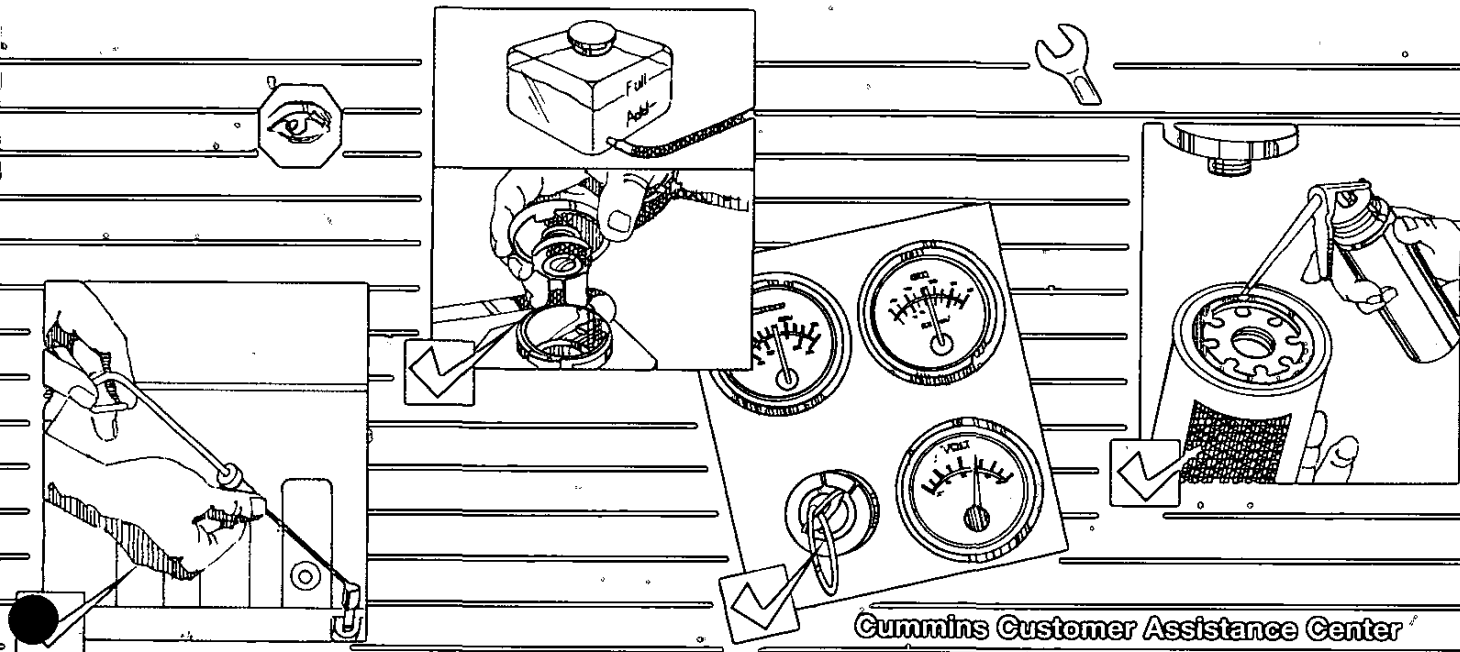




# Operation and Maintenance Manual ISB Engine

U.S.A., Canada, Australia, New Zealand, and Puerto Rico



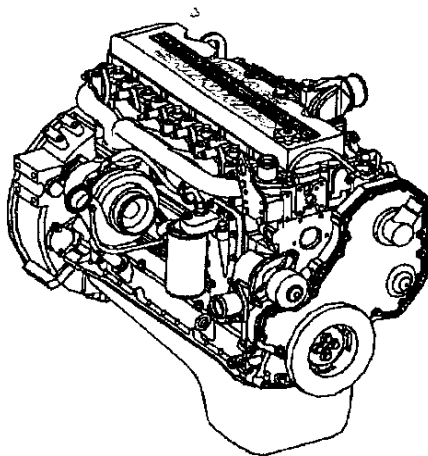
Cummins Customer Assistance Center

1-800-DIESELS (1-800-643-7357)

APPLICABLE ONLY IN U.S.A. AND CANADA



# Operation and Maintenance Manual ISB Engine



00900730

Copyright© 1997  
Cummins Engine Company, Inc.  
All rights reserved

Bulletin No. 3666170-00  
Printed 2/97

# 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).

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



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

# Table of Contents

---

	<b>Section</b>
<b>Introduction</b> .....	<i>i</i>
<b>Engine Identification</b> .....	E
<b>Operating Instructions</b> .....	1
<b>Maintenance Guidelines</b> .....	2
<b>Maintenance Procedures at Daily Interval</b> .....	3
<b>Maintenance Procedures at 12,000 Kilometers [7,500 miles] 250 Hours or 3 Months</b> .....	4
<b>Maintenance Procedures at 24,000 Kilometers [15,000 miles] 500 Hours or 6 Months</b> .....	5
<b>Maintenance Procedures at 48,000 Kilometers [30,000 miles] 1000 Hours or 12 Months</b> .....	6
<b>Maintenance Procedures at 96,000 Kilometers [60,000 miles] 2000 Hours or 2 Years</b> .....	7
<b>Adjustment, Repair and Replacement</b> .....	A
<b>System Diagrams</b> .....	D

---

---

**Section**

---

<b>Service Literature</b> .....	L
<b>Component Manufacturers</b> .....	M
<b>Service Assistance</b> .....	S
<b>Troubleshooting Symptoms</b> .....	TS
<b>Specifications</b> .....	V
<b>Warranty</b> .....	W
<b>Index</b> .....	X

# 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.

Engine Model		
Engine Serial Number (ESN)		
Control Parts List (CPL)		
Fuel Pump Part Number		
Filter Part Numbers:		
● Air Cleaner Element		
● Lubricating Oil Filter		
– Bypass		
– Full-flow		
– Combination		
● Fuel		
● Fuel-Water Separator		
Belt Part Numbers		
Electronic control Module (ECM)		

## Section i - Introduction

### Section Contents

	<b>Page</b>
<b>About the Manual</b> .....	i-2
General Information .....	i-2
<b>General Safety Instructions</b> .....	i-9
Important Safety Notice .....	i-9
<b>How to Use the Manual</b> .....	i-3
General Information .....	i-3
<b>Illustrations</b> .....	i-8
<b>Symbols</b> .....	i-4
<b>To the Owner and Operator</b> .....	i-1
General Information .....	i-1

**THIS PAGE LEFT INTENTIONALLY BLANK.**



## To the Owner and Operator

### General Information

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

Keep records of regularly scheduled maintenance.

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

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

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

## About the Manual

### General Information

This manual contains information needed to correctly operate and maintain your engine as recommended by Cummins Engine Company, Inc. Additional service literature can be ordered from your local Cummins distributor. For problems with literature orders, contact 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 listed in this manual. The metric value is listed first, followed by the U.S. customary in brackets.

Numerous illustrations and symbols are used to aid in understanding the meaning of the text. Refer to Symbols (Section i) for a complete listing 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) which 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 previous maintenance intervals **must** also be performed.

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

Refer to Section TS for a guide to troubleshooting your engine. Follow the directions given in that section 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 that section.

## Symbols

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



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



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



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



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



**INSPECTION** is required.



**CLEAN** the part or assembly.



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



**LUBRICATE** the part or assembly.



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



**TIGHTEN** to a specific torque.



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



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



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

17800009

## Simbolos

Los símbolos siguientes son usados en este manual para clarificar el proceso de las instrucciones. Cuando aparece uno de estos símbolos, su significado se especifica en la parte inferior.



**ADVERTENCIA** - Serios daños personales o daño a la propiedad puede resultar si las instrucciones de Advertencia no se consideran.



**PRECAUCION** - Daños menores pueden resultar, o de piezas del conjunto o el motor puede averiarse si las instrucciones de Precaución no se siguen.



Indica un paso de **REMOCION** o **DESMONTAJE**.



Indica un paso de **INSTALACION** o **MONTAJE**.



Se requiere **INSPECCION**.



**LIMPIESE** la pieza o el montaje.



**EJECUTESE** una **MEDICION** mecánica o del tiempo.



**LUBRIQUESE** la pieza o el montaje.



Indica que se dará una **LLAVE DE TUERCAS** o el **TAMAÑO DE HERRAMIENTA**.



**APRIETESE** hasta un par torsor específico.



**EJECUTESE** una **MEDICION** eléctrica.



Para información adicional refiérase a otro emplazamiento de este manual o a otra publicación anterior.



El componente pesa 23 kg [50 lb] o mas. Para evitar dano corporal empleen una cabria u obtengan ayuda para elevar el componente.

## Symbole

In diesem Handbuch werden die folgenden Symbole verwendet, die wesentliche Funktionen hervorheben. Die Symbole haben folgende Bedeutung:



**WARNUNG** - Wird die Warnung nicht beachtet, dann besteht erhöhte Unfall- und Beschädigungsgefahr.



**VORSICHT** - Werden die Vorsichtsmassnahmen nicht beachtet, dann besteht Unfall- und Beschädigungsgefahr.



**AUSBAU** bzw. **ZERLEGEN**.



**EINBAU** bzw. **ZUSAMMENBAU**.



**INSPEKTION** erforderlich.



Teil oder Baugruppe **REINIGEN**.



**DIMENSION** - oder **ZEITMESSUNG**.



Teil oder Baugruppe **ÖLEN**.



**WERKZEUGGRÖSSE** wird angegeben.



**ANZUG** auf vorgeschriebenes Drehmoment erforderlich.



Elektrische **MESSUNG DURCHFÜHREN**.



Weitere Informationen an anderer Stelle bzw. in anderen Handbüchern.



Das teil wiegt 23 kg [50 lb] oder mehr. Zur Vermeidung von Körperverletzung wurde benutzten oder Hilfe beim Heben des teils in anspruch nehmen.

## Symboles

Les symboles suivants sont utilisés dans ce manuel pour aider à communiquer le but des instructions. Quand l'un de ces symboles apparaît, il évoque le sens défini ci-dessous:



**AVERTISSEMENT** - De graves lésions corporelles ou des dommages matériels considérables peuvent survenir si les instructions données sous les rubriques "Avertissement" ne sont pas suivies.



**ATTENTION** - De petites lésions corporelles peuvent survenir, ou bien une pièce, un ensemble ou le moteur peuvent être endommagés si les instructions données sous les rubriques "Attention" ne sont pas suivies.



Indique une opération de **DEPOSE**.



Indique une opération de **MONTAGE**.



**L'INSPECTION** est nécessaire.



**NETTOYER** la pièce ou l'ensemble.



**EFFECTUER** une **MESURE** mécanique ou de temps.



**GRAISSER** la pièce ou l'ensemble.



Indique qu'une **DIMENSION DE CLE** ou **D'OUTIL** sera donnée.



**SERRER** à un couple spécifique.



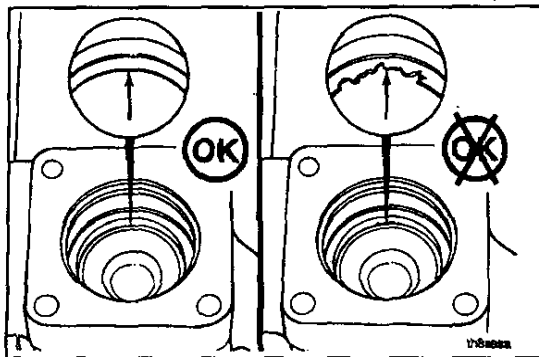
**EFFECTUER** une **MESURE** électrique.



Se reporter à un autre endroit dans ce manuel ou à une autre publication pour obtenir des informations plus complètes.

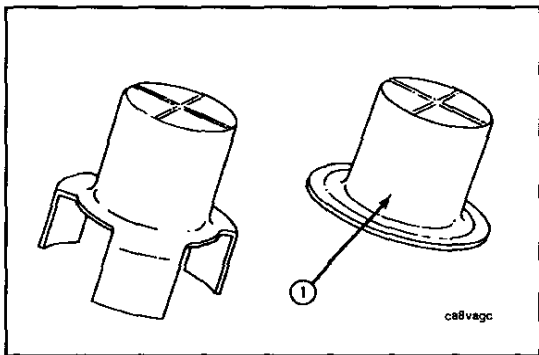


Le composant pèse 23 kg [50 lb] ou davantage. Pour éviter toute blessure, employer un appareil de levage ou demander de l'aide pour le soulever.



## Illustrations

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



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



## General Safety Instructions

### Important Safety Notice

#### ▲ WARNING ▲

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

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

- Make sure the work area surrounding the product is dry, well lit, ventilated, free from clutter, loose tools, parts, ignition sources and hazardous substances. Be aware of hazardous conditions that can exist.
- **Always** wear protective glasses and protective shoes when working.
- Rotating parts can cause cuts, mutilation or strangulation.
- Do **not** wear loose-fitting or torn clothing. Remove all jewelry when working.
- Disconnect the battery (negative [-] cable first) and discharge any capacitors before beginning any repair work. Disconnect the air starting motor if equipped to prevent accidental engine starting. Put a "Do **Not** Operate" tag in the operator's compartment or on the controls.
- Use **ONLY** the proper engine barring techniques for manually rotating the engine. Do **not** attempt to rotate the crankshaft by pulling or prying on the fan. This practice can cause serious personal injury, property damage, or damage to the fan blade(s) causing premature fan failure.
- If an engine has been operating and the coolant is hot, allow the engine to cool before you slowly loosen the filler cap and relieve the pressure from the cooling system.
- Do **not** work on anything that is supported **ONLY** by lifting jacks or a hoist. **Always** use blocks or proper stands to support the product before performing any service work.
- Relieve all pressure in the air, oil, fuel and the cooling systems before any lines, fittings, or related items are removed or disconnected. Be alert for possible pressure when disconnecting any device from a system that utilizes pressure. Do **not** check for pressure leaks with your hand. High pressure oil or fuel can cause personal

injury.

- To prevent suffocation and frostbite, wear protective clothing and **ONLY** disconnect fuel and liquid refrigerant (freon) lines in a well ventilated area. To protect the environment, liquid refrigerant systems **must** be properly emptied and filled using equipment that prevents the release of refrigerant gas (fluorocarbons) into the atmosphere. Federal law requires capturing and recycling refrigerant.
- To avoid personal injury, use a hoist or get assistance when lifting components that weigh 23 kg [50 lb] or more. Make sure all lifting devices such as chains, hooks, or slings are in good condition and are of the correct capacity. Make sure hooks are positioned correctly. **Always** use a spreader bar when necessary. The lifting hooks **must not** be side-loaded.
- Corrosion inhibitor, a component of SCA and lubricating oil, contains alkali. Do **not** get the substance in your eyes. Avoid prolonged or repeated contact with skin. Do **not** swallow internally. In case of contact, immediately wash skin with soap and water. In case of contact, immediately flood eyes with large amounts of water for a minimum of 15 minutes. IMMEDIATELY CALL A PHYSICIAN. KEEP OUT OF REACH OF CHILDREN.
- Naptha and Methyl Ethyl Ketone (MEK) are flammable materials and **must** be used with caution. Follow the manufacturer's instructions to provide complete safety when using these materials. KEEP OUT OF REACH OF CHILDREN.
- To avoid burns, be alert for hot parts on products that have just been turned off, and hot fluids in lines, tubes, and compartments.
- **Always** use tools that are in good condition. Make sure you understand how to use them before performing any service work. Use **ONLY** genuine Cummins or Cummins ReCon® replacement parts.
- **Always** use the same fastener part number (or equivalent) when replacing fasteners. Do **not** use a fastener of lesser quality if replacements are necessary.
- Do **not** perform any repair when fatigued or after consuming alcohol or drugs that can impair your functioning.
- Some state and federal agencies in the United States of America have determined that used engine oil can be carcinogenic and can cause reproductive toxicity. Avoid inhalation of vapors, ingestion, and prolonged contact with used engine oil.

## Section E - Engine Identification

### Section Contents

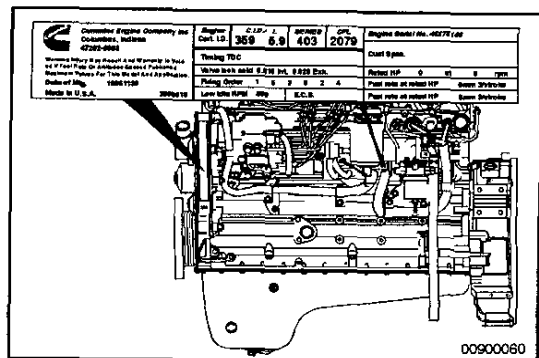
	Page
<b>Engine Diagrams</b> .....	E-11
Engine Views .....	E-11
<b>Engine Identification</b> .....	E-1
Cummins Engine Nomenclature .....	E-3
ECM Dataplate .....	E-5
Engine Dataplate .....	E-1
Fuel Injection Pump Dataplate .....	E-4
<b>Specifications</b> .....	E-6
Air Intake System .....	E-8
Batteries (Specific Gravity) .....	E-10
Cooling System .....	E-8
Electrical System .....	E-9
Exhaust System .....	E-9
Fuel System .....	E-7
General Specifications .....	E-6
Lubricating Oil System .....	E-7

**THIS PAGE LEFT INTENTIONALLY BLANK.**

## Engine Identification


### Engine Dataplate

The engine dataplate shows specific information about your engine. The engine serial number (1) and Control Parts List (CPL) (2) provide information for ordering parts and service needs. The engine dataplate **must not** be changed unless approved by Cummins Engine Company, Inc.

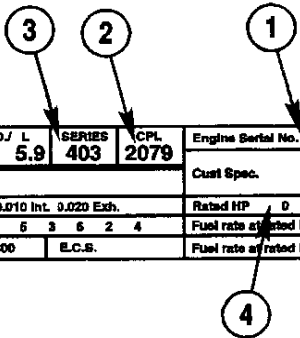


Have the following engine data available when communicating with a Cummins Authorized Repair Location. The information on the dataplate is **mandatory** when sourcing service parts.

1. Engine Serial Number (ESN)
2. Control Parts List (CPL)
3. Model
4. Horsepower and rpm rating

 Cummins Engine Company Inc Columbus, Indiana 47202-3005  Warning Injury May Result And Warranty Is Voided If Fuel Rate Or Altitudes Exceed Published Maximum Values For This Model And Application. Date of Mfg. 19951130 Made in U.S.A. 3906610	Engine Cert. I.D.	C.I.D./ L	SERIES	CPL	Engine Serial No. 45275188	
		359 5.9	403	2079	Cust Spec.	
	Timing TDC					
	Valve lash cold	0.010 Int.	0.020 Exh.	Rated HP 0 at 0 rpm		
	Firing Order	1 6 3 6 2 4	Fuel rate at rated HP		0mm 3/stroke	
	Low Idle RPM	800	E.C.S.	Fuel rate at rated HP		0mm 3/stroke

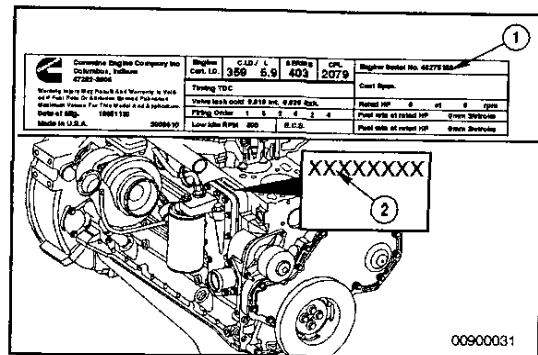
0090061



## ISB Engines Section E - Engine Identification

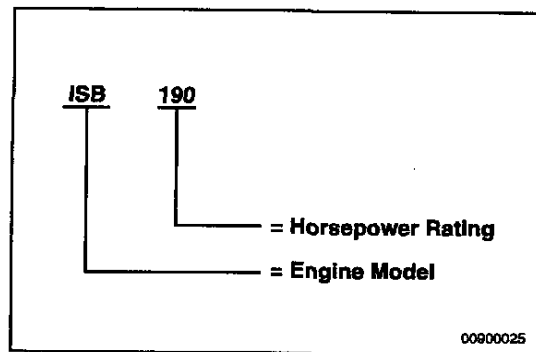
**NOTE:** If the engine dataplate (1) is not readable, the engine serial number (2) can be identified on the engine block on top of the lubricating oil cooler housing. Additional engine information is available by reading the Electronic Control Module (ECM) dataplate.

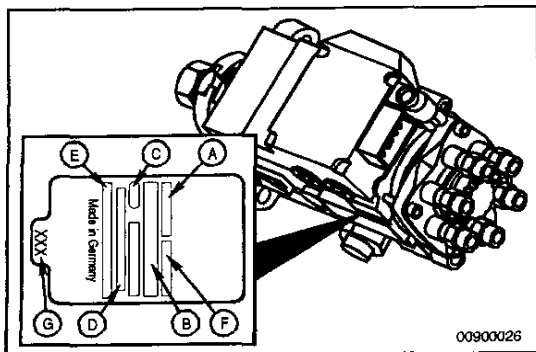
## Engine Identification Page E-3



## Cummins Engine Nomenclature

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





### Fuel Injection Pump Dataplate

The VP44 fuel injection pump dataplate is located on the side of the fuel pump. The dataplate contains the following information:

- A. Order Number
- B. Bosch Part Number
- C. Factory Code
- D. Cummins Part Number
- E. Manufacture Date
- F. Pump Serial Number
- G. Last Three Digits of Key Part Number



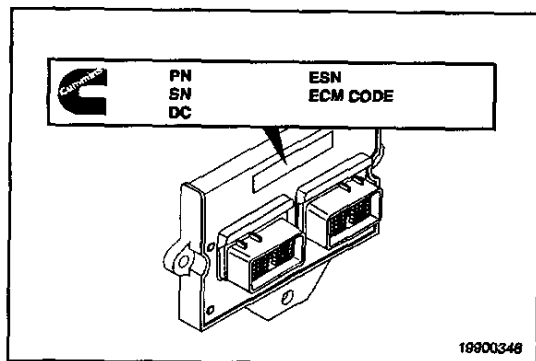
## ECM Dataplate

The electronic control module (ECM) dataplate shows information about your ECM, and how the ECM was programmed. The dataplate is located on the ECM, above the ECM connectors.

The following information is available on the ECM dataplate:

- ECM Part Number
- ECM Serial Number
- ECM Date Code
- Engine Serial Number (ESN)
- ECM Code: Software Number how the ECM was programmed

**NOTE:** Have the ECM code for your engine available when communicating with a Cummins Authorized Repair Location.



## Specifications

### General Specifications

Horsepower (Refer to engine dataplate)

Bore and Stroke ..... 102 mm [4.02 in] X 120 mm [4.72 in]

Displacement ..... 5.9 liters [359 C.I.D.]

Compression Ratio ..... 16.5:1

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

Engine Weight (with Standard Accessories):

Dry Weight ..... 1010

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

Valve Clearance

Intake ..... 0.010

Exhaust ..... 0.020

**NOTE:** The ISB engine features a no—adjust overhead. The ISB valve train is designed such that adjustment of the valve lash is not required for normal service during the first 150,000 miles. The valve train operates acceptably within the limits of 0.006 inch to 0.015 inch intake valve lash and 0.015 inch to 0.030 inch exhaust valve lash.

## Fuel System

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

Engine Idle Speed .....	700 to 875 rpm
Maximum Fuel Inlet Restriction to Lift Pump: .....	152 mm Hg [6 in Hg]
Maximum Fuel Pressure to Fuel Filter Inlet (at Idle) .....	69 kPa [10 psi]
Maximum Pressure Drop Across Fuel Filter .....	10 in Hg [5 psi]
Fuel Drain Line Maximum Restriction .....	20.4 in Hg [10 psi]
Fuel Inlet Maximum Temperature .....	71°C [160°F]
Engine Minimum Cranking Speed .....	150 rpm

## Lubricating Oil System

### Oil Pressure:

Low Idle (Minimum Allowable) .....	69 kPa [10 psi]
at Rated Speed (Minimum Allowed) .....	207 kPa [30 psi]

Regulated Pressure .....

60 psi

### Oil Capacity of Standard Engine:

#### Standard

Pan Only .....	14.2 liters [15 qt.]
Total System .....	16.4 liters [17 qt.]

#### Deep Sump

Pan Only .....	16.1 liters [17 qt.]
Total System .....	18.3 liters [19 qt.]

Oil Pan High — Low	
Standard Pan .....	15 qt – 13 qt
Deep Sump Pan .....	17 qt – 13 qt

**NOTE:** Some applications may use a slightly different lubricating oil pan capacity. Contact your local Cummins Distributor if you have questions.

### Cooling System

Coolant Capacity (Engine Only) .....	9.0 Liters [9.5 U.S. qt.]
Standard Modulating Thermostat-Range .....	84°C to 91°C [184°F to 195°F]
Maximum Allowable Operating Temperature .....	100°C [212°F]
Minimum Recommended Operating Temperature .....	71°C [160°F]
Minimum Recommended Pressure Cap .....	48 kPa [7 psi]

### Air Intake System

Maximum Intake Restriction (Clean Air Filter Element) .....	254 mm H <sub>2</sub> O [10.0 in H <sub>2</sub> O]
Maximum Intake Restriction (Dirty Air Filter Element) .....	635 mm H <sub>2</sub> O [25.0 in H <sub>2</sub> O]

## Exhaust System

Maximum Back Pressure From Piping and Silencer (Combined):

Hg .....	76 mm [3 in]
H <sub>2</sub> O .....	1016 mm [40 in]
Exhaust Pipe Size (Normally Acceptable Inside Diameter) .....	76 mm [3 in]

## Electrical System

Minimum Recommended Battery Capacity

System Voltage	Ambient Temperature			
	-18°C [0°F]		0°C [32°F]	
	Cold Cranking Amperes	Reserve Capacity <sup>1</sup> Amperes	Cold Cranking Amperes	Reserve Capacity <sup>1</sup> Amperes
12 Volt	1800	640	1280	480
24 Volt <sup>2</sup>	900	320	640	240

1. The number of plates within a given battery size determines reserve capacity. Reserve capacity determines the length of time which sustained cranking can occur.
2. CCA ratings are based on two 12 volt batteries in series.

**Batteries (Specific Gravity)**

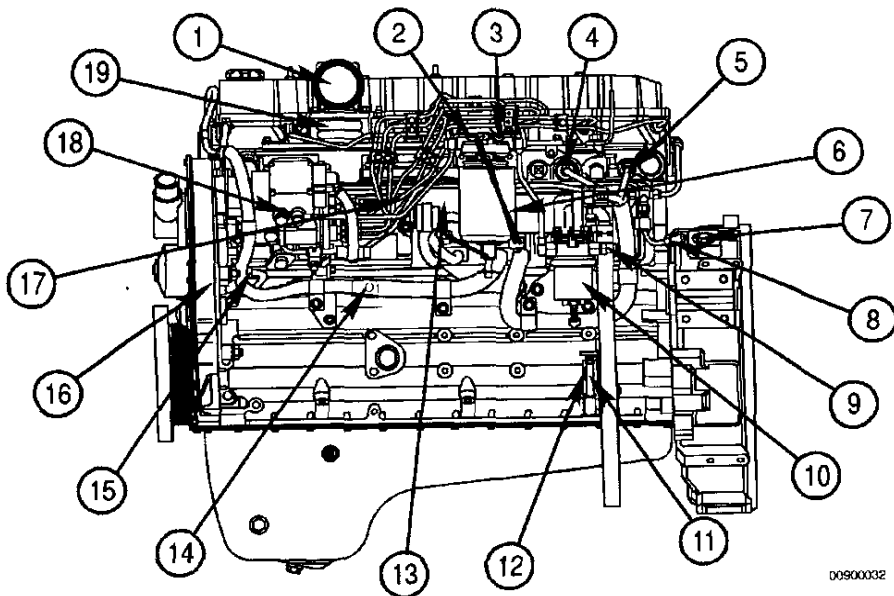
Specific Gravity at 27°C [80°F]	State of Charge
1.260 to 1.280	100%
1.230 to 1.250	75%
1.200 to 1.220	50%
1.170 to 1.190	25%
1.110 to 1.130	Discharged

## **Engine Diagrams**

### **Engine Views**

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

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



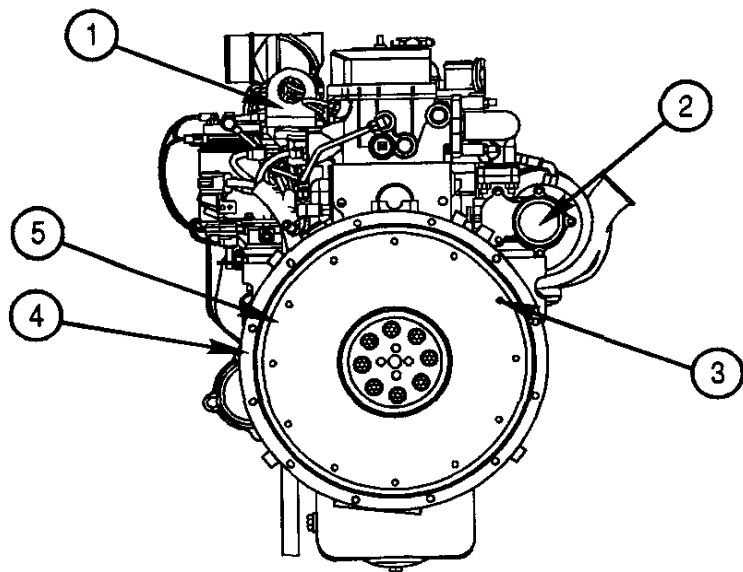
00900032

Air Intake Side View



**ISB Engines**  
**Section E - Engine Identification**

1. Engine Air Inlet
2. M10 (STOR) Fuel Pressure After Filter
3. M10 (STOR) Fuel Pressure Before Filter
4. Intake Manifold Pressure Sensor
5. Intake Manifold Temperature Sensor
6. Fuel Filter/Water Separator
7. Magnetic Pickup Location 3/4-16 UNF
8. Fuel Return Connection
9. Fuel Inlet Connection
10. Fuel Lift Pump
11. Dipstick
12. Engine Position Sensor (EPS)
13. Engine Control Module (ECM)
14. M10 (STOR) Oil Pressure
15. Engine Diagnostic Sensor
16. Engine Data Plate
17. High Pressure Fuel Lines
18. Fuel Injection Pump
19. Intake Air Preheater

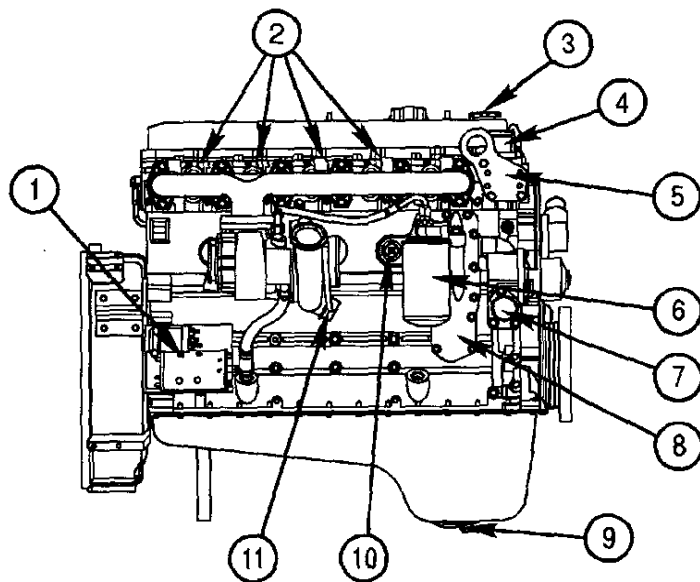


Rear View

00900033

**ISB Engines**  
**Section E - Engine Identification**

1. Rear Engine Lifting Bracket
2. Turbocharger Exhaust Outlet
3. Clutch Mounting Holes
4. Flywheel Housing
5. Flywheel/Flexplate

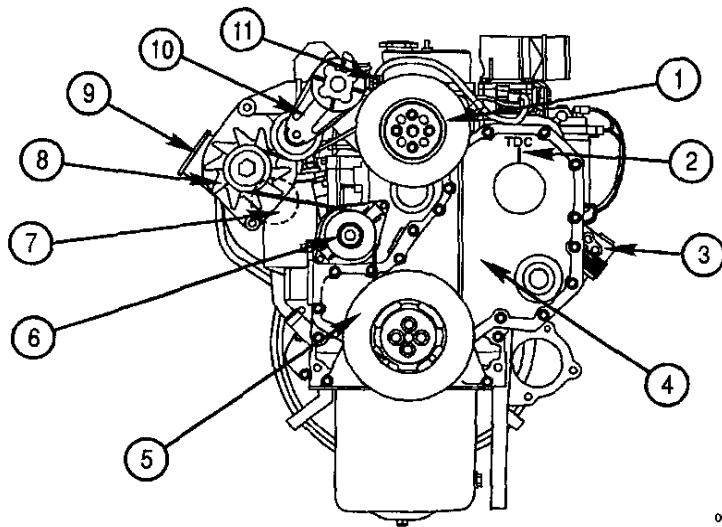


00900034

Exhaust Side View

**ISB Engines**  
**Section E - Engine Identification**

1. Starter Motor and Solenoid
2. 1/2 inch (NPTF) Coolant Taps
3. Oil Fill
4. Water Outlet
5. Front Engine Lifting Bracket
6. Lubricating Oil Filter
7. Water Inlet
8. Lubricating Oil Cooler
9. Oil Drain
10. Provision for Coolant Heater
11. Turbocharger Wastegate Actuator



00900035

Front View

**ISB Engines**  
**Section E - Engine Identification**

1. Fan Pulley
2. Top Dead Center Indication
3. Air Compressor
4. Front Gear Cover
5. Vibration Damper
6. Water Pump
7. Turbocharger *Air Inlet*
8. Alternator
9. Turbocharger Air Outlet
10. Automatic Belt Tensioner
11. Coolant Temperature Sensor

# Section 1 - Operating Instructions

## Section Contents

	Page
<b>Cold Weather Operation</b> .....	1-11
<i>General Information</i> .....	1-11
Shutters .....	1-15
Thermo Control Settings .....	1-13
Winterfronts .....	1-15
<b>Cold Weather Starting Using Starting Fluid</b> .....	1-7
Ether Starting Aids .....	1-7
<b>Driving Techniques</b> .....	1-57
<b>Electromagnetic Interference (EMI)</b> .....	1-58
General Information .....	1-58
ISB System EMI Radiation Levels .....	1-58
ISB System EMI Susceptibility .....	1-58
<b>Electronic Controlled Fuel System</b> .....	1-16
Diagnostic Fault Codes .....	1-51
Fault Code Snapshot Data.....	1-57
Engine Protection System .....	1-20
Air Conditioner Pressure Switch Input .....	1-25
Application Type .....	1-25
Automatic Transmission .....	1-26
Electric Lift Pump.....	1-28
Engine Protection Shutdown.....	1-21
Fan Clutch Enable.....	1-24
Intake Air Heater .....	1-26
Maximum Engine Speed Without VSS.....	1-22



	Page
Number of Transmission Tailshaft Gear Teeth .....	1-23
Rear Axle Ratio .....	1-23
Tire Revolutions Per Mile.....	1-22
Vehicle Speed Sensor Type .....	1-21
VSS anti-tampering (Fault Code 242).....	1-24
Water in Fuel (WIF) sensor .....	1-27
General Information .....	1-16
Programmable Features .....	1-28
Accelerator Interlock.....	1-29
Accelerator Override in PTO .....	1-37
Automotive/Variable Speed (VS) Governor .....	1-41
Brake and Clutch Override in PTO.....	1-36
Cruise Control .....	1-31
Cruise Control Governor Lower Droop .....	1-32
Cruise Control Governor Upper Droop .....	1-32
Gear Down Maximum Vehicle Speed, Heavy Engine Load .....	1-41
Gear Down Maximum Vehicle Speed, Light Engine Load .....	1-40
Gear Down Protection .....	1-38
Idle Shutdown .....	1-43
Idle Shutdown in PTO.....	1-44
Idle Shutdown Override .....	1-44
Idle Shutdown Time.....	1-43
Low Idle Adjustment .....	1-42
Low Idle Speed .....	1-42
Maintenance Monitor .....	1-45
Maximum Cruise Control Speed .....	1-31
Maximum Engine Load in PTO .....	1-36
One Gear Down Gear Ratio.....	1-40
Power Takeoff (PTO) .....	1-33
PTO Maximum Speed .....	1-34
PTO Minimum Speed .....	1-34

	<b>Page</b>
PTO Resume Speed.....	1-35
PTO Set Point.....	1-35
Remote PTO.....	1-37
Road Speed Governor.....	1-29
Road Speed Governor Lower Droop .....	1-30
Road Speed Governor Upper Droop.....	1-30
SET/ACCEL .....	1-33
Top Transmission Gear Ratio .....	1-39
<b>Engine Operating Range .....</b>	<b>1-9</b>
<b>Engine Shutdown.....</b>	<b>1-16</b>
General Information.....	1-16
<b>Normal Starting Procedure .....</b>	<b>1-3</b>
<b>Operating Instructions - General Information .....</b>	<b>1-1</b>
<b>Operating the Engine .....</b>	<b>1-8</b>

**THIS PAGE LEFT INTENTIONALLY BLANK.**

## Operating Instructions - General Information

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

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

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

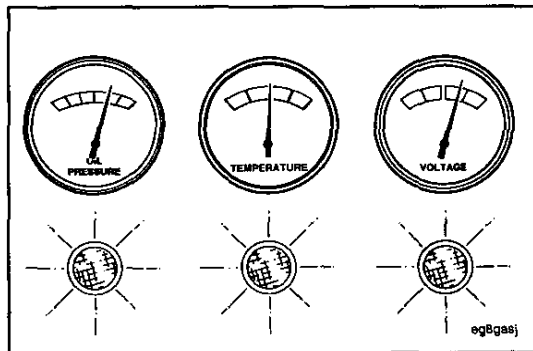
Check the oil pressure indicators, temperature indicators, warning lights, and other gauges daily to make sure they are operational.

Avoid exposure of your engine to corrosive chemicals.

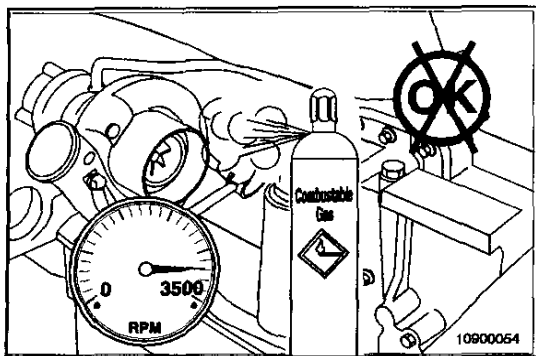


ISB Engine Maintenance Schedule 19-00				
Usely of Rebuilding	Every 12,000 km (7,500 mi), 2,000 Hours or 3 Months	Every 24,000 km (15,000 mi), 4,000 Hours, or 6 Months	Every 48,000 km (30,000 mi), 8,000 Hours or 1 Year	Every 96,000 km (60,000 mi), 16,000 Hours or 2 Years
<b>Maintenance Check</b> • Check operation is correct • Check and correct — - Engine oil level - Coolant level • Grease air control and retainers • Clean fuel-water separator • Air Cleaner • Inspect Injection • Change Air Filter • Check Fan • Visually inspect engine • Visually check characterizing marks	<b>Change/Inspect</b> • Fuel Filter • Lubricating oil • Lubricating oil filter • Fuel filter • Lubricating oil • Lubricating Oil Filter • Air Filter			
	<b>Check/Inspect</b> • Air Cleaner • Inspect Injection • Change Air Filter • Check Fan • Visually inspect engine • Visually check characterizing marks			
1. The lubricating oil and lubricating oil filter interval can be adjusted based on fuel consumption, gross vehicle weight, and the use of the fuel filter.				
2. Service interval is every 24,000 km (15,000 miles), 4,000 hours, or 6 months, whichever occurs first. Must use a heavy duty (new actual) antifreeze that meets the chemical composition of G4803M. The change interval is 2 years or 48,000 km (30,000 mi), whichever occurs first. Antifreeze is essential for freeze protection and corrosion protection.				
3. Service interval is 2 years or 96,000 km (60,000 miles), whichever occurs first.				

00900066



egBgasj



**▲ WARNING ▲**

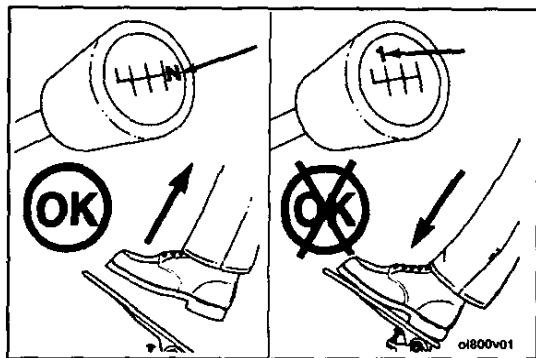
**DO NOT OPERATE A DIESEL ENGINE WHERE THERE ARE OR CAN BE COMBUSTIBLE VAPORS.** These vapors can be sucked through the air intake system and cause engine acceleration and over-speeding which can result in a fire, an explosion, and extensive property damage. Numerous safety devices are available, such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

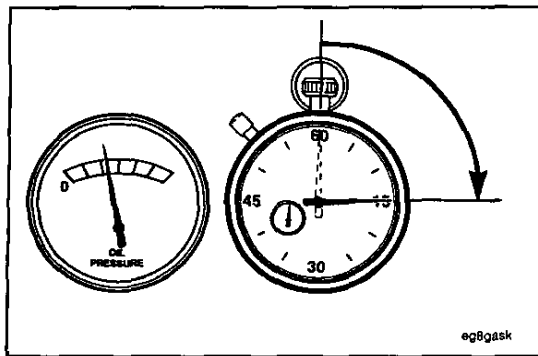
## Normal Starting Procedure

△ CAUTION △

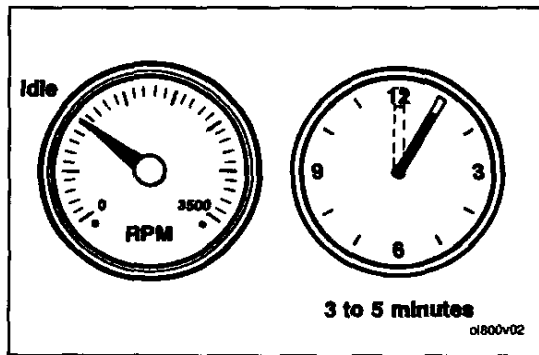
To prevent damage to the starting motor, do not engage the starting motor more than 30 seconds. Wait 2 minutes between each attempt to start (electrical starting motors only).

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





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.

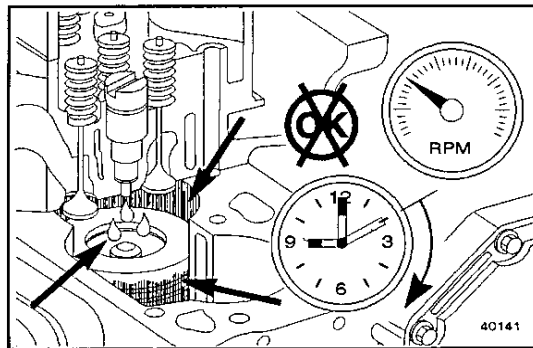
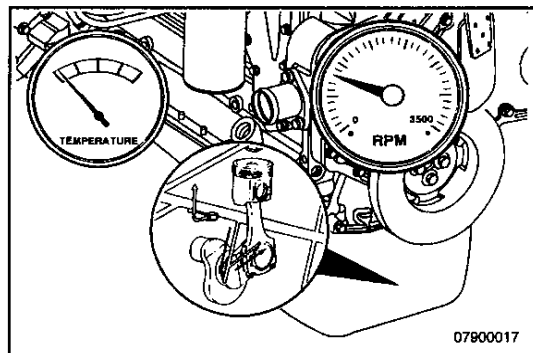


Idle the engine 3 to 5 minutes before operating with a load.

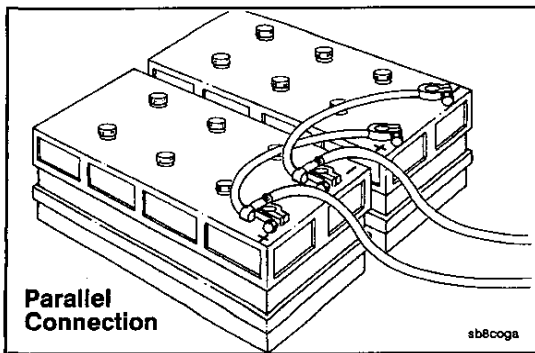
## ISB Engines Section 1 - Operating Instructions

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 because combustion chamber temperatures drop so low 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.







**▲ CAUTION ▲**

To avoid damage to the ISB engine parts, do not connect jumper starting or battery charging cables to any ISB part. Always remove the negative (-) battery cable before the positive (+) battery cable and attach the positive before the negative in order to avoid potentially damaging arcing. 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.

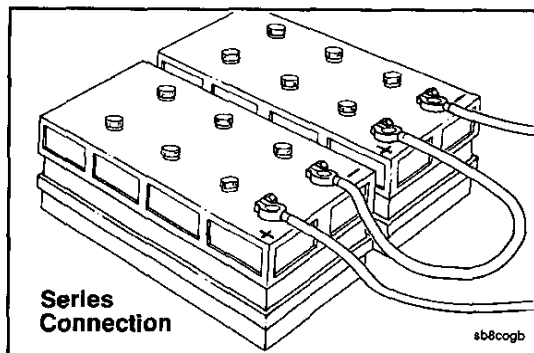
The accompanying illustration shows a typical parallel battery connection. This arrangement doubles the cranking amperage.

## ISB Engines Section 1 - Operating Instructions

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



## Cold Weather Starting Using Starting Fluid Page 1-7

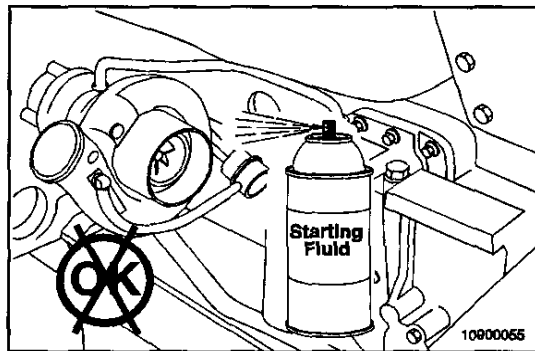


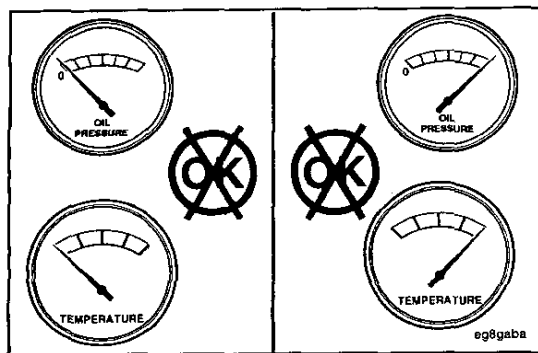
## Cold Weather Starting Using Starting Fluid

### Ether Starting Aids



To avoid damage to the engine do not use starting fluids. This engine is equipped with an intake air heater and use of a starting fluid can cause an explosion.

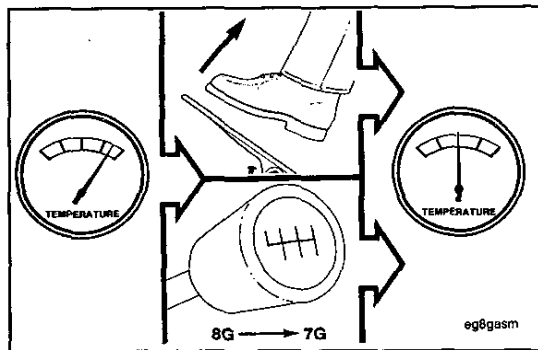




## Operating the Engine

Monitor the oil pressure and coolant temperature gauges frequently. Refer to Lubricating Oil System Specifications 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.

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



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

## ISB Engines Section 1 - Operating Instructions

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

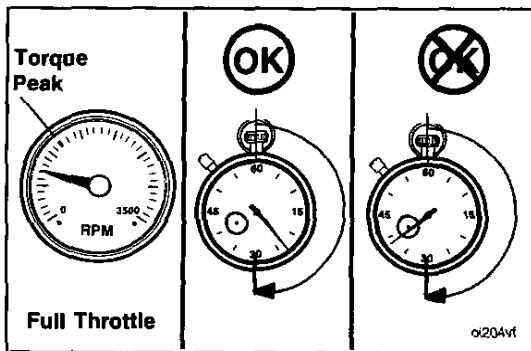
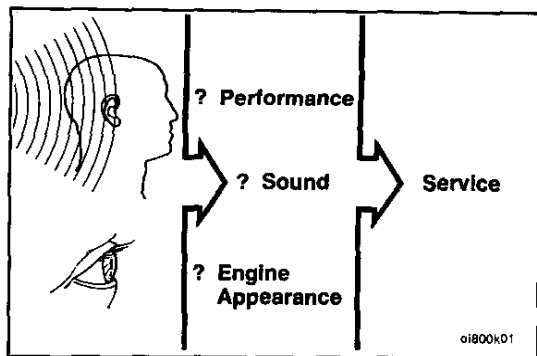
- Engine misfires
- Vibration
- Unusual engine noises
- Sudden changes in engine operating temperatures or pressures
- Excessive smoke
- Loss of power
- An increase in oil consumption
- An increase in fuel consumption
- Fuel, oil, or coolant leaks

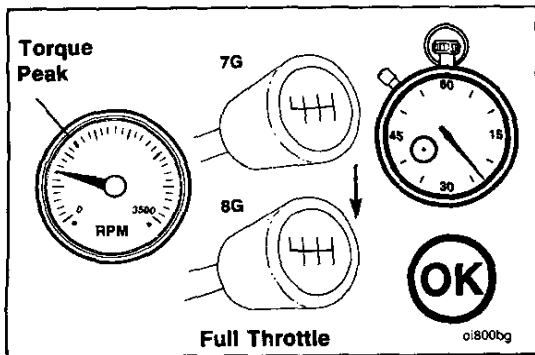
## Engine Operating Range



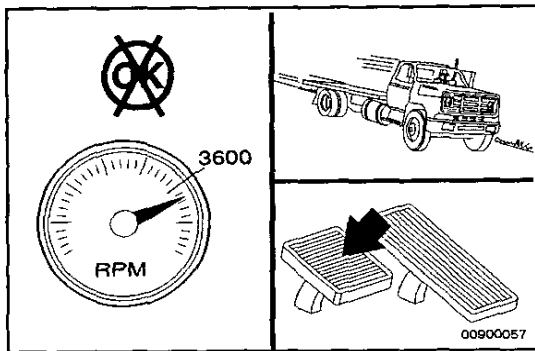
Do not operate the engine at excessive full throttle operation below peak torque rpm (refer to engine dataplate for peak torque rpm) for more than 30 seconds. This condition will shorten engine life to overhaul, can cause serious engine damage, and is considered driver abuse.

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





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



**△ CAUTION △**  
Do not operate the engine beyond high idle speed. Operating the engine beyond high idle speed can cause severe engine damage. The engine speed must not exceed 3600 rpm under any circumstances. When descending a steep grade, use a combination of transmission gears and engine or service brakes to control the vehicle and engine speed.

## Cold Weather Operation

### General Information

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

<b>Winterize</b> 0° to -32°C [32° to -25°F]	<b>Arctic Specifications</b> -32° to -54°C [-25° to -65°F]
<p>Use 50 percent ethylene glycol or propylene glycol antifreeze and 50 percent water in your coolant mixture.</p> <p>Use multi viscosity oil meeting API CG-4 or CF-4 specifications.</p> <p>Fuel to have maximum cloud and pour points 6°C [10°F] lower than ambient temperature in which engine operates.</p>	<p>Use 60 percent ethylene glycol or propylene glycol antifreeze and 40 percent water in your coolant mixture.</p> <p>Use Arctic oil meeting API CG-4 or CF-4 specifications.</p> <p>Fuel to have maximum cloud and pour points 6°C [10°F] lower than ambient temperature in which engine operates.</p>

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

### Cold Weather Operating Aids

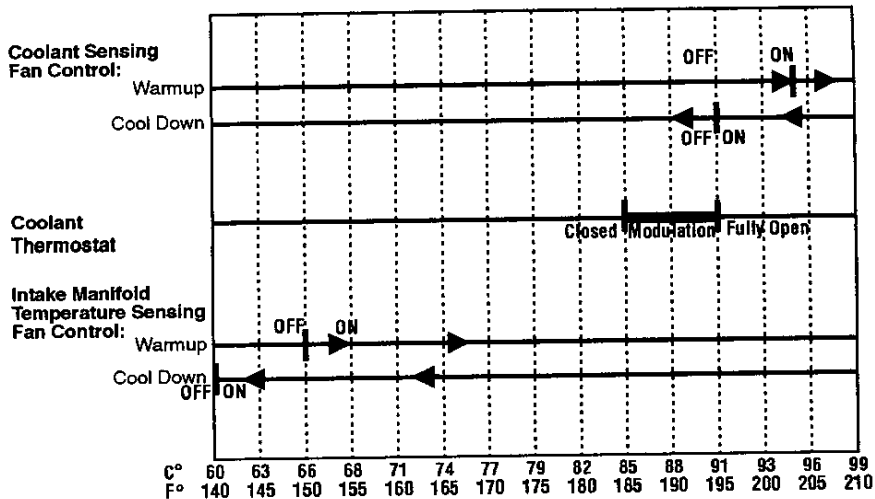
Temperature	Coolant Heater	Oil Heater	Battery Heater	Winter Front	Thermostatic Fan
50 to 32°F 10 to 0° C					Suggested
32 to -10°F 0 to -23° C	↑		↑		↑
-10 to -25°F -23 to -32° C	Suggested	↑	Suggested*	↑	Suggested
-25 to -65°F -32 to -54° C	↓	↓	↓	↓	↓

\* Required dependent upon viscosity/pour point.

## **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 which allow the ECM to control the on/off operation of the cooling fan. Consult your local OEM for other types of control.

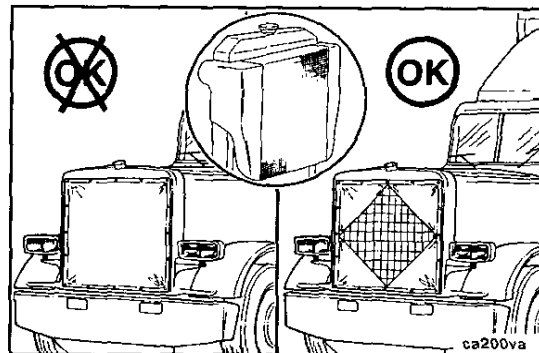




06900055

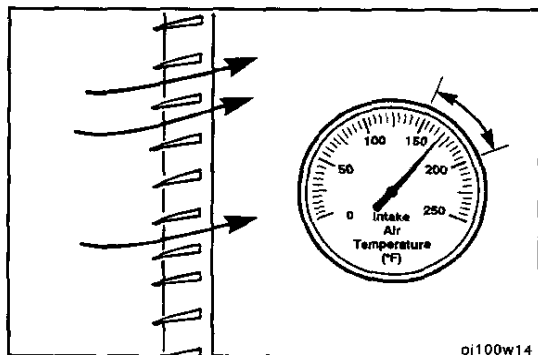
## Winterfronts

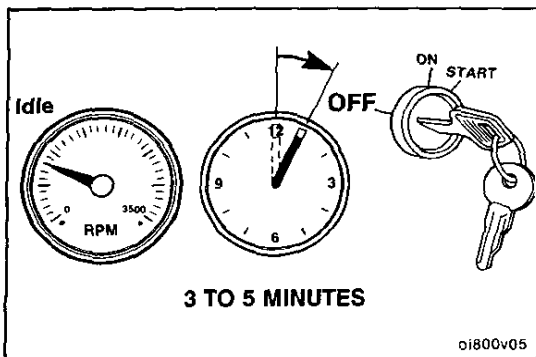
Winterfronts can be used on a vehicle equipped with charge air cooling (CAC) but **must** be designed to partially cover the frontal area of the cooling system. A minimum of 384 sq cm (19.6 x 19.6 cm) [60 sq in (7.5x 7.5 in)] of frontal area **must** be left open to allow air flow for the CAC to function correctly.



