

Product: Case ISUZU 4JB1 Engine Service Repair Workshop Manual  
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# SERVICE MANUAL 4JB1 ISUZU ENGINES

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**Case**

Cre 7-28470GB

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Issued 12-00

<b>TABLE OF CONTENTS</b>	
<b>SECTION</b>	<b>DESCRIPTION</b>
<b>1</b>	General Information
<b>2</b>	Maintenance
<b>3</b>	Disassembly
<b>4</b>	Inspection and repair
<b>5</b>	Reassembly
<b>6</b>	Lubricating system
<b>7</b>	Cooling system
<b>8</b>	Fuel system
<b>12</b>	Troubleshooting
<b>13</b>	Special tools



SECTION 1

GENERAL INFORMATION

TABLE OF CONTENTS

ITEM	PAGE
General repair instructions .....	1-2
Notes on the format of this manual.....	1-2
Main data and specifications .....	1-6
Tightening torque specifications .....	1-7
Major component mounting nuts and bolts.....	1-9
Identification .....	1-15

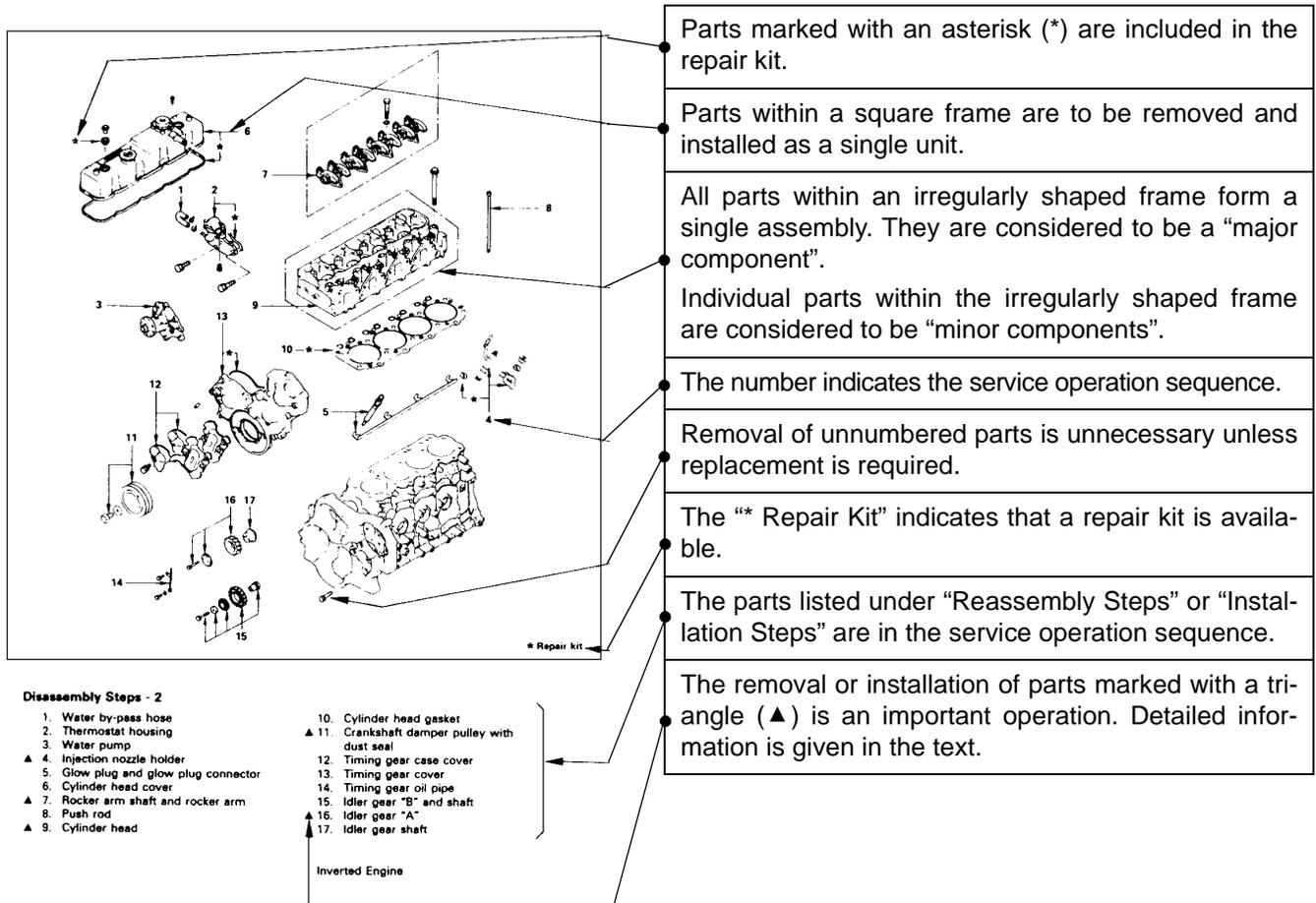
## GENERAL REPAIR INSTRUCTIONS

1. Before performing any service operation with the engine mounted, disconnect the grounding cable from the battery.  
This will reduce the chance of cable damage and burning due to short circuiting.
2. Always use the proper tool or tools for the job on hand.  
Where specified use the specially designed tool or tools.
3. Use genuine CASE parts, referring to the CASE PARTS CATALOG for engine safety.
4. Never reuse cotter pins, gaskets, O-rings, lock washers, and self locking nuts. Discard them as you remove them. Replace them with new ones.
5. Always keep disassembled parts neatly in groups. This will ensure a smooth reassembly operation.  
It is especially important to keep fastening parts separate. These parts vary in hardness and design, depending on their installation position.
6. All parts should be carefully cleaned before inspection or reassembly.  
Oil ports and other openings should be cleaned with compressed air to make sure that they are completely free of obstructions.
7. Rotating and sliding part surfaces should be lubricated with oil or grease before reassembly.
8. If necessary, use sealing compound on gaskets to prevent leakage.
9. Nut and bolt torque specifications should be carefully followed.
10. Always release the air pressure from any machine-mounted air tank(s) before dismantling the engine or disconnecting pipes and hoses. To not do so is extremely dangerous.
11. Always check and recheck you work. No service operation is complete until you have done this.

## NOTES ON THE FORMAT OF THIS MANUAL

1. Find the applicable section by referring to the Table of Contents at the beginning of the Manual.
2. Common technical data such as general maintenance items, service specifications, and tightening torques are included in the "General Information" section.
3. Each section is divided into sub-sections dealing with disassembly, inspection and repair, and reassembly.  
The section ENGINE ASSEMBLY is an exception. This part is divided into three sections to facilitate quick indexing.

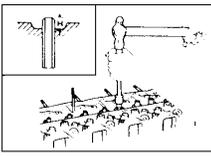
4. Each service operation section in this Service Manual begins with an exploded view of the applicable area. A brief explanation of the notation used follows.



- Parts marked with an asterisk (\*) are included in the repair kit.
- Parts within a square frame are to be removed and installed as a single unit.
- All parts within an irregularly shaped frame form a single assembly. They are considered to be a "major component".
- Individual parts within the irregularly shaped frame are considered to be "minor components".
- The number indicates the service operation sequence.
- Removal of unnumbered parts is unnecessary unless replacement is required.
- The "\* Repair Kit" indicates that a repair kit is available.
- The parts listed under "Reassembly Steps" or "Installation Steps" are in the service operation sequence.
- The removal or installation of parts marked with a triangle (▲) is an important operation. Detailed information is given in the text.

## 1-4 GENERAL INFORMATION

5. Below is a sample of the text of the Service Manual



**Valve Guide Installation**

1. Lubricate the valve guide outer face with engine oil.
2. Attach the installer to the valve guide.
3. Use a hammer to drive the valve guide into position from the cylinder head upper face.
4. Measure the height of the valve guide upper end from the upper face of the cylinder head.

Valve Guide Upper End Height (H)	mm(in)
	14.1 (0.56)

**Note:**  
If the valve guide has been removed, both the valve and the valve guide must be replaced with new ones as a set.  
Be absolutely sure to discard the used valves and valve guides.

This is the item shown in the illustration. It is marked with a triangle (▲) on the Major Components page.

Letters and numbers contained in a circle refer to the illustration.

Symbols indicate the type of service operation or step to be performed. A detailed explanation of these symbols follows.

Service data and specifications are given in this table.

6. The following symbols appear throughout this Service Manual. They indicate the type of service operation or step to perform.



