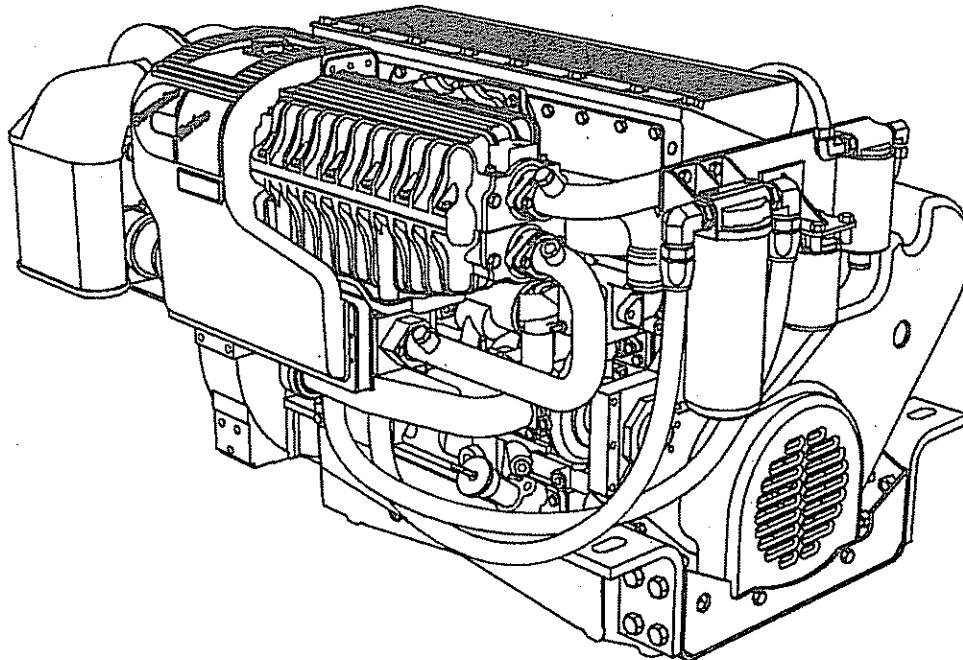
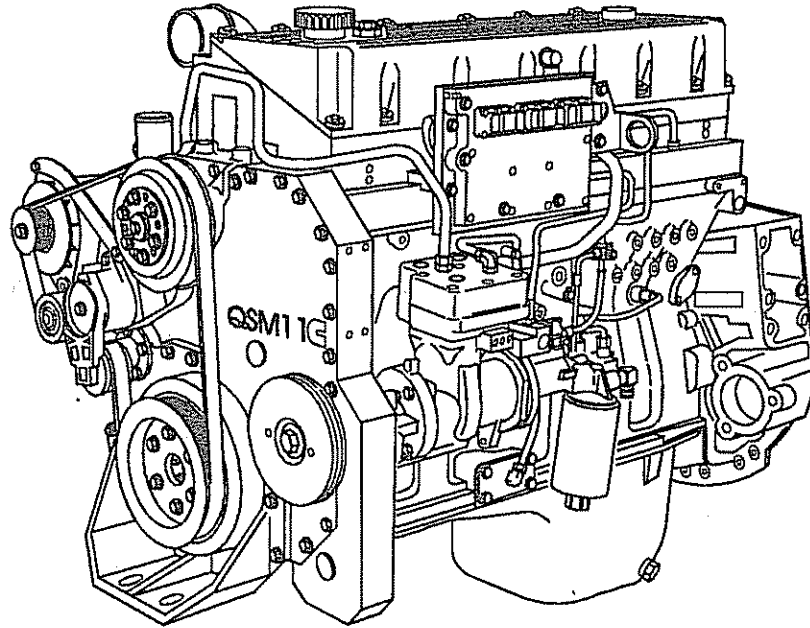




Operation and Maintenance Manual Marine and Industrial QSM11 Engine



19200008

Foreword

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

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

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

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

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



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

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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.

Part Name	Part Number	Part Number
Engine Model		
Engine Serial Number (ESN)		
Control Parts List (CPL)		
Fuel Pump Part Number		
Electronic Control Module (ECM)		
Electronic Control Module Serial Numbers (ECM)		
Filter Part Numbers:		
◦ Air Cleaner Element		
◦ Lubricating Oil Filter		
◦ Fuel		
◦ Fuel-Water Separator		
◦ Coolant		
◦ Remote Gas		
Governor Control Module (GCM) (if applicable)		
Belt Part Numbers:		
◦		
◦		
◦		
Clutch or Marine Gear (if applicable):		
◦ Model		
◦ Serial Number		
◦ Part Number		
◦ Oil Type		
◦ Sea Water Pump		
– Model		
– Part Number		

Section i - Introduction

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To the Owner and Operator

General Information

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

Keep records of regularly scheduled maintenance.

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

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

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

About the Manual

General Information

This manual contains information needed to operate and maintain your engine correctly, as recommended by Cummins Engine Company, Inc. Additional service literature can be ordered from your local Cummins Distributor or with the order form found in Service Literature, Section L. For problems with literature orders, call 1-800-DIESELS (1-800-343-7357) for U.S.A. and Canada.

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

Both metric and U.S. customary values are used. The metric value is listed first, followed by the U.S. customary in brackets.

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

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

How to Use the Manual

General Information

This manual is organized according to intervals at which maintenance on your engine is to be performed. A maintenance chart (table) that gives required intervals and checks to be made is located in Section 2. Locate the interval at which you are performing maintenance; then follow the steps given in that section for all the procedures to be performed. In addition, the procedures completed under the previous maintenance intervals **must** also be performed.

Keep a record of all the checks and inspections made. A record form for recording the date or hours at which maintenance checks and inspections were performed is located in Section 2.

Refer to Section TS for a guide to troubleshooting your engine. Follow the directions given in Section TS to locate and correct engine problems.

Refer to Section V for specifications recommended by Cummins Engine Company, Inc., for your engine. Specifications and torque values for each engine system are given in Section V.

Symbols

General Information

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



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



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



Indicates a **REMOVAL** or **DISASSEMBLY** step.



Indicates an **INSTALLATION** or **ASSEMBLY** step.



INSPECTION is required.



CLEAN the part or assembly.



PERFORM a mechanical or time **MEASUREMENT**.



LUBRICATE the part or assembly.



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



TIGHTEN to a specific torque.



PERFORM an electrical **MEASUREMENT**.



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

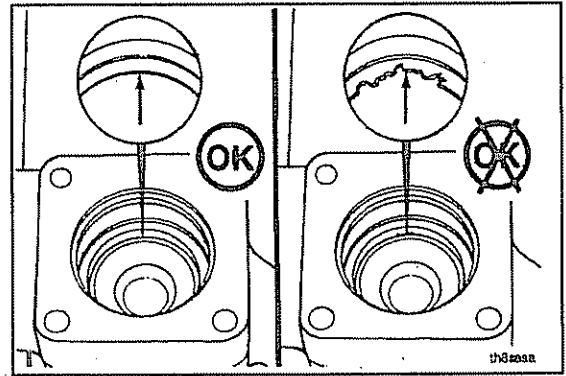


The component weighs 23 kg [50 lb] or more. To avoid personal injury, use a hoist or get assistance to lift the component.

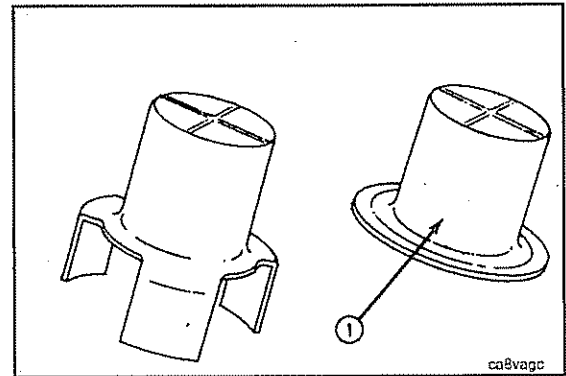
Illustrations

General Information

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



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



General Safety Instructions

Important Safety Notice



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

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

- 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 the cooling systems before any lines, fittings, or related items are removed or disconnected. Be alert for possible pressure when disconnecting any device from a system that utilizes pressure. Do **not** check for pressure leaks with your hand. High pressure oil or fuel can cause personal injury.
- To prevent suffocation and frostbite, wear protective clothing and **ONLY** disconnect fuel and liquid refrigerant (Freon) lines in a well ventilated area. To protect the environment, liquid refrigerant systems **must** be properly emptied and filled using equipment that prevents the release of refrigerant gas (fluorocarbons) into the atmosphere. Federal law requires capturing and recycling refrigerant.
- To avoid personal injury, use a hoist or get assistance when lifting components that weigh 23 kg [50 lb] or more. Make sure all lifting devices such as chains, hooks, or slings are in good condition and are of the correct capacity. Make sure hooks are positioned correctly. **Always** use a spreader bar when necessary. The lifting hooks **must not** be side-loaded.
- Corrosion inhibitor, a component of SCA and lubricating oil, contains alkali. Do **not** get the substance in eyes. Avoid prolonged or repeated contact with skin. Do **not** swallow internally. In case of contact, immediately wash skin with soap and water. In case of contact, immediately flood eyes with large amounts of water for a minimum of 15 minutes. **IMMEDIATELY CALL A PHYSICIAN. KEEP OUT OF REACH OF CHILDREN.**
- Naptha and Methyl Ethyl Ketone (MEK) are flammable materials and **must** be used with caution. Follow the manufacturer's instructions to provide complete safety when using these materials. **KEEP OUT OF REACH OF CHILDREN.**
- To avoid burns, be alert for hot parts on products that have just been turned off, and hot fluids in lines, tubes, and compartments.
- **Always** use tools that are in good condition. Make sure you understand how to use 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.
- Coolant is toxic. If **not** reused, dispose of in accordance with local environmental regulations.

General Repair Instructions

General Information

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

- Cummins Engine Company, Inc. does not recommend or authorize any modifications or repairs to engines or components except for those detailed in Cummins Service Information. In particular, unauthorized repair to safety-related components can cause personal injury or death. Below is a partial listing of components classified as safety-related:

Air Compressor
Air Controls
Air Shutoff Assemblies
Balance Weights
Cooling Fan
Fan Hub Assembly
Fan Mounting Bracket(s)
Fan Mounting Capscrews
Fan Hub Spindle
Flywheel
Flywheel Crankshaft Adapter

Flywheel Mounting Capscrews
Fuel Shutoff Assemblies
Fuel Supply Tubes
Lifting Brackets
Throttle Controls
Turbocharger Compressor Casing
Turbocharger Oil Drain Line(s)
Turbocharger Oil Supply Line(s)
Turbocharger Turbine Casing
Vibration Damper Mounting Capscrews

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

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

Welding on a Vehicle with an Electronic Controlled Fuel System

CAUTION

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

General Cleaning Instructions

Solvent and Acid Cleaning

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

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

WARNING

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

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

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

Steam Cleaning

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

WARNING

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

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

- | | |
|--------------------------|--------------------|
| 1. Electrical Components | 4. Fuel Pump |
| 2. Wiring | 5. Belts and Hoses |
| 3. Injectors | 6. Bearings |

Glass or Plastic Bead Cleaning

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

CAUTION

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

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

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

1. Bead size:
 - a. Use U.S. size No. 16-20 for piston cleaning with plastic bead media, Part No. 3822735.
 - b. Use U.S. size No. 70 for piston domes with glass media.
 - c. Use U.S. size No. 60 for general purpose cleaning with glass media.
2. Operating Pressure:
 - a. Glass: Use 620 kPa [90 psi] for general purpose cleaning.
 - b. Plastic: Use 270 kPa [40 psi] for piston cleaning.
3. Steam clean or wash the parts with solvent to remove all of the foreign material and glass or plastic beads after cleaning. Rinse with hot water. Dry with compressed air.

4. Do **not** contaminate the wash tanks with glass or plastic beads.

Acronyms and Abbreviations

General Information

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

AFC	Air Fuel Control
API	American Petroleum Institute
ASA	Air Signal Attenuator
ASTM	American Society of Testing and Materials
°C	Celsius
CARB	California Air Resources Board
C.I.D.	Cubic Inch Displacement
CNG	Compressed Natural Gas
CPL	Control Parts List
cSt	Centistokes
ECM	Electronic Control Module
ECS	Emission Control System
EPA	Environmental Protection Agency
EPS	Engine Position Sensor
°F	Fahrenheit
GVW	Gross Vehicle Weight
Hg	Mercury
hp	Horsepower
H ₂ O	Water
ICM	Ignition Control Module
km/l	Kilometers per Liter
kPa	Kilopascal
LNG	Liquid Natural Gas
LTA	Low Temperature Aftercooling
MIP	Mixer Inlet Pressure
MPa	Megapascal
mph	Miles Per Hour
mpq	Miles Per Quart
N•m	Newton-meter
NG	Natural Gas
OEM	Original Equipment Manufacturer
ppm	Parts Per Million
psi	Pounds Per Square Inch
PTO	Power Takeoff
rpm	Revolutions Per Minute
SAE	Society of Automotive Engineers
SCA	Supplemental Coolant Additive
STC	Step Timing Control
VS	Variable Speed
VSS	Vehicle Speed Sensor

Section E - Engine Identification

Section Contents

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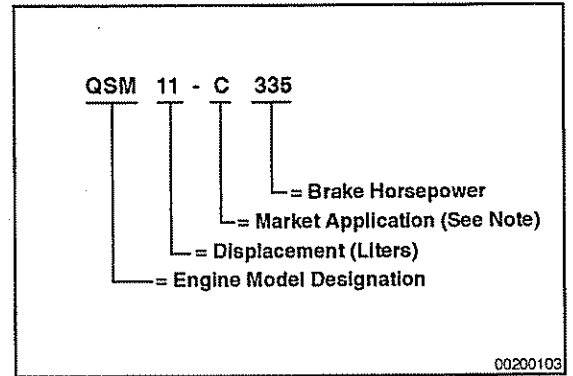
Engine Identification

Cummins Engine Nomenclature

The Cummins engine nomenclature provides the data as illustrated in the graphic.

NOTE: The following letters designate some of the different market applications for a Cummins engine.

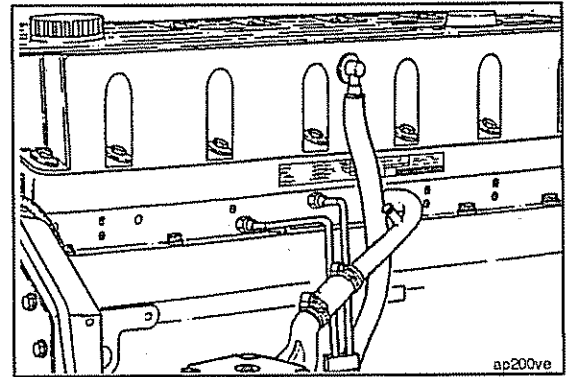
- A = agriculture
- C = construction
- M = marine.



Engine Dataplate

The engine dataplate shows important facts about your engine. The engine serial number and CPL provide data for ordering parts and service. The engine dataplate **must not** be changed unless approved by Cummins Engine Company, Inc.

The dataplate is located on the fuel pump side of the engine, on the rocker housing. Have the following engine data available when communicating with a Cummins Authorized Repair Location. The following information on the dataplate is **mandatory** when sourcing service parts:



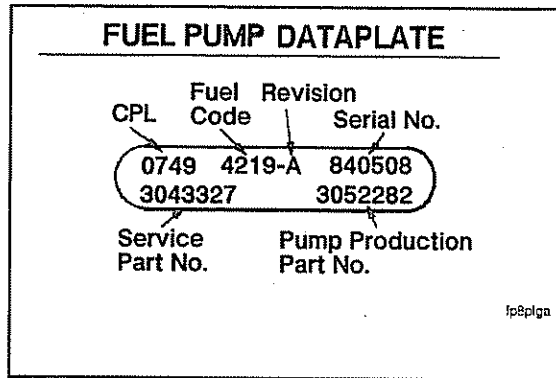
Engine No. Model No. Family Model Options Date of Mfg. Date Fabricated In Accordance With Part No.	Advert. HP (kW) (indicated) Displacement (Liters) (indicated) Gross Combust. & Brake Indicated (kW) (indicated) Gross Combust. & Brake Indicated (hp) (indicated) Date of Mfg. Date Fabricated In Accordance With Part No.	RPM E.C.S. (by) Starting System (by) Control System (by) Fuel System (by) Lubrication System (by) Cooling System (by) Air Intake System (by) Exhaust System (by) Other	FIRING ORDER 1-3-5-2-4 IMPORTANT ENGINE INFORMATION This engine complies with the EPA 40 CFR regulations for the relevant group. See the Operator's Manual for EPA Approval Registration to apply.
--	---	---	--

1. Engine serial number
2. Model
3. Horsepower and rpm rating
4. CPL
5. Emission statement (if applicable).

Cummins Engine Co., Inc.
Made in U.S.A.
338793

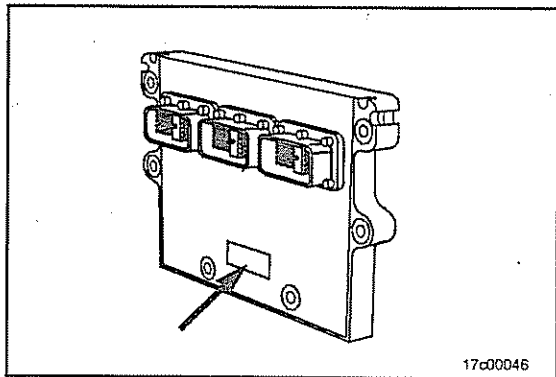
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1. Engine serial number
2. Model
3. Horsepower and rpm rating
4. CPL
5. Emission statement (if applicable).



Fuel Injection Pump Dataplate

The fuel pump dataplate is located on top of the fuel pump. It provides data needed to calibrate the fuel pump.



ECM Dataplate

The ECM dataplate is located on the front of the ECM.

The abbreviations on the dataplate are explained as follow:

- P/N = part number
- S/N = serial number
- D/C = date code.

Specifications

General Specifications

Marine and Industrial Applications

Type	Four-cycle, In-line six-cylinder, four-valves per cylinder
Displacement	10.8 liters [659 C.I.D.]
Firing Order	1-5-3-6-2-4
Horsepower (refer to engine dataplate)	
Engine Speed at Maximum Output:	
Marine Applications	
Governed Speed (rpm)	2300
Industrial Applications	
Governed Speed (rpm)	2100
Bore and Stroke	125 mm [4.921 in] x 147 mm [5.787 in]
Engine Weight (with standard accessories):	
Marine Applications	
Dry Weight	1124 kg [2478 lb]
Industrial Applications	
Dry Weight	940 kg [2072 lb]
Wet Weight	996 kg [2196 lb]
Crankshaft Rotation (viewed from the front of the engine)	Clockwise

Fuel System

Marine and Industrial Applications

Maximum Fuel Inlet Temperature	71°C [160°F]
Fuel Inlet Maximum Restriction:	
Marine Applications	
Clean Fuel Filter	152 mm Hg [6 in Hg]
Dirty Fuel Filter	203 mm Hg [8 in Hg]
Industrial Applications	
Clean Fuel Filter	102 mm Hg [4 in Hg]
Dirty Fuel Filter	203 mm Hg [8 in Hg]
Fuel Drain Line Maximum Restriction:	
Without Check Valves	63 mm Hg [2.5 in Hg]
Engine Minimum Cranking Speed	120 rpm

Lubricating Oil System

Marine and Industrial Applications

Oil Pressure	
Minimum at Idle	69 kPa [10 psi]
Operating Range	207 to 448 kPa [30 to 65 psi]
at torque peak or 1200 rpm (minimum allowable)	207 kPa [30 psi]
Oil Temperature	
Maximum	121°C [250°F]
Oil Pan Capacity:	
Marine Applications	
Low	30 liters [8 gal]
High	34 liters [9 gal]
Industrial Applications	
Low	26 liters [7 gal]

High	34 liters [9 gal]
Total System Capacity:	
With Engine Mounted Filter (combination filter holds 2.6 liters [0.7 gal])	37 liters [9.8 gal]
With Remote Mounted Filter	38 liters [10 gal]
Maximum Operational Angularity of Oil Pan:	
Marine Applications	
Front Down:	
Rear Sump	30 degrees
Front Sump	45 degrees
Rear Down:	
Rear Sump	25 degrees
Front Sump	27 degrees
Side to Side:	
Rear Sump	30 degrees
Front Sump	42 degrees
Industrial Applications	
Varies by oil pan option - example numbers are based on stamped steel pan.	
Front Down:	
Rear Sump	42 degrees
Front Sump	45 degrees
Rear Down:	
Rear Sump	45 degrees
Front Sump	45 degrees
Side to Side:	
Rear Sump	45 degrees
Front Sump	35 degrees

Cooling System

Marine and Industrial Applications

Marine Applications

Coolant Capacity:	
Engine with Heat Exchanger	29.4 liters [8 gal]
Minimum Drawdown	15.2 liters [4 gal]
Minimum Fill Rate	18.9 liters/min [5 gpm]
Minimum Initial Fill Time	2 minutes
Maximum Deaeration Time	10 minutes
Standard Thermostat Modulating Range	71 to 79.4°C [160 to 175°F]
Maximum Coolant Temperature	96°C [205°F]
Minimum Coolant Expansion Space:	
Percent of Cooling System	5%
External Pressure Loss in Cooling System:	
Maximum	35 kPa [5 psi]
Static Pressure of Coolant:	
Maximum - Exclusive of Pressure Cap	103 kPa [15 psi]
Coolant Inlet Pressure with Open Thermostat and No Cap:	
Minimum	64 mm Hg [2.5 in Hg]
Block Coolant Pressure with Closed Thermostat and No Cap:	
Maximum	246 kPa [36 psi]
Maximum Sea Water Pressure	103 kPa [15 psi]
Maximum Sea Water Pump Inlet Restriction	127 mm Hg [5 in Hg]
Maximum Sea Water Pump Initial Suction Lift	3 m [10 ft]
Pressure Cap Rating (with heat exchanger)	103 kPa [15 psi]

Industrial Applications

Coolant Capacity	9.5 liters [2.5 gal]
Standard Modulating Thermostat Range	82 to 93°C [180 to 199°F]
Cylinder Block Coolant Pressure (pressure cap removed):	
Minimum:	
Closed Thermostat (1800 rpm no load)	138 kPa [20 psi]
Maximum:	
Closed Thermostat	275 kPa [40 psi]
Maximum Allowable Operating Coolant Temperature	100°C [212°F]
Minimum Recommended Operating Coolant Temperature	70°C [160°F]
Maximum Allowable Deaeration Time	35 minutes
Minimum Recommended Pressure Cap	48 kPa [7 psi]

Air Intake System

Marine and Industrial Applications

Marine Applications

Maximum Intake Restriction	
Clean Element	254 mm H ₂ O [10 in H ₂ O]
Dirty Element	507 mm H ₂ O [20 in H ₂ O]
Maximum Intake Manifold Temperature	49°C [120°F]
Maximum Engine Room Temperature:	
Intake Air Versus Ambient Air at Rated Condition	17°C [63°F] difference

Industrial Applications

Maximum Temperature Rise between Ambient Air and Engine Inlet Air:	
Ambient above 0°C [32°F]	35°C [63°F] difference
Maximum Intake Restriction:	
Clean Air Filter Element	381 mm H ₂ O [15 in H ₂ O]
Dirty Air Filter Element	635 mm H ₂ O [25 in H ₂ O]

Exhaust System

Marine and Industrial Applications

Exhaust Pipe Size (normally acceptable inside diameter)	102 mm [4 in]
Maximum Exhaust Pipe Restriction	
H ₂ O	1016 mm H ₂ O [40 in H ₂ O]
Hg	75 mm [3 in]

Compressed Air System

Cummins 18.7 CFM Model

Cylinders	1
Compressor Swept Volume at 1250 rpm	6.6 l/sec. [14.0 cfm]
Piston Displacement	318 cc [19.405 C.I.D.]
Bore	85 mm [3.346 in]
Stroke	56 mm [2.205 in]
Speed	Engine speed
Cooling	Engine coolant

Lubrication	Engine lubricating oil
Plumbing Line Sizes:	
Coolant Inlet and Outlet	3/4 x 16 STOR
Air Inlet	1-in nominal hose
Air Outlet	M27 x 2 STOR
Unloader Port	M10 x 1 STOR
Governor Mounting Direct	M8 x 1.25
Height, Overall (approximate)	217.4 mm [8.559 in]
Width, Overall (approximate)	142 mm [5.591 in]
Length, Overall (approximate)	216 mm [8.504 in]
Weight (approximate)	15 kg [33.0 lb]

Cummins 37.4 CFM Model

Cylinders	2
Compressor Swept Volume at 1250 rpm	15.5 l/sec. [35.5 cfm]
Piston Displacement	636 cc [39 C.I.D.]
Bore	85 mm [3.35 in]
Stroke	56 mm [2.2 in]
Speed	Engine speed
Cooling	Engine coolant
Lubrication	Engine Oil
Plumbing Line Sizes:	
Coolant Inlet and Outlet	3/4 x 16 STOR
Air Inlet	1-in nominal hose
Air Outlet	M27 x 2 STOR
Unloader Port	M10 x 1 STOR
Governor Mounting Direct	M8 x 1.25
Height, Overall (approximate)	306 mm [12 in]
Width, Overall (approximate)	142 mm [5.6 in]
Length, Overall (approximate)	286.7 mm [11.29 in]
Weight (approximate)	17.24 kg [38 lb]

Electrical System

Marine and Industrial Applications

Starting Motor Circuit:

Maximum Resistance:

12 VDC	0.00075 ohm
24 VDC	0.002 ohm

Maximum Voltage Drop:

12 VDC	1.95 VDC
24 VDC	1.7 VDC

Marine Applications

Unaided Cold Start:

Maximum Ambient Temperature	-7°C [19°F]
Minimum Cranking Speed Required	120 rpm

Industrial Applications

Unaided Cold Start:

Maximum Ambient Temperature	-12°C [10°F]
-----------------------------------	--------------

Minimum Cranking Speed Required 120 rpm

Minimum recommended battery capacity:

System Voltage	Ambient Temperature			
	-18°C [0°F]		0°C [32°F]	
	Cold Cranking Amperes	Reserve Capacity ¹ Minutes	Cold Cranking Amperes	Reserve Capacity ¹ Minutes
12 VDC	2700	580	1800	580
24 VDC ²	1200	360	1200	360

1. The number of plates within a given battery size determines reserve capacity. Reserve capacity determines the length of time that sustained cranking can occur.
2. Cold Cranking Amperes ratings are based on two 12-VDC batteries in series.

A minimum of 6.5 VDC at the power connector is required to power up the ECM.

Batteries (Specific Gravity)

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

Maximum Resistance of Starting Motor Circuit

12-VDC Starting Motor (Ohms) 0.00075

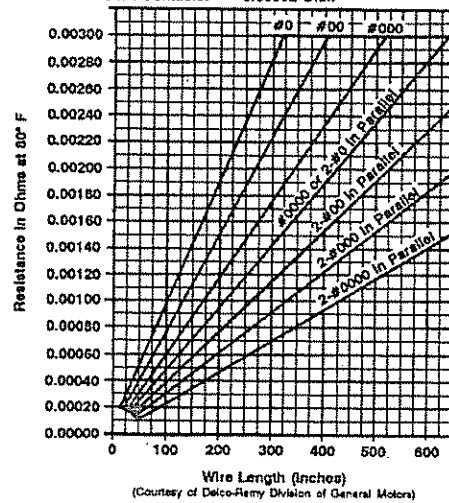
24-VDC Starting Motor (Ohms) 0.002

Cable resistances can be obtained in the accompanying Battery Cable Resistance Chart. If the frame is in ground circuit, the frame length **must** be considered cable of the same size as that used in the balance of the system.

Item	Resistance Ohms
Connection	0.00001
Additional Contactor (Series-Parallel Switch, Relays, etc.)	0.00020

Deduct the Following from the Total Circuit Resistance Recommended Before Determining Wire Size for a Given Length:

- 1 - Each Connection = 0.00001 Ohm
- 2 - Each Contactor = 0.00002 Ohm



01800v07

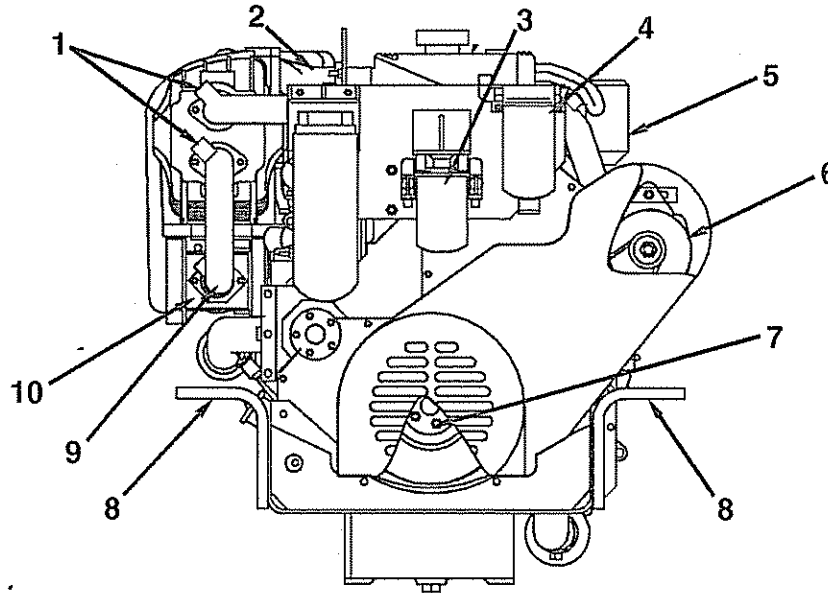
Engine Diagrams

Engine Views

Marine Applications

The following illustrations contain information about engine components, filter locations, drain points, and access locations for instrumentation and engine controls. The location and configuration of components shown in these drawings are of a general nature. Some component locations will vary depending on applications and installations.

Marine

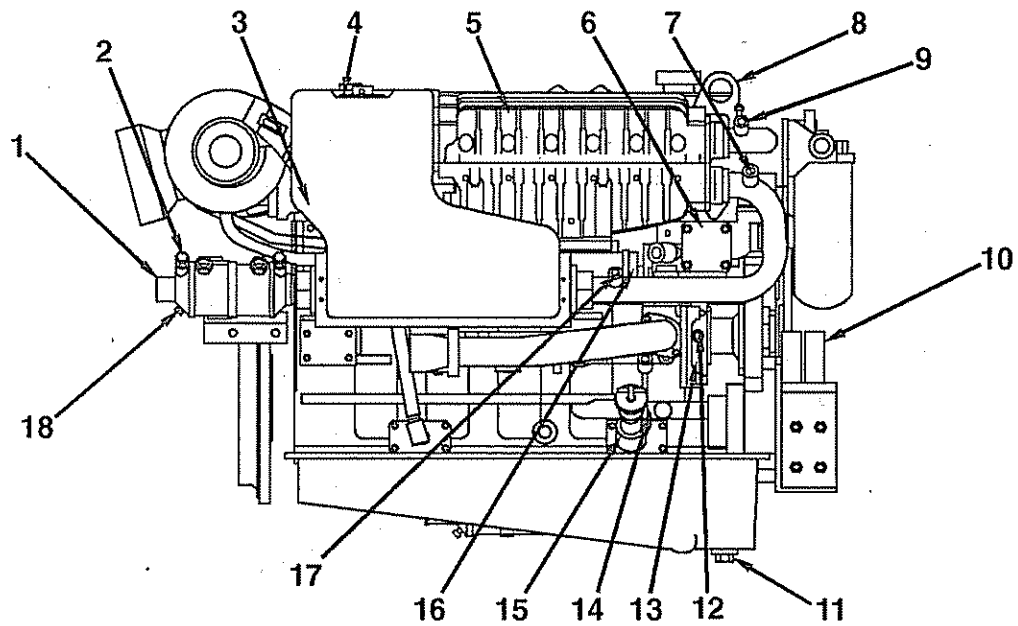


17200015

Front View

- | | |
|-----------------------|---------------------------------------|
| 1. Zinc plugs | 6. Alternator |
| 2. Air crossover | 7. Vibration damper |
| 3. Coolant filter | 8. Front engine mounts |
| 4. Fuel filter | 9. Aftercooler-to-heat-exchanger pipe |
| 5. Crankcase breather | 10. Heat exchanger. |

Marine

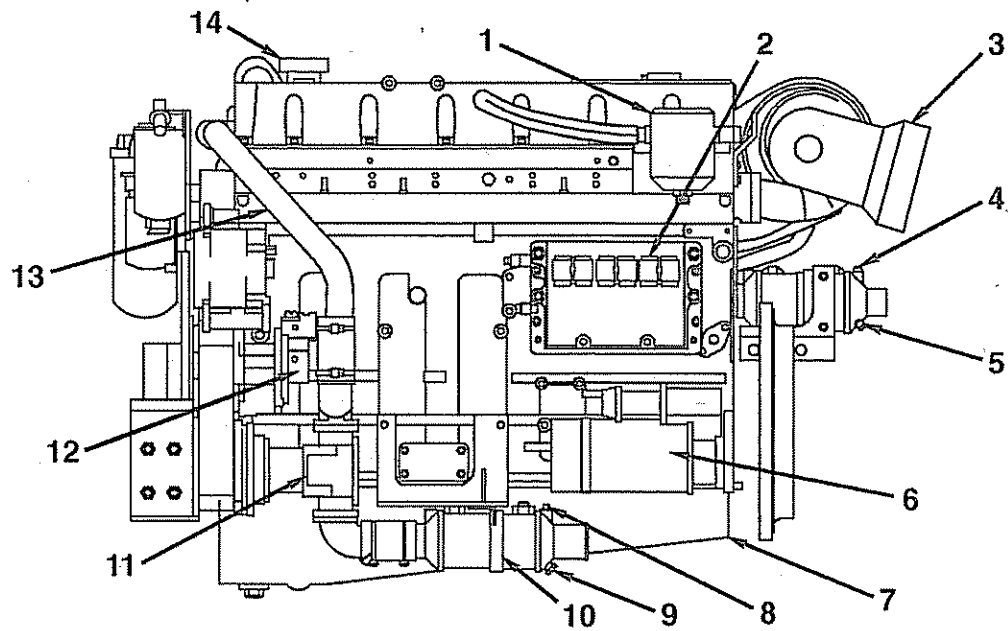


17200014

Starboard View

- | | |
|----------------------------|---------------------------------|
| 1. Gear oil cooler | 10. Vibration damper |
| 2. Zinc plug (gear cooler) | 11. Oil pan drain plug |
| 3. Heat exchanger | 12. Coolant drain |
| 4. Expansion tank | 13. Water pump |
| 5. Aftercooler | 14. Oil dipstick |
| 6. Thermostat housing | 15. Oil fill |
| 7. Zinc anode | 16. Engine oil cooler |
| 8. Engine lifting bracket | 17. Zinc anode |
| 9. Zinc anode | 18. Gear oil cooler drain plug. |

Marine

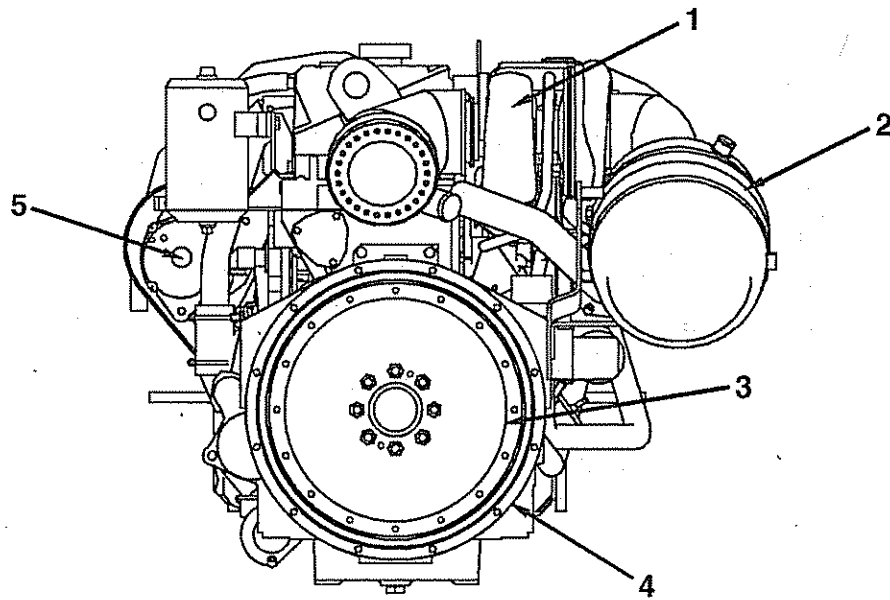


17200013

Port View

- | | |
|---------------------------|--|
| 1. Crankcase breather | 8. Zinc anode (fuel cooler) |
| 2. ECM | 9. Fuel cooler drain plug |
| 3. Exhaust elbow | 10. Fuel cooler |
| 4. Zinc anode | 11. Sea water pump |
| 5. Gear cooler drain plug | 12. Fuel pump |
| 6. Starter | 13. Sea-water-pump-to-aftercooler pipe |
| 7. Oil pan | 14. Oil fill. |

Marine

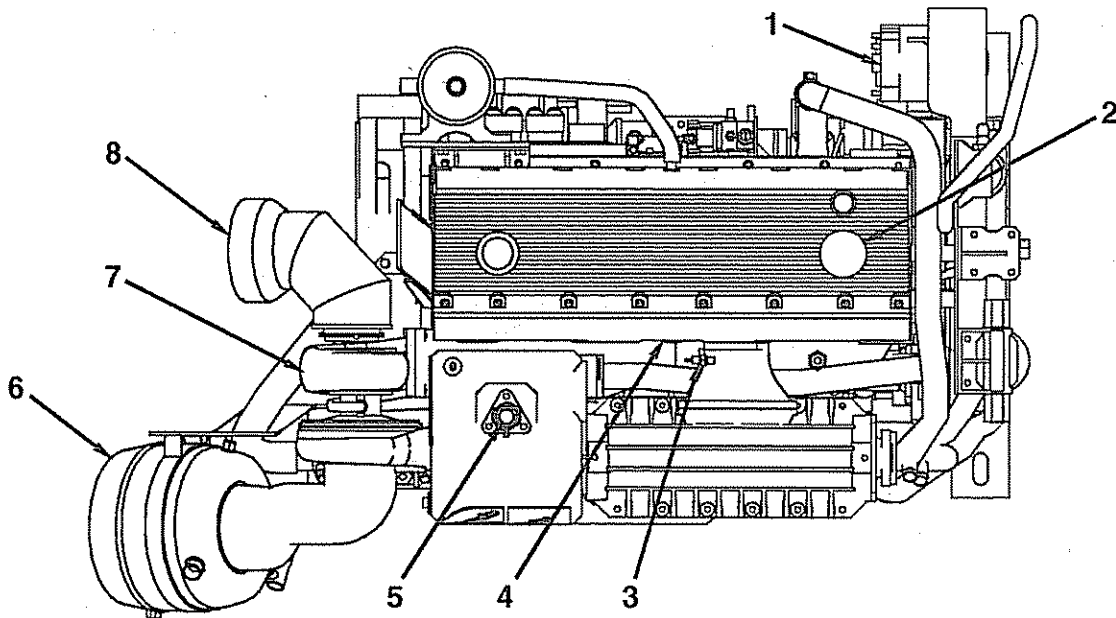


17200017

Rear View

- | | |
|-----------------|---------------------|
| 1. Turbocharger | 4. Flywheel housing |
| 2. Air cleaner | 5. Alternator. |
| 3. Flywheel | |

Marine

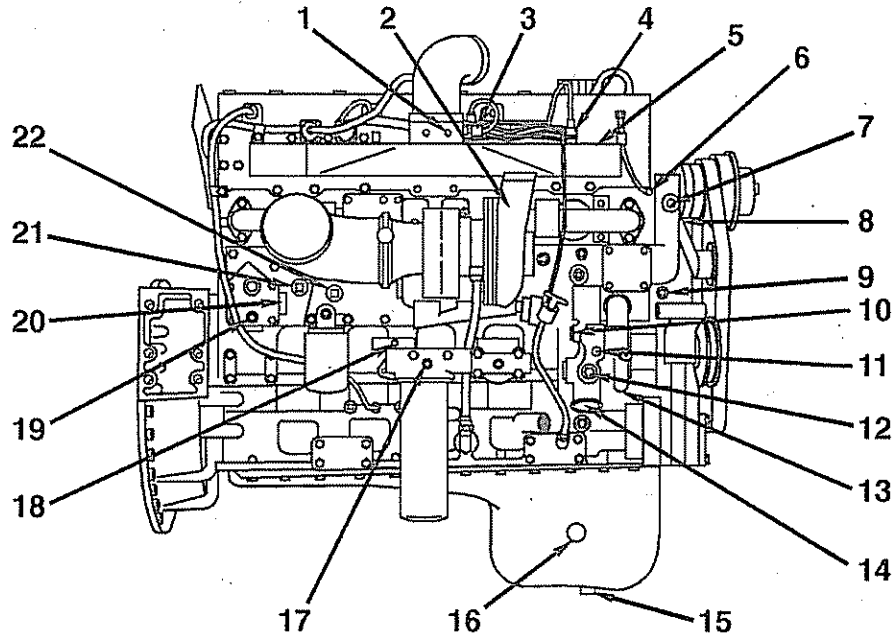


17200016

Top View

- | | |
|---------------------------------------|-------------------|
| 1. Alternator | 5. Coolant fill |
| 2. Oil fill (alternate) | 6. Air cleaner |
| 3. Intake manifold temperature sensor | 7. Turbocharger |
| 4. Intake manifold pressure sensor | 8. Exhaust elbow. |

Industrial

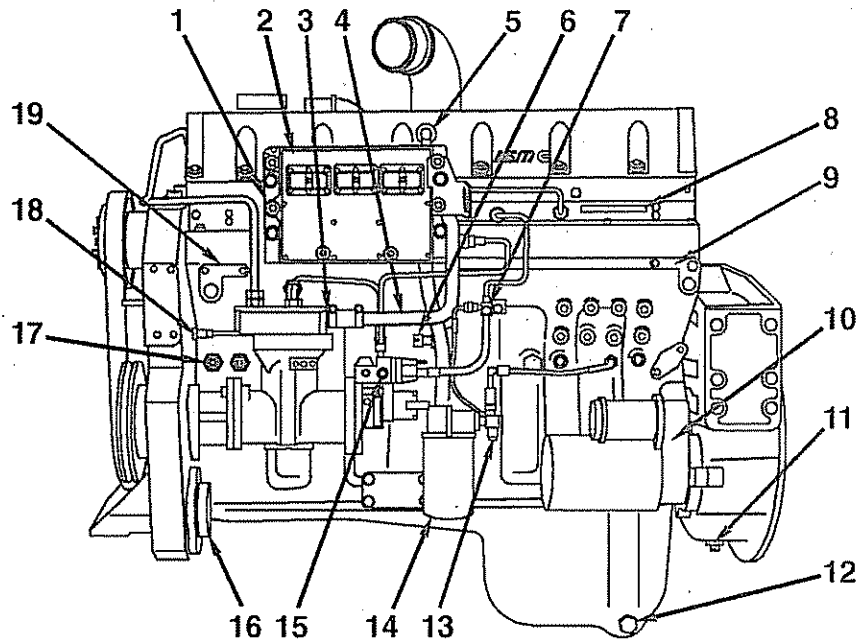


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Exhaust Side

- | | |
|------------------------------------|---------------------------------|
| 1. Ether hookup | 12. Makeup line from radiator |
| 2. Before charge air cooler | 13. Water pump pressure |
| 3. Boost temperature sensor | 14. Coolant inlet |
| 4. Intake manifold pressure sensor | 15. Oil drain |
| 5. After charge air cooler | 16. Oil pan sump heater |
| 6. Engine vent coolant | 17. Filter out pressure |
| 7. Shutterstat | 18. Filter inlet pressure |
| 8. Fan sensor | 19. Block coolant pressure |
| 9. Coolant temperature sensor | 20. Coolant heater |
| 10. Heater return | 21. Heater supply |
| 11. Coolant inlet pressure | 22. Coolant temperature pickup. |

Industrial



052001E2

Fuel Pump Side

- | | |
|------------------------------------|---|
| 1. ECM cooling plate | 11. Flywheel ring gear sensor |
| 2. Electronic control module (ECM) | 12. Side oil drain |
| 3. Compressor air discharge | 13. Fuel inlet to pump |
| 4. Compressor air inlet | 14. Fuel filter |
| 5. Blowby measurement | 15. Rail pressure |
| 6. Ambient air pressure sensor | 16. Power steering pump mounting location |
| 7. Fuel return to tank | 17. Oil pressure and temperature sensor |
| 8. Engine data tag | 18. Engine position sensor |
| 9. Engine serial number | 19. Freon compressor mounting location. |
| 10. Starter | |

Section 1 - Operating Instructions

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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 the Maintenance Schedule, Section 2.

The new Cummins engine associated with this manual does **not** require a "break-in" procedure. Section 1 of this manual provides all of the necessary information required for proper engine operation.

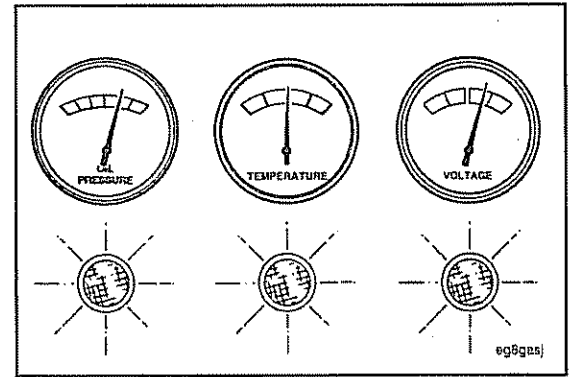


B7T Engine Maintenance Schedule					
Hourly	Weekly	Every 200 Hours or 2 Months*	Every 1000 Hours	Every 5000 Hours	Every 10000 Hours
Check	Check	Change	Adjust	Check	Change
<ul style="list-style-type: none"> Check oil level Check coolant level Check battery Check air filter Check belt tension Check engine compartment Check for leaks 	<ul style="list-style-type: none"> Check oil level Check coolant level Check battery Check air filter Check belt tension Check engine compartment Check for leaks 	<ul style="list-style-type: none"> Change oil and filter Change coolant Check and adjust belt tension Check and adjust valve clearance Check and adjust timing Check and adjust idle speed Check and adjust governor 	<ul style="list-style-type: none"> Adjust idle speed Adjust governor Adjust timing Adjust valve clearance 	<ul style="list-style-type: none"> Check and adjust idle speed Check and adjust governor Check and adjust timing Check and adjust valve clearance 	<ul style="list-style-type: none"> Check and adjust idle speed Check and adjust governor Check and adjust timing Check and adjust valve clearance

*NOTE: Refer to the Maintenance Schedule for specific procedures and replacement parts.
1. Follow the manufacturer's recommended maintenance procedures for all non-Cummins components and accessories. Cummins does not warrant the performance or life of non-Cummins components and accessories.
2. For information on engine operation, refer to the Cummins Operator's Manual. For information on engine maintenance, refer to the Cummins Maintenance Manual.
3. These maintenance intervals are based on normal operating conditions. For information on engine maintenance, refer to the Cummins Maintenance Manual, paragraph 2.1. For information on engine maintenance, refer to the Cummins Maintenance Manual.
4. Do not change the default filter if the OIL consumption level is over 2 litres.

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



Normal Starting Procedure

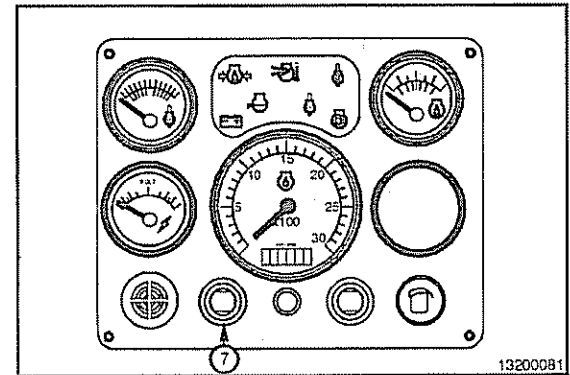
General Information

Marine and Industrial Applications

Engine Start Button

This black push button (7) is used to engage the starter motor.

NOTE: There is a separate keyswitch wired to the primary panel. It will be installed in the helm at the boat manufacturer's or installer's desired location. The keyswitch **must** be in the ON position to crank-start the engine.

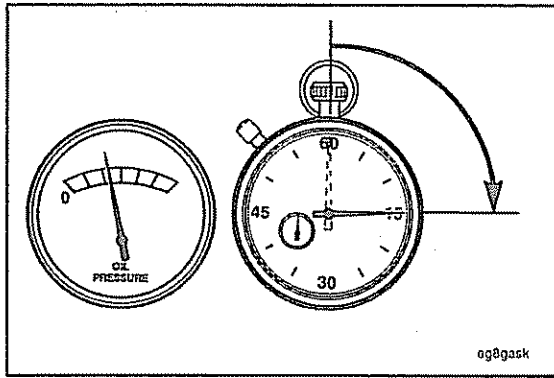


⚠ CAUTION ⚠

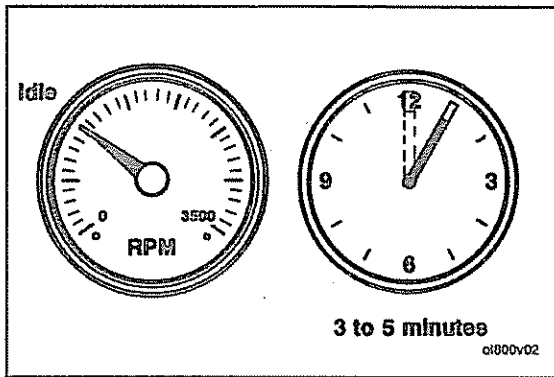
To prevent damage to the starting motor, do not engage the starting motor for more than 30 seconds. Wait 2 minutes between each attempt to start (electrical starting motors only).

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

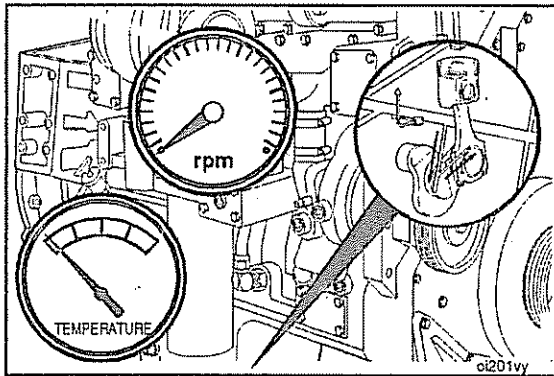
- Disengage the drive unit; put the transmission in neutral.
- Activate the ignition switch to open the fuel pump shutoff valve.
- Start the engine with the throttle in the IDLE position.



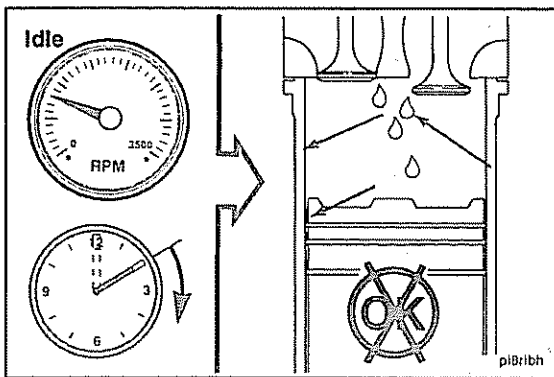
The engine **must** have adequate oil pressure within 15 seconds after starting the engine. If the warning light indicating low oil pressure has **not** gone out or there is no oil pressure indicated on the gauge within 15 seconds, shut off the engine immediately to avoid engine damage. Confirm the correct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



Idle the engine 3 to 5 minutes; this allows the engine to warm up before operating it with a load.

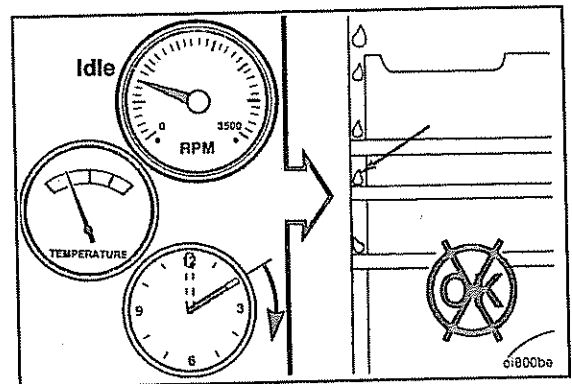


Increase the engine speed (rpm) slowly to provide adequate lubrication to the bearings, and to allow the oil pressure to stabilize.



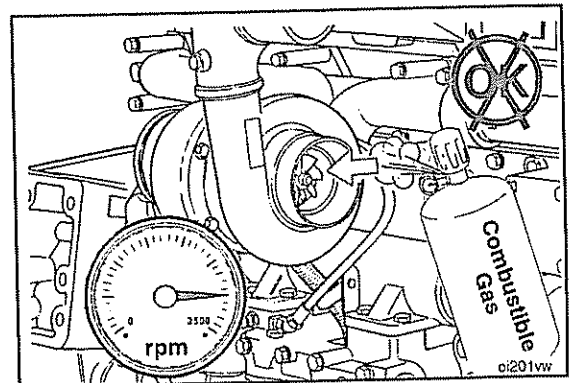
Do **not** keep the engine at low idle for long periods. Long periods at low idle, more than 10 minutes, can damage an engine. Combustion chamber temperatures will drop so low that the fuel will **not** burn completely. This will cause carbon to build up around the injector spray holes and piston rings,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

If the engine coolant temperature becomes too low, below 60°C [140°F], raw fuel will wash the lubricating oil off the cylinder walls and dilute the crankcase oil. Fuel dilution breaks down the lubricating oil properties and can shorten engine life. Operate the engine at a fast idle to prevent these conditions.



▲ WARNING ▲

DO NOT OPERATE A DIESEL ENGINE WHERE THERE ARE OR CAN BE COMBUSTIBLE VAPORS. These vapors can be sucked through the air intake system and cause engine acceleration and overspeeding 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 might operate in a combustible environment, due to its application, 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.**



▲ WARNING ▲

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

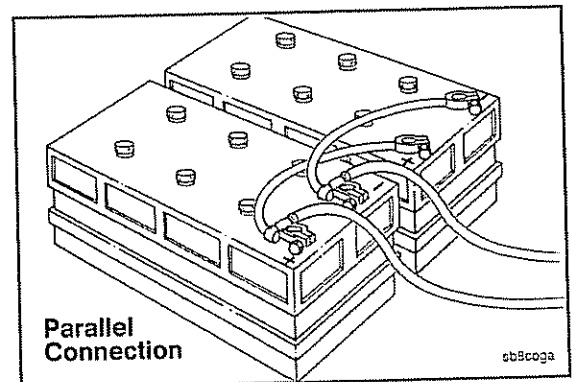
▲ CAUTION ▲

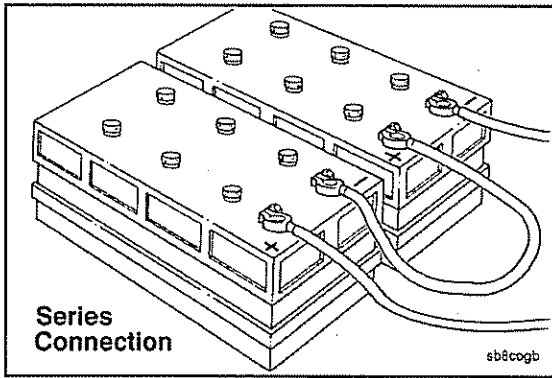
When using jumper cables to start the engine, make sure to connect the cables in parallel: Positive (+) to positive (+) and negative (-) to negative (-). When using an external electrical source to start the engine, turn the disconnect switch to the OFF position. Remove the key before attaching the jumper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

▲ CAUTION ▲

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

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





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

Cold Weather Operation

General Information

Marine and Industrial Applications

Satisfactory performance of a diesel engine operating in low ambient temperature conditions requires modification of the engine, surrounding equipment, operating practices, and maintenance procedures. The colder the temperatures encountered, the greater the amount of modification required; yet with the modifications applied, the engine **must** still be capable of operating in warmer climates without extensive changes. The following information is provided to engine owners, operators, and maintenance personnel on how the modifications can be applied to get satisfactory performance from their diesel engines.

There are three basic objectives to be accomplished:

1. Reasonable starting characteristics followed by practical and dependable warm-up of the engine and equipment
2. A unit or installation that is as independent as possible from external influences
3. Modifications that maintain satisfactory operating temperatures with a minimum increase in maintenance of the equipment and accessories.

If satisfactory engine temperature is **not** maintained, higher maintenance costs can result from the increased engine wear, poor performance, and formation of excessive carbon, varnish, and other deposits. Special provisions to overcome low temperatures are definitely necessary, whereas a change to warmer climate normally requires **only** a minimum of revision. Most of the accessories will be designed in such a way that they can be disconnected so there is little effect on the engine when they are **not** in use.

The two **most** commonly used terms associated with preparation of equipment for low-temperature operation are:

- Winterization
- Arctic specifications.

Winterization

Winterization of the engine and/or its components is done so that starting and operating are possible in the lowest temperatures encountered. This requires the following:

1. Use of the correct materials
2. Proper lubrication; low-temperature lubricating oils. Refer to the Lubricating Oil Specifications, Section V
3. Protection from low-temperature air. The metal temperature does **not** change, but the rate of heat dissipation is affected
4. Fuel of the proper grade for the lowest temperature. Refer to the Fuel Recommendations, Section V
5. Heating to be provided to increase the engine block and component temperature to a minimum of -32°C [-27°F] for starting in lower temperatures
6. Proper external heating source available
7. Electrical equipment capable of operating in the lowest expected temperatures.

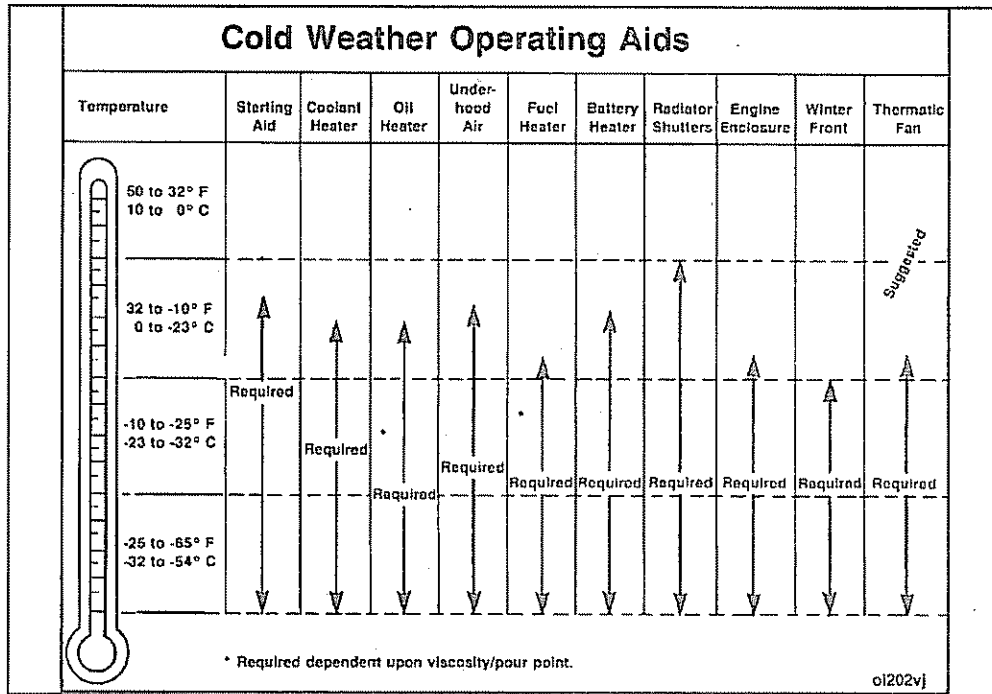
Arctic Specifications

It is possible to operate a diesel engine in extremely cold environments if they are properly prepared and maintained. The correct lubricants, fuels, and coolants **must** be used for the cold-weather range in which the vessel is being operated. For additional information on cold-weather operation, obtain Engine Operation in Cold Weather, Service Bulletin 3379009, from the nearest Cummins Distributor or Dealer. Refer to the table below for recommendations in different operating ranges.

Winterization 0°C to -32°C [32°F to -26°F]	Arctic Specification -32°C to -54°C [-26°F to -65°F]
Use a 50-percent mixture of a recommended anti-freeze (refer to the Coolant Recommendations, Section V) and 50-percent water. Use a recommended multiviscosity oil (refer to the Lubricating Oil Specifications, Section V) meeting Cummins specifications. The cloud point of the fuel must be 5.5°C or 10°F below the ambient temperature.	Use a 60-percent mixture of a recommended anti-freeze (refer to the Coolant Recommendations, Section V) and 40-percent water. Use a recommended multiviscosity oil (refer to the Lubricating Oil Specifications, Section V) meeting Cummins specifications. The cloud point of the fuel must be 5.5°C or 10°F below the ambient temperature.

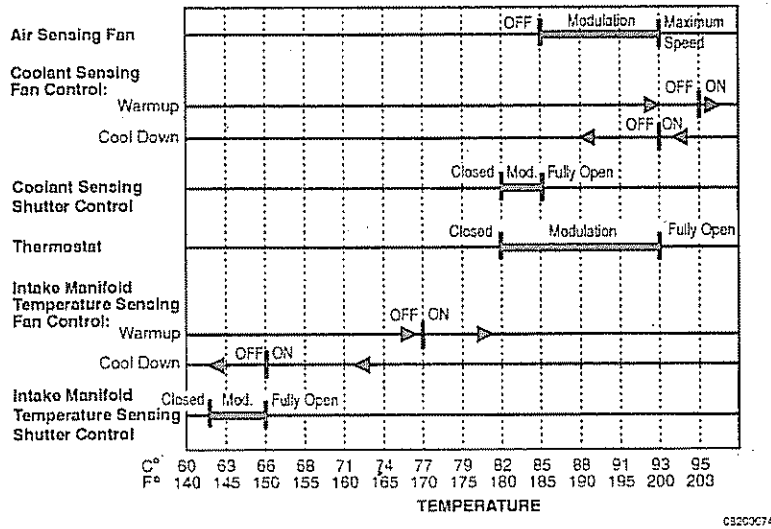
Industrial Applications

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



Thermo Control Settings

The temperatures listed in this chart for coolant temperature sensing fan control and intake manifold temperature sensing fan control are correct for vehicles that allow the ECM to control the on/off operation of the cooling fan. Consult your local OEM for other types of control.

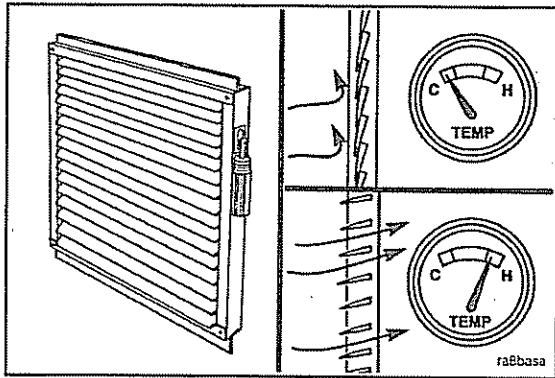


Industrial

- The fan should be 100% on when the intake manifold temperature reaches 60°C [140°F].
- The shutter should be full open when the intake manifold temperature reaches 60°C [140°F].

Winterfronts

Winterfronts can be used on equipment with charge air cooling, but **must** be designed to cover the frontal area of the cooling system partially. A minimum of 18.6 square centimeters (4.31 cm x 4.31 cm) of frontal area **must** be left open to airflow for the charge air cooling to function correctly.

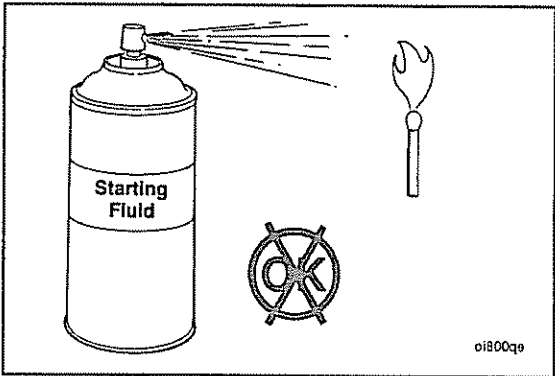


Shutters

The flow of air across the radiator core into the engine compartment can be prevented by installing radiator shutters. Because airflow has a major effect on heat loss through radiation, reducing the airflow with shutters will reduce the time required for engine warm-up and help maintain engine operating temperature.

Shutters **must** operate in the same temperature range as the thermostat with which they are used.

Installations of charge air cooling engines with shutters also require an intake manifold air temperature switch to open the shutters to prevent excessive intake manifold temperatures. This prevents engine damage due to high intake manifold temperatures as a result of blocked airflow across the charge air cooling.



Cold Weather Starting Aids

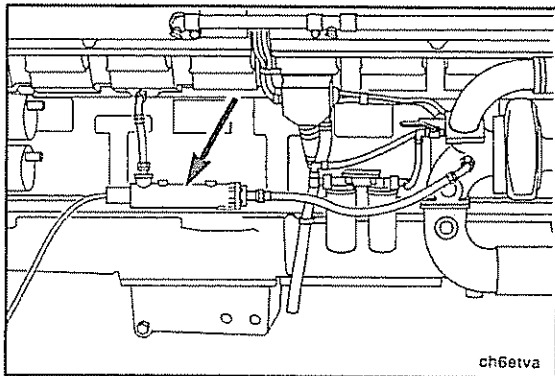
General Information

Marine and Industrial Applications



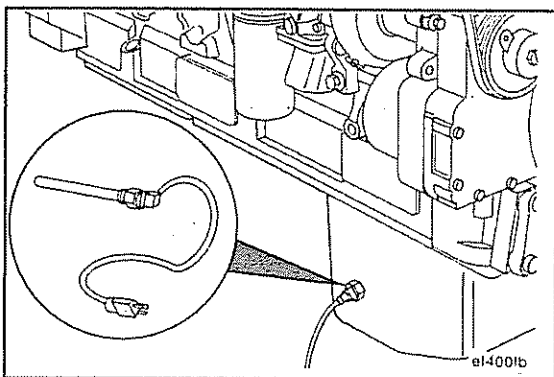
Starting fluid is highly flammable and explosive. Keep flames, sparks, and arcing switches away from starting fluid.

Because of the increased safety hazards and potential for engine damage, Cummins Engine Company, Inc., does **not** recommend the use of starting fluid of any kind in marine applications.



The **only** approved starting aids for marine applications are engine coolant preheaters and oil pan immersion heaters.

NOTE: Coolant heaters can be stacked, up to 500 watts each, if the temperature requirements demand more capacity.



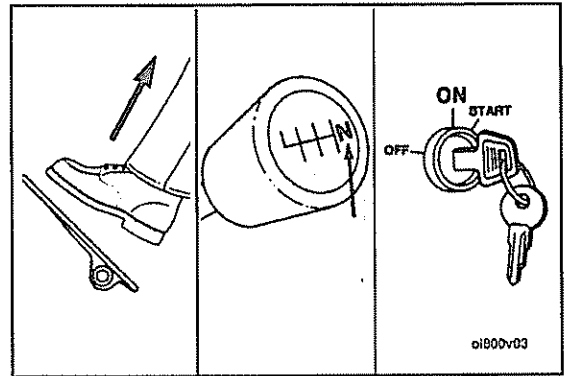
Immersion-type oil heaters can heat up to 300 watts, maximum.

Cold Weather Starting Using Starting Fluid

With Mechanical or Electrical Metering Equipment (Ether)

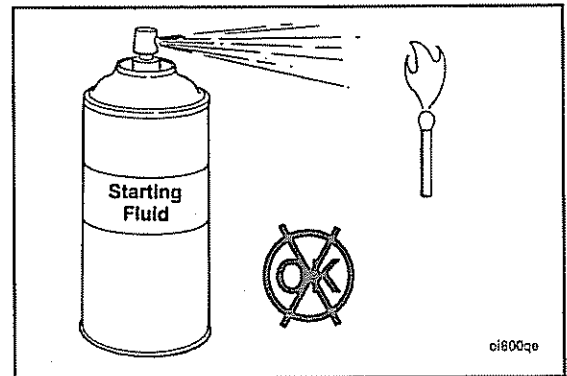
Industrial Applications

- Set the throttle at idle.
- Disengage any driven accessories and, if equipped, put the transmission in NEUTRAL.
- Turn the keyswitch to the ON position to power up the ECM.



▲ WARNING ▲

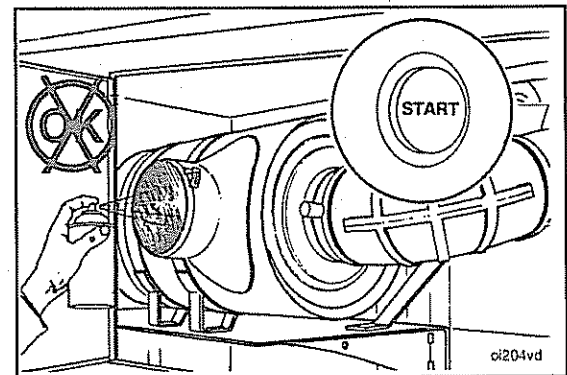
Because of the potential for an explosion, do not use volatile cold starting aids in underground mine or tunnel operations. Ask the local U.S. Bureau of Mines inspector for instructions.



▲ WARNING ▲

Starting fluid is highly flammable and explosive. Keep flames, sparks, and arcing switches away from starting fluid.

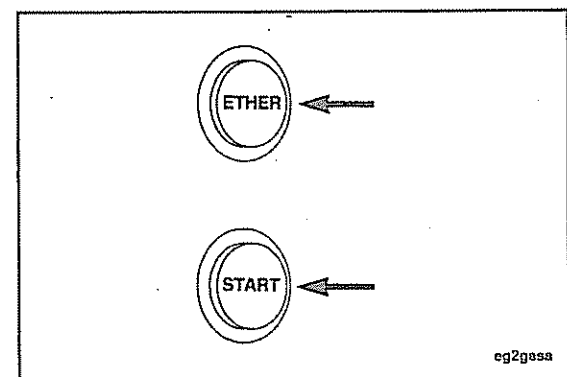
Due to increased safety hazards and potential for engine damage, do **not** use starting fluid without metering equipment.

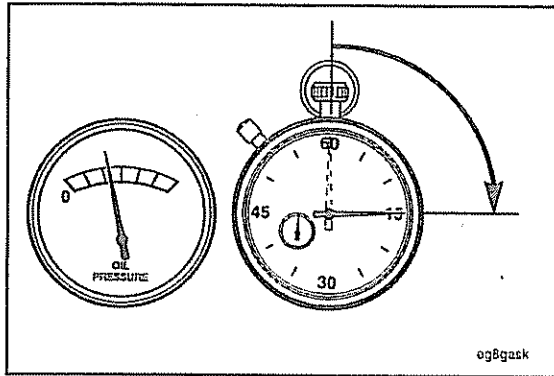


▲ CAUTION ▲

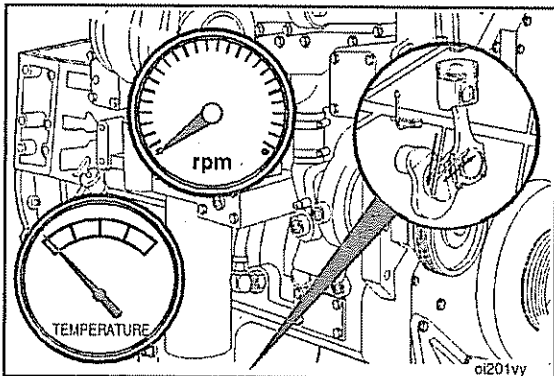
Do not use excessive amounts of starting fluid when starting an engine. The use of too much starting fluid will damage the engine.

- While cranking the engine, press the ETHER switch to inject a metered amount of starting fluid.



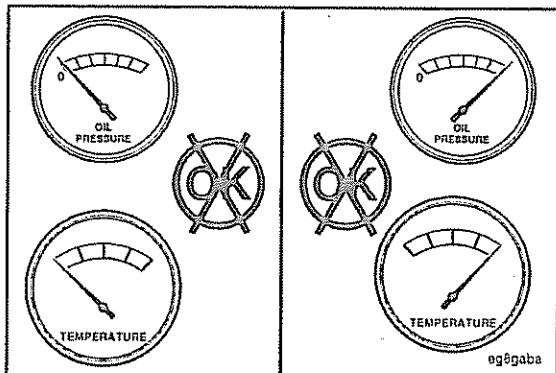


The engine **must** have adequate oil pressure within 15 seconds after starting. If the warning light indicating low oil pressure has **not** gone out or there is no oil pressure indicated on a gauge within 15 seconds, shut off the engine immediately to avoid engine damage. Confirm the correct oil level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



Do **not** increase the engine speed above low idle until the coolant temperature gauge needle starts to move or 10 minutes have elapsed. This will provide adequate lubrication to the bearings.

Monitor the oil pressure after normal operation is initiated.



Operating the Engine

General Information



Marine and Industrial Applications

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



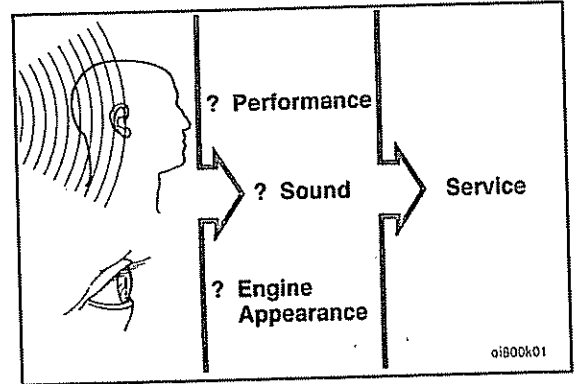
CAUTION

Continuous operation with a low coolant temperature, below 71°C [160°F]; or a high coolant temperature, above 100°C [212°F], can damage the engine.

If an overheating condition starts to occur, reduce the power output of the engine, until the temperature returns to the normal operating range. If the engine temperature does **not** return to normal, shut off the engine, and refer to Troubleshooting Symptoms, Section TS, or contact a Cummins Authorized Repair Location.

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

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



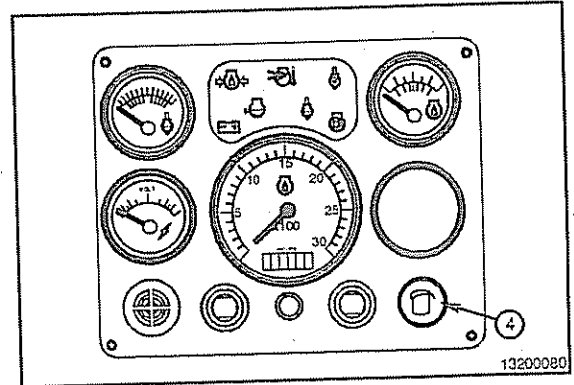
Instrument Panel

Illumination Control

Marine Applications

Turning the illumination control knob (4) will control the panel illumination and all switch panel backlighting.

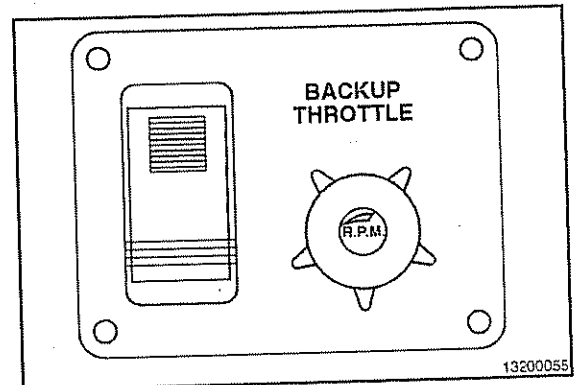
NOTE: Turning the knob **clockwise** will decrease the illumination. Turning it **counterclockwise** will increase the illumination.

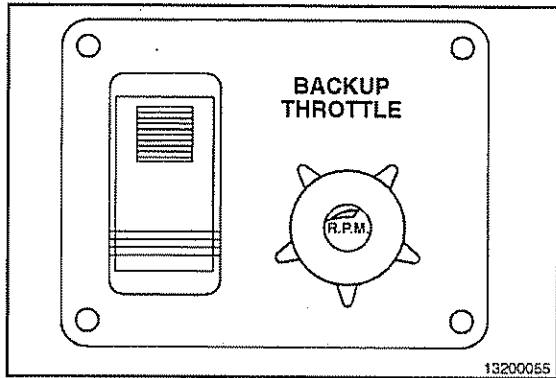


Backup Throttle

Marine Applications

The backup throttle was designed to be used in the event of a main throttle failure.



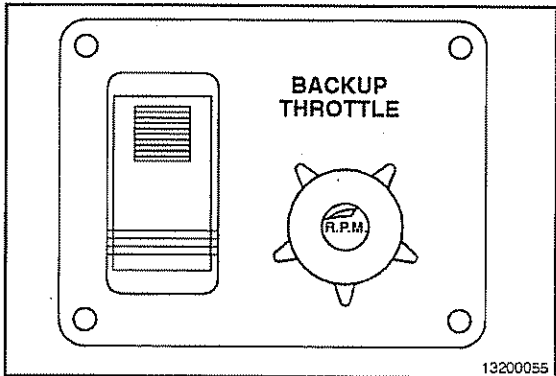


To use the backup throttle:

1. Rotate the backup throttle knob **counterclockwise** to the idle position, or depress the knob to bring the engine to idle.
2. Put the main throttle lever in the idle position.
3. Move the backup throttle switch to the ON position.

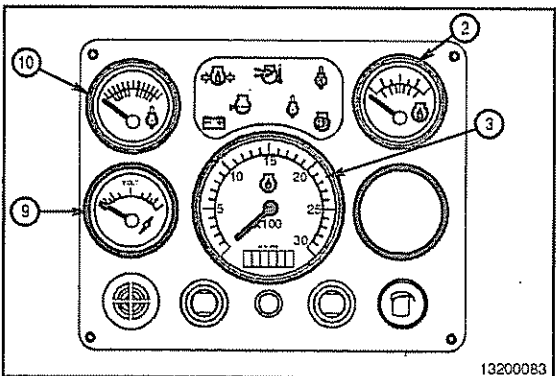
NOTE: The backup throttle switch has a safety latch feature; press the latch down and move the switch to the ON position. The throttle also has a friction adjustment collar. Rotate the collar **clockwise** to tighten, or **counterclockwise** to loosen, until the desired throttle tension is obtained.

4. Rotate the throttle knob **clockwise** to desired engine speed.



To turn the backup throttle off and to regain control of the engine speed using the main throttle lever:

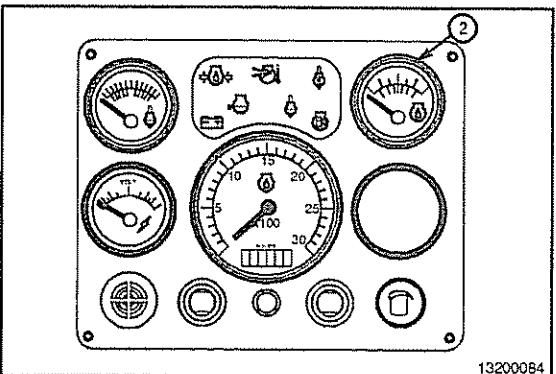
1. Set the backup throttle to idle.
2. Set the main throttle to idle.
3. Put the backup throttle switch in the OFF position by depressing the bottom of the rocker switch.



Gauges

Marine Applications

All of the gauges, except the voltmeter (9), used with the QSM11 engines are electronically driven. The gauges receive the reading from a high-speed datalink that is connected to the different sensors. If a gauge has no information from the datalink, it will slowly toggle between its high and low extremes.



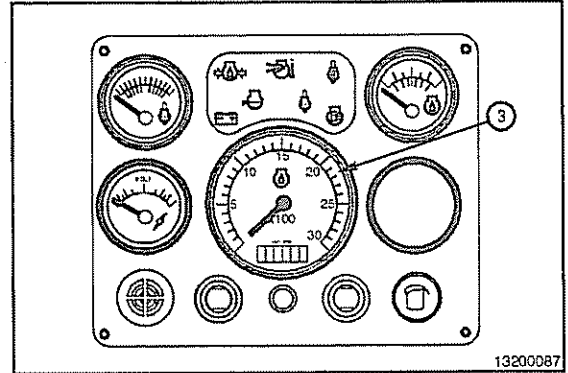
Oil Pressure Gauge

The oil pressure gauge (2) shows the operating oil pressure of the engine.

Tachometer w/Hour Meter

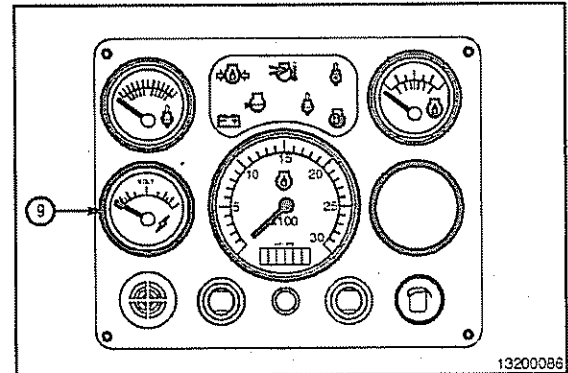
The tachometer (3) shows the engine's crankshaft speed in revolutions per minute (rpm).

The hour meter shows the numbers of hours of operation. This function is used for maintenance of the engine(s).



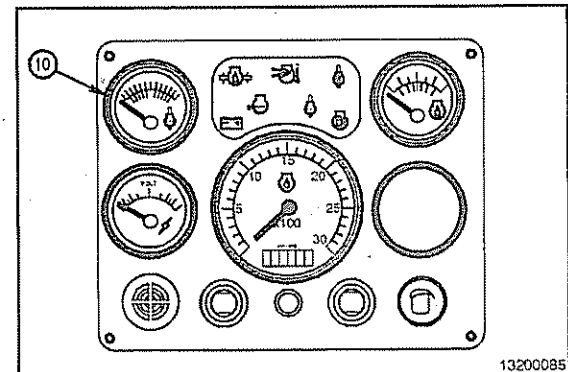
Voltmeter

The voltmeter (9) shows the battery voltage.



Coolant Temperature Gauge

The coolant temperature gauge (10) shows the temperature of the engine coolant during operation.



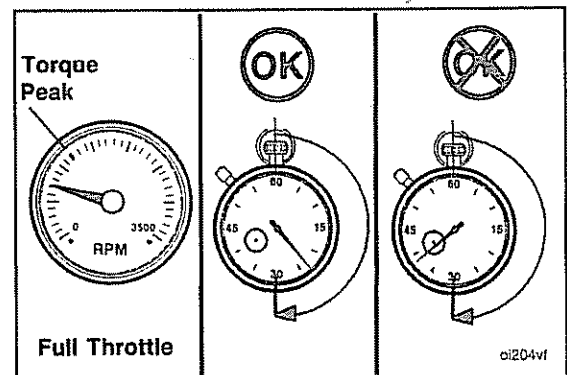
Engine Operating Range

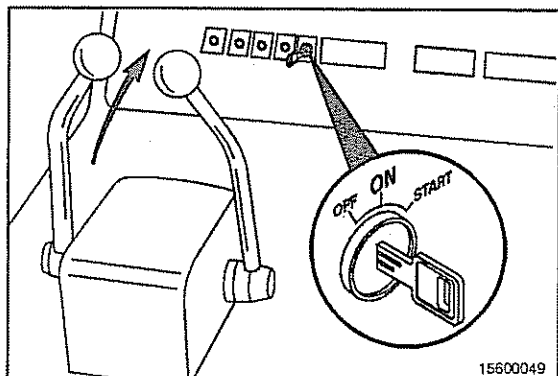
General Information



Do not operate the engine at excessive full-throttle operation below peak torque rpm (refer to engine data-plate for peak torque rpm) for more than 30 seconds. This condition will shorten engine life to overhaul, can cause serious engine damage, and is considered operator 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.

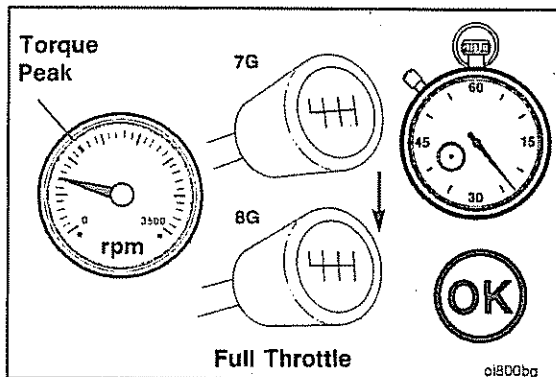




Marine Applications

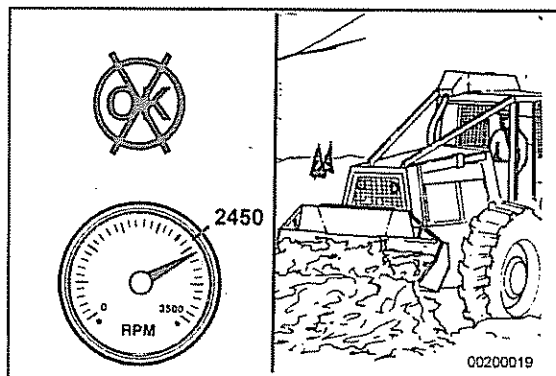


Do not operate the engine beyond the high-idle speed. Operating the engine beyond high-idle speed can cause severe engine damage. The engine speed must not exceed 2450 rpm under any circumstances.

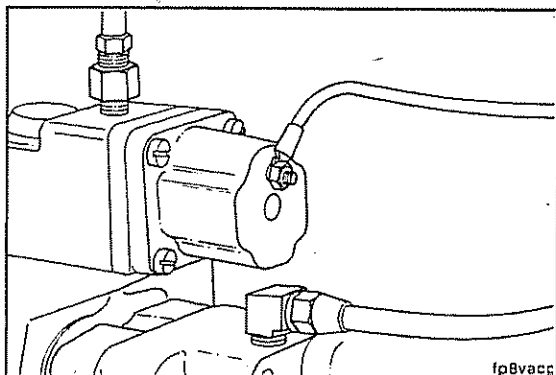


Industrial Applications

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



Do not operate the engine beyond the high-idle speed. Operating the engine beyond high-idle speed can cause severe engine damage. The engine speed must not exceed 2450 rpm under any circumstances. When descending a steep grade, use a combination of transmission gears and service brakes to control the vehicle and engine speed.



Fuel Shutoff Valve

General Information

Marine and Industrial Applications



The ECM provides a voltage output in the harness to control the fuel shutoff valve solenoid. The output voltage is equal to the battery voltage (system voltage). This must be the only wire connected to the fuel shutoff valve solenoid. Excessive current draw will cause possible engine shutdowns and fault codes to be logged.

Engine Shutdown

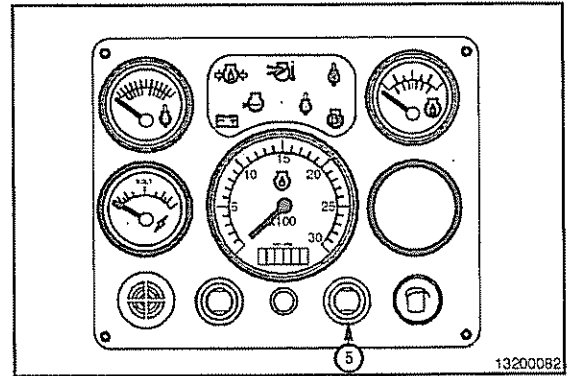
General Information

Marine Applications

Engine Stop Button

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

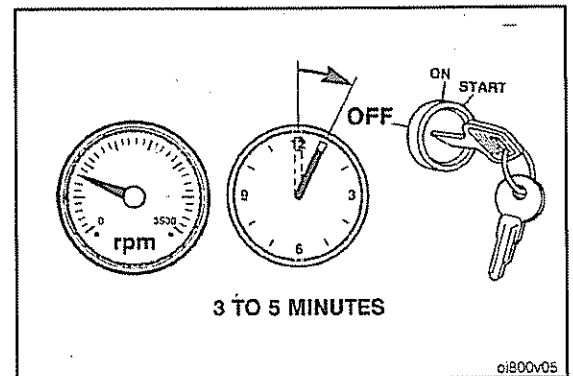
This red push button (5) is used to stop the engine(s).



Industrial Applications

1. Allow the engine to idle 3 to 5 minutes before shutting it off after a full-load operation. This allows adequate cooldown time for the pistons, cylinders, bearings, and turbocharger components.
2. Turn the ignition keyswitch to the OFF position.

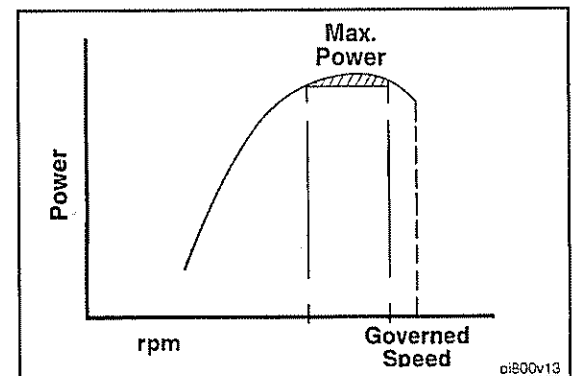
NOTE: If the engine does **not** shut off, rotate the manual fuel shutoff thumbscrew **counterclockwise** to make sure the valve is **not** being held open by the manual override screw.