## Shutters

Installations of CAC 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 air flow across the CAC.





## ISB Fuel System

- Optimized Engine Control
- Reduced Exhaust Emissions

19900812

## Engine Shutdown

### General Information

1. Allow the engine to idle 3 to 5 minutes before shutting it off after a full load operation. This allows adequate cool down of pistons, cylinders, bearings, and turbo-charger components.
2. Turn the ignition key switch to the "OFF" position.

## Electronic Controlled Fuel System

### General Information

The ISB engine control system is an electronically operated fuel control system that also provides many operator and vehicle or equipment features.

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

## ISB Engines

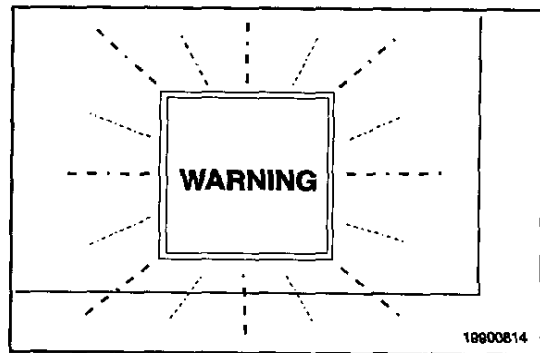
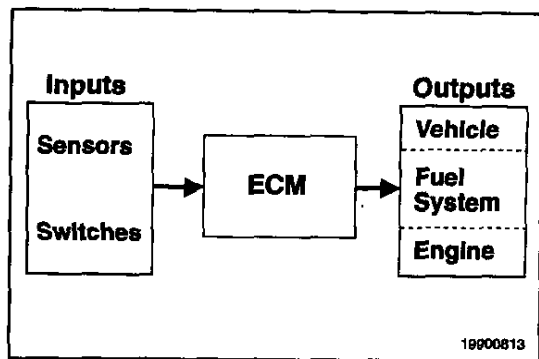
### Section 1 - Operating Instructions

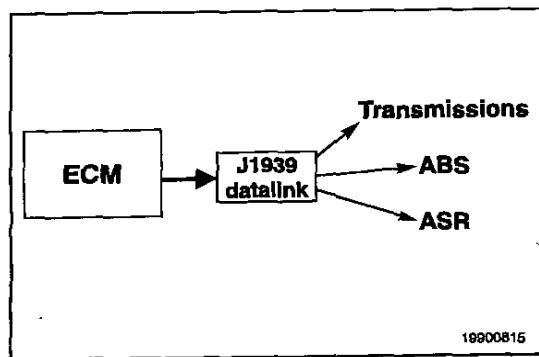
The control system uses inputs from the operator and it's sensors to determine the fueling and timing required to operate at the desired engine speed.

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

The ECM performs diagnostic tests on most of it's circuits and will activate a fault code if a problem is detected in one of these circuits. Along with the fault code identifying the problem, a snapshot of engine operating parameters at the time of fault activation is also stored in memory.

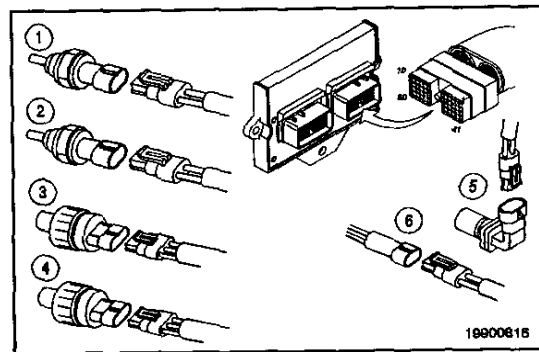
Some fault codes will cause a diagnostic lamp to activate to signal the driver.





The ECM communicates with service tools and some other vehicle controllers (i.e. transmissions, ABS, ASR, etc.) through an SAE J1939 datalink.

Some vehicles and equipment will have J1939 networks on them that link many of the "smart" controllers together. Vehicle control devices can temporarily command engine speed or torque to perform one of it's functions (i.e. transmission shifting, anti-lock braking, etc.).



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

1. Coolant Temperature Sensor
2. Intake Air Temperature Sensor
3. Intake Manifold Pressure Sensor
4. Oil Pressure Sensor
5. Engine Speed/position Sensor
6. Water-In-Fuel Sensor

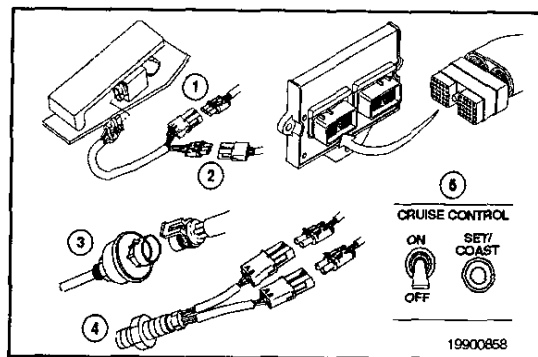
## ISB Engines Section 1 - Operating Instructions

The following inputs are provided by OEM selected devices:

1. Accelerator Pedal Position Sensor
2. Idle Validation Switch
3. Coolant Level Sensor
4. Vehicle Speed Sensors
5. Feature Control Switches (i.e. Cruise Control Switches)

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

## Electronic Controlled Fuel System Page 1-19



### Engine Protection System Monitors

- Coolant Temperature
- Coolant Level (Optional)
- Oil Pressure
- Intake Manifold Temperature
- Engine Overspeed
- Fuel Temperature

19900861

### Engine Protection System

The ISB engines are equipped with an engine protection system. The system monitors critical engine temperatures and pressures, and will log diagnostic faults when an over or under normal operation 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.

***Engine Protection Shutdown***

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

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

***Vehicle Speed Sensor Type***

Indicates the type of vehicle speed sensor being used to the ECM.

**Engine Protection System  
Monitors**

- Coolant Temperature
- Coolant Level (Optional)
- Oil Pressure
- Intake Manifold Temperature
- Engine Overspeed
- Fuel Temperature

19900861

**Vehicle Speed Sensor**

19900820



**Maximum Engine Speed  
Without VSS**

19900821

***Maximum Engine Speed Without VSS***

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

**Tire Revolutions  
Per Mile**

19900822

***Tire Revolutions Per Mile***

This is used to tell the ECM how many times the tire will turn a full revolution in one mile.

***Rear Axle Ratio***

Used to tell the ECM the gear ratio of the rear axle.

**Rear Axle Ratio**

19900823

***Number of Transmission Tailshaft Gear Teeth***

Used to tell the ECM the number of gear teeth on the transmission tailshaft.

**Transmission Tailshaft  
Number of Gear Teeth**

19900824

## VSS Anti-Tampering (Fault Code 242) - (Y/N)

19900825

### VSS anti-tampering (Fault Code 242)

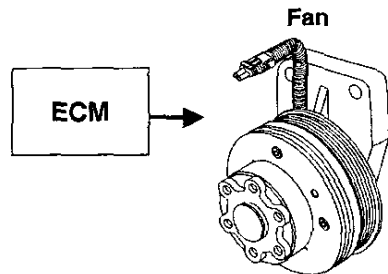
This is a feature which gives the customer the option of disabling Fault Code 242.

**NOTE:** Fault Code 242 is logged when an invalid or inappropriate vehicle speed signal is detected by the ECM indicating an intermittent connection or signal tampering. This fault code is **not** a guarantee that vehicle speed sensor tampering has been performed.

### Fan Clutch Enable

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

Some applications will also provide inputs to the ECM for auxiliary device cooling (e.g. air conditioner pressure, power steering temperature, transmission temperature) or a manual fan switch for fan control.



19900862

***Air Conditioner Pressure Switch Input***

This allows for the air conditioner pressure switch input to be disabled if that input into the ECM is **not** being used. Select this feature if the Air Conditioner Pressure switch input into the ECM is being used.

**Air Conditioner  
Pressure Switch Input**

19900827

***Application Type***

This feature selection tells the ECM what type of application is being used in this vehicle. Choose between on-highway or on/off-highway. On-highway applications are those which use top gear for the majority of its operations. On/off-highway applications are those which use gears lower than top gear for the majority of its operation.

**Application Type**

**On-Highway (Top Gear)**

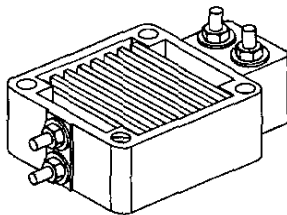
**On/Off Highway (Lower Gears)**

19200047

## Automatic Transmission (Y/N)

Factory Setting = No

19200046



19900829

### **Automatic Transmission**

This feature tells the ECM what type of transmission is used in the vehicle. The transmission is either manual or automatic.

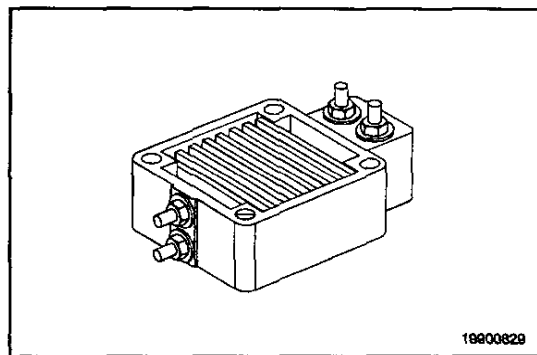
### **Intake Air Heater**

This feature controls the heating elements that are located in the engines intake air stream. These elements heat the intake air when starting the engine in cold ambient conditions. Start ability and white smoke control are enhanced by the use of an intake air heater. A "Wait to Start" lamp is located on the operator controls to indicate when to crank the engine.

**ISB Engines**  
**Section 1 - Operating Instructions**

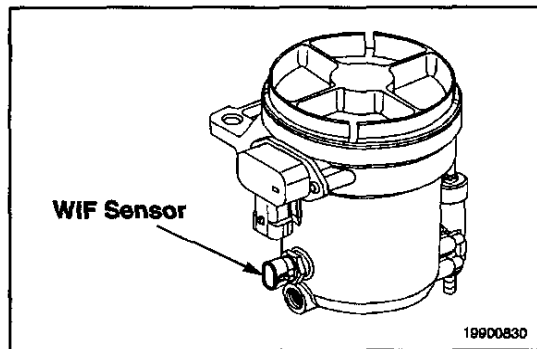
The ECM checks intake manifold temperature to determine how long to energize the air heater before extinguishing the "Wait to Start" lamp (this is for the pre-heat phase).

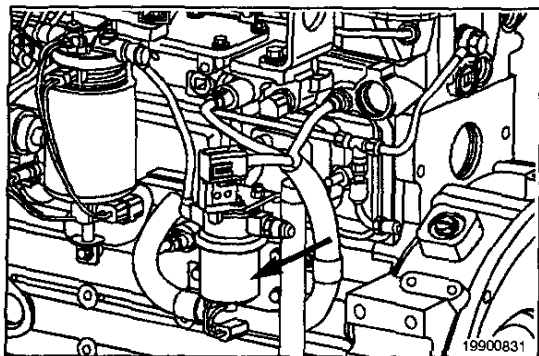
Once the engine is started, the heater will be energized again for a time period determined by intake air temperature and fuel temperature (this is for the post-heat phase).



***Water in Fuel (WIF) sensor***

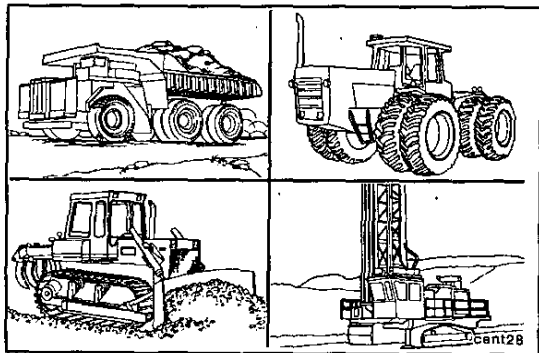
The sensor is located in the fuel filter housing. Once the storage space in the bottom of the filter housing fills with a certain amount of water, the sensor will signal the ECM. A WIF lamp will illuminate, at the operator controls, indicating that the water should be drained from the fuel filter assembly.





### *Electric Lift Pump*

The ECM controls the electric lift pump located in between the fuel tank and the injection pump. Whenever the keyswitch is turned "ON", the lift pump will be energized for a few seconds to ensure that the low pressure fuel lines are fully primed.



### **Programmable Features**

The control system can provide many features that are integrated into the vehicle operation. Some of these features can be adjusted or turned "ON" or "OFF" with a service tool, but some are set at the factory and **cannot** be changed.

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

### ***Accelerator Interlock***

When the accelerator interlock feature is active and the external accelerator inhibit switch is active, the accelerator action will be disregarded with respect to fueling and the engine shall run at low idle speed or at the remote PTO speed, if the remote PTO switch is activated. Due to different customer needs, each particular manufacturer will build the interaction with its brakes, transmission, and fast/slow idle selection capabilities.

Example: Most buses use this feature to disable the accelerator pedal and PTO operation, while the bus door is open.

**NOTE:** This is **not** a customer adjustable feature.

### ***Road Speed Governor***

The road speed governor limits the maximum road speed of the vehicle.

The maximum vehicle speed in top gear is the maximum road speed for the vehicle. This speed **must** be greater than or equal to the gear-down maximum vehicle speeds if gear-down protection is enabled (see gear down protection feature description), and the maximum cruise speed if the cruise control feature is enabled.

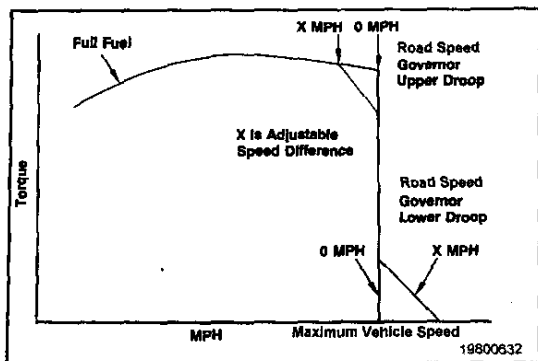
## **Accelerator Interlock**

19200045

## **Road Speed Governor**

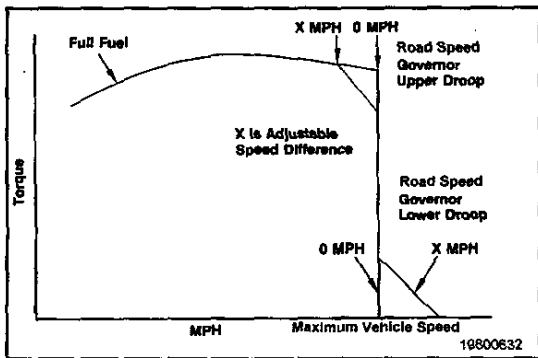
19900817





### ***Road Speed Governor Upper Droop***

The road speed governor upper droop allows tailoring of the torque curve before the maximum vehicle speed is reached while operating on the road speed governor. Increasing the droop can increase fuel economy in hilly terrain. The setting can be between 0 and 3 mph.



### ***Road Speed Governor Lower Droop***

The road speed governor lower droop allows tailoring of the torque curve in a downhill or no-load condition while operating on the road speed governor before fueling is completely cut off. Faster downhill speed increases momentum going up next hill and can improve fuel economy in rolling terrain. The setting can be between 0 and 3 mph.

### Cruise Control



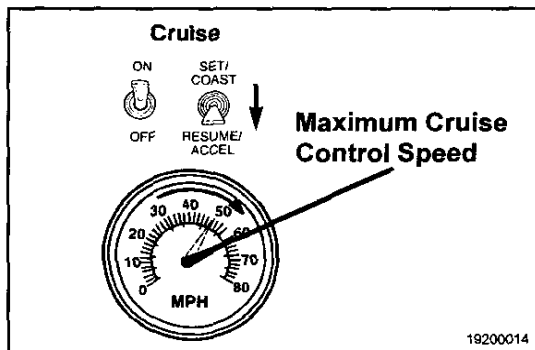
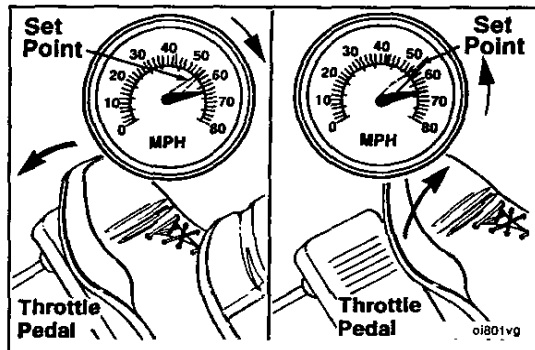
Do not use cruise control when the road is slippery, in heavy traffic, or when the weather is inclement. Loss of vehicle control can result.

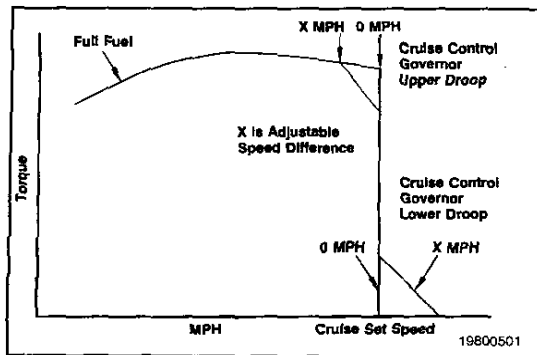
The cruise control feature gives the driver the capability of a "foot off" accelerator cruise operation. It is similar to an automobile cruise control.

### Maximum Cruise Control Speed

This is the maximum allowable cruise set speed.

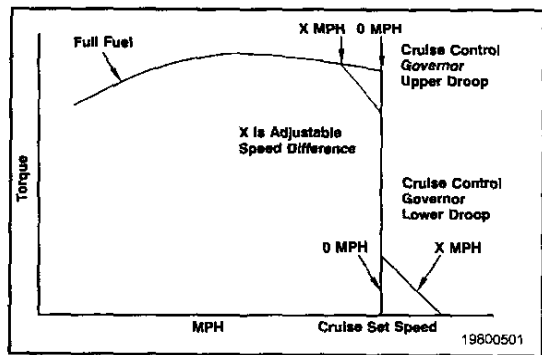
**NOTE:** The maximum cruise control speed **cannot** exceed the maximum vehicle speed in the top gear setting.





### ***Cruise Control Governor Upper Droop***

Allows tailoring of the torque curve before the maximum vehicle speed is reached while operating in cruise control. Increasing the droop can increase fuel economy in hilly terrain. The setting can be between 0 and 3 mph.



### ***Cruise Control Governor Lower Droop***

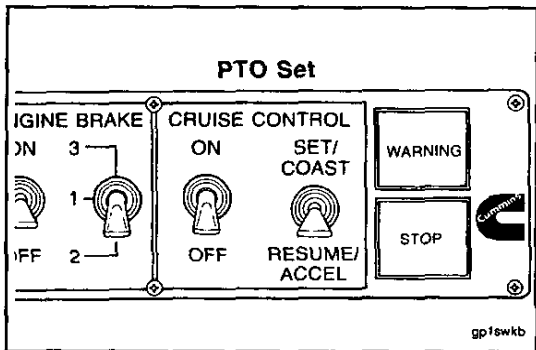
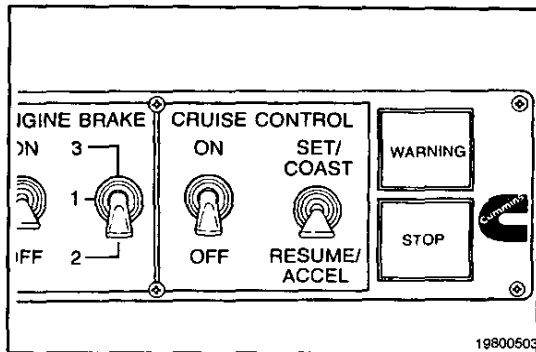
Allows tailoring of the torque curve in a downhill or no-load condition while operating in cruise control before fueling is completely cut off. Faster downhill speed increases momentum going up the next hill and can improve fuel economy in rolling terrain. The setting can be between 0 and 3 mph.

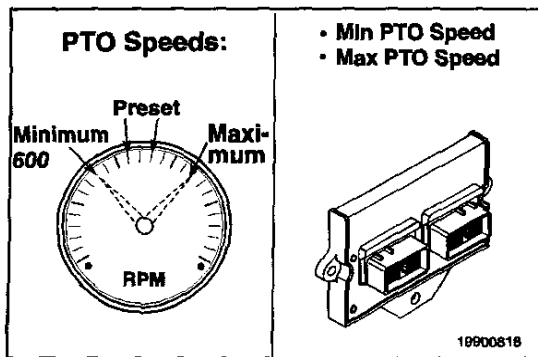
### SET/ACCEL

The SET/ACCEL parameter tells the ECM how the cab switch is configured. If it is set to YES, then the cab switch will be SET/ACCEL in one position and RESUME/COAST in the other position. If it is set to NO, then SET/COAST will be in one position while RESUME/ACCEL will be in the other position.

### Power Takeoff (PTO)

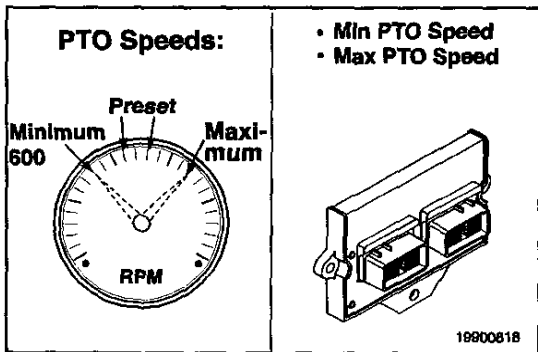
The PTO feature controls the engine at a constant RPM selected by the operator. For applications needing the PTO mode, a remote mounted switch can be used where a cab switch is **not** desirable. The cruise control switches are used for the PTO features also.





***PTO Maximum Speed***

The PTO maximum speed is the maximum engine speed that can be obtained while in the PTO Mode.



***PTO Minimum Speed***

The PTO minimum speed is the minimum engine speed that can be obtained while in PTO Mode.

### *PTO Set Point*

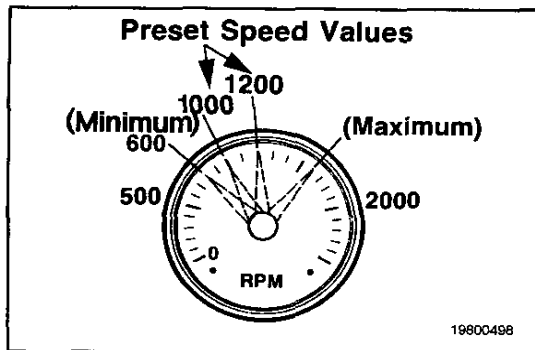
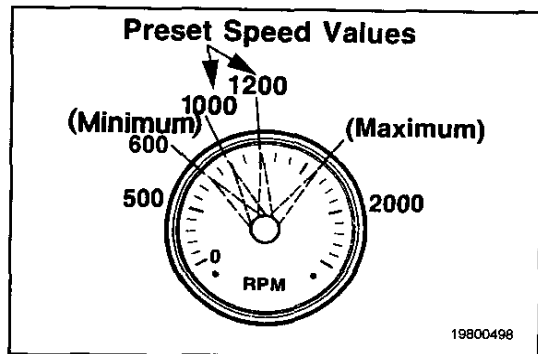
The set point is for the PTO engine speed. This speed is obtained when the PTO "ON/OFF" switch is in the "ON" position and the "SET" switch is used.

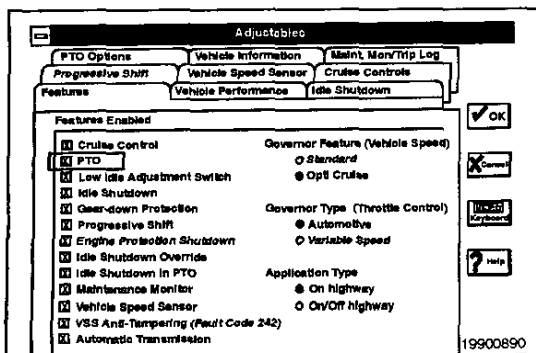
**NOTE:** PTO set speed **cannot** exceed the maximum PTO speed.

### *PTO Resume Speed*

This is the engine speed that will be obtained when the RESUME switch is used.

**NOTE:** PTO resume speed **cannot** exceed the maximum PTO speed.





### Maximum Engine Load in PTO

Some devices that are driven by the engine during PTO operation are sensitive to input torque. The maximum engine torque that can be output by the engine during PTO operation can be adjusted to protect these devices.

**NOTE:** This torque limit is also in effect during accelerator override of the PTO function.

**Brake PTO Disable (Y/N)**  
**Clutch PTO Disable (Y/N)**

19900859

### Brake and Clutch Override in PTO

The brake override in PTO allows the operator to exit PTO operation if the brake is activated.

The clutch override in PTO allows the operator to exit PTO operation if the clutch pedal is depressed.

***accelerator Override in PTO***

Some applications require the ability to override the PTO set speed with the accelerator to increase engine speed without disengaging the PTO function. When the accelerator override in PTO feature is enabled, the engine speed can be increased above the current PTO operating speed by *depressing the accelerator*. Engine speed can only be overridden up to the maximum accelerator override in PTO speed. If the accelerator is released, then the engine speed will return to the PTO set speed that was in effect before the accelerator override event.

***Remote PTO***

The remote PTO allows the PTO mode to be activated from a separate remote switch. Remote PTO can have up to five different set speeds depending on how many times the switch is toggled from "OFF" to "ON" before being left in the "ON" position.

EXAMPLE: to obtain remote PTO set speed 3, rapidly toggle the remote PTO "ON/OFF" switch from "OFF" to "ON" three times and leave it in the "ON" position on the last cycle.

**Brake Override in PTO (Y/N)**  
**Clutch Override in PTO (Y/N)**  
**PTO Accelerator Override (Y/N)**

19900819

**Remote PTO**

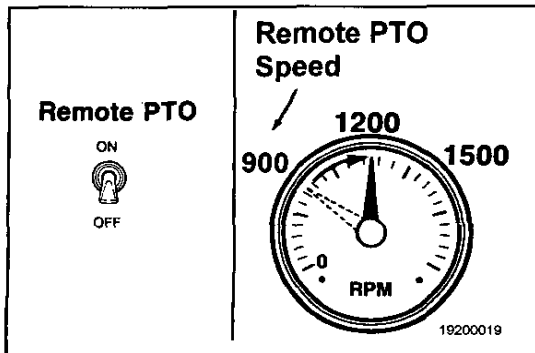
ON



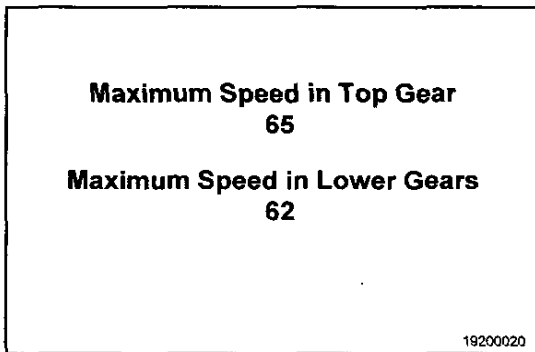
OFF

gp8swks





Remote PTO speeds 1 through 5 are the possible engine speeds when the remote PTO is enabled. The remote PTO has higher priority than the cab PTO so it will control engine speeds in cases where both the cab and remote PTO are enabled.



***Gear Down Protection***

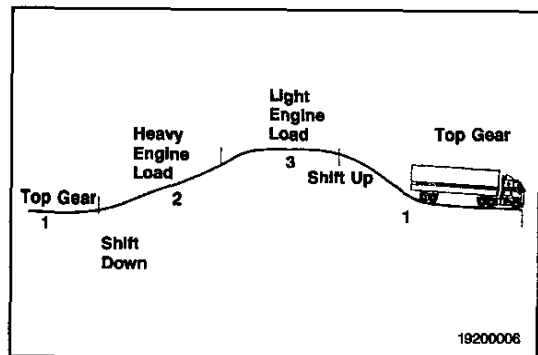
This feature limits the vehicle speed in the lower gears. The maximum vehicle speed in the lower gears is set at a lower MPH than the maximum vehicle speed in the top gear. This encourages driving in the top gear for better fuel economy. The parameters gear down maximum vehicle speed, light engine load and heavy engine load are associated with this feature.

## ISB Engines Section 1 - Operating Instructions

This feature allows the operator to down shift from top gear to the next lower gear under heavy load and maintain a speed higher than the gear down speed. This allows the operator to keep the vehicle momentum up by using a lower gear to maintain a high engine speed when going uphill. As soon as the engine load drops off (e.g. going downhill) or the operator down shifts to another lower gear, then the vehicle speed limit will ramp back down to the light load gear down speed limit. The driver will then have to up shift back into top gear to reach the maximum vehicle speed limit. The driver will then have to up shift back into top gear to reach the maximum vehicle speed limit.

### ***Top Transmission Gear Ratio***

This parameter is needed for gear down protection to work properly with double overdrive transmissions. This parameter will also be used by the Trip Information System to record the percentage of distance traveled in top gear.



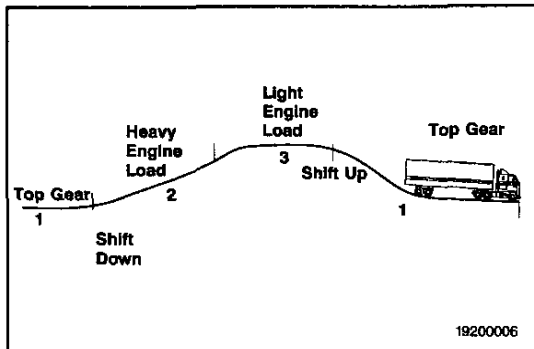
### **Top Transmission Gear Ratio**

## One Gear-Down Ratio

19800634

### *One Gear Down Gear Ratio*

This parameter is used to tell the ECM the first gear down gear ratio of the transmission.

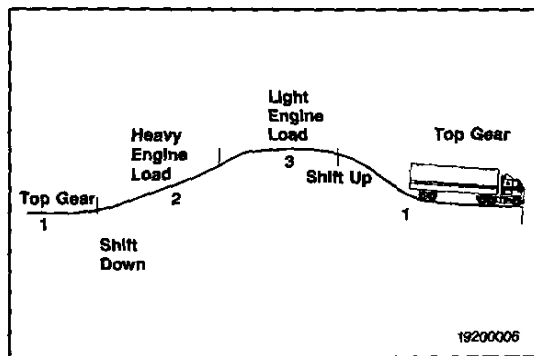


### *Gear Down Maximum Vehicle Speed, Light Engine Load*

This is the maximum vehicle speed (3) for operating one gear below top gear during light engine load operations. This value **cannot** exceed gear down maximum vehicle speed, heavy engine load (2).

***Gear Down Maximum Vehicle Speed, Heavy Engine Load***

This is the maximum vehicle speed (2) for operating one gear below top gear during heavy engine load operations. This value **cannot** exceed maximum vehicle speed in top gear (1).



***Automotive/Variable Speed (VS) Governor***

This feature gives the owner a choice of engine governors. The VS governor maintains a constant engine speed for a given accelerator position under varying load conditions. The automotive governor allows a longer speed variation under varying load conditions for a given accelerator position.

**Automotive Governor**

**- Engine Speed Varies With Load**

**Variable Speed Governor**

**- Engine Speed is Constant Under Varying Loads**

## Low Idle Speed

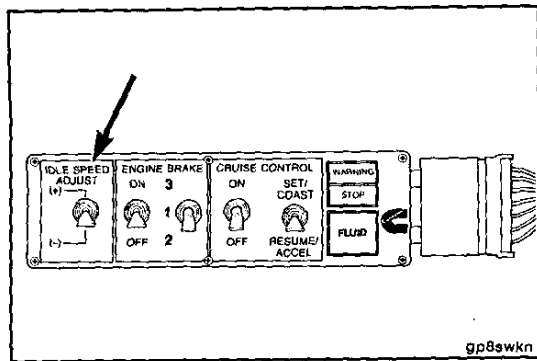
19800505

### Low Idle Speed

This is the speed at which the engine will idle. This speed can be adjusted by a cab switch if the switch is installed and the Low Idle Adjust feature is enabled.

### Low Idle Adjustment

This feature allows the idle speed to be increased or decreased in 25 RPM increments with the in-cab increment or decrement switch. There are limits on how high or low the low idle speed can be adjusted. The allowable adjustment range for a ISB engine is 700 to 875 rpm.



### Idle Shutdown

This feature automatically shuts off an engine after a period of engine idling when there is no activity from the driver such as clutch, brake, or accelerator actuation.

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

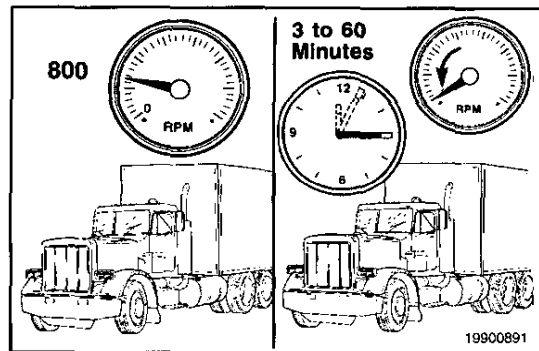
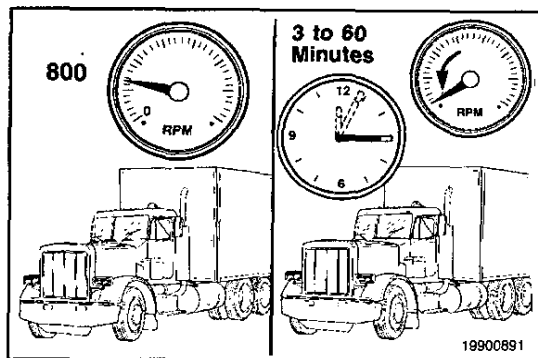
After an engine has been automatically shut off, the key **must** be turned off for 5 seconds before attempting a re-start.

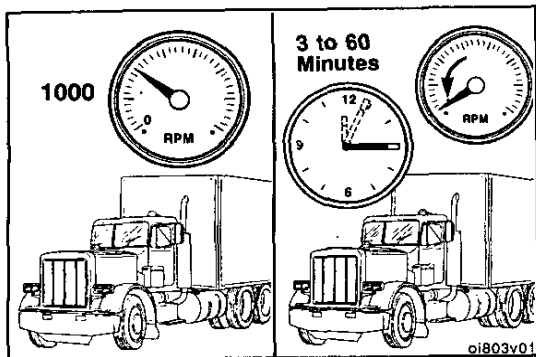
**NOTE:** This feature will shut off the engine only. It will **not** remove power from other accessories powered by the key switch and these can cause a drain on the battery.

### Idle Shutdown Time

This is the period of engine idling time when there is no activity from the driver such as clutch, brake, or accelerator actuation before the engine automatically shuts off.

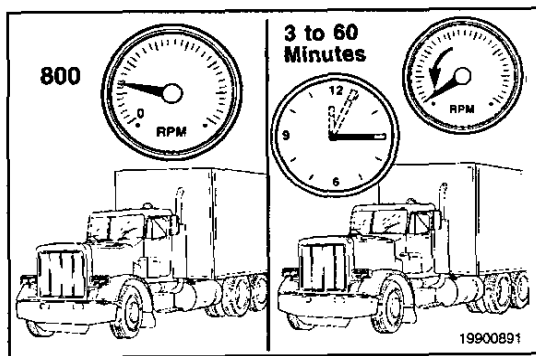
**NOTE:** This parameter will **not** appear if the idle shutdown feature is turned OFF.





#### *Idle Shutdown in PTO*

This feature automatically shuts off the engine after a period of PTO or Remote PTO operation in which there is no activity from the driver such as clutch, brake, or accelerator actuation.



#### *Idle Shutdown Override*

This feature allows the driver to override the idle shutdown by changing the position of the brake, clutch, or accelerator.

After the idle shutdown feature has been overridden, this feature will **not** shut off the engine again until the vehicle has been moved.

### Maintenance Monitor

**▲ CAUTION ▲**

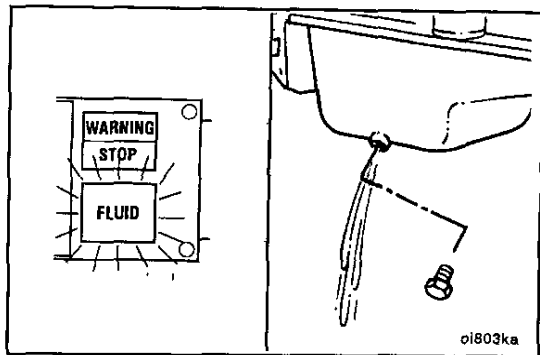
The maintenance monitor is designed to alert the operator of the need for a routine maintenance stop. Maintenance records must still be maintained for historical purposes.

**▲ CAUTION ▲**

The maintenance monitor uses data received from the vehicle speed sensor (VSS) to determine distance and data from the ECM to determine the amount of fuel burned. Whenever a VSS, 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 distance the vehicle has traveled, 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.





### Maintenance Monitor

- Automatic Mode
- Distance Mode
- Time Mode

19200031

### Maintenance Monitor

- **Automatic Mode**
- Distance Mode
- Time Mode

19200032

## ISB Engines Section 1 - Operating Instructions

The maintenance monitor has three modes of operation:

- automatic mode
- distance 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 distance traveled, engine operating time, and fuel burned.

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

**▲ CAUTION ▲**

Refer to "Lubricating Oil Drain Intervals" in Section V 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 **automatic mode** allows the customer to enter a desired distance interval. The maintenance monitor will then monitor the distance the engine has traveled and alert the operator when the interval has been consumed.

**NOTE:** This mode of the maintenance monitor requires the use of a VSS. This mode **must not** be selected for applications that do **not** have this sensor.

**Maintenance Monitor**

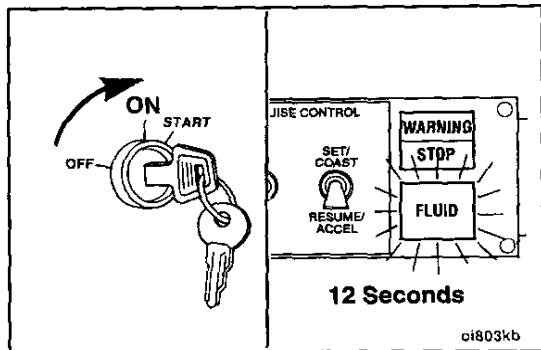
- Automatic Mode
- Distance Mode
- Time Mode

192D0033

## Maintenance Monitor

- Automatic Mode
- Distance Mode
- **Time Mode**

19200034



### ⚠ CAUTION ⚠

Refer to "Lubricating Oil Drain Intervals" in Section V 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 **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.

### ⚠ CAUTION ⚠

The diagnostic switch must be in the "OFF" position for the flashing sequence to occur.

## ISB Engines Section 1 - Operating Instructions

**Viewing maintenance monitor data:** with the use of a Compulink™, Echeck™, or INSITE™ service tool, the following maintenance data can be viewed or printed from the ECM:

- percent of current interval consumed (by either distance, time, or fuel burned)
- distance since last reset
- time since last reset
- fuel burned since last reset
- current maintenance monitor mode

### Reset Log

The Maximum Threshold is entered by the user either directly using the manual distance or time mode, or by entering the interval factor in the automatic mode.

The Adjusted Threshold is the new threshold set automatically by the Maintenance Monitor when automatic mode is selected. Maintenance Monitor automatically reduces the maintenance interval when the engine is operating outside of the optimum oil temperature range. The longer the engine operates outside optimum oil temperature, the more the adjusted threshold is reduced.

The Interval Reset At is the length of the maintenance interval at the time the Maintenance Monitor was reset.

### Maintenance Monitor Data

Percent of Current Maintenance Interval	XXX.X %
Distance Since Last MM Reset	XXXXXX Mi
Time Since Last MM Reset	XXXXX Hrs
Gallon Burned Since Last MM Reset	XXXX Gal.
Current MM Mode	XXXX

19800755

### Maintenance Monitor Reset Log 1

	Maximum Threshold	Adjusted Threshold	Interval Reset
Distance:	XXXX	XXXX	XXXX
Fuel:	XXXX	XXXX	XXXX
Time:	XXXX	XXXX	XXXX

19800756

### Maintenance Monitor Reset Log 2

	Cumulative Reset @	Possible Error
Distance:	XXXX	XXXX
Fuel:	XXXX	XXXX
Time:	XXXX	XXXX

19800757

### Maintenance Monitor Interval Alert Percentage

19800639

The Cumulative Reset At is the total distance, time, and fuel recorded by the ECM at the time the Maintenance Monitor was reset.

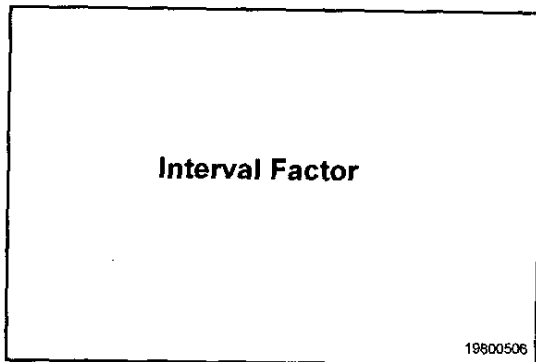
The Possible Error will contain an "X" next to a row of data that can be inaccurate due to a system fault. The "X" will be triggered when a vehicle speed sensor fault, or powerdown fault occurs. These faults can cause data to either **not** accumulate or accumulate inaccurately.

**Maintenance monitor interval alert percentage:** this allows the user to enter the percentage of the current 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 24194 km [15,000 miles] and the Interval Alert Percentage is set to 90%, the lamp will illuminate at 21774 km [13,500 miles] (90% of 15,000).*

The **interval factor** is used only in the Maintenance Monitor "Auto" Mode. It is used to *adjust the maintenance interval* for "sever", "normal", or "light" duty applications. It is also used to extend the interval when using Premium Blue 2000 oil or any other product that can extend maintenance intervals.

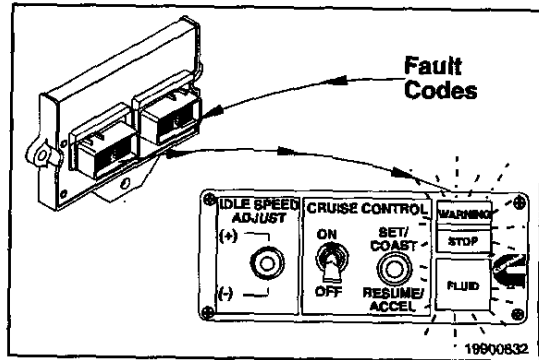
The original factory programmed value is **NORMAL**.



### **Diagnostic Fault Codes**

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

**NOTE:** Not all engine or ISB control system anomalies are shown as fault codes.



## Diagnostic Fault Codes

Engine Electronic Fuel  
System Fault Codes

Engine Protection System  
Fault Codes

19400329

There are two types of fault codes:

- Engine electronic control system codes.
- Engine protection system codes.

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

## ISB Engines Section 1 - Operating Instructions

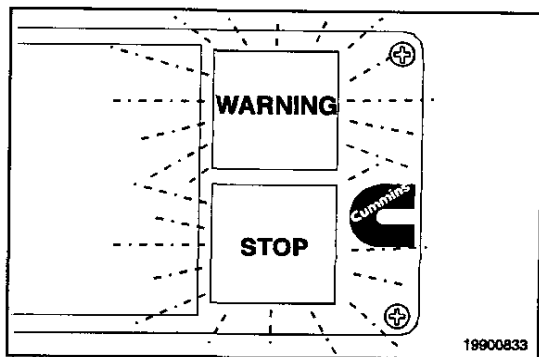
Some, but **not** all, of the electronic fault codes will light a lamp when they are active. There are three possible lamps that can be lit when a fault is active.

The "Warning" or "Check Engine" light is yellow and indicated the need to repair the fault at the first available opportunity.

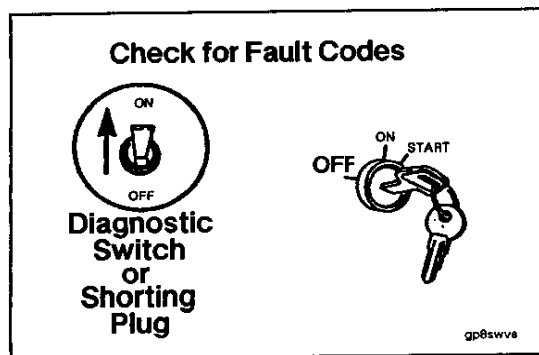
The "Stop" or "Stop Engine" light is red and indicates the need to stop the engine as soon as it can be safely done. The engine should remain shutdown until the fault can be repaired.

The "Engine Protection" lamp will illuminate when an engine protection fault code is active.

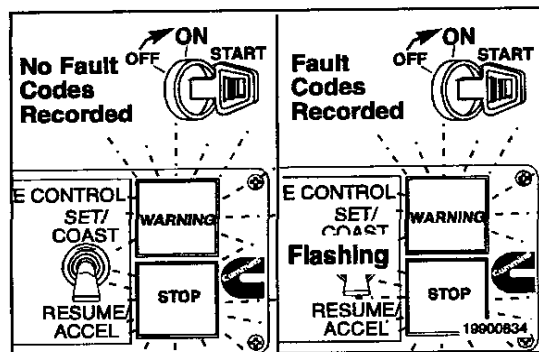
**NOTE:** The names and colors of these lamps may vary with equipment manufacturer.







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



Turn the vehicle key switch to the ON position.

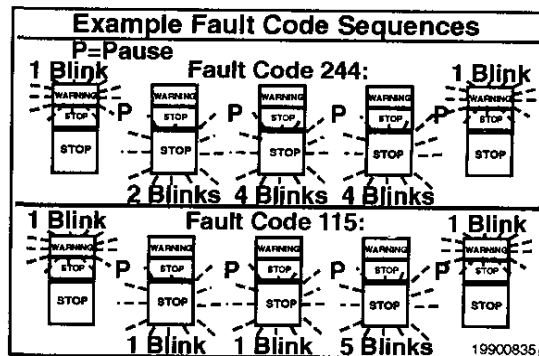
If no active fault codes are recorded, both lights will come on and stay on.

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

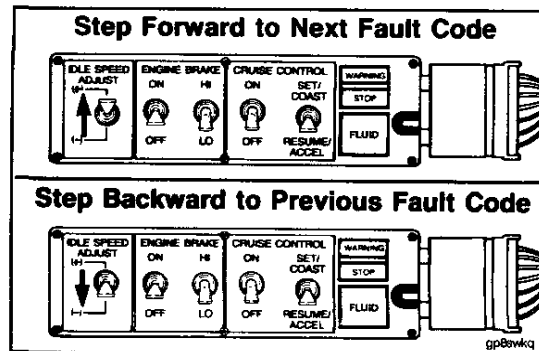
**ISB Engines**  
**Section 1 - Operating Instructions**

The fault code will flash in the following sequence:

First, a WARNING (yellow) light will flash. Then there will be a short one or two second pause after which the number of the recorded fault code will flash in STOP (red). There will be a one or two 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.



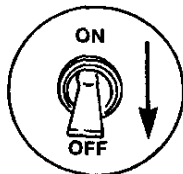
The lights flash each fault code out three times before advancing to the next code. To skip to the next fault code, move the IDLE SPEED ADJUST switch (if equipped) momentarily to the “(+)” position. You can go back to the previous fault code by momentarily moving the IDLE SPEED ADJUST switch (if equipped) to the “(-)” position. If only one active fault is recorded, the ISB control system will continuously display the same fault code when either “(+)” or “(-)” switch is depressed.



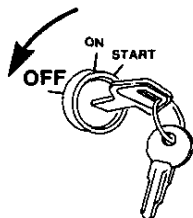
The explanation and correction of the fault codes is in SECTION TF.

## Troubleshooting And Repair Charts

19400340



Diagnostic  
Switch  
or  
Shorting  
Plug



gp8swv

When **not** using the diagnostic system, turn off the diagnostic switch, or remove the shorting plug. If the diagnostic switch is left on or the shorting plug in, the ECM will **not** log some faults.

### Fault Code Snapshot Data

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

### Fault Code Snapshot Data (First and Last)

- Sensors
- Switches 1
- Switches 2

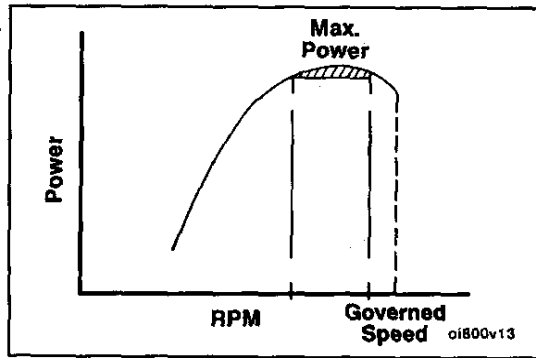
19200040

### Driving Techniques

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

To obtain optimum engine performance on a grade, allow the engine speed to load down to near torque peak before shifting. This 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.



## Electromagnetic Interference (EMI)

### General Information

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

### ISB System EMI Susceptibility

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

### ISB System EMI Radiation Levels

Your Cummins product has also been designed and tested to emit minimum electromagnetic energy. Testing has shown that the ISB fuel system, when properly installed on vehicles, meets or exceeds by a wide margin Part 15 of the FCC 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 ISB control system on vehicles will **not** interfere with on-board communication equipment for urban and suburban background electromagnetic noise levels; however, the system, if used with accessories which are **not** installed properly or do **not** utilize adequate filtering designs, can interfere with on-board communications equipment in rural applications where background radio frequency noise levels are very low.

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

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



## Section 2 - Maintenance Guidelines

### Section Contents

	Page
Maintenance Guidelines - General Information .....	2-1
Maintenance Record Form .....	2-6
Maintenance Schedule .....	2-3
Page References for Maintenance Instructions .....	2-4
Tool Requirements .....	2-2



**THIS PAGE LEFT INTENTIONALLY BLANK.**

## Maintenance Guidelines - General Information

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

If the engine is operating in ambient temperatures consistently below  $-18^{\circ}\text{C}$  [ $0^{\circ}\text{F}$ ] or above  $38^{\circ}\text{C}$  [ $100^{\circ}\text{F}$ ], perform maintenance at shorter intervals. Shorter maintenance intervals are also required if the engine is operated in an abnormally dusty environment or if frequent stops are made. See your Cummins Authorized Repair Location for recommended intervals.

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. A listing of supplier's addresses and telephone numbers is provided in Component Manufacturers (Section M).

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

**NOTE:** The ISB engine features a no—adjust overhead. The ISB valve train is designed such that adjustment of the valve lash is not required for normal service within the first 150,000 miles. The valve train operates acceptably within the limits of 0.006 inch to 0.015 inch intake valve lash and 0.015 inch to 0.030 inch exhaust valve lash. It is recommended that the valve lash be check around 150,000 miles.

## Tool Requirements

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

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

<b>Tool Part No.</b>	<b>Description</b>
ST-1273	Pressure Gauge
3375045	Torque Wrench (0 to 175 ft-lb)
3375049	Oil Filter Wrench
3376807	Engine Coolant and Fuel Filter Wrench
3822524	Belt Tension Gauge, Click Type (v-belts and v-ribbed with 4 or 5 ribs)
3822525	Belt Tension Gauge, Click Type (v-ribbed with 6 to 12 ribs)
3824556	CAC Pressure Kit
3824591	Engine Barring Gear
3824783	Torque Wrench (0 to 300 in-lb)
CC-2800	Refractometer
CC-2802	Coolant Test Kit

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

## Maintenance Schedule

ISB Engine Maintenance Schedule: <sup>(1),(2)</sup>				
Daily or Refueling	Every 12,000 km [7,500 mi] 250 Hours or 3 Months	Every 24,000 km [15,000 mi], 500 Hours or 6 Months <sup>(1),(2)</sup> .	Every 48,000 km [30,000 mi], 1,000 Hours or 1 Year	Every 96,000 km [60,000 mi], 2,000 Hours or 2 Years <sup>(3)</sup>
<b>Maintenance Check</b>	<b>Change/Replace</b>			
<ul style="list-style-type: none"> <li>● Check operator's report</li> <li>● Check and correct               <ul style="list-style-type: none"> <li>- Engine oil level</li> <li>- Coolant level</li> </ul> </li> <li>● Drain air tanks and reservoirs</li> <li>● Drain fuel-water separator</li> <li>● Visually inspect cooling fan</li> <li>● Visually inspect engine</li> <li>● Visually check crankcase breather tube</li> </ul>		<ul style="list-style-type: none"> <li>● Fuel filter</li> <li>● Lubricating oil</li> <li>● Lubricating oil filter</li> </ul>	<ul style="list-style-type: none"> <li>● Fuel filter</li> <li>● Lubricating oil</li> <li>● Lubricating oil filter</li> </ul>	<ul style="list-style-type: none"> <li>● Fuel filter</li> <li>● Lubricating Oil</li> <li>● Lubricating Oil Filter</li> <li>● Antifreeze</li> </ul>
	<b>Check/Inspect</b>			
	<ul style="list-style-type: none"> <li>● Air Cleaner</li> <li>● Intake System</li> <li>● Charge Air Cooler</li> <li>● Mounting Hardware e.g. Injection Pump and Air Compressor)</li> </ul>	<ul style="list-style-type: none"> <li>● Antifreeze</li> <li>● Radiator Fins and Shrouds</li> <li>● Drive belt</li> </ul>	<ul style="list-style-type: none"> <li>● Air Cleaner</li> <li>● Intake System</li> <li>● Charge Air Cooler</li> <li>● Antifreeze</li> <li>● Fan Hub</li> <li>● Belt Tensioner</li> <li>● Belt Tension</li> <li>● Drive belt</li> </ul>	<ul style="list-style-type: none"> <li>● Air Cleaner</li> <li>● Charge Air Cooler</li> <li>● Intake System</li> <li>● Fan Hub</li> <li>● Belt Tensioner Bearing</li> <li>● Belt Tension</li> <li>● Vibration Damper</li> <li>● Drive belt</li> </ul>
<ol style="list-style-type: none"> <li>1. The lubricating oil and lubricating oil filter interval can be adjusted based on fuel consumption, gross vehicle weight, and idle time. Refer to Section V.</li> <li>2. Service interval is every oil change or 24,000 km [15,000 miles], 500 hours, or 6 months, whichever occurs first. Must use a heavy duty year around antifreeze that meets the chemical composition of GM6038M. The change interval is 2 years or 96,000 km [60,000 mi], whichever occurs first. Antifreeze is essential for freeze, overheat and corrosion protection.</li> <li>3. Service interval is 2 years or 96,000 km [60,000 miles], whichever occurs first.</li> </ol>				

## Page References for Maintenance Instructions

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

### Daily or Refueling - Maintenance Check

- Air intake piping — visually inspect ..... 3-8
- Cooling fan — visually inspect ..... 3-6
- Crankcase breather tube — visually check ..... 3-9
- Engine coolant level — check/correct ..... 3-4
- Engine lubricating oil level — check/correct ..... 3-3
- Fuel water separator — drain ..... 3-2

### Every 12,000 km [7,500 mi], 250 Hours or 3 Months — Maintenance Check

- Charge air piping — check/correct ..... 4-2
- Charge air cooler (CAC) — check/correct ..... 4-2
- Air cleaner restriction — check/correct ..... 4-3
- Fuel injection pump mounting maintenance — check/correct ..... 4-4
- Air compressor mounting maintenance check — check/correct ..... 4-4

**Every 24,000 km [15,000 mi], 500 Hours or 6 Months — Maintenance Check**

- Lubricating oil — change ..... 5-1
- Lubricating oil Filters — replace ..... 5-1
- Fuel filter, canister type — replace ..... 5-9
- Fuel filter, spin-on type — change ..... 5-11
- Air in fuel — test ..... 5-17
- Cooling system — antifreeze check ..... 5-20
- Fuel supply lines, — vent ..... 5-21

**Every 48,000 km [30,000 mi], 1,000 Hours or 1 Year — Maintenance Check**

- Drive Belts — check/correct ..... 6-2
- Fan Hub, belt driven — check/correct ..... 6-3
- Belt Tensioner, automatic — check/correct ..... 6-4

**Every 96,000 km [60,000 mi], 2,000 Hours or 2 Years — Maintenance Check**

- Cooling system, clean ..... 7-2
- Vibration damper — check ..... 7-8

## Maintenance Record Form

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

Date	km [Miles], Hours or Time Interval	Actual km [Miles] or Hours	Maintenance Check Performed	Check Performed By	Comments







## Section 3 - Maintenance Procedures at Daily Interval

### Section Contents

	Page
<b>Air Intake Piping</b> .....	3-8
Maintenance Check .....	3-8
<b>Coolant Level</b> .....	3-4
Maintenance Check .....	3-4
<b>Crankcase Breather Tube</b> .....	3-9
Maintenance Check .....	3-9
<b>Daily Maintenance Procedures - General Information</b> .....	3-1
<b>Fan, Cooling</b> .....	3-6
Inspect for Reuse .....	3-6
<b>Fuel-Water Separator</b> .....	3-2
Drain .....	3-2
<b>Lubricating Oil Level</b> .....	3-3
Maintenance Check .....	3-3

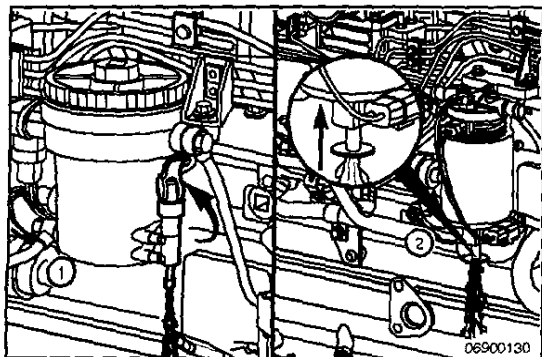
**THIS PAGE LEFT INTENTIONALLY BLANK.**

## **Daily Maintenance Procedures - 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



## Fuel-Water Separator

### Drain



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

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

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

Shut off the engine. Use your hand to open the drain valve.