**Removal**



**Adjustment**



**Installation**



**Cleaning**



**Disassembly**



**Important Operation Requiring Extra Care**



**Reassembly**



**Specified Torque (Tighten)**



**Alignment (Marks)**



**Commercially Available Tool Use Required or Recommended**



**Directional Indication**



**Lubrication (Oil)**



**Inspection**



**Lubrication (Grease)**

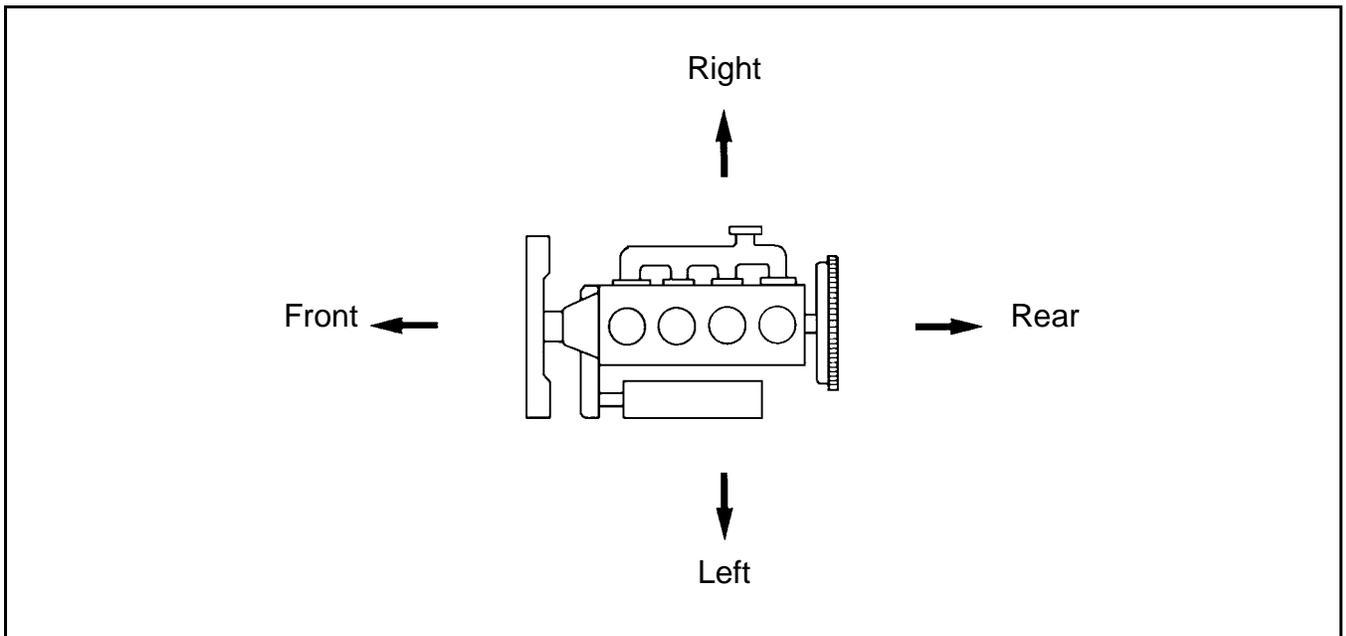


**Measurement**



**Sealant Application**

7. Measurement criteria are defined by the terms “standard” and “limit”.  
A measurement falling within the “standard” range indicates that the applicable part or parts are serviceable.  
“Limit” should be taken as an absolute value.
8. Components and parts are listed in the singular form throughout the Manual.
9. Directions used in this Manual are as follows:  
**Front:** The cooling fan side of the engine viewed from the flywheel.  
**Left:** The injection pump side of the engine.  
**Right:** The exhaust manifold side of the engine.  
**Rear:** The flywheel side of the engine.  
Cylinder numbers are counted from the front of the engine.  
The front cylinder is No. 1 and rear cylinder is No. 4.  
The engine’s direction of rotation is counterclockwise as viewed from the flywheel.



## 1-6 GENERAL INFORMATION

### MAIN DATA AND SPECIFICATIONS

**Note:**

1. These specifications are based on the standard engine.
2. Specifications for items marked with an asterisk (\*) will vary according to the type of equipment on which the engine is installed.

If you are unable to locate the data applicable to these specifications, please contact Isuzu Motors LTD through your machine supplier.

Item	Engine Model 4JB1
Engine type	Water cooled, four-cycle, in-line, overhead valve
Combustion chamber type	Direct injection
Cylinder liner type	Dry
No. of cylinders - bore x stroke mm (in)	4 - 93 x 102 (3.66 x 4.02)
Total piston displacement cm <sup>3</sup> (cid)	2.771 (169.0)
Compression ratio	18.2
* Engine dimensions mm (in)	
Length x width x height	805 x 590 x 750 (31.7 x 23.2 x 29.5)
* Engine weight (Dry) kg (lb)	220 (486)
Fuel injection order	1 - 3 - 4 - 2
Fuel injection timing (B.T.D.C) degrees	17
Specified fuel	Diesel fuel
Injection pump	In-line plunger, Bosch A type
Governor	Mechanical, RSV type
Low idle speed (rpm)	650-1.350
Injection nozzle	Hole type (with 4 orifices)
Injection starting pressure kg/cm <sup>2</sup> (psi)	185 (2630/18.142)
Fuel filter type	Cartridge paper element
Water sediment decanter (if so equipped)	Sediment water level indicating type
Compression pressure kg/cm <sup>2</sup> (psi)	31 (441/3.041)
Valve clearances (When cold)	
Intake mm (in)	0.40 (0.016)
Exhaust mm (in)	0.40 (0.016)
Lubrication method	Pressurized circulation
Oil pump	Trachoid type
Main oil filter type	Cartridge paper element, full flow
Partial oil filler	Not equipped
* Lubricating oil volume lit. (US/UK gal.)	5.5 (1.45/1.21)
Oil cooler	Water cooled built in oil filter
Cooling method	Pressurized forced circulation
Coolant volume (engine only) lit. (US/UK gal.)	5.0 (1.32/1.10)
Water pump	Belt driven impeller type
Thermostat type	Wax pellet type
* Generator V-A	12-35 or 24-45 or 24-20
* Starter V-KW	12-2.2 or 24-3.5

## TIGHTENING TORQUE SPECIFICATIONS

The tightening torque values given in the table below are applicable to the bolts unless otherwise specified.

## STANDARD BOLT

kgf.m (lb.ft/Nm)

Strength Class	4.8 (4T)	(7T)	8.8		9.8 (9T)
			Refined	Non-Refined	
Bolt Identification					
	 No mark	—			
Bolt Diameter x pitch (mm)					
<b>M6 x 1.0</b>	0.4 ~ 0.8 (2.9 ~ 5.8/3.9 ~ 7.8)		0.5 ~ 1.0 (3.6 ~ 7.2/4.9 ~ 9.8)		—
<b>M8 x 1.25</b>	0.8 ~ 1.8 (5.8 ~ 13.0/7.8 ~ 17.7)		1.2 ~ 2.3 (8.7 ~ 16.6/11.8 ~ 22.6)		1.7 ~ 3.1 (12.3 ~ 22.4/16.7 ~ 30.4)
<b>M10 x 1.25</b>	2.1 ~ 3.5 (15.2 ~ 25.3/20.6 ~ 34.3)		2.8 ~ 4.7 (20.3 ~ 34.0/27.5 ~ 46.1)		3.8 ~ 6.4 (27.5 ~ 46.3/37.3 ~ 62.8)
<b>M12 x 1.25</b>	5.0 ~ 7.5 (36.2 ~ 54.2/49.0 ~ 73.6)		6.2 ~ 9.3 (44.8 ~ 67.3/60.8 ~ 91.2)		7.7 ~ 11.6 (55.7 ~ 83.9/75.5 ~ 113.8)
<b>M14 x 1.5</b>	7.8 ~ 11.7 (56.4 ~ 84.6/78.5 ~ 114.7)		9.5 ~ 14.2 (68.7 ~ 102.7/93.2 ~ 139.3)		11.6 ~ 17.4 (83.9 ~ 125.6/113.8 ~ 170.6)
<b>M16 x 1.5</b>	10.6 ~ 16.0 (76.7 ~ 115.7/103.0 ~ 156.9)		13.8 ~ 20.8 (99.8 ~ 150.4/135.3 ~ 204.0)		16.3 ~ 24.5 (118.9 ~ 177.2/159.9 ~ 240.3)
<b>M18 x 1.5</b>	15.4 ~ 23.0 (111.1 ~ 166.4/151.0 ~ 225.6)		19.9 ~ 29.9 (143.9 ~ 216.3/195.2 ~ 391.3)		23.4 ~ 35.2 (169.3 ~ 254.6/229.5 ~ 345.2)
<b>M20 x 1.5</b>	21.0 ~ 31.6 (151.9 ~ 228.6/205.9 ~ 307.9)		27.5 ~ 41.3 (198.9 ~ 298.7/269.7 ~ 405.0)		32.3 ~ 48.5 (233.6 ~ 350.8/316.8 ~ 475.6)
<b>M22 x 1.5</b>	25.6 ~ 42.2 (185.2 ~ 305.2/251.1 ~ 413.8)		37.0 ~ 55.5 (267.6 ~ 401.4/362.9 ~ 544.3)		43.3 ~ 64.9 (313.2 ~ 469.4/424.6 ~ 636.5)
<b>M24 x 2.0</b>	36.6 ~ 55.0 (264.7 ~ 397.8/358.9 ~ 539.4)		43.9 ~ 72.5 (317.5 ~ 523.9/430.5 ~ 711.0)		56.5 ~ 84.7 (408.7 ~ 612.6/554.1 ~ 830.6)
<b>*M10 x 1.5</b>	2.0 ~ 3.4 (14.5 ~ 24.6/19.6 ~ 32.4)		2.8 ~ 4.6 (20.3 ~ 33.3/27.5 ~ 45.1)		3.7 ~ 6.1 (26.8 ~ 44.1/36.3 ~ 59.8)
<b>*M12 x 1.5</b>	4.6 ~ 7.0 (33.3 ~ 50.6/45.1 ~ 68.7)		5.8 ~ 8.6 (42.0 ~ 62.2/56.9 ~ 84.3)		3.8 ~ 6.4 (27.5 ~ 46.3/37.3 ~ 62.8)
<b>*M14 x 2.0</b>	7.3 ~ 10.9 (52.8 ~ 78.8/71.6 ~ 106.9)		9.0 ~ 13.4 (65.1 ~ 96.9/88.3 ~ 131.4)		10.9 ~ 16.3 (78.8 ~ 118.9/106.9 ~ 159.9)
<b>*M16 x 2.0</b>	10.2 ~ 15.2 (73.8 ~ 110.0/100.0 ~ 149.1)		13.2 ~ 19.8 (95.5 ~ 143.2/129.5 ~ 194.2)		15.6 ~ 23.4 (112.8 ~ 169.3/162.8 ~ 229.5)

An asterisk (\*) indicates that the bolts are used for female threaded parts that are made of soft materials such as cast iron. Those shown in parentheses in the strength class indicate the classification by the old standard.