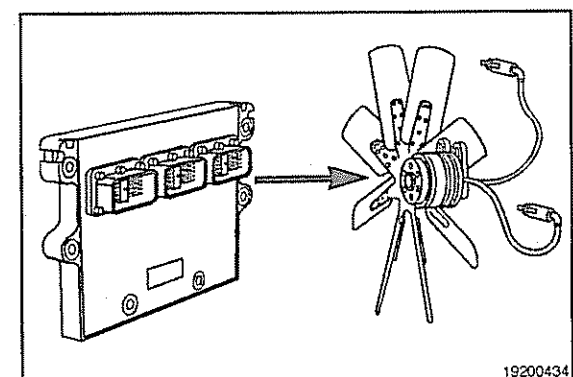
Electronic Controlled Fuel System

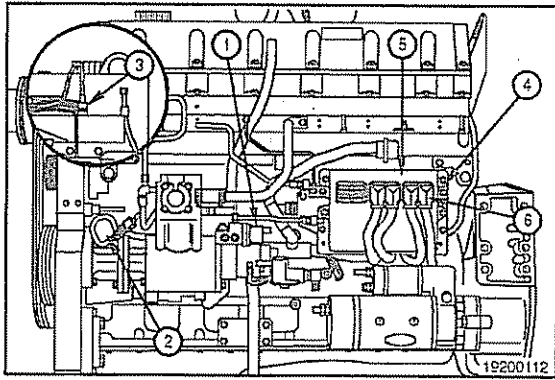
General Information

The system is an electronically controlled fuel injection system that optimizes fuel economy and reduces exhaust emissions. It does this by controlling the torque and horsepower curve, air-fuel control (AFC) function, engine high speed, low idle, and road speed.



The engine has the capability of controlling the fan clutch actuator if an electronically controlled fan clutch is used.



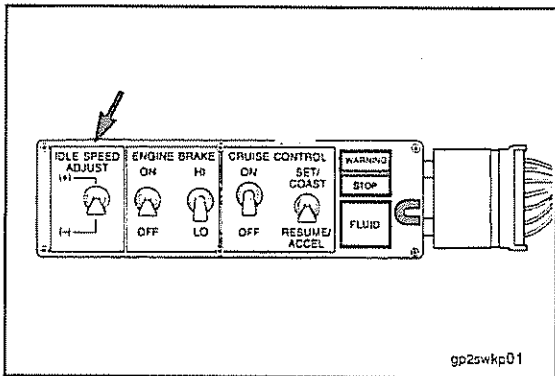
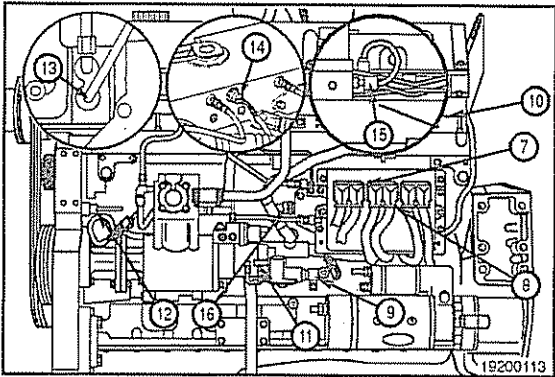


Fuel System Description

Industrial Applications

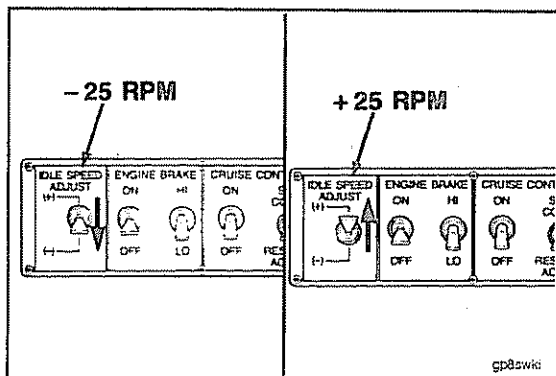
The fuel system on a QSM11 engine consists of:

1. Fuel shutoff valve
2. Oil pressure sensor and temperature sensor
3. Intake manifold boost sensor
4. Cooling plate
5. ECM
6. Engine wiring harness deutsch connector.
7. OEM wiring harness
8. Engine wiring harness deutsch connector
9. Fuel in
10. Fuel out
11. Fuel gear pump
12. Engine position sensor (eps)
13. Coolant temperature sensor (in thermostat support)
14. Coolant level sensor (in overflow tank) - optional
15. Intake manifold temperature sensor
16. Ambient air pressure sensor.



The idle adjustment is in the cab panel. Use this switch to adjust the engine idle speed in increments of 25 rpm.

— Industrial - 650 to 800 rpm.

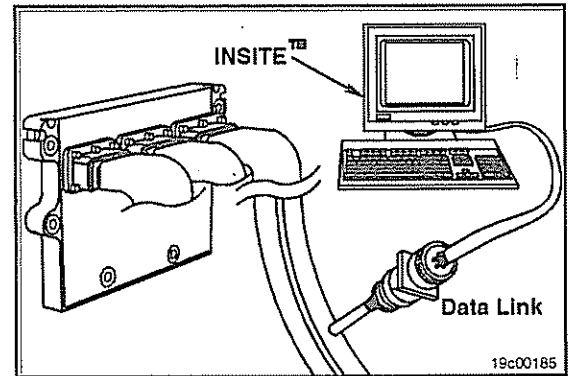


Each time the switch is briefly moved to the minus (-) position, the idle speed is decreased by 25 rpm. When the switch is briefly moved to the plus (+) position, the idle speed is increased by 25 rpm.

Programmable Features

General Information

The system provides additional electronic features that enhance engine and vehicle performance and control. These are programmable features in the ECM. For more information on additional features, refer to the Troubleshooting and Repair Manual, Electronic Control System, ISM and QSM11 Engines, Bulletin 3666266; or contact a Cummins Authorized Repair Location.



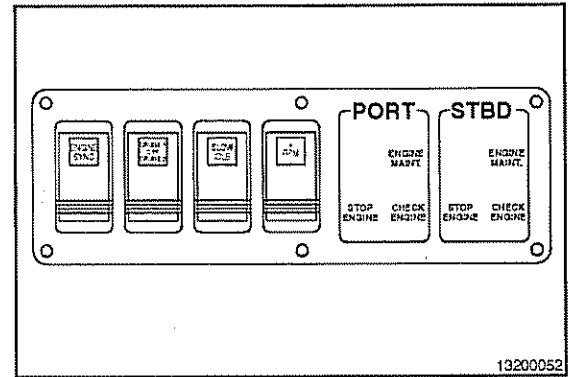
Marine Programmable Features

Slow Idle



Deactivate the SLOW-IDLE feature during docking maneuvers. In slow-idle mode, propeller inertia can cause the engine to stall when shifting into forward or reverse, which can cause the user to collide with the dock. Failure to turn off the SLOW-IDLE feature can cause personal injury, damage to the vessel, and/or the dock.

The SLOW-IDLE feature allows for lower idle speed for operation in "No Wake Zones." When activated, the slow-idle feature reduces the engine speed to 550 rpm.

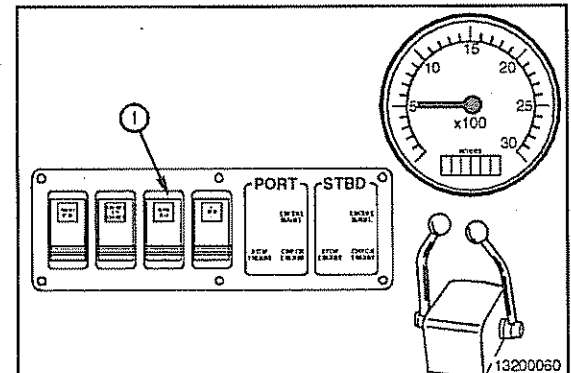


NOTE: A single switch controls both engines on twin-engine vessels.

To use the SLOW-IDLE feature:

1. The vessel **must** be in gear
2. The throttle **must** be in the idle position
3. Put the SLOW-IDLE switch in the ON position (1) by depressing the top of the rocker switch.

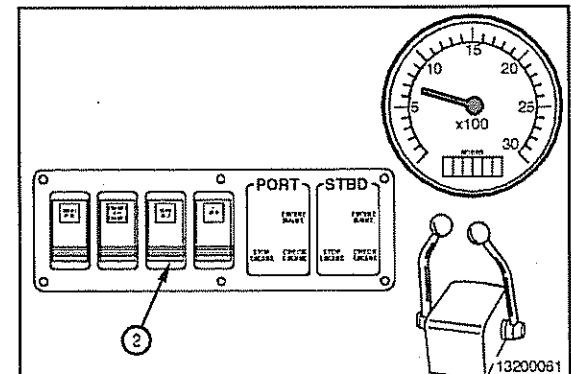
The engine(s) idle will decrease to 550 rpm.

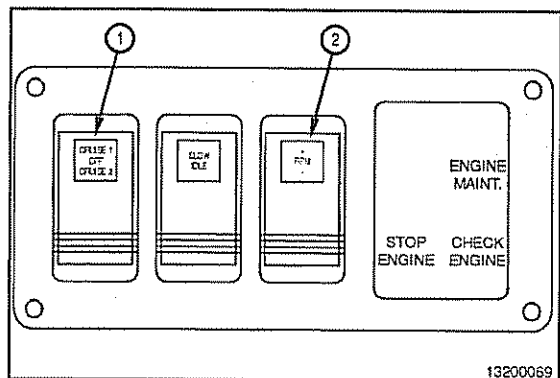


To turn the slow-idle feature off, put the SLOW-IDLE switch in the OFF position (2) by depressing the bottom of the rocker switch.

The engine(s) will adjust to the idle set speed.

NOTE: When the slow-idle switch is on, increasing the throttle will **temporarily** turn off the slow-idle feature. When the throttle is moved back into the idle position, the slow-idle feature will **automatically** turn itself on again.



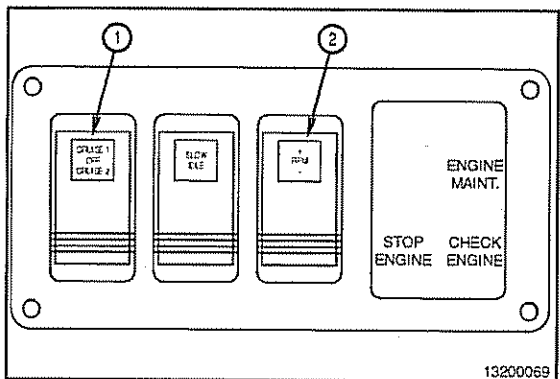


Engine Speed Control

The engine speed control (rpm \pm) switch (2) allows the idle speed to be adjusted in 25-rpm increments by pressing the rocker switch.

Pressing the top of the switch increases (+) engine rpm.

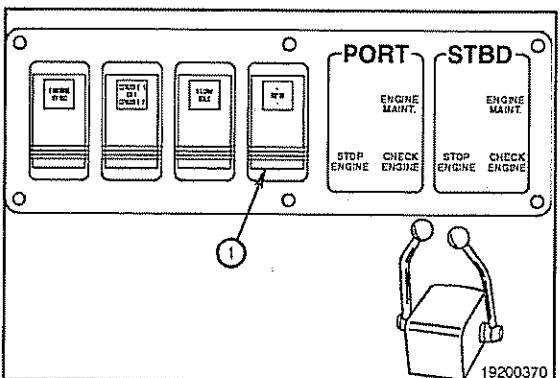
Pressing the bottom of the switch decreases (-) engine rpm.



When the rpm \pm switch (2) is used with the engine at idle, the switch will **only** work from 600 to 1000 rpm.

NOTE: The rpm \pm switch (2) will **not** change the idle speed when the engine is in SLOW-IDLE mode.

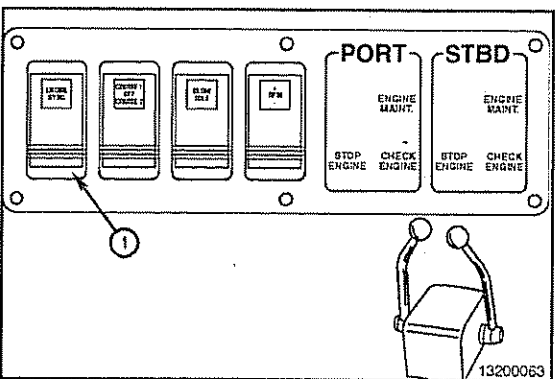
Use of the slow-idle feature will deactivate the rpm \pm feature.



Twin-Engine Vessels

If the engine speed between the two engines is **not** the same, adjust both engines to the minimum rpm setting, 600 rpm, by depressing the bottom (-) of the switch until both engines are at 600 rpm.

Then using the rpm \pm switch (1), adjust the idle to the desired speed, rpm.



Engine Synchronization Switch

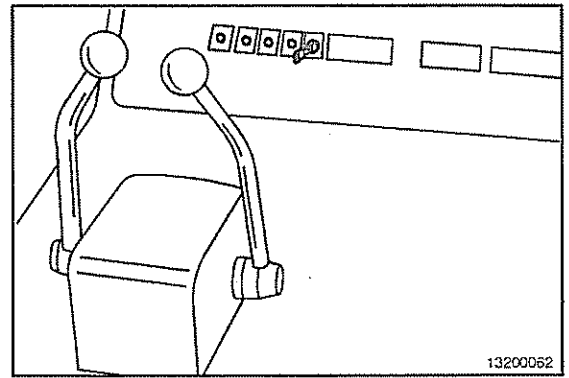


The engine synchronization feature must be turned off before docking or low-speed maneuvering; this allows full and separate control of each engine. Failure to turn off the engine synchronization feature can cause personal injury, damage to the vessel, and/or the dock.

NOTE: The engine synchronization feature is an option available **only** on twin-engine vessels.

The engine synchronization feature is used to control the speed of both engines electronically, using one throttle lever.

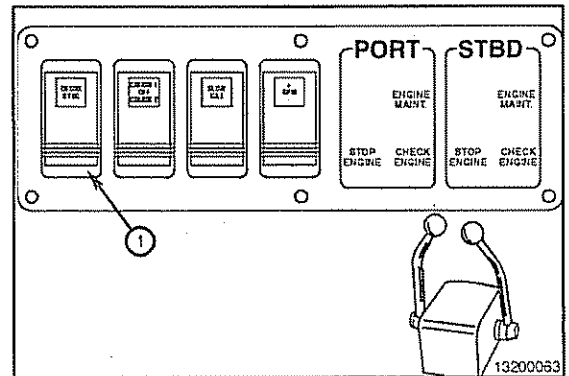
Normally the starboard throttle is used as the master throttle. The distributor or dealer can change it to the port throttle, if desired, by changing the master and slave plugs in the engine wiring. Refer to the installation manual.



To use the engine synchronization feature:

1. Both engines **must** be in the same throttle position, running at the same rpm.
2. Put the ENG SYNC switch (1) in the ON position by depressing the top of the rocker switch.

Both engines will adjust to the same rpm. The master throttle will control both engines.



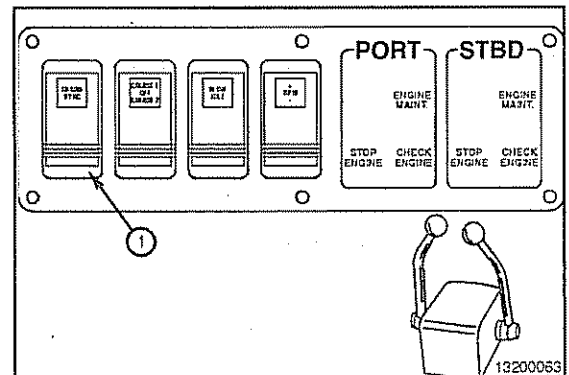
▲ CAUTION ▲

Adjust both throttles to the same position before turning the engine synchronization feature off. Failure to do so can cause a sudden port or starboard turn.

To turn the engine synchronization feature off:

1. Both throttles **must** be in the same position.
2. Put the ENG SYNC switch (1) in the OFF position by depressing the bottom of the rocker switch.

The engines speed will slowly ramp to their physical throttle settings.



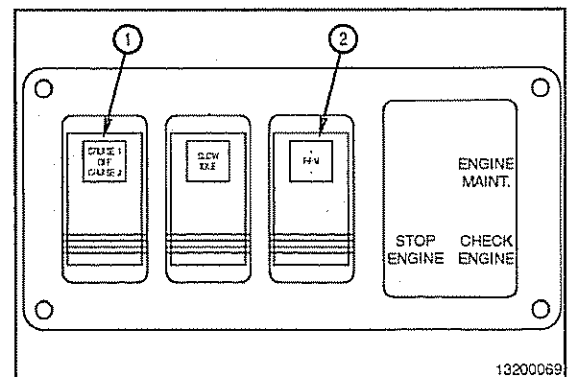
Marine Cruise Control

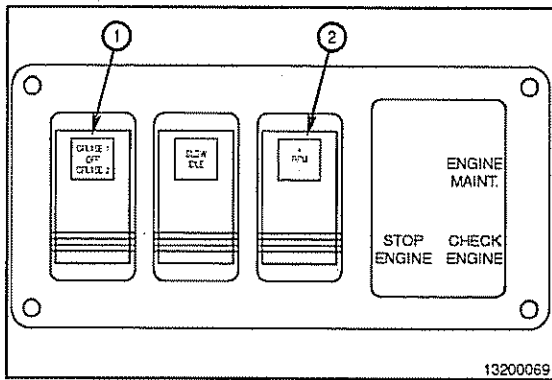
The marine cruise control feature provides two adjustable engine speeds. The cruise control can be used to run the engine(s) at the optimal cruise rpm or trolling rpm.

CRUISE 1 has a default setting of 2100 rpm.

CRUISE 2 has a default setting of 1200 rpm.

NOTE: The marine cruise control feature can be used in conjunction with the engine synchronization feature.



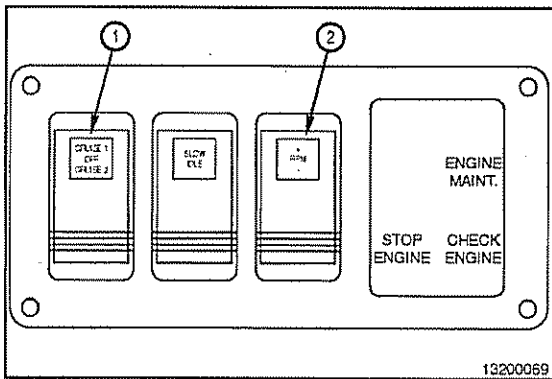


To activate the marine cruise control feature:

1. Put the cruise switch (1) in the desired position, CRUISE 1 or CRUISE 2.
2. Move the throttle(s) past the desired cruise speed.

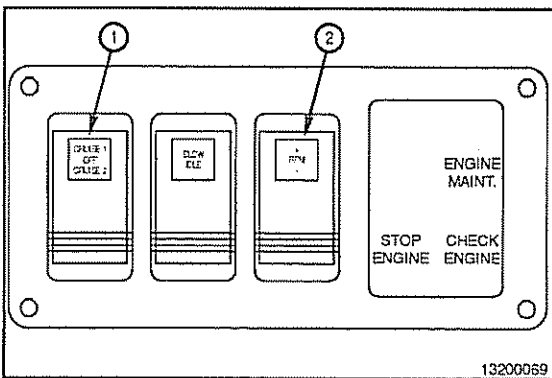
The engine(s) speed will increase to the cruise setting.

NOTE: When using the engine synchronization feature, the master throttle is the **only** throttle that **must** be moved past the cruise point.



To turn the marine cruise control off, put the cruise switch (1) in the OFF position (rocker switch in the center position).

The engine(s) rpm will slowly ramp to the throttle lever setting.



To change the CRUISE 1 or CRUISE 2 default setting rpm:

1. With the engine running, select the cruise setting that you want by setting the cruise control switch (1) to CRUISE 1 or CRUISE 2.
2. Move the throttle to the full-throttle position while underway, or at the dock with the gear in neutral. The engine will **not** exceed the existing cruise setting. For example, if CRUISE 2 is at the factory setting of 1200 rpm, the engine will **only** reach 1200 rpm at full throttle.
3. Using the rpm \pm switch (2), adjust the cruise rpm to the new desired engine speed.

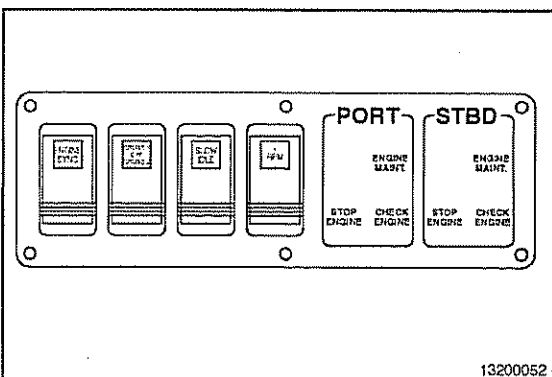
NOTE: The cruise speeds can be set between 600 and 2100 rpm. This new setting will be saved until the cruise is readjusted.

Twin-Engine Applications

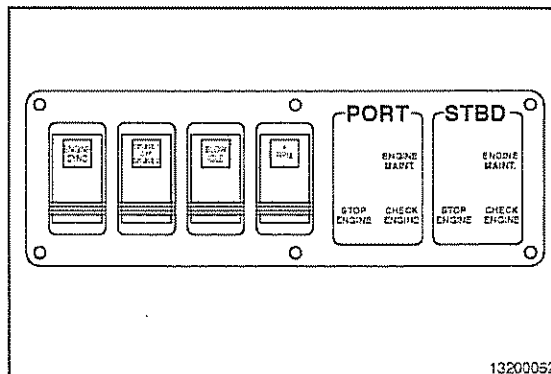
If the engines are running at different speeds:

Adjust the cruise to the minimum or maximum setting, using the rpm \pm switch.

Adjust the cruise to the desired setting, using the rpm \pm switch.



NOTE: If an engine will **not** reach rated rpm, make sure the marine cruise control feature is in the OFF position. If the marine cruise control feature is left in the CRUISE 1 or CRUISE 2 position, maximum engine speed will be limited to the set point of the position that the cruise switch is in.



Industrial Programmable Features

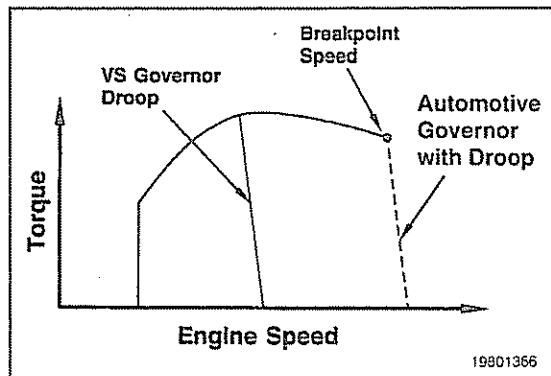
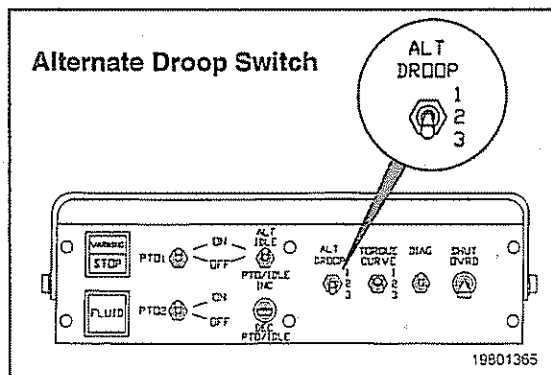
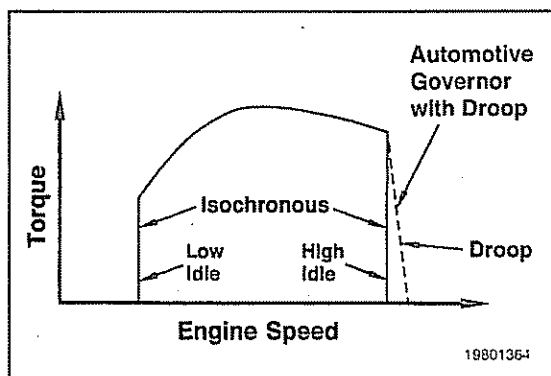
Alternate Droop

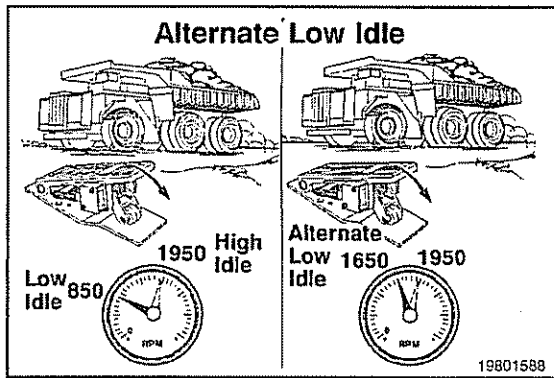
The alternate droop feature allows characteristics to be changed for the automotive governor and for the variable speed governor. Droop is usually expressed as a percentage. The graph to the right illustrates the isochronous (0-percent droop) and droop (more than 0-percent droop) governor characteristics. Less governor droop provides a more responsive governor for more precise engine control. More governor droop provides smoother shifting and smoother mechanical clutch engagement.

Alternate droop is available for industrial calibrations **only** and is specific to each calibration and application.

The alternate droop feature provides the ability to select different droop settings as follows. An OEM-provided switch can be used to select up to three droop settings (base, alternate 1, and alternate 2) and/or vehicle speed can be used to select up to five droop settings (base, alternate 1, alternate 2, Jcomm, and no selection). The final droop is based on a user-defined priority assigned to either the switch or the vehicle speed. The availability of these droop settings and abilities is dependent on the individual OEM setup and application.

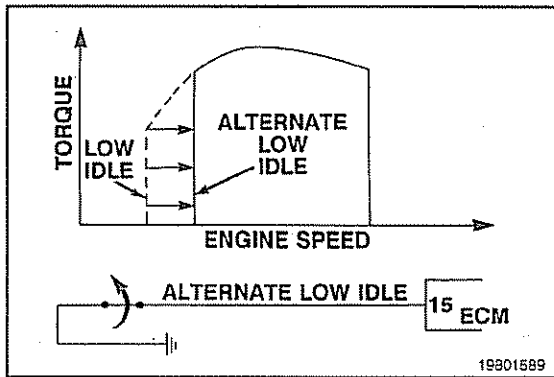
Each alternate droop setting provides the ability to select the breakpoint droop percent for the automotive governor and droop percent for VS governor. The breakpoint speed determines what position on the engine torque curve the automotive governor will start to limit engine torque output.



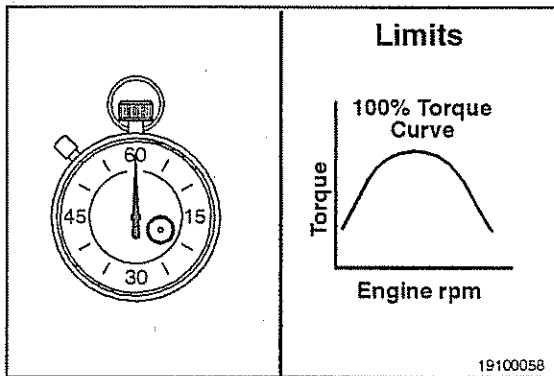


Alternate Low Idle Speed

This feature allows for two different low-idle speed settings with normal throttle control above the low-idle speed setting. This feature is often used on electric drive haul trucks when they are traveling above 5 kph [3 mph].



The alternate low-idle feature is activated whenever the normally closed alternate low-idle switch is opened and 5 VDC are detected on the alternate low-idle signal line. The following art illustrates an alternate low-idle speed that is above the normal low-idle speed.



Automatic Boost Power

The automatic boost power feature will limit the time that the engine can operate on the 100-percent torque curve. Engine load intake manifold temperature and coolant temperature will be compared to thresholds to determine if boost power is available. Once boost power has been selected, the amount of the time spent on the 100-percent torque curve is limited. Boost power will be active and **not** time-limited when the engine speed is below a calibration threshold. A boost power lamp will be illuminated while active, and will flash as boost power is about to time out. The availability of this feature is dependent on the individual OEM application.

Sensed Parameters

This feature allows an OEM-provided pressure sensor and/or an OEM-provided temperature sensor to be read by the ECM. It also determines the out-of-range limits for each sensor. If the sensor value is outside the limits, then a fault will be logged corresponding to the out-of-range sensor and a default value will be used for the out-of-range sensor. This feature can be enabled or disabled by INSITE. The Number of Inputs, Upper and Lower Pressure Thresholds, and Upper and Lower Temperature Thresholds can be adjusted by INSITE.

The temperature and pressure sensors can be used by the ECM to control other features, such as the Electronic Fan Clutch or Switched Outputs.

Low Idle Shutdown

The low-idle shutdown feature automatically shuts off an engine after a period of idling when there is no activity from the driver such as clutch, brake, or throttle actuation. The time interval can be changed using an electronic service tool.

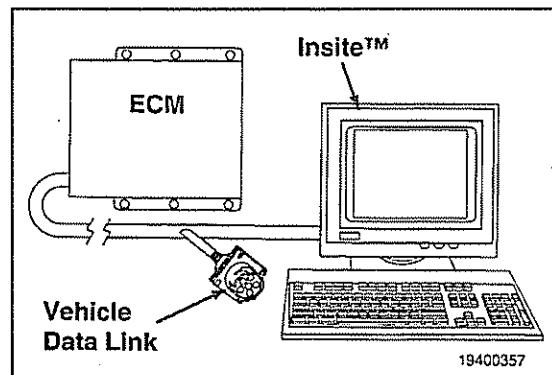
The idle shutdown system will **not** be active at coolant temperatures below 43°C [109°F].

After an engine has been automatically shut off, the key **must** be turned off for 5 seconds before attempting a re-start.

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

Hot Shutdown Monitor

The hot shutdown monitor is a selectable feature within the electronic service tool INSITE™. If this feature is enabled, the ECM will log an inactive fault when the engine is turned off while still "hot" by the operator or by the engine protection feature.



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

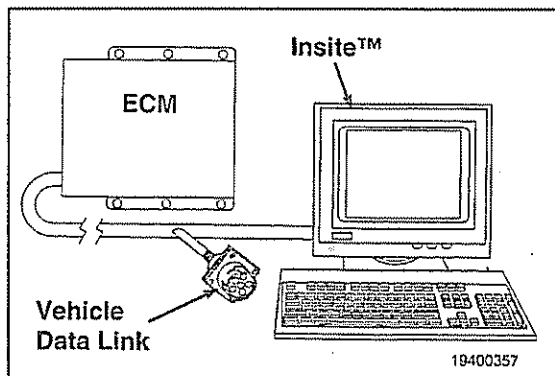
Engine Protection Shutdown Manual Override

The engine protection shutdown manual override feature can override the engine shutdown process when it is necessary. The engine protection shutdown manual override feature detects the operator request for engine protection shutdown manual override, records the times of occurrences, and sends a flag to inform the engine protection shutdown feature and lamp control to restart the shutdown warning period. This feature can be enabled by INSITE.

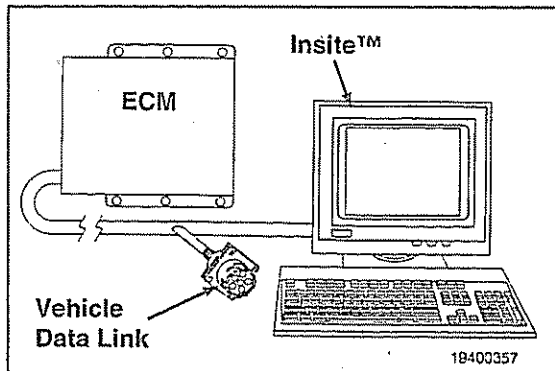
During an engine protection shutdown sequence, the warning lamp will flash. With the engine protection shutdown manual override feature enabled, the shutdown will be overridden if the dash-mounted override switch is turned on as the warning lamp is flashing. The feature will also record a snapshot that can be viewed under the Engine Protection Data in INSITE.

Electronic Fan Clutch

The electronic fan clutch feature provides a pulse-width modulated signal to control a variable-speed fan clutch based on the need provided by eight possible sensor inputs, or an input from an electronic service tool. This feature will reduce fuel consumption by minimizing fan on-time and lengthen belt life by eliminating belt hop and slippage.



The electronic fan clutch can be enabled or disabled with the INSITE™ service tool. The fan percent ON (0 to 100 percent) can be monitored and the fan clutch ramp rate adjusted in units of percent/second. Adjusting the ramp rate allows different applications to be tuned for different fan characteristics.



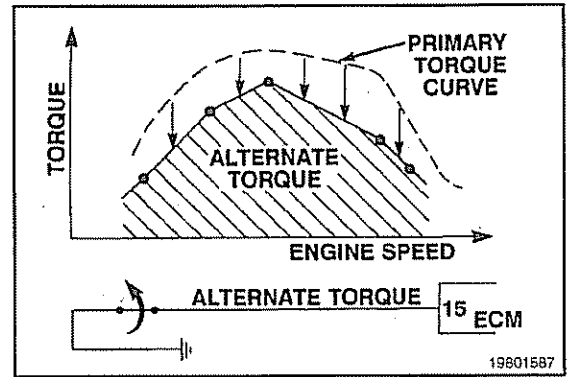
The INSITE™ service tool also has the capability to control the fan clutch percent ON with the fan clutch control dialog. While the engine is running and the service tool is connected to the datalink, the user can enter the fan percent ON request between 0 and 100 percent. Controlling the fan clutch with the service tool will aid in troubleshooting and diagnostics of the fan clutch and engine cooling system. Refer to INSITE™ User's Manual, Bulletin 3666148.

Switchable (Alternate) Torque

This feature enables an alternative electronically controlled maximum engine torque curve for optimum operating efficiency in loaded versus unloaded conditions.

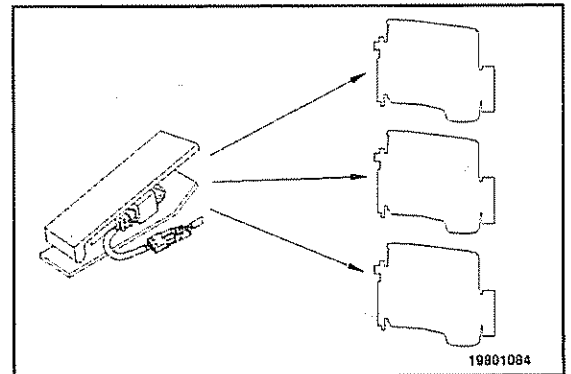
The alternate torque feature is activated whenever the normally closed alternate torque switch is opened and 5 VDC are detected on the alternate torque signal line. Five torque versus engine speed points define the alternate torque curve.

Shown is a graph illustrating an alternate torque curve that is below the normal torque curve.

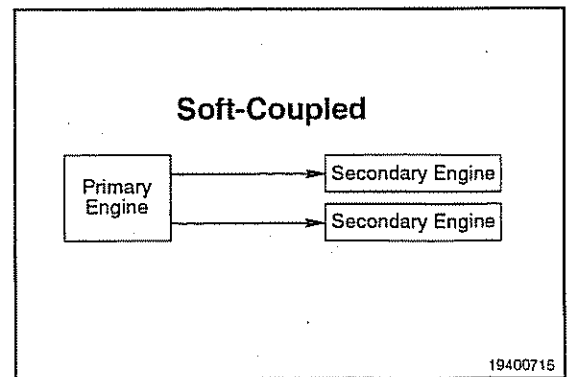


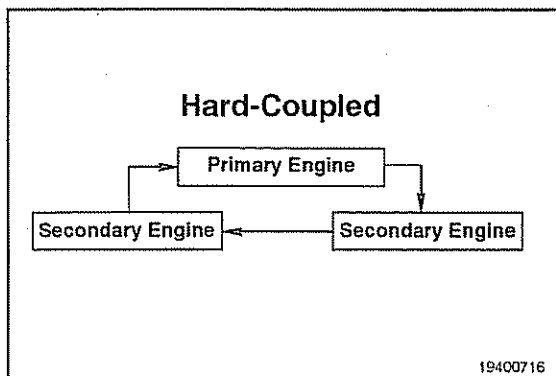
Multiple Unit Synchronization

The multiple unit synchronization feature allows two or more engines (up to a maximum of 11) to be controlled by a single throttle signal. There are three engine configurations available with this feature. They are soft-coupled, hard-coupled, and soft-coupled marine.

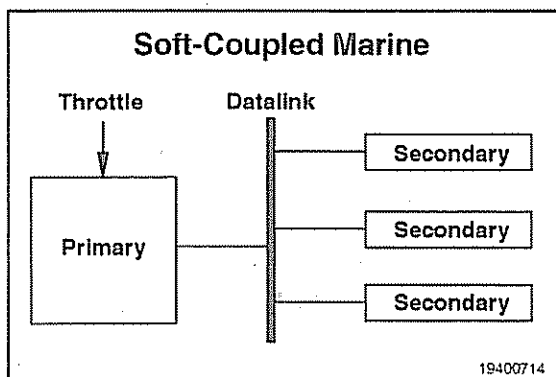


The soft-coupled configuration has all secondary engines in parallel.

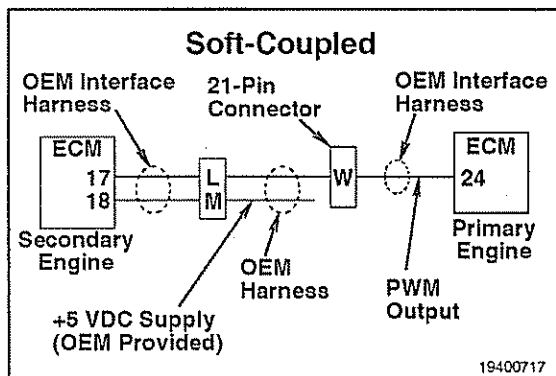




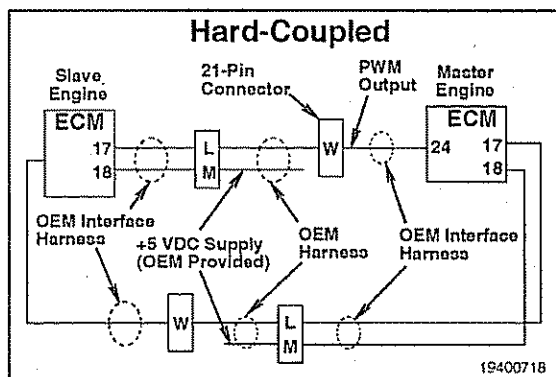
The hard-coupled configuration has all secondary engines in series.



The soft-coupled marine configuration has all engines connected to a J1939 datalink.

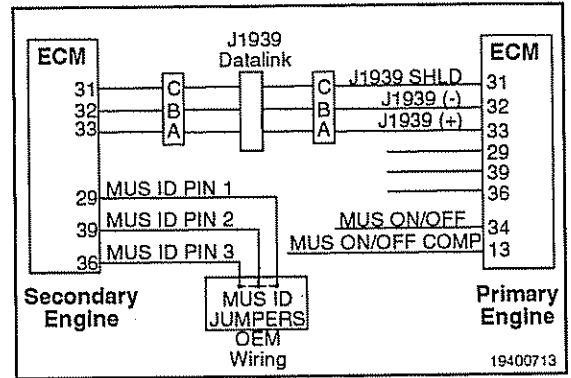


In the soft-coupled configuration, the primary engine outputs a throttle signal on ECM pin 24. This signal is received by the secondary engine(s) on ECM pin 17. The secondary engine also receives a +5-VDC supply (OEM provided) to ECM pin 18 to complete the circuit. This setup allows all engines to remain running if a secondary engine stops running.



In the hard-coupled configuration, the primary engine outputs a throttle signal on ECM pin 24. This signal is received by the secondary engine(s) on ECM pin 17. The secondary engine also receives a +5-VDC supply (OEM provided) to ECM pin 18. The secondary engine then outputs the throttle signal on ECM pin 24 to the next secondary engine in the series. This process is repeated by all secondary engines until the throttle signal and +5-VDC supply are received by the primary engine.

In the soft-coupled marine configuration, the primary engine outputs a throttle signal to the J1939 datalink pins 31, 32, and 33. Secondary engines that are connected to the datalink then read the throttle value. The soft-coupled marine application also allows for primary/secondary configuration via wiring harness jumpers (pins 29, 39, and 36) instead of specific calibrations. The soft-coupled marine configuration uses a multiple unit synchronization on/off switch (pins 13 and 34) to control the enabling or disabling of the engine synchronization.

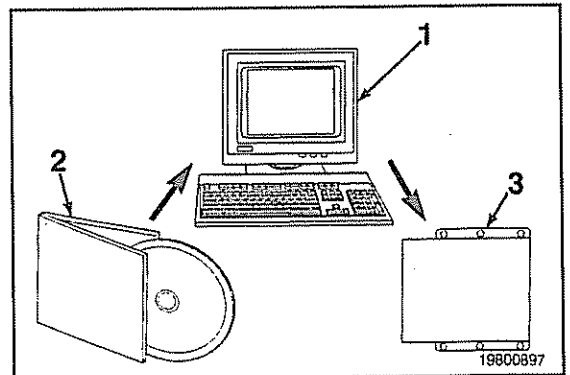
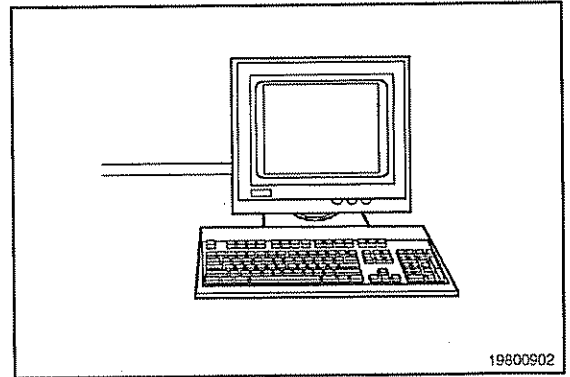


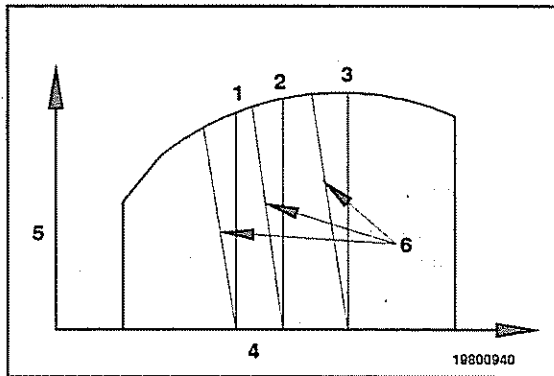
The INSITE™ service tool can be used to monitor the following parameters:

- Multiple unit synchronization couple type (soft-coupled, hard-coupled, or soft-coupled marine)
- Multiple unit synchronization engine type (primary or secondary)
- Multiple unit synchronization on/off switch
- Percent pulse-width modulate output (throttle signal).

The multiple unit synchronization couple type is **not** adjustable by the INSITE™ service tool, but the type can be changed by downloading a calibration to the ECM.

This feature can **only** be enabled or disabled by calibration. An electronic service tool (1) will be required to download a calibration from the ESDN (2) to the electronic control module (3) if this feature needs to be enabled or disabled.





Intermediate Speed Control

The intermediate-speed control feature can control the engine to three programmable engine set speeds (1, 2, 3) in three different modes of operation. The three set speeds are determined by a three-position switch and a two-position switch. The three modes of operation are a manual normal set speed operation, a low speed limit operation, and a high speed limit operation.

NOTE: These three modes of operation are set by the calibration and are **not** customer-adjustable.

An intermediate-speed droop is also programmable.

NOTE: Depending on the electronic calibration, the third intermediate speed switch can act as a validation switch. The purpose of the validation switch is to eliminate accidentally switching to intermediate speed 1 or 2. To switch to intermediate speed 1 or 2, the validation switch **must** be engaged first; then move the intermediate-speed switch to 1 or 2.

This feature also uses a momentary increment and decrement switch to raise the engine set speed while in operation.

Switched Outputs

This feature provides up to two fully independent switched outputs for OEM use. The state of each switched output is determined by up to 12 different inputs to the ECM. The ECM can provide different outputs if any of the inputs are above or below calibrated thresholds. Each switched output is independent of the other in controlling parameter input and threshold settings. This feature can be enabled or disabled with INSITE. The thresholds can **not** be adjusted with INSITE.

The ECM can determine the state of the switched outputs based on the following possible inputs (either or both switched outputs can use the same inputs):

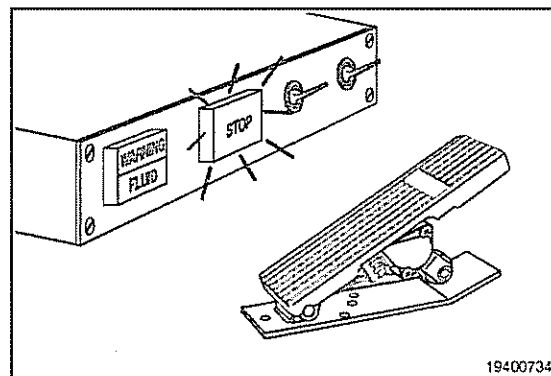
- Engine speed
- Fueling command (cubic mm per second)
- Boost pressure (in Hg)
- Auxiliary speed input (rpm)
- Oil pressure (psi)
- Coolant temperature (degrees Fahrenheit)
- Commanded throttle (percent)
- ISC 2 status (off or active)
- OEM temperature (degrees Fahrenheit)
- OEM pressure (psi)
- OEM supplied sensor (volts)
- OEM supplied switch (open or ground)

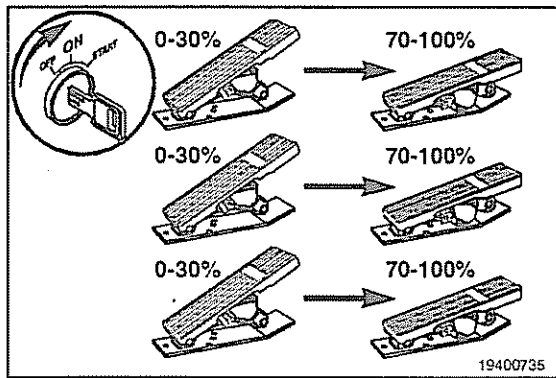
Each of these inputs can have a specified threshold and threshold type (over or under). Each of the switched outputs can be calibrated to either "on" or "off" after a threshold is crossed. Also, each output can be calibrated to change states if either any threshold is crossed or all thresholds are crossed.

Throttle Activated Diagnostic Switch

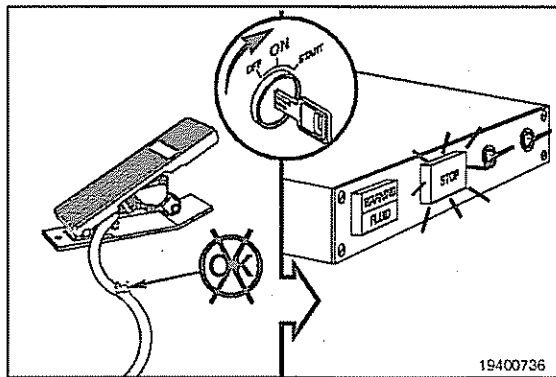
Throttle-activated diagnostic switch is intended to eliminate the need for a dash-mounted diagnostic switch, which is used to activate the diagnostic mode to display active fault codes in a sequence of flashing lamps. The throttle-activated diagnostic switch feature eliminates the need for a dash-mounted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

NOTE: This feature will work with all throttle types.

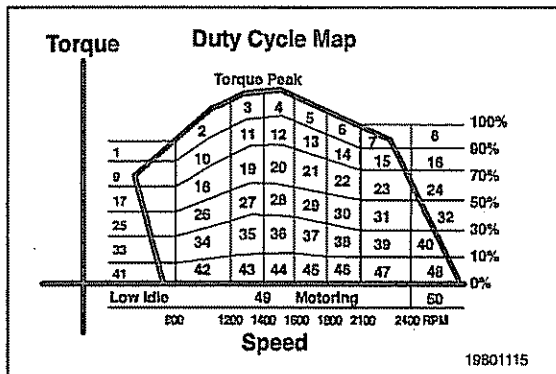




When the engine is **not** running, the keyswitch is turned on, and the feature flag is enabled, a sequence of three throttle cycles from 30 to 70 percent within a specific time will activate the diagnostic mode. The increment/decrement switch can be used to navigate to the next or previous fault code. In case these switches are **not** available, a throttle cycle from 30 to 70 percent will also increment to the next fault.

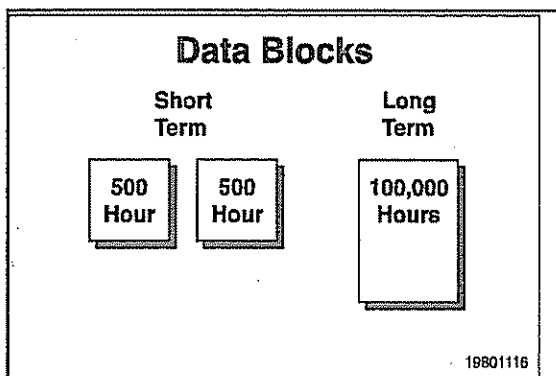


A sensitive mode is enabled when this feature is enabled. The sensitive mode is an algorithm that will automatically activate the diagnostic mode when the engine is **not** running, the keyswitch is turned on, and any throttle-related errors are detected. This allows the user to activate the diagnostic mode when throttle errors prevent them from doing so with throttle movements.



Duty Cycle Monitor

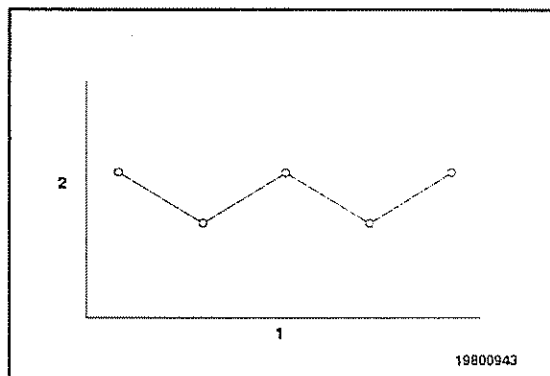
The duty cycle monitor tracks the time the engine spends in 50 different operating regions. These operating regions are based on engine speed and engine torque.



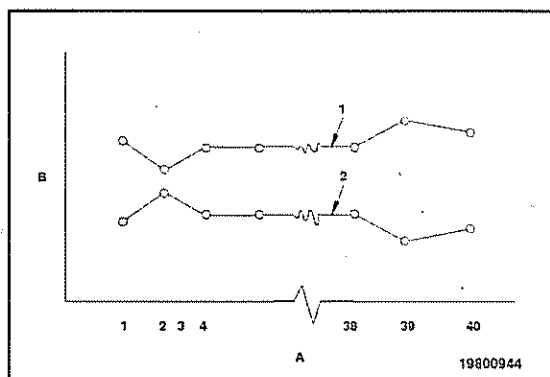
This feature provides two short-term 500-hour resettable data blocks and one long-term 100,000-hour nonresettable data block.

Fuel Consumption Rate Logger

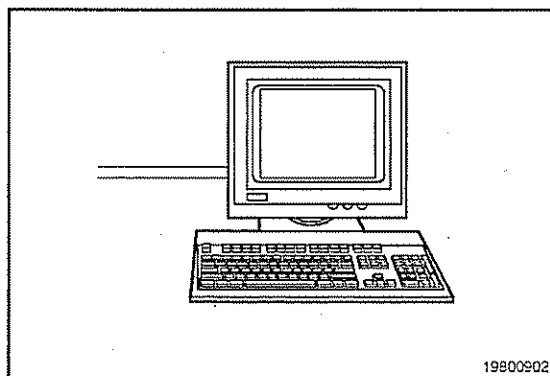
The fuel consumption rate feature allows an electronic service tool to access fuel consumption data (1 = time, 2 = gallons/hour).

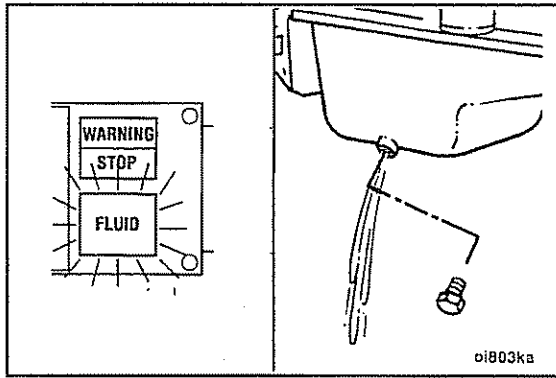


This feature provides two resettable 40-hour fuel consumption periods (1 and 2). Each period records fuel consumption data in forty 1-hour segments. These 40 data segments can be graphed to show fuel consumption over both 40-hour periods (A = hours, B = gallons/hour).



An instantaneous fuel consumption rate and a nonresettable lifetime or running average fuel consumption rate are available on the monitor screen of an electronic service tool. In addition, the two 40-hour fuel consumption periods are individually resettable using an electronic service tool.





Maintenance Monitor

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

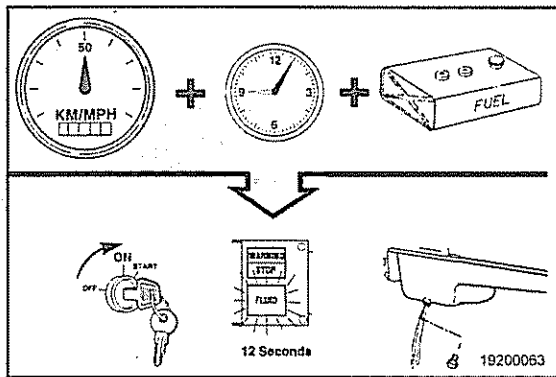
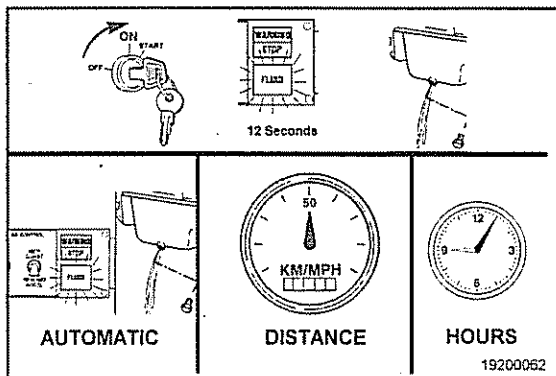
NOTE: The maintenance monitor uses data received from the ECM to determine the amount of fuel burned. Whenever a VSS, injector circuit, or battery voltage fault has occurred, the maintenance monitor data can be inaccurate.

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

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

The maintenance monitor has three modes of operation:

- Automatic mode
- Time mode.



The **automatic mode** alerts the operator when it is time to change oil based on Cummins recommended interval. It determines the maintenance interval based on engine operating time and fuel burned.

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

The original factory programmed value is AUTOMATIC.

▲ CAUTION ▲

Refer to Oil Drain Intervals in Section V of this manual when selecting the correct oil change interval for your application. Cummins Engine Company, Inc. does not recommend exceeding these published intervals and is not responsible for damage sustained due to overextended drain intervals.

The maintenance monitor automatic mode is easily adjusted to accommodate severe-, normal-, or light-duty applications and Valvoline® Premium Blue 2000™ engine oil. This is done by using a Compulink™ or Echeck™ service tool to enter an interval factor that corresponds to the appropriate duty cycle and type of product used.

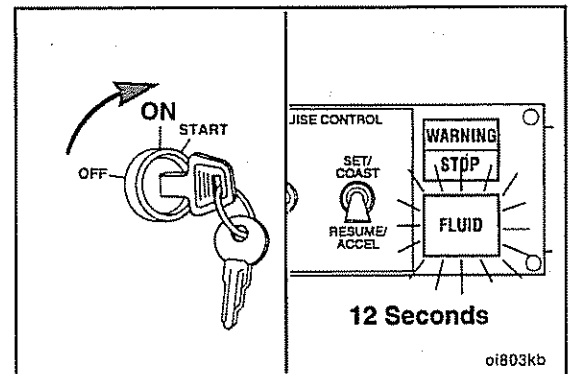
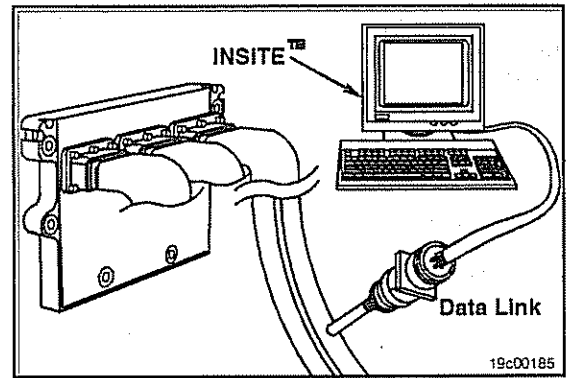
When selecting the correct interval factor for your application, refer to Section V, Oil Drain Interval, to determine which oil drain interval duty cycle fits your application: Severe duty, normal duty, or light duty. Once the duty cycle is chosen, use an interval factor of 1.00 for severe duty, 1.50 for normal duty, and 2.00 for light duty.

NOTE: These interval factors **must** be adjusted accordingly if Valvoline® Premium Blue® 2000 oil is used to extend the oil drain interval. Refer to the Valvoline® Premium Blue® 2000 product literature to determine how much your drain interval can be extended.

The **time mode** allows the customer to enter a desired time interval. The maintenance monitor will then monitor the time the engine has been operating and alert the operator when the interval has been consumed.

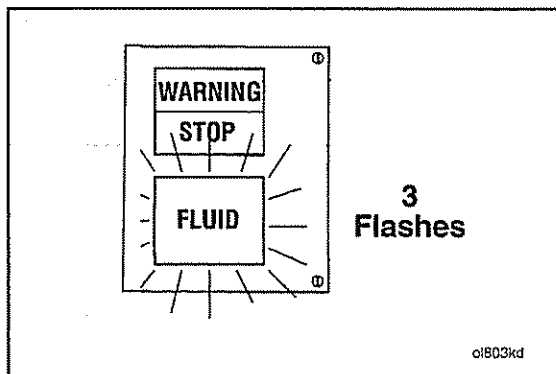
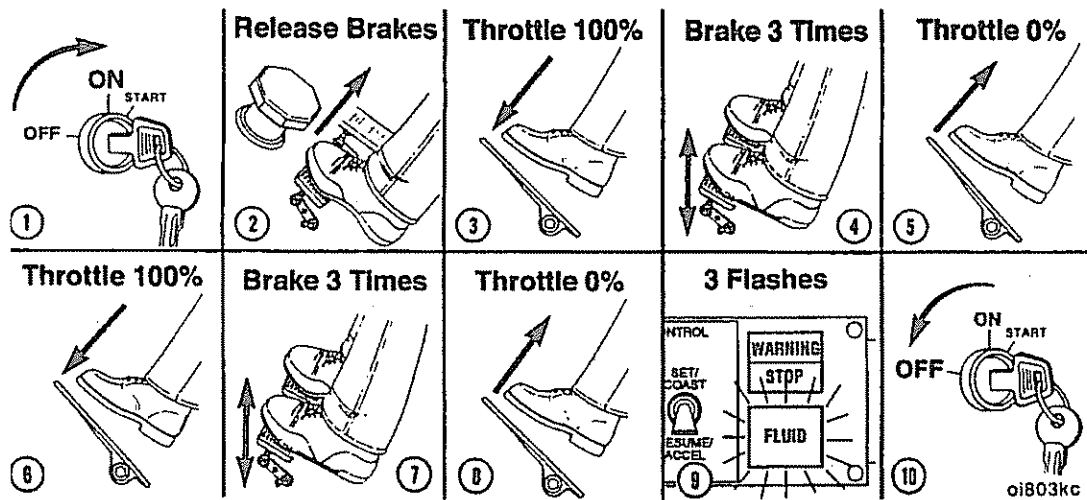
Alerting the operator: The maintenance monitor will alert the operator of the need to change oil by flashing the engine protection lamp (fluids lamp) for approximately 12 seconds after key-on. The flashing sequence will be three quick flashes, followed by a pause. This flash sequence will go through five cycles in the 12-second period. This sequence will occur at every key-on until the maintenance monitor has been reset.

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



Resetting the Maintenance Monitor. The maintenance monitor can be reset using an INSITE™ service tool or by following steps 1 through 10 below. Steps 3 through 8 **must** be done within 12 seconds in order for the maintenance monitor to be reset. The diagnostic switch **must** be in the OFF position and the vehicle air system **must** be fully charged.

1. Turn on the keyswitch (engine **must not** be operating)
2. Make sure brakes are released (service and trailer brakes)
3. Hold throttle pedal at 100-percent throttle
4. Press and release service brake three times
5. Release throttle pedal
6. Depress and hold throttle pedal at 100-percent throttle again
7. Press and release service brake three more times
8. Release throttle pedal
9. The light will flash three times
10. Turn off the keyswitch.



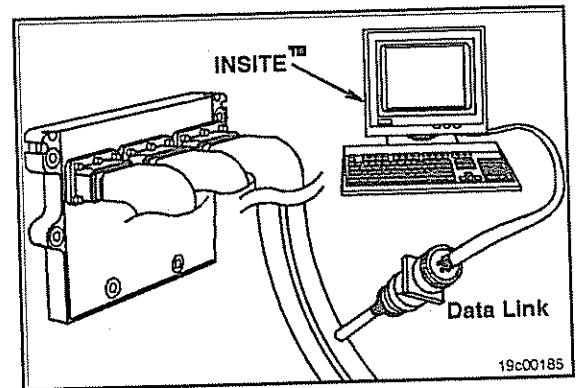
As soon as the throttle pedal is released (step 8), the engine protection lamp will flash three quick flashes. This means that the reset command has been received and the maintenance monitor will reset its distance (miles or kilometers), time (hours), and fuel (gallons or liters) to zero the next time the keyswitch is turned off (step 10).

NOTE: If the engine protection lamp does not flash after the throttle pedal is released on step 8 above, the reset sequence **must** be performed again.

**QSM11 Marine and Industrial
Section 1 - Operating Instructions**

When viewing maintenance monitor data with an INSITE™ service tool, the following maintenance data can be viewed or printed from the ECM:

- Percent of present interval consumed (by either distance, time, or fuel burned)
- Distance since last reset
- Time since last reset
- Reset log (distance and time at the last three resets).



The **interval factor** is **only** used in the maintenance monitor Auto mode to adjust the following applications:

- Severe duty
- Normal duty
- Light duty
- Extended interval when using Valvoline® Premium Blue® 2000
- Other products that extend maintenance intervals.

The interval factor can be adjusted between 0 and 5.0.

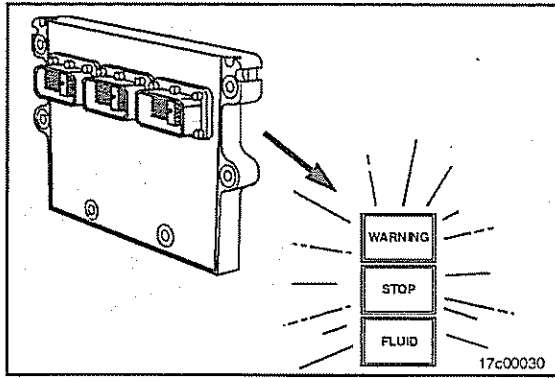
The original factory programmed value is 1.

The maintenance monitor **interval alert percentage** allows the user to enter the percentage of the present interval at which the light should come on indicating the need for an oil change. The parameter allows the user to obtain an early warning of the need for a maintenance stop.

For example, if the distance mode is set to 24,194 km [15,000 mi] and the interval alert percentage is set to 90 percent, the lamp will illuminate at 21,774 km [13,500 mi], which is 90 percent of 24,174 km [15,000 miles].

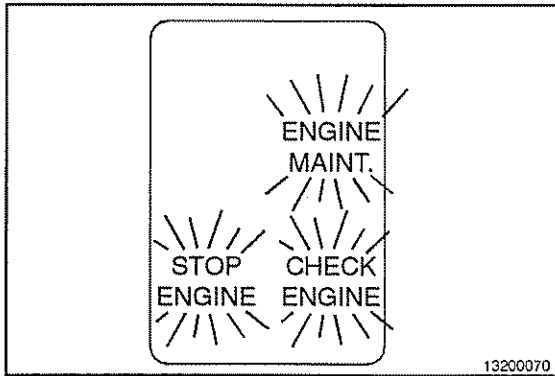
The interval alert percentage can be set between 0 and 100 percent.

The original factory programmed value is 100 percent.



Fault Lamp Sequencing

The fault lamp sequencing feature is used to determine whether the diagnostic dashboard lamps have been installed and wired correctly. After key-on, all dashboard diagnostic lamps will turn on at once and then turn off in sequence.



Diagnostic Fault Codes

Marine Applications

Engine Fault and Maintenance Lamps

The ENGINE FAULT and MAINTENANCE lamps are illuminated for 2 seconds when the keyswitch is turned to the ON position.

After 2 seconds, the red STOP ENGINE lamp will turn off. After an additional 1/2 second, the amber CHECK ENGINE lamp will turn off. After an additional 1/2 second, the amber ENGINE MAINT lamp will turn off.

The lamps will remain off until a fault is detected.

NOTE: This is a self-test feature of the lamp wiring and lamps.

NOTE: The names and colors of the lamps can vary with vessel manufacturer if non-Cummins panels are used.

The following chart summarizes the different lamps and their operation.

Feature	Operator Message	Lamp Operation		
		Check Engine	Stop Engine	Engine Maint.
Lamp Display	Power-up lamp test	On then off	On then off	On then off
Diagnostics	Fault code flashout	Flash once/code	Flash code Number	
Engine Protection	System problem		Slow flash	
Maintenance Monitor	Interval expired			3x5 fast flash
Maintenance Monitor	Interval rest			3x5 fast flash
Diagnostics	Nonfatal system error	On steady		
Diagnostics	Fatal system error		On steady	
Diagnostics	Maintenance required			On steady

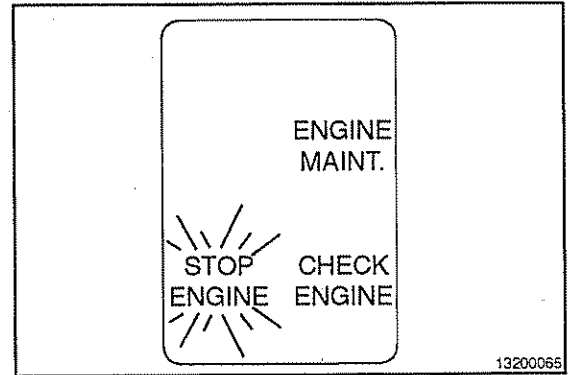
If the STOP or CHECK ENG lamp comes on when the engine is running, it means a fault code has been recorded. The lamp will remain on as long as the fault exists. The severity of the fault will determine the lamp that will come on.

STOP ENGINE Lamp

The STOP ENGINE lamp is a red lamp. This lamp indicates that the engine needs to be shut down before permanent damage occurs to the engine.

NOTE: The engine should be shut off as soon as it can be shut off safely. The engine should **not** be run until the fault is corrected.

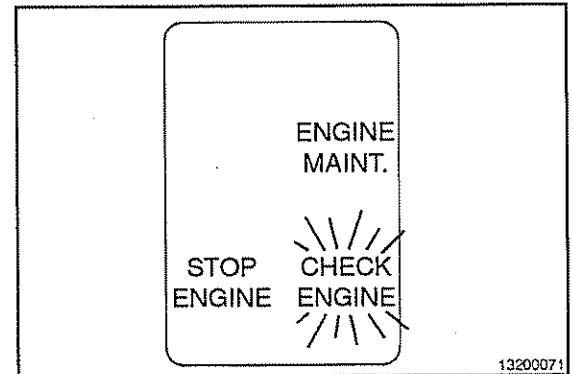
This lamp is also used to flash out the fault code number in the diagnostic mode.



CHECK ENGINE Lamp

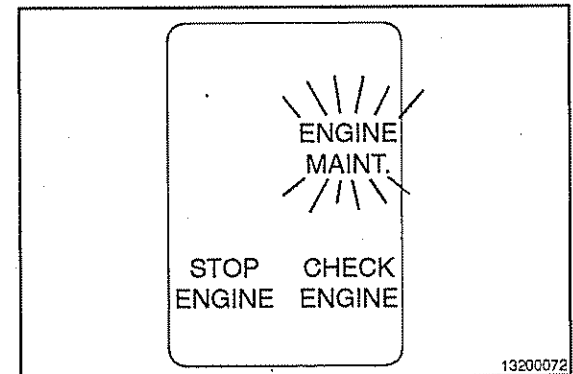
The CHECK ENGINE lamp comes on during a nonfatal system error. The engine can still be run, but the fault should be corrected as soon as possible.

NOTE: In the diagnostic mode, the check engine lamp will flash after the stop engine lamp completes the three-digit fault code.



ENGINE MAINT Lamp

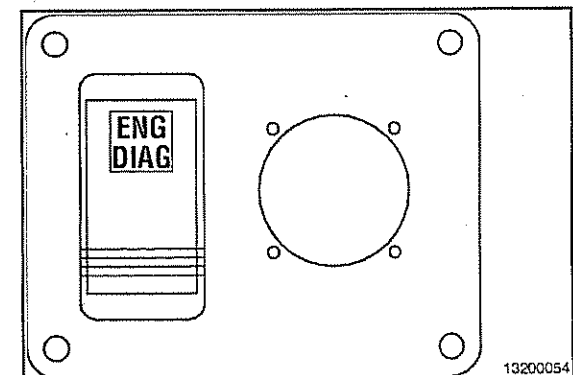
The ENGINE MAINT lamp comes on when engine maintenance is required.

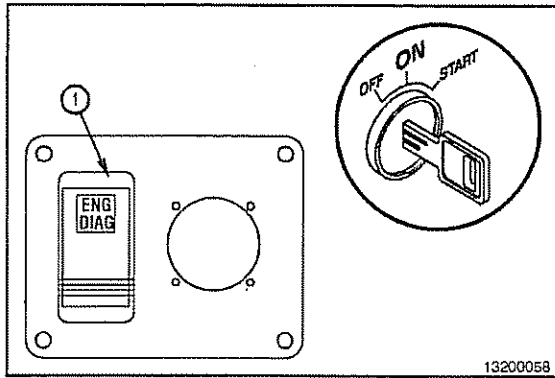


Engine Diagnostics

When a fault or maintenance lamp is lit, the engine diagnostics switch allows the operator to view the fault codes. The receptacle to the right of the switch is for the technician's computer connection using INSITE™ or Echet™ service tool.

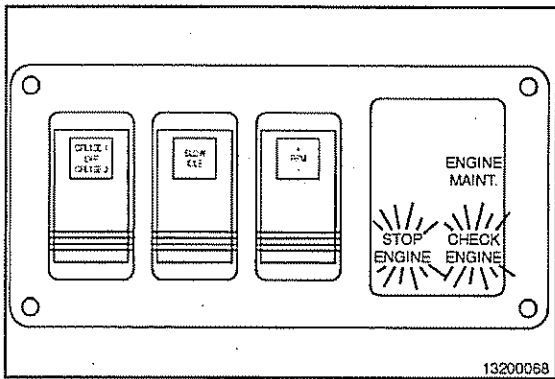
Active fault codes can be viewed using the stop engine warning lamp as described below.





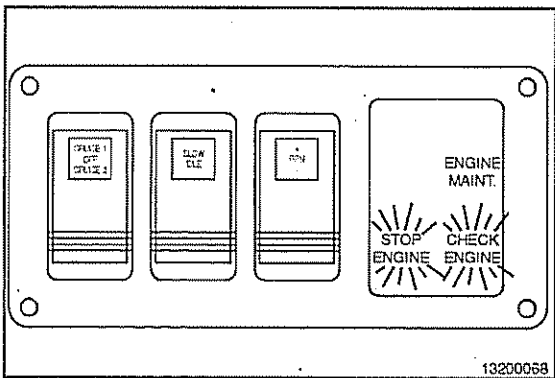
To view the fault codes:

1. The engine **must** be shut off (**not** running)
2. The keyswitch **must** be in the ON position
3. The ENG DIAG switch (1) **must** be in the ON position.



The check engine and stop engine lamps flash if there are any fault codes to display.

If there are no fault codes to display, the check engine and stop engine lamps will remain lit.



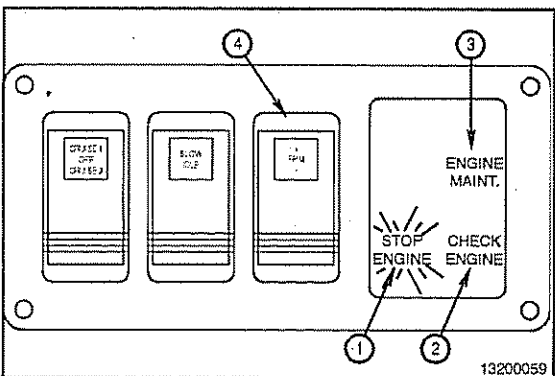
If there are fault codes to be displayed, the check engine lamp will flash momentarily. Then the stop engine lamp will flash the first, second, and third digits of the fault code.

Example:

Fault Code 432
4 flashes, pause
3 flashes, pause
2 flashes.

NOTE: The check engine lamp will flash between each fault code.

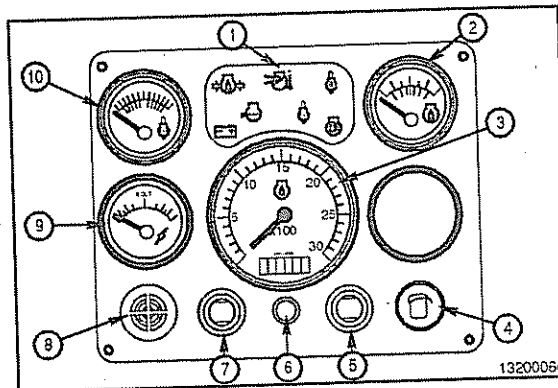
The pattern repeats itself until the fault is cleared or the switch is turned off.



To view the next fault code, press the rpm \pm switch (4) in the + direction.

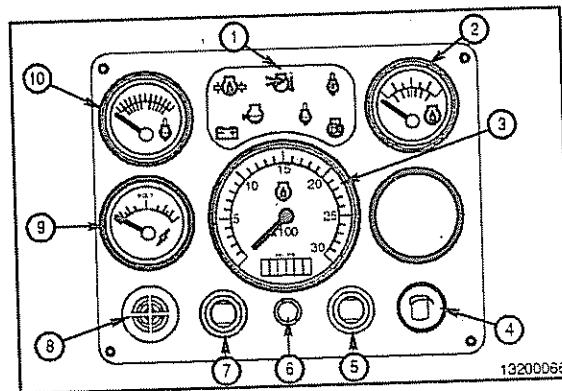
To view the previous fault code, press the rpm \pm switch (4) in the - direction.

The audible alarm (8) comes on anytime the warning or caution symbols are illuminated.



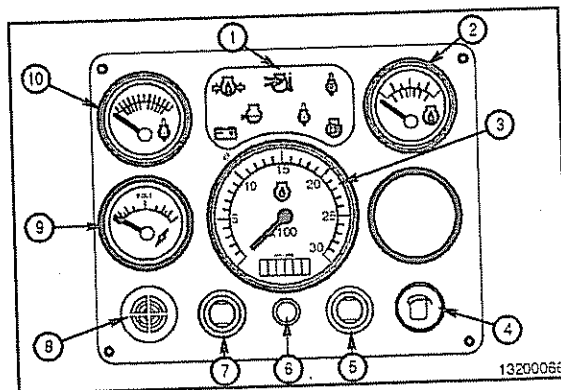
The alarm silence button (6) will temporarily silence the audible alarm.

NOTE: The alarm will be silenced for up to 2 minutes. As long as the fault condition exists, the alarm will "chirp" every 2 minutes to remind the operator that a fault exists.



The alarm silence button (6) is also used to test the warning and caution symbol lamps (1) and the gauges.

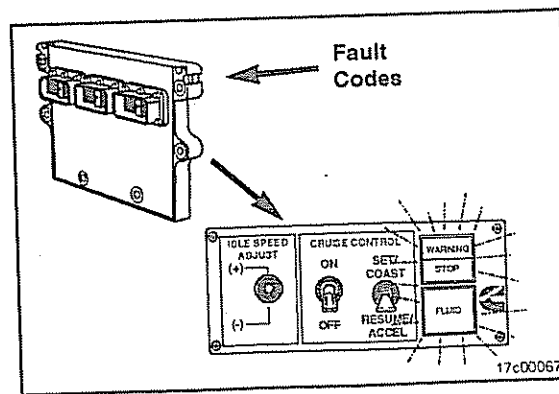
NOTE: To test the gauges and symbol lamps, press the alarm silence button (6) while turning on the keyswitch. The alarm will come on for 5 seconds and for 25 seconds all symbols will illuminate and the gauge needles will move from the lowest position to the highest position and back to the lowest position.

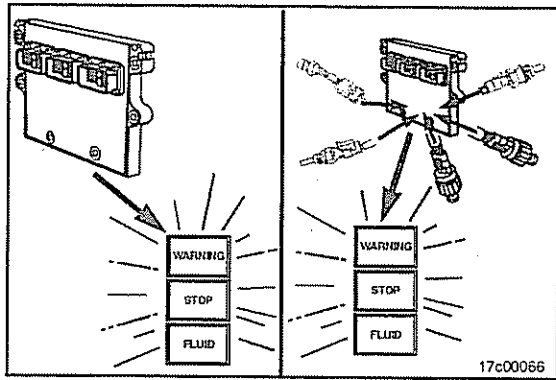


Industrial Applications

The system can show and record operation irregularities that present themselves as fault codes. These codes will make troubleshooting easier. The fault codes are recorded in the ECM. They can be read using the two fault lamps in the cab panel or with INSITE™.

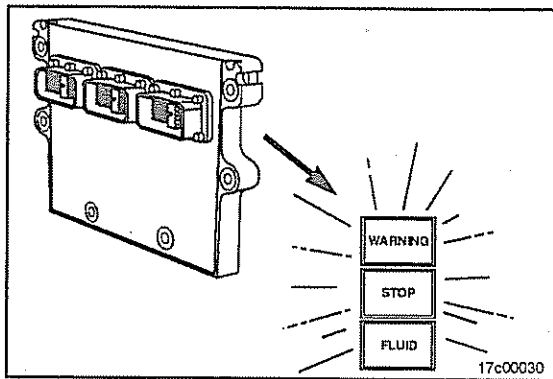
NOTE: Not all engine irregularities are shown as fault codes.





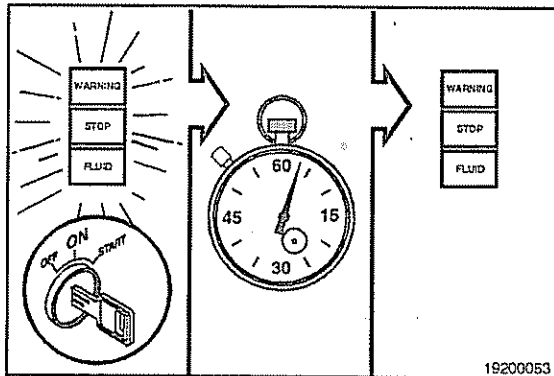
There are two types of fault codes:

- Engine electronic fuel system codes
- Engine protection system codes.

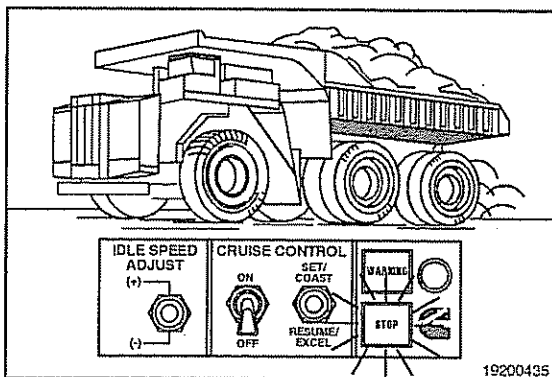


The engine electronic fuel system fault codes can be seen on the WARNING and STOP lights in the cab panel.

NOTE: Inactive fault codes can **not** be blinked out on the two lights in the cab panel. An INSITE™ service tool **must** be used to read inactive faults in the ECM. Refer to your Cummins Authorized Repair Location.



The STOP fault light will be red. The WARNING light will be yellow or red, depending on the OEM's preference. When the vehicle keyswitch is turned on and the diagnostic switch is off, all three lights will illuminate to check their operation. The lights will go off in sequence after about 2 seconds.

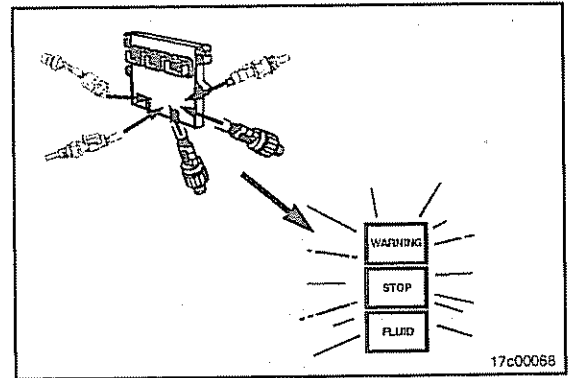


The lights will remain off until a fault code is recorded. If a light remains on, an active fault exists.

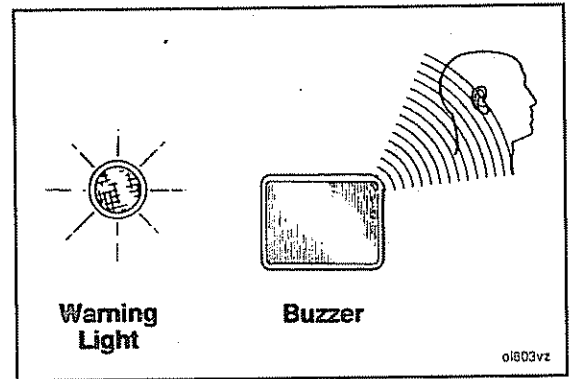
If the STOP light (red) is illuminated while operating, the fault can be engine disabling. The equipment **must** be shut off as soon as it can be done in a safe manner. The equipment **must** remain parked as long as this fault exists. If the WARNING light (yellow or red) is illuminated, the equipment can be safely operated, but the fault **must** be corrected as soon as possible.

The engine protection system logs separate fault codes for out-of-range conditions associated with any of the following sensors:

- Coolant temperature
- Coolant level
- Oil temperature
- Oil pressure
- Intake manifold temperature.

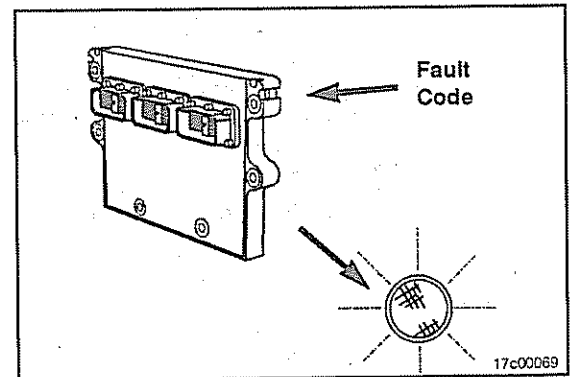


This system will activate an in-cab warning device when an out-of-range condition occurs. The warning device is a light, a buzzer, or both. This system will also activate the yellow fluid lamp, if equipped.

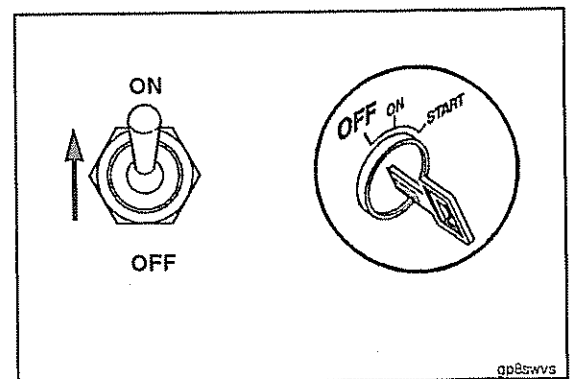


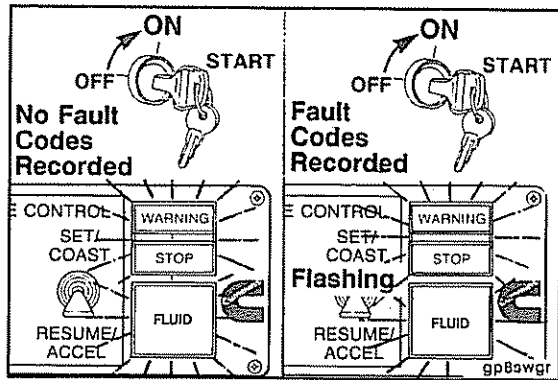
If the engine protection system light or buzzer comes on while driving, it means a fault code has been recorded. The lamp will remain on as long as the fault exists, and engine power and speed will gradually be reduced. If the out-of-range conditions continue, the light will start to flash or blink. If the engine protection shutdown feature is enabled, the engine will be shut down to help prevent engine damage.

The fault **must** be corrected as soon as possible.



Turn off the engine. To check for engine electronic fuel system and engine protection system fault codes, move the diagnostic switch to the ON position, or connect the shorting plug into the diagnostic connector.

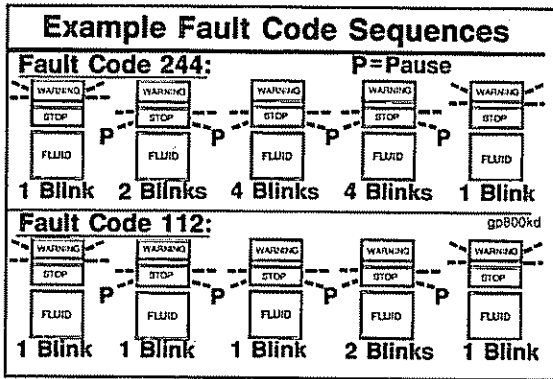




Turn the keyswitch to the ON position.

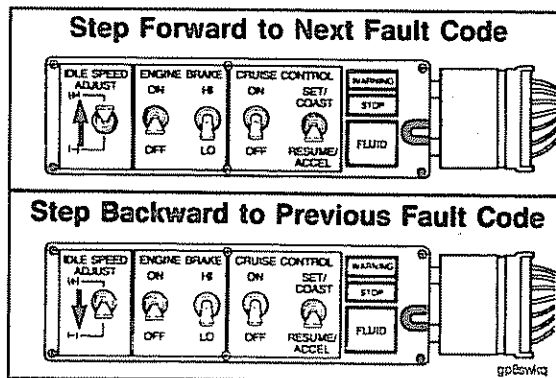
If no active fault codes are recorded, both lights will come on and stay on.

If active fault codes are recorded, both lights will come on momentarily, then begin to flash the code of the recorded faults.



The fault code will flash in the following sequence:

First, a WARNING (yellow) light will flash. Then there will be a short 1- or 2-second pause after which the number of the recorded fault code will flash in STOP (red). There will be a 1- or 2-second pause between each number. When the number has finished flashing in red, a yellow light will appear again. The three-digit code will repeat in the same sequence.



The lights will continue to flash the same code until the system is told to do something else. To go to the next fault code, move the CRUISE CONTROL/PTO switch momentarily to the RESUME/ACCEL position. You can go back to the previous fault code by momentarily moving the CRUISE CONTROL/PTO switch to the SET/COAST position. If **only** one active fault is recorded, the system will continuously display the same fault code when either RESUME/ACCEL or SET/COAST switch is depressed.

Engine Protection System

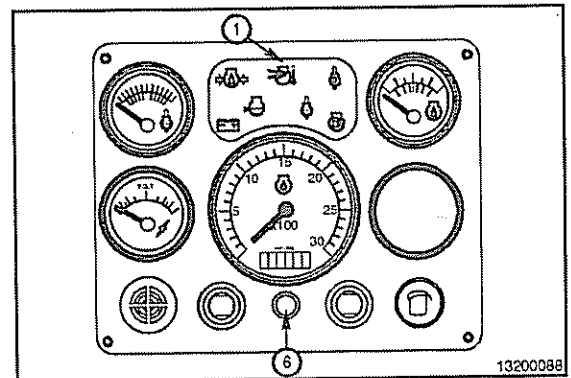
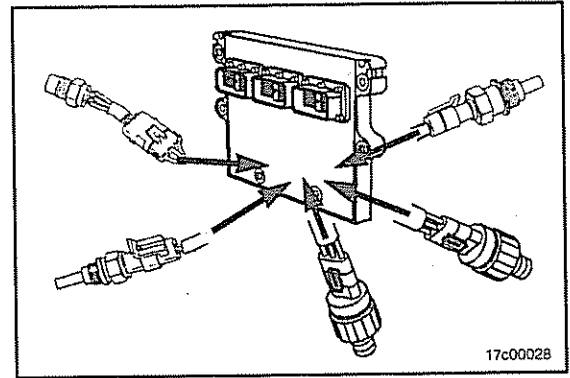
Marine and Industrial Applications

The engines are equipped with an engine protection system. The system monitors critical engine temperatures and pressures, and will log diagnostic faults when an abnormal operating condition occurs. If an out-of-range condition exists and engine derate action is to be initiated, the operator will be alerted by an in-cab warning light. The warning light will blink or flash when out-of-range conditions continue to get worse. The driver **must** pull to the side of the road, when it is safe to do so, to reduce the possibility of engine damage.