#### Top Load (1)

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

#### Spin-On (2)

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

Drain the filter sump until clear fuel is visible.

## Lubricating Oil Level

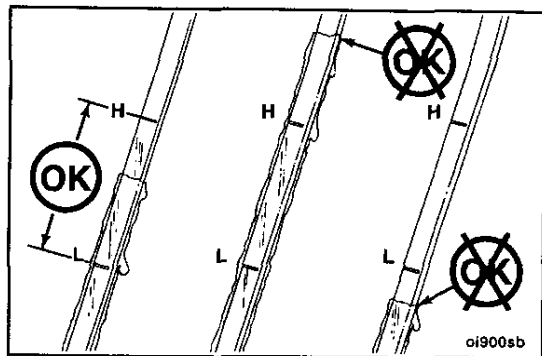
### Maintenance Check

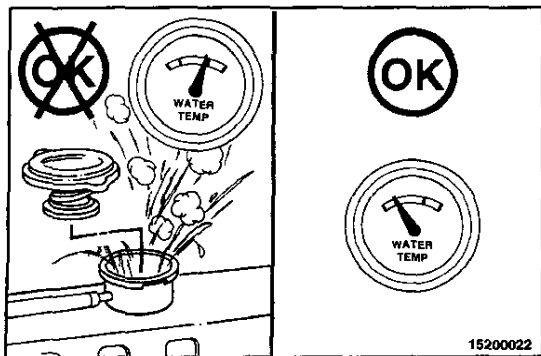
The engine **must** be level when checking the oil level to make sure the measurement is correct.

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 5 minutes after shutting off the engine to check the oil level. This allows time for the oil to drain to the oil pan.

Refer to Lubricating Oil Recommendations/Specifications in Section V for add oil recommendations.





## Coolant Level

### Maintenance Check

#### ▲ WARNING ▲

Do not remove the radiator cap from a hot engine. Wait until the temperature is below 50°C [120°F] before removing the pressure cap. Failure to do so can result in personal injury from heated coolant spray or steam. Remove the filler cap slowly to relieve coolant system pressure.

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

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

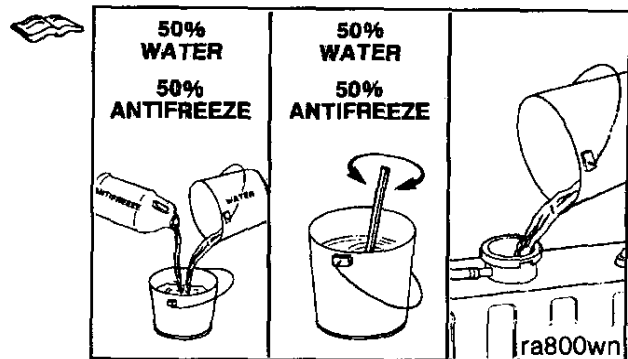
ISB Engines  
Section 3 - Maintenance Procedures at Daily Interval

△ CAUTION △

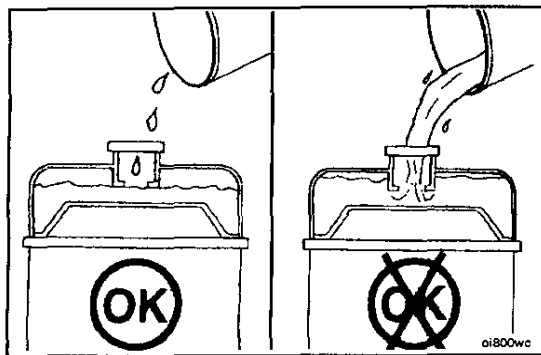
Do not add cold coolant to a hot engine. Engine castings can be damaged. Allow the engine to cool to below 50°C [120°F] before adding coolant.

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

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



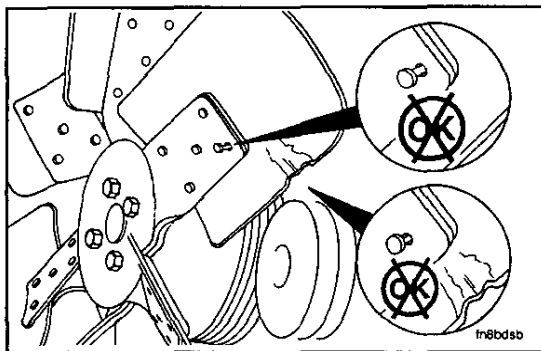




### ISB Engines Section 3 - Maintenance Procedures at Daily Interval

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

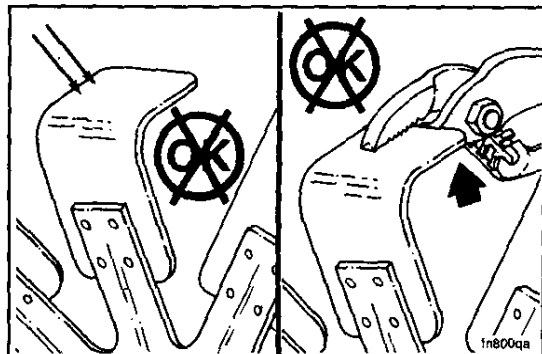
**▲ WARNING ▲**

**Personal injury can result from a fan blade failure. Never pull or pry on the fan. This can damage the fan blade(s) and cause fan failure.**

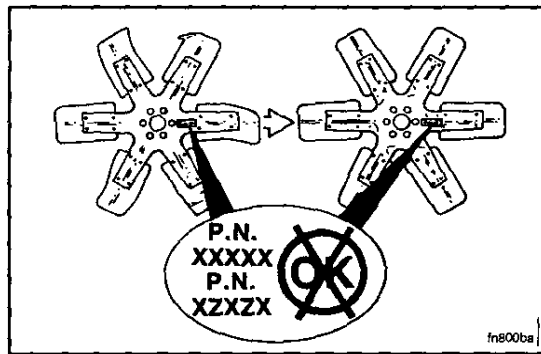
A visual inspection of the cooling fan is required daily. Check for cracks, loose rivets, and bent or loose blades. Check the fan to make sure it is securely mounted. Tighten the capscrews if necessary.

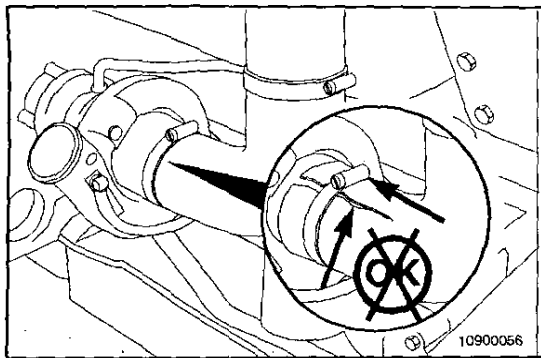
**▲ WARNING ▲**

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



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





**Section 3 - Maintenance Procedures at Daily Interval**

**ISB Engines**

**Air Intake Piping**  
**Maintenance Check**

Visually inspect the intake piping daily for wear points and damage to piping, loose clamps, or punctures which can damage the engine.

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

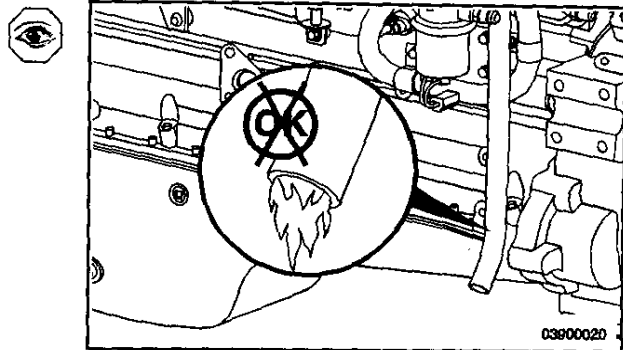
**Torque Value:** 8 N•m [72 in-lb]

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

## Crankcase Breather Tube Maintenance Check

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

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





# Maintenance Procedures at 12,000 Kilometers [7,500 Miles], 250 Hours or 3 Months

## Section Contents

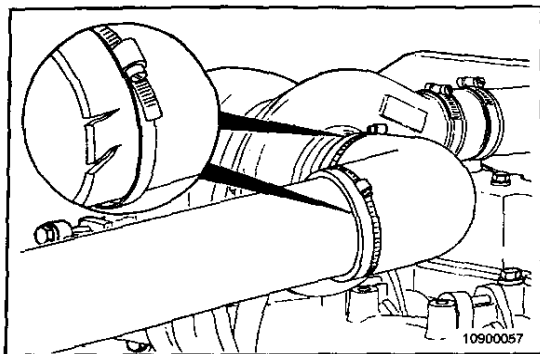
	Page
<b>Air Cleaner Restriction</b> .....	4-3
Maintenance Check .....	4-3
<b>Air Compressor</b> .....	4-4
Maintenance Check .....	4-4
<b>Charge Air Cooler (CAC)</b> .....	4-2
Maintenance Check .....	4-2
<b>Charge Air Piping</b> .....	4-2
Maintenance Check .....	4-2
<b>Fuel Pump</b> .....	4-4
Maintenance Check .....	4-4
<b>Maintenance Procedures - General Information</b> .....	4-1

**THIS PAGE LEFT INTENTIONALLY BLANK.**

## **Maintenance Procedures - General Information**

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



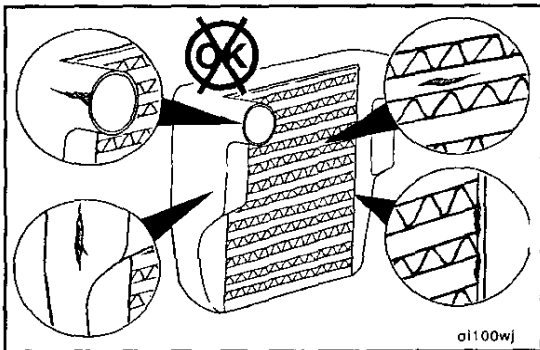


## Charge Air Piping Maintenance Check



Visually inspect the charge air piping and hoses daily for holes, cracks or loose connections. Tighten the hose clamps if necessary.

**Torque Value:** 8 N•m [72 in-lb]



## Charge Air Cooler (CAC) Maintenance Check



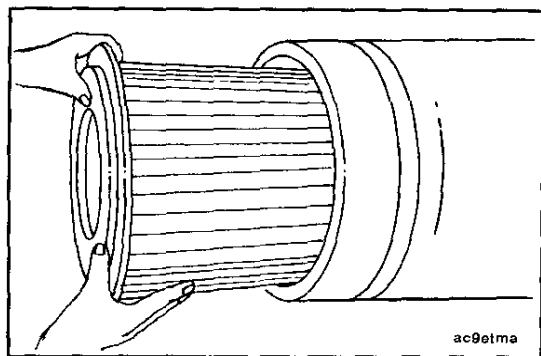
Visually inspect the charge air cooler for dirt and debris blocking the fins. Check for cracks, holes, or other damage. If damage is found, refer to the OEM dealer.

## Air Cleaner Restriction

### Maintenance Check

Maximum intake air restriction is 635 mm [25.0 in.] of water for turbocharged engines.

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

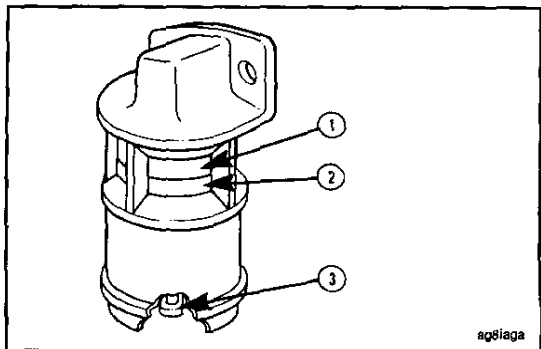


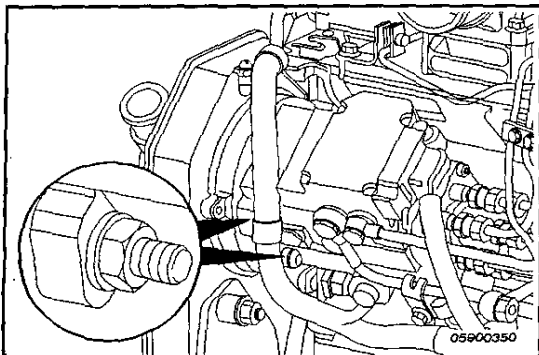
**NOTE:** Follow the manufacturer's instructions when cleaning or replacing the air cleaner element.

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

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

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

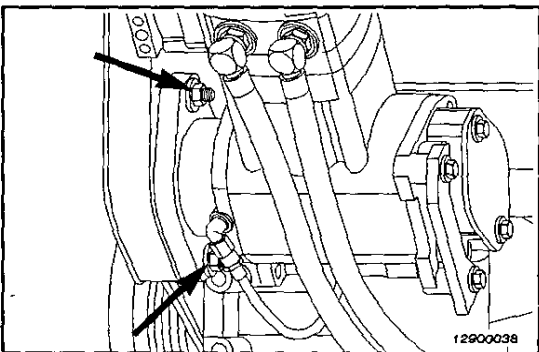




## Fuel Pump

### Maintenance Check

Inspect the fuel injection pump mounting nuts for loose or damage.



## Air Compressor

### Maintenance Check

Inspect the air compressor mounting nuts for loose or damage.

# Maintenance Procedures at 24,000 Kilometers [15,000 Miles], 500 Hours or 6 Months

## Section Contents

	Page
<b>Air in Fuel</b> .....	5-17
Test .....	5-17
<b>Cooling System</b> .....	5-20
Maintenance Check .....	5-20
<b>Drive Belts</b> .....	5-22
Maintenance Check .....	5-22
<b>Fuel Filter (Canister Type)</b> .....	5-9
Install .....	5-10
Preparatory .....	5-9
Remove .....	5-10
<b>Fuel Filter (Spin-On Type)</b> .....	5-11
Inspect for Reuse .....	5-14
Install .....	5-14
Preparatory .....	5-11
Remove .....	5-12
<b>Fuel Supply Lines</b> .....	5-21
Vent .....	5-21
High Pressure Fuel line(s) .....	5-21
<b>Lubricating Oil and Filters</b> .....	5-1
Drain .....	5-3
Fill .....	5-4

	<b>Page</b>
Oil Drain Intervals .....	5-1
<b>Maintenance Procedures - General Information</b> .....	<b>5-1</b>
General Information .....	5-1

## Maintenance Procedures - General Information

### General Information

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

Fleetguard is a subsidiary of Cummins Engine Company. 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.

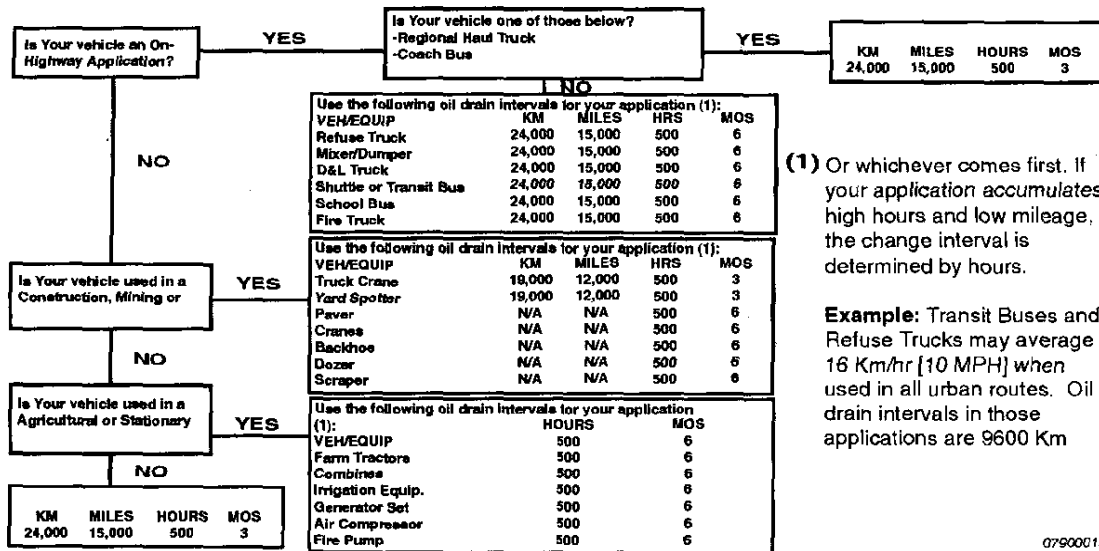
Fleetguard® products meet all Cummins' Source Approval Test standards to provide the quality filtration necessary to achieve the engine's design life. If other brands are substituted, the purchaser must insist on products which the supplier has tested to meet Cummins' high quality standards.

Cummins **cannot** be responsible for problems caused by non-genuine filters which do **not** meet Cummins' performance or durability requirements.

### Lubricating Oil and Filters

#### Oil Drain Intervals

Refer to the following flow chart to determine the maximum recommended oil change and filter change intervals in kilometers, miles, hours or months; whichever comes first.



(1) Or whichever comes first. If your application accumulates high hours and low mileage, the change interval is determined by hours.

**Example:** Transit Buses and Refuse Trucks may average 16 Km/hr [10 MPH] when used in all urban routes. Oil drain intervals in those applications are 9600 Km

## Drain

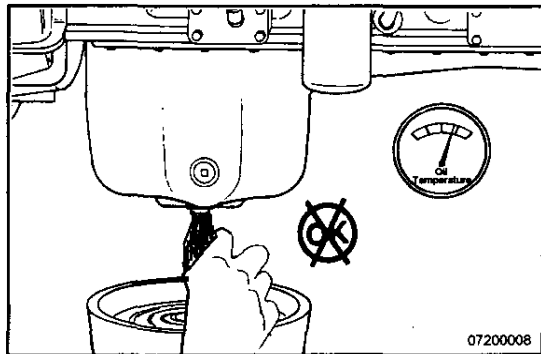
Change the lubricating oil and filter(s) at the specified oil change interval. Refer to *Lubricating Oil Recommendations/Specifications* (Section V) to find the correct change interval for your application.

**▲ WARNING ▲**

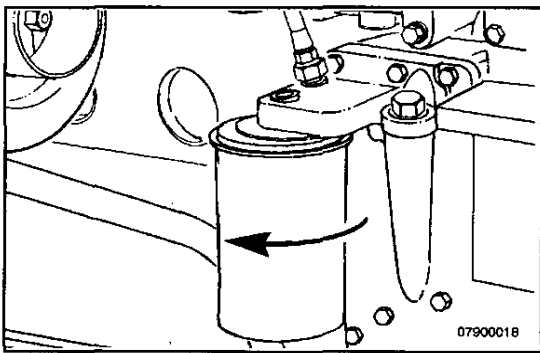
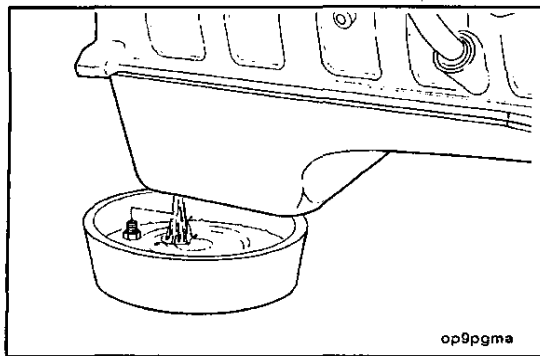
Some state and federal agencies in the United States of America have determined that used engine oil can be carcinogenic and can cause reproductive toxicity. Avoid inhalation of vapors, ingestion, and prolonged contact with used engine oil.

**▲ WARNING ▲**

Avoid direct contact of hot oil with your skin. Hot oil can cause personal injury.







**ISB Engines**  
**Maintenance Procedures at 24,000 km [15,000 mi]**

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

**NOTE:** Use a container that can hold at least 26 liters [20 U.S. qts.] of lubricating oil.

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

**Fill**

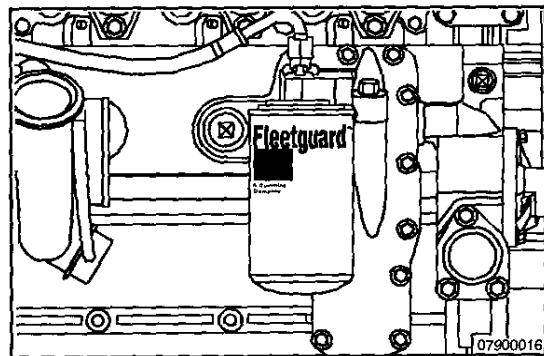
Clean the area around the lubricating oil filter head. Remove the filter. Clean the gasket surface of the filter head.

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

**ISB Engines**  
**Maintenance Procedures at 24,000 km [15,000 mi]**

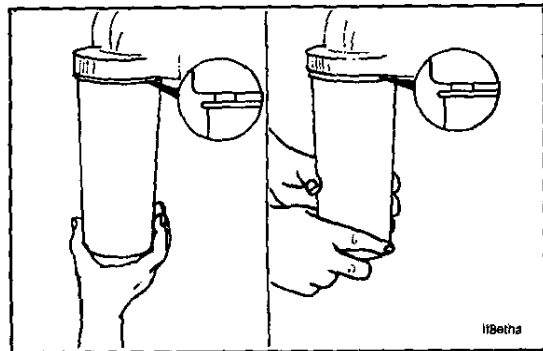
Make sure the correct oil filter is used.

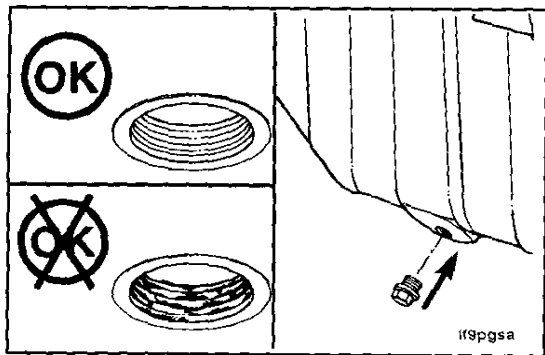
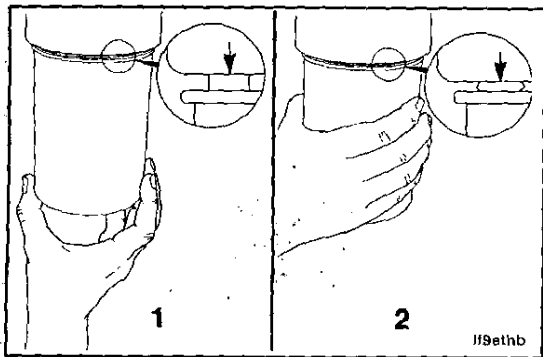
Cummins Part No. 3942365 is standard for ISB engine.



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

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





**⚠ CAUTION ⚠**

**Mechanical over-tightening can distort the threads or damage the filter element seal.**

Install the filter as specified by the filter manufacturer:

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

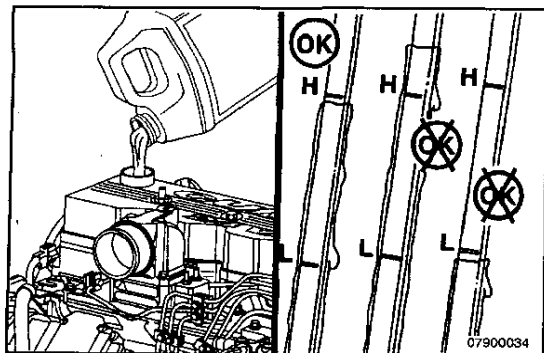
Install the drain plug.

**Torque Value: 80 N•m [60 ft-lb]**

**ISB Engines**  
**Maintenance Procedures at 24,000 km [15,000 mi]**

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





ISB Engines  
Maintenance Procedures at 24,000 km [15,000 mi]

Fill the engine with clean lubricating oil to the proper level

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

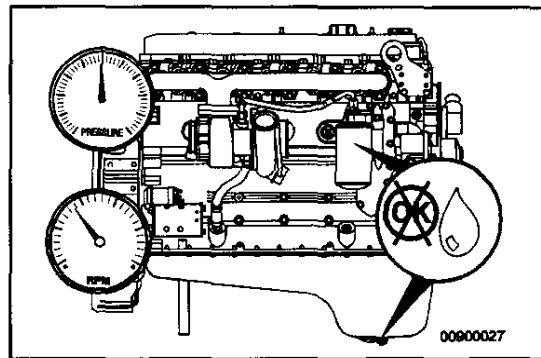
Some applications may use a slightly different lubricating oil pan capacity, and all lubricating oil quantities **must** be adjusted accordingly. Contact your local Cummins Distributor if you have questions.

	Lubricating Oil Capacity		
	liters		U.S.gal
Standard Pan Capacity	14.2	MAX	3.75
Total System Capacity	16.4	MAX	4.3
Deep Sump Pan Capacity	16.1	MAX	4.25
Total System Capacity	18.3	MAX	4.75

**ISB Engines**  
**Maintenance Procedures at 24,000 km [15,000 mi]**

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

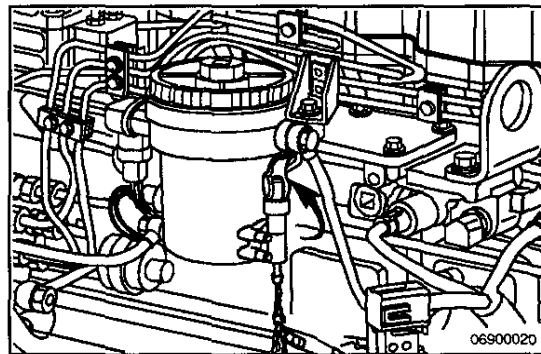
**Fuel Filter (Canister Type)**  
**Page 5-9**

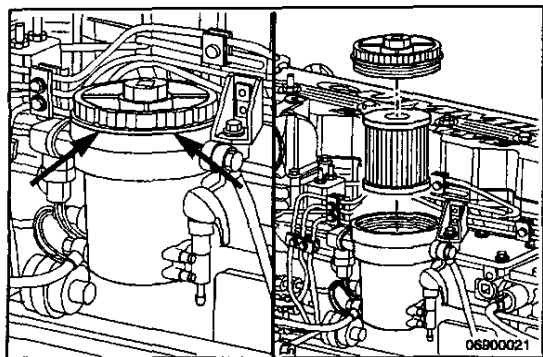


**Fuel Filter (Canister Type)**

**Preparatory**

Lift up on the filter drain lever to drain fuel out of the filter for approximately 5 seconds. This will eliminate fuel from running over the top of the filter upon removal.



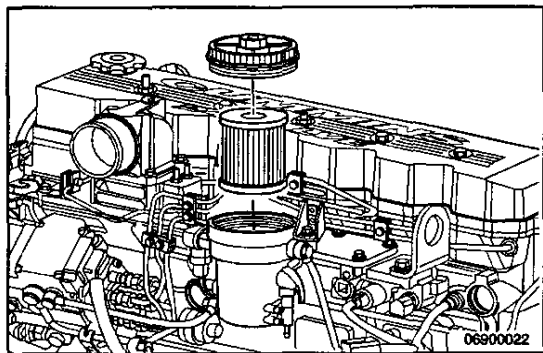


### Remove


Clean all debris from around the canister lid.

Remove the filter lid and filter element. A crescent wrench can be used if the lid cannot be removed by hand.

**NOTE:** Remove the filter element by twisting the element sideways from the filter lid. The filter element is incinerable.



### Install

 Fill the canister with clean fuel if possible. The ISB engine has a self-priming, low pressure fuel system, but filling the fuel canister aids in purging air out of the system.

Install the new element in the canister lid and place back in the canister by twisting clockwise.

**NOTE:** The replacement filter element comes with a new o-ring for the canister lid. The o-ring **must** be replaced with the filter element.

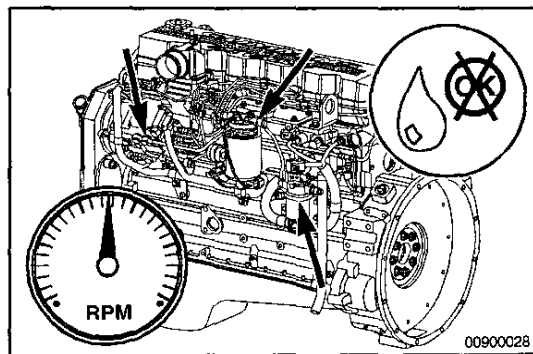
Hand tighten the lid.

## ISB Engines Maintenance Procedures at 24,000 km [15,000 mi]

Fuel Filter (Spin-On Type)  
Page 5-11

Crank the engine for 1 to 2 seconds. If the engine does not start, then release the key or starter button back to the "RUN" position (do not turn the key back to the "OFF" position). The electric fuel transfer pump will continue to run and purge air from the system for about 25 seconds. After 25 seconds attempt to start the engine again.

Operate the engine and check for leaks.



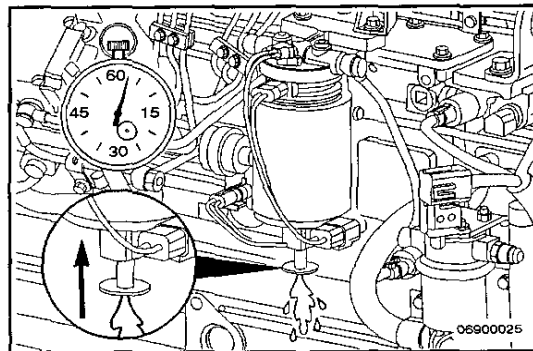
## Fuel Filter (Spin-On Type)

### Preparatory



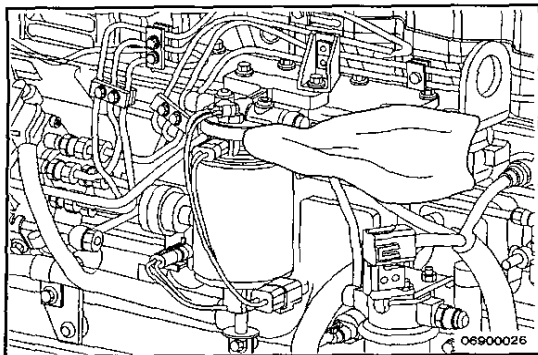
**Drain the water/fuel into a container and dispose of in accordance with local environmental regulations.**

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



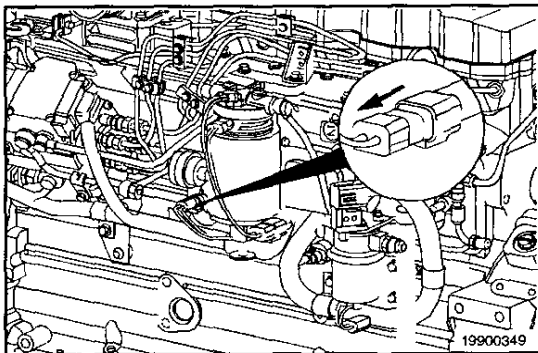


Clean all debris from around the fuel filter head.



### Remove

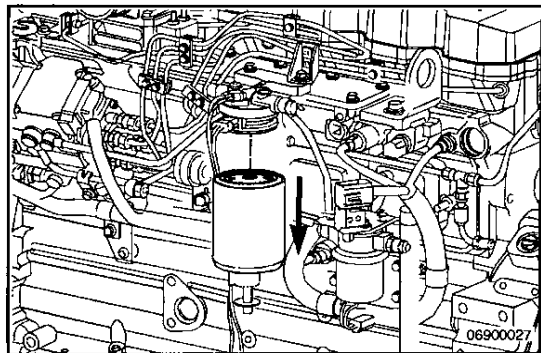
Disconnect the water in fuel sensor from the wiring harness.



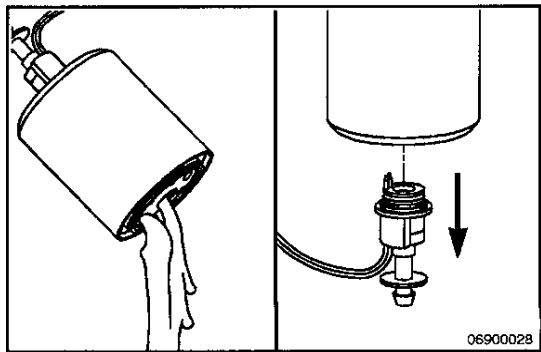
**ISB Engines**  
**Maintenance Procedures at 24,000 km [15,000 mi]**

Remove the fuel filter.

**Fuel Filter (Spin-On Type)**  
**Page 5-13**

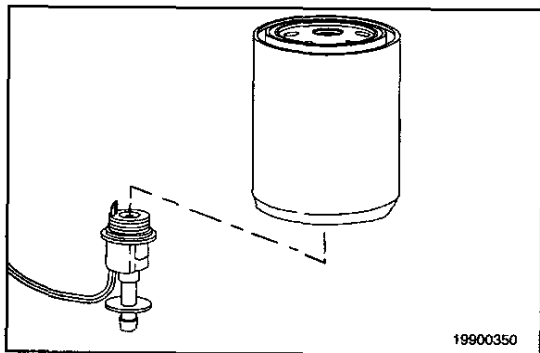
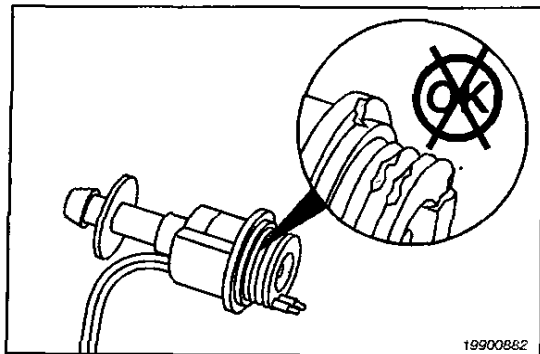


Drain the fuel filter and remove the water in fuel sensor from the fuel filter.



### Inspect for Reuse

Visually inspect the water in fuel sensor for cracks or damage.



### Install

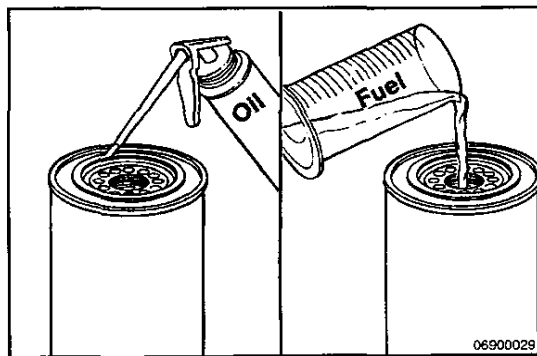
Install the water in fuel sensor into the new fuel filter.

## ISB Engines Maintenance Procedures at 24,000 km [15,000 mi]

Fill the fuel filter with clean fuel and lubricate the o-ring seal with clean lubricating oil.

The ISB engine has a self-priming, low pressure system, but pre-filling the fuel filter aids in purging air from the system.

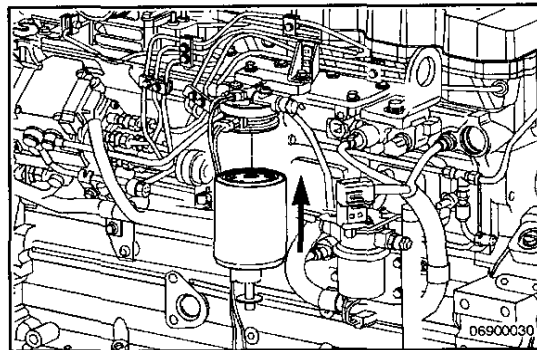
Fuel Filter (Spin-On Type)  
Page 5-15



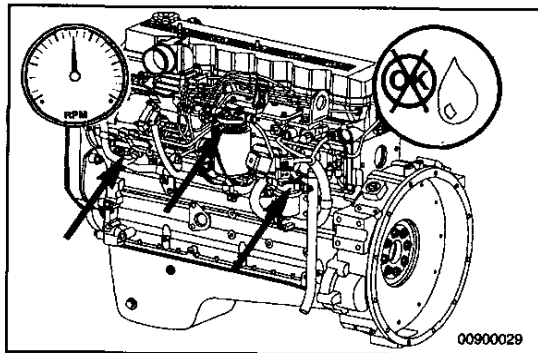
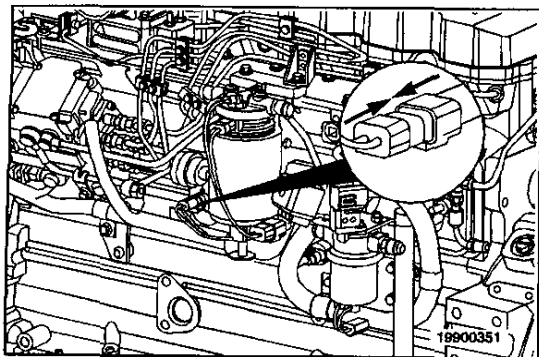
### ▲ CAUTION ▲

**Mechanical tightening will distort the threads, filter element seal or filter can.**

Install the filter as specified by the filter manufacturer.



Connect the water in fuel sensor to the wiring harness.



Crank the engine for 1 to 2 seconds. If the engine does not start, then release the key or starter button back to the "RUN" position (do not turn the key back to the "OFF" Position). The electric fuel transfer pump will continue to run and purge air from the system for about 25 seconds. After 25 seconds attempt to start the engine again.

Operate the engine and check for fuel leaks.

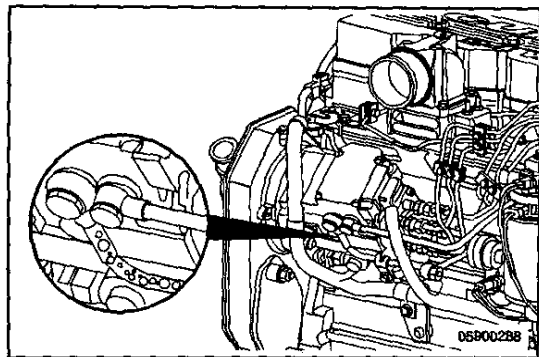
## Air in Fuel

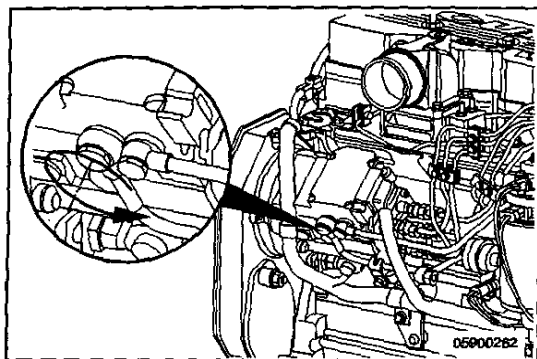
### Test

The over flow valve on the VP44 fuel system creates a self-bleeding system during replacement of most supply side components.

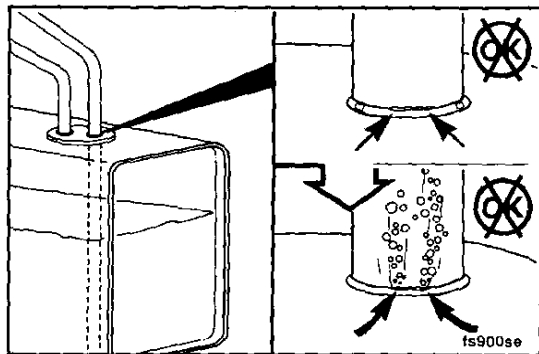
Generally most of the air that enters the system during component replacement can be bled out by turning the electric fuel transfer pump on for about 25 seconds.

To cycle the fuel transfer pump for about 25 seconds, crank the engine for 1 to 2 seconds and release the key or starter button back into the "RUN" position (do not turn the key back to the "OFF" position). The electric fuel transfer pump will continue to run for about 25 seconds.





If an excessive amount of air has entered the system, the system will need to be bled. Loosen the return banjo fitting on the fuel pump. Run the electric fuel transfer pump until all the air has been bled. When all air has been bled from the system, tighten the fitting.



If air continues to bubble out of the system for several minutes then an air leak is present.

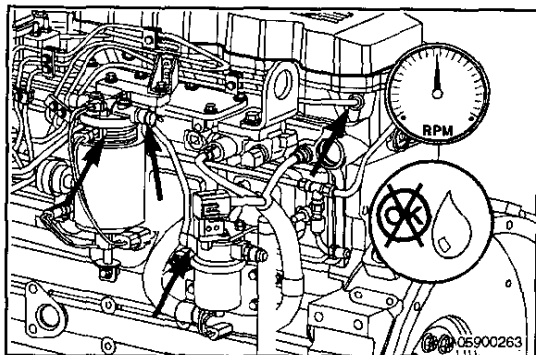
A source, which is often overlooked, for air to enter the fuel system is between the inlet of the fuel transfer pump and the suction tube in the tank. Fuel tanks that have the outlet fitting at the top will have a suction tube that extends to the bottom of the tank. Cracks or pin holes in the weld that joins the tube to the fitting can let air enter the fuel system.

Also check to make sure all the fittings from the fuel supply line on the tank to the inlet of the fuel transfer pump are tight.

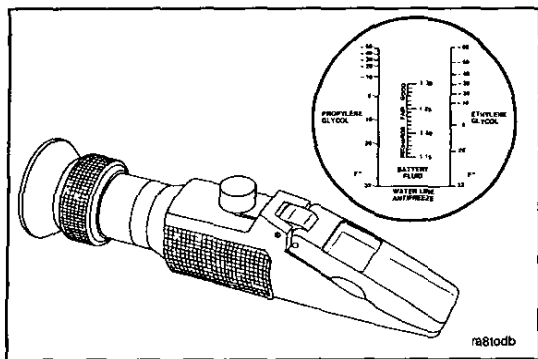
Use a sight glass at the fuel transfer pump inlet to check for air in the fuel supply lines.

**ISB Engines**  
**Maintenance Procedures at 24,000 km [15,000 mi]**

Since the fuel transfer pump provides a positive pressure through the fuel filter and supply line to the fuel injection pump, loose connections or defective seals should show as a fuel leak and not as an air leak.







## Cooling System

### Maintenance Check



**Over concentration of antifreeze or use of high silicate antifreeze can cause damage to the engine.**

Check the antifreeze concentration. Use a mixture of 50 percent water and 50 percent ethylene glycol or propylene glycol base antifreeze to protect the engine to  $-32^{\circ}\text{C}$  [ $-25^{\circ}\text{F}$ ] year around.

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

**Antifreeze is essential in any climate.**

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

The corrosion inhibitors also protects the cooling system components from corrosion and provides longer component life.

## Fuel Supply Lines

### Vent

19 mm

#### High Pressure Fuel line(s)



The pressure of the fuel in the line is sufficient to penetrate the skin and cause serious bodily harm.

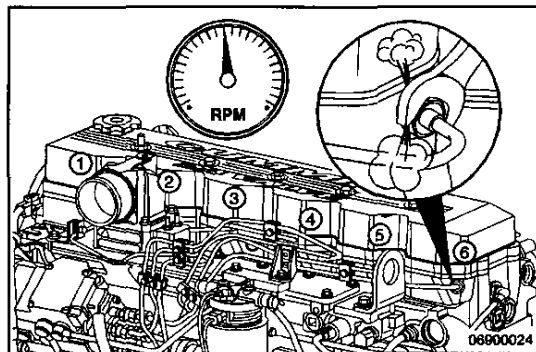
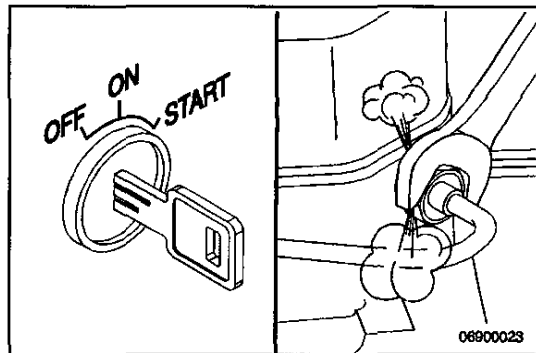
To check for air in the high pressure lines, loosen the fittings at the cylinder head and crank the engine to allow entrapped air to bleed from the line. Tighten the fittings.

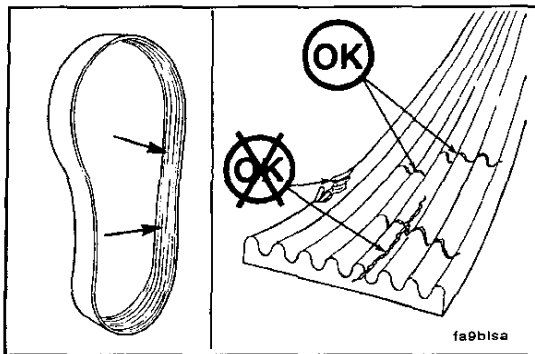
Torque Value: 38 N•m [28 ft-lb]



Do not bleed a hot engine as this could cause fuel to spill onto a hot exhaust manifold creating a danger of fire.

Operate the engine and vent one line at a time until the engine runs smoothly.





## Drive Belts

### Maintenance Check

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

Belt damage can be caused by:

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

# Maintenance Procedures at 48,000 Kilometers [30,000 Miles], 1,000 Hours or 1 Year

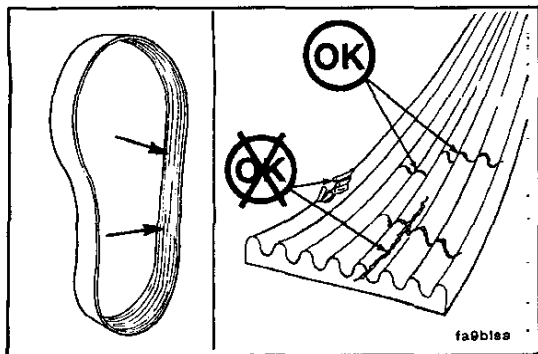
## Section Contents

	Page
<b>Belt Tensioner, Automatic</b> .....	6-4
Maintenance Check .....	6-4
<b>Drive Belts</b> .....	6-2
Maintenance Check .....	6-2
<b>Fan Hub, Belt Driven</b> .....	6-3
Maintenance Check .....	6-3
<b>Maintenance Procedures - General Information</b> .....	6-1

**THIS PAGE LEFT INTENTIONALLY BLANK.**

## Maintenance Procedures - General Information

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



## Drive Belts

### Maintenance Check

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

Belt damage can be caused by:

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

## Fan Hub, Belt Driven

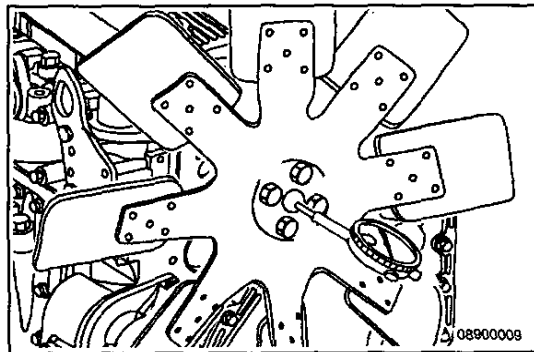
### Maintenance Check

Remove the drive belt.

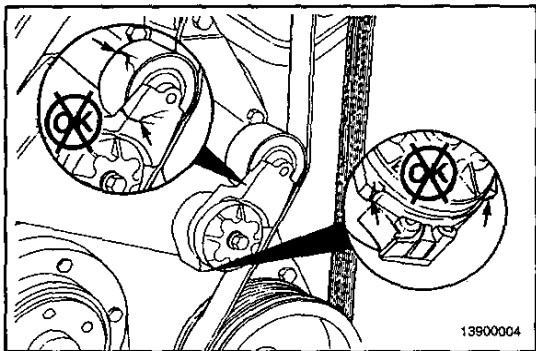
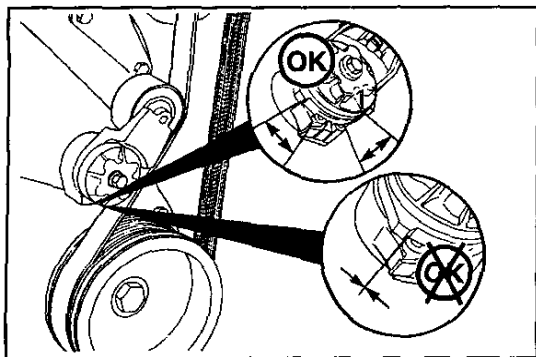


**NOTE:** The fan hub should rotate without any wobble or excessive end play.

Fan Hub End Play		
mm		in
0.15	MAX	0.006







## Belt Tensioner, Automatic

### Maintenance Check

Every 48,000 km [30,000 mi], 1,000 hours or 1 year, whichever comes first, inspect the automatic belt tensioner.

With the engine turned off, check that neither the top or bottom tensioner arm stop is touching the cast boss on the tensioner body. If either of the stops are touching a boss, the drive belt **must** be replaced. Check to make sure the correct belt part number is being used if either condition exists.



Check the tensioner pulley and body for cracks. If any cracks are noticed, the tensioner **must** be replaced. Refer to Section A for replacement.

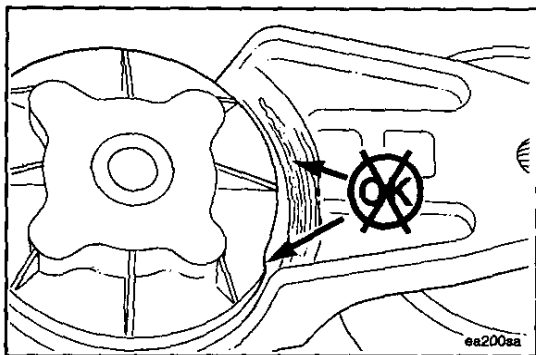


Check the tensioner for dirt buildup. If this condition exists, the tensioner **must** be removed and steam cleaned.

**ISB Engines**  
**Maintenance Procedures at 48,000 km [30,000 mi]**

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

**Belt Tensioner, Automatic**  
**Page 6-5**





# Maintenance Procedures at 96,000 Kilometers [60,000 Miles], 2,000 Hours or 2 Years

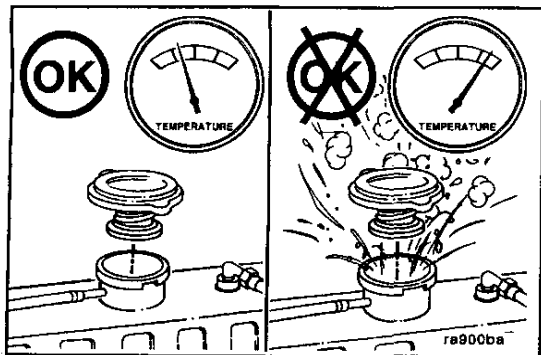
## Section Contents

	Page
<b>Cooling System</b> .....	7-2
Drain .....	7-2
Fill .....	7-6
Flush .....	7-4
<b>Maintenance Procedures - General Information</b> .....	7-1
<b>Vibration Damper</b> .....	7-10
Inspect .....	7-10
<b>Vibration Damper, Rubber</b> .....	7-8
Inspect .....	7-8

**THIS PAGE LEFT INTENTIONALLY BLANK.**

## Maintenance Procedures - General Information

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



## Cooling System

### Drain

#### △ CAUTION △

**Avoid prolonged or repeated skin contact with used antifreeze. Such prolonged repeated contact can cause skin disorders or other bodily injury.**

- Avoid excessive contact — wash thoroughly after contact.
- Keep out of reach of children.

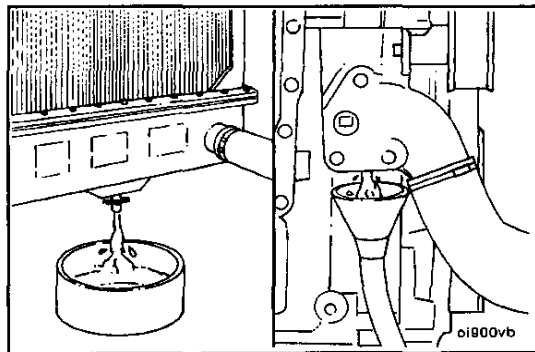
Protect the environment: Handling and disposal of used antifreeze can be subject to federal, state, and local law regulations. Use authorized waste disposal facilities, including civic amenity sites and garages providing authorized facilities for the receipt of used antifreeze. If in doubt, contact your local authorities of the EPA for guidance as to proper handling of used antifreeze.

#### △ CAUTION △

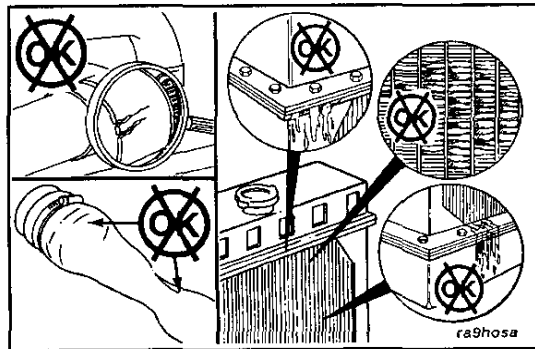
**Wait until the temperature is below 50°C [120°F] before removing the coolant system pressure cap. Failure to do so can cause personal injury from heated coolant spray.**

## ISB Engines Maintenance Procedures at 96,000 km [60,000 mi]

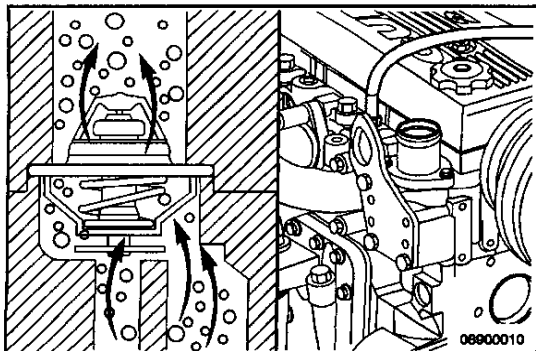
Drain the cooling system by opening the drain valve on the radiator and removing the plug in the bottom of the water inlet. A drain pan with a capacity of 20 liters [5 U.S. gallons] will be adequate in most applications.



