

INDUSTRIAL DIESEL ENGINE

AI-4JJ1X
AJ-4JJ1T
BJ-4JJ1X
BU-4JJ1T
MODEL

WORKSHOP MANUAL

ISUZU MOTORS LIMITED

Product: ISUZU AI-4JJ1X,AJ-4JJ1X,BJ-4JJ1X,BU-4JJ1T Engine Workshop Manual

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General Information

General Information

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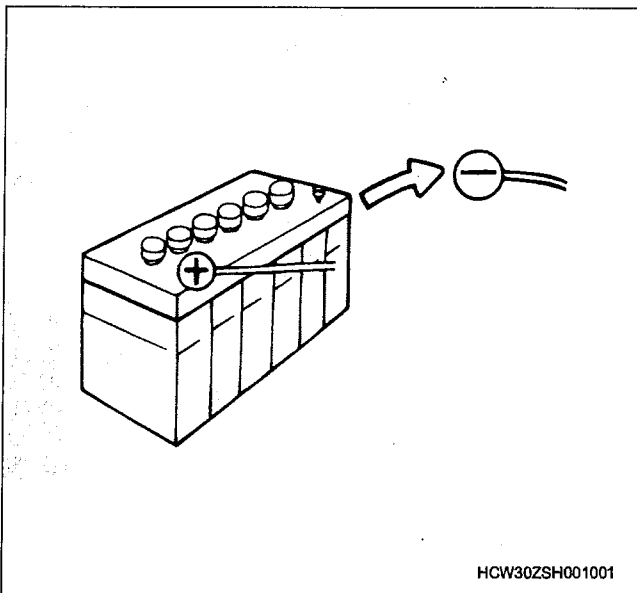
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General Information

Service Precautions

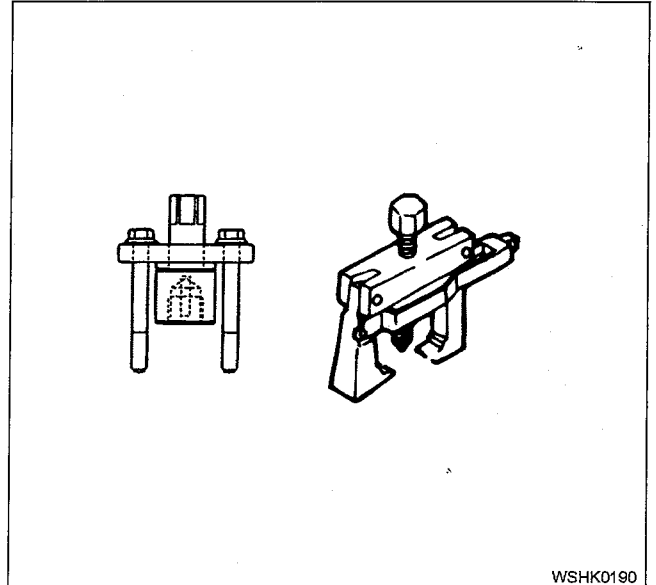
In order to carry out work safely

1. Always use an engine stand when taking the engine down from the vehicle.
Do not place the engine directly onto the ground, or place in a manner that interferes with the oil pan.
2. If you are working together with others, always pay attention to each other's safety.
3. If you are repairing any part of the electrical system, always remove the minus side cable from the battery terminal before starting work. If you are removing the battery cover, always remove the cover in a place that is away from sources of fire/heat.

