CUMMINS QSX15 ENGINE

OWNERS MANUAL

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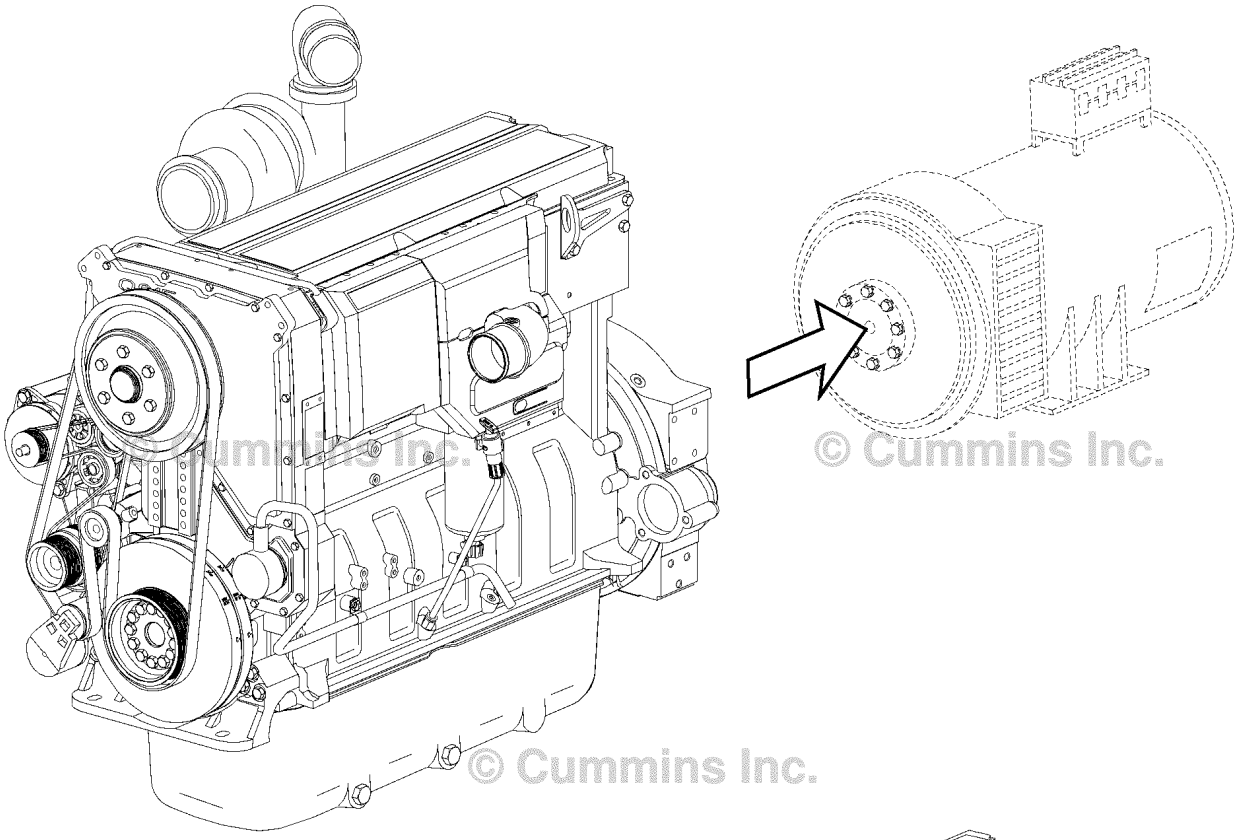
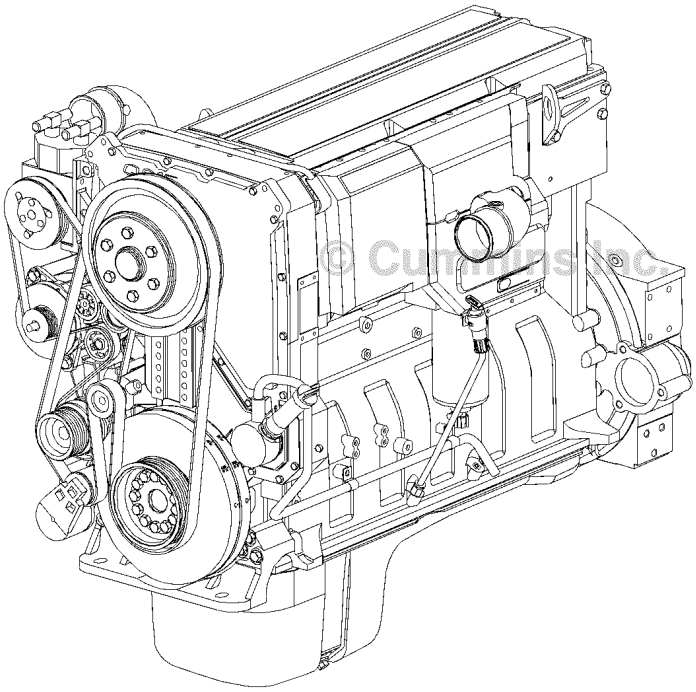
Owners Manual
QSX15 Industrial and Power Generation Engines





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Foreword

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

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

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

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

The latest technology and the highest quality components were used to produce this engine. When replacement parts are needed, we recommend using only genuine Cummins or ReCon® exchange parts.

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

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Table of Contents

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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		

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Section i - Introduction

Section Contents

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Symbols

General Information

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

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

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

Indicates a **REMOVAL or DISASSEMBLY** step.

Indicates an **INSTALLATION or ASSEMBLY** step.

INSPECTION is required.

CLEAN the part or assembly.

PERFORM a mechanical or time **MEASUREMENT**.

LUBRICATE the part or assembly.

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

TIGHTEN to a specific torque.

PERFORM an electrical **MEASUREMENT**.

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

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

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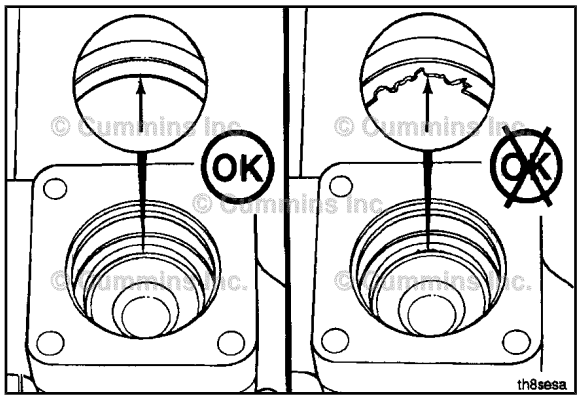
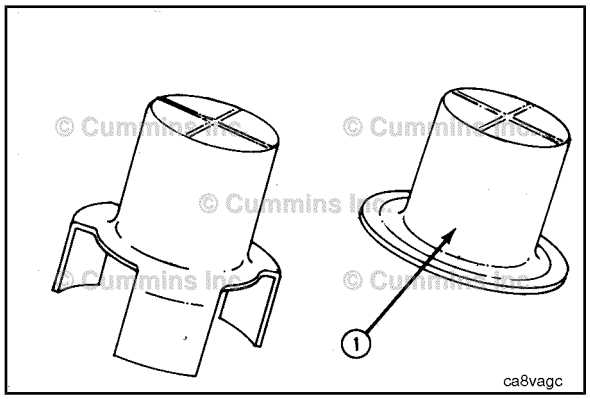


Illustrations

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.

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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.
- Do **not** perform any repair when fatigued or after consuming alcohol or drugs that can impair your functioning.
- Some state and federal agencies in the United States of America have determined that used engine oil can be carcinogenic and can cause reproductive toxicity. Avoid inhalation of vapors, ingestion, and prolonged contact with used engine oil.
- Liquified petroleum gas is heavier than air and can accumulate near the floor, in sumps, and low-lying areas.
- Natural gas is lighter than air and can accumulate under hood and awnings.
- To reduce the possibility of suffocation and frostbite, wear protective clothing and ONLY disconnect natural gas and liquified petroleum gas lines in a well ventilated area.
- Coolant is toxic. If **not** reused, dispose of in accordance with local environmental regulations.
- 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.

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- 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.

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Acronyms and Abbreviations

General Information

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

API	American Petroleum Institute
ASTM	American Society of Testing and Materials
BTU	British Thermal Unit
°C	Celsius
CARB	California Air Resources Board
C.I.D.	Cubic Inch Displacement
CNG	Compressed Natural Gas
CPL	Control Parts List
cSt	Centistokes
ECM	Electronic Control Module
EGR	Exhaust Gas Recirculation
EPA	Environmental Protection Agency
°F	Fahrenheit
FMI	Failure Mode Indentifier
GVW	Gross Vehicle Weight
LPG	Liquified Petroleum Gas
Hg	Mercury
hp	Horsepower
H_2O	Water
ICM	Ignition Control Module
km/l	Kilometers per Liter
kPa	Kilopascal
LNG	Liquid Natural Gas
LTA	Low Temperature Aftercooling
MPa	Megapascal
mph	Miles Per Hour
mpq	Miles Per Quart
N•m	Newton-meter
NG	Natural Gas
OEM	Original Equipment Manufacturer
PID	Parameter Identification Descriptions
ppm	Parts Per Million
psi	Pounds Per Square Inch
PTO	Power Takeoff
RGT	Rear Gear Train
rpm	Revolutions Per Minute
SAE	Society of Automotive Engineers
SCA	Supplemental Coolant Additive
STC	Step Timing Control
SID	Subsystem Identification Descriptions
VS	Variable Speed
VSS	Vehicle Speed Sensor

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Notes

Section E - Engine Identification

Section Contents

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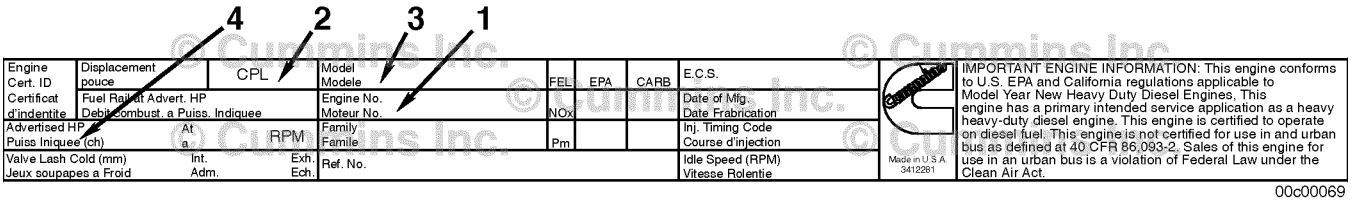
Engine Identification

Engine Dataplate



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The engine dataplate, located on top of the rocker lever cover, provides the model identification and other important data about the engine.

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

1. Engine serial number (ESN)
2. Control parts list
3. Model
4. Advertised horsepower and rpm.

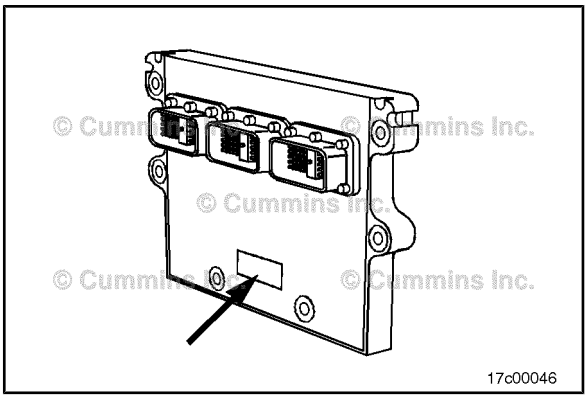
ECM Dataplate

Industrial Applications

The electronic control module (ECM) dataplate is located on the front of the ECM.

The abbreviations on the dataplate are explained as follows:

- P/N = Part number
- S/N = Serial number
- D/C = Data code.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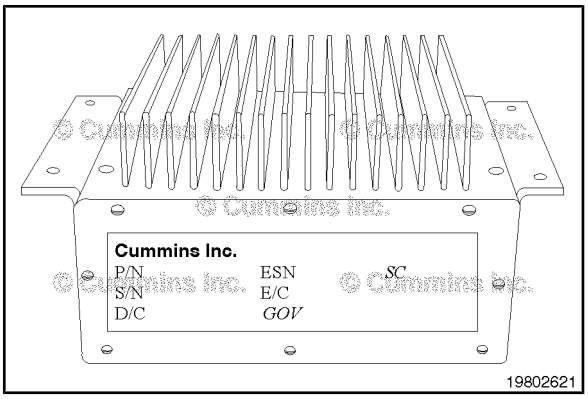
Power Generation

The electronic control module (ECM) dataplate is located on the front of the ECM.