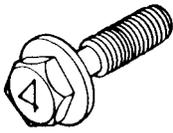
## 1-8 GENERAL INFORMATION

### TIGHTENING TORQUE SPECIFICATIONS

The tightening torque values given in the table below are applicable to the bolts unless otherwise specified.

#### FLANGED HEAD BOLT

kgf.m (lb.ft/Nm)

Bolt head marking  Nominal Size (dia. x pitch)			
	<b>M6 x 1</b>	0.5 ~ 0.9 (3.61 ~ 6.50/4.6 ~ 8.5)	0.6 ~ 1.2 (4.33 ~ 8.67/5.88 ~ 11.76)
<b>M8 x 1.25</b>	1.1 ~ 2.0 (7.95 ~ 14.46/70.78 ~ 19.61)	1.4 ~ 2.9 (4.33 ~ 8.67/5.88 ~ 11.76)	1.9 ~ 3.4 (13.74 ~ 24.59/18.63 ~ 33.34)
<b>M10 x 1.25</b>	2.3 ~ 3.9 (17.35 ~ 28.20/23.53 ~ 38.24)	3.6 ~ 6.4 (26.03 ~ 44.12/35.30 ~ 59.82)	4.3 ~ 7.2 (31.10 ~ 52.07/42.16 ~ 70.60)
<b>*M10 x 1.5</b>	2.3 ~ 3.8 (16.63 ~ 27.48/22.55 ~ 37.26)	3.5 ~ 5.8 (25.31 ~ 41.95/34.32 ~ 56.87)	4.1 ~ 6.8 (29.65 ~ 49.18/40.20 ~ 66.68)
<b>M12 x 1.25</b>	5.6 ~ 8.4 (40.50 ~ 60.75/54.91 ~ 82.37)	7.9 ~ 11.9 (57.14 ~ 86.07/77.47 ~ 116.69)	8.7 ~ 13.0 (62.92 ~ 94.02/85.31 ~ 127.48)
<b>*M12 x 1.75</b>	3.5 ~ 9.5 (37.61 ~ 56.41/50.99 ~ 76.49)	7.3 ~ 10.9 (52.80 ~ 78.83/1.58 ~ 106.99)	8.1 ~ 12.2 (58.58 ~ 88.24/79.43 ~ 119.64)
<b>M14 x 1.5</b>	8.5 ~ 12.7 (61.48 ~ 91.85/83.35 ~ 124.54)	11.7 ~ 17.6 (84.62 ~ 127.30/114.73 ~ 172.59)	12.6 ~ 18.9 (91.13 ~ 136.70/123.56 ~ 185.34)
<b>*M14 x 2</b>	7.6 ~ 11.5 (57.14 ~ 85.34/77.47 ~ 115.71)	11.1 ~ 16.6 (80.28 ~ 120.06/108.85 ~ 162.79)	11.8 ~ 17.7 (85.34 ~ 128.02/115.71 ~ 173.57)
<b>M16 x 1.5</b>	11.8 ~ 17.7 (85.34 ~ 128.02/115.71 ~ 173.57)	17.1 ~ 26.5 (125.85 ~ 189.50/170.63 ~ 256.93)	18.0 ~ 27.1 (130.19 ~ 196.01/176.52 ~ 265.76)
<b>*M16 x 2</b>	11.2 ~ 16.7 (81.00 ~ 120.79/109.83 ~ 163.77)	16.6 ~ 24.9 (120.06 ~ 180.10/162.79 ~ 244.18)	17.2 ~ 25.7 (124.40 ~ 186.61/168.67 ~ 253.01)

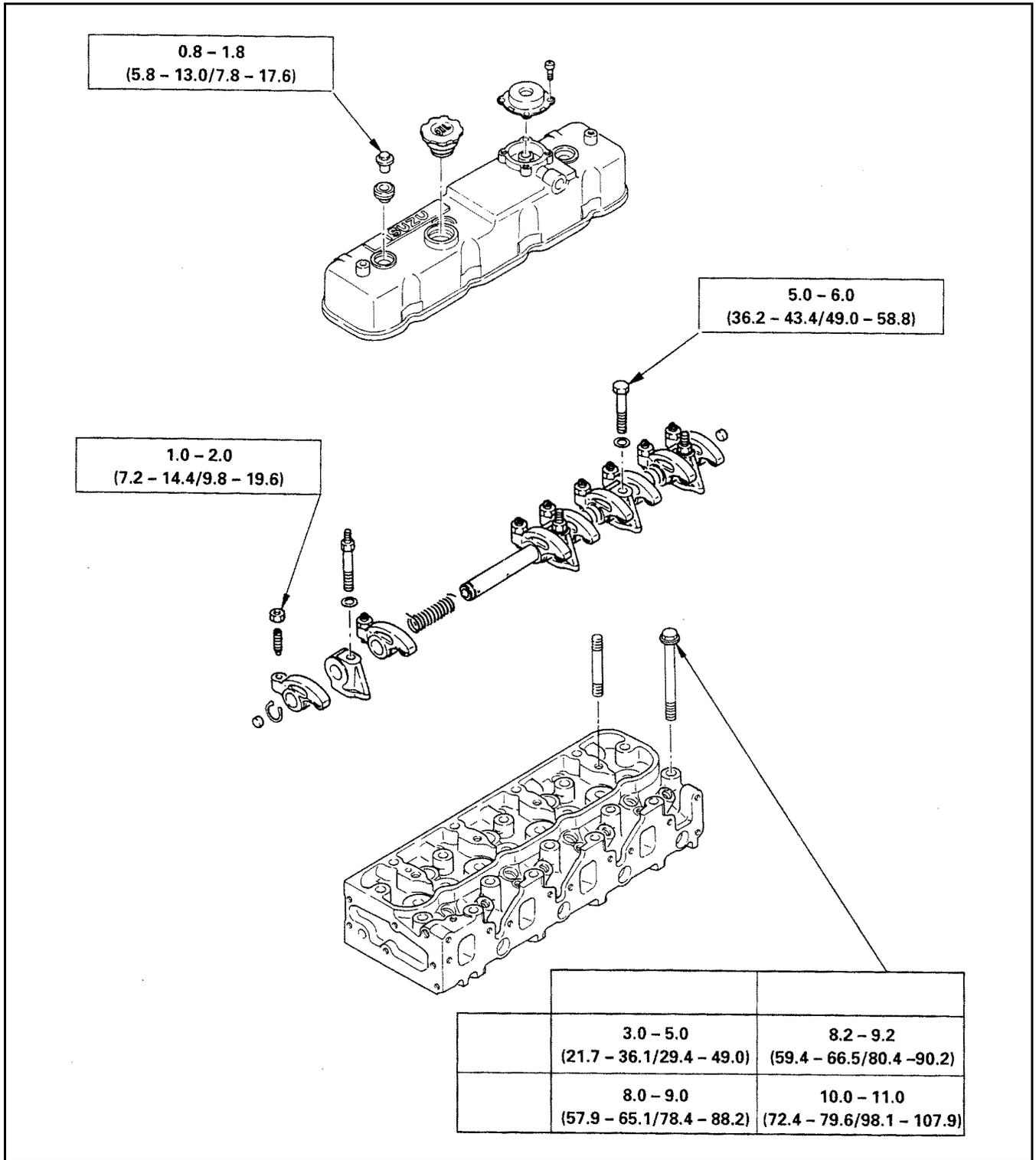
A bolt with an asterisk (\*) is used for female screws of soft material such as cast iron.