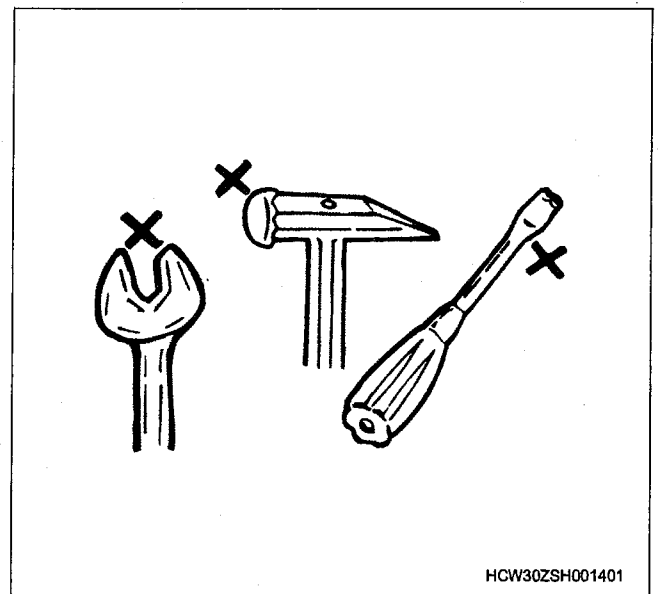


4. Do not perform painting work or leave the engine running for long periods of time in an enclosed or badly ventilated indoor workshop.

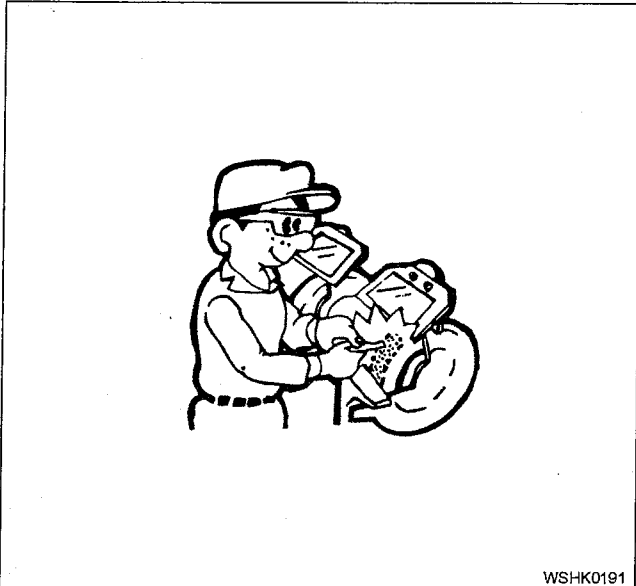
5. Always use the correct specialized tool indicated in the instructions. Using the incorrect tool may cause damage to the parts or injury to the person using the tool.



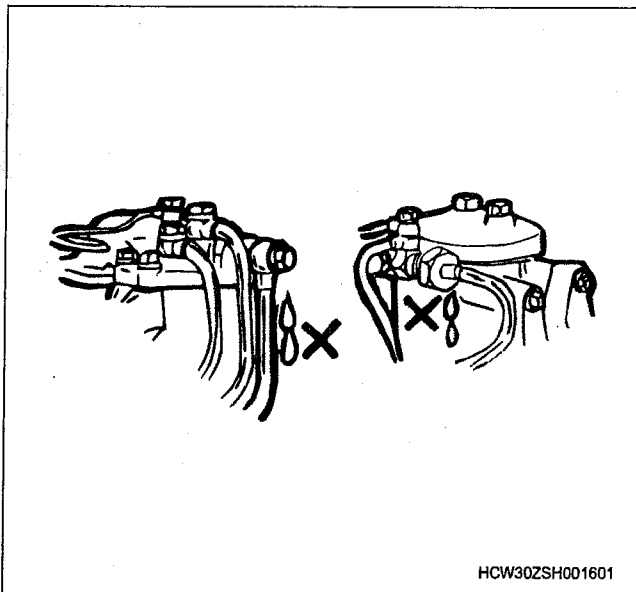
6. All regular tools, gauges and special tools should be regularly inspected, and prepared before starting work. Do not use bent spanners, hammers with damaged edges, chipped chisels, or any other faulty or damaged tools.



7. Always pay close attention to safety and handling requirements when using grinders, cranes, welders, and other such equipment. Moreover, always wear the correct protective garments and use the necessary safety tools for the job in hand.



8. Always check that there are no fuel leaks when performing maintenance work on the fuel system. (It may cause a fire.)



9. Pay close attention to the risk of ignition if you are handling parts that carry a high voltage. Furthermore, any oil or grease spilt onto rubber parts must be wiped off immediately, as it will cause deterioration of the rubber.