NOTE: Engine power and speed will be gradually reduced, depending on the level of severity of the observed condition. The engine protection system will **not** shut down the engine unless the engine protection shutdown feature has been selected. If the feature has been selected and the engine does shut down, the engine can be restarted by turning off the keyswitch, then turning it back on.

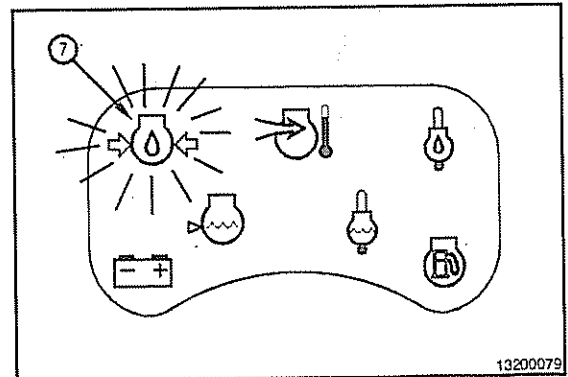
The indicator symbols (1) provide additional information on the type of fault that the ECM has detected. The individual symbols will flash during a fault condition.

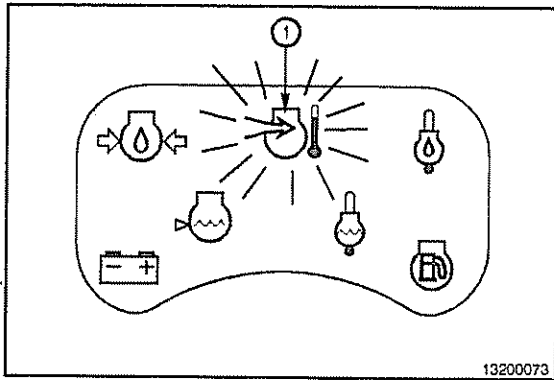
NOTE: Pressing the alarm cancel button (6) when the keyswitch is turned on will illuminate the symbols for a self-test.



Low Engine Oil Pressure

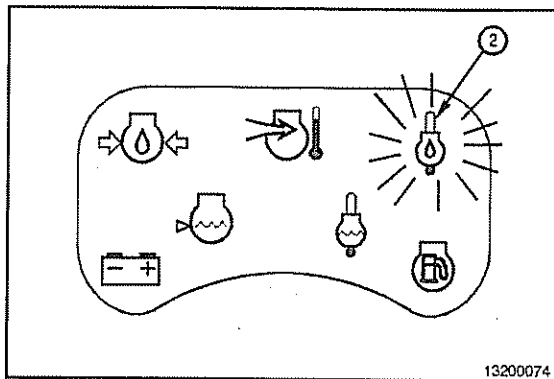
The low engine oil pressure lamp (7) comes on when the engine oil pressure is below specification. Refer to Section V for the oil pressure specifications.





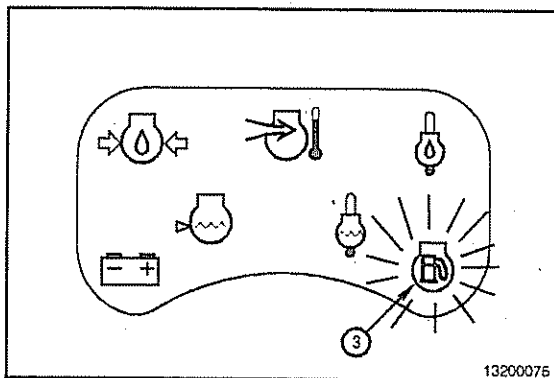
High Intake Manifold Temperature

The high intake manifold temperature lamp (1) comes on when the intake manifold temperature is above specification.



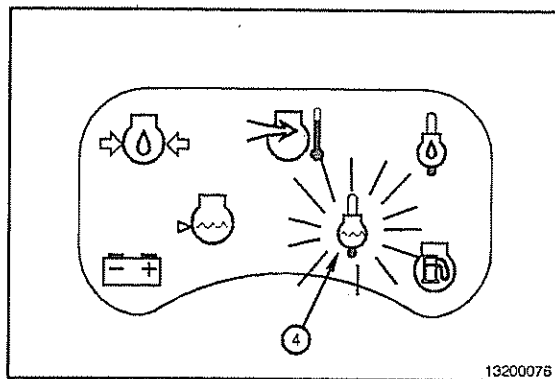
High Engine Oil Temperature

The high engine oil temperature lamp (2) comes on when the engine oil temperature is above specification.



Water in Fuel

The water-in-fuel lamp (3) interfaces with the optional water-in-fuel sensor in the primary fuel filter. It comes on when there is water in the fuel filter.

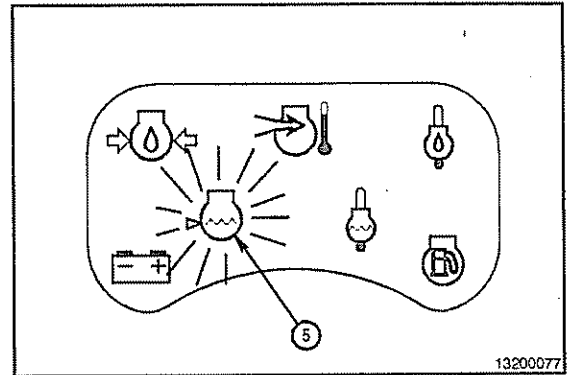


High Coolant Temperature

The high coolant temperature lamp (4) comes on when the engine coolant temperature is above specification.

Low Coolant Level

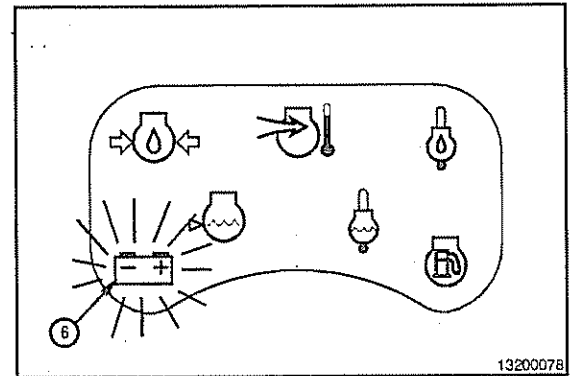
The low coolant level lamp (5) comes on when the coolant level is below specification. Refer to Section V for the coolant specifications.



Low Battery Voltage

NOTE: This voltage lamp **only** applies to marine applications.

The low battery voltage lamp (6) comes on when the battery voltage is below specification.

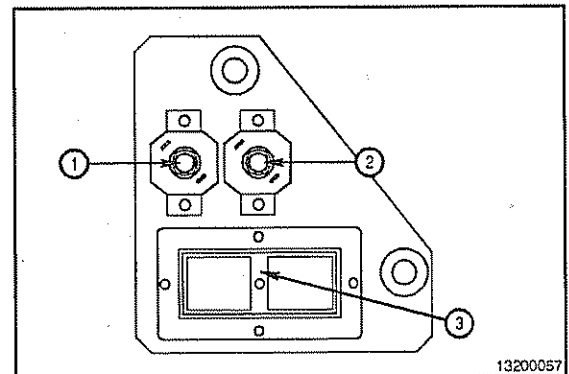


Circuit Breakers

Marine Applications

The QSM11 marine engine is equipped with two circuit breakers, located on the ECM side of the engine.

A 5-amp circuit breaker (1) is used for keyswitched power and a 10-amp circuit breaker (2) is used for nonkeyswitched power. The circuit breaker panel also houses a 40-pin OEM connector (3).



Electromagnetic Interference (EMI)

General Information

Marine and Industrial Applications

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

System EMI Susceptibility

Marine and Industrial Applications

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

System EMI Radiation Levels

Marine and Industrial Applications

Your Cummins product has also been designed and tested to emit minimum electromagnetic energy. Testing has shown that the fuel system, when properly installed on vehicles, meets or exceeds by a wide margin Part 15 of the Federal Communications Commission Rules and SAE J1551 specifications. Other accessories should be designed with the proper filtering to reject electromagnetic noise emission from their system. Experience has shown that the electronically controlled fuel system on vehicles will **not** interfere with onboard communication equipment for urban and suburban background electromagnetic noise levels; however, the system, if used with accessories that are **not** installed properly or do **not** utilize adequate filtering designs, can interfere with onboard communications equipment in rural applications where background radio frequency noise levels are very low. If an interference condition is observed, follow the suggestions below to reduce the amount of interference:

1. Locate the receiving antenna as far away from the engine and as high as possible.
2. Locate the receiving antenna as far away as possible from all metal obstructions (exhaust stacks, and so forth).
3. Consult a representative of the accessory supplier in your area to:
 - Calibrate the device for proper frequency, power output, and sensitivity (both base- and remote-site devices **must** be properly calibrated accurately)
 - 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.

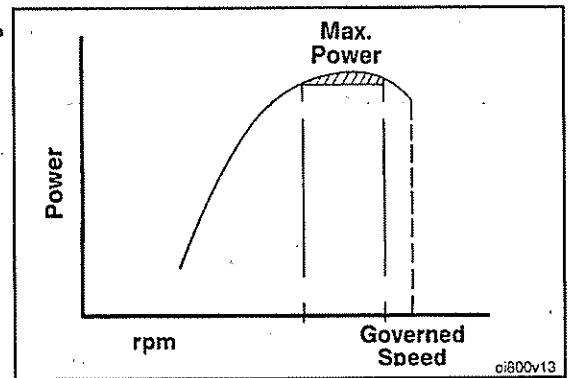
Operating Techniques

General Information

The engines produce maximum power at an rpm less than governed engine speed.

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

Refer to the engine dataplate for torque peak rpm and governed speed rpm.



Section 2 - Maintenance Guidelines

Section Contents

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General Information	2-1
Maintenance Record Form	2-6
Maintenance Data	2-6
Maintenance Schedule	2-2
General Information	2-2
Marine Applications	2-2
Oil Drain Intervals	2-3
Page References for Maintenance Instructions	2-4
General Information	2-4
Tool Requirements	2-1
General Information	2-1

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Maintenance Guidelines - Overview

General Information

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

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

Some maintenance procedures require special tools or **must** be performed by a qualified technician. These procedures are outlined in the specific manuals as follows:

Procedure	Bulletin	Description
Repair and rebuild components	3666075	Shop Manual, M11 Series Engines
Troubleshoot and repair components	3666322	Troubleshooting and Repair Manual, ISM/QSM11 Series Engines
Troubleshoot and repair electronics	3666266	Troubleshooting and Repair Manual, Electronic Control System, ISM and QSM11 Engines

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

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

Tool Requirements

General Information

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

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

Tool Part Number:	Description:
3397929	Oil filter wrench
3376592	Torque wrench (valve and injector adjustment)
3163196	Torque wrench adapter (used with 3376592 torque wrench)
3823024	Injector puller
3398145	Engine coolant and fuel filter wrench
3822524	Belt tension gauge, click type (v-belts and v-ribbed with 4 or 5 ribs)
3822525	Belt tension gauge, click type (v-ribbed with 6 to 12 ribs)
ST-1138	Belt tension gauge (v-belts)
ST-537	Dial depth gauge
ST-1272-11	Chip removing tool
ST-1293	Belt tension gauge (v-ribbed belts)
CC-2800	Refractometer
CC-2602	Coolant test kit

Contact your nearest Cummins Authorized Repair Location for the required service tools.

Maintenance Schedule

General Information

Marine Applications

QSM11 Marine and Industrial Applications Maintenance Schedule ¹				
Daily or Refueling	Every 250 Hours or 6 Months ¹	Every 600 Hours or 1 Year ¹	Every 1500 Hours or 1 Year ¹	Every 6000 Hours or 2 Years ¹
<ul style="list-style-type: none"> • Operator's report • Drain fuel-water Separator • Check: <ul style="list-style-type: none"> - Drive belts - Lubricating oil level - Coolant level - Air cleaner restriction <li style="text-align: center;">Marine • Disassemble, clean, prime and assemble sea water strainer • Check marine gear <li style="text-align: center;">Industrial • Drain air tanks and reservoirs • Check: <ul style="list-style-type: none"> - Crankcase breather tube - Charge-air piping • Inspect fan, cooling 	<ul style="list-style-type: none"> • Replace fuel filter (spin-on type) • Change: <ul style="list-style-type: none"> - Lubricating oil and filters - Coolant filter • Check: <ul style="list-style-type: none"> - Supplemental coolant additive (SCA) - Engine wiring harness <li style="text-align: center;">Marine • Inspect sacrificial plug 	<p style="text-align: center;">Marine</p> <ul style="list-style-type: none"> • Adjust overhead set 	<ul style="list-style-type: none"> • Check: <ul style="list-style-type: none"> - Water pump - Turbocharger - Engine mounting bolts - Air leaks, air intake and exhaust systems - Air cleaner assembly (engine-mounted) - Cooling system hoses - Batteries - Air cleaner restriction • Clean engine <li style="text-align: center;">Marine • Inspect sea water pump • Flush sea water system <li style="text-align: center;">Industrial • Adjust overhead set • Check radiator shutter assembly 	<ul style="list-style-type: none"> • Flush cooling system • Check vibration damper <li style="text-align: center;">Industrial • Check: <ul style="list-style-type: none"> - Fan drive Idler pulley assembly - Fan hub, belt driven - Turbocharger - Air compressor
<p>Note: Refer to the appropriate sections for complete inspection and maintenance procedures.</p> <ol style="list-style-type: none"> 1. These maintenance intervals must be performed at hours or months, whichever interval occurs first. At each scheduled maintenance interval, perform all previous maintenance procedures that are due for scheduled maintenance. 2. Follow the gear manufacturer's recommended maintenance procedures for checking, filling, and changing oil. Some gear manufacturers require an initial oil change at low hours, in addition to their regular maintenance. 3. Fuel burn is the most accurate method for determining oil change intervals. Oil change intervals can be required more frequently, depending on the quality of oil available. Refer to the Oil Drain Intervals table in this section for additional oil change intervals. 4. Do not change the coolant filter if the SCA concentration level is over three units. 5. Depending upon the quality of electrical bonding and water conditions, increased maintenance of the zinc anode plugs could be necessary. 				

Oil Drain Intervals

QSM11 Marine Engines - Oil Drain Intervals				
Oil Type	Fuel Burned	Hours	Months	Acceptable Filter
CF-4 ⁽¹⁾	6625 liters [1750 gal]	125	6	LF9001 ⁽⁴⁾
CG-4	13,249 liters [3500 gal]	250	6	LF9001 ⁽⁴⁾
CH-4 (CES 20071) ⁽²⁾	15,142 liters [4000 gal]	300	12	LF9001 ⁽⁴⁾
CES 20076 ⁽³⁾	15,142 liters [4000 gal]	300	12	LF9001 ⁽⁴⁾

Note:

1. CF-4 oil is **not** recommended and should **only** be used if better quality oil is **not** available.
2. Valvoline® Premium Blue® meets and exceeds API CH-4 and CES20071 specifications.
3. Valvoline® Premium Blue® 2000 meets and exceeds CES 20076 specifications.
4. Oil filters **must** meet CES 10065 specifications. LF9001 meets and exceeds CES 10065 specifications.

QSM11 Industrial Engines - Oil Drain Intervals by Duty Cycle (hours)				
	Severe	Heavy	Medium	Light
Fuel Consumption	> 13 gal/hr	10 to 13 gal/hr	8.5 to 10 gal/hr	< 8.5 gal/hr
API CF-4	150	200	250	300
API CG-4	250	300	400	500
API CH-4 or ACEA E5	300	350	500	600
CES20076 or CES20077	350	400	550	700

Note:

1. Valvoline Premium Blue and Premium Blue 2000 meet 20076 standards.
2. Limit oil change interval to 250-hour max for all oil grades if 40% of the operating time is in ambient temperatures above 38°C [100°F] to prevent engine damage due to oil degradation resulting from high oil temperatures.
3. Cummins does **not** recommend the use of CE or CD grade oils. If CD or CE oils **must** be used, make the oil drain intervals half of the API CF-4 values.
4. Engine oil drain intervals need to be reduced by 50% when fuel sulfur content exceeds 0.5%.
5. Oil filters **must** meet CES 10065 specifications. LF9001 meets and exceeds CES 10065 specifications.

Page References for Maintenance Instructions

General Information

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

Daily or Refueling

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Air Tanks and Reservoirs - Drain	3-9
Charge-Air Piping - Maintenance Check	3-8
Coolant Level - Maintenance Check	3-3
Crankcase Breather Tube - Maintenance Check	3-2
Drive Belts - Maintenance Check	3-9
Fan, Cooling - Inspect for Reuse	3-4
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Every 250 Hours or 6 Months

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Remove	4-6
Engine Wiring Harness	4-10
Fuel Filter (spin-on-type):	
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Remove	4-1
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Install	4-8
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Supplemental Coolant Additive (SCA) - Maintenance Check	4-9

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Overhead Set - Adjust	5-1
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Every 1500 Hours or 1 Year

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Air Cleaner Restriction - Maintenance Check	6-15
Air Leaks, Air Intake and Exhaust Systems - Maintenance Check	6-15
Batteries - Maintenance Check	6-17
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Vibration Damper - Maintenance Check	7-1

Section 3 - Maintenance Procedures at Daily Interval

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Marine and Industrial Applications	3-8
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Industrial Applications	3-9
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Daily Maintenance Procedures - Overview

General Information

Good maintenance begins with day-to-day awareness of the engine and its system.

Before starting the engine, check the oil and coolant levels. Look for:

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

Engine Operation Report

General Information

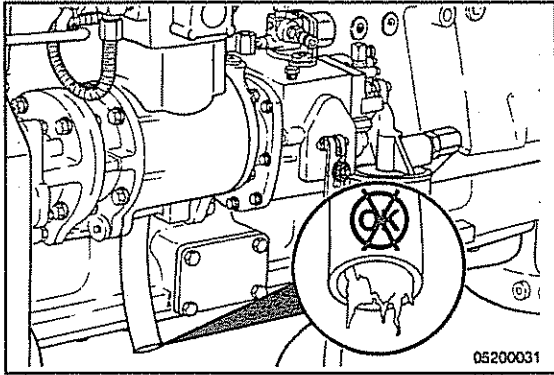
Marine and Industrial Applications

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

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

Report to the maintenance department any of the following conditions:

- Low lubricating oil pressure
- Low power
- Abnormal water or oil temperature
- Unusual engine noise
- Excessive smoke
- Excessive use of coolant, fuel, or lubricating oil .
- Any fuel, coolant, or lubricating oil leaks
- Check engine light flashing or staying on.



Crankcase Breather Tube

Maintenance Check

Industrial Applications

Check the crankcase breather tube daily during cold weather operations for ice buildup, which could obstruct the tube.

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

Fuel-Water Separator

Drain

Marine and Industrial Applications



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

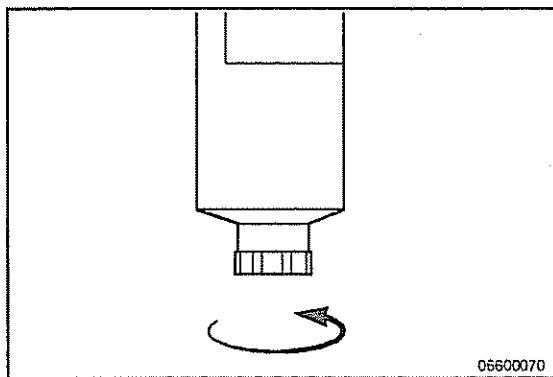
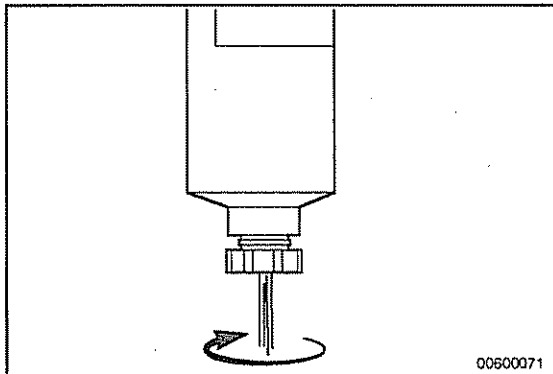
Cummins Engine Company, Inc., requires a fuel-water separator or fuel filter and water separator be installed in the fuel supply system.

Drain the water and sediment from the separator daily.

Shut off the engine.

Use your hand to open the drain valve. Turn the valve **counterclockwise** approximately 3-1/2 turns until the valve drops down 25.4 mm [1 in] and draining occurs.

Drain the filter sump until clear fuel is visible.



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

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

Lubricating Oil Level

Maintenance Check

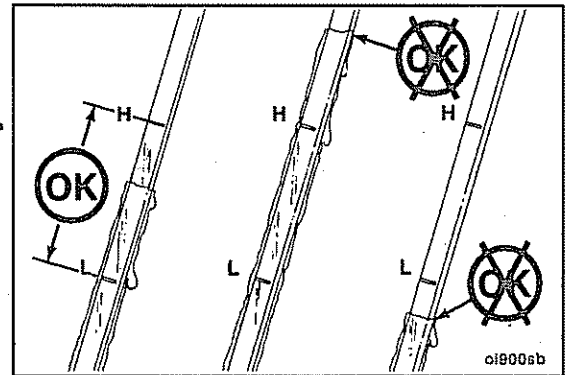
Marine and Industrial Applications

The engine **must** be level when checking the oil level to obtain a correct measurement.

Shut off the engine for an accurate reading.

Never operate the engine with the oil level below the L (low) mark or above the H (high) mark. Wait at least 10 minutes after shutting the engine off before checking the oil level. This allows time for the oil to drain into the oil pan.

Refer to Lubricating Oil Recommendations/Specifications in Section V.



Coolant Level

Maintenance Check

Marine and Industrial Applications

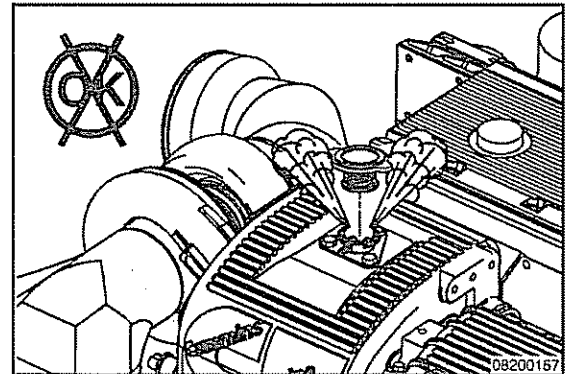


WARNING

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

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

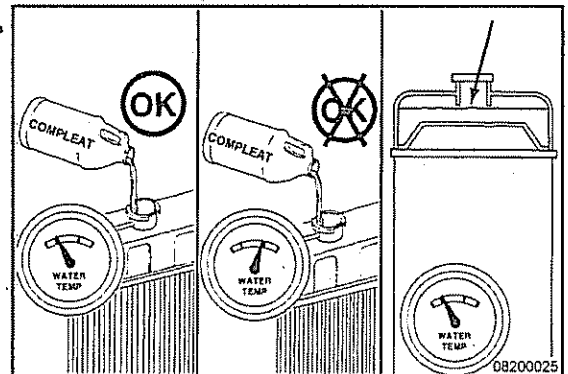
NOTE: Never use a sealing additive to stop leaks in the cooling system. This can result in cooling system plugging and inadequate coolant flow, causing the engine to overheat.



CAUTION

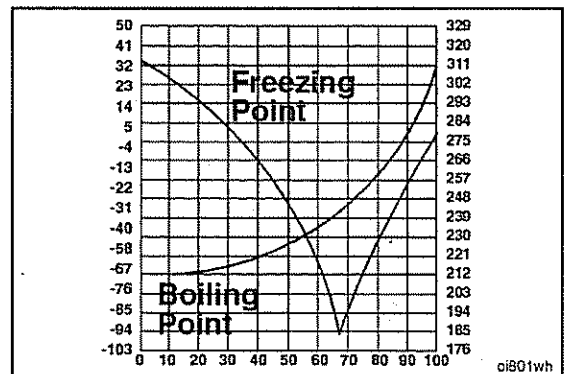
Do not add cold coolant to a hot engine; engine castings can be damaged. Allow the engine to cool to below 50°C [120°F] before adding coolant.

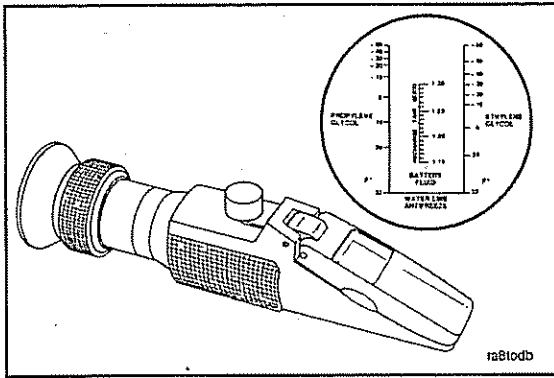
Cummins Engine Company, Inc., recommends using either a 50/50 mixture of good-quality water and a recommended fully formulated antifreeze, or fully formulated coolant when filling the cooling system. The fully formulated antifreeze or coolant **must** meet TMC RP 329 or TMC RP 330 specifications. Refer to Coolant Recommendations and Specifications in Section V.



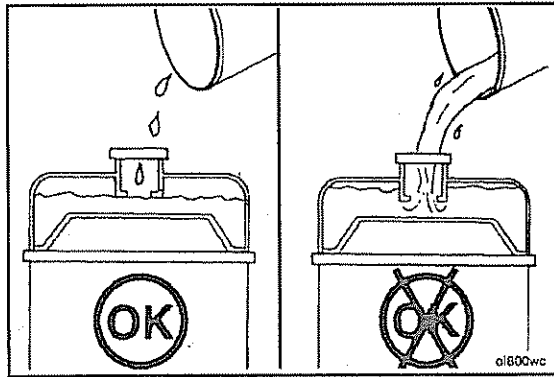
Fully formulated antifreeze **must** be mixed with good-quality water at a 50/50 ratio (40- to 60-percent working range). A 50/50 mixture of antifreeze and water gives a -36°C [-33°F] freezing point and a boiling point of 110°C [230°F], which is adequate for locations in North America. The actual lowest freezing point of ethylene glycol antifreeze is at 68 percent. Using higher concentrations of antifreeze will raise the freezing point of the solution and increase the possibility of a silica gel problem.

Use ethylene glycol or propylene glycol antifreeze year-round to provide freezing point and boilover protection.



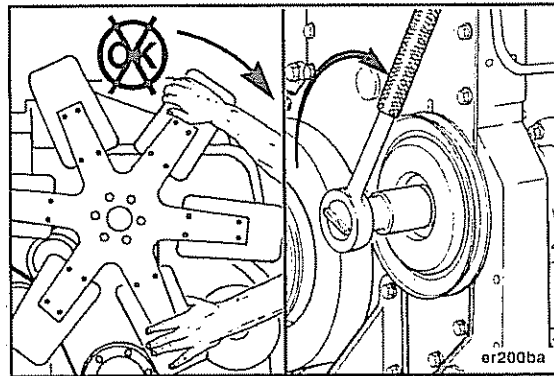


The Fleetguard® refractometer, Part Number CC2800, provides a reliable and easy-to-read measurement of freezing point protection and glycol (antifreeze) concentration.



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

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



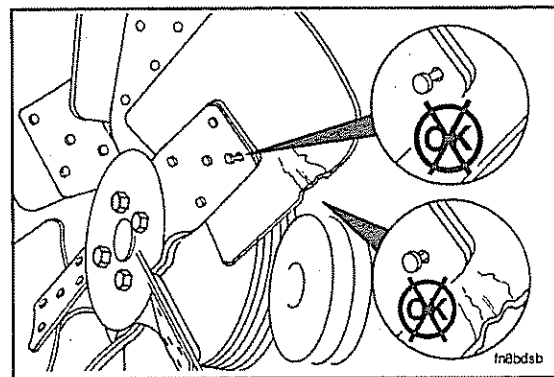
Fan, Cooling

Inspect for Reuse

Industrial Applications



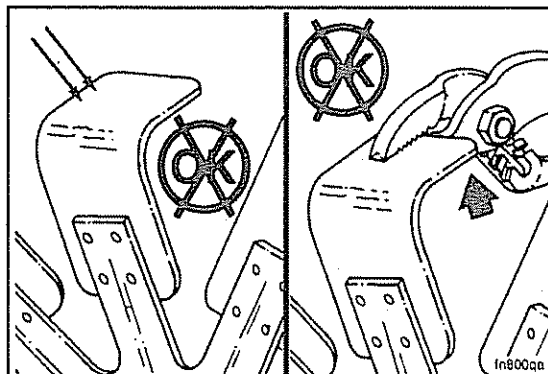
Do not rotate the engine by pulling or prying the fan. A bent or damaged fan blade can fail during operation and cause personal injury or property damage. Use the accessory driveshaft to rotate the crankshaft.



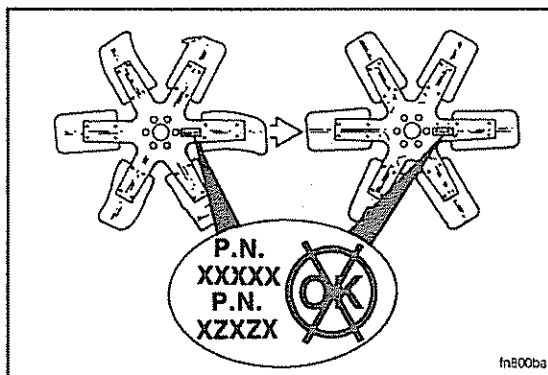
An inspection of the cooling fan is required daily. Check for cracks, loose rivets, and bent or loose blades. Check the fan to make sure it is securely mounted. Tighten the cap-screws, if necessary.

▲ WARNING ▲

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



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

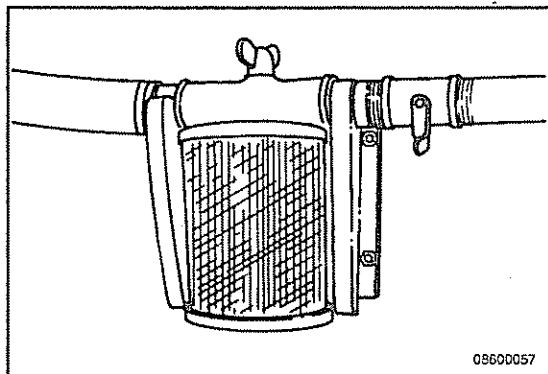


Sea Water Strainer

General Information

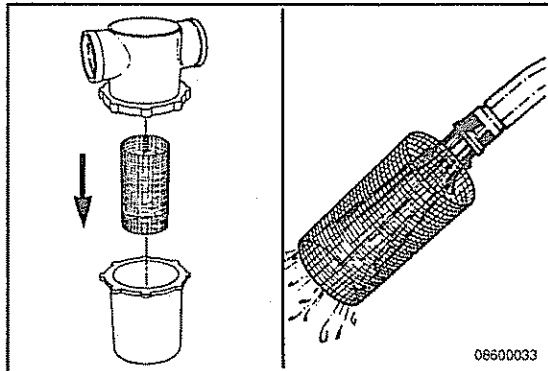
Marine Applications

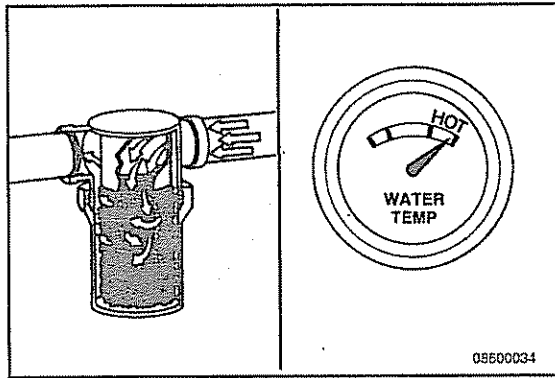
NOTE: Most sea water systems for heat exchanger cooled engines use a sea water strainer. The strainer removes debris from the sea water before it enters the sea water pump.



NOTE: Sea water strainer arrangements may differ.

Inspect the sea water strainer daily for any foreign objects that could restrict water flow.

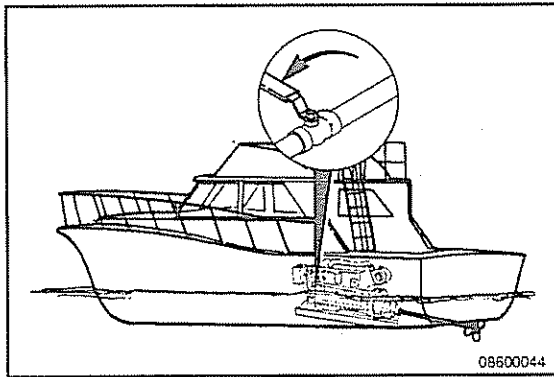




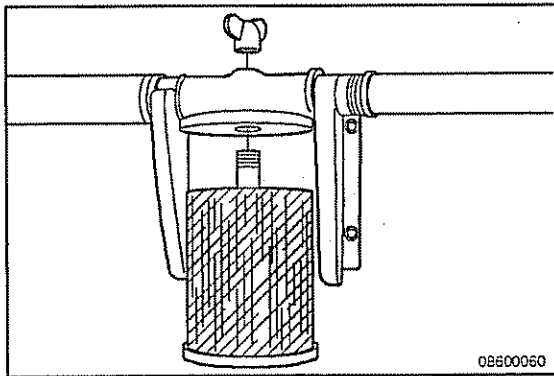
CAUTION

A restricted or clogged sea water strainer can result in hotter than normal, or overheated, engine coolant and marine gear oil temperatures.

For more detailed information, refer to Sea Water Strainer Cleaning in this section.

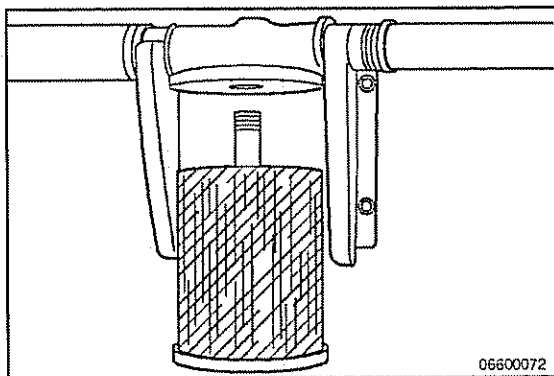


NOTE: If the sea water strainer is below the water level, close the sea water inlet valves before servicing the sea water strainer.



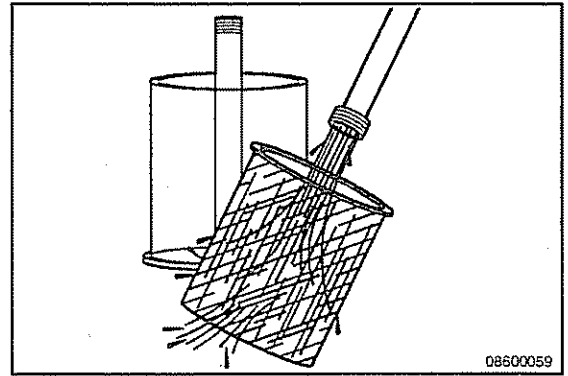
**Disassemble
Marine Applications**

Loosen and remove the sea water strainer wing nut(s) as required.



Remove the sea water strainer assembly. Be careful not to damage o-ring. Retain and inspect for damage.

Remove the sea water strainer basket.

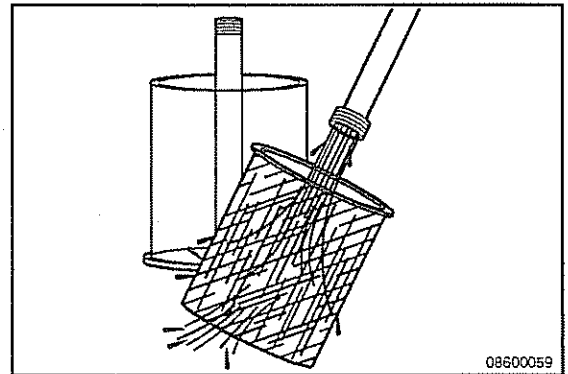


Clean

Marine Applications

Empty all debris from the sea water strainer basket.

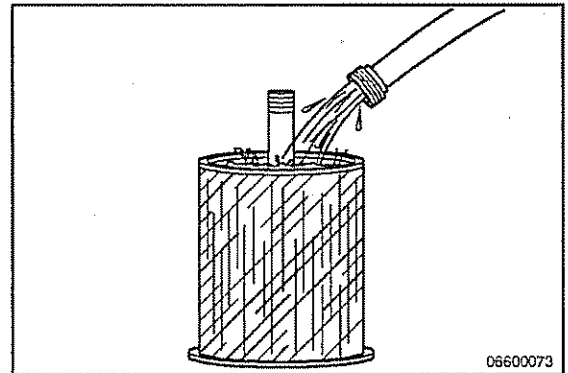
Clean the sea water strainer.



Prime

Marine Applications

Prime the sea water strainer with clean water.

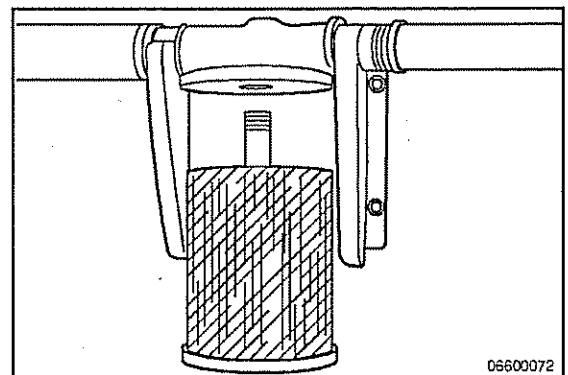


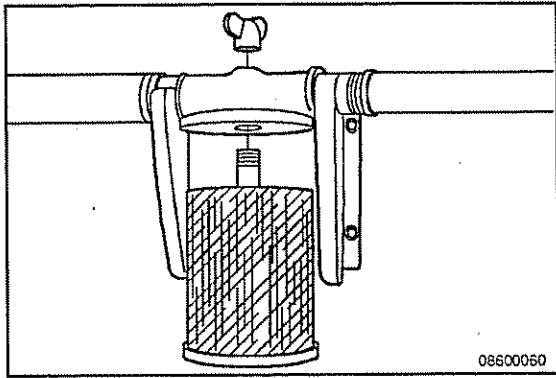
Assemble

Marine Applications

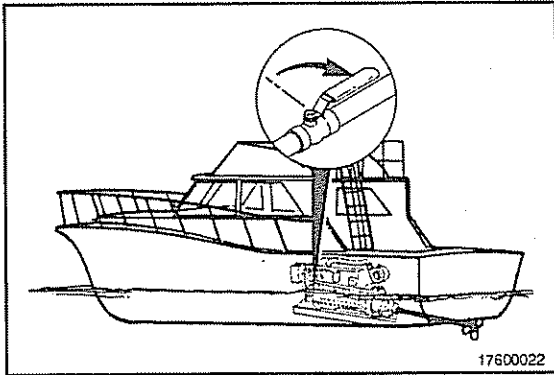
Install the sea water strainer.

Inspect o-ring seal for tears or damage. Replace if necessary. Be sure o-ring is seated properly.

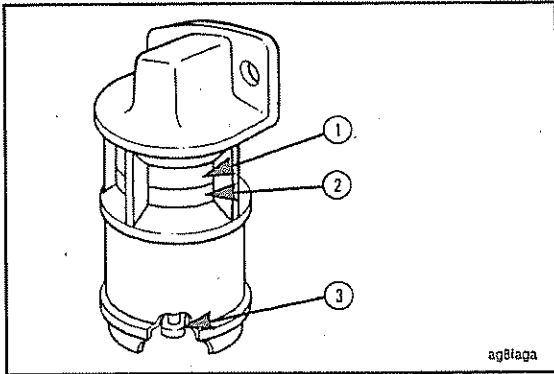




Install and tighten the wing nut(s).



Open the sea water inlet valves.



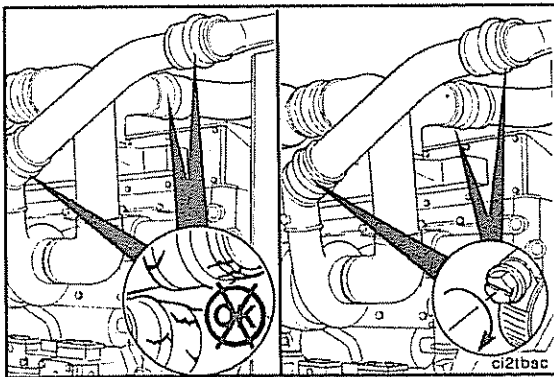
Air Cleaner Restriction Maintenance Check

Marine and Industrial Applications

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

NOTE: Refer to the air cleaner element manufacturer for specific information about your element.

After the air cleaner has been serviced, reset the restriction indicator by pushing the button (3) in the end of the service indicator.

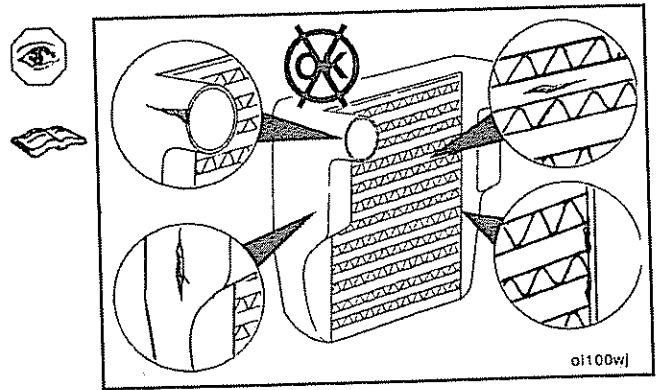


Charge-Air Piping Maintenance Check

Industrial Applications

Inspect the charge air piping and hoses daily for holes, cracks, or loose connections. Tighten the hose clamps, if necessary. Refer to the manufacturer's specifications for the correct torque value.

Inspect the charge air cooler for dirt and debris blocking the fins. Check for cracks, holes, or other damage. If damage is found, refer to the OEM service manual.

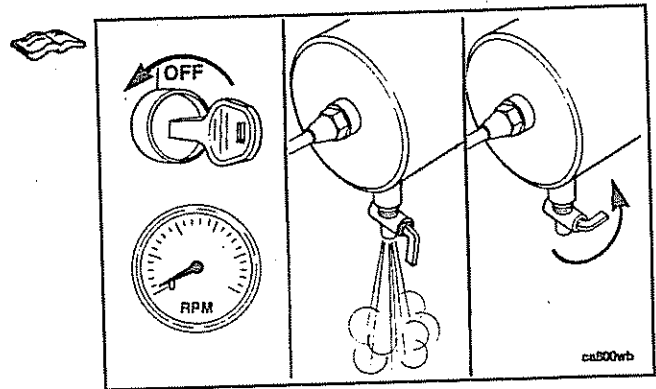


Air Tanks and Reservoirs

Drain

Industrial Applications

Open the draincock on the wet tank to drain any moisture accumulated in the air system. If oil is present, the air compressor system **must** be checked. Refer to the troubleshooting and repair manual listed in Section L, or contact your Cummins Authorized Repair Location.



Marine Gear

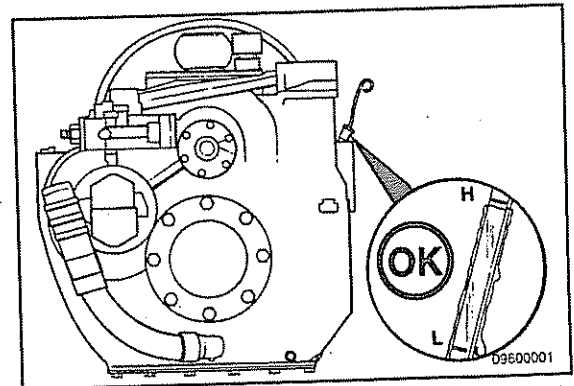
Maintenance Check

Marine Applications

Check the marine gear oil level daily.

Refer to the OEM's recommendations for the gear oil requirements.

NOTE: Different models of marine gears will have the marine gear oil dipstick and fill cap in different locations. The location shown is typical.



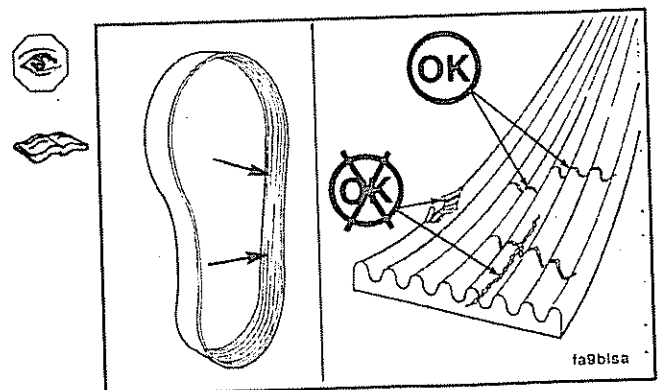
Drive Belts

Maintenance Check

Marine and Industrial Applications

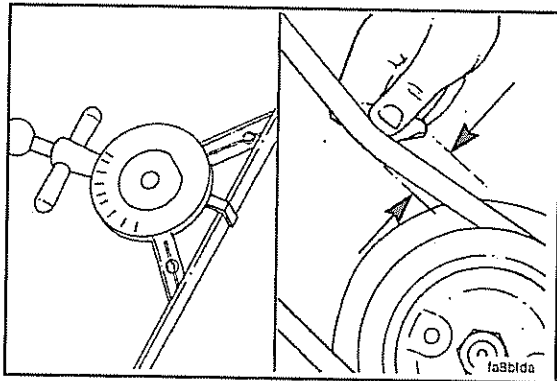
Inspect the drive belts daily. Replace any belt that is frayed or has chunks of material missing. Small cracks that run across the width of the belt are acceptable. Cracks that run along the length of the belt are **not** acceptable.

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



Belt damage can be caused by:

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



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

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



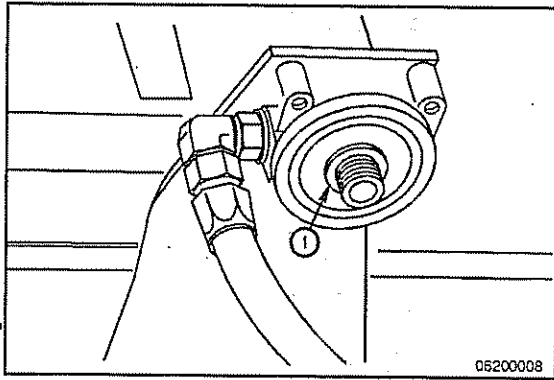
An alternate method (deflection) can be used to check belt tension by applying 110 N [25 lb] between the pulleys on V-belts. If the deflection is more than one belt thickness per foot of pulley center distance, the belt tension **must** be adjusted.

Maintenance Procedures at 250 Hours or 6 Months

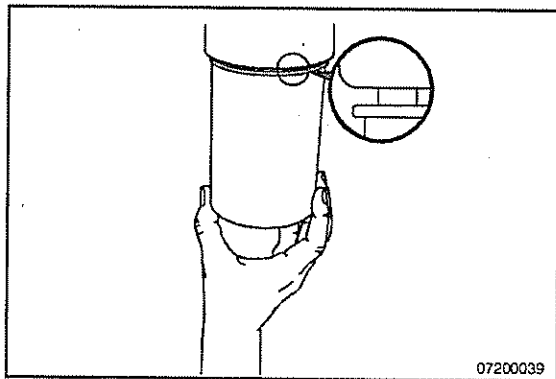
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Install the new thread adapter sealing ring (1) supplied with the new filter.



⚠ CAUTION ⚠

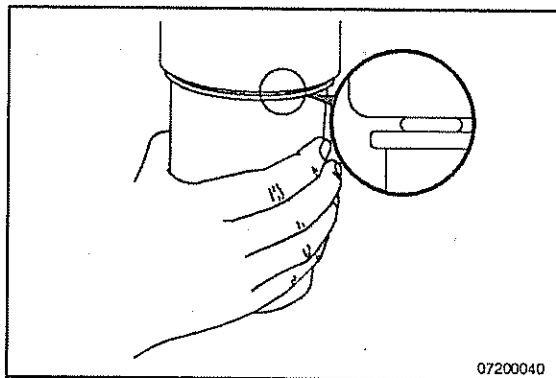
If the filter canister is damaged in any way, do not use it. Dents or scrapes can lead to a rupture or premature failure of the filter.

⚠ CAUTION ⚠

Mechanical overtightening of the filter can distort the threads and damage the fuel filter seal.

Install the filter on the filter head.

Turn the filter until the gasket contacts the filter head surface.



Tighten the filter, by hand, an additional $\frac{1}{2}$ to $\frac{3}{4}$ of a turn after the gasket contacts the filter head surface, or as specified by the filter manufacturer.

Lubricating Oil and Filters

Drain

Marine and Industrial Applications



WARNING

Some state and federal agencies 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.

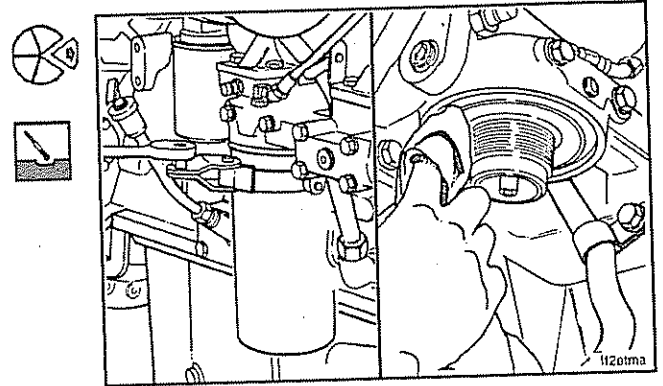
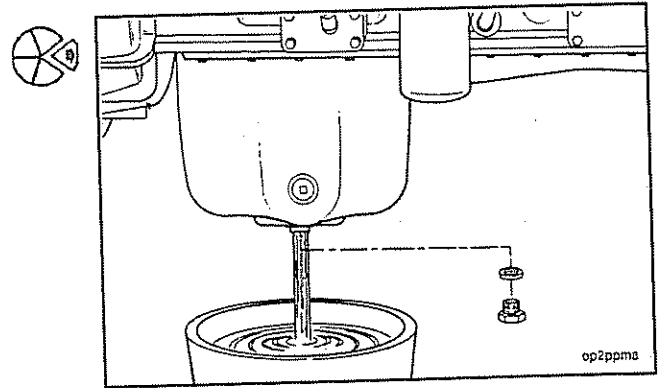
Operate the engine until the coolant temperature reaches 60°C [140°F]. Shut off the engine. Remove the oil drain plug from the bottom of the lubricating oil pan.

NOTE: Do **not** remove the plugs on either side of the oil pan to drain the oil. They will **not** allow the oil to drain completely.

Clean the area around the lubricating oil filter head.

Use oil filter wrench, Part Number 3375049, to remove the oil filter(s).

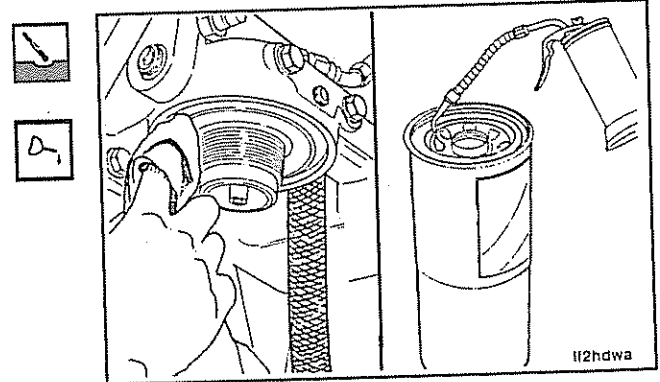
Clean the gasket surface of the oil filter head. The o-ring can stick on the filter head; make sure it is removed.



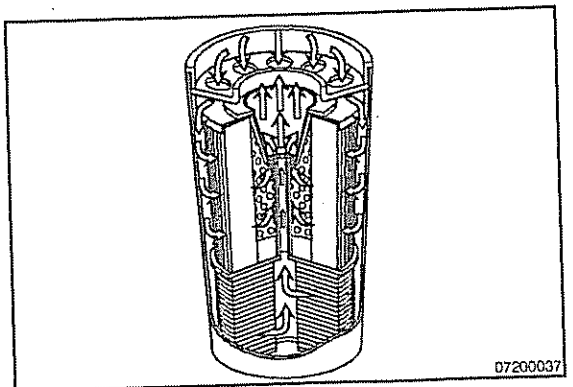
Fill

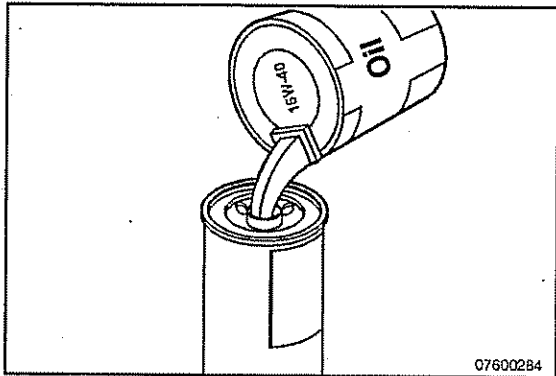
Clean the oil filter head gasket surface.

Use clean engine oil to coat the gasket surface of the new oil filter.



Use the correct oil filter for your engine. Refer to the oil drain interval tables in Section 2 and the filter specifications in Section V.





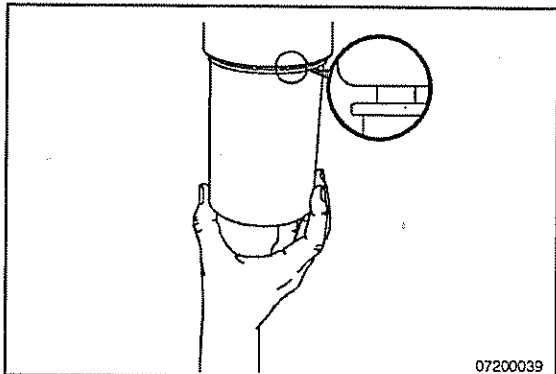
⚠ CAUTION ⚠

If the filter canister is damaged in any way, do not use it. Dents or scrapes can lead to a rupture or premature failure of the filter.

⚠ CAUTION ⚠

Lack of lubrication during start-up is harmful to the engine.

Fill the new oil filter(s) with clean engine oil.

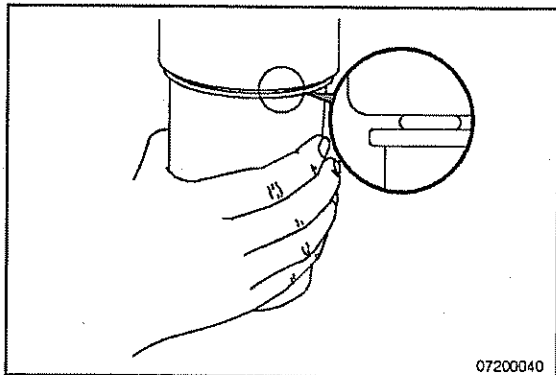


⚠ CAUTION ⚠

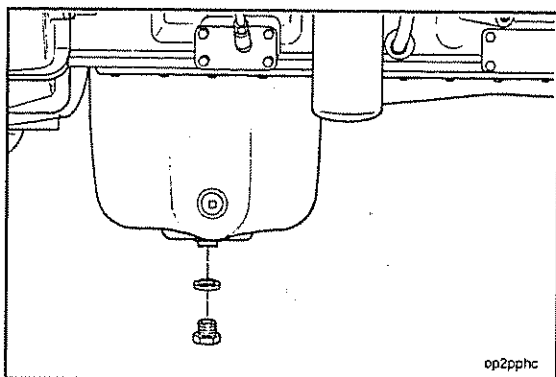
Mechanical overtightening of the oil filter can distort the threads and damage the oil filter element seal.

Install the new oil filter on the filter head.

Turn the filter until the gasket contacts the filter head surface.



Tighten the filter an additional $\frac{1}{2}$ to $\frac{3}{4}$ of a turn after the gasket contacts the filter head surface, or as specified by the filter manufacturer.



Clean and inspect the oil drain plug threads and the seal surface. If any damage is found, the oil drain plug **must** be replaced.

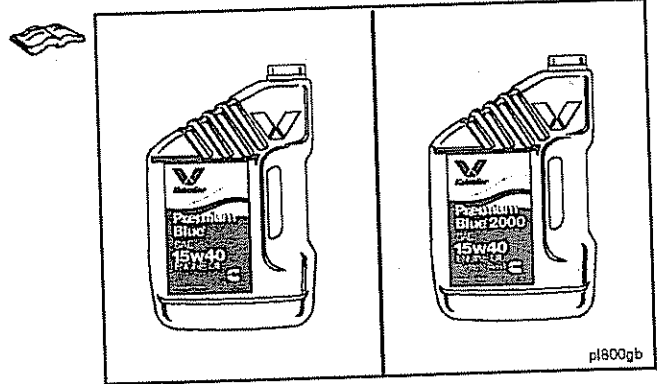


Install and tighten the oil drain plug.

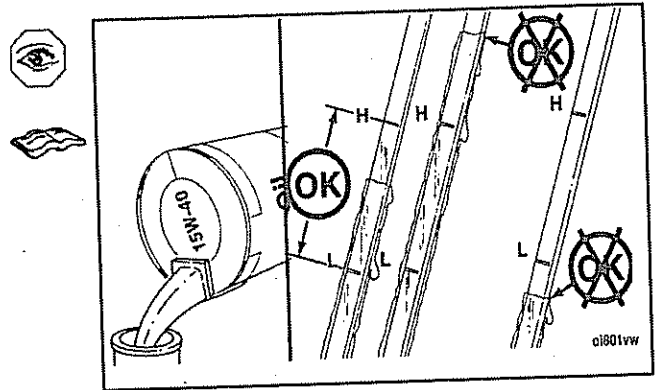
Torque Value: 88 N•m [65 ft-lb]

QSM11 Marine and Industrial Maintenance Procedures at 250 Hours or 6 Months

Use a high-quality multiviscosity oil such as Valvoline® Premium Blue®, Valvoline Premium Blue® 2000, or equivalent. Refer to Section V for the proper oil for your engine.

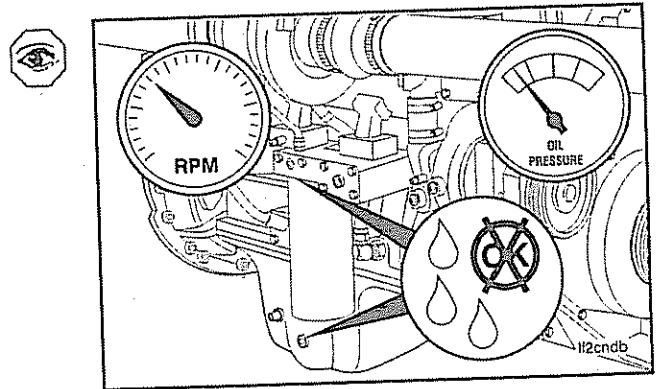


Fill the engine with clean engine oil to the H (high) mark on the dipstick. Refer to Section V for total system capacity.



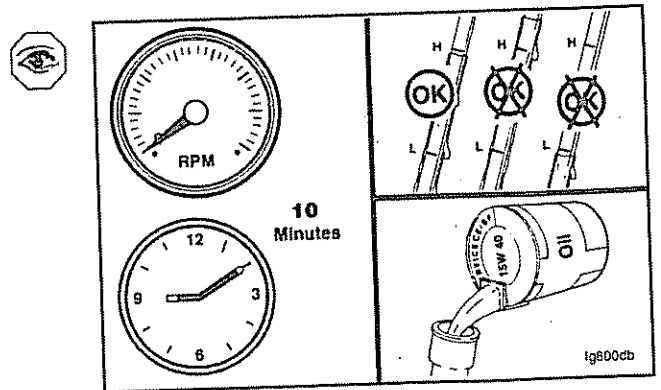
NOTE: Engine oil pressure **must** be indicated on the gauge within 15 seconds after starting engine. If oil pressure is **not** registered within 15 seconds, shut off the engine immediately to avoid engine damage. Confirm the correct oil level in the oil pan.

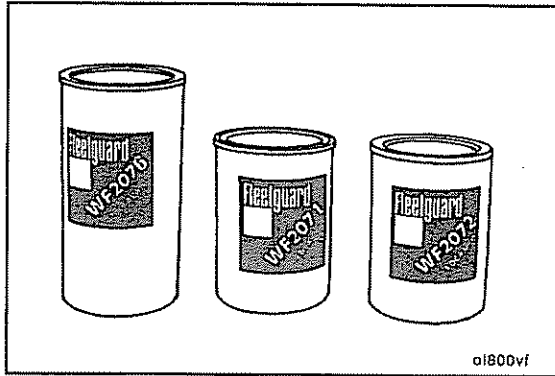
Operate the engine at idle speed until normal operating temperature is reached. Check for oil leaks.



Shut off the engine. Wait approximately 10 minutes for the oil to drain into the oil pan.

Check the oil level again. Add oil as necessary to bring the level up to the H (high) mark on the dipstick. Do **not** overfill the engine with oil.



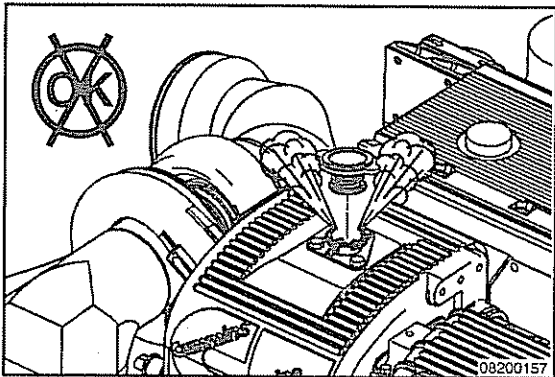


Coolant Filter

Remove

Marine and Industrial Applications

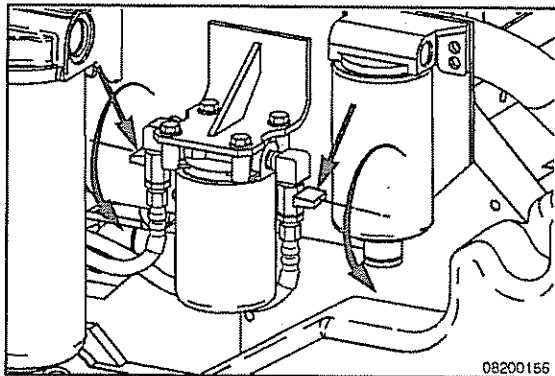
The correct coolant filter to be used is determined by the total cooling system capacity and other operational factors. For the correct filter for your engine, refer to Coolant Recommendations and Specifications: Section V.



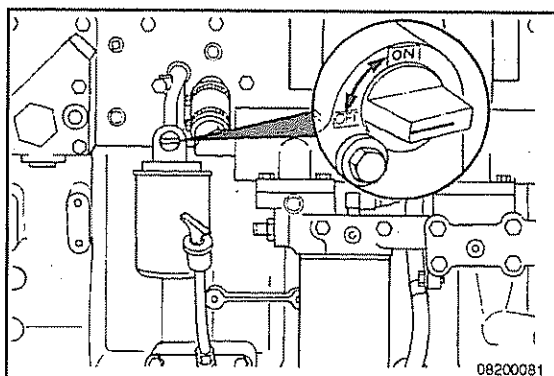
▲ WARNING ▲

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

Remove the cooling system pressure cap.



Turn the valve on the remote-mounted coolant filter head to the OFF position.



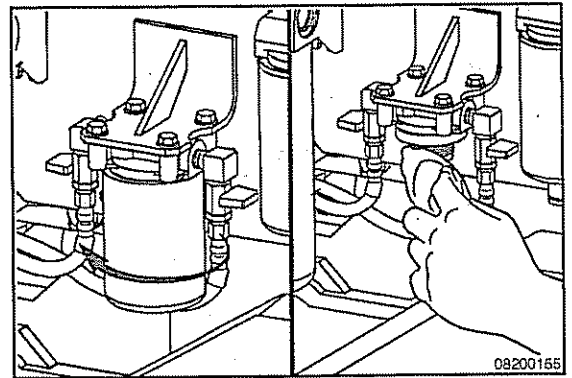
Turn the valve on the engine-mounted coolant filter head to the OFF position.

▲ WARNING ▲

A small amount of coolant can leak when servicing the coolant filter with the shutoff valve in the OFF position. To avoid personal injury, avoid contact with hot coolant.

Remove and discard the coolant filter.

Clean the coolant filter head gasket's surface.



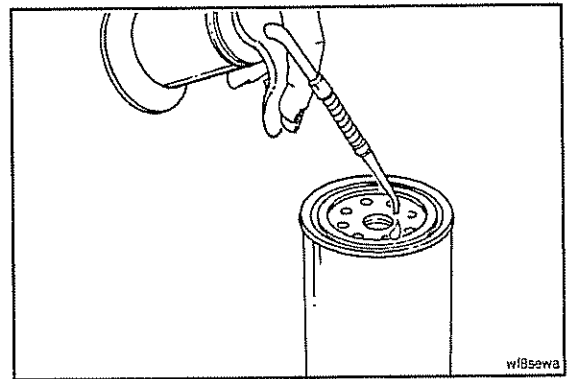
Install

Marine and Industrial Applications

▲ CAUTION ▲

If the filter canister is damaged in any way, do not use it. Dents or scrapes can lead to a rupture or premature failure of the filter.

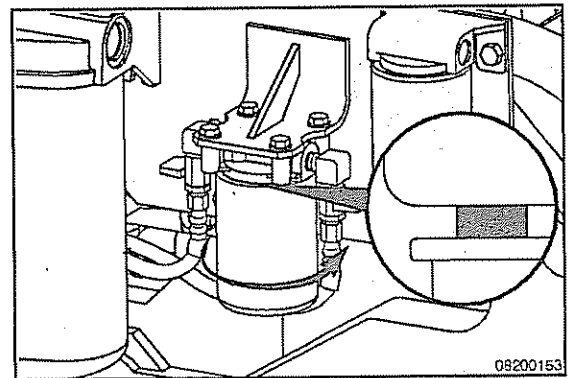
Apply a thin film of clean engine oil to the gasket sealing surface before installing the new coolant filter.



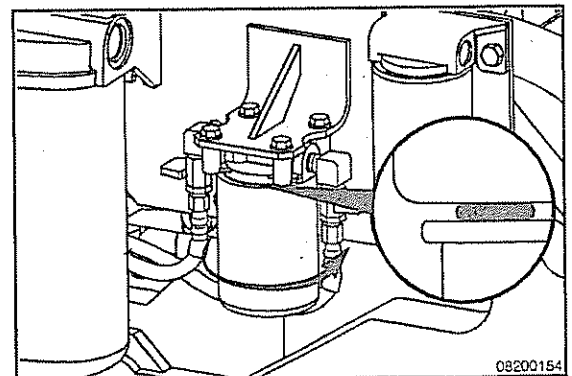
▲ CAUTION ▲

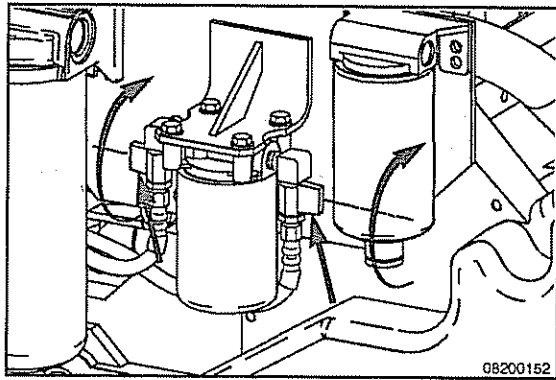
Mechanical overtightening can distort the filter threads or damage the filter head.

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



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

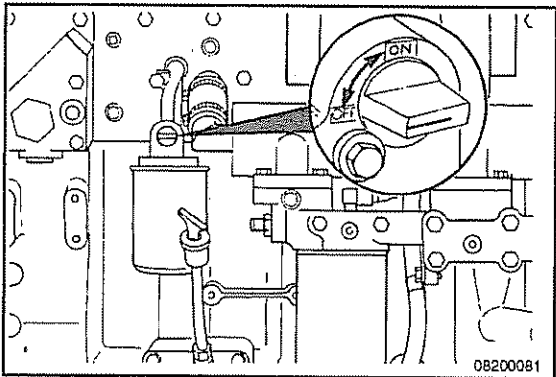




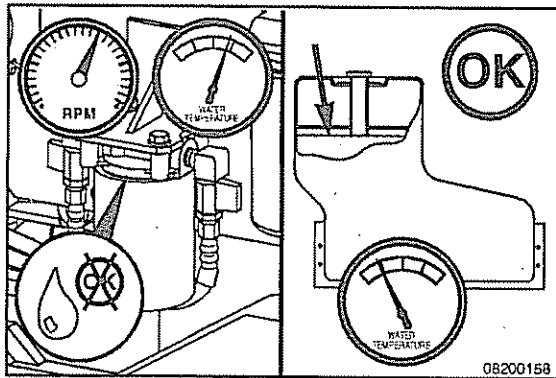
CAUTION

The valve(s) must be in the ON position to prevent engine damage.

Turn the valve on the remote-mounted filter head to the ON position, and install the coolant system pressure cap.

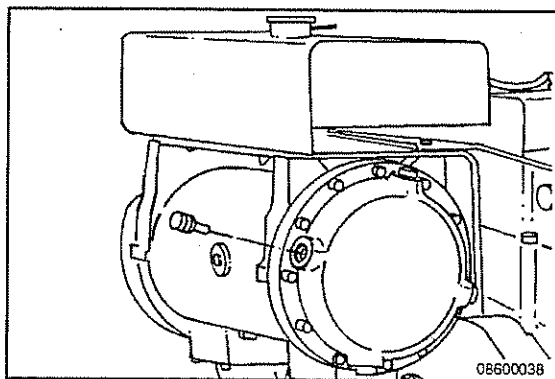


Turn the valve on the engine-mounted filter head to the ON position, and install the coolant system pressure cap.



Operate the engine and check for leaks.

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



Sacrificial Plug

Remove



Marine Applications

CAUTION

In some cases, it will be necessary to hold the welded fitting on the heat exchanger with an additional wrench to prevent damage to the heat exchanger.

Shut off the sea water inlet valve on the vessel hull.

Remove the zinc plug(s).

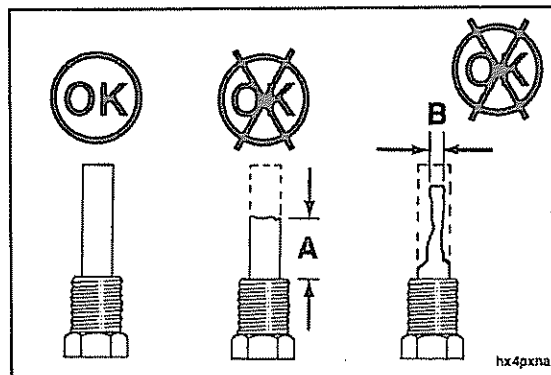
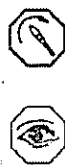
NOTE: The illustration shown is generic. For engine-specific locations, refer to Section E.

Inspect for Reuse

Marine Applications

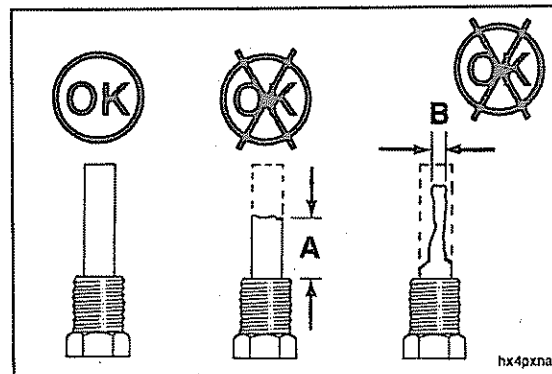
Measure the length of the zinc plug(s) removed from the heat exchanger. Replace any zinc plug if it is 50 percent or more eroded.

NOTE: The frequency of change depends on the chemical reaction of the sea water circulated through the heat exchanger.



Zinc Plug Erosion Limits			
	mm		in
A	19.0	MIN	0.750
New	51.0	MAX	2.000
B	6.4	MIN	0.250
New	16.0	MAX	0.630

NOTE: If any zinc plug does not meet specification, replace it with a new zinc plug.



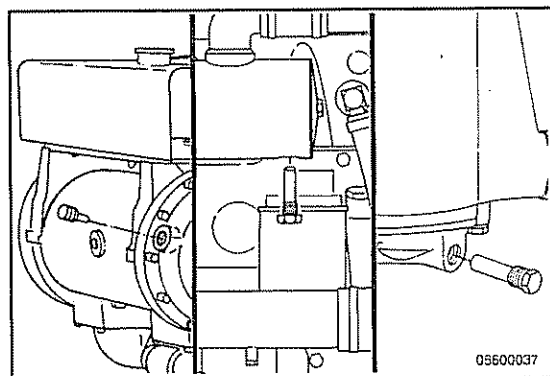
Install

Marine Applications

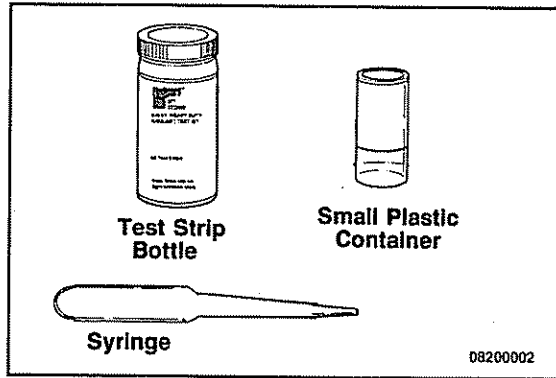
Install and tighten the zinc plug(s).

NOTE: Do not use Teflon™ tape or pipe sealant on the threads of the sacrificial zinc plugs. Use of any type of sealant will insulate the zinc anode and prevent a good ground.

Torque Value: 44 N•m [33 ft-lb]



09500037



Supplemental Coolant Additive (SCA)

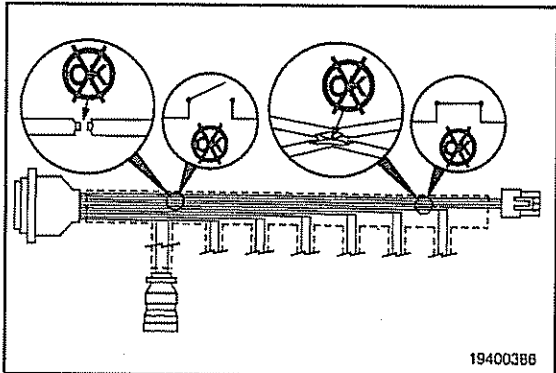
Maintenance Check

Marine and Industrial Applications

Check the SCA concentration level:

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

Use Fleetguard® coolant test kit, Part Number CC2602, to check the concentration level. Instructions are included with the test kit. Refer to Coolant Recommendations and Specifications in Section V for the correct SCA level.



Engine Wiring Harness

Maintenance Check

Marine and Industrial Applications



Never touch any wiring connection when the keyswitch is in the ON position. An electrical shock or personal injury can result.

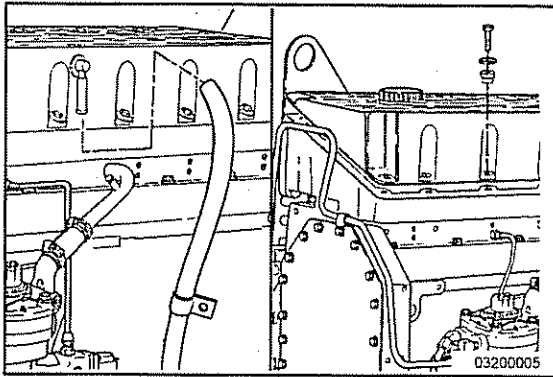
Inspect all wiring connections and wiring harnesses for damage. Faulty wiring can cause improper engine operation and poor performance.

Maintenance Procedures at 600 Hours or 1 Year

Section Contents

	Page
Maintenance Procedures - Overview	5-1
General Information	5-1
General Information	5-1
Overhead Set	5-1
Adjust	5-1
Marine Applications	5-1

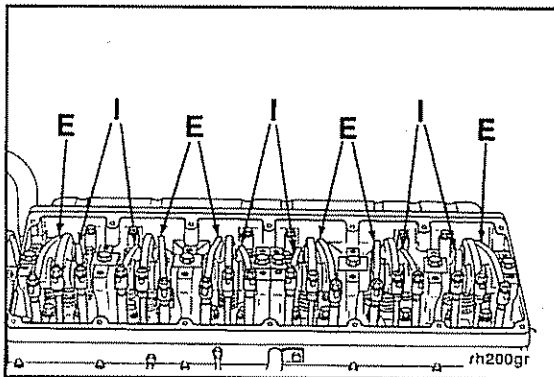
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Remove the crankcase breather tube from the crankcase breather outlet.

Remove the 16 capscrews, isolators, and spacers from the rocker lever cover.

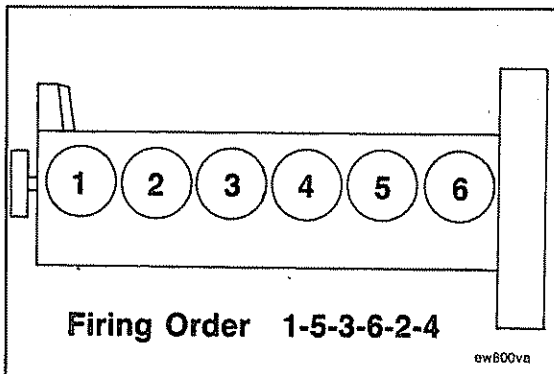
Remove the rocker lever cover and gasket.



Each cylinder has three rocker levers:

- The long rocker lever (E) is the exhaust lever.
- The center rocker lever is the injector lever.
- The short rocker lever (I) is the intake lever.

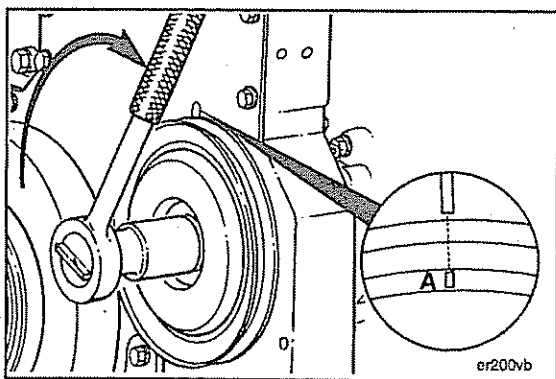
Refer to the accompanying figure for the intake and exhaust valve rocker lever locations.



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

NOTE: The cylinders are numbered from the front gear cover end of the cylinder block.

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



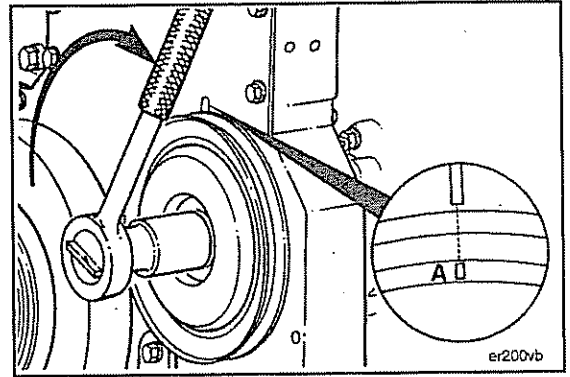
NOTE: The valves and injectors on the same cylinders are adjusted at the same index mark on the accessory drive pulley.

One pair of valves and one injector are adjusted at each pulley index mark before rotating the accessory drive to the next index mark.

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

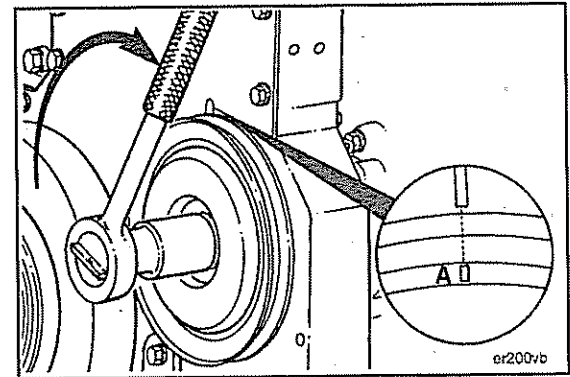
NOTE: See the example before attempting to begin the adjusting procedure.

Valve and Injector Measurement Sequence			
Bar Engine in Direction of Rotation	Pulley Position	Set Cylinder Valve Injector	
Start	A	1	1
Advance to	B	5	5
Advance to	C	3	3
Advance to	A	6	6
Advance to	B	2	2
Advance to	C	4	4
Firing Order: 1-5-3-6-2-4			

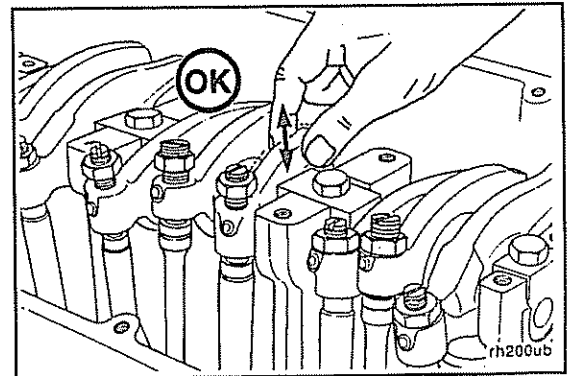


The adjustment can begin on any valve set mark. In the following example, the adjustment will begin on the A valve set mark with cylinder number 1 valves closed and ready for adjustment.

Rotate the accessory drive **clockwise** until the A valve set mark on the accessory drive pulley is aligned with the pointer on the gear cover.



When the A mark is aligned with the pointer, the intake and exhaust valves for cylinder number 1 **must** be closed. If these conditions are **not** correct, cylinder number 6 injector and valves will be ready to set. Set the injector and valves on the cylinder so that both the intake and exhaust valve rocker levers are loose and can be moved from side to side.



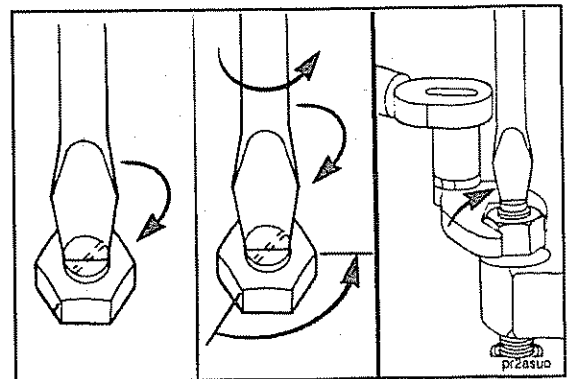
Injector Adjustment

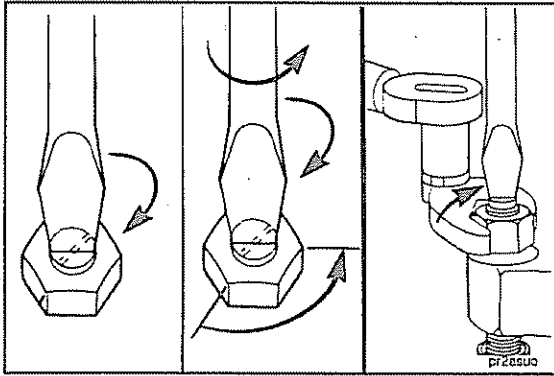
Loosen the injector adjusting screw locknut.

Using a screwdriver and the adjusting screw, bottom the injector plunger three or four times to remove any fuel in the injector.

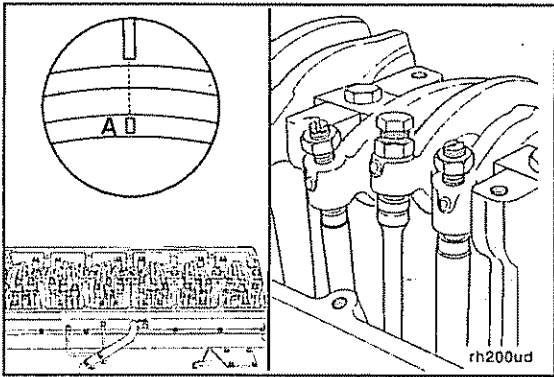
NOTE: Turn the adjusting screw in until you can feel it just bottom the injector plunger.

NOTE: Do **not** use excessive force when bottoming the plunger.





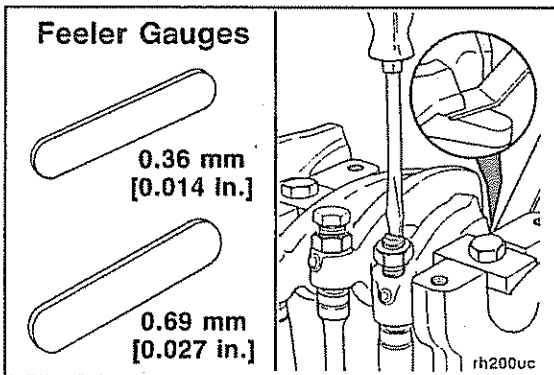
Back out the adjusting screw two flats, 120 degrees.
Hold the adjusting screw and tighten the locknut.
Torque Value: 61 N•m [45 ft-lb]



Valve Adjustment

After setting the injector, set the valves on the **same** cylinder.

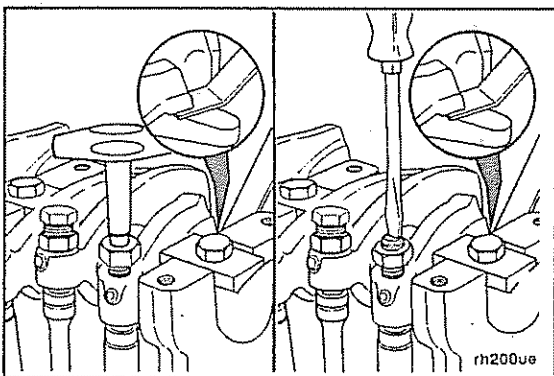
With the A valve set mark aligned with the pointer on the gear cover and both valves closed on the cylinder to be adjusted, loosen the adjusting screw locknuts on the intake and exhaust valves.



Select a feeler gauge for the correct valve lash specification.

	Valve Lash Specifications		
	mm		in
Intake Valves	0.36	MIN	0.014
Exhaust Valves	0.68	MIN	0.027

Insert the feeler gauge between the top of the crosshead and the rocker lever pad.



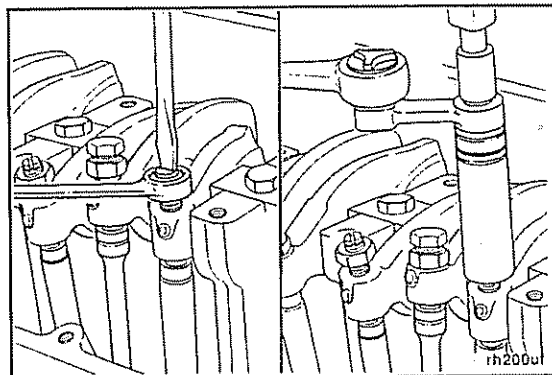
Two different methods for establishing valve lash clearance are described below. Either method can be used; however, the torque wrench method has proven to be the **most** consistent method.

- **Torque Wrench Method:** Insert the proper feeler gauge, use inch-pound torque wrench, Part Number 3376592, and tighten the adjusting screw.

Torque Value: 1 N•m [9 in-lb]

- **Touch Method:** Tighten the adjusting screw until a slight drag is felt on the feeler gauge.

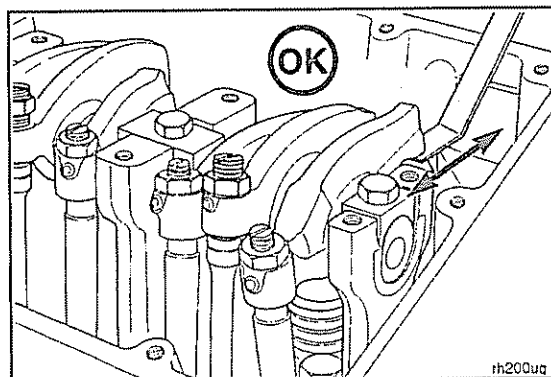
Hold the adjusting screw in this position. The adjusting screw **must not** turn when the locknut is tightened.



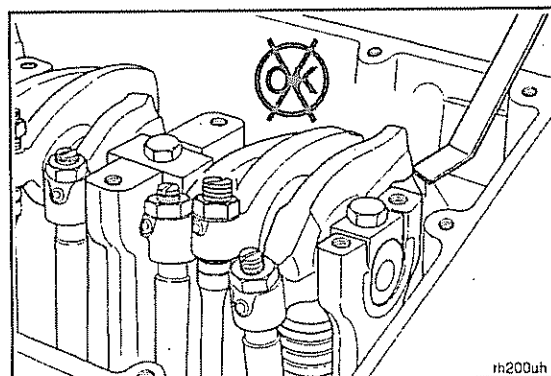
Torque Value:

With Torque Wrench Adapter, Part Number ST-669	47 N•m	[35 ft-lb]
Without Torque Wrench Adapter	61 N•m	[45 ft-lb]

After tightening the locknut to the correct torque value, check to make sure the feeler gauge will slide back and forth between the crosshead and the rocker lever with **only a slight drag**.