The abbreviations on the dataplate are explained as follows:

- P/N = Part number
- S/N = Serial number
- D/C = Date code.



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Notes

Section 1 - Operating Instructions

Section Contents

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Operating Instructions - Overview

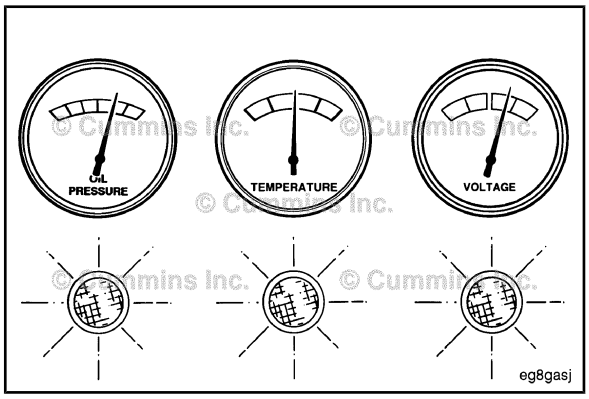
General Information

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

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

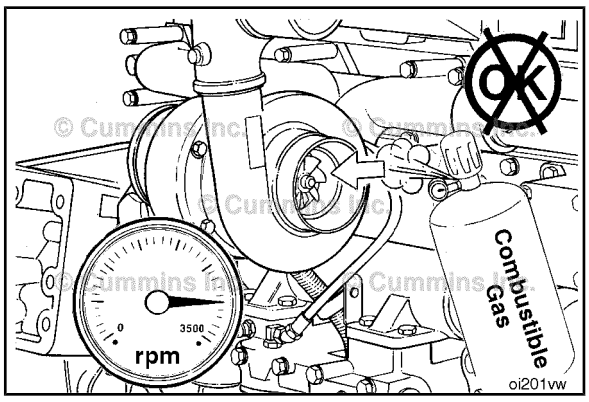
The **new** Cummins engine associated with this manual does **not** require a ”break-in” procedure. This section of the manual provides all of the necessary information required for proper engine operation.

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

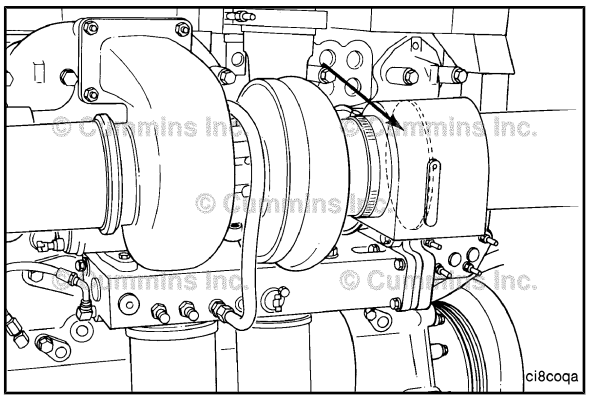


⚠ WARNING ⚠

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



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



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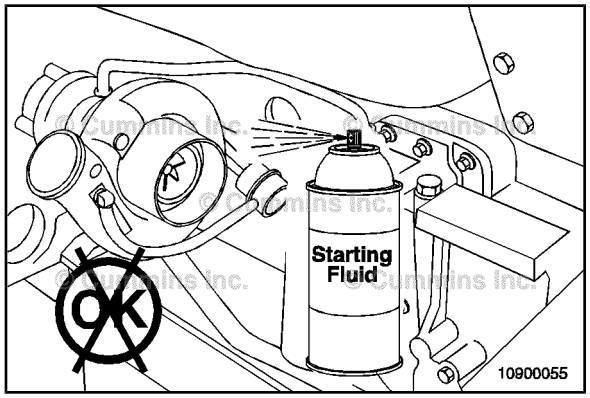
⚠CAUTION⚠

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

Cold Weather Starting

General Information

Follow the Normal Starting Procedures in this section. In cold weather, the engine can run at idle **only** longer.



Using Starting Aids

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

Starting Procedure After Extended Shutdown or Oil Change

General Information

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.

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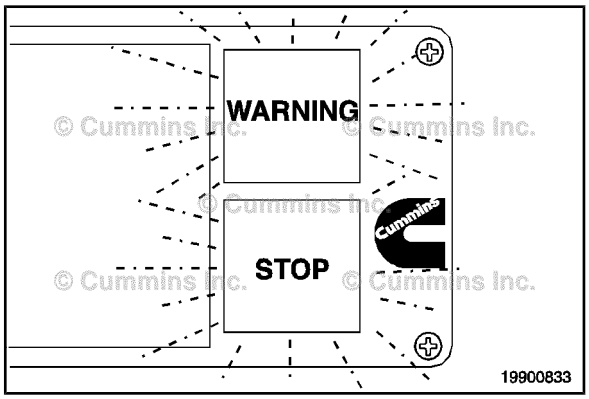
Normal Starting Procedure

General Information



The stop or stop engine lamp is red and indicates 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.

The warning or check engine lamp is yellow. When it illuminates, the engine is in need of repair at the first available opportunity.

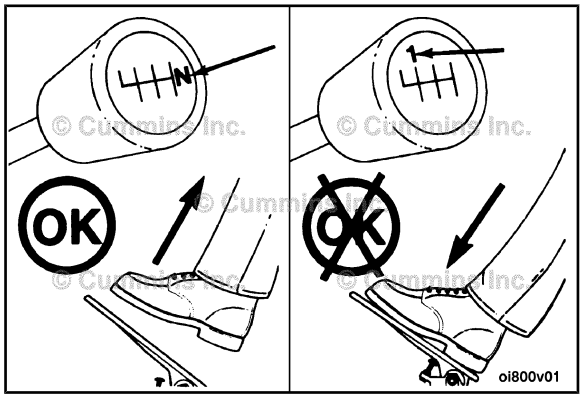
The yellow lamp will flash for 30 seconds at key-on when one of the following occurs:

- Maintenance required (if maintenance monitor is enabled)
- Water-in-fuel is detected.

If the warning light flashes for 30 seconds at key-on and water is drained from the primary water-separating fuel filter, then the secondary fuel filter **must** be replaced.

⚠WARNING⚠

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



⚠CAUTION⚠

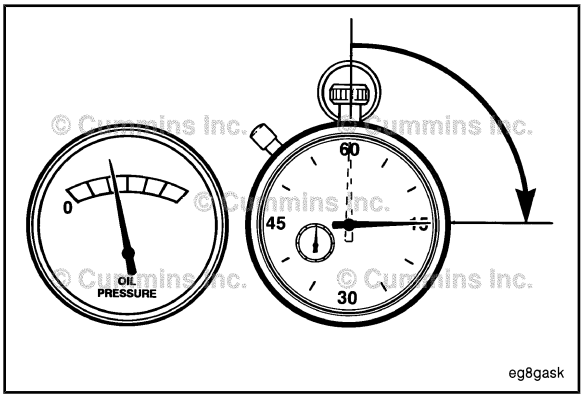
To prevent damage to the starting motor, do not engage the starting motor for more than 30 seconds. Wait 2 minutes between each attempt to start (electrical starting motors only).

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

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

⚠CAUTION⚠

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



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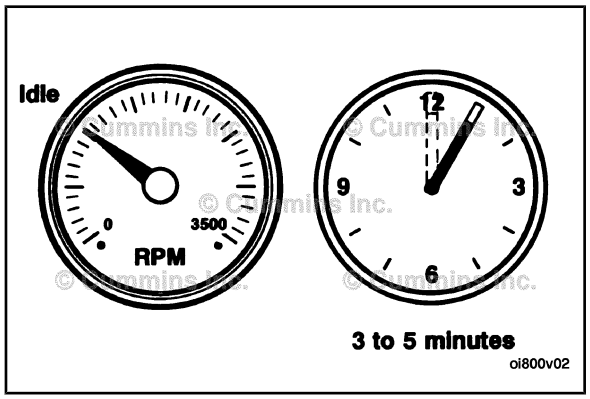
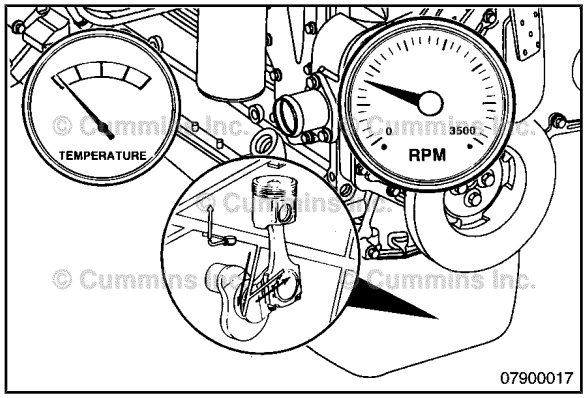
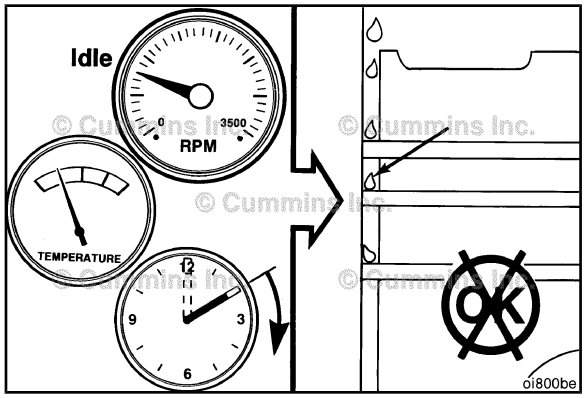


Idle the engine 3 to 5 minutes before operating with a load.



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



⚠CAUTION⚠

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

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

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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.

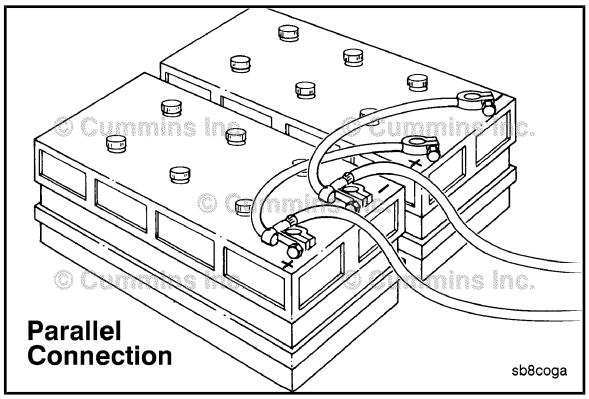
△CAUTION△

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.

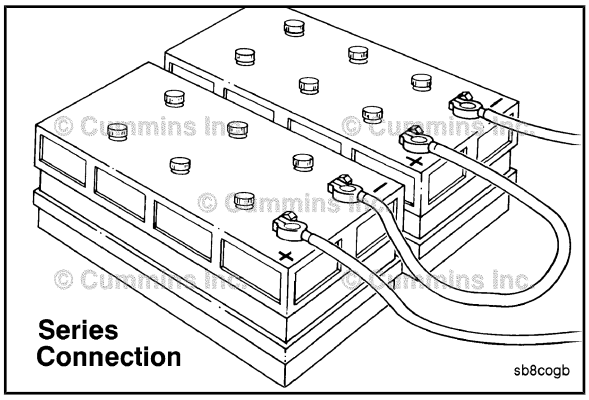
△CAUTION△

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

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



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

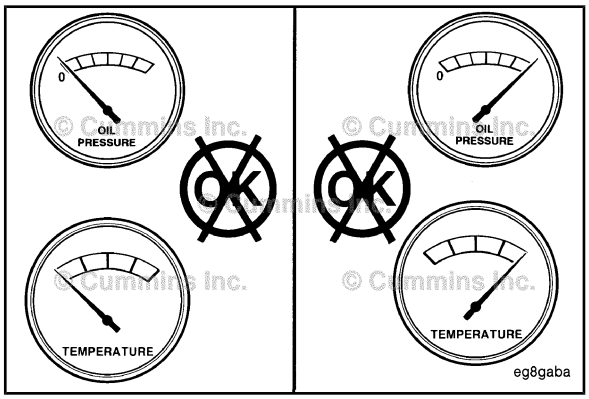


Operating the Engine

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.



