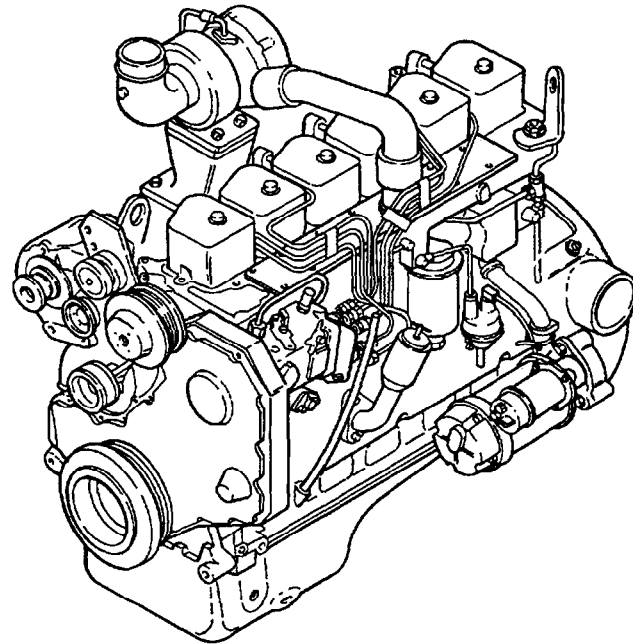
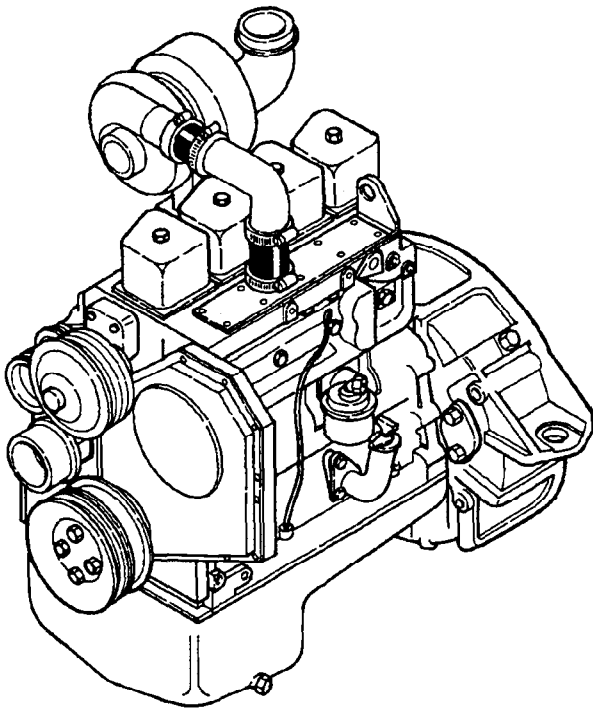


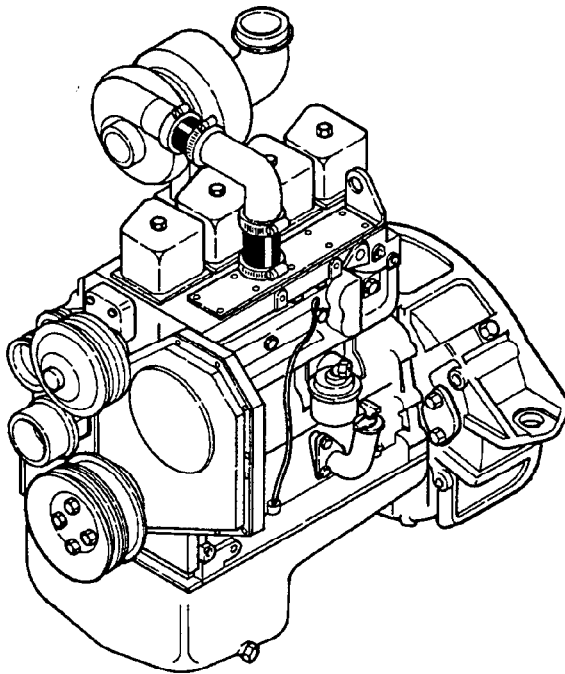
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KDC 410 AND 610 SERIES ENGINE TROUBLESHOOTING AND REPAIR MANUAL 1991 SERIES

