycling action will cause temporary dimming of the headlamps, interior lamps, and other vehicle electrical accessories.





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.

NOTE: For engines equipped with engine warm-up protection feature; this feature limits engine speed and torque following engine start-up until sufficient oil pressure is available to the engine components. This feature reduces the risk of engine part damage due to operating at engine speeds too high or loads before adequate oil pressure is achieved.

Some engines are equipped with a Fast Idle Warm Up feature. When enabled, this feature elevates the idle speed of the engine in cold ambient conditions in order to shorten the time necessary to warm up the engine. When the idle speed is elevated, the engine noise may change. This is normal. To bring the engine back to low idle speed:

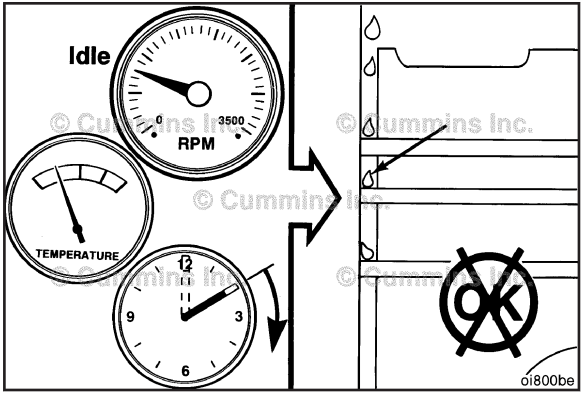
- For vehicles equipped with a manual transmission and clutch switch: Depress the clutch pedal.
- For vehicles equipped with a brake switch: Depress the service brake pedal.
- Depress the accelerator pedal.

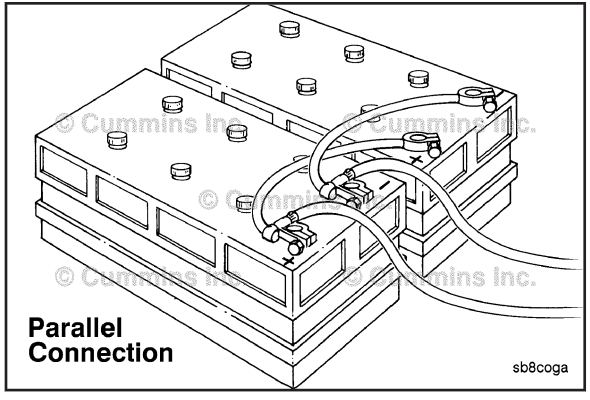
For more information on the Fast Idle Warm Up feature, contact a Cummins® Authorized Repair Location.

⚠CAUTION⚠

Do not operate the 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 buildup in the cylinder
- Cylinder head valve sticking
- Reduced performance.





Jump Starting

⚠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.

⚠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.

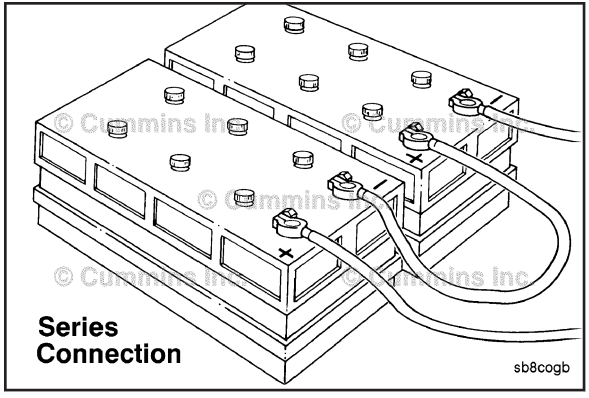
⚠CAUTION⚠
To reduce the possibility of damage to engine parts, do not connect the jumper starting or battery charging cable to any fuel system or electronic component.

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

NOTE: Always reference the relevant OEM literature for jump starting procedures. Failure to follow correct procedures can result in damage to the engine control module and other electrical equipment.

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

NOTE: Always reference the relevant OEM literature for jump starting procedures. Failure to follow correct procedures can result in damage to the engine control module and other electrical equipment.

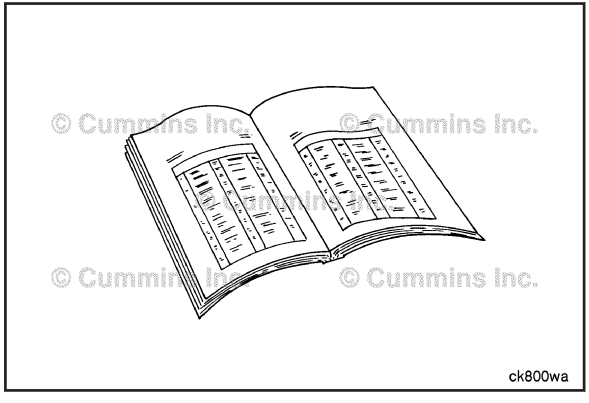


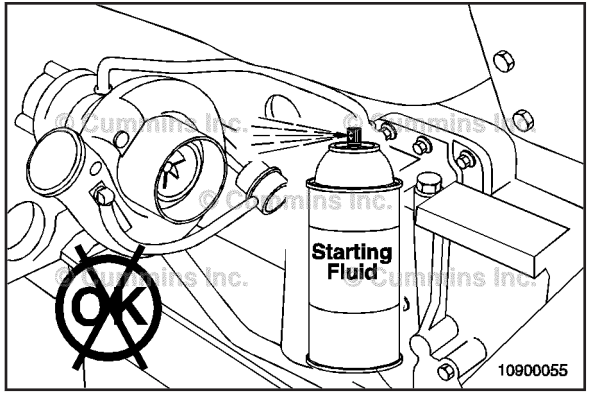
Cold Weather Starting

General Information

Follow the Normal Starting Procedure in this section. If equipped with an intake air heater, the Wait-To-Start lamp will stay on longer.

Refer to the OEM service manual for any additional cold weather starting procedures.





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 this engine. Contact a Cummins® Authorized Repair Location for more information.

Starting Procedure After Extended Shutdown or Oil Change

General Information

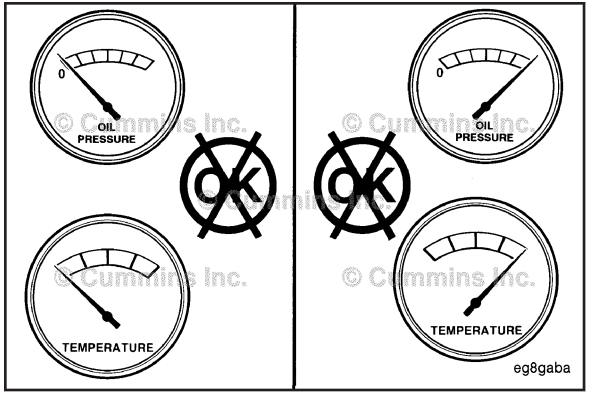
Follow the Normal Starting Procedure in this section. The engine will run at idle **only** until the minimum oil pressure is detected by the ECM.

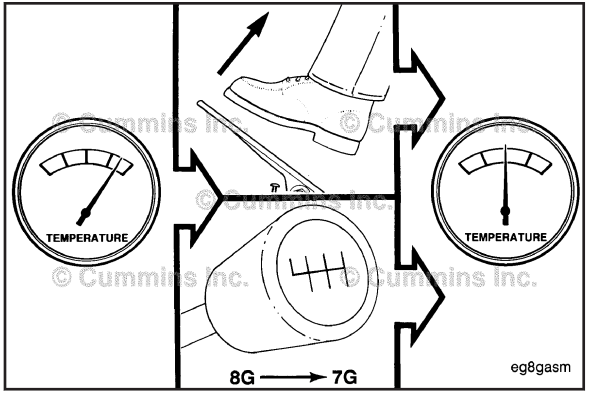
Operating the Engine

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.

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).

Unique Operating Characteristics of an Engine with Aftertreatment Diesel Particulate Filter

General Information

The aftertreatment system is used to reduce particulate emissions and is composed of six main components:

1 Aftertreatment inlet and aftertreatment diesel oxidation catalyst

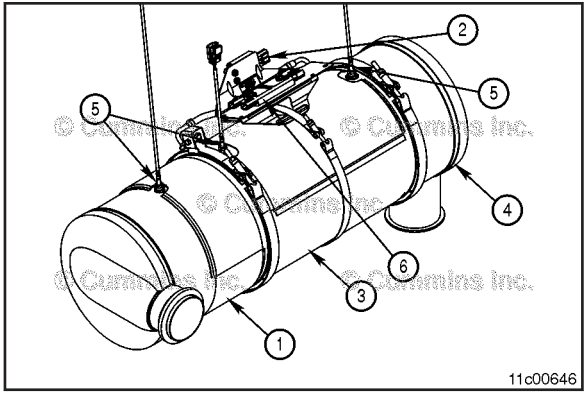
2 Aftertreatment disesel particulate filter differential pressure sensor

3 Aftertreatment diesel particulate filter

4 Aftertreatment outlet

5 Aftertreatment exhaust gas temperature sensors

6 Aftertreatment diesel particulate filter temperature sensor interface module



The components of the aftertreatment system perform the following functions:

The aftertreatment inlet and outlet adapt the equipment exhaust piping to the aftertreatment system.

The aftertreatment diesel particulate filter differential pressure sensor measures the restriction across the aftertreatment diesel particulate filter.

The aftertreatment diesel particulate filter captures the soot and ash from the engine exhaust.

The aftertreatment diesel oxidation catalyst is used to oxidize fuel in the exhaust in order to create heat for the regeneration process.

The aftertreatment exhaust gas temperature sensors are used to measure the exhaust gas temperatures at various points in the aftertreatment system.

Soot is composed of the partially burned particles of fuel that occur during normal engine operation (black smoke).

Ash is composed of the partially burned particles of engine oil that occur during normal engine operation.

Over time, both soot and ash accumulate in the aftertreatment diesel particulate filter and **must** be removed. Soot is removed by a process called regeneration. Ash is removed by removing the aftertreatment diesel particulate filter and cleaning it at specified intervals.

Equipment with an aftertreatment system has three additional indicator lamps on the dashboard. Two of the additional lamps, along with the check engine lamp, alert the operator of the status of the aftertreatment diesel particulate filter. The third additional indicator lamp indicates the position of the regeneration permit switch.

NOTE: Use the following procedure for additional information about the engine indicator lamps. Refer to Procedure 101-048 in Section 1.