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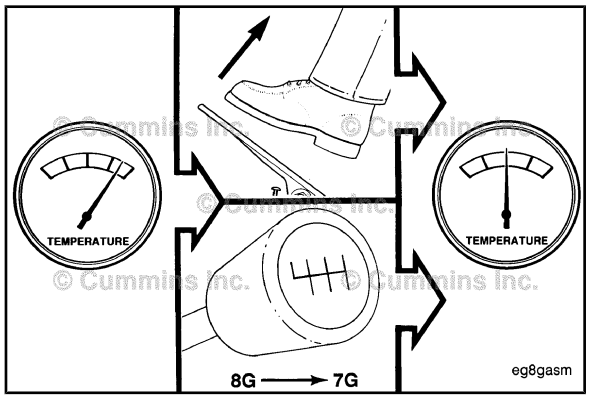
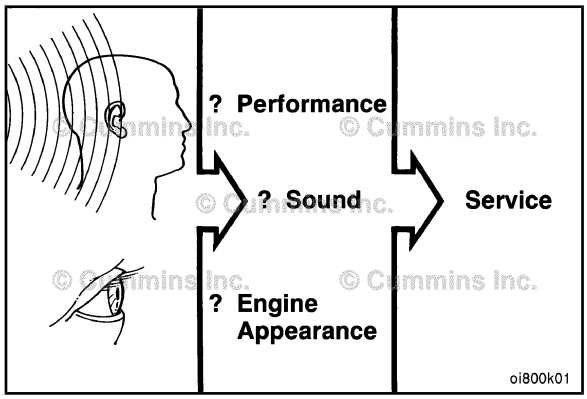


If an overheating condition starts to occur, reduce the power output of the engine by releasing the accelerator pedal or lever or shifting the transmission to a lower gear, or both, until the temperature returns to the normal operating range. If the engine temperature does **not** return to normal, shut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



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

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

Cold Weather

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

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

Ambient Temperature

0 to -32°C [32 to -25°F]

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

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

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

-32 to -54°C [-25 to -65°F]

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

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

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

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

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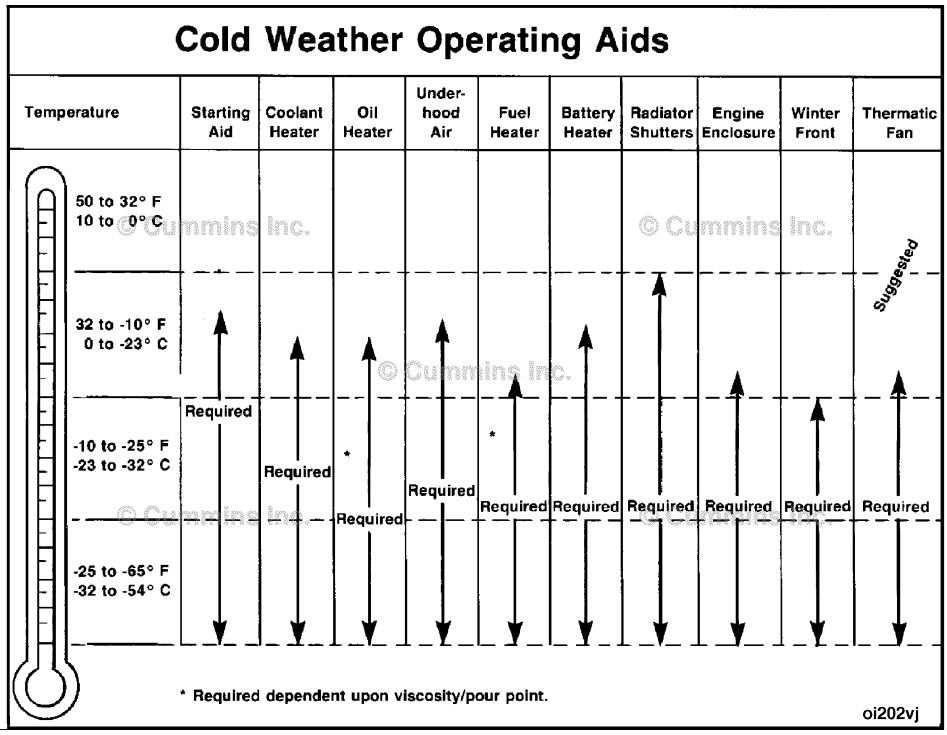

Winterfronts and Shutters

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).

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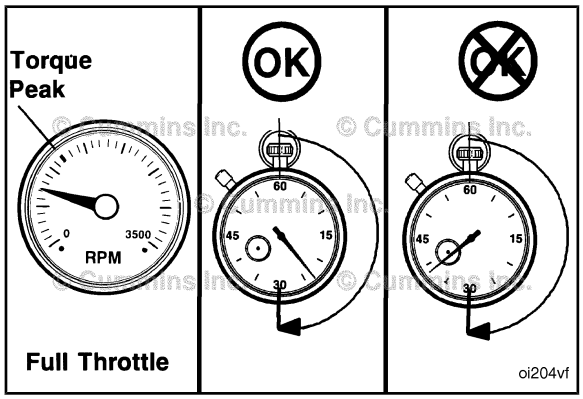


Engine Operating Range

General Information

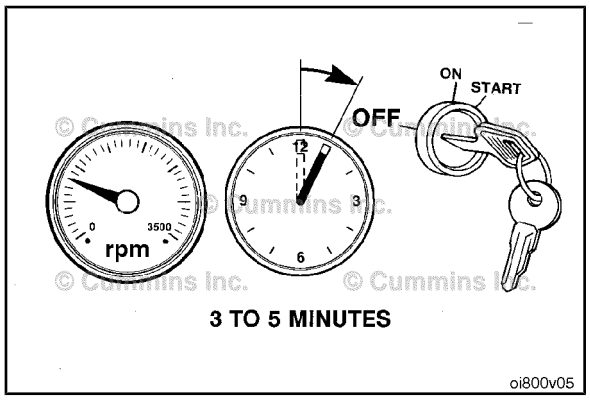
⚠CAUTION⚠

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

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

⚠CAUTION⚠

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



Engine Shutdown

General Information

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

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

Electromagnetic Interference (EMI)

General Information

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

System EMI Susceptibility

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

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System EMI Radiation Levels

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

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

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

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Notes

Section 2 - Maintenance Guidelines

Section Contents

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Maintenance Guidelines - Overview

General Information

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

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

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

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

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

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Maintenance Schedule

General Information

Daily or Refueling - Maintenance Check (1)

- Air Intake Piping - check
- Air Tanks and Reservoirs - drain
- Charge Air Piping - check
- Coolant Level - check
- Cooling Fan - check
- Crankcase Breather Tube - check
- Drive Belts - check
- Fuel-Water Separator - drain
- Lubricating Oil Level - check

Every 250 Hours, or 6 Months(1), (4)

- Lubricating Oil and Filters - change
- Supplemental Coolant Additive (SCA) and Antifreeze Concentration - check

Every 1,500 Hours, or 1 Year (2), (3)

- Air Cleaner Restriction - check
- Air Leaks, Air Intake and Exhaust Systems - check
- Cooling Fan Belt Tensioner - check
- Coolant Filter - replace
- Engine Wiring Harness - check
- Fuel Filter (Spin-On Type) - replace

Every 6,000 Hours, or 2 Years (3)

- Cold Weather Starting Aids - check
- Crankcase Breather Tube - check
- Engine Hoses - check
- Engine Mounting Bolts - check
- Engine Steam Cleaning - clean
- Vibration Damper, Viscous - inspect for reuse
- Overhead Set - adjust

Every 10,000 Hours, or 5 Years(3)

- Air Compressor Discharge Lines - check
- Fan Hub, Belt Driven - replace

Oil Drain Intervals

All Others Without EGR

Select oil drain interval based on oil classification for Recreational Vehicle, Refuse, Mixer, Dump, Delivery, Logging, Fire Truck or Crane vehicle applications.

Oil Classification	Kilometers	Miles	Hours	Months
CES 20071	11,500	7,000	300	6
CES 20076 and CES 20078, CES 20081[1]	14,500	9,000	400	6

If your application is **not** one of the above, select the oil drain interval Severe Duty, Normal Duty, or Light Duty based on how you use your engine. See Oil Drain Intervals by severity km [mi] located in this section.

- Follow oil drain interval Severe Duty if your vehicle operates under either of the conditions listed in interval Severe Duty.
- Follow oil drain interval Normal Duty if your vehicle operates under either of the conditions listed in interval Normal Duty and does **not** meet any of the conditions listed in interval Severe Duty.
- Follow oil drain interval Light Duty if your vehicle operates under both of the conditions listed in interval Light Duty and does **not** meet any of the conditions listed in interval Severe Duty or interval Normal Duty.

1. When used with ultra-low sulfur diesel fuel (15 ppm sulfur). If the sulfur content of the fuel is greater than 15 ppm, the oil change intervals **must** be reduced by 20 percent.

1. When used with ultra-low sulfur diesel fuel (15 ppm sulfur). If the sulfur content of the fuel is greater than 15 ppm, the oil change intervals **must** be reduced by 20 percent.

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Oil Classification	Severe Duty	Normal Duty	Light Duty
	< 2.3 km/liter [5.5 mpg] or > 36,287 kg [80,000 lb] gross vehicle weight	2.3 to 2.8 km/liter [5.5 to 6.5 mpg] or 36,287 kg [80,000 lb] gross vehicle weight	> 2.8 km/liter [6.5 mpg] or < 31,751 kg [70,000 lb] gross vehicle weight
CES 20071	24,000 km [15,000 mi]	56,500 km [35,000 mi]	72,500 km [45,000 mi]
CES 20076 and CES 20078, CES 20081[1]	32,000 km [20,000 mi]	64,500 km [40,000 mi]	80,500 km [50,000 mi]

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

NOTE: If the sulfur content of the fuel is greater than 0.50 percent, the oil change intervals **must** be reduced by an additional 20 percent.

For industrial engines, the oil drain intervals are based on the duty cycle (as reflected by fuel consumption) and lubricating oil quality. The table below specifies the maximum oil drain interval for the listed lubricating oil classifications based on the three different duty cycles: Heavy, Medium, and Light.

- Follow oil drain interval Heavy Duty if your equipment uses more than 57 liter [15 gal] of fuel per hour.
- Follow oil drain interval Medium Duty if your equipment uses between 42 to 57 liter [11 to 15 gal] of fuel per hour.
- Follow oil drain interval Light Duty if your equipment uses less than 42 liter [11 gal] of fuel per hour.

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

Duty Cycle (Fuel Consumption)			
Oil Classification	**Heavy >57 liters/hour [14 gallons/hour]**	**Medium 42 to 57 liters/ hour [11 to 15 gallons/ hour]**	**Light < 42 liters/hour] [11 gallons/hour]**
API CD-4, CE-4, CF-4[1, 3]	125	250	375
API CG-4[3]	250	375	500
API CH-4[3]	400	525	650
CES 20076/CH-4[2, 3]	500	625	750

NOTE:

1. The oil classifications CD, CE, and CF have been obsoleted by API and **must not** be used, as their specifications are no longer controlled.
2. Valvoline Premium Blue and Premium Blue 2000 meet CES 20076 standards.
3. Refer to Procedure 018-003, Lubricating Oil Recommendations and Specifications, the lubricating oil filter specification table in Section V.

The table below list typical duty cycles by application.

NOTE: The actual duty cycle can vary from the below chart. In those cases, it is necessary to change the lubricating oil as a function of average fuel consumption. Therefore, select a column based on the representative fuel consumption range.

Typical Duty Cycles by Applications		
Heavy	**Medium**	**Light**
Air Compressor	Articulated Dump Truck	Crane
Combine	Irrigation Equipment	Rear Dump Truck
Dozer	Scraper	
Dragline	Skidder	
Excavator		
Farm Tractors		
Forage Harvester		
Rock Drill		
Tub Grinder		

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For Generator Drive engines, this service interval is based on load factor (as reflected by fuel usage), lubricating oil quality, lubricating system capacity, and operating speed 1,500 rpm (50 Hz) or 1,800 rpm (60 Hz). Premium grade oils (API CG-4, CH-4, and CES 20076) are recommended for the QSX15 engine. The oil grades CD, CE, and CF have been obsoleted by API and **must not** be used, as their specifications are no longer controlled. There are two recommended methods for determining the proper oil change interval:

- Fixed hour method; based on fixed hours of operation or months of service, whichever occurs first.
- Chart method; based on known fuel consumption rates.