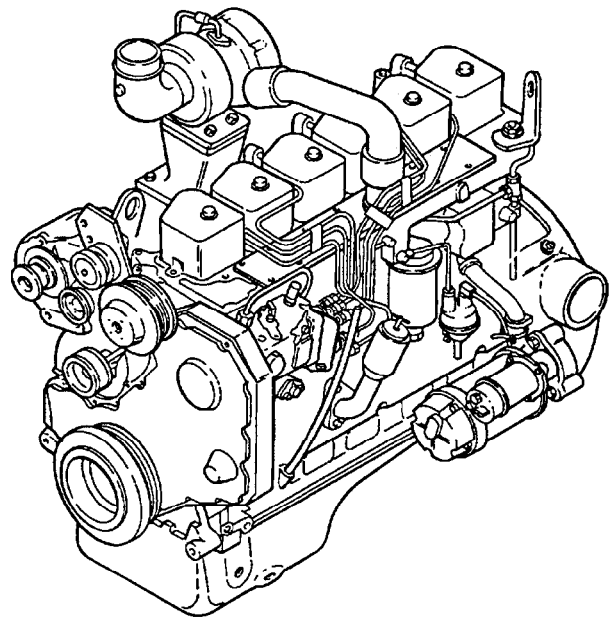


Komatsu Dresser
Company

[Rev. A]



KDC 410 Series Engine



KDC 610 Series Engine

Foreword

This manual provides instructions for troubleshooting and repairing the 410 and 610 Series Engine in the chassis. Component and assembly rebuild procedures are provided in the 410 and 610 Series Engine Shop Manual. Refer to Page i-2 in the Introduction for instructions on how to use this manual. The procedures given in this manual are applicable for the 410 and 610 Series engines introduced in 1991.

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 machine or equipment problems. Consult the appropriate chassis shop manual for repair procedures.

A series of specific service manuals (Shop, Specification, Alternative Repair, and so forth) are available and can be ordered through your distributor using the form in Section L.

The repair procedures used in this manual are recommended by Komatsu Dresser Company. Some service procedures require the use of special service tools. Use the correct tools as described.

The specifications and rebuild information in this manual is based on the information in effect at the time of printing. Komatsu Dresser Company 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 your KDC Distributor.

The latest technology and the highest quality components are used to manufacture KDC engines. When replacement parts are needed, we recommend using only genuine KDC exchange parts.

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Section i - Introduction

Section Contents

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About the Manual

The procedures in this manual were developed for an in-chassis environment. The information has been grouped by the main engine systems. The Table of Contents defines the systems. The section contents at the beginning of each section subdivides the instructions for the various components of the system. Wrench sizes and special tools are identified in the procedures as needed.

How to Use the Manual

The organization of this manual is based on the troubleshooting logic presented in Section T. To fix a problem, find the logic chart for the particular symptom. Follow the steps specified until the problem is corrected.

The left column of the charts indicate a probable cause. The right column provides a brief description of the corrective action with a reference to the repair procedure or diagnostic discussion when appropriate.

The logic charts reflect three basic considerations:

- (1) Assumes the engine has provided satisfactory service prior to the problem.
- (2) Performing the easiest things first,
- (3) Most logical cause in descending order.

If the problem occurs with a new engine or after repair of the engine, the diagnostics discussion for each major system will provide guidance for sorting out the cause of the problem.

Generic Symbols

The following group of 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,



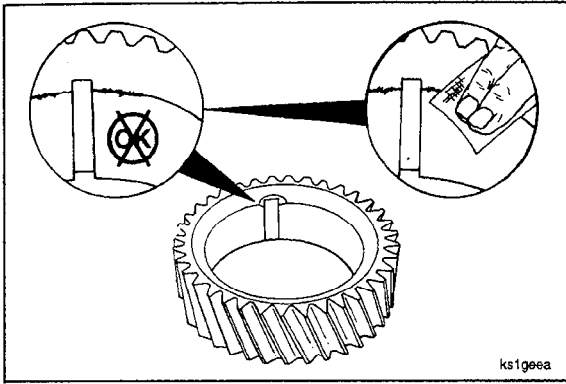
PERFORM an electrical **MEASUREMENT**.