Ultra low sulfur diesel fuel is required for an engine equipped with an aftertreatment diesel particulate filter. If ultra low sulfur diesel is **not** used, the aftertreatment diesel particulate filter or aftertreatment diesel oxidation catalyst can be damaged.

NOTE: Use the following procedure for additional information about the fuel recommendations and specifications required for use in the engine being serviced. Refer to Procedure 018-002 in Section V.

To maximize the maintenance intervals of the aftertreatment diesel particulate filter, Cummins Inc. requires the use of a lubricating engine oil meeting Cummins® Enginnering Standard 20081. The use of oil meeting CES 20081 also requires the use of ultra low sulfur diesel fuel to maintain the specified oil drain interval without risk of engine damage.

NOTE: Use the following procedure for additional information about the lubricating oil recommendations and specifications recommended for use in the engine being serviced. Refer to Procedure 018-003 in Section V.

NOTE: Use the following procedure for information on the Maintenance Schedule, which provides the aftertreatment diesel particulate filter cleaning intervals for the engine being serviced. Refer to Procedure 102-002 in Section 2.

Regeneration

Regeneration is the process of converting the soot collected in the aftertreatment diesel particulate filter into carbon dioxide.

The regeneration process requires heat to occur, and can be classified into two different types: passive regeneration and active regeneration.

Passive Regeneration

Passive regeneration occurs when the exhaust temperatures are naturally high enough to oxidize the soot collected in the aftertreatment diesel particulate filter faster than the soot is collected.

Passive regeneration typically occurs when the equipment is operated under heavy loads.

Active Regeneration

Active regeneration occurs when the exhaust temperatures are **not** naturally high enough to oxidize the soot collected in the aftertreatment diesel particulate filter faster than collected.

Active regeneration requires assistance from the engine in order to increase the exhaust temperature. This is typically accomplished by the engine injecting a small amount of diesel fuel into the exhaust stream, which is then oxidized by the aftertreatment diesel oxidation catalyst, which creates the heat needed to regenerate the aftertreatment diesel particulate filter.

Active regeneration will occur more frequently in equipment with low load, or stop and go duty cycles.

Active regeneration only occurs if the engine ECM has detected that the aftertreatment diesel particulate filter restriction has reached a specified limit. The engine ECM will activate and de-activate regeneration as needed.

Active regeneration is largely transparent to the equipment operator. The equipment operator may notice an increase in turbocharger noise during an active regeneration event, and may notice that the high exhaust temperature lamp is illuminated, if the exhaust temperature is greater than the high exhaust system temperature threshold set by the equipment OEM.

During active regeneration, the exhaust temperature can be hotter than when the engine is operating at full load. The exhaust temperature during a normal active regeneration event could reach 593°C [1100 °F], and possibly 816°C [1500 °F] under certain conditions.

NOTE: Use the following procedure for additional information about the engine indicator lamps. Refer to Procedure 101-048 in Section 1.

⚠ WARNING ⚠

During regeneration, exhaust gas temperature could reach 816°C [1500°F], and exhaust system surface temperature could exceed 740°C [1300°F], which is hot enough to ignite or melt common materials, and to burn the skin. The exhaust and exhaust components can remain hot after the equipment has stopped moving. To avoid the risk of fire, property damage, burns, or personal injury, allow the exhaust system to cool before beginning this procedure or repair, and make sure that no combustible materials are located where they are likely to come in contact with hot exhaust or exhaust components.

Manual (Non-Mission)

Under some operating conditions, such as low speed, low load, or stop and go duty cycles, the engine may **not** have enough opportunity to regenerate the aftertreatment diesel particulate filter during normal operation. When this occurs, the engine will illuminate the aftertreatment diesel particulate filter lamp to inform the operator that assistance is required, typically in the form of a manual (non-mission) regeneration.

Manual (non-mission) regeneration is a form of active regeneration that is initiated by the equipment operator when **not** in operation.

Manual (non-mission) regeneration requires an elevated engine speed of approximately 1000 to 1400 RPM. The length of a manual (non-mission) regeneration will vary depending on how full the aftertreatment diesel particulate filter is, but will typically take anywhere from 45 minutes to 1.5 hours to complete.

A manual (non-mission) regeneration can be initiated one of two ways:

- An equipment mounted manual (non-mission) regeneration switch. Use the owners manual for the location and operation of this switch (this switch may also be called a "parked regeneration" switch or "start" switch). The mounted manual (non-mission) regeneration switch will only initiate a manual (non-mission) regeneration when the aftertreatment diesel particulate filter lamp is illuminated.
- INSITE™ electronic service tool can initiate a manual (non-mission) regeneration by starting the "Aftertreatment Diesel Particulate Filter Regeneration Test".

⚠ WARNING ⚠

During regeneration, exhaust gas temperature could reach 816°C [1500°F], and exhaust system surface temperature could exceed 740°C [1300°F], which is hot enough to ignite or melt common materials, and to burn the skin. The exhaust and exhaust components can remain hot after the equipment has stopped moving. To avoid the risk of fire, property damage, burns, or personal injury, allow the exhaust system to cool before beginning this procedure or repair and make sure that no combustible materials are located where they are likely to come in contact with hot exhaust or exhaust components.

To perform a manual (non-mission) regeneration, follow the steps listed:

- Select an appropriate location to park the equipment.
- Choose a surface that will **not** burn or melt under high exhaust temperatures (such as clean concrete or gravel, **not** grass or asphalt).
- Make sure there are no items within 0.6 m [2 ft] of the exhaust outlet.
- Items that can burn, melt, or explode **must** be kept at least 1.5 m [5 ft] from the exhaust outlet (such as gasoline, paper, plastics, fabrics, compressed gas containers, hydraulic lines).
- Make sure that there are no gases or vapors nearby that could burn, explode, or contribute to a fire (such as LP gas, gasoline vapors, oxygen, nitrous oxide).
- Park the vehicle securely. Place the transmission in park, if provided, otherwise in neutral. Set wheel chocks at the front and rear of at least one tire.
- Set up a safe exhaust area. If bystanders might enter the area, set up barriers to keep people at least 1.5 m [5 ft] from the exhaust outlet during the manual (non-mission) regeneration. When indoors, attach an exhaust discharge pipe rated for at least 816°C [1500°F].
- Keep a fire extinguisher nearby.
- Check the exhaust system surfaces. Confirm that nothing is on or near the exhaust system surfaces (such as tools, rags, grease, or debris).
- The clutch pedal is released.
- The brake pedal is released.
- The transmission is in neutral or park.
- PTO or Remote PTO is off.

- The vehicle speed is 0 MPH.
- The throttle pedal is released.
- Initiate the manual (non-mission) regeneration by toggling the equipment mounted manual (non-mission) regeneration switch or by using INSITE™ electronic service tool.
- Once the manual (non-mission) regeneration is initiated, the engine speed may increase, the turbocharger noise will increase, and the High Exhaust System Temperature Lamp will illuminate.
- When the engine ECM detects that the aftertreatment diesel particulate filter has been regenerated, the engine will automatically return to normal idle speed, if increased.
- Monitor the vehicle and surrounding area during the stationary (parked) regeneration. If any unsafe condition occurs, shut off the engine immediately.

To stop a manual (non-mission) regeneration before it has completed, depress the clutch, brake, or throttle pedal, set the regeneration permit switch to the inhibit position, or turn off the engine.

Once the manual (non-mission) regeneration is complete, exhaust gas and surface temperatures will remain elevated for 3 to 5 minutes.

NOTE: If a manual (non-mission) regeneration is attempted, and the High Exhaust System Temperature Lamp doesn't illuminate, contact a Cummins® Authorized Repair Location for assistance.

NOTE: If the low idle engine speed is 1000 RPM or greater, the engine speed will **not** increase when a manual (non-mission) regeneration is initiated.

Engine Indicator Lamps

General Information

The following engine indicator lamps cover **only** the lamps controlled by the engine ECM. The equipment manufacturer can provide additional indicator lamps. Please reference the equipment owners manual for additional lamp information.

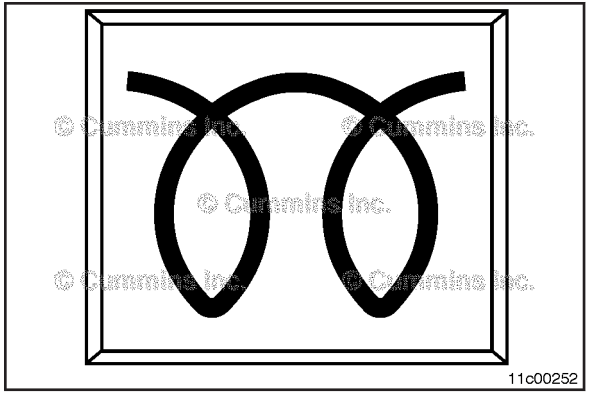
Wait to Start Lamp

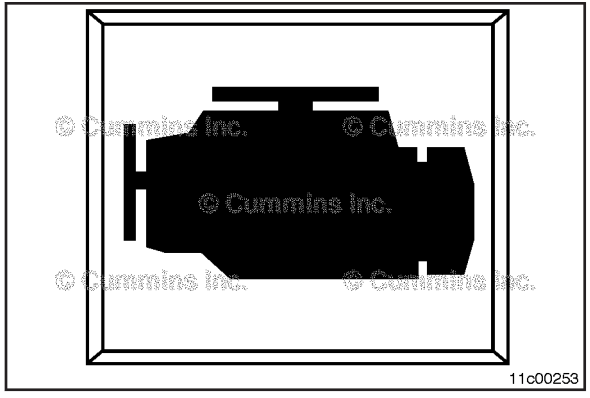
The WAIT TO START lamp illuminates when the intake air heater needs to warm the intake air prior to starting the engine.

The WAIT TO START lamp time will vary, depending on the ambient air temperature. Refer to Procedure 101-014 in Section 1.

The WAIT TO START lamp can look like:

- The words WAIT TO START spelled out
- A symbol similar to the graphic illustrated
- The color of the symbol or words can vary, based on the manufacturer of the vehicle, but will typically be red or amber.





Check Engine Lamp

The CHECK ENGINE lamp illuminates when the engine needs to be serviced at the first available opportunity.

The CHECK ENGINE lamp is amber, and can look like:

- The words WARNING or CHECK ENGINE spelled out
- A symbol of an engine, similar to the graphic illustrated.

Another function of the CHECK ENGINE lamp is to flash for 30 seconds at key ON when one of the following occurs. This flashing function is referred to as the MAINTENANCE lamp. The MAINTENANCE lamp could flash for any of the following reasons:

- Maintenance required, if the Maintenance Monitor is enabled
- Water-in-fuel is detected
- Low engine lubricating oil level, if equipped with an engine lubricating oil level sensor
- Coolant level is low.