Check for damaged hoses and loose or damaged hose clamps. Replace as required. Check the radiator for leaks, damage and build up of dirt. Clean and replace as required.





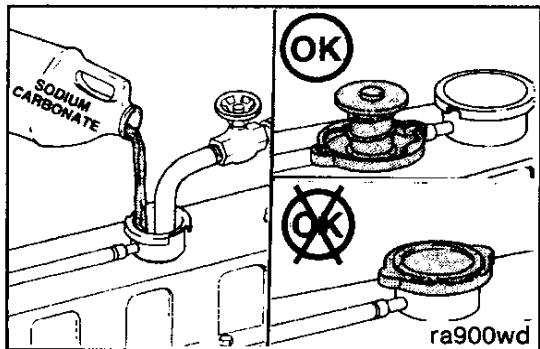


## Flush

**△ CAUTION △**

During filling, air must be vented from the engine coolant passages. The air vents through the "jiggle pin" openings to the top radiator hose and out the fill opening. Additional venting is provided for engines equipped with an aftercooler. Open the petcock during filling.

**NOTE:** Adequate venting is provided for a fill rate of 19 liters/minute [5 U.S. gallon/minute].



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

**NOTE:** Use a 0.5 kilogram [1.0 pound] of sodium carbonate for every 23 liters [6.0 U.S. gallons] of water.

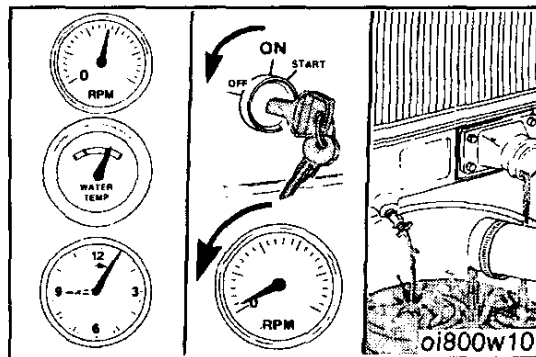
**△ CAUTION △**

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

**ISB Engines**  
**Maintenance Procedures at 96,000 km [60,000 mi]**

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

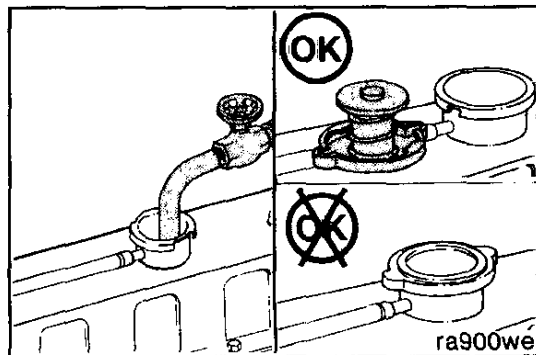
Shut the engine off and drain the cooling system.

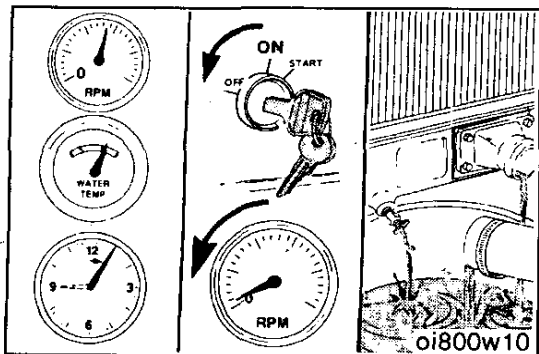


Fill the cooling system with good quality water.

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

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

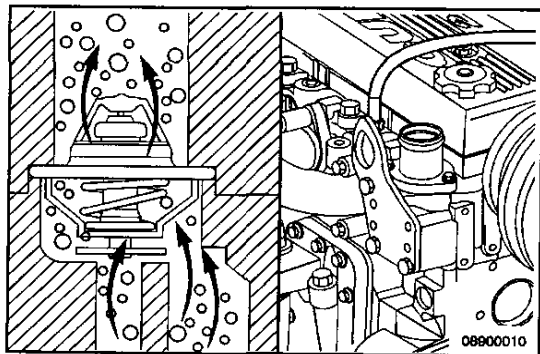




Operate the engine for 5 minutes with the coolant temperature above 80°C [176°F].

Shut the engine off and drain the cooling system.

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



### Fill

The system has a design fill rate of 19 liters per minute [5 U.S. gallons per minute].

### ⚠ CAUTION ⚠

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

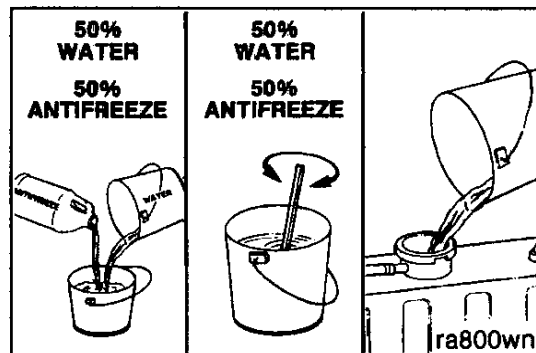
**△ CAUTION △**

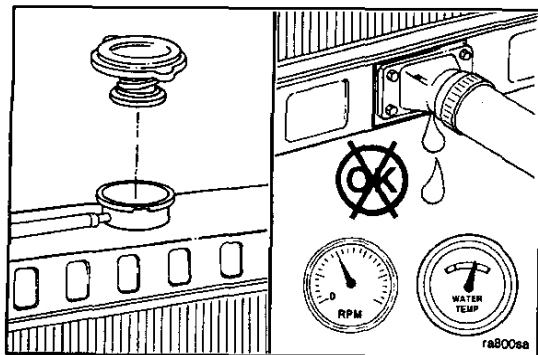
Never use water alone for coolant. Damage from corrosion can be the result of using water alone for coolant.

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

Coolant Capacity (Engine Only)			
	liters		U.S.gal
6BT5.9	9	MAX	2.38
6BTA5.9*	9.9	MAX	2.63

\* 6BTA engines use a jacket-water aftercooler. If a Charge Air Cooler is used, the coolant capacity is the same as the naturally aspirated or turbocharged only engines.





**⚠ CAUTION ⚠**

Before removing the pressure cap, wait until the coolant temperature is below 50°C [120°F]. Failure to do so can cause personal injury from heated coolant spray.

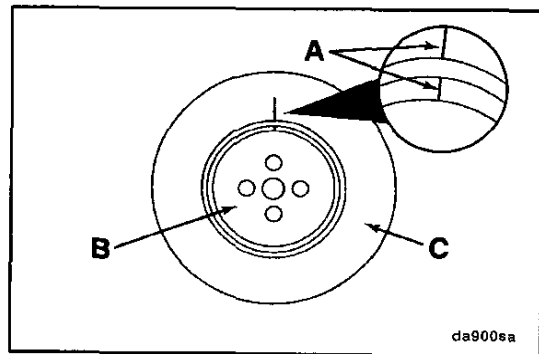
Install the pressure cap. Operate the engine until it reaches a temperature of 80°C [180°F], and check for coolant leaks.

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

**Vibration Damper, Rubber**

**Inspect**

Check the index lines (A) in the vibration damper hub (B) and the inertia member (C). If the lines are more than 1.59 mm [1/16 inch] out of alignment, replace the vibration damper.



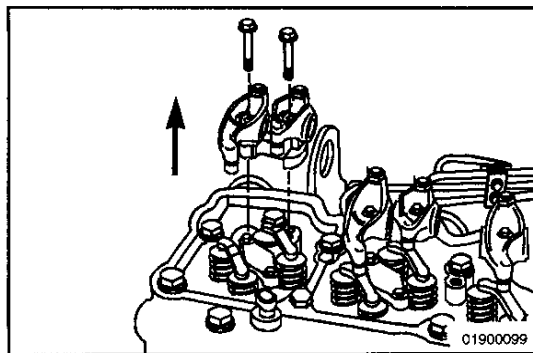
**ISB Engines**  
**Maintenance Procedures at 96,000 km [60,000 mi]**

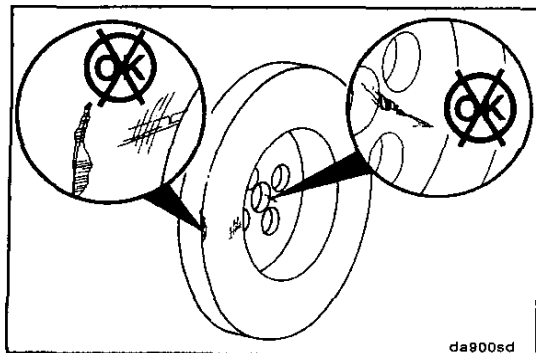
Inspect the rubber member for deterioration. If pieces of rubber are missing or if the elastic member is more than 3.18 mm [1/8 inch] (1) below the metal surface, replace the damper.

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



**Vibration Damper, Rubber**  
**Page 7-9**





## Vibration Damper

### Inspect



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

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

If any variations or deformations are detected, refer to the B Shop Manual, Bulletin No. 3666017, for inspection procedures.

# Section A - Adjustment, Repair and Replacement

## Section Contents

	<b>Page</b>
<b>Alternator</b> .....	A-14
Install .....	A-16
Preparatory .....	A-14
Remove .....	A-15
<b>Belt Tensioner, Automatic</b> .....	A-2
Install .....	A-3
Preparatory .....	A-2
Remove .....	A-3
<b>Charge Air Cooler (CAC)</b> .....	A-9
General Information .....	A-9
Leak Test .....	A-11
Pressure Test .....	A-10
Temperature Differential Test .....	A-10
<b>Coolant Thermostat</b> .....	A-6
Clean .....	A-7
Install .....	A-8
Preparatory .....	A-6
Remove .....	A-7
<b>Drive Belt, Water Pump</b> .....	A-1
Install .....	A-2
Remove .....	A-1
<b>Fan Spacer and Pulley</b> .....	A-4
Install .....	A-5



	Page
Preparatory .....	A-4
Remove .....	A-5
<b>Starting Motor</b> .....	<b>A-12</b>
Install .....	A-14
Preparatory .....	A-12
Remove .....	A-13

## Drive Belt, Water Pump

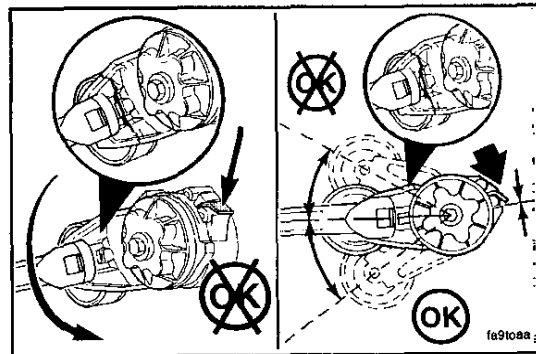
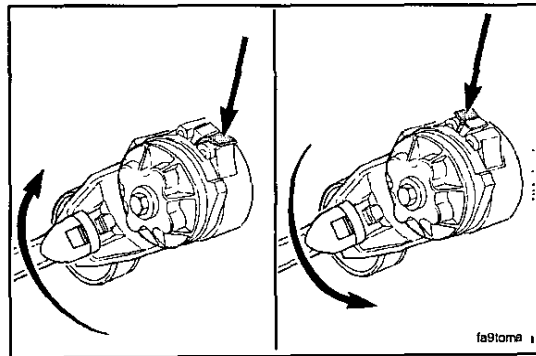
### Remove

#### 3/8 inch Square Drive

Lift the tensioner to remove the drive belt.

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

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





**Install**

**3/8 inch Square Drive**

Lift the tensioner to install the drive belt.



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

**Belt Tensioner, Automatic**

**Preparatory**

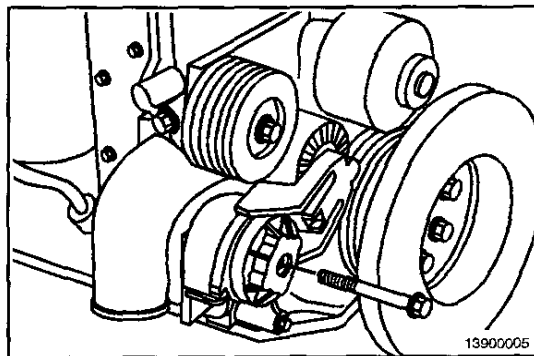
- Remove the drive belt.

**ISB Engines**  
**Section A - Adjustment, Repair and Replacement**

**Remove**

**15 mm**

Remove the capscrew and belt tensioner from the bracket.

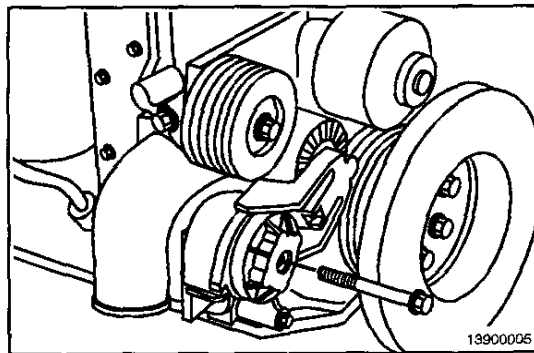


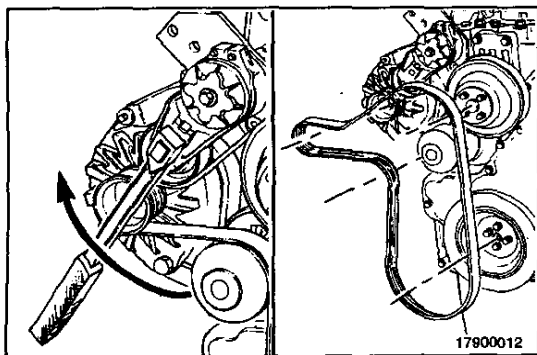
**Install**

**15 mm**

Install the tensioner and capscrews.

**Torque Value:** 43 N•m [32 ft-lb]





### 3/8 Inch Square Drive

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



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

## Fan Spacer and Pulley

### Preparatory

#### Preparatory Step:

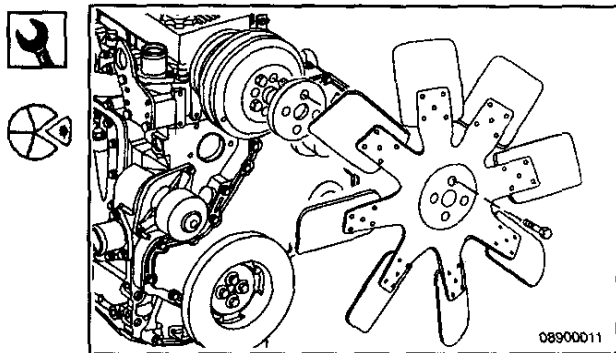
- Remove the drive belt.

**NOTE:** Loosen the capscrews before removing the belt and torque the capscrews after the belt is installed.

## Remove

13 mm

Remove the four capscrews, fan and spacer.

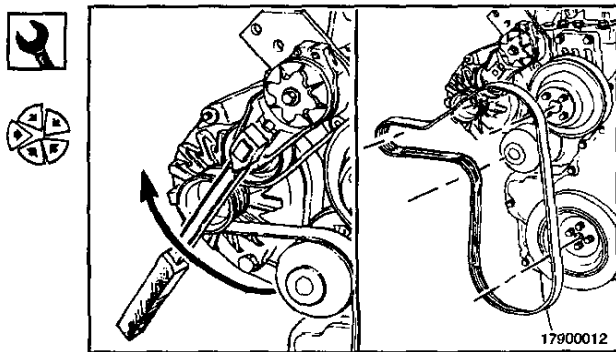


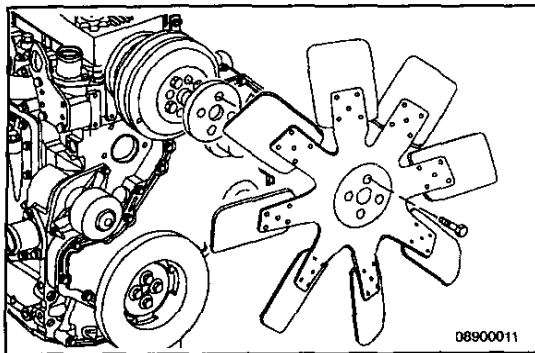
## Install

3/8 Inch Square Drive

Lift the tensioner and install the belt.

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





13 mm

Install the four capscrews, fan and spacer.

Torque Value: 24 N•m [18 ft-lb]



## Coolant Thermostat

### Preparatory

#### Preparatory Steps:

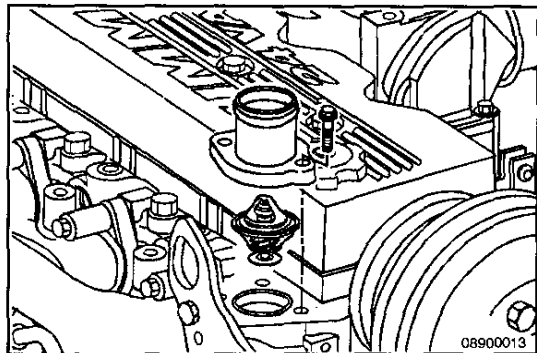
- Drain the coolant.
- Disconnect the upper radiator hose.

## Remove

10 mm

Remove the three mounting capscrews, and the coolant outlet connection.

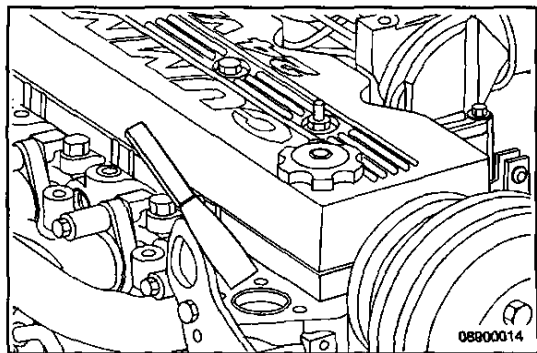
Remove the thermostat.



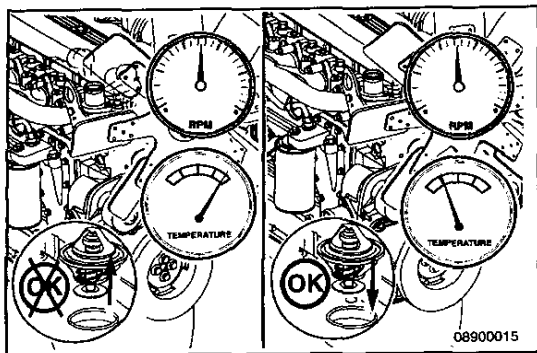
## Clean

Clean the mating surfaces.

**NOTE:** Do not let any debris fall into the thermostat cavity when cleaning the gasket surfaces.



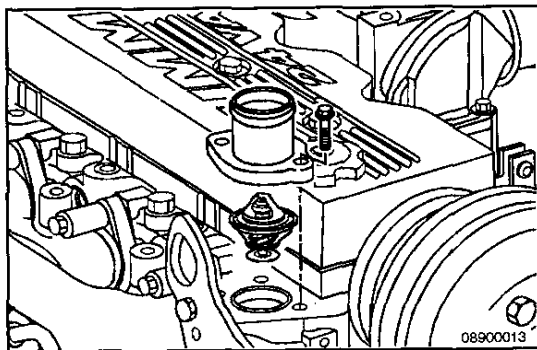




### Install

**⚠ CAUTION ⚠**

Always use the correct thermostat and never operate the engine without a thermostat installed. The engine *may overheat if operated without a thermostat* because without a thermostat the path of least resistance for the coolant is through the bypass to the pump inlet. An incorrect thermostat can cause the engine to overheat or run too cold.



Install the removed parts in the reverse order of removal.

**Torque Value:** 24 N•m [18 ft-lb]



## ISB Engines Section A - Adjustment, Repair and Replacement

Fill the cooling system. Operate the engine and check for leaks.



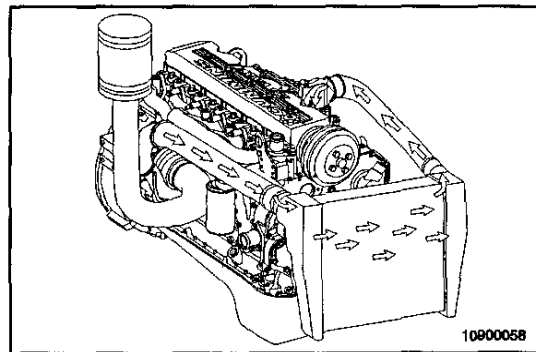
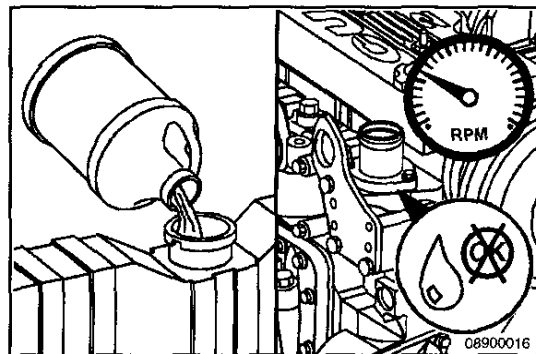
**Be sure to vent the engine and aftercooler during filling, to remove air from the coolant system or overheating will result.**

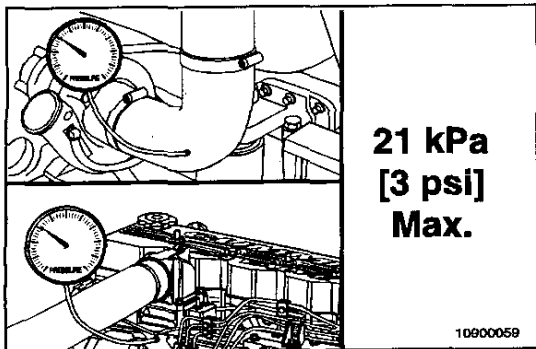
Refer to Procedure 008-018-028.

## Charge Air Cooler (CAC)

### General Information

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





### Pressure Test

#### ST-1273 Pressure Gauge

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

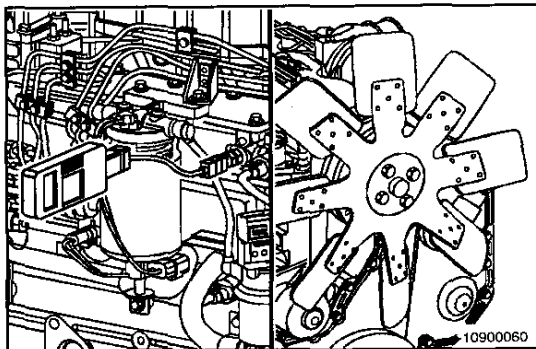


Install another pressure gauge, Part No. ST-1273, in the intake manifold.



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

If the differential pressure is greater than 21 kPa [3 psi], check the charge air cooler for plugging. Clean or replace if necessary.



### Temperature Differential Test

Install a temperature gauge in the intake manifold.



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

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

## ISB Engines Section A - Adjustment, Repair and Replacement

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

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

The maximum temperature differential **must not** be greater than 25°C [45°F].

If the temperature differential is greater than 25°C [45°F], check the charge air cooler for dirt and debris on the fins, and clean as necessary. If the problem still exists, check the cooler for internal contamination or plugging.

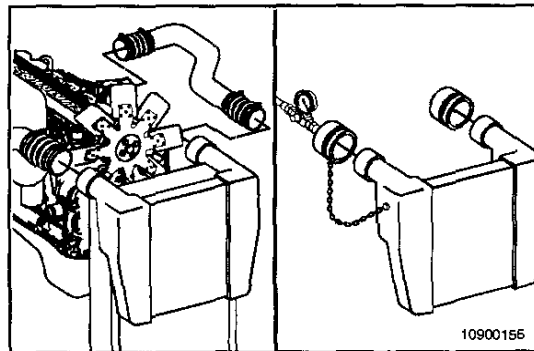
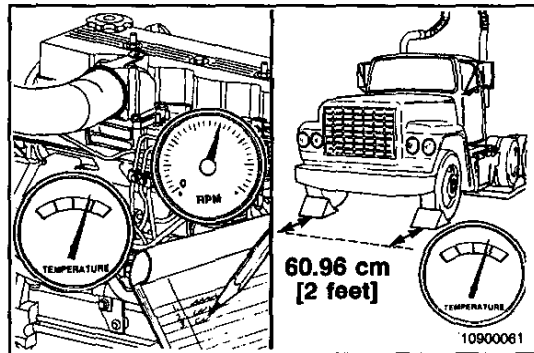
### Leak Test

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

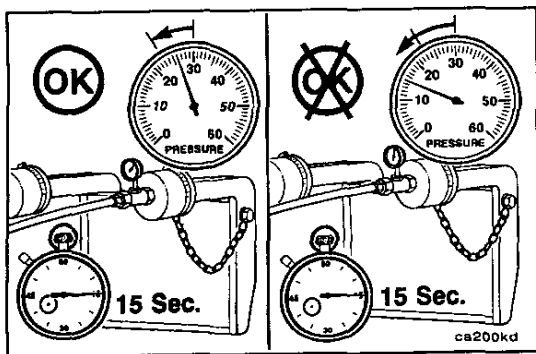
Remove the charge air cooler.

Using Service Tool No. 3824556, install a cap over the outlet side of the cooler. Install a pressure gauge and a shop air supply line to the inlet side of the cooler.

## Charge Air Cooler (CAC) Page A-11



Section A - Adjustment, Repair and Replacement

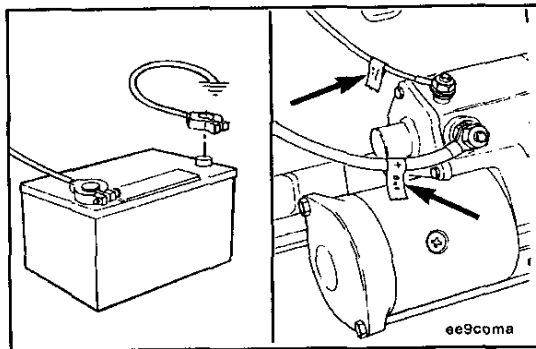


Apply 207 kPa [30 psi] of air pressure to the cooler. If the pressure drop is 48 kPa [7 psi] or less in 15 seconds, the cooler is okay.



If the pressure drop is greater than 48 kPa [7 psi] in 15 seconds, the charge air cooler **must** be repaired or replaced. Refer to the CAC manufacturer for repair instructions.

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



## Starting Motor

### Preparatory

Preparatory Steps:

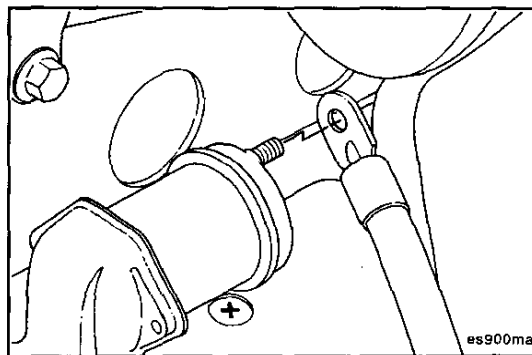
- Disconnect the ground cable from the battery terminal.
- Identify each electrical wire with a tag indicating location.

**ISB Engines**  
**Section A - Adjustment, Repair and Replacement**

**Remove**

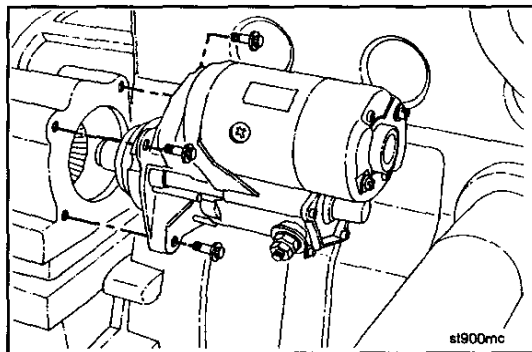
**17 mm**

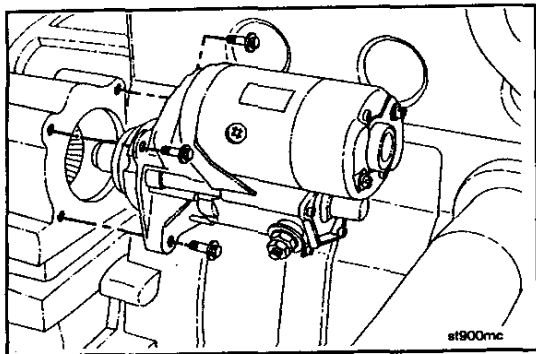
Remove the battery cable from the solenoid.



**10 mm**

Remove the starting motor.





### Install

10 mm

Install the starter motor in the reverse order of removal.

Torque Value: 43 N•m [32 ft-lb]



## Alternator

### Preparatory

Preparatory Steps:

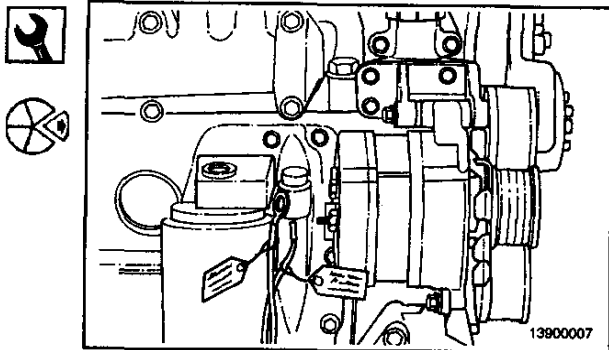
- Disconnect the ground cable from the battery terminal.
- Remove the drive belt from the alternator pulley.

**ISB Engines**  
**Section A - Adjustment, Repair and Replacement**

**Remove**

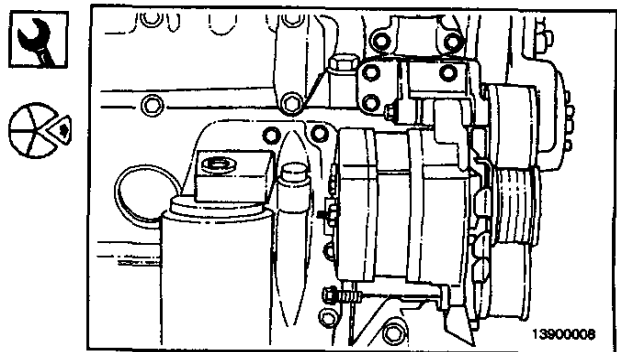
**11 mm**

Remove and tag all wires and complete the following steps.

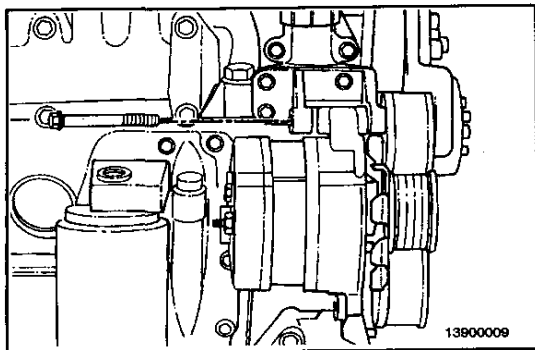


**13 mm**

Remove the alternator link capscrew.

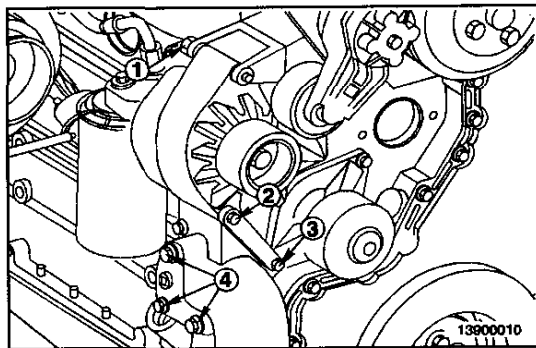






16 mm

Remove the alternator mounting capscrew.



### Install

To assemble the alternator, the alternator mounting components *must* be loosened and tightened in the following sequence.

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

**NOTE:** Wrench size and torque value is determined by the make and model of alternator. Refer to the Engine Component Torque Values.

## Section D - System Diagrams

### Section Contents

	<b>Page</b>
Flow Diagram, Air Intake System.....	D-14
Flow Diagram, Compressed Air System.....	D-18
Flow Diagram, Cooling System.....	D-12
Flow Diagram, Exhaust System.....	D-16
Flow Diagram, Fuel System.....	D-2
Flow Diagram, Lubricating Oil System.....	D-4
<b>System Diagrams - General Information.....</b>	<b>D-1</b>
General Information.....	D-1

**THIS PAGE LEFT INTENTIONALLY BLANK.**

## **System Diagrams - General Information**

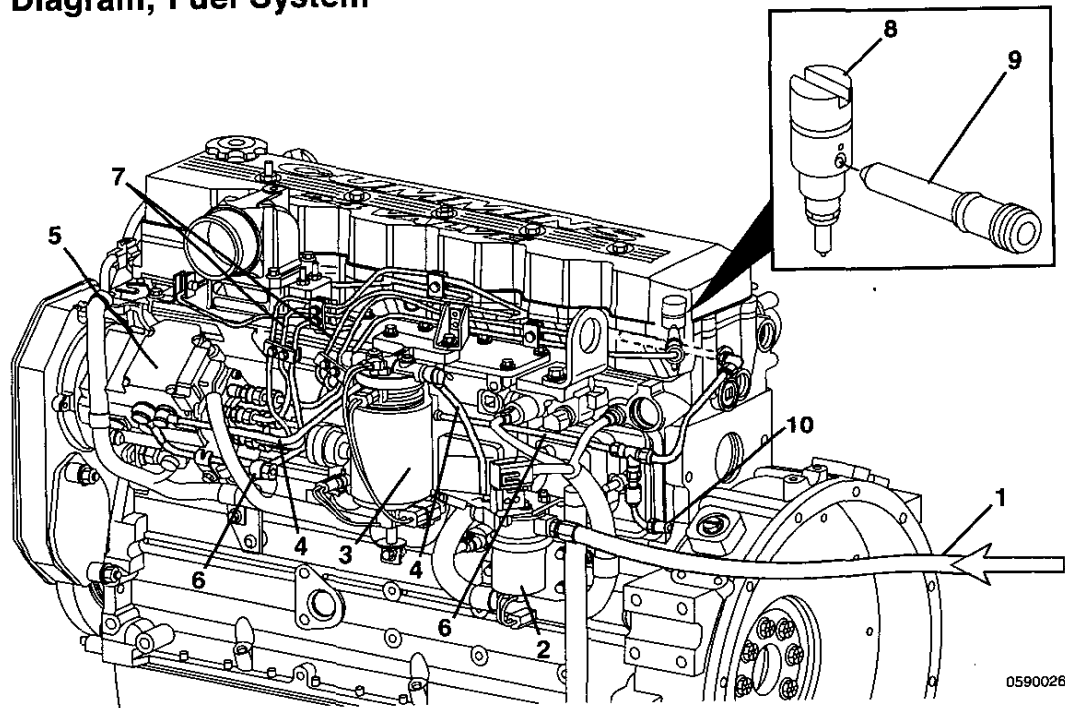
### **General Information**

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.

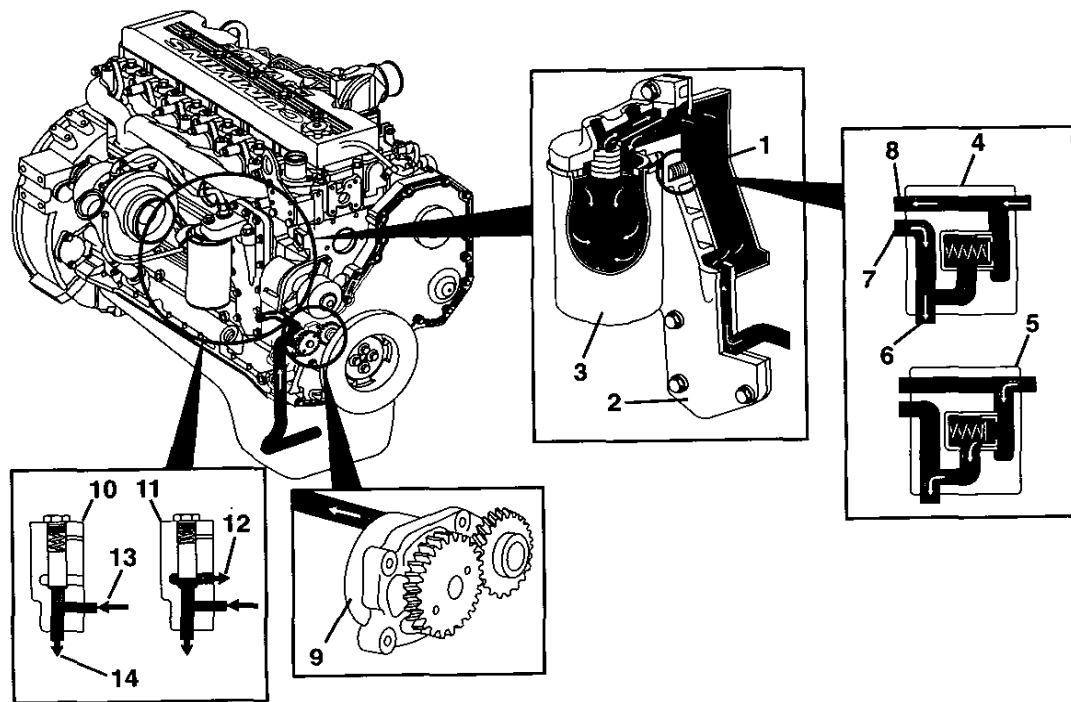
# Flow Diagram, Fuel System



**ISB Engines**  
**Section D - System Diagrams**

1. Fuel from Supply Tank
2. Electronic Lift Pump
3. Fuel Filter/Water Separator
4. Low Pressure Supply Lines
5. Robert Bosch VP44 Injection Pump
6. Fuel Drain Line
7. High Pressure Supply Lines
8. *Robert Bosch Closed Nozzle Injectors*
9. Fuel Connector
10. Fuel Return to Supply Tank

# Flow Diagram, Lubricating Oil System



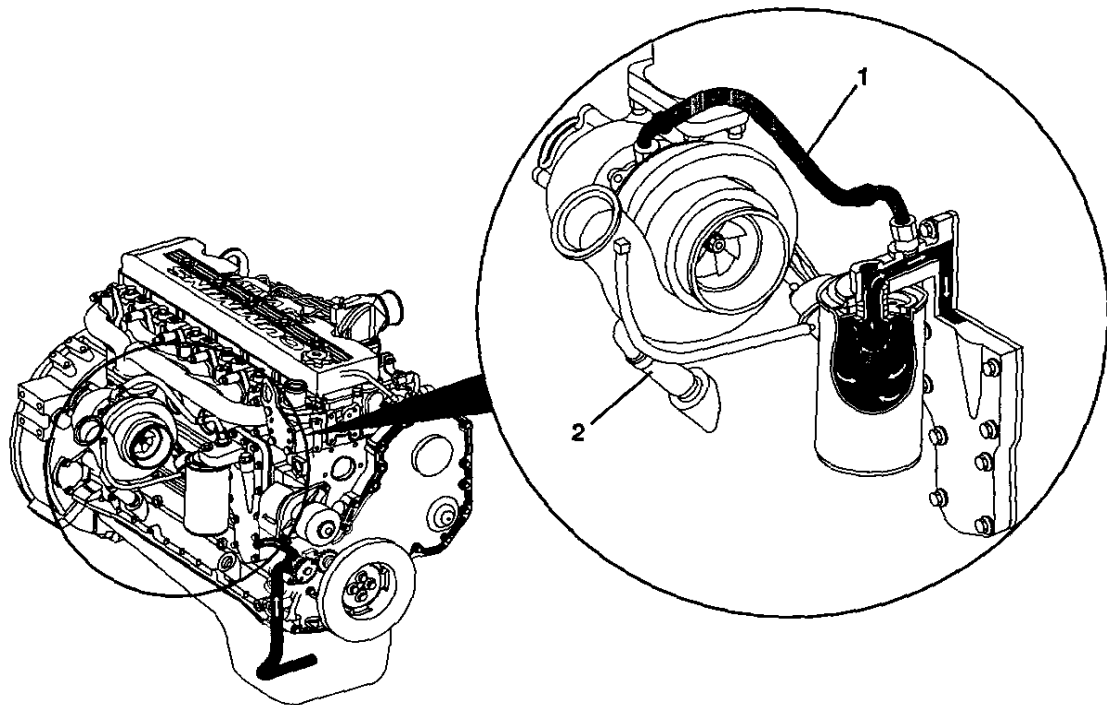
**ISB Engines**  
**Section D - System Diagrams**

**Flow Diagram, Lubricating Oil System**  
**Page D-5**

1. Filter Bypass Valve
2. Lubricating Oil Cooler
3. Full Flow Lubricating Oil Filter
4. Filter Bypass Valve Closed
5. Filter Bypass Valve Open
6. Main Lubricating Oil Rifle
7. From Lubricating Oil Filter
8. To Lubricating Oil Filter
9. Gerotor Lubricating Oil Pump
10. Pressure Regulating Valve Closed
11. Pressure Regulating Valve Open
12. To Lubricating Oil Pump
13. From Lubricating Oil Pump
14. To Lubricating Oil Cooler



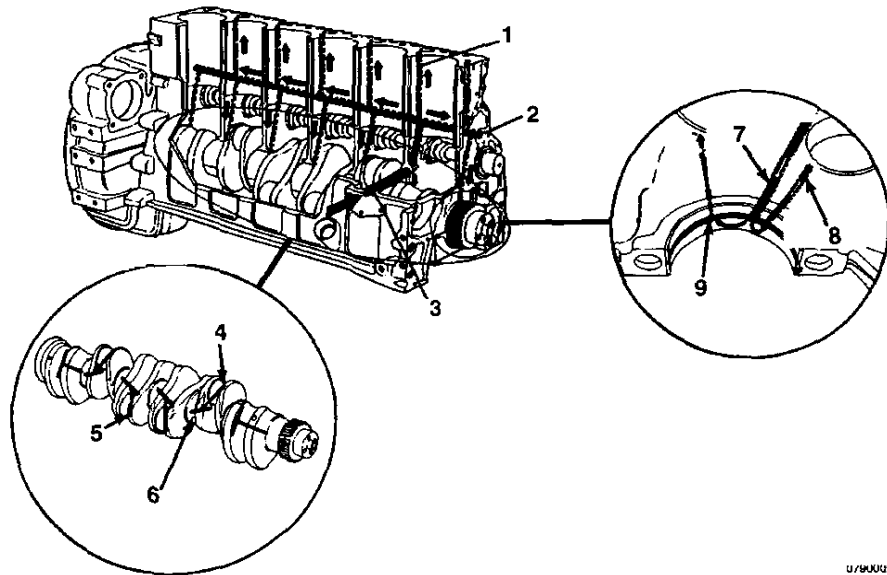
Lubrication for the Turbocharger



**ISB Engines**  
**Section D - System Diagrams**

1. Lubricating Oil Supply
2. Lubricating Oil Drain

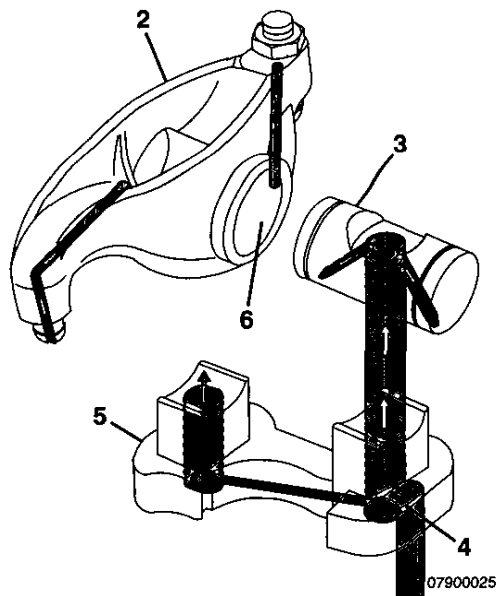
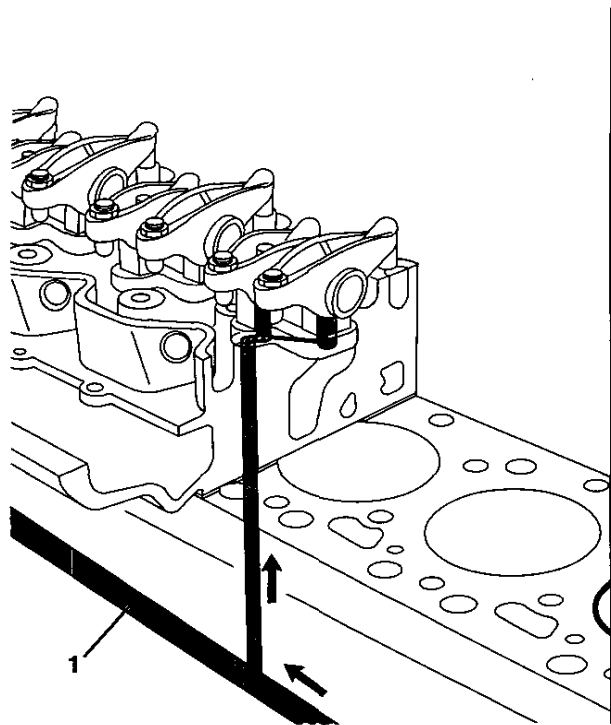
Lubrication for the Power Components



**ISB Engines**  
**Section D - System Diagrams**

1. To Valve Train
2. Main Lubricating Oil Rifle
3. From Lubricating Oil Cooler
4. To Connecting Rod Bearing
5. Connecting Rod Journal
6. Crankshaft Main Journal
7. From Main Lubricating Oil Rifle
8. To Camshaft
9. To Piston Cooling Nozzle

Lubrication for the Overhead

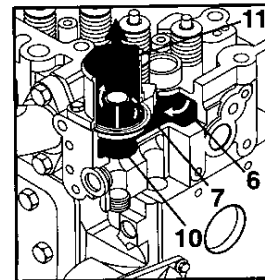
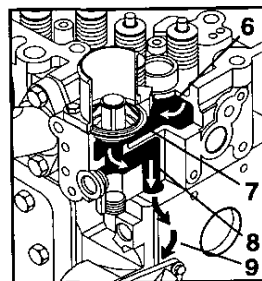
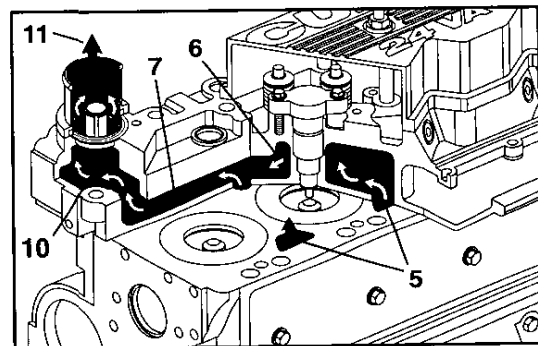
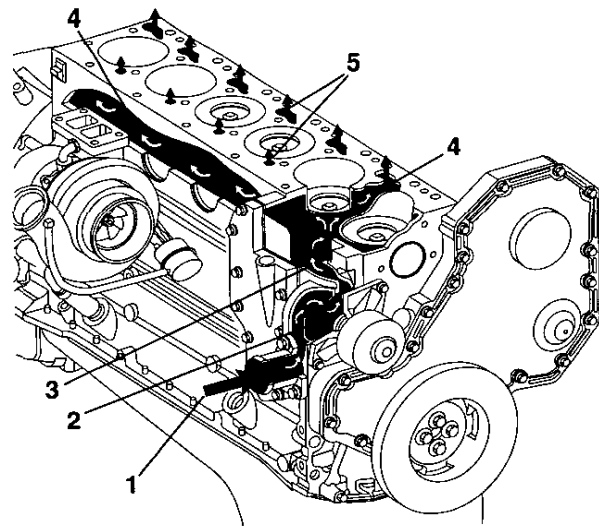


07900025

**ISB Engines**  
**Section D - System Diagrams**

1. Main Lubricating Oil Rifle
2. Rocker Lever
3. Rocker Lever Shaft
4. Transfer Slot
5. Rocker Lever Support
6. Rocker Lever Bore

# Flow Diagram, Cooling System

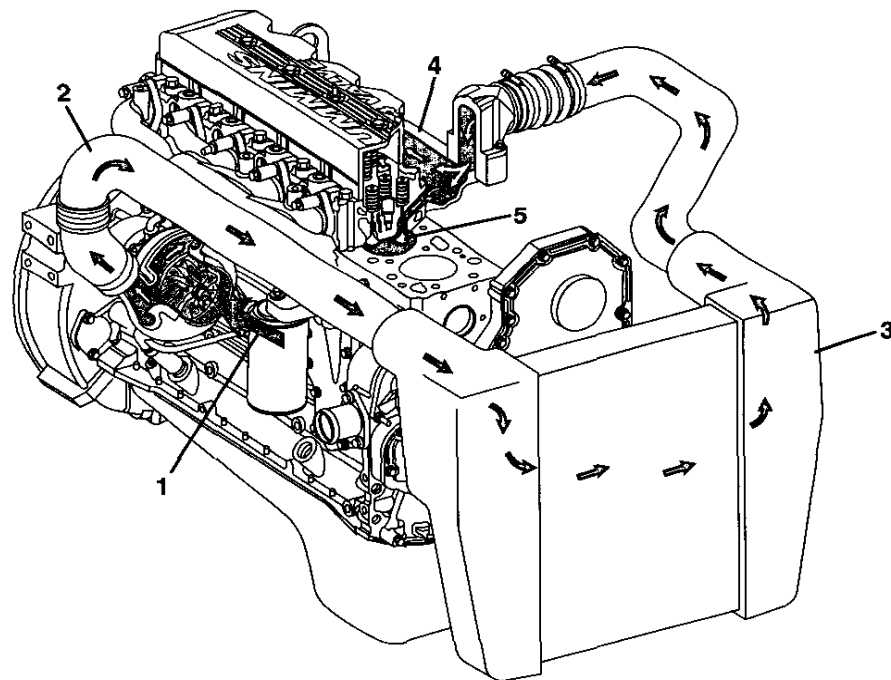


**ISB Engines**  
**Section D - System Diagrams**

1. Coolant Inlet
2. Pump Impeller
3. Coolant Flow Past Lubricating Oil Cooler
4. Coolant Flow Past Cylinders
5. Coolant Flow from Cylinder Block to Cylinder Head
6. Coolant Flow Past Injector
7. Coolant Flow to Thermostat Housing
8. Coolant Bypass Passage
9. Coolant Flow to Pump Inlet
10. Bypass Closed
11. Coolant Flow Back to Radiator



## Flow Diagram, Air Intake System

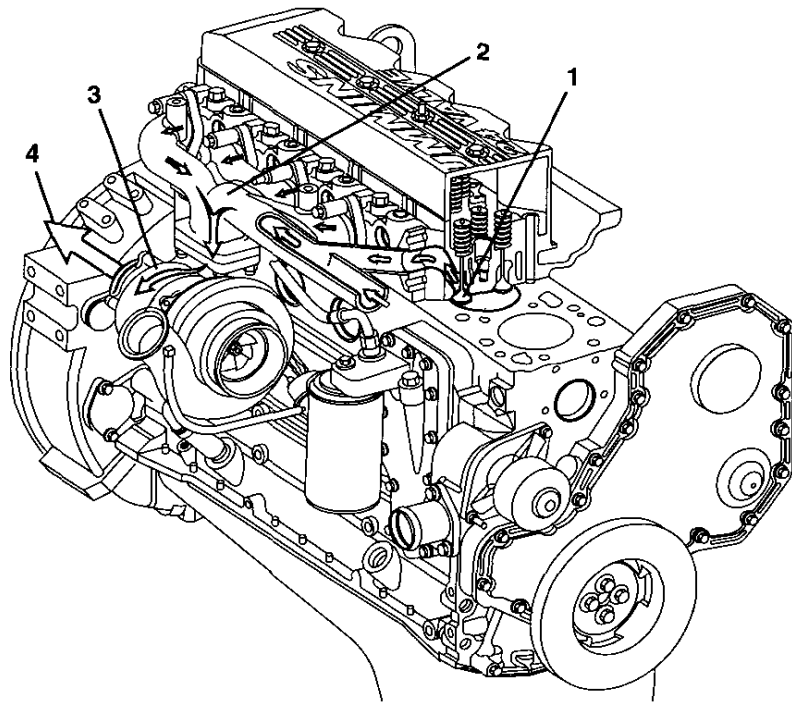


**ISB Engines**  
**Section D - System Diagrams**

**Flow Diagram, Air Intake System**  
**Page D-15**

1. Intake Air Inlet to Turbocharger
2. Turbocharger Air to Charge Air Cooler
3. Charge Air Cooler
4. Intake Manifold (Integral Part of Cylinder Head)
5. Intake Valve

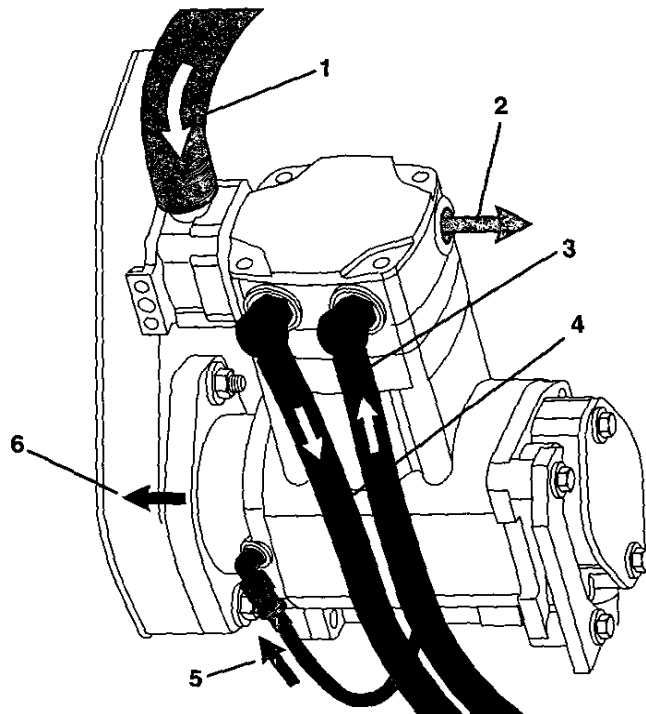
## Flow Diagram, Exhaust System



**ISB Engines**  
**Section D - System Diagrams**

1. Exhaust Valve
2. Exhaust Manifold (Pulse Type)
3. Dual Entry Turbocharger
4. Turbocharger Exhaust Outlet

## Flow Diagram, Compressed Air System



**ISB Engines**  
**Section D - System Diagrams**

**Flow Diagram, Compressed Air System**  
**Page D-19**

1. Air In
2. Air Out
3. Coolant In

4. Coolant Out
5. Lubricating Oil In
6. Lubricating Oil Out is Internal to the Gear Housing



## Section L - Service Literature

### Section Contents

	Page
Additional Service Literature.....	L-1
Literature Order Form.....	L-3
Service Literature Ordering Location.....	L-2



**THIS PAGE LEFT INTENTIONALLY BLANK.**

## **Additional Service Literature**

The following publications can be purchased by filling in and mailing the Literature Order Form:

<b>Bulletin No.</b>	<b>Title of Publication</b>
3666087	Troubleshooting and Repair Manual
3666017	B Series Engine Shop Manual
3810234	B Series Alternative Repair
3810326	4B Series Standard Repair Times
3810350	6B Series Standard Repair Times
3666025	Specification Manual

## Service Literature Ordering Location

### Region

United States and Canada

U.K., Europe, Mid-East, Africa,  
and Eastern European Countries

South and Central America  
(excluding Brazil and Mexico)

Brazil and Mexico

Far East (excluding  
Australia and New Zealand)

Australia and New Zealand

### Ordering Location

Cummins Distributors

or

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

Cummins Engine Co., Ltd.  
Royal Oak Way South  
Daventry  
Northants, NN11 5NU, England

Cummins Americas, Inc.  
16085 N.W. 52nd Avenue  
Hialeah, FL 33104

Cummins Engine Co., Inc.  
International Parts Order Dept., MC 40931  
Box 3005  
Columbus, IN 47202-3005

Cummins Diesel Sales Corp.  
Literature Center  
8 Tanjong Penjuru  
Jurong Industrial Estate  
Singapore

Cummins Diesel Australia  
Maroondah Highway, P.O.B. 139  
Ringwood 3134  
Victoria, Australia

Obtain current price information from your local Cummins Distributor.