If the chart method is **not** used or, for all stand-by power applications, the oil **must** be changed at a regular interval or 12 months, whichever occurs first:

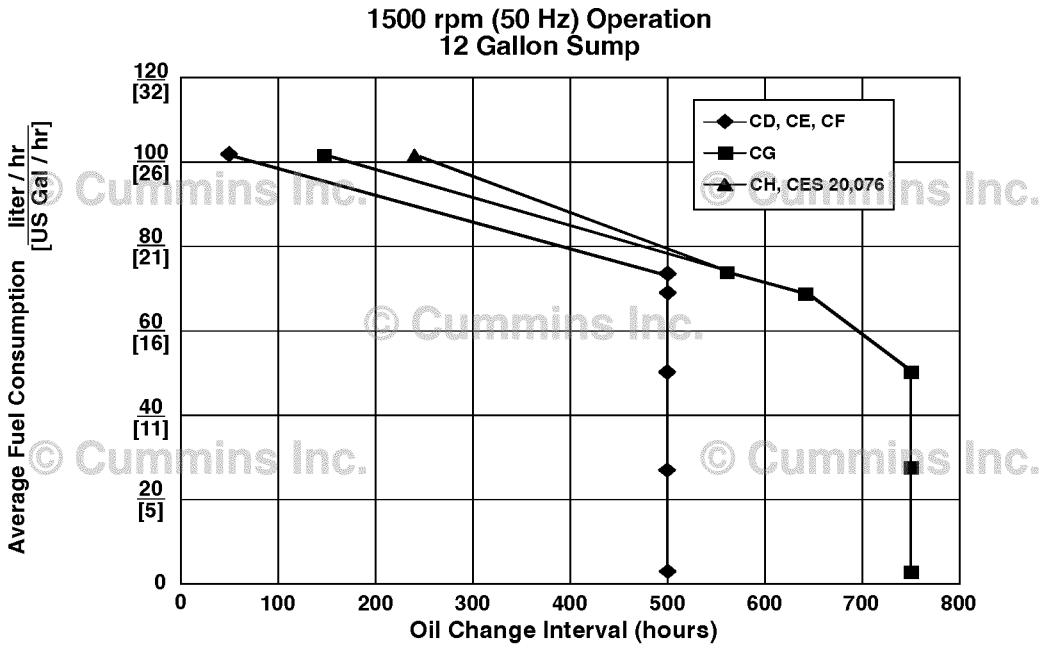
Operating Speed	Sump Size	Change Interval
1,500 rpm (50 Hz)	45 liters [12 gal]	125 Hours or 12 Months
	45 liters [12 gal]	250 Hours or 12 Months
1,800 rpm (60 Hz)	95 liters [25 gal]	250 Hours or 12 Months
	95 liters [25 gal]	500 Hours or 12 Months

The chart method is recommended to provide the lowest total cost of operation while still protecting the engine. Due to differing availability outside North America, lower grade oil (CD, CE, and CF) are also depicted, however their classifications have been obsoleted by API, and oil change intervals are greatly reduced.

The charts **must** be used as guidelines because actual oil drain intervals will also depend on operation and maintenance practices. It is suggested that oil analysis **must** be used periodically for prime power applications (every 100 hours) to make sure the proper oil change interval is being applied.

To use the charts, locate the chart for the appropriate sump size and operating speed. Find the fuel consumption rate in U.S. gallons per hour or liters per hour on the left vertical axis. Draw a horizontal line from left to right across the chart, parallel with the bottom of the chart, until it intersects the curve.

From the intersection point on the curve, draw a line perpendicular to the bottom of the chart. The number the line intersects across the bottom of the chart represents the recommend oil change interval in hours.



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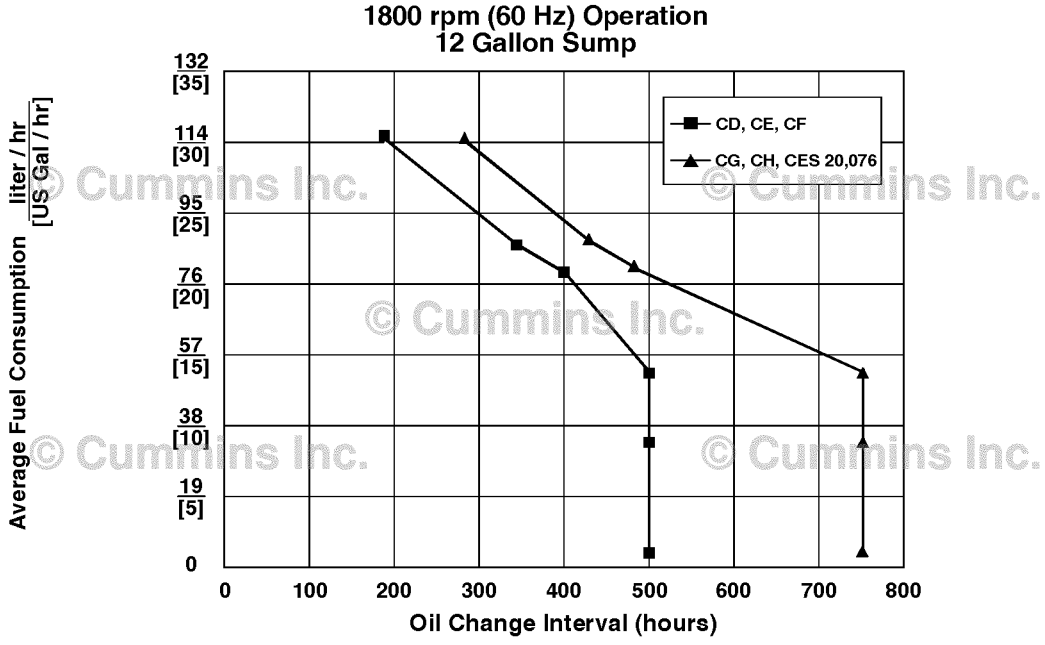

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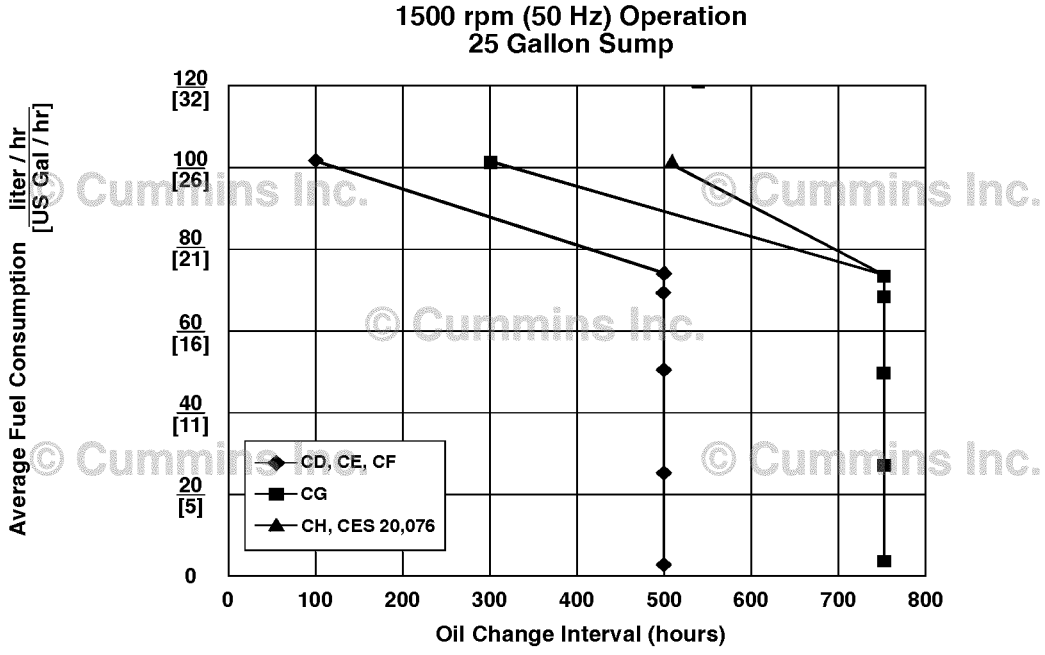

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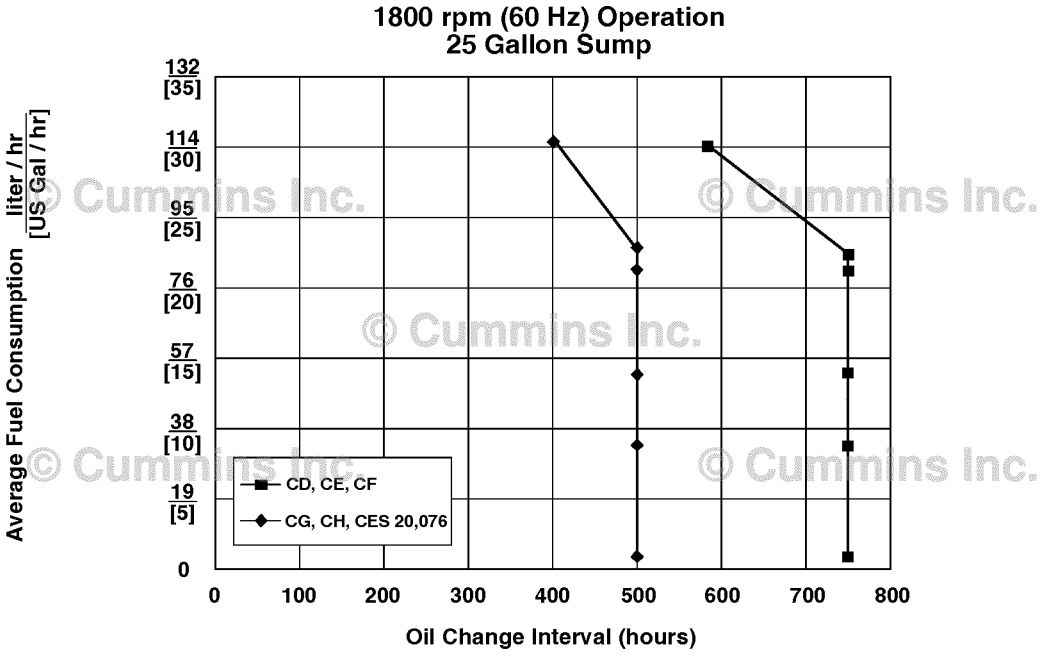

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Maintenance Record Form

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

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Notes

Section L - Service Literature

Section Contents

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Additional Service Literature

General Information

The following publications can be purchased:

Bulletin Number	Title of Publication
3379001	Fuel for Cummins Engines
3810340	Cummins Engine Oil Recommendations
3387251	Coolant Additives and Filtration
3387266	Cold Weather Operation
3666209	Cooling System Maintenance Extended Interval
3666239	Troubleshooting and Repair Manual, Signature, ISX, and QSX15 Engines
3666259	Troubleshooting and Repair Manual, Electronic Control System, Signature ISX, and QSX15 Engines
3666393	Troubleshooting and Repair Manual Generator-Drive Control System QSX15, QSK45, and QSK60 Engines
3666394	Troubleshooting and Repair Manual PowerCommand Control QSX15, QSK45, and QSK60 Generator Sets
3666414	QSX15 Industrial Wiring Diagram
3666349	QSX15 Generator Drive Wiring Diagram
3666466	QSX15 PowerCommand Control Wiring Diagram

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Service Literature Ordering Location
Contact Information

Region	Ordering Location
United States and Canada	Cummins Distributors or Credit Cards at 1-800-646-5609 or Order online at www.powerstore.cummins.com
All Other Countries	Cummins Distributors or Dealers

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Cummins Customized Parts Catalog

General Information

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

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

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

Additional Features of the Customized Catalog include:

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

Ordering the Customized Parts Catalog

Ordering by Telephone

North American customers can contact their Cummins Distributor or call Gannett Direct Marketing Services at 1-800-646-5609 and order by credit card. Outside North America order on-line or make an International call to Gannett at (+ +)502-454-6660.

Ordering On-Line

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

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

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

- Customer Name
- Street Address
- Company Name (optional)
- Telephone no.
- Credit Card No.
- Cummins Engine Serial Number (located on the engine data plate)
- Please identify the required media: Printed Catalog, CD-ROM, or PDF File

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

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.