# MAJOR COMPONENT MOUNTING NUTS AND BOLTS

CYLINDER HEAD COVER, CYLINDER HEAD AND ROCKER ARM SHAFT BRACKET

kgf.m (lb.ft/Nm)



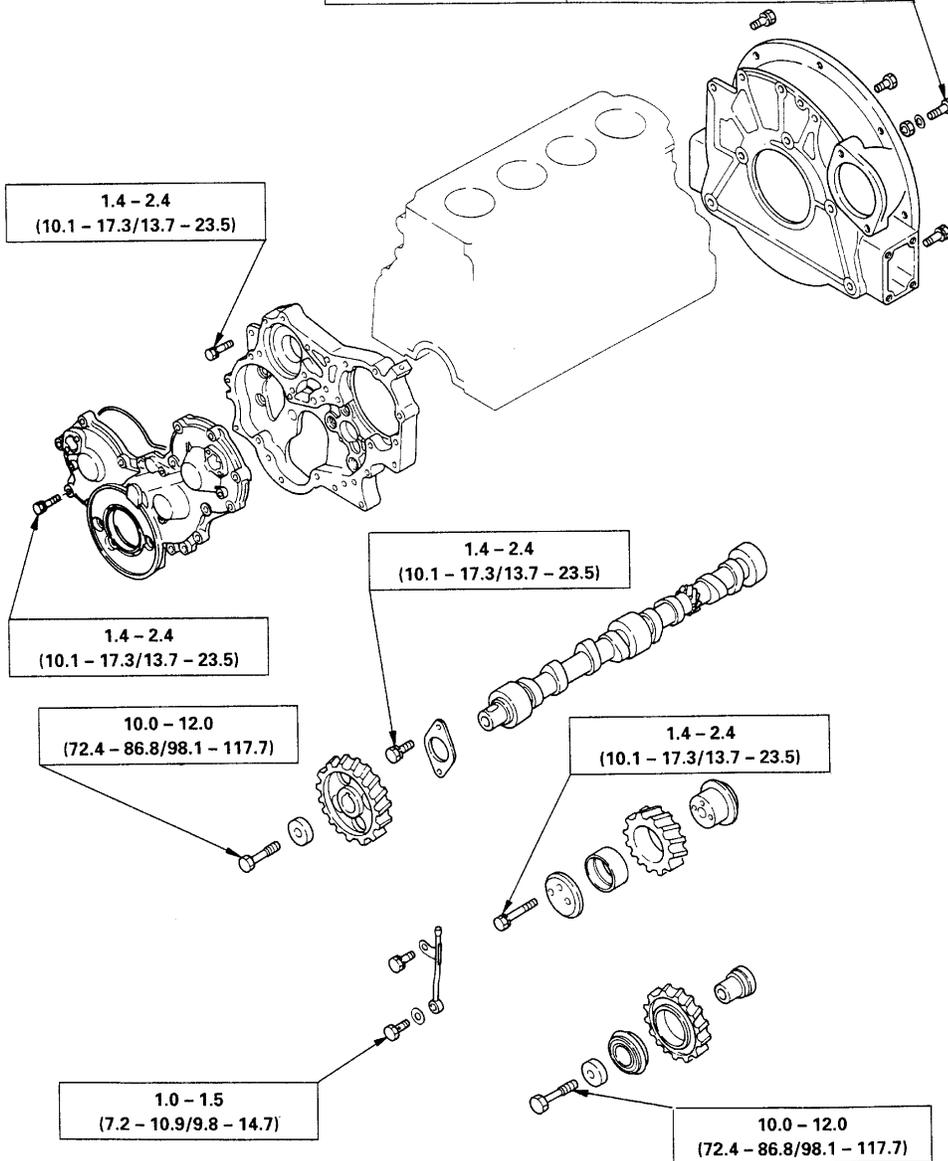




**TIMING GEAR CASE, FLYWHEEL HOUSING, CAMSHAFT AND TIMING GEAR**

kgf.m (lb.ft/Nm)

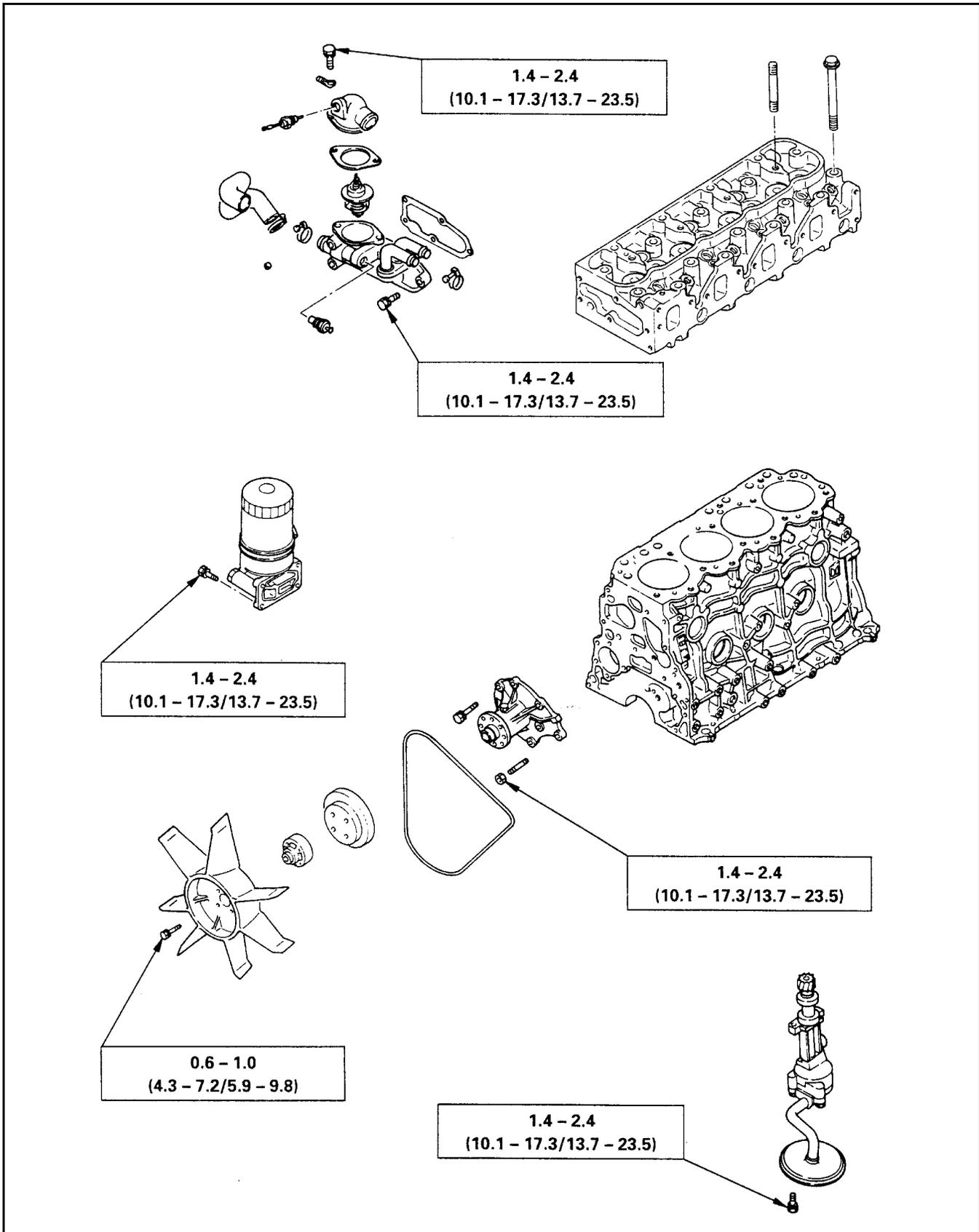
M10x1.25 (0.39x0.05)	4.6 – 6.6 (33.3 – 47.7/45.1 – 64.7)
M12x1.25 (0.47x0.05)	9.6 – 11.6 (69.4 – 83.9/94.1 – 113.8)
M12x1.75 (0.47x0.07)	8.8 – 10.8 (63.7 – 78.1/86.3 – 105.9)





COOLING AND LUBRICATING SYSTEM

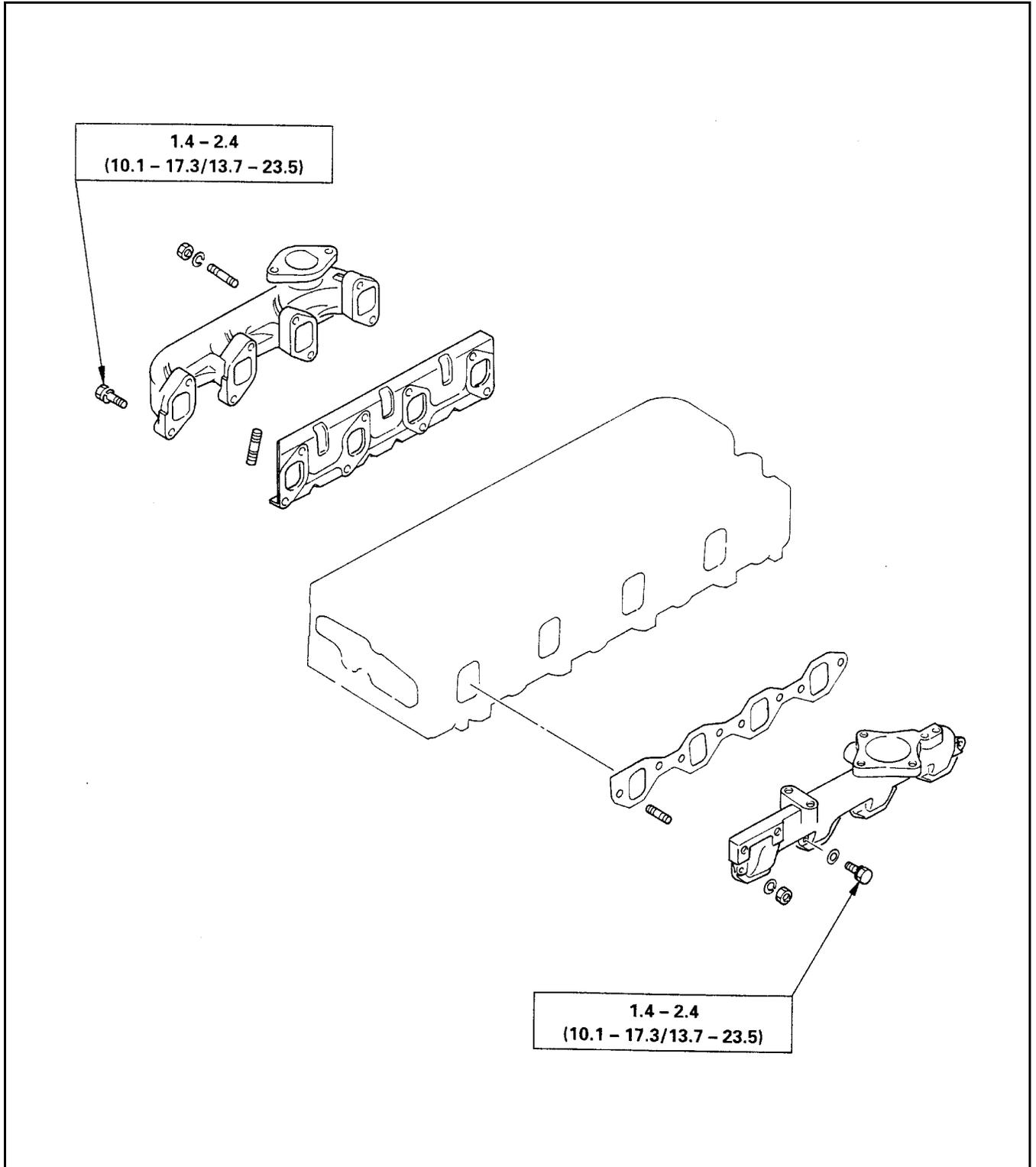
kgf.m (lb.ft/Nm)