## Literature Order Form

Use this form for prompt handling of your literature order.

Item	Bulletin Number	Title of Publication	Quantity	U.S. Price Each	Amount
1				\$	\$
2					
3					
4					
5					
6					
<b>Order Total</b>					\$

Contact your Cummins distributor for prices and availability.

For problems with literature orders (for U.S.A. and Canada), contact 1-800-DIESELS (1-800-343-7357). All other locations contact your local Distributor.

Prices subject to change without notice.

Mail the Literature Order Form along with your ship-to address to your nearest Cummins distributor.

<b>FROM:</b>			
Name:			
Street Address:			
City:	State/Province:	Zip/Postal Code:	
Country:			

<b>SHIP TO: (Name and address where literature is to be shipped)</b>			
Name:			
Street Address:			
City:	State/Province:	Zip/Postal Code:	
Country:			

# Section M - Component Manufacturers

## Section Contents

	Page
<b>Component Manufacturers' Addresses</b> .....	M-1
Air Compressors.....	M-1
Air Cylinders.....	M-1
Air Heaters.....	M-1
Air Starting Motors.....	M-1
Alternators.....	M-2
Auxiliary Brakes.....	M-2
Belts.....	M-2
Catalytic Convertors.....	M-2
Clutches.....	M-3
Coolant Heaters.....	M-3
Coolant Level Switches.....	M-3
Drive Plates.....	M-3
Electric Starting Motors.....	M-3
Electronic Switches.....	M-3
Engine Protection Controls.....	M-4
Fan Clutches.....	M-4
Fans.....	M-4
Fault Lamps.....	M-4
Filters.....	M-4
Flexplates.....	M-5
Fuel Coolers.....	M-5
Fuel Warmers.....	M-5
Gauges.....	M-5
Governors.....	M-6
Heat Sleeves.....	M-6

	Page
Hydraulic and Power Steering Pumps.....	M-6
In-Line Connectors.....	M-6
Oil Heaters.....	M-6
Prelubrication Systems.....	M-7
Radiators.....	M-7
Throttle Assemblies.....	M-7
Torque Converters.....	M-7

## Component Manufacturers' Addresses

**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  
Warpie Way  
London  
W3 7SS  
England  
Telephone: 01-743-3111

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

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

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

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

### **Auxiliary Brakes**

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

### **Belts**

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

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

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

Gates Rubber Company  
900 S. Broadway  
Denver, CO 80217

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

### **Catalytic Convertors**

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

**ISB Engines  
Section M - Component Manufacturers**

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  
Warpole Way  
London  
W3 7SS  
England  
Telephone: 01-743-3111

**Component Manufacturers' Addresses  
Page M-3**

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**

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**

Truffo 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: (615) 526-9551

### **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

Wohliert 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 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

### Section Contents

	Page
<b>Service Assistance</b> .....	S-1
Distributors and Branches - Australia .....	S-25
Distributors and Branches - Canada .....	S-22
Distributors and Branches - New Zealand .....	S-28
Distributors and Branches - United States .....	S-5
Division and Regional Offices .....	S-3
Emergency and Technical Service .....	S-1
Problem Solving .....	S-2
Routine Service and Parts .....	S-1



**THIS PAGE LEFT INTENTIONALLY BLANK.**

## 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.

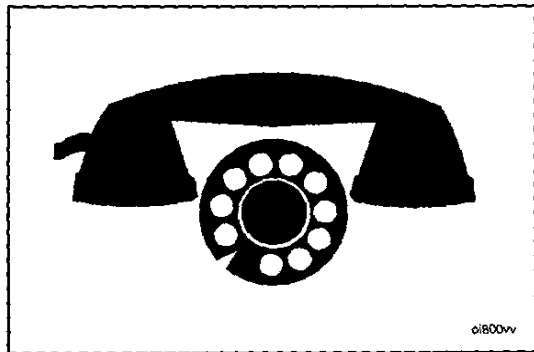
### Emergency and Technical Service

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:

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

## Division and Regional Offices

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

### United States

#### Northern Division Office

Cummins Engine Company, Inc.  
21 Southpark Blvd.  
Greenwood, IN 46143  
Telephone: (317) 885-4400  
FAX: (317) 885-4423

#### Southern Division Office

Cummins Engine Company, Inc.  
425 Franklin Road S.W.  
Suite 500  
Marietta, GA 30067  
Telephone: (404) 423-1108  
FAX: (404) 499-8240

#### Western Division Office

Cummins Engine Company, Inc.  
5660 Greenwood Plaza Blvd.  
Englewood, CO 80111  
Telephone: (303) 773-2866  
FAX: (303) 779-1629

### Western Regional Office

Cummins Engine Company, Inc.  
569 First Street West  
Sonoma, CA 95476  
Telephone: (707) 935-3842  
FAX: N/A

### Plains Regional Office

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

### Canada

#### Canadian Division Office

Cummins Diesel of Canada, Ltd.  
700 Dorval Drive  
Suite 600  
Oakville, Ontario L6K 3V3  
Telephone: (905) 842-8070  
FAX: (905) 842-8075

### Western Canada Regional Office

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

### Eastern Canada Regional Office

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

### Central Canada Regional Office

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

**Australia Regional Office**

**Diesel ReCon Australia**

2 Caribbean Drive  
Scoresby, Victoria 3179  
Australia  
Telephone: (61) 3-765-3222  
FAX: (61) 3-763-0079

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

**Cummins Americas Regional Office**

**Cummins Caribbean**

16085 N. W. 52nd Avenue  
Hialeah, FL 33014  
Telephone: (305) 821-1300

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

**Distributors and Branches - United States**

**Alabama**

**Birmingham Distributor**

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

**Mobile Branch**

Cummins Alabama, Inc.  
1924 Beltline Highway,  
I-65 North  
P.O. Box 2566  
Mobile, AL 36601  
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) 473-8657

**Montgomery Branch**

Cummins Alabama, Inc.  
2325 West Fairview Avenue  
P.O. Box 9271  
Montgomery, AL 36108  
Telephone: (334) 263-2594  
FAX: (334) 263-2594

**Alaska**

**Anchorage - (Branch of Seattle)**

Cummins Northwest, Inc.  
2618 Commercial Drive  
Anchorage, AK 99501-3905  
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: (602) 887-7440  
FAX: (602) 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 Charianne Drive  
Redding, CA 96002  
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 92714  
Telephone: (714) 253-6000  
FAX: (714) 253-6070 or 253-6080

**Montebello Branch**

Cummins Cal Pacific Inc.  
1105 South Greenwood Avenue  
Montebello, CA 90640  
Telephone: (213) 728-8111  
FAX: (213) 889-7422

**Rialto Branch**

Cummins Cal Pacific Inc.  
3061 S. Riverside Avenue  
Rialto, 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

**ISB Engines  
Section S - Service Assistance**

**Service Assistance  
Page S-7**

**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.  
13589 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**

**Hartford Distributor**

Cummins - Connecticut, Inc.  
260 Murphy Road  
Hartford, CT 06114  
Telephone: (203) 527-9156  
FAX: (203) 527-9955

**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, Unit #3  
Ft. Myers, FL 33916  
Telephone: (813) 337-1211  
FAX: (813) 337-5374

**Jacksonville Branch**

Cummins Southeastern Power, Inc.  
2060 West 21st Street  
P.O. Box 12036  
Jacksonville, FL 32209  
Telephone: (904) 355-3437  
FAX: (904) 354-4594

**Hialeah (Miami) Branch**

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

**Orlando Branch**

Cummins Southeastern Power, Inc.  
4820 North  
Orange Blossom Trail  
Orlando, FL 32810  
Telephone: (407) 298-2080  
FAX: (407) 290-8727

**Tampa Branch**

Cummins Southeastern Power, Inc.  
5910 E. Hillsborough Avenue  
P. O. Box 11737  
Tampa, FL 33680  
Telephone: (813) 626-1101  
FAX: (813) 628-4183

**Georgia**

**Atlanta Distributor**

Cummins South, Inc.  
5125 Georgia Highway 85  
College Park, GA 30349-5976  
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  
P.O. Box 5212  
Boise, ID 83705  
Telephone: (208) 336-5000  
FAX: N/A

**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.  
P.O. Box 348  
(at U.S. 51 N and I-55)  
414 W. Northtown Road  
Bloomington-Normal, IL 61761  
Telephone: (309) 452-4454  
FAX: (309) 452-1642

**Harrisburg (Branch of St. Louis)**

Cummins Gateway, Inc.  
Rt. 4, Box 629  
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  
P.O. Box 4445  
Rock Island, IL 61204  
Telephone: (309) 787-4300  
FAX: (309) 787-4397

**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 46242-917  
Telephone: (317) 244-7251  
FAX: (317) 240-1215

**Onan Branch**

Mid-States Power & Refrigeration  
Division of Cummins Mid-States Power  
4301 W. Morris Street  
P.O. Box 42917  
Indianapolis, IN 46240-0917  
Telephone: (317) 240-1867  
FAX: (317) 240-1975

**Iowa**

**Cedar Rapids - (Branch of Omaha)**

Cummins Great Plains Diesel, Inc.  
625 - 33rd Avenue SW  
P.O. Box 1107  
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, Inc.  
1880 South Range  
Colby, KS 67701  
Telephone: (913) 462-3945  
FAX: (913) 462-3970

**Service Assistance**  
**Page S-10**

**Garden City - (Branch of Kansas City, Missouri)**

Cummins Mid-America, Inc.  
2208 West Mary  
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 67219  
Telephone: (316) 838-0875  
FAX: (316) 838-0704

**Kentucky**

**Louisville Distributor**

Cummins Cumberland, Inc.  
(Corporate Office)  
304 Whittington Parkway  
Suite 200  
Louisville, KY 40220  
Telephone: (502) 426-9300  
FAX: (502) 327-9851

**Hazard Branch**

Cummins Cumberland, Inc.  
Highway 15 South  
P.O. Box 510  
Hazard, KY 41701  
Telephone: (606) 436-5718  
FAX: (606) 436-4038

**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

**ISB Engines**  
**Section S - Service Assistance**

**Maine**

**Bangor (Branch of Boston)**

Cummins Northeast, Inc.  
142 Target Industrial Circle  
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 Chesapeake Power, Inc.  
3140 Washington St.  
Baltimore, MD 21230-1090  
Telephone: (410) 633-5161  
FAX: (410) 633-6031/5540

**Baltimore Branch**

Cummins Chesapeake Power, Inc.  
3140 Washington Boulevard  
Baltimore, MD 21230-1090  
Telephone: (410) 644-6500  
FAX: (410) 644-2438

**Massachusetts**

**Boston Distributor**

Cummins Northeast, Inc.  
100 Allied Drive  
Dedham, MA 02026  
Telephone: (617) 329-1750  
FAX: (617) 329-4428

**West 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: (810) 478-9700  
FAX: (810) 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.  
P.O. Box 703  
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: (810) 380-4300  
FAX: (810) 380-0910

**Saginaw Branch**

Cummins Michigan, Inc.  
722 N. Outer Drive  
Saginaw, MI 48605  
Telephone: (517) 752-5200  
FAX: (517) 752-4194

**Service Assistance**  
**Page S-12**

**Standby Power - (Branch of Detroit)**

Standby Power, Inc.  
12130 Dixie  
Redford, MI 48239  
Telephone: (313) 538-0200  
FAX: (313) 538-3966

**Minnesota**

**St. Paul Distributor**

Cummins North Central, Inc.  
2690 North Cleveland Avenue  
St. Paul, MN 55113

**Mailing Address:**

P.O. Box 64578  
St. Paul, MN 55164  
Telephone: (612) 636-1000  
FAX:

Office/Sales: (612) 638-2442  
Parts/Service: (612) 638-2497

**Duluth Branch**

Cummins Diesel Sales, Inc.  
3115 Truck Center Drive  
Duluth, MN 55806-1786  
Telephone: (218) 628-3641  
FAX: (218) 628-0488

**Mississippi**

**Jackson - (Branch of Memphis)**

Cummins Mid-South, Inc.  
325 New Highway 49 South  
P.O. Box 54224  
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**

Cummins Mid-America, Inc.  
1760 Universal  
P.O. Box 4985  
Kansas City, MO 64120  
General Accounting Office  
Telephone: (816) 483-5070  
FAX: (816) 483-5013

**Kansas City Branch**

Cummins Mid-America, Inc.  
3527 Gardner Avenue  
Kansas City, MO 64120  
Telephone: (816) 483-6313  
FAX: (816) 483-4073

**ISB Engines**  
**Section S - Service Assistance**

**Kansas City Fuel Systems Branch**

Cummins Mid-America, Inc.  
2810 Nicholson  
Kansas City, MO 64120  
Telephone: (816) 241-3400  
FAX: (816) 241-5434

**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 65202-1028  
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

**Montana**

**Billings - (Branch of Denver)**

Cummins Rocky Mountain, Inc.  
5151 Midland Road  
P.O. Box 30377  
Billings, MT 59101  
Telephone: (406) 245-4194  
FAX: (406) 245-7923

**Great Falls - (Branch of Denver)**

Cummins Rocky Mountain, Inc.  
415 Vaughn Road (59404)  
P.O. Box 1199  
Great Falls, MT 59403  
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  
P.O. Box 1326  
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: (702) 738-6405  
FAX: (702) 738-1719

**Las Vegas - (Branch of Salt Lake City)**

Cummins Intermountain, Inc.  
2750 Losee Road  
North Las Vegas, NV 89036  
Mailing Address:  
P.O. Box 3997  
North Las Vegas, NV 89036-3998  
Telephone: (702) 399-2339  
FAX: (702) 399-7457

**Sparks - (Branch of Salt Lake City)**

Cummins Intermountain, Inc.  
150 Glendale Avenue  
Sparks, NV 89431  
Telephone: (702) 331-4983  
FAX: (702) 331-7429

**New Jersey**

**Newark - (Branch of Bronx)**

Cummins Metropower, Inc.  
41-85 Doremus Ave.  
Newark, NJ 07105  
Telephone: (201) 242-2255  
FAX: (201) 242-6142

## 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

### Rochester - (Branch of Boston)

Cummins Northeast, Inc.  
3543 Winton Place  
Rochester, NY 14623

### Syracuse - (Branch of Boston)

Cummins Northeast, Inc.  
6193 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: (910) 275-4531  
FAX: (910) 275-8304

### Wilson Branch

Cummins Atlantic, Inc.  
1514 Cargill Avenue (27893)  
P.O. Box 1177  
Wilson, NC 27894-1117  
Telephone: (919) 237-9111  
FAX: (919) 237-9132

## North Dakota

### Fargo - (Branch of St. Paul)

Cummins Diesel Sales, Inc.  
4050 West Main Avenue (58103)  
P.O. Box 2111  
Fargo, ND 58107  
Telephone: (701) 282-2466  
FAX: (701) 281-2543

**ISB Engines**  
**Section S - Service Assistance**

**Service Assistance**  
**Page S-15**

**Grand Forks - (Branch of St. Paul)**

Cummins Diesel Sales, Inc.  
4728 Gateway Drive (58201)  
P.O. Box 12637  
Grand Forks, ND 58208-2637  
Telephone: (701) 775-8197  
FAX: (701) 775-4833

**Minot - (Branch of St. Paul)**

Cummins Diesel Sales, Inc.  
1501 - 20th Avenue, S.E. (58701)  
P.O. Box 1179  
Minot, ND 58702  
Telephone: (701) 852-3585  
FAX: (701) 852-3588

**Ohio**

**Columbus Distributor and Branch**

Cummins Ohio, Inc.  
4000 Lyman Drive  
Hilliard (Columbus), OH 43026  
Telephone: (614) 771-1000  
FAX: (614) 771-0769

**Akron Branch**

Cummins Ohio, Inc.  
1033 Kelly Avenue  
Akron, OH 44306  
Telephone: (216) 773-7821  
FAX: (216) 773-2201

**Cincinnati Branch**

Cummins Ohio, Inc.  
10470 Evendale Drive  
Cincinnati, OH 45241  
Telephone: (513) 563-6670  
FAX: (513) 563-0594

**Cleveland Branch**

Cummins Ohio, Inc.  
7585 Northfield Road  
Cleveland, OH 44146  
Telephone: (216) 439-6800  
FAX: (216) 439-7390

**Lima Branch**

Cummins Ohio, Inc.  
960 Broadway St.  
Lima, OH 45804  
Telephone: (419) 227-2641  
FAX: (419) 225-5506

**Strasburg Branch**

Cummins Ohio, Inc.  
777 South Wooster Avenue  
Box 136  
Strasburg, OH 44680  
Telephone: (216) 878-5511  
FAX: (216) 878-7666

**Toledo Branch**

Cummins Ohio, Inc.  
801 Illinois Avenue  
Maumee  
(Toledo), OH 43537  
Telephone: (419) 893-8711  
FAX: (419) 893-5362

**Youngstown Branch**

Cummins Ohio, 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  
P.O. Box 1636  
Oklahoma City, OK 73101-1636  
Telephone: (405) 946-4481 (24 hours)  
FAX: (405) 946-3336



**Tulsa - (Branch of Arlington)**

Cummins Southern Plains, Inc.  
9725 E. Admiral Place  
P.O. Box 471616  
Tulsa, OK 74147-1616  
Telephone: (918) 838-2555 (24 hours)  
FAX: (918) 838-9818

**Oregon**

**Bend - (Branch of Seattle)**

Cummins Northwest, Inc.  
3500 N. Highway 97 (97701-5729)  
P.O. Box 309  
Bend, OR 97709-0309  
Telephone: (503) 389-1900  
FAX: (503) 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: (503) 687-0000  
FAX: (503) 687-1977

**Medford - (Branch of Seattle)**

Cummins Northwest, Inc.  
4045 Crater Lake Highway  
Medford, OR 97504-9796  
Telephone: (503) 779-0151  
FAX: (503) 772-2395

**Pendleton - (Branch of Seattle)**

Cummins Northwest, Inc.  
223 S.W. 23rd Street  
Pendleton, OR 97801-1810  
Telephone: (503) 276-2561  
FAX: (503) 276-2564

**Portland - (Corporate 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

**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 19007-6895  
Telephone: (215) 785-6005 and  
(609) 563-0005  
FAX: (215) 785-4085

**Bristol Branch**

Cummins Power Systems, Inc.  
2727 Ford Road  
Bristol, PA 19007-6895  
Telephone: (215) 785-6005 and  
(609) 563-0005  
FAX: (215) 785-4728

**Clearfield Branch**

Cummins Power Systems, Inc.  
501 Williams Street  
Clearfield, PA 16830-1426  
Telephone: (814) 765-2421  
FAX: (814) 765-2988

**Harmar Branch**

Cummins Power Systems, Inc.  
3 Alpha Drive  
Harmar, PA 15238-2901  
Telephone: (412) 820-8300  
FAX: (412) 820-8308

**ISB Engines**  
**Section S - Service Assistance**

**Service Assistance**  
**Page S-17**

**Harrisburg Branch**

Cummins Power Systems, Inc.  
4499 Lewis Road  
Harrisburg, PA 17111-2541  
Telephone: (717) 564-1344  
FAX: (717) 558-8217

**Monroeville Branch**

Cummins Power Systems, Inc.  
2740 Mossie Boulevard  
Monroeville, PA 15146-2712  
Telephone: (412) 856-6700  
FAX: (412) 856-9822

**Puerto Rico**

**Puerto Nuevo - (Branch of Tampa)**

Cummins Diesel Power, Inc.  
#31 Calle "C"  
El Matadero  
Puerto Nuevo, Puerto Rico 00920  
Telephone: (809) 793-0300  
FAX: (809) 793-1072

**South Carolina**

**Charleston - (Branch of Charlotte)**

Cummins Atlantic, Inc.  
3028 Montague Avenue  
Charleston, SC 29418  
Telephone: (803) 554-5112  
FAX: (803) 745-0745

**Charleston - (Onan Branch of Charlotte)**

Cummins Atlantic Inc.  
Atlantic Power Generation  
3028 West Montague Avenue  
Charleston, SC 29418  
Telephone: (803) 554-9804  
FAX: (803) 745-0745

**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  
P.O. Box 3080  
Memphis, TN 38103  
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: (615) 523-0446  
FAX: (615) 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  
P.O. Box 90027  
Arlington, TX 76004-3027  
Telephone: (817) 640-6801 (24 Hours)  
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

**Corpus Christi Branch**

Cummins Southern Plains, Inc.  
1302 Corn Products Road  
P.O. Box 48  
Corpus Christi, TX 78403-0048  
Telephone: (512) 289-0700 (24 hours)  
FAX: (512) 289-7355

**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

**Stafford Onan Branch**

Southern Plains Power  
A Division of Cummins Southern Plains  
11100 W. Airport Blvd.  
Stafford, TX 77477  
Mailing Address:  
P.O. Box 2088  
Houston, TX 77252-2088  
Telephone: (713) 879-2828  
FAX: (713) 879-2867

**Utah**

**Salt Lake City Distributor**

Cummins Intermountain, Inc.  
1030 South 300 West  
P.O. Box 25428  
Salt Lake City, UT 84125  
Telephone: (801) 355-6500  
FAX: (801) 524-1351

**Vernal Branch**

Cummins Intermountain, Inc.  
1435 East 335 South  
P.O. Box 903  
Vernal, UT 84078  
Telephone: (801) 789-5732  
FAX: N/A

**Virginia**

**Richmond - (Branch of Charlotte)**

Cummins Atlantic, Inc.  
3900 Deepwater Terminal Road  
Richmond, VA 23234  
Telephone: (804) 232-7891  
FAX: (804) 232-7428

**Roanoke - (Branch of Charlotte)**

Cummins Atlantic, Inc.  
5307 Peters Creek Road  
P.O. Box 7237  
Roanoke, VA 24019-7237  
Telephone: (703) 362-1673  
FAX: (703) 362-1304

**Tidewater - (Branch of Charlotte)**

Cummins Atlantic, Inc.  
Atlantic Power Generation  
3729 Holland Blvd.  
Chesapeake, VA 23323  
Telephone: (804) 485-4848  
FAX: (804) 485-5085

**Washington**

**Seattle Distributor**

Cummins Northwest, Inc.  
811 S.W. Grady Way (98055-2944)  
P.O. Box 9811  
Renton, WA 98057-9811  
Telephone: (206) 235-3400  
FAX: (206) 235-8202

**Chehalis Branch**

Cummins Northwest, Inc.  
1200 N.W. Maryland  
Chehalis, WA 98532-1813  
Telephone: (206) 748-8841  
FAX: (206) 748-8843

**Spokane Branch**

Cummins Northwest, Inc.  
East 3904 Trent Avenue (99202-4471)  
P.O. Box 2746 -  
Terminal Annex  
Spokane, WA 99220-2746  
Telephone: (509) 534-0411  
FAX: (509) 534-0416

**Tacoma Branch**

Cummins Northwest, Inc.  
3701 Pacific Highway East  
Tacoma, WA 98424-1135  
Telephone: (206) 922-2191  
FAX: (206) 922-2379

**Service Assistance**  
**Page S-20**

**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.  
Charleston Ordnance Center  
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: (414) 337-1991  
FAX: (414) 337-9746

**Chippewa Falls Branch**

Cummins Great Lakes, Inc.  
4860 Hallie Road  
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: (414) 336-9631  
(800) 236-1191  
FAX: (414) 336-8984

**ISB Engines**  
**Section S - Service Assistance**

**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

**ISB Engines**  
**Section S - Service Assistance**

**Service Assistance**  
**Page S-21**

**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

Cummins Alberta  
14755 - 121A Avenue  
Edmonton, Alberta T5L 2T2, Canada  
Telephone: (403) 455-2151  
FAX: (403) 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: N/A

#### Hinton Branch

Cummins Alberta  
135 Veats Avenue  
Hinton, Alberta T7V 1S8, Canada  
Telephone: (403) 865-5111  
FAX: (403) 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: (604) 828-2388  
FAX: (604) 828-6713

#### Prince George Branch

Cummins British Columbia  
102- 3851- 18th Avenue  
Prince George, B.C. V2N 1B1  
Telephone: (604) 564-9111  
FAX: (604) 564-5853

### Sparwood Branch

Cummins British Columbia  
731 Douglas Fir Road  
Sparwood, B.C. V0B 2G0, Canada  
Telephone: (604) 425-0522  
FAX: (604) 425-0323

### Tumbler Ridge Branch

Cummins British Columbia  
Industrial Site, Box 226  
Tumbler Ridge, B.C.  
Canada V0C 2W0  
Telephone: (604) 242-4217  
FAX: (604) 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 Diesel  
Branch of Cummins Americas, Inc.  
R.R.#1 Doak Road  
Fredericton,  
New Brunswick E3B 4X2, Canada  
Telephone: (506) 451-1929  
FAX: (506) 451-1921

**Newfoundland**

**St. John's - (Branch of Montreal)**

Cummins Diesel  
Branch of Cummins Americas, Inc.  
122 Clyde Avenue  
Donovans Industrial Park  
Mount Pearl, Newfoundland A1N 4S3  
Canada  
Telephone: (709) 747-0176  
FAX: (709) 747-2283

**Wabush - (Branch of Montreal)**

Cummins Diesel  
Branch of Cummins Americas, Inc.  
Wabush Industrial Park  
Wabush, Newfoundland A0R 1B0  
Telephone: (709) 282-3626  
FAX: (709) 282-3108

**Nova Scotia**

**Halifax - (Branch of Montreal)**

Cummins Diesel  
Branch of Cummins Americas, 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.  
Corporate Office & Parts Distribution  
Centre  
301 Wyecroft Road  
Oakville, Ontario L6K 2H2, Canada  
Telephone: (905) 844-5851  
FAX: (905) 844-7040

**Toronto Branch**

Cummins Ontario Inc.  
150 N. Queen Street  
Etobicoke, Ontario, Canada M9C 1A8  
Telephone: (416) 621-9921  
FAX: (416) 633-8343

**Kenora - (Branch of Winnipeg)**

Cummins Mid-Canada Ltd.  
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, Canada  
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 Diesel*  
Branch of Cummins Americas, Inc.  
7200 Trans Canada Highway  
Pointe Claire, Quebec H9R 1C2,  
Canada  
Telephone: (514) 695-8410  
FAX: (514) 695-8917

**Montreal Branch**

*Cummins Diesel*  
Branch of Cummins Americas, 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

**Quebec City Branch**

*Cummins Diesel*  
Branch of Cummins Americas, Inc.  
2400 Watt Street  
Ste. Foy, Quebec G1P 3T3, Canada  
Telephone: (418) 651-2911  
FAX: (418) 651-0965  
Parts: (418) 651-8434

**Saskatchewan**

**Lloydminster - (Branch of Winnipeg)**

*Cummins Mid-Canada Ltd.*  
3709 - 44th Street  
P.O. Box 959  
Lloydminster, SK S9V 0Y9  
Telephone: (306) 825-2062  
FAX: (306) 825-6702

**Regina - (Branch of Winnipeg)**

*Cummins Mid-Canada Ltd.*  
110 Kress Street  
P.O. Box 98  
Regina, SK S4P 2Z5, Canada  
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**

**Sydney (Lansvale)**

Cummins Diesel Sales & Service  
P.O. Box 150  
Cambramatta, 2166  
New South Wales, Australia  
Location:  
164-170 Hume Highway  
Lansvale, 2166, Australia  
Telephone: (61-2) 728-6211

**Branches:**

**Adelaide**

Cummins Diesel Sales & Service  
P.O. Box 108  
Blair Athol, 5084  
South Australia, Australia  
Location:  
45-49 Cavan Road  
Gepps Cross, 5094  
Telephone: (61-8) 262-5211

**Brisbane**

Cummins Diesel Sales & Service  
P.O. Box 124  
Darra, 4076  
Queensland, Australia  
Location:  
33 Kimberley Street  
Darra, 4076, Australia  
Telephone: (61-7) 375-3277

**Cairns**

Cummins Diesel Sales & Service  
P.O. Box 7189  
Cairns Mail Centre, 4870  
Queensland, Australia  
Location:  
Cnr. Toohey & Knight Streets  
Portsmith, Cairns, 4870  
Telephone: (61-70) 35-1400

**Campbellfield**

Cummins Diesel Sales & Service  
Private Bag 9  
Campbellfield, 3061  
Victoria, Australia  
Location:  
1788-1800 Hume Highway  
Campbellfield, 3061  
Telephone: (613) 357-9200

**Dandenong**

Cummins Diesel Sales & Service  
Lot 7 Greens Road  
Dandenong, 3175  
Victoria, Australia  
Telephone: (613) 706-8088

**Darwin**

Cummins Diesel Sales & Service  
P.O. Box 37587  
Winnellie, 0821  
Northern Territory, Australia  
Location:  
Lot 1758 Graffin Crescent  
Winnellie, 0821  
Telephone: (61-89) 47-0766

**Devonport**

Cummins Diesel Sales & Service  
P.O. Box 72E  
Tasmania, Australia  
Location:  
2 Matthews Way  
Devonport, 7310  
Telephone: (61-04) 24-8800

**Emerald**

Cummins Diesel Sales & Service  
P.O. Box 668  
Emerald, 4720  
Queensland, Australia  
Location:  
Capricorn Highway  
Emerald, 4720  
Telephone: (61-79) 82-4022

**Grafton**

Cummins Diesel Sales & Service  
P.O. Box 18  
South Grafton, 2461  
New South Wales, Australia  
Location:  
18-20 Induna Street  
South Grafton, 2461  
Telephone: (61-66) 42-3655

**Hexham**

Cummins Diesel Sales & Service  
21 Galleghan Street  
Hexham, 2322  
New South Wales, Australia  
Telephone: (61-49) 64-8466

**Kalgoorlie**

Cummins Diesel Sales & Service  
P.O. Box 706  
Kalgoorlie, 6430  
Western Australia, Australia  
Location:  
16 Atbara Street  
Kalgoorlie, 6430  
Telephone: (61-90) 21-2588 or 21-2994

**Mackay**

Cummins Diesel Sales & Service  
P.O. Box 842  
Mackay, 4740  
Queensland, Australia  
Location:  
4 Presto Avenue  
Mackay, 4746  
Telephone: (61-79) 55-1222

**Mount Gambier**

Cummins Diesel Sales & Service  
P.O. Box 2219  
Mount Gambier, 5290  
South Australia, Australia  
Location:  
2 Avey Road  
Mount Gambier, 5290  
Telephone: (61-87) 25-6422

**Penrith**

Cummins Diesel Sales & Service  
P.O. Box 132  
Cambridge Park, 2747  
New South Wales, Australia  
Location:  
7 Andrews Road  
Penrith, 2750  
Telephone: (61-47) 29-1313

**Queanbeyan**

Cummins Diesel Sales & Service  
P.O. Box 527  
Queanbeyan, 2620  
New South Wales, Australia  
Location:  
15-27 Bayldon Road  
Queanbeyan, 2620  
Telephone: (61-62) 97-3433

**Swan Hill**

Cummins Diesel Sales & Service  
P.O. Box 1264  
Swan Hill, 3585  
Victoria, Australia  
Location:  
5 McAllister Road  
Swan Hill, 3585  
Telephone: (61-50) 32-1511

**ISB Engines**  
**Section S - Service Assistance**

**Tamworth**

Cummins Diesel Sales & Service  
P.O. Box 677  
Tamworth, 2320  
New South Wales, Australia  
Location:  
Lot 65 Gunnedah Road  
Tamworth, 2340  
Telephone: (61-67) 65-5455

**Welshpool**

Cummins Diesel Sales & Service  
P. O. Box 52  
Welshpool, 6986  
Western Australia, Australia  
Location:  
50 Kewdale Road  
Welshpool, 6106  
Telephone: (61-9) 458-5911

**Wodonga**

Cummins Diesel Sales & Service  
P.O. Box 174  
Wodonga, 3690  
Victoria, Australia  
Location:  
9-11 McKoy Street  
Wodonga, 3690  
Telephone: (61-60) 24-3655

**Distributors and Branches - New Zealand**

**Auckland**

Cummins Diesel Sales & Service (NZ)  
Ltd.  
Private Bag 92804  
Penrose, Auckland, New Zealand  
Location:  
440 Church Street  
Penrose  
Telephone: (64-9) 579-0085

**Branches:**

**Auckland**

Cummins Diesel Engines  
Private Bag 92804  
Penrose, Auckland, New Zealand  
Location:  
440 Church Street  
Penrose  
Telephone: (64-9) 579-0085

**Christchurch**

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

**Mt. Maunganui**

Cummins Diesel Engines  
P.O. Box 4005  
Mt. Maunganui, New Zealand  
Location:  
101 Totara Street  
Mt. Maunganui  
Telephone: (64-7) 575-0545

**Palmerston North**

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

## Section TS - Troubleshooting Symptoms

### Section Contents

	<b>Page</b>
<b>Troubleshooting Procedures and Techniques</b> .....	TS-1
<b>Troubleshooting Symptoms</b> .....	TS-1
Alternator Not Charging or Insufficient Charging .....	TS-2
Alternator Overcharging .....	TS-4
Coolant Loss — External.....	TS-5
Coolant Temperature Above Normal — Gradual Overheat .....	TS-6
Coolant Temperature is Above Normal — Sudden Overheat.....	TS-9
Coolant Temperature is Below Normal .....	TS-11
Cranking Fuel Pressure is Low.....	TS-12
Engine Acceleration or Response Poor.....	TS-13
Engine Difficult to Start or Will Not Start (Exhaust Smoke) .....	TS-16
Engine Difficult to Start or Will Not Start (No Exhaust Smoke).....	TS-19
Engine Noise Excessive .....	TS-21
Engine Noise Excessive — Combustion Knocks.....	TS-23
Engine Power Output Low .....	TS-24
Engine Runs Rough at Idle .....	TS-26
Engine Runs Rough or Misfires.....	TS-28
Engine Shuts Off Unexpectedly or Dies During Deceleration .....	TS-29
Engine Speed Surges at Low or High Idle .....	TS-31
Engine Speed Surges in PTO or Cruise Control .....	TS-32
Engine Speed Surges Under Load or in Operating Range.....	TS-33
Engine Starts But Will Not Keep Running.....	TS-35
Engine Vibration Excessive .....	TS-36
Engine Will Not Crank or Cranks Slowly (Air Starter).....	TS-38
Engine Will Not Crank or Cranks Slowly (Electric Starter).....	TS-39
Engine Will Not Reach Rated Speed (RPM) .....	TS-40

	Page
Fault Code Warning Lamps Do Not Illuminate .....	TS-42
Fault Code Warning Lamps Stay On (No Apparent Reason) .....	TS-41
Fuel Consumption Excessive.....	TS-43
Fuel in Coolant.....	TS-45
Fuel in the Lubricating Oil .....	TS-46
Intake Manifold Air Temperature Above Specification.....	TS-47
Intake Manifold Pressure (Boost) is Below Normal.....	TS-49
Lubricating Oil Consumption Excessive .....	TS-50
Lubricating Oil Contaminated .....	TS-51
Lubricating Oil Pressure High.....	TS-52
Lubricating Oil Pressure Low.....	TS-53
Lubricating Oil Sludge in the Crankcase Excessive .....	TS-55
Smoke, Black — Excessive .....	TS-56
Smoke, White — Excessive .....	TS-57
Turbocharger Leaks Engine Oil or Fuel.....	TS-59

## Troubleshooting Procedures and Techniques

This guide describes some typical engine operating problems, their causes, and some acceptable corrections to those problems. Unless noted otherwise, the problems listed are those which an operator can diagnose and repair.

### ▲ CAUTION ▲

**Performing troubleshooting procedures NOT outlined in this section can result in equipment damage or personal injury. Consult a Cummins Authorized Repair Location for diagnosis and repair beyond that which is outlined, and for symptoms not listed in this section. Before beginning any troubleshooting, refer to General Safety Instructions in Section i of this manual.**

Follow the suggestions below for troubleshooting:

- Study the complaint thoroughly before acting
- Refer to the engine system diagrams
- Do the easiest and most logical things first
- Find and correct the cause of the complaint

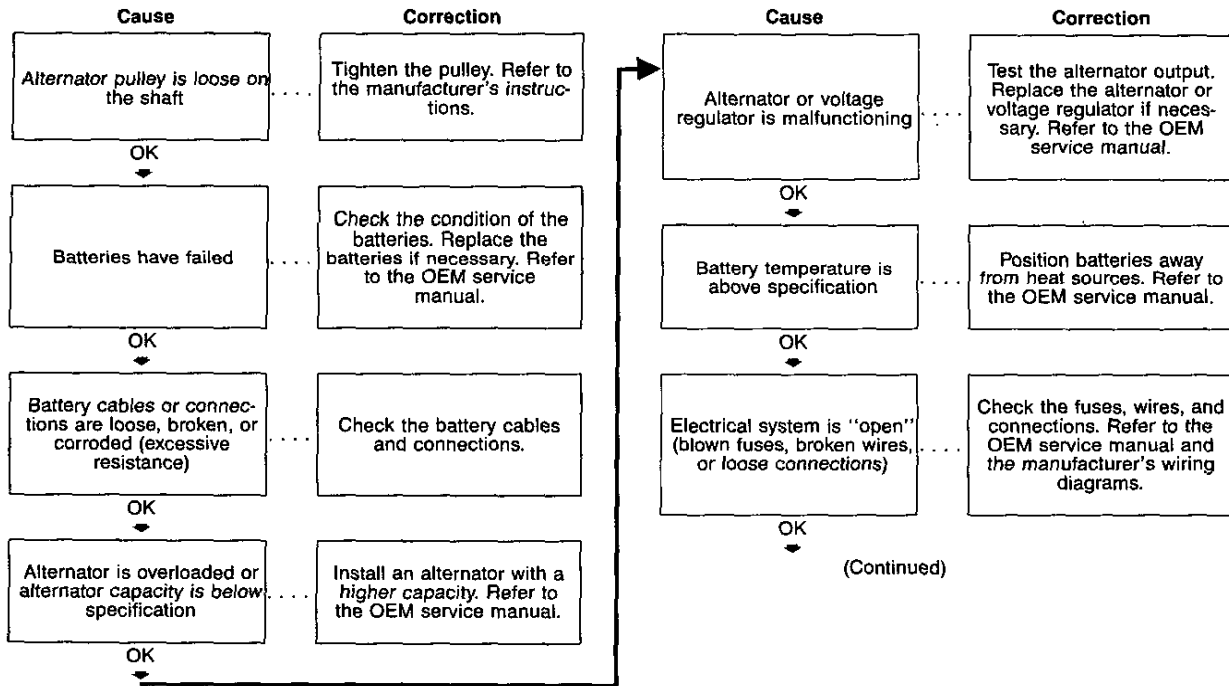
## Troubleshooting Symptoms

Use the following charts to aid in diagnosing specific engine symptoms. Read each row of blocks from top to bottom. Follow the arrows through the chart to identify corrective action.

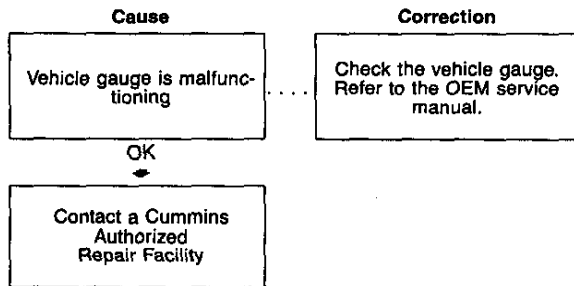


### Alternator Not Charging or Insufficient Charging

This is symptom tree T013.

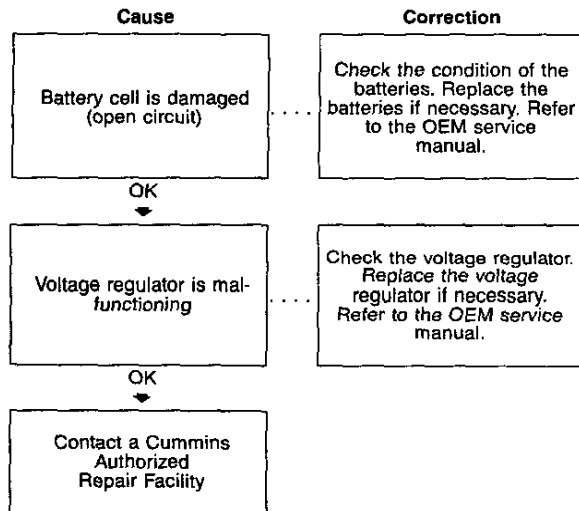


**Alternator Not Charging or Insufficient Charging (Continued)**



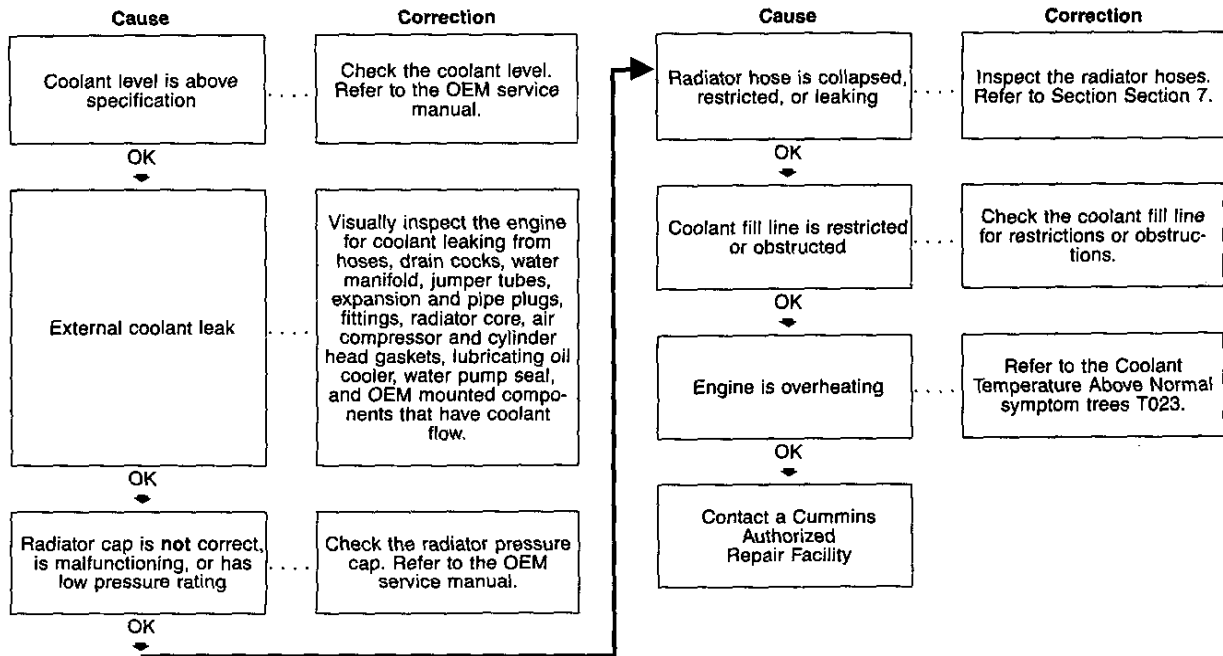
## Alternator Overcharging

This is symptom tree T014.



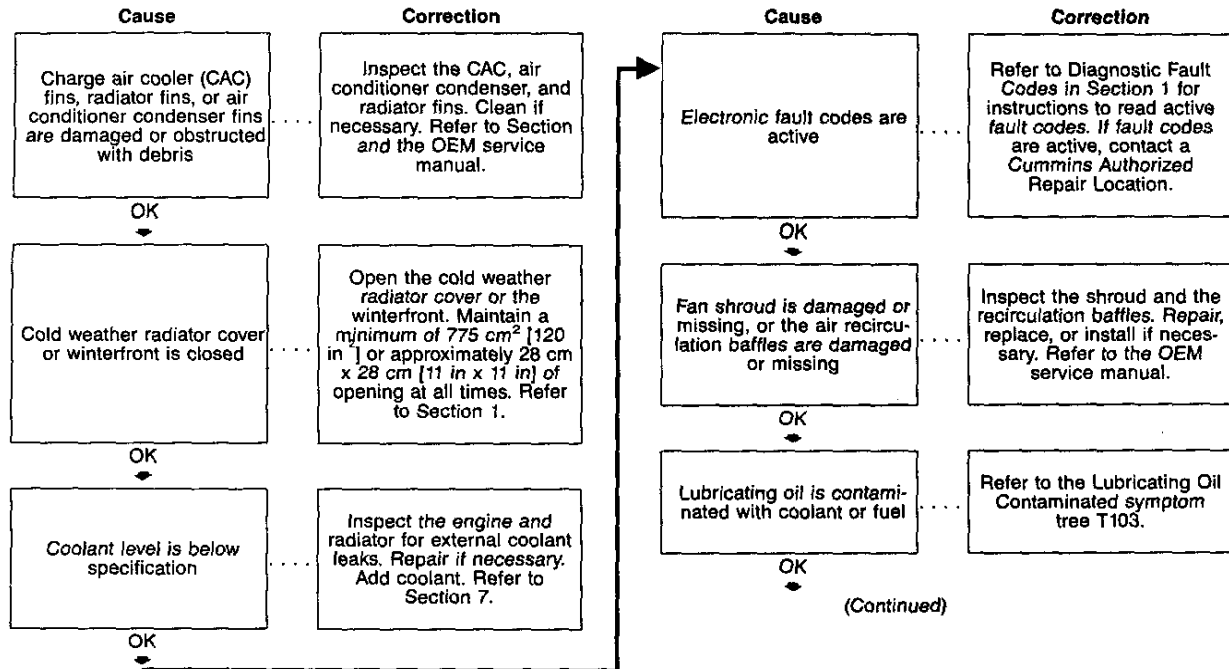
### Coolant Loss — External

This is symptom tree T020.

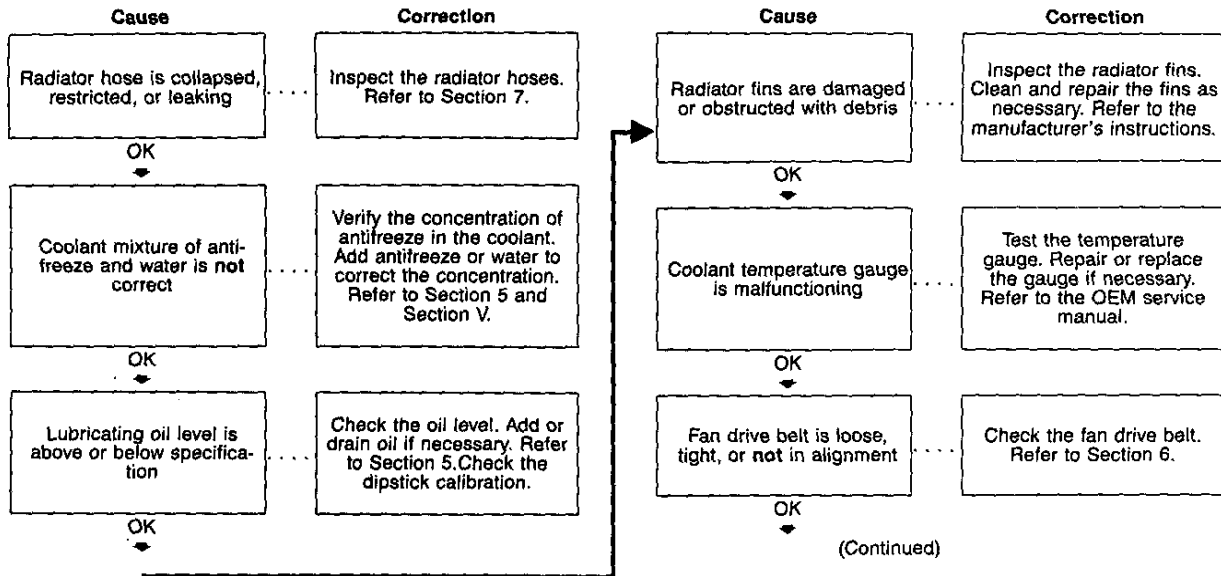


### Coolant Temperature Above Normal — Gradual Overheat

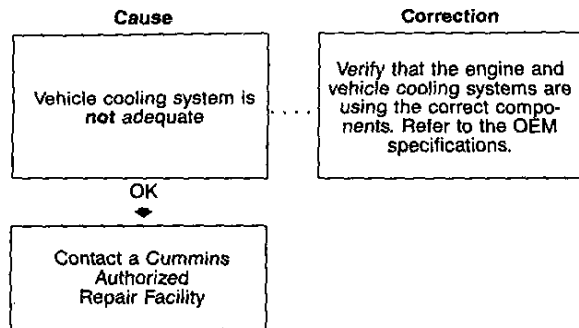
This is symptom tree T022.



### Coolant Temperature Above Normal — Gradual Overheat (Continued)

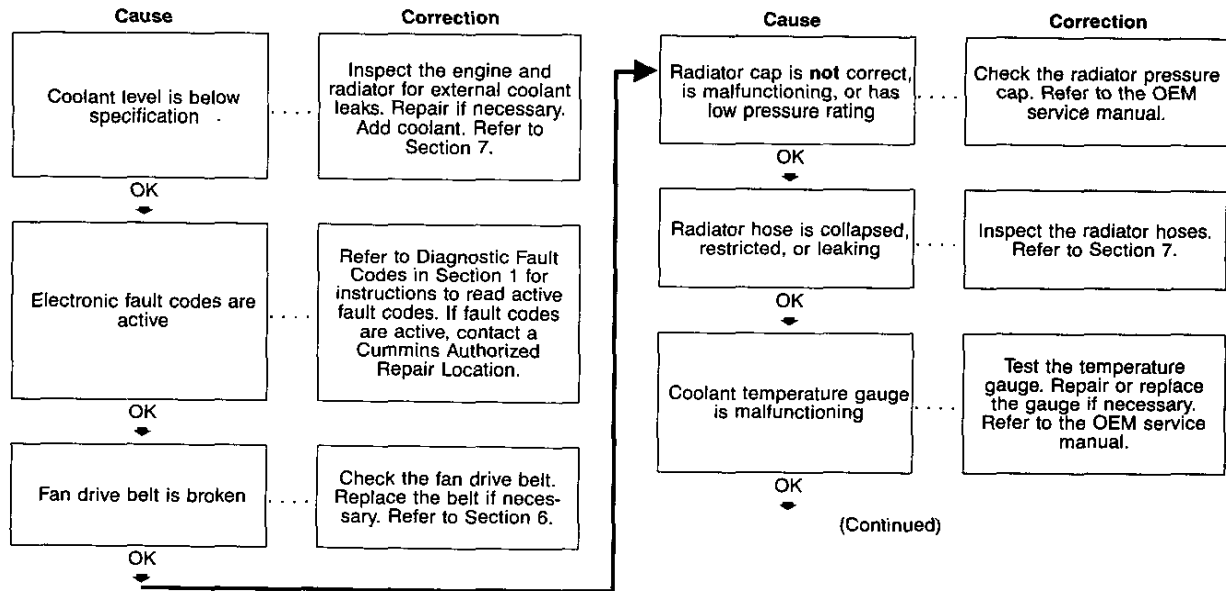


### Coolant Temperature Above Normal — Gradual Overheat (Continued)



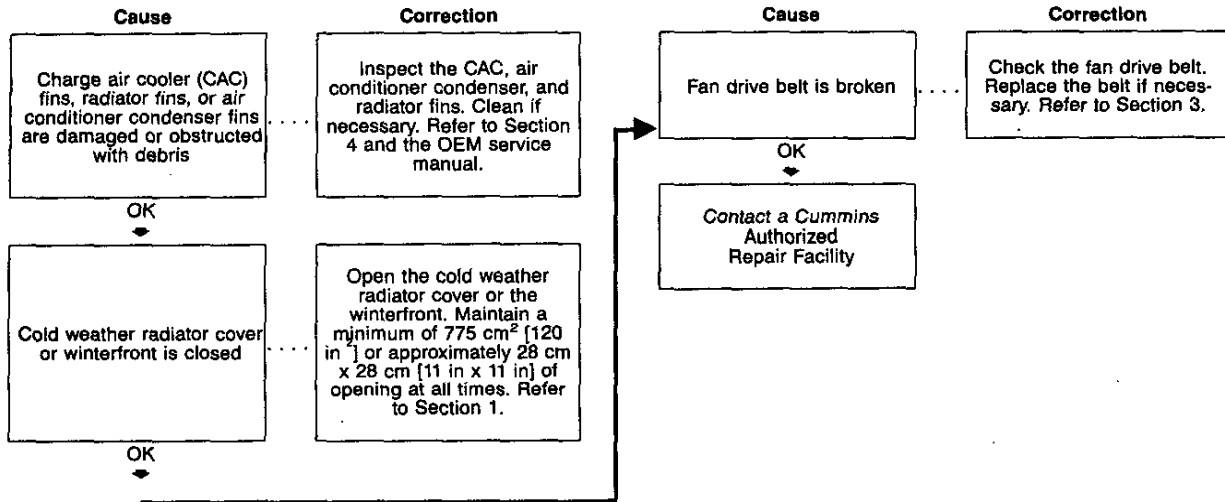
## Coolant Temperature is Above Normal — Sudden Overheat

This is symptom tree T023.



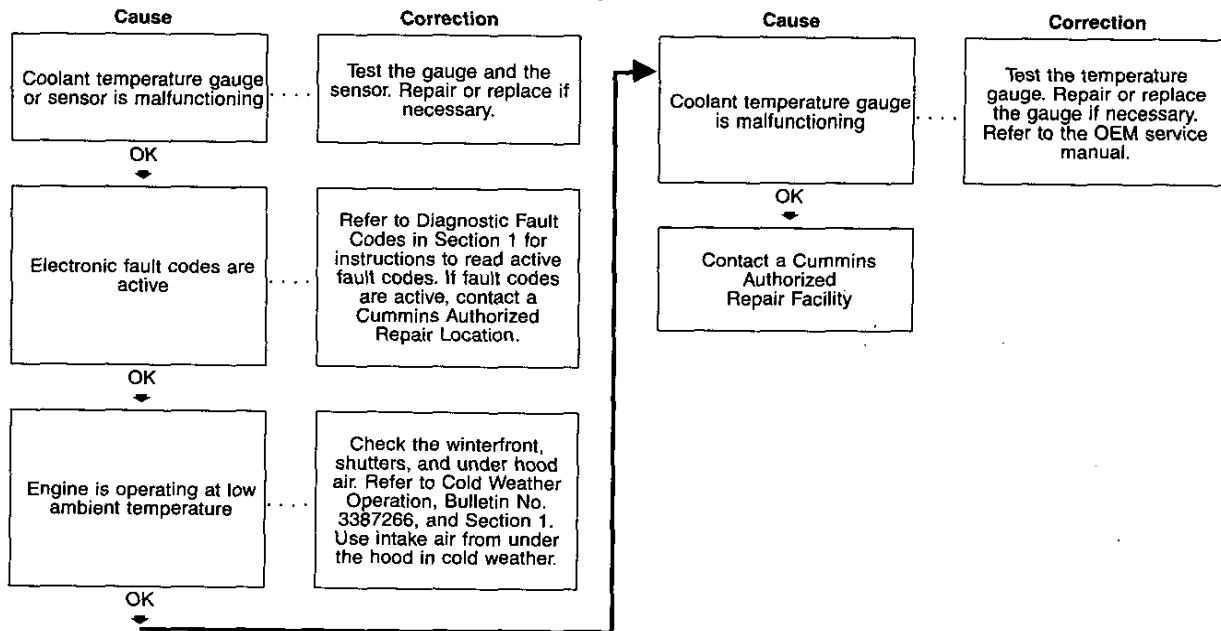


### Coolant Temperature is Above Normal — Sudden Overheat (Continued)



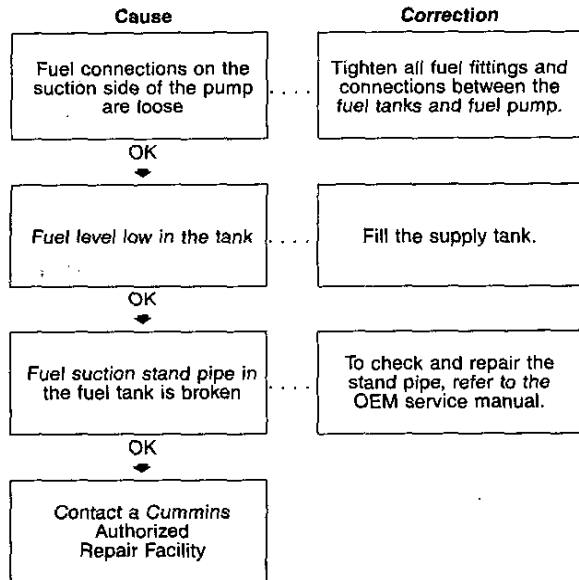
### Coolant Temperature is Below Normal

This is symptom tree T024.



