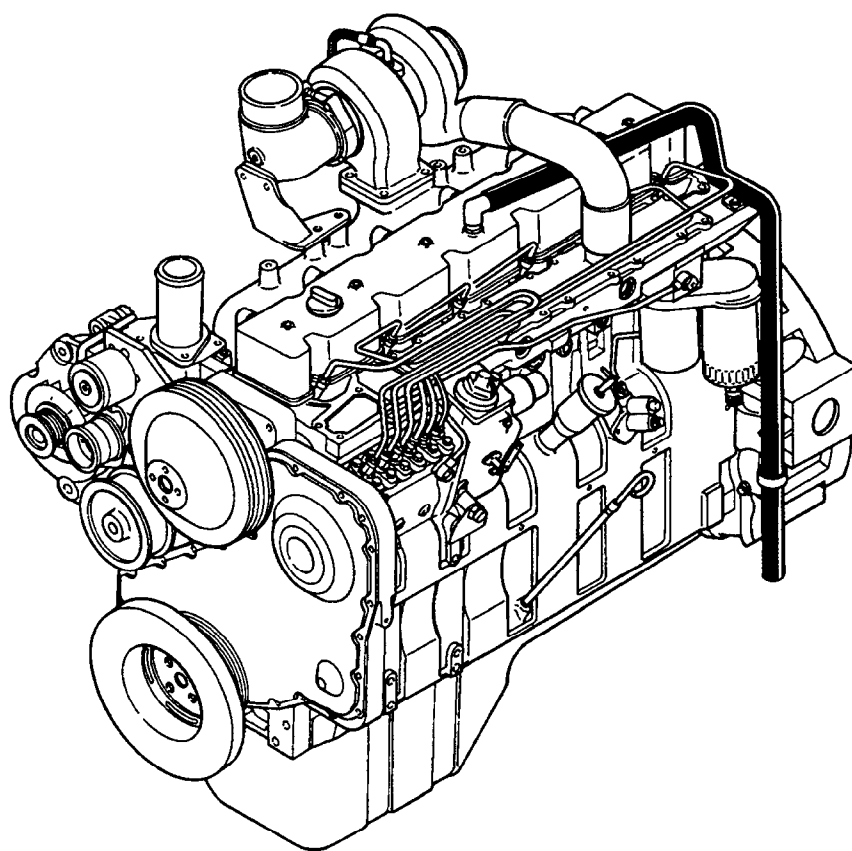


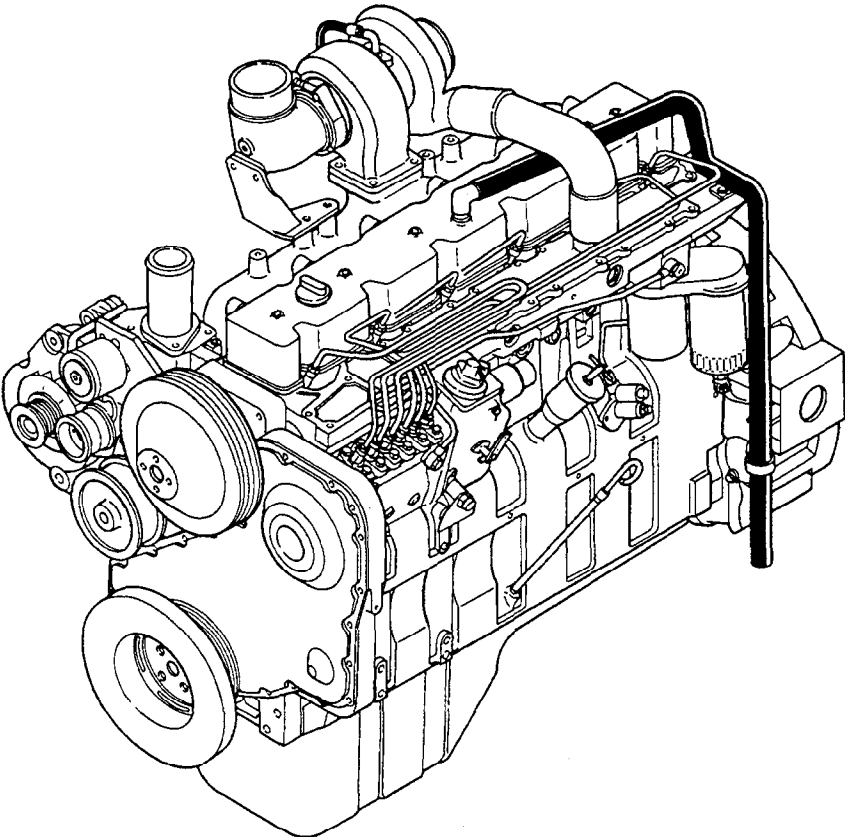
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KDC 614 SERIES ENGINE ALTERNATIVE REPAIR MANUAL 1991 SERIES



Komatsu Dresser
Company

[Rev. A]



KDC 614 Series Engine

Foreword

This alternative repair manual contains specifications and instructions for repairing damaged or worn components in the 614 engine. The repair procedures are based on the engine being repaired with approved machining and grinding equipment. Some procedures require the use of special service tools. Make sure the correct tools and equipment are used as described in the procedures.