If using the touch method, attempt to insert a feeler gauge that is 0.03 mm [0.001 in] thicker between the crosshead and the rocker lever pad.

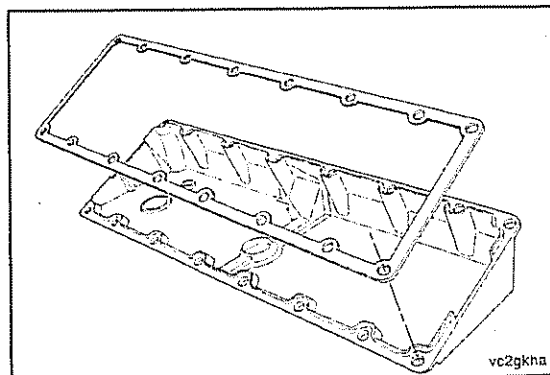


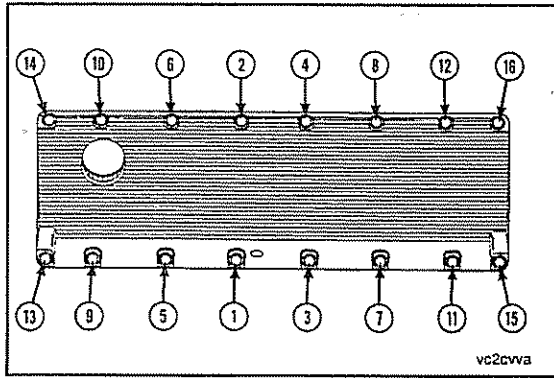
NOTE: The valve lash is **not** correct when a thicker feeler gauge will fit between the crosshead and the rocker lever pad.

NOTE: If the rocker lever cover gasket was **not** damaged, it can be used again after cleaning it. If the gasket was damaged, it **must** be discarded and a new gasket used.



Install the rocker lever cover gasket.





Install the rocker lever cover on the rocker lever housing.

Install the 16 isolators, spacers, and capscrews in the rocker lever housing.



Tighten the capscrews in the sequence shown.

Torque Value: 15 N•m [133 in-lb]

Maintenance Procedures at 1500 Hours or 1 Year

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Overhead Set

Adjust

Industrial Applications

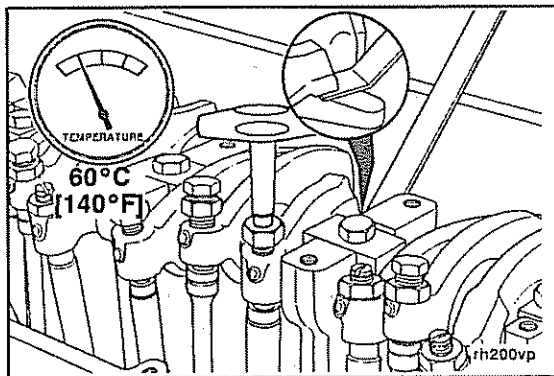
CELECT

Valves and injectors **must** be correctly adjusted for the engine to operate efficiently. Valve and injector adjustment **must** be performed using the values listed in this section. The accompanying table gives the adjustment specifications for CELECT™ engines.

Adjust the valves and injectors at each 1500-hour or 1 year, whichever comes first, maintenance interval. If the valves and injectors have been adjusted during troubleshooting or before this scheduled interval, adjustment is **not** required at this time.

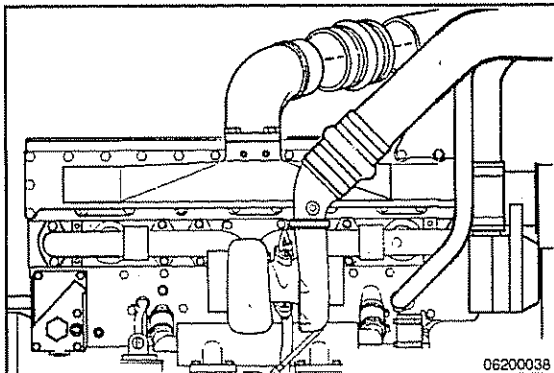
CELECT™ Plus
Valve and Injector Adjustment Specifications

	mm	in
Intake Valve	0.35	0.014
Exhaust Valve	0.68	0.027



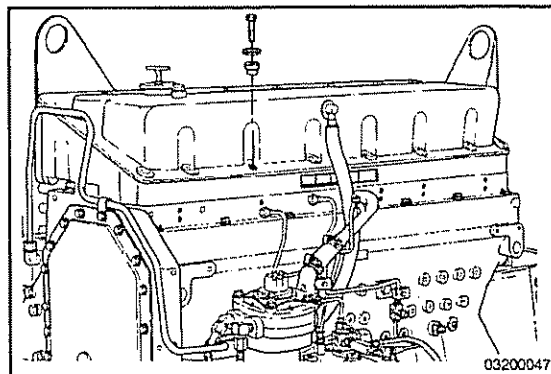
Injector Adjustment

All valve and injector adjustments **must** be made when the engine is cold, any stabilized coolant temperature at 60°C [140°F] or below.



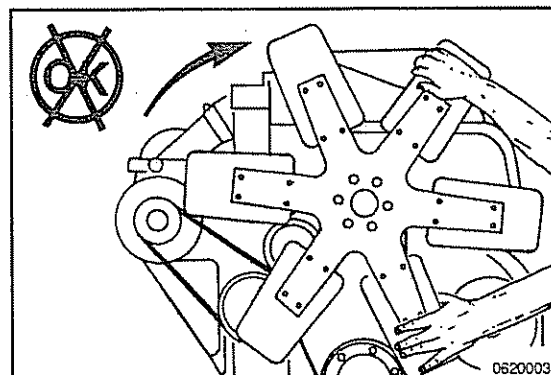
Remove the air piping from the intake manifold.

Remove the rocker lever cover.

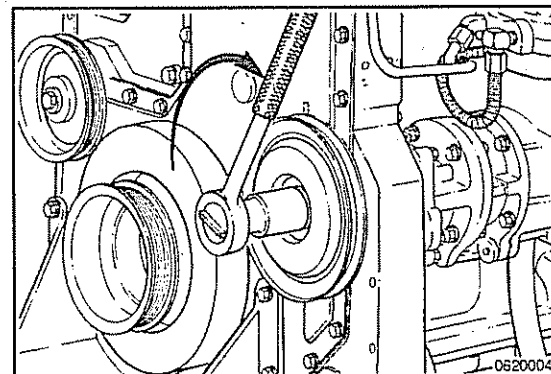


▲ WARNING ▲

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



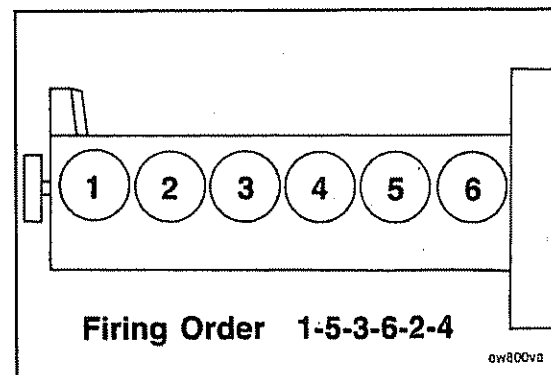
The valve set marks are located on the accessory drive pulley. The marks align with a pointer on the gear cover. Use the accessory driveshaft to rotate the crankshaft.

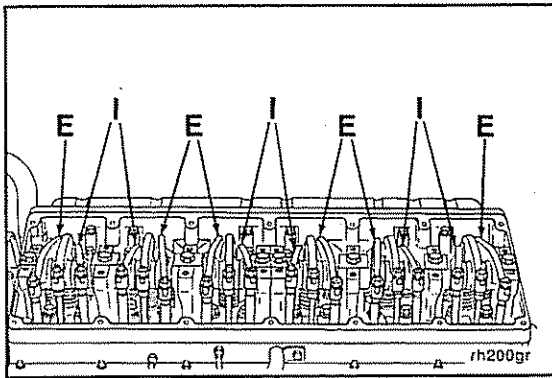


The crankshaft rotation is **clockwise** when viewed from the front of the engine.

The cylinders are numbered from the front gear housing end of the engine.

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





Each cylinder has three rocker levers:

- The long rocker lever (E) is the exhaust lever.
- The center rocker lever is the injector lever.
- The short rocker lever (I) is the intake lever.

Refer to the accompanying chart for valve rocker lever locations.

CELECT™ Injector and Valve Measurement Sequence			
Bar Engine in Direction of Rotation	Pulley Position	Set Cylinder	
		Injector	Valve
Start	A	1	1
Advance to	B	5	5
Advance to	C	3	3
Advance to	A	6	6
Advance to	B	2	2
Advance to	C	4	4

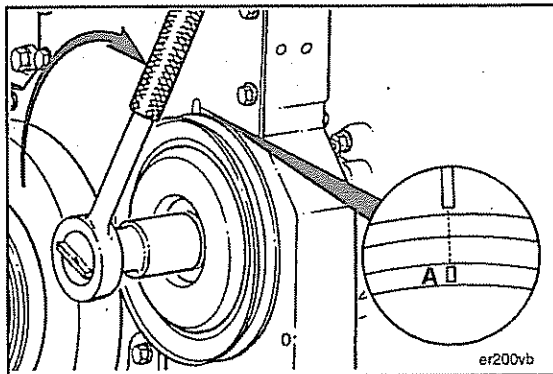
Firing Order: 1-5-3-6-2-4

ol200vh

The valves and injectors on the same cylinders are adjusted at the same index mark on the accessory drive pulley on CELECT™ engines.

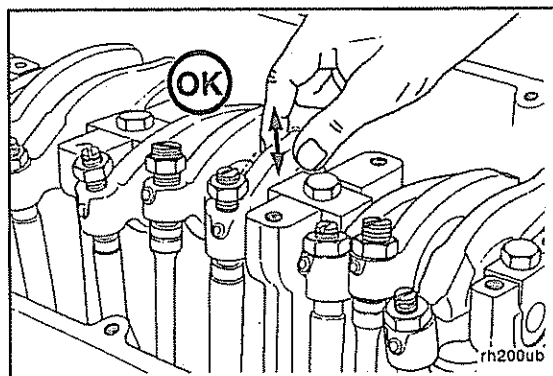
One pair of valves and one injector are adjusted at each pulley index mark before rotating the accessory drive to the next index mark.

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



The adjustment can begin on any valve set mark. In the following example, the adjustment will begin on the "A" valve set mark with cylinder number 1 valves closed and ready for adjustment.

Rotate the accessory drive **clockwise** until the "A" valve set mark on the accessory drive pulley is aligned with the pointer on the gear cover.



When the "A" mark is aligned with the pointer, the intake and exhaust valves for cylinder number 1 **must** be closed. If these conditions are **not** correct, cylinder number 6 injector and valves **must** be ready to set. Set the injector and valves on the cylinder so that both the intake and exhaust valve rocker lever arms are loose and can be moved from side to side.

Both valves are closed when both rocker levers are loose and can be moved from side to side.

Loosen the injector adjusting screw locknut. Using a screwdriver, or box end wrench, and the adjusting screw, bottom the injector plunger three or four times to remove the fuel.

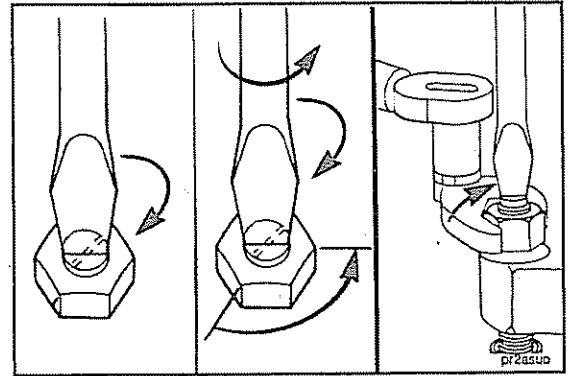


Turn the adjusting screw in until you can feel it just bottom the plunger.

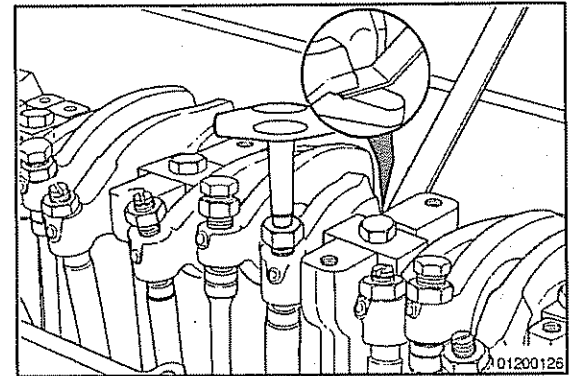
NOTE: Do **not** use excessive force when bottoming the plunger.

Back out the adjusting screw two flats, 120 degrees. Hold the adjusting screw and tighten the locknut.

Torque Value: 61 N•m [45 ft-lb]

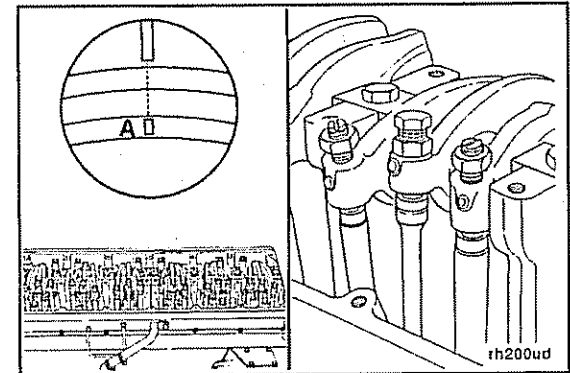


After setting the injector, set the valves on the same cylinder.



Valve Adjustment

With the "A" valve set mark aligned with the pointer on the gear cover and both valves closed on the cylinder to be adjusted, loosen the adjusting screw locknuts on the intake and exhaust valves.

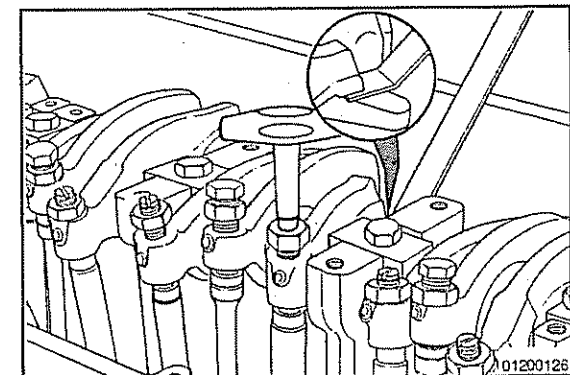


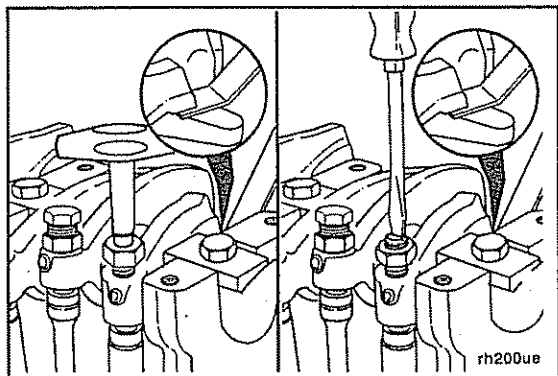
Select a feeler gauge for the correct valve lash specification.



	Valve Lash Specification	
	mm	in
Intake	0.36	0.014
Exhaust	0.69	0.027

Insert the feeler gauge between the top of the crosshead and rocker lever pad.



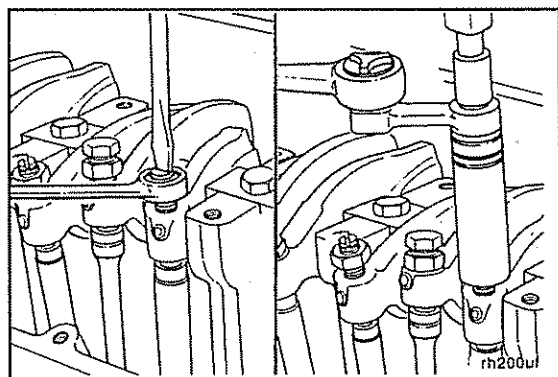


Two different methods for establishing valve lash clearance are described below. Either method can be used; however, the torque wrench method has proven to be the most consistent. It eliminates the need to feel the drag on the feeler gauge.

- **Torque Wrench Method:** Use the inch-pound torque wrench. Part Number 3376592 (normally used to set preload on top stop injectors), and tighten the adjusting screw.

Torque Value: 1 N•m [9 in-lb]

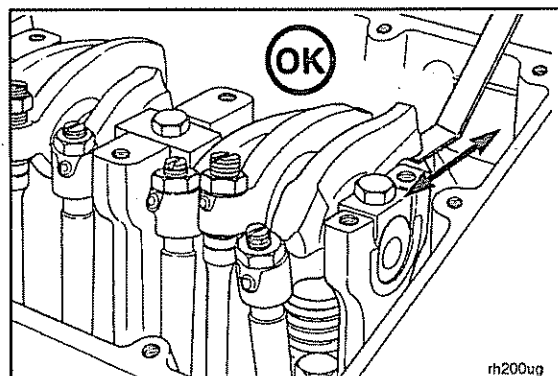
- **Touch Method:** Tighten the adjusting screw until a light drag is felt on the feeler gauge.



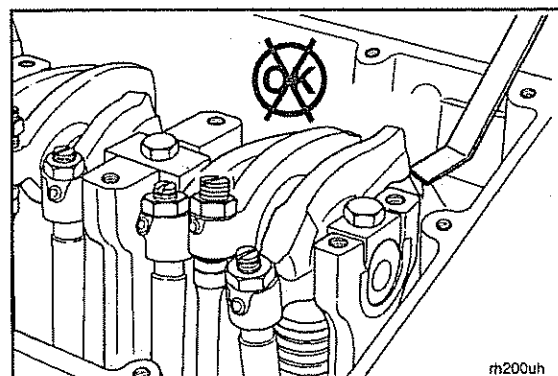
Hold the adjusting screw in this position. The adjusting screw **must not** turn when the locknut is tightened. Tighten the locknut.

Torque Value:

- **Without Torque Wrench Adapter:**
61 N•m [45 ft-lb]
- **With Torque Wrench Adapter (1):**
47 N•m [35 ft-lb]

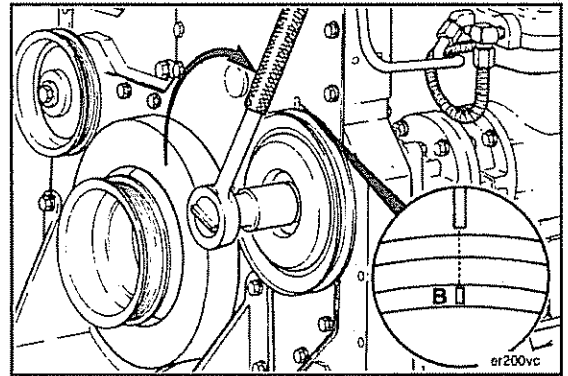


After tightening the locknut to the correct torque value, check to make sure the feeler gauge will slide backward and forward between the crosshead and the rocker lever with **only a slight drag**.



If using the touch method, attempt to insert a feeler gauge that is 0.03 mm [0.001 in] thicker between the crosshead and the rocker lever pad. The valve lash is **not** correct when a thicker feeler gauge will fit.

After adjusting the injector and valves on the appropriate cylinder, rotate the accessory drive pulley and align the next valve set mark with the pointer on the gear cover.



Adjust the appropriate injector and valves following the injector and valve adjustment sequence chart.

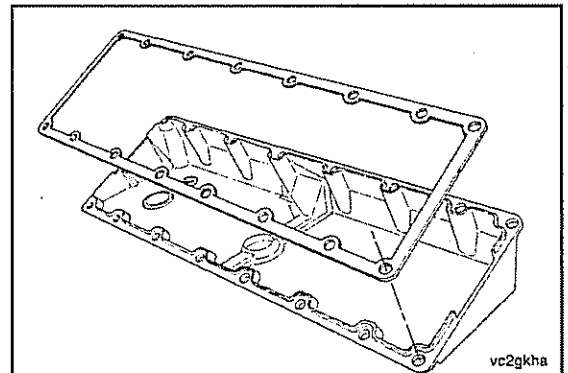
Repeat the process to adjust all injectors and valves correctly.

CELECT™ Injector and Valve Measurement Sequence			
Bar Engine in Direction of Rotation	Pulley Position	Set Cylinder	
		Injector	Valve
Start	A	1	1
Advance to	B	5	5
Advance to	C	3	3
Advance to	A	6	6
Advance to	B	2	2
Advance to	C	4	4

Firing Order: 1-5-3-6-2-4 ol200vh

If the valve cover gasket was **not** damaged, it can be used again. If the gasket was damaged, it **must** be discarded.

Install the gasket on the cover.

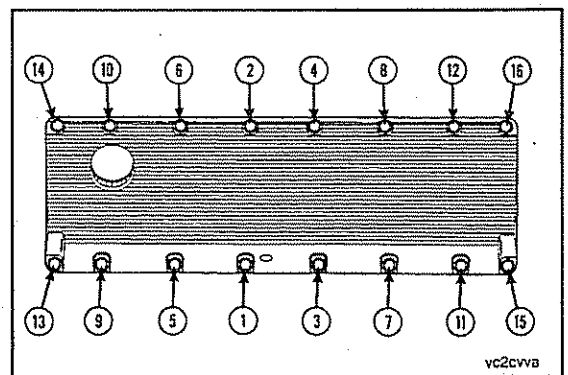


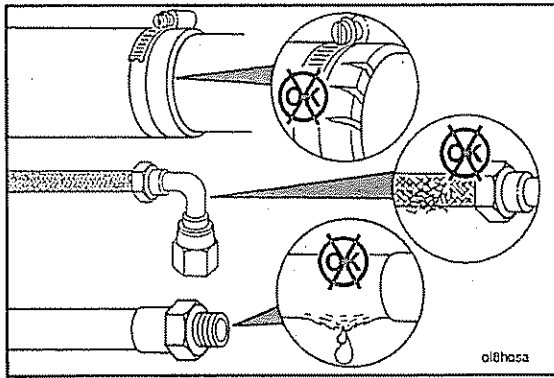
Install the cover on the rocker lever housing.

Install the 16 isolators, spacers, and capscrews in the cover.

Tighten the capscrews in the sequence shown.

Torque Value: 15 N•m [133 in-lb]



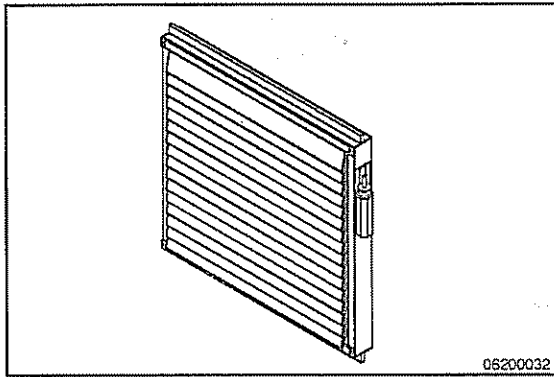


Cooling System Hoses

Maintenance Check

Marine and Industrial Applications

Annually, inspect the cooling system hoses and hose connections for leaks or deterioration. Particles of deteriorated hose can be carried through the cooling system and restrict or clog small passages, especially the heat exchanger and lubricating oil cooler, and partially stop circulation. Replace as necessary.



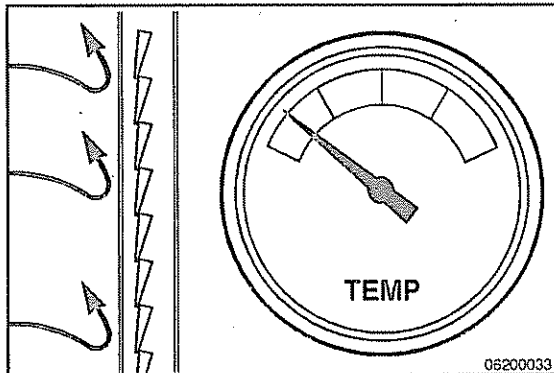
Radiator Shutter Assembly

Maintenance Check



Industrial Applications

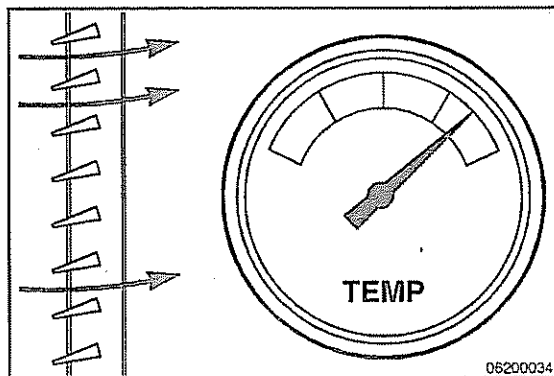
Check the shutters and the thermatic fan every 1500 hours or 1 year.



Check the shutters in the closed position to be sure they are completely closed.



NOTE: If the shutters are **not** closed, refer to the manufacturer's instructions.



Be sure the shutters open completely at the desired temperature setting.



NOTE: If the shutters are **not** open, refer to the manufacturer's instructions.

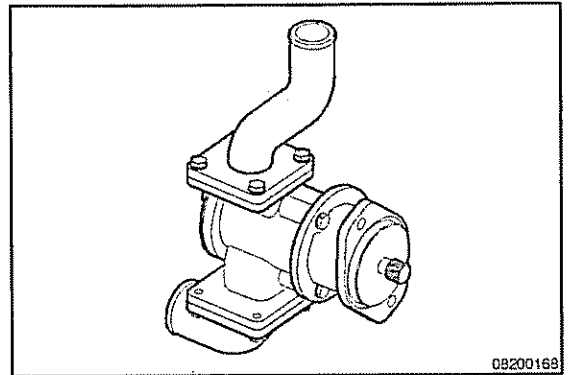
Shutters and thermatic fans **must** be set to operate in the same temperature range as the thermostat with which they are used. Refer to the Thermal Control Settings chart in Section 1.



Sea Water Pump General Information

Marine Applications

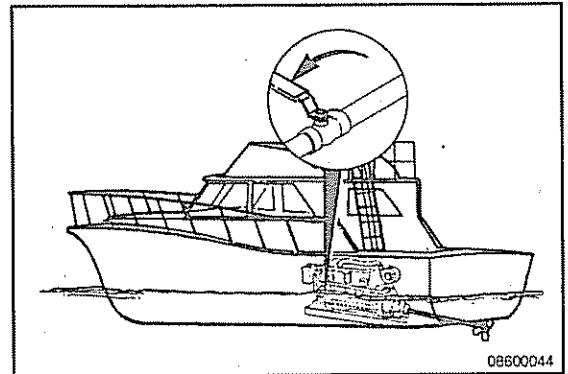
The QSM11 uses a vane-type, positive displacement, self-priming sea water pump.



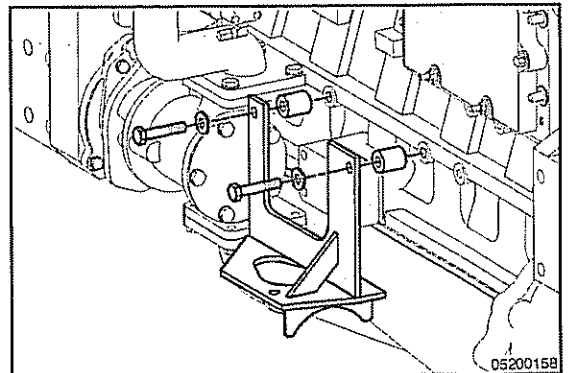
Disassemble

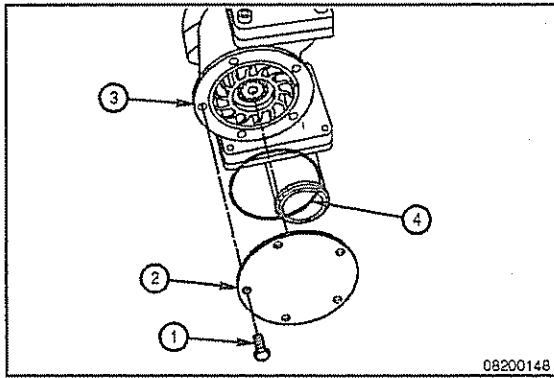
Marine Applications

Shut off the sea water inlet valves.



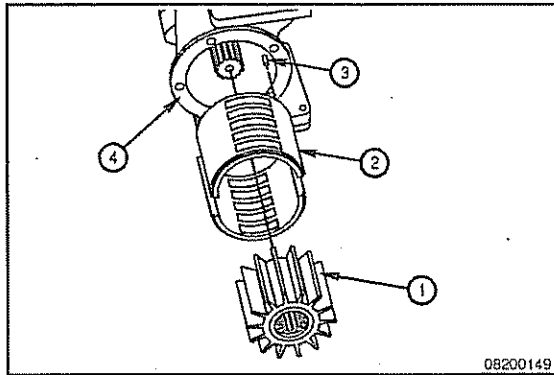
Remove the fuel cooler bracket to gain access to the sea water pump cover.





Remove the five capscrews and washers (1) and the cover (2) from the sea water pump (3).

Remove the o-ring (4).

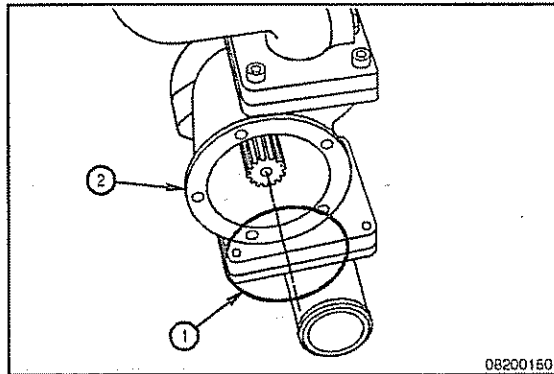


CAUTION

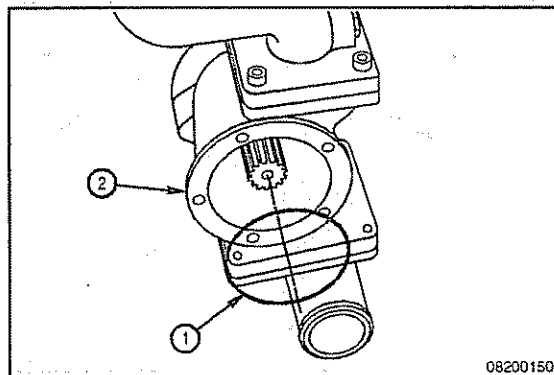
Do not pry against the cam liner to remove the impeller as this will break the cam liner.

NOTE: The two-piece cam liner will separate when removed. Do not drop the cam liner.

Remove the impeller (1), two-piece cam liner (2), and pin (3) from the sea water pump (4).



Remove the inner o-ring (1) from the sea water pump housing (2).



Assemble

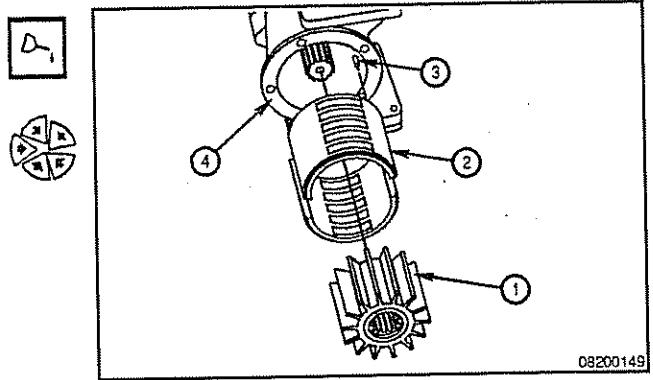
Marine Applications

Install the wear plate and inner o-ring (1) into the sea water pump housing (2).

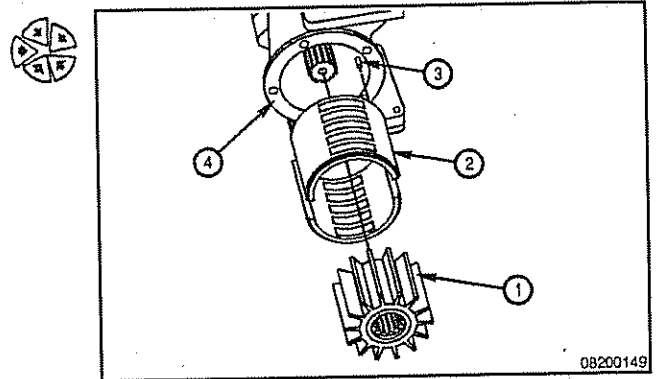
Apply silicone grease to the edges of the two-piece cam liner (2), the pin (3), and the outside surface of the cam liner (2).

Put the cam liner together and install the pin (3).

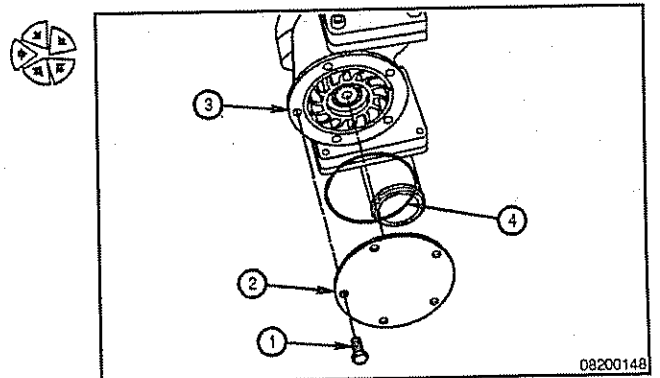
Install the cam liner (2) into the sea water pump housing (4). Make sure that the pin (3) is aligned with the notch in the bottom of the housing (4).



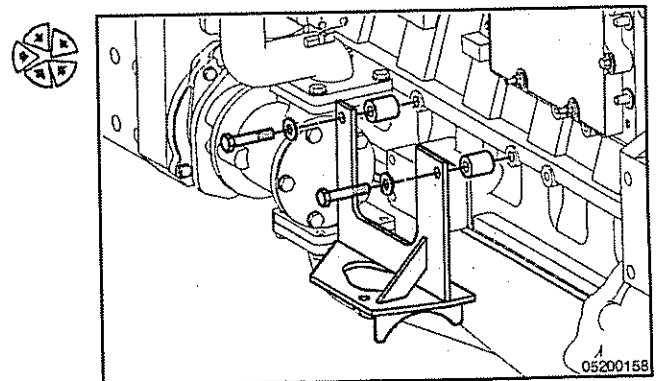
Install the impeller (1) into the sea water pump housing (3).



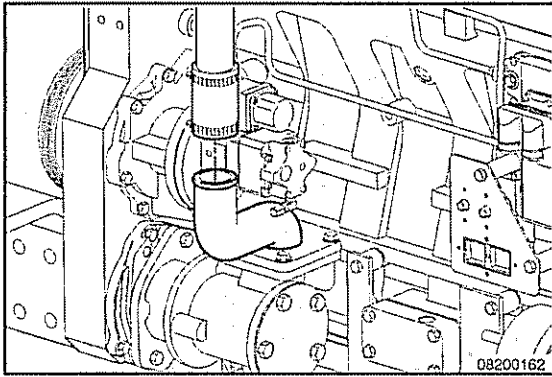
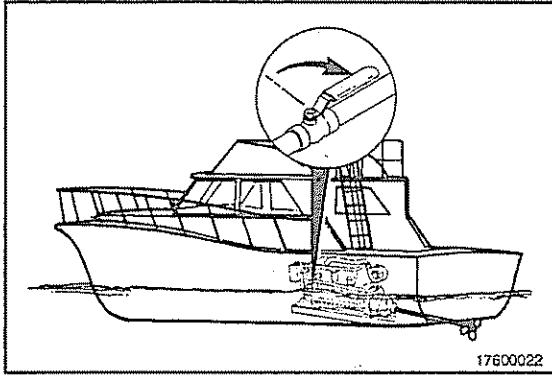
Install the outer o-ring (4), cover plate (2), and five mounting capscrews (1).



Install the fuel cooler bracket.



Open the sea water inlet valves.

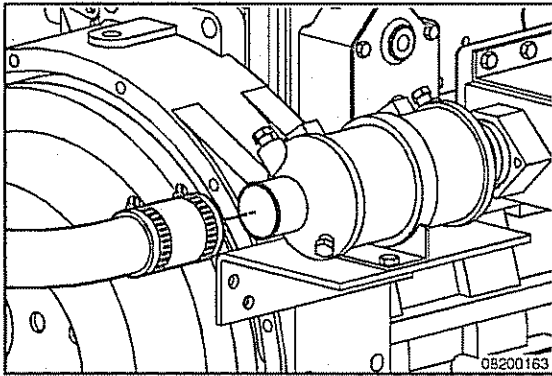


Sea Water System Flush

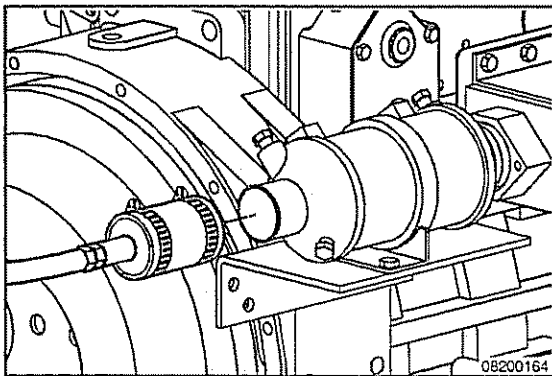
Marine Applications

Remove the hose from the sea water pump outlet.

NOTE: Place the hose into a container to catch the backflushed water.



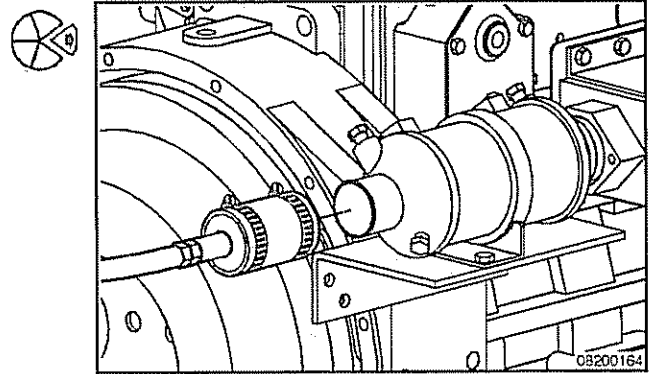
Remove the sea water discharge line from the gear cooler.



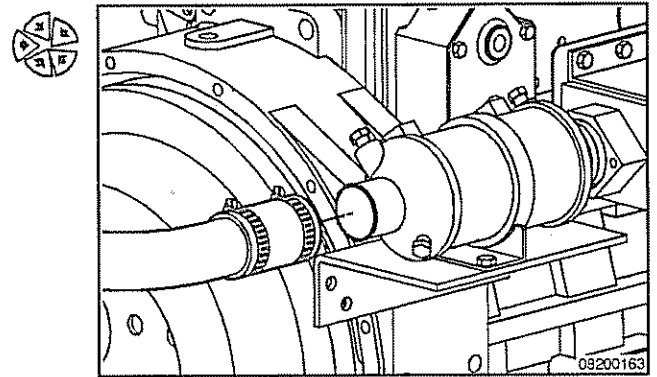
Using hose reducers, install a clean, fresh water supply to the outlet of the gear oil cooler.

Flush the sea water system.

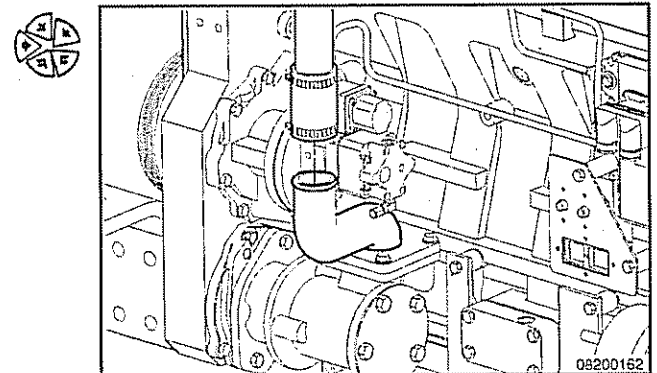
Remove the fresh water supply.



Install the sea water discharge line to the gear cooler.



Install the sea water pump outlet line onto the sea water pump.



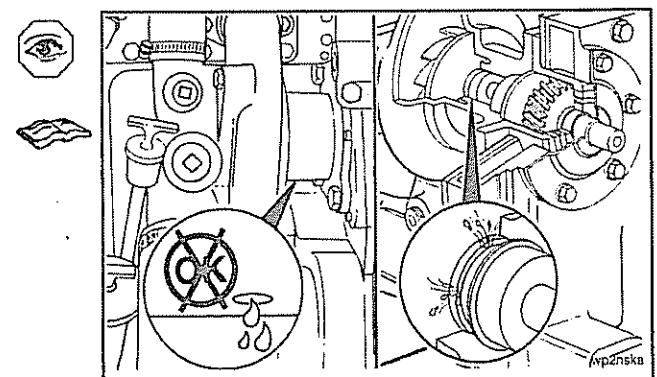
Water Pump

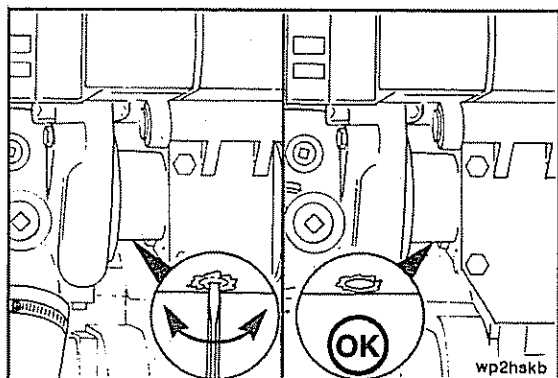
Maintenance Check

Marine and Industrial Applications

If a steady flow or drip of coolant or oil is observed at the weep hole, replace the water pump with a new or rebuilt unit. Refer to Section A for the water pump replacement procedure.

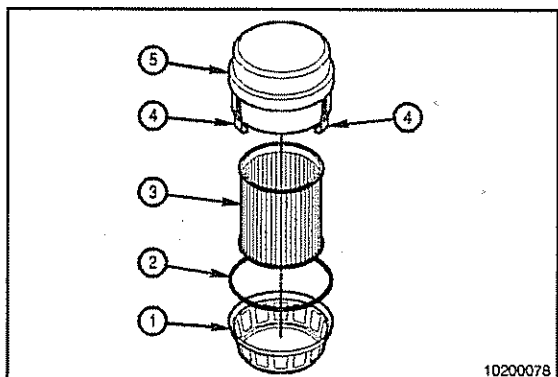
NOTE: A streak or chemical buildup at the weep hole is **not** justification for water pump replacement.





Make sure the weep hole is open.

NOTE: A small screwdriver or a similar tool can be used to remove any debris.



Air Cleaner Assembly (Engine-Mounted)

Maintenance Check

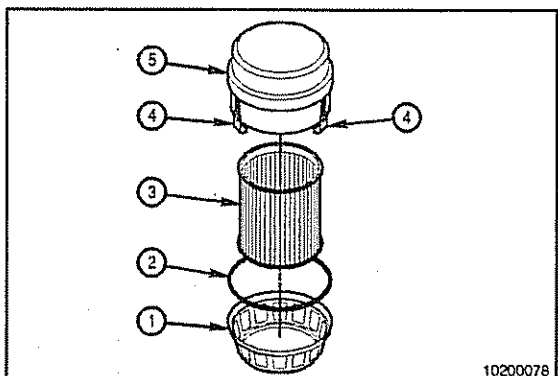


Marine and Industrial Applications



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

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



To avoid damage to the element, pull the cover and the element straight out when removing them from the air cleaner housing.



Unsnap the latches (4) that secure the cover (1) to the air cleaner housing (5). Remove the cover (1).

Pull the element (3) out of the housing.

Remove the o-ring (2) from the cover (1) and inspect. If the o-ring (2) is damaged, it **must** be replaced.

Install the air cleaner element (3) into the housing.

Make sure that the o-ring (2) is seated properly on the cover (1). Install the cover (1).

Snap the latches (4) to secure the cover (1).

Air Cleaner Restriction

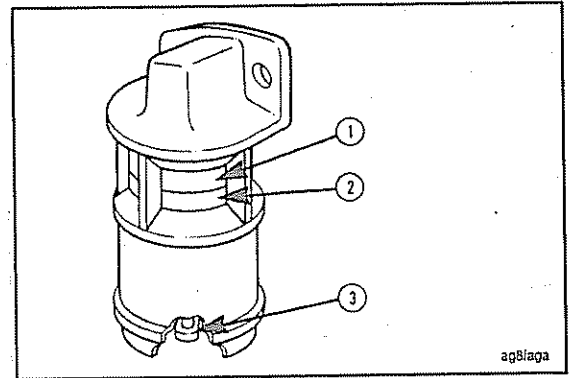
Maintenance Check

Marine and Industrial Applications

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

NOTE: Refer to the air cleaner element manufacturer for specific information about your element.

After the air cleaner has been serviced, reset the restriction indicator by pushing the button (3) in the end of the service indicator.



Air Leaks, Air Intake and Exhaust Systems

Maintenance Check

Marine and Industrial Applications



The engine's intake air must be filtered to prevent dirt and debris from entering the engine. If any of the intake air piping is damaged or loose, unfiltered air will enter the engine, which can cause premature wear and engine failure.

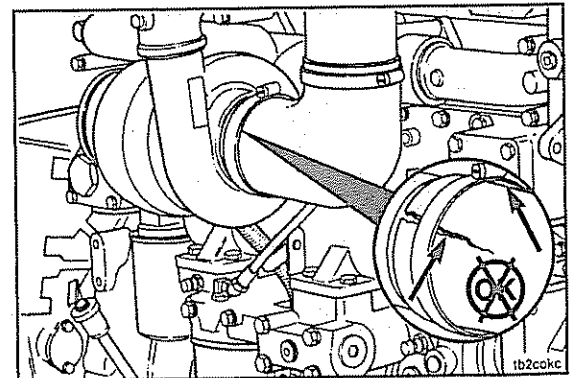
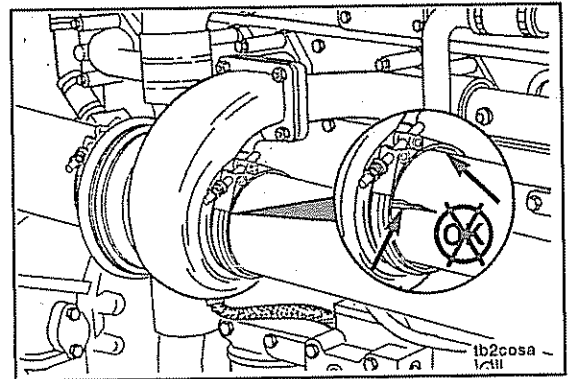
Inspect the intake air piping once a week for cracked hoses, damage, or loose clamps.

Replace damaged pipes and tighten loose clamps as necessary to make sure the air intake system does **not** leak.

Torque Value: 8 N•m [71 in-lb]

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

Disassemble and clean the intake air piping as required.

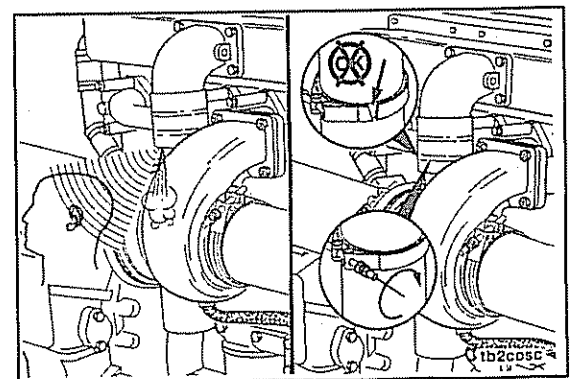


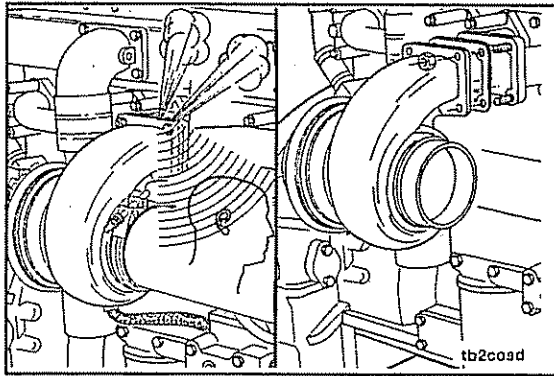
Noise can be caused by an air leak from the:

- Turbocharger-to-discharge-elbow connection

Inspect for damage. Tighten loose clamps.

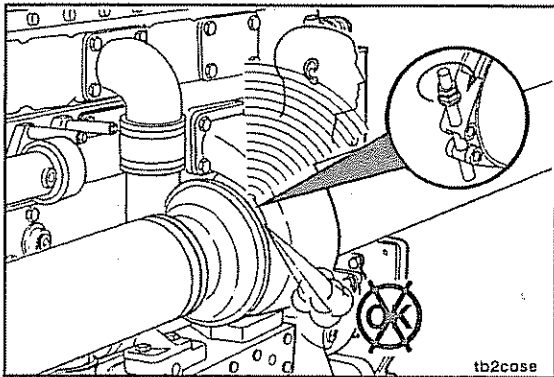
Torque Value: 8 N•m [71 in-lb]





- Turbocharger-to-exhaust-manifold mounting gasket

Replace the gasket. Refer to Section A for turbocharger removal and installation.

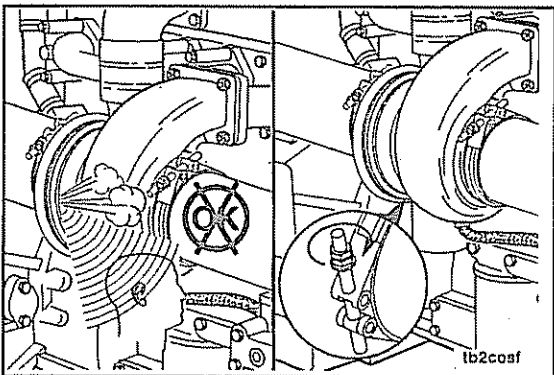


- Turbine housing sealing surface exhaust leak

Tighten the turbine housing cap screws or V-band clamps.

Torque Value:

Cap screws	14 N•m	[120 in-lb]
V-band	9 N•m	[80 in-lb]

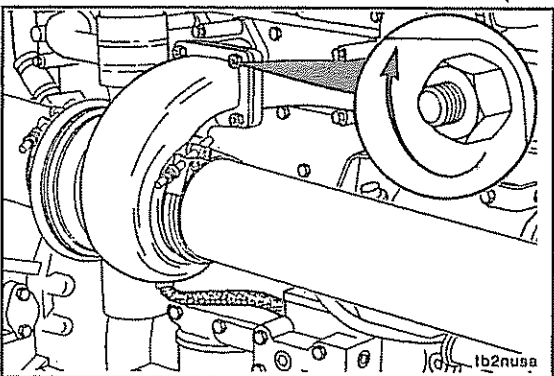


- Compressor housing sealing surface air leak.

Tighten the compressor housing V-band clamp nut.

Torque Value:

Cap screws	7 N•m	[62 in-lb]
V-band	9 N•m	[80 in-lb]



Turbocharger

Maintenance Check

Marine and Industrial Applications

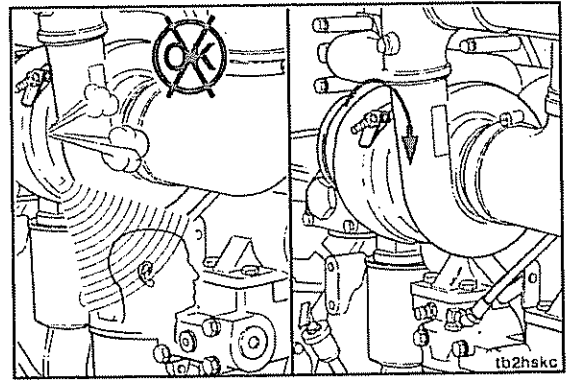
Tighten the turbocharger mounting nuts.

Torque Value: 61 N•m [45 ft-lb]

Check the turbine housing's sealing surface for exhaust leaks.

If a leak is found, tighten the V-band clamp nut.

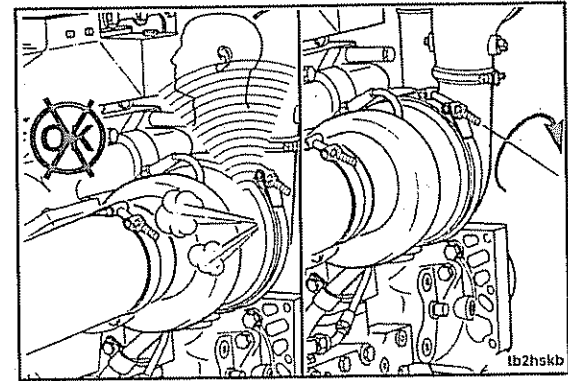
Torque Value: 9 N•m [80 in-lb]



Check the compressor housing sealing surface for leaks.

If a leak is found, tighten the V-band clamp nut.

Torque Value: 9 N•m [80 in-lb]



Batteries

Maintenance Check

Marine and Industrial Applications



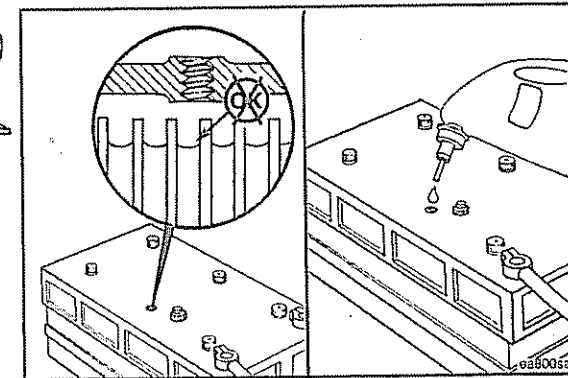
WARNING

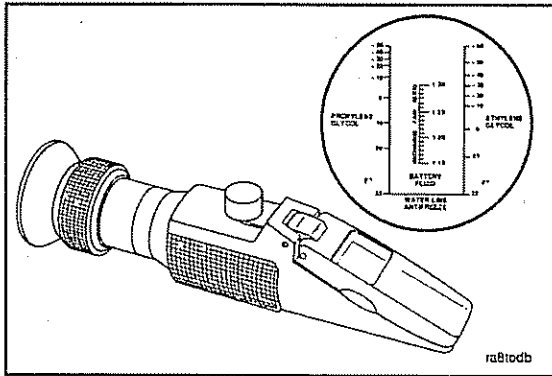
Acid is extremely dangerous and can damage the machinery and can also cause serious burns. Always provide a tank of strong soda water as a neutralizing agent when servicing the batteries. Wear goggles and protective clothing to avoid serious personal injury.

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

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

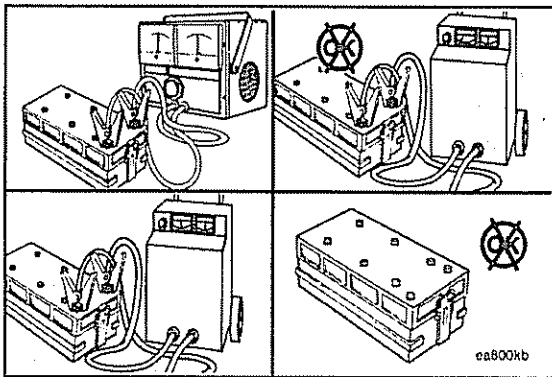
Fill each battery cell with distilled water. Refer to the OEM's specifications.





Use the Fleetguard® refractometer, Part Number CC-2800, to check the condition of the batteries.

Refer to the battery fluid column in the refractometer to determine the state of charge of each battery cell.



Use a battery tester to test the state of charge of maintenance-free batteries.

If the state of charge is low, use a battery charger to charge the battery. Refer to the OEM's instructions.

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

Maintenance Procedures at 6000 Hours or 2 Years

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Maintenance Check	7-7
Industrial Applications	7-7
Cooling System	7-3
Flush	7-3
Marine and Industrial Applications	7-3
Fan Drive Idler Pulley Assembly	7-1
Maintenance Check	7-1
Industrial Applications	7-1
Fan Hub, Belt Driven	7-2
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Maintenance Procedures - Overview	7-1
General Information	7-1
General Information	7-1
Turbocharger	7-5
Maintenance Check	7-5
Industrial Applications	7-5
Vibration Damper	7-1
Maintenance Check	7-1
Marine and Industrial Applications	7-1

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Maintenance Procedures - Overview

General Information

General Information

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



Item	Frequency	Check	Change	Adjust	Check	Change
1. Oil	Every 200 hours or 2 weeks	Check oil level	Change oil	Adjust oil level	Check oil level	Change oil
2. Air Filter	Every 200 hours or 2 weeks	Check air filter	Change air filter	Adjust air filter	Check air filter	Change air filter
3. Water Pump	Every 200 hours or 2 weeks	Check water pump	Change water pump	Adjust water pump	Check water pump	Change water pump
4. Fan Drive Idler Pulley Assembly	Every 200 hours or 2 weeks	Check fan drive idler pulley assembly	Change fan drive idler pulley assembly	Adjust fan drive idler pulley assembly	Check fan drive idler pulley assembly	Change fan drive idler pulley assembly
5. Vibration Damper	Every 200 hours or 2 weeks	Check vibration damper	Change vibration damper	Adjust vibration damper	Check vibration damper	Change vibration damper

NOTE: Refer to the appropriate section for service procedures and instructions for all items. Changes may be required in some instances. Check for any other items that may be affected by the changes listed in this table. For more information, refer to the appropriate section of the manual.

1. Do not change the oil level if the oil level is low or high.

2. Do not change the oil level if the oil level is low or high.

3. Do not change the oil level if the oil level is low or high.

4. Do not change the oil level if the oil level is low or high.

5. Do not change the oil level if the oil level is low or high.

00200018

Vibration Damper

Maintenance Check

Marine and Industrial Applications



The silicone fluid in the vibration damper will become solid after extended service, which makes the vibration damper inoperative. An inoperative vibration damper can cause major engine or driveline failures.

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

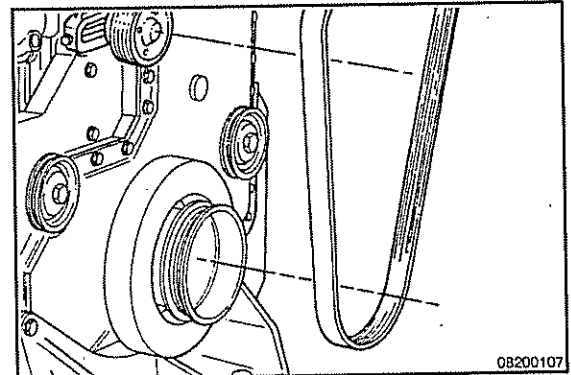
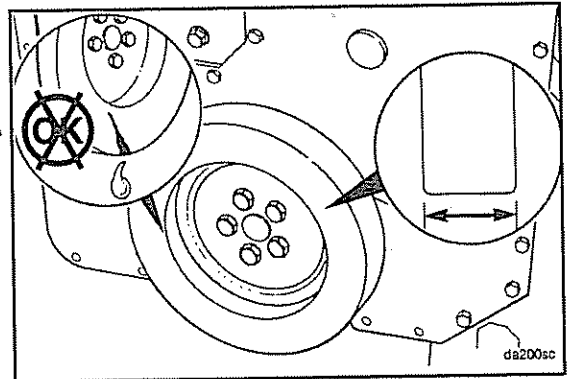
If any variations or deformations are detected, refer to the M11 Series Engine Shop Manual, Bulletin 3666075, or contact a Cummins Authorized Repair Location for service.

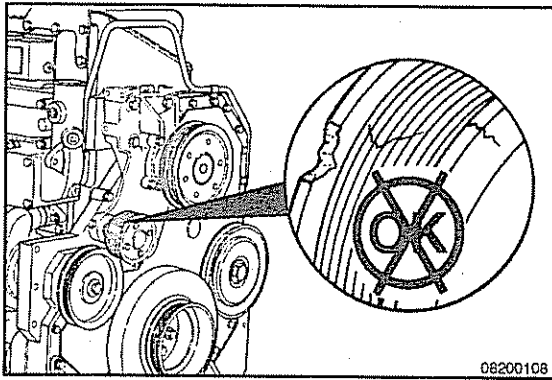
Fan Drive Idler Pulley Assembly

Maintenance Check

Industrial Applications

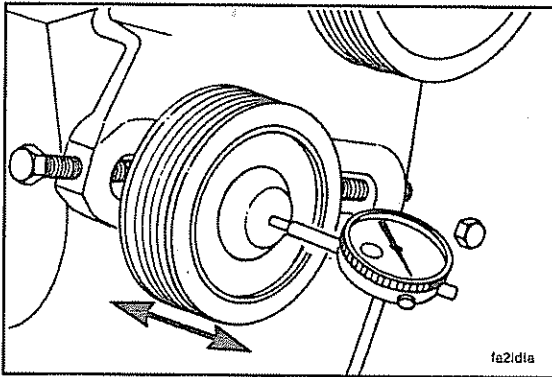
Remove the fan drive belt.





Inspect the idler pulley for:

- Freedom of rotation
- Cracked, chipped, or broken pulley grooves.

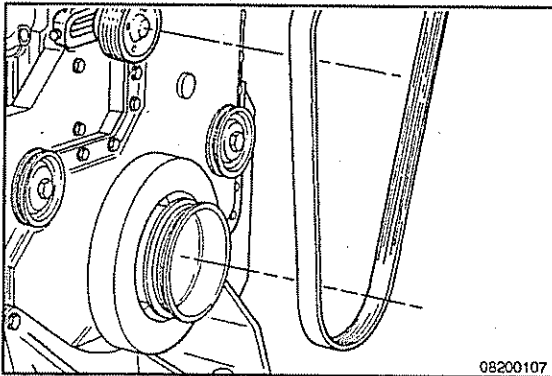


Measure the idler pulley end clearance.



Idler Pulley End Clearance			
mm			in
0.025	MIN		0.0010
0.250	MAX		0.0100

Replace or rebuild the idler pulley if the end clearance is **not** within these specifications. Refer to Section A for the replacement procedure. Refer to the shop manual listed in Section L for rebuilding procedures, or contact your local Cummins Authorized Repair Location.



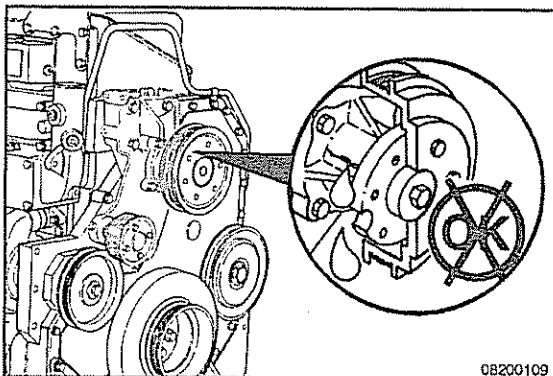
Fan Hub, Belt Driven Maintenance Check



Industrial Applications

Every 6000 hours, measure the drive pulley flange end clearance.

Remove the fan drive belt.



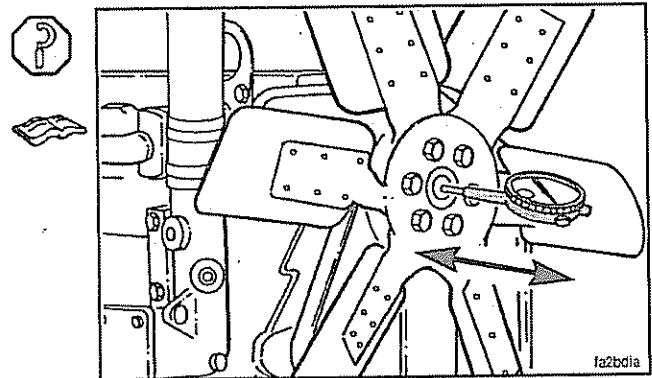
Inspect the fan hub for:

- Freedom of rotation
- Cracks
- Grease seal leakage.

Measure the fan hub end clearance.

Fan Hub End Clearance		
mm		in
0.08	MIN	0.003
0.41	MAX	0.016

Replace or rebuild the fan-hub if the end clearance does **not** meet these specifications. Refer to Section A for the replacement procedure. Refer to the shop manual listed in Section L for rebuilding procedures, or contact your local Cummins Authorized Repair Location for rebuilding the fan hub.



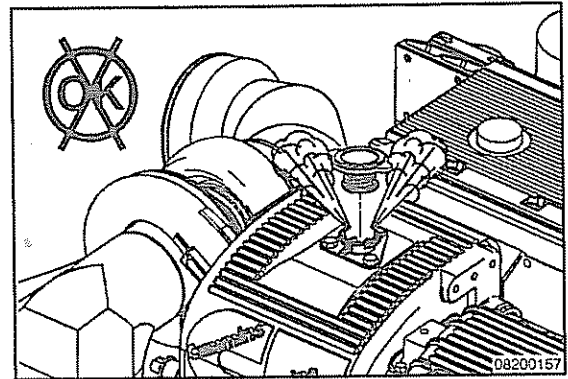
Cooling System

Flush

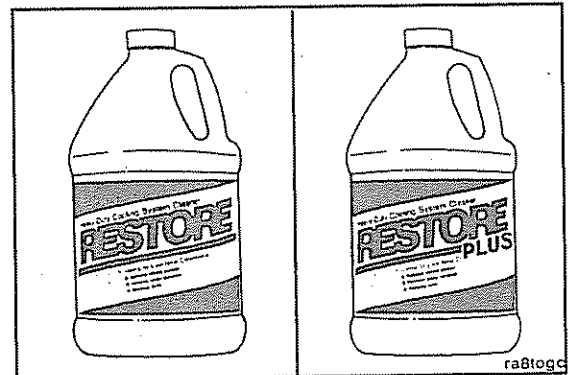
Marine and Industrial Applications



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



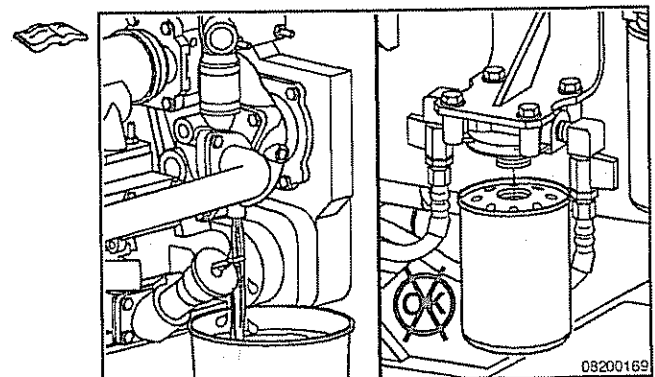
RESTORE™ is a heavy-duty cooling system cleaner that removes corrosion products, silica gel, and other deposits. The performance of RESTORE™ is dependent on time, temperature, and concentration levels. An extremely scaled or flow-restricted system, for example, can require higher concentrations of cleaners, higher temperatures, or longer cleaning times or the use of RESTORE Plus™. Up to twice the recommended concentration levels of RESTORE™ can be used safely. RESTORE Plus™ **must** be used **only** at its recommended concentration level. Extremely scaled or fouled systems can require more than one cleaning.

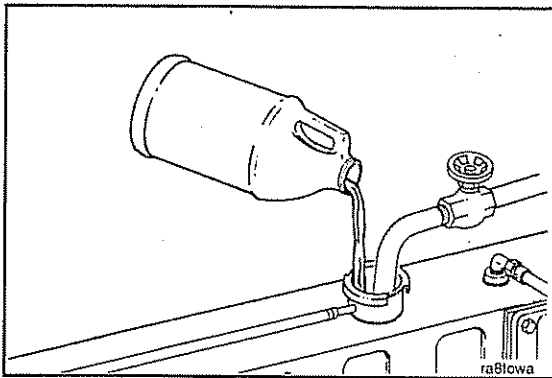


Coolant is toxic. Keep away from children and animals. If not reused, dispose of in accordance with local environmental regulations.

Drain the cooling system. Do not allow the cooling system to dry out.

Do not remove the coolant filter.

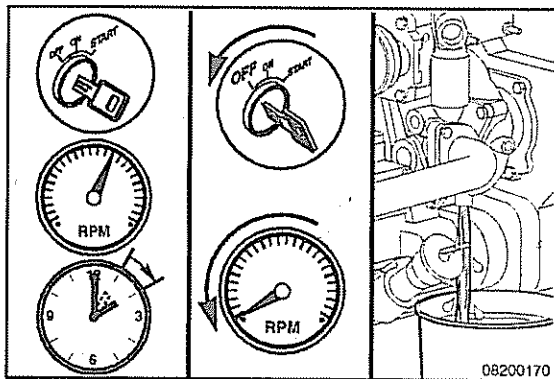




CAUTION

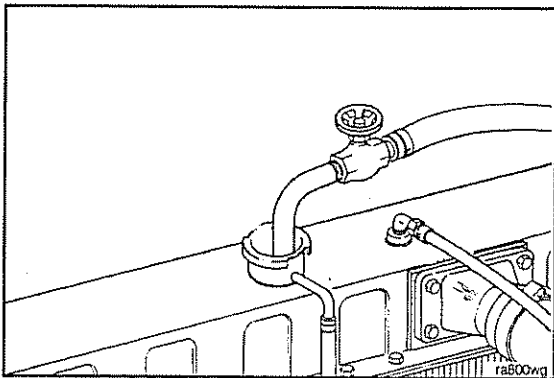
Fleetguard® RESTORE™ contains no antifreeze. Do not allow the cooling system to freeze during the cleaning operation.

Immediately add 3.8 liters [1 gal] of Fleetguard® RESTORE™, RESTORE Plus™, or equivalent, for each 38 to 57 liters [10 to 15 gal] of cooling system capacity. Fill the system with clean water.

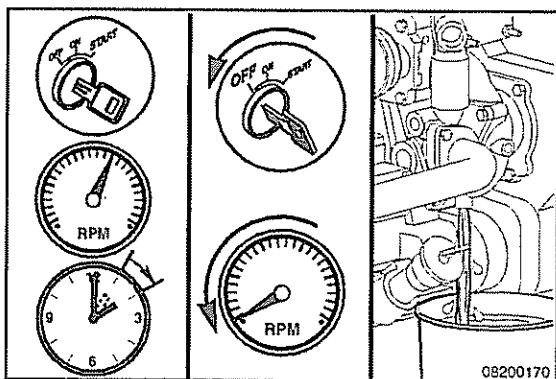


Operate the engine at normal operating temperatures, at least 85°C [185°F], for 1 to 1½ hours.

Shut off the engine, allow to cool to 50°C [122°F] and drain the cooling system.



Fill the cooling system with clean water.



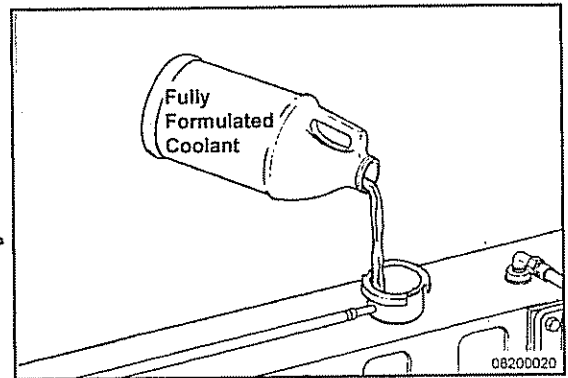
Operate the engine for 5 minutes with the coolant temperature above 85°C [185°F].

Shut off the engine, allow to cool to 50°C [122°F], and drain the cooling system.

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

Fill the cooling system with a 50/50 mixture of fully formulated coolant or a recommended antifreeze, and clean, good-quality water. (Refer to the Coolant Specifications in Section V.) Use a service filter to bring the coolant to the correct SCA concentration level.

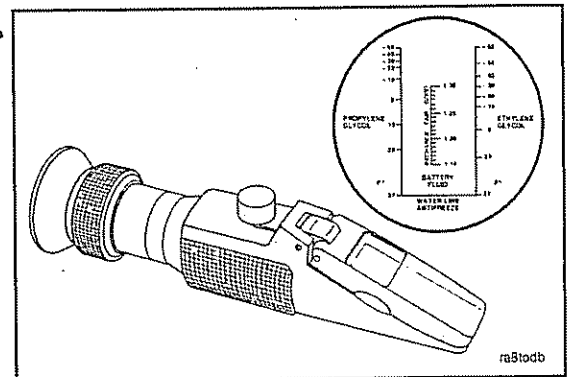
Install the pressure cap. Operate the engine until it reaches a temperature of 50°C [122°F], and check for coolant leaks.



The freeze point protection **must** be checked after coolant is added to the cooling system.

The Fleetguard® refractometer, Part Number C2800, provides a reliable, easy-to-read, and accurate measurement of freeze point protection and antifreeze concentration.

Refer to the OEM's instructions for the correct operation instructions for the Fleetguard® refractometer, Part Number C2800.



Turbocharger Maintenance Check Industrial Applications

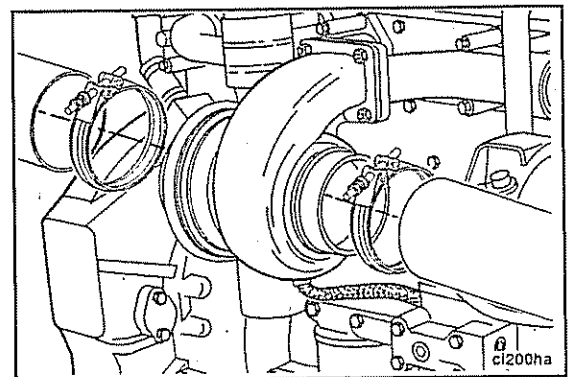
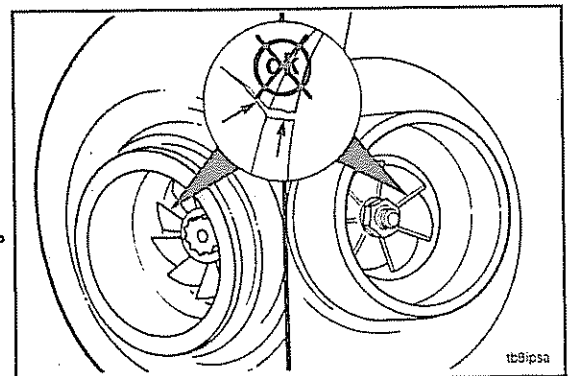
Every 6000 hours, inspect the turbocharger. Remove the air intake and the exhaust piping. Check the turbocharger as follows:

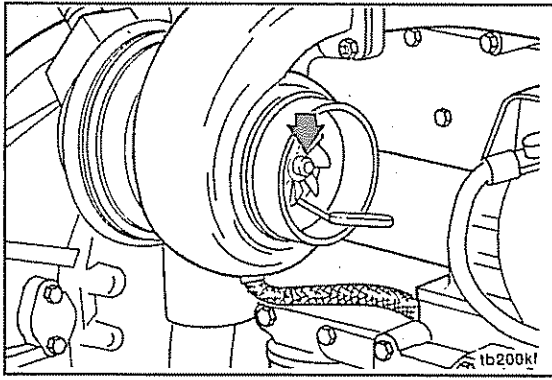
- Look for damaged or cracked compressor or turbine blades. Check to see that the turbocharger shaft spins freely.

If inspections or dimensional checks indicate a problem, contact a Cummins Authorized Repair Location for assistance. Refer to the model number on the turbocharger dataplate.

Industrial Applications Radial Bearing Clearance - Checking

Remove the intake and exhaust pipes from the turbocharger.

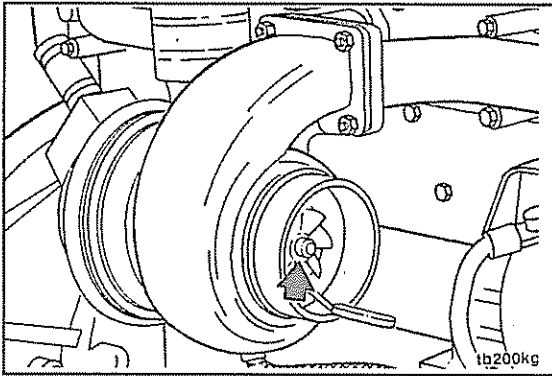




Use a wire-type feeler gauge to measure the clearance between the compressor wheel and housing.

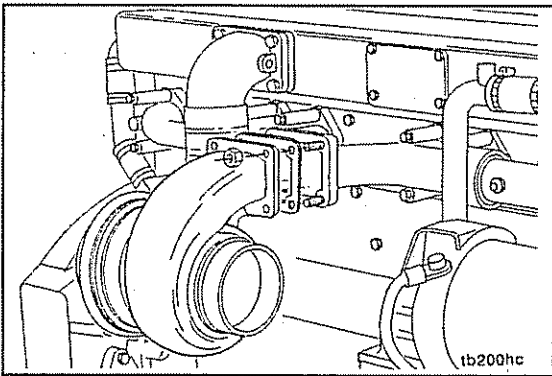
Gently push the compressor wheel toward the compressor housing and gauge.

Record this clearance.



With the feeler gauge in the same location, gently push the compressor wheel away from the compressor housing, and measure the clearance between the compressor wheel and housing.

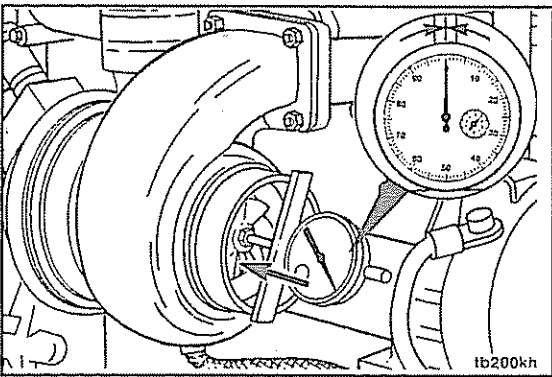
Record this clearance.



Subtract the smaller clearance from the larger clearance. This is the radial bearing clearance.

Radial Bearing Clearance		
mm		in
0.15	MIN	0.006
0.64	MAX	0.025

Replace the turbocharger if the radial bearing clearance does **not** meet the specifications. Refer to Section A for the replacement procedure.



Axial Clearance - Checking

Use dial depth gauge, Part Number ST-537.

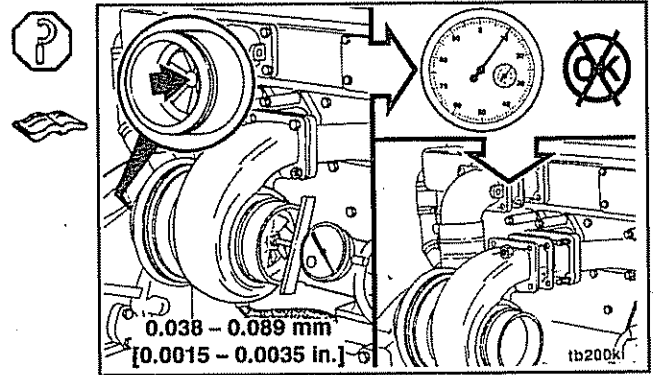
Push the rotor assembly away from the gauge.

Set the gauge on zero.

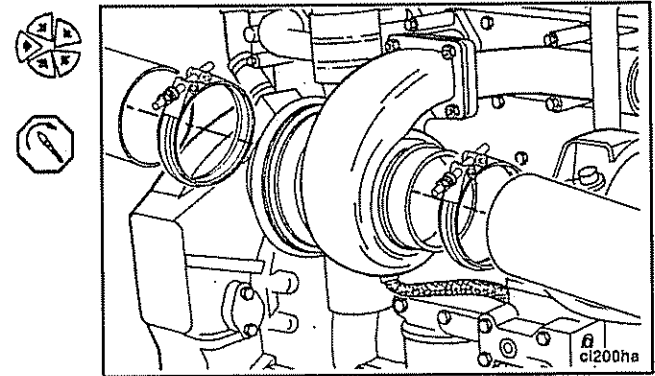
Push the rotor assembly toward the gauge, and record the reading.

Axial Clearance		
mm		in
0.038	MIN	0.0015
0.089	MAX	0.0035

Replace the turbocharger if the clearance does **not** meet the specifications. Refer to Section A for the replacement procedure.



Install the exhaust pipe, and tighten the clamp.
Install the intake pipe, and tighten the clamp.
Torque Value: 8 N•m [71 in-lb]



Air Compressor Carbon Buildup Maintenance Check

Industrial Applications

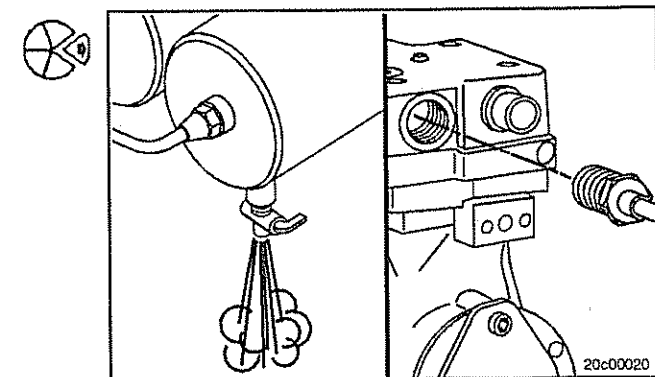
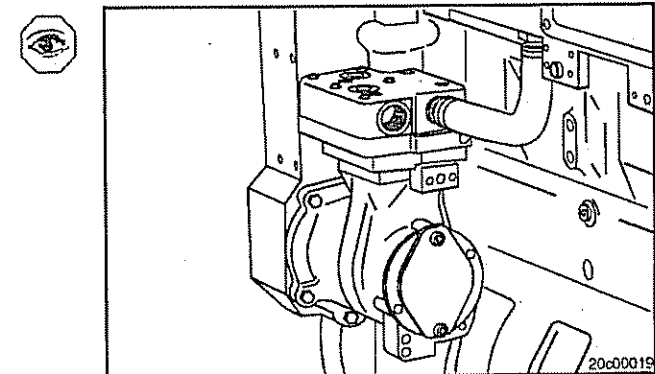
Complete air compressor inspection is required every 6000 hours or 2 years.

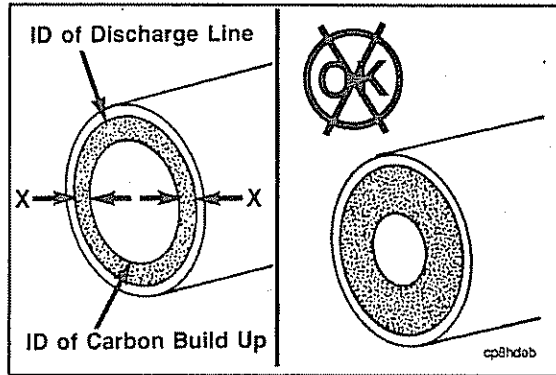
NOTE: All air compressors have a small amount of oil carryover that lubricates the piston rings and moving parts. When this oil is exposed to normal air compressor operating temperatures over a period of time, it will form varnish or carbon deposits. If the following inspections are **not** done, the air compressor piston rings can be affected by high operating temperatures and pressures and can **not** seal correctly.

Industrial Applications

Air Compressor Discharge - Inspection

Drain the air system wet tank to release the system air pressure. Remove the air discharge line from the air compressor.

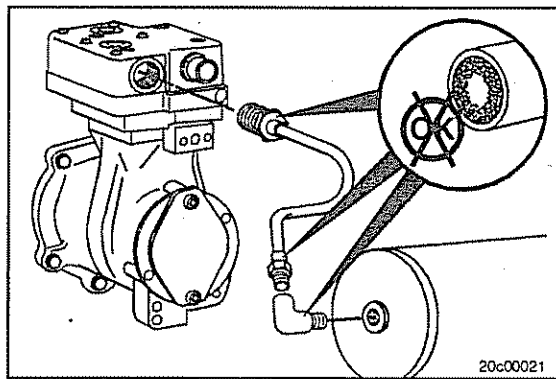




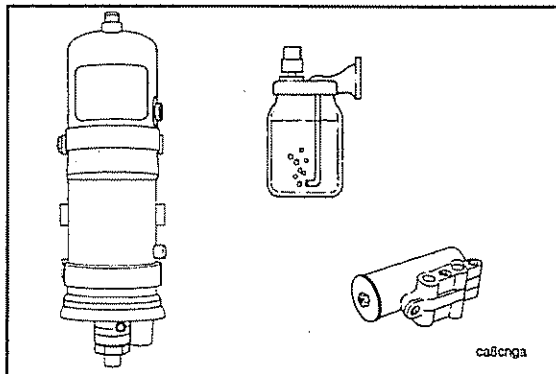
Measure the total carbon deposit thickness inside the air discharge line as shown. If the total carbon deposit ($X + X$) exceeds 2 mm [1/16 in], inspect the cylinder head assembly and the discharge line. Replace if necessary.



NOTE: If cylinder head replacement does **not** correct problem, replace compressor assembly.



If the total carbon deposit exceeds specifications, continue checking the air discharge line connections, up to the first tank, until total carbon deposit is less than 2 mm [1/16 in]. Replace any lines or connections that exceed this specification.



Inspect any air driers, downstream air valves, and the air governor for carbon deposits or malfunctioning parts. Inspect for air leaks. Maintain and repair the parts according to the manufacturer's specifications.



Section A - Adjustment, Repair, and Replacement

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Coolant Thermostat

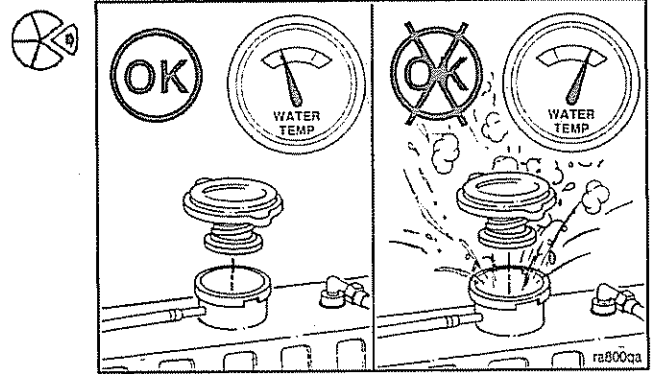
Remove

Marine and Industrial Applications



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

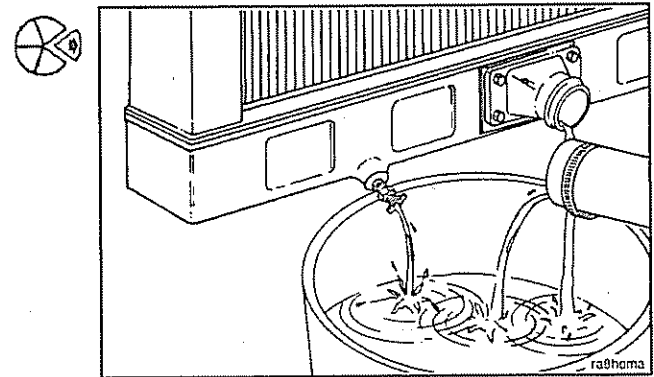
Remove the pressure cap when the engine is cool.



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

Drain the cooling system as follows:

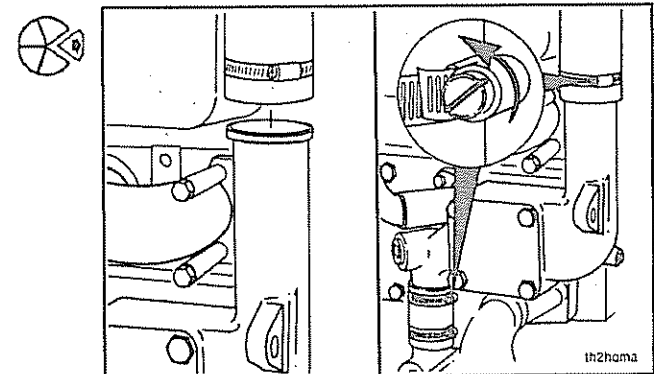
- Open the radiator draincock.
- Remove the lower radiator hose.



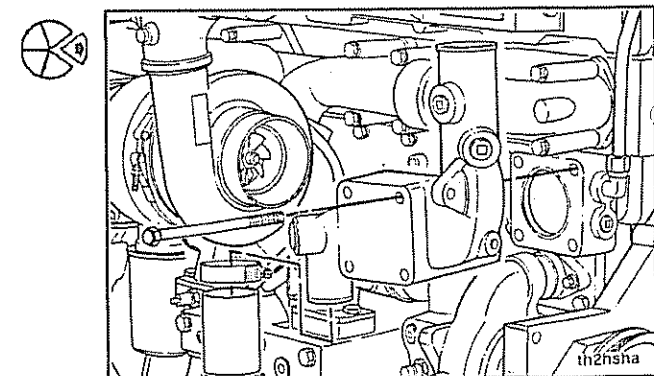
Remove the upper coolant hose from the thermostat housing.