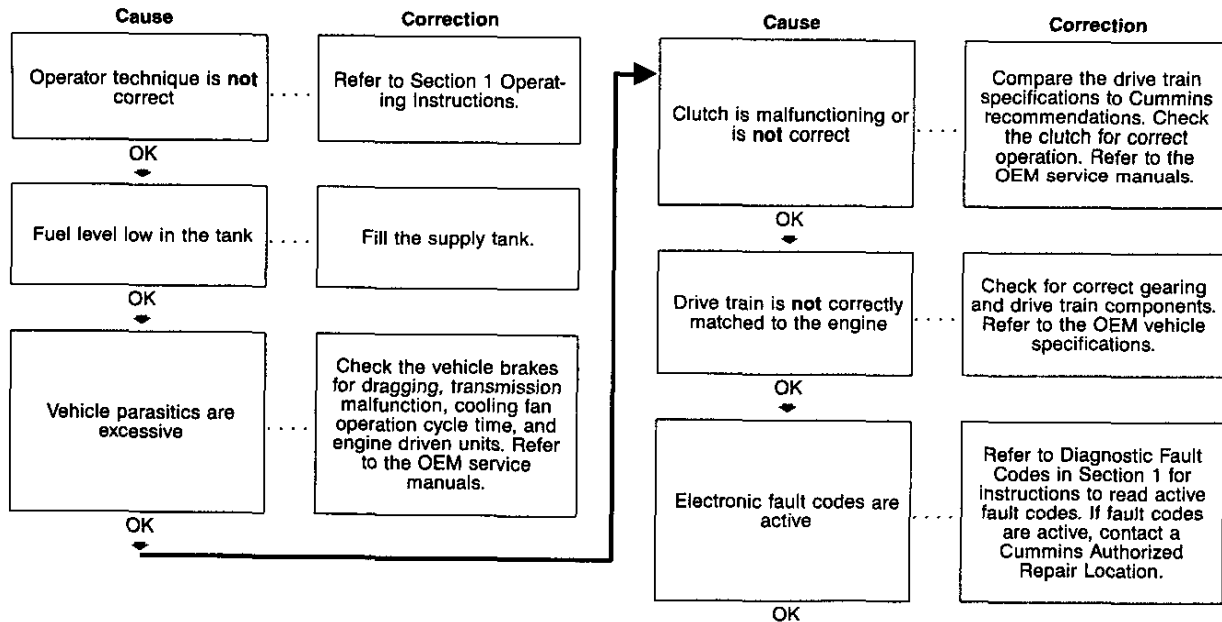
## Cranking Fuel Pressure is Low

This is symptom tree T029.



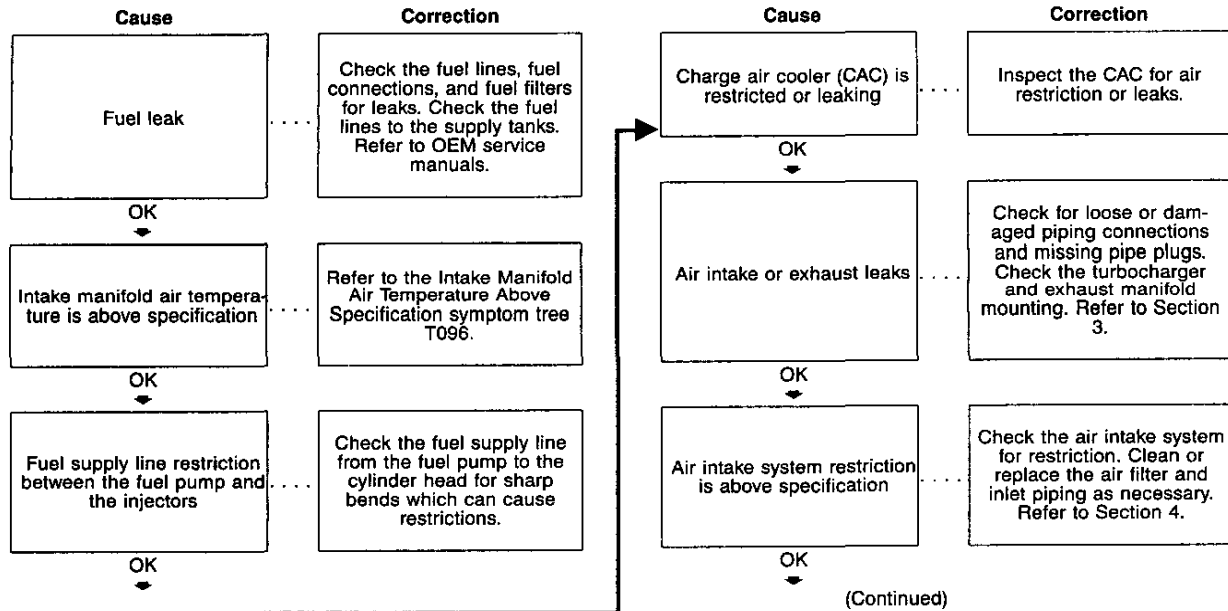
### Engine Acceleration or Response Poor

This is symptom tree T033.

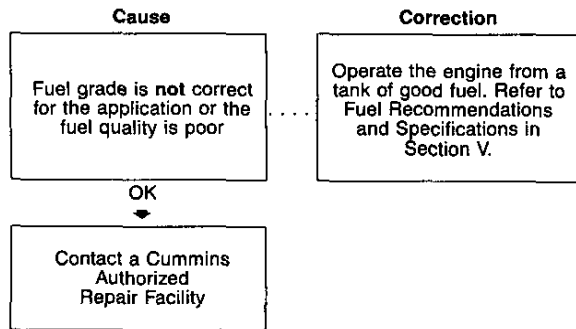


(Continued)

### Engine Acceleration or Response Poor (Continued)

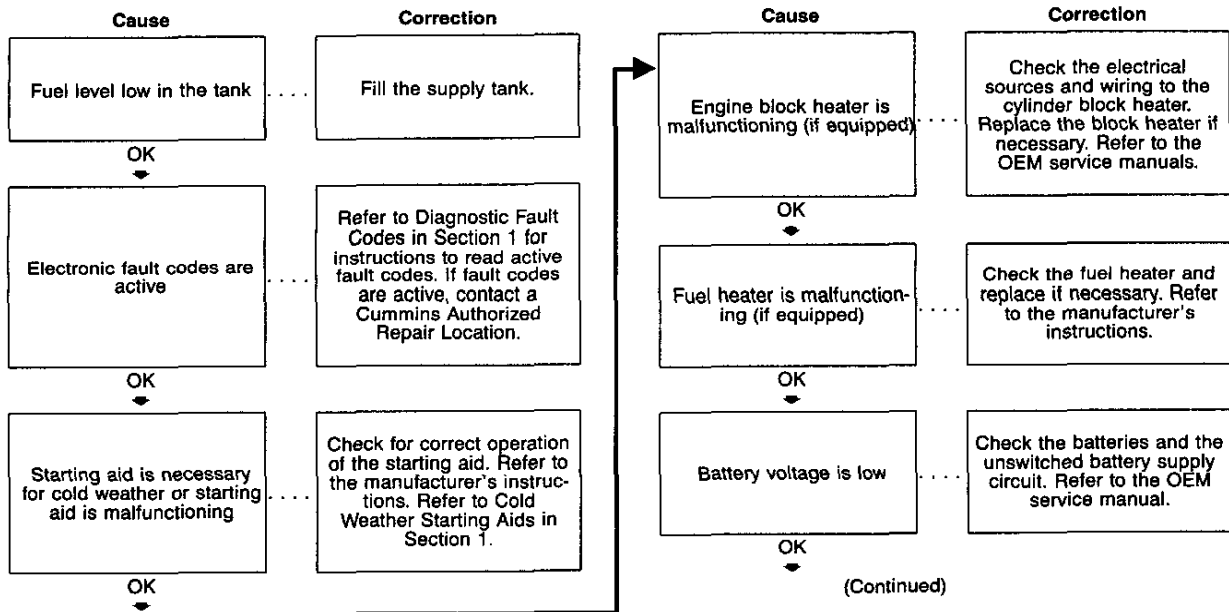


### Engine Acceleration or Response Poor (Continued)

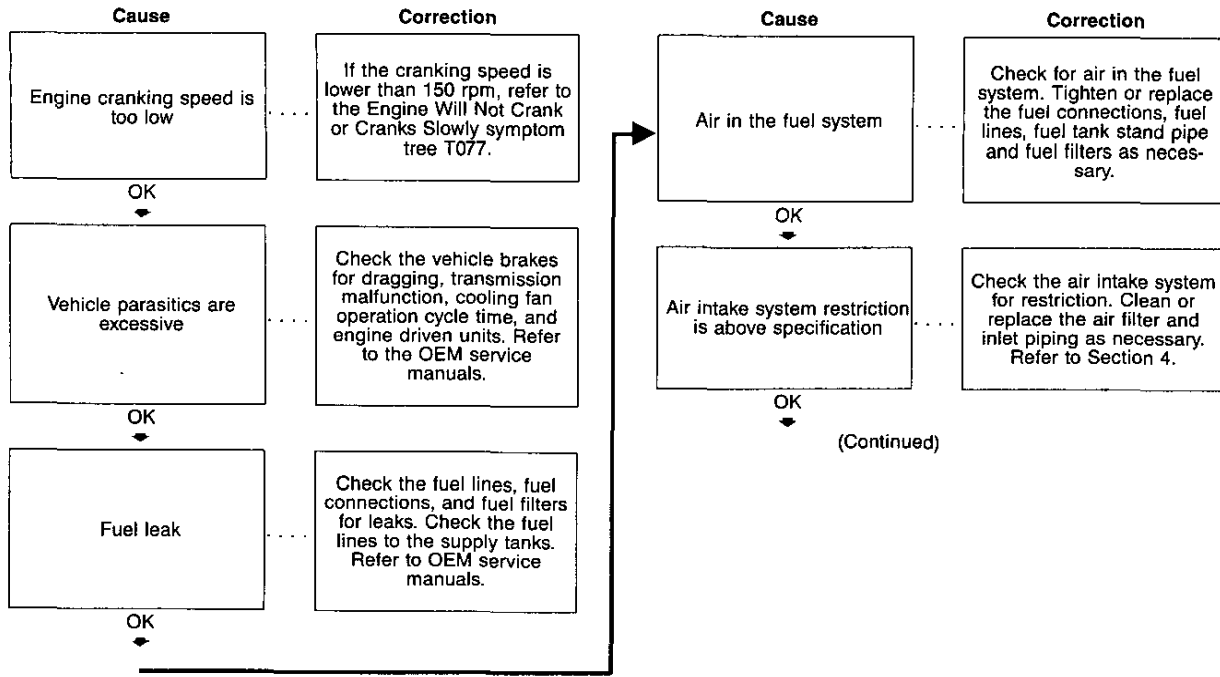


### Engine Difficult to Start or Will Not Start (Exhaust Smoke)

This is symptom tree T043.

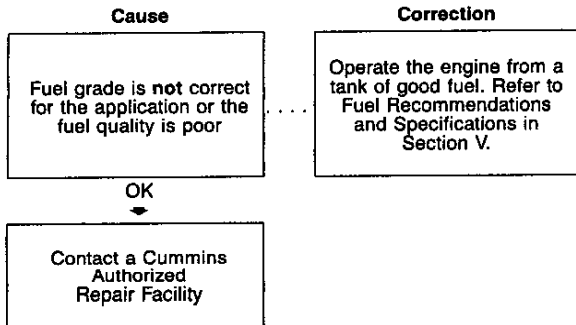


### Engine Difficult to Start or Will Not Start (Exhaust Smoke) (Continued)



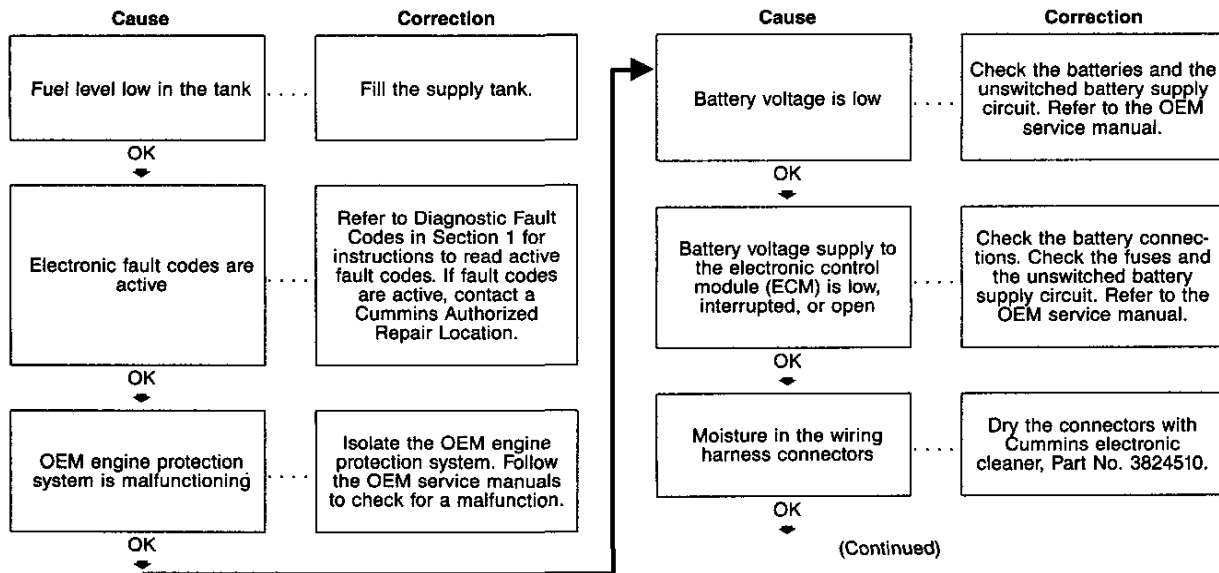


### Engine Difficult to Start or Will Not Start (Exhaust Smoke) (Continued)

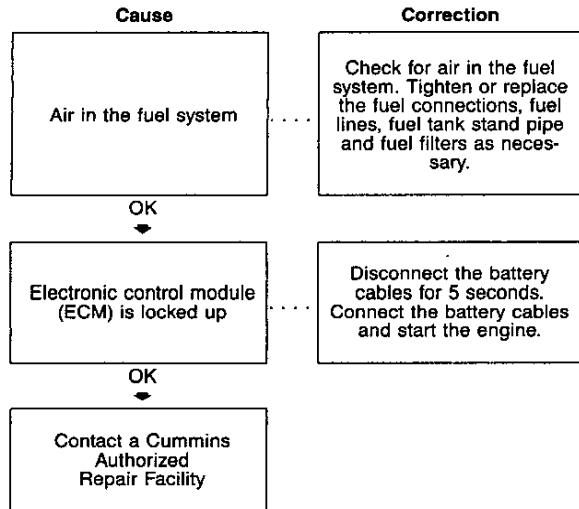


### Engine Difficult to Start or Will Not Start (No Exhaust Smoke)

This is symptom tree T044.

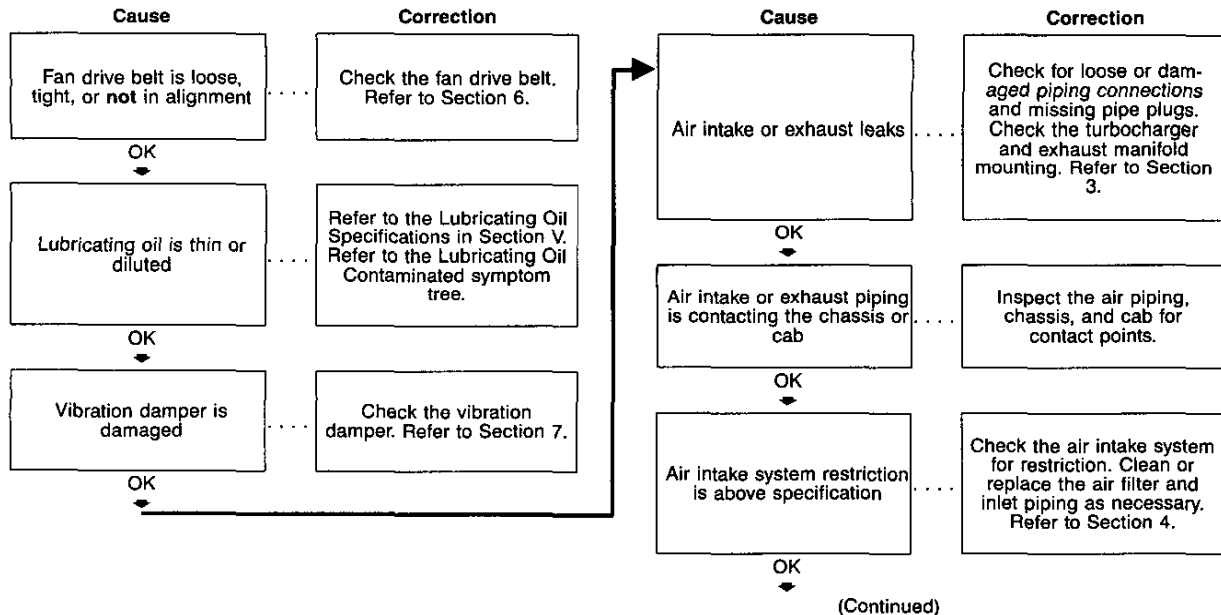


### Engine Difficult to Start or Will Not Start (No Exhaust Smoke) (Continued)

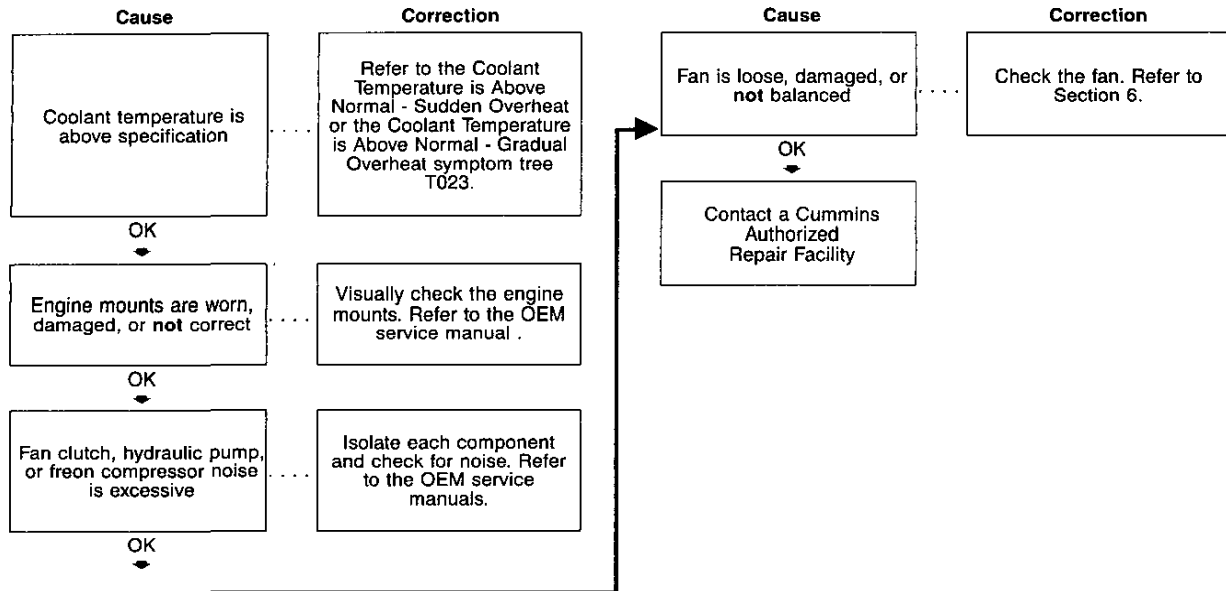


### Engine Noise Excessive

This is symptom tree T047.

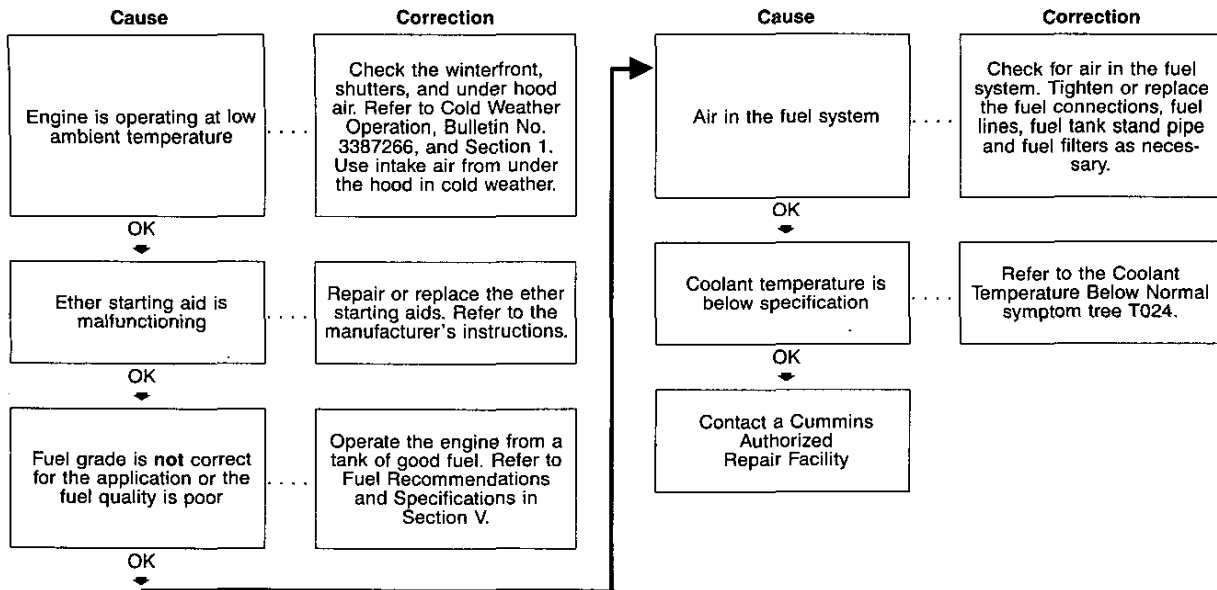


### Engine Noise Excessive (Continued)



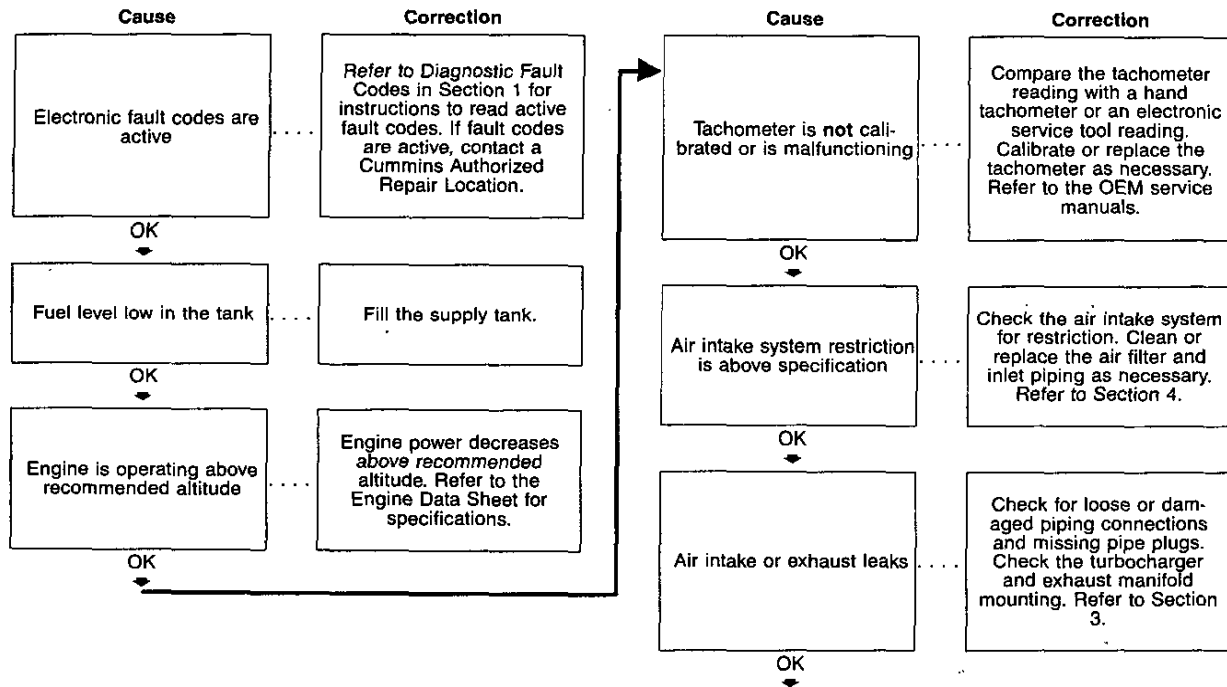
## Engine Noise Excessive — Combustion Knocks

This is symptom tree T048.



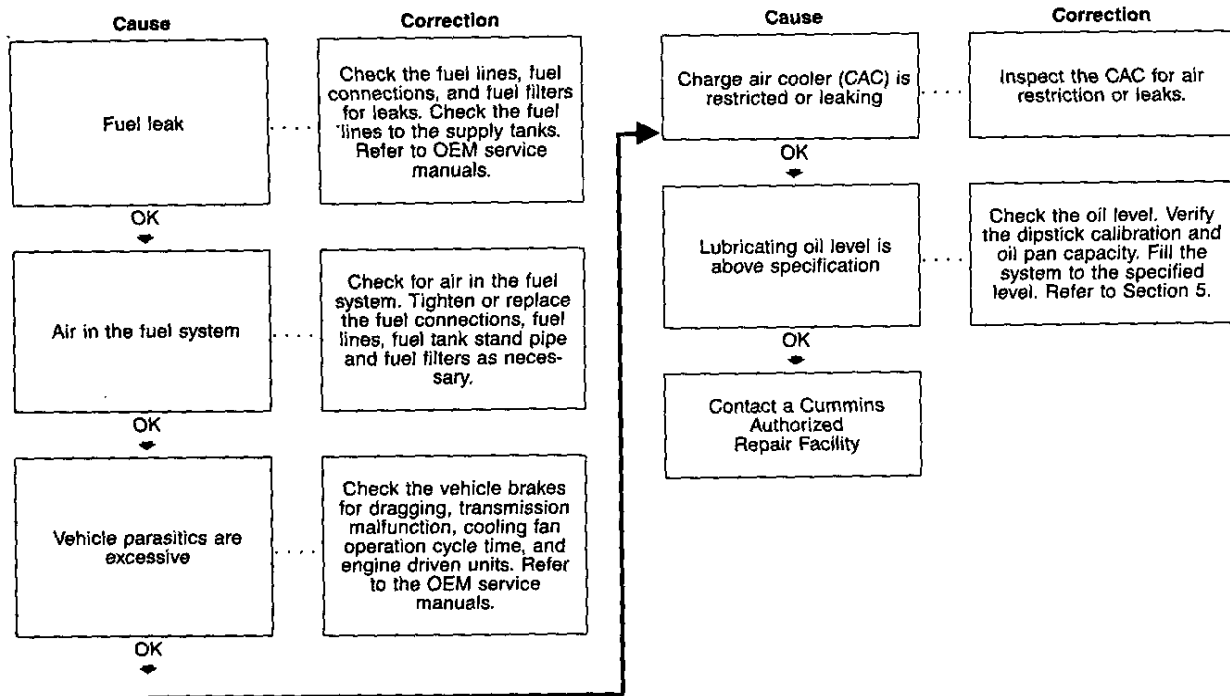
### Engine Power Output Low

This is symptom tree T057.



(Continued)

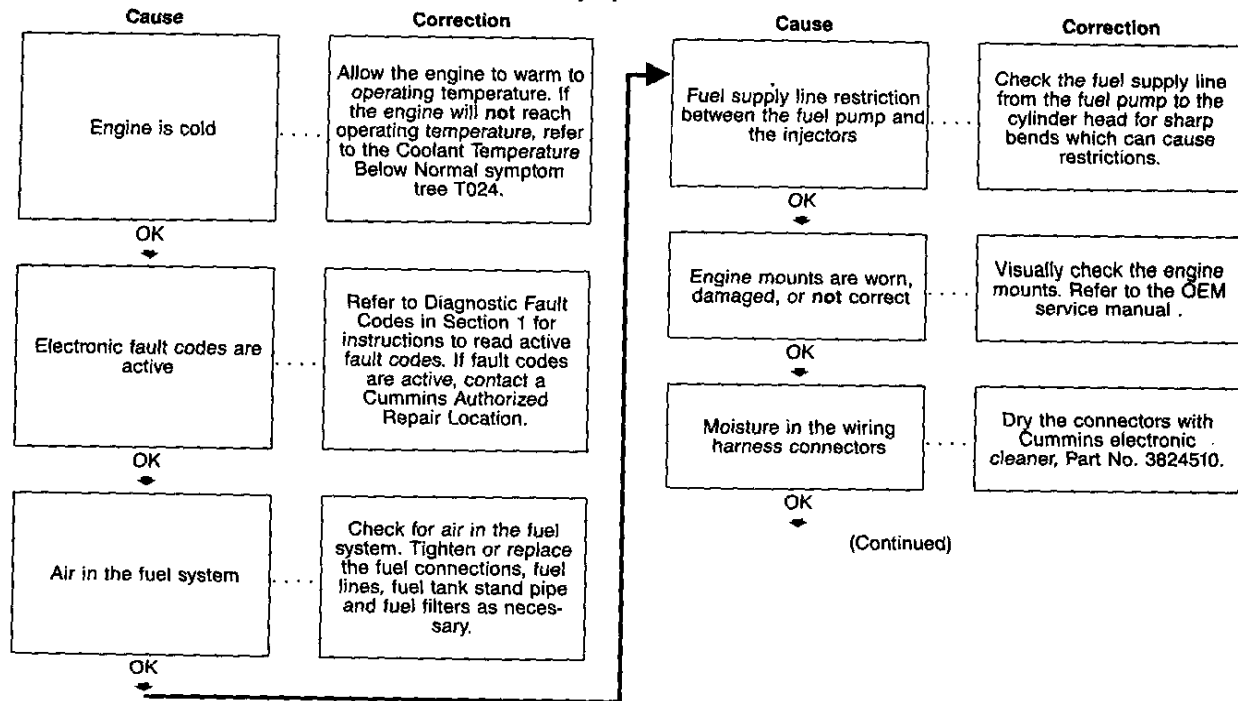
### Engine Power Output Low (Continued)





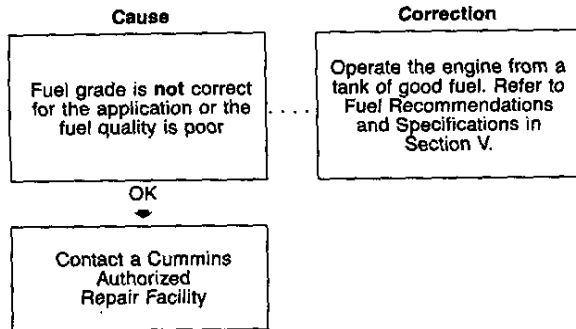
### Engine Runs Rough at Idle

This is symptom tree T061.



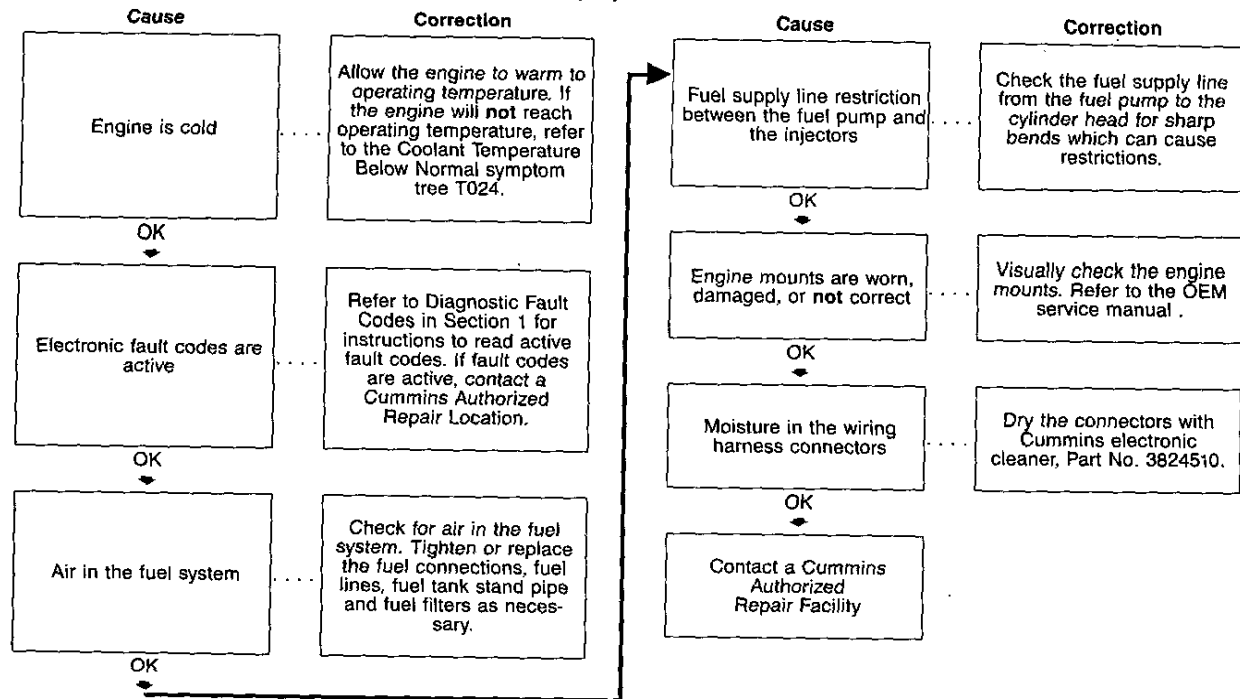
(Continued)

### Engine Runs Rough at Idle (Continued)



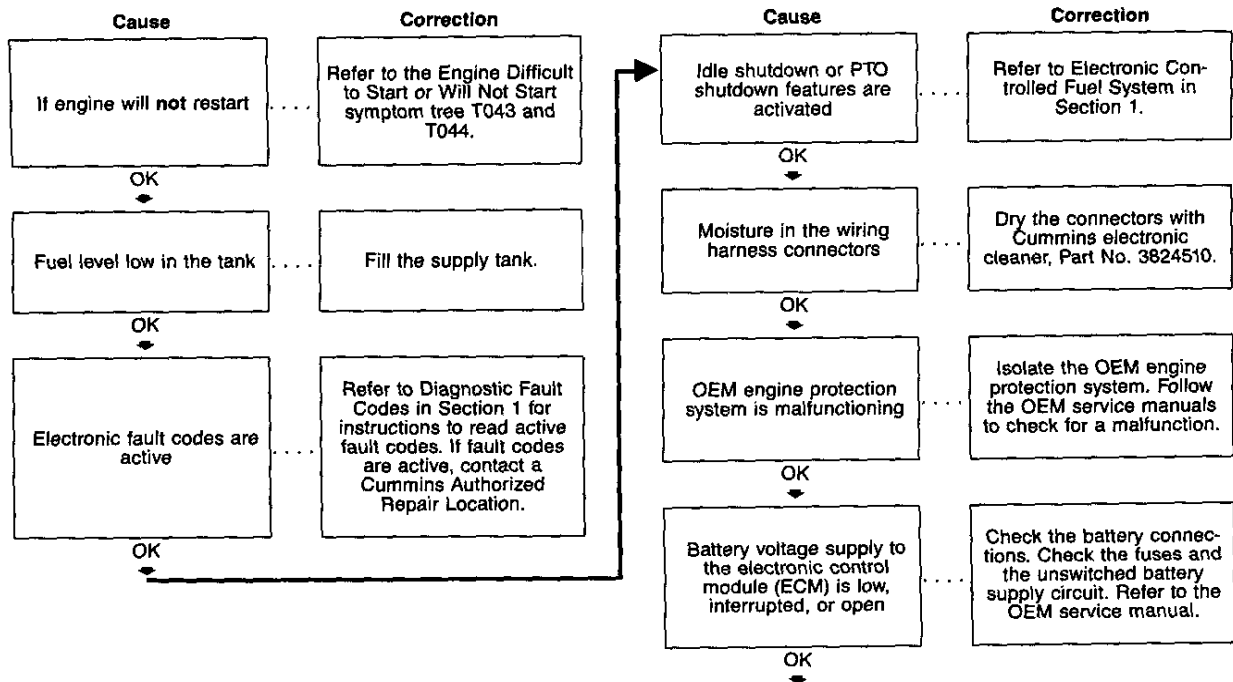
### Engine Runs Rough or Misfires

This is symptom tree T062.



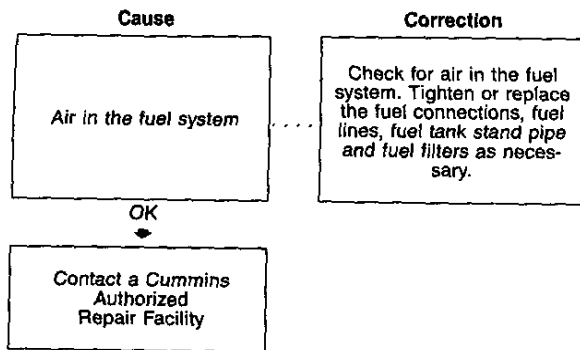
## Engine Shuts Off Unexpectedly or Dies During Deceleration

This is symptom tree T064.



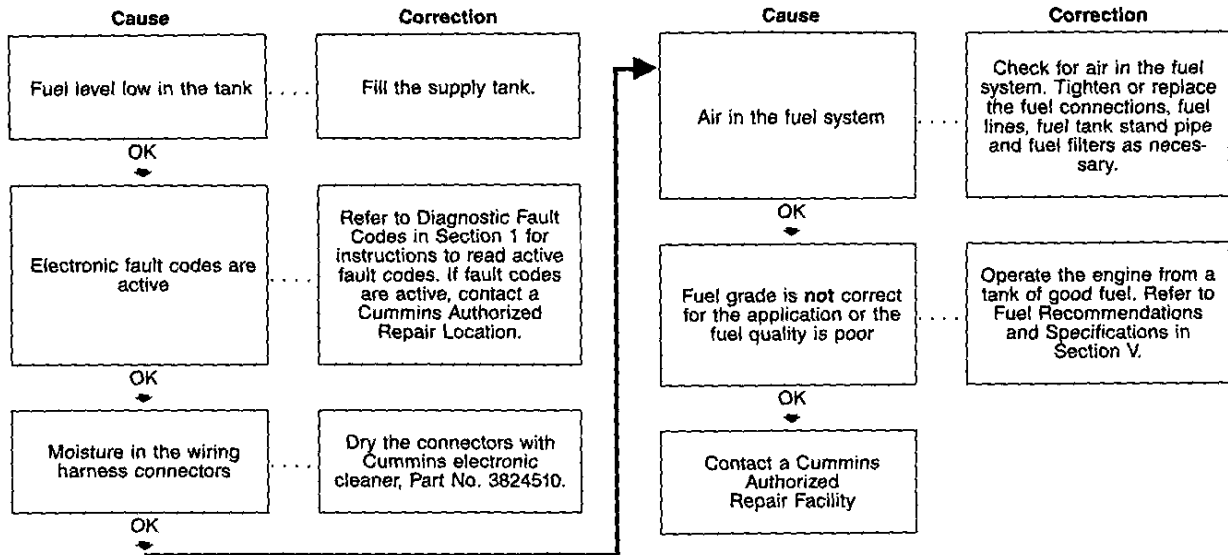
(Continued)

### Engine Shuts Off Unexpectedly or Dies During Deceleration (Continued)



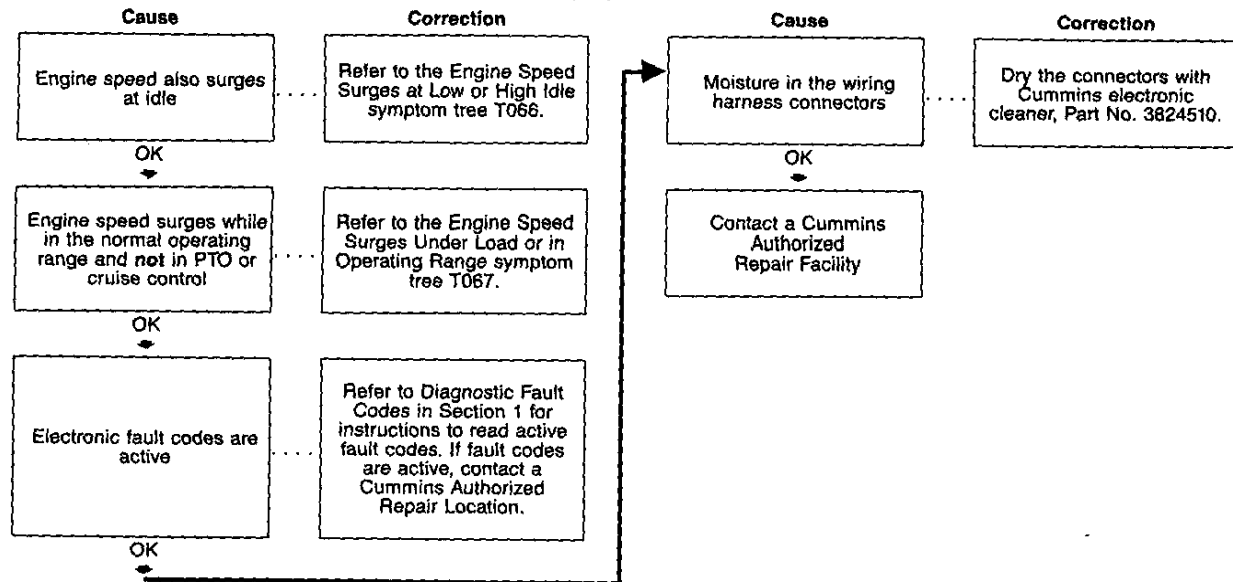
## Engine Speed Surges at Low or High Idle

This is symptom tree T066.



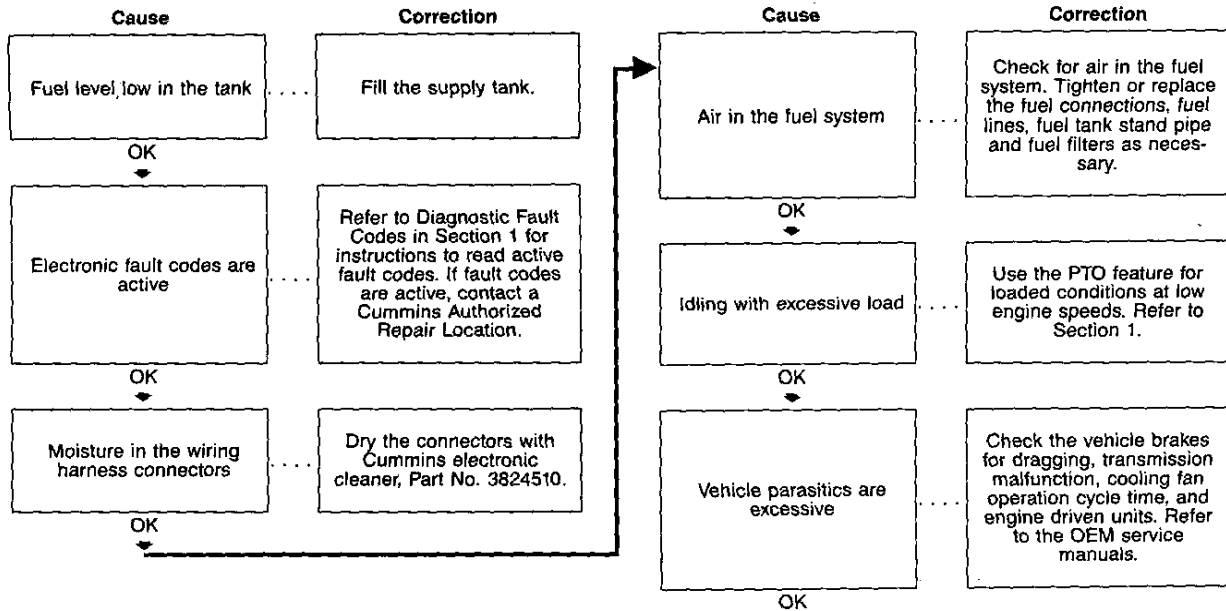
### Engine Speed Surges in PTO or Cruise Control

This is symptom tree T068.



## Engine Speed Surges Under Load or in Operating Range

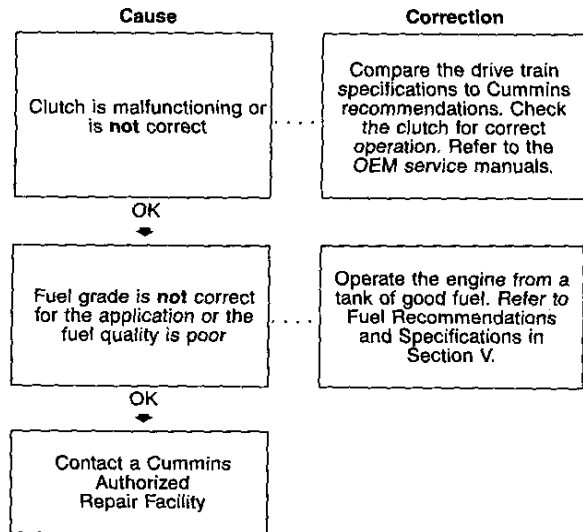
This is symptom tree T067.



(Continued)

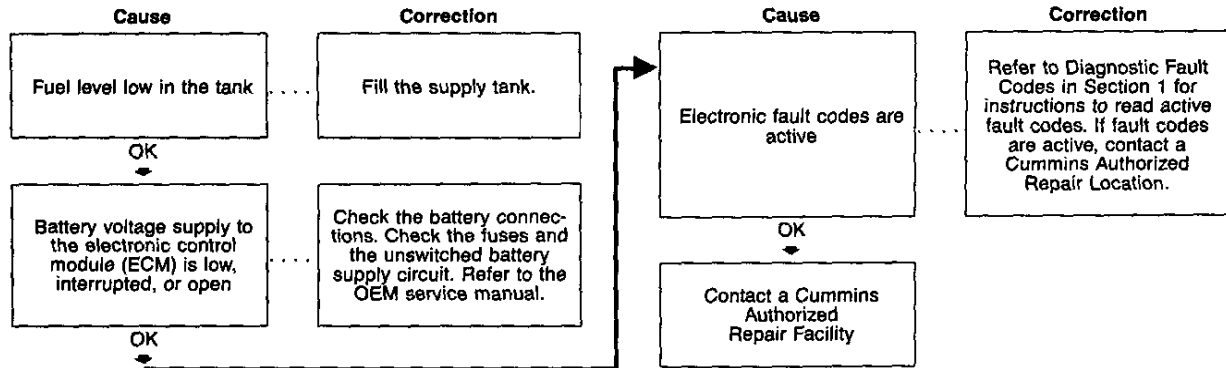


### Engine Speed Surges Under Load or in Operating Range (Continued)



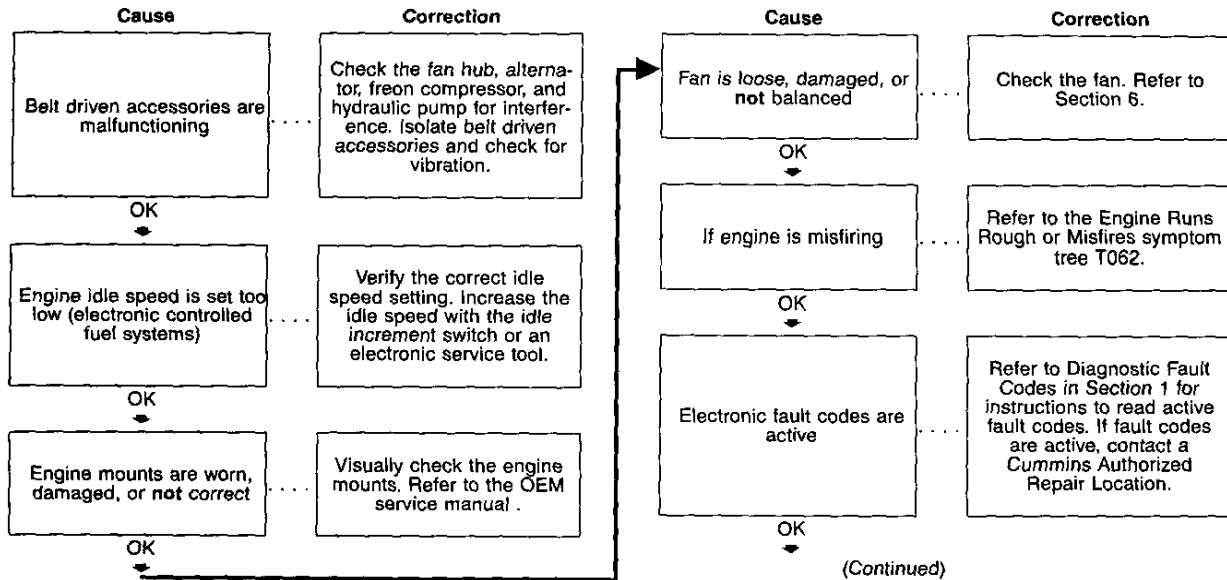
### Engine Starts But Will Not Keep Running

This is symptom tree T072.

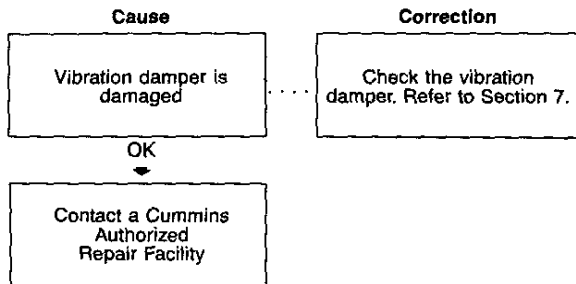


### Engine Vibration Excessive

This is symptom tree T075.

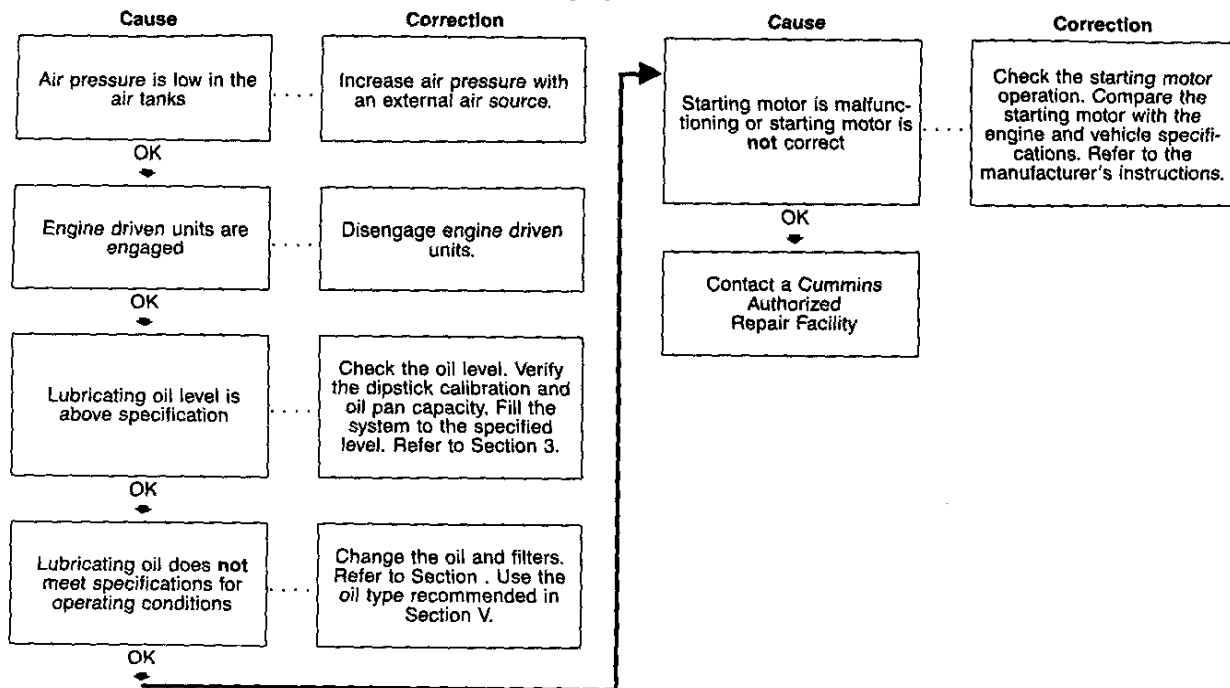


### Engine Vibration Excessive (Continued)



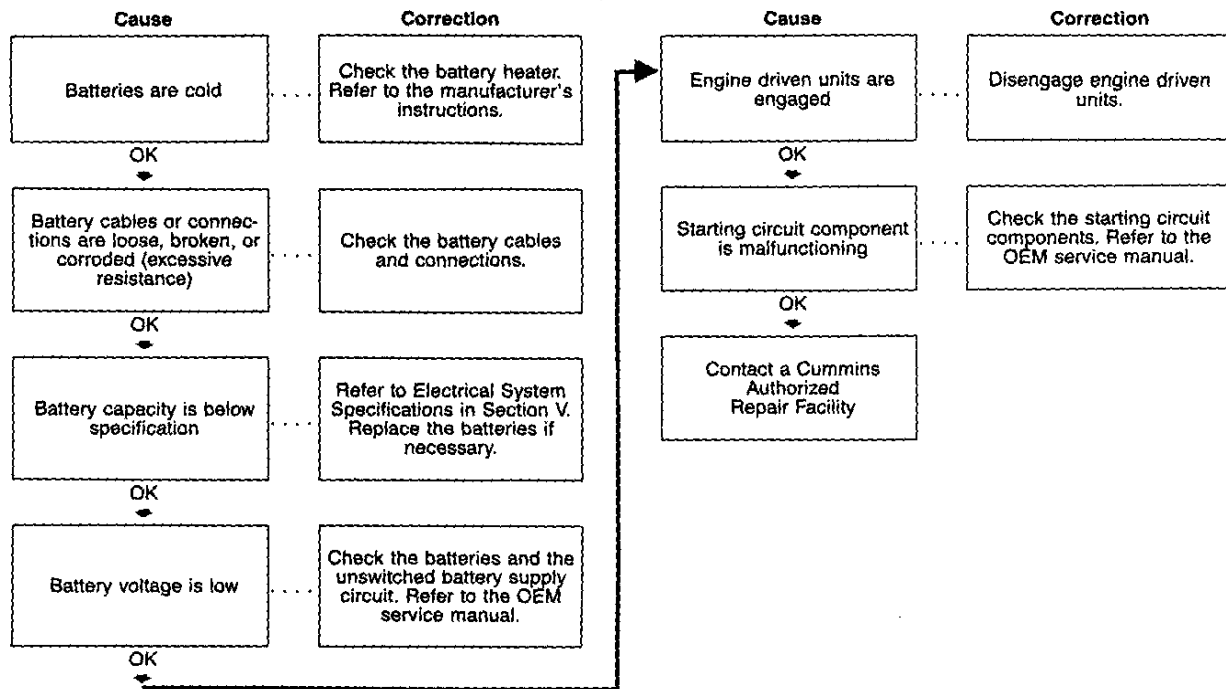
### Engine Will Not Crank or Cranks Slowly (Air Starter)

This is symptom tree T077.