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Notes

Section V - Maintenance Specifications

Section Contents

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General Engine

Specifications

Listed below are general specifications for this engine.

Horsepower.....Refer to the engine dataplate.
Engine Speed.....Refer to the engine dataplate.
Engine Speed
400 to 450 hp.....1800 rpm
500 to 600 hp.....2000 rpm
Displacement.....15 liters [912 C.I.D.]
Bore and Stroke.....137 mm [5.40 in] x 169 mm [6.65 in]
Dry Engine Weight:
Power Generation.....1370 kg [3020 lb]
Industrial.....1524 kg [3360 lb]
Wet Engine Weight:
Power Generation.....1475 kg [3250 lb]
Industrial.....1628 kg [3590 lb]

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Lubricating Oil System

Specifications

Oil Pressure at Idle (minimum allowable at 93°C [200°F] oil temperature).....103 kPa [15 psi]
Oil Pressure at No-Load Governed Speed (automotive and industrial **only**).....241 to 276 kPa [35 to 40 psi]
Oil Capacity of Standard Engine:
  Combination Full-Flow/Bypass Filter Capacity.....3.78 liters [1 gal]
Oil Pan Capacity:
Automotive and Industrial
  High.....41.6 liters [11 gal]
  Low.....34.1 liters [9 gal]
Power Generation (for oil pan option OP1493)
  High.....83.3 liters [22 gal]
  Low.....72.0 liters [19 gal]
Oil Change Capacity (oil pan and filter filled to capacity):
  Automotive and Industrial.....45.4 liters [12 gal]
  Power Generation (for oil pan option OP1493).....87.0 liters [23 gal]
Total Lubricating Oil System Capacity Including Filter:
  Automotive and Industrial.....45.4 liters [12 gal]
  Power Generation (for oil pan option OP1493).....98.4 liters [26 gal]
Oil Pressure Range:
  Cold Engine.....Up to 900 kPa [130 psi]
  Warm Engine.....241 to 276 kPa [35 to 40 psi]

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General Information

Cummins Inc. recommends the use of fully-formulated antifreeze or coolant containing a precharge of supplemental coolant additive (SCA). The antifreeze or coolant **must** meet the specifications outlined in The Maintenance Council (TMC) Recommended Practice (RP) 329 (ethylene glycol) or RP 330 (propylene glycol). The use of fully-formulated antifreeze or coolant significantly simplifies cooling system maintenance.

Copies of TMC specifications can be obtained through Cummins Inc., or by contacting:

The Maintenance Council
American Trucking Association
2200 Mill Road
Alexandria, VA 33314-5388
Phone: (703) 838-1763
Fax (703) 836-6070

Fully-formulated antifreeze contains balanced amounts of antifreeze, SCA, and buffering compounds, but does **not** contain 50 percent water. Fully-formulated coolant contains balanced amounts of antifreeze, SCA, and buffering compounds already premixed 50/50 with deionized water.

The following pages explain water, antifreeze, and SCA's and how to test antifreeze and SCA levels.

This section also contains information on cooling system maintenance and a coolant treatment chart that is used to determine the correct SCA service filter.

Alternative maintenance practices for cooling systems can be found in Cummins Coolant Requirements and Maintenance, Bulletin 3666132.

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Cummins/Fleetguard® Filter Specifications

Specifications

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

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

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

Cummins Inc. requires a lubricating oil filter be used that meets Cummins Source Approval Method 10,765.

Filter Type	
Lubricating Oil Filter	
Cummins Part Number	3406810 and 3406809
Fleetguard® Part Number	LF9000 and LF9001
Fuel-Water Separator	
Cummins Part Number	4010650 and 4010651
Fleetguard® Part Number	FS1007 and FS1040
Coolant Filter	
Fleetguard® Part Number	WF2125[1] WF2126[2] WF2127[3]

1. This filter is designed for use with Fleetguard®'s extended service cooling system, which extends cooling system service to 1 year, 150,000 miles, or 4000 hours, whichever comes first. This filter is used for cooling systems up to 20 gallons. Refer to Coolant Requirements and Maintenance, Bulletin 3666132. Fleetguard® ES coolant **must** be used for all fill and top-off, which is critical for extended cooling system maintenance intervals.
2. This filter is designed for extended service intervals up to 50,000 miles when using TMC RP329 or RP330 coolants and is used for cooling systems up to 20 gallons. Refer to Coolant Requirements and Maintenance, Bulletin 3666132.
3. This filter has been designed for extended service intervals of 50,000 to 150,000 miles. It has no chemical additives and can be used in the following systems:

- Cooling systems above 20 gallons in capacity.
- See maintenance chart below.

When using WF2127 filter, the following volumes of treatment **must** be added at the designated mileages:

Cooling System Capacity	50,000-Mile Service Interval with RP329/330 Coolant or Treated Water (Fleetcool or DCA4)	150,000-Mile Service Interval with ES Coolant (ES Liquid)
0 to 20 gallons	1 qt (10 units)	1 qt (15 units)
20 to 40 gallons	2 qt (20 units)	2 qt (30 units)
40 to 60 gallons	3 qt (30 units)	3 qt (45 units)
60 to 80 gallons	4 qt (40 units)	4 qt (60 units)
80 to 100 gallons	5 qt (50 units)	5 qt (75 units)

NOTE: Filters **must** meet Cummins SAM 10,769. Fleetguard® filters meet Cummins SAM 10,769. The standard filter for the Signature engine is Fleetguard® WF2126. For systems larger than 100 gallons, use 1 quart per 15 gallons. Consult vehicle manufacturer for total cooling system capacity.

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Fuel Recommendations and Specifications

Fuel Recommendations

⚠WARNING⚠

Do not bleed the fuel system of a hot engine; this can result in fuel spilling onto a hot exhaust manifold, which can cause a fire.

⚠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⚠

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

Fuel Recommended Properties

Cummins Inc. recommends the use of fuels that meet the following specifications:

Property	Recommended Specifications
Viscosity (ASTM D445)	1.3 to 4.1 centistokes [1.3 to 4.1 mm per second] at 40°C [104°F].
Cetane Number (ASTM D613)	40 Minimum above 0°C [32°F]. 45 Minimum below 0°C [32° F].
Sulfur Content (ASTMD129 or 1552)	**Not** to exceed 0.05 mass percent for engines without aftertreatment devices. For engines with aftertreatment devices, sulfur content can **not** exceed 0.0015 (15 ppm) mass percent.
Active Sulfur (ASTM D130)	Copper Strip Corrosion **not** to exceed Number 3 rating after three hours at 50°C [122°F].
Water and Sediment (ASTM D1796)	**Not** to exceed 0.05 volume percent.
Carbon Residue (Rams bottom, ASTM D524 or Conradson, ASTM D189)	**Not** to exceed 0.35 mass percent on 10 volume percent residuum.
Density (ASTM D287)	42 to 30° API gravity at 0.816 to 0.876 g/cc at 15°C [60°F].
Cloud Point (ASTM D97)	6°C [10°F] below lowest ambient temperature at which the fuel is expected to operate.
Ash (ASTM D482)	**Not** to exceed 0.02 mass percent (0.05 mass percent with lubricating oil blending). Oil blending is prohibited on engines with aftertreatment devices.
Distillation (ASTM D86)	The distillation curve **must** be smooth and continuous.
Acid Number (ASTM D664)	**Not** to exceed 0.1 mg KOA per 100 ml.

1. For additonal information on fuel recommendations and specifications, refer to Fuel for Cummins Engines, Bulletin 3379001. See ordering information in the back of this manual.

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Lubricating Oil Recommendations and Specifications

General Information

Industrial Applications

The use of high-quality engine lubricating oils and appropriate oil drain and filter change intervals are critical factors in maintaining engine performance and durability.

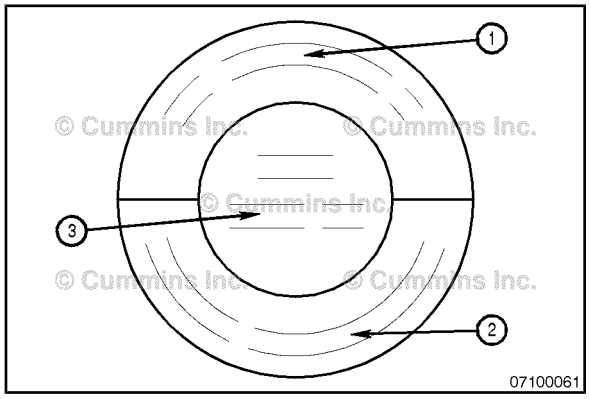
Cummins Inc. recommends the use of a high-quality 15W-40 multiviscosity heavy-duty engine oil that meets the requirements in Cummins Engineering Specification CES 20071 or CES 20076 (such as Valvoline® Premium Blue® or Premium Blue® 2000). American Petroleum Institute (API) specification CH-4 can be used as an alternative to CES 20071. Oils that meet API specification CG-4 can be used, but at a reduced drain interval according to the Oil Drain Intervals chart listed in Section 2. The oil grades CC, CD, CE, and CF have been obsoleted by API and **must not** be used.

Shortened drain intervals can be required with monograde oils as determined by close monitoring of the oil condition with scheduled oil sampling. Use of single-grade oils can affect engine oil control.

Synthetic engine oils, API category III, are recommended for use in Cummins engines operating in ambient temperature conditions consistently below -25°C [-13°F]. Above this temperature, petroleum-based multigrade lubricants are recommended. Synthetic 0W-30 oils that meet API category III 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.

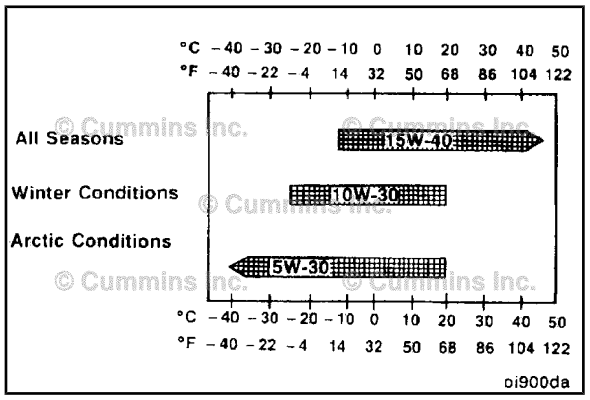
For further details and an explanation of engine lubricating oils for Cummins engines, refer to Cummins Engine Oil Recommendations, Bulletin 3810340.

Additional information regarding lubricating oil availability throughout the world is available in the Engine Manufacturing Association (EMA) Lubricating Oils Data Book for Heavy-Duty Automotive and Industrial Engines. The data book can be ordered from Engine Manufacturers Association, Two North LaSalle Street, Chicago, IL 60602; (312) 827-8733, (321) 827-8700, (www.engine-manufacturers.org).



The API service symbols are shown in the accompanying illustration.

1. The upper half of the symbols displays the appropriate oil categories.
2. The lower half contains words to describe oil energy-conserving features.
3. The center section identifies the SAE oil viscosity grade.



Oil viscosity should be chosen according to the typical climate conditions experienced by the user. Use of 15W-40 is recommended for the best engine durability at higher ambient temperature. For temperate or cold conditions, 10W-30 or 5W-30 viscosity can be used for easier starting, improved oil flow, and improved fuel economy.

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AfterMarket Oil Additive Usage

Cummins Inc. does **not** recommend the use of aftermarket oil additives. Current high-quality fully additive engine lubricating oils are very sophisticated, with precise amounts of additives blended into the lubricating oil to meet stringent requirements defined in 1) Cummins Engineering Specification CES 20076 that is similar to API CH-4, in 2) CES 20078 that is similar to API CI-4, and in 3) CES 20081 that is similar to API CJ-4. These furnished 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 capability to protect the engine.

New Engine Break-in Oils

Special "break-in" engine lubricating oils are **not** recommended for new or rebuilt Cummins® engines. Use the same lubricating oil that will be used during normal operation.