Replacement parts and part numbers

1. Always replace packing, oil seals, O-rings, caulking lock nuts, folding lock plates, split pins and other such parts with brand new parts.
2. The parts numbers contained in this manual may not represent the supply condition of the parts, and the part numbers may be changed due to revisions. Therefore, parts should always be checked against a parts catalogue before use.

Liquid gasket

1. Each time you disassemble parts that use liquid gasket, completely remove the old gasket residue from each of the parts and matching sections using a scraper, then clean each of the parts to completely remove oil, water, and dirt etc. from the various surfaces by a cloth. Using the specified type of liquid gasket, apply new liquid gasket to each of the surfaces before reassembling the parts.
2. In order to make it easier to clean liquid gasket surfaces, apply gasket remover liquid (Pando- 391D made by ThreeBond Co., Ltd.) and leave the part to stand for approximately 10 minutes, after which the old liquid gasket residue will be easier to remove.
However, this should not be used on resin components or painted components.
3. Please take care not to apply too much or too little liquid gasket.
Also, you should always re-apply the liquid gasket upon itself when you start and finish application.

0A-4 General Information

4. Make sure that there are no gaps when reinstalling the liquid gasket parts to each other. If there are gaps between the two parts, re-apply the liquid gasket. Some parts, especially the oil pan, use the same size studs as a guide to eliminate the need for knock pin positioning etc.
5. Re-install these parts within 7 minutes of applying the liquid gasket.
If more than 7 minutes passes, remove the previous liquid gasket and re-apply it.
6. Please wait for at least 30 minutes since the last part is installed before starting the engine.

Liquid gasket

Seal section	Product name	Manufacturer's name
Between cylinder head and – Upper timing chain cover	1207B	ThreeBond
Between cylinder block and – Crankcase	1207B	ThreeBond
Between oil cooler ASM and – Gear case cover	1207B	ThreeBond
Between gear case and – Cylinder head	1207B	ThreeBond
Between gear case and – Gear case cover	1207B	ThreeBond
Between gear case and – Cylinder block and – Crank case	1207B	ThreeBond
Between gear case cover and – Lower timing chain cover	1207B	ThreeBond
Between cylinder block and – Crankcase and – Retainer	1207B	ThreeBond
Between cylinder head and – Cam end packing	1207B	ThreeBond
Cylinder block, head plug nipple, unit, switches	262	Loctite

- Always use the liquid gasket products listed above, or a liquid gasket identical to the ones listed above.
- Use the correct quantity of liquid gasket. Always follow the handling instructions for each product.

Application procedure

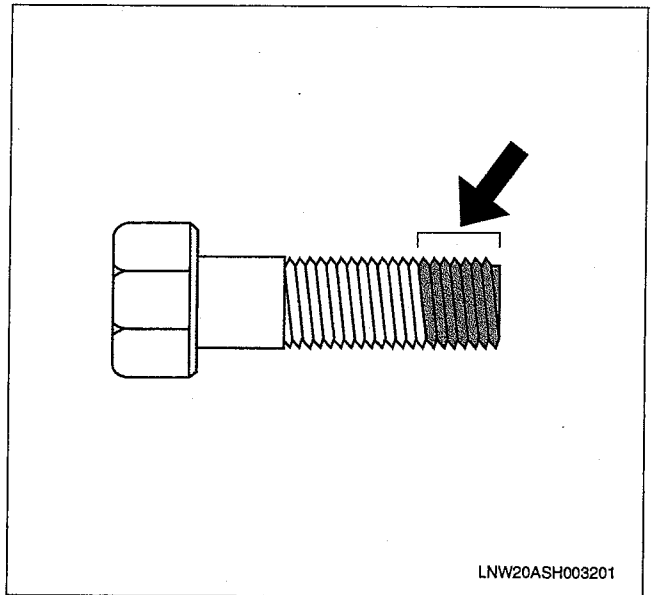
1. Wipe the contact surfaces clean of all water, oil or grease. The contact surfaces should be dry.
2. Apply a regular bead width of liquid gasket to one of the contact surfaces. Make sure that the bead does not break at this point.

Note:

If there are special regulations concerning the application procedure in the repair document, please follow those regulations.