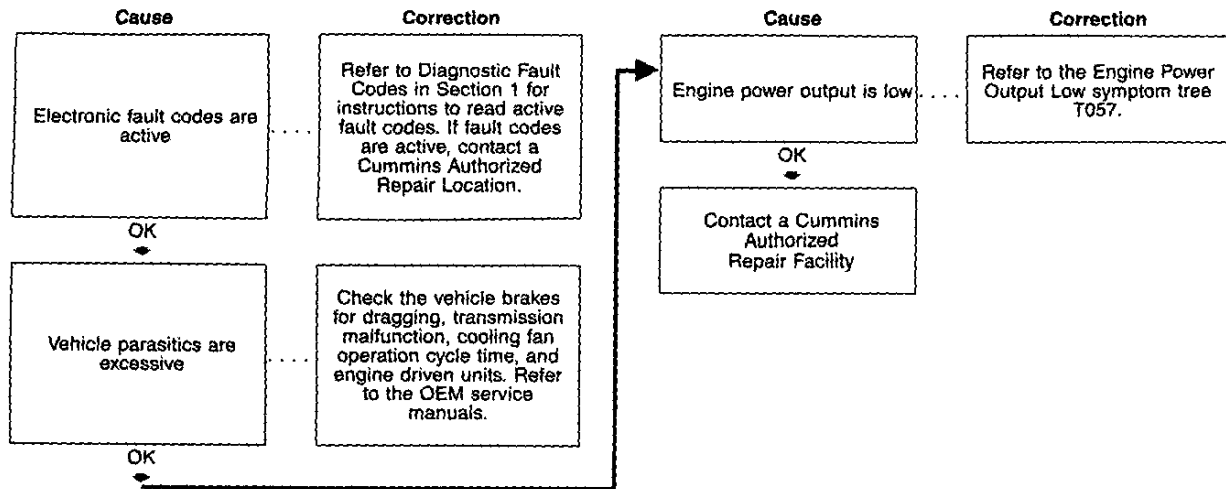
## Engine Will Not Crank or Cranks Slowly (Electric Starter)

This is symptom tree T078.



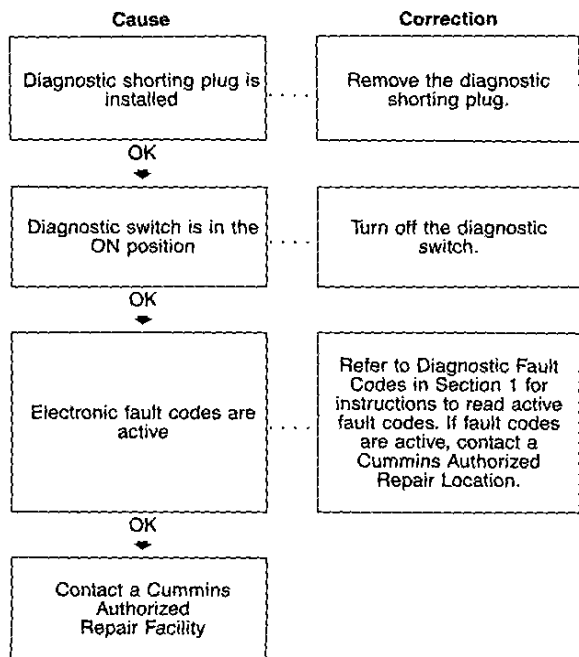
### Engine Will Not Reach Rated Speed (RPM)

This is symptom tree T080.



## Fault Code Warning Lamps Stay On (No Apparent Reason)

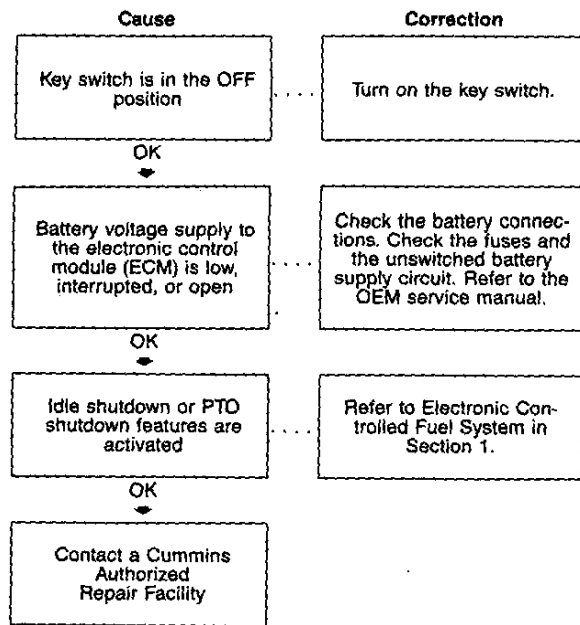
This is symptom tree T083.





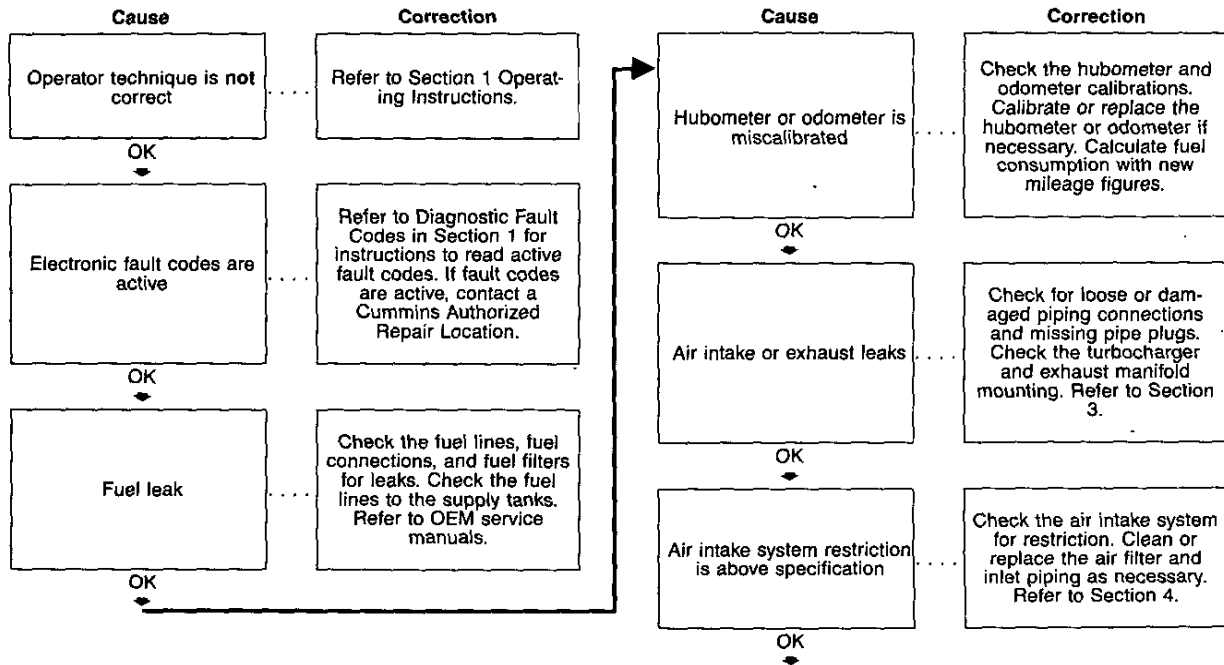
## Fault Code Warning Lamps Do Not Illuminate

This is symptom tree T084.



## Fuel Consumption Excessive

This is symptom tree T087.



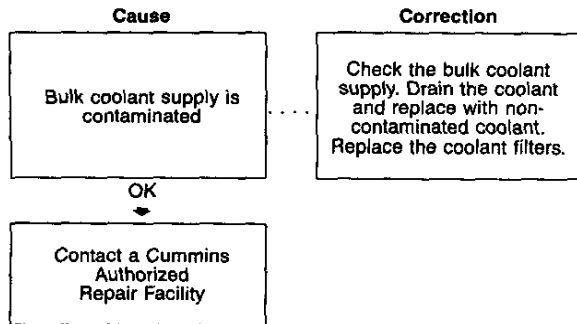
(Continued)

### Fuel Consumption Excessive (Continued)

Cause	Correction
Equipment and environmental factors are affecting fuel consumption	Consider ambient temperatures, wind, tire size, axle alignment, routes, and use of aerodynamic aids when evaluating fuel consumption.
OK	
Lubricating oil level is above specification	Check the oil level. Verify the dipstick calibration and oil pan capacity. Fill the system to the specified level. Refer to Section V.
OK	
Contact a Cummins Authorized Repair Facility	

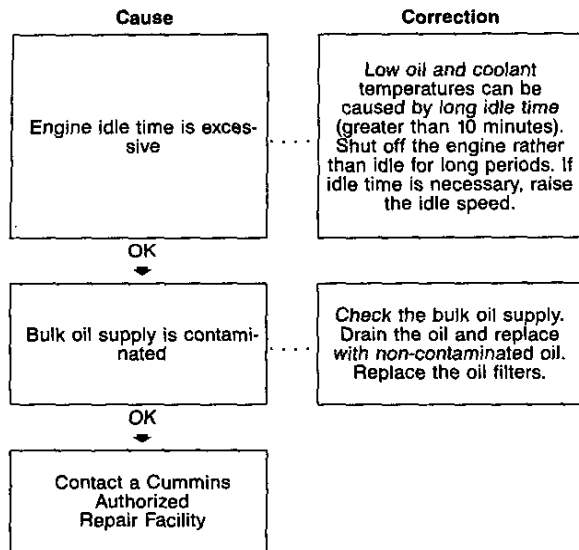
## Fuel in Coolant

This is symptom tree T091.



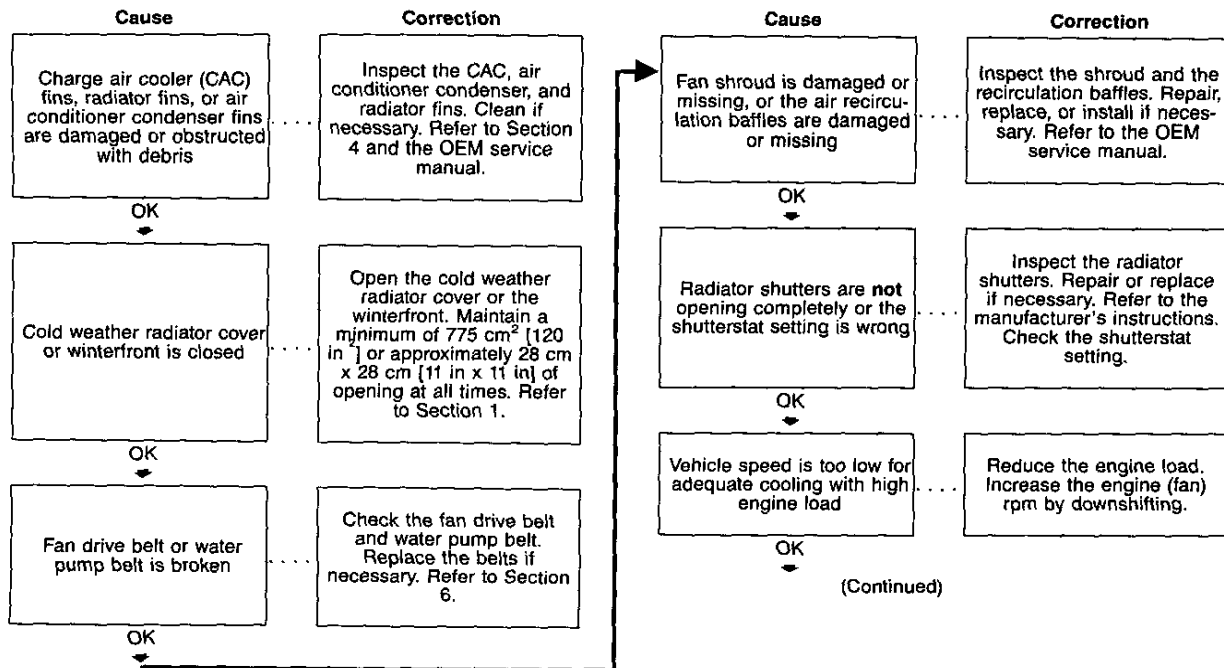
## Fuel in the Lubricating Oil

This is symptom tree T092.



## Intake Manifold Air Temperature Above Specification

This is symptom tree T096.

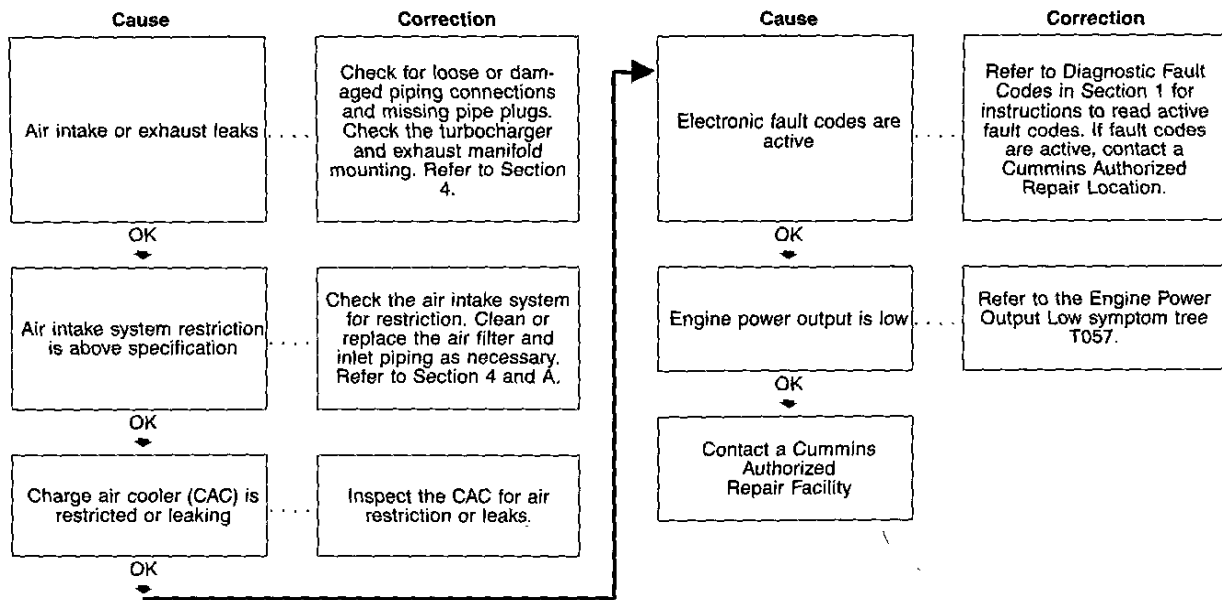


### Intake Manifold Air Temperature Above Specification (Continued)

Cause	Correction
Vehicle cooling system is <b>not</b> adequate	Verify that the engine and vehicle cooling systems are using the correct components. Refer to the OEM specifications.
OK ↓	
Intake manifold temperature gauge is malfunctioning	Test the temperature gauge. Refer to the OEM service manual.
OK ↓	
Fan is <b>not</b> an adequate size for the application	Verify that the fan is the correct size. Refer to the engine and OEM specifications.
OK ↓	
Contact a Cummins Authorized Repair Facility	

## Intake Manifold Pressure (Boost) is Below Normal

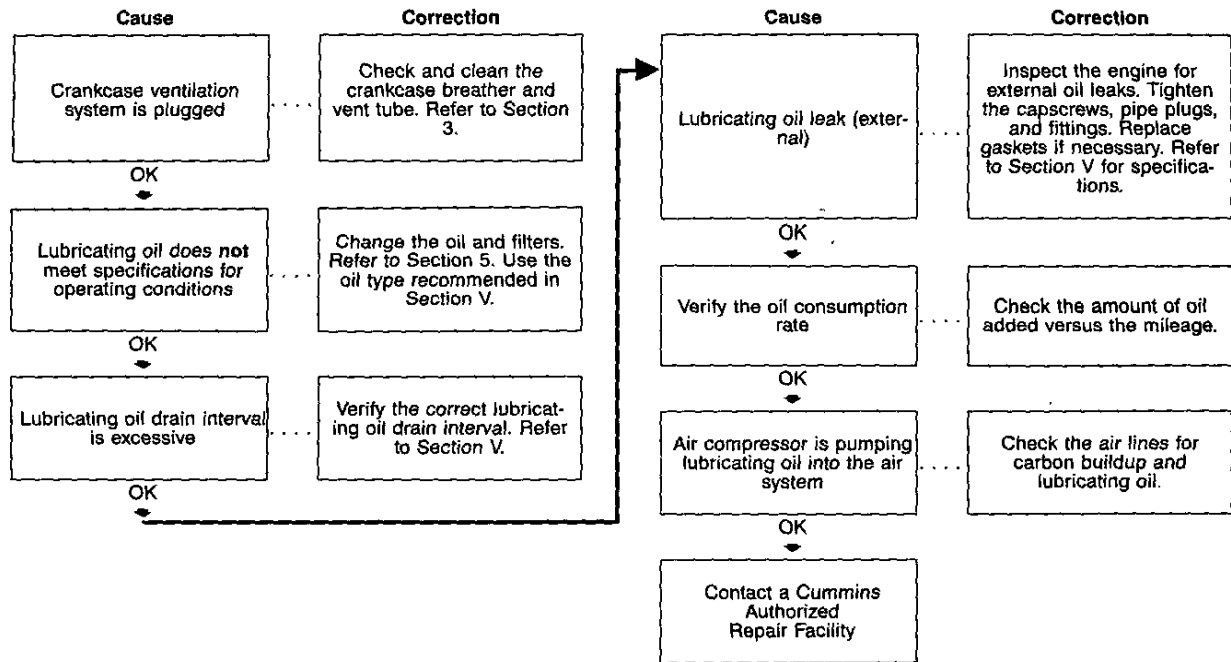
This is symptom tree T097.





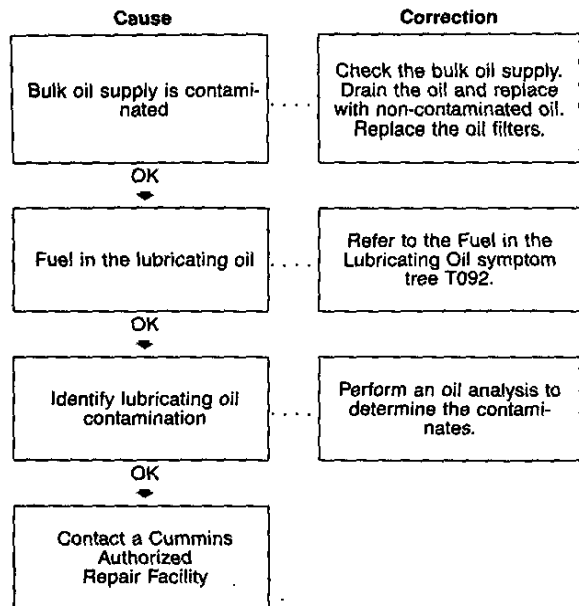
### Lubricating Oil Consumption Excessive

This is symptom tree T102.



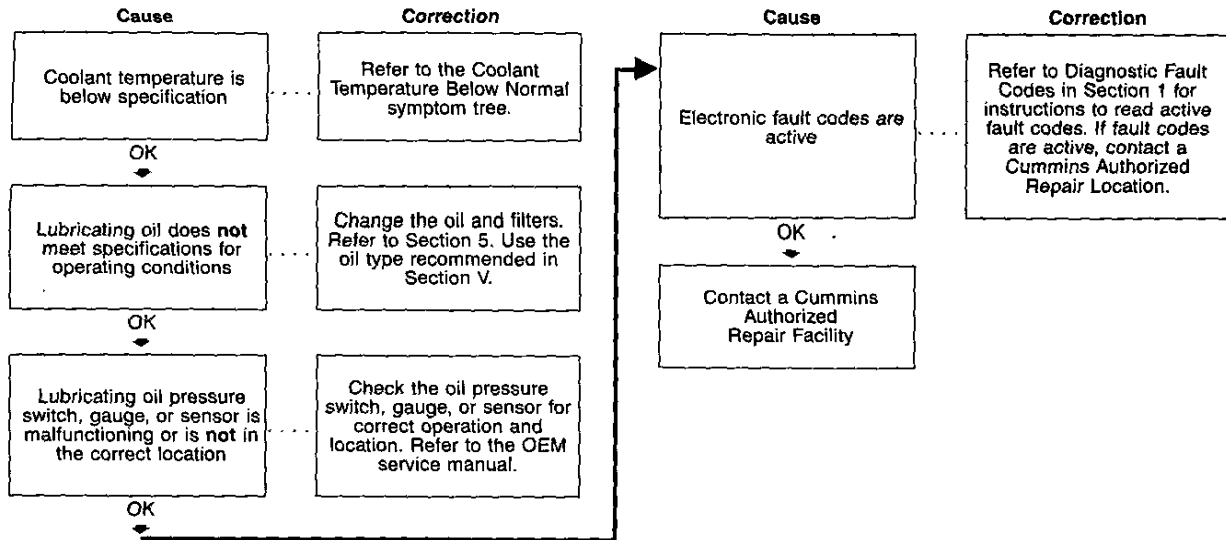
## Lubricating Oil Contaminated

This is symptom tree T103.



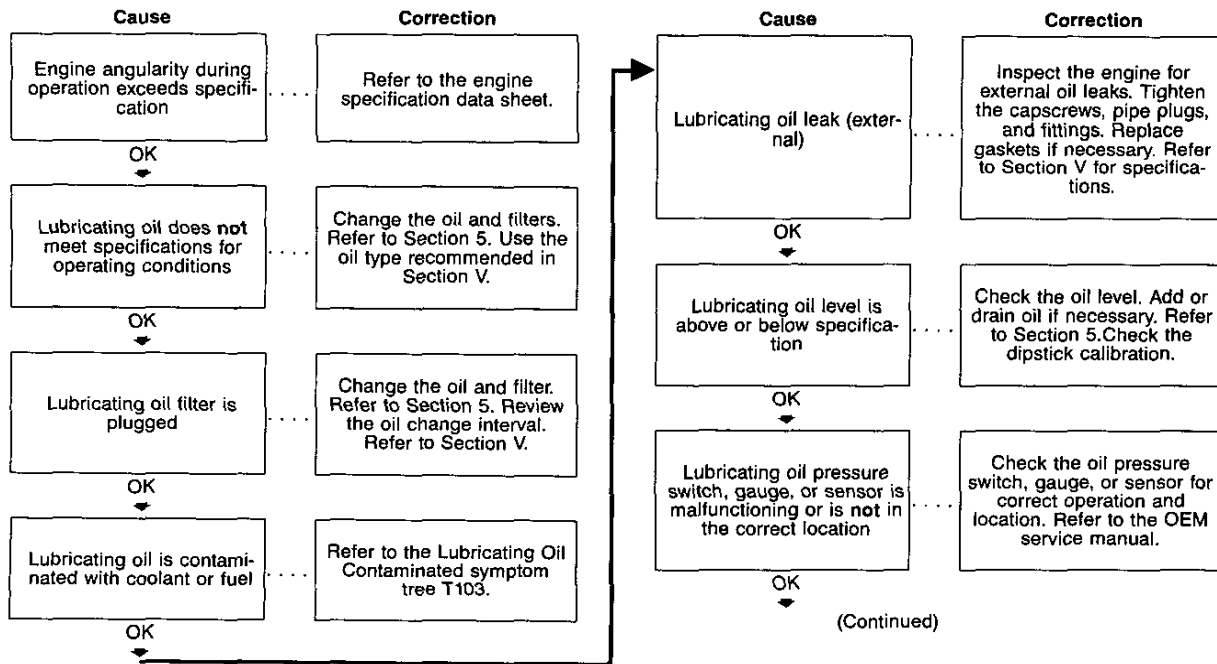
## Lubricating Oil Pressure High

This is symptom tree T104.

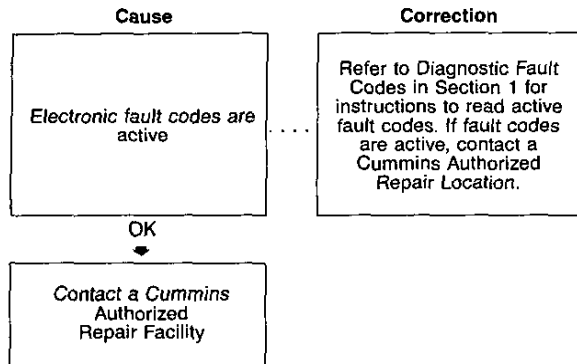


### Lubricating Oil Pressure Low

This is symptom tree T105.

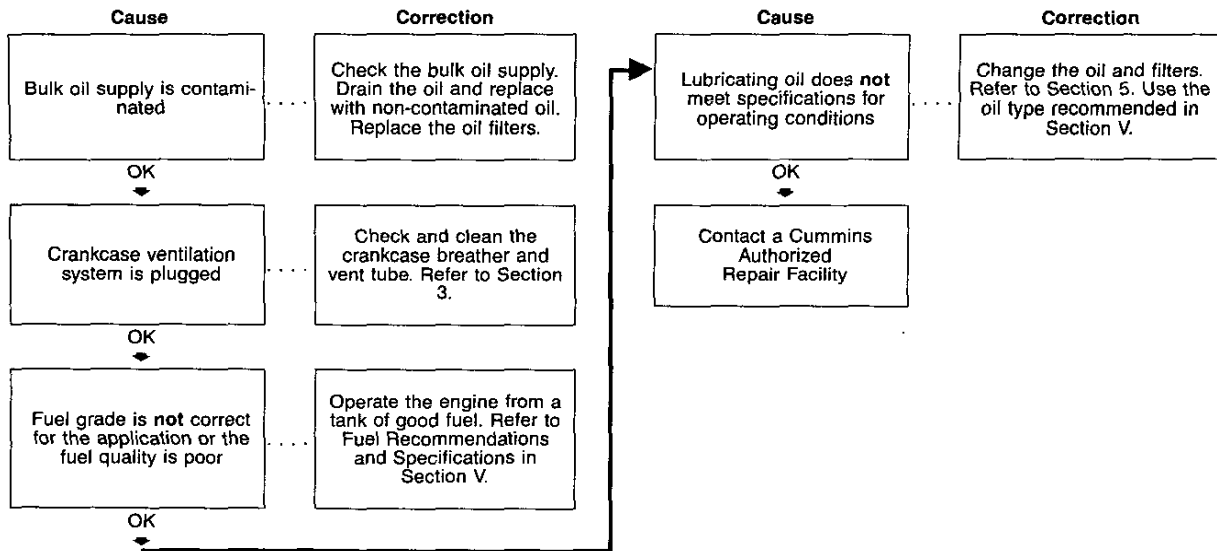


### Lubricating Oil Pressure Low (Continued)



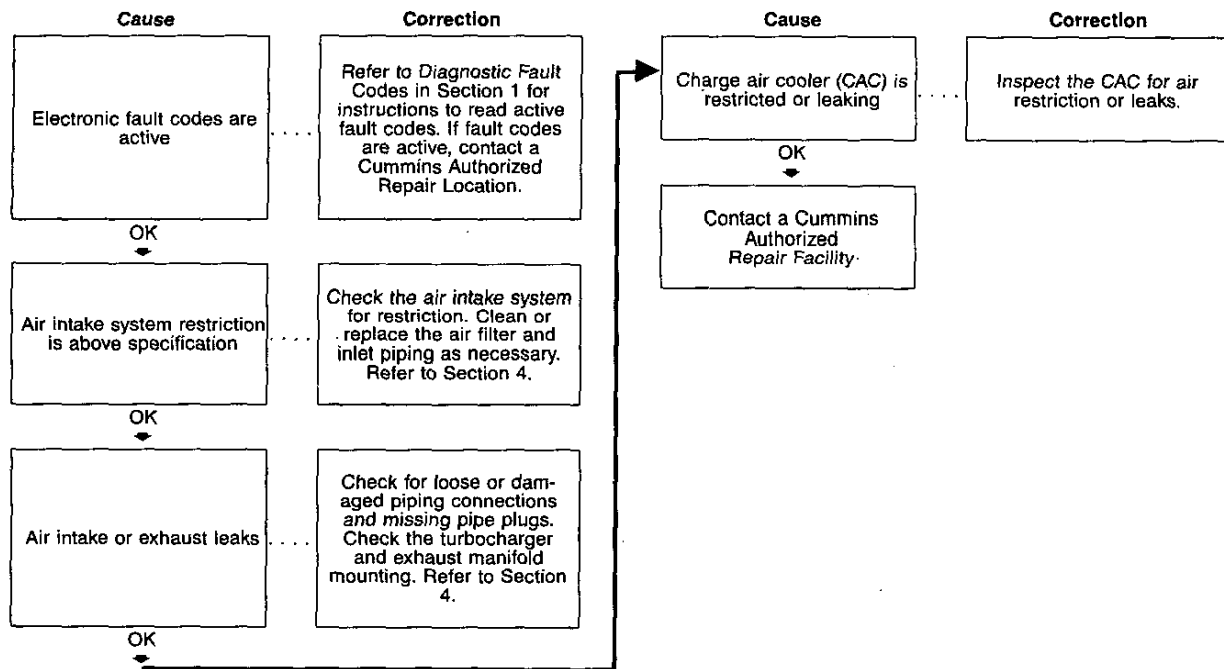
### Lubricating Oil Sludge in the Crankcase Excessive

This is symptom tree T106.



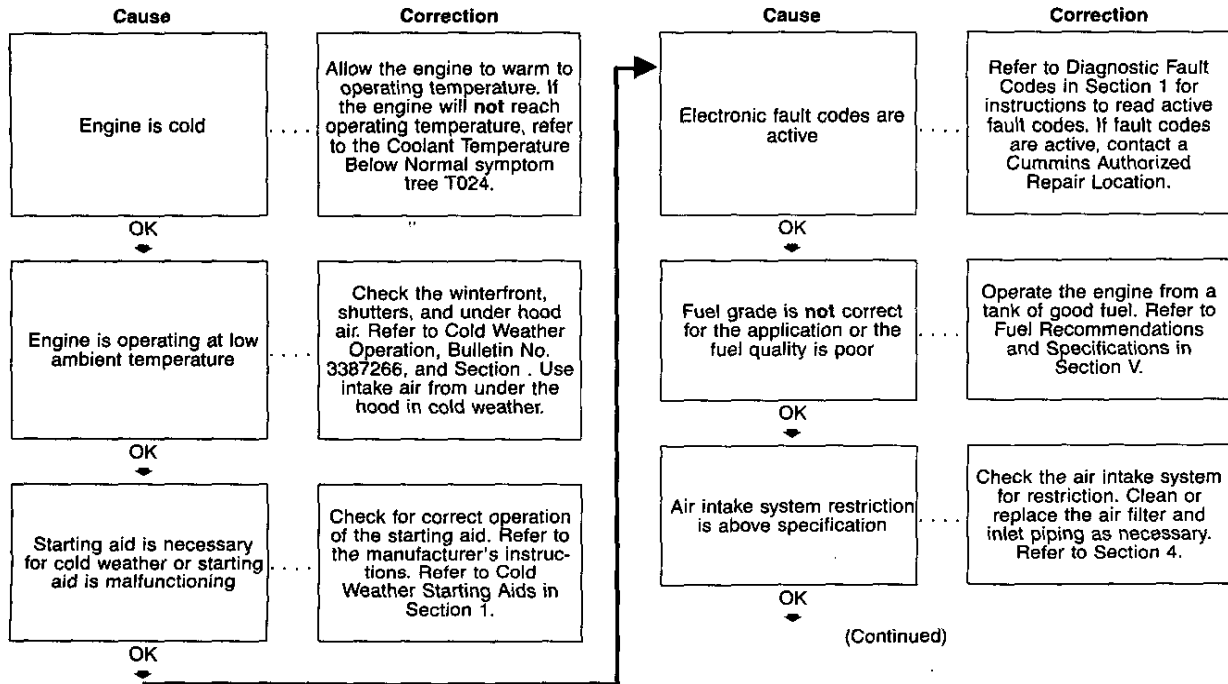
### Smoke, Black — Excessive

This is symptom tree T116.



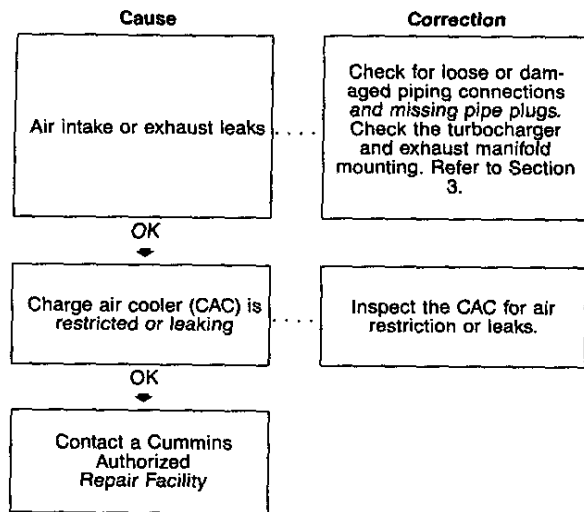
### Smoke, White — Excessive

This is symptom tree T118.



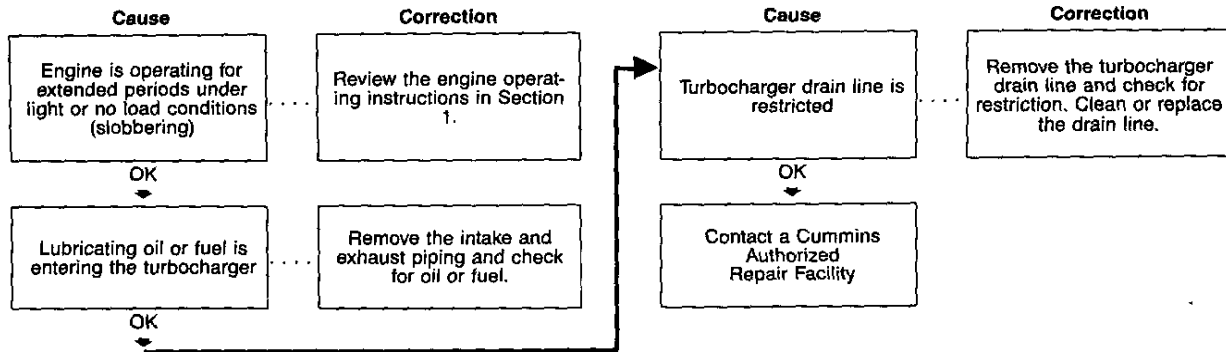


### Smoke, White — Excessive (Continued)



### Turbocharger Leaks Engine Oil or Fuel

This is symptom tree T122.





# Section V - Maintenance Specifications

## Section Contents

	Page
<b>Arctic Operation</b> .....	V-23
General Information .....	V-23
<b>Capscrew Markings and Torque Values</b> .....	V-24
Capscrew Markings and Torque Values — Metric .....	V-25
Capscrew Markings and Torque Values — U.S. Customary .....	V-26
<b>Coolant Recommendations and Specifications</b> .....	V-16
Cooling System Sealing Additives .....	V-19
Cooling System Soluble Oils .....	V-19
Fully Formulated Coolant/Antifreeze .....	V-16
<b>Drive Belt Tension</b> .....	V-20
<b>Engine Component Torque Values</b> .....	V-21
<b>Fuel Recommendations and Specifications</b> .....	V-7
Cummins/Fleetguard® Filter Specifications .....	V-9
Fuel Filter .....	V-9
Fuel Recommendations .....	V-7
<b>Lubricating Oil Recommendations and Specifications</b> .....	V-10
Cummins/Fleetguard® Filter Specifications .....	V-15
Lubricating Oil Filters .....	V-15
General Information .....	V-11
New Engine Break-in Oils .....	V-10
Arctic Operation Engine Oil .....	V-10
Oil Drain Intervals .....	V-14

	Page
<b>Specifications</b> .....	V-1
Air Intake System .....	V-3
Batteries (Specific Gravity) .....	V-5
Cooling System .....	V-3
Cummins/Fleetguard® Filter Specifications .....	V-6
Electrical System .....	V-4
Exhaust System .....	V-4
Fuel System .....	V-2
General Specifications .....	V-1
Lubricating Oil System .....	V-2

## Specifications

### General Specifications

Horsepower (Refer to engine dataplate)

Bore and Stroke ..... 102 mm [4.02 in] X 120 mm [4.72 in]

Displacement ..... 5.9 liters [359 C.I.D.]

Compression Ratio ..... 16.5:1

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

Engine Weight (with Standard Accessories):

Dry Weight ..... 1010

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

Valve Clearance

Intake ..... 0.010

Exhaust ..... 0.020

**NOTE:** The ISB engine features a no—adjust overhead. The ISB valve train is designed such that adjustment of the valve lash is not required for normal service during the first 150,000 miles. The valve train operates acceptably within the limits of 0.006 inch to 0.015 inch intake valve lash and 0.015 inch to 0.030 inch exhaust valve lash.

## Fuel System

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

Engine Idle Speed .....	700 to 875 rpm
Maximum Fuel Inlet Restriction to Lift Pump: .....	152 mm Hg [6 in Hg]
Maximum Fuel Pressure to Fuel Filter Inlet (at Idle) .....	69 kPa [10 psi]
Maximum Pressure Drop Across Fuel Filter .....	10 in Hg [5 psi]
Fuel Drain Line Maximum Restriction .....	20.4 in Hg [10 psi]
Fuel Inlet Maximum Temperature .....	71°C [160°F]
Engine Minimum Cranking Speed .....	150 rpm

## Lubricating Oil System

### Oil Pressure:

Low Idle (Minimum Allowable) .....	69 kPa [10 psi]
at Rated Speed (Minimum Allowed) .....	207 kPa [30 psi]

Regulated Pressure .....

.....	60 psi
-------	--------

### Oil Capacity of Standard Engine:

#### Standard

Pan Only .....	14.2 liters [15 qt.]
Total System .....	16.4 liters [17 qt.]

#### Deep Sump

Pan Only .....	16.1 liters [17 qt.]
Total System .....	18.3 liters [19 qt.]

Oil Pan High — Low	
Standard Pan .....	15 qt — 13 qt
Deep Sump Pan .....	17 qt — 13 qt

**NOTE:** Some applications may use a slightly different lubricating oil pan capacity. Contact your local Cummins Distributor if you have questions.

### **Cooling System**

Coolant Capacity (Engine Only) .....	9.0 Liters [9.5 U.S. qt.]
Standard Modulating Thermostat-Range .....	84°C to 91°C [184°F to 195°F]
Maximum Allowable Operating Temperature .....	100°C [212°F]
Minimum Recommended Operating Temperature .....	71°C [160°F]
Minimum Recommended Pressure Cap .....	48 kPa [7 psi]

### **Air Intake System**

Maximum Intake Restriction (Clean Air Filter Element) .....	254 mm H <sub>2</sub> O [10.0 in H <sub>2</sub> O]
Maximum Intake Restriction (Dirty Air Filter Element) .....	635 mm H <sub>2</sub> O [25.0 in H <sub>2</sub> O]



## Exhaust System

Maximum Back Pressure From Piping and Silencer (Combined):

Hg .....	76 mm [3 in]
H <sub>2</sub> O .....	1016 mm [40 in]

Exhaust Pipe Size (Normally Acceptable Inside Diameter) ..... 76 mm [3 in]

## Electrical System

Minimum Recommended Battery Capacity

System Voltage	Ambient Temperature			
	-18°C [0°F]		0°C [32°F]	
	Cold Cranking Amperes	Reserve Capacity <sup>1</sup> Amperes	Cold Cranking Amperes	Reserve Capacity <sup>1</sup> Amperes
12 Volt	1800	640	1280	480
24 Volt <sup>2</sup>	900	320	640	240

1. The number of plates within a given battery size determines reserve capacity. Reserve capacity determines the length of time which sustained cranking can occur.
2. CCA ratings are based on two 12 volt batteries in series.

**Batteries (Specific Gravity)**

Specific Gravity at 27°C (80°F)	State of Charge
1.260 to 1.280	100%
1.230 to 1.250	75%
1.200 to 1.220	50%
1.170 to 1.190	25%
1.110 to 1.130	Discharged

### Cummins/Fleetguard® Filter Specifications

Fleetguard is a subsidiary of Cummins Engine Company. 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 which the supplier has tested to meet Cummins' high quality standards.

Cummins **cannot** be responsible for problems caused by non-genuine filters which do **not** meet Cummins' performance or durability requirements.

## Fuel Recommendations and Specifications

### Fuel Recommendations

#### ▲ WARNING ▲

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

#### ▲ CAUTION ▲

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

Cummins Engine Company, Inc. recommends the use of ASTM No. 2 D fuel. The use of No. 2 diesel fuel will result in optimum engine performance.

At operating temperatures below 0°C [32°F], acceptable performance can be obtained by using blends of No. 2 D and No. 1 D.

**NOTE:** Lighter fuels can reduce fuel economy or possible damage to the fuel injection pump.

The viscosity of the fuel **must** be kept above 1.3 cSt at 40°C [104°F] to provide adequate fuel system lubrication.

The following chart lists acceptable alternate fuels for ISB Series engines.

Acceptable Substitute Fuels - Cummins ISB Fuel System									
No. 1D Diesel	No. 2D Diesel	No. 1K Kerosene	Jet-A	Jet-A1	JP-5	JP-8	Jet-B	JP-4	CITE
A	OK	A	A	A	A	A	NOT OK	NOT OK	NOT OK

An "A" means OK, only if fuel lubricity is adequate. Wear scar diameter (WSD) less than 0.3 mm at 25°C or 0.4 mm at 60°C as measured with the HFRR method.

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

Additional information for fuel recommendations and specifications can be found in Fuel for Cummins Engines, Bulletin No. 3379001. See ordering information in the back of this manual.

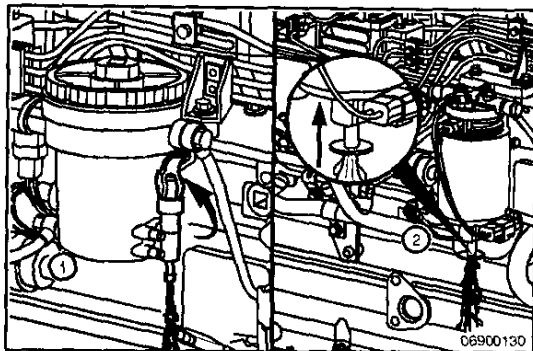
## **Cummins/Fleetguard® Filter Specifications**

### **Fuel Filter**

Fuel Water Separator with a water in fuel sensor used in single filter applications.

1. Canister filter.
2. Spin-on filter.

Efficiency rating must meet Cummins specifications for the VP44 fuel system.



## Lubricating Oil Recommendations and Specifications

### New Engine Break-in Oils

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

#### **△ 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.**

*Additional information regarding lubricating oil availability throughout the world is available in the EMA Lubricating Oils Data Book for Heavy Duty Automotive and Industrial Engines. The data book can be ordered from the Engine Manufacturers Association, One Illinois Center, 111 East Wacker Drive, Chicago, IL U.S. A. 60601. The telephone number is: (312) 644-6610.*

### *Arctic Operation Engine Oil*

#### **△ CAUTION △**

**The use of a 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.**

If an engine is operated in ambient temperatures consistently below  $-23^{\circ}\text{C}$  [ $-10^{\circ}\text{F}$ ] and there are no provisions to keep the engine warm when it is **not** in operation, use a synthetic CE/SF or higher API classification engine oil with adequate low temperature properties such as 5W-20 or 5W-30.

The oil supplier **must** be responsible for meeting the performance service 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.

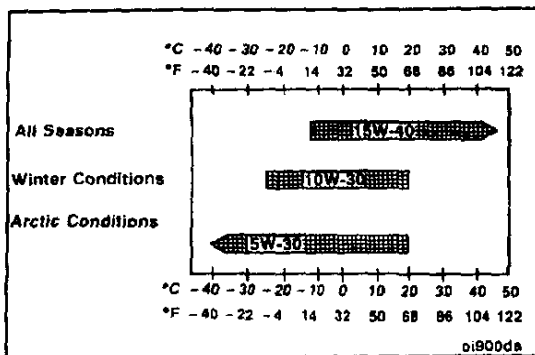
Cummins Engine Company, Inc. recommends the use of a high quality SAE 15W-40 heavy duty engine oil, such as Cummins Premium Blue, which meets the American Petroleum Institute (API) performance classification CG-4/SF or CF-4/SF.

**NOTE:** In areas where CG-4/SF or CF-4/SF engine oils are **not** yet available, contact your Cummins Distributor for other oil recommendations.

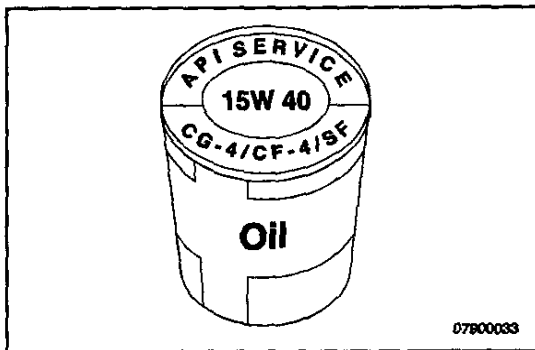
A sulfated ash limit of 1.0 mass percent is suggested for optimum valve and piston deposit, and oil consumption control. The sulfated ash **must not** exceed 1.85 mass percent.

For further details and discussion of engine lubricating oils for Cummins engines, refer to Cummins Engine Oil Recommendations, Bulletin No. 3810340.





The use of low viscosity oils, such as 10W or 10W-30 can be used to aid in starting the engine and in providing sufficient oil flow at ambient temperatures below  $-5^{\circ}\text{C}$  [ $23^{\circ}\text{F}$ ]. However, continuous use of low viscosity oils can decrease engine life due to wear. Refer to the accompanying chart.



The API service symbols are shown in the accompanying illustration. The upper half of the symbol displays the appropriate oil categories.

The lower half can contain words to describe oil energy conserving features.

The center section identifies the SAE oil viscosity grade.

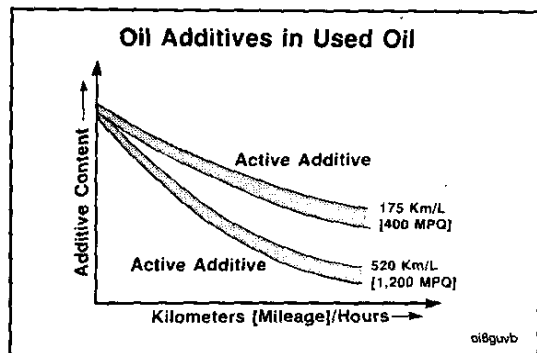
## ISB Engines Section V - Maintenance Specifications

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.

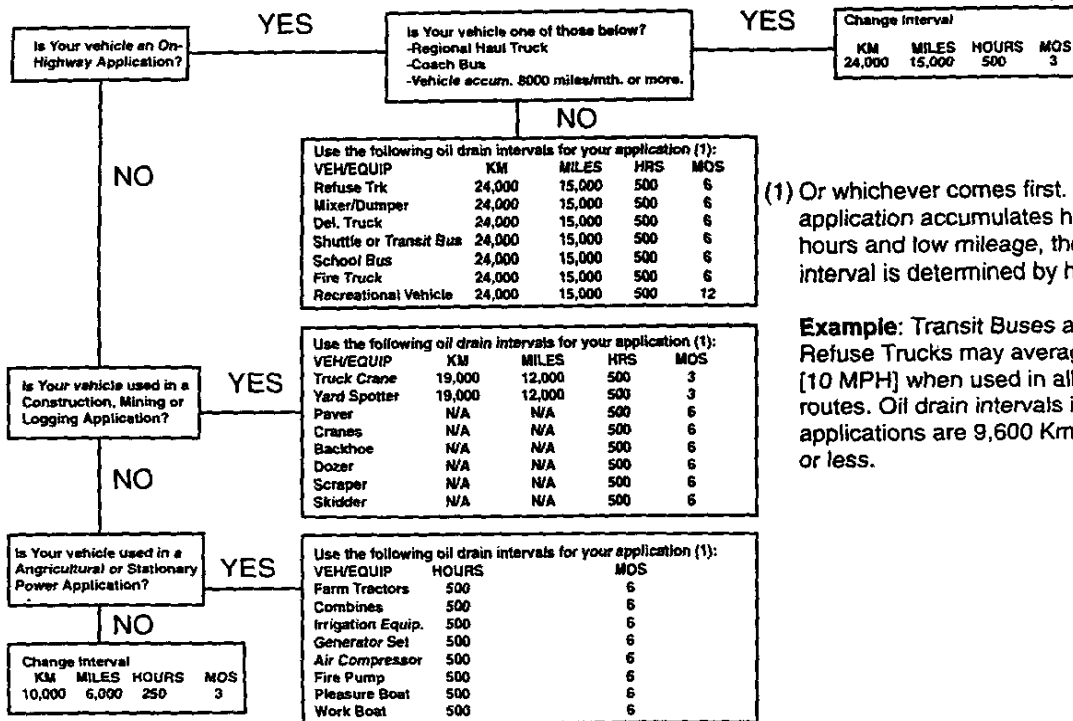
Extending oil and filter change intervals beyond the recommendations will decrease engine life due to factors such as: corrosion, deposits, and wear.

Refer to the oil drain chart in this section to determine which oil drain interval to use for your application.

## Lubricating Oil Recommendations and Specifications Page V-13



### Oil Drain Intervals



(1) Or whichever comes first. If your application accumulates high hours and low mileage, the change interval is determined by hours.

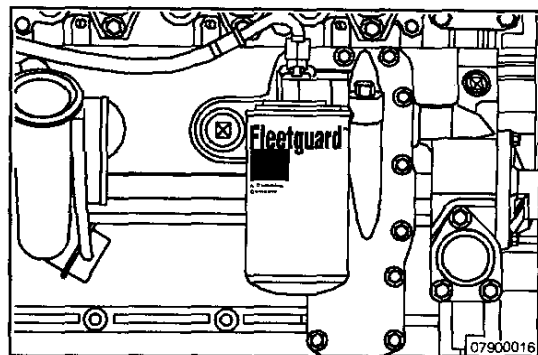
**Example:** Transit Buses and Refuse Trucks may average 16 Km/hr [10 MPH] when used in all urban routes. Oil drain intervals in those applications are 9,600 Km [6,000 mi] or less.

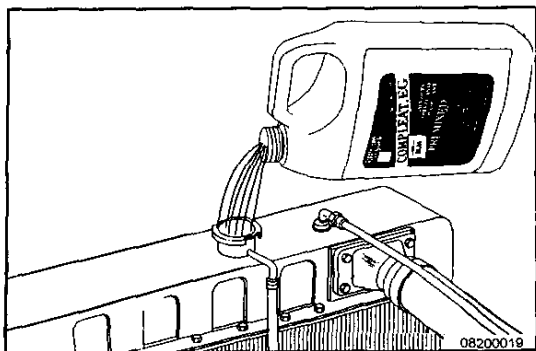
**ISB Engines**  
**Section V - Maintenance Specifications**

**Cummins/Fleetguard® Filter Specifications**

**Lubricating Oil Filters**

Cummins Part No. 3942365 is standard for ISB engine.





## Coolant Recommendations and Specifications

### Fully Formulated Coolant/Antifreeze

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

## Water Quality

Calcium Magnesium (Hardness)	Maximum 170 ppm as (CaCO <sub>3</sub> + MgCO <sub>3</sub> )
Chloride	40 ppm as (Cl)
Sulfur	100 ppm as (SO <sub>4</sub> )

18200001

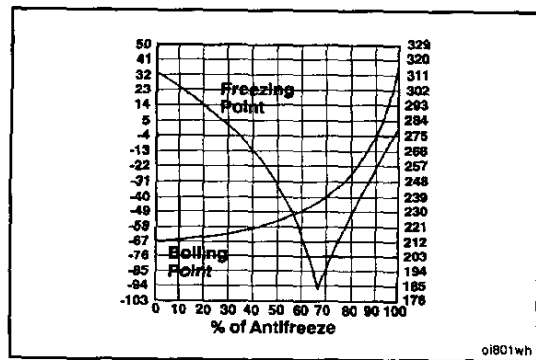
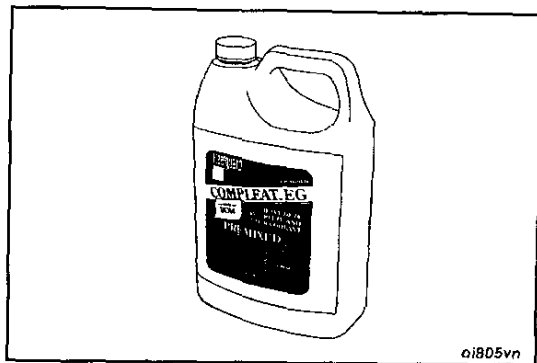
Good quality water is important for cooling system performance. Excessive levels of calcium and magnesium contribute to scaling problems, and excessive levels of chlorides and sulfates cause cooling system corrosion.

## ISB Engines Section V - Maintenance Specifications

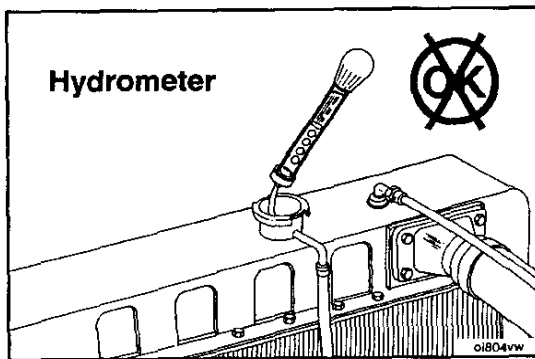
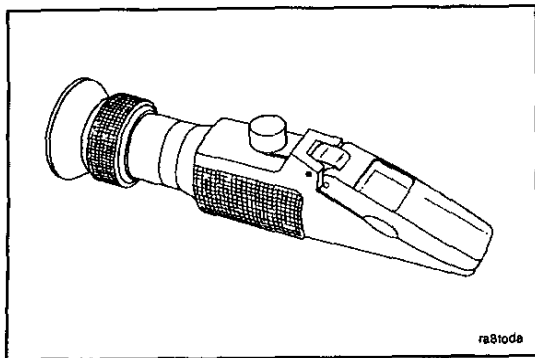
Cummins Engine Company, Inc. recommends using Fleetguard® Compleat. It is available in both glycol forms (ethylene and propylene).

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

## Coolant Recommendations and Specifications Page V-17



A refractometer **must** be used to **accurately** measure the freeze point of the coolant. Use Fleetguard® refractometer, Part No. C2800.