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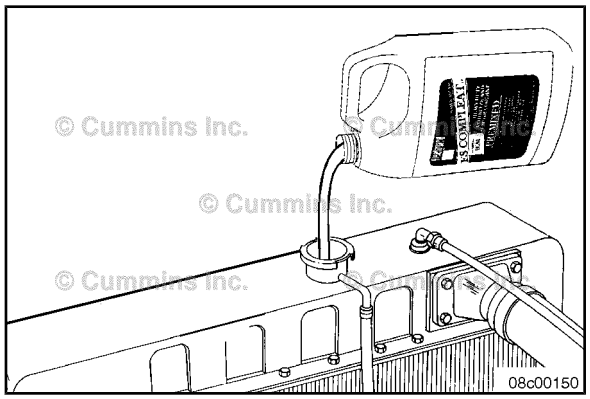


Coolant Recommendations and Specifications

Fully Formulated Coolant/Antifreeze

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. The fully formulated antifreeze or coolant **must** meet TMC RP329 or TMC RP330 specifications.

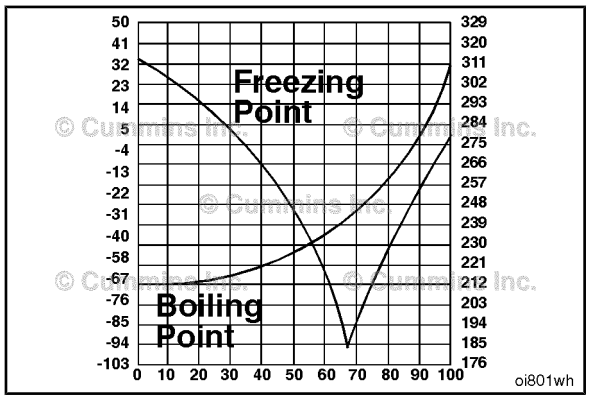
NOTE: Use of products meeting TMC RP329 or RP330 is necessary for 50,000-mile and 150,000-mile service intervals.

NOTE: Low-silicate antifreeze meeting ASTM D4985 is inadequate for these extended service intervals.

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)
Sulfate	100 ppm as (SO_4)

Cummins Inc. recommends using Fleetguard® COMPLEAT ES. It is available in glycol forms (ethylene and propylene) and complies with TMC RP329 and RP330 standards.



Fully formulated antifreeze **must** be mixed with quality water at a 50/50 ratio (40-percent to 60-percent working range). A 50/50 mixture of antifreeze and water gives a -36°C [-34°F] freezing point and a 110°C [228°F] boiling point, which is adequate for locations in North America. The actual lowest freezing point of ethylene glycol antifreeze is 68 percent. Using higher concentrations of antifreeze will raise the freezing point of the solution and increase the possibility of a silica gel problem.

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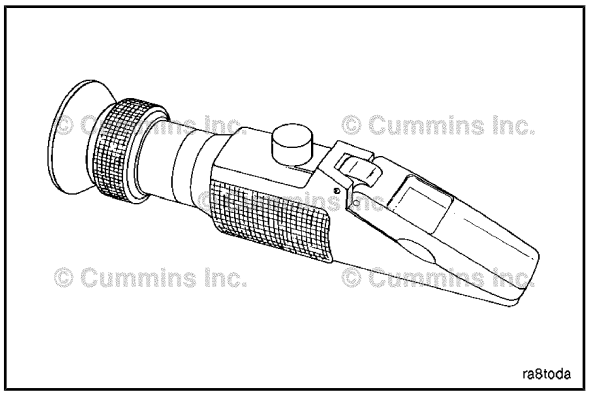
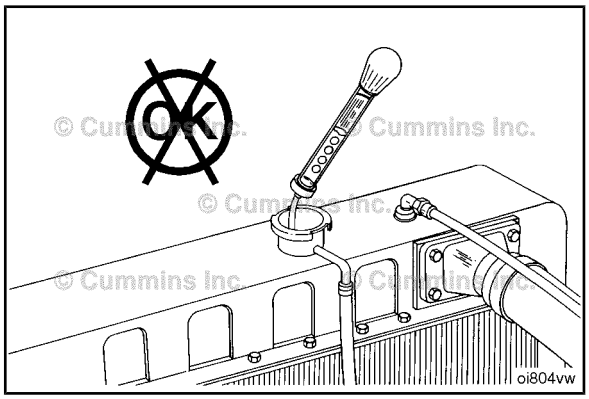
A refractometer **must** be used to measure the freezing point of the coolant **accurately**.



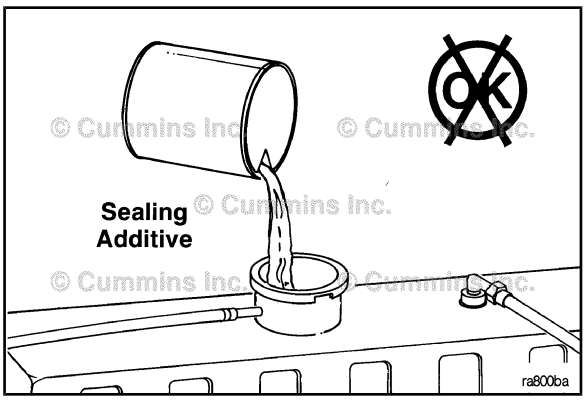
Do **not** use a floating ball hydrometer. Using a floating ball hydrometer can give an incorrect reading.



Cooling System Sealing Additives

Do **not** use sealing additives in the cooling systems. The use of sealing additives can:

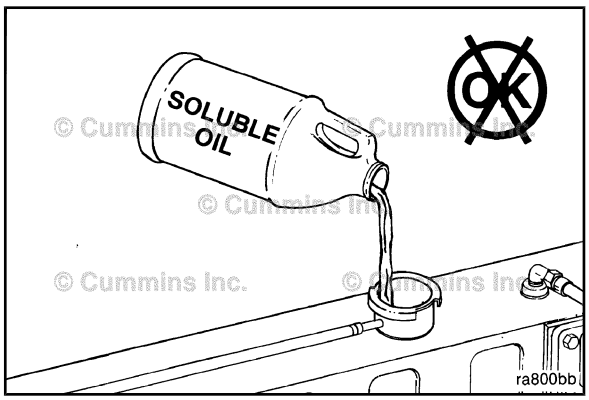
- Build up in coolant low-flow areas
- Clog coolant filters
- Plug radiator and oil cooler.



Cooling System Soluble Oils

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

- Allow cylinder liner pitting
- Corrode brass, aluminum, and copper
- Damage heat transfer surfaces
- Damage seals and hoses.



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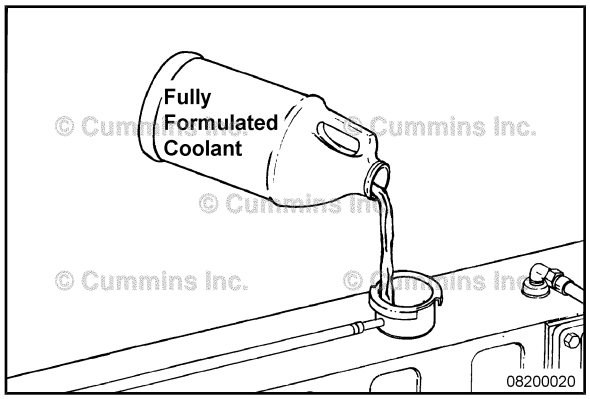

Supplemental Coolant Additive (SCA)

⚠CAUTION⚠

The Signature, ISX, and QSX15 engines use aluminum parts that are in contact with the coolant. Improper coolant, coolant filter selection, and maintenance will likely result in perforation of one of these parts. Insufficient concentration of the coolant additives will result in liner pitting and engine failure.

Fully formulated products contain SCAs and are required to protect the cooling system from scale and fouling, solder corrosion, and general corrosion. The coolant filter is required to protect the cooling system from abrasive materials, debris, and precipitated coolant additives.

Fleetguard® DCA4 Service Filters and Liquid Precharge

Signature, ISX, and QSX15 Series Coolant Filter Options

WF2125 - This filter is designed for use with Fleetguard®'s extended service cooling system, which extends cooling system service to 1 year, 150,000 miles, or 4000 hours, whichever comes first. This filter is used for cooling systems up to 20 gallons. Refer to Coolant Requirements and Maintenance, Bulletin 3666132. Fleetguard® ES coolant **must** be used for all fill and top-off, which is critical for extended cooling system maintenance intervals.

WF2126 - This filter is designed for extended service intervals up to 50,000 miles when using TMC RP329 or RP330 coolants and is used for cooling systems up to 20 gallons. Refer to Coolant Requirements and Maintenance, Bulletin 3666132.

WF2127 - This filter has been designed for extended service intervals of 50,000 to 150,000 miles. It has no chemical additives and can be used in the following systems:

- Cooling systems above 20 gallons in capacity.
- See maintenance chart below.

When using WF2127 filter, the following volumes of treatment **must** be added at the designated mileages:

Cooling System Capacity	50,000-Mile Service Interval with RP329/330 Coolant or Treated Water (Fleetcool or DCA4)	150,000-Mile Service Interval with ES Coolant (ES Liquid)
0 to 20 gallons	1 qt (10 units)	1 qt (15 units)
20 to 40 gallons	2 qt (20 units)	2 qt (30 units)
40 to 60 gallons	3 qt (30 units)	3 qt (45 units)
60 to 80 gallons	4 qt (40 units)	4 qt (60 units)
80 to 100 gallons	5 qt (50 units)	5 qt (75 units)

NOTE: Filters **must** meet Cummins SAM 10,769. Fleetguard® filters meet Cummins SAM 10,769. The standard filter for the Signature engine is Fleetguard® WF2126. For systems larger than 100 gallons, use 1 quart per 15 gallons. Consult vehicle manufacturer for total cooling system capacity.

Testing SCA Concentration Level CC-2602 Test Kit

Precautions and Instructions for Proper Kit Use

Carefully follow the instructions to test the coolant. Take the appropriate action recommended by the kit.

- The coolant sample to be tested **must** be between 10 and 54 °C [50 and 130°F]. If the sample is too cold or too hot, you will get incorrect results.
- To get the best color match results, compare test strip pads to the color chart in daylight or under cool white fluorescent lighting. If unsure about a specific color match when a test does fall between two colors on the color chart, choose the lower numbered (or lettered) block. It is safer to underestimate your results than to overestimate.
- The test strips do have a limited shelf life and are sensitive to humidity and extreme heat. Proper handling and storage is necessary to protect the life of the strips.
- Keep the cap tightly sealed on the test strip bottle **except** when removing a strip. Store away from direct sunlight and in an area where the temperature will generally stay below 32°C [90°F].

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- Do **not** use the test strips after the expiration date stamped on the bottle.
- Discard the kit if the top pad on the unused strips have turned light brown.
- Use one strip at a time and take care **not** to touch any of the pads on the strip. Doing so will contaminate the pads and skew the test results.
- If the strip container is left uncapped for 24 hours, moisture in the air will render the strips useless, even though no discoloration will be evident.
- **Only** use the color chart supplied with the kit.
- Following the correct test times is very important. Use a clock or stopwatch.
- Do **not** utilize the test kit to maintain minimum SCA concentration levels (i.e., 1.5 units).
- When performing service that requires draining the cooling system, take special precautions to collect coolant in a clean non-galvanized container, seal coolant to prevent contamination, and save for reuse.

Coolant Testing

- Probablizer:
  - 3318169S Plug - Installs on the engine for easy coolant sampling
  - 3318168S Cap - Use with Monitor C bottle to sample coolant
  - CC2700 Monitor C™ - Use lab analysis of coolant samples for more detailed analysis.

CC2602 Coolant Test Kit

- Works with any SCA formulation. Call 1-800-22FILTER (800-223-4583) if you have this test kit and the color chart does **not** show the number of units of SCA gallon of coolant.)

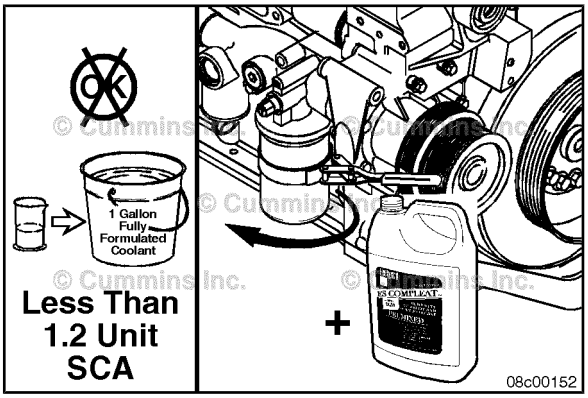
Test Intervals

⚠WARNING⚠

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

Testing is recommended if the operator is **not** sure of his cooling system condition due to leaks, uncontrolled topping off of the system, or major coolant loss.

If the concentration is below 1.2 units per gallon, replace the filter and precharge with liquid.