When a specific brand name, number or special tool is referenced in this manual, an equivalent product can be used in place of the recommended item.

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 specifications and rebuild 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

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About The Manual

The procedures in this manual were developed for a shop environment. A Group System has been used to subdivide the instructions by major components and systems. Refer to the Section Contents for the various groups. Wrench sizes and shop tooling are identified in the procedure when needed.

The initial publication provides some general repair information, cylinder block repair and cylinder head repair. Subsequent versions of the manual will include alternative repairs for additional components as they are developed.

The contents of this manual are based on information in effect at the time of publication approval and are subject to change without notice.

How to Use the Manual

This manual is divided in the same group system used for the KDC engine shop manual. Each group is organized in a way that all mechanics, both those who are and are not familiar with the 614 Series engine models, can reference the manual. Refer to the Section Contents at the front of the manual to determine the group that details the desired information.

Each group contains the following in sequence:

- Section contents at the beginning of each group to quickly aid in locating the information desired.
- Service tools list with recommended tools needed to rebuild the components.
- General information to aid in repairing the component.
- Step-by-step rebuild instructions for cleaning, inspection and salvage of the component.
- Symbols which represent the action outlined in the instructions. The definitions of the symbols appear on page 4.

Topics will be listed alphabetically on the "Section Contents" page. All procedures are described using the "text symbol picture" (TSP) format. In general, each component rebuild will be described through a 3-step sequence of: (1) cleaning and inspection for reuse; (2) rebuild; and (3) replacement. Reference numbers (procedure numbers) are assigned to each process. Reference numbers are constructed with a section number and a two-digit sequenced number.

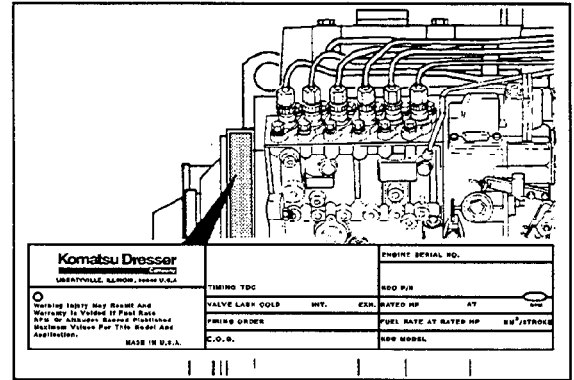
Both metric and U.S. customary values are used in this manual. The metric value is listed first, followed by the U.S. customary in brackets. An example is 60°C [140°F].

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.



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

E2BW0001

Engine Dataplate

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

Example Engine Model Name:

6 14 TA
(1) (2) (3)

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

T = Turbocharged
A = Aftercooled

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**.



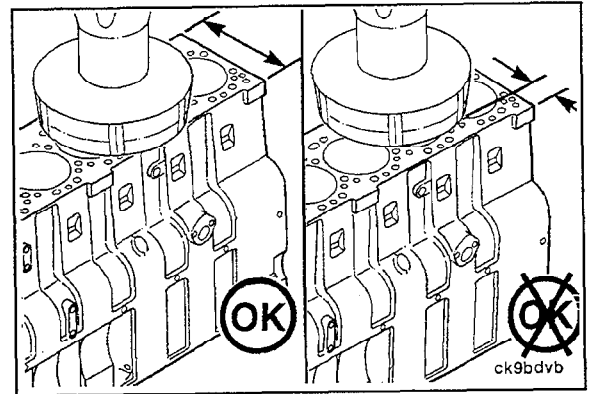
Refer to another location in this manual or another publication for additional information,



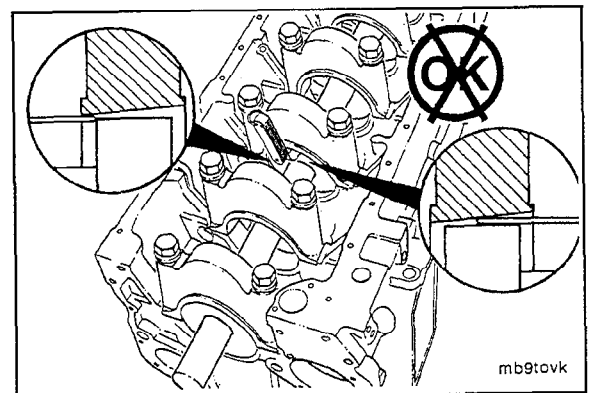
The component weighs 23 kg [50 lb] or more, To avoid personal injury, use a hoist or get assistance to lift the component.