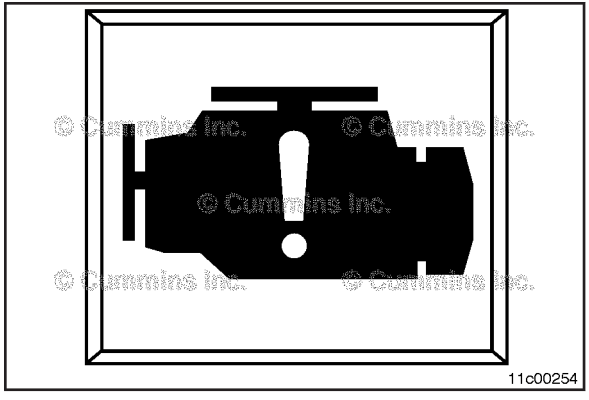
Stop Engine Lamp

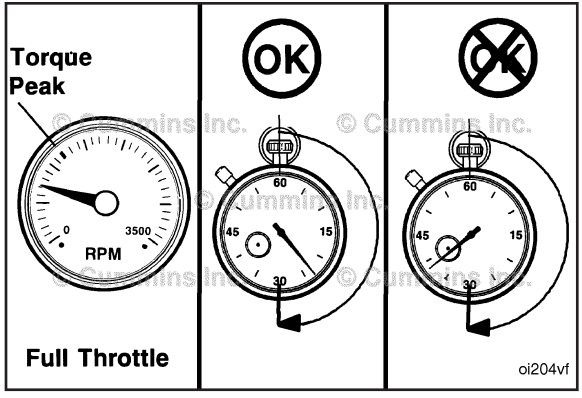
The STOP ENGINE lamp indicates, when illuminated, the need to stop the engine as soon as it can be safely done. The engine **must** remain shut down until the engine can be repaired.

For engines with the Engine Protection Shutdown feature enabled, if the STOP ENGINE lamp begins to flash, the engine will automatically shut down after 30 seconds. The flashing STOP ENGINE lamp alerts the operator to the impending shutdown.

The STOP ENGINE lamp is red in color, and can look like:

- The words STOP or STOP ENGINE spelled out
- A symbol of an engine with an exclamation point in the center, similar to the graphic illustrated.





Engine Operating Range

General Information

⚠CAUTION⚠

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

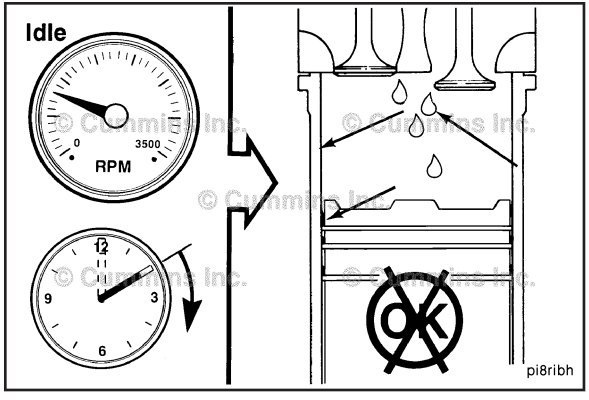
Cummins® engines are designed to operate successfully at full throttle under transient conditions down to peak torque engine speed. This is consistent with recommended operating practices.

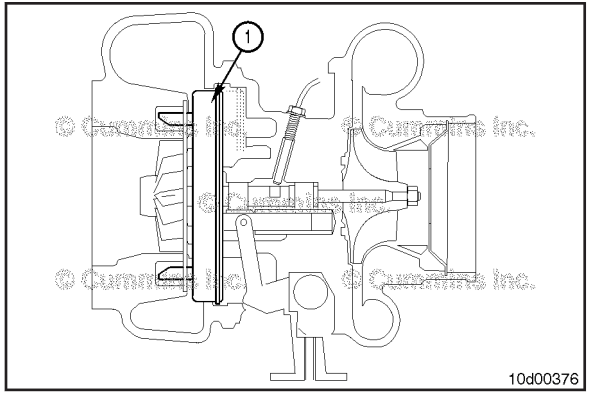
⚠CAUTION⚠

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

⚠CAUTION⚠

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





Engine Braking System

General Information

Engines equipped with a variable geometry turbocharger (VGT) may be equipped with an optional engine (VGT) exhaust brake feature. The ON/OFF function would be controlled by a switch located on the dash of the vehicle.

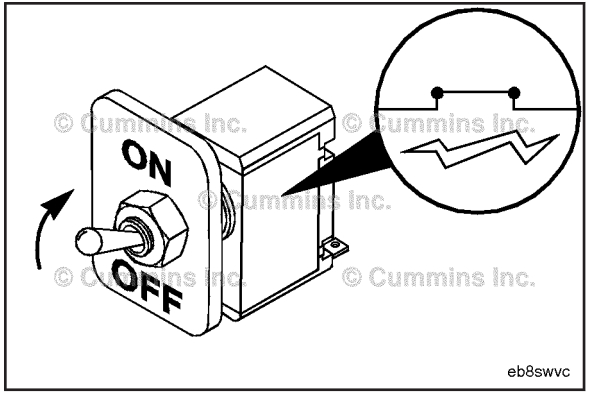
This feature, if the vehicle is equipped, allows the variable geometry turbocharger (VGT) to act as an exhaust brake. An engine (VGT) exhaust brake retards the speed of the engine during motoring conditions to provide additional vehicle braking power and to extend the life of the vehicle service brakes.

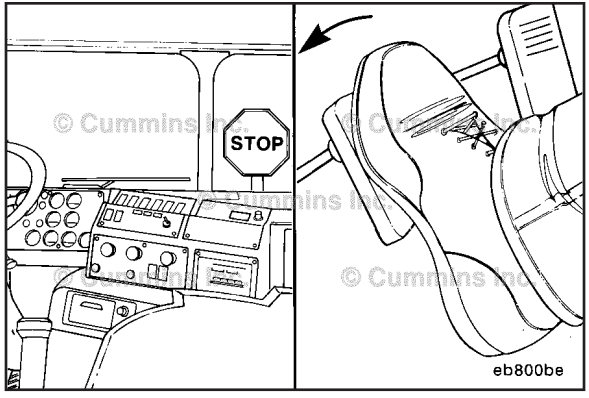
An engine (VGT) exhaust brake works to retard engine speed by creating high exhaust back pressure. This back pressure is obtained by restricting airflow through the turbine housing of the turbocharger. This restriction through the turbine housing of the turbocharger is created through positioning of the sliding nozzle (1) located internally to the variable geometry turbocharger (VGT). The position of the sliding nozzle is controlled by the engine electronic control module (ECM).

When the engine (VGT) exhaust brake switch is in the ON position, the engine's electronic control module (ECM) monitors inputs (such as accelerator pedal position and engine speed). From these inputs, the ECM determines when to enable the engine (VGT) exhaust brake feature (when the proper braking conditions are present).

Other features/switches like cruise control, can also affect when the engine (VGT) exhaust brake activates. For more information on how the engine (VGT) exhaust brake functions, refer to the OEM service manual or contact a Cummins® Authorized Repair Location.

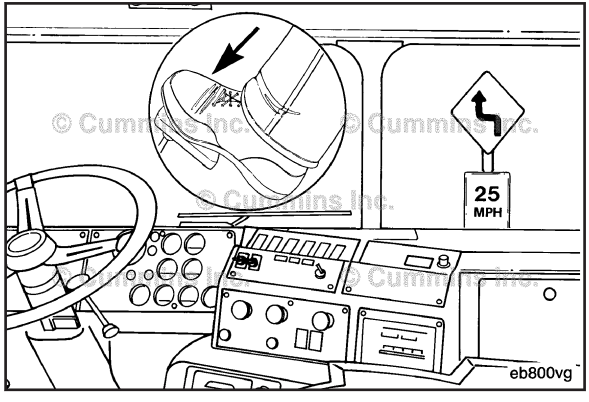
NOTE: The exhaust brake can only be activated when the accelerator pedal is at its low idle position. With the throttle at low idle position, fueling commands to the cylinders will **not** detract from the braking power of the brake system.





NOTE: The engine (VGT) exhaust brake is designed to assist the vehicle's service brakes when slowing the vehicle to a stop.

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



⚠WARNING⚠

To reduce the possibility of personal injury or property damage, always be prepared to use the vehicle service brakes for emergency stopping. The safe control speed of a vehicle will vary with the size of the load, the type of load, the grade, and the road conditions.

Vehicle service brakes **must** be used when additional braking power is required.

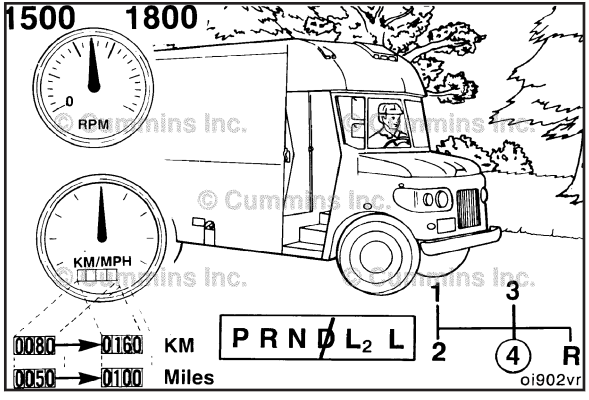
⚠CAUTION⚠

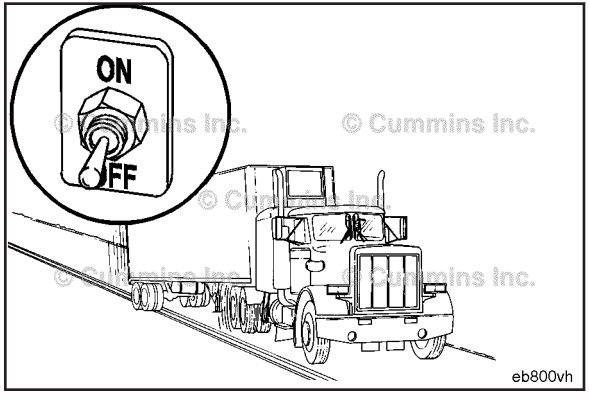
Exceeding governed engine speed can cause engine damage.