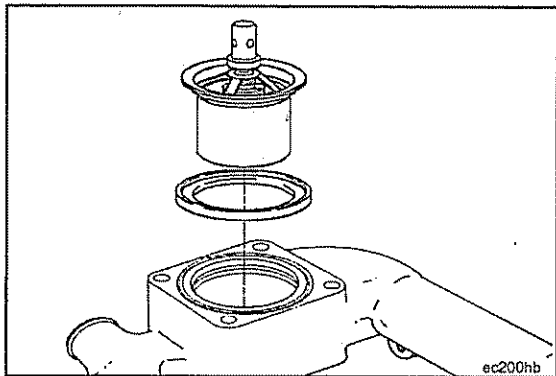
Loosen the coolant bypass hose clamps.

NOTE: Some models could have a converter cooler disc located in the bypass hose.

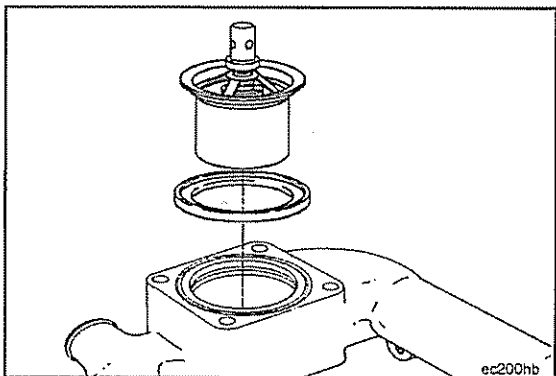


Remove the four thermostat housing mounting capscrews and the thermostat housing.





Remove the thermostat from the housing.

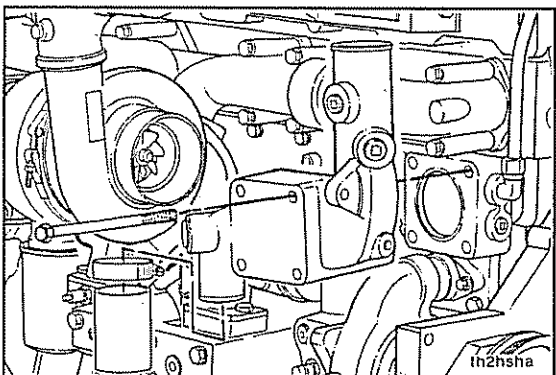


Install

Marine and Industrial Applications

Install the thermostat in the housing.

Install a new o-ring seal in the groove on the thermostat housing mounting surface.



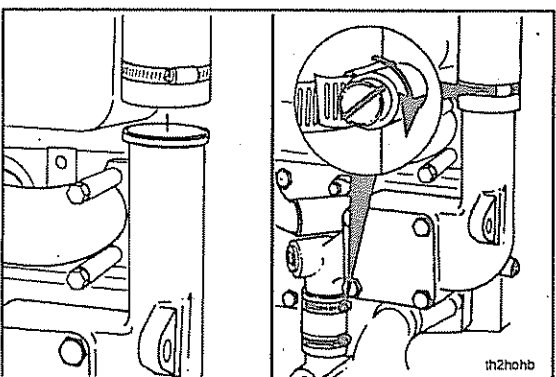
Install the hose on the thermostat housing bypass outlet.

Install the thermostat housing and four mounting cap screws.



Tighten the mounting cap screws.

Torque Value: 54 N•m [40 ft-lb]



Install the upper coolant hose to the thermostat housing outlet.

Tighten the coolant bypass hose clamps.

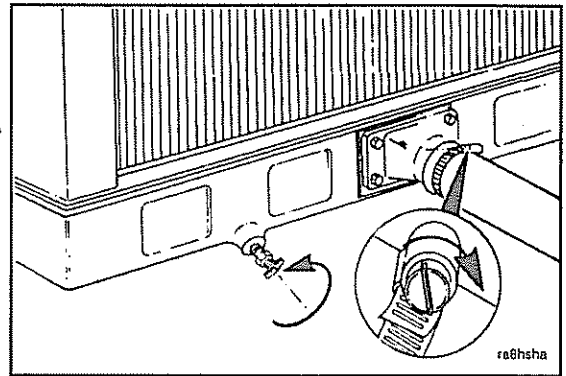
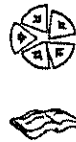


Torque Value: 3 N•m [27 in-lb]

Close the cooling system draincock, and install the lower coolant hose.

Tighten the hose clamp.

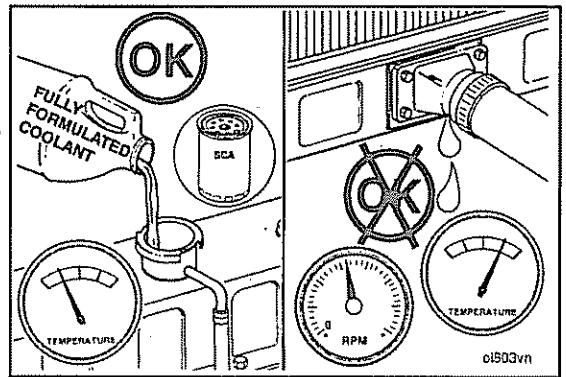
Refer to the OEM's specifications for the correct torque value.



The correct concentration of coolant additives **must** be used in the cooling system. Refer to Section V.

Fill the cooling system.

Operate the engine until it reaches 80°C [176°F], and check for coolant leaks.



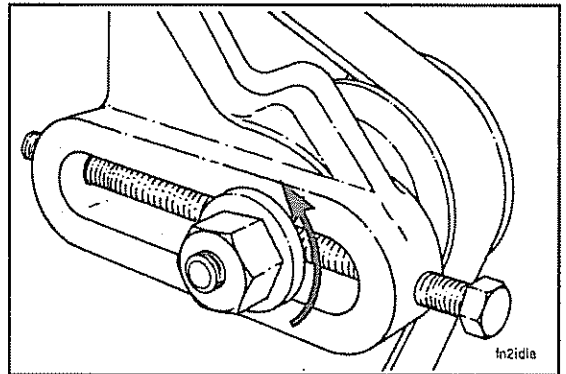
Fan Drive Idler Pulley Assembly

Remove

Industrial Applications

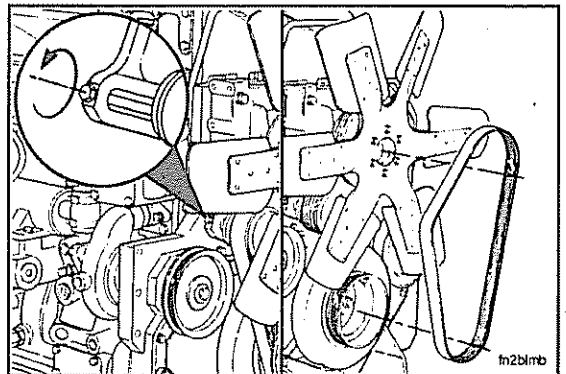
NOTE: Consult the vehicle manufacturer for non-Cummins fan hub installations.

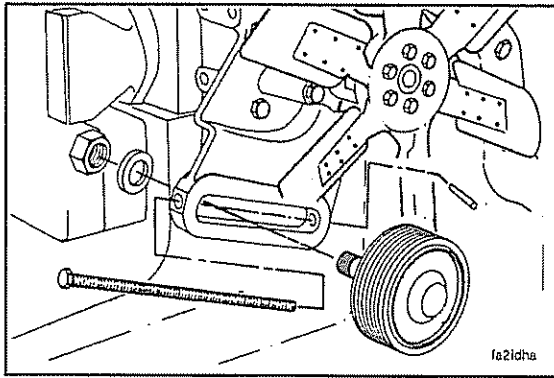
Loosen the fan idler pulley shaft locknut.



Loosen the adjusting mechanism and move the fan idler pulley and fan pulley centers as close as possible.

Remove the fan belt.



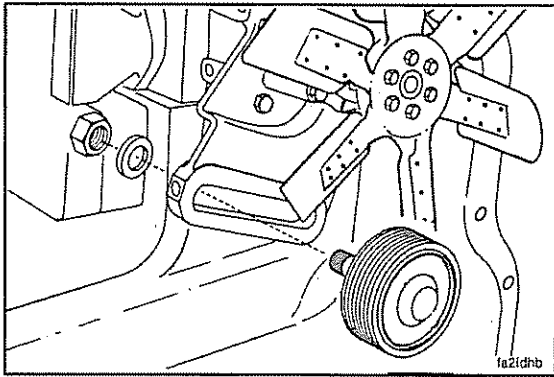


Remove the roll pin and washer from the idler pulley adjusting screw.

Remove the locknut and washer from the back of the idler pulley shaft.

Remove the adjusting screw.

Remove the fan idler pulley from the fan hub support bracket.



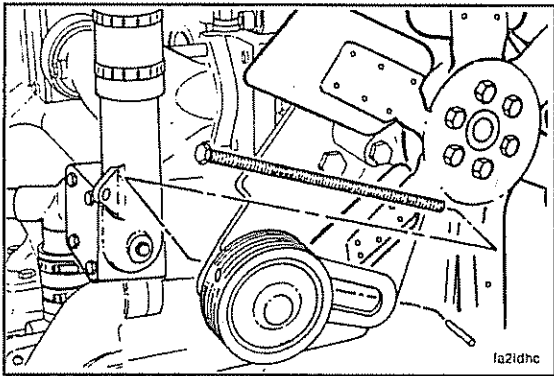
Install

Industrial Applications

NOTE: Do not tighten the locknut until the fan drive belt has been installed and adjusted.

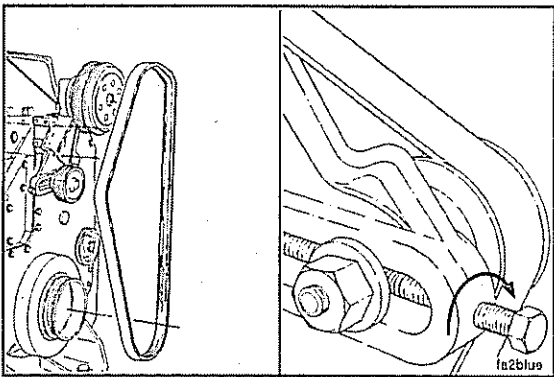
Install the idler pulley in the fan hub support bracket.

Install the washer and locknut on the idler pulley shaft.



Install the adjusting screw in the idler pulley shaft.

Turn the adjusting screw in far enough to install the washer and roll pin in the shaft at the bottom of the fan hub support bracket.



Install and adjust the fan drive belt.

Tighten the idler pulley shaft locknut.

Torque Value: 190 N•m [140 ft-lb]



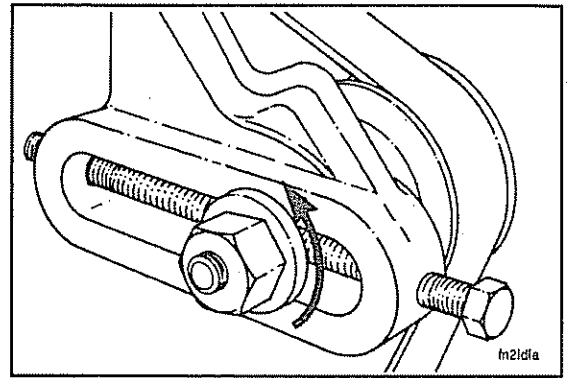
Check the belt tension again after the locknut is tightened.

Fan Hub, Belt Driven

Remove

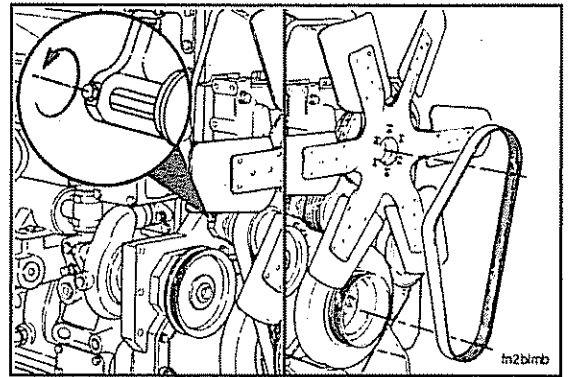
Industrial Applications

Loosen the fan idler pulley shaft locknut.

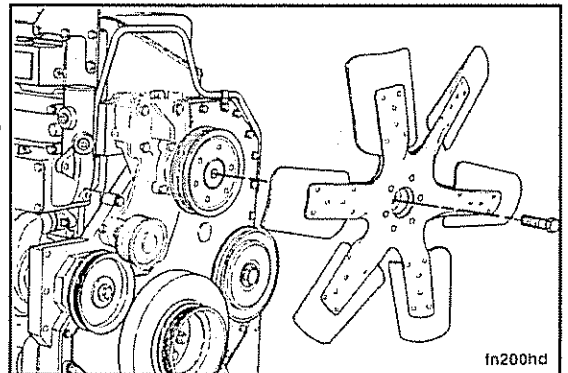


Loosen the adjusting mechanism and move the fan idler pulley and fan pulley centers as close as possible.

Remove the fan belt.

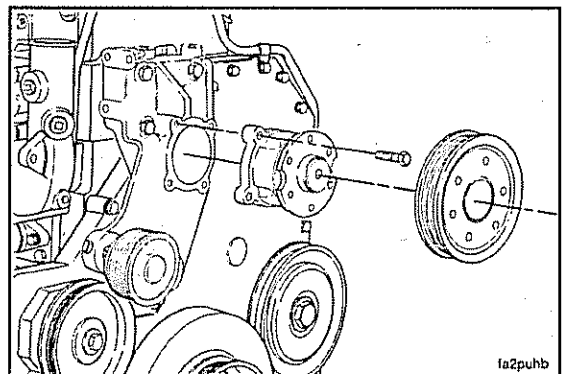


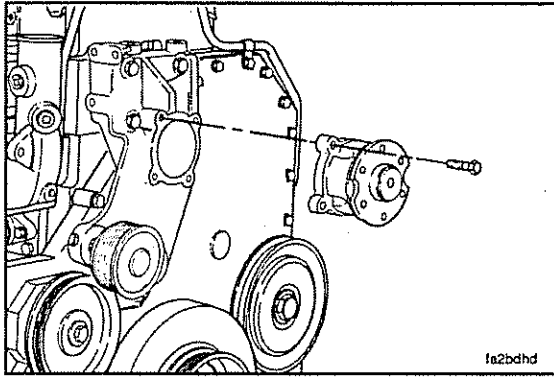
Remove the fan and clutch assembly.



Remove the fan drive pulley.

Remove the four capscrews and the fan hub.



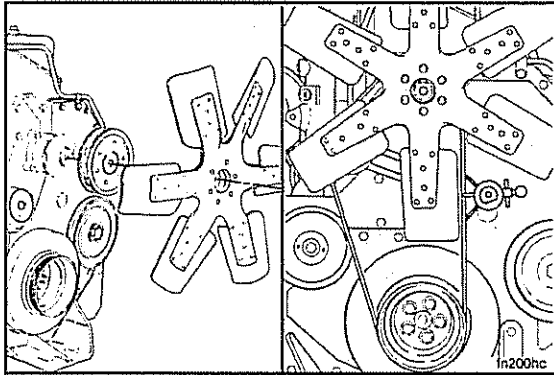


Install

Industrial Applications

Install the new fan hub and four capscrews.

Torque Value: 47 N•m [35 ft-lb]



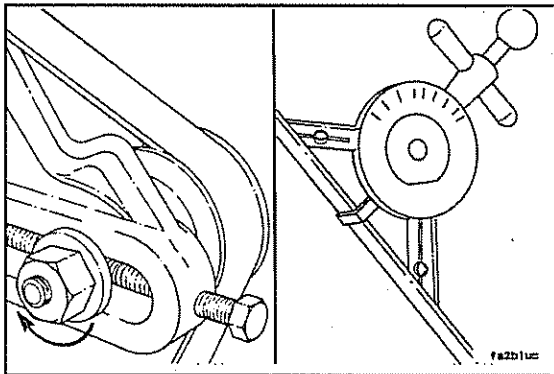
Install the fan drive pulley.

Install the fan and clutch assembly.

Install and tighten the mounting capscrews.

Torque Value: 68 N•m [50 ft-lb]

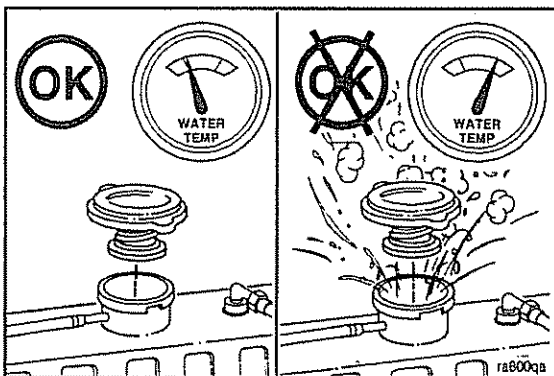
Install, adjust, and tighten the fan drive belt. Refer to Drive Belt Tension in Section V for the correct belt tension.



Tighten the fan idler pulley shaft locknut.

Torque Value: 190 N•m [140 ft-lb]

Check the belt tension again after the locknut is tightened.



Water Pump

Remove

Marine and Industrial Applications



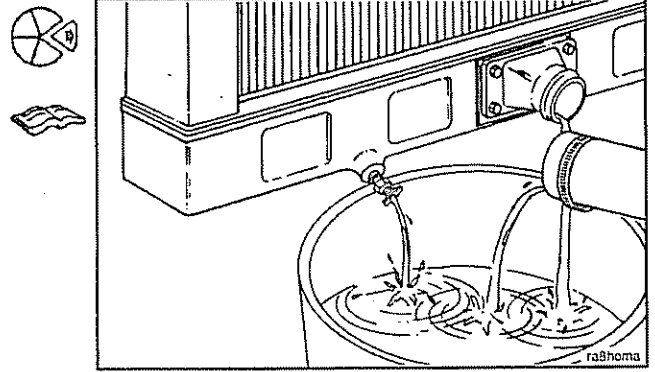
Do not remove the pressure cap from a hot engine. Wait until the coolant temperature is below 50°C [120°F] before removing the pressure cap. Heated coolant spray or steam can cause personal injury.

Remove the pressure cap when the engine is cool.

Drain the cooling system as follows:

- Open the radiator draincock.
- Remove the lower radiator hose from the radiator and water pump.

NOTE: If the coolant is **not** going to be reused, dispose of used coolant and antifreeze in accordance with federal, state, and local regulations.

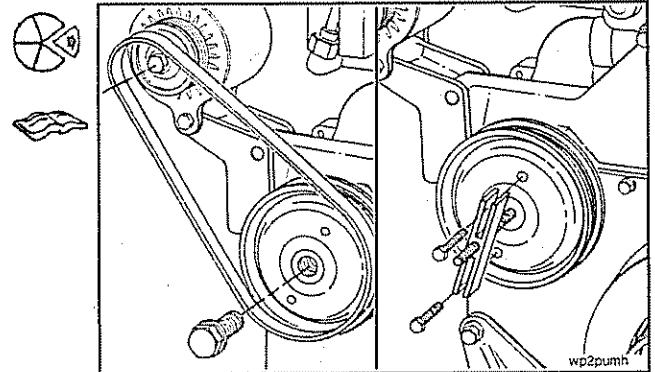


Remove the alternator drive belt. Refer to the Drive Belt, Alternator in this section of the manual.

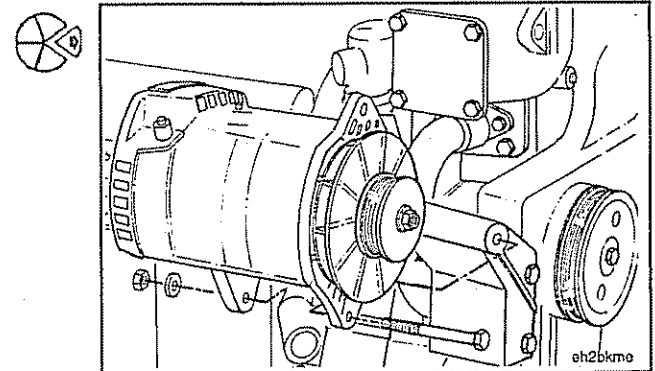
Remove the water pump pulley retaining capscrew.

Use the standard pulley puller, Part Number ST-647, and two 5/16 x 18 x 2 capscrews to remove the pulley.

NOTE: Be sure the puller capscrews are threaded all the way through the puller before applying pressure to the puller screw.



Remove the alternator.

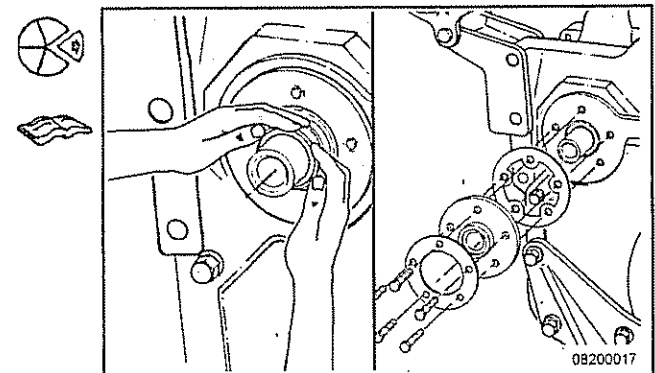


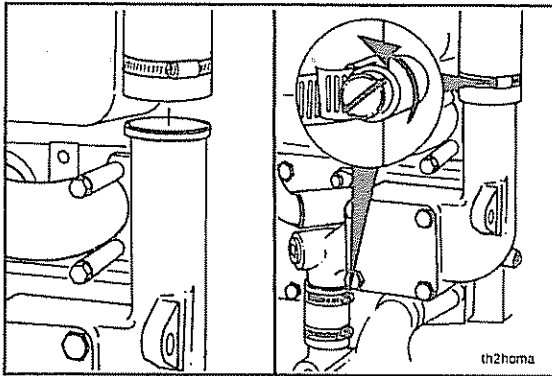
Remove the dust seal.

Remove the five water pump oil seal capscrews, clamping ring, oil seal, and gasket.

NOTE: Remove the dust seal as the seal carrier is removed, or use a heel bar, or similar tool, to pry the dust seal away from the seal case. Then remove the dust seal by hand.

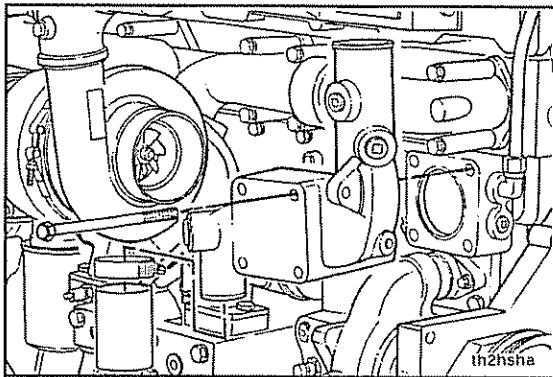
Discard the oil seal and dust seal.



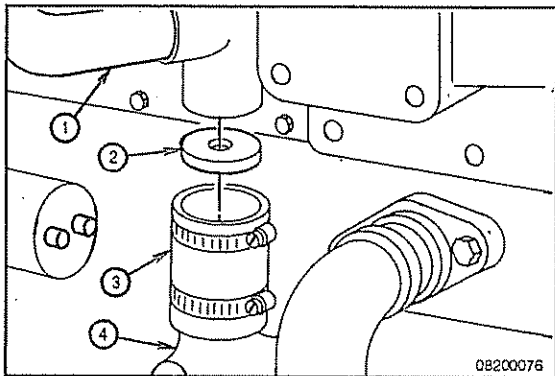


Loosen the coolant bypass hose clamps on both the upper and lower hoses.

Remove the upper coolant hose from the thermostat housing.



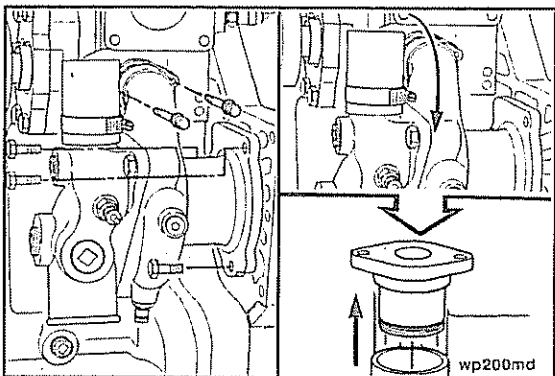
Remove the four thermostat housing mounting capscrews and the thermostat housing.



The coolant flow that provides cooling to the torque converter (if equipped) is achieved in different manners.

M Series engines use a torque converter cooler disc inside the coolant bypass hose to direct engine coolant to the inlet side of the torque converter cooler.

1. Torque converter coolant supply
2. Torque converter disc (orifice)
3. Bypass hose
4. Water pump.



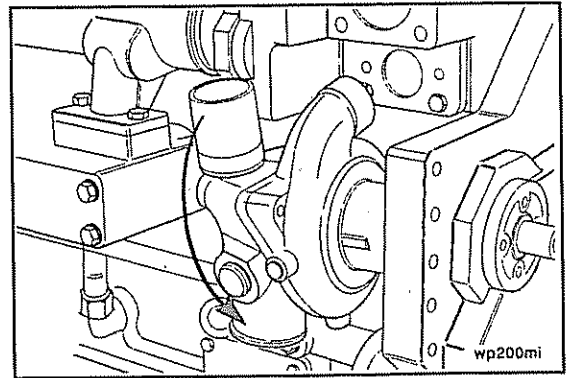
Remove the two water pump water transfer connection capscrews.

Remove the three water pump mounting capscrews.

Rotate the water pump outward so the water transfer connection can be removed from the water pump.

Remove the water transfer connection from the water pump.

Remove the water pump. Twist the pump outward from the top, and angle the rear of the pump downward as it is being removed to allow the pump to pass the thermostat housing support.



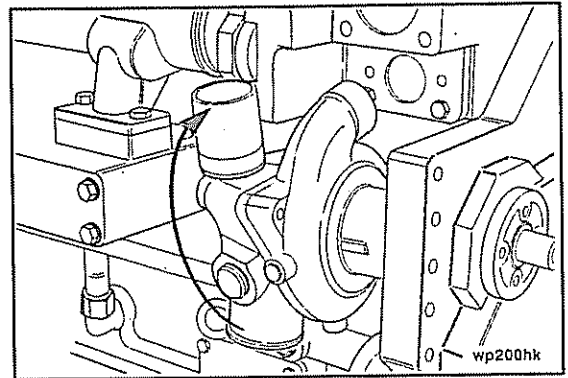
Install

Marine and Industrial Applications

Install a new o-ring on the water pump mounting flange.

NOTE: The water pump **must** be twisted outward from the top until the transfer outlet clears the thermostat housing support during installation.

Install the water pump.



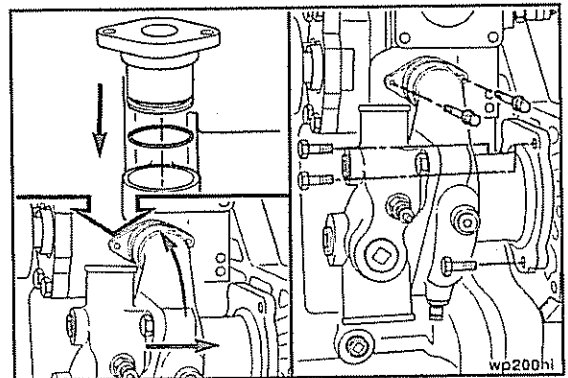
Install a new o-ring on the water pump water transfer tube.
Install the connection into the water pump.

Twist the water pump inward, and install the three water pump mounting capscrews.

Torque Value: 47 N•m [35 ft-lb]

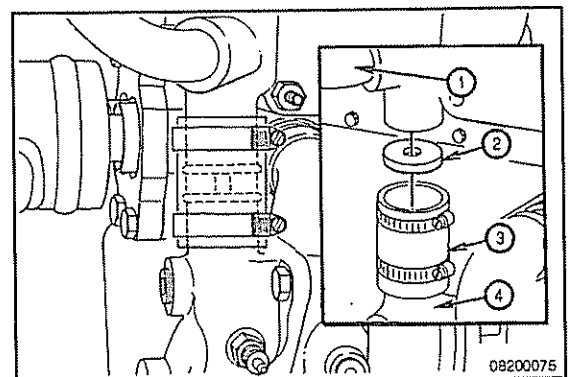
Install a new gasket on the water pump water transfer connection. Install and tighten the water transfer connection capscrews.

Torque Value: 25 N•m [221 in-lb]

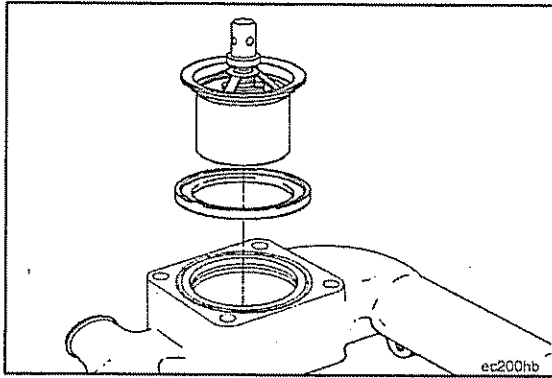


If the engine is equipped with a torque converter cooler, install the disc in the bypass hose before installing the thermostat housing.

1. Torque converter cooler coolant supply
2. Torque converter cooler disc (orifice)
3. Bypass hose
4. Water pump.

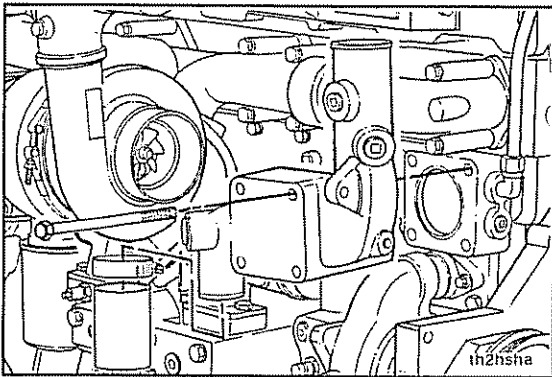


08200075



Install the thermostat in the housing.

Install a new seal in the groove on the thermostat housing mounting surface.

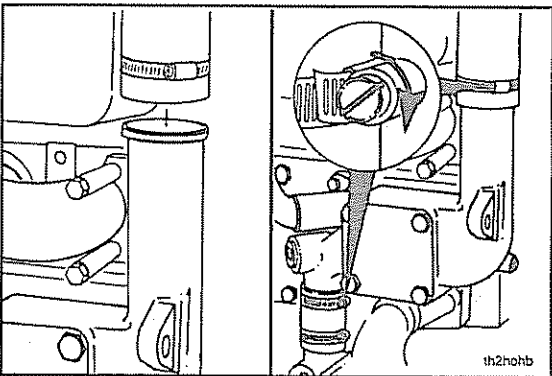


Install the hose on the thermostat housing bypass outlet.

Install the thermostat housing and four mounting cap screws.



Torque Value: 54 N•m [40 ft-lb]



Equally space the bypass hose over the water pump connection and thermostat housing connection, and tighten the bypass hose clamps.

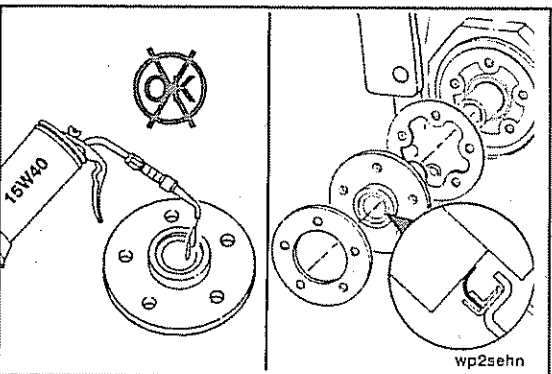


Torque Value: 3 N•m [27 in-lb]

Install the upper coolant hose. Refer to the OEM's specifications for the correct torque value.



Install the lower coolant hose. Refer to the OEM's specifications for the correct torque value.



The oil seal **must** be installed with the lip of the seal and the shaft clean and dry. Do **not** lubricate. The yellow dust lip **must** be facing out.

Install the new gasket and oil seal. Use the installation sleeve provided with the new seal to install the seal.

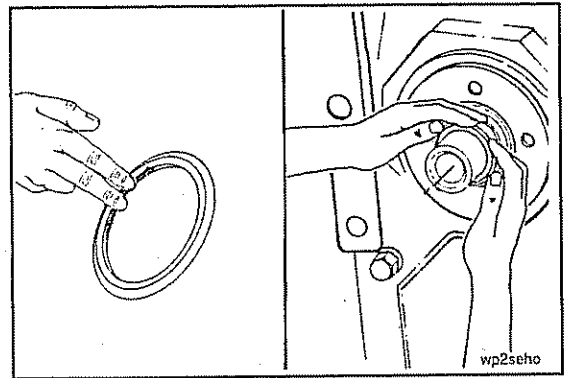
The capscrew threads **must** be coated with thread sealant, Part No. 3823494, to prevent oil leakage.

Torque Value: Step 1 7 N•m [62 in-lb]
2 20 N•m [177 in-lb]

Place a light film of oil or antifreeze on the inside diameter of the dust seal.

Install the dust seal onto the shaft with the larger outside diameter facing the engine.

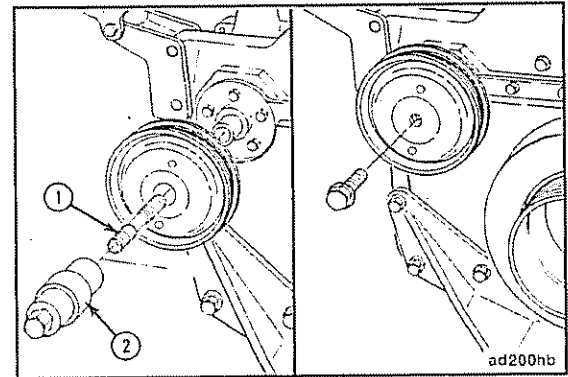
Push the dust seal back by hand on the shaft until the entire dust seal contacts the oil seal case.



Use Part Number 3377401, pulley pusher adapter (1), and Part Number 3376326, pulley pusher (2), to install the pulley.

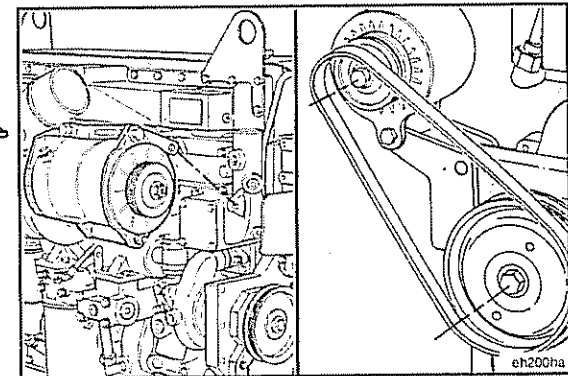
Install the capscrew in the shaft.

Torque Value: 75 N•m [55 ft-lb]



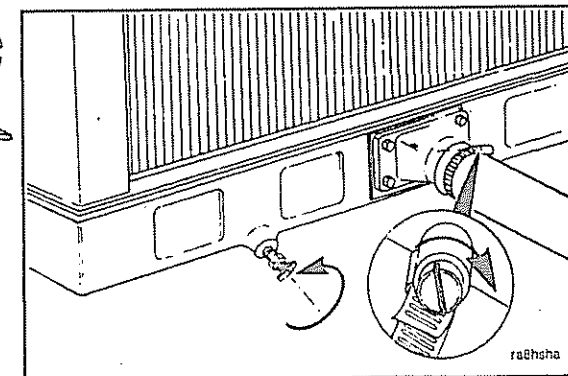
Install the alternator.

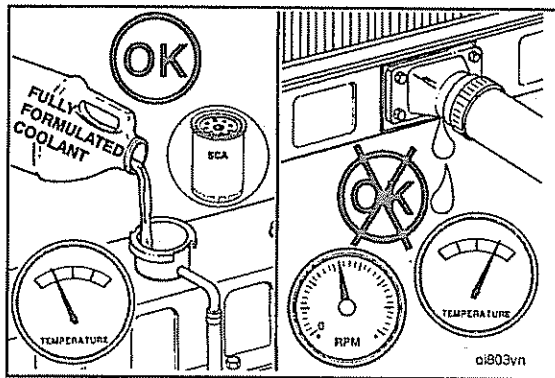
Install and adjust the alternator drive belt. Refer to Drive Belt, Alternator in this section of the manual for the correct procedure.



Close the cooling system draincock, and install the lower coolant hose.

Tighten the hose clamps(s). Refer to the manufacturer's specifications for the correct torque value.





The correct concentration of coolant additives **must** be used in the cooling system. Refer to Section V.

Fill the cooling system.

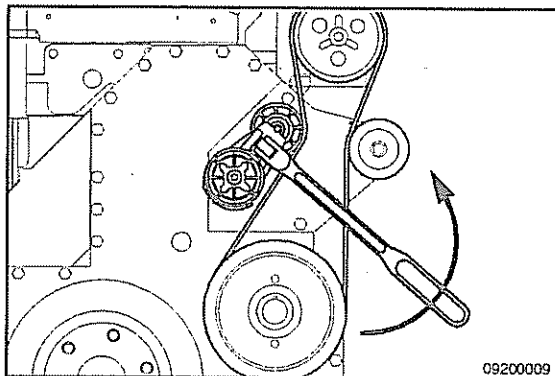
Operate the engine until it reaches a temperature of 71°C [160°F] and check for coolant leaks.

Refrigerant Compressor Drive

General Information

Industrial Applications

A new refrigerant compressor drive system is offered on the QSM11 industrial. The new drive system has an accessory drive pulley, a six-rib poly-vee belt with automatic tensioning and a backside idler for use with a Sanden rotary compressor.



Remove

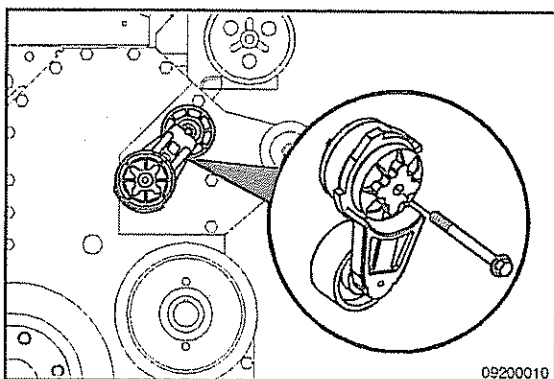
Industrial Applications

Use a 3/8-inch drive breaker bar to hold back the tensioner and relieve the belt tension.

Rotate the tensioner away from the belt.

Remove the refrigerant drive belt while holding the tensioner back.

Relieve the tensioner to neutral position.



Remove the belt tensioner by removing the nut located on top of the tensioner.

Install

Industrial Applications

Position the enclosed subassembly (idler pulley) (1) and tensioner mounting bracket (2) on the gear cover and mount with the four capscrews (3) and washers.

- a. The tensioner idler pulley will be located in front of two of the mounting capscrew locations in the freestate. The tensioner either will have to be removed completely for this process or the arm moved to one side to have access to all four capscrew mounting locations.
- b. Install the belt tensioner (4), and tighten the mounting nut.

Torque Value: 47 N•m [35 ft-lb]

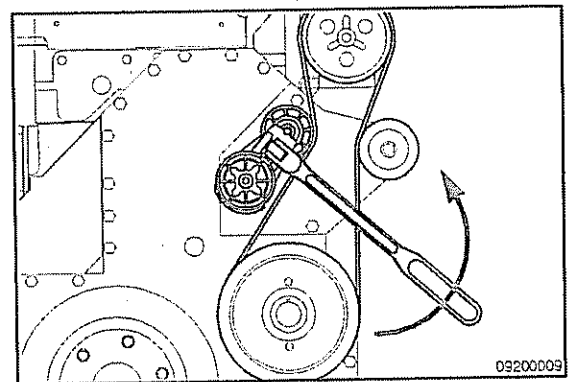
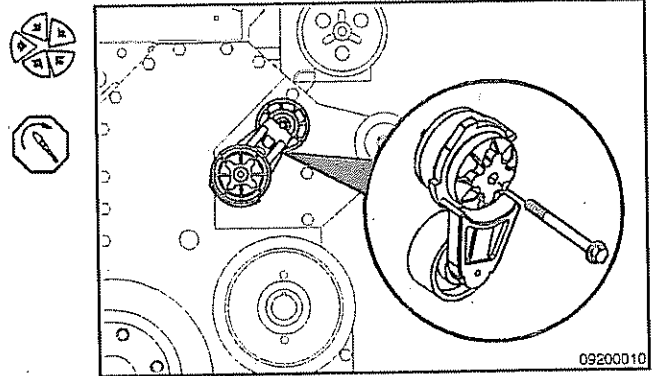
Tighten the four mounting capscrews.

Torque Value: 20 N•m [177 in-lb]

Use a 3/8-inch drive breaker bar to hold back the tensioner.

Install the drive belt while holding the tensioner back.

Allow the tensioner to rotate against the belt.

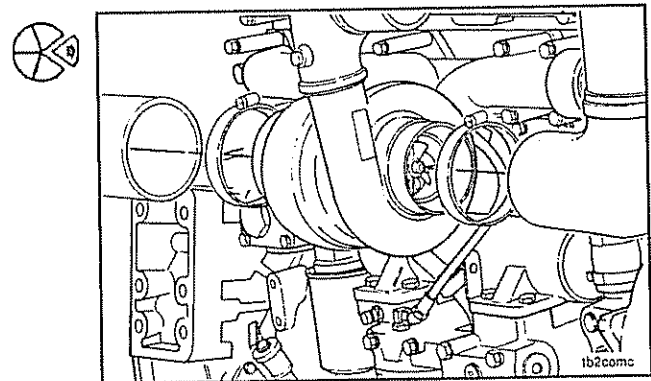


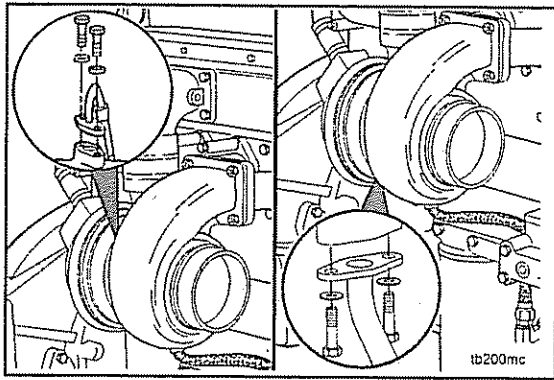
Turbocharger

Remove

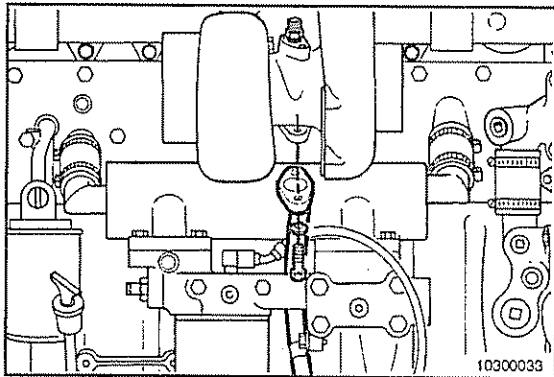
Marine and Industrial Applications

Remove the intake and exhaust pipes from the turbocharger.

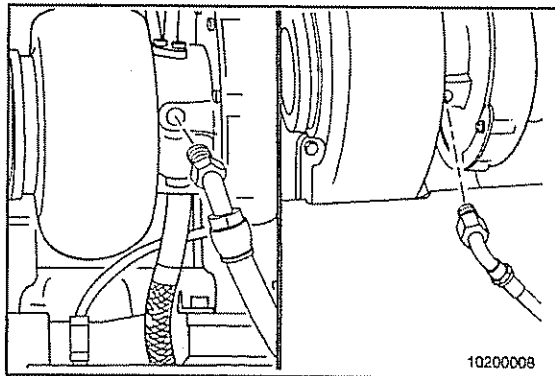




Remove the oil supply line from the turbocharger.

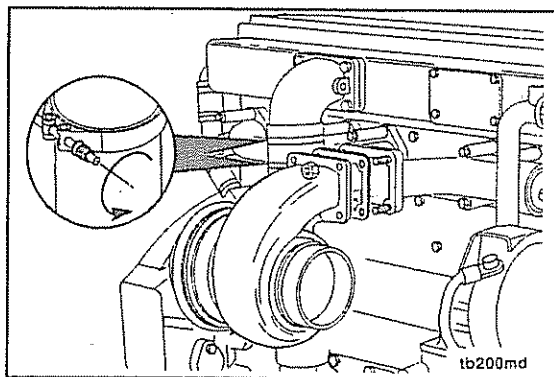


Remove the oil drain line from the turbocharger.



NOTE: Some applications use water-cooled turbochargers.

If a water-cooled turbocharger is used, drain the cooling system, and remove the water supply and return lines from the turbocharger.



Loosen the hose clamps on the aftercooler air inlet connection.

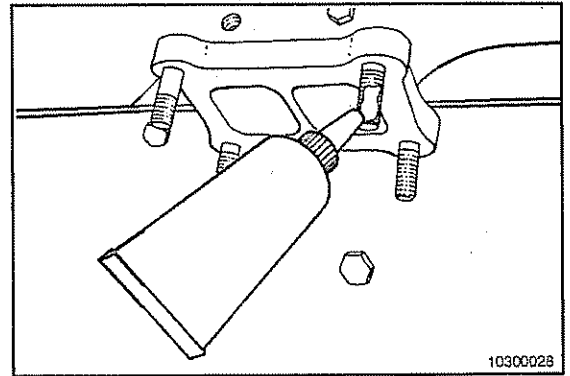
Remove the four turbocharger mounting nuts.

Remove the turbocharger and gasket.

Install

Marine and Industrial Applications

Apply a film of anti-seize lubricant, Part Number 3824879, to the turbocharger mounting studs in the exhaust manifold.

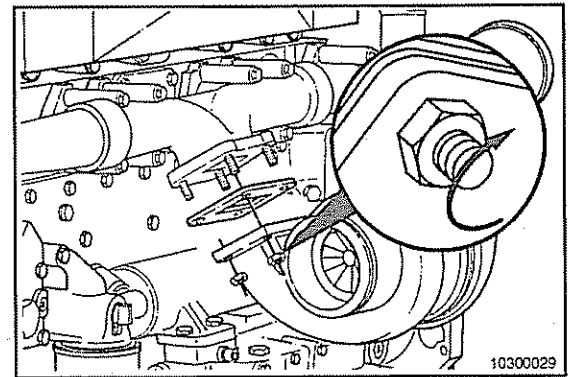


Use a new gasket when installing the turbocharger.

Install the aftercooler air inlet hose evenly over the turbocharger outlet and the aftercooler inlet.

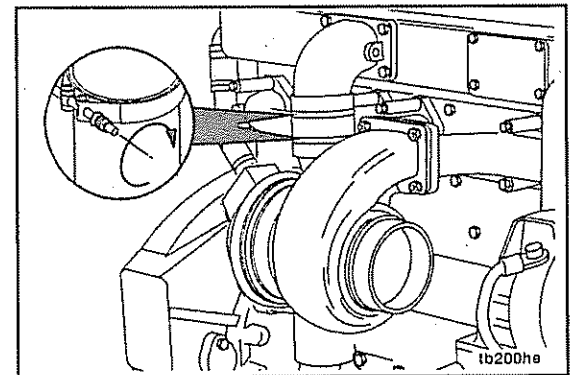
Install and tighten the four mounting nuts.

Torque Value: 61 N•m [45 ft-lb]



Tighten the hose clamps.

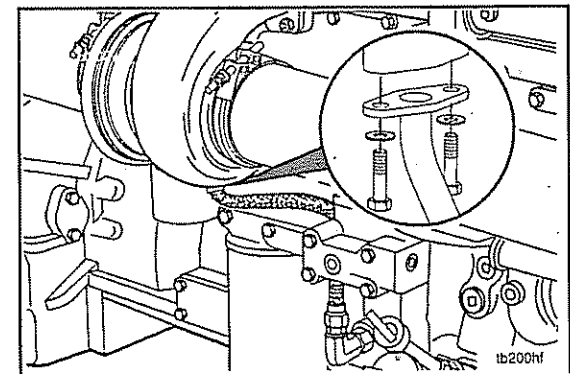
Torque Value: 8 N•m [71 in-lb]

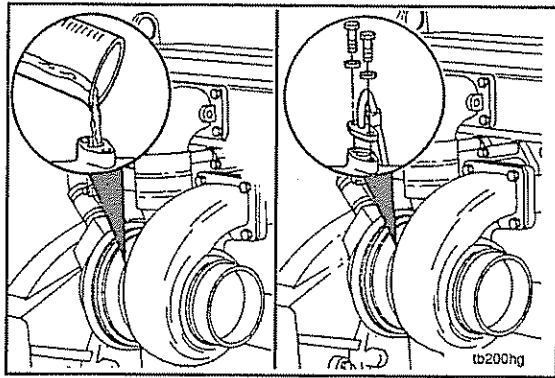


Install a new gasket on the turbocharger oil drain line connection, and install the drain line to the bottom of the turbocharger.

Tighten the two turbocharger oil drain line mounting cap-screws.

Torque Value: 27 N•m [239 in-lb]

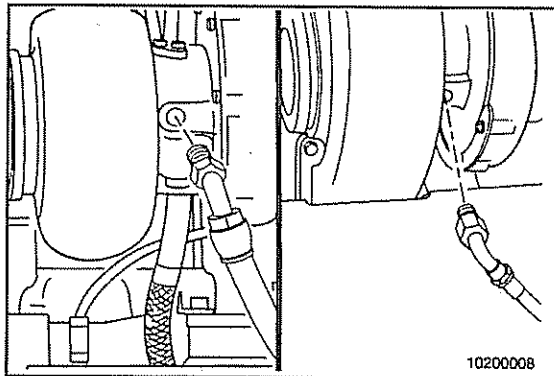




Pour 50 to 60 cc [2.0 to 3.0 oz] of clean engine oil in the turbocharger oil supply line fitting.

Install a new gasket on the turbocharger oil supply line, and install the supply line to the top of the turbocharger. Tighten the two capscrews.

Torque Value: 20 N•m [177 in-lb]



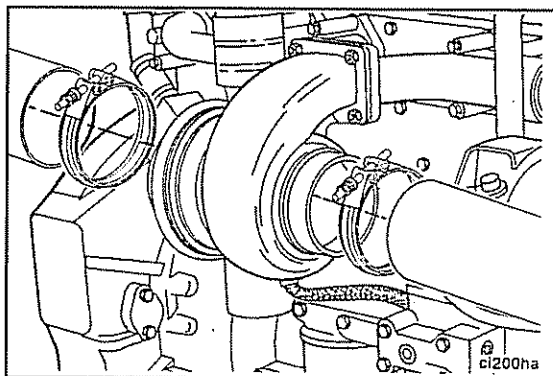
NOTE: Some applications use water-cooled turbochargers.

Install the water supply and return lines, if applicable, to the turbocharger and tighten.



Torque Value: 35 N•m [26 ft-lb]

Fill the cooling system. Refer to Section 7.



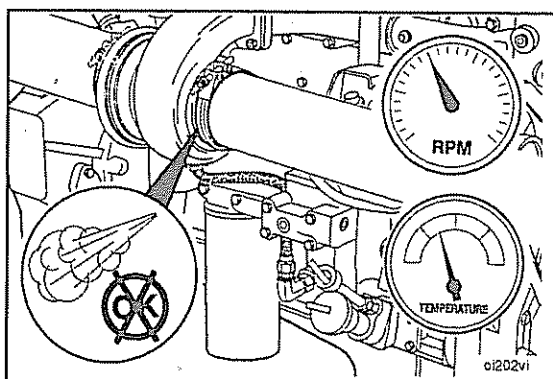
Install the intake pipe, and tighten the clamp.

Torque Value: 8 N•m [71 in-lb]

Install the exhaust pipe, and tighten the clamp.



Torque Value: 8 N•m [71 in-lb]



Operate the engine until it reaches a temperature of 71°C [160°F] and check for air leaks.

Air Starting Motor

Maintenance Check

Industrial Applications

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

Air Starting Motor Maintenance

- Do **not** operate the air starting motor with air pressure lower than 480 kPa [67 psi].
- Maintain the air compressor according to the recommendations outlined in the manual.
- For maximum efficiency, the hoses, tubes, and lines **must not** leak.
- Refer to the OEM and starting motor manufacturer's manuals for specific information regarding the starting motors, valves, and systems.

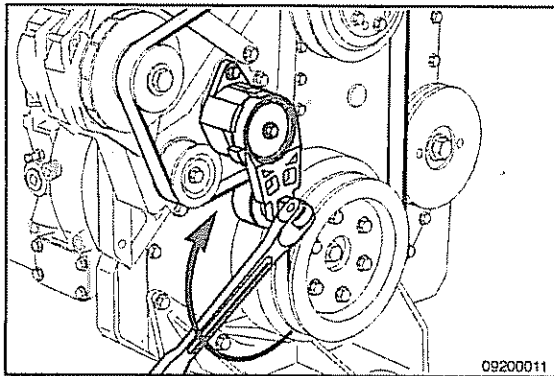
Belt Tensioner, Automatic

General Information

Industrial Applications

A new automatic tensioning single belt fan and alternator drive is the standard option for the QSM industrial engine. The design uses an eight-rib poly-vee belt with an automatic tensioner and a fixed idler.

The belt tensioner is designed to operate within the limit of arm movement provided by the cast stops when the belt length and geometry are correct. If the tensioner is hitting either of the limits during operation, check the mounting brackets and the belt length. Loose brackets, bracket failure, alternator movement, incorrect belt length, or belt failure can cause the tensioner to hit the limits.



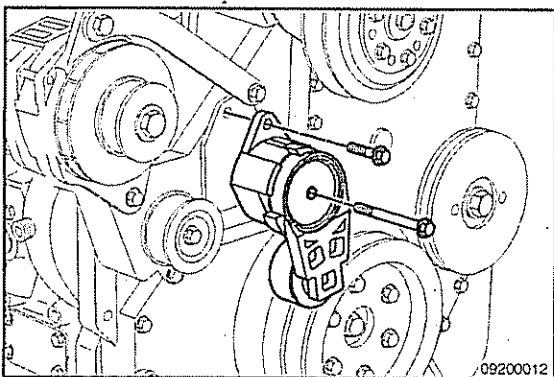
Remove

Industrial Applications

Use a $\frac{3}{4}$ -inch drive breaker bar to hold back the tensioner and relieve the belt tension.

Rotate the tensioner away from the belt until it stops.

Remove the alternator belt while holding the tensioner back.



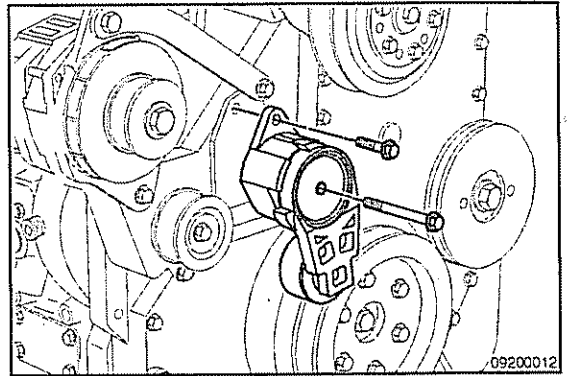
Remove the belt tensioner from the engine.

Install

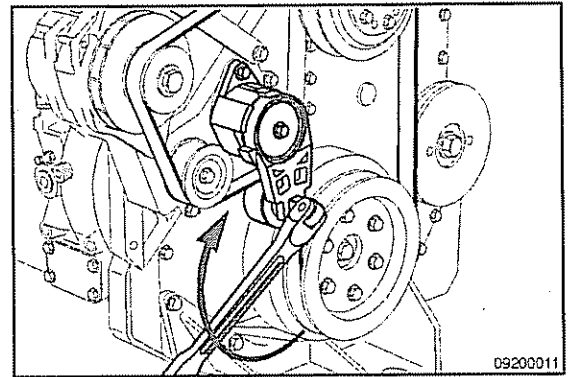
Industrial Applications

Tighten the tensioner mounting capscrew.

Torque Value: 47 N•m [35 ft-lb]



Install the alternator belt over the pulleys while holding the tensioner back with a 3/4-inch drive breaker bar. Use care in working belt over the edge of flanged pulleys.



Release the tensioner and remove the breaker bar.

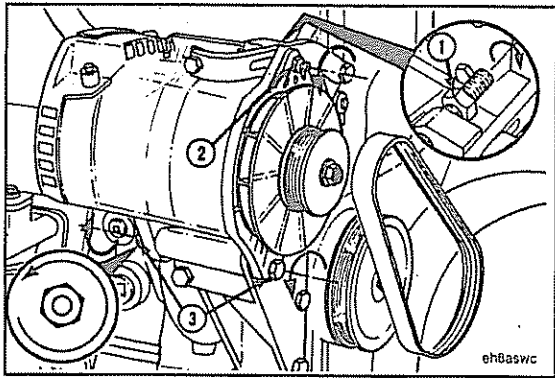
The belt tensioner is designed to operate well within the limit of arm movement, provided by the cast stops, when the belt length and geometry are correct.

Drive Belt, Alternator

General Information

Marine and Industrial Applications

This adjustment procedure is used when an automatic tensioner system is **not** used.



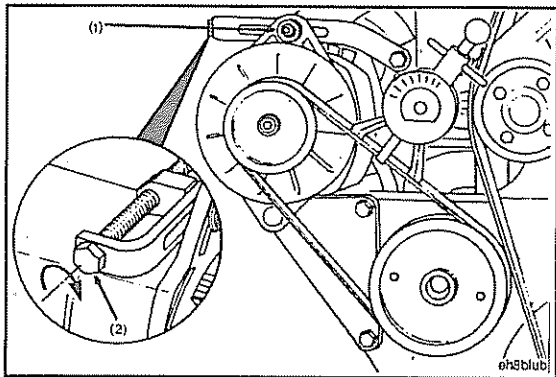
Adjust

Marine and Industrial Applications

Loosen the adjusting screw (1).

Loosen the adjustment link locking capscrew (2).

Loosen the pivot capscrew and nut (3).



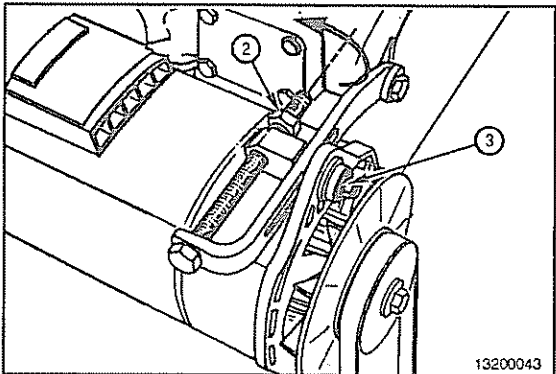
Use belt tension gauge, Part Number ST-1293, to measure belt tension.



Turn the alternator adjusting screw (2) **clockwise** to tighten the belt. Refer to Drive Belt Tension in Section V for the correct belt tension for the alternator belt.

NOTE: A belt is considered used if it has been in operation for 10 minutes or longer.

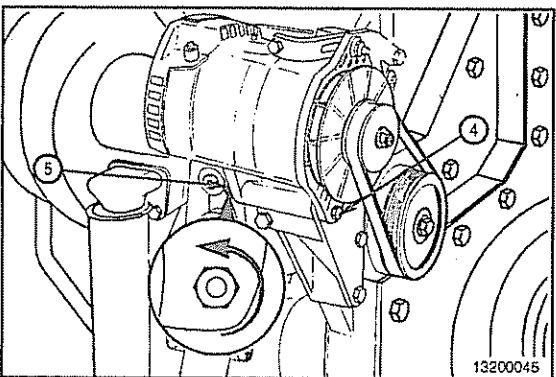
NOTE: If the alternator drive belt has more than five ribs, refer to the Belt Tension Chart in Section V for correct belt adjustment.



Tighten the adjusting screw locknut (2) against the retainer.

Tighten the adjustment link locking capscrew (3).

Torque Value: 80 N•m [59 ft-lb]



Tighten the pivot capscrew (4) and nut (5).

Torque Value: 47 N•m [35 ft-lb]

Remove

Marine and Industrial Applications

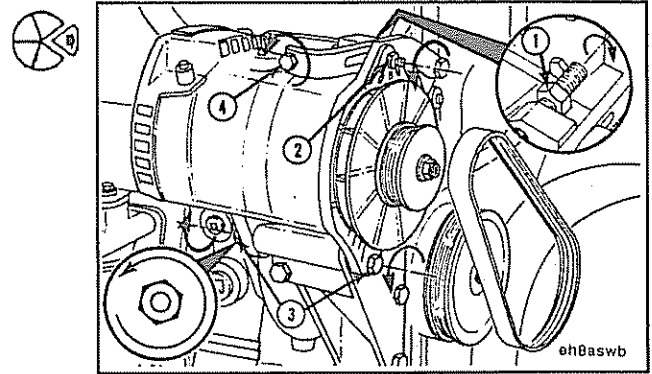
Loosen the adjusting screw locknut (1).

Loosen the adjustment link locking capscrew (2).

Loosen the alternator mounting capscrew (3).

Turn the adjusting screw (4) **counterclockwise** to release tension.

Remove the alternator belt.



Install

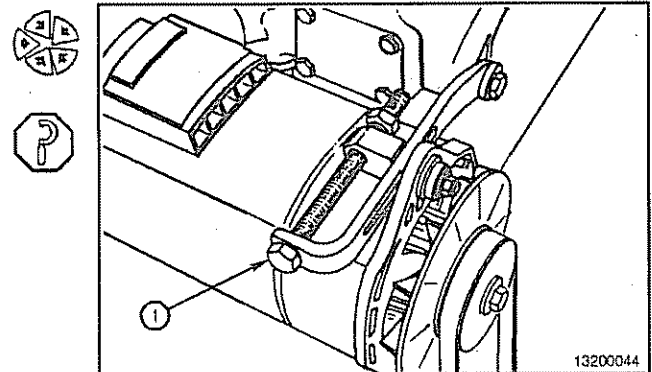
Marine and Industrial Applications



To prevent damage, do not roll a belt over the pulley or pry it on with a tool.

Install a new belt on the water pump and alternator pulleys.

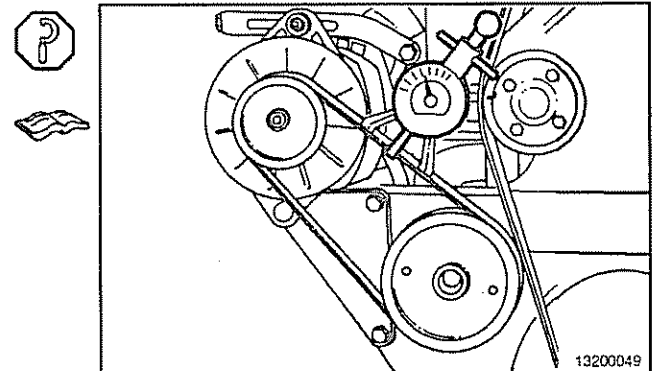
Turn the adjusting screw (1) **clockwise** to increase belt tension; **counterclockwise** to decrease belt tension. Refer to Section V for the proper belt tension.



Use belt tension gauge, Part Number ST-1293, to measure the belt tension. Refer to Drive Belt Tension in Section V for the correct tension value for the alternator belt.

NOTE: A belt is considered used if it has been in operation for 10 minutes or longer.

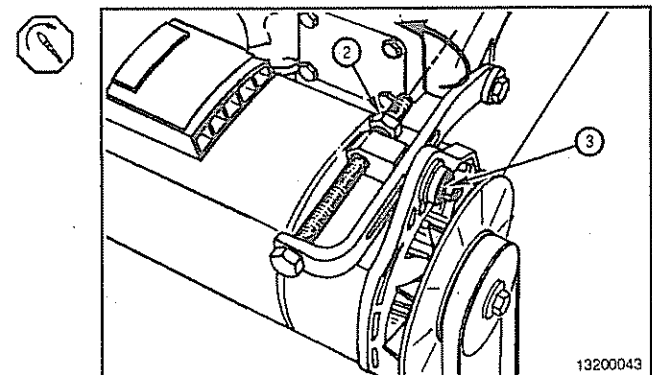
NOTE: If the alternator drive belt has more than five ribs, refer to the Belt Tension Chart in Section V for the correct belt adjustment.

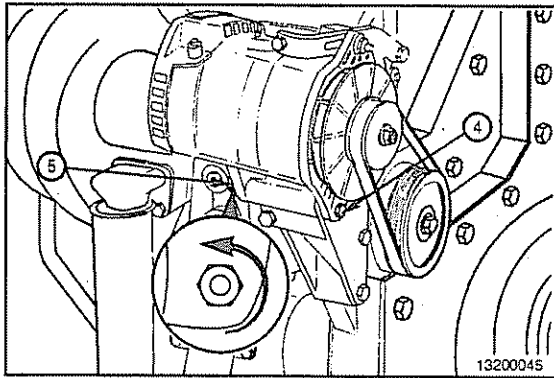


Tighten the adjusting screw locknut (2) against the retainer.

Tighten the adjustment link locking capscrew (3).

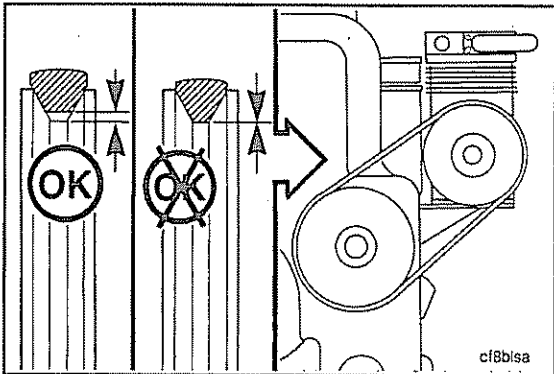
Torque Value: 80 N•m [59 ft-lb]



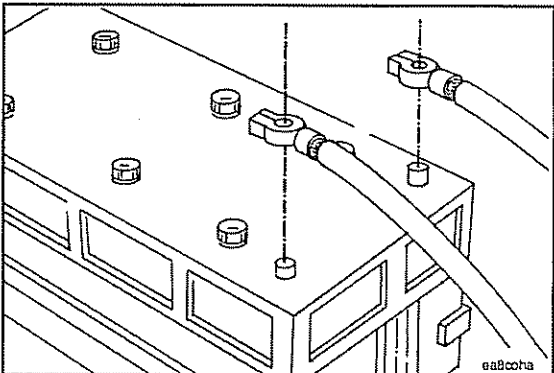


Tighten the pivot cap screw (4) and nut (5).

Torque Value: 47 N•m [35 ft-lb]



Belts **must not** touch the bottom of the pulley grooves, nor **must** they protrude over 3 mm [3/32 in] above the top edge of the groove.



Starting Motor

Remove

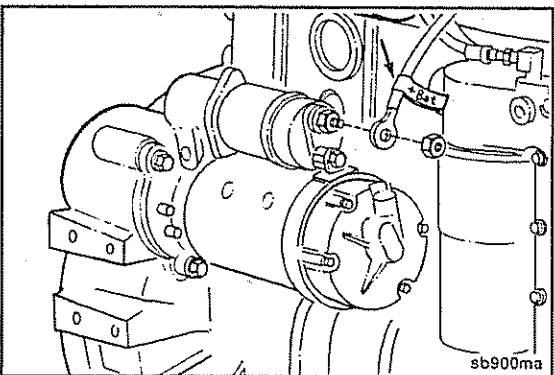
Marine and Industrial Applications



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

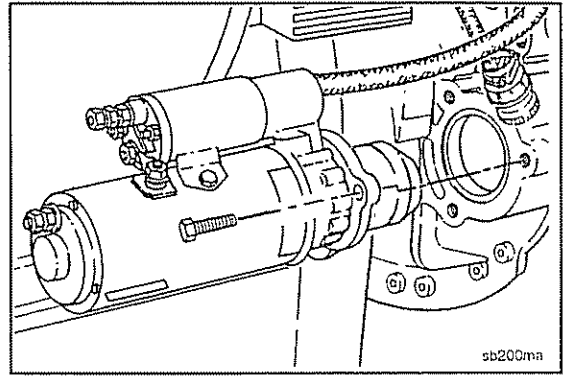
NOTE: The starting motor mounting capscrews can be metric or standard thread sizes. Make sure to install the same-size capscrews that were removed.

Remove the electrical connections from the batteries.



Tag and remove the electrical connections from the starting motor.

Remove the three capscrews and the starting motor.



Install

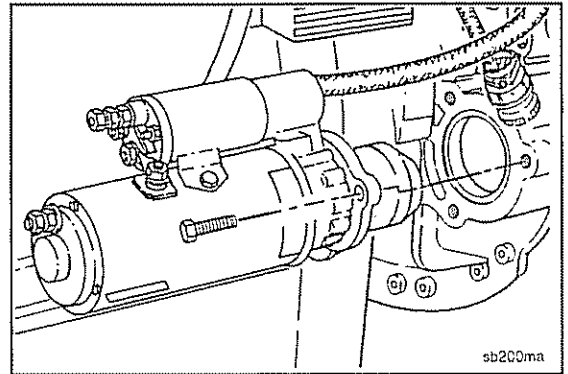
Marine and Industrial Applications

Before installing the starting motor, make sure the capscrews are the correct size and grade.

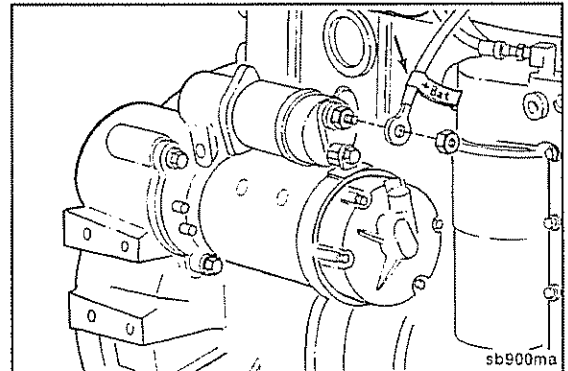
Install the starting motor and the three mounting capscrews.

Tighten the capscrews.

Torque Value: 90 N•m [66 ft-lb]



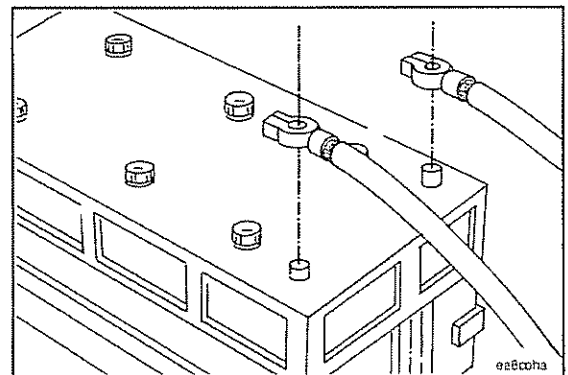
Install and tighten the electrical connections to the starting motor.



▲ WARNING ▲

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

Install and tighten the battery electrical connections.



Engine Storage - Long Term

General Information

Marine and Industrial Applications

If the engine will be out of service longer than 6 months, take special precautions to prevent rust. Contact the nearest Cummins Authorized Repair Location, or refer to the M11 Series Engine Shop Manual, Bulletin 3666075, for information concerning engine storage procedures.

Section D - System Diagrams

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System Diagrams - Overview

General Information

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

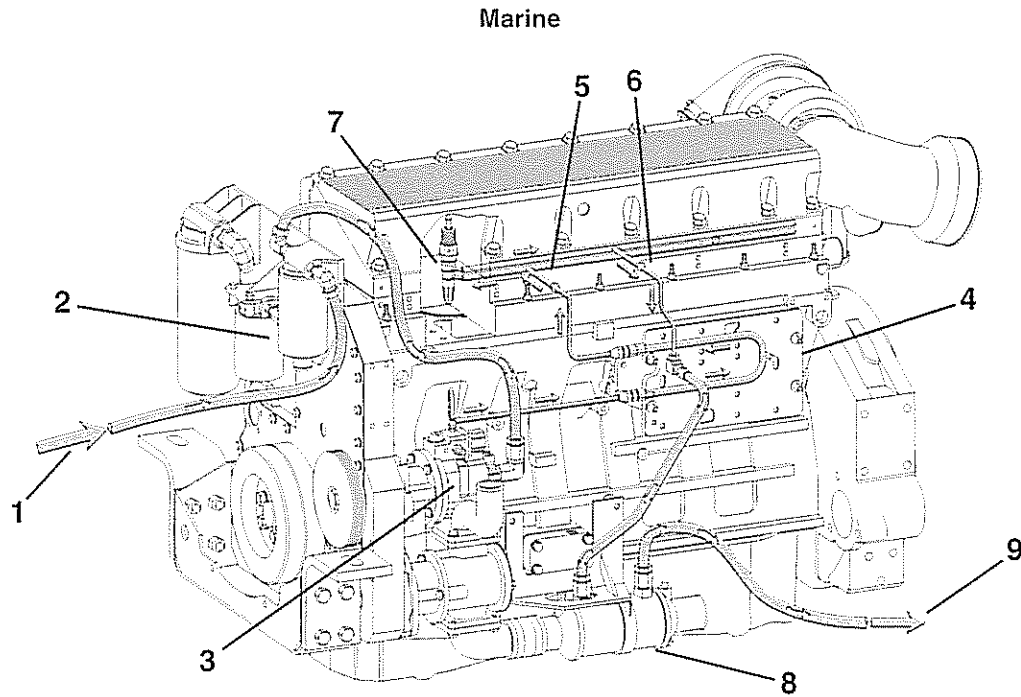
- Fuel system
- Lubricating oil system
- Coolant system
- Intake air system
- Exhaust system
- Compressed air system.

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

Flow Diagram, Fuel System

Engine Views

Marine Applications



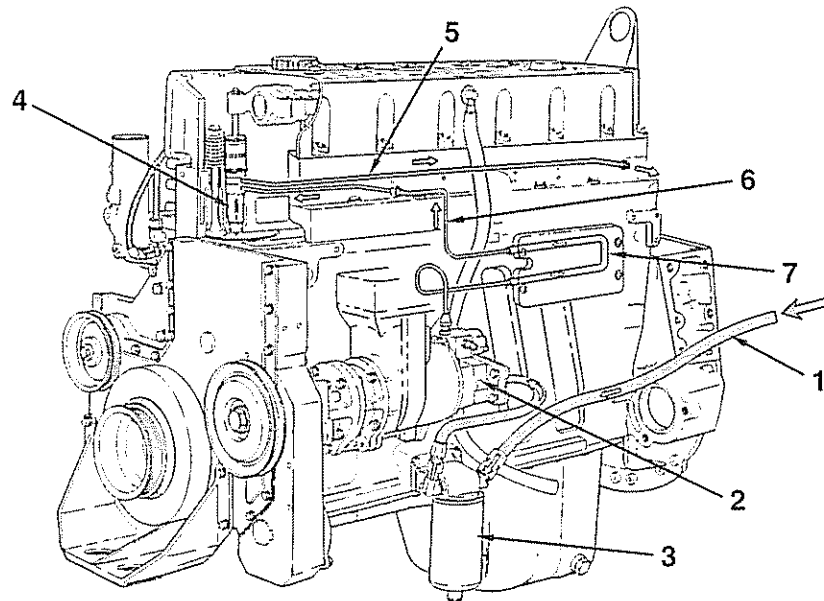
05200156

1. Fuel inlet supply
2. Fuel filter
3. Fuel pump
4. ECM cooling plate
5. Fuel to injector

6. Fuel drain to fuel cooler
7. Injector
8. Fuel cooler
9. Fuel return to supply tank.

Industrial Applications

Industrial



05800084

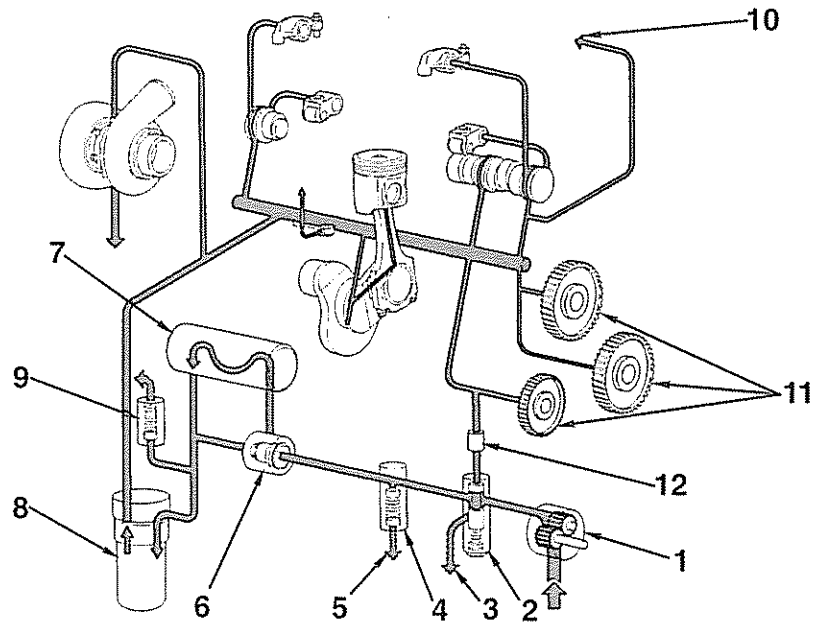
- 1. Fuel inlet supply
- 2. Fuel pump
- 3. Fuel filter
- 4. Injector

- 5. Fuel drain return
- 6. Fuel to injector
- 7. ECM cooling plate.

Flow Diagram, Lubricating Oil System

Engine Views

Marine and Industrial Applications



07200041

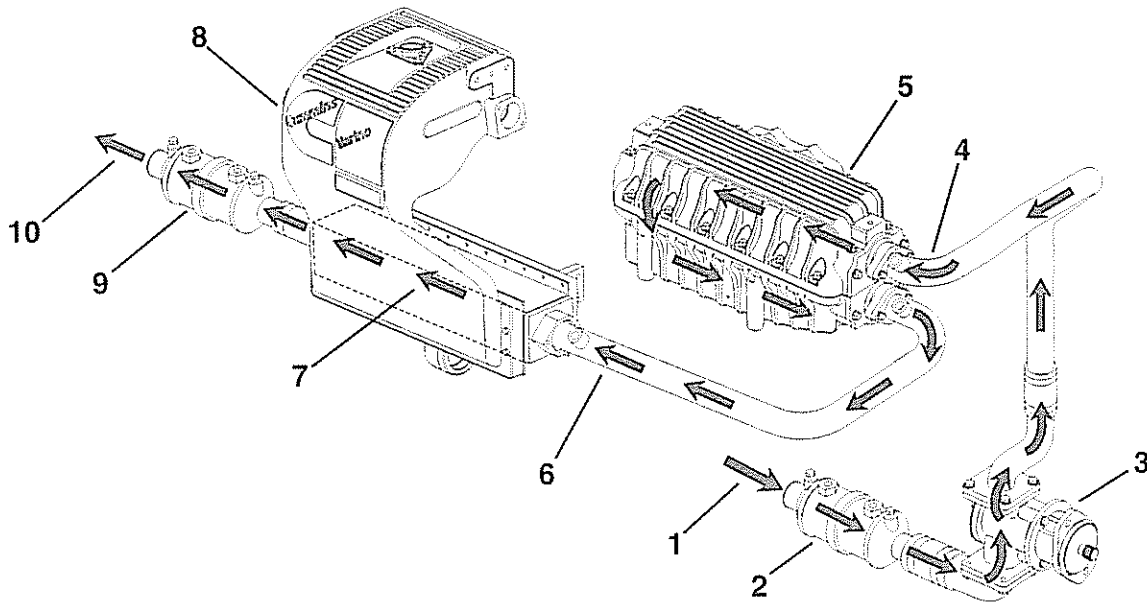
- | | |
|-------------------------------|------------------------------------|
| 1. Oil pump | 7. Oil cooler |
| 2. Pressure regulator valve | 8. Combination oil filter |
| 3. Oil return to pan | 9. Filter bypass valve |
| 4. High-pressure relief valve | 10. Accessory drive/air compressor |
| 5. Oil return to pan | 11. Idler gears |
| 6. Oil thermostat | 12. Viscosity sensor. |

Flow Diagram, Cooling System

Engine Views

Marine Applications

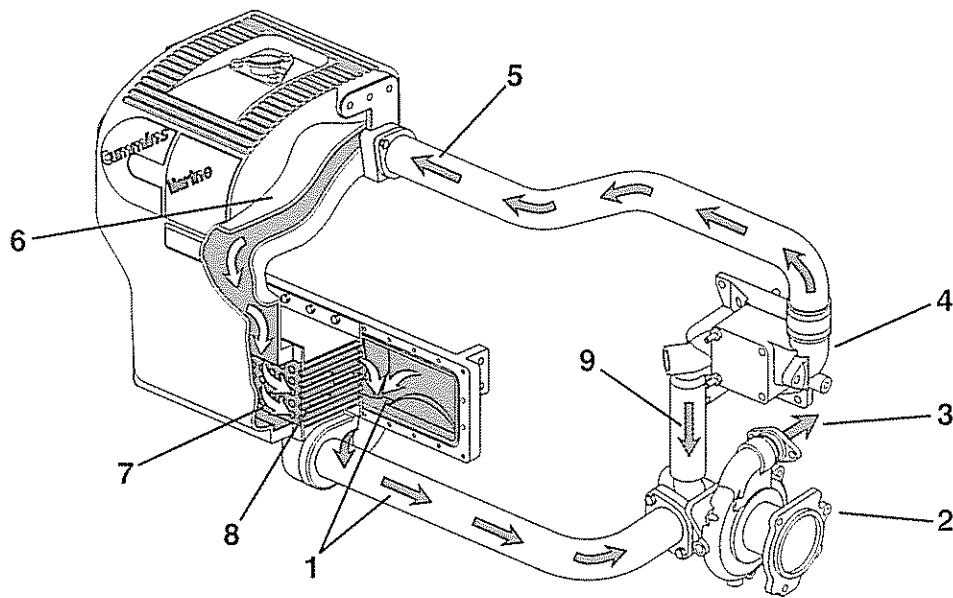
Marine



08200160

Sea Water Flow

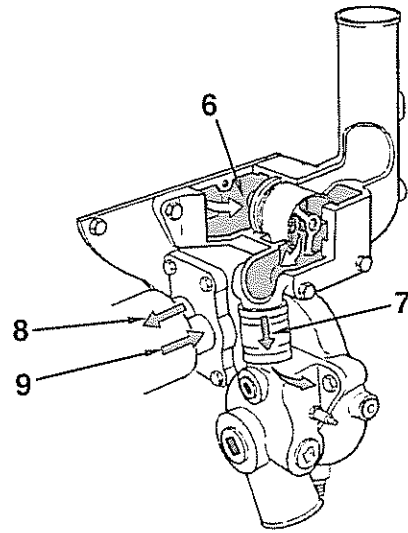
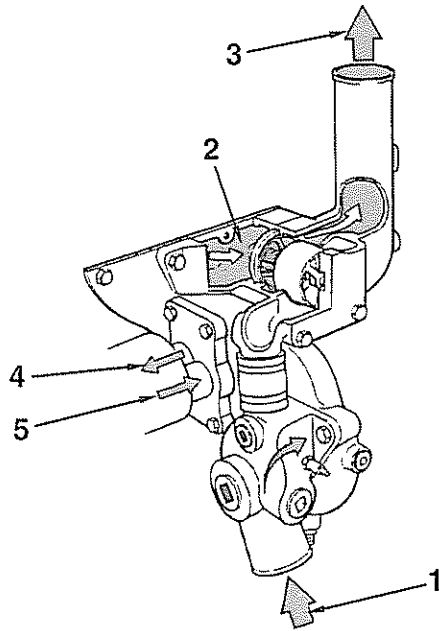
1. Sea water inlet
2. Fuel cooler
3. Sea water pump
4. Sea water pump to aftercooler
5. Aftercooler
6. Aftercooler to heat exchanger
7. Heat exchanger
8. Expansion tank
9. Gear oil cooler
10. Sea water outlet.



06200161

Coolant Flow (one of three)

1. Coolant flow to water pump
2. Water pump
3. Coolant flow to lower manifold cavity
4. Thermostat housing
5. Thermostat housing to heat exchanger
6. Expansion tank
7. Heat exchanger sea water core
8. Coolant flow through sea water core
9. Coolant bypass.



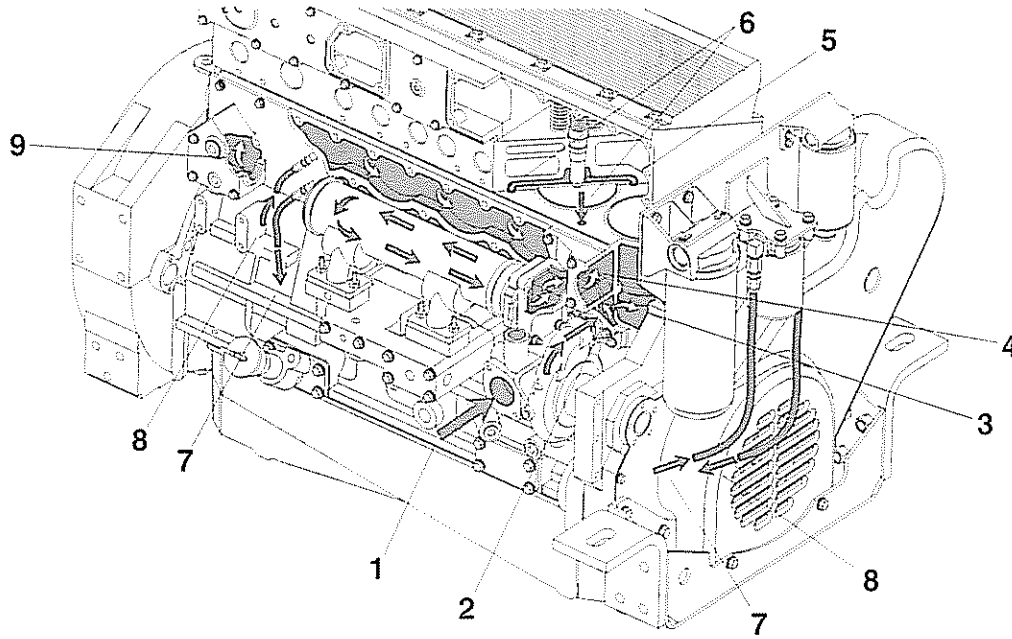
08200087

**Coolant Flow (two of three)
Thermostat Open**

1. Water pump coolant inlet
2. Upper manifold cavity
3. Coolant outlet
4. Lower manifold cavity to cooler
5. Cooler to upper manifold cavity (before thermostat).

Thermostat Closed

6. Upper manifold cavity (coolant to thermostat)
7. Coolant bypass (return to water pump)
8. Lower manifold cavity to cooler
9. Cooler to upper manifold cavity (before thermostat).



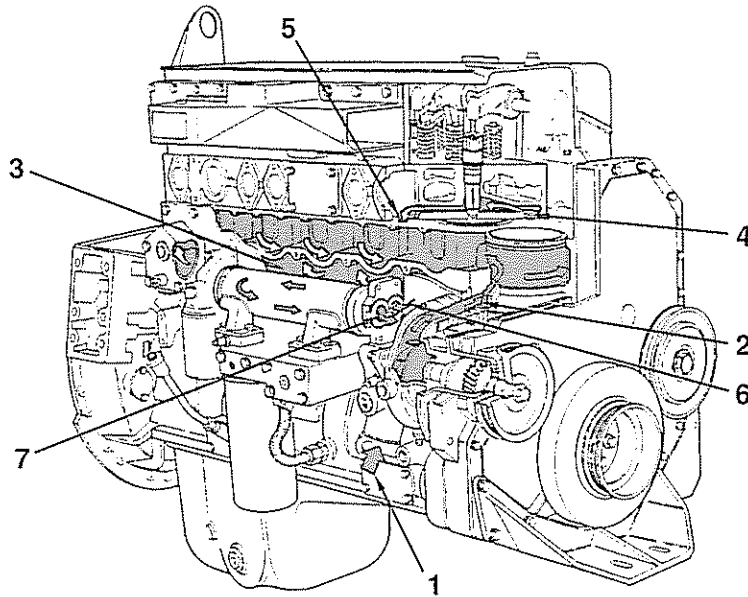
08200159

Coolant Flow (three of three)

- | | |
|---|---|
| 1. Flow from heat exchanger to water pump | 6. Flow from cylinder head to upper manifold cavity |
| 2. Flow to oil cooler and lower manifold cavity | 7. Flow to coolant filter |
| 3. Flow from lower manifold cavity to cylinder liners | 8. Flow from coolant filter |
| 4. Flow from oil cooler to thermostat housing | 9. Coolant heater - optional. |
| 5. Flow to Cylinder Head | |

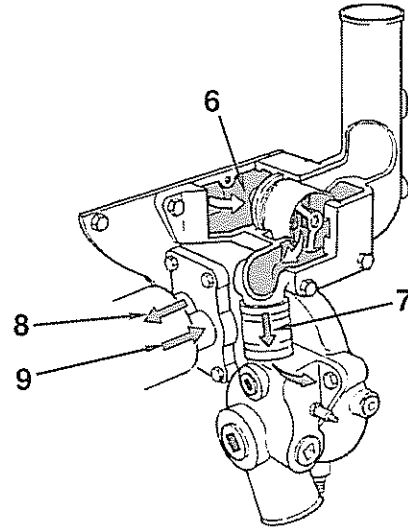
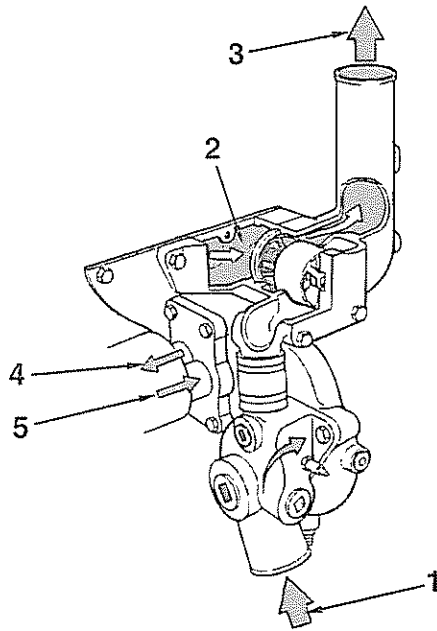
Industrial Applications

Industrial



05200055

- | | |
|---|---|
| 1. Water pump coolant inlet | 5. Coolant to upper manifold cavity |
| 2. Coolant to lower manifold cavity | 6. Lower manifold coolant to oil cooler |
| 3. Coolant to cylinder liner block cavity | 7. Oil cooler to upper manifold cavity. |
| 4. Coolant to cylinder head | |



08200087

Open

1. Water pump coolant inlet
2. Upper manifold cavity (coolant to thermostat)
3. Coolant outlet
4. Lower manifold cavity to cooler
5. Cooler to upper manifold cavity (before thermostat).