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

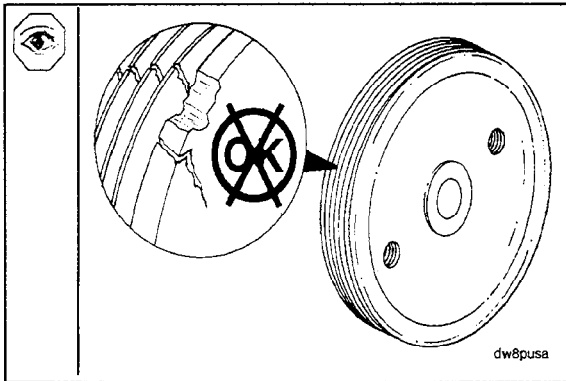


The component weighs 23 kg [50 lb] or more, To avoid personal injury, use a hoist or get assistance to lift the component.



Illustrations

The illustrations used in the "Repair Sections" of this manual are intended to give an example of a problem, and to show what to look for and where the problem can be found. Some of the illustrations are "generic" and will **not** look exactly like the engine or parts used in your application. Some illustrations contain symbols to indicate an action required, and an acceptable or **not** acceptable condition.



The illustrations are intended to show repair or replacement procedures with the engine "in-chassis." The illustration can differ from your application, but the procedure given will be the same. Certain procedures may not apply to all applications (e.g. engine balancer). Disregard any procedures that are not applicable.

General Safety Instructions

Important Safety Notice



WARNING



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 safe. Be aware of hazardous conditions that can exist.
- **Always** wear protective glasses and protective shoes when working.
- Do **not** wear loose-fitting or torn clothing. Remove all jewelry when working.
- Disconnect the battery 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 engine 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 any thing 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, 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 liquid refrigerant (freon) lines in a well ventilated area.
- 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 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 KDC 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.

General Repair Instructions

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

- **Komatsu Dresser Co. does not recommend or authorize any modifications or repairs to engines or components except for those detailed in KDC Service Information. In particular, unauthorized repair to safety-related components can cause personal injury. 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 there substances used during the repair of the engine. **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 and components will cause premature wear.
- **Perform the Inspections Specified in the Procedures.**
- **Use Genuine KDC Service Parts and Assemblies**
- **Replace all Components or Assemblies Which are Damaged or Worn Beyond the Specifications**
 - 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 KDC components. All of the repair services described in this manual are available from all KDC Distributors.
- **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 your KDC Distributor. Refer to Section L, 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. **Komatsu Dresser Company** does not recommend any specific cleaners. Always follow the cleaner manufacturer's instructions.

Experience has shown that the best results can be obtained using a cleaner that can be heated to 90 to 95° Celsius [80 to 200° Fahrenheit]. A cleaning tank that provides a constant mixing and filtering of the cleaning solution will give the best results.

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: The use of acid can be extremely dangerous to personnel, and can 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
2. Wiring
3. Injectors
4. Fuel Pump
5. Belts and Hoses
6. Bearings