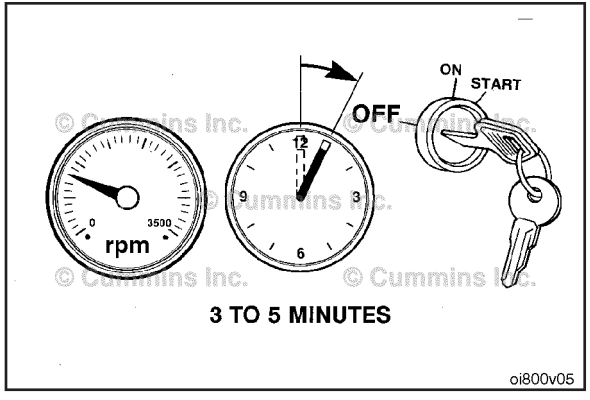
The optimum braking power of the engine (VGT) exhaust brake is reached at rated engine speed. Correct gear selection, therefore, is critical.

NOTE: Typically, on vehicles equipped with automatic transmissions, the engine electronic control module (ECM) and the transmission will determine the correct gear selection. Refer to the OEM service manual for further information.

Turn the engine (VGT) exhaust brakes OFF on slick roads. Using the engine (VGT) exhaust brake on wet or slippery roads can cause over-braking, especially on vehicles with light loads or single-drive axles. Stopping distance can actually increase, or the vehicle can skid or jackknife.







Engine Shutdown

General Information

NOTE: For engines equipped with an electronic control module (ECM) ensure the keyswitch is turned off for a minimum of 70 seconds prior to disconnecting the continuous (unswitched) battery power supply. If the unswitched battery power supply is disconnected in less than 70 seconds after the keyswitch is turned off active fault codes and incorrect ECM information can occur.

Turn the ignition switch to the OFF position. If the engine does **not** shut down, refer to Troubleshooting Symptom (Section TS) in appropriate Operation and Maintenance manual.

△CAUTION△
Failure to follow the correct shutdown procedure may result in damage to the turbocharger and shorten the turbocharger life.

Electromagnetic Interference (EMI)

General Information

Some applications utilize accessories such as (CB radios, mobile transmitters, etc.) if not installed and used correctly the radio frequency energy generated by these accessories can cause electromagnetic interference (EMI) conditions to exist between the accessory and the Cummins electronically controlled systems. Cummins is **not** liable for any

performance problems with either the electronically controlled systems or the accessory due to EMI. EMI is **not** considered by Cummins to be a system 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 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 electronically controlled systems EMI susceptibility level will protect your systems from most, if **not** all, electromagnetic energy-emitting devices that meet the 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 systems are properly installed, they 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 transmitting antenna as far away from the electronically controlled systems and as high as possible.

2 Locate the transmitting 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:

- Accurately calibrate the device for proper frequency, power output, and sensitivity (both base and remote site devices **must** be properly calibrated)
- Obtain antenna reflective energy data measurements to determine the optimum antenna location
- Obtain optimum antenna type and mounting arrangement for your application

- Make sure your accessory equipment model is built for maximum filtering to reject incoming electromagnetic noise.

Section 2 - Maintenance Guidelines

Section Contents

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Maintenance Guidelines - Overview

General Information

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

If the system 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 system is operated in a dusty environment or if frequent stops are made. For gas fueled generator sets, shorter maintenance intervals are also required, if operating at loads below 70% for prolonged periods. 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 system is equipped with a component or accessory not manufactured or supplied by Cummins Inc., refer to the component manufacturer's maintenance recommendations.

OEM supplied equipment and components can impact on the performance and reliability of the engine if they are not correctly maintained.

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

Maintenance Schedule

General Information

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

Maintenance Procedures at Daily Interval

- Air Intake Piping - Check
- Fan, Cooling - Check
- Crankcase Breather Tube - Check
- Air Tanks and Reservoirs - Drain
- Coolant Level - Check
- Fuel-Water Separator - Drain
- Lubricating Oil Level - Check
- Aftertreatment Exhaust Piping - Check
- Dust Ejection Valve - Check

Maintenance Procedures at 250 Hours or 3 Months

- Air Cleaner Restriction - Check
- Charge-Air Piping - Check
- Charge-Air Cooler - Check
- Radiator Hoses - Check

- Air Intake Piping - Check
- Radiator - Check

Maintenance Procedures at 500 Hours or 6 Months

- Fuel Filter (Spin-On Type) - Change[1]
- Lubricating Oil and Filters - Change[2, 4]
- Engine Coolant Antifreeze - Check
- Batteries - Check
- Battery Cables and Connections - Check
- Radiator Pressure Cap - Check

Maintenance Procedures 1000 Hours or 1 Year

- Drive Belt, Cooling Fan - Check
- Cooling Fan Belt Tensioner - Inspect for Reuse

Maintenance Procedures at 2000 Hours or 2 Years

- Cooling System - Flush[3, 5]
- Vibration Damper, Viscous - Check
- Vibration Damper, Rubber - Check
- Air Compressor Discharge Lines - Check
- Engine Steam Cleaning - Clean

Maintenance Procedures at 2000 Hours

- Crankcase Ventilation Filter - Change

Maintenance Procedures at 5000 Hours or 4 Years

- Overhead Set - Adjust

Maintenance Procedures at 5000 Hours

- Aftertreatment Diesel Particulate Filter - Clean

NOTES:

1 If the oil drain interval being used is greater than 500 hours, as determined by the Oil Drain Intervals section below, the fuel filter change can be extended until the oil drain interval.

2 The oil drain intervals are based on an engine equipped with a 14.2 liter [15 qt] capacity lubricating oil pan and a normal duty cycle. For detailed information on oil drain intervals based on oil pan capacity, see the Oil Drain Intervals Section of this procedure. Cummins Inc. requires the use of a high-quality, heavy-duty engine oil. Use the following procedure for lubricating oil recommendations and specifications. Refer to Procedure 018-003 in Section V.

3 Extended coolant drain/flush/fill intervals may be followed when certain requirements are met. For information on these requirements, refer to the Cummins® Coolant Requirements and Maintenance Service Bulletin 3666132.

4 For Standby Generator Sets, the recommended lubricating oil change interval is 250 hours or yearly, whichever occurs first. For Prime or Continuous rated Generator Sets, the lubricating oil change interval is 500 hours or yearly, whichever occurs first.

5 This cooling system requirement to Flush at this scheduled maintenance includes: Drain, Flush, and Fill.

If the engine is equipped with a component or accessory that is **not** manufactured by Cummins Inc., reference the component manufacturer's maintenance recommendations.

Use the following procedure for fuel recommendations and specifications. Refer to Procedure 018-002 in Section V.

Oil Drain Intervals

The lubricating oil and lubricating oil filter interval can be adjusted, based on the oil pan capacity.

Table 1: Lubricating Oil Drain Interval	
Lubricating Oil Pan Capacity	**Lubricating Oil Change Interval**
14.2 liters [15 qt]	500 Hours or 6 Months
Greater than 14.2 liters [15 qt]	550 Hours or 6 Months

If the type/oil capacity of the oil pan is not known:

a Contact a Cummins® Distributor/Dealer

b Determine the capacity of the oil pan option for the engine being serviced, use QuickServe™ Online and the engine serial number.

c For the first oil drain interval, use the 14.2 liter [15 qt] oil drain interval. When filling the engine with oil, determine the capacity of the oil pan.

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 L - Service Literature

Section Contents

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Additional Service Literature

General Information

The following publications can be purchased:

Additional Service Literature	
4022255	QSB6.7 CM2250 (174 HP and Above) Service Manual
2883477	QSB6.7 CM2250 (174 HP and Above), QSL9 CM2250, QSX11.9 CM2250 ECF, QSX15 CM2250 ECF Fault Code Troubleshooting Manual
4022260	QSB6.7 CM2250 Wiring Diagram
4022265	QSB6.7 CM2250 (174 HP and Above) Operation and Maintenance Manual
4022264	QSB6.7 CM2250 (174 HP and Above) Owners Manual
3379000	Air for Your Engine
3379001	Fuels for Cummins® Engines
3379009	Operation of Diesel Engines in Cold Climates
3666132	Cummins® Coolant Requirements and Maintenance
3387266	Cold Weather Operation
3810340	Cummins® Engine Oil and Oil Analysis Recommendations

Service Literature Ordering Location

Contact Information

Region	Ordering Location
United States and Canada	Cummins Distributors or Credit Cards at https://store.cummins.com
All Other Countries	Cummins Distributors or Dealers

Cummins Customized Parts Catalog

General Information

Cummins is pleased to announce the availability of a parts catalog compiled specifically for you. Unlike the generic versions of parts catalogs that support general high volume parts content; Cummins Customized catalogs 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.

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 Cummins QuickServe Online.

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 Distributors, Original Equipment Manufacturers and Cummins Factory personnel order by calling Iron Mountain Fulfillment Services (IMFS) at 1-800-646-5609.

- International Distributors and Original Equipment Manufacturers order the CPC from their regional Cummins Parts Distribution Centers (PDC).
- International PDC orders are called into Iron Mountain at (++) 630-283-2420.
- Retail Credit Card Orders require a 2 step ordering process.

Ordering On-Line

Access the Cummins QSOL store at https://store.cummins.com

- Find the Customized Parts Catalog button located on the left of the homepage
- Select format. Your Price is also shown here
- Finalize Shopping Cart and Check Process as described on the website

North America call Iron Mountain Fulfillment Services (IMFS) at 800-646-5609, International customers call (++) 630-283-2420. Provide IMFS the catalog detail as described on the website. This step is required until we have our On Line form available.

Required information needed for your Customized Parts Catalog Order.

- 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 Customized Parts Catalogs. 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.

Notes

Section V - Maintenance Specifications

Section Contents

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General Engine

Specifications

Listed below are the general specifications for this engine.