INTAKE AND EXHAUST MANIFOLD

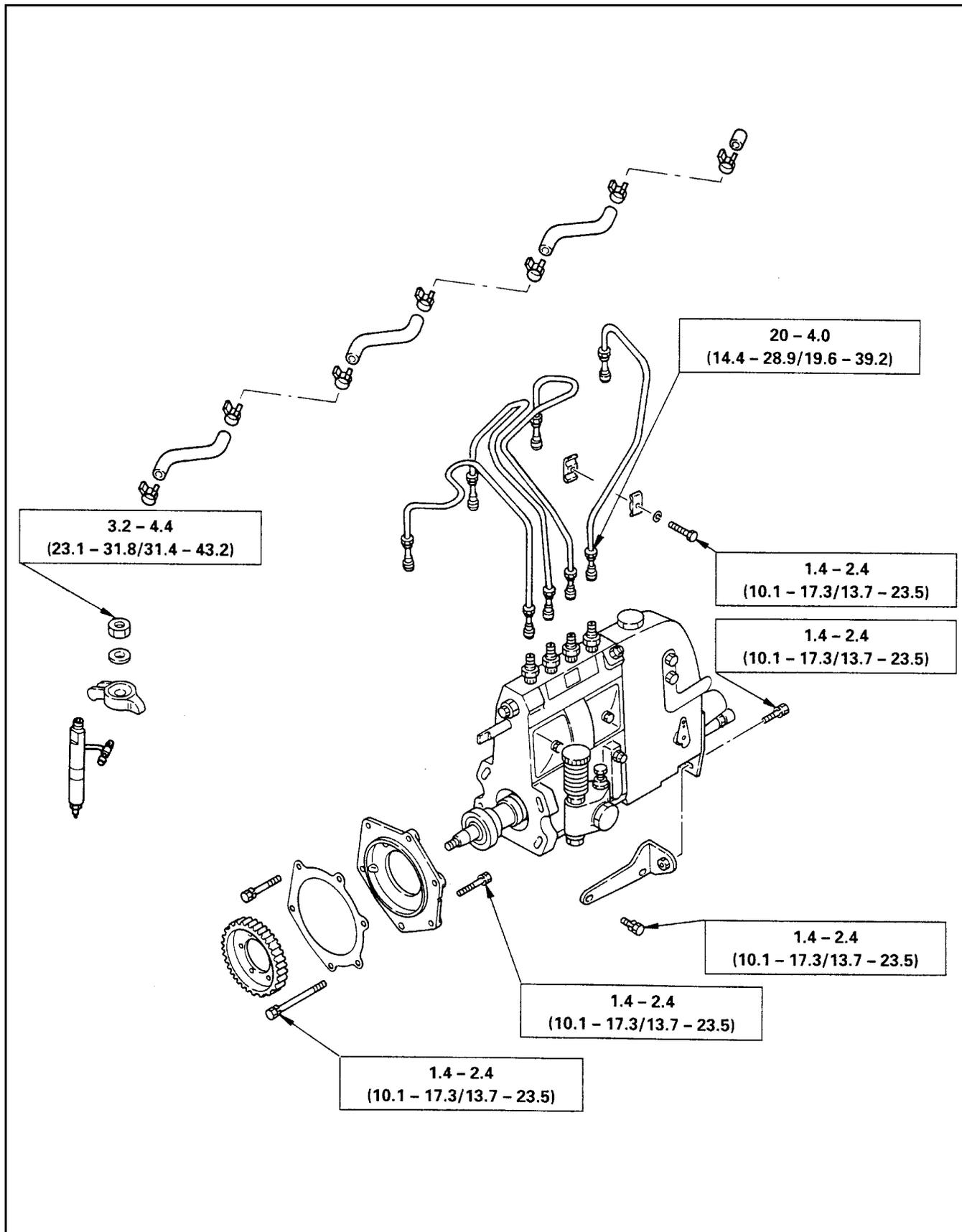
kgf.m (lb.ft/Nm)





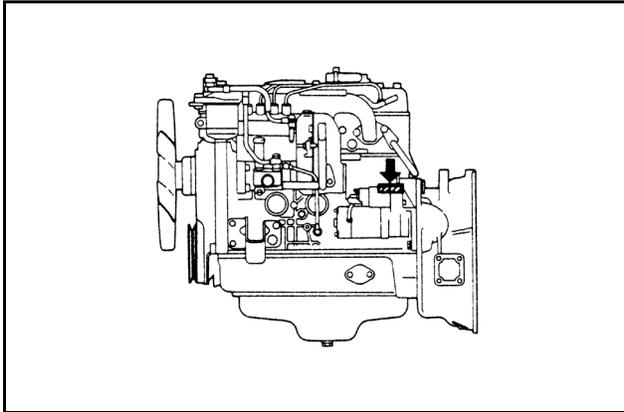
FUEL INJECTION SYSTEM

kgf.m (lb.ft/Nm)



## IDENTIFICATION

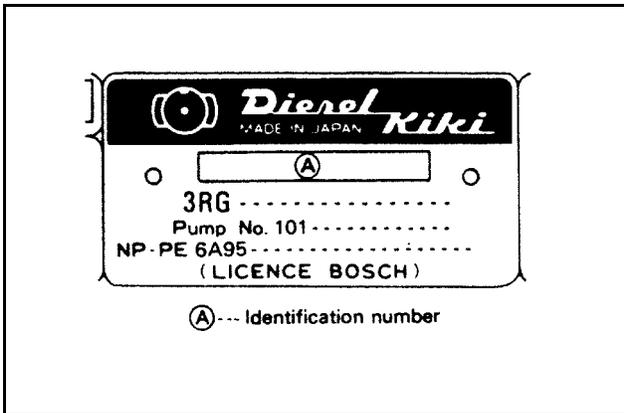
Servicing refers to general maintenance procedures to be performed by qualified service personnel. Maintenance interval such as fuel or oil filter changes should be referred to "INSTRUCTION MANUAL".



### MODEL IDENTIFICATION

#### Engine Serial Number

The engine number is stamped on the rear left-hand side of the cylinder body.



### INJECTION PUMP IDENTIFICATION

#### Injection Pump Number

Injection volume should be adjusted after referring to the adjustment data applicable to the injection pump installed.

The injection pump identification number (A) is stamped on the injection pump identification plate.

#### Note:

Always check the identification number before beginning a service operation.

Applicable service data will vary according to the identification number. Use of the wrong service data will result in reduced engine performance and engine damage.