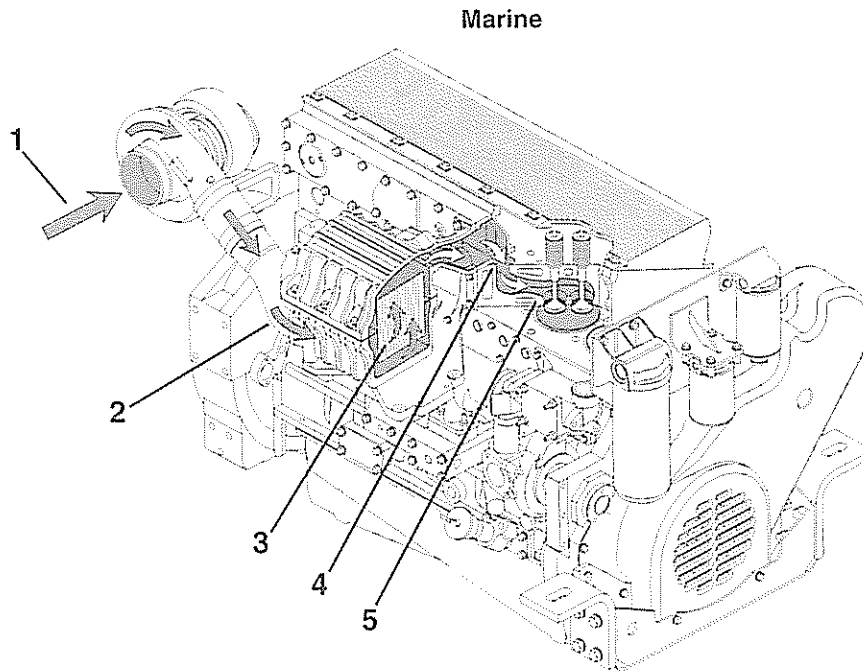
Closed

6. Upper manifold cavity (coolant to thermostat)
7. Coolant bypass (return to water pump)
8. Lower manifold cavity to cooler
9. Cooler to upper manifold cavity (before thermostat).

Flow Diagram, Air Intake System

Engine Views

Marine Applications

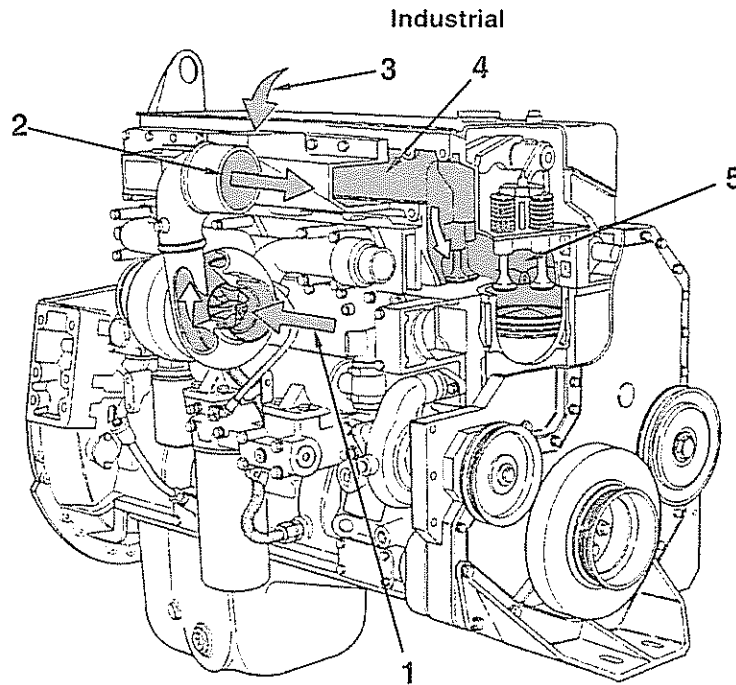


10200076

1. Filtered intake air to turbocharger
2. Turbocharger air to aftercooler
3. Intake air through the aftercooler

4. Aftercooled air through intake manifold
5. Intake valve ports.

Industrial Applications



10200035

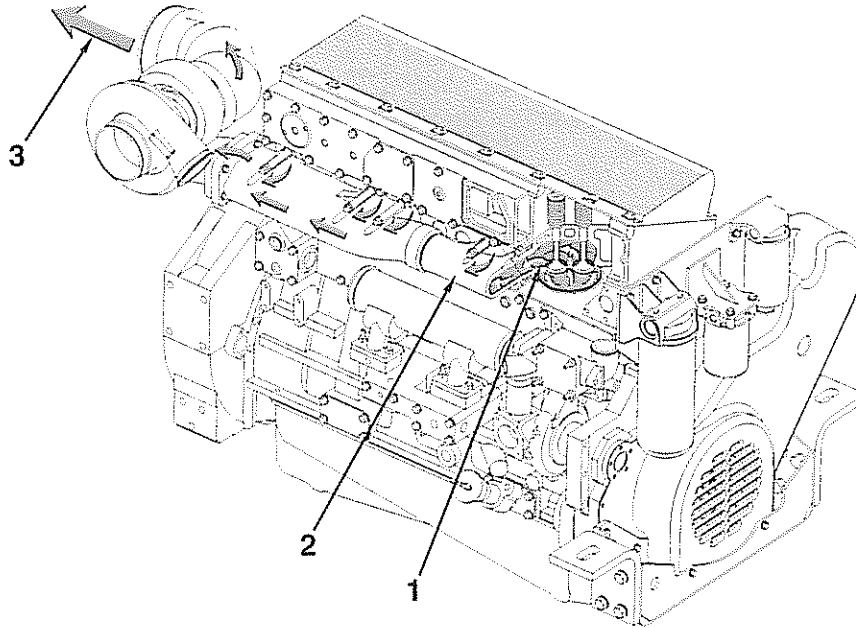
- | | |
|--|------------------------|
| 1. Filtered intake air to turbocharger | 4. Intake manifold |
| 2. Turbocharger air to charge air cooler | 5. Intake valve ports. |
| 3. Charge air cooler intake air to intake manifold | |

Flow Diagram, Exhaust System

Engine Views

Marine Applications

Marine



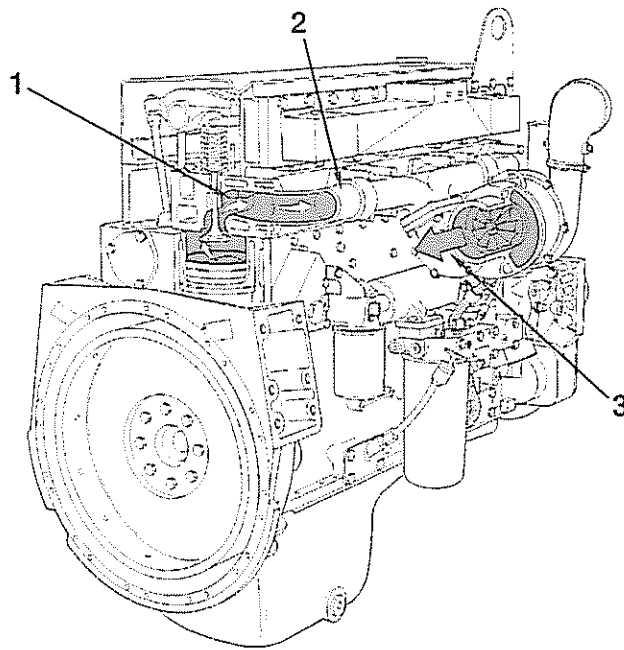
11200027

- 1. Exhaust valve ports
- 2. Exhaust manifold

- 3. Turbocharger exhaust outlet.

Industrial Applications

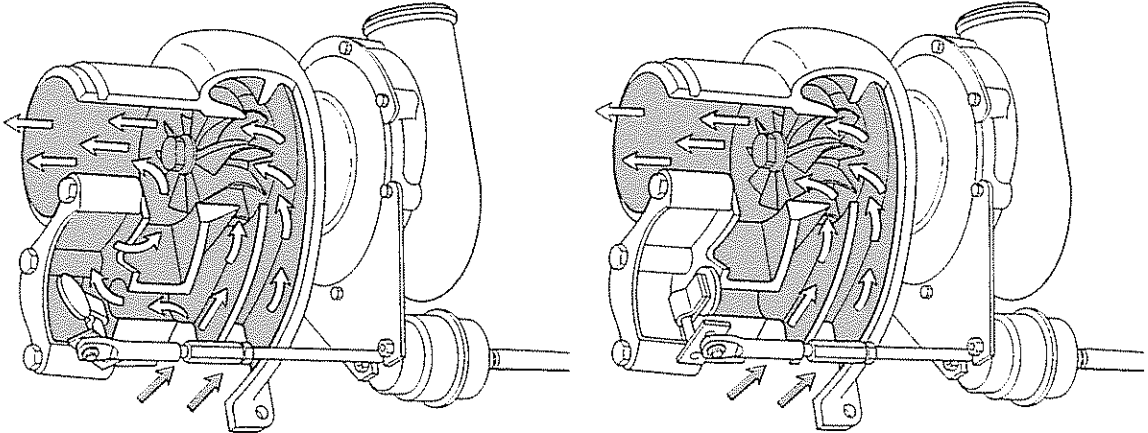
Industrial



11200009

- 1. Exhaust valve ports
- 2. Exhaust manifold

- 3. Turbocharger exhaust outlet.



12200016

OPEN

CLOSED

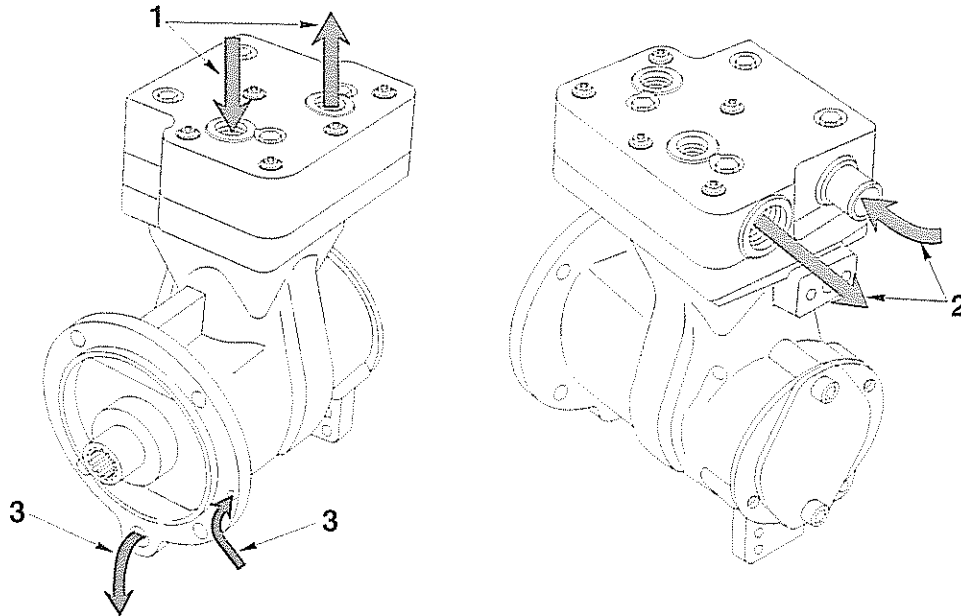
Wastegate Actuation

Flow Diagram, Compressed Air System

Engine Views

Industrial Applications

Industrial



10200072

1. Coolant
2. Air
3. Lubricant.

Section L - Service Literature

Section Contents

	Page
Additional Service Literature	L-1
General Information	L-1
Service Literature Ordering Location	L-2
Contact Information	L-2

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Additional Service Literature

General Information

The following publications can be purchased:

Bulletin	Title of Publication
3666322	Troubleshooting and Repair Manual, ISM/QSM11 Series Engines
3666266	Troubleshooting and Repair, Electronic Control System, ISM and QSM11 Engines
3666075	Shop Manual, M11 Series Engines
3666476	Specifications Manual, ISM and QSM11 Engines
3810340	Cummins Engine Oil Recommendations
3379001	Fuel for Cummins Engines (QP-20)
3666132	Coolant Requirements and Maintenance
3387266	Cold Weather Operation
3666413	Wiring Diagram, QSM11
3666468	Wiring Diagram, QSM11 Marine

Service Literature Ordering Location

Contact Information

Obtain current price information from your local Cummins Distributor.

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

Section M - Component Manufacturers

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Component Manufacturers' Addresses

General Information

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

Air Compressors

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

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

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

Air Cylinders

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

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

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

Air Heaters

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

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

Air Starting Motors

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

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

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

Alternators

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

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

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

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

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

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

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

Auxiliary Brakes

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

Belts

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

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

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

Gates Rubber Company
900 S. Broadway
Denver, CO 80217

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

Catalytic Converters

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

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

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

Coolant Level Switches

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

Clutches

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

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

Coolant Heaters

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

Drive Plates

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

Electric Starting Motors

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

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

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

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

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

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

Electronic Switches

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

Engine Protection Controls

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

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

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

Fan Clutches

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

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

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

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

Fans

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

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

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

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

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

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

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

Fault Lamps

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

Filters

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

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

Flexplates

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

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

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

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

Fuel Coolers

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

Fuel Pumps

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

Fuel Warmers

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

Gauges

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

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

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

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

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

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

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

Governors

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

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

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

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

Heat Sleeves

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

Hydraulic and Power Steering Pumps

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

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

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

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

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

In-Line Connectors

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

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

Oil Heaters

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

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

Prelubrication Systems

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

Radiators

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

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

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

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

Throttle Assemblies

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

Torque Converters

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

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

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

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

Section S - Service Assistance

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Problem Solving	S-2
Routine Service and Parts	S-1

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Service Assistance

Routine Service and Parts

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

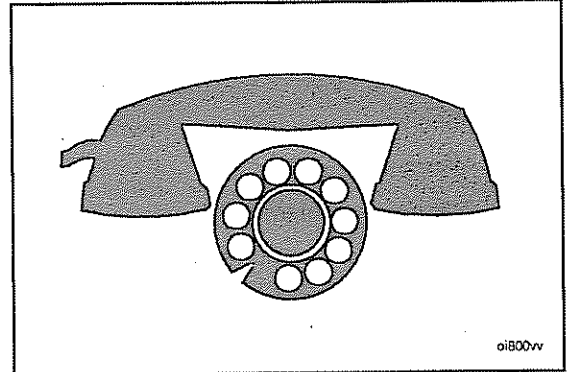
Emergency and Technical Service

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

If additional assistance is required, call Toll-Free:

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

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



Problem Solving

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

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

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

Distributors and Branches - United States

Alabama

Birmingham Distributor

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

Mobile Branch

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

Mobile Onan/Marine Branch

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

Montgomery Branch

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

Alaska

Anchorage - (Branch of Seattle)

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

Arizona

Phoenix Distributor and Branch

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

Tucson Branch

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

Arkansas

Little Rock - (Branch of Memphis)

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

California

San Leandro Distributor

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

Arcata Branch

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

Bakersfield Branch

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

Fresno Branch

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

Redding Branch

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

Stockton Branch

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

West Sacramento Branch

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

Los Angeles Distributor

Cummins Cal Pacific Inc.
1939 Deere Avenue (Irvine)
Irvine, CA 92606
Telephone: (949) 253-6000
FAX: (949) 253-6080

Montebello Branch

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

Bloomington Branch

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

San Diego Branch

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

Ventura Branch

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

Colorado

Denver Distributor

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

Denver Onan/Industrial Branch

Cummins Rocky Mountain, Inc.
5100 East 58th Ave.
Commerce City, CO 80022
Telephone: (303) 286-7697
FAX: (303) 287-4837

Durango Branch

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

Grand Junction Branch

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

Connecticut

Rocky Hill - (Branch of Bronx)

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

Florida

Tampa Distributor

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

Ft. Myers Branch

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

Jacksonville Branch

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

Hialeah (Miami) Branch

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

Ocala Branch

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

Orlando Branch

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

Tampa Branch

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

Georgia

Atlanta Distributor

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

Albany Branch

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

Atlanta Branch

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

Augusta Branch

Cummins South, Inc.
1255 New Savannah Road
Augusta, GA 30901-3891
Telephone: (706) 722-8825
FAX: (706) 722-7553

Savannah Branch

Cummins South, Inc.
8 Interchange Court
Savannah, GA 31401-1627
Telephone: (912) 232-5565
FAX: (912) 232-5145

Hawaii

Kapolei Distributor

Cummins Hawaii Diesel Power, Inc.
91-230 Kalaeloa Blvd.
Kapolei, HI 96707
Telephone: (808) 682-8110
FAX: (808) 682-8477

Idaho

Boise - (Branch of Salt Lake City)

Cummins Intermountain, Inc.
2851 Federal Way City
Boise, ID 83705
Telephone: (208) 336-5000
FAX: (208) 338-5436

Pocatello - (Branch of Salt Lake City)

Cummins Intermountain, Inc.
14299 Highway 30 West
Pocatello, ID 83201
Telephone: (208) 234-1661
FAX: (208) 234-1662

Illinois

Chicago Distributor

Cummins Northern Illinois, Inc.
7145 Santa Fe Drive
Hodgkins, IL 60525
Telephone: (708) 579-9222
FAX: (708) 352-7547

Bloomington-Normal - (Branch of Indianapolis)

Cummins Mid-States Power, Inc.
(at U.S. 51 N and I-55)
414 W. Northtown Road
Bloomington-Normal, IL 61761
Telephone: (309) 452-4454
FAX: (309) 452-1642

Onan Branch

Cummins/Onan Northern Illinois
8745 W. 82nd Place
Justin, IL 60458
Telephone: (708) 563-7070
FAX: (708) 563-7095

Harrisburg (Branch of St. Louis)

Cummins Gateway, Inc.
Highway 45 North
Harrisburg, IL 62946
Telephone: (618) 273-4138
FAX: (618) 273-4531

Rock Island - (Branch of Omaha)

Cummins Great Plains Diesel, Inc.
7820 - 42nd Street West
Rock Island, IL 61204
Telephone: (309) 787-4300
FAX: (309) 787-4397

Onan Branch

Cummins Gateway, Inc.
#1 Extra Mile Drive
Collinsville, IL 62234
Telephone: (618) 345-0123
FAX: (314) 531-6604

Indiana

Indianapolis Distributor

Cummins Mid-States Power, Inc.
P.O. Box 42917
3762 West Morris Street
Indianapolis, IN 46242-0917
Telephone: (317) 243-7979
FAX: (317) 240-1925

Evansville - (Branch of Louisville)

Cummins Cumberland, Inc.
7901 Highway 41 North
Evansville, IN 47711
Telephone: (812) 867-4400
FAX: (812) 421-3282

Ft. Wayne Branch

Cummins Mid-States Power, Inc.
3415 Coliseum Blvd. West
(At Jct. I-69 & 30/33)
Ft. Wayne, IN 46808
Telephone: (219) 482-3691
FAX: (219) 484-8930

Gary - (Branch of Chicago)

Cummins Northern Illinois, Inc.
1440 Texas Street
Gary, IN 46402
Telephone: (219) 885-5591
FAX: (219) 883-4817

Indianapolis Branch

Cummins Mid-States Power, Inc.
P. O. Box 42917
3621 West Morris Street
Indianapolis, IN 46242-0917
Telephone: (317) 244-7251
FAX: (317) 240-1215

Onan Branch

Mid-States Power, Inc.
4301 W. Morris Street
P.O. Box 42917
Indianapolis, IN 46240-0917
Telephone: (317) 240-1967
FAX: (317) 240-1975

Iowa

Cedar Rapids - (Branch of Omaha)

Cummins Great Plains Diesel, Inc.
625 - 33rd Avenue SW
Cedar Rapids, IA 52406
Telephone: (319) 366-7537 (24 hours)
FAX: (319) 366-7562

Des Moines - (Branch of Omaha)

Cummins Great Plains Diesel, Inc.
1680 N.E. 51st Avenue
P.O. Box B
Des Moines, IA 50313
Telephone: (515) 262-9591
Parts: (515) 262-9744
FAX: (515) 262-0626

Des Moines - (Branch of Omaha)

Midwestern Power Products
Division of Cummins Great Plains Diesel, Inc.
5194 N.E. 17th Street
Des Moines, IA 50313
Telephone: (515) 264-1650
FAX: (515) 264-1651

Kansas

Colby - (Branch of Kansas City, Missouri)

Cummins Mid-America, LLC.
1880 South Range
Colby, KS 67701
Telephone: (785) 462-3945
FAX: (785) 462-3970

Garden City - (Branch of Kansas City, Missouri)

Cummins Mid-America, Inc.
1285 Acraway
Garden City, KS 67846
Telephone: (316) 275-2277
FAX: (316) 275-2533

Wichita - (Branch of Kansas City, Missouri)

Cummins Mid-America, Inc.
5101 North Broadway
Wichita, KS 67201
Telephone: (316) 838-0875
FAX: (316) 838-0704

Kentucky

Louisville Distributor

Cummins Cumberland, Inc.
(Corporate Office)
2301 Nelsonville Parkway
Louisville, KY 40223
Telephone: (502) 254-3363
FAX: (502) 254-9272

Hazard Branch

Cummins Cumberland, Inc.
Highway 15 South
P.O. Box 510
Hazard, KY 41701
Telephone: (606) 436-5718
FAX: (606) 436-5038

Louisville Branch

Cummins Cumberland, Inc.
9820 Bluegrass Parkway
Louisville, KY 40299
Telephone: (502) 491-4263
FAX: (502) 499-0896

Louisiana

Morgan City - (Branch of Memphis)

Cummins Mid-South, Inc.
Hwy. 90 East
P.O. Box 1229
Amelia, LA 70340
Telephone: (504) 631-0576
FAX: (504) 631-0081

New Orleans - (Branch of Memphis)

Cummins Mid-South, Inc.
110 E. Airline Highway
Kenner, LA 70062
Telephone: (504) 468-3535
FAX: (504) 465-3408

Maine

Bangor (Branch of Boston)

Cummins Northeast, Inc.
221 Hammond Street
Bangor, ME 04401
Telephone: (207) 941-1061
FAX: (207) 945-3170

Scarborough - (Branch of Boston)

Cummins Northeast, Inc.
10 Gibson Road
Scarborough, ME 04074
Telephone: (207) 883-8155
FAX: (207) 883-5526

Maryland

Baltimore Distributor

Cummins Power Systems, Inc.
1907 Parkwood Drive
MD 21061
Telephone: (410) 590-8700
FAX: (410) 590-8723

Massachusetts

Boston Distributor

Cummins Northeast, Inc.
100 Allied Drive
Dedham, MA 02026
Telephone: (781) 329-1750
FAX: (781) 329-4428

Springfield Branch

Cummins Northeast, Inc.
177 Rocus Street
Springfield, MA 01104
Telephone: (413) 737-2659
FAX: (413) 731-1082

Mexico

Tijuana - (Branch of Los Angeles)

Distribuidora Cummins De Baja
Blvd. 3ra. Oeste No. 17523
Fracc. Industrial
Garita de Otay C.P. 22400
Tijuana, Baja California
Mexico
Telephone: 011-52-66-238433
FAX: 011-52-66-238649

Michigan

Detroit (Novi) Distributor

Cummins Michigan, Inc.
41216 Vincenti Court
Novi, MI 48375
Telephone: (248) 478-9700
FAX: (248) 478-1570

Blissfield, Michigan

Diesel Fuel Systems, Inc.
Subsidiary of Cummins Michigan Inc.
211 N. Jipson Street
Blissfield, MI 49228
Telephone: (517) 486-4324
FAX: (517) 486-3614

Dearborn Branch

Cummins Michigan, Inc.
3760 Wyoming Avenue
Dearborn, MI 48120
Telephone: (313) 843-6200
FAX: (313) 843-6070

Grand Rapids Branch

Cummins Michigan, Inc.
3715 Clay Avenue, S.W.
Grand Rapids, MI 49508
Telephone: (616) 538-2250
FAX: (616) 538-3830

Grand Rapids Branch

Standby Power, Inc.
7580 Expressway Drive S.W.
Grand Rapids, MI 49548
Telephone: (616) 281-2211
FAX: (616) 281-3177

Iron Mountain - (Branch of De Pere)

Cummins Great Lakes, Inc.
1901 Stevenson Avenue
Iron Mountain, MI 49801
Telephone: (906) 774-2424
(800) 236-2424
FAX: (906) 774-1190

Novi Branch

Cummins Michigan, Inc.
25100 Novi Road
Novi, MI 48375
Telephone: (248) 380-4300
FAX: (248) 380-0910

Power Products (Branch of Detroit)

Cummins Michigan, Inc.
41326 Vincenti Ct.
Novi, MI 48375
Telephone: (248) 426-9300
FAX: (248) 473-8560

Saginaw Branch

Cummins Michigan, Inc.
722 N. Outer Drive
Saginaw, MI 48605
Telephone: (517) 752-5200
FAX: (517) 752-4194

Standby Power - (Branch of Detroit)

Cummins Michigan, Inc.
12130 Dixie
Redford, MI 48239
Telephone: (313) 538-0200
FAX: (313) 538-3966

Minnesota

St. Paul Distributor

Cummins North Central, Inc.
3030 Centre Pointe Drive
Suite 500
Roseville, MN 55113
Telephone: (651) 636-1000
FAX: (651) 638-2442

Duluth Branch

Cummins Diesel Sales, Inc.
3115 Truck Center Drive
Duluth, MN 55806-1786
Telephone: (218) 628-3641
FAX: (218) 628-0488

St. Paul Branch

Cummins North Central, Inc.
2690 Cleveland Ave. North
St. Paul, MN 55113
Telephone: (651) 636-1000
FAX: (651) 638-2497

Mississippi

Jackson - (Branch of Memphis)

Cummins Mid-South, Inc.
325 New Highway 49 South
Jackson, MS 39288-4224
Telephone:
Admin.: (601) 932-7016
Parts: (601) 932-2720
Service: (601) 939-1800
FAX: (601) 932-7399

Missouri

Kansas City Distributor and Branch

Cummins Mid-America, Inc.
8201 NE Parvin Road
Kansas City, MO 64161
Telephone: (816) 414-8200
FAX: (816) 414-8299

Joplin Branch

Cummins Mid-America, Inc.
3507 East 20th Street
Joplin, MO 64801
Telephone: (417) 623-1661
FAX: (417) 623-1817

Springfield Branch

Cummins Mid-America, Inc.
3637 East Kearney
Springfield, MO 65803
Telephone: (417) 862-0777
FAX: (417) 862-4429

St. Louis Distributor

Cummins Gateway, Inc.
7210 Hall Street
St. Louis, MO 63147
Telephone: (314) 389-5400
FAX: (314) 389-9671

Columbia Branch

Cummins Gateway, Inc.
5221 Highway 763 North
Columbia, MO 65202
Telephone: (314) 449-3711
FAX: (314) 449-3712

Sikeston Branch

Cummins Gateway, Inc.
101 Keystone Drive
Sikeston, MO 63801
Telephone: (314) 472-0303
FAX: (314) 472-0306

Industrial Power Branch

Cummins Gateway, Inc.
3256 E. Outer Road
Scott City, MO 63788
Telephone: (573) 335-9399
FAX: (573) 335-7062

Montana

Billings - (Branch of Denver)

Cummins Rocky Mountain, Inc.
5151 Midland Road
Billings, MT 59101
Telephone: (406) 245-4194
FAX: (406) 245-7923

Great Falls - (Branch of Denver)

Cummins Rocky Mountain, Inc.
415 Vaughn Road
Great Falls, MT 59404
Telephone: (406) 452-8561
FAX: (406) 452-9911

Missoula - (Branch of Seattle)

Cummins Northwest, Inc.
4950 North Reserve Street
Missoula, MT 59802-1498
Telephone: (406) 728-1300
FAX: (406) 728-8523

Nebraska

Omaha Distributor and Branch

Cummins Great Plains Diesel, Inc.
5515 Center Street
P.O. Box 6068
Omaha, NE 68106
Telephone: (402) 551-7678 (24 Hours)
FAX: (402) 551-1952

Kearney Branch

Cummins Great Plains Diesel, Inc.
515 Central Avenue
Kearney, NE 68847
Telephone: (308) 234-1994
FAX: (308) 234-5776

Nevada

Elko - (Branch of Salt Lake City)

Cummins Intermountain, Inc.
5370 East Idaho Street
Elko, NV 89801
Telephone: (775) 738-6405
FAX: (775) 738-1719

Las Vegas - (Branch of Salt Lake City)

Cummins Intermountain, Inc.
2750 Losee Road
North Las Vegas, NV 89030
Telephone: (702) 399-2339
FAX: (702) 399-7457

Sparks - (Branch of Salt Lake City)

Cummins Intermountain, Inc.
150 Glendale Avenue
Sparks, NV 89431
Telephone: (775) 331-4983
FAX: (775) 331-7429

New Jersey

Newark - (Branch of Bronx)

Cummins Metropower, Inc.
41-85 Doremus Ave.
Newark, NJ 07105
Telephone: (973) 491-0100
FAX: (973) 578-8873

New Mexico

Albuquerque - (Branch of Phoenix)

Cummins Southwest, Inc.
1921 Broadway N.E.
Albuquerque, NM 87102
Telephone: (505) 247-2441
FAX: (505) 842-0436

Farmington - (Branch of Phoenix)

Cummins Southwest, Inc.
1101 North Troy King Road
Farmington, NM 87401
Telephone: (505) 327-7331
FAX: (505) 326-2948

New York

Bronx Distributor

Cummins Metropower, Inc.
890 Zerega Avenue
Bronx, NY 10473
Telephone: (718) 892-2400
FAX: (718) 892-0055

Albany - (Branch of Boston)

Cummins Northeast, Inc.
101 Railroad Avenue
Albany, NY 12205
Telephone: (518) 459-1710
FAX: (518) 459-7815

Buffalo - (Branch of Boston)

Cummins Northeast, Inc.
480 Lawrence Bell Dr.
Williamsville, NY 14221-7090
Telephone: (716) 631-3211
FAX: (716) 626-0799

Syracuse - (Branch of Boston)

Cummins Northeast, Inc.
29 Eastern Avenue
Syracuse, NY 13211
Telephone: (315) 437-2751
FAX: (315) 437-8141

North Carolina

Charlotte Distributor

Cummins Atlantic, Inc.
11101 Nations Ford Road (28273)
P.O. Box 240729
Charlotte, NC 28224-0729
Telephone: (704) 588-1240
FAX: (704) 587-4870

Charlotte Branch

Cummins Atlantic, Inc.
3700 North Interstate 85
Charlotte, NC 28206
Telephone: (704) 596-7690
FAX: (704) 596-3038

Greensboro Branch

Cummins Atlantic, Inc.
513 Preddy Boulevard (27406)
P.O. Box 22066
Greensboro, NC 27420-2066
Telephone: (336) 275-4531
FAX: (336) 275-8304

Wilson Branch

Cummins Atlantic, Inc.
1514 Cargill Avenue (27893)
P.O. Box 1177
Wilson, NC 27894-1117
Telephone: (252) 237-9111
FAX: (252) 237-9132

North Dakota

Fargo - (Branch of St. Paul)

Cummins North Central, Inc.
3801 - 34th Ave. SW
Fargo, ND 58104
Telephone: (701) 282-2466
FAX: (701) 277-5399

Grand Forks - (Branch of St. Paul)

Cummins North Central, Inc.
4728 Gateway Drive
Grand Forks, ND 58201
Telephone: (701) 775-8197
FAX: (701) 775-4833

Minot - (Branch of St. Paul)

Cummins North Central, Inc.
1501 - 20th Avenue, S.E.
Minot, ND 58702
Telephone: (701) 852-3585
FAX: (701) 852-3588

Ohio

Columbus Distributor and Branch

Cummins Interstate Power, Inc.
4000 Lyman Drive
Hilliard (Columbus), OH 43026
Telephone: (614) 771-1000
FAX: (614) 771-0769

Columbus Distributor

Cummins Interstate Power, Inc.
2297 Southwest Blvd., Suite K
Grove City, OH 43123
Telephone: (614) 771-1000
FAX: (614) 527-2576

Cincinnati Branch

Cummins Interstate Power, Inc.
10470 Evendale Drive
Cincinnati, OH 45241
Telephone: (513) 563-6670
FAX: (513) 563-0594

Cleveland Branch

Cummins Interstate Power, Inc.
7585 Northfield Road
Cleveland, OH 44146
Telephone: (440) 439-6800
FAX: (440) 439-7390

Strasburg Branch

Cummins Interstate Power, Inc.
777 South Wooster Avenue
Strasburg, OH 44680
Telephone: (216) 878-5511
FAX: (216) 878-7666

Toledo Branch

Cummins Interstate Power, Inc.
801 Illinois Avenue
Maumee
(Toledo), OH 43537
Telephone: (419) 893-8711
FAX: (419) 893-5362

Youngstown Branch

Cummins Interstate Power, Inc.
7145 Masury Road
Hubbard
(Youngstown), OH 44425
Telephone: (216) 534-1935
FAX: (216) 534-5606

Oklahoma

Oklahoma City - (Branch of Arlington)

Cummins Southern Plains, Inc.
5800 West Reno
Oklahoma City, OK 73127
Telephone: (405) 946-4481 (24 hours)
FAX: (405) 946-3336

Tulsa - (Branch of Arlington)

Cummins Southern Plains, Inc.
16525 East Skelly Drive
Tulsa, OK 74116
Telephone: (918) 234-3240
FAX: (918) 234-2342

Oregon

Bend - (Branch of Seattle)

Cummins Northwest, Inc.
3500 N. Highway 97 (97701-5729)
P.O. Box 309
Bend, OR 97709-0309
Telephone: (541) 389-1900
FAX: (541) 389-1909

Coburg/Eugene - (Branch of Seattle)

Cummins Northwest, Inc.
91201 Industrial Parkway
Coburg, OR 97401
(Mailing Address)
P.O. Box 10877
Eugene, OR 97440-2887
Telephone: (541) 687-0000
FAX: (541) 687-1977

Medford - (Branch of Seattle)

Cummins Northwest, Inc.
4045 Crater Lake Highway
Medford, OR 97504-9796
Telephone: (541) 779-0151
FAX: (541) 772-2395

Pendleton - (Branch of Seattle)

Cummins Northwest, Inc.
223 S.W. 23rd Street
Pendleton, OR 97801-1810
Telephone: (541) 276-2561
FAX: (541) 276-2564

Portland - (Branch of Seattle)

Cummins Northwest, Inc.
4711 N. Basin Avenue
P. O. Box 2710 (97208-2710)
Portland, OR 97217-3557
Telephone: (503) 289-0900
FAX: (503) 286-5938

Pennsylvania

Philadelphia Distributor

Cummins Power Systems, Inc.
2727 Ford Road
Bristol, PA 19007
Telephone: (215) 785-6005 and
(609) 563-0005
FAX: (215) 785-4085

Bristol Branch

Cummins Power Systems, Inc.
2727 Ford Road
Bristol, PA 19007
Telephone: (215) 785-6005 and
(609) 563-0005
FAX: (215) 785-4728

Pittsburgh Branch

Cummins Power Systems, Inc.
3 Alpha Drive
Pittsburgh, PA 15238-2901
Telephone: (412) 820-8300
FAX: (412) 820-8308

Harrisburg Branch

Cummins Power Systems, Inc.
4499 Lewis Road
Harrisburg, PA 17111-2541
Telephone: (717) 564-1344
FAX: (717) 558-8217

Puerto Rico

Puerto Nuevo - (Branch of Tampa)

Cummins Diesel Power, Inc.
#31 Calle "C"
El Matadero
Puerto Nuevo, Puerto Rico 00920
Telephone: (787) 793-0300
FAX: (787) 793-1072

South Carolina

Charleston - (Branch of Charlotte)

Cummins Atlantic, Inc.
3028 West Montague Avenue
Charleston, SC 29418-5593
Telephone: (843) 554-5112
FAX: (843) 745-0745

Charleston - (Branch of Charlotte)

Cummins Atlantic Inc.
231 Farmington Road
Charleston, SC 29483
Telephone: (843) 851-9819
FAX: (843) 875-4338

Columbia - (Branch of Charlotte)

Cummins Atlantic, Inc.
1233 Bluff Road (29201)
P.O. Box 13543
Columbia, SC 29201-3543
Telephone: (803) 799-2410
FAX: (803) 779-3427

South Dakota

Sioux Falls - (Branch of Omaha)

Cummins Great Plains Diesel, Inc.
701 East 54th Street North
Sioux Falls, SD 57104
Telephone: (605) 336-1715
FAX: (605) 336-1748

Tennessee

Memphis Distributor & Distribution Center

Cummins Mid-South, Inc.
666 Riverside Drive
Memphis, TN 38703
Telephone: (901) 577-0666
FAX: (901) 522-8758

Chattanooga - (Branch of Atlanta)

Cummins South, Inc.
1509 East 26th Street
Chattanooga, TN 37407-1095
Telephone: (615) 629-1447
FAX: (615) 629-1494

Knoxville - (Branch of Louisville)

Cummins Cumberland, Inc.
1211 Ault Road
Knoxville, TN 37914
Telephone: (423) 523-0446
FAX: (423) 523-0343

Memphis Branch

Cummins Mid-South, Inc.
1784 E. Brooks Road
Memphis, TN 38116
Telephone:
Sales/Admin.: (901) 345-7424
Parts: (901) 345-1784
Service: (901) 345-6185
FAX: (901) 346-4735

Nashville - (Branch of Louisville)

Cummins Cumberland, Inc.
706 Spence Lane
Nashville, TN 37217
Telephone: (615) 366-4341
FAX: (615) 366-5693

Texas

Arlington Distributor

Cummins Southern Plains, Inc.
600 N Watson Road
Arlington, TX 76004-3027
Telephone: (817) 640-6801
FAX: (817) 640-6852

Amarillo Branch

Cummins Southern Plains, Inc.
5224 Interstate 40 -
Expressway East
P.O. Box 31570
Amarillo, TX 79120-1570
Telephone: (806) 373-3793 (24 hours)
FAX: (806) 372-8547

Dallas Branch

Cummins Southern Plains, Inc.
3707 Irving Boulevard
Dallas, TX 75247
Telephone: (214) 631-6400 (24 hours)
FAX: (214) 631-2322

El Paso - (Branch of Phoenix)

Cummins Southwest, Inc.
14333 Gateway West
El Paso, TX 79927
Telephone: (915) 852-4200
FAX: (915) 852-3295

Fort Worth Branch

Cummins Southern Plains, Inc.
3250 North Freeway
Fort Worth, TX 76111
Telephone: (817) 624-2107 (24 hours)
FAX: (817) 624-3296

Houston Branch

Cummins Southern Plains, Inc.
4750 Homestead Road
P.O. Box 1367
Houston, TX 77251-1367
Telephone: (713) 675-7421 (24 hours)
FAX: (713) 675-1515

Mesquite Branch

Cummins Southern Plains, Inc.
2615 Big Town Blvd.
Mesquite, TX 75150
Telephone: (214) 321-5555 (24 hours)
FAX: (214) 328-2732

Odessa Branch

Cummins Southern Plains, Inc.
1210 South Grandview
P.O. Box 633
Odessa, TX 79760-0633
Telephone: (915) 332-9121 (24 hours)
FAX: (915) 333-4655

San Antonio Branch

Cummins Southern Plains, Inc.
6226 Pan Am Expressway North
P.O. Box 18385
San Antonio, TX 78218-0385
Telephone: (512) 655-5420 (24 hours)
FAX: (512) 655-3865

Houston Onan Branch

Southern Plains Power
A Division of Cummins Southern Plains
1155 West Loop North
Houston, TX 77055
Telephone: (713) 956-0020
FAX: (713) 956-0266

Utah

Salt Lake City Distributor

Cummins Intermountain, Inc.
1030 South 300 West
Salt Lake City, UT 84101
Telephone: (801) 355-6500
FAX: (801) 524-1351

Vernal Branch

Cummins Intermountain, Inc.
1435 East 335 South
Vernal, UT 84078
Telephone: (435) 789-5732
FAX: (435) 789-2853

Virginia

Cloverdale - (Branch of Charlotte)

Cummins Atlantic, Inc.
263 Simmons Drive
Cloverdale, VA 24077
Telephone: (540) 966-3169
FAX: (540) 966-3749

Richmond - (Branch of Charlotte)

Cummins Atlantic, Inc.
3900 Deepwater Terminal Road
Richmond, VA 23234
Telephone: (804) 232-7891
FAX: (804) 232-7428

Tidewater - (Branch of Charlotte)

Cummins Atlantic, Inc.
Atlantic Power Generation
3729 Holland Blvd.
Chesapeake, VA 23323
Telephone: (757) 485-4848
FAX: (757) 485-5085

Washington

Seattle Distributor

Cummins Northwest, Inc.
811 S.W. Grady Way (98055-2944)
P.O. Box 9811
Renton, WA 98057-9811
Telephone: (425) 235-3400
FAX: (425) 235-8202

Chehalis Branch

Cummins Northwest, Inc.
926 N.W. Maryland
Chehalis, WA 98532-0339
Telephone: (360) 748-8841
FAX: (360) 748-8843

Spokane Branch

Cummins Northwest, Inc.
11134 W. Westbow Blvd.
Spokane, WA 99204
Telephone: (509) 455-4411
FAX: (509) 624-4681

Tacoma Branch

Cummins Northwest, Inc.
3701 Pacific Highway East
Tacoma, WA 98424-1135
Telephone: (253) 922-2191
FAX: (253) 922-2379

Yakima Branch

Cummins Northwest, Inc.
1905 East Central Avenue (98901-3609)
P.O. Box 9129
Yakima, WA 98909-0129
Telephone: (509) 248-9033
FAX: (509) 248-9035

West Virginia

Charleston - (Branch of Louisville)

Cummins Cumberland, Inc.
3100 MacCorkle Ave. SW
P.O. Box 8456
South Charleston, WV 25303
Telephone: (304) 744-6373
FAX: (304) 744-8605

Fairmont - (Branch of Louisville)

Cummins Cumberland, Inc.
South Fairmount Exit, I-79
145 Middletown Road
Fairmont, WV 26554
Telephone: (304) 367-0196
FAX: (304) 367-1077

Wisconsin

DePere Distributor

Cummins Great Lakes, Inc.
Corporate Office
875 Lawrence Drive
P.O. Box 5070
DePere, WI 54115-5070
Telephone: (920) 337-1991
FAX: (920) 337-9746

Chippewa Falls Branch

Cummins Great Lakes, Inc.
2030 St. Highway 53
Chippewa Falls, WI 54729
Telephone: (715) 720-0680
FAX: (715) 720-0685

DePere Branch

Cummins Great Lakes, Inc.
939 Lawrence Drive
P. O. Box 5070
DePere, WI 54115-5070
Telephone: (920) 336-9631
(800) 236-1191
FAX: (920) 336-8984

Milwaukee Branch

Cummins Great Lakes, Inc.
9401 South 13th Street
P.O. Box D
Oak Creek, WI 53154
Telephone: (414) 768-7400
(800) 472-8283
FAX: (414) 768-9441

Wausau Branch

Cummins Great Lakes, Inc.
4703 Rib Mountain Drive
Wausau, WI 54401
Telephone: (715) 359-6888
(800) 236-3744
FAX: (715) 359-3744

Wyoming

Gillette - (Branch of Denver)

Cummins Rocky Mountain, Inc.
2700 Hwy. 14 & 16 North
P.O. Box 1207 (82717)
Gillette, WY 82716
Telephone: (307) 682-9611
FAX: (307) 682-8242

Rock Springs - (Branch of Salt Lake City)

Cummins Intermountain, Inc.
2000 Foothill Blvd.
P.O. Box 1634
Rock Springs, WY 82901
Telephone: (307) 362-5168
FAX: (307) 362-5171

Distributors and Branches - Canada

Alberta

Edmonton Distributor and Branch

Cummins Alberta
11751 - 181 Street
Edmonton, AB T5S 2K5
Telephone: (780) 455-2151
FAX: (780) 454-9512

Calgary Branch

Cummins Alberta
4887 - 35th Street S.E.
Calgary, Alberta T2B 3H6, Canada
Telephone: (403) 569-1122
FAX: (403) 569-0027

Grande Prairie

Cummins Alberta - Grande Prairie
RR2, Site 9, Box 22
Sexsmith, AB CN T0H 3C0
Telephone: (780) 568-3359
FAX: (780) 568-2263

Hinton Branch

Cummins Alberta
135 Veats Avenue
Hinton, Alberta T7V 1S8, Canada
Telephone: (780) 865-5111
FAX: (780) 865-5714

Lethbridge Branch

Cummins Alberta
240 - 24th Street North
Lethbridge, Alberta T1H 3T8, Canada
Telephone: (403) 329-6144
FAX: (403) 320-5383

British Columbia

Vancouver Distributor

Cummins British Columbia
18452 - 96th Avenue
Surrey, B.C., Canada
V4N 3P8
Telephone: (604) 882-5000
FAX: (604) 882-5080

Kamloops Branch

Cummins British Columbia
976 Laval Crescent
Kamloops, B.C. Canada V2C 5P5
Telephone: (250) 828-2388
FAX: (250) 828-6713

Prince George Branch

Cummins British Columbia
102- 3851- 18th Avenue
Prince George, B.C. V2N 1B1
Telephone: (250) 564-9111
FAX: (250) 564-5853

Sparwood Branch

Cummins British Columbia
731 Douglas Fir Road
Sparwood, B.C. VOB 2G0, Canada
Telephone: (250) 425-0522
FAX: (250) 425-0323

Tumbler Ridge Branch

Cummins British Columbia
Industrial Site, Box 226
Tumbler Ridge, B.C.
Canada VOC 2W0
Telephone: (250) 242-4217
FAX: (250) 242-4906

Manitoba

Winnipeg Distributor

Cummins Mid-Canada Ltd.
489 Oak Point Road
P.O. Box 1860
Winnipeg, MB R3C 3R1, Canada
Telephone: (204) 632-5470
FAX: (204) 697-0267

New Brunswick

Fredericton - (Branch of Montreal)

Cummins Eastern Canada, Inc.
R.R.#1 Doak Road
P.O. Box 1178, Station 'A'
Fredericton,
New Brunswick E3B 4X2, Canada
Telephone: (506) 451-1929
FAX: (506) 451-1921

Newfoundland

St. John's - (Branch of Montreal)

Cummins Eastern Canada, Inc.
122 Clyde Avenue
Donovans Industrial Park
Mount Pearl, Newfoundland A1N 2C2
Canada
Telephone: (709) 747-0176
FAX: (709) 747-2283

Wabush - (Branch of Montreal)

Cummins Eastern Canada, Inc.
Wabush Industrial Park
Wabush, Newfoundland A0R 1B0
Telephone: (709) 282-3626
FAX: (709) 282-3108

Nova Scotia

Halifax - (Branch of Montreal)

Cummins Eastern Canada, Inc.
50 Simmonds Drive
Dartmouth, Nova Scotia B3B 1R3
Telephone: (902) 468-7938
FAX: (902) 468-5177
Parts: (902) 468-6560

Ontario

Toronto Distributor

Cummins Ontario, Inc.
7175 Pacific Circle
Mississauga, ON L5T 2A5
Telephone: (905) 795-0050
FAX: (905) 795-0021

Kenora - (Branch of Winnipeg)

Cummins Mid-Canada Ltd.
Highway 17 East
P.O. Box 8
Kenora, Ontario P9N 3X1
Telephone: (807) 548-1941
FAX: (807) 548-8302

Ottawa Branch

Cummins Ontario Inc.
3189 Swansea Crescent
Ottawa, Ontario K1G 3W5,
Telephone: (613) 736-1146
FAX: (613) 736-1202

Thunder Bay Branch

Cummins Ontario Inc.
1400 W. Walsh Street
Thunder Bay
Ontario P7E 4X4
Telephone: (807) 577-7561
FAX: (807) 577-1727

Whitby Branch

Cummins Ontario Inc.
1311 Hopkins Street
Whitby, Ontario L1N 2C2, Canada
Telephone: (905) 668-6886
FAX: (905) 668-1375

Quebec

Montreal Distributor

Cummins Eastern Canada, Inc.
7200 Trans Canada Highway
Pointe Claire, Quebec H9R 1C2,
Telephone: (514) 695-8410
FAX: (514) 695-8917

Montreal Branch

Cummins Eastern Canada, Inc.
7200 Trans Canada Highway
Pointe Claire, Quebec H9R 1C2,
Canada
Telephone: (514) 695-8410
Sales: (514) 695-4555
Parts: (514) 694-5880
FAX: (514) 695-8917

Dorval Onan Branch

Cummins, Eastern Canada, Inc.
580 Lepihe
Dorval, Quebec H9H 1G2
Telephone: (514) 631-5000
FAX: (514) 631-0104

Quebec City Branch

Cummins Diesel
Branch of Cummins Americas, Inc.
2575 Dalton Street
Ste. Foy, Quebec G1P 3S7
Telephone: (418) 653-6411
FAX: (418) 653-5844

Val D'Or Branch

Cummins, Eastern Canada, Inc.
1025 Rue Del
Val D'Or, Quebec 59P 4P6
Telephone: (819) 825-0993
FAX: (819) 825-8488

Saskatchewan

Lloydminster - (Branch of Winnipeg)

Cummins Mid-Canada Ltd.
4005 52nd
Lloydminster, SK S9V 0Y9
Telephone: (305) 825-2062
FAX: (305) 825-6702

Regina - (Branch of Winnipeg)

Cummins Mid-Canada Ltd.
110 Kress Street
P.O. Box 98
Regina, SK S4P 2Z5
Telephone: (306) 721-9710
FAX: (306) 721-2962

Saskatoon - (Branch of Winnipeg)

Cummins Mid-Canada, Ltd.
3001 Faithful Avenue
P.O. Box 7679
Saskatoon, SK S7K 4R4, Canada
Telephone: (306) 933-4022
FAX: (306) 242-1722

Distributors and Branches - Australia

Branches:

Gepps Cross

Cummins Engine Company, Pty. Ltd.
P.O. Box 108
Blair Athol, 5084
South Australia, Australia
Location:
45-49 Cavan Road
Gepps Cross, 5094
Telephone: (61-8) 8262-5211

Dosra

Cummins Engine Company, Pty. Ltd.
P.O. Box 124
Darra, 4076
Queensland, Australia
Location:
33 Kimberley Street
Darra, 4076, Australia
Telephone: (61-7) 3375-3277

Bunbury

Cummins Engine Company, Pty. Ltd.
P.O. Box 1751
Bunbury, WA 6230
Australia
Location:
11 Dryanda Court
Picton, WA 6230
Telephone: (61-8) 9725-6777
FAX: (61-8) 9725-6444

Cairns

Cummins Engine Company, Pty. Ltd.
P.O. Box 7189
Cairns Mail Centre, 4870
Queensland, Australia
Location:
Liberty Street
Cairns, 4870
Telephone: (61-7) 935-2999

Campbellfield

Cummins Engine Company, Pty. Ltd.
Private Bag 9
Campbellfield, 3061
Victoria, Australia
Location:
1788-1800 Hume Highway
Campbellfield, 3061
Telephone: (613) 9357-9200

Dandenong

Cummins Engine Company, Pty. Ltd.
Lot 7 Greens Road
Dandenong, 3175
Victoria, Australia
Telephone: (613) 9706-8088

Darwin

Cummins Engine Company, Pty. Ltd.
P.O. Box 37587
Winnellie, 0821
Northern Territory, Australia
Location:
Lot 1758 Graffin Crescent
Winnellie, 0821
Telephone: (61-8) 8947-0766

Devonport

Cummins Engine Company, Pty. Ltd.
P.O. Box 72E
Tasmania, Australia
Location:
2 Matthews Way
Devonport, 7310
Telephone: (61-3) 6424-8800

Emerald

Cummins Engine Company, Pty. Ltd.
P.O. Box 668
Emerald, 4720
Queensland, Australia
Location:
Capricorn Highway
Emerald, 4720
Telephone: (61-7) 4982-4022

Grafton

Cummins Engine Company, Pty. Ltd.
P.O. Box 18
South Grafton, 2461
New South Wales, Australia
Location:
18-20 Induna Street
South Grafton, 2461
Telephone: (61-2) 6642-3655

Hexham

Cummins Engine Company, Pty. Ltd.
21 Galleghan Street
Hexham
New South Wales, Australia
Telephone: (61-2) 4964-8466
FAX: (61-2) 4964-8616

Kalgoorlie

Cummins Engine Company, Pty. Ltd.
P.O. Box 706
Kalgoorlie, 6430
Western Australia, Australia
Location:
16 Albara Street
Kalgoorlie, 6430
Telephone: (61-8) 9021-2588

Karratha

Cummins Engine Company, Pty. Ltd.
P.O. Box 377
Karratha, WA 6714
Australia
Location:
1490 Lambert Road
Karratha, WA 6714
Australia
Telephone: (61-8) 9144-4646
FAX: (61-8) 9143-1507

Laverton

Cummins Engine Company, Pty. Ltd.
Locked Bag 1
Laverton, Victoria 3028
Australia
Location:
195 Boundary Road
Laverton North, Victoria 3028
Australia
Telephone: (61-3) 9360-0800
FAX: (61-3) 9360-0438

Leeton

Cummins Engine Company, Pty. Ltd.
P.O. Box 775
Leeton, NSW 2705
Australia
Location:
29 Brady Way
Leeton, NSW 2705
Australia
Telephone: (61-2) 6953-3077
FAX: (61-2) 6953-3109

Mackay

Cummins Engine Company, Pty. Ltd.
P.O. Box 842
Mackay, 4740
Queensland, Australia
Location:
4 Presto Avenue
Mackay, 4746
Telephone: (61-7) 4955-1222

Mount Gambier

Cummins Engine Company, Pty. Ltd.
P.O. Box 2219
Mount Gambier, 5290
South Australia, Australia
Location:
2 Avey Road
Mount Gambier, 5290
Telephone: (61-87) 25-6422

Penrith

Cummins Engine Company, Pty. Ltd.
P.O. Box 132
Cambridge Park, 2747
New South Wales, Australia
Location:
7 Andrews Road
Penrith, 2750
Telephone: (61-2) 4729-1313

Queanbeyan

Cummins Engine Company, Pty. Ltd.
P.O. Box 527
Queanbeyan, 2620
New South Wales, Australia
Location:
15-27 Bayldon Road
Queanbeyan, 2620
Telephone: (61-2) 6297-3433
FAX: (61-2) 6297-6709

Regency Park

Cummins Engine Company, Pty. Ltd.
P.O. Box 2147
Regency Park, SA 5942
Australia
Location:
11 Manton Street
Hindmarsh, SA 5942
Australia
Telephone: (61-8) 8346-3832
FAX: (61-8) 8340-2045

Wodonga

Cummins Engine Company, Pty. Ltd.
P.O. Box 174
Wodonga, 3690
Victoria, Australia
Location:
9-11 McKoy Street
Wodonga, 3690
Telephone: (61-2) 6024-3655

Swan Hill

Cummins Engine Company, Pty. Ltd.
P.O. Box 1264
Swan Hill, 3585
Victoria, Australia
Location:
5 McAllister Road
Swan Hill, 3585
Telephone: (61-3) 5032-1511

Tamworth

Cummins Engine Company, Pty. Ltd.
P.O. Box 677
Tamworth, 2320
New South Wales, Australia
Location:
Lot 65 Gunnedah Road
Tamworth, 2340
Telephone: (61-2) 6765-5455

Townsville

Cummins Engine Company, Pty. Ltd.
P.O. Box 7339
Garbutt Business Centre, QLD4814
Australia
Location:
704-710 Ingham Road
Townsville, QLD 4814
Telephone: (61-7) 4774-7733
FAX: (61-7) 4774-7640

Welshpool

Cummins Engine Company, Pty. Ltd.
P. O. Box 52
Welshpool, 6986
Western Australia, Australia
Location:
50 Kewdale Road
Welshpool, 6106
Telephone: (61-8) 9458-5911

Wetherill Park

Cummins Engine Company, Pty. Ltd.
Private Bag 150
Wetherill Park, NSW 2164
Australia
Location:
492-494 Victoria Street
Wetherill Park, NSW 2164
Australia
Telephone: (61-2) 9616-5300
FAX: (61-2) 9616-5399

Distributors and Branches - New Zealand

Auckland

Cummins Diesel Sales & Service (NZ)
Ltd.
Private Bag 92804
Penrose, Auckland, New Zealand
Location:
440 Church Street
Penrose
Telephone: (64-9) 579-0085

Branches:

Auckland

Cummins Diesel Engines
Private Bag 92804
Penrose, Auckland, New Zealand
Location:
440 Church Street
Penrose
Telephone: (64-9) 579-0085

Christchurch

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

Mt. Maunganui

Cummins Diesel Engines
P.O. Box 4005
Mt. Maunganui, New Zealand
Location:
101 Totara Street
Mt. Maunganui
Telephone: (64-7) 575-0545

Palmerston North

Cummins Diesel Engines
P.O. Box 9024
Palmerston North, New Zealand
Location:
852-860 Tremain Avenue
Telephone: (64-6) 356-2209

Distributors - International

ABU DHABI

- See United Arab Emirates

AFGHANISTAN

- See Middle East Regional Office

ALBANIA

- See Germany Regional Office -
Gross-Gerau

ALGERIA

Algiers

Cummins Corporation
Bureau de Liaison
38, Lotissement Benachour Abdelkader
Cheraga
43200 Wilaya de Tipasa
Algeria
Telephone: (213) 237-43-26

AMERICAN SAMOA

- See South Pacific Regional Office

ANDORRA

- See European Regional Office -
Mechelen

ANTIGUA

Miami (Office In U.S.A.)
Cummins Southeastern Power, Inc.
9900 N.W. 77 Court
Hialeah Gardens, FL 33016
Telephone: (305) 821-4200

ARGENTINA

Buenos Aires

Distribuidora Cummins, S.A.
(DICUMAR)
Av. Del Libertador 602 Piso 5
Buenos Aires, Argentina
Telephone: (54-1)814-1895/1395/1393

ARUBA, ISLAND OF

- See Netherlands Antilles

AUSTRIA

Neudoerfl

Cummins Diesel Motorenvertriebsges
m.b.H. Trenner & Co.
Bickfordstr. 25
A-7201 Neudoerfl
Austria
Telephone: (43-2622) 77418/77625

BAHAMAS

Miami (Office in U.S.A.)

Cummins Southeastern Power, Inc.
9900 N.W. 77 Court
Hialeah Gardens, FL 33016
Telephone: (305) 821-4200

BAHRAIN

Bahrain

Yusuf Bin Ahmed Kanoo W.L.L.
P.O. Box 45, Manama
Bahrain
Telephone: (973) 400414/400506

BALEARIC ISLANDS

Madrid (Office in Spain)

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

BANGLADESH

Dhaka

Equipment & Engineering Co., Ltd.
G.P.O. Box 2339
Dhaka 1000, Bangladesh
Location:
56, Dilkusha Commercial Area
2nd Floor/Eastern Block
Telephone: (880-2) 234357, 234060

BARBADOS

Miami (Office in U.S.A.)

Cummins Southeastern Power, Inc.
9900 N.W. 77 Court
Hialeah Gardens, FL 33016
Telephone: (305) 821-4200

BELGIUM

Brussels

Cummins Distributor
Belgium S.A.
623/629 Chaussee de Haecht
B-1030 Brussels, Belgium
Telephone: (24 hr.)
(32-2) 216-81-10

BELIZE

Tampa (Office in U.S.A.)

Cummins Southeastern Power, Inc.
5421 N. 59th Street
Tampa, FL 33610
Telephone: (813) 621-7202

BENIN

- See Togo

BERMUDA

Bronx (Office in U.S.A.)

Cummins Metropower, Inc.
890 Zerega Avenue
Bronx, NY 10473
Telephone: (718) 892-2400

BHUTAN

Pune (Office in India)

Cummins Diesel Sales &
Service (India) Ltd.
35A/1/2, Erandawana
Pune - 411 038, India
(State of Maharashtra) India
Telephone: (91-212) 331234/331554/
331635/330066/
330166/330356/
31703

BOLIVIA

La Paz

Machinery & Auto Service
Casilla 4042
La Paz, Bolivia
Location:
Av. 20 de Octubre Esq.
Rosendo Gutierrez
Telephone: (591-2) 379650, 366394

BONAIRE, ISLAND OF

- See Netherlands Antilles

BOTSWANA

- See East and Southern Africa Re-
gional Office - Harare

BRAZIL

Ananindeua

Marcos Marcelino & Companhia
Ltda.
Rodovia BR-316, Km 9
67020-010 Ananindeua, Para,
Brazil
Telephone: (55-91) 235-4100/4132/
4143/4012

Belo Horizonte

Distribuidora Cummins
Minas S.A.
31950-640 Olhos D'Agua Norte
Belo Horizonte, MG
Brazil
Telephone: (55-31) 288-1344

Campo Grande

Distribuidora Cummins
Mato Grosso Ltda.
Rodovia BR 163 Km 01
79060-000 Campo Grande
Mato Grosso do Sul, Brazil
Telephone: (55-67) 787-1166

Curitiba

Distribuidora Cummins Parana S.A.
Rua Brasilio Itibere, 2195
80230 Curitiba, Parana
Brazil
Telephone: (55-41) 222-4036

Fortaleza

Distribuidora Cummins Diesel
Do Nordeste Ltda.
Av. da Abolicao, 3882,
Mucuripe
60165-081 Fortaleza, Ceara
Brazil
Telephone: (55-85) 263-1212

Goianian

Distribuidora de Motores Cummins
Centro Oeste Ltda.
Av. Caiapo 777 - Setor Sta. Genoveva
74672-400 Goiania, Goias
Brazil
Telephone: (55-62) 207-1010

Manaus

Distribuidora Cummins
Amazonas Ltda.
Estrada da Ponta Negra, 6080 - Sao
Jorge
69037 Manaus, Amazonas,
Brazil
Telephone: (55-92) 656-5444

Porto Alegre

Distribuidora Cummins
Meridional S.A.
Rua Dona Alzira, 98, Sarandi
91110-010 Porto Alegre,
Rio Grande do Sul, Brazil
Telephone: (55-51) 340-8222

Rio de Janeiro

Distribuidora Cummins
Leste Ltda.
Rua Sariema, 138-Olaria
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Rio de Janeiro, Brazil
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Sao Paulo

Companhia Distribuidora
de Motores Cummins
Rua Martin Burchard, 291 - Bras
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Sao Paulo, Brazil
Telephone: (55-11) 270-2311

BRITISH VIRGIN ISLANDS

- See Puerto Rico

BRUNEI

- See Malaysia

BURKINA - FASO

- See North/West Africa Regional
Office - Daventry

BULGARIA

- See Germany Regional Office - Gross-
Gerau

BURMA

Kuala Lumpur (Office In Malaysia)

Contact: Scott &
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50710 Kuala Lumpur
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16 Jalan Chan Sow Lin
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West Malaysia
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BURUNDI

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Bia, S.A.
Rameistraat, 123
B-3090 - Overijse, Belgium
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CAMBODIA

- See South & East Asia Regional Office
- Singapore

CANARY ISLANDS

Madrid (Office in Spain)

Cummins Ventas y
Servicio, S.A.
Torrelauna, 56
28027 Madrid, Spain
Telephone: (34-91) 3672000/3672404

CAPE VERDE

- See North/West Africa Regional Office
- Daventry

CENTRAL AFRICAN REPUBLIC

- See North/West Africa Regional Office
- Daventry

CEYLON

- See Sri Lanka

CHAD

- See North/West Africa Regional Office
- Daventry

CHILE

Santiago

Distribuidora Cummins Diesel
S.A.C.I.
Casilla Postal 1230
Calle Bulnes 1203
Santiago, Chile
Corporate Office:
Av. Providencia 2653, Office 1901
Santiago, Chile
Telephone: (56-2) 698-2113/4/5,
697-3566/7/8,
697-2709

CHINA, PEOPLE'S REPUBLIC

- See China Regional Office - Beijing

COLOMBIA

Barranquilla

Cummins de Colombia S.A.
Apartado Aereo 5347
Barranquilla, Colombia
Location: Calle 30, No. 19 - 21
Telephone: (57-58) 40-02-06/40-13-46

Bogota

Cummins Colombiana Ltda.
Apartado Aereo No. 7431
Bogota, D.E. Colombia
Location:
Av. Americas X Carrera
42C No. 19-45
Telephone: (57-1) 244-5688/5882

Bucaramanga

Cummins API, Ltda.
Apartado Aereo 352
Bucaramanga, Colombia
Location:
Autopista a Giron, Km 7
Telephone: (57-76) 468060

Cali

Distribuidora Cummins del Valle, Ltda.
Apartado Aereo No. 6398
Cali, Colombia
Location:
Av. 3a. # 39-35 - Vipasa
Telephone: (57-3) 65-4343

Medellin

Equipos Tecnicos Ltda.
Apartado Aereo No. 2046
Medellin, Colombia
Location: Carrera 52 No. 10-184
Telephone: (57-4) 255-4200

Pereira

Equipos Tecnicos Ltda. C.Q.R.
Apartado Aereo No. 1240
Pereira, Colombia
Location: Carrera 8a. No. 45-39
Telephone: (57-63) 366341

COMOROS

- See East and Southern Africa Re-
gional Office - Harare

CONGO, PEOPLE'S REPUBLIC

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

CORSICA

- See France

COSTA RICA

San Jose

Servicios Unidos, S.A.
P.O. Box 559
San Jose, Costa Rica
Location:
100 metros al este de
Excelsior Antiguo
Curridabat, San Jose
Telephone Office: (506) 53-93-93
Telephone Service Shop:
(506) 26-00-76

CUBA

Miami (Office in U.S.A.)

Cummins Southeastern Power, Inc.
9900 N.W. 77 Court
Hialeah Gardens, FL 33016
Telephone: (305) 821-4200

CYPRUS

Nicosia

Alexander Dimitriou & Sons Ltd.
P.O. Box 1932
Nicosia, Cyprus
Location:
4 Salamis Avenue
Telephone: (357-2) 349450

CZECH REPUBLIC

- See European Regional Office -
Mechelen

DENMARK

Glostrup

Preben Lange Industrimaskiner A/S
Post Box 166
2605 Broendby, Denmark
Location:
Midtager 22
Telephone: (45-43) 96-21-61

DJIBOUTI

- See Middle East Regional Office -
Daventry

DOMINICA

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Cummins Southeastern Power, Inc.
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Hialeah Gardens, FL 33016
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DOMINICAN REPUBLIC

Santo Domingo

Argico C. Por A.
P.O. Box 292-2 Feria
Santo Domingo
Dominican Republic, ZP-6
Location:
Calle Jose A. Soler
No. 3, ESQ.
Avenida Lope de Vega
Telephone: (809) 562-6281

DUBAI

- See United Arab Emirates

ECUADOR

Guayaquil

Motores Cummins (MOTCUM) S.A.
P.O. Box 1062
Guayaquil, Ecuador
Location:
Avenida Carlos Julio
Arosemena Km. 4
Telephone: (593-4) 203995/201177

Quito

Rectificadora Botar S.A.
P.O. Box 17-01-3344
Quito, Ecuador
Location:
Av. 10 de Agosto No. 5980
Telephone: (593-2) 465-176/177/
178/195/197

EGYPT

Cairo

ADAT
P.O. Box 1572
Cairo, Egypt
Sales and Service Location:
25, Pyramid Road
Giza, Cairo, Egypt
Telephone: (20-2) 384-6607/384-6609
385-4001/2/4/5/6/8/9

EL SALVADOR

San Salvador

Salvador Machinery
Company, S.A. de C.V.
P.O. Box 125
San Salvador, El Salvador
Location:
Blvd. Ejercito Nacional
Telephone: (503) 711022, 228388

ENGLAND

- See United Kingdom

EQUATORIAL GUINEA

- See North/West Africa Regional Office
- Daventry

ESTONIA

- See Moscow Regional Office - Moscow

FAROE ISLANDS

Wellingborough (Office in United Kingdom)

Cummins Diesel
Denington Industrial Estate
Wellingborough
Northants NN8 2QH,
England
Telephone: (44-933) 276231

FERNANDO PO

- See Spain

FIJI

- See Cummins Diesel Sales & Service
New Zealand Ltd.

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Machinery OY
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SF 00511 Helsinki, Finland
Location:
Teollisuuskatu 29
Telephone: Int: (358-9) 77221

FRANCE

Lyon

Cummins Diesel
Sales Corporation
39, rue Ampere Z.I.
69680 Chassieu, France
Telephone: (33) 72-22-92-72
Parts and Service Telephone:
(33) 72-22-92-69

GABON

- See North/West Africa Regional Office
- Daventry

GAMBIA

Senegal (Matforce)

GEORGIA

- See Moscow Regional Office - Moscow

GERMANY

Gross-Gerau

Cummins Diesel Deutschland GmbH
P.O. Box 1134
D-6080 Gross-Gerau,
Germany
Location: Odenwaldstr. 23
Telephone: (49-6152) 174-0

GHANA

Accra

Leyland DAF (Ghana) Ltd.
P.O. Box 2969
Accra, Ghana
Location:
39/40 Ring Road South
Industrial Estate
Telephone: (233-21) 22-88-06

GREECE

Athens

Eliopoulos Brothers Ltd.
P.O.B. 51528
14 Km. National Rd.
Athens-Lamia
14510 Kifissia, Greece
Telephone: (30-1) 6202401/6202066/
6201955

GREENLAND

- See Denmark

GRENADA

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GUADELOUPE

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GUAM

Barrigada

Mid-Pac Far East, Inc.
Airport Industrial Park
825 Tiyan Parkway
Barrigada, Guam 96921
Telephone: (671) 632-5160

GUATEMALA

Guatemala City

Maquinaria y Equipos, S.A.
P.O. Box 2304
Guatemala City, Guatemala
Location:
Carretera Amatitlan
Km 12 zona 12
Telephone: (502-2) 773334/7/9

GUINEA BISSAU

- See North/West Africa Regional Office
- Daventry

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HAITI

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HOLLAND

- See Netherlands

HONDURAS

Tegucigalpa

Comercial Laeis
Honduras, S.A.
P.O. Box 1022
Tegucigalpa, D.C., Honduras
Location:

Zona La Burrera,
Blvd. Toncontin
Frente a Gasolinera Esso.
Telephone: (504) 333570/335615

HONG KONG

Kowloon

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

INDIA

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Cummins Diesel Sales &
Service (India) Ltd.
35A/1/2, Erandawana
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India
Telephone: (91-212) 331234, 331554,
331635, 330066,
330166, 330356,
331703

Bombay

Cummins Diesel Sales &
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Bombay 400001, India
Telephone: (91-22) 2863566/2862247

Calcutta

Cummins Diesel Sales &
Service (I) Ltd.
94, Tivoli Court, I/C Ballygunge
Circular Road
Calcutta 700 019 (West Bengal), India
Telephone: (91-33) 2478065/2470481/
2470774

New Delhi

Cummins Diesel Sales &
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94 Nehru Place
New Delhi 110 019, India
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6452817

Raipur

Cummins Diesel Sales &
Service (I) Ltd.
Plot No. 15, Jalashay Marg
Choube Colony
Raipur 492 001 (Madhya Pradesh),
India
Telephone: (91-771) 24994/23157/29498

Ranchi

Cummins Diesel Sales &
Service (I) Ltd.
'Shanti Kunj' C-202, Vidyalaya Marg
Road No. 1, Ashoknagar
Ranchi 834 002 (Bihar)
India
Telephone: (91-651) 301948/303623

INDONESIA

Jakarta

P.T. Alltrak 1978
P.O. Box 64/KBYL
Jakarta Selatan 12330, Indonesia
Location:
J1. R.S.C. Veteran No. 4
Bintaro, Rempoa
Telephone: (62-21) 736-1978/736-3302

IRAN

Tehran

Technical Service Development
Company
P.O. Box 13445/741
No. 152 Sohravardi Crossing
Dr. Beheshti Avenue
Tehran, Iran
Telephone:
Head Office: (98-21) 846666, 851021-7
Work Shop: (98-21) 995021-2/993240

IRAQ

- See Middle East Regional Office -
Daventry

IRELAND

Wellingborough (Office in England)

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Northants NN8 2QH, England
Telephone: (44-933) 276231

ISRAEL

Tel Aviv

Israel Engines &
Trailers Co. Ltd.
Levinson Brothers Engineers
P. O. Box 390
33 Hahashmal Street
Tel Aviv, Israel 61003
Telephone: (972-3) 5607671

ITALY

Milan

Cummins Diesel Italia S.p.A.
Piazza Locatelli, 8
Zona Industriale Sesto Ulteriano
20098 S. Giuliano
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Telephone: (39-2) 9828-1235/6/7

IVORY COAST

- See Cote d' Ivoire

JAMAICA

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JAPAN

Tokyo

Cummins Diesel (Japan) Ltd.
1-12-10-Shintomi
Chuo-ku, Tokyo 104
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JORDAN

Amman

S.E.T.I. Jordan Limited
P.O. Box 8053
Amman, Jordan
Telephone: (962-6) 621867/621884

KENYA

Nairobi

Werrot & Company Limited
P.O. Box 41216
Nairobi, Kenya
Location:
Lusaka Road
Telephone: (254-150) 20316

KOREA, SOUTH

Seoul

Hwa Chang Trading Co., Ltd.
Central P.O. Box No. 216
Seoul, South Korea
Location:
143-11 Doksan-dong, Kuro-ku
Telephone: (82-2) 854-0071/2/3/4/5,
869-1411/2/3

KUWAIT

Kuwait

General Transportation &
Equipment Co.
(Sales Department)
P.O. Box 1096
13011 Safat, Kuwait
Location:
Shuwaikh Behind
Canada Dry Factory
Telephone: (965) 4833380/1/2

Kuwait

General Transportation &
Equipment Co.
(Service Department)
East Ahmadi Area
13011 Safat, Kuwait
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LAOS

- See South and East Asia Regional Of-
fice - Singapore

LATVIA

- See Moscow Regional Office - Moscow

LEBANON

Beirut

S.E.T.I. Charles Keller
S.A.L.
B.P. 16-6726
Beirut, Lebanon
Location:
Corniche du Fleuve
Telephone: (961-1) 425040/41

LESOTHO

- See South Africa

LIBYA

- See North/West Africa Regional Office
- Davenport

LIECHTENSTEIN

- See Switzerland

LUXEMBOURG

Gross-Gerau (Office in Germany)

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Telephone: (49-6152) 174-0

MACAU

- See Hong Kong

MADAGASCAR

- See East and Southern Africa Re-
gional Office - Harare

MADEIRA ISLANDS

- See Portugal

MALAYSIA

Kuala Lumpur

Cummins Diesel Sales & Service
Div. of Scott & English
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50710 Kuala Lumpur, West Malaysia
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16 Jalan Chan Sow Lin
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Telephone: (60-3) 2211033

MALI

- See Senegal (Matforce)

MALTA

Valletta

Plant & Equipment Ltd.
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23-16-23, 24-75-17

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MEXICO

Guadalajara

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Lazaro Cardenas No. 2950
Fracc. Alamo Industrial
45560 Guadalajara, Jal. Mexico
Telephone: (52-3) 670-93-06, 670-53-38,
670-63-61, 670-62-33

Monterrey

Tecnica Automotriz, S.A.
Av. Alfonso Royes
No. 3637 Nte.
Monterrey, Nuevo Leon, Mexico
Telephone: (52-83) 51-41-51, 51-46-56

Merida

Cummins Del Sureste, S.A. de C.V.
Av. Aviacion Civil No. 647
Esquina Calle 100
Col. Sambula
97259 Merida, Yucatan, Mexico
Telephone: (52-99) 24-11-55, 24-00-15

Puebla

Cummins de Oriente, S.A. de C.V.
Av. Reforma No. 2112,
Puebla, Pue. Mexico
Telephone: (52-22) 48-76-74, 48-76-75

Queretaro

Distribuidor Cummins Del Centro, S.A.
de C.V.
Blvd. Bernardo Quintana No. 518
Col. Arboledas
C.P. 76140 Queretaro, Qro., Mexico
Telephone: (52-42) 12-41-90, 12-58-90,
12-62-94, 14-04-16,
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Tlalnepantla

Distribuidor Cummins
Metropolitana, S.A. DE C.V.
Sor Juana Ines de la Cruz No. 555
54000 Tlalnepantla, Edo. de Mexico,
Mexico
Telephone: (52-5) 327-38-00, 390-64-37,
390-12-27

MOROCCO

Casablanca

Societe Auto-Hall, S.A.
44 Avenue Lalla Yacout
Casablanca, Morocco
Telephone: (212) 31-84-60, 31-70-52,
31-90-56, 31-70-44

MOZAMBIQUE

- See East and Southern Africa Regional Office - Harare

NAMIBIA (Southwest Africa)

Windhoek

Propower, Namibia
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Namibia (Southwest Africa)
Location:
7 Nasmyth Street
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NETHERLANDS

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Cummins Diesel Sales &
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3316 GH Dordrecht
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NETHERLANDS ANTILLES

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NEW CALEDONIA

- See South Pacific Regional Office -
Melbourne

NEW GUINEA

- See Papua New Guinea

NICARAGUA

Managua

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Apartado Postal No. 46
Managua, Nicaragua
Location:
6a. Calle
30 y 31 Avs. N.O., Zona 5
Telephone: (505-2) 660616

NIGERIA

Lagos

SCOATRAC MOSEL
P.M.B. 21108
Ikeja, Lagos
Nigeria
Location:
Apapa-Oshodi Expressway
Isolo Industrial Estate,
Isolo
Telephone: (234-1) 52-15-39, 52-19-31,
52-46-70

Paris (Office in France)

SCOATRAC MOSEL
c/o SCOA
9 et 11 rue Robert de Flers
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France
Telephone: (33-1) 40-58-48-48

NORTHERN IRELAND

- See United Kingdom

NORWAY

Oslo

Cummins Diesel Salg & Service A/S
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Location:
Verkseler Furulunds vei 11
Telephone: (47) 22326110

OMAN

Ruwi

Universal Engineering
Services L.L.C.
P.O. Box 5688
Ruwi
Sultanate of Oman
Telephone: (968) 590830, 591304

PAKISTAN

Karachi

- See Middle East Regional Office -
Daventry

PANAMA

Panama City

Grupo Tiesa, S.A.
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Partillo, Panama
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PAPUA NEW GUINEA

Sydney (Office in Australia)

Cummins Diesel Sales & Service
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Cabramatta, 2166
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PARAGUAY

Asuncion

Automotores y Maquinaria,
S.R.L.
Yegros y Fulgencio R. Moreno
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Asuncion, Paraguay
Telephone: (595-21) 493111, 493115

PERU

Lima

Comercial Diesel
del Peru S.A.
P.O. Box 14-0234
Lima, Peru
Location:
Ave. V.R. Haya
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Lima 3, Peru
Telephone: (51-14) 74-3173/4374/
3144/2281

PHILIPPINES

EDSA

Power Systems, Inc. EDSA
P.O. Box 3241
Manila
Philippines 1501
Location:
79E. Delos Santos Ave.
Mandaluyong, Metro Manila
Telephone: (63-2) 791769, 791771,
5311945, 5315448,
5311934, 5312531,
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POLAND

- See Germany Regional Office - Gross-
Gerau

PORTUGAL

Lisbon

Electro Central
Vulcanizadora, Lda.
P.O. Box 3077
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Location:
Rua Conselheiro
Martins de Carvalho
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1400 Lisboa (Restelo)
Telephone: (351-1) 3015361

QATAR

Doha

Jaidah Motors & Trading Co.
P.O. Box 150
Doha, Qatar (Arabian Gulf)
Telephone: (974) 810000

REUNION

- See Lyon Regional Office - Lyon

RIO DE ORO

- See Spain

ROMANIA

- See Germany Regional Office - Gross-Gerau

RUSSIA

- See Moscow Regional Office - Moscow

RWANDA

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SAN MARINO

- See Italy

SAO TOME AND PRINCIPE

- See North/West Africa Regional Office
- Daventry

SAUDI ARABIA

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P.O. Box 5111
Dammam 31422, Saudi Arabia
Telephone: (966-3) 842-1216

SCOTLAND

- See United Kingdom

SENEGAL

Dakar
Matforce
B.P. 397
Dakar, Senegal
Location:
10 Avenue Faidherbe
Telephone: (221) 22-30-40

SEYCHELLES

- See East/Southern Africa Regional Office - Harare

SIERRA LEONE

- See North/West Africa Regional Office
- Daventry

SINGAPORE

Singapore

Applied Diesel Sales & Service Pte Ltd
8 Tanjong Penjuru
Jurong Industrial Estate
Singapore 2260
Telephone: (65) 261-3555

SLOVAKIA

- See European Regional Office - Mechelen

SOLOMON ISLANDS

- See South Pacific Regional Office - Melbourne

SOMALIA

- See East and Southern Africa Regional Office - Harare

SOUTH AFRICA

Johannesburg

Propower Pty. Ltd.
Private Bag X4
Wendywood 2144
South Africa
Location:
13 Eastern Service Road
Kelvin 2054
Telephone: (27-11) 444-3225

SOUTHWEST AFRICA

- See Namibia

SPAIN

Madrid

Cummins Ventas y
Servicio S.A.
Torrelaguna, 56
28027 Madrid, Spain
Telephone: (34-91) 367-2000/3672404

SPANISH GUINEA

- See Spain

SRI LANKA

Colombo

Trade Promoters Ltd
P.O. Box 321
69, Walukarama Road
Colombo 3
Sri Lanka
Telephone: (94-1) 573927, 574651,
575005

SUDAN

Khartoum

Bittar Engineering Ltd.
P.O. Box 1011
Gamhouria Street
Khartoum, Sudan
Telephone: (249-11) 70952, 71245,
70306

SURINAM

Miami (Office in U.S.A.)

Cummins Southeastern Power, Inc.
9900 N.W. 77 Court
Hialeah Gardens, FL 33016
Telephone: (305) 821-4200

SWAZILAND

- See South Africa

SWEDEN

Stockholm

SMA Maskin AB
Aggelundavagen 7
S-17562 Jarfalla
Sweden
Telephone: (46-8) 621-25-00

SWITZERLAND

Regensdorf

Robert Aebi AG
Riedthofstrasse 100
8105 Regensdorf
Switzerland
Telephone: (41-1) 842-5111

SYRIA

Damascus

Puzant Yacoubian & Sons
P.O. Box 3617
Damascus, Syria
Location:
Abou Baker El Saddik Street
Kafar Sousse Square
Telephone: (963-11) 231547/8/9

TAHITI, ISLAND OF

- See French Polynesia

TAIWAN

Taipei

Cummins Corporation - Taiwan Branch
12th Floor, No. 149
Min-Sheng E. Road, Sec. 2
Taipei, Taiwan
Telephone: (886-2) 515-0891

TANZANIA

Dar es Salaam

Riddoch Motors 1987 Ltd
P.O. Box 40040
Dar es Salaam
Tanzania
Location:
92 Kipawa-Pugu Road
Dar es Salaam
Telephone: (255-51) 44493, 41140

THAILAND

Bangkok

Diethelm & Company Ltd.
1696 New Petchburi Road
Bangkok 10310, Thailand
Telephone: (66-2) 254-4900

TOGO (and BENIN)

Lome
Togomat
B.P. 1641
Lome, Togo
Location:
Zone Industrielle CNPPME
Telephone: (228) 21-23-95

TONGA, ISLAND OF

- See South Pacific Regional Office -
Melbourne

TRINIDAD and TOBAGO

Miami (Office in U.S.A.)
Cummins Southeastern Power Inc.
9900 N.W. 77 Court
Hialeah Gardens, FL 33016
Telephone: (305) 821-4200

TURKEY

Istanbul
Hamamcioglu Muesseseleri
Ticaret T.A.S.
P.K. 136
80222 Sisli
Istanbul, Turkey
Location:
Buyukdere Caddesi, 13/A
80260 Sisli
Istanbul, Turkey
Telephone: (90-1) 231-3406; 234-5123

UKRAINA

- See Moscow Regional Office - Moscow

UNITED ARAB EMIRATES

Abu Dhabi
Technical Oilfield Supplies Centre
P.O. Box 2647
Abu Dhabi,
United Arab Emirates
Telephone: (971-2) 723863, 723298

UNITED KINGDOM

Wellingborough
Cummins Diesel
Denington Estate
Wellingborough
Northants NN8 2QH, England
Telephone: (44-933) 276231

UPPER VOLTA

- See Burkina - Faso

URUGUAY

Montevideo
Santaro S.A.
P.O. Box 379
Montevideo
Uruguay
Location:
Avenida Millan No. 2441
Telephone: (598-2) 293908

U.S.S.R.

- See Moscow Regional Office - Moscow

VATICAN CITY

- See Italy

VENEZUELA

Caracas
Sudimat
Apartado Postal 1322
Carmelitas
Caracas 1010
Venezuela
Location:
Final Avenida San Martin
Urb. la Quebradita
Caracas 1061
Telephone: (58-2) 442-6161/2647

VIETNAM

Hanoi
Diethelm & Co. Ltd. Engineering
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8 Trang Thi Street
Hanoi, Vietnam
Telephone: (84-4) 260-332, 244-394

Ho Chi Minh City

Diethelm & Co. Ltd. Engineering
3rd Floor, IBC Building
1 Me Linh Square
District 1
Ho Chi Minh City, Vietnam
Telephone: (84-8) 294-102, 294-103

WESTERN SAMOA

- See South Pacific Regional Office -
Melbourne

YEMEN ARAB REPUBLIC

Sana'a
Zubieri Trading Co.
P.O. Box 535
Sana'a, Yemen Arab Republic
Location:
Zubieri Street
Telephone: (967-1) 244400/79149

YEMEN, SOUTH

- See Middle East Regional Office -
Daventry

YUGOSLAVIA

- See Southeastern Europe

ZAIRE

Brussels (Office in Belgium)

N.V. Bia, S.A.
Rameistraat, 123
B-3090 - Overijse, Belgium
Telephone: (32-2) 689-28-11

ZAMBIA

Ndola
N.E.I. (Zambia) Ltd.
P.O. Box 71501
Ndola, Zambia
Telephone: (260-2) 610729

ZIMBABWE

Harare
Cummins Zimbabwe (Pvt) Ltd.
P.O. Box ST363
Southerton
Harare, Zimbabwe
Location:
72 Birmingham Road
Southerton, Harare
Telephones: (263-4) 67645, 69220

Section TS - Troubleshooting Symptoms

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Troubleshooting Procedures and Techniques

General Information

A thorough analysis of the customer's complaint is the key to successful troubleshooting. The more information known about a complaint, the faster and easier the problem can be solved.

The Troubleshooting Symptom Charts are organized so that a problem can be located and corrected by doing the easiest and most logical things first. Complete all steps in the sequence shown from top to bottom.

It is **not** possible to include all the solutions to problems that can occur; however, these charts are designed to stimulate a thought process that will lead to the cause and correction of the problem.