Glossary of Terms

Definition

A. C.:	Alternating Current
AFC:	Air Fuel Control; a device in the fuel pump that limits the fuel delivery until there is sufficient intake manifold pressure to allow for complete combustion.
ATDC:	After Top Dead Center; refers to the position of the piston or the crankshaft rod journal. The piston is moving downward on the power stroke or intake stroke.
BDC:	Bottom Dead Center; refers to the position of the piston or the crankshaft rod journal. The piston is at its lowest position in the cylinder.
BTDC:	Before Top Dead Center; refers to the position of the piston or the crankshaft rod journal. The piston is moving upward on the compression stroke or exhaust stroke.
Circumferential Direction:	In the direction of a circle in respect to the centerline of a round part or a bore.
Concentricity:	A measurement of the difference between the centers of either two or more parts or the bores in one part.
Silicone Sealant:	This is a one part Room Temperature Vulcanizing (RTV) silicone rubber, adhesive and sealant material having high heat and oil resistance, and low compression set. Some of the equivalent products are Marston Lubricants, Hylosil, Dow Corning, Silastic 732, Loctite Superflex, General Electric RTV108 and Three Bond Sealant.
D. C.:	Direct Current
Dye Penetrant Method:	A method used to check for cracks in a part by using a dye penetrant and a developer. Use crack detection kit, Part No. 3375432, or its equivalent.
End Clearance:	The clearance in an assembly determined by pushing the shaft in an axial direction one way and then pushing the shaft the other way .
E. S. N.	Engine Serial Number
Hammer:	A hand tool consisting of a hard steel head on a handle.
I. D.:	Inside Diameter
Loctite 290:	A single component, anaerobic, polyester resin, liquid sealant compound that hardens between closely fitted metal surfaces producing a tough, hard bond. Equivalent products are KDC 1232 273 H1 and Perma-Lok HL 126.
Loctite 609:	A single component anaerobic, liquid adhesive that meets or exceeds the requirements of MIL-R-46082A (MN) TYPE1. Some of the equivalent products are KDC 634 018 C1, Loctite 601 and Permabond HL 138.
Lubriplate 105:	A mineral oil base grease with calcium soap (2 percent to 6 percent), and zinc oxide (2 percent to 4 percent) additives.
Magnetic Particle Inspection:	A method of checking for cracks in either steel or iron parts. This method requires a Magnaflux or equivalent machine that imparts a magnetic field on the part being checked.
Mallet:	A hand tool consisting of a soft head, either wood, plastic, lead, brass, or rawhide , on a handle.

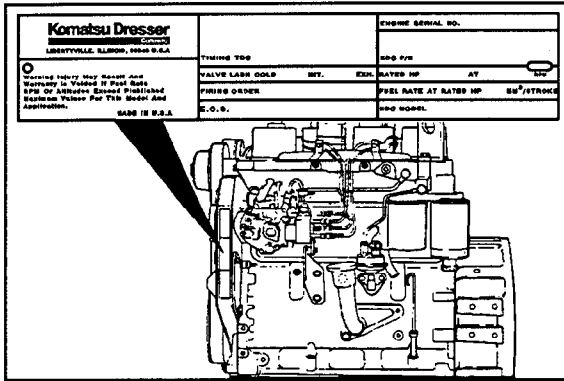
	Defintion
MAX:	Maximum allowed
MIN:	Minimum allowed
No.:	Number
O.D.:	Outside Diameter
OS:	Oversize
Protrusion:	The difference in the height between two parts in the assembled state.
STD:	Standard
TC:	Torque Converter; used when referring to the torque converter cooler.
TDC:	Top Dead Center; refers to the position of the piston or the crankshaft rod journal. The piston is at its highest position in the cylinder. The rod journal is pointing straight up toward the piston.
T.I.R.:	Total Indicator Runout; used when measuring the concentricity or the runout. The T.I.R. refers to the total movement of the needle on a dial indicator, from the most negative reading to the most positive reading.
Water Pump Grease:	A premium high temperature grease that will lubricate antifriction bearings continually from minus 40° C [minus 40° F] to plus 150° C [plus 350° F] . Some of the greases meeting this requirement are Aeroshell No. 5, Chevron SRI, Amoco Rykon Premium No. 2, Texaco Premium RB, and Shell Dolium R. Aeroshell No. 5 is not compatible with the other greases and must not be mixed. Aeroshell No. 5 is used on new engines and components.

Section E - Engine and Component Identification

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Lubrication System	E-4
Lucas CAV DPA dataplate location.	E-3
Robert Bosch VE dataplate location.	E-3


Engine Identification



Engine Dataplate

The engine dataplate shows specific information about your engine. The engine serial number provides information for ordering parts and service needs.

NOTE: The engine dataplate **must not** be changed unless approved by KDC.

 LIBERTYVILLE, ILLINOIS, 60048 U.S.A. Warning Injury May Result And Warranty Is Voided If Fuel Rate RPM Or Altitudes Exceed Published Maximum Values For This Model And Application. MADE IN U.S.A.			ENGINE SERIAL NO.		
	TIMING TDC		KDC P/N		
	VALVE LASH COLD	INT.	EXH.	RATED HP	AT <input type="text"/> RPM
	FIRING ORDER		FUEL RATE AT RATED HP		MM ³ /STROKE
	E.C.S.		KDC MODEL		

E2BW0001

Engine Dataplate

The KDC model designation represent the basic design and configuration of your engine.