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**SECTION 2**

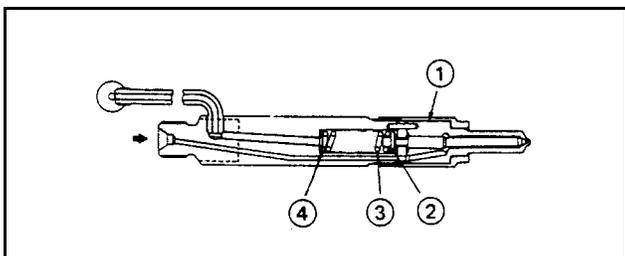
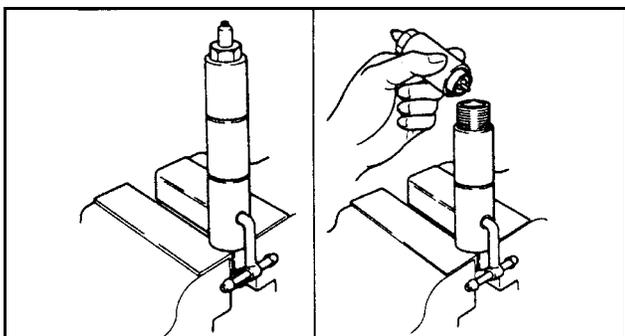
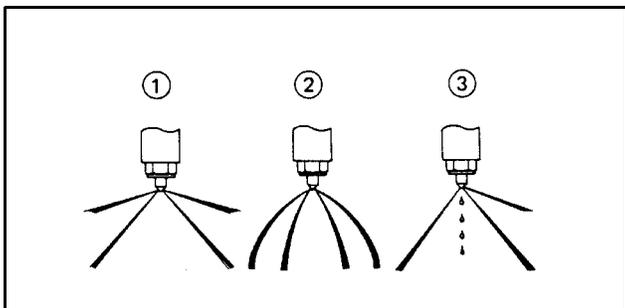
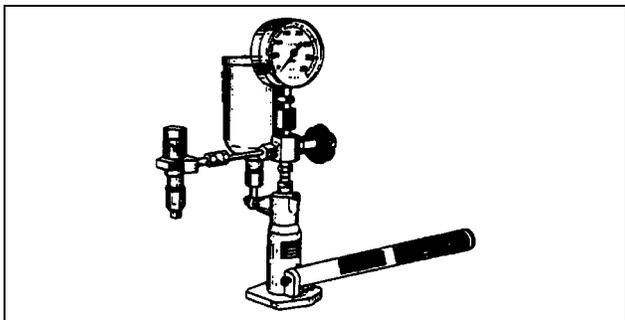
**MAINTENANCE**

**TABLE OF CONTENTS**

<b>ITEM</b>	<b>PAGE</b>
Fuel system .....	2-2
Cooling system .....	2-3
Valve clearance adjustment.....	2-3
Injection timing.....	2-4
Compression pressure measurement .....	2-5
Engine repair kit.....	2-7

Note: Maintenance intervals such as fuel or oil filter changes should be referred to in the Operator's Manual.

## FUEL SYSTEM



### Injection Nozzle

#### Inspection procedure

Use a nozzle tester to check the injection nozzle opening pressure and the spray condition.

If the opening pressure is above or below the specified value, the injection nozzle must be replaced or reconditioned.

If the spray condition is bad, the injection nozzle must be replaced or reconditioned.

#### Injection nozzle opening pressure:

185 kg/cm<sup>2</sup> (2.630 psi/18.142 kPa)

#### Spray condition

- (1) Correct
- (2) Incorrect (Restrictions in orifice)
- (3) Incorrect (Dripping)



#### Injection Nozzle Adjustment

1. Clamp the injection nozzle in a vise.
2. Use a wrench to remove the injection nozzle retaining nut.
3. Install the injection nozzle (1), the push rod (2), the spring (3) and adjusting shim (4).



#### Retaining nut torque

4.0 - 5.0 kgf.m (28.9 - 36.2 lb.ft/39.2 - 49.0 Nm)

4. Attach the injection nozzle holder to the injection nozzle tester.
5. Apply pressure to the nozzle tester to check that the injection nozzle opens at the specified pressure.

If the injection nozzle does not open at the specified pressure, install or remove the appropriate number of adjusting shims to adjust it.

#### Adjusting shim availability

##### Range:

0.50 - 1.50 mm (0.02 - 0.06 in)

##### Increment:

0.025 mm (0.001 in)

##### Total No. of Shims: 40

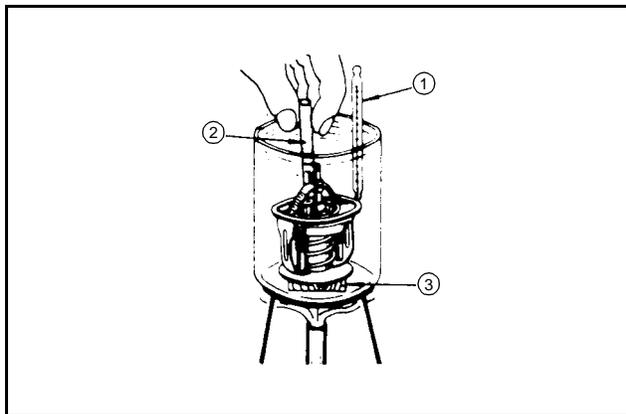
(Reference)

Removing or installing one shim will increase or decrease the nozzle opening pressure approximately 3.77 kg/cm<sup>2</sup> (53.6 psi/370 kPa).

#### WARNING

Test fluid from the injection nozzle tester will spray out under great pressure. It can easily puncture a person's skin. Keep your hands away from the injection nozzle tester at all times.

## COOLING SYSTEM



### Thermostat

#### Inspection



Visually inspect the thermostat.

Replace the thermostat if excessive wear or damage is discovered during inspection.

Measure the valve lift.



#### Amount of valve lift at 95°C (203°F)

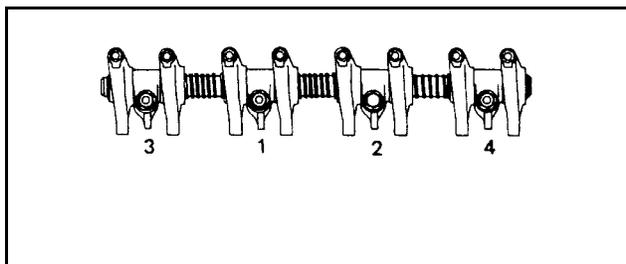
10.0 mm (0.39 in).

#### Valve opening temperature:

80-84°C (176-183°F).

- (1) Thermometer
- (2) Agitating rod
- (3) Wood piece

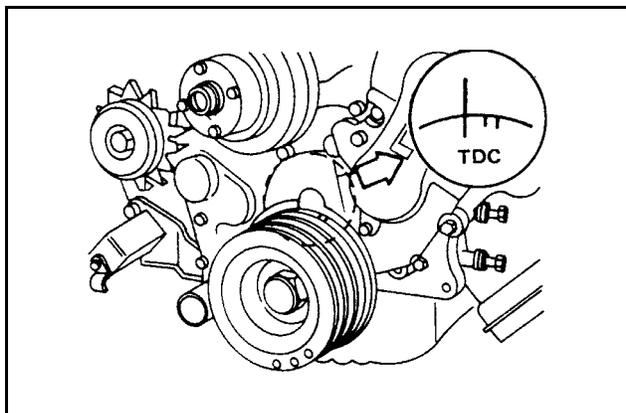
## VALVE CLEARANCE AND ADJUSTMENT



### Note:

Retighten the rocker arm shaft bracket bolts in sequence as shown in the illustration:

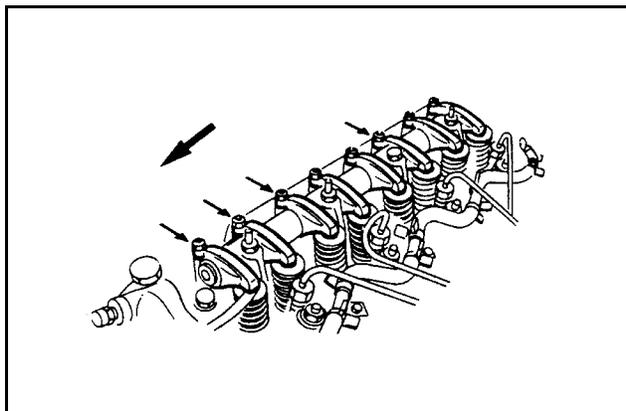
**Torque:** 5.0 - 6.0 kgm (36.1-43.4 lb.ft/49.0 - 58.8 Nm).

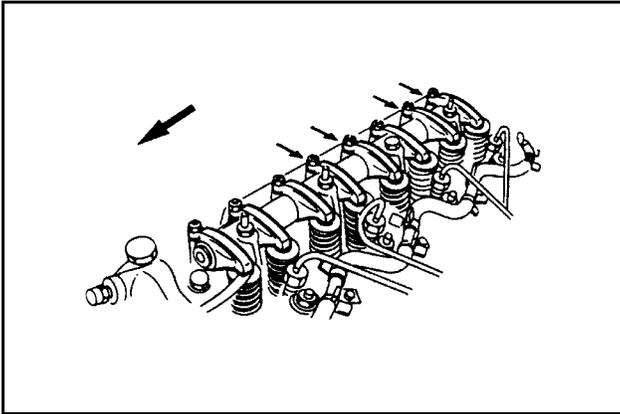
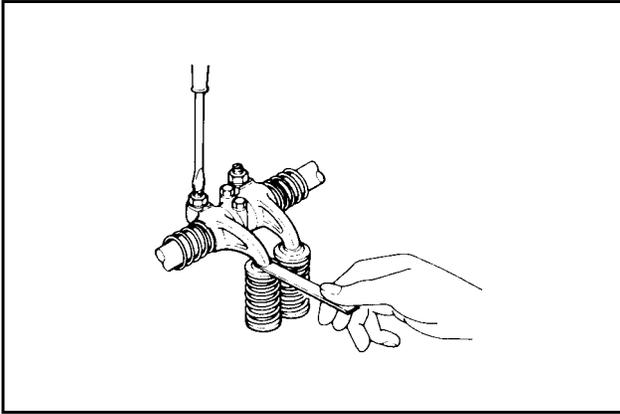


1. Bring the piston in either the No. 1 cylinder or the No. 6 cylinder to Top Dead Center on the compression stroke by turning the crankshaft until the TDC notched line on the crankshaft pulley is aligned with the timing pointer.
2. Check to see if there is play in the No.1 intake and exhaust valve rocker arms.