Follow these basic troubleshooting steps:

- Get all the facts concerning the complaint
- Analyze the problem thoroughly
- Relate the symptoms to the basic engine systems and components
- Consider any recent maintenance or repair action that can relate to the complaint
- Double-check before beginning any disassembly
- Solve the problem by using the symptom charts and doing the easiest things first
- Determine the cause of the problem and make a thorough repair
- After repairs have been made, operate the engine to make sure the cause of the complaint has been corrected

Troubleshooting Symptoms Charts

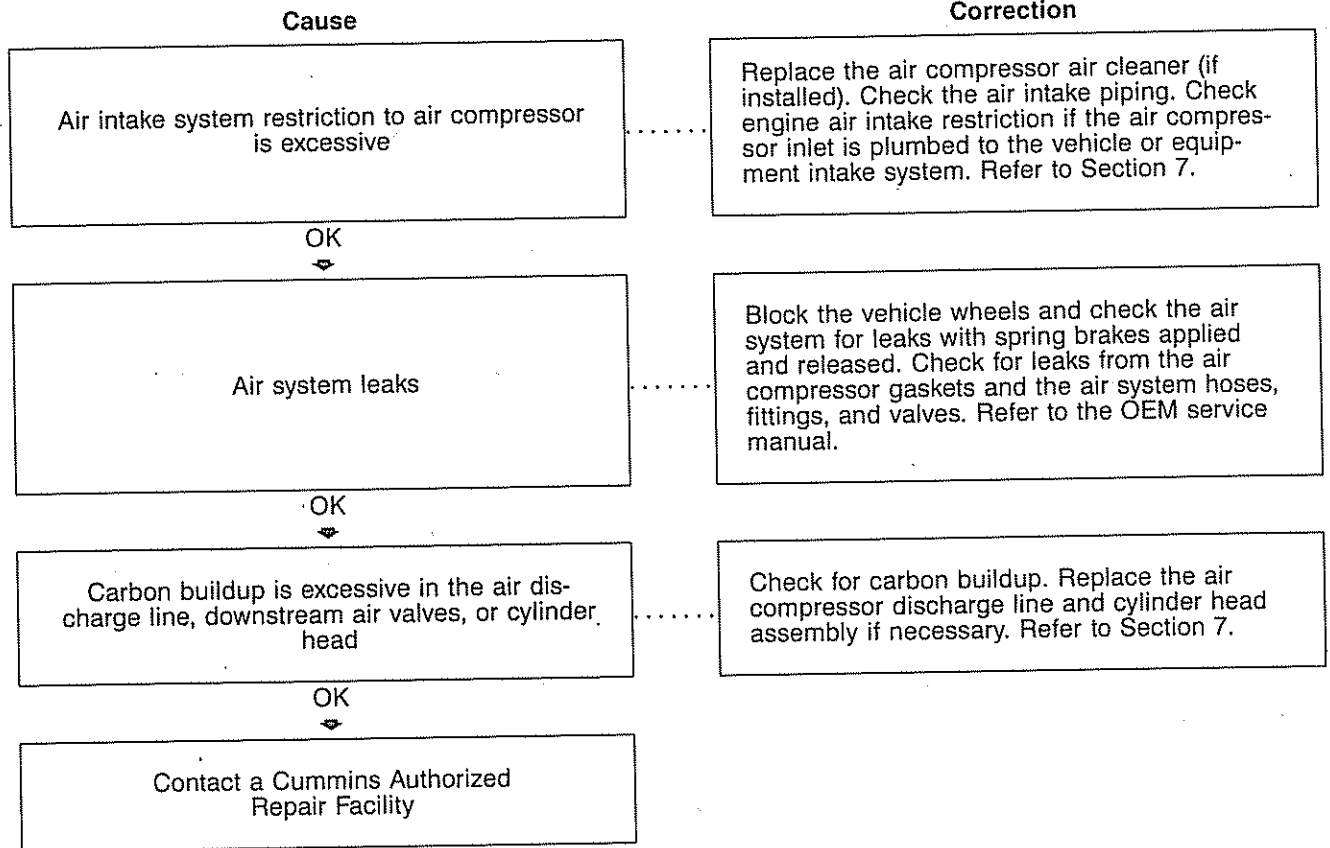
General Information

Use the charts on the following pages of this section to aid in diagnosing specific engine symptoms. Read each row of blocks from top to bottom. Follow through the chart to identify the corrective action.



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

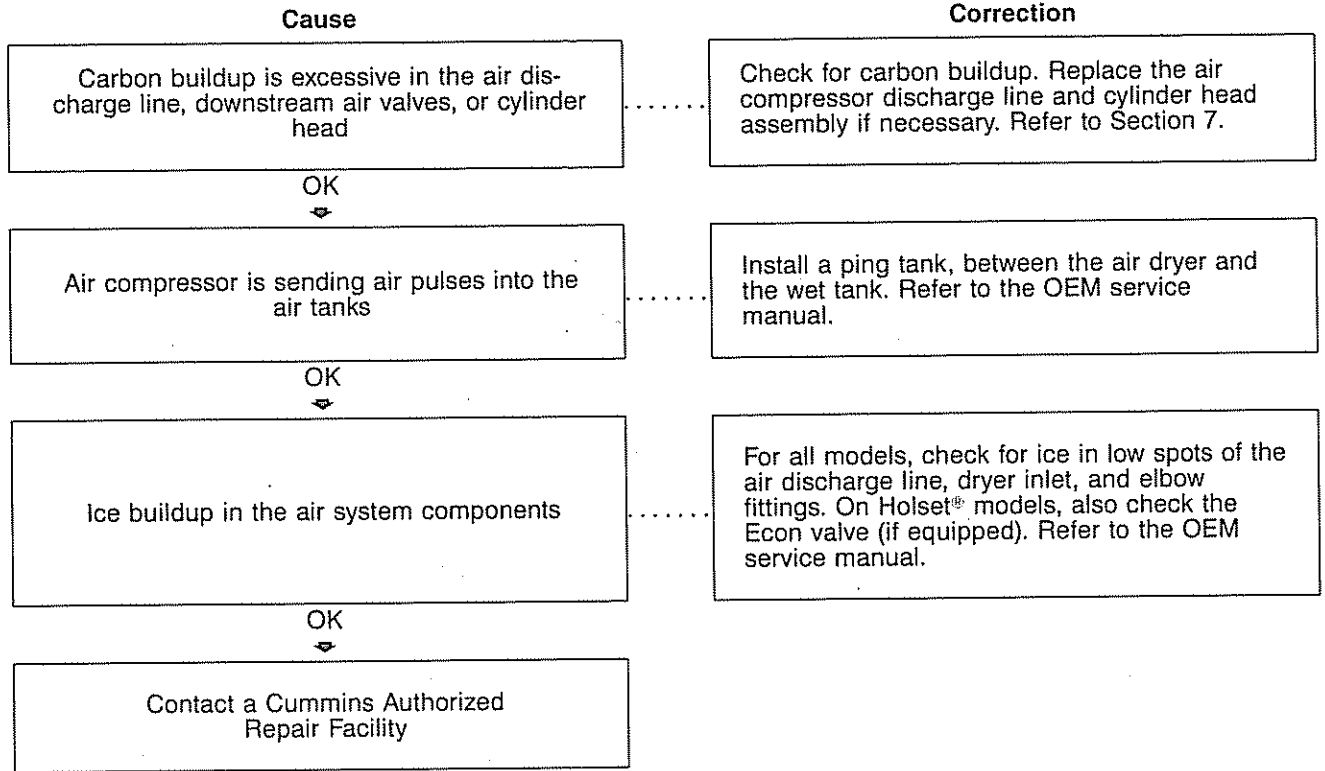
Air Compressor Air Pressure Rises Slowly



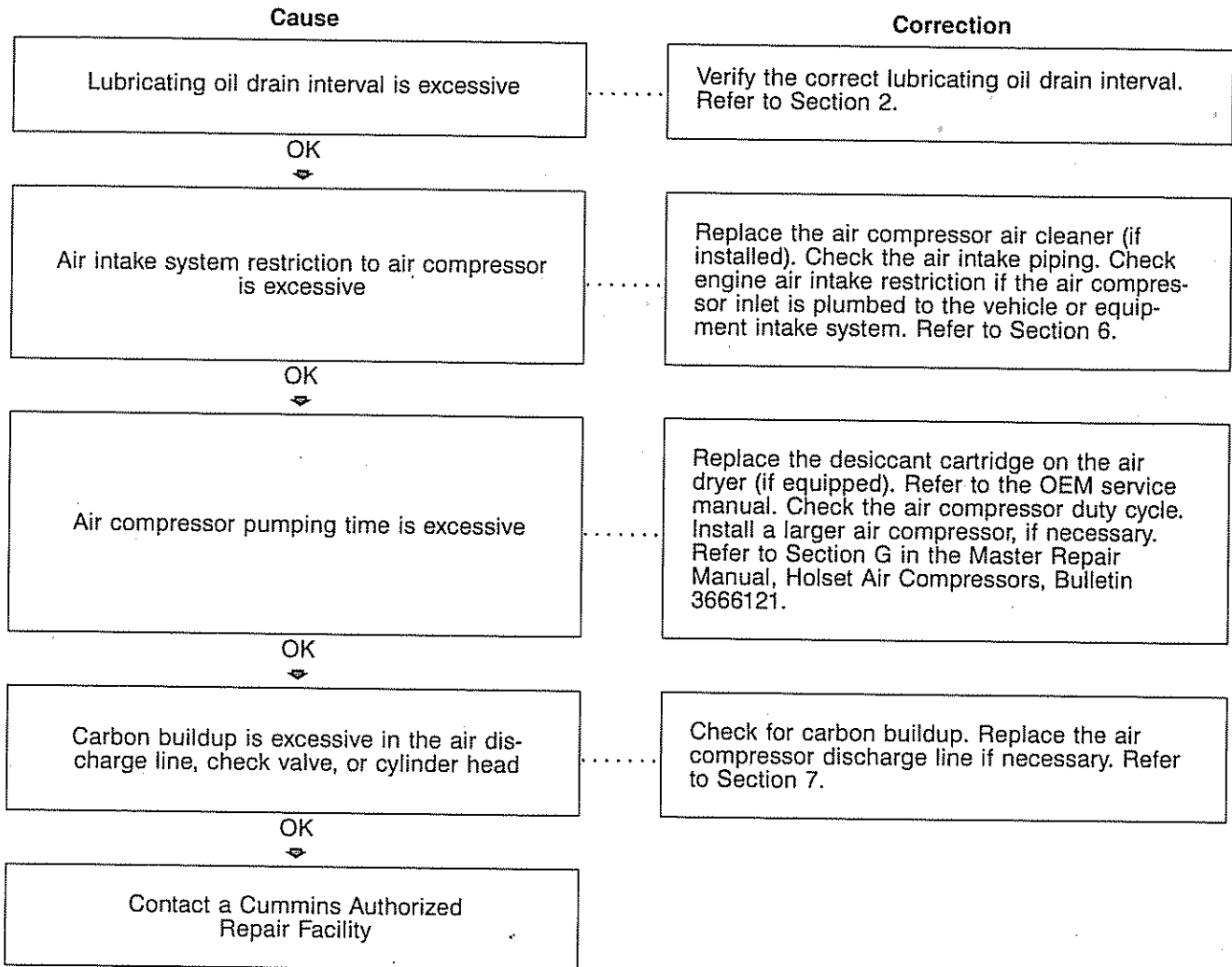
Air Compressor Cycles Frequently

Cause	Correction
Air system leaks	Block the vehicle wheels and check the air system for leaks with spring brakes applied and released. Check for leaks from the air compressor gaskets and the air system hoses, fittings, and valves. Refer to the OEM service manual.
OK ↓	
Carbon buildup is excessive in the air discharge line, check valve, or cylinder head	Check for carbon buildup. Replace the air compressor discharge line if necessary. Refer to Section 7.
OK ↓	
Air compressor pumping time is excessive	Replace the desiccant cartridge on the air dryer (if equipped). Refer to the OEM service manual. Check the air compressor duty cycle. Install a larger air compressor, if necessary. Refer to Section G in the Master Repair Manual, Holset® Air Compressors, Bulletin 3666121.
OK ↓	
Contact a Cummins Authorized Repair Facility	

Air Compressor Noise is Excessive



Air Compressor Pumping Excess Lubricating Oil into the Air System



Air Compressor Will Not Maintain Adequate Air Pressure (Not Pumping Continuously)

Cause

Air system leaks

OK

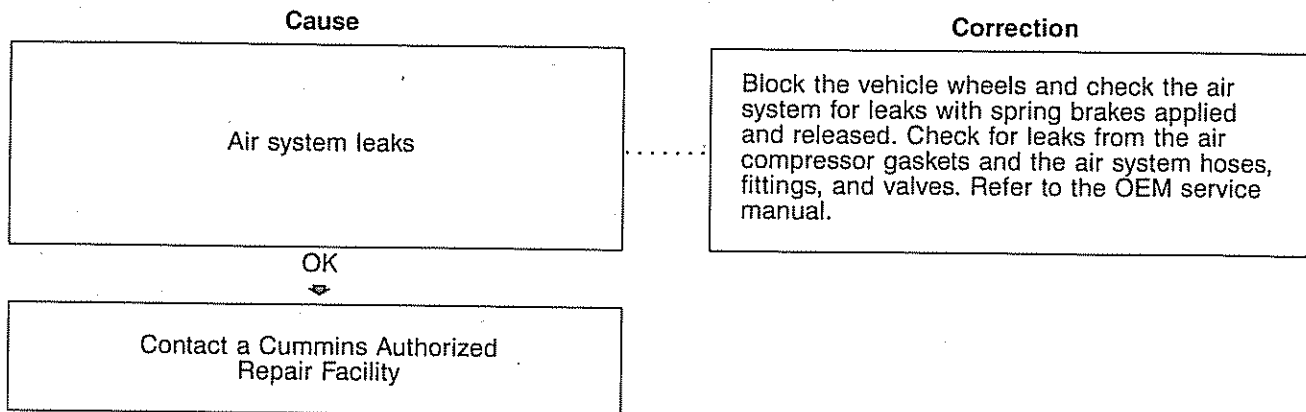


Contact a Cummins Authorized
Repair Facility

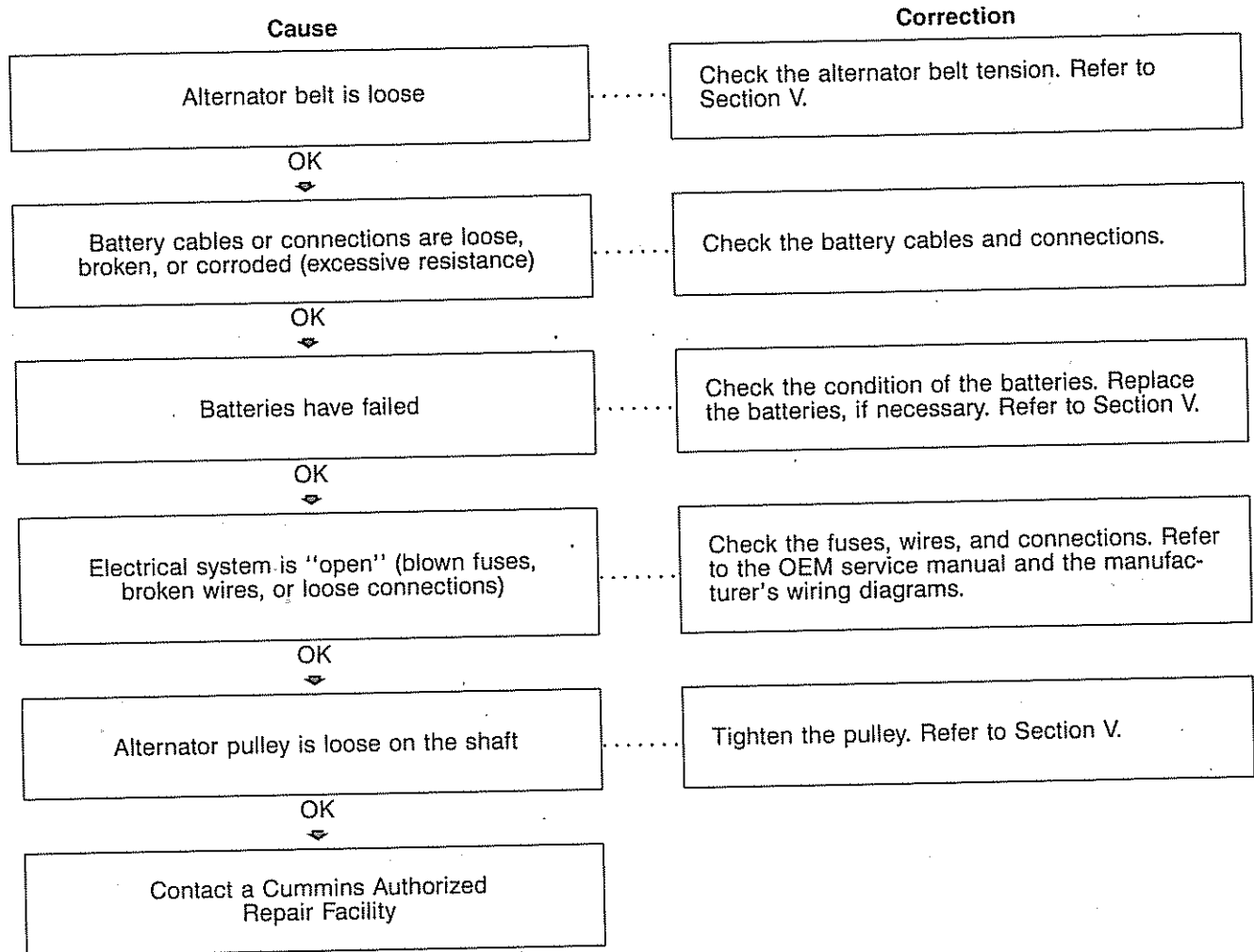
Correction

Block the vehicle wheels and check the air system for leaks with spring brakes applied and released. Check for leaks from the air compressor gaskets and the air system hoses, fittings, and valves. Refer to the OEM service manual.

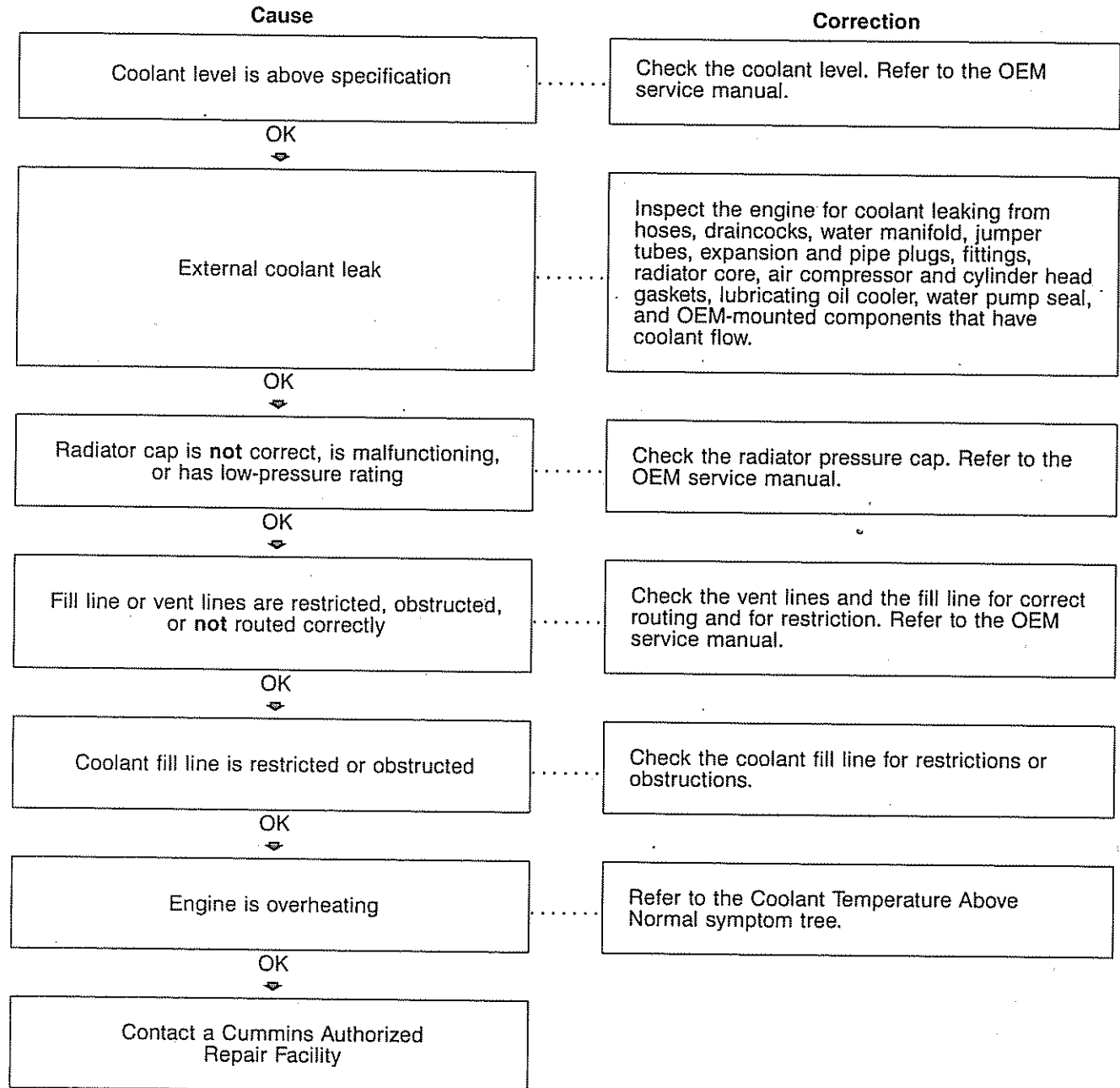
Air Compressor Will Not Stop Pumping



Alternator Not Charging or Insufficient Charging



Coolant Loss – External



Coolant Temperature Above Normal – Gradual Overheat

Cause	Correction
Coolant level is below specification	Inspect the engine and cooling system for external coolant leaks. Repair if necessary. Add coolant to the FULL line. Refer to Section 3.
OK ↓	
Charge air cooler fins, radiator fins, or air conditioner condenser fins are damaged or obstructed with debris	Inspect the charge air cooler, air conditioner condenser, and radiator fins. Clean, if necessary. Refer to Section 3.
OK ↓	
Cold weather radiator cover or winterfront is closed	Open the cold weather radiator cover or the winterfront. Maintain a minimum of 784 cm ² [122 in ²], or approximately 28 x 28 cm [11 x 11 in], of opening at all times. Refer to Section 1.
OK ↓	
Cooling system hose is collapsed, restricted, or leaking	Inspect the radiator hoses. Refer to Section 3.
OK ↓	
Fan drive belt or water pump belt is loose	Check the belt tension and tighten if necessary. Refer to Section 3.
OK ↓	
Lubricating oil level is above or below specification	Check the oil level. Add or drain oil, if necessary. Refer to Section 3.
OK ↓	
Fan shroud is damaged or missing, or the air recirculation baffles are damaged or missing	Inspect the shroud and the recirculation baffles. Repair, replace, or install, if necessary. Refer to the OEM service manual.
OK ↓	
Radiator cap is not correct, is malfunctioning, or has low-pressure rating	Check the radiator pressure cap. Refer to the OEM service manual.
OK ↓	

(Continued)

Coolant Temperature Above Normal – Gradual Overheat (Continued)

Cause

Supplemental coolant additive (SCA) level is above specification or the coolant is overconcentrated with antifreeze

OK

Contact a Cummins Authorized Repair Facility

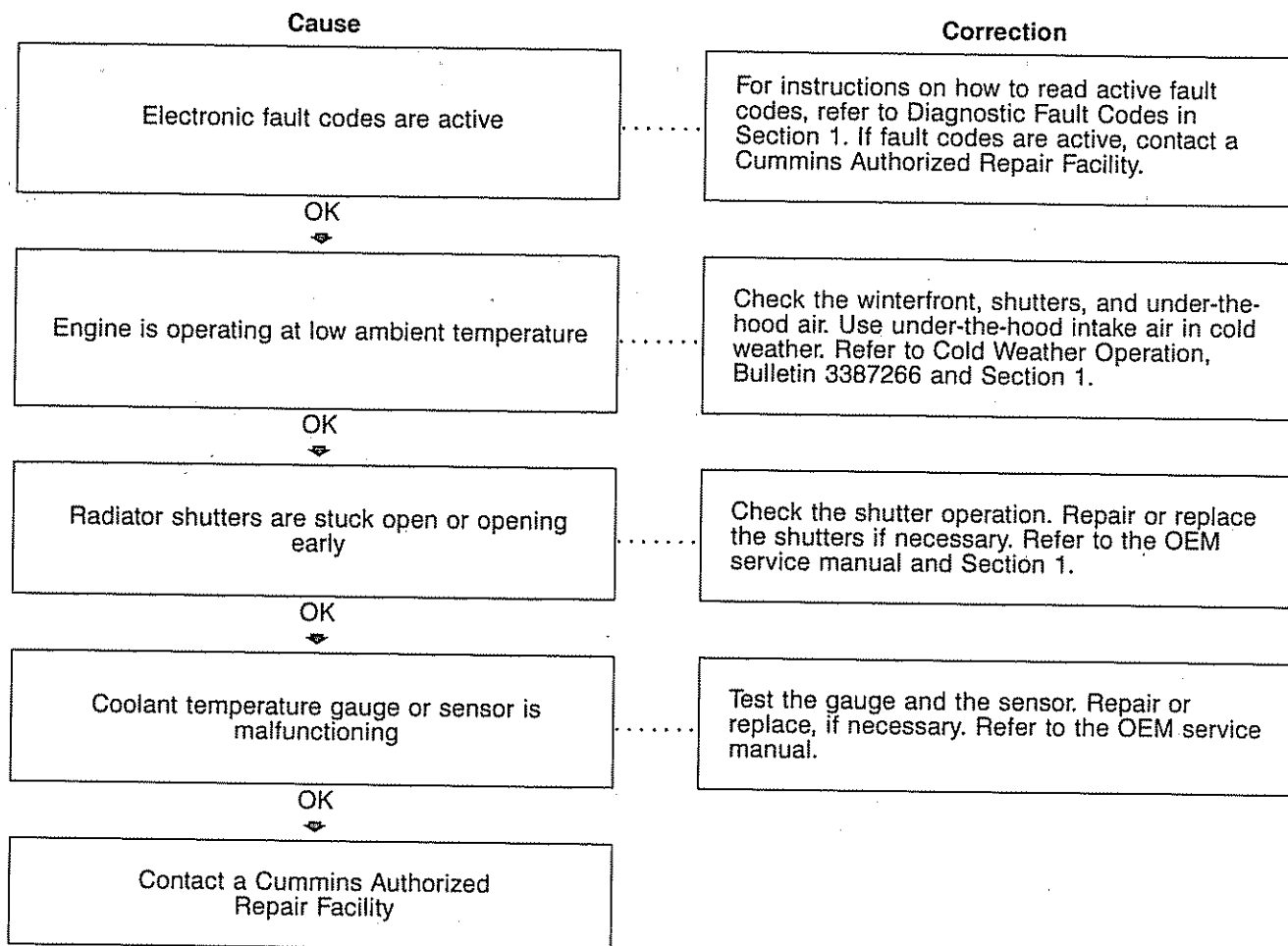
Correction

Check the SCA level. Verify the antifreeze concentration. Refer to Section 4.

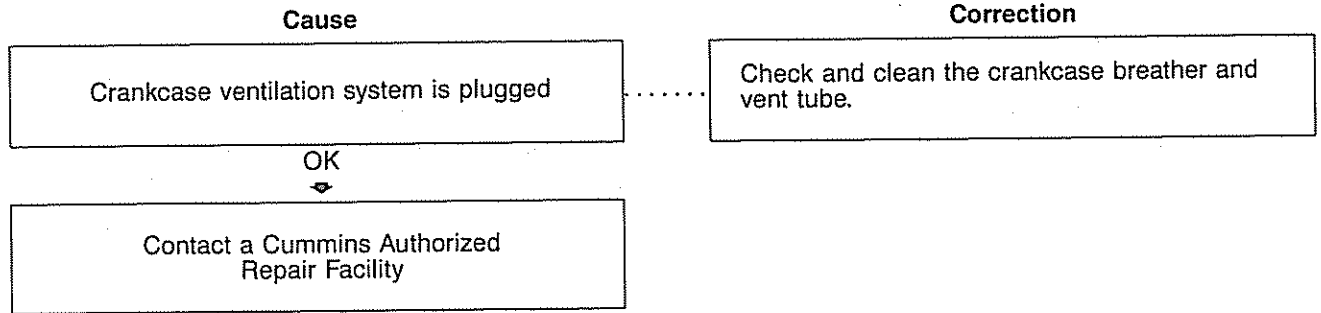
Coolant Temperature is Above Normal – Sudden Overheat

Cause	Correction
Electronic fault codes are active	For instructions on how to read active fault codes, refer to Diagnostic Fault Codes in Section 1. If fault codes are active, contact a Cummins Authorized Repair Facility.
OK ↓	
Coolant level is below specification	Inspect the engine and cooling system for external coolant leaks. Repair if necessary. Add coolant to the FULL line. Refer to Section 3.
OK ↓	
Charge air cooler fins, radiator fins, or air conditioner condenser fins are damaged or obstructed with debris	Inspect the charge air cooler, air conditioner condenser, and radiator fins. Clean, if necessary. Refer to Section 3.
OK ↓	
Cooling system hose is collapsed, restricted, or leaking	Inspect the radiator hoses. Refer to Section 3.
OK ↓	
Fan drive belt is broken	Check the fan drive belt. Replace the belt, if necessary. Refer to Section A.
OK ↓	
Radiator cap is not correct, is malfunctioning, or has low-pressure rating	Check the radiator pressure cap. Refer to the OEM service manual.
OK ↓	
Cold weather radiator cover or winterfront is closed	Open the cold weather radiator cover or the winterfront. Maintain a minimum of 784 cm ² [122 in ²], or approximately 28 x 28 cm [11 x 11 in], of opening at all times. Refer to Section 1.
OK ↓	
Fill line or vent lines are restricted, obstructed, or not routed correctly	Check the vent lines and the fill line for correct routing and for restriction. Refer to the OEM service manual.
OK ↓	
Contact a Cummins Authorized Repair Facility	

Coolant Temperature is Below Normal



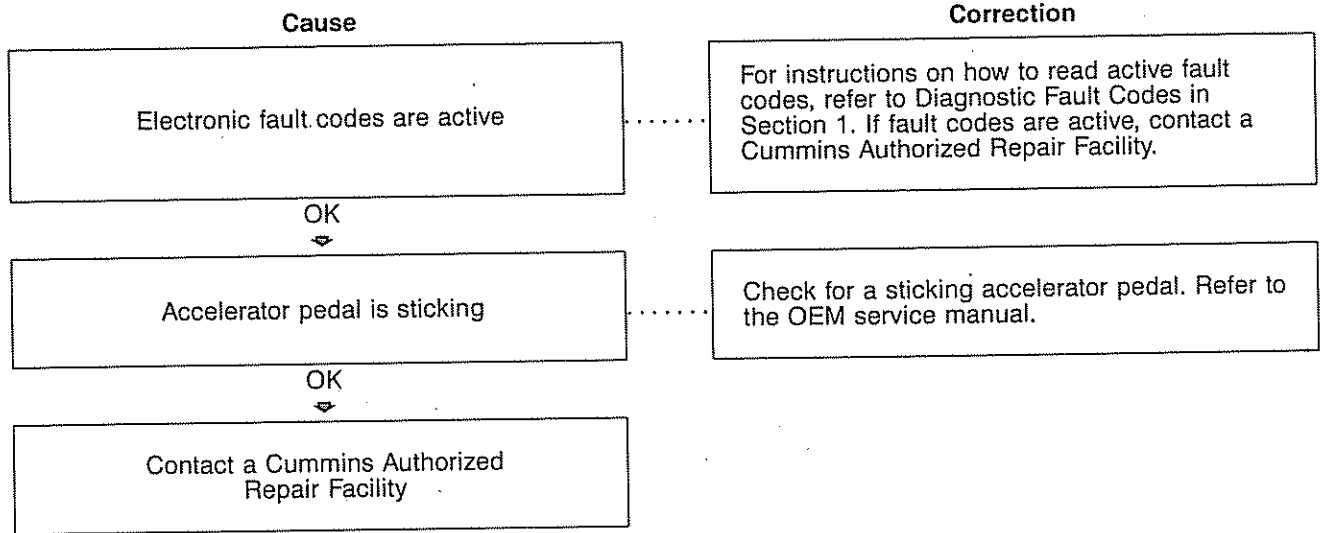
Crankcase Gases (Blowby) Excessive



Engine Acceleration or Response Poor

Cause	Correction
Electronic fault codes are active	For instructions on how to read active fault codes, refer to Diagnostic Fault Codes in Section 1. If fault codes are active, contact a Cummins Authorized Repair Facility.
OK	
Engine is operating at low ambient temperature	Check the winterfront, shutters, and under-the-hood air. Use under-the-hood intake air in cold weather. Refer to Cold Weather Operation, Bulletin 3387266 and Section 1.
OK	
Air intake or exhaust leaks	Check for loose or damaged piping connections and missing pipe plugs. Check the turbocharger and exhaust manifold mounting. Refer to Section 6.
OK	
Fuel temperature is above specification	Fill the fuel tanks. Turn off or bypass the fuel heater, if equipped. Refer to the OEM service manual.
OK	
Fuel grade is not correct for the application, or the fuel quality is poor	Operate the engine from a tank of high-quality fuel. Refer to Section V for specifications.
OK	
Drivetrain is not correctly matched to the engine	Check for correct gearing and drivetrain components. Make sure the propeller size is correct.
OK	
Engine is operating at high ambient temperature	Use outside air to the turbocharger in hot weather.
OK	
Contact a Cummins Authorized Repair Facility	

Engine Decelerates Slowly



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

Cause	Correction
Electronic fault codes are active	For instructions on how to read active fault codes, refer to Diagnostic Fault Codes in Section 1. If fault codes are active, contact a Cummins Authorized Repair Facility.
OK	
Battery voltage is low	Check the batteries and the unswitched battery supply circuit. Refer to the OEM service manual.
OK	
Engine-driven units are engaged	Disengage engine-driven units.
OK	
Engine cranking speed is too slow	If the cranking speed is slower than 150 rpm, refer to the Engine Will Not Crank or Cranks Slowly symptom tree.
OK	
Fuel shutoff valve(s) closed (electronically controlled injection)	Check the fuel shutoff valve and circuit. Contact a Cummins Authorized Repair Facility.
OK	
Fuse(s) malfunctioning	Replace the fuse(s) in the OEM interface harness.
OK	
Exhaust system restriction	Check the exhaust system for any restrictions. Refer to Section V for specifications.
OK	
Fuel grade is not correct for the application, or the fuel quality is poor	Operate the engine from a tank of high-quality fuel. Refer to Section V for specifications.
OK	
Starting aid is necessary for cold weather, or starting aid is malfunctioning	Check for the correct operation of the starting aid. Refer to the manufacturer's instructions. Refer to Cold Weather Starting Aids Using Starting Fluid in Section 1.
OK	

(Continued)

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

Cause	Correction
Fuel filter or fuel suction line is restricted	Replace the fuel filter. Refer to Section 4. Check the fuel suction line for restriction.
OK ↓	
Air intake system restriction is above specification	Check the air intake system for restriction. Clean or replace the air filter and inlet piping as necessary. Refer to Section 6.
OK ↓	
Contact a Cummins Authorized Repair Facility	

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

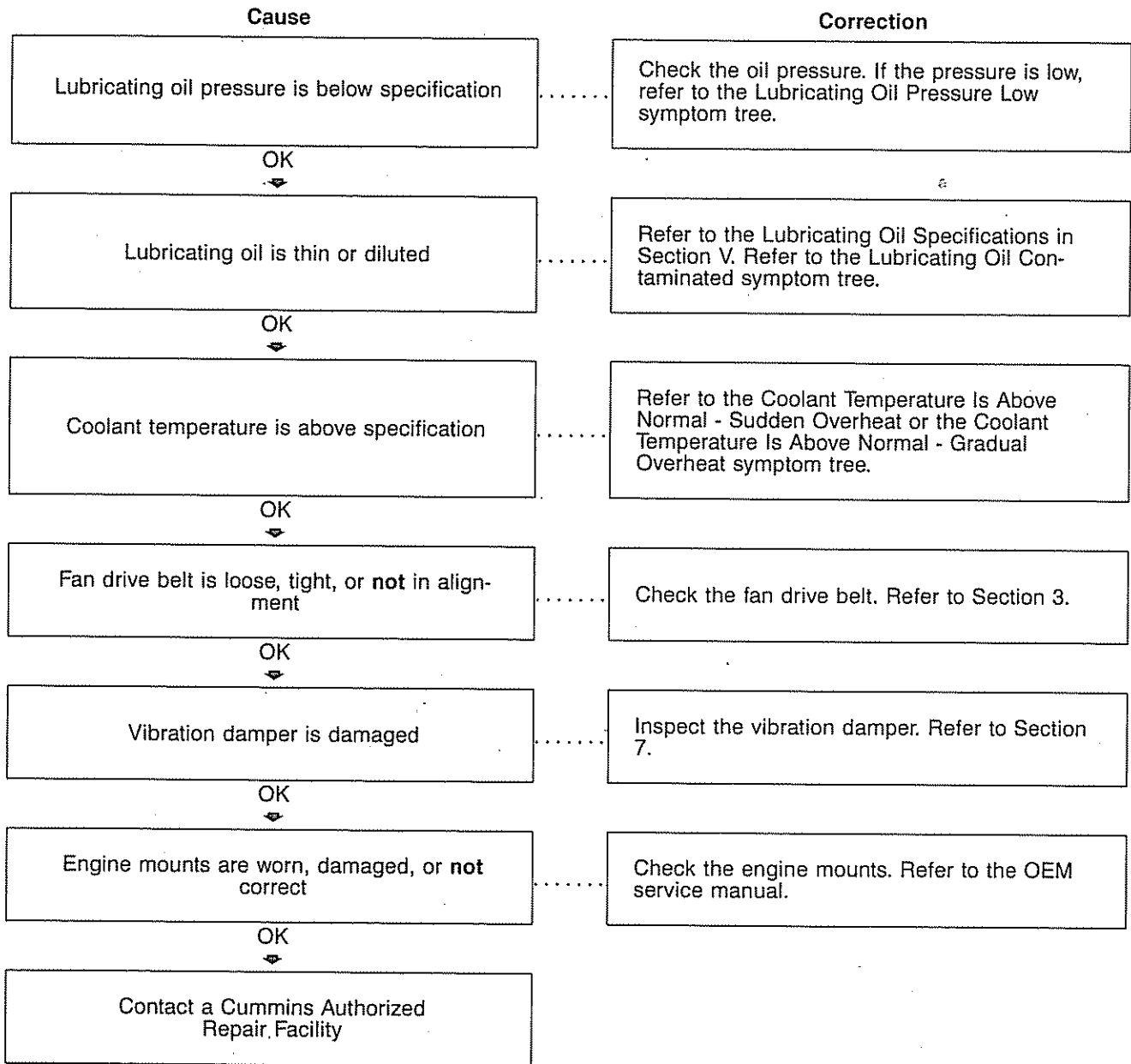
Cause	Correction
Electronic fault codes are active	For instructions on how to read active fault codes, refer to Diagnostic Fault Codes in Section 1. If fault codes are active, contact a Cummins Authorized Repair Facility.
OK ↓	
Fuel level is low in the tank	Fill the supply tank. Refer to the OEM service manual.
OK ↓	
Starting motor rotation is not correct	Check the direction of crankshaft rotation. Replace the starting motor if necessary.
OK ↓	
Engine cranking speed is too slow	If the cranking speed is slower than 150 rpm, refer to the Engine Will Not Crank or Cranks Slowly symptom tree.
OK ↓	
Exhaust system leaking hot air into engine compartment	Check the exhaust plumbing for leaks or broken components.
OK ↓	
Fuel shutoff valve is closed	Check for loose wires. Check for power to the fuel shutoff valve solenoid.
OK ↓	
Battery voltage supply to the electronic control system is low, interrupted, or open	Check the battery connections. Check the fuses and the unswitched battery supply circuit. Refer to the OEM service manual.
OK ↓	
Fuel inlet restriction	Check for fuel inlet restriction. Contact a Cummins Authorized Repair Facility.
OK ↓	
Fuel connections on the suction side of the pump are loose	Tighten all the fuel fittings and connections between the fuel tanks and fuel pump.
OK ↓	

(Continued)

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

Cause	Correction
Fuel drain line restriction	Check the fuel drain lines for restriction. Clear or replace the fuel lines, check valves, or tank vents as necessary.
OK	
Fuel suction stand pipe in the fuel tank is broken	Check and repair the stand pipe, if necessary. Refer to the OEM service manual.
OK	
Contact a Cummins Authorized Repair Facility	

Engine Noise Excessive



Engine Noise Excessive — Combustion Knocks

Cause	Correction
Engine is operating at low ambient temperature	Check the winterfront, shutters, and under-the-hood air. Use under-the-hood intake air in cold weather. Refer to Cold Weather Operation, Bulletin 3387266, and Section 1.
OK	
Ether starting aid is malfunctioning	Repair or replace the ether starting aids. Refer to the OEM service manual.
OK	
Fuel grade is not correct for the application, or the fuel quality is poor	Operate the engine from a tank of high-quality fuel. Refer to Section V for specifications.
OK	
Contact a Cummins Authorized Repair Facility	

Engine Power Output Low

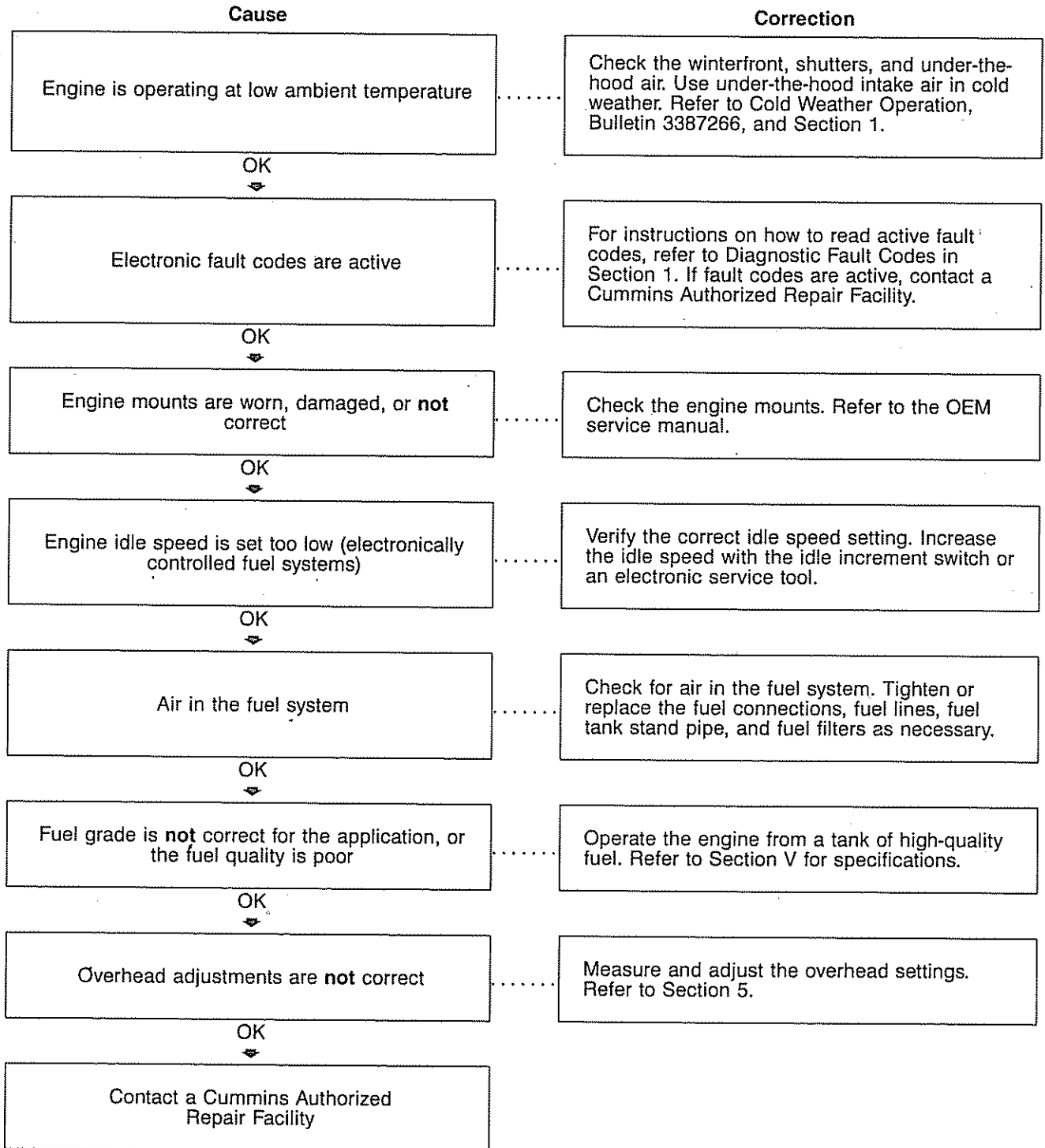
Cause	Correction
Electronic fault codes are active	For instructions on how to read active fault codes, refer to Diagnostic Fault Codes in Section 1. If fault codes are active, contact a Cummins Authorized Repair Facility.
OK	
Drivetrain is not correctly matched to the engine	Check for correct gearing and drivetrain components. Make sure the propeller size is correct.
OK	
Engine is operating above recommended altitude	Engine power decreases above recommended altitude. Refer to the Engine Data Sheet for specifications.
OK	
Turbocharger is not correct	Check the turbocharger part number and compare it to the Control Parts List (CPL), Bulletin 3379133. Replace the turbocharger if necessary. Refer to Section A.
OK	
Fuel filter or fuel suction line is restricted	Replace the fuel filter. Refer to Section 4. Check the fuel suction line for restriction.
OK	
Lubricating oil level is above specification	Check the oil level. Verify the dipstick calibration and oil pan capacity. Fill the system to the specified level. Refer to Section 3.
OK	
Air intake system restriction is above specification	Check the air intake system for restriction. Clean or replace the air filter and inlet piping as necessary. Refer to Section 6.
OK	
Air intake or exhaust leaks	Check for loose or damaged piping connections and missing pipe plugs. Check the turbocharger and exhaust manifold mounting. Refer to Section A.
OK	

(Continued)

Engine Power Output Low (Continued)

Cause	Correction
Air in the fuel system	Check for air in the fuel system. Tighten or replace the fuel connections, fuel lines, fuel tank stand pipe, and fuel filters as necessary.
OK	
Fuel drain line restriction	Check the fuel drain lines for restriction. Clear or replace the fuel lines, check valves, or tank vents as necessary.
OK	
Fuel grade is not correct for the application, or the fuel quality is poor	Operate the engine from a tank of high-quality fuel. Refer to Section V for specifications.
OK	
Intake manifold air temperature is above specification	Refer to the Intake Manifold Air Temperature Above Specification symptom tree.
OK	
Fuel inlet temperature to pump is above specification	Fill the fuel tank, turn off or bypass the fuel heaters, and check the fuel cooler. Refer to the OEM service manual.
OK	
Contact a Cummins Authorized Repair Facility	

Engine Runs Rough at Idle

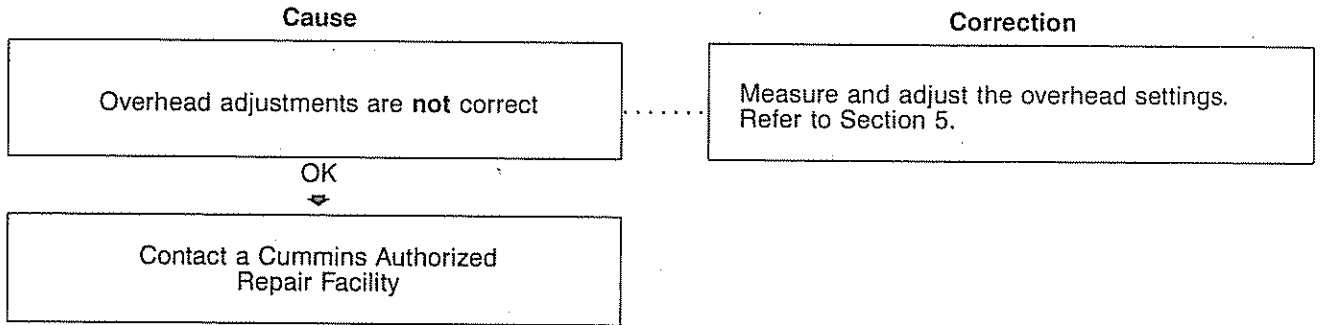


Engine Runs Rough or Misfires

Cause	Correction
Condition occurs only at idle	Refer to the Engine Runs Rough at Idle symptom tree.
OK	
Engine is operating at low ambient temperature	Check the winterfront, shutters, and under-the-hood air. Use under-the-hood intake air in cold weather. Refer to Cold Weather Operation, Bulletin 3387266, and Section 1.
OK	
Electronic fault codes are active	For instructions on how to read active fault codes, refer to Diagnostic Fault Codes in Section 1. If fault codes are active, contact a Cummins Authorized Repair Facility.
OK	
Fuel leak	Check the fuel lines, fuel connections, and fuel filters for leaks. Check the fuel lines to the supply tanks. Refer to the OEM service manual.
OK	
Fuel grade is not correct for the application, or the fuel quality is poor	Operate the engine from a tank of high-quality fuel. Refer to Section V for specifications.
OK	
Air in the fuel system	Check for air in the fuel system. Tighten or replace the fuel connections, fuel lines, fuel tank stand pipe, and fuel filters as necessary.
OK	
Fuel inlet restriction	Check for fuel inlet restriction. Contact a Cummins Authorized Repair Facility.
OK	
Engine mounts are worn, damaged, or not correct	Check the engine mounts. Refer to the OEM service manual.
OK	

(Continued)

Engine Runs Rough or Misfires (Continued)

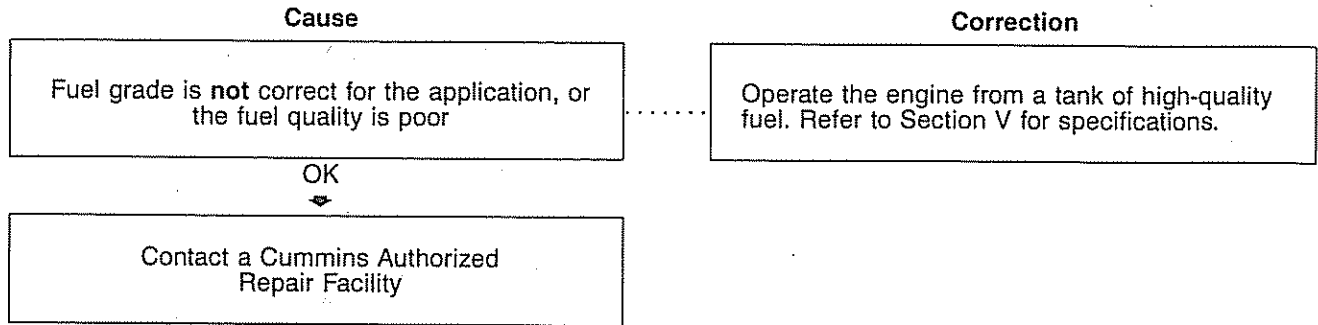


Engine Shuts Off Unexpectedly or Dies During Deceleration

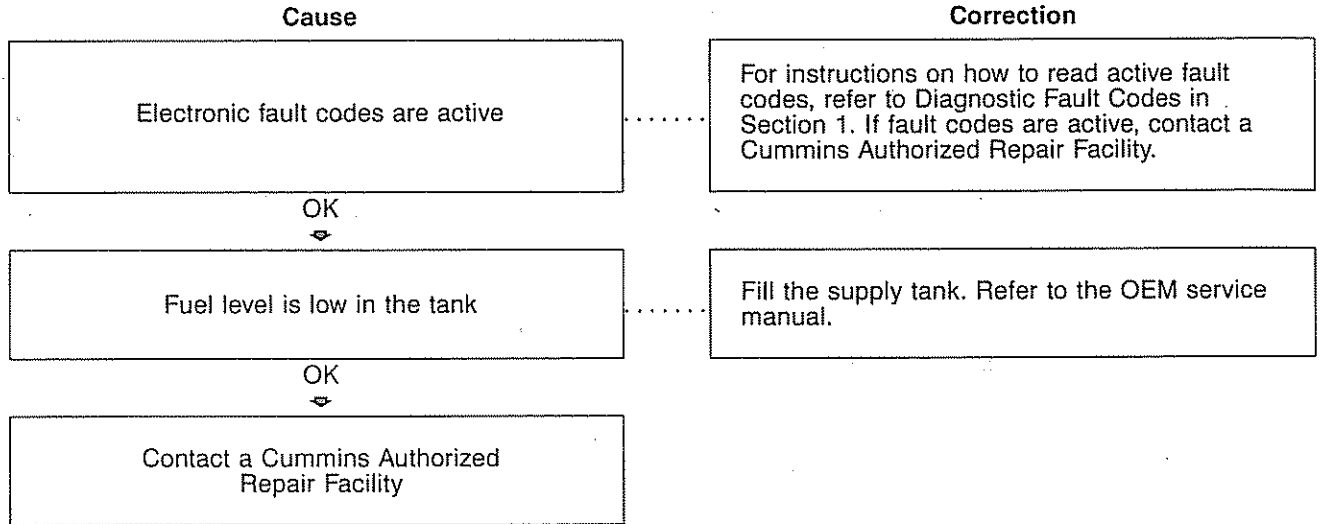
Cause	Correction
Electronic fault codes are active	For instructions on how to read active fault codes, refer to Diagnostic Fault Codes in Section 1. If fault codes are active, contact a Cummins Authorized Repair Facility.
OK	
Battery voltage supply to the electronic control module (ECM) has been lost	Check the battery connections. Check the fuses and the unswitched battery supply circuit. Refer to the OEM service manual.
OK	
Idle shutdown or PTO shutdown features are activated	Check the time limit on idle and PTO shut-downs with an electronic service tool. Refer to Section 1.
OK	
Engine will not restart	Refer to Electronically Controlled Fuel System in Section 1.
OK	
Fuel inlet restriction	Check for fuel inlet restriction. Contact a Cummins Authorized Repair Facility.
OK	
Air in the fuel system	Check for air in the fuel system. Tighten or replace the fuel connections, fuel lines, fuel tank stand pipe, and fuel filters as necessary.
OK	
Battery voltage is low	Check the batteries and the unswitched battery supply circuit. Refer to the OEM service manual.
OK	
OEM engine protection system is malfunctioning	Isolate the OEM engine protection system. Follow the OEM service manuals to check for a malfunction.
OK	
Fuel shutoff valve is closed	Check for loose wires. Check for power to the fuel shutoff valve solenoid.
OK	

(Continued)

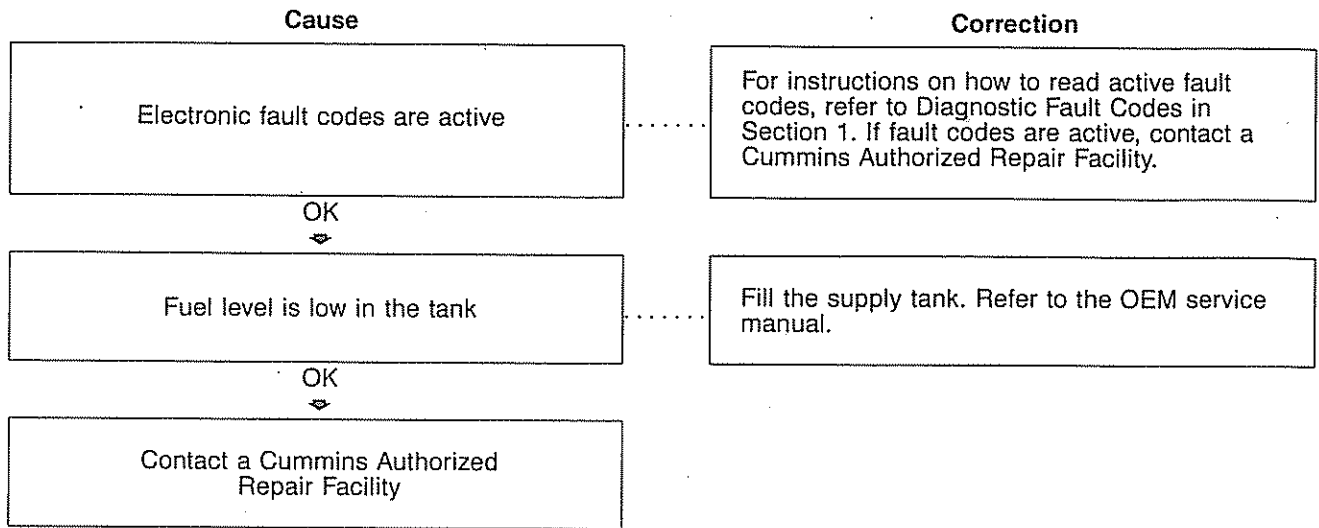
Engine Shuts Off Unexpectedly or Dies During Deceleration (Continued)



Engine Speed Surges at Low or High Idle



Engine Speed Surges Under Load or in Operating Range



Engine Starts But Will Not Keep Running

Cause	Correction
Electronic fault codes are active	For instructions on how to read active fault codes, refer to Diagnostic Fault Codes in Section 1. If fault codes are active, contact a Cummins Authorized Repair Facility.
OK ↓	
Idle shutdown or PTO shutdown features are activated	Turn OFF the keyswitch for 5 seconds. Turn ON the keyswitch and check fault lamp operation.
OK ↓	
Fuel level is low in the tank	Fill the supply tank. Refer to the OEM service manual.
OK ↓	
Air in the fuel system	Check for air in the fuel system. Tighten or replace the fuel connections, fuel lines, fuel tank stand pipe, and fuel filters as necessary.
OK ↓	
Fuel filter or fuel suction line is restricted	Replace the fuel filter. Refer to Section 4. Check the fuel suction line for restriction.
OK ↓	
Engine-driven units are engaged	Disengage engine-driven units.
OK ↓	
Fuel is waxing due to cold weather	Check the fuel heater, if installed. Weather conditions sometimes require a fuel heater.
OK ↓	
Fuel inlet restriction	Check for fuel inlet restriction. Contact a Cummins Authorized Repair Facility.
OK ↓	
Fuel shutoff valve is closed	Check for loose wires. Check for power to the fuel shutoff valve solenoid.
OK ↓	

(Continued)

Engine Starts But Will Not Keep Running (Continued)

Cause	Correction
Exhaust system restriction.	Check the exhaust system for any restrictions. Refer to Section V for specifications.
OK	
Fuel grade is not correct for the application, or the fuel quality is poor	Operate the engine from a tank of high-quality fuel. Refer to Section V for specifications.
OK	
Air intake system restriction is above specification	Check the air intake system for restriction. Clean or replace the air filter and inlet piping as necessary. Refer to Section 6.
OK	
Contact a Cummins Authorized Repair Facility	

Engine Vibration Excessive

Cause	Correction
Electronic fault codes are active	For instructions on how to read active fault codes, refer to Diagnostic Fault Codes in Section 1. If fault codes are active, contact a Cummins Authorized Repair Facility.
OK ↓	
Engine is misfiring	Refer to the Engine Runs Rough or Misfires symptom tree.
OK ↓	
Engine idle speed is set too low (electronically controlled fuel systems)	Verify the correct idle speed setting. Increase the idle speed with the idle increment switch or an electronic service tool.
OK ↓	
Fan is loose, damaged, or not balanced	Check the fan. Refer to Section 3.
OK ↓	
Belt-driven accessories are malfunctioning	Check the fan hub, alternator, freon compressor, and hydraulic pump for interference. Isolate belt-driven accessories, and check for vibration.
OK ↓	
Engine mounts are worn, damaged, or not correct	Check the engine mounts. Refer to the OEM service manual.
OK ↓	
Vibration damper is damaged	Inspect the vibration damper. Refer to Section 7.
OK ↓	
Contact a Cummins Authorized Repair Facility	

Engine Will Not Crank or Cranks Slowly (Air Starter)

Cause	Correction
Air pressure is low in the air tanks	Increase air pressure with an external air source.
OK ⇩	
Engine-driven units are engaged	Disengage engine-driven units.
OK ⇩	
Lubricating oil temperature switch, gauge, or sensor malfunctioning or not in the correct location	Check the oil temperature switch, gauge, or sensor for correct operation and location.
OK ⇩	
Lubricating oil does not meet specifications for operating conditions	Change the oil and filters. Refer to Section 4. Use the oil recommended in Section V.
OK ⇩	
Lubricating oil level is above specification	Check the oil level. Verify the dipstick calibration and oil pan capacity. Fill the system to the specified level. Refer to Section 3.
OK ⇩	
Contact a Cummins Authorized Repair Facility	

Engine Will Not Crank or Cranks Slowly (Electric Starter)

Cause	Correction
Battery cables or connections are loose, broken, or corroded (excessive resistance)	Check the battery cables and connections.
OK ↓	
Engine-driven units are engaged	Disengage engine-driven units.
OK ↓	
Lubricating oil temperature is below specification	Install an oil pan heater, or drain the oil and fill the system with warm oil.
OK ↓	
Lubricating oil does not meet specifications for operating conditions	Change the oil and filters. Refer to Section 4. Use the oil type recommended in Section V.
OK ↓	
Contact a Cummins Authorized Repair Facility	

Engine Will Not Reach Rated Speed (RPM)

Cause	Correction
Load is excessive for engine horsepower rating	Reduce the vehicle load or use a lower gear.
OK ↓	
Tachometer is not calibrated or is malfunctioning	Compare the tachometer reading with a handheld tachometer or an electronic service tool reading. Calibrate or replace the tachometer as necessary. Refer to the OEM service manual.
OK ↓	
Electronic fault codes are active	For instructions on how to read active fault codes, refer to Diagnostic Fault Codes in Section 1. If fault codes are active, contact a Cummins Authorized Repair Facility.
OK ↓	
Drivetrain is not correctly matched to the engine	Check for correct gearing and drivetrain components. Make sure the propeller size is correct.
OK ↓	
Engine power output is low	Refer to the Engine Power Output Low symptom tree.
OK ↓	
Fuel grade is not correct for the application, or the fuel quality is poor	Operate the engine from a tank of high-quality fuel. Refer to Section V for specifications.
OK ↓	
Fuel inlet restriction	Check for fuel inlet restriction. Contact a Cummins Authorized Repair Facility.
OK ↓	
Overhead adjustments are not correct	Measure and adjust the overhead settings. Refer to Section 5.
OK ↓	
Vessel is overloaded	Load the vessel correctly. Refer to the OEM service manual.
OK ↓	

(Continued)

Engine Will Not Reach Rated Speed (RPM) (Continued)

Cause

Programmable parameters or selected features are **not** correct

Correction

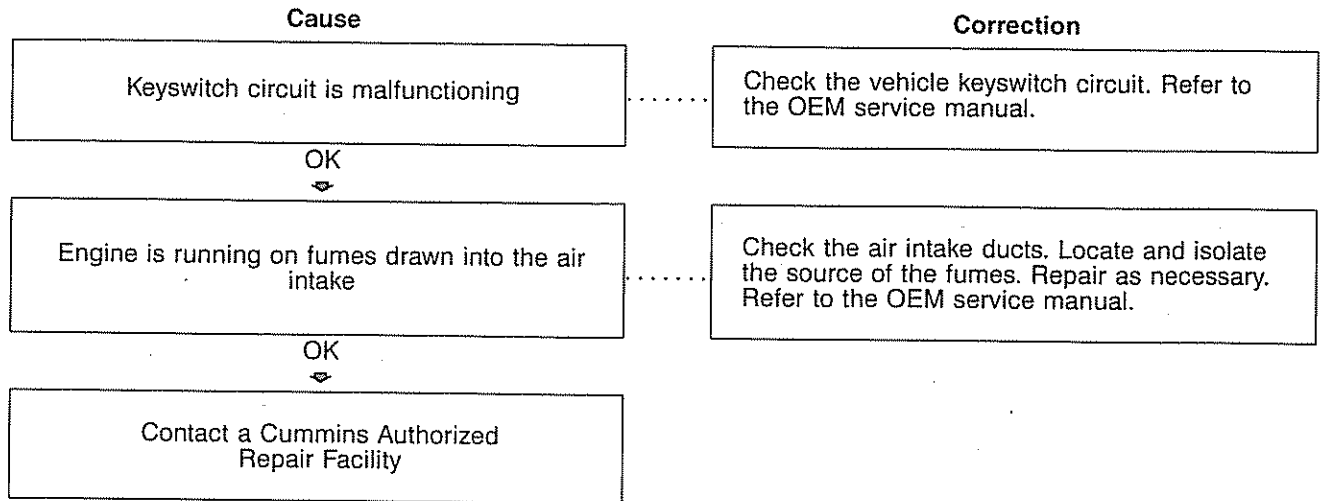
Check the programmable parameters and the selected features with an electronic service tool. Set the parameters and features again if necessary. Refer to the appropriate electronic service tool manual.

OK

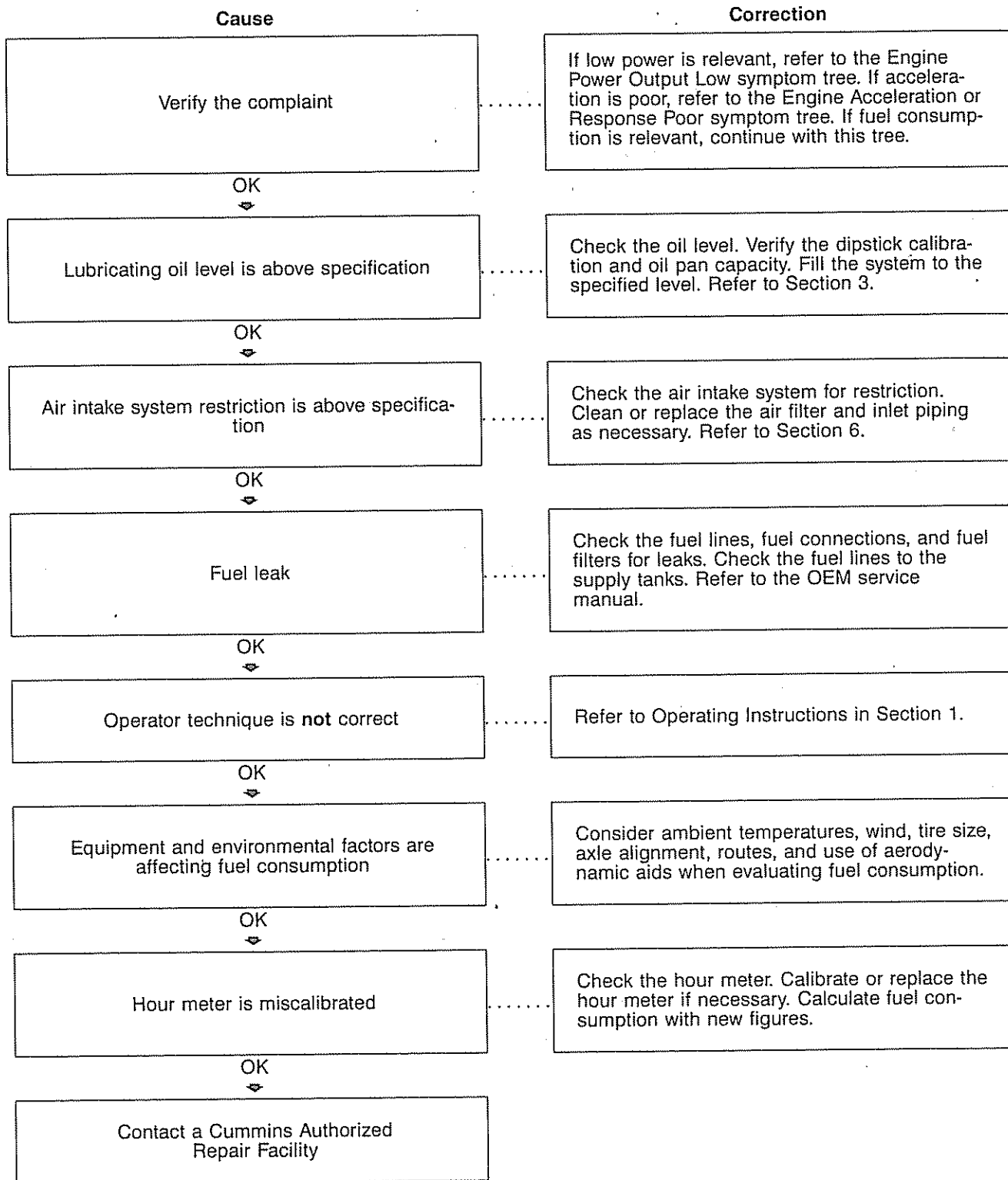


Contact a Cummins Authorized Repair Facility

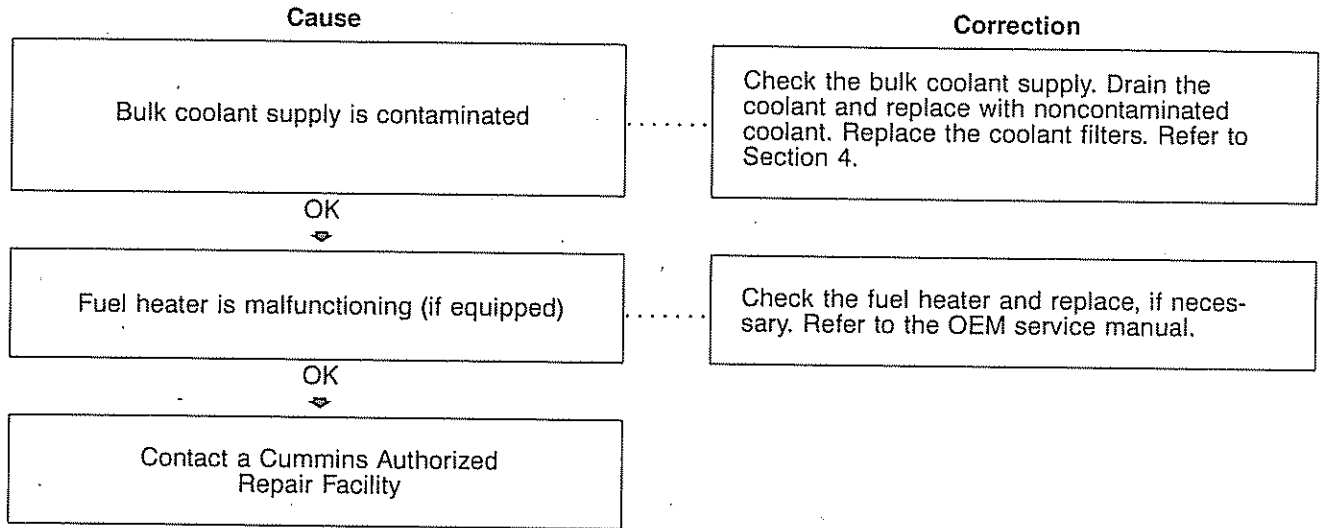
Engine Will Not Shut Off



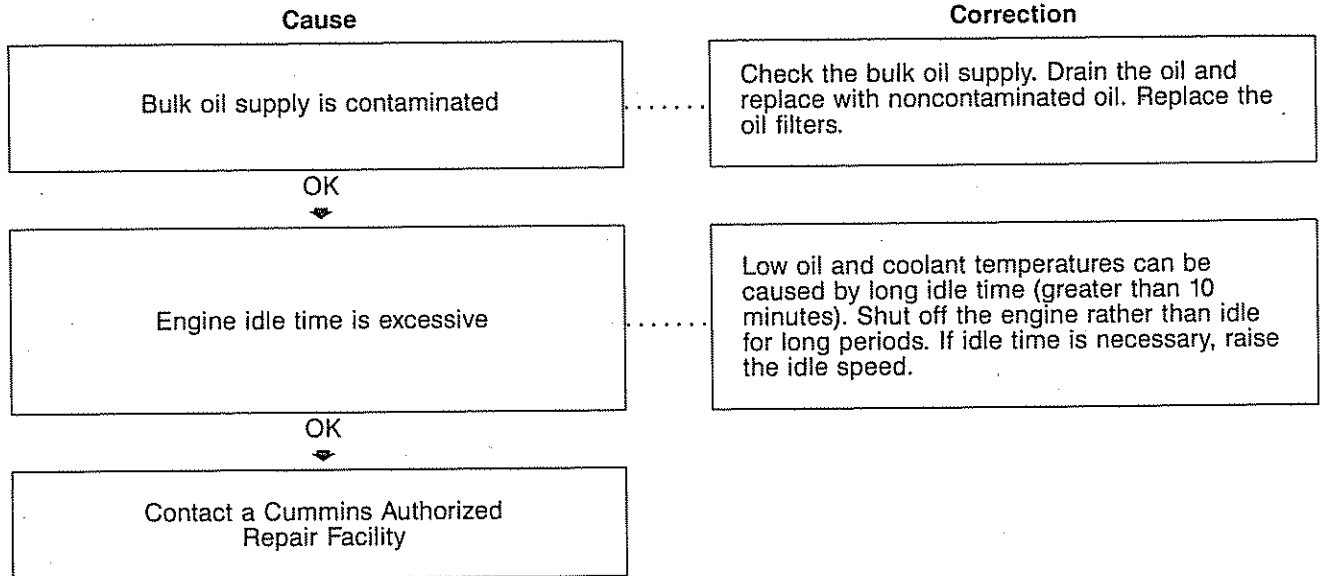
Fuel Consumption Excessive



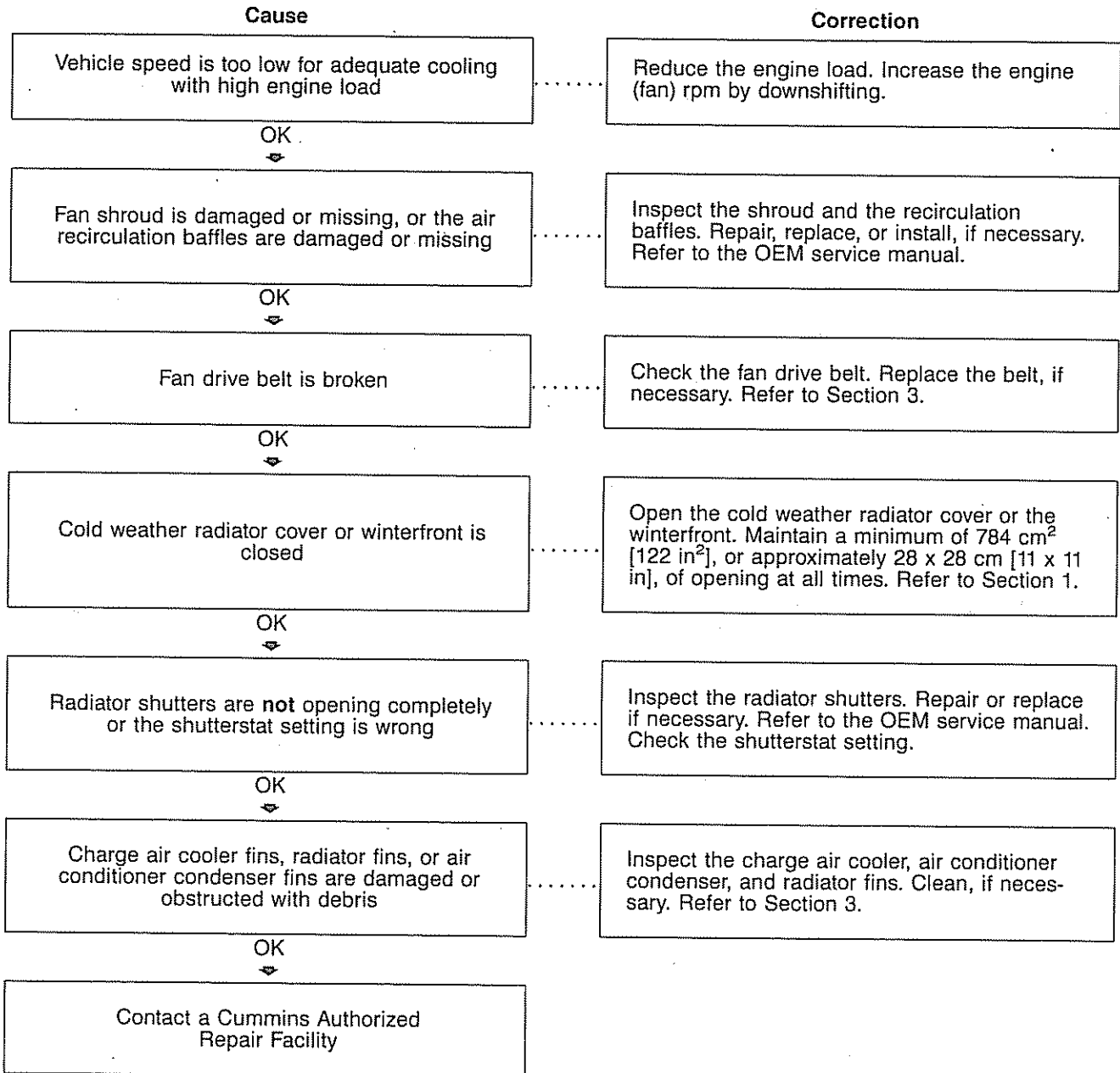
Fuel in Coolant



Fuel in the Lubricating Oil



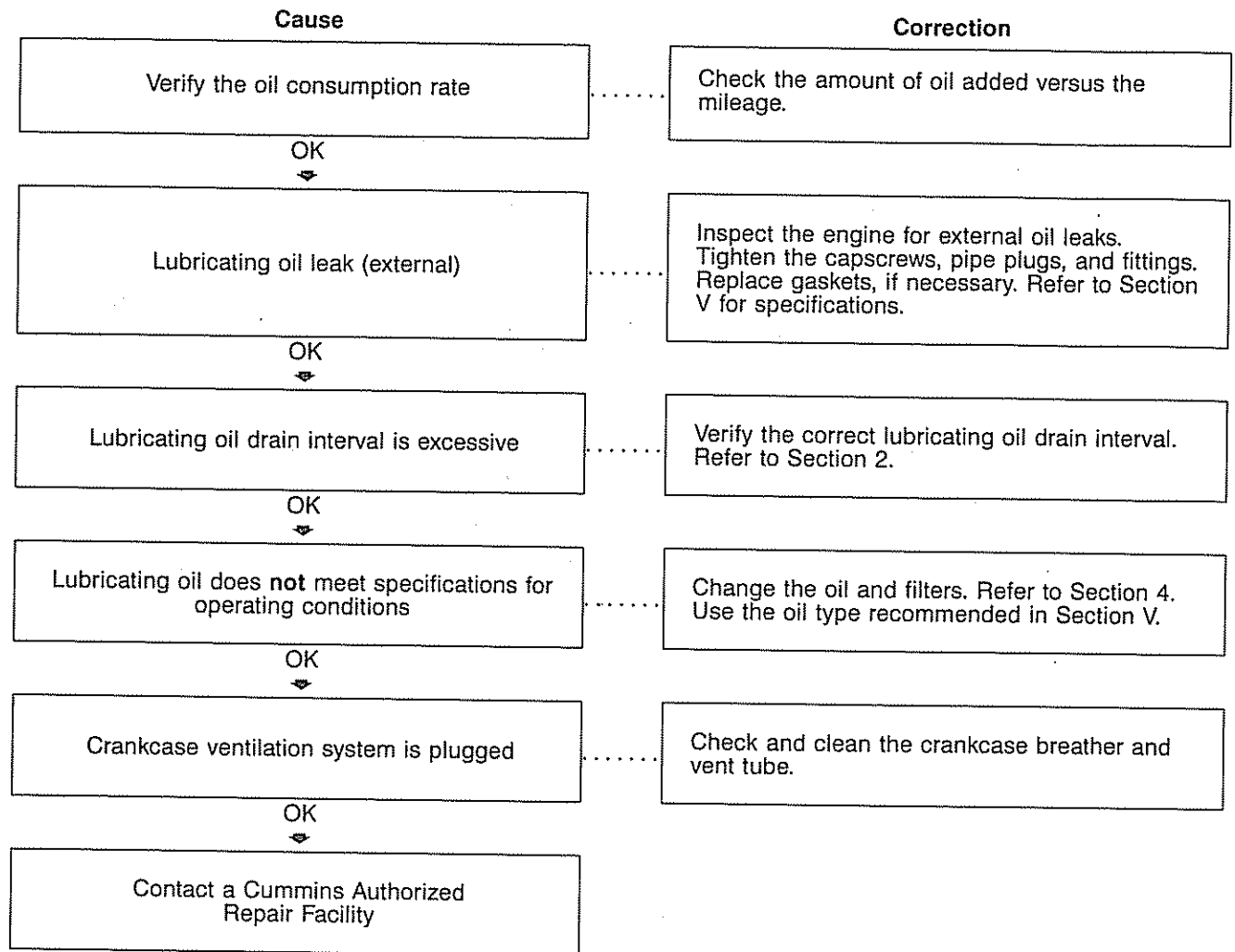
Intake Manifold Air Temperature Above Specification



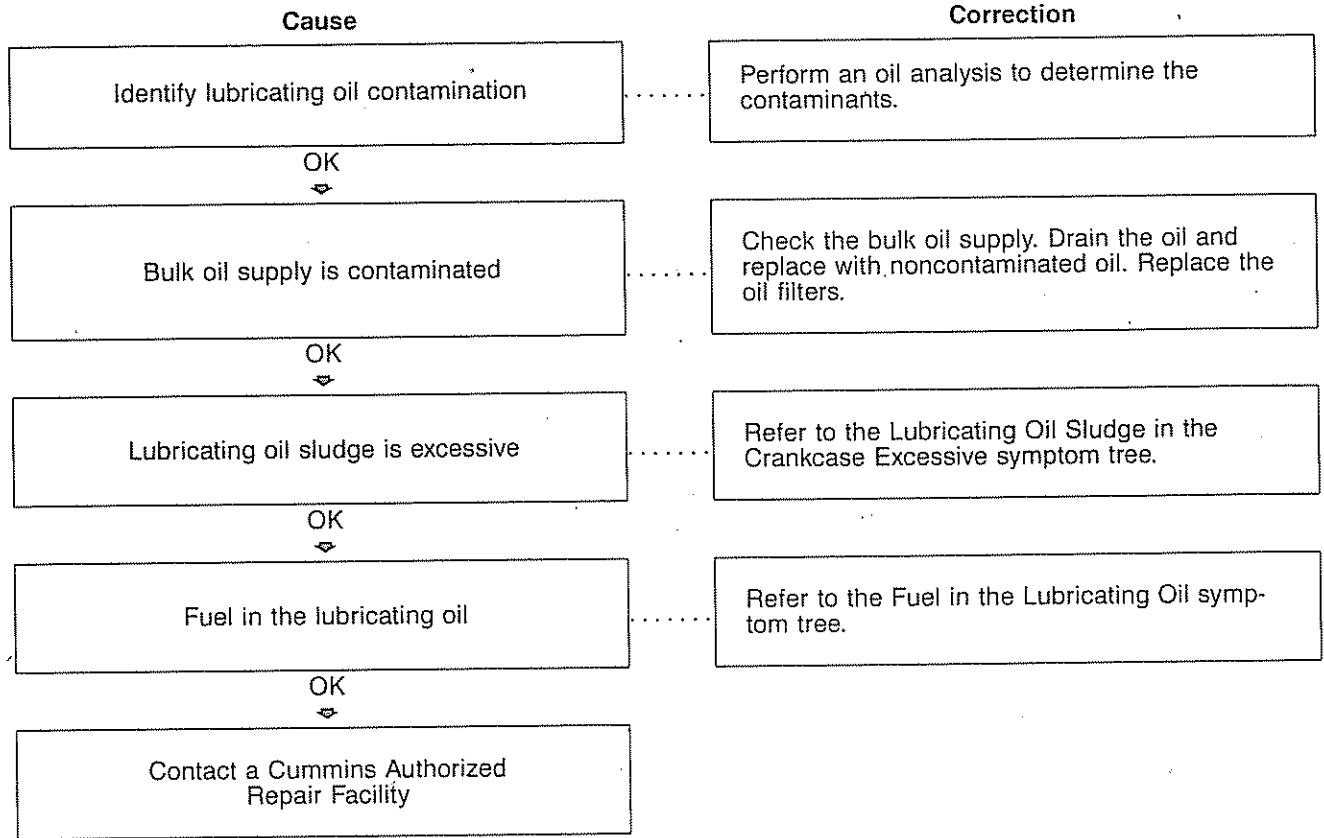
Intake Manifold Pressure (Boost) is Below Normal

Cause	Correction
Turbocharger is not correct	Check the turbocharger part number and compare it to the Control Parts List (CPL), Bulletin 3379133. Replace the turbocharger if necessary. Refer to Section A.
OK ↓	
Air intake or exhaust leaks	Check for loose or damaged piping connections and missing pipe plugs. Check the turbocharger and exhaust manifold mounting. Refer to . Refer to Section 7.
OK ↓	
Air compressor connection is loose or damaged	Check the connection between the manifold and the air compressor. Repair or replace if necessary.
OK ↓	
Contact a Cummins Authorized Repair Facility	

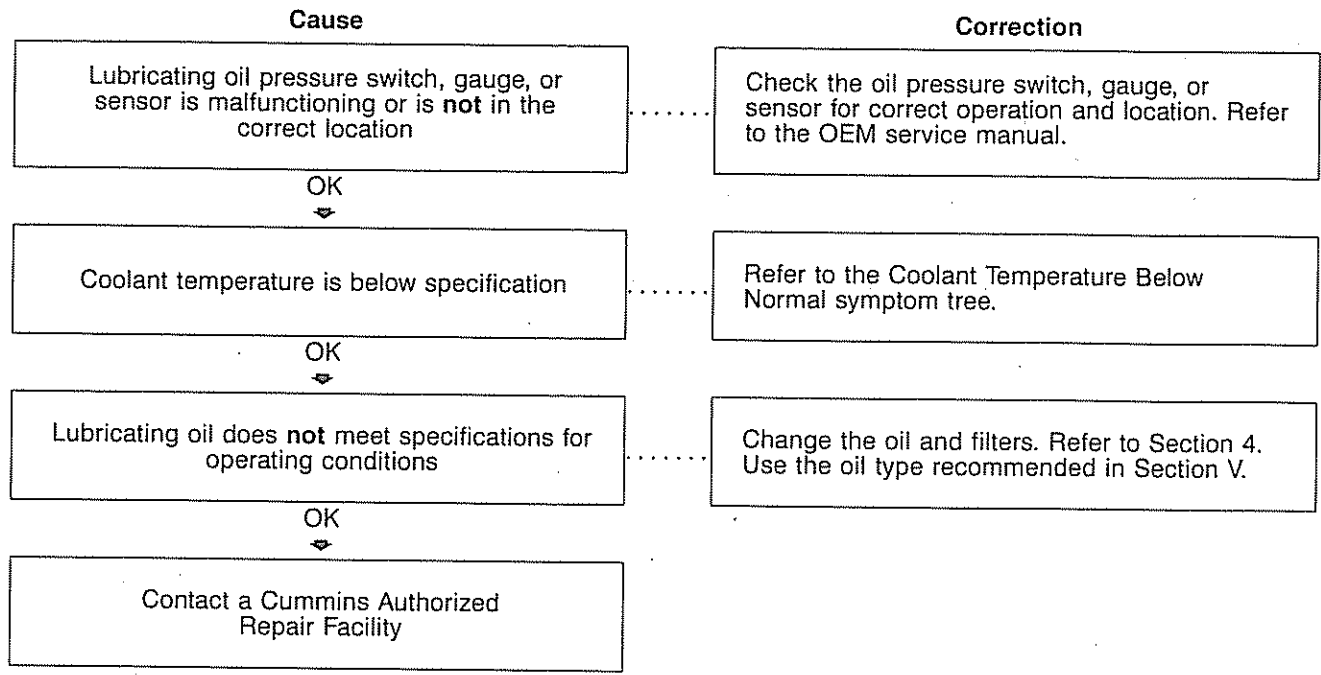
Lubricating Oil Consumption Excessive



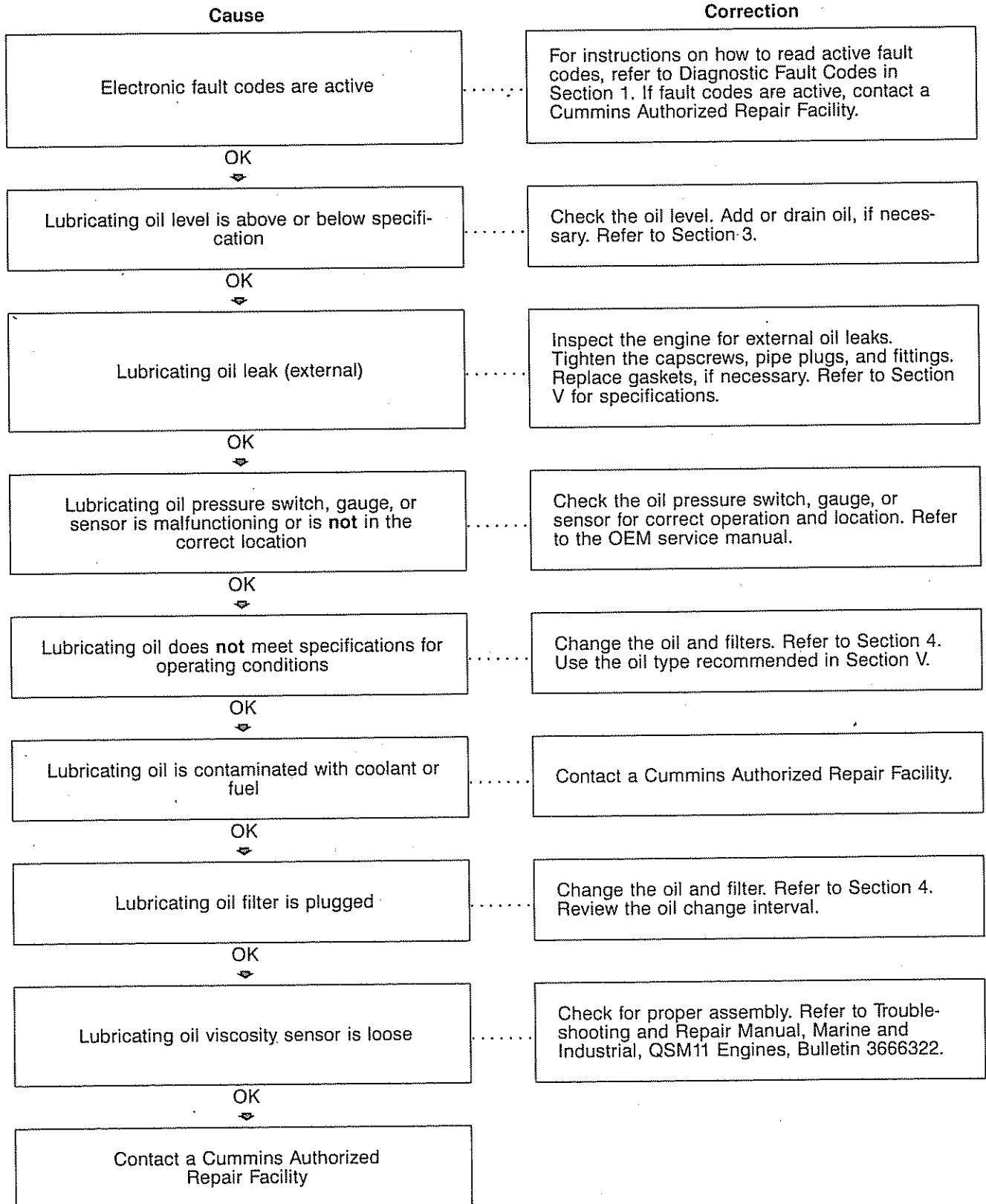
Lubricating Oil Contaminated



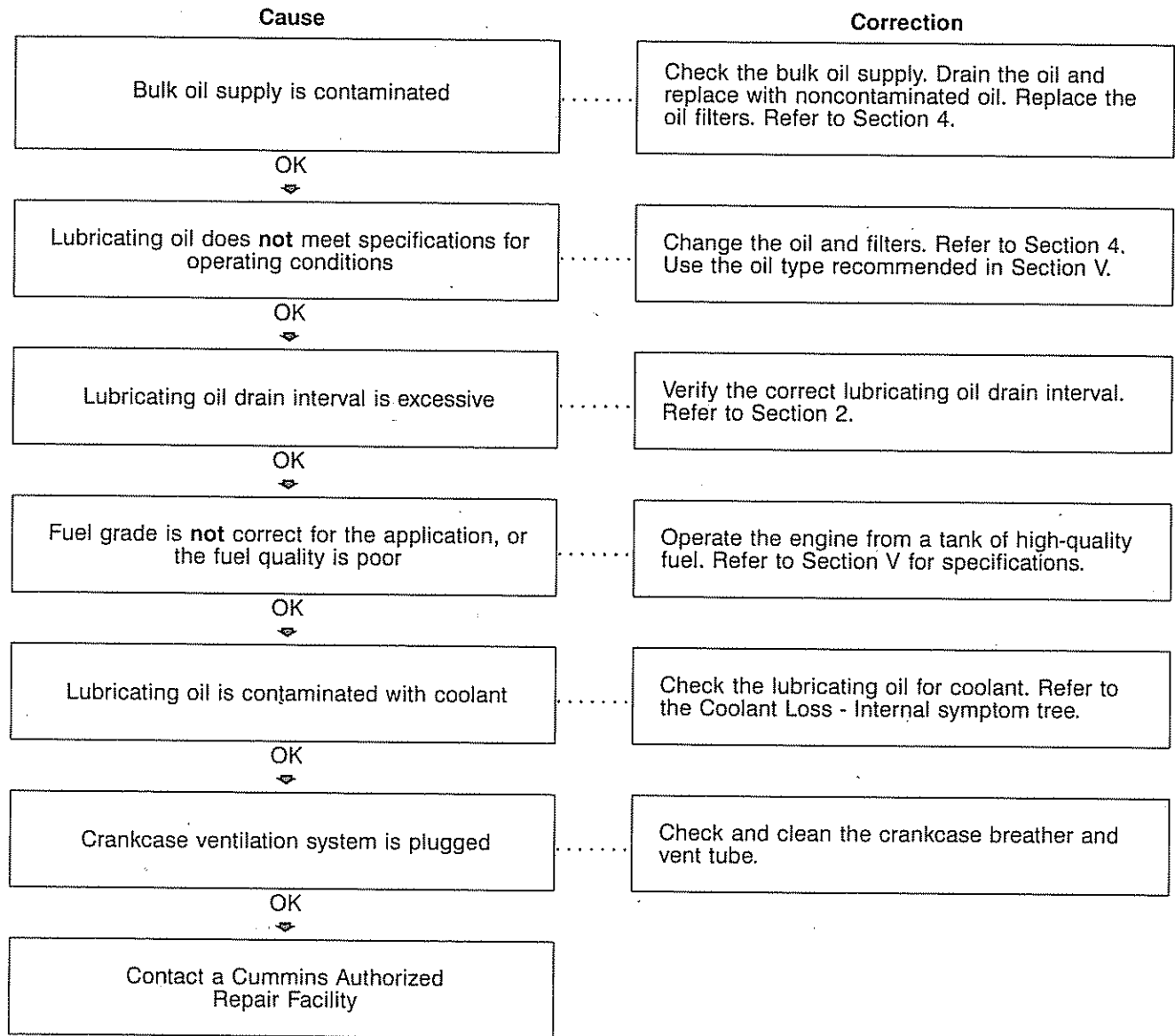
Lubricating Oil Pressure High



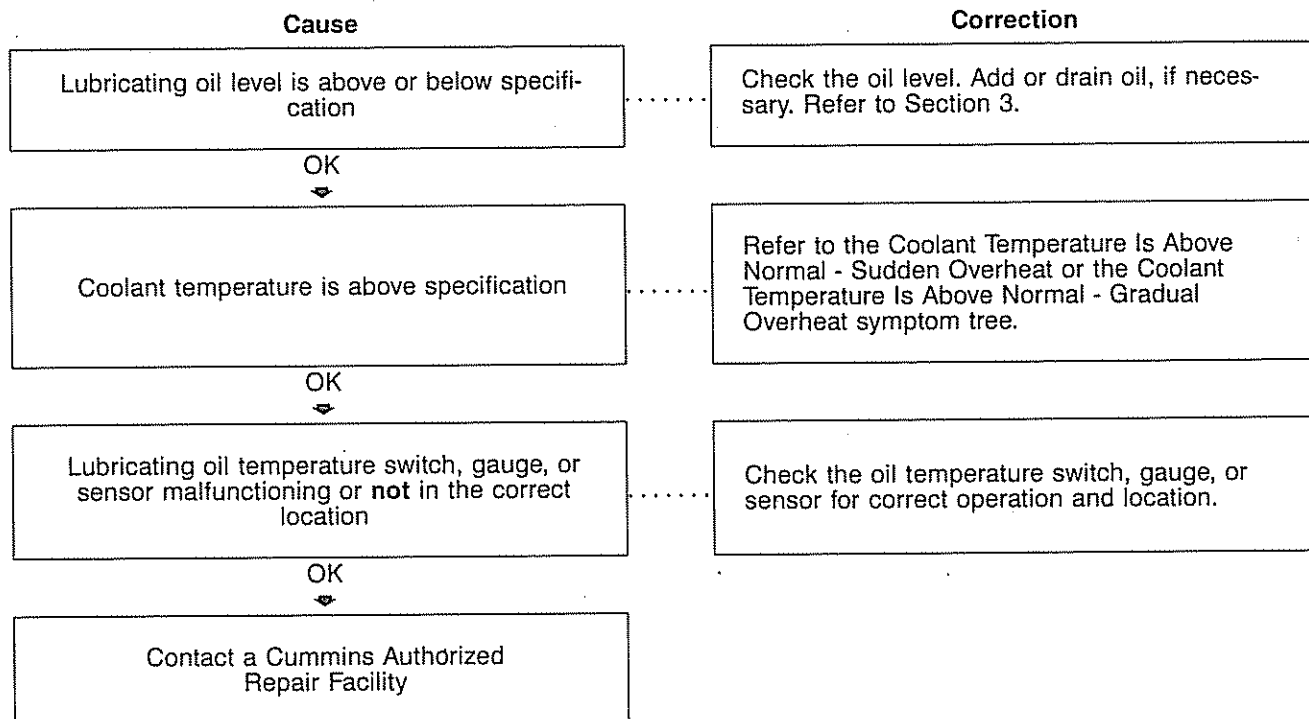
Lubricating Oil Pressure Low



Lubricating Oil Sludge in the Crankcase Excessive



Lubricating Oil Temperature Above Specification



Lubricating or Transmission Oil in the Coolant

Cause

Correction

Bulk coolant supply is contaminated

Check the bulk coolant supply. Drain the coolant and replace with noncontaminated coolant. Replace the coolant filters. Refer to Section 4.

