
WORKSHOP MANUAL SERIE C CUMMINS ENGINES

Workshop manual integration of the following models:

EX255 - EX285 - FH270

G170 - G200 - FG75A - FG85A + FG105A

W170 - W190 - W230

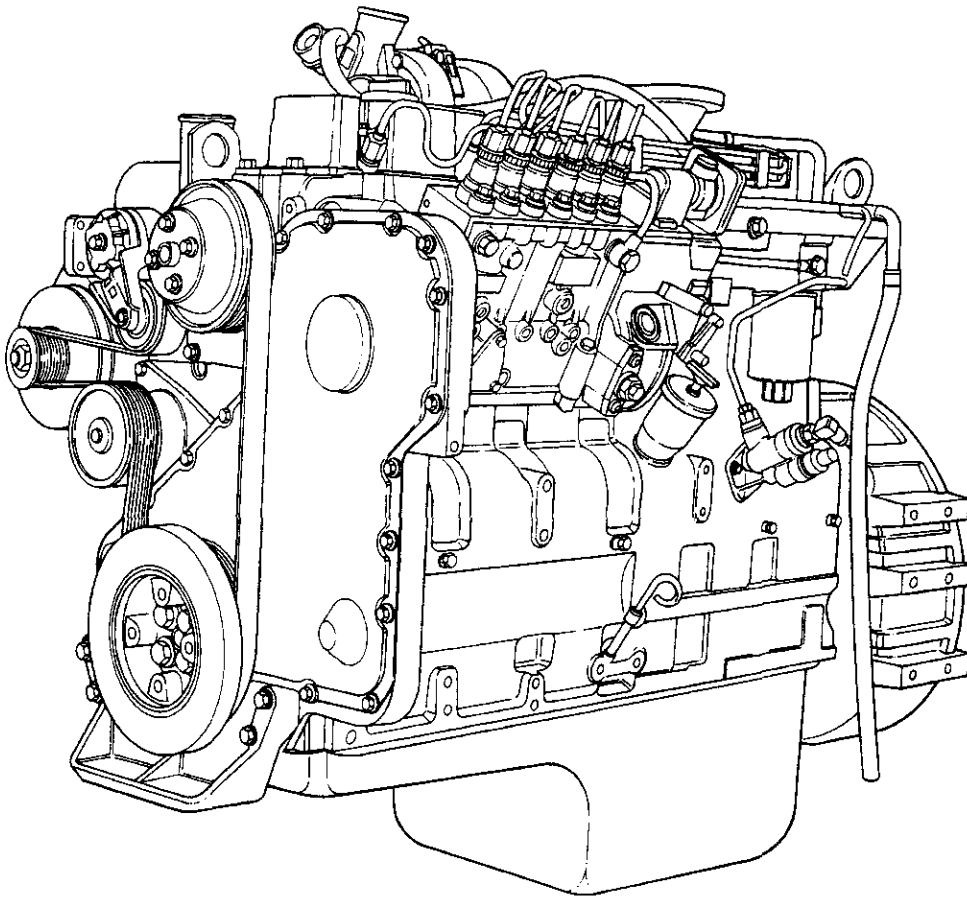


All information, illustrations and specifications in this manual are based on the latest product information available at the time of publication.

The right is reserved to make changes at any time without notice.



Troubleshooting and Repair Manual C Series Engines



ew900gu

Foreword

This manual provides instructions for troubleshooting and repairing this engine in the chassis. Component and assembly rebuild procedures are provided in the engine shop manual. Refer to Section i - Introduction for instructions on how to use this manual.

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

The manual is organized to guide a service technician through the logical steps of identifying and correcting problems related to the engine. This manual does not cover vehicle or equipment problems. Consult the vehicle or equipment manufacturer for repair procedures.

A series of specific service manuals (for example: Shop, Specifications, and Alternative Repair) are available and can be ordered by filling out and mailing the Literature Order Form located in Section L - Service Literature.

The repair procedures used in this manual are recommended by Cummins Engine Co., Inc. Some service procedures require the use of special service tools. Use the correct tools as described.

Cummins Engine Company, Inc. encourages the user of this manual to report errors, omissions, and recommendations for improvement. Please use the postage paid, pre-addressed Literature Survey Form in the back of this manual for communicating your comments.

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

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



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Section i - Introduction

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About the Manual

This C Series Engine Troubleshooting and Repair Manual is intended to aid in determining the cause of engine-related problems and to provide recommended repair procedures. The manual is divided into sections by system. Each section provides general information, specifications, diagrams, and service tools, where applicable. The specific repair procedures are referenced in the Troubleshooting Symptoms Charts.

How to Use the Manual

This manual is organized to provide an easy flow from problem identification to problem correction. A list of troubleshooting symptoms containing the most common engine problems is in the Troubleshooting Symptoms, Section TS. This manual is designed to use the Troubleshooting Symptoms as a guide in locating the problem and directing the end user to the correct procedure for making the necessary repairs to the engine. Complete the following steps to locate and correct any problems:

1. Locate the symptom on the Section Contents page of Section TS.
2. Reference to the page number where the Troubleshooting Symptom Tree is found is made to the right of the symptom tree title.
3. The left column of boxes in the Troubleshooting Symptom Charts indicates a probable cause of the problem, starting at the top with the simplest and easiest to repair, and continuing downward to the most difficult.
4. The right column of boxes provides a brief description of the corrective action with a reference number to the correct procedure used to make the repair.
5. Locate the probable cause in the left column then turn to the procedure referenced in the right column.

The Troubleshooting Symptom Charts are based on the following assumptions:

- The engine has been installed according to the OEM's specifications.
- The easiest repairs are done first.
- "Generic" solutions to cover problems with the most common applications and OEM.

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

Symbols

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



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



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



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



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



INSPECTION is required.



CLEAN the part or assembly.



PERFORM a mechanical or time **MEASUREMENT**.



LUBRICATE the part or assembly.



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



TIGHTEN to a specific torque.



PERFORM an electrical **MEASUREMENT**.



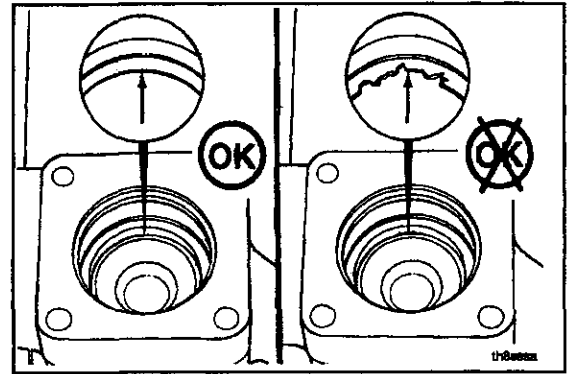
Refer to another location in this manual or another publication for additional information.



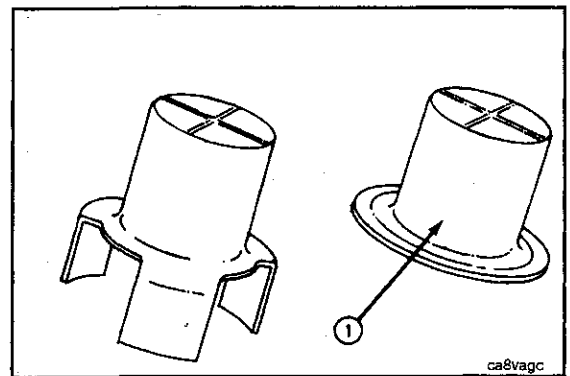
The component weighs 23 kg [50 lb] or more. To avoid personal injury, use a hoist or get assistance to lift the component.

Illustrations

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.
- Coolant is toxic. If **not** reused, dispose of in accordance with local environmental regulations.

General Repair Instructions

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

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

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

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

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

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

General Cleaning Instructions

Solvent and Acid Cleaning

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

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

▲ WARNING ▲

Acid is extremely dangerous and can cause personal injury and damage the machinery. Always provide a tank of strong soda water as a neutralizing agent.

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

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

Steam Cleaning

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

▲ WARNING ▲

Wear protective clothing to prevent personal injury from the high pressure and extreme heat.

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

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

Glass or Plastic Bead Cleaning

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

▲ CAUTION ▲

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

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

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

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

Acronyms and Abbreviations

AFC	Air Fuel Control	kPa	Kilopascal
API	American Petroleum Institute	LNG	Liquid Natural Gas
ASA	Air Signal Attenuator	LTA	Low Temperature Aftercooling
ASTM	American Society of Testing and Materials	MIP	Mixer Inlet Pressure
°C	Celsius	MPa	Megapascal
CARB	California Air Resources Board	mph	Miles Per Hour
C.I.D.	Cubic Inch Displacement	mpq	Miles Per Quart
CNG	Compressed Natural Gas	N•m	Newton-meter
CPL	Control Parts List	NG	Natural Gas
cSt	Centistokes	OEM	Original Equipment Manufacturer
ECM	Electronic Control Module	ppm	Parts Per Million
ECS	Emission Control System	psi	Pounds Per Square Inch
EPA	Environmental Protection Agency	PTO	Power Takeoff
EPS	Engine Position Sensor	rpm	Revolutions Per Minute
°F	Fahrenheit	SAE	Society of Automotive Engineers
GVW	Gross Vehicle Weight	SCA	Supplemental Coolant Additive
Hg	Mercury	STC	Step Timing Control
hp	Horsepower	VS	Variable Speed
H₂O	Water	VSS	Vehicle Speed Sensor
ICM	Ignition Control Module		
km/l	Kilometers per Liter		

Section E - Engine Identification

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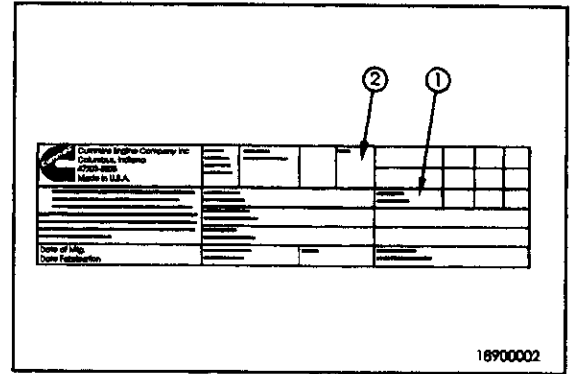
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Engine Identification

Engine Dataplate

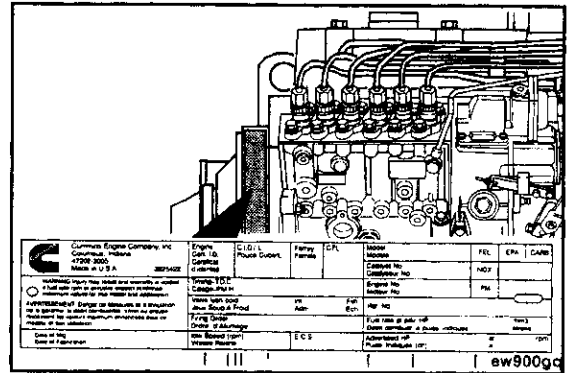
The engine dataplates show specific information about your engine. The engine serial number and control parts list (CPL) provide information for ordering parts and service needs.

NOTE: The engine dataplate **must not** be changed unless approved by Cummins Engine Company, Inc.



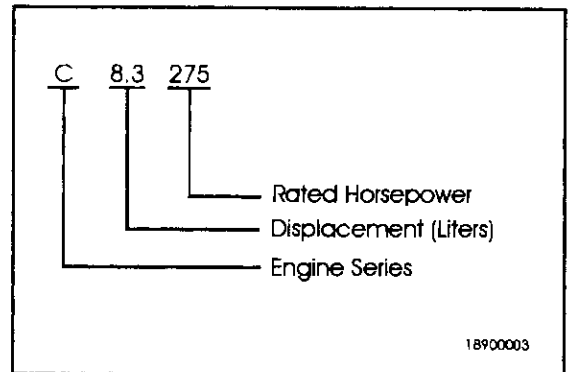
The dataplate is located on the top side of gear cover. Have the following engine data available when communicating with a Cummins Authorized Repair Location. The information on the dataplate is **mandatory** when sourcing service parts.

1. Engine Serial Number (ESN)
2. Control Parts List (CPL).



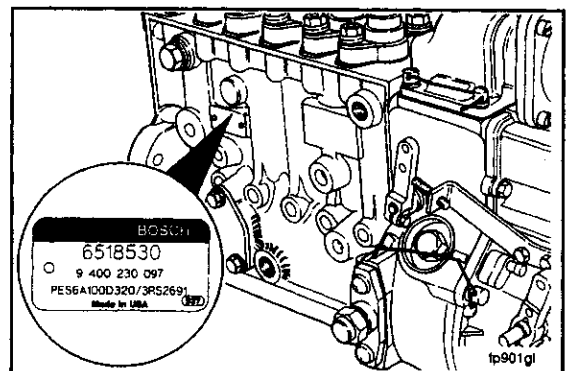
Cummins Engine Nomenclature

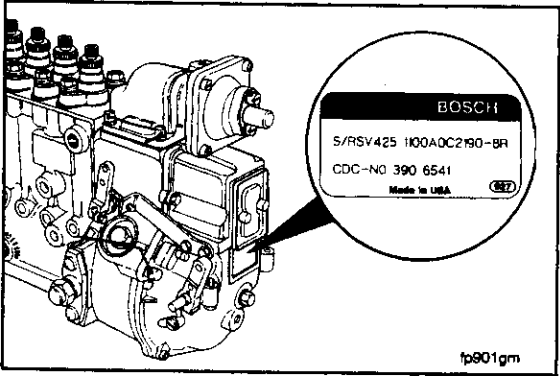
The Cummins engine nomenclature provides the data as illustrated in the graphic.



Fuel Injection Pump Dataplate

The Bosch® and Nippondenso fuel injection pump dataplate is located on the side of the injection pump. It provides information for fuel pump calibration.





The Cummins part number for the fuel pump - governor combination is located on the governor dataplate.

Specifications

General Specifications

Bore and Stroke	114 mm [4.49 in] x 135 mm [5.32 in]
Displacement	8.27 liters [504.5 C.I.D.]
Compression Ratio	17.3:1
Firing Order	1-5-3-6-2-4
Engine Weight (with standard accessories):	
Dry Weight	612 kg [1350 lb]
Wet Weight	658 kg [1450 lb]
Crankshaft Rotation (viewed from the front of the engine)	Clockwise

Fuel System

Fuel Transfer Pump	
Inlet Restriction	100 mm Hg [4 in Hg]
Fuel Transfer Pump Output Pressure	
Minimum @ Rated Speed	
High Flow	172 kPa [25 psi]
Low Flow	83 kPa [12 psi]
Fuel Filter Restriction	
Maximum Pressure Drop across Filters	35 kPa [5 psi]
Fuel Return Restriction (maximum)	518 mm Hg [20.4 in Hg]

Fuel Recommendations



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



Due to the precise tolerances of diesel injection systems, it is extremely important that the fuel be kept clean and free of dirt and water. Dirt and water in the fuel 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 diesel 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 possibly damage 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 C Series engines.

Acceptable Substitute Fuels - Cummins C Series Fuel System						
No. 1 D Diesel ^{(1) (2)}	No. 2 D Diesel ⁽³⁾	No. 1 K Kerosene	Jet-A	Jet-A1	JP-5	JP-8
A	OK	A	A	A	A	A
<p>1. An "A" means OK, only if the fuel lubricity is adequate. Wear scar diameter (WSD) must be less than 0.3 mm @ 25°C or 0.4 mm @ 60°C [0.012 in @ 77°F or 0.016 in @ 140°F] as measured with the high-frequency reciprocating rig (HFRR) method.</p> <p>2. Any adjustment to compensate for reduced performance with a fuel system using alternate fuel is not warrantable.</p> <p>3. Winter blend fuels, such as found at commercial fuel dispensing outlets, are combinations of No. 1 D and No. 2 D diesel fuel, and are acceptable.</p>						

Additional information for fuel recommendations and specifications can be found in Fuel for Cummins Engines, Bulletin No. 3379001.

Cooling System

Coolant Capacity (engine only)	9.9 liter [10.5 qt]
Standard Modulating Thermostat Range	81 to 95°C [181 to 203°F]
Pressure Cap for:	
99°C [210°F] System	50 kPa [7 psi]
104°C [220°F] System	103 kPa [15 psi]
Operating Temperatures	
Minimum Recommended	70°C [158°F]
Maximum Allowable	100°C [212°F]

Air Intake System

Intake Restriction

Maximum:

with Clean Air Filter 254 mm H₂O [10 in H₂O]
with Dirty Air Filter 635 mm H₂O [25 in H₂O]

Exhaust Back Pressure

Maximum 76.2 mm Hg [3 in Hg]

CPL	Model Engine	hp @ rpm Rating	Peak Torque ft-lb @ rpm	Rated Boost (in Hg)			Peak Torque Boost (in Hg)		
				min	nom	max	min	nom	max
D601	6C8.3	132 @ 2200	380 @ 1200	NA	NA	NA	NA	NA	NA
D601	6C8.3	132 @ 2200	380 @ 1200	NA	NA	NA	NA	NA	NA
D601	6C8.3	150 @ 2200	415 @ 1200	NA	NA	NA	NA	NA	NA
D601	6C8.3	150 @ 2200	415 @ 1200	NA	NA	NA	NA	NA	NA
602	6CT8.3	153 @ 2500	431 @ 1600	18	*20	22	11	*12	13
602	6CT8.3	165 @ 2200	499 @ 1500	19	*21	23	13	*14	15
D602	6CT8.3	173 @ 2200	467 @ 1500	18	*21	24			
D602	6CT8.3	173 @ 2200	467 @ 1500	17	*20	23	11	*12	13
602	6CT8.3	173 @ 2350	486 @ 1450	18	*21	24	12	*13	14
602	6CT8.3	177 @ 2500	465 @ 1500	22	*24	26	12	*13	14
602	6CT8.3	188 @ 2200	575 @ 1500	22	*24	26	16	*18	20
602	6CT8.3	202 @ 2200	606 @ 1500	28	*31	34	22	*24	26
602	6CT8.3	202 @ 2200	606 @ 1500	28	*31	34	22	*24	26
602	6CT8.3	211 @ 2200	635 @ 1500	29	*32	35	20	*22	24
D602	6CT8.3	215 @ 2500	567 @ 1500	21	*24	27			
603	6CT8.3	210 @ 2200		47	*50	53			
D604	6CTA8.3	250 @ 2200	716 @ 1500	30	*33.8	38			
D604	6CTA8.3	250 @ 2200	716 @ 1500	30	*33.8	38			
605	6CTA8.3	240 @ 2100		33	*36	39			
605	6CTA8.3	250 @ 2100		35	*38	41			
753	6CT8.3	180 @ 2400		21	*24	27			
753	6CT8.3	211 @ 2400		27	*30	33			
754	6CTA8.3	240 @ 2400	650 @ 1500	40	*43	46	24	*27	30
755	6CTA8.3	190 @ 2100		22	*25	28			
D755	6CTA8.3	210 @ 2200	650 @ 1500	31	*35	39			
755	6CTA8.3	220 @ 2200		28	*32	36			
755	6CTA8.3	220 @ 2500		27	*30	33			
755	6CTA8.3	230 @ 2000		29	*33	37			
755	6CTA8.3	233 @ 2100		32	*35	38			
D755	6CTA8.3	234 @ 2200	640 @ 1500	26	*30	34			
D755	6CTA8.3	234 @ 2200	640 @ 1500	26	*30	34			
D755	6CTA8.3	234 @ 2200	640 @ 1500	32	*35	38			
D805	6C8.3	160 @ 2500	415 @ 1200	NA	NA	NA	NA	NA	NA
818	6CT8.3	210 @ 2200		50	*53	56			
D819	6CT8.3	210 @ 2200	605 @ 1500	45	*49.1	53	21	*23.9	27
D819	6CT8.3	210 @ 2200	620 @ 1500	49	*53.3	57	28	*32.4	36
828	6CT8.3	121 @ 2100		9	*12	15			
829	6CT8.3	181 @ 1500		20	*23	26			
829	6CT8.3	207 @ 1800		25	*28	31			
830	6CT8.3	230 @ 2500		27	*30	33			
D830	6CTA8.3	250 @ 2500	650 @ 1500	29	*32.9	37			
D831	6CTA8.3	219 @ 1500	NA	37	*41	45	NA	NA	NA
D831	6CTA8.3	241 @ 1500	NA	35	*37	41	NA	NA	NA
D831	6CTA8.3	252 @ 1500	NA	37	*41	45	NA	NA	NA
D831	6CTA8.3	277 @ 1800	NA	39	*43.2	47	NA	NA	NA
848	6CTA8.3	240 @ 2100		35	*38	41			
890	6CTA8.3	250 @ 2100		49	*52	55			

(Continued)

CPL	Model Engine	hp @ rpm Rating	Peak Torque ft-lb @ rpm	Rated Boost (in Hg)			Peak Torque Boost (in Hg)		
892	6CTA8.3	250 @ 2200		48	*51	54			
893	6CTA8.3	235 @ 2100	658 @ 1500	46	*49	52	25	*28	31
893	6CTA8.3	237 @ 2100		46	*49	52			
893	6CTA8.3	240 @ 2200		46	*49	52			
893	6CTA8.3	250 @ 2200		49	*52	55			
D942	6CT8.3	181 @ 1500	NA	21	*24	27	NA	NA	NA
D942	6CT8.3	214 @ 1800	NA	25	*29	33	NA	NA	NA
954	6CTA8.3	240 @ 2400		37	*40	43			
954	6CTA8.3	265 @ 2400		37	*40	43			
955	6CTA8.3	210 @ 2500		27	*30	33			
959	6CTA8.3	230 @ 2200	690 @ 1500	29	*32	35	23	*25	28
959	6CTA8.3	230 @ 2200	715 @ 1500	32	*35	39	26	*29	32
D982	6CTA8.3	240 @ 2200	775 @ 1300	39	*43	47	22	*26.2	30
D982	6CTA8.3	250 @ 2200	775 @ 1300	44	*47	50	22	*26.2	30
984	6CTA8.3	220 @ 2500		27	*30	33			
985	6CT8.3	138 @ 1900		9	*12	15			
D985	6CT8.3	164 @ 1500	NA				NA	NA	NA
D985	6CT8.3	181 @ 1500	NA	20	*23	26	NA	NA	NA
D985	6CT8.3	188 @ 1800	NA				NA	NA	NA
985	6CT8.3	200 @ 2100		26	*29	32			
D985	6CT8.3	207 @ 1800	NA	25	*28	31	NA	NA	NA
985	6CT8.3	195 @ 1900	563 @ 1600	20	22	24	16	18	20
D985	6CT8.3	207 @ 2100	NA	25	*28	31	NA	NA	NA
D985	6CT8.3	173 @ 2200	467 @ 1500	27	*31	35			
D985	6CT8.3	173 @ 2200	467 @ 1500						
D985	6CT8.3	210 @ 2200	567 @ 1500	27	*31	35			
D985	6CT8.3	210 @ 2200	567 @ 1500	28	*31	34			
D985	6CT8.3	210 @ 2200	567 @ 1500	28	*31	34			
1196	6CTA8.3	240 @ 2400		37	*40	43			
1212	6CTA8.3	222 @ 2000		43	*46	49			
1221	6CTA-M1	250 @ 2100	NA	24	29	32	NA	NA	NA
1221	6CTA8.3	250 @ 2100	NA	21	*23	25	NA	NA	NA
1221	6CTA8.3	280 @ 2200		29	*32	35			
1221	6CTA-M1	300 @ 2500	NA	34	*37	40	NA	NA	NA
1222	6CTA8.3	250 @ 2400		45	*48	51			
1248	6CT8.3	210 @ 2200		28	*31	34			
D1262	6CTA8.3	250 @ 2000	800 @ 1300	36	*40	44	25	*28.7	33
D1262	6CTA8.3	250 @ 2300	660 @ 1300	32	*36	40	16	*18.9	23
D1262	6CTA8.3	250 @ 2400	660 @ 1300	33	*37.1	41	16	*18.9	22
1262	6CTA8.3	260 @ 2000		39	*42	45			
1262	6CTA8.3	270 @ 2200		39	*42	45			
D1262	6CTA8.3	275 @ 1800	860 @ 1300	39	*42.8	47	30	*34.2	36
D1262	6CTA8.3	275 @ 2000	800 @ 1300	39	*43	47	24	*28	36
D1263	6CTA8.3	210 @ 2400	605 @ 1300	32	*35	39	12	*14.5	18
1263	6CTA8.3	210 @ 2400	660 @ 1300	33	*36	39	17	*19	20
1263	6CTA8.3	225 @ 2400		39	*42	45			
1269	6CTA8.3	240 @ 2400		39	*42	45			
1270	6CTA8.3	275 @ 2500	719 @ 1500	37	*41	45	29	*32	35
1273	6CTA8.3	230 @ 2200	690 @ 1500	30	*33	36	23	*25	28
1273	6CTA8.3	180 @ 2200	690 @ 1500	31	*34	37	23	*25	28
1274	6CTA8.3	180 @ 2200		19	*22	45			
1274	6CT8.3	188 @ 2200	575 @ 1500	23	*26	36	17	*19	21
1274	6CT8.3	202 @ 2200	606 @ 1500	24	*26	37	18	*20	22
1275	6CT8.3	202 @ 2200	607 @ 1500	24	*27	25	22	*24	26
1281	6CT8.3	211 @ 2400		29	*32	29			
1282	6CTA-M2	350 @ 2600	NA	25	*28	30	NA	NA	NA

(Continued)

CPL	Model Engine	hp @ rpm Rating	Peak Torque ft-lb @ rpm	Rated Boost (in Hg)			Peak Torque Boost (in Hg)		
1282	6CTA-M2	400 @ 2600	NA	37	*41	35	NA	NA	NA
1282	6CTA-M2	403 @ 2600	NA	55	*57	31	NA	NA	NA
1356	6CT8.3	210 @ 2200		37	*40	43			
D1366	6CTA8.3	240 @ 2100							
D1366	6CTA8.3	240 @ 1760	716 @ 160						
D1366	6CTA8.3	270 @ 2100	716 @ 160						
D1366	6CTA8.3	300 @ 2100							
1366	6CTA8.3	350 @ 2100		44	*49	54			
1371	6CTA8.3	290 @ 2200		39	*42	45			
1372	6CTA8.3	275 @ 2200		41	*45	49			
1377	6CTA8.3	240 @ 2200		34	*37	40			
1406	6CTA8.3	285 @ 2400		42	*44	48			
D1406	6CTA8.3	300 @ 2200	820 @ 1300	41	*45	49	25	*29.4	33
D1439	6CTA8.3	210 @ 2200	605 @ 1300	40	*44	48	24	*28	32
D1439	6CTA8.3	225 @ 2200	660 @ 1300	42	*46	50	24	*28	32
1464	6CT8.3	157 @ 2500	470 @ 1600	16	*18	20	13	*14	15
1529	6CTA8.3	240 @ 2200	694 @ 1600	31	*34	37	24	*27	30
1547	6CTA8.3	260 @ 2200	700 @ 1500	39	*43	47	24	*27	30
1547	6CTA8.3	260 @ 2200	700 @ 1500	41	*46	51	28	*31	34
1547	6CTA8.3	284 @ 2200	830 @ 1500	50	*55	61	36	*40	44
D1563	6CTA8.3	210 @ 2200	605 @ 1300	34	*38	42	12	*15	18
D1563	6CTA8.3	210 @ 2200	605 @ 1300	34	*38	42	12	*15	18
D1563	6CTA8.3	225 @ 2200	660 @ 1300	36	*40	44	16	*19	22
D1563	6CTA8.3	225 @ 2200	660 @ 1300	36	*40	44	16	*19	22
D1564	6CTA8.3	300 @ 2200	820 @ 1300	40	*43.8	48	24	*27.5	32
D1564	6CTA8.3	300 @ 2200	820 @ 1300	40	*43.8	48	24	*27.5	32
D1566	6CTA8.3	250 @ 2000	800 @ 1300	35	*39	43	23	*27	31
D1566	6CTA8.3	250 @ 2000	800 @ 1300	35	*39	43	23	*27	31
1566	6CTA8.3	250 @ 2000	800 @ 1300	39	*43	47	27	*31	35
D1566	6CTA8.3	275 @ 1800	860 @ 1300	35	*39	43	27	*31	35
D1566	6CTA8.3	275 @ 1800	860 @ 1300	35	*39	43	27	*31	35
1566	6CTA8.3	275 @ 1800	860 @ 1300	39	*43	47	31	*35	39
D1566	6CTA8.3	275 @ 2000	800 @ 1300	36	*40	44	23	*27	31
D1566	6CTA8.3	275 @ 2000	800 @ 1300	36	*40	44	23	*31	31
1566	6CTA8.3	275 @ 2000	800 @ 1300	40	*44	48	27	*19	35
D1569	6CTA8.3	250 @ 2200	660 @ 1300	32	*38	42	16	*19	22
D1569	6CTA8.3	250 @ 2200	660 @ 1300	32	*38	42	16	*21	22
1603	6CTA8.3	202 @ 2200	606 @ 1500	26	*30	34	19	*24	23
1603	6CT8.3	211 @ 2200	572 @ 1700	26	*30	34	22	*25	26
1616	6CT8.3	211 @ 2200	572 @ 1700	28	*30	42	23	*31	28
1658	6CT8.3	250 @ 2000	800 @ 1300	36	*37.8	41	28	*35	34
1658	6CTA8.3	275 @ 1800	860 @ 1300	35	*36.9	42	32	*31	39
1658	6CTA8.3	275 @ 2000	800 @ 1300	36	*37.8	46	28	*37	34
1804	6CTA8.3	250 @ 2200	785 @ 1500	38	*42	40	33	*23	41
1812	6CTA8.3	250 @ 2200	660 @ 1300	34	*36	40	21	*41	25
1826	6CTA8.3	270 @ 2000	800 @ 1500	41	*45	50	37	*44	45
D1845	6CTA8.3	260 @ 2200	800 @ 1500	46	*50	54	40	*44	48
D1845	6CTA8.3	260 @ 2200	800 @ 1500	46	*50	54	40	*44	48
1845	6CTA8.3	260 @ 2200	816 @ 1500	46	*50	54	40	*44	48
1845	6CTA8.3	260 @ 2200	825 @ 1500	46	*50	54	40	*43.1	48
1846	6CTAA8.3	280 @ 2200	905 @ 1500	40	*50	46	40	*27	46
D1905	6CTA8.3	275 @ 2000	800 @ 1300	36	*43.4	44	23	*19	21
1917	6CTA8.3	210 @ 2200	605 @ 1300	34	*40	40	17	*23	25
1917	6CTA8.3	225 @ 2200	660 @ 1300	36	*36	42	21	*31	34
1918	6CTA8.3	250 @ 2000	800 @ 1300	33	*37.8	41	28	*31	35
1918	6CTA8.3	250 @ 2000	800 @ 1300	39	*36.9	47	27	*35	39
1918	6CTA8.3	275 @ 1800	860 @ 1300	35	*43	41	32	*35	39

(Continued)

CPL	Model Engine	hp @ rpm Rating	Peak Torque ft-lb @ rpm	Rated Boost (in Hg)			Peak Torque Boost (in Hg)		
1918	6CTA8.3	275 @ 1800	860 @ 1300	39	*36.9	47	31	*31	34
1918	6CTA8.3	275 @ 2000	800 @ 1300	36	*43	42	28	*31	35
1918	6CTA8.3	275 @ 2000	800 @ 1300	40	*37.8	48	27	*31.5	35
1919	6CTA8.3	300 @ 2200	820 @ 1300	40	*44	46	28	*23	25
1920	6CTA8.3	250 @ 2200	660 @ 1300	34	*41.4	40	21	*31	34
1922	6CTA8.3	250 @ 2200	800 @ 1300	36	*36	42	28	*31	34
1922	6CTA8.3	275 @ 2000	800 @ 1300	36	*37.8	42	28	*31	35
1922	6CTA8.3	275 @ 2000	800 @ 1300	40	*37.8	48	27	*23	25
1923	6CTA8.3	250 @ 2200	660 @ 1300	34	*44	40	21	*23.3	26
D1943	6CT8.3	150 @ 2200	475 @ 1500	32	*36	40	20	*25.7	29
D1943	6CT8.3	170 @ 2200	520 @ 1500	34	*35.5	40	23	*31	34
1943	6CT8.3	180 @ 2000	575 @ 1500	33	*36.9	40	28	*30	34
1943	6CT8.3	185 @ 2200	575 @ 1500	33	*36	41	26	*30	34
D1943	6CT8.3	185 @ 2200	575 @ 1500	33	*37	41	26	*31	35
D1943	6CT8.3	190 @ 2200	590 @ 1500	35	*37	43	27	*34.3	38
D1943	6CT8.3	205 @ 2200	636 @ 1500	35	*39	43	30	*34	38
D1943	6CT8.3	205 @ 2200	643 @ 1500	35	*39	43	30	*34.3	38
D1943	6CT8.3	215 @ 2200	642 @ 1500	36	*39	44	30	*23	25
D1972	6CTA8.3	250 @ 2200	660 @ 1300	34	*39.5	40	21	*37.5	41
1999	6CTAA8.3	276 @ 2200	756 @ 1400	45	*36	51	35	*38	41
2007	6CTA8.3	215 @ 2200	667 @ 1500	41	*48.4	49	34	*37	41
D2007	6CTA8.3	215 @ 2200	700 @ 1500	41	*45	49	33	*38	42
D2007	6CTA8.3	215 @ 2200	711 @ 1500	41	45	49	34	28	25
2034	6CTAA8.3	275 @ 2000	800 @ 1300	46	*45	40	31	*42	46
D2054	6CTA8.3	250 @ 2200	794 @ 1500	41	*43	49	38	*41	45
D2055	6CTA8.3	215 @ 2000	750 @ 1500	41	*45	49	37	*40	44
2055	6CTA8.3	230 @ 2000	720 @ 1500	41	*45	49	36	*34	38
D2056	6CTA8.3	215 @ 1900	645 @ 1500	39	*45	47	30	*23	25
D2057	6CTAA8.3	230 @ 2200		33	*36.7	41			
2060	6CT8.3	150 @ 2200	475 @ 1500	32	*35.4	38	21	*23.9	27
D2060	6CT8.3	177 @ 2100	575 @ 1500	30	*34	38	27	*31	35
2060	6CT8.3	178 @ 2000	626 @ 1500	36	*38.7	42	33	*36	39
2060	6CT8.3	178 @ 2000	626 @ 1500	36	*38.7	42	33	*36	39
D2060	6CT8.3	180 @ 2000	575 @ 1500	32	*39	40	27	*31	35
D2060	6CT8.3	195 @ 1900	588 @ 1600	32	*36	40	30	*34	38
D2060	6CT8.3	205 @ 2000	636 @ 1500	35	*36	41	22	*34.6	38
D2061	6CT8.3	177 @ 2500	510 @ 1500	34	*38	42	28	*25	28
D2061	6CT8.3	201 @ 2500	547 @ 1500	38	*38	44	28	*30.7	34
2061	6CT8.3	215 @ 2500	574 @ 1500	38	*41	44	36	*31	34
D2062	6CTA8.3	230 @ 2200	725 @ 1500	41	*41	49	36	*40	44
D2062	6CTA8.3	230 @ 2200	730 @ 1500	41	*45	49	36	*40	44
D2062	6CTA8.3	230 @ 2200	733 @ 1500	41	*45	49	36	*40	44
D2062	6CTA8.3	230 @ 2200	733 @ 1500	41	*45	49	36	*40	44
D2062	6CTA8.3	240 @ 2200	733 @ 1500	41	*45	49	36	*40	44
2062	6CTA8.3	240 @ 2200.2	750 @ 1500	41	*45	49	15	*40	44
2101	6CTA8.3	225 @ 2200	605 @ 1300	38	*42	46	19	*19	23
2101	6CTA8.3	225 @ 2200	660 @ 1300	40	*44	48	28	*23	27
2102	6CTA8.3	300 @ 2200	820 @ 1300	44	*47.8	52	19	*31.5	36
2103	6CTA8.3	250 @ 2200	660 @ 1300	38	*42	46	15	*23	27
2104	6CTA8.3	210 @ 2200	605 @ 1300	38	*42	46	19	*19	23
2104	6CTA8.3	225 @ 2200	660 @ 1300	40	*44	48	28	*23	27
2105	6CTA8.3	300 @ 2200	820 @ 1300	44	*47.8	52	19	*31.5	36
2106	6CTA8.3	250 @ 2200	660 @ 1300	38	*42	46	19	*23	27
2108	6CTA8.3	250 @ 2200	660 @ 1300	38	*42	46	19	*23	27
D2118	6CT8.3	300 @ 2200	900 @ 1600						
D2120	6CT8.3	173 @ 2380	496 @ 1600	41	*44.5	49	25	*28.9	33
D2150	6CTA8.3	250 @ 2200	660 @ 1300	41	*41.6	43	23	*24.2	26

(Continued)

CPL	Model Engine	hp @ rpm Rating	Peak Torque ft-lb @ rpm	Rated Boost (in Hg)			Peak Torque Boost (in Hg)		
D2158	6CTA8.3	325 @ 2200	960 @ 1300	42	*46	50	31	*34.6	39
D2169	6CTA8.3	325 @ 2200	960 @ 1300	42	*46	50	31	*34.6	39
2169	6CTA8.3	325 @ 2200	915 @ 1300	47	*50.5	55	33	*36.6	41
D2185	6CT8.3	215 @ 2500	610 @ 1500	41	*45	49	28	*32.2	36
D2191	6CTA8.3	325 @ 2200	960 @ 1300	42	*46	50	31	*34.6	39
2191	6CTA8.3	325 @ 2200	915 @ 1300	47	*50.5	55	33	*36.6	41
2194	6CTAA8.3	242 @ 2200	739 @ 1400	19	*22	25	13	*15.9	19
2194	6CTAA8.3	256 @ 2400	756 @ 1400	43	*45.8	49	33	*36.3	39
2196	6CTAA8.3	300 @ 2200	850 @ 1500	40	*43.4	47	35	*38.4	41
2196	6CTAA8.3	300 @ 2200	850 @ 1500	40	*44	48	35	*39	43

Exhaust System

Maximum Exhaust Pipe Restriction:

C8.3	75 mm Hg [3 in Hg]
C8.3 (with catalyst)	152 mm Hg [6 in Hg]

Electrical System

Starting Circuit

Maximum Resistance

12-VDC Starter	0.0012 ohm
24-VDC Starter	0.0040 ohm

Battery Cables

Maximum Resistance

12-VDC System	0.001 ohm
24-VDC System	0.002 ohm

Battery Cable Size

4 Gauge

Nominal Resistance

Per Meter	0.000984
Per Foot	0.000300

Maximum Total Length

12-VDC	Not Recommended
24-VDC	2.03 m [6.70 ft]

2 Gauge

Nominal Resistance

Per Meter	0.000615
Per Foot	0.000188

Maximum Total Length

12-VDC	1.63 m [5.30 ft]
24-VDC	3.26 m [10.60 ft]

1 Gauge

Nominal Resistance

Per Meter	0.000492
Per Foot	0.000150

Maximum Total Length

12-VDC	2.03 m [6.70 ft]
24-VDC	4.06 m [13.40 ft]

0 Gauge

Nominal Resistance

Per Meter	0.000386
Per Foot	0.000118

Maximum Total Length

12-VDC	2.59 m [8.50 ft]
24-VDC	5.18 m [17.00 ft]

00 Gauge

Nominal Resistance

Per Meter	0.000292
Per Foot	0.000090

Maximum Total Length

12-VDC	3.43 m [11.30 ft]
24-VDC	6.86 m [22.60 ft]

000 Gauge

Nominal Resistance

Per Meter	0.000232
Per Foot	0.000071

Maximum Total Length

12-VDC	4.32 m [14.20 ft]
24-VDC	8.64 m [28.40 ft]

Wiring Size Recommendations for Starter Solenoid and Fuel Solenoid Circuit

NOTE: Values in the table are AWG size.

Copper Conductor Stranded Wire								
Wire Length in Circuit:	Positive Battery Terminal to Magnetic Switch		Magnetic Switch to "S" Terminal on Starter Solenoid		*Magnetic Switch to Fuel Solenoid Pull-in Winding		Fuel Solenoid Pull-in Winding to Negative Battery Terminal	
	12 VDC	24 VDC	12 VDC	24 VDC	12 VDC	24 VDC	12 VDC	24 VDC
up to 0.9 m [3 ft]	10	14	12	14	14	16	14	16
0.9 to 1.4 m [3 to 4.5 ft]	10	12	10	14	14	16	14	16
1.4 to 2.1 m [4.5 to 7 ft]	8	10	8	10	10	12	12	14
2.1 to 2.7 m [7 to 9 ft]	6	8	8	10	10	12	12	14
2.7 to 3.4 m [9 to 11 ft]	4	6	6	8	10	12	8	10

NOTE: Wire length in a circuit means the total length in each individual circuit. The positive battery terminal to the magnetic switch is one circuit.

For example, in a 12-VDC circuit:

Positive battery terminal to magnetic switch = 2 m [6.6 ft]; gauge required = 8g.

Magnetic switch to starter solenoid = 2 m [6.6 ft]; gauge required = 8g.

Magnetic switch to fuel solenoid = 3 m [10 ft]; gauge required = 10g.

Fuel solenoid to negative battery terminal = 3 m [10 ft]; gauge required = 10g.

NOTE: If the system uses double-pole wiring, no frame ground, then the fuel and starter solenoid circuit lengths would include the ground wire.

***Special requirements for 3 wire fuel solenoids:**

The pull-in wiring (white lead) should conform to the above chart recommendations.

The ground wiring (block lead) **must** be the same gauge as the pull-in wiring (white lead).

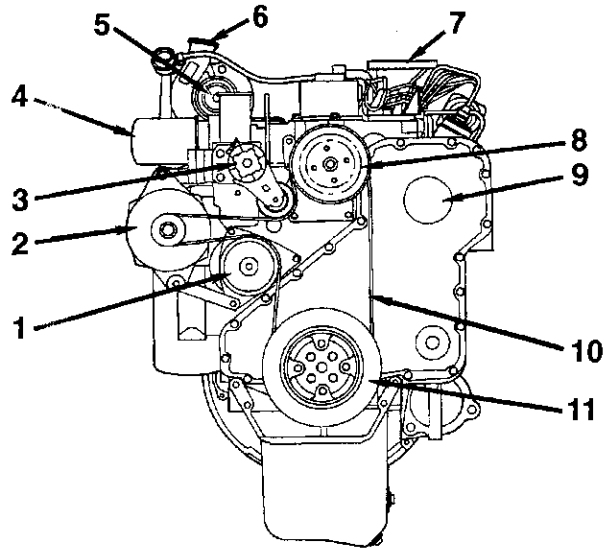
The hold-in wiring (red lead) that connects to the **Run** terminal **must** use a minimum of a 14-gauge wire.

NOTE: Starter solenoids are usually internally grounded through the starter motor. No ground wire from the starting solenoid to the negative battery terminal is required.

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

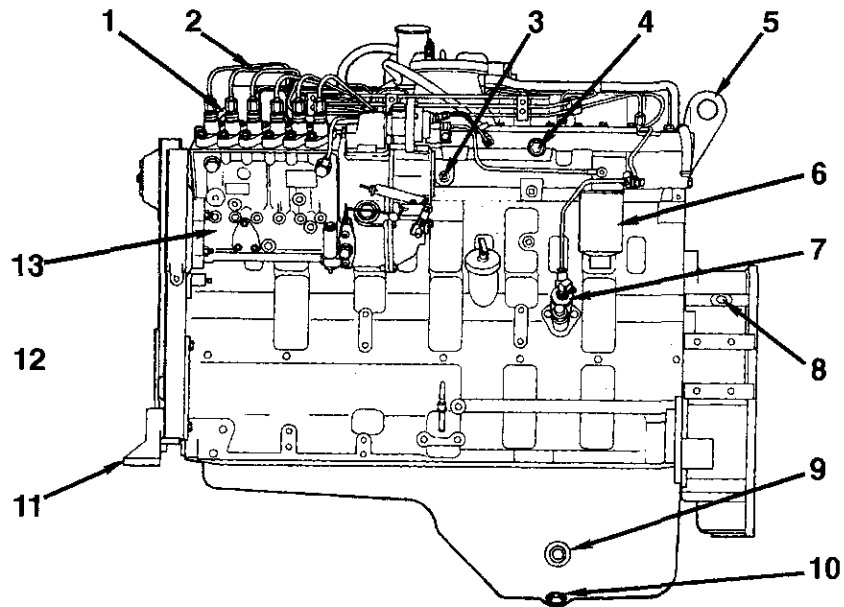
Engine Diagrams



00900284

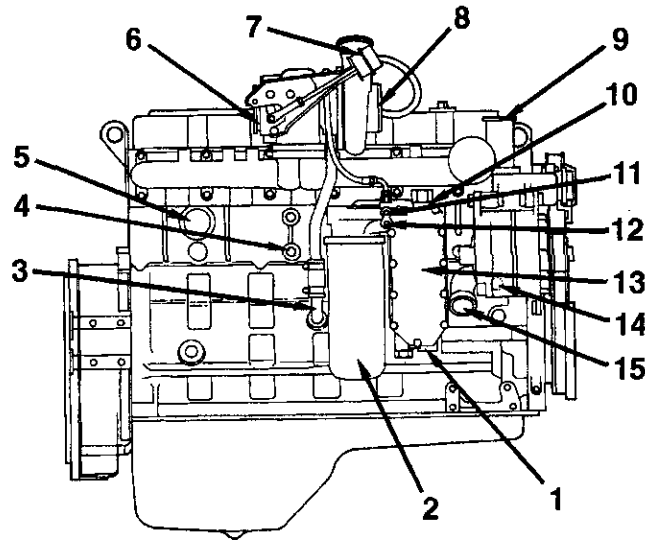
Front View

- | | |
|----------------------------|--------------------------|
| 1. Water Pump | 7. Engine Air Inlet |
| 2. Alternator | 8. Fan Pulley |
| 3. Belt Tensioner | 9. Fuel Pump Drive Cover |
| 4. Coolant Filter | 10. Drive Belt |
| 5. Turbocharger Air Inlet | 11. Vibration Damper |
| 6. Turbocharger Air Outlet | |



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- | | |
|--------------------------------------|--|
| 1. Provision for Oil Pan Sump Heater | 8. 1/4-Inch NPTF (air) |
| 2. Lubricating Oil Drain Plug | 9. M22 x 1.50 (air) |
| 3. Front Engine Mounting Bracket | 10. Rear Lifting Bracket |
| 4. Air Compressor (not shown) | 11. Fuel/Water Separator |
| 5. Fuel Injection Pump | 12. Fuel Transfer Pump |
| 6. Front Lifting Bracket | 13. 3/4 x 16-Inch UNF Tap for Magnetic Pickup. |
| 7. High-Pressure Fuel Lines | |



ew900gp

Turbocharger Side View

- | | |
|---------------------------------------|--|
| 1. Lubricating Oil Temperature Sensor | 9. Water Outlet Connection |
| 2. Lubricating Oil Filter | 10. Lubricating Oil Temperature Thermostat |
| 3. Turbocharger Oil Drain | 11. Lubricating Oil Pressure (after filter) |
| 4. Provision for Cab Heater | 12. Lubricating Oil Pressure (before filter) |
| 5. Provision for Coolant Heater | 13. Lubricating Oil Cooler |
| 6. Turbocharger Exhaust Outlet | 14. 1/2-Inch NPTF (coolant) |
| 7. Turbocharger Wastegate Actuator | 15. Coolant Inlet. |
| 8. Turbocharger Air Outlet | |

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