If the No. 1 cylinder intake and exhaust valve rocker arms have play, the No.1 piston is at TEC on the compression stroke.

If the No.1 cylinder intake and exhaust valve rocker arms are depressed, the No. 4 piston is at TDC on the compression stroke.





Adjust the No.1 or the No.4 cylinder valve clearances while their respective cylinders are at TDC on the compression stroke.

**Intake and exhaust valve clearance (cold):**  
0.40 mm (0.016 in)

3. Loosen each valve clearance adjusting screw as shown in the illustration. At TDC on the compression stroke of the No.1 cylinder.
4. Insert a 0.40 mm (0.016 in) feeler gauge between the rocker arm and the valve stem end.
5. Turn the valve clearance adjusting screw until a slight drag can be felt on the feeler gauge.
6. Tighten the lock nut securely.



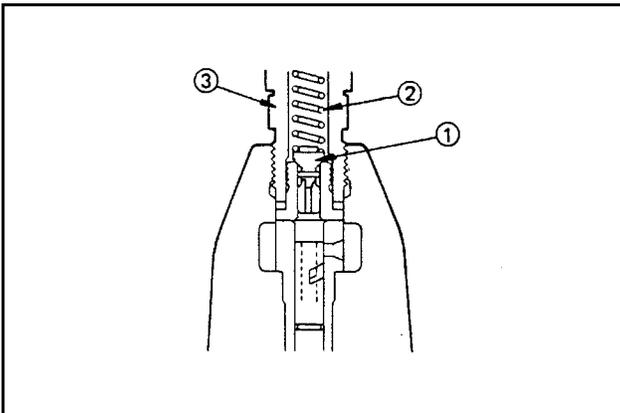
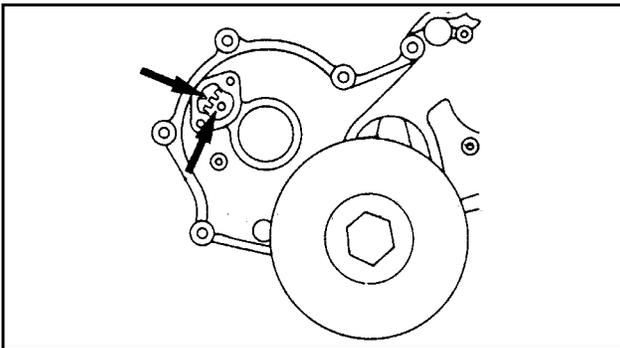
7. Rotate the crankshaft 360°.



Realign the crankshaft pulley TDC notched line with the timing pointer.

8. Adjust the clearances for the remaining valves as shown in the illustration. At TDC on the compression stroke of the No.4 cylinder.

## INJECTION TIMING



### Injection timing confirmation procedure

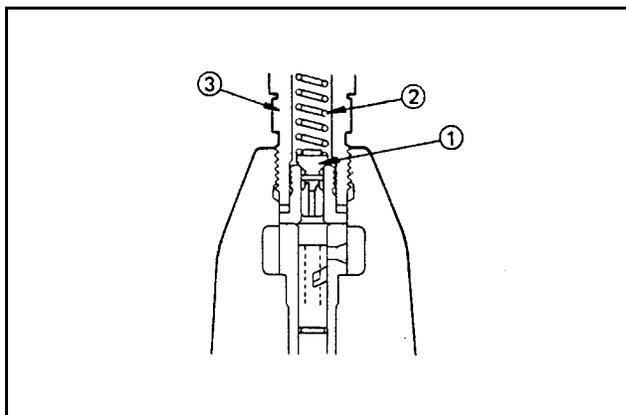
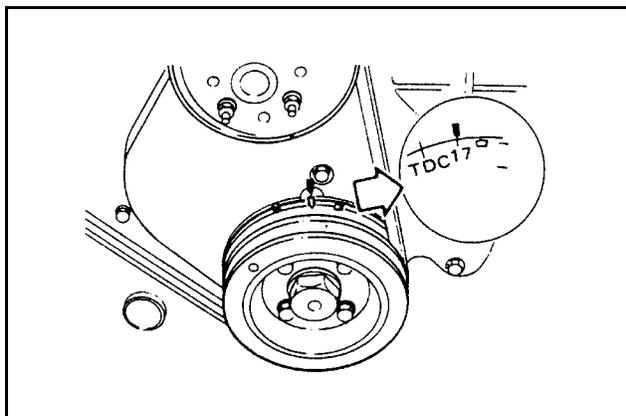


1. Rotate the crankshaft clockwise to align the camshaft gear timing mark "O" with the timing gear case cover pointer.  
The No.1 cylinder will now be at the point where nearly injection timing.
2. Remove the No.1 fuel injection pipe.

3. Remove the delivery valve holder (1), the delivery valve spring (2), and the delivery valve (3).
4. Tighten the delivery valve holder to the specified torque.

### Delivery valve holder torque

4.0-4.5 kgf.m (28.9-32.5 lb.ft/39.2-44.1 Nm)



- Operate the injection pump priming pump while slowly rotating the crankshaft until fuel stops flowing from the delivery valve holder.



- Conform that the crankshaft damper pulley notched line is aligned with the timing gear case cover pointer.

**Injection timing (static BTDC)**

17°

- Remove the delivery valve holder.
- Install the delivery valve (1), the delivery valve spring (2) and the delivery valve holder (3).
- Tighten the delivery valve holder to the specified torque.
- Install the fuel injection pipes and tighten them to the specified torque.

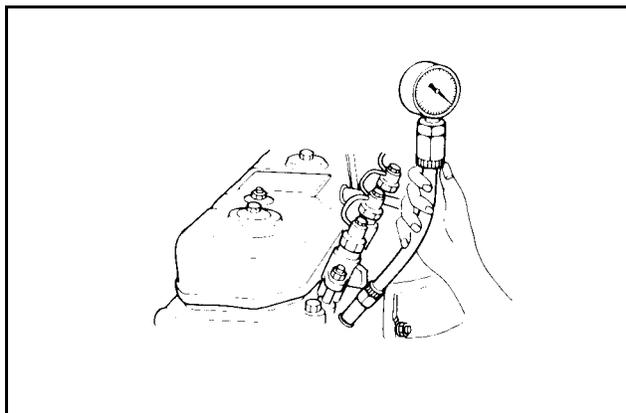


**Fuel injection pipe torque**

1.8-4.2 kgf.m (13.0-30.4 lb.ft/17.7-41.2 Nm)

- Operation to air breeding.

**COMPRESSION PRESSURE MEASUREMENT**



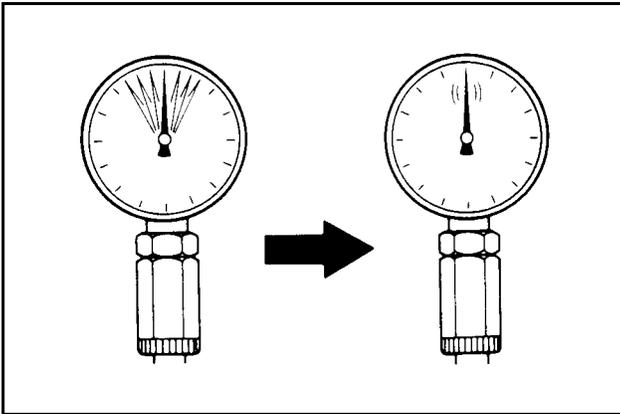
- Operate the engine to warm-up until the coolant temperature reaches to 75°C (167°F).
- Remove all of the glow plugs and the injection pipes.
- Attach a compression gauge to the No.1 cylinder glow plug installation threads.

**Note:**

Compression pressure may be measured starting at any cylinder and in no particular cylinder order. However, it is very important that the compression pressure be measured in each cylinder.

Therefore, start at the No.1 cylinder and work back. In this way, you will be sure to measure the compression pressure in each cylinder.