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 might **not** look exactly like the engine or parts used in your application. The illustrations can contain symbols to indicate an action required. The illustrations may also indicate an acceptable or **not** acceptable condition.



The illustrations are intended to show repair or replacement procedures. The illustration can differ from your application, but the procedure given will be the same.



General Safety Instructions

Important Safety Notice



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 Company 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 other 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.**
- **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°C [180 to 200°F]. 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

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: - Use U.S. size No. 16-20 for piston cleaning with plastic bead media, Part No. 3822735.
- Use U.S. size No. 70 for piston domes with glass media.
- Use U.S. size No. 60 for general purpose cleaning with glass media.
2. Operating Pressure: - Glass: Use 620 kPa [90 psi] for general purpose cleaning.
- 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.

Definition of Terms

AFC	Air Fuel Control	kg	Kilograms
API	American Petroleum Institute	km	Kilometers
ASA	Air Signal Attenuator	km/l	Kilometers per Liter
ASTM	American Society of Testing and Materials	kPa	Kilopascal
C	Celsius	l	Liter
CARB	California Air Resources Board	m	Meter
C.I.D.	Cubic Inch Displacement	mm	Millimeter
Cm	Centimeter	MPa	Megapascal
cSt	Centistokes	MPH	Miles Per Hour
DCA	Diesel Coolant Additive	MPQ	Miles Per Quart
ECM	Electronic Control Module	N•m	Newton-meter
E.C.S.	Emission Control System	OEM	Original Equipment Manufacturer
EPA	Environmental Protection Agency	ppm	Parts Per Million
EPS	Engine Position Sensor	psi	Pounds Per Square Inch
F	Fahrenheit	PTO	Power Takeoff
ft-lb	Foot Pound	RPM	Revolutions Per Minute
GVW	Gross Vehicle Weight	S.A.E.	Society of Automotive Engineers
Hg	Mercury	STC	Step Timing Control
HP	Horsepower	VS	Variable Speed
H₂O	Water	VSS	Vehicle Speed Sensor
in-lb	Inch Pound		

Service Tools

There are some service tools that were not available at the time this manual was released for publication. The tools that were not available are listed below. The procedures and dimensions are correct for the specific operations described in this manual. Because of the need to get the information to the field, the book was published without waiting for all of the tools. As the tools become available, interim service publications will be published. If you need one of the tools listed below, please check on the current status with your local KDC Distributor. Repairs without tools available will need to be made by other means.

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Oversize Valve Guide Ream	Reamer	2-18
Injector Seal Bore	Machining Kit	2-43 & 2-44


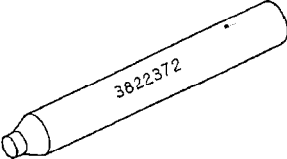
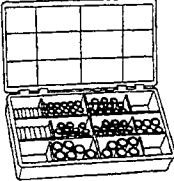

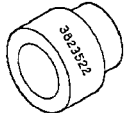
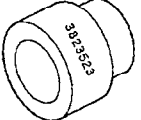
Section 0 - General Repairs