Check the SCA concentration level at least every 6 months, and anytime the coolant condition is unknown or corrosion is apparent within the cooling system.

Use Fleetguard® coolant test kit, CC2602, to check the concentration level. Instructions are included with the test kit.

Call the following numbers to get answers to any questions you have about cooling system maintenance:

Cummins	Fleetguard®
1-800-DIESELS	**1-800-22FILTER**
1-800-343-7357	**1-800-223-4583**

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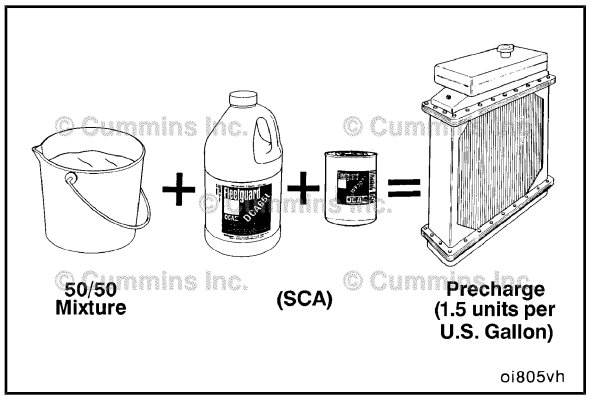

Coolant Replacement Requirements

Drain and flush the cooling system after 6000 hours or 3 years of service. However, if Fleetguard®'s ES coolant and ES filters are used, check chloride, sulfate, and pH levels according to Coolant Requirements and Maintenance, Bulletin 3666132, to determine whether the coolant **must** be replaced. Refill with either new fully formulated coolant or ES coolant.

NOTE: Dispose of used coolant/antifreeze in accordance with federal, state, and local laws and regulations.

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Section W - Warranty

Section Contents

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All Diesel EnginesWorldwideGenerator Drive

Engines Warranted

This warranty applies to new Engines sold by Cummins and delivered to the first user on or after April 1, 1999 that are used in generator drive application anywhere in the world where Cummins approved service is available. These Engines will have the following rating designations:

Standby Power Rating

Engines of this rating are applicable for supplying emergency power for the duration of the utility power outage. No overload capability is available for this rating. Under no condition is an Engine allowed to operate in parallel with the public utility at the Standby Power rating. This rating should be applied where reliable utility power is available. A standby rated engine is to be sized for a maximum of an 80 percent average load factor and 200 hours of operation per year. This includes less than 25 hours per year at the Standby Power rating. Standby rating should never be applied except in true emergency power outages. Negotiated power outages contracted with a utility company are not considered an emergency.

Unlimited Time Running Prime Power Rating

Engines with this rating are available for an unlimited number of hours per year in a variable load application. Variable load is not to exceed a 70 percent average of the Prime Power Rating during any operating period of 250 hours. Total operating time at 100 percent Prime Power shall not exceed 500 hours per year.

A 10 percent overload capability is available for a period of one hour within a twelve hour period of operation. Total operating time at the 10 percent overload power shall not exceed 25 hours per year.

Limited Time Running Prime Power Rating

Engines of this rating are available for a limited number of hours in a non-variable load application. It is intended for use in situations where power outages are contracted, such as in utility power curtailment. Engines may be operated in parallel to the public utility up to 750 hours per year at power levels never to exceed the Prime Power rating.

Limited Time Running Prime Power ratings differ from Unlimited Time Running in that even though the maximum power output of the engines are the same, the Limited Time Running allows the Engine to be parallel to Public Utility and run at the full Prime Power rating and must never exceed the Prime Power rating.

Continuous/Base Power Rating

Engines with this rating are available for supplying utility power at a constant 100 percent load for an unlimited number of hours per year. No overload capability is available for this rating.

Continuous/Base Power ratings differ from Unlimited Time Running Prime Power ratings in that the Continuous/Base Load ratings are significantly reduced from the Prime Power ratings. Continuous/Base Load ratings have no load factor or application restrictions.

Coverage

Base Engine Warranty

This warranty covers any failures of the Engine, under normal use and service, which result from a defect in material or factory workmanship (Warrantable Failure).

Coverage begins with the sale of the Engine by Cummins and continues for the Duration stated below. The Duration commences either on the date of delivery of the Engine to the first user, or on the date the Engine is first leased, rented or loaned, or when the Engine has been operated for 50 hours, whichever occurs first.

Base Engine Warranty

	Duration Whichever Occurs First	
Rating	**Months**	**Hours**
Standby Power	24	400
Unlimited Prime Power	12	Unlimited
Limited Prime Power	12	750
Continuous/Base Power	12	Unlimited

Extended Major Components Warranty

The Extended Major Components Warranty applies to Engines other than B and C series and covers Warrantable Failures of the Engine cylinder block, camshaft, crankshaft and connecting rods (Covered Parts). Bushing and bearing

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failures are not covered. This coverage begins with the expiration of the Base Engine Warranty and continues for the following stated Duration. The Duration commences either on the date of delivery of the Engine to the first user, or on the date the Engine is first leased, rented or loaned, or when the Engine has been operated for 50 hours, whichever occurs first.

Extended Major Components Warranty

	Duration Whichever Occurs First	
Rating	**Months**	**Hours**
Standby Power	36	600
Unlimited Prime Power	36	10,000
Limited Prime Power	36	2,250
Continuous/Base Power	36	10,000

Consumer Products

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

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

Cummins Responsibilities

During Base Engine Warranty

Cummins will pay for all parts and labor needed to repair the damage to the Engine resulting from a Warrantable Failure when performed during normal business hours. All labor costs will be paid in accordance with Cummins published Standard Repair Time guidelines.

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

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

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

During the Extended Major Components Warranty

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

Owner's Responsibilities

During the Base Engine Warranty

Owner is responsible for the cost of lubricating oil, antifreeze, filter elements and other maintenance items replaced during warranty repairs unless such items are not reusable due to the Warrantable Failure.

During the Extended Major Components Warranty

Owner is responsible for the cost of all labor needed to repair the Engine, including the labor cost for Engine removal and reinstallation. When Cummins elects to repair a part instead of replacing it, the Owner is not responsible for the labor needed to repair the part.

Owner is responsible for the cost of all parts required for the repair except for the defective Covered Part and any Covered Part damaged by a Warrantable Failure of the defective Covered Part.

Owner is responsible for the cost of lubricating oil, antifreeze, filter elements and other maintenance items replaced during repair of a Warrantable Failure.

During the Base Engine and Extended Major Components Warranties

Owner is responsible for the operation and maintenance of the Engine as specified in the applicable Cummins Operation and Maintenance Manual. Owner is also responsible for providing proof that all recommended maintenance has been performed.

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Before the expiration of the applicable warranty, Owner must notify a Cummins distributor, authorized dealer or other repair location approved by Cummins of any Warrantable Failure and make the Engine available for repair by such facility. Locations in the United States* and Canada are listed in the Cummins United States and Canada Sales and Service Directory; other locations are listed in the Cummins International Sales and Service Directory.

Owner is responsible for communication expenses, meals, lodging and similar costs incurred as a result of a Warrantable Failure.

Owner is responsible for non-Engine repairs, "downtime" expenses, fines, all applicable taxes, all business costs and other losses resulting from a Warrantable Failure.

Owner is responsible for providing sufficient access to and reasonable ability to remove the Engine from the installation in the event of a Warrantable Failure.

Owner is responsible for maintaining an operating Engine hourmeter. If the hourmeter is not operational, engine usage will be estimated at 400 hours per month.

Limitations

Cummins is not responsible for failures or damage resulting from what Cummins determines to be abuse or neglect, including, but not limited to: operation without adequate coolants or lubricants; overfueling; overspeeding; lack of maintenance of lubricating, cooling or intake systems; improper storage, starting, warm-up, run-in or shutdown practices; unauthorized modifications to the Engine. Cummins is also not responsible for Engine performance problems or failures caused by incorrect oil or fuel, or by water, dirt or other contaminants in the fuel or oil.

This warranty does not apply to accessories supplied by Cummins which bear the name of another company. Such non-warranted accessories include, but are not limited to: alternators, starters, fans**, air conditioning compressors, clutches, filters, transmissions, air cleaners and safety shutdown switches.

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

Failure of belts and hoses supplied by Cummins are not covered beyond the first 500 hours or one year of operation, whichever occurs first after the warranty start date.

Parts used to repair a Warrantable Failure may be new Cummins parts, Cummins approved rebuilt parts, or repaired parts. Cummins is not responsible for failures resulting from the use of parts not approved by Cummins.

A new Cummins or Cummins-approved rebuilt part used to repair a Warrantable Failure assumes the identity of the part it replaced and is entitled to the remaining coverage hereunder.

Cummins is not responsible for Engine performance problems or failures resulting from:

1. Use or application of the Engine inconsistent with its rating designation as set forth above.
2. Inadequate or incorrect installations deviating from Cummins Generator Drive Installation Guidelines.

CUMMINS IS NOT RESPONSIBLE FOR WEAR OR WEAROUT OF COVERED PARTS.

CUMMINS IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

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

In the United States* and Canada, this warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Outside the United States* and Canada, in case of consumer sales, in some countries, the Owner has statutory rights which cannot be affected or limited by the terms of this warranty.

Nothing in this warranty excludes or restricts any contractual rights the owner may have against third parties.

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

** Alternators, starters, and fans ARE covered for the duration of the base engine warranty on B3.3 engines.

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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.

Extended Major Components Warranty

The Extended Major Components Warranty covers Warrantable Failures of the Engine cylinder block, camshaft, crankshaft and connecting rods (Covered Parts).

Bushing and bearing failures are not covered.

This Coverage begins with the expiration of the Base Engine Warranty and ends three years or 10,000* hours of operation from the date of delivery of the Engine to the first user, or from the date the unit is first leased, rented or loaned, or from when the Engine has been operated for 50 hours, whichever occurs first.

*3,000 hours for A series engines.

Consumer Products

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

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

Cummins' Responsibilities

During The Base Engine Warranty

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

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

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

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

During The Extended Major Components Warranty

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

Owner's Responsibilities

During The Base Engine Warranty

Owner is responsible for the cost of lubricating oil, antifreeze, filter elements and other maintenance items provided during warranty repairs unless such items are not reusable due to the Warrantable Failure.

During The Extended Major Components Warranty

Owner is responsible for the cost of all labor needed to repair the Engine, including the labor to remove and reinstall the Engine. When Cummins elects to repair a part instead of replacing it, Owner is not responsible for the labor needed to repair the part.

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Owner is responsible for the cost of all parts required for the repair except for the defective Covered Part and any Covered Part damaged by a Warrantable Failure of the defective Covered Part.

Owner is responsible for the cost of lubricating oil, antifreeze, filter elements and other maintenance items replaced during repair of a Warrantable Failure.

During The Base Engine and Extended Major Components Warranties

Owner is responsible for the operation and maintenance of the Engine as specified in the applicable Cummins Operation and Maintenance Manual. Owner is also responsible for providing proof that all recommended maintenance has been performed.

Before the expiration of the applicable warranty, Owner must notify a Cummins distributor, authorized dealer or other repair location approved by Cummins of any Warrantable Failure and make the Engine available for repair by such facility. Locations in the United States and Canada are listed in the Cummins Off Highway Authorized Dealer Directory.

Owner is responsible for communication expenses, meals, lodging and similar costs incurred as a result of a Warrantable Failure.

Owner is responsible for non-Engine repairs, "downtime" expenses, cargo damage, fines, all applicable taxes, all business costs and other losses resulting from a Warrantable Failure.

Limitations

Cummins is not responsible for failures or damage resulting from what Cummins determines to be abuse or neglect, including, but not limited to: operation without adequate coolants or lubricants; overfueling; overspeeding; lack of maintenance of lubricating, cooling or intake systems; improper storage, starting, warm-up, run-in or shutdown practices; unauthorized modifications of the Engine. Cummins is also not responsible for failures caused by incorrect oil or fuel or by water, dirt or other contaminants in the fuel or oil.

For power units and fire pumps (package units), this warranty applies to accessories, except for clutches and filters, supplied by Cummins which bear the name of another company.

Except for power units and fire pumps, this warranty does not apply to accessories which bear the name of another company. Such non-warranted accessories include, but are not limited to: alternators, starters, fans**, air conditioning compressors, clutches, filters, transmissions, torque converters, steering pumps, and non-Cummins fan drives, engine compression brakes and air compressors.