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

### Cooling System Sealing Additives

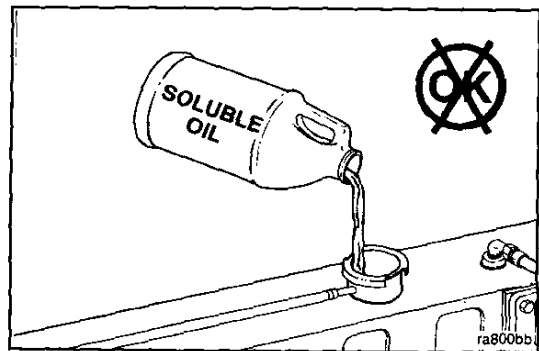
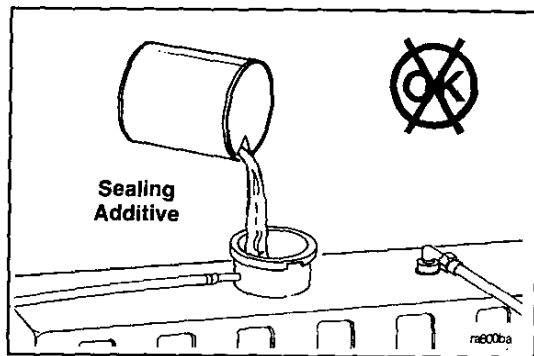
Do **not** use sealing additives in the cooling systems. The use of sealing additives will:

- build up in coolant low flow areas,
- plug radiator and oil cooler.

### Cooling System Soluble Oils

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

- corrode brass and copper,
- damage heat transfer surfaces,
- damage seals and hoses.





## Drive Belt Tension

SAE Belt Size	Belt Tension Gauge Part No.		Belt Tension New		Belt Tension Range Used*	
	Click-type	Burroughs	N	lbf	N	lbf
0.380 in	3822524		620	140	270 to 490	60 to 110
0.440 in	3822524		620	140	270 to 490	60 to 110
1/2 in	3822524	ST-1138	620	140	270 to 490	60 to 110
11/16 in	3822524	ST-1138	620	140	270 to 490	60 to 110
3/4 in	3822524	ST-1138	620	140	270 to 490	60 to 110
7/8 in	3822524	ST-1138	620	140	270 to 490	60 to 110
4 rib	3822524	ST-1138	620	140	270 to 490	60 to 110
5 rib	3822524	ST-1138	670	150	270 to 530	60 to 120
6 rib	3822525	ST-1293	710	160	290 to 580	65 to 130
8 rib	3822525	ST-1293	890	200	360 to 710	80 to 160
10 rib	3822525	3823138	1110	250	440 to 890	100 to 200
12 rib	3822525	3823138	1330	300	530 to 1070	120 to 240
12 rib K section	3822525	3823138	1330	300	890 to 1070	200 to 240

**NOTE:** This chart does not apply to automatic belt tensioners.

- \* A belt is considered used if it has been in service for ten minutes or longer.
- \* If used belt tension is less than the minimum value, tighten the belt to the maximum used belt value.

## Engine Component Torque Values

Component	Wrench Size	Torque Value	
		N•m	ft-lb
Aftercooler Mounting	10 mm	24	18
Aftercooler Water Hose Clamp	8 mm	5	4
Alternator Link (Delco 10-15 SI)	13 mm	24	18
Alternator Link (Delco 20-27 SI)	3/4 in.	43	32
Alternator Mtg. Bolt 10-15 SI	15 mm.	43	32
Alternator Mtg. 27 SI	18 mm	77	57
Alternator Support (Upper)	10 mm	24	18
Belt Tensioner Flat Bracket	Allen 5 mm	24	18
Belt Tensioner Mounting	15 mm	43	32
Crankshaft Damper and Pulley	15 mm	137	101
Crossover Clamp	5/16 in.	5	4
Tee Bolt Type Clamp	11 mm	8	6
Exhaust Outlet Pipe, V Band Clamp	7/16 in.	8	6
Fan Bracket Mounting	10 mm	24	18
Fan Pulley	10 mm	24	18
Fan Pulley	13 mm	43	32

Component	Wrench Size	Torque Value	
		N•m	ft-lb
Fuel Filter	75 to 85	Install as specified by filter manufacturer	
Fuel Filter Adapter Nut	24 mm	32	24
Lubricating Oil Filter	75 to 85	3/4 Turn After Contact	
Lubricating Oil Cooler Assembly	10 mm	24	18
Lubricating Oil Pan Drain Plug	17 mm.	80	60
Lubricating Oil Pan Heater Plug	27 mm	80	60
Lubricating Oil Pressure Regulator Plug	19 mm	80	60
Starting Mounting	10 mm	43	32
Thermostat Housing	10 mm	24	18
Water Inlet Connection	15 mm	43	32
Water Pump Mounting	13 mm	24	18
Valve Cover	15 mm	24	18
Water in Fuel (WIF) Sensor	19 mm	Hand Tight	
Top - Load Filter Lid	3/8 in. Ratchet Drive	24	18 or Hand Tight

## Arctic Operation

### General Information

#### **△ CAUTION △**

**The use of a 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.**

If an engine is operated in ambient temperatures consistently below  $-23^{\circ}\text{C}$  [ $-10^{\circ}\text{F}$ ] and there are no provisions to keep the engine warm when it is **not** in operation, use a synthetic CE/SF or higher API classification engine oil with adequate low temperature properties such as 5W-20 or 5W-30.

The oil supplier **must** be responsible for meeting the performance service specifications.

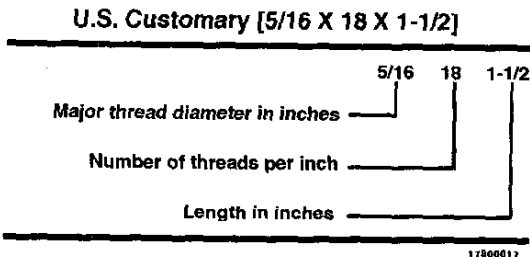
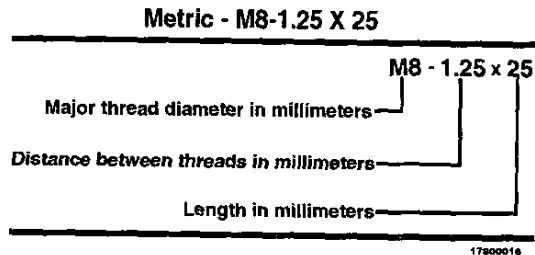
## Capscrew Markings and Torque Values



When replacing capscrews, always use a capscrew of the same measurement and strength as the capscrew being replaced. Using the wrong capscrews can result in engine damage.

Metric capscrews and nuts are identified by the grade number stamped on the head of the capscrew or on the surface of the nuts. U.S. Customary capscrews are identified by radial lines stamped on the head of the capscrew.

The following examples indicate how capscrews are identified:



### NOTES:

1. **Always** use the torque values listed in the following tables when specific torque values are **not** available.
2. Do **not** use the torque values in place of those specified in other sections of this manual.
3. The torque values in the table are based on the use of lubricated threads.
4. When the ft-lb value is less than 10, convert the ft-lb value to in-lb to obtain a better torque with an in-lb torque wrench. Example: 6 ft-lb equals 72 in-lb.

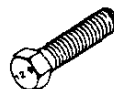
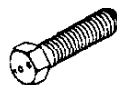
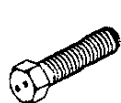
## Capscrew Markings and Torque Values — Metric

Commercial Steel Class  
8.8

10.9




12.9

Capscrew Head Markings



Body Size	Torque				Torque				Torque			
	Cast Iron		Aluminum		Cast Iron		Aluminum		Cast Iron		Aluminum	
	Diam.											
mm	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb
6	9	5	7	4	12	9	7	4	14	9	7	4
7	14	9	11	7	18	14	11	7	23	18	11	7
8	25	18	18	14	33	25	18	14	40	29	18	14
10	45	33	30	25	60	45	30	25	70	50	30	25
12	80	60	55	40	105	75	55	40	125	95	55	40
14	125	90	90	65	165	122	90	65	195	145	90	65
16	180	130	140	100	240	175	140	100	290	210	140	100
18	230	170	180	135	320	240	180	135	400	290	180	135

Capscrew Markings and Torque Values — U.S. Customary

SAE Grade Number	5	8
Capscrew Head Markings		
These are all SAE Grade 5 (3) line		
		
	<b>Capscrew Torque - Grade 5 Capscrew</b>	<b>Capscrew Torque - Grade 8 Capscrew</b>

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
- 28	12	9	9	7	18	13	9	7
5/16 - 18	20	15	16	12	30	22	16	12
- 24	23	17	19	14	33	24	19	14
3/8 - 16	40	30	25	20	55	40	25	20
- 24	40	30	35	25	60	45	35	25
7/16 - 14	60	45	45	35	90	65	45	35
- 20	65	50	55	40	95	70	55	40
1/2 - 13	95	70	75	55	130	95	75	55
- 20	100	75	80	60	150	110	80	60
9/16 - 12	135	100	110	80	190	140	110	80
- 18	150	110	115	85	210	155	115	85
5/8 - 11	180	135	150	110	255	190	150	110
- 18	210	155	160	120	290	215	160	120
3/4 - 10	325	240	255	190	460	340	255	190
- 16	365	270	285	210	515	380	285	210
7/8 - 9	490	360	380	280	745	550	380	280
- 14	530	390	420	310	825	610	420	310
1 - 8	720	530	570	420	1100	820	570	420
- 14	800	590	650	480	1200	890	650	480

## Section W - Warranty

### Section Contents

	<b>Page</b>
California Emission Control System Warranty, Off-Highway .....	W-46
California Emission Control System Warranty, On-Highway .....	W-41
Cummins Warranty, B Series U.S. and Canada Automotive .....	W-1
Cummins Warranty, Diesel Engine School Bus .....	W-12
Cummins Warranty, Fire and Crash Trucks U.S. and Canada .....	W-23
Cummins Warranty, Industrial United States and Canada .....	W-28
Cummins Warranty, Recreational Vehicle United States and Canada .....	W-18
Cummins Warranty, United States and Canada Diesel Engine Intercity Coach, Shuttle and Transit Buses.	W-6
Cummins Warranty, Worldwide Generator Drive .....	W-34



**THIS PAGE LEFT INTENTIONALLY BLANK.**

## Cummins Warranty, B Series U.S. and Canada Automotive

### Coverage

#### Products Warranted

This warranty applies to new B series Engines sold by Cummins Engine Company, Inc., hereinafter "Cummins", and delivered to the first user on or after July 1, 1991, that are used in automotive on-highway applications in the United States\* or Canada with three exceptions. Cummins provides different warranty coverage for engines used in fire truck, bus and coach, and recreational vehicle applications.

#### Base Engine Warranty

This warranty covers any failures of the Engine which result, under normal use and service, from a defect in material or factory workmanship (Warrantable Failure). This coverage begins with the sale of the engine by Cummins and continues for the Duration stated below from the date of delivery of the Engine to the first user.

ENGINE	YEARS	DURATION (whichever occurs first)
		MILES (KILOMETERS)
4 cylinder B series	2	50,000 (80,468 kilometers)
6 cylinder B series	2	unlimited

Additional coverage is outlined in the Emission Warranty section.

#### Consumer Products

This warranty on Consumer Products in the United States is a **LIMITED** warranty. **CUMMINS IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.** Any implied warranties applicable to Consumer Products in the United States terminate concurrently with the expiration of the express warranties applicable to such products. 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**

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, belts, hoses 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.

Cummins will pay reasonable costs for towing a vehicle disabled by a Warrantable Failure to the nearest authorized repair station for the first year from the date of delivery of the Engine to the first user or the duration of the warranty, whichever occurs first. In lieu of the towing expense, Cummins will pay reasonable costs for mechanics to travel to and from the location of the vehicle, including meals, mileage, and lodging when the repair is performed at the site of the failure.

## **Owner Responsibilities**

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. Except for Engines disabled by a Warrantable Failure during the first year from the date of delivery of the Engine to the first user or the duration of the warranty, whichever occurs first, Owner must also deliver the Engine to the repair facility. Locations in the United States and Canada are listed in the Cummins United States and Canada Sales and Service Directory.

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.

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 and for "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.

This warranty does not apply to accessories supplied by Cummins which bear the name of another company. This category includes, but is not limited to: alternators, starters, fans, air conditioning compressors, clutches, filters, transmissions, torque converters, vacuum pumps, power steering pumps, fan drives and air compressors.

Failures resulting in excessive oil consumption are covered for the duration of the coverage or 100,000 miles (160,935 kilometers) or 7000 hours from the date of delivery of the Engine to the first user, whichever of the three occurs first. 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 covered during the first year from the date of delivery of the Engine to the first user or the duration of the warranty, 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.**

**THIS WARRANTY AND THE EMISSION WARRANTY SET FORTH HEREINAFTER 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 B series Engines marketed by Cummins that are used in the United States\* in vehicles designed for transporting persons or property on a street or highway. This warranty applies to Engines delivered to the ultimate purchaser on or after January 1, 1990.

### **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 material or factory workmanship which would cause it not to meet these regulations within the longer of the following periods: (A) Five years or 100,000 miles (160,935 kilometers) 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 material or factory workmanship, are not covered by this warranty.

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

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

### **CUMMINS IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.**

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

## **Cummins Warranty, United States and Canada Diesel Engine Intercity Coach, Shuttle and Transit Buses**

### **Coverage**

#### **Products Warranted**

This warranty applies to new B, C, L, M, and N series diesel engines sold by Cummins Engine Company, Inc., hereinafter "Cummins" and delivered to the first user on or after January 1, 1996, that are used in transit, intercity coach, and shuttle bus applications in the United States\* or Canada.

#### **Base Engine Warranty**

The Base Engine Warranty covers any failures of the Engine which result, under normal use and service, from a defect in material or factory workmanship (Warrantable Failure). This coverage begins with the sale of the engine by Cummins and continues for two years from the date of delivery of the Engine to the first user.

#### **Extended Major Components Warranty**

The Extended Major Components Warranty applies only to C, L, M and N series engines and covers Warrantable Failures of the engine cylinder block, camshaft, crankshaft, connecting rods and Cummins fan clutch (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 300,000 miles (482,805 kilometers) or 10,800 hours of operation, whichever occurs first, from the date of delivery of the Engine to the first user.*

#### **Emission Warranty**

*Additional coverage is outlined in the Emission Warranty on the back page.*

## Consumer Products

This warranty on Consumer Products in the United States is a **LIMITED** warranty. **CUMMINS IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.** Any implied warranties applicable to Consumer Products in the United States terminate concurrently with the expiration of the express warranties applicable to such products. 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, belts, hoses 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.

Cummins will pay reasonable costs for towing a vehicle disabled by a Warrantable Failure to the nearest authorized repair location when necessary to make the repair. In lieu of towing expenses, Cummins will pay reasonable costs for mechanics to travel to and from the location of the vehicle, including meals, mileage, and lodging, when the repair is performed at the site of the failure.

### During The Extended Major Components Warranty

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



## **Owner Responsibilities**

### **During The Base Engine Warranty**

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

### **During The Extended Major Components Warranty**

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

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

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

### **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 Manuals. 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. Except for Engines disabled by a Warrantable Failure during the Base Engine Warranty, the Owner must also deliver the Engine to the repair facility. Locations in the United States and Canada are listed in the Cummins United States and Canada 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 and for "downtime" expenses, passenger delays, fines, cargo damage, 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.

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, vacuum pumps, power steering pumps and air compressors.

Excessive oil consumption for B series engines is covered for the duration of the coverage or 100,000 miles (160,935 kilometers) or 7000 hours from the date of delivery of the Engine to the first user, whichever of the three occurs first. 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 covered for the first year from the date of delivery of the Engine to the first user.

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 AND THE EMISSION WARRANTY SET FORTH HEREINAFTER 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 transporting persons or property on a street or highway*. This warranty applies to Engines delivered to the ultimate purchaser on or after January 1, 1996.

### **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 material or factory workmanship which would cause it not to meet these regulations *within the longer of the following periods: (A) Five years or 100,000 miles (160,935 kilometers) 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 material or factory workmanship, are not covered by this warranty.

Cummins is not responsible for failures or damage resulting from what Cummins determines to be abuse or neglect, including, but not limited to: operation without adequate coolants or lubricants; overfueling; overspeeding; lack of maintenance of lubricating, cooling or intake systems; improper storage, starting, warm-up, run-in or shutdown

practices; unauthorized modifications of the Engine. Cummins is also not responsible for failures caused by incorrect oil or fuel or by water, dirt or other contaminants in the fuel or oil.

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

**CUMMINS IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.**

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

## **Cummins Warranty, Diesel Engine School Bus**

### **Coverage**

#### **Products Warranted**

This warranty applies to new B, C8.3, L10, M11 and N14 series diesel Engines sold by Cummins Engine Company, Inc., hereafter "Cummins", and delivered to the first user on or after September 15, 1996, that are used in school bus\* applications in the United States\*\* or Canada.

#### **Base Engine Warranty**

The Base Engine Warranty covers any failures of the Engine which result, under normal use and service, from a defect in material or factory workmanship (Warrantable Failure). This coverage begins with the sale of the Engine by Cummins and continues for five years or 100,000 miles (160,935 kilometers), whichever occurs first, from the date of delivery of the Engine to the first user.

#### **Extended Major Components Warranty**

The Extended Major Components Warranty applies only to C8.3, L10, M11 and N14 series Engines and covers Warrantable Failures of the engine cylinder block, camshaft, crankshaft, connecting rods and Cummins fan clutch (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 300,000 miles (482,805 kilometers), whichever occurs first, from the date of delivery of the Engine to the first user.

#### **Emission Warranty**

Additional coverage is outlined in the Emission Warranty on the back page.

## Consumer Products

This warranty on Consumer Products in the United States is a **LIMITED** warranty. **CUMMINS IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.** Any implied warranties applicable to Consumer Products in the United States terminate concurrently with the expiration of the express warranties applicable to such products. 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, belts, hoses 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.

Cummins will pay reasonable costs for towing a vehicle disabled by a Warrantable Failure to the nearest authorized repair location when necessary to make the repair for the first 2 years from the date of delivery of the Engine to the first user. In lieu of towing expenses, Cummins will pay reasonable costs for mechanics to travel to and from the location of the vehicle, including meals, mileage, and lodging, when the repair is performed at the site of the failure.

### During The Extended Major Components Warranty

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

## **Owner Responsibilities**

### ***During The Base Engine Warranty***

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

### ***During The Extended Major Components Warranty***

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

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

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

### ***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. Except for Engines disabled by a Warrantable Failure during the first year from the date of delivery of the Engine to the first user, Owner must also deliver the Engine to the repair facility. Locations in the United States and Canada are listed in the Cummins United States and Canada 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 and for "downtime" expenses, passenger delays, 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.

This warranty does not apply to accessories which bear the name of another company. This category includes, but is not limited to: alternators, starters, fans, air conditioning compressors, clutches, filters, transmissions, torque converters, vacuum pumps, power steering pumps and air compressors. Cummins branded alternators and starters are covered for the first two years from the date of delivery of the Engine to the first user, or the expiration of the Base Engine Warranty, whichever occurs first.

Excessive oil consumption for B series Engines is covered for the duration of the coverage or 100,000 miles (160,935 kilometers) or 7000 hours from the date of delivery of the Engine to the first user, whichever of the three occurs first. 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 year from the date of delivery of the Engine to the first user or the expiration of the applicable Base Warranty, 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 AND THE EMISSION WARRANTY SET FORTH HEREINAFTER 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 transporting persons or property on a street or highway. This warranty applies to Engines delivered to the ultimate purchaser on or after January 1, 1996.

### **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 material or factory workmanship which would cause it not to meet these regulations within the longer of the following periods: (A) Five years or 100,000 miles (160,935 kilometers) 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 material or factory workmanship, are not covered by this warranty.*

*Cummins is not responsible for failures or damage resulting from what Cummins determines to be abuse or neglect, including, but not limited to: operation without adequate coolants or lubricants; overfueling; overspeeding; lack of*

maintenance of lubricating, cooling or intake systems; improper storage, starting, warm-up, run-in or shutdown practices; unauthorized modifications of the Engine. Cummins is also not responsible for failures caused by incorrect oil or fuel or by water, dirt or other contaminants in the fuel or oil.

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

**CUMMINS IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.**

\* A vehicle used to transport students to and from school and school-related events. Vehicle must have warning lights and the words "SCHOOL BUS" written on the front and rear roof caps.

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

## Cummins Warranty, Recreational Vehicle United States and Canada

### Coverage

#### Products Warranted

This warranty applies to new B, C, L10, M11 and N14 series diesel Engines sold by Cummins Engine Company, Inc., hereafter "Cummins", and delivered to the first user on or after September 15, 1996, that are used in recreational vehicle applications in the United States\* or Canada.

#### Base Engine Warranty

The Base Engine Warranty covers any failures of the Engine which result, under normal use and service, from a defect in material or factory workmanship (Warrantable Failure). This coverage begins with the sale of the Engine by Cummins and continues for seven years or 150,000 miles (241,400 kilometers), whichever occurs first, from the date of delivery of the Engine to the first user.

#### Emission Warranty

Additional coverage is outlined in the Emission Warranty on the back page.

#### Consumer Products

This warranty on Consumer Products in the United States is a **LIMITED** warranty. **CUMMINS IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.** Any implied warranties applicable to Consumer Products in the United States terminate concurrently with the expiration of the express warranties applicable to such products. 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, belts, hoses 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.

Cummins will pay reasonable costs for towing a vehicle disabled by a Warrantable Failure to the nearest authorized repair location when necessary to make the repair for the first year from the date of delivery of the Engine to the first user. In lieu of towing expenses, Cummins will pay reasonable costs for mechanics to travel to and from the location of the vehicle, including meals, mileage, and lodging, when the repair is performed at the site of the failure.

## **Owner Responsibilities**

### **During The Base Engine Warranty**

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

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. Except for Engines disabled by a Warrantable Failure during the first year from the date of delivery of the Engine to the first user, Owner must also deliver the Engine to the repair facility. Locations in the United States and Canada are listed in the Cummins United States and Canada 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 and for "downtime" expenses, passenger delays, 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.

This warranty does not apply to accessories which bear the name of another company. This category includes, but is not limited to: alternators, starters, fans, air conditioning compressors, clutches, filters, transmissions, torque converters, vacuum pumps, power steering pumps and air compressors. Cummins branded alternators and starters are covered for the first two years from the date of delivery of the Engine to the first user, or the expiration of the Base Engine Warranty, whichever occurs first.

Excessive oil consumption for B series Engines is covered for the duration of the coverage or 150,000 miles (241,400 km) or 10,000 hours from the date of delivery of the Engine to the first user, whichever of the three occurs first. 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 12 months from the date of delivery of the Engine to the first user or the expiration of the applicable Base Warranty, 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 AND THE EMISSION WARRANTY SET FORTH HEREINAFTER 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 transporting persons or property on a street or highway. This warranty applies to Engines delivered to the ultimate purchaser on or after July 1, 1991.

### **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 material or factory workmanship which would cause it not to meet these regulations within the longer of the following periods: (A) Five years or 100,000 miles (160,935 kilometers) 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 material or factory workmanship, are not covered by this warranty.

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

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

**CUMMINS IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.**

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

## Cummins Warranty, Fire and Crash Trucks U.S. and Canada

### Coverage

#### Products Warranted

This warranty applies to new B, C, L10, M11 and N14 series diesel Engines sold by Cummins Engine Company, Inc., hereinafter "Cummins", and delivered to the first user on or after September 15, 1996, that are used in fire truck and crash rescue vehicle applications in the United States\* or Canada.

#### Base Engine Warranty

The Base Engine Warranty covers any failures of the Engine which result, under normal use and service, from a defect in material or factory workmanship (Warrantable Failure). This coverage begins with the sale of the engine by Cummins and continues for five years or 100,000 miles (160,935 kilometers), whichever occurs first, from the date of delivery of the Engine to the first user.

Additional coverage is outlined in the Emission Warranty section.

#### Consumer Products

This warranty on Consumer Products in the United States is a **LIMITED** warranty. **CUMMINS IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.** Any implied warranties applicable to Consumer Products in the United States terminate concurrently with the expiration of the express warranties applicable to such products. 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

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, belts, hoses 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*.

Cummins will pay reasonable costs for towing a vehicle disabled by a *Warrantable Failure* to the nearest authorized repair location. In lieu of the towing expense, Cummins will pay reasonable costs for mechanics to travel to and from the location of the vehicle, including meals, mileage, and lodging when the repair is performed at the site of the failure.

## **Owner Responsibilities**

Owner is responsible for the operation and maintenance of the Engine as specified in Cummins Operation and Maintenance Manuals. 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. Except for Engines disabled by a *Warrantable Failure*, Owner must also deliver the Engine to the repair facility. Locations in the United States and Canada are listed in the *Cummins United States and Canada Sales and Service Directory*.

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*.

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 and for "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.

This warranty does not apply to accessories supplied by Cummins which bear the name of another company. Such non-warranted accessories include, but are not limited to: alternators, starters, fans, air conditioning compressors, clutches, filters, transmissions, torque converters, vacuum pumps, power steering pumps, fan drives and air compressors. Cummins branded alternators and starters are covered for the first two years from the date of delivery of the Engine to the first user, or the expiration of the Base Engine Warranty, whichever occurs first.

Failures resulting in excessive oil consumption are not covered beyond the duration of the coverage or 100,000 miles (160,935 kilometers) or 7000 hours from the date of delivery of the Engine to the first user, whichever of the three occurs first. 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 year from the date of delivery of the Engine to the first user or the duration of the warranty, 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.**

**THIS WARRANTY AND THE EMISSION WARRANTY SET FORTH HEREINAFTER 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 transporting persons or property on a street or highway. This warranty applies to Engines delivered to the ultimate purchaser on or after September 1, 1992.

### **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 material or factory workmanship which would cause it not to meet these regulations within the longer of the following periods: (A) Five years or 100,000 miles (160,935 kilometers) 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 material or factory workmanship, are not covered by this warranty.

Cummins is not responsible for failures or damage resulting from what Cummins determines to be abuse or neglect, including, but not limited to: operation without adequate coolants or lubricants; overfueling; overspeeding; lack of maintenance of lubricating, cooling or intake systems; improper storage, starting, warm-up, run-in or shutdown

practices; unauthorized modifications of the Engine. Cummins is also not responsible for failures caused by incorrect oil or fuel or by water, dirt or other contaminants in the fuel or oil.

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

**CUMMINS IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.**

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

## Cummins Warranty, Industrial United States and Canada

### Coverage

#### PRODUCTS WARRANTED

This warranty applies to new Engines sold by Cummins Engine Company, Inc., hereinafter 'Cummins', and delivered to the first user on or after February 1, 1993, 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 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.

## 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.

## Owners 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 January 1, 1996.

### **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.

## **Cummins Warranty, Worldwide Generator Drive**

### **Engines Warranted**

This warranty applies to new Engines sold by Cummins Engine Company, Inc., hereinafter 'Cummins', and delivered to the first user on or after June 1, 1993 that are used in generator drive application anywhere in the world where Cummins approved service is available. These Engines will have the following rating designations:

#### **Standby Power Rating**

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

#### **Unlimited Time Running Prime Power Rating**

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

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

#### **Limited Time Running Prime Power Rating**

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

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

### **Continuous/Base Power Rating**

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

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

## **Coverage**

### **Base Engine Warranty**

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

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

#### **Base Engine Warranty**

<b>Rating</b>	<b>Duration Whichever Occurs First</b>	
	<b>Months</b>	<b>Hours</b>
Standby Power	24	400
Unlimited Prime Power	12	Unlimited
Limited Prime Power	12	750

### Base Engine Warranty

	Duration
	Whichever Occurs First
Continuous/Base Power	12 Unlimited

### Extended Major Components Warranty

The Extended Major Components Warranty applies to Engines other than B and C series and covers Warrantable Failures of the Engine cylinder block, camshaft, crankshaft and connecting rods (Covered Parts). Bushing and bearing failures are not covered. This coverage begins with the expiration of the Base Engine Warranty and continues for the following stated Duration. The Duration commences either on the date of delivery of the Engine to the first user, or on the date the Engine is first leased, rented or loaned, or when the Engine has been operated for 50 hours, whichever occurs first.

### Extended Major Components Warranty

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

### Consumer Products

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

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

## **Cummins Responsibilities**

### **During Base Engine Warranty**

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

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

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

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

### **During the Extended Major Components Warranty**

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

## **Owner's Responsibilities**

### **During the Base Engine Warranty**

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

### **During the Extended Major Components Warranty**

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

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

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

### **During the Base Engine and Extended Major Components Warranties**

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

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

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

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

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

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

## Limitations

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

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

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

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

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

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

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

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

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

**CUMMINS IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.**



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

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

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

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

## **California Emission Control System Warranty, On-Highway**

### **Products Warranted**

This Emission Control System Warranty applies to heavy duty diesel engines (hereafter, engines) certified with the California Air Resources Board beginning with the year 1991, marketed by Cummins, and registered in California for use in automotive on-highway applications.

### **Your Warranty Rights and Obligations**

The California Air Resources Board and Cummins Engine Company, Inc., are pleased to explain the emission control system warranty on your 1992 and subsequent model year heavy duty diesel engine. In California, new motor vehicle engines must be designed, built and equipped to meet the State's stringent anti-smog standards. Cummins must warrant the emission control system on your heavy duty diesel engine for the periods of time listed below provided there has been no abuse, neglect or improper maintenance of your heavy duty diesel engine.

Your emission control system may include parts such as the fuel injection system and engine electronic control module. Also included may be hoses, connectors and other emission-related assemblies.

If an emission-related part on your engine is found to have a defect in material or factory workmanship (Warrantable Condition), the part will be repaired or replaced by Cummins. This is your emission control system defects warranty.

### **Manufacturer's Warranty Coverage**

This warranty coverage is provided for five years or 160,935 km [100,000 miles] or 3,000 hours of engine operation, whichever first occurs from the date of delivery of the engine to the first user.

Where a Warrantable Condition exists, Cummins will repair your engine at no cost to you including diagnosis, parts and labor.

## Owner's Warranty Responsibilities

As the engine owner, you are responsible for the performance of the required maintenance listed in your Cummins Operation and Maintenance Manual. Cummins recommends that you retain all receipts covering maintenance on your engine, but Cummins cannot deny warranty solely for the lack of receipts or for your failure to substantiate the performance of all scheduled maintenance.

You are responsible for presenting your engine to a Cummins dealer as soon as a problem exists. The warranty repairs should be completed in a reasonable amount of time, not to exceed 30 days.

As the engine owner, you should also be aware that Cummins may deny you warranty coverage if your engine or a part has failed due to abuse, neglect, improper maintenance or unapproved modifications.

If you have any questions regarding your warranty rights and responsibilities, you should contact Cummins Customer Relation Department at 1-800-343-7357 or the California Air Resources Board at 9528 Telstar Avenue, El Monte, CA 91731.

A warranted part which is scheduled for replacement as required maintenance is warranted up to the first scheduled replacement point.

Prior to the expiration of the applicable warranty, Owner must give notice of any warranted emission control failure to a Cummins distributor, authorized dealer or other repair location approved by Cummins and deliver the engine to such facility for repair. Repair locations are listed in Cummins United States and Canada Service Directory.

Owner is responsible for incidental costs such as: communication expenses, meals, lodging incurred by Owner or employees of Owner as a result of a Warrantable Condition.

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

**CUMMINS IS NOT RESPONSIBLE FOR OTHER INCIDENTAL OR CONSEQUENTIAL DAMAGES. INCIDENTAL OR CONSEQUENTIAL DAMAGES INCLUDE BUT ARE NOT LIMITED TO FINES, THEFT, VANDALISM OR COLLISIONS.**

## Coverage

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

### Fuel Pump

Static Timing  
Delivery Valve  
Injector Supply Line

### Injectors

Calibration  
Needle  
Nozzle  
Spring

### Turbocharger

Compressor Wheel  
Turbine Wheel  
Turbine Oil Seal  
Wastegate Valve

### Intake Manifold

Charge Air Cooler

### Exhaust Manifold

### Oxidation Catalyst

### Electronic Control System

Control Module  
Boost Pressure Sensor  
Coolant Temperature Sensor

## Replacement Parts

Cummins recommends that any service parts used for maintenance, repair or replacement of emission control systems be new, genuine Cummins or Cummins approved rebuilt parts and assemblies, and that the engine be serviced by a Cummins distributor, authorized dealer or the repair location approved by Cummins. The owner may elect to have maintenance, replacement or repair of the emission control parts performed by a facility other than a Cummins distributor, an authorized dealer or a repair location approved by Cummins, and may elect to use parts other than new genuine Cummins or Cummins approved rebuilt parts and assemblies for such maintenance, replacement or repair; however, the cost of such service or parts and subsequent failures resulting from such service or parts will not be covered

under this emission control system warranty, except for Emergency Repairs as described below.

## **Cummins Responsibilities**

The warranty coverage begins when the engine is delivered to the ultimate purchaser.

*Repairs and service will be performed by any Cummins distributor, authorized dealer or other repair location approved by Cummins using new, genuine Cummins or Cummins approved rebuilt parts and assemblies. Cummins will repair any of the emission control parts found by Cummins to be defective without charge for parts or labor (including diagnosis which results in determination that there has been a failure of a warranted emission control part).*

## **Emergency Repairs**

In the case of an emergency where a Cummins distributor, authorized dealer, or other repair location approved by Cummins is not available, repairs may be performed by any available repair location or by any individual using any replacement parts. A part not being available within 30 days or a repair not being complete within 30 days constitutes an emergency. Cummins will reimburse the Owner for expenses (including diagnosis), not to exceed the manufacturer's suggested retail price for all warranted parts replaced and labor charges based on the manufacturer's recommended time allowance for the warranty repair and the geographically appropriate hourly labor rate. Replaced parts and paid invoices must be presented at a Cummins authorized repair facility as a condition of reimbursement for emergency repairs not performed by a Cummins distributor, authorized dealer, or other repair location approved by Cummins.

## **Warranty Limitations**

Cummins is not responsible for failures 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 improper repair or the use of parts which are not genuine *Cummins* or *Cummins* approved parts.

Cummins is not responsible for the material and labor costs of emission control parts and assemblies replaced during Scheduled Maintenance of the engine as specified in Cummins Operation and Maintenance Manuals.

**THIS WARRANTY, TOGETHER WITH THE EXPRESS COMMERCIAL WARRANTIES ARE THE SOLE WARRANTIES MADE BY CUMMINS. THERE ARE NO OTHER WARRANTIES, EXPRESS OR IMPLIED, OR OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.**

## California Emission Control System Warranty, Off-Highway

### Products Warranted

This Emission Control System Warranty applies to heavy-duty off-road diesel engines certified with the California Air Resources Board beginning with the year 1996, marketed by Cummins, and registered in California for use in industrial off-highway applications.

### Your Warranty Rights and Obligations

The California Air Resources Board and Cummins Engine Company, Inc., are pleased to explain the emission control system warranty on your 1996 engine. In California, new heavy-duty off-road diesel engines must be designed, built and equipped to meet the State's stringent anti-smog standards. Cummins must warrant the emission control system on your engine for the periods of time listed below provided there has been no abuse, neglect or improper maintenance of your engine.

Your emission control system may include parts such as the fuel injection system and the air induction system. Also included may be hoses, belts, connectors and other emission-related assemblies.

Where a warrantable condition exists, Cummins will repair your heavy-duty off-road diesel engine at no cost to you including diagnosis, parts and labor.

### Manufacturer's Warranty Coverage

The 1996 and later heavy-duty off-road diesel engines are warranted for 5 years or 3,000 hours of engine operation, whichever first occurs from the date of delivery of the engine to the first user. If any emission-related part on your engine is defective, the part will be repaired or replaced by Cummins.

### Coverage

This emission control system warranty applies only to the following B5.9 and C8.3 emission control parts:

**Fuel Pump**

Static Timing  
Delivery Valve  
Injector Supply Line

**Injectors**

Calibration  
Needle  
Nozzle  
Spring

**Turbocharger**

Compressor Wheel  
Turbine Wheel  
Turbine Oil Seal  
Wastegate Valve

**Intake Manifold**

Charge Air Cooler  
Aftercooler

**Exhaust Manifold**

**Oxidation Catalyst**

**Electronic Control System**

Control Module  
Boost Pressure Sensor  
Coolant Temperature Sensor

## **Owner's Warranty Responsibilities**

As the heavy-duty off-road diesel engine owner, you are responsible for the performance of the required maintenance listed in your Cummins Operation and Maintenance Manual. Cummins recommends that you retain all receipts covering maintenance on your heavy-duty off-road diesel engine, but Cummins cannot deny warranty solely for the lack of receipts or for your failure to ensure the performance of all scheduled maintenance.

You are responsible for presenting your heavy-duty off-road diesel engine to a Cummins dealer as soon as a problem exists. The warranty repairs should be completed in a reasonable amount of time, not to exceed 30 days.

As the heavy-duty off-road diesel engine owner, you should also be aware that Cummins may deny you warranty coverage if your heavy-duty off-road diesel engine or a part has failed due to abuse, neglect, improper maintenance or unapproved modifications.



Your engine is designed to operate on diesel fuel only. Use of any other fuel may result in your engine no longer operating in compliance with California's emissions requirements.

If you have any questions regarding your warranty rights and responsibilities, you should contact Cummins Customer Relation Department at 1-800-343-7357 or the California Air Resources Board at 9528 Telstar Avenue, El Monte, CA 91731.

Prior to the expiration of the applicable warranty, Owner must give notice of any warranted emission control failure to a Cummins distributor, authorized dealer or other repair location approved by Cummins and deliver the engine to such facility for repair. Repair locations are listed in Cummins United States and Canada Service Directory.

Owner is responsible for incidental costs such as: communication expenses, meals, lodging incurred by Owner or employees of Owner as a result of a warrantable failure.

Owner is responsible for business costs and losses, "downtime" expenses, and cargo damage resulting from a warrantable failure. **CUMMINS IS NOT RESPONSIBLE FOR OTHER INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCIDENTAL OR CONSEQUENTIAL DAMAGES INCLUDE BUT ARE NOT LIMITED TO FINES, THEFT, VANDALISM OR COLLISIONS.**

## Replacement Parts

Cummins recommends that any service parts used for maintenance, repair or replacement of emission control systems be new, genuine Cummins or Cummins approved rebuilt parts and assemblies, and that the engine be serviced by a Cummins distributor, authorized dealer or the repair location approved by Cummins. The owner may elect to have maintenance, replacement or repair of the emission control parts performed by a facility other than a Cummins distributor, an authorized dealer or a repair location approved by Cummins, and may elect to use parts other than new genuine Cummins or Cummins approved rebuilt parts and assemblies for such maintenance, replacement or repair; however, the cost of such service or parts will not be covered under this emission control system warranty.

## Cummins Responsibilities

Repairs and service will be performed by any Cummins distributor, authorized dealer or other repair location approved by Cummins using new, genuine Cummins or Cummins approved rebuilt parts and assemblies. Cummins will repair any of the emission control parts found by Cummins to be defective without charge for parts or labor (including diagnosis which results in determination that there has been a failure of a warranted emission control part).

## Emergency Repairs

In the case of an emergency where a Cummins distributor, authorized dealer, or other repair location approved by Cummins is not available, repairs may be performed by any available repair location using any replacement parts. Cummins will reimburse the Owner for expenses (including diagnosis), not to exceed the manufacturer's suggested retail price for all warranted parts replaced and labor charges based on the manufacturer's recommended time allowance for the warranty repair and the geographically appropriate hourly labor rate. A part not being available within 30 days or a repair not being complete within 30 days constitutes an emergency. Replaced parts and paid invoices must be presented at a Cummins authorized repair facility as a condition of reimbursement for emergency repairs not performed by a Cummins distributor, authorized dealer, or other repair location approved by Cummins.

## Warranty Limitations

Cummins is not responsible for failures resulting from Owner or operator abuse or neglect, such as: operation without adequate coolant, fuel or lubricants; overfueling; overspeeding; lack of maintenance of lubricating, cooling or air intake systems; improper storage, starting, warm-up, run-in or shutdown practices.

The manufacturer warrants to the ultimate purchaser and each subsequent purchaser that the engine is designed, built, and equipped so as to conform with all applicable regulations adopted by the Air Resources Board, and that it is free from defects in materials and workmanship which cause the failure of a warranted part.

Any warranted part which is not scheduled for replacement as required maintenance, or which is scheduled only for regular inspection to the effect of "repair or replace as necessary" is warranted for the warranty period.

Any warranted part which is scheduled for replacement as required maintenance is warranted for the period of time prior to the first scheduled replacement point for that part.

The owner will not be charged for diagnostic labor which leads to the determination that a warranted part is defective, if the diagnostic work is performed at a warranty station.

The manufacturer is liable for damages to other engine components caused by the failure under warranty of any warranted part.

Cummins is not responsible for failures resulting from improper repair or the use of parts which are not genuine Cummins or Cummins approved parts.

These warranties, together with the express commercial warranties and emission warranty are the sole warranties of Cummins. There are no other warranties, express or implied, or of merchantability or fitness for a particular purpose.

<b>About the Manual</b> .....	i-2	General Information .....	1-11
General Information .....	i-2	Shutters .....	1-15
<b>Additional Service Literature</b> .....	L-1	Thermo Control Settings .....	1-13
<b>Air Cleaner Restriction</b> .....	4-3	Winterfronts .....	1-15
Maintenance Check .....	4-3	<b>Cold Weather Starting Using Starting Fluid</b> .....	1-7
<b>Air Compressor</b> .....	4-4	Ether Starting Aids .....	1-7
Maintenance Check .....	4-4	<b>Component Manufacturers' Addresses</b> .....	M-1
<b>Air in Fuel</b> .....	5-17	Air Compressors .....	M-1
Test .....	5-17	Air Cylinders .....	M-1
<b>Air Intake Piping</b> .....	3-8	Air Heaters.....	M-1
Maintenance Check .....	3-8	Air Starting Motors.....	M-1
<b>Alternator</b> .....	A-14	Alternators .....	M-2
Install .....	A-16	Auxiliary Brakes .....	M-2
Preparatory .....	A-14	Belts .....	M-2
Remove .....	A-15	Catalytic Convertors.....	M-2
<b>Arctic Operation</b> .....	V-23	Clutches .....	M-3
General Information .....	V-23	Coolant Heaters .....	M-3
<b>Belt Tensioner, Automatic</b> .....	6-4, A-2	Coolant Level Switches.....	M-3
Install .....	A-3	Drive Plates .....	M-3
Maintenance Check .....	6-4	Electric Starting Motors.....	M-3
Preparatory .....	A-2	Electronic Switches.....	M-3
Remove .....	A-3	Engine Protection Controls.....	M-4
<b>California Emission Control System Warranty, Off-Highway</b> .	W-46	Fan Clutches.....	M-4
<b>California Emission Control System Warranty, On-Highway</b> .	W-41	Fans.....	M-4
<b>Capscrew Markings and Torque Values</b> .....	V-24	Fault Lamps.....	M-4
Capscrew Markings and Torque Values — Metric .....	V-25	Filters.....	M-4
Capscrew Markings and Torque Values — U.S. Customary ..	V-26	Flexplates .....	M-5
<b>Charge Air Cooler (CAC)</b> .....	A-9	Fuel Coolers .....	M-5
General Information .....	A-9	Fuel Warmers .....	M-5
Leak Test .....	A-11	Gauges .....	M-5
Maintenance Check .....	4-2	Governors .....	M-6
Pressure Test .....	A-10	Heat Sleeves.....	M-6
Temperature Differential Test .....	A-10	Hydraulic and Power Steering Pumps .....	M-6
<b>Charge Air Piping</b> .....	4-2	In-Line Connectors.....	M-6
Maintenance Check .....	4-2	Oil Heaters.....	M-6
<b>Cold Weather Operation</b> .....	1-11	Prelubrication Systems.....	M-7

## Index Page 2

Radiators .....	M-7	Drive Belts .....	5-22, 6-2
Throttle Assemblies.....	M-7	Maintenance Check .....	5-22, 6-2
Torque Converters.....	M-7	<b>Driving Techniques</b> .....	1-57
<b>Coolant Level</b> .....	3-4	<b>Electromagnetic Interference (EMI)</b> .....	1-58
Maintenance Check .....	3-4	General Information .....	1-58
<b>Coolant Recommendations and Specifications</b> .....	V-16	ISB System EMI Radiation Levels .....	1-58
Cooling System Sealing Additives .....	V-19	ISB System EMI Susceptibility .....	1-58
Cooling System Soluble Oils .....	V-19	<b>Electronic Controlled Fuel System</b> .....	1-16
Fully Formulated Coolant/Antifreeze .....	V-16	Diagnostic Fault Codes .....	1-51
<b>Coolant Thermostat</b> .....	A-6	Fault Code Snapshot Data .....	1-57
Clean .....	A-7	Engine Protection System .....	1-20
Install .....	A-8	Air Conditioner Pressure Switch Input.....	1-25
Preparatory .....	A-6	Application Type .....	1-25
Remove .....	A-7	Automatic Transmission .....	1-26
<b>Cooling System</b> .....	5-20, 7-2	Electric Lift Pump .....	1-28
Drain .....	7-2	Engine Protection Shutdown .....	1-21
Fill .....	7-6	Fan Clutch Enable .....	1-24
Flush .....	7-4	Intake Air Heater.....	1-26
Maintenance Check .....	5-20	Maximum Engine Speed Without VSS .....	1-22
<b>Crankcase Breather Tube</b> .....	3-9	Number of Transmission Tailshaft Gear Teeth.....	1-23
Maintenance Check .....	3-9	Rear Axle Ratio .....	1-23
<b>Cummins Warranty, B Series U.S. and Canada Automotive</b> .	W-1	Tire Revolutions Per Mile.....	1-22
<b>Cummins Warranty, Diesel Engine School Bus</b> .....	W-12	Vehicle Speed Sensor Type.....	1-21
<b>Cummins Warranty, Fire and Crash Trucks U.S.</b>		VSS anti-tampering (Fault Code 242) .....	1-24
<b>and Canada</b> .....	W-23	Water in Fuel (WIF) sensor .....	1-27
<b>Cummins Warranty, Industrial United States and Canada</b> ..	W-28	General Information .....	1-16
<b>Cummins Warranty, Recreational Vehicle United</b>		Programmable Features .....	1-28
<b>States and Canada</b> .....	W-18	Accelerator Interlock .....	1-29
<b>Cummins Warranty, United States and Canada Diesel</b>		Accelerator Override in PTO .....	1-37
<b>Engine Intercity Coach, Shuttle and Transit Buses</b> .....	W-6	Automotive/Variable Speed (VS) Governor.....	1-41
<b>Cummins Warranty, Worldwide Generator Drive</b> .....	W-34	Brake and Clutch Override in PTO .....	1-36
<b>Daily Maintenance Procedures - General Information</b> .....	3-1	Cruise Control.....	1-31
<b>Drive Belt Tension</b> .....	V-20	Cruise Control Governor Lower Droop .....	1-32
<b>Drive Belt, Water Pump</b> .....	A-1	Cruise Control Governor Upper Droop .....	1-32
Install .....	A-2	Gear Down Maximum Vehicle Speed, Heavy Engine Load ..	1-41
Remove .....	A-1	Gear Down Maximum Vehicle Speed, Light Engine Load....	1-40

Gear Down Protection.....	1-38	Maintenance Check .....	6-3
Idle Shutdown.....	1-43	<b>Fan Spacer and Pulley</b> .....	A-4
Idle Shutdown in PTO.....	1-44	Install .....	A-5
Idle Shutdown Override .....	1-44	Preparatory .....	A-4
Idle Shutdown Time .....	1-43	Remove .....	A-5
Low Idle Adjustment .....	1-42	<b>Flow Diagram, Air Intake System</b> .....	D-14
Low Idle Speed.....	1-42	<b>Flow Diagram, Compressed Air System</b> .....	D-18
Maintenance Monitor .....	1-45	<b>Flow Diagram, Cooling System</b> .....	D-12
Maximum Cruise Control Speed .....	1-31	<b>Flow Diagram, Exhaust System</b> .....	D-16
Maximum Engine Load in PTO .....	1-36	<b>Flow Diagram, Fuel System</b> .....	D-2
One Gear Down Gear Ratio.....	1-40	<b>Flow Diagram, Lubricating Oil System</b> .....	D-4
Power Takeoff (PTO).....	1-33	<b>Fuel Filter (Canister Type)</b> .....	5-9
PTO Maximum Speed.....	1-34	Install .....	5-10
PTO Minimum Speed.....	1-34	Preparatory .....	5-9
PTO Resume Speed .....	1-35	Remove .....	5-10
PTO Set Point.....	1-35	<b>Fuel Filter (Spin-On Type)</b> .....	5-11
Remote PTO.....	1-37	Inspect for Reuse .....	5-14
Road Speed Governor .....	1-29	Install .....	5-14
Road Speed Governor Lower Droop .....	1-30	Preparatory .....	5-11
Road Speed Governor Upper Droop .....	1-30	Remove .....	5-12
SET/ACCEL.....	1-33	<b>Fuel Pump</b> .....	4-4
Top Transmission Gear Ratio .....	1-39	Maintenance Check .....	4-4
<b>Engine Component Torque Values</b> .....	V-21	<b>Fuel Recommendations and Specifications</b> .....	V-7
<b>Engine Diagrams</b> .....	E-11	Cummins/Fleetguard® Filter Specifications .....	V-9
Engine Views .....	E-11	Fuel Filter .....	V-9
<b>Engine Identification</b> .....	E-1	Fuel Recommendations .....	V-7
Cummins Engine Nomenclature .....	E-3	<b>Fuel Supply Lines</b> .....	5-21
ECM Dataplate .....	E-5	Vent .....	5-21
Engine Dataplate .....	E-1	High Pressure Fuel line(s).....	5-21
Fuel Injection Pump Dataplate .....	E-4	<b>Fuel-Water Separator</b> .....	3-2
<b>Engine Operating Range</b> .....	1-9	Drain .....	3-2
<b>Engine Shutdown</b> .....	1-16	<b>General Safety Instructions</b> .....	i-9
General Information.....	1-16	Important Safety Notice .....	i-9
<b>Fan, Cooling</b> .....	3-6	<b>How to Use the Manual</b> .....	i-3
Inspect for Reuse .....	3-6	General Information .....	i-3
<b>Fan Hub, Belt Driven</b> .....	6-3	<b>Illustrations</b> .....	i-8

# Index

## Page 4

Literature Order Form .....	L-3	Cooling System .....	V-3 , E-8
Lubricating Oil and Filters .....	5-1	Cummins/Fleetguard® Filter Specifications .....	V-6
Drain .....	5-3	Electrical System .....	V-4 , E-9
Fill .....	5-4	Exhaust System .....	V-4 , E-9
Oil Drain Intervals .....	5-1	Fuel System .....	V-2 , E-7
Lubricating Oil Level .....	3-3	General Specifications .....	V-1 , E-6
Maintenance Check .....	3-3	Lubricating Oil System .....	V-2 , E-7
Lubricating Oil Recommendations and Specifications .....	V-10	Starting Motor .....	A-12
Cummins/Fleetguard® Filter Specifications .....	V-15	Install .....	A-14
Lubricating Oil Filters .....	V-15	Preparatory .....	A-12
General Information .....	V-11	Remove .....	A-13
New Engine Break-in Oils .....	V-10	Symbols .....	i-4
Arctic Operation Engine Oil .....	V-10	System Diagrams - General Information .....	D-1
Oil Drain Intervals .....	V-14	General Information .....	D-1
Maintenance Guidelines - General Information .....	2-1	To the Owner and Operator .....	i-1
Maintenance Procedures - General Information .....	4-1, 5-1, 6-1, 7-1	General Information .....	i-1
General Information .....	5-1	Tool Requirements .....	2-2
Maintenance Record Form .....	2-6	Troubleshooting Procedures and Techniques .....	TS-1
Maintenance Schedule .....	2-3	Troubleshooting Symptoms .....	TS-1
Normal Starting Procedure .....	1-3	Alternator Not Charging or Insufficient Charging .....	TS-2
Operating Instructions - General Information .....	1-1	Alternator Overcharging .....	TS-4
Operating the Engine .....	1-8	Coolant Loss — External .....	TS-5
Page References for Maintenance Instructions .....	2-4	Coolant Temperature Above Normal — Gradual Overheat .....	TS-6
Service Assistance .....	S-1	Coolant Temperature is Above Normal — Sudden Overheat .....	TS-9
Distributors and Branches - Australia .....	S-25	Coolant Temperature is Below Normal .....	TS-11
Distributors and Branches - Canada .....	S-22	Cranking Fuel Pressure is Low .....	TS-12
Distributors and Branches - New Zealand .....	S-28	Engine Acceleration or Response Poor .....	TS-13
Distributors and Branches - United States .....	S-5	Engine Difficult to Start or Will Not Start (Exhaust Smoke) ..	TS-16
Division and Regional Offices .....	S-3	Engine Difficult to Start or Will Not Start (No Exhaust Smoke) .....	TS-19
Emergency and Technical Service .....	S-1	Engine Noise Excessive .....	TS-21
Problem Solving .....	S-2	Engine Noise Excessive — Combustion Knocks .....	TS-23
Routine Service and Parts .....	S-1	Engine Power Output Low .....	TS-24
Service Literature Ordering Location .....	L-2	Engine Runs Rough at Idle .....	TS-26
Specifications .....	V-1	Engine Runs Rough or Misfires .....	TS-28
Air Intake System .....	V-3 , E-8	Engine Shuts Off Unexpectedly or Dies During Deceleration ..	TS-29
Batteries (Specific Gravity) .....	V-5 , E-10		

Engine Speed Surges at Low or High Idle .....	TS-31
Engine Speed Surges in PTO or Cruise Control .....	TS-32
Engine Speed Surges Under Load or in Operating Range ..	TS-33
Engine Starts But Will Not Keep Running .....	TS-35
Engine Vibration Excessive .....	TS-36
Engine Will Not Crank or Cranks Slowly (Air Starter).....	TS-38
Engine Will Not Crank or Cranks Slowly (Electric Starter)....	TS-39
Engine Will Not Reach Rated Speed (RPM).....	TS-40
Fault Code Warning Lamps Do Not Illuminate .....	TS-42
Fault Code Warning Lamps Stay On (No Apparent Reason).	TS-41
Fuel Consumption Excessive .....	TS-43
Fuel in Coolant .....	TS-45
Fuel in the Lubricating Oil.....	TS-46
Intake Manifold Air Temperature Above Specification.....	TS-47
Intake Manifold Pressure (Boost) is Below Normal.....	TS-49
Lubricating Oil Consumption Excessive.....	TS-50
Lubricating Oil Contaminated .....	TS-51
Lubricating Oil Pressure High .....	TS-52
Lubricating Oil Pressure Low .....	TS-53
Lubricating Oil Sludge in the Crankcase Excessive .....	TS-55
Smoke, Black — Excessive .....	TS-56
Smoke, White — Excessive.....	TS-57
Turbocharger Leaks Engine Oil or Fuel .....	TS-59
<b>Vibration Damper</b> .....	7-10
Inspect .....	7-10
<b>Vibration Damper, Rubber</b> .....	7-8
Inspect .....	7-8



**CALIFORNIA**  
**Proposition 65 Warning**

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

Cummins Engine Company, Inc.  
Box 3005  
Columbus, Indiana, U.S.A., 47202

Registered Office  
Cummins Engine Company, Ltd.  
46-50 Coombe Road  
New Malden,  
Surrey KT3 4QL,  
England  
Registration No. 573951 England

Copyright\* 1999  
Cummins Engine Company, Inc.

Cummins Customer Assistance Center  
1-800-DIESELS (1-800-343-7357)

APPLICABLE ONLY IN U.S.A. AND CANADA

Bulletin No. 3666170-03  
Printed in U.S.A. 7/99