Section Contents

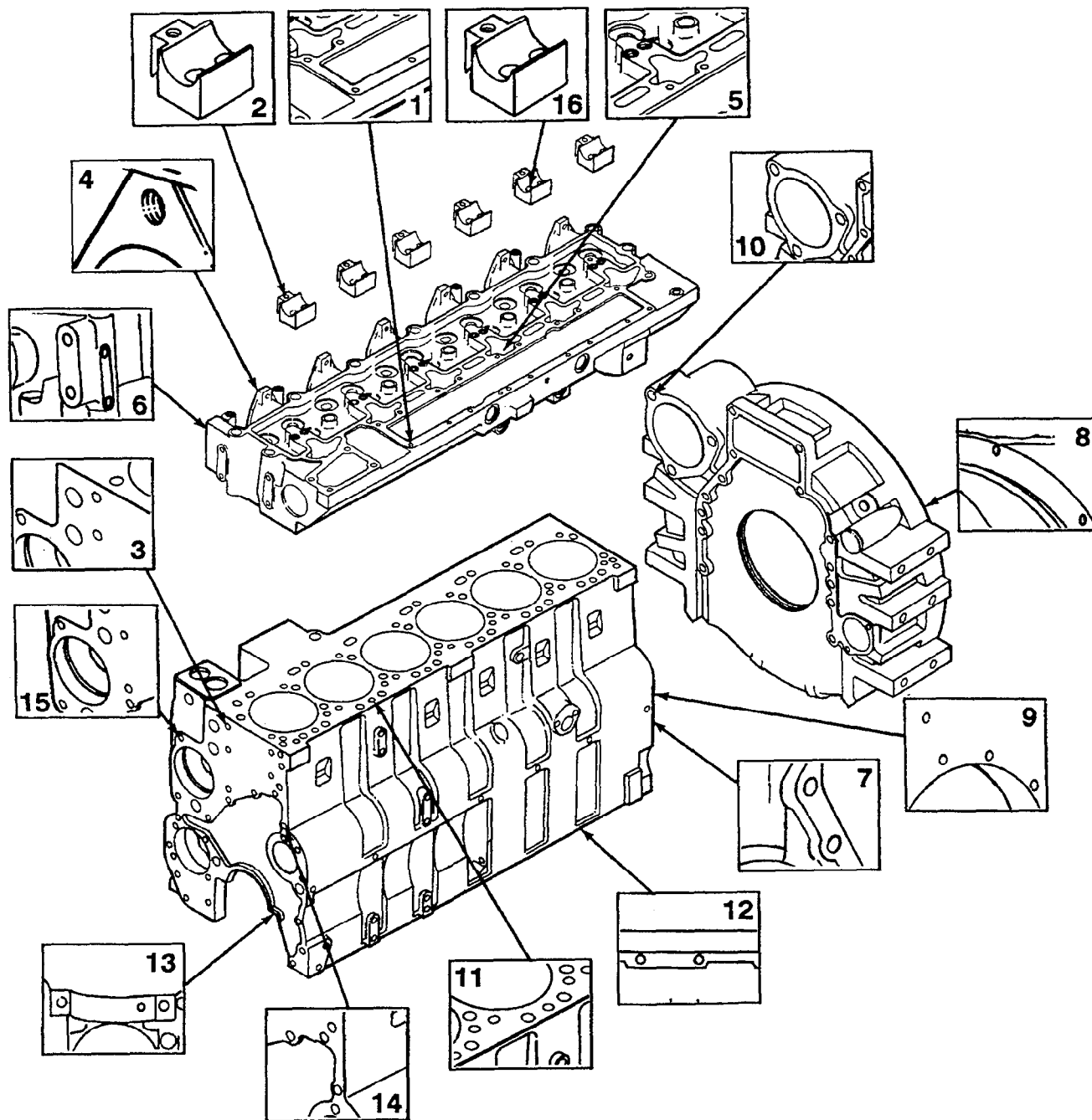
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Service Tools

The following special tools are recommended to perform procedures in Group 00. The use of these tools is shown in the appropriate procedure. These tools can be purchased from your local Distributor.

Tool No.	Tool Description	Tool Illustration
3375068	<p>Expansion Plug Sealant</p> <p>Used when installing pipe plugs, expansion plugs, etc. on the engine to prevent leaks.</p>	
3822372	<p>Expansion Plug Driver</p> <p>Install 0.380 inch diameter expansion plugs in the cylinder block.</p>	
3822709	<p>Metric Thread Insert Kit</p> <p>Repair damaged internal metric threads.</p>	
3823521	<p>Expansion Plug Driver</p> <p>Install 0.8125 inch expansion plug to specified depth. Used with expansion plug driver handle, Part No. 3376795.</p>	
3823522	<p>Expansion Plug Driver</p> <p>Install 1.1875 inch expansion plug to specified depth. Used with expansion plug driver handle, Part No. 3376795.</p>	
3823523	<p>Expansion Plug Driver</p> <p>Install 1.375 inch expansion plug to specified depth. Used with expansion plug driver handle, Part No. 3376795.</p>	

Straight Thread Holes - Exploded View



Ref No.	Mounting Capscrew Thread Location	Thread Size
1	Aftercooler	M8X1.25
2	Rocker Cover	M8X1.25
3	Fan Support	M8X1.25
4	Exhaust Manifold	M10X1.50
5	Injector Hold Down Clamps	M8X1.25
6	Lifting Bracket	M12X1.75
7	Flywheel Housing	M12X1.75
8	*Transmission	M10X1.50 or 7/16X14UNC

Ref No.	Mounting Capscrew Thread Location	Thread Size
9	Rear Crankshaft Seal	M6X1.00
10	*Starting Motor Mounting	M12X1.75
11	Cylinder Head	M14X2.00
12	Lubricating Oil Pan	M8X1.25
13	Main Bearing Cap	M14X2.00
14	Gear Cover	M8X1.25
15	Water Pump	M8X1.25
16	Rocker Lever Support	M10X1.50