OK



Contact a Cummins Authorized Repair Facility

PTO or Cruise Control Does Not Operate

Cause	Correction
Cruise control/PTO on/off switch is off	Turn on the switch.
OK	
Cruise control/PTO switch wires or connectors are loose	Check the cruise control/PTO on/off switch, selector switch, clutch switch, and brake switch for loose wires and connections.
OK	
Electronic fault codes are active	For instructions on how to read active fault codes, refer to Diagnostic Fault Codes in Section 1. If fault codes are active, contact a Cummins Authorized Repair Facility.
OK	
Contact a Cummins Authorized Repair Facility	

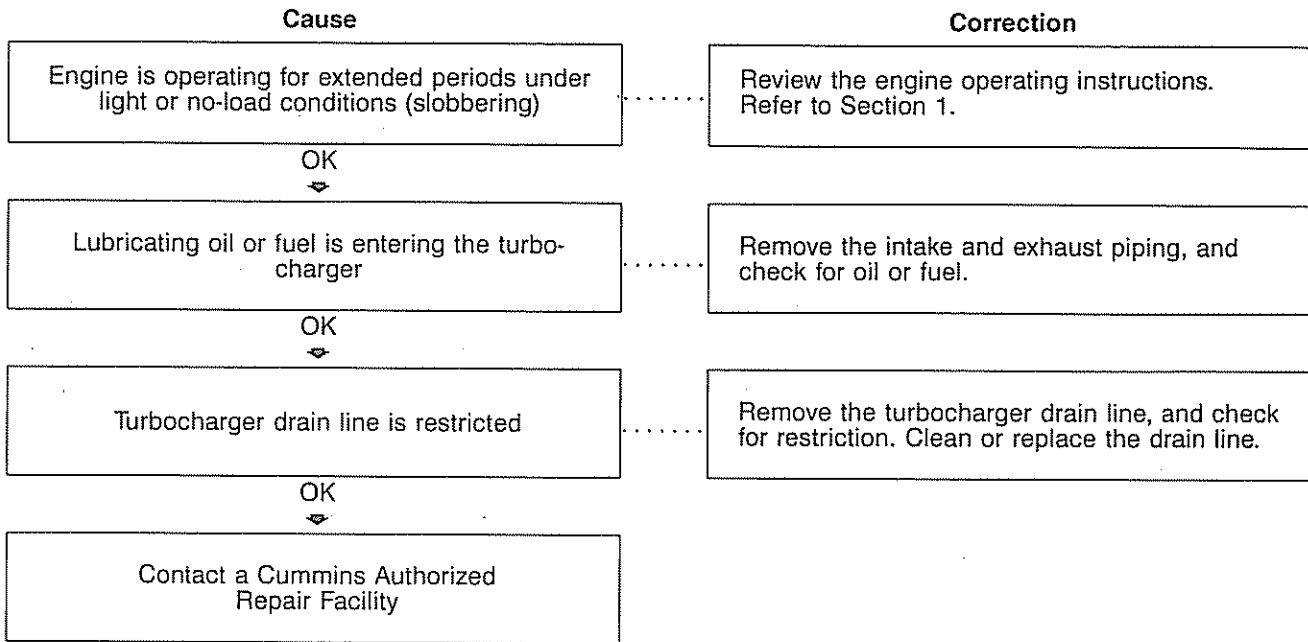
Smoke, Black — Excessive

Cause	Correction
Turbocharger wheel clearance is out of specification	Check the radial bearing clearance and axial clearance. Inspect the turbocharger. Repair or replace the turbocharger if necessary.
OK	
Air intake or exhaust leaks	Check for loose or damaged piping connections and missing pipe plugs. Check the turbocharger and exhaust manifold mounting. Refer to Section 6.
OK	
Fuel grade is not correct for the application, or the fuel quality is poor	Operate the engine from a tank of high-quality fuel. Refer to Section V for specifications.
OK	
Fuel drain line restriction	Check the fuel drain lines for restriction. Refer to Section V.
OK	
Contact a Cummins Authorized Repair Facility	

Smoke, White — Excessive

Cause	Correction
Electronic fault codes are active	For instructions on how to read active fault codes, refer to Diagnostic Fault Codes in Section 1. If fault codes are active, contact a Cummins Authorized Repair Facility.
OK ⇓	
Engine block heater is malfunctioning (if equipped)	Check the electrical sources and wiring to the cylinder block heater. Replace the block heater, if necessary. Refer to the OEM service manual.
OK ⇓	
Coolant temperature is below specification	Refer to the Coolant Temperature Below Normal symptom tree.
OK ⇓	
Engine is cold	Allow the engine to warm to operating temperature. If the engine will not reach operating temperature, refer to the Coolant Temperature Below Normal symptom tree.
OK ⇓	
Fuel grade is not correct for the application, or the fuel quality is poor	Operate the engine from a tank of high-quality fuel. Refer to Section V for specifications.
OK ⇓	
Overhead adjustments are not correct	Measure and adjust the overhead settings. Refer to Section 5.
OK ⇓	
Contact a Cummins Authorized Repair Facility	

Turbocharger Leaks Engine Oil or Fuel



Section V - Maintenance Specifications

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Specifications

General Specifications

Marine and Industrial Applications

Type	Four-cycle, In-line six-cylinder, four-valves per cylinder
Displacement	10.8 liters [659 C.I.D.]
Firing Order	1-5-3-6-2-4
Horsepower (refer to engine dataplate)	
Engine Speed at Maximum Output:	
Marine Applications	
Governed Speed (rpm)	2300
Industrial Applications	
Governed Speed (rpm)	2100
Bore and Stroke	125 mm [4.921 in] x 147 mm [5.787 in]
Engine Weight (with standard accessories):	
Marine Applications	
Dry Weight	1124 kg [2478 lb]
Industrial Applications	
Dry Weight	940 kg [2072 lb]
Wet Weight	996 kg [2196 lb]
Crankshaft Rotation (viewed from the front of the engine)	Clockwise

Fuel System

Marine and Industrial Applications

Maximum Fuel Inlet Temperature	71°C [160°F]
Fuel Inlet Maximum Restriction:	
Marine Applications	
Clean Fuel Filter	152 mm Hg [6 in Hg]
Dirty Fuel Filter	203 mm Hg [8 in Hg]
Industrial Applications	
Clean Fuel Filter	102 mm Hg [4 in Hg]
Dirty Fuel Filter	203 mm Hg [8 in Hg]
Fuel Drain Line Maximum Restriction:	
Without Check Valves	63 mm Hg [2.5 in Hg]
Engine Minimum Cranking Speed	120 rpm

Lubricating Oil System

Marine and Industrial Applications

Oil Pressure	
Minimum at Idle	69 kPa [10 psi]
Operating Range	207 to 448 kPa [30 to 65 psi]
at torque peak or 1200 rpm (minimum allowable)	207 kPa [30 psi]
Oil Temperature	
Maximum	121°C [250°F]
Oil Pan Capacity:	
Marine Applications	
Low	30 liters [8 gal]
High	34 liters [9 gal]
Industrial Applications	
Low	26 liters [7 gal]

High	34 liters [9 gal]
Total System Capacity:	
With Engine Mounted Filter (combination filter holds 2.6 liters [0.7 gal])	37 liters [9.8 gal]
With Remote Mounted Filter	38 liters [10 gal]
Maximum Operational Angularity of Oil Pan:	
Marine Applications	
Front Down:	
Rear Sump	30 degrees
Front Sump	45 degrees
Rear Down:	
Rear Sump	25 degrees
Front Sump	27 degrees
Side to Side:	
Rear Sump	30 degrees
Front Sump	42 degrees
Industrial Applications	
Varies by oil pan option - example numbers are based on stamped steel pan.	
Front Down:	
Rear Sump	42 degrees
Front Sump	45 degrees
Rear Down:	
Rear Sump	45 degrees
Front Sump	45 degrees
Side to Side:	
Rear Sump	45 degrees
Front Sump	35 degrees

Cooling System

Marine and Industrial Applications

Marine Applications

Coolant Capacity:	
Engine with Heat Exchanger	29.4 liters [8 gal]
Minimum Drawdown	15.2 liters [4 gal]
Minimum Fill Rate	18.9 liters/min [5 gpm]
Minimum Initial Fill Time	2 minutes
Maximum Deaeration Time	10 minutes
Standard Thermostat Modulating Range	71 to 79.4°C [160 to 175°F]
Maximum Coolant Temperature	96°C [205°F]
Minimum Coolant Expansion Space:	
Percent of Cooling System	5%
External Pressure Loss in Cooling System:	
Maximum	35 kPa [5 psi]
Static Pressure of Coolant:	
Maximum - Exclusive of Pressure Cap	103 kPa [15 psi]
Coolant Inlet Pressure with Open Thermostat and No Cap:	
Minimum	64 mm Hg [2.5 in Hg]
Block Coolant Pressure with Closed Thermostat and No Cap:	
Maximum	246 kPa [36 psi]
Maximum Sea Water Pressure	103 kPa [15 psi]
Maximum Sea Water Pump Inlet Restriction	127 mm Hg [5 in Hg]
Maximum Sea Water Pump Initial Suction Lift	3 m [10 ft]
Pressure Cap Rating (with heat exchanger)	103 kPa [15 psi]

Industrial Applications

Coolant Capacity	9.5 liters [2.5 gal]
Standard Modulating Thermostat Range	82 to 93°C [180 to 199°F]
Cylinder Block Coolant Pressure (pressure cap removed):	
Minimum:	
Closed Thermostat (1800 rpm no load)	138 kPa [20 psi]
Maximum:	
Closed Thermostat	275 kPa [40 psi]
Maximum Allowable Operating Coolant Temperature	100°C [212°F]
Minimum Recommended Operating Coolant Temperature	70°C [160°F]
Maximum Allowable Deaeration Time	35 minutes
Minimum Recommended Pressure Cap	48 kPa [7 psi]

Air Intake System

Marine and Industrial Applications

Marine Applications

Maximum Intake Restriction	
Clean Element	254 mm H ₂ O [10 in H ₂ O]
Dirty Element	507 mm H ₂ O [20 in H ₂ O]
Maximum Intake Manifold Temperature	49°C [120°F]
Maximum Engine Room Temperature:	
Intake Air Versus Ambient Air at Rated Condition	17°C [63°F] difference

Industrial Applications

Maximum Temperature Rise between Ambient Air and Engine Inlet Air:	
Ambient above 0°C [32°F]	35°C [63°F] difference
Maximum Intake Restriction:	
Clean Air Filter Element	381 mm H ₂ O [15 in H ₂ O]
Dirty Air Filter Element	635 mm H ₂ O [25 in H ₂ O]

Exhaust System

Marine and Industrial Applications

Exhaust Pipe Size (normally acceptable inside diameter)	102 mm [4 in]
Maximum Exhaust Pipe Restriction	
H ₂ O	1016 mm H ₂ O [40 in H ₂ O]
Hg	75 mm [3 in]

Compressed Air System

Cummins 18.7 CFM Model

Cylinders	1
Compressor Swept Volume at 1250 rpm	6.6 l/sec. [14.0 cfm]
Piston Displacement	318 cc [19.405 C.I.D.]
Bore	85 mm [3.346 in]
Stroke	56 mm [2.205 in]
Speed	Engine speed
Cooling	Engine coolant

Lubrication	Engine lubricating oil
Plumbing Line Sizes:	
Coolant Inlet and Outlet	3/4 x 16 STOR
Air Inlet	1-in nominal hose
Air Outlet	M27 x 2 STOR
Unloader Port	M10 x 1 STOR
Governor Mounting Direct	M8 x 1.25
Height, Overall (approximate)	217.4 mm [8.559 in]
Width, Overall (approximate)	142 mm [5.591 in]
Length, Overall (approximate)	216 mm [8.504 in]
Weight (approximate)	15 kg [33.0 lb]

Cummins 37.4 CFM Model

Cylinders	2
Compressor Swept Volume at 1250 rpm	15.5 l/sec. [35.5 cfm]
Piston Displacement	636 cc [39 C.I.D.]
Bore	85 mm [3.35 in]
Stroke	56 mm [2.2 in]
Speed	Engine speed
Cooling	Engine coolant
Lubrication	Engine Oil
Plumbing Line Sizes:	
Coolant Inlet and Outlet	3/4 x 16 STOR
Air Inlet	1-in nominal hose
Air Outlet	M27 x 2 STOR
Unloader Port	M10 x 1 STOR
Governor Mounting Direct	M8 x 1.25
Height, Overall (approximate)	306 mm [12 in]
Width, Overall (approximate)	142 mm [5.6 in]
Length, Overall (approximate)	286.7 mm [11.29 in]
Weight (approximate)	17.24 kg [38 lb]

Electrical System

Marine and Industrial Applications

Starting Motor Circuit:

Maximum Resistance:

12 VDC	0.00075 ohm
24 VDC	0.002 ohm

Maximum Voltage Drop:

12 VDC	1.95 VDC
24 VDC	1.7 VDC

Marine Applications

Unaided Cold Start:

Maximum Ambient Temperature	-7°C [19°F]
Minimum Cranking Speed Required	120 rpm

Industrial Applications

Unaided Cold Start:

Maximum Ambient Temperature	-12°C [10°F]
-----------------------------------	--------------

Minimum Cranking Speed Required 120 rpm

Minimum recommended battery capacity:

System Voltage	Ambient Temperature			
	-18°C [0°F]		0°C [32°F]	
	Cold Cranking Amperes	Reserve Capacity ¹ Minutes	Cold Cranking Amperes	Reserve Capacity ¹ Minutes
12 VDC	2700	580	1800	580
24 VDC ²	1200	360	1200	360

1. The number of plates within a given battery size determines reserve capacity. Reserve capacity determines the length of time that sustained cranking can occur.
2. Cold Cranking Amperes ratings are based on two 12-VDC batteries in series.

A minimum of 6.5 VDC at the power connector is required to power up the ECM.

Cummins/Fleetguard®/Nelson Filter Specifications

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

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

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

Batteries (Specific Gravity)

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

Maximum Resistance of Starting Motor Circuit

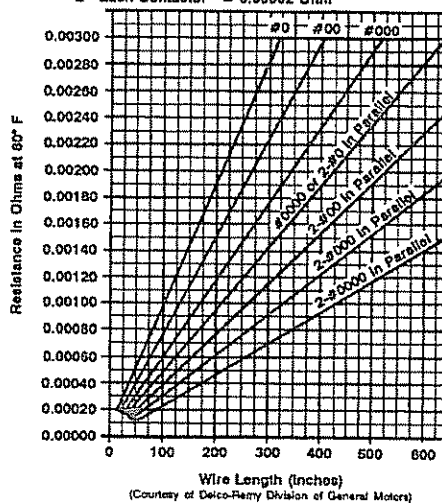
12-VDC Starting Motor (Ohms) 0.00075

24-VDC Starting Motor (Ohms) 0.002

Cable resistances can be obtained in the accompanying Battery Cable Resistance Chart. If the frame is in ground circuit, the frame length **must** be considered cable of the same size as that used in the balance of the system.

Item	Resistance Ohms
Connection	0.00001
Additional Contactor (Series-Parallel Switch, Relays, etc.)	0.00020

Deduct the Following from the Total Circuit Resistance Recommended Before Determining Wire Sizes for a Given Length:
1 - Each Connection = 0.00001 Ohm
2 - Each Contactor = 0.00002 Ohm



01800v07

Fuel Recommendations and Specifications

Fuel Recommendations

▲ WARNING ▲

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

▲ CAUTION ▲

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

▲ CAUTION ▲

Do not use diesel fuel blended with lubricating oil in engines equipped with a catalytic converter. Damage to the converter will result.

Cummins Engine Company, Inc., recommends the use of ASTM Number 2D diesel fuel. The use of Number 2D diesel fuel will result in optimum engine performance.

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

NOTE: Lighter fuels can reduce fuel economy.

The viscosity of the fuel **must** be kept above 1.3 cSt at 40°C [104°F] to provide adequate fuel system lubrication.

The following chart lists acceptable alternate fuels.

Acceptable Substitute Fuels - Cummins Fuel System									
Number 1D Diesel	Number 2D Diesel	Number 1K Kerosene	Jet-A	Jet-A1	JP-5	JP-8	Jet-B	JP-4	CITE
1	OK	1	1	1	OK	OK	NOT OK	NOT OK	NOT OK
1. OK - Only if fuel lubricity is adequate. Refer to Fuel for Cummins Engines, Bulletin 3379001. 2. Acceptable only if - Chrome plated injector plungers, fuel additives, and heavy-duty carbon graphite bushed gear pump are used. - The fuel is blended with enough fuel additive to increase the lubricity above the minimum level. Refer to Fuel for Cummins Engines, Bulletin 3379001. 3. NOTE: Any adjustment to compensate for reduced performance with a fuel system using substitute fuel is not warrantable.									

Additional information for fuel recommendations and specifications can be found in Fuel for Cummins Engines, Bulletin 3379001. See ordering information in Section L.

Lubricating Oil Recommendations and Specifications

General Information

The use of quality engine lubricating oils, combined with appropriate oil drain and filter change intervals, is a critical factor in maintaining engine performance and durability.

Cummins Engine Company, Inc. recommends the use of a high-quality 15W-40 multiviscosity heavy-duty engine oil that meets the requirements of 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 by Severity of Service mi [km] chart listed in Section 2. The oil grades CC, CD, and CE have been obsoleted by API and should **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.

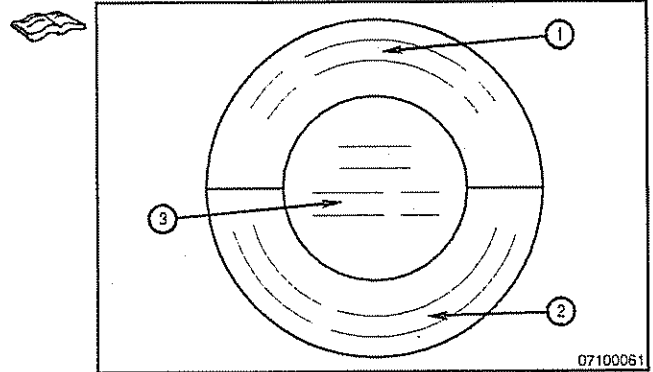
Synthetic engine oils, API category III, are recommended for use in Cummins engines operating in ambient temperature conditions consistently below -25°C [-13°F]. Above this temperature, it is recommended the petroleum-based multigrade lubricants be used. Synthetic 0W-30 oils that meet API category III can be used in operations where the ambient temperature **never** exceeds 0°C [32°F]. Synthetic 0W-30 oils 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.

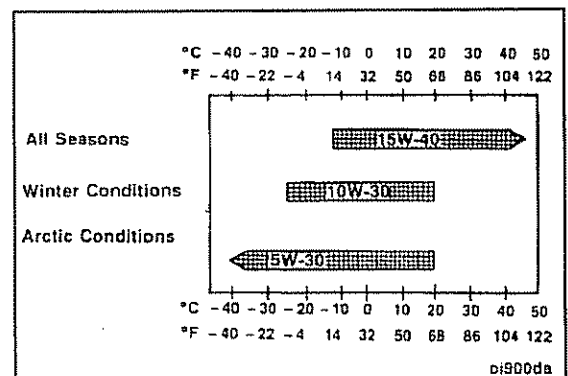
Additional information regarding lubricating oil availability throughout the world is available in the Engine Manufacturing Association (EMA) Lubricating Oils Data Book for Heavy-Duty Automotive and Industrial Engines. The data book can be ordered from Engine Manufacturers Association, One Illinois Center, 111 East Wacker Drive, Chicago, IL, U.S.A. 60601; (312) 644-6610.

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 temperature or cold conditions, 10W-30 or 5W-30 viscosity can be used for easier starting, improved oil flow, and improved fuel economy.



△ CAUTION △

A sulfated ash limit of 1.85 percent has been placed on all engine lubricating oils recommended for use in Cummins engines. Higher ash oils can cause valve and/or piston damage and lead to excessive oil consumption.

New Engine Break-in Oil

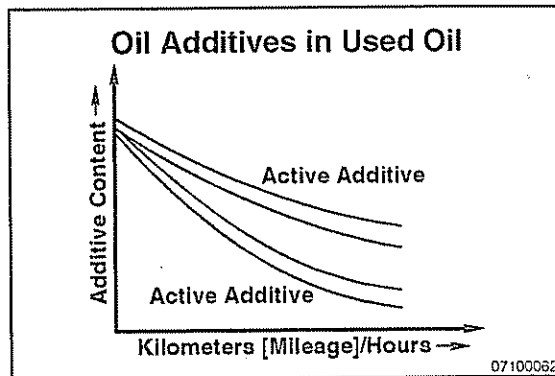
Synthetic or partially synthetic engine lubricating oils can **not** be used during break-in of a new or rebuilt engine. To make sure the piston rings seat properly, use a high-quality petroleum-based engine lubricating oil during the first engine oil drain period.

Oil Drain Interval

As the engine oil becomes contaminated, essential oil additives are depleted. Lubricating oils protect the engine as long as these additives are functioning properly. Progressive contamination of the oil between oil and filter change intervals is normal. The amount of contamination will vary depending on the operation of the engine, kilometers or miles on the oil, fuel consumed, and new oil added.

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

Refer to the oil drain chart in Section 2 to determine which oil drain interval to use.



⚠ CAUTION ⚠

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

Maximum oil drain intervals are based upon the use of fuel with 0.05-percent sulfur. Refer to Cummins Engine Oil Recommendations, Bulletin 3810340, for further details. If there are any questions about fuel sulfur content, ask your fuel supplier to provide a written analysis of the fuel.

The lubricating oil filter is to be replaced at each oil drain with a high-quality filter that meets the Cummins Source Approval Method 10,765 specification, including the cold-flow specifications.

Aftermarket Oil Additive Usage

Cummins Engine Company does **not** recommend the use of aftermarket oil additives. Present high-quality fully additive engine lubricating oils are very sophisticated, with precise amounts of additives blended into the lubricating oil to meet stringent requirements defined by Cummins Engineering Specification CES 20071 that is similar to API CH-4 and CES 20076. 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

⚠ CAUTION ⚠

A sulfated ash limit of 1.85 percent has been placed on all engine lubricating oils recommended for use in Cummins engines. Higher ash oils can cause valve and/or piston damage and lead to excessive oil consumption.

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

Additional information regarding lubricating oil availability throughout the world is available in the E.M.A. Lubricating Oils Data Book for Heavy-Duty Automotive and Industrial Engines. The data book can be ordered from the Engine Manufacturers Association, One Illinois Center, 111 East Wacker Drive, Chicago, IL, U.S.A. 60601. The telephone number is (312) 644-6610.

Coolant Recommendations and Specifications

General Information

Cummins 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 Recommended Practice ASTM D6210 (ethylene glycol) or ASTM D6211 (propylene glycol). The use of fully formulated antifreeze or coolant significantly simplifies cooling system maintenance.

Copies of The Maintenance Council specifications can be obtained through Cummins Engine Company, Inc., or by contacting:

The Maintenance Council
American Trucking Association
2200 Mill Road
Alexandria, VA 22314-5388
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 will give an explanation of water, antifreeze, and SCAs. They will also explain how to test antifreeze and SCA levels.

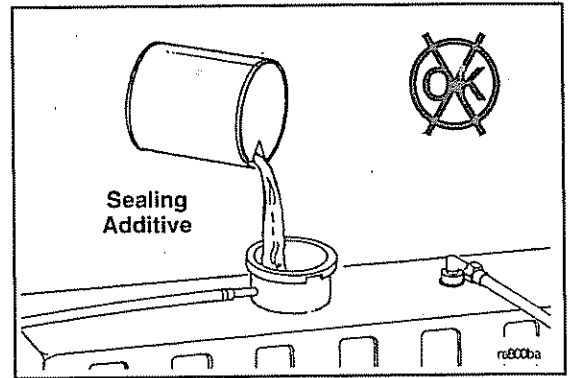
This section also contains information on cooling system maintenance and a coolant treatment chart that is used to determine the correct SCA service filter.

Alternative maintenance practices for cooling systems can be found in Cummins Coolant Requirements and Maintenance Manual, Bulletin 3666132-01.

Cooling System Sealing Additives

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

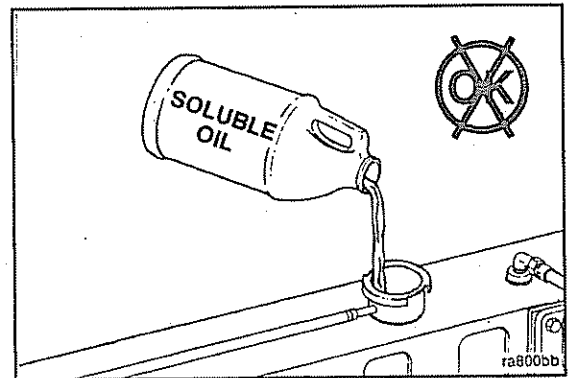
- Build up in coolant low-flow areas
- Clog coolant filters
- Plug radiator and oil cooler.



Cooling System Soluble Oils

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

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



Fleetguard® Nelson® DCA4 Service Filters and Liquid Precharge

DCA4 ⁽¹⁾ Service Filters:		DCA ⁽¹⁾ (Fleetcool) Service Filters:	
Part Number	SCA Units	Part Number	SCA Units
WF2070	2	WF2050	2
WF2071	4	WF2051	4
WF2072	6	WF2052	6
WF2073	8	WF2053	8
WF2074	12	Not available	12
WF2075	15	WF2054	15
WF2076	23	WF2055	23
WF2077	(blank filter without SCAs)	WF2077	(blank filter without SCAs)

Note:

(1) DCA4 (phosphate/nitrite/molybdate chemistry) and DCA (borate/nitrite chemistry) meets Cummins requirements for supplemental coolant additives.

Part Number	DCA4 Liquid		Part Number	DCA (Fleetcool) Liquid	
	Size	SCA Units		Size	SCA Units
DCA60L	0.47 liter [1 pt]	5	DCA30L	0.47 liter [1 pt]	5
DCA65L	1.89 liters [2 qt]	20	DCA35L	1.89 liters [2 qt]	20
DCA70L	3.78 liters [1 gal]	40	DCA40L	3.78 liters [1 gal]	40
DCA75L	18.9 liters [5 gal]	200	DCA45L	18.9 liters [5 gal]	200
DCA80L	208 liters [55 gal]	2200	DCA50L	208 liters [55 gal]	2200

Maintenance Intervals for Cooling Systems up to 76 Liters [20 Gallons]

Install service filter(s) and/or liquid containing number of SCA units below:

Service Interval	System Size in Liters [Gallons]					
	Kilometers [Miles]	[Hours]	4 to 19 [1 to 5]	19 to 38 [6 to 10]	42 to 57 [11 to 15]	60 to 76 [16 to 20]
72,001 to 80,000	[45,001 to 50,000]	1126 to 1250	8	12	23	30
64,001 to 72,000	[40,001 to 45,000]	1001 to 1125	4	12	15	26
56,001 to 64,000	[35,001 to 40,000]	876 to 1000	4	8	12	23
48,001 to 56,000	[30,001 to 35,000]	751 to 875	4	6	12	20
40,001 to 48,000	[25,001 to 30,000]	626 to 750	4	6	10	18
32,001 to 40,000	[20,001 to 25,000]	501 to 625	2	6	8	15
24,001 to 32,000	[15,001 to 20,000]	376 to 500	2	4	6	12
16,001 to 24,000	[10,001 to 15,000]	251 to 375	2	4	6	8
0 to 16,000	[0 to 10,000]	0 to 250	2	2	4	6

Maintenance Intervals for Cooling System up to 1514 Liters [400 gal]

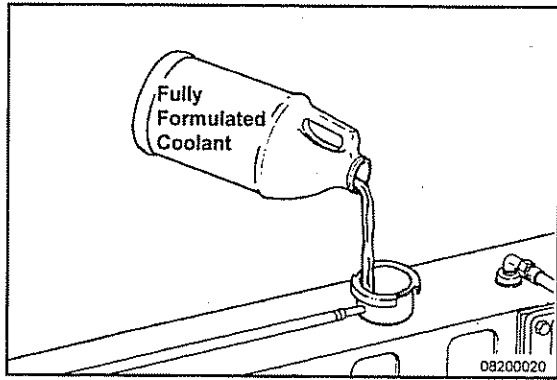
Install service filter(s) and/or liquid containing number of SCA units below:

Service Interval	System Size in Liters [Gallons]									
	79 to 144	117 to 189	193 to 284	288 to 378	382 to 568	572 to 757	761 to 946	950 to 1135	1139 to 1325	1329 to 1574
Hours	[21 to 30]	[31 to 50]	[51 to 75]	[76 to 100]	[101 to 150]	[151 to 200]	[201 to 250]	[251 to 300]	[301 to 350]	[351 to 400]
751 to 1000	25	50	80	100	150	200	250	300	350	400
501 to 750	20	35	60	75	110	150	190	225	260	300
251 to 500	15	25	40	50	75	100	125	150	175	200
0 to 250	10	15	20	25	40	50	65	75	90	100

Notes:

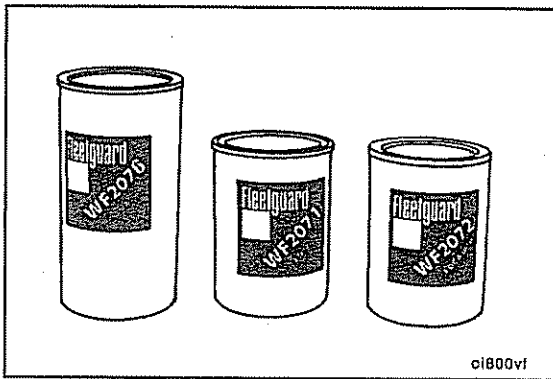
- A. Consult the vehicle equipment manufacturer's maintenance information for total cooling system capacity.
- B. When draining and replacing the coolant, **always** precharge the cooling system to an SCA level of 1.5 units per gallon. This concentration level **must never** be allowed to go below 1.2 units and **must** be controlled when the level is greater than 3 units. Action needed when the level goes below 1.2 is a filter and liquid precharge from 1.2 to 3 units, filter **only**; above 3, test at every oil change until level falls to 3 or below.
- C. Change coolant filters at each oil change to protect the cooling system. Consult the coolant capacity chart to determine the correct coolant filter for a given cooling system capacity and oil drain interval.

NOTE: When performing service that requires draining the cooling system, take special precautions to collect it in a clean container, seal it to prevent contamination, and save for reuse.



Supplemental Coolant Additive (SCA)

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

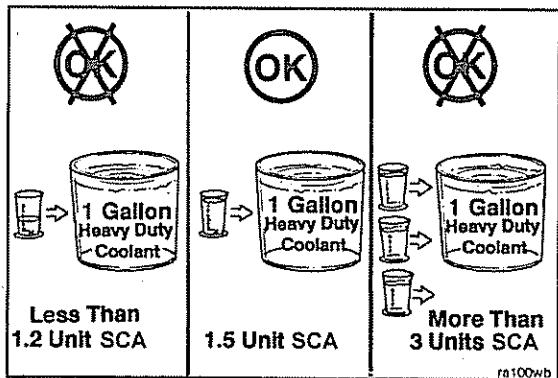


Supplemental coolant additives, or equivalent, are used to prevent liner pitting, corrosion, and scale deposits in the cooling system.

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

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

NOTE: The correct filter is determined by the total cooling system capacity and oil drain interval. Refer to the Coolant Capacity Specifications in this section.



⚠ CAUTION ⚠

Insufficient concentration of the coolant additives will result in liner pitting and engine failure.

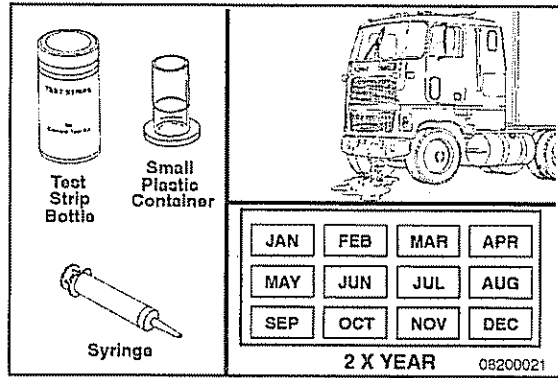
The SCA concentration **must not** fall below 1.2 units or exceed 3 units per gallon of cooling system capacity.

Testing SCA Concentration Level CC-2602 Test Kit

Carefully follow the instructions to test the coolant, and take the appropriate action recommended by the kit.

Precautions and Instructions for Proper Kit Use

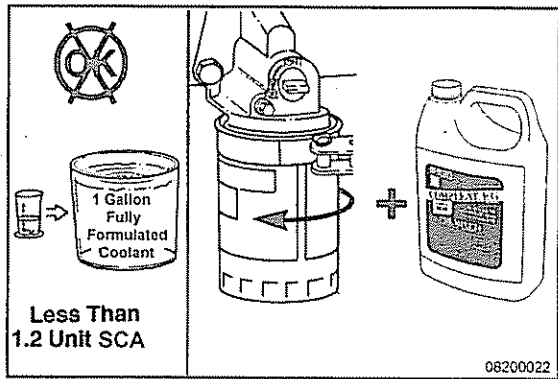
- The coolant sample to be tested **must** be between 10 and 54°C [50 and 129°F]. If the sample is too cold or too hot, you will get incorrect results.
- To get the best color match results, compare test strip pads to the color chart in daylight or under cool white fluorescent lighting. If unsure about a specific color match when a test does fall between two colors on the color chart, choose the lower numbered block. It is safer to underestimate your results than to overestimate.
- The test strips do have a limited shelf life and are sensitive to humidity and extreme heat. Proper handling and storage is necessary to protect the life of the strips.
- Keep the cap tightly sealed on the test strip bottle **except** when removing a strip. Store away from direct sunlight and in an area where the temperature will generally stay below 32°C [90°F].
- Do **not** use the test strips after the expiration date stamped on the bottle.
- Discard the kit if any of the pads on the unused strips have turned light brown or pink.
- Use one strip at a time and take care **not** to touch any of the pads on the strip. Doing so will contaminate the pads and 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.
- Clean and dry the sample cup and syringe after each use. This will prevent contamination of future samples.
- 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 container, seal coolant to prevent contamination, and save for reuse.



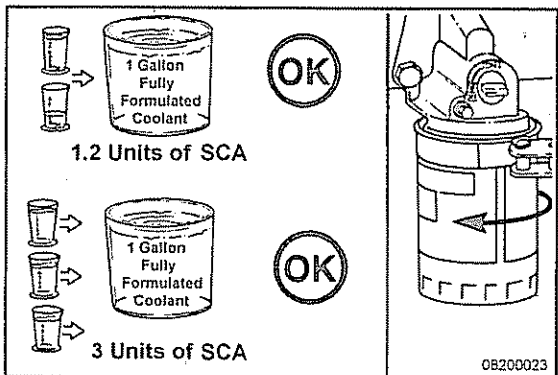
Test Intervals

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

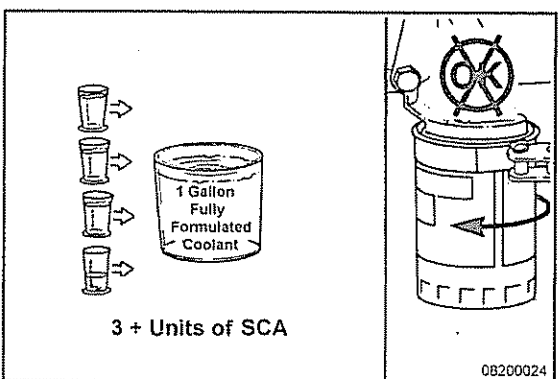
Testing is also recommended twice a year to monitor the SCA level. If the SCA level is above 3 units, test at subsequent oil drain intervals until the concentration is back under 3 units. When the concentration is back under 3 units, start installing the correct service filters at each drain interval.



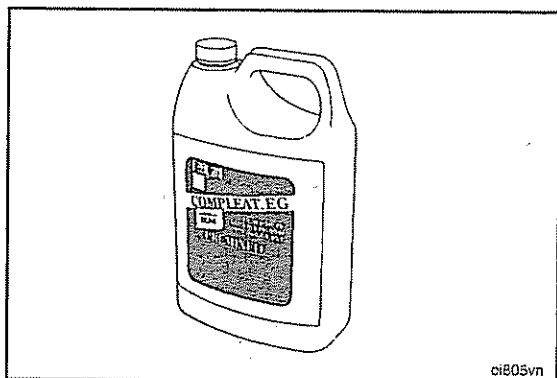
If the concentration is below 1.2 units per gallon, replace the filter and precharge with liquid.



If the concentration is 1.2 to 3 units per gallon, replace the filter.

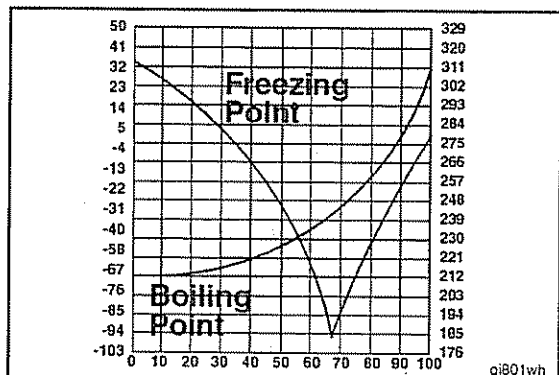


If the concentration is above 3 units per gallon, do **not** replace the service filter. Test the coolant at subsequent oil drain intervals until the concentration is back under 3 units. When the concentration is back under 3 units, start installing service filters at each oil change interval.



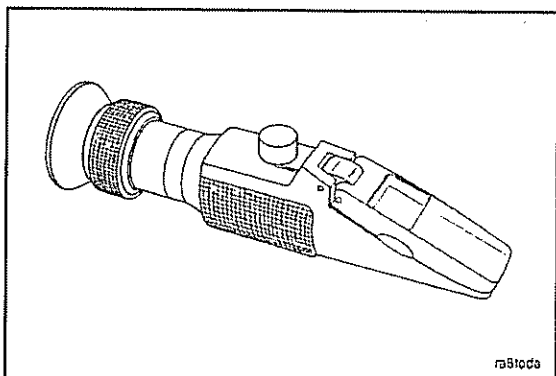
ci805vn

Cummins Engine Company, Inc., recommends using Fleetguard® Compleat. It is available in both glycol forms (ethylene and propylene) and complies with The Maintenance Council RP 329 or The Maintenance Council RP 330 standards.



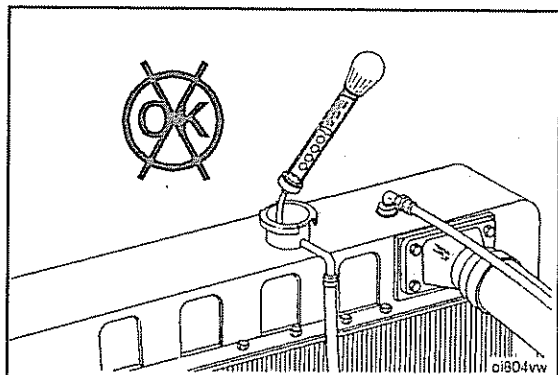
ci801wh

Fully formulated antifreeze **must** be mixed with good-quality water at a 50/50 ratio (40- to 60-percent working range). A 50/50 mixture of antifreeze and water gives a -36°C [-33°F] freezing point and a boiling point of 110°C [230°F], which is adequate for locations in North America. The actual lowest freezing point of ethylene glycol antifreeze is at 68 percent. Using higher concentrations of antifreeze will raise the freezing point of the solution and increase the possibility of a silica gel problem.



ra8toda

A refractometer, Part No. CC-2800, **must** be used to measure the freezing point of the coolant accurately.



ci804vw

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

Drive Belt Tension

Tension Chart

SAE Belt Size	Belt Tension Gauge Part No.		Belt Tension New		Belt Tension Range Used*	
	Click-type	Burroughs	N	lbf	N	lbf
0.380 in	3822524		620	140	270 to 490	60 to 110
0.440 in	3822524		620	140	270 to 490	60 to 110
1/2 in	3822524	ST-1138	620	140	270 to 490	60 to 110
11/16 in	3822524	ST-1138	620	140	270 to 490	60 to 110
3/4 in	3822524	ST-1138	620	140	270 to 490	60 to 110
7/8 in	3822524	ST-1138	620	140	270 to 490	60 to 110
4 rib	3822524	ST-1138	620	140	270 to 490	60 to 110
5 rib	3822524	ST-1138	670	150	270 to 530	60 to 120
6 rib	3822525	ST-1293	710	160	290 to 580	65 to 130
8 rib	3822525	ST-1293	890	200	360 to 710	80 to 160
10 rib	3822525	3823138	1110	250	440 to 890	100 to 200
12 rib	3822525	3823138	1330	300	530 to 1070	120 to 240
12 rib K section	3822525	3823138	1330	300	890 to 1070	200 to 240

NOTE: This chart does not apply to automatic belt tensioners.

- * A belt is considered used if it has been in service for ten minutes or longer.
- * If used belt tension is less than the minimum value, tighten the belt to the maximum used belt value.

Engine Component Torque Values

General Information

Component	Wrench Size	Torque Value	
		N•m	ft-lb
Oil Pan Drain Plug	1-1/4	88	65
Turbocharger Mounting Nuts	16 mm	68	50
Air Compressor Unloader Valve Capscrews	1/2 in	14	10
Fan Drive Idler Pulley Shaft Locknut		165 to 190	120 to 140
Injector/Valve Adjusting Screw Locknut W/Adapter, Part No. ST-669	3/4 in	47	35
Injector/Valve Adjusting Screw Locknut Without Adapter, Part No. ST-669	3/4 in	61	45
Rocker Lever Cover Capscrews	13 mm	15	130 in-lb
Injector Holddown Clamps		75	55

Capscrew Markings and Torque Values

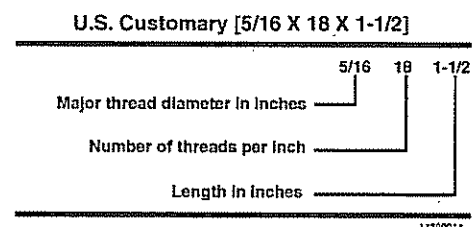
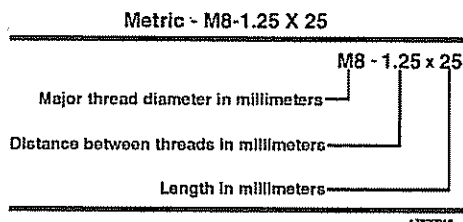
General Information



When replacing capscrews, always use a capscrew of the same measurement and strength as the capscrew being replaced. Using the wrong capscrews can result in engine damage.

Metric capscrews and nuts are identified by the grade number stamped on the head of the capscrew or on the surface of the nuts. U.S. Customary capscrews are identified by radial lines stamped on the head of the capscrew.




The following examples indicate how capscrews are identified:



NOTES:

1. **Always** use the torque values listed in the following tables when specific torque values are **not** available.
2. Do **not** use the torque values in place of those specified in other sections of this manual.
3. The torque values in the table are based on the use of lubricated threads.
4. When the ft-lb value is less than 10, convert the ft-lb value to in-lb to obtain a better torque with an in-lb torque wrench. Example: 6 ft-lb equals 72 in-lb.

Capscrew Markings and Torque Values - U.S. Customary

SAE Grade Number	5	8
Capscrew Head Markings These are all SAE Grade 5 (3 line)		
	Capscrew Torque - Grade 5 Capscrew	Capscrew Torque - Grade 8 Capscrew

Capscrew Body Size	Cast Iron		Aluminum		Cast Iron		Aluminum	
	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb
1/4 - 20	9	7	8	6	15	11	8	6
1/4 - 28	12	9	9	7	18	13	9	7
5/16 - 18	20	15	16	12	30	22	16	12
5/16 - 24	23	17	19	14	33	24	19	14
3/8 - 16	40	30	25	20	55	40	25	20
3/8 - 24	40	30	35	25	60	45	35	25
7/16 - 14	60	45	45	35	90	65	45	35
7/16 - 20	65	50	55	40	95	70	55	40
1/2 - 13	95	70	75	55	130	95	75	55
1/2 - 20	100	75	80	60	150	110	80	60
9/16 - 12	135	100	110	80	190	140	110	80
9/16 - 18	150	110	115	85	210	155	115	85
5/8 - 11	180	135	150	110	255	190	150	110
5/8 - 18	210	155	160	120	290	215	160	120
3/4 - 10	325	240	255	190	460	340	255	190
3/4 - 16	365	270	285	210	515	380	285	210
7/8 - 9	490	360	380	280	745	550	380	280
7/8 - 14	530	390	420	310	825	610	420	310
1 - 8	720	530	570	420	1100	820	570	420
1 - 14	800	590	650	480	1200	890	650	480

Capscrew Markings and Torque Values - Metric

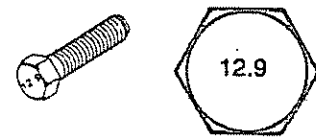
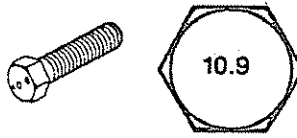
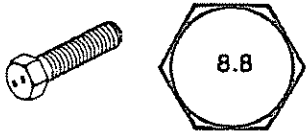
Commercial Steel Class

8.8

10.9

12.9

Capscrew Head Markings



Body Size Diameter mm	Torque				Torque				Torque			
	Cast Iron		Aluminum		Cast Iron		Aluminum		Cast Iron		Aluminum	
	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb
6	9	5	7	4	13	10	7	4	14	9	7	4
7	14	9	11	7	18	14	11	7	23	18	11	7
8	23	17	18	14	33	25	18	14	40	29	18	14
10	45	33	30	25	65	50	30	25	70	50	30	25
12	80	60	55	40	115	85	55	40	125	95	55	40
14	125	90	90	65	180	133	90	65	195	145	90	65
16	195	140	140	100	280	200	140	100	290	210	140	100
18	280	200	180	135	390	285	180	135	400	290	180	135
20	400	290	—	—	550	400	—	—	—	—	—	—

Fraction, Decimal, Millimeter Conversions

Conversion Chart

Fraction	inch	mm	Fraction	inch	mm
1/64	0.0156	0.397	33/64	0.5156	13.097
1/32	0.0313	0.794	17/32	0.5313	13.494
3/64	0.0469	1.191	35/64	0.5469	13.891
1/16	0.0625	1.588	9/16	0.5625	14.288
5/64	0.0781	1.984	37/64	0.5781	14.684
3/32	0.0938	2.381	19/32	0.5938	15.081
7/64	0.1094	2.778	39/64	0.6094	15.478
1/8	0.1250	3.175	5/8	0.6250	15.875
9/64	0.1406	3.572	41/64	0.6406	16.272
5/32	0.1563	3.969	21/32	0.6563	16.669
11/64	0.1719	4.366	43/64	0.6719	17.066
3/16	0.1875	4.763	11/16	0.6875	17.463
13/64	0.2031	5.159	45/64	0.7031	17.859
7/32	0.2188	5.556	23/32	0.7188	18.256
15/64	0.2344	5.953	47/64	0.7344	18.653
1/4	0.2500	6.350	3/4	0.7500	19.050
17/64	0.2656	6.747	49/64	0.7656	19.447
9/32	0.2813	7.144	25/32	0.7813	19.844
19/64	0.2969	7.541	51/64	0.7969	20.241
5/16	0.3125	7.938	13/16	0.8125	20.638
21/64	0.3281	8.334	53/64	0.8281	21.034
11/32	0.3438	8.731	27/32	0.8438	21.431
23/64	0.3594	9.128	55/64	0.8594	21.828
3/8	0.3750	9.525	7/8	0.8750	22.225
25/64	0.3906	9.922	57/64	0.8906	22.622
13/32	0.4063	10.319	29/32	0.9063	23.019
27/64	0.4219	10.716	59/64	0.9219	23.416
7/16	0.4375	11.113	15/16	0.9375	23.813
29/64	0.4531	11.509	61/64	0.9531	24.209
15/32	0.4688	11.906	31/32	0.9688	24.606
31/64	0.4844	12.303	63/64	0.9844	25.003
1/2	0.5000	12.700	1	1.0000	25.400

Conversion Factor: 1 inch = 25.4 mm

Newton-Meter to Foot-Pound Conversions

Conversion Chart

N•m	ft-lb	N•m	ft-lb	N•m	ft-lb
1	9 in-lb	55	41	155	114
5	44 in-lb	60	44	160	118
6	53 in-lb	65	48	165	122
7	62 in-lb	70	52	170	125
8	71 in-lb	75	55	175	129
9	80 in-lb	80	59	180	133
10	89 in-lb	85	63	185	136
11	97 in-lb	90	66	190	140
12	106 in-lb	95	70	195	144
14	124 in-lb	100	74	200	148
15	133 in-lb	105	77	205	151
16	142 in-lb	110	81	210	155
18	159 in-lb	115	85	215	159
20	15 ft-lb	120	89	220	162
25	18	125	92	225	165
30	22	130	96	230	170
35	26	135	100	235	173
40	30	140	103	240	177
45	33	145	107	245	180
50	37	150	111	250	184

NOTE: To convert from Newton-Meters to Kilogram-Meters divide Newton-Meters by 9.803.

Pipe Plug Torque Values

Torque Table

Size		Torque		Torque	
Thread	Actual Thread O.D.	In Aluminum Components		In Cast Iron or Steel Components	
in	in	N•m	ft-lb	N•m	ft-lb
1/16	0.32	5	45 in-lb	15	10
1/8	0.41	15	10	20	15
1/4	0.54	20	15	25	20
3/8	0.68	25	20	35	25
1/2	0.85	35	25	55	40
3/4	1.05	45	35	75	55
1	1.32	60	45	95	70
1-1/4	1.66	75	55	115	85
1-1/2	1.90	85	65	135	100

Tap-Drill Chart - U.S. Customary and Metric

General Information

NOTE ON SELECTING TAP-DRILL SIZES: The tap drill sizes shown on this card give the theoretical tap drill size for approximately 60% and 75% of full thread depth. Generally, it is recommended that drill sizes be selected in the 60% range as these sizes will provide about 90% of the potential holding power. Drill sizes in the 75% range are recommended for shallow hole tapping (less than 1 1/2 times the hole diameter) in soft metals and mild steel.

Tap Size		Drill Size
60%	75%	
		48
		1.95mm
		5/64
	3-48	47
		2.00mm
	M2.5x.45	2.05mm
		46
3-48	3056	45
		2.10mm
M2.5x.45	M2.6x.45	2.15mm
3-56	4-36	44
		2.20mm
M2.6x.45		2.25mm
4-36	4-40	43
		2.30mm
		2.35mm
4-40	4-48	42
		3/32
	M3x.6	2.40mm
4-48		41
		2.45mm
		40
M3x.6	M3x.5	2.50mm
		39
	5-40	38
M3x.5		2.60mm
5-40	5-44	37
		2.70mm
5-44	6-32	36
		2.75mm
		7/64
		35
		2.80mm
		34
6-32	6-40	33
	M3.5x.6	2.90mm
		32
M3.5x.6		3.00mm
6-40		31
		3.10mm
		1/8
	M4x.75	3.20mm
		3.25mm
		30
M4x.75	M4x.7	3.30mm
M4x.7	8-32	3.40mm
		29
8-32	8-36	3.50mm
		28
		9/64
8-36		3.60mm
		27
		3.70mm
		26
	M4.5x.75	3.75mm
	10-24	25
		6.70mm
		17/64
M4.5x.75		24
		3.80mm
		3.90mm
		23
		5/32
10-24		22
		4.00mm
	M5x1	21
	10-32	20
		4.10mm
M5x1	M5x.9	4.20mm
10-32	M5x.8	19
M5x.9		4.25mm
M5x.8		4.30mm
		18
		11/64
		17

Tap Size		Drill Size	
60%	75%		
		4.40mm	
	12-24	16	
		4.50mm	
		15	
		4.60mm	
	12-24	14	
		13	
		4.70mm	
	M5.5x.9	4.75mm	
	12-28	3/16	
		12	
		4.80mm	
		11	
		4.90mm	
		10	
		9	
	M6x1	5.00mm	
		8	
		5.10mm	
	1/4-20	7	
		13/64	
		6	
	M6x1	5.20mm	
		5	
		5.25mm	
	M6x.75	5.30mm	
		4	
	1/4-20	5.40mm	
	M6x.75	3	
		1/4-28	5.50mm
		7/32	
		5.60mm	
		2	
	1/4-28	5.70mm	
		5.75mm	
		1	
		5.80mm	
		5.90mm	
		A	
		15/64	
	M7x1	6.00mm	
		B	
		6.10mm	
		C	
	M7x1	6.20mm	
		D	
		6.25mm	
	M7x.75	6.30mm	
		E	
		1/4	
		6.40mm	
		6.50mm	
		F	
	5/16-18	6.60mm	
		G	
		6.70mm	
		17/64	
		6.75mm	
	5/16-18	H	
		6.80mm	
		6.90mm	
		I	
	M8x1.25	7.00mm	
		J	
		7.10mm	
		K	
	5/16-24	9/32	
		7.20mm	
	M8x1	7.25mm	
		7.30mm	
		L	
		7.40mm	
		M	

Tap Size		Drill Size
60%	75%	
		7.50mm
		19/64
		7.60mm
		N
		7.70mm
	M8x1.25	7.75mm
		7.80mm
		7.90mm
		5/16
	M8x1.25	8.00mm
		O
	M9x1	8.10mm
		8.20mm
		P
		8.25mm
		8.30mm
	3/8-16	21/64
		8.40mm
		Q
	3/8-24	8.50mm
	M10x1.5	8.60mm
		R
	3/8-24	8.70mm
	1/8-27NPT	11/32
		8.75mm
	M10x1.5	8.80mm
		S
		8.90mm
	M10x1.25	9.00mm
		T
		9.10mm
		23/64
		9.20mm
	M10x1	9.30mm
		U
		9.40mm
		9.50mm
		3/8
		V
		9.60mm
		9.70mm
		9.75mm
		9.80mm
	M11x1.5	9.90mm
	7/16-14	W
		9.90mm
		25/64
		10.00mm
	7/16-20	X
		10.20mm
		Y
		13/32
		Z
	M12x1.75	10.50mm
		10.60mm
	M12x1.5	10.75mm
	M12x1.25	11.00mm
		7/16
	1/4-18NPT	
		11.25mm
		11.50mm
		29/64
		11.75mm
		11.90mm
		29/64
		15/32
	9/16-12	12.00mm
	M14x2	12.25mm
		31/64
	9/16-12	12.50mm
		1/2
	M14x1.5	12.75mm
	M14x1.25	13.00mm
	9/16-18	33/64

Tap Size		Drill Size
60%	75%	
		13.25mm
		17/32
		13.50mm
	M15x1.5	13.75mm
	5/8-11	35/64
		14.00mm
	M16x2	14.25mm
		9/16
		14.50mm
	M16x2	37/64
	5/8-18	14.75mm
	M16x1.5	15.00mm
		19.32
		15.25mm
		39/64
		15.50mm
	M17x1.5	15.75mm
		5/8
	M18x2.5	16.00mm
	M18x2	16.25mm
		41/64
		16.50mm
	3/4-10	21/32
	M18x1.5	16.75mm
	M19x2.5	17.00mm
		43/64
		17.25mm
	3/4-16	11/16
		17.50mm
	3/4-16	17.75mm
	M20x2.5	45/64
	M20x2	18.00mm
		18.25mm
		23/32
		18.50mm
	M20x1.5	47/64
		18.75mm
	M20x1.5	19.00mm
		3/4
		19.25mm
		49/64
	7/8-9	19.50mm
	M22x2.5	25/32
		19.75mm
	M22x2	20.00mm
	7/8-14	51/64
		20.25mm
	M22x2	20.50mm
		13/16
	7/8-14	20.75mm
	M22x1.5	21.00mm
		53/64
		21.25mm
	M24x3	21.50mm
		21.75mm
		55/64
		22.00mm
	M24x2	7/8
		22.25mm
	M24x2	22.50mm
		57/64
	1"-8	22.75mm
	M24x1.5	23.00mm
		29/32
	M25x2	23.25mm
	1"-12	59/64
		23.50mm
	M25x1.5	23.75mm
	1"-14	15/16

Weights and Measures - Conversion Factors

Conversion Chart

Quantity	U.S. Customary		Metric		From U.S. Customary To Metric Multiply By	From Metric To U.S. Customary Multiply By
	Unit Name	Abbreviation	Unit Name	Abbreviation		
Area	sq. inch	in ²	sq. millimeters	mm ²	645.16	0.001550
			sq. centimeters	cm ²	6.452	0.155
	sq. foot	ft ²	sq. meter	m ²	0.0929	10.764
Fuel Consumption	pounds per horsepower hour	lb/hp-hr	grams per kilowatt hour	g/kW-hr	608.277	0.001645
Fuel Performance	miles per gallon	mpg	kilometers per liter	km/l	0.4251	2.352
	gallons per mile	gpm	liters per kilometer	l/km	2.352	0.4251
Force	pounds force	lbf	Newton	N	4.4482	0.224809
Length	inch	in	millimeters	mm	25.40	0.039370
	foot	ft	millimeters	mm	304.801	0.00328
Power	horsepower	hp	kilowatt	kW	0.746	1.341
Pressure	pounds force per sq. inch	psi	kilopascal	kPa	6.8948	0.145037
	inches of mercury	in Hg	kilopascal	kPa	3.3769	0.29613
	inches of water	in H ₂ O	kilopascal	kPa	0.2488	4.019299
	inches of mercury	in Hg	millimeters of mercury	mm Hg	25.40	0.039370
	inches of water	in H ₂ O	millimeters of water	mm H ₂ O	25.40	0.039370
	bars	bars	kilopascals	kPa	100.001	0.00999
	bars	bars	millimeters of mercury	mm Hg	750.06	0.001333
Temperature	fahrenheit	°F	centigrade	°C	(°F-32) ÷ 1.8	(1.8 x °C) + 32
Torque	pound force per foot	ft-lb	Newton-meter	N•m	1.35582	0.737562
	pound force per inch	in-lb	Newton-meter	N•m	0.113	8.850756
Velocity	miles/hour	mph	kilometers/hour	kph	1.6093	0.6214
Volume: liquid displacement	gallon (U.S.)	gal.	liter	l	3.7853	0.264179
	gallon (Imp*)	gal.	liter	l	4.546	0.219976
	cubic inch	in ³	liter	l	0.01639	61.02545
	cubic inch	in ³	cubic centimeter	cm ³	16.387	0.06102
Weight (mass)	pounds (avoir.)	lb	kilograms	kg	0.4536	2.204623
Work	British Thermal Unit	BTU	joules	J	1054.5	0.000948
	British Thermal Unit	BTU	kilowatt-hour	kW-hr	0.000293	3414
	horsepower hours	hp-hr	kilowatt-hour	kW-hr	0.746	1.341

Section W - Warranty

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Recreational Applications Marine Propulsion Products

Coverage

Products Warranted

This warranty applies to new recreational engines sold by Cummins Engine Company, Inc., herein after 'Cummins', that are used in recreational Marine propulsion applications anywhere in the world where Cummins approved service is available and delivered to the first user on or after September 1, 1998. The 'Product' consists of a new Cummins Engine, as well as accessories, as listed below, 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:

High Output Rating

This power rating is for use in variable load applications where full power is limited to one (1) hour out of every eight (8) 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 pleasure/non-revenue generating applications that operate less than 300 hours per year.

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 continues for the Duration stated below. The Duration commences on either 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.

Extended Major Components Warranty

The Extended Major Components Warranty covers Warrantable Failures of the following Engine parts or castings (Covered Parts):

- Engine Cylinder Block Casting
- Engine Cylinder Head Casting
- Engine Camshaft Forging
- Engine Crankshaft Forging
- Engine Connecting Rods
- Engine Gear Train Gears:
 - Crankshaft Gear
 - Camshaft Gear
 - Camshaft Idler Gear
 - Accessory Drive Gear
 - Fuel Pump Gear
- Engine Gear Cover and Housing
- Flywheel Housing

Bushing and bearing failures are NOT covered.

Extended Major Components Warranty continues beyond the expiration of the Base Engine Warranty and continues for the Duration stated below. The Duration commences on either 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.

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 terminate concurrently with the expiration of the express warranties applicable to the Product. In the United States, some states do not allow the exclusion of incidental or consequential damages, or limitations on how long an implied warranty lasts, so the above limitations or exclusions may not apply to you.

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.

Warranty Coverage						
Coverage Category	Coverage Duration*		Repair Charge Paid by Cummins			
	Months	Hours	Parts	Labor	Removal & Installation Labor	Travel
Base Engine Warranty**	24	600	Yes	Yes	Yes	Yes - Up to 6 hours
Extended Major Components	72	1800	Yes***	Yes	Yes	No

* Whichever occurs first.

** The Engine's Sea Water Pump, Gear Oil Cooler, and Heat Exchanger are covered for a period of 24 months or 600 hours, whichever occurs first. Other accessories, ie. Marine Gear and Drive Plate, Instruments, Instrument Panel, Gage Senders, Starter, Alternator, Vibration Isolators, and Fuel/Water Separator are covered for a period of twelve (12) months or 300 hours, whichever occurs first.

*** Covered Parts as listed above.

Cummins Responsibilities

During the 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 up to six hours total 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 of any Covered Part damaged by a Warrantable Failure of the defective Covered Part.

Owner Responsibilities

During the Extended Major Components Warranty

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.

During Both the Base Engine and the Extended Major Components Warranties

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

Owner is responsible for 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 Product 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.

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 maintenance components supplied by Cummins beyond 90 days after the coverage duration start date. Maintenance components include, but are not limited to: sea water pump impellers; zinc plugs; oil filters; fuel filters; air filters; water filters; fuel/water separator filters; expansion tank pressure caps.

Failures of belts and hoses supplied by Cummins are not covered beyond 90 days after the warranty start date.

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.

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 DOES NOT COVER WEAR OR WEAROUT OF COVERED PARTS.

CUMMINS IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

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

In the 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.

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

Commercial Applications Marine Propulsion and Marine Auxiliary Products Worldwide

Coverage

Products Warranted

This warranty applies to new Engines sold by Cummins Engine Company, Inc., herein after "Cummins", that are used in Marine propulsion applications anywhere in the world where Cummins approved service is available* and delivered to the first user on or after January 1, 1998. 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 a 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 ratings.

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 continues for the Duration stated in the following table. The Duration commences on either 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.

Rating	Duration Whichever Occurs First	
	Years	Hours
Intermittent	1	1500
Medium Continuous	1	3000
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 three years or 10,800 hours of operation, whichever occurs first, from the date of delivery 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.

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 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 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 up to six hours total 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.

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

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.

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 DOES NOT COVER WEAR OR WEAROUT OF COVERED PARTS.

CUMMINS IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

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

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

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

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

* Locations in the United States and Canada are listed in the Cummins United States and Canada Sales and Service Directory; other locations are listed in the Cummins International Sales and Service Directory.

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

US Marine (division of Brunswick Corp.) Worldwide Propulsion Products

Coverage

Products Warranted

This warranty applies to new B and C Series Engines and Marine Gears sold by Cummins Engine Company, Inc., herein after 'Cummins', that are installed in Marine (division of Brunswick Corp.) hulls and used in Marine propulsion applications anywhere in the world where Cummins approved service is available* and delivered to the first user on or after May 1, 1995. The 'Product' consists of a new Cummins Engine, as well as accessories approved and installed by Cummins. These Products have the following designation:

High Output Rating

This power rating is for use in variable load applications where full power is limited to one (1) hour out of every eight (8) 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 pleasure/non-revenue generating applications that operate less than 300 hours per year.

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 continues for the Duration stated below. The Duration commences on either 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.

Extended Major Components Warranty

The Extended Major Components Warranty covers Warrantable Failures of the following Engine parts or castings (Covered Parts):

- Engine Cylinder Block Casting
- Engine Cylinder Head Casting
- Engine Camshaft Forging
- Engine Crankshaft Forging
- Engine Connecting Rods
- Engine Gear Train Gears:
 - Crankshaft Gear
 - Camshaft Gear
 - Camshaft Idler Gear
 - Accessory Drive Gear
 - Fuel Pump Gear
- Engine Gear Cover and Housing
- Flywheel Housing

Bushing and bearing failures are NOT covered.

Extended Major Components Warranty continues beyond the expiration of the Base Engine Warranty and continues for the Duration stated below. The Duration commences on either 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.

Warranty Coverage						
Coverage Category	Coverage Duration *		Repair Charge Paid by Cummins			
	Months	Hours	Parts	Labor	Removal & Installation Labor	Travel
Base Engine Warranty	24	600	Yes	Yes	Yes	Yes - Up to 6 hours
Extended Major Components	72	1800	Yes**	Yes	Yes	No
* Whichever occurs first.						
** Covered Parts as listed above.						

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 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 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 up to six hours total 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 of any Covered Part damaged by a Warrantable Failure of the defective Covered Part.

Owner Responsibilities

During the Extended Major Components Warranty

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

During Both the Base Engine and the Extended Major Components Warranties

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

Owner is responsible for 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 Product 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.

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.

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.

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.

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 DOES NOT COVER WEAR OR WEAROUT OF COVERED PARTS.

CUMMINS IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

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

In the 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.

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

Off-Highway Engines United States and Canada

Coverage

Products Warranted

This warranty applies to new Engines sold by Cummins and delivered to the first user on or after April 1, 1999, that are used in industrial (off-highway) applications in the United States* and Canada, except for Engines used in marine, generator drive and certain defense applications, for which different warranty coverage is provided.

Base Engine Warranty

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

Coverage begins with the sale of the Engine by Cummins. Coverage continues for two years or 2,000 hours of operation, whichever occurs first, from the date of delivery of the Engine to the first user, or from the date the unit is first leased, rented or loaned, or when the Engine has been operated for 50 hours, whichever occurs first. If the 2,000 hour limit is exceeded during the first year, Coverage continues until the end of the first year.

Extended Major Components Warranty

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

Bushing and bearing failures are not covered.

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

Consumer Products

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

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

Cummins' Responsibilities

During The Base Engine Warranty

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

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

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

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

During The Extended Major Components Warranty

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

Owner's Responsibilities

During The Base Engine Warranty

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

During The Extended Major Components Warranty

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

to repair the part.

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

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

During The Base Engine and Extended Major Components Warranties

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

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

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

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

Limitations

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

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

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

Cummins Compusave units are covered by a separate warranty.

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

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

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

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

CUMMINS DOES NOT COVER WEAR OR WEAROUT OF COVERED PARTS.

CUMMINS IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

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

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

Emission Warranty

Products Warranted

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

Coverage

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

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

Limitations

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

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

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

CUMMINS IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

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

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

Moteurs tout terrain Etats-Unis et Canada

Garantie

Produits garantis

La présente garantie s'applique aux nouveaux moteurs vendus par Cummins et livrés au premier utilisateur à compter du 1er avril 1999 pour un usage dans des applications industrielles (tout terrain) aux États-Unis* et au Canada, à l'exception des moteurs utilisés dans des applications marines et d'entraînement de générateur, ainsi que dans certaines applications militaires, pour lesquelles une couverture de garantie différente est fournie.

Garantie de base du moteur

La présente garantie couvre toute panne du moteur, dans des conditions normales d'utilisation et d'entretien, provenant d'un défaut de matériau ou de fabrication en usine (pannes couvertes).

La garantie prend effet à dater de la vente du moteur. Elle s'étend sur une période de deux ans ou 2 000 heures d'utilisation, suivant lequel de ces termes intervient en premier, à compter de la date de livraison du moteur au premier utilisateur ou de la date à laquelle le moteur est mis en location de courte ou longue durée ou en prêt pour la première fois, ou encore lorsque le moteur a été utilisé pendant 50 heures, suivant lequel de ces termes intervient en premier. En cas d'une utilisation dépassant 2 000 heures durant la première année, la période de garantie s'étend jusqu'à la fin de la première année.

Garantie étendue des composants principaux

La Garantie prolongée des principaux éléments couvre les pannes justifiables du bloc-cylindre, de l'arbre à cames, du vilebrequin, des bielles du moteur (pièces couvertes).

Les pannes de bagues et roulement de paliers ne sont pas garanties.

Cette couverture prend effet à la date d'expiration de la garantie de base du moteur et se termine trois ans ou 10 000 heures d'utilisation après la date de livraison du moteur au premier utilisateur ou à compter de la date à laquelle le moteur est mis en location de courte ou longue durée ou en prêt pour la première fois, ou encore lorsque le moteur a été utilisé pendant 50 heures, suivant lequel de ces termes intervient en premier.

Produits de consommation

La garantie sur les produits de consommation aux États-Unis est LIMITEE. CUMMINS N'EST PAS RESPONSABLE DES DOMMAGES INDIRECTS OU INDUITS Aux États-Unis, toute garantie implicite applicable aux produits de consommation vient à échéance à l'expiration des garanties expresses applicables au produit. Certains États d'Amérique réfutent l'exclusion des détériorations provoquées par des dommages indirects ou induits, ou les limitations de durée de garanties implicites.

Ces garanties s'appliquent à tous les propriétaires du circuit de distribution et la couverture s'applique à tous les propriétaires ultérieurs jusqu'à la fin de la période de couverture.

Responsabilités Cummins

Pendant la garantie de base du moteur

Cummins réglera tous les frais des pièces détachées et de la main d'oeuvre nécessaires à la réparation du produit endommagé en raison d'une panne justifiable.

Cummins prend en charge l'huile, l'antigel, les cartouches de filtre ainsi que d'autres pièces ou fournitures d'entretien non réutilisables en raison d'une panne sous garantie.

Cummins paie la majeure partie des frais de déplacement des mécaniciens ce qui comprend les frais de repas, les frais kilométriques et les frais d'hébergement, dans le cas où une réparation doit être effectuée sur les lieux de la panne.

Cummins prend en charge une partie des frais de main d'oeuvre lorsqu'il est nécessaire de déposer et de remonter le moteur lors d'une panne sous garantie.

Pendant la garantie étendue des principaux composants

Cummins réglera la réparation ou, s'il préfère, le remplacement de la pièce couverte défectueuse et de toute pièce couverte endommagée par une panne justifiable de la pièce couverte défectueuse.

Responsabilités du propriétaire

Pendant la garantie de base du moteur

Le propriétaire doit régler l'huile de graissage, l'antigel, les éléments filtrants et les autres articles d'entretien remplacés au cours des réparations effectuées dans le cadre de la garantie à moins que ces articles ne puissent plus être utilisés en raison d'une panne justifiable.

Pendant la garantie étendue des principaux composants

Le propriétaire est responsable de tous les frais de la main-d'oeuvre nécessaire à la réparation du moteur, y compris les frais de main-d'oeuvre pour démonter et réinstaller le moteur. Lorsque Cummins choisit de réparer une pièce plutôt que de la remplacer, le propriétaire n'est pas responsable de la main-d'oeuvre nécessaire à la réparation de la pièce.

Le propriétaire supporte les frais occasionnés par le remplacement des pièces excepté pour la pièce défectueuse sous garantie et toute pièce garantie dont la détérioration a été provoquée par une panne sous garantie de la pièce défectueuse sous garantie.

Le propriétaire supporte les frais de remplacement de l'huile, de l'antigel, des cartouches de filtre ainsi que des autres pièces ou fournitures lors d'une réparation en raison d'une panne sous garantie.

Pendant la garantie de base du moteur et la garantie étendue des composants principaux

Le propriétaire est responsable de l'utilisation et de l'entretien du moteur comme il est spécifié dans le manuel d'utilisation et d'entretien Cummins. Le propriétaire doit également pouvoir prouver que tous les travaux d'entretien recommandés ont été effectués.

Avant la date d'expiration de la garantie en vigueur, le propriétaire doit avertir un concessionnaire Cummins, un concessionnaire agréé ou un autre site de réparation homologué, de toute panne sous garantie et pouvoir confier le moteur afin qu'il puisse être réparé. Les sites de réparation aux États-Unis ainsi qu'au Canada sont énumérés dans le répertoire des concessionnaires moteur tout terrain Cummins agréé.

Le propriétaire supporte les frais de communication, de repas, d'hébergement et d'autres frais similaires occasionnés par une panne sous garantie.

Le propriétaire est responsable des réparations autres que celles du moteur, des dépenses de temps mort, des dommages au chargement, des amendes, de toutes les taxes en vigueur, de tous les coûts commerciaux et de toute autre dépense résultant d'une panne sous garantie.

Limites

Cummins décline toute responsabilité en cas de pannes ou de détériorations résultant de ce que Cummins considère comme un abus ou une négligence de la part du propriétaire, notamment et non limitativement: une utilisation sans les lubrifiants ou les liquides de refroidissement appropriés; surremplissage de carburant; vitesse trop élevée; négligence d'entretien des systèmes d'admission, de refroidissement ou de lubrification; mauvaises conditions d'entreposage, pratiques inappropriées de démarrage, de chauffage, de rodage ou d'arrêt; modifications non homologuées du moteur. Cummins n'est également pas responsable des pannes provoquées par l'utilisation d'une huile, d'un carburant ou d'une eau non appropriés, ainsi que des pannes provoquées par la présence de dépôts dans le carburant ou dans l'huile.

Pour les générateurs de courant et les pompes à incendie (unités conditionnées), cette garantie s'applique aux accessoires, sauf pour les embrayages et filtres fournis par Cummins qui portent le nom d'une autre société.

Mis à part les générateurs de courant et les pompes à incendie, Cummins ne garantit pas les accessoires portant le nom d'une autre société. Ces accessoires comprennent: les alternateurs, les démarreurs, les ventilateurs**, les compresseurs d'air conditionnés, les embrayages, les filtres, les transmissions, les convertisseurs de couple, les pompes d'assistance de direction, les entraînements ventilateurs d'une marque différente de celle de Cummins, les freins de compression moteur et les compresseurs d'air.

Les unités Compusave Cummins sont assujetties à une garantie différente.

Avant qu'une réclamation concernant une consommation excessive en huile soit prise en compte, le propriétaire doit fournir une documentation adéquate afin de pouvoir prouver que la consommation dépasse celle définie par Cummins.

Les détériorations des courroies et flexibles fournis par Cummins ne sont pas garanties au-delà des 500 premières heures ou après un an d'utilisation, suivant lequel de ces termes intervient en premier.

Les pièces utilisées pour la réparation d'une panne sous garantie peuvent être des pièces Cummins neuves, des pièces reconditionnées homologuées ou des pièces réparées. Cummins n'est pas responsable des pannes résultant de l'utilisation de pièces non homologuées.

Une nouvelle pièce Cummins ou une pièce reconditionnée homologuée utilisée pour la réparation d'une panne sous garantie est alors identifiée comme la pièce originale remplacée en vertu de cette garantie.

CUMMINS NE COUVRE PAS L'USURE DES PIECES COUVERTES.

CUMMINS N'EST PAS RESPONSABLE DES DOMMAGES INDIRECTS OU INDIITS

LES PRESENTES GARANTIES SONT LES GARANTIES EXCLUSIVES DE CUMMINS CONCERNANT CES MOTEURS. CUMMINS NE CONSENT AUCUNE AUTRE GARANTIE EXPRESSE OU IMPLICITE ET AUCUNE GARANTIE DE BONNE QUALITÉ COMMERCIALE OU D'ADAPTATION A UN USAGE SPÉCIFIQUE.

Cette garantie vous procure certains droits qui peuvent varier d'un État à l'autre.

Garantie concernant l'émission de polluants

Produits garantis

Cette garantie s'applique aux nouveaux moteurs commercialisés par Cummins et utilisés aux États-Unis* sur des véhicules à usage industriel tout-terrain. La présente garantie s'applique aux moteurs livrés à l'acheteur final à compter du 1er avril 1999 pour les moteurs jusqu'à 750 chevaux ou à compter du 1er janvier 2000 pour les moteurs d'au moins 751 chevaux.

Garantie

Cummins garantit au dernier acheteur et à chaque futur acheteur que le moteur a été conçu, construit et équipé selon les lois américaines en vigueur portant sur la pollution et qu'il ne comporte aucun défaut de fabrication des composants, ce qui engendrerait une non-conformité du moteur pendant les périodes suivantes: (A) cinq ans ou 3 000 heures d'utilisation, suivant lequel de ces termes intervient en premier, et à dater de la livraison du moteur à l'acquéreur final ou (B) la garantie de base des moteurs.

Si le véhicule muni du moteur Cummins est enregistré dans l'Etat de Californie, une autre garantie du système antipollution s'applique également.

Limites

Les pannes autres que celles résultant d'un défaut de matériaux ou de main d'oeuvre, ne sont pas garanties.

Cummins décline toute responsabilité en cas de pannes ou de détériorations résultant de ce que Cummins considère comme un abus ou une négligence de la part du propriétaire, notamment et non limitativement: une utilisation sans les lubrifiants ou les liquides de refroidissement appropriés; surremplissage de carburant; vitesse trop élevée; négligence d'entretien des systèmes d'admission, de refroidissement ou de lubrification; mauvaises conditions d'entreposage, pratiques inappropriées de démarrage, de chauffage, de rodage ou d'arrêt; modifications non homologuées du moteur. Cummins n'est également pas responsable des pannes provoquées par l'utilisation d'une huile, d'un carburant ou d'une eau non appropriés, ainsi que des pannes provoquées par la présence de dépôts dans le carburant ou dans l'huile.

Cummins n'est pas responsable des réparations autres que celles du moteur, des dépenses de temps mort, des dommages au chargement, des amendes, de toutes les taxes en vigueur, de tous les coûts commerciaux et de toute autre dépense résultant d'une panne sous garantie.

CUMMINS N'EST PAS RESPONSABLE DES DOMMAGES INDIRECTS OU INDIITS

*Doivent être pris en compte l'archipel américain Samoa, le Commonwealth des îles Mariana du nord, les îles Guam, Porto Rico et les îles américaines Vierges.

** Les alternateurs, les démarreurs et les ventilateurs SONT couverts pendant la durée de la garantie de base des moteurs B3.3.

Off-Highway Engines International

Coverage

PRODUCTS WARRANTED

This warranty applies to new Engines sold by Cummins and delivered to the first user on or after April 1, 1999, that are used in industrial (off-highway) applications anywhere in the world where Cummins-approved service is available, except the United States* and Canada. Different warranty coverage is provided for Engines used in marine, generator drive and certain defense applications.

BASE ENGINE WARRANTY

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

Coverage begins with the sale of the Engine by Cummins. Coverage continues for two years or 2,000 hours of operation, whichever occurs first, from the date of delivery of the Engine to the first user, or from the date the unit is first leased, rented or loaned, or when the Engine has been operated for 50 hours, whichever occurs first. If the 2,000 hour limit is exceeded during the first year, coverage continues until the end of the first year.

EXTENDED MAJOR COMPONENTS WARRANTY

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

Bushing and bearing failures are not covered.

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

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

Cummins' Responsibilities

DURING THE BASE ENGINE WARRANTY

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

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

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

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

DURING THE EXTENDED MAJOR COMPONENTS WARRANTY

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

Owner's Responsibilities

DURING THE BASE ENGINE WARRANTY

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

DURING THE EXTENDED MAJOR COMPONENTS WARRANTY

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

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

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

DURING THE BASE ENGINE AND EXTENDED MAJOR COMPONENTS WARRANTIES

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

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

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

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

Limitations

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

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

Starters, alternators, power steering pumps and non-Cummins air compressors supplied by Cummins on B or C Series Engines that are not supplied as part of a package unit are covered for six months* from the date of delivery of the Engine to the first user, or the date the Engine is first leased, rented or loaned, or from when the Engine has been operated for 50 hours, whichever occurs first.

Except for the accessories noted previously, Cummins does not warrant accessories which bear the name of another company. Such non-warranted accessories include, but are not limited to: alternators, starters, fans*, air conditioning compressors, clutches, filters, transmissions, torque converters, steering pumps, non-Cummins fan drives, and air cleaners.

Cummins Compusave units are covered by a separate warranty.

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

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

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

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

CUMMINS DOES NOT COVER WEAR OR WEAROUT OF COVERED PARTS.

CUMMINS IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

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

In case of consumer sales, in some countries, the Owner has statutory rights which cannot be affected or limited by the terms of this warranty.

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

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

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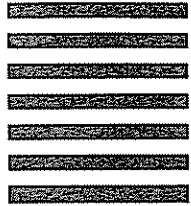
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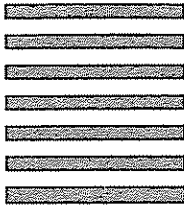
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