## 2-6 MAINTENANCE



4. Crank the engine with the starter motor and take the compression gauge reading:

**Standard:**

31.0 kg/cm<sup>2</sup> (441 psi) at 200 rpm at sea level

**Limit:**

22.0 kg/cm<sup>2</sup> (313 psi) at 200 rpm at sea level

5. Repeat the procedure (Steps 2 and 3) for the remaining cylinders.

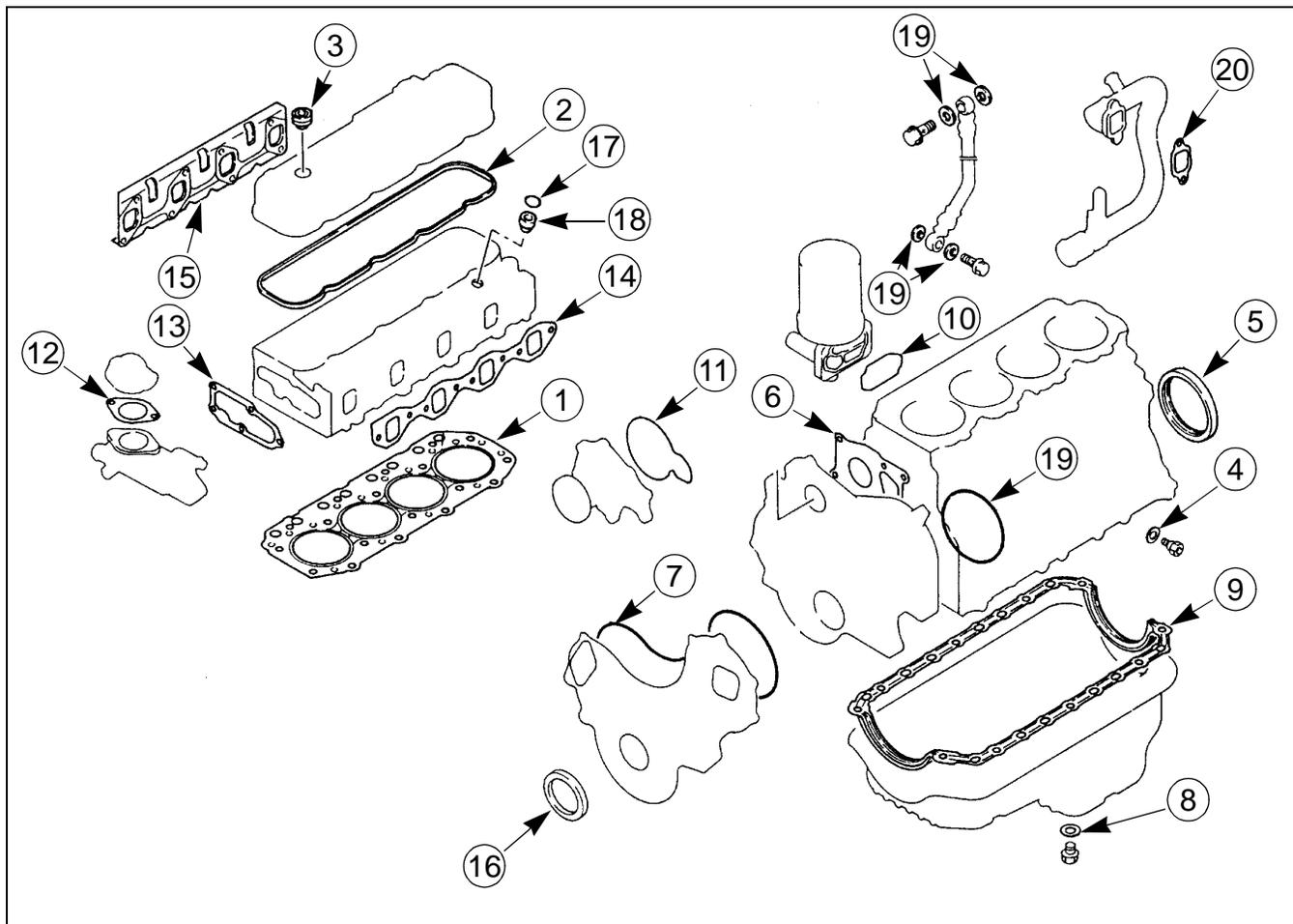
Compression pressure should be approximately the same for each cylinder. A variation exceeding 2.0 kg/cm<sup>2</sup> (28 psi) is unacceptable.

If the measured value exceeds the specified limit, the leated parts must be checked.

## ENGINE REPAIR KIT

All of the numbered parts listed below are included in the Engine Repair Kit.

The gaskets marked with an asterisk (\*) are also included in the Top Overhaul Kit.



- |     |                              |     |                             |
|-----|------------------------------|-----|-----------------------------|
| 1.  | Cylinder head gasket *       | 11. | Water pump gasket           |
| 2.  | Cylinder head cover gasket * | 12. | Water outlet pipe gasket    |
| 3.  | Head cover cap nut gasket *  | 13. | Thermostat housing gasket * |
| 4.  | Drain cock gasket            | 14. | Intake manifold gasket *    |
| 5.  | Crankshaft rear oil seal     | 15. | Exhaust manifold gasket *   |
| 6.  | Gear case gasket             | 16. | Crankshaft front oil seal   |
| 7.  | Gear case cover gasket       | 17. | Nozzle holder O-ring *      |
| 8.  | Drain plug gasket            | 18. | Nozzle holder gasket *      |
| 9.  | Oil pan gasket               | 19. | Joint bolt gasket           |
| 10. | Oil filter gasket            | 20. | Vacuum pump pipe gasket     |

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**SECTION 3**  
**ENGINE ASSEMBLY I**  
**(DISASSEMBLY)**

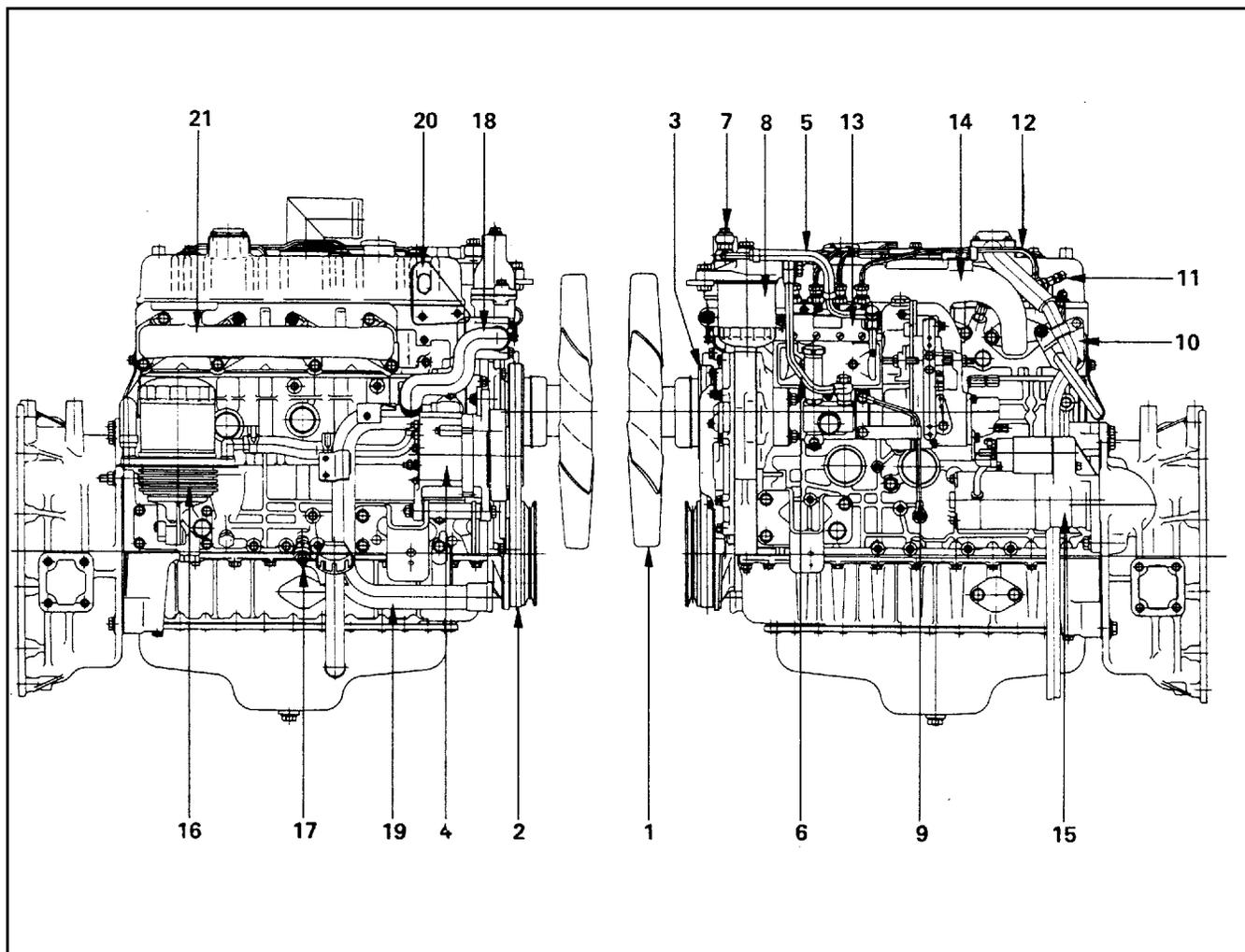
**TABLE OF CONTENTS**

<b>ITEM</b>	<b>PAGE</b>
External parts disassembly steps .....	3-2
Rocker arm shaft and rocker arm .....	3-11
Cylinder head disassembly steps .....	3-12
Piston and connecting rod disassembly steps.....	3-14
Camshaft, camshaft timing gear and thrust plate disassembly steps.....	3-16



## EXTERNAL PARTS DISASSEMBLY STEPS

MODEL 4JB1



### Disassembly Steps

- |   |                                    |
|---|------------------------------------|
| 1. Cooling fan and spacer                     | 10. Rear engine                    |
| 2. Cooling fan drive belt                     | 11. Fuel leak off pipe             |
| 3. Cooling fan drive pulley                   | ▲12. Fuel injection pipe with clip |
| 4. Generator and adjusting plate              | ▲13. Injection pump                |
| 5. Fuel pipe (Fuel filter to injection pump)  | 14. Intake manifold                |
| 6. Fuel pipe (Fuel filter to feed pump)       | 15. Starter                        |
| 7. Fuel pipe (fuel filter leak off)           | 16. Oil filter                     |
| 8. Fuel filter                                | 17. Oil pressure switch            |
| 9. Oil pipe (injection pump to cylinder body) | 18. Cooling water rubber hose      |
|   | 19. Cooling water intake pipe      |
|   | 20. Front engine hanger            |
|   | ▲21. Exhaust manifold              |

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