Horsepower.....Refer to engine dataplate
Bore and Stroke.....107 mm [4.21 in] X 124 mm [4.88 in]
Displacement.....6.7 liters [409 C.I.D.]
Firing Order.....1-5-3-6-2-4
Approximate Engine Dry Weight (without standard accessories).....519 kg [1144 lb]
Crankshaft Rotation (viewed from the front of the engine)..... **Clockwise**
Valve Clearance:
- Intake.....0.254 mm [0.010 in]
- Exhaust.....0.508 mm [0.020 in]

Maximum Overspeed Capability (15 seconds maximum).....3750 rpm
Minimum Ambient Air Temperature for Unaided Cold Start..... -12.2°C [10°F]
Minimum Engine Cranking Speed.....120 rpm
Engine Idle Speed.....Minimum 700 rpm to Maximum 1200 rpm
Altitude Limit.....3658 m [12,000 ft]

Lubricating Oil System

Specifications

Oil Pressure
- Low Idle (minimum allowed)..... 69 kPa [10 psi]
- At Rated Speed (minimum allowed).....207 kPa [30 psi]

Oil Regulating Valve Opening Pressure Range.....448 kPa [65 psi] to 517 kPa [75 psi]
Oil Filter Differential Pressure to Open Bypass.....345 kPa [50 psi]

Lubricating Oil Capacity of Standard Engine (Standard Oil Pan)
- Pan **Only** .....14.2 liters [15 qt]
- Total System.....16.7 liters [17.6 qt]
- High to Low (on dipstick).....1.9 liters [2 qt]

Lubricating Oil Filter Capacity.....0.950 liters [1 qt]

Lubricating Oil Capacity of Standard Engine (High Capacity Oil Pan)
- Pan **Only** .....17.2 liters [18.5 qt]
- Total System.....19.7 liters [20.8 qt]
- High to Low (on dipstick).....2.8 liters [3 qt]

Lubricating Oil Filter Capacity.....0.950 liters [1 qt]
Maximum Oil Temperature.....138°C [280°F]

NOTE: If the type/oil capacity of each pan is **not** known:

- Contact a Cummins® Distributor/Dealer
- Determine the capacity of the oil pan option for the engine being serviced by using QuickServe™ Online and the engine serial number.

- Fill the lubricating oil pan to the smallest oil pan capacity listed for the engine being serviced. Then add 0.95 liters [1 qt] of oil at a time until it reaches the high mark on the dipstick. Record the number of liters/quarts added, so the capacity is known the next time the oil is drained.

Cooling System

Specifications

Coolant Capacity (Includes block, cylinder head, water pump volute, EGR cooler, and EGR plumbing)....11.5 liters [3.0 gal]
Standard Modulating Thermostat - Range.....86 to 97°C [186 to 207°F]
Maximum Allowed Operating Temperature.....107°C [225°F]
Minimum Recommended Operating Temperature.....71°C [160°F]
Minimum Recommended Pressure Cap.....90 kPa [13 psi]
Maximum Recommended Pressure Cap.....172 kPa [25 psi]

Cummins®/Fleetguard® Filter Specifications

General Information

Cummins Filtration™, which produces Fleetguard® products, is a division of Cummins Inc. Fleetguard® filters are developed through joint testing at Cummins Inc. and are standard on new Cummins® engines. Cummins Inc. recommends their use.

Fleetguard® products meet all Cummins® Source Approval Test standards to provide the quality filtration necessary to achieve the engine's design life. If other brands are substituted, the purchaser **must** insist on products that 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 Part Numbers

Lubricating Oil Filter	
Cummins® Part Number	3937736
Fleetguard® Part Number	LF3970

Fuel Filter (Primary)	
Cummins® Part Number	4934845
Fleetguard® Part Number	FF5632

Fuel Filter (Prefilter with WIF Sensor)[1]	
Cummins® Part Number	4934879
Fleetguard® Part Number	FS1065

1. The fuel filter (Prefilter with WIF Sensor) could be OEM-supplied.

Crankcase Ventilation Filter (Rocker Lever Cover Mounted)	
Cummins® Part Number	4936636
Fleetguard® Part Number	CV5200100

Crankcase Ventilation Filter (Rear Engine Mounted)	
Cummins® Part Number	3683918
Fleetguard® Part Number	CV5060700

Air Filter (Primary)	
127 x 381 x 203 mm [5 x 15 x 8 in]	
Cummins® Part Number	5261248
Fleetguard® Part Number	AF55005
127 x 381 x 305 mm [5 x 15 x 12 in]	
Cummins® Part Number	5261249
Fleetguard® Part Number	AF55014
254 x 254 x 305 mm [10 x 10 x 12 in]	
Cummins® Part Number	5261250
Fleetguard® Part Number	AF55015

Air Filter (Secondary)	
127 x 381 x 203 mm [5 x 15 x 8 in]	
Cummins® Part Number	5261251

Air Filter (Secondary)	
Fleetguard® Part Number	AF55308
127 x 381 x 305 mm [5 x 15 x 12 in]	
Cummins® Part Number	5261251
Fleetguard® Part Number	AF55308
254 x 254 x 305 mm [10 x 10 x 12 in]	
Cummins® Part Number	5261252
Fleetguard® Part Number	AF55309

Fuel Recommendations and Specifications

Fuel Recommendations

⚠WARNING⚠

Do not mix gasoline, alcohol, or gasohol with diesel fuel. This mixture can cause an explosion.

⚠CAUTION⚠

Due to the precise tolerances of diesel injection systems, it is extremely important that the fuel be kept clean and free of dirt or water. Dirt or water in the system can cause severe damage to both the fuel pump and the fuel injectors.

⚠CAUTION⚠

Lighter fuels can reduce fuel economy or possibly damage fuel system components.

⚠CAUTION⚠

Do not use diesel fuel blended with lubricating oil in engines equipped with an aftertreatment system. Service intervals for aftertreatment systems will be reduced.

Cummins Inc. recommends the use of ASTM number 2D fuel. The use of number 2D diesel fuel will result in optimum engine performance.

⚠CAUTION⚠

Ultra-low sulfur diesel fuel is required for correct operation of the aftertreatment system. If ultra-low sulfur diesel fuel is not used, the engine could possibly not meet emission regulations and the aftertreatment system could possibly be damaged.

The engine has been optimized for use with an exhaust aftertreatment to meet the Tier 4 Interim/Stage IIIB off-highway emissions regulations. It must operate on ultra-low sulfur diesel (ULSD) with a maximum sulfur content of 15

ppm in the United States and 10 ppm in the European Union. Failure to do so can permanently damage engine and aftertreatment systems within a short period of time. This damage could cause the engine to become inoperable and affect the warranty coverage on the engine.

Ultra-low sulfur diesel fuel, also defined by ASTM S-15, is defined as diesel fuel **not** exceeding 0.0015 (15 ppm) mass percent sulfur content. There is **no** acceptable substitute.

At operating temperatures below 0°C [32°F], acceptable performance can be obtained by using blends of number 2D and number 1D.

The following chart lists acceptable fuel types for this engine.

Acceptable Fuels - Cummins® Fuel System									
Number 1D Diesel(1) (2)	**Number 2D Diesel(2)**	**Number 1K Kerosene**	**Jet-A**	**Jet-A1**	**JP-5**	**JP-8**	**Jet-B**	**JP-4**	**CITE**
OK	OK	**NOT** OK	**NOT** OK	**NOT** OK	**NOT** OK	**NOT** OK	**NOT** OK	**NOT** OK	**NOT** OK
48-34(3)	40-24(3)	50-35(3)	51-37(3)	51-37(3)	48-36(3)	51-37(3)	57-45(3)	57-45(3)	57-45(3)

1 Any adjustment to compensate for reduced performance with a fuel system using alternate fuel is **not** warrantable.

2 Winter blend fuels, such as those found at commercial fuel dispensing outlets, are combinations of number 1D and number 2D diesel fuel, and are acceptable.

3 BTU Content/Degree API Gravity - Low API gravity fuels have a higher thermal energy content (BTU). As a general rule, there is a 3 to 5 percent decrease in BTU content for every 10 degree increase in API gravity; there is also a 0.7 degree API gravity increase with an increase in fuel temperature. This decrease in energy content equates

roughly to the same percentage of power loss. Use of fuels with higher API gravity will cause higher than normal fuel consumption.

NOTE: Cummins Inc. recommends that the cetane number of diesel fuel be a minimum of 45 for engines that are expected to operate at temperatures below 0°C [32°F] and a minimum of 42 for engines that are operated at temperatures above 0°C [32°F].

NOTE: The use of diesel fuel with a lower than recommended cetane number can cause hard starting, instability, and excessive white smoke. To maintain satisfactory operation at low ambient temperatures, it is important to specify diesel fuel of the correct cetane number.

NOTE: Cummins Inc. requires all permissible fuels to have adequate fuel lubricity. This means the BOCLE number is 3100 or greater as measured by ASTM specification D6078, Scuffing Load Ball On Cylinder Evaluator (SLBOCLE). Lubricity can also be measured by ASTM specification D6079, ISO 12156, High Frequency Reciprocating Rig (HFRR), in which the fuel **must** have a wear scar diameter of 0.45 mm [0.02 in] or less.

The equipment OEM is required to display readily visible labels on the dashboard (or instrument panel), and near all fuel fill inlets that states "Use Ultra Low-Sulfur Diesel Fuel Only" or "Ultra Low-Sulfur Diesel Fuel Only".

ULSD / Biodiesel blends up to B20 (20 percent biodiesel) supplied by a BQ9000 certified supplier are acceptable.

For information on alternative fuels, such as biodiesel, and additional information for fuel recommendations and specifications, refer to Fuels for Cummins® Engines, Bulletin 3379001.

Lubricating Oil Recommendations and Specifications

General Information

⚠CAUTION⚠

Extending the oil and filter change interval beyond the recommendations will decrease the engine life due to factors such as corrosion, deposits, and wear.

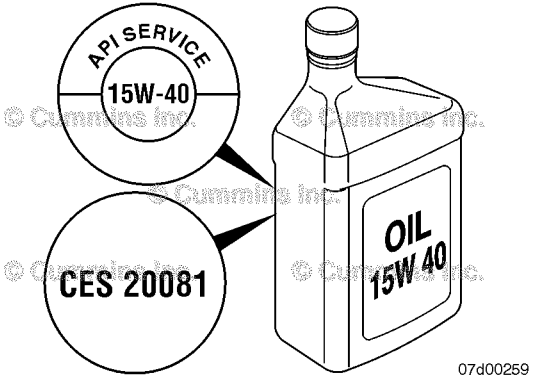
The use of quality engine lubricating oils, combined with appropriate oil drain and filter change intervals, is a critical factor in maintaining engine performance and durability. Extending the oil and filter change interval beyond the recommendations will decrease engine life due to factors such as corrosion, deposits, and wear. Use the following procedure to determine which oil drain interval to use for an application. Refer to Procedure 102-002 in Section 2.

NOTE: The responsibility is with the owner. If recommendations are ignored, warranty could be affected.

API: American Petroleum Institute

CES: Cummins® Engineering Standard

Cummins Inc. requires the use of a high-quality SAE 15W-40 heavy-duty engine oil, such as Valvoline Premium Blue™ (USA) or Valvoline Premium Blue® Extra (International), which meets or exceeds CES 20081 and the American Petroleum Institute (API) performance classification CJ-4.



To determine if the lubricating oil meets CES 20081, review the label on the back of the lubricating oil bottle for the CES 20081 reference. If acquiring the lubricating oil in bulk, contact the supplier for the lubricating oil specifications and confirm that the oil meets CES 20081.

Also located on the lubricating oil bottle is the API service symbol, which is shown in the accompanying illustration. The upper half of the symbol displays the appropriate oil categories. The center section identifies the SAE oil viscosity grade. The table below shows how the Cummins® Engineering Standard (CES) compares to the American Petroleum Institute (API) classification.

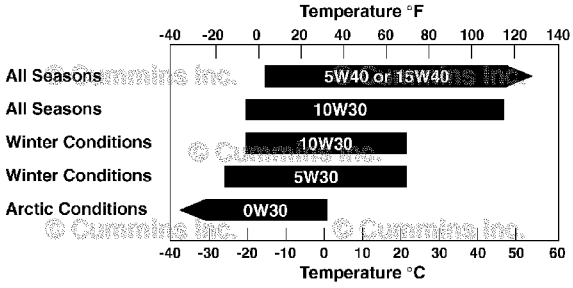
Cummins® Engineering Standard Classifications (CES)	American Petroleum Institute Classification (API)	Comments
CES-20081	CJ-4/SL	Minimum oil classification required.

NOTE: A lubricating oil that meets the American Petroleum Institute (API) performance classification CJ-4/SL may **not** meet the CES 20081 requirement. Always make sure that the lubricating oil used meets the CES 20081 requirement in addition to the API performance classification CJ-4/SL.

The primary Cummins Inc. recommendation is for the use of 15W-40 multigrade lubricating oil for normal operation at ambient temperatures above -15°C [5°F]. The use of multigrade oil reduces deposit formation, improves engine cranking in low temperature conditions, and increases engine durability by maintaining lubrication during high temperature operating conditions. Since multigrade oils have been shown to provide approximately 30 percent lower oil consumption than monograde oils, it is important to use multigrade oils, to be certain the engine will meet applicable emissions requirements.

Use of "synthetic engine oils" (those made with API group 3 or group 4 base stocks) is permitted, subject to the same performance and viscosity limitations of petroleum (mineral) based engine oils. The same oil change intervals that are applied to petroleum (mineral) based engine oils **must** be applied to synthetic oils.

For further details and discussion of engine lubricating oils for Cummins® engines, refer to the latest revision of Cummins® Engine Oil Recommendations, Bulletin 3810340.



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While the preferred viscosity grade is 15W-40, lower viscosity multigrade oils can be used in colder climates. See the accompanying chart. Any viscosity grade lower than 15W-40 **must** still meet CES 20081.

Synthetic engine oils, API Group III and Group IV basestocks, are recommended for use in Cummins® engines operating in ambient temperature conditions consistently below -25°C [-13°F]. Synthetic 0W-30 oils that meet the requirements of API Group III or Group IV basestocks, can be used in operations where the ambient temperature **never** exceeds 0°C [32°F]. Multiviscosity oils rated 0W-30 do **not** offer the same level of protection against fuel dilution as do higher multigrade oils. Higher cylinder wear can be experienced when using 0W-30 oils in high-load situations.

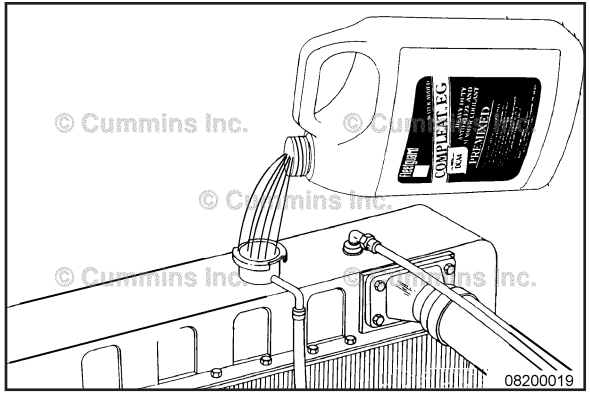
As these oils have directionally thinner oil films than 15W-40 oils, top-quality Fleetguard® filters **must** be used above 20°C [70°F]. Some oil suppliers might claim better fuel economy for these oils. Cummins Inc. can neither approve nor disapprove any product **not** manufactured by Cummins Inc. These claims are between the customer and the oil supplier. Obtain a commitment from the oil supplier that the oil will give satisfactory performance in Cummins® engines, or do **not** use the oil.

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 period as is to be used in normal operation.

AfterMarket Oil Additive Usage

Cummins Inc. does **not** recommend the use of aftermarket oil additives. Present high-quality fully additive engine lubricating oils are very sophisticated, with precise amounts of additives blended into the lubricating oil to meet stringent requirements. These oils meet performance characteristics that conform to the lubricant industry standards. Aftermarket lubricating oil additives are **not** necessary to enhance engine oil performance, and in some cases, can reduce the finished oil's ability to protect the engine.



Coolant Recommendations and Specifications

Fully Formulated Coolant/Antifreeze

Cummins Inc. recommends the use of fully formulated antifreeze/coolant meeting Cummins Engineering Standards (C.E.S.) 14603. For further details and discussion of coolant for Cummins® engines, refer to Coolant Requirements and Maintenance, Bulletin 3666132.

Typically, antifreeze/coolants meeting ASTM4985 (GM6038M specification) or ASTM D6210 criteria are acceptable antifreeze/coolants for engines covered by the manual.

Low-silicate antifreeze/coolants meeting ASTM D4985 (GM6038M specification) are **not** adequate for extended service intervals.

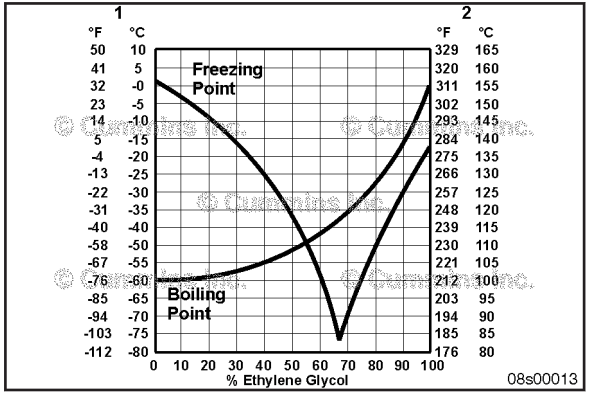
Cummins Inc. recommends using either a 50/50 mixture of good-quality water and fully formulated antifreeze, or fully formulated coolant when filling the cooling system.

Good-quality water is important for cooling system performance. Excessive levels of calcium and magnesium contribute to scaling problems, and excessive levels of chlorides and sulfates cause cooling system corrosion.

Water Quality	
Calcium Magnesium (hardness)	**Maximum 170 ppm as ($CaCO_3$ + $MgCO_3$)**
Chloride	40 ppm as (Cl)
Sulfur	100 ppm as (SO_4)

Cummins Inc. recommends using Fleetguard® Compleat. It is available in both glycol forms (ethylene and propylene).

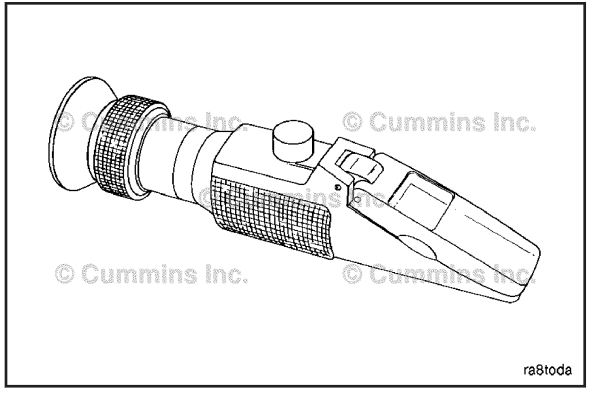
Fully formulated antifreeze **must** be mixed with good-quality water at a 50/50 ratio (40- to 60-percent working range). A 50/50 mixture of antifreeze and water gives a -36°C [-33°F] freezing point and a 108°C [226°F] boiling point, which is adequate for locations in North America. The actual lowest freezing point of ethylene glycol antifreeze is at 68 percent. Using higher concentrations of antifreeze will raise the freezing point of the solution and increase the possibility of a silica gel problem.



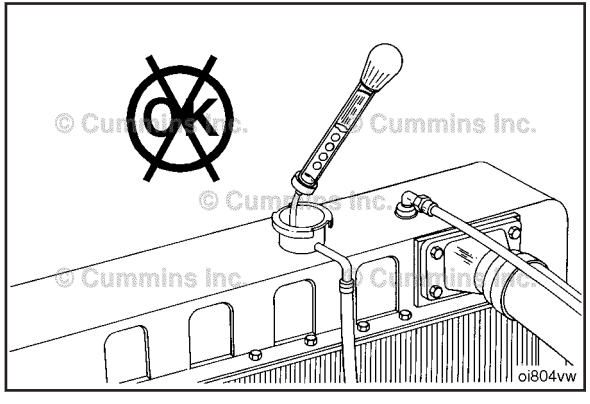
Legend

1 Freezing Point Temperature Scale

2 Boiling Point Temperature Scale



A refractometer **must** be used to measure the freezing point of the coolant **accurately**. Use Fleetguard® refractometer, Part Number C2800.

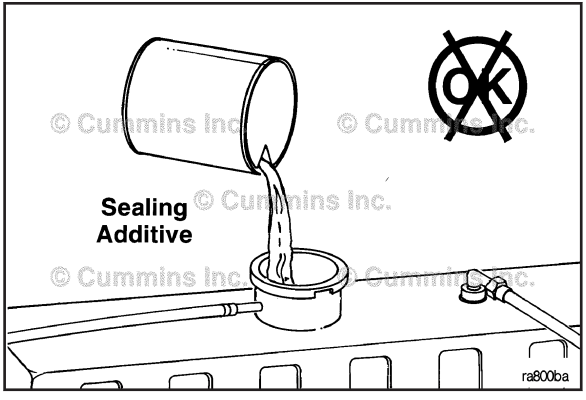


Do **not** use a floating ball hydrometer. The use of floating ball hydrometers can give an incorrect reading.

Cooling System Sealing Additives

Do **not** use sealing additives in the cooling system. The use of sealing additives will:

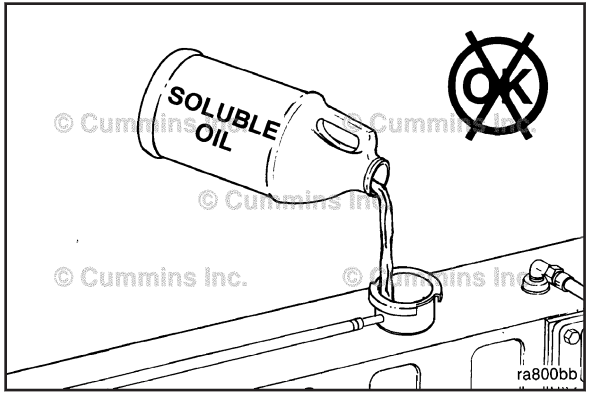
- Buildup in coolant low-flow areas
- Plug the radiator and oil cooler
- Possibly damage the water pump seal.



Cooling System Soluble Oils

Do **not** use soluble oils in the cooling system. The use of soluble oils will:

- Corrode brass and copper
- Damage heat transfer surfaces
- Damage seals and hoses.



Notes

Section W - Warranty

Section Contents

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All Engines United States And Canada Industrial (Off-Highway) 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.

Engine aftertreatment components included in the Cummins Critical Parts List (CPL) and marked with a Cummins part number are covered under Base Engine Warranty.

Additional Coverage is outlined in the Emission Warranty section.

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 (3,000 hours for A Series Engines) hours of operation from the date of delivery of the Engine to the first user, or from the date the unit is first leased, rented or loaned, or from when the Engine has been operated for 50 hours, whichever occurs first.

Consumer Products

The Warranty on Consumer Products in the United States* is a LIMITED Warranty. **CUMMINS IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.** Any implied Warranties applicable to Consumer Products in the United States* terminate concurrently with the expiration of the express Warranties applicable to the product. In the United States*, some states do not allow the exclusion of incidental or consequential damages, or limitations on how long an implied Warranty lasts, so the limitations or exclusions herein may not apply to you.

These Warranties are made to all Owners in the chain of distribution and Coverage continues to all subsequent Owners until the end of the periods of Coverage.

Cummins Responsibilities

During The Base Engine Warranty

Cummins will pay for all parts and labor needed to repair the damage to the Engine resulting from a Warrantable Failure.

Cummins will pay for the lubricating oil, antifreeze, filter elements and other maintenance items that are not reusable due to the Warrantable Failure.

Cummins will pay reasonable costs for mechanics to travel to and from the equipment site, including meals, mileage and lodging, when the repair is performed at the site of the failure.

Cummins will pay reasonable labor costs for Engine removal and reinstallation when necessary to repair a Warrantable Failure.

During The Extended Major Components Warranty

Cummins will pay for the repair or, at its option, replacement of the defective Covered Part and any Covered Part damaged by a Warrantable Failure of the defective Covered Part.

Owner 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. Service locations are listed on the Cummins Worldwide Service Locator at cummins.com.

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

Engines with an emissions certification listed below must be operated using only diesel fuel having no more than the corresponding maximum sulfur content. Failure to use the specified fuel as listed in the Cummins Fuel Bulletin

#3379001 Table 1 (Cummins Inc. Required Diesel Fuel Specifications) can damage the Engine and aftertreatment system within a short period of time. This damage could cause the Engine to become inoperable and failures attributable to the use of incorrect fuels will be denied Warranty Coverage. Fuel specifications also need to comply with local fuel regulations (EN590 for Europe and ASTM D975 for North America) for Warranty eligibility.

Maximum sulfur levels by emissions certification level as listed on the Engine's dataplate are:	
EPA 2007/2010/2013	max. 15 parts per million
EPA Tier 4 Interim / Final	max. 15 parts per million
EU Stage IIIB 2011	max. 15 parts per million
Euro 4/5	max. 50 parts per million
Euro 6	max. 10 parts per million

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, fuel or diesel exhaust fluid or by water, dirt or other contaminants in the fuel, oil or diesel exhaust fluid.

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.

For all other Industrial engines (except those previously mentioned), 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.

For all A Series Applications, including Industrial, travel reimbursement for non-transportable equipment will be limited to 4.0 hours, $0.25/mile and 250 miles maximum. Any costs beyond this limit are the customer's responsibility.

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* and Canada 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 and 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 for industrial applications, five years or 3,500 hours of operation for industrial spark-ignited Engines (GTA855, G855, G5.9C, G8.3-C, GTA8.9E, QSK19G) and five years or 2,500 hours of operation for industrial spark-ignited Engines (GKTA19-GC), 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

Engines with an emissions certification listed below must be operated using only diesel fuel having no more than the corresponding maximum sulfur content. Failure to use the specified fuel as listed in the Cummins Fuel Bulletin #3379001 Table 1 (Cummins Inc. Required Diesel Fuel Specifications) can damage the Engine and aftertreatment system within a short period of time. This damage could cause the Engine to become inoperable and failures attributable to the use of incorrect fuels will be denied Warranty Coverage. Fuel specifications also need to comply with local fuel regulations (EN590 for Europe and ASTM D975 for North America) for Warranty eligibility.

Maximum sulfur levels by emissions certification level as listed on the Engine's dataplate are:	
EPA 2007/2010/2013	max. 15 parts per million
EPA Tier 4 Interim / Final	max. 15 parts per million
EU Stage IIIB 2011	max. 15 parts per million
Euro 4/5	max. 50 parts per million
Euro 6	max. 10 parts per million

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 oil, fuel or diesel exhaust fluid or by water, dirt or other contaminants in the fuel, oil or diesel exhaust fluid.

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.

* United States 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.

** Alternators and starters are covered for the duration of the Base Engine Warranty on QSK23 Engines.

*** Emissions Warranty for BLPG Industrial Off-Highway Engines is 5 years / 3,500 hours.

All Engines International Industrial (Off-Highway)

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.

Engine aftertreatment components included in the Cummins Critical Parts List (CPL) and marked with a Cummins part number are covered under Base Engine Warranty.

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 (3,000 hours for A Series Engines) 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 when the Engine has been operated for 50 hours, whichever occurs first.

These Warranties are made to all Owners in the chain of distribution, and Coverage continues to all subsequent Owners until the end of the periods of Coverage.

Cummins Responsibilities

During The Base Engine Warranty

Cummins will pay for all parts and labor needed to repair the damage to the Engine resulting from a Warrantable Failure.

Cummins will pay for the lubricating oil, antifreeze, filter elements and other maintenance items that are not reusable due to a Warrantable Failure.

Cummins will pay reasonable costs for mechanics to travel to and from the equipment site, including meals, mileage and lodging, when the repair is performed at the site of the failure.

Cummins will pay reasonable labor costs for Engine removal and reinstallation when necessary to repair a Warrantable Failure.

During The Extended Major Components Warranty

Cummins will pay for the repair or, at its option, replacement of the defective Covered Part and any Covered Part damaged by a Warrantable Failure of the defective Covered Part.

Owner 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 Warranty 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. Service locations are listed in the Cummins Worldwide Service Locator at cummins.com.

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

Engines with an emissions certification listed below must be operated using only diesel fuel having no more than the corresponding maximum sulfur content. Failure to use the specified fuel as listed in the Cummins Fuel Bulletin #3379001 Table 1 (Cummins Inc. Required Diesel Fuel Specifications) can damage the Engine and aftertreatment system within a short period of time. This damage could cause the Engine to become inoperable and failures attributable to the use of incorrect fuels will be denied Warranty Coverage. Fuel specifications also need to comply with local fuel regulations (EN590 for Europe and ASTM D975 for North America) for Warranty eligibility.

Maximum sulfur levels by emissions certification level as listed on the Engine's dataplate are:	
EPA 2007/2010/2013	max. 15 parts per million
EPA Tier 4 Interim / Final	max. 15 parts per million
EU Stage IIIB 2011	max. 15 parts per million
Euro 4/5	max. 50 parts per million
Euro 6	max. 10 parts per million

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, fuel or diesel exhaust fluid or by water, dirt or other contaminants in the fuel, oil or diesel exhaust fluid.

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.

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.

For all A Series Applications, including Industrial, travel reimbursement for non-transportable equipment will be limited to 4.0 hours, $0.25/mile and 250 miles maximum. Any costs beyond this limit are the customer's responsibility.

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 the 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.

* Alternators and starters are covered for the duration of the Base Engine Warranty on QSK23 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 A series, B3.3, B3.9, B4.5^{S}, B5.9, B6.7^{S}, QSB3.9-30, QSB4.5-30, QSB5.9-30, QSB5.9-44, C8.3, QSC8.3, QSF2.8, QSF3.8, and QSL9 emission control parts:

EPA Diesel

Aftertreatment System Component
Aftertreatment Electrical Connections
Aftertreatment Fuel Drain Valve
Aftertreatment Fuel Injector/Regulator
Aftertreatment Fuel Pressure Sensor
Aftertreatment Fuel Shut-Off Valve
Aftertreatment Injector Manifold
Aftertreatment Inlet and Outlet Modules
Aftertreatment Temperature Interface Module
Aftertreatment Temperature Sensors

Base Engine System Component
Camshaft
Camshaft Injector Lobe
Camshaft Valve Lobe
Coolant Temperature Sensor
Crankcase Breather
Engine Oil Pressure Sensor
Engine Speed, Position Sensor, Cam Position Sensor
Exhaust Valve
Static Cam Timing

Aftertreatment System (cont') Component
Decomposition Tube

EGR System Component
EGR Cooler

EPA Diesel

DEF Dosing Controller (DCU)
DEF Dosing Unit (Pump)
DEF Dosing Valve
Diesel Oxidation Catalyst
Diesel Particulate Filter (except for ash maintenance)
Diesel Particulate Filter Differential Pressure Sensor
NH3 Sensor
NOx Sensors
SCR Catalyst

EGR Differential Pressure Sensor
EGR Mixer/Venturi
EGR Temperature Sensor
EGR Valve

Air Handling
Component
Barometric Air Pressure Sensor
Exhaust Gas Pressure Sensor
Exhaust Manifold
Grid Heater
Humidity Sensor
Intake Air Throttle Actuator

Electronic Control System
Component
Engine Control Module
Wiring Harness Circuits Connected at Both Ends to Emissions Warrantable Components
Engine Control Module Calibration
Engine Control Module Calibration

EPA Diesel

Intake Manifold
Intake Manifold Air Temperature Sensor

Air Handling (cont')

Component
Intake Manifold Temperature/Pressure Sensor
Turbocharger Actuator
Turbocharger Assembly
Turbocharger Compressor Inlet Air Temperature Sensor
Turbocharger Speed Sensor

Ignition System

Component
Ignition Coils
Ignition Control Module

Fuel System

Component
Fuel Control Valve
Fuel Lines
Fuel Pressure Sensor
Fuel Pump
Fueling/Timing Actuators

Fuel System (cont')

Component
Injector
Secondary Fuel Pressure/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.

CMD Quantum Commercial Marine Propulsion (QSB5.9/QSB6.7/QSC8.3/QSL9/QSM11/SDI/TDI)

Coverage

Engines Included in this Coverage

Marine Propulsion

QSB5.9/QSB6.7/QSC8.3/QSL9/QSM11/SDI/TDI

Products Warranted

This Warranty applies to new Product sold by Cummins MerCruiser Diesel, herein after “CMD”, that is branded as Cummins MerCruiser Diesel product and used in Commercial and Government Marine Propulsion applications anywhere in the world as permitted by US ITAR and Export Compliance regulations where CMD approved service is available* and delivered to the first user on or after May 1, 2011.

This Warranty covers any failures of the Product, under normal use and service, which results from a defect in CMD material or workmanship (Warrantable Failure). The (Product) includes the Engine, controls and other components other than pods or sterndrives as delivered from the CMD factory and accessories with a CMD part number that are added by a CMD approved distributor or OEM. Pods and sterndrives are covered under a separate CMD Warranty.

COMMERCIAL USE

Commercial use is defined as any work or employment related use of the product, or any use of the product which generates income, or any part of the warranty period, even if the product is only occasionally used for such purposes.

GOVERNMENT USE

Government use is defined as use by Federal, State, and Local agencies in non-revenue producing applications.

MARINE PROPULSION RATINGS

Government Service (GS) Rating

Intended for use in variable load applications where full power is limited to one hour out of every eight hours of operation.

Reduced power operation must be at or below cruise speed (rpm). Cruise speed (rpm) is dependent on the engine rated speed (rpm):

Rated Speed (rpm)	Cruise Speed (Reduction from rated speed, rpm)
2,000 to 2,800 rpm	200 rpm below rated
2,801 to 3,500 rpm	300 rpm below rated
3,501 to 4,500 rpm	400 rpm below rated

Government Service (GS)
The Government Service Rating applies to Government use in variable load applications where annual use is less than 500 hours and full power is one (1) out of every eight (8) hours of operation. Reduced power operation must be at or below cruise speed.

Light Commercial (LC)
The Light Commercial Rating applies to Commercial use in variable load applications where annual use is less than 500 hours and full power is one (1) out of every eight (8) hours of operation. Reduced power operation must be at or below cruise speed.

Intermittent Duty (ID)
This power rating is intended for intermittent use in variable load applications where full power is limited to two hours out of every eight hours of operation. Also, reduced power operations must be at or below 200 rpm of the maximum rated rpm. This rating is an ISO3046 Fuel Stop Power Rating and is for applications that operate less than 1,500 hours per year.

Medium Duty (MD)
This power rating is intended for continuous use in variable load applications where full power is limited to six hours out of every twelve hours of operation. Also, reduced power operations must be at or below 200 rpm of the maximum rated rpm. This rating is an ISO3046 Fuel Stop Power Rating and is for applications that operate less than 3,000 hours per year.

Heavy Duty (HD)
This power rating is intended for continuous use in variable load applications where full power is limited to eight hours out of every ten hours of operation. Also, reduced power must be at least 200 rpm below the maximum rated rpm. This rating is an ISO3046 Fuel Stop Power Rating and is for applications that operate less than 5,000 hours per year.

Continuous Duty (CD)
This power rating is intended for continuous use in applications requiring uninterrupted service at full power. This rating is an ISO3046 Standard Power Rating.

Base Engine Warranty
This warranty covers any failures of the Product, under normal use and service, which result from a defect in CMD material or factory workmanship (Warrantable Failure). Coverage begins with the sale of the Engine by CMD and continues for the Duration stated in the following table. The Duration commences on either the date of delivery of the Product to the first end-user, or the date the unit is first leased, rented or loaned, or when the Product has been operated for 50 hours, whichever occurs first. The Base Coverage duration ends two (2) years after the in-service date or allowed hours of total operation, whichever occurs first.

Warranty Coverage Periods				
Rating	**QSB, QSC, QSL, SDI, TDI**		**QSM11**	
	Coverage ends at whichever occurs first, months or hours of usage.		Coverage ends at whichever occurs first, months or hours of usage.	
	Months	Hours	Months	Hours
Government Service (GS)	24	1,000	24	1,000

Warranty Coverage Periods				
Rating	QSB, QSC, QSL, SDI, TDI		QSM11	
Light Commercial (LC)	24	1,000	NA	NA
Intermittent Duty (ID)	24	3,000	24	3,000
Medium Duty (MD)	24	5,000	24	6,000
Heavy Duty (HD)	24	5,500	24	8,000
Continuous Duty (CD)	24	6,500	24	9,000

Cummins MerCruiser Diesel Responsibilities

During Engine Warranty

CMD will pay for all parts and labor needed to repair the damage to the Product 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.

When it is necessary for mechanics to make on-site warranty repairs CMD will pay reasonable travel expenses, including meals, mileage and lodging, for mechanics to travel to and from the repair dock. Labor must be performed by an authorized CMD Repair Facility.

CMD will pay for the lubricating oil, antifreeze, filter elements, and other maintenance items that are not reusable due to the Warrantable Failure.

CMD will pay for reasonable labor costs for Engine removal and reinstallation when necessary to repair a Warrantable Failure.

Owner Responsibilities

During the Engine Warranty

Owner is responsible for the operation and maintenance of the Product as specified in the applicable CMD Operation and Maintenance Manual. Owner is also responsible for providing proof that all recommended maintenance has been performed. This warranty does not cover normal wear and tear of covered parts. Exceeding the operational parameters of the rating will void this Warranty. The Owner of the boat is ultimately responsible for ensuring the Engine is properly operated and maintained. The Warranty will be void on any Engines that are misapplied, not maintained properly or misused.

Before the expiration of the applicable warranty, Owner must notify a CMD service provider, distributor, authorized dealer, or other repair location approved by CMD 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 U.S. and Canada Sales and Service Directory; other locations are listed in the CMD International Sales and Service Directory.

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.

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.

In the event of any Product failure, Owner is responsible for the cost of towing the boat to the repair dock and for all associated docking and harbor charges.

Owner is responsible for maintaining the Engine hourmeter in good working order at all times and to ensure that the hourmeter accurately reflects the total hours of operation of the Product.

Owner is responsible for the costs to investigate complaints, unless the problem is caused by a defect in CMD material or factory workmanship.

Limitations

1. Maintenance Component Limitations

CMD will replace certain maintenance components if they fail within 90 days or less after the base coverage starts. Maintenance components include but are not limited to: sea water pump impellers, zinc plugs, oil filters, fuel filters, air filters, water filters, fuel/water separator filters, expansion tank pressure caps, belts, hoses.

2. Other Component Limitations

CMD does not warrant components that are not supplied by CMD factory.

3. CMD supplied alternators and starters limitation

Warranty coverage is limited to 2 years or 2,000 hours, whichever expires first for rating other than Government Service.

Warranty coverage is limited to 2 years or 1,000 hours, whichever expires first for the Government Service rating.

Consumer Products

The warranty on Consumer Products in the United States is a limited warranty. **CMD 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 above limitations or exclusions may not apply to you.

CMD is not responsible for failures or damage resulting from what CMD determines to be abuse or neglect, including, but not limited to: operation without adequate coolants or lubricants; overfueling; overspeeding; lack of maintenance of cooling, lubricating or intake systems; improper storage, starting, warm-up, run-in or shutdown practices; unauthorized modifications to the engine; improper propping that does not allow the engine to run at its maximum rated speed; submersion, freezing temperatures, improper service, removal of parts, or running the engine out of water; water

ingestion, unless caused by a Warrantable failure. CMD is also not responsible for failures caused by incorrect oil or fuel or by water, dirt or other contaminants in the fuel or oil.

Before a claim for excessive oil consumption will be considered, Owner must submit adequate documentation to show that oil consumption exceeds CMD published standards.

CMD is not responsible for failures of maintenance components supplied by CMD beyond 90 days after the coverage duration start date. Maintenance components include, but are not limited to: sea water pump impellers; zinc plugs; oil filters; fuel filters; air filters; water filters; fuel/water separator filters.

Parts used in warranty repairs may be new CMD parts, CMD approved rebuilt parts, or repaired parts. CMD is not responsible for failures resulting from the use of parts not supplied by CMD.

A new CMD or CMD approved rebuilt part used to replace a Warranted Part assumes the identity of the Warranted Part it replaced and is entitled to the remaining coverage hereunder.

CMD DOES NOT COVER WEAR OR WEAROUT OF COVERED PARTS.

CMD IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

THESE WARRANTIES SET FORTH HEREIN ARE THE SOLE WARRANTIES MADE BY CMD IN REGARD TO THESE ENGINES. CMD MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, OR OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

Emission Warranty

Products Warranted

This Emission Warranty applies to new Engines certified to United States EPA 40 CFR 94 sold by CMD that are installed in vessels flagged or registered in the United States**.

Coverage

CMD warrants to the first user and each subsequent purchaser that the Engine is designed, built, and equipped so as to conform at the time of sale by CMD 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 5,000 hours of operation, whichever occurs first. The Emissions Warranty starts from the date of delivery of the Engine to the first user, or the date the unit is first leased, rented, or loaned, or when the Engine has been operated for 50 hours, whichever occurs first, or (B) The Base Engine Warranty.

Limitations

The owner may elect to have maintenance, replacement, or repair of the emission control parts performed by a facility other than a CMD distributor, an authorized dealer or a repair location approved by CMD, and may elect to use parts other than new genuine CMD or CMD approved rebuilt parts and assemblies for such maintenance, replacement or repair; however, the cost of such service or parts and subsequent failures resulting from such service or parts will not be covered under this emission control system warranty.

Failures, except those resulting from a defect in materials, or factory workmanship, are not covered by this WARRANTY.

CMD IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

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.

* 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.

** United States includes American Samoa, the Commonwealth of Northern Mariana Islands, Guam, Puerto Rico, and the U.S. Virgin Islands.

Notes

NOTES

CALIFORNIA
Proposition 65 Warning

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

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