Cummins Compusave units are covered by a separate warranty.

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

Failures of belts and hoses supplied by Cummins are not covered beyond the first 500 hours or one year of operation, whichever occurs first.

Parts used to repair a Warrantable Failure may be new Cummins parts, Cummins-approved rebuilt parts, or repaired parts. Cummins is not responsible for failures resulting from the use of parts not approved by Cummins.

A new Cummins or Cummins-approved rebuilt part used to repair a Warrantable Failure assumes the identity of the part it replaced and is entitled to the remaining coverage hereunder.

CUMMINS DOES NOT COVER WEAR OR WEAROUT OF COVERED PARTS.

CUMMINS IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

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

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Emission Warranty

Products Warranted

This emission warranty applies to new Engines marketed by Cummins that are used in the United States* in vehicles designed for Industrial off-highway use. This warranty applies to Engines delivered to the ultimate purchaser on or after April 1, 1999 for engines up to 750 horsepower, on or after January 1, 2000 for engines 751 horsepower and over.

Coverage

Cummins warrants to the ultimate purchaser and each subsequent purchaser that the Engine is designed, built and equipped so as to conform at the time of sale by Cummins with all U.S. Federal emission regulations applicable at the time of manufacture and that it is free from defects in workmanship or material which would cause it not to meet these regulations within the longer of the following periods: (A) Five years or 3,000 hours of operation, whichever

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occurs first, as measured from the date of delivery of the Engine to the ultimate purchaser, or (B) The Base Engine Warranty.

If the vehicle in which the Engine is installed is registered in the state of California, a separate California Emission Warranty also applies.

Limitations

Failures, other than those resulting from defects in materials, or workmanship, are not covered by this warranty.

Cummins is not responsible for failures or damage resulting from what Cummins determines to be abuse or neglect, including, but not limited to: operation without adequate coolant or lubricants; overfueling; overspeeding; lack of maintenance of lubricating, cooling or intake systems; improper storage, starting, warm-up, run-in or shutdown practices; unauthorized modifications of the Engine. Cummins is also not responsible for failures caused by incorrect fuel or by water, dirt or other contaminants in the fuel.

Cummins is not responsible for non-Engine repairs, "downtime" expenses, cargo damage, fines, all business costs or other losses resulting from a Warrantable Failure.

CUMMINS IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

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

** Alternators, starters, and fans ARE covered for the duration of the base engine warranty on A series and B3.3 engines.

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All Engines InternationalIndustrial (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.

EXTENDED MAJOR COMPONENTS WARRANTY

The Extended Major Components Warranty covers Warrantable Failures of the Engine cylinder block, camshaft, crankshaft and connecting rods (Covered Parts).

Bushing and bearing failures are not covered.

This coverage begins with the expiration of the Base Engine Warranty and ends three years or 10,000* hours of operation, from the date of delivery of the Engine to the first user, or from the date the unit is first leased, rented or loaned, or when the Engine has been operated for 50 hours, whichever occurs first.

*3,000 hours for A series engines.

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

Cummins' Responsibilities

DURING THE BASE ENGINE WARRANTY

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

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

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

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

DURING THE EXTENDED MAJOR COMPONENTS WARRANTY

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

Owner's Responsibilities

DURING THE BASE ENGINE WARRANTY

Owner is responsible for the cost of lubricating oil, antifreeze, filter elements and other maintenance items replaced during warranty repairs unless such items are not reusable due to the Warrantable Failure.

DURING THE EXTENDED MAJOR COMPONENTS WARRANTY

Owner is responsible for the cost of all labor needed to repair the Engine, including the labor to remove and reinstall the Engine. When Cummins elects to repair a part instead of replacing it, Owner is not responsible for the labor needed to repair the part.

Owner is responsible for the cost of all parts required for the repair except for the defective Covered Part and any Covered Part damaged by a Warrantable Failure of the defective Covered Part.

Owner is responsible for the cost of lubricating oil, antifreeze, filter elements and other maintenance items replaced during repair of a Warrantable Failure.

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DURING THE BASE ENGINE AND EXTENDED MAJOR COMPONENTS WARRANTIES

Owner is responsible for the operation and maintenance of the Engine as specified in the applicable Cummins Operation and Maintenance Manual. Owner is also responsible for providing proof that all recommended maintenance has been performed.

Before the expiration of the applicable warranty, Owner must notify a Cummins distributor, authorized dealer or other repair location approved by Cummins of any Warrantable Failure and make the product available for repair by such facility. Locations are listed in the Cummins International Sales and Service Directory.

Owner is responsible for communication expenses, meals, lodging and similar costs incurred as a result of a Warrantable Failure.

Owner is responsible for non-Engine repairs, "downtime" expenses, cargo damage, fines, all applicable taxes, all business costs and other losses resulting from a Warrantable Failure.

Limitations

Cummins is not responsible for failures or damage resulting from what Cummins determines to be abuse or neglect, including, but not limited to: operation without adequate coolants or lubricants; overfueling; overspeeding; lack of maintenance of lubricating, cooling or intake systems; improper storage, starting, warm-up, run-in or shutdown practices; unauthorized modifications of the Engine. Cummins is also not responsible for failures caused by incorrect oil or fuel or by water, dirt or other contaminants in the fuel or oil.

For power units and fire pumps (package units) the warranty applies to accessories, except for clutches and filters supplied by Cummins which bear the name of another company.

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 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.

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All Engines WorldwideCommercial Marine PropulsionAuxiliary Products

Coverage

Products Warranted Marine

This warranty applies to new Engines sold by Cummins Inc., herein after "Cummins", and used in Marine propulsion and marine auxiliary applications anywhere in the world where Cummins approved service is available and delivered to the first user on or after July 1, 2002. This warranty excludes all engines branded and sold as Cummins Mercruiser Diesel products. The `Product' consists of a new Cummins Engine, as well as accessories, which are approved and supplied by Cummins and which are either installed by Cummins or a Cummins authorized distributor. These Products have the following designation:

MARINE PROPULSION AND MARINE AUXILIARY (EXCLUDING GENERATOR DRIVE ENGINES)

Intermittent Rating

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 1500 hours per year.

Medium Continuous Rating

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 3000 hours per year.

Heavy Duty Rating

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 Rating

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

MARINE GENERATOR DRIVE

Prime Power

Engines with this rating are available for an unlimited number of hours per year in variable load applications. Variable load is not to exceed a 70 percent average of the Prime Power rating during any operating period of 250 hours. Total operating time at 100 percent Prime Power shall not exceed 500 hours per year.

A 10 percent overload capability is available for a period of one hour within a twelve hour period of operation. Total operating time at the 10 percent overload power shall not exceed 25 hours per year. This power rating conforms to ISO 8528 guidelines.

Continuous Power

Engines with this rating are available for supplying utility power at a constant 100 percent load for an unlimited number of hours per year. No overload capability is available for this rating.

Continuous Power ratings differ from Prime Power ratings in that the Continuous Load ratings are significantly reduced from the Prime Power ratings. Continuous Load ratings have no load factor or application restrictions. This power rating conforms to ISO 8528 guidelines.

Base Engine Warranty

This warranty covers any failures of the Product, under normal use and service, which result from a defect in Cummins material or factory workmanship (Warrantable Failure). Coverage begins with the sale of the Engine by Cummins and ends at the time and hours 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.

	Duration Whichever Occurs First	
Rating	Years	Hours
Intermittent	1	1500
Medium Continuous	1	3000

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Heavy Duty	1	5000
Continuous	1	Unlimited
Prime Power	1	Unlimited
Continuous Power	1	Unlimited

Extended Major Components Warranty

The Extended Major Components Warranty applies to engines other than B and C Series. It 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 at three years or 10,800 hours of operation, whichever occurs first, after the date of delivery 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.

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

Cummins Responsibilities

During Base Engine Warranty

Cummins will pay for all parts and labor needed to repair the damage to the 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, Cummins will pay reasonable travel expenses, including meals, mileage and lodging, for mechanics to travel to and from the repair dock.

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 for 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 cost for Engine removal and reinstallation. When Cummins elects to repair a part instead of replacing it, the Owner is not responsible for the labor needed to repair the part.

Owner is responsible for the cost of all parts required for the repair except for the defective Covered Part and any Covered Part damaged by a Warrantable Failure of the defective Covered Part.

Owner is responsible for the cost of lubricating oil, antifreeze, filter elements and other maintenance items replaced during repair of a Warrantable Failure.

During the Base Engine and Extended Major Components Warranties

Owner is responsible for the operation and maintenance of the Product as specified in the applicable Cummins Operation and Maintenance Manual. Owner is also responsible for providing proof that all recommended maintenance has been performed.

Before the expiration of the applicable warranty, Owner must notify a Cummins distributor, authorized dealer, or other repair location approved by Cummins of any Warrantable Failure and make the Engine available for repair by such facility. Locations in the United States and Canada are listed in the Cummins U.S. and Canada Sales and Service Directory; other locations are listed in the Cummins International Sales and Service Directory.

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 communication expenses, meals, lodging, and similar costs incurred as a result of a Warrantable Failure.

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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 Cummins material or factory workmanship.

Owner is responsible for non-Engine repairs, "downtime" expenses, cargo damage, fines, all applicable taxes, all business costs, and other losses resulting from a Warrantable Failure.

Limitations

Cummins is not responsible for failures or damage resulting from what Cummins determines to be abuse or neglect, including, but not limited to: operation without adequate coolants or lubricants; overfueling; overspeeding; lack of maintenance of cooling, lubricating or intake systems; improper storage, starting, warm-up, run-in or shutdown practices; unauthorized modifications to the Engine. Cummins is also not responsible for failures caused by incorrect oil or fuel or by water, dirt or other contaminants in the fuel or oil.

Cummins is not responsible for failures resulting from:

1. Use or application of the Product inconsistent with its rating designation set forth above.
2. Incorrect installation.

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

Cummins is not responsible for failures of marine maintenance components supplied by Cummins beyond ninety days after the coverage start date. Marine 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.

Failure of belts and hoses supplied by Cummins are not covered beyond 90 days after the date of delivery of the Product to the first 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.

Except for the accessories noted previously, Cummins does not warrant accessories which bear the name of another company.

Parts used in warranty repairs 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 supplied by Cummins.

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 replace a Warranted Part assumes the identity of the Warranted Part it replaced and is entitled to the remaining coverage hereunder.

Cummins Inc. reserves the right to interrogate Electronic Control Module (ECM) data for purposes of failure analysis.

CUMMINS DOES NOT COVER WEAR OR WEAROUT OF COVERED PARTS.

CUMMINS IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

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

In the United States** and Canada, this warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Outside the United States** and Canada, in case of consumer sales, in some countries the Owner has statutory rights which cannot be affected or limited by the terms of this warranty.

Nothing in this warranty excludes or restricts any contractual rights the Owner may have against third parties.

Emission Warranty

Products Warranted

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

Coverage

Cummins 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 Cummins with all United States Federal emission regulations applicable at the time of manufacture and that it is free from defects in material or factory workmanship 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, as measured from the date of delivery of the engine to the first user, or the date the unit is first leased,

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rented or loaned, or when the Engine has been operated for 50 hours, whichever occurs first, or (B) The Base Engine Warranty.

Limitations

An 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 and subsequent failures resulting from such service or parts will not be covered under this emission control system warranty.

Failures, other than those resulting from defects in materials or factory 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 coolants or lubricants; overfueling; overspeeding, lack of maintenance of lubricating, cooling or intake systems; improper storage, starting, warm-up, run-in or shutdown practices; unauthorized modifications of the Engine. Cummins is also not responsible for failures caused by incorrect oil or fuel or by water, dirt or other contaminants in the fuel or oil.

Cummins is not responsible for non-Engine repairs, “downtime” expenses, cargo damage, fines, all applicable taxes, 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.

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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.

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Coverage

This emission control system warranty applies to the following emission control parts:

Turbocharger
- Compressor Wheel
- Turbine Wheel
- Turbine Oil Seal
- Wastegate Valve
- Wastegate Actuator/Controller

Intake Manifold
- Charge Air Cooler

Exhaust Manifold

Fuel System
- Actuators (Fueling & Timing)
- Fuel Pressure Sensor
- Injectors (TP)

Electronic Control System
- Control Module
- Intake Manifold Pressure Sensor
- Coolant Temperature Sensor

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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.

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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.

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