Example Engine Model Name:

4 10 TA
(1) (2) (3)

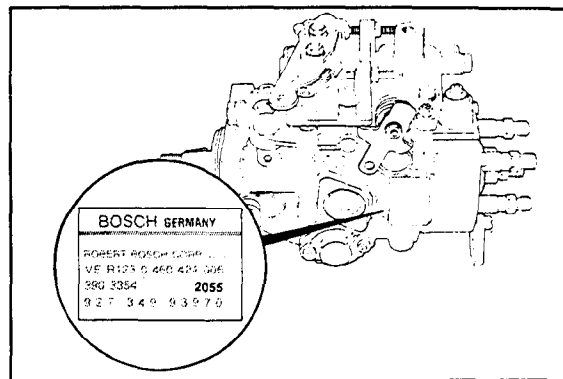
- (1) Number of cylinders
- (2) Displacement per cylinder/100 in cc
- (3) Type of aspiration:

T = Turbocharged
A = Aftercooled

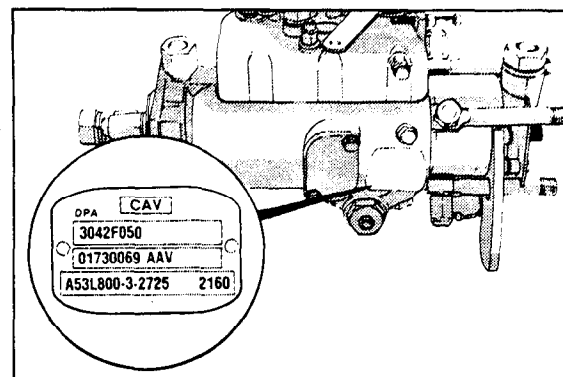
Injection Pump Dataplate

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

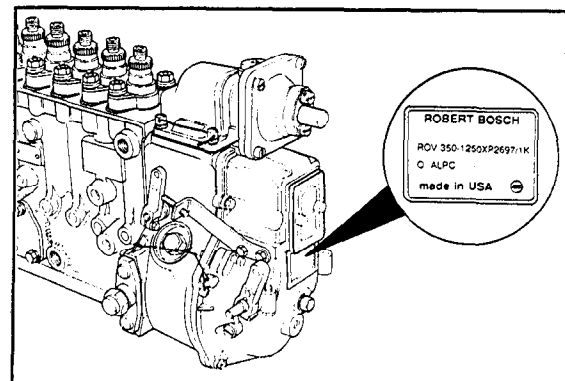
Robert Bosch VE dataplate location.



Lucas CAV DPA dataplate location.



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



Engine Specifications - General

General Engine Data

Bore	102 mm [4.02 in]
Stroke	120 mm [4.72 in]
Displacement	
410	3.92 liters [239 in ³]
610	5.88 liters [359 in ³]
Compression ratio	
410/610	18.5:1
410T/610T	17.5:1
410TA/610TA	16.5:1
Firing order	
4 cylinder	1-3-4-2
6 cylinder	1-5-3-6-2-4
Valve clearance	
Intake	0.25 mm [0.010 in]
Exhaust	0.51 mm [0.020 in]
Engine rotation (viewed from front of engine)	Clockwise
Aspiration	
410/610	Naturally Aspirated
410T/610T	Turbocharged
410TA/610TA	Turbocharged and Aftercooled
Engine weight (with standard accessories)	
4 cylinder engine	325 to 350 kg [715 to 770 lb]
6 cylinder engine	410 to 440 kg [910 to 970 lb]

Lubrication System

Oil pressure	
At idle (minimum allowable)	69 kPa [10 psi]
At rated speed (minimum allowable)	207 kPa [30 psi]
Regulating valve opening pressure	449 kPa [65 psi]
Differential pressure to open oil filter bypass valve	138 kPa [20 psi]
Oil pan capacity (standard oil pan)	
4 cylinder engine	9.5 liters [10 U.S. Qts.]
6 cylinder engine	14.2 liters [15 U.S. Qts.]
Total system capacity	
410	10.9 liters [11.5 U.S. Qts.]
410T, 410TA	11.0 liters [11.6 U.S. Qts.]
610	16.3 liters [17.2 U.S. Qts.]
610T, 610TA	16.4 liters [17.3 U.S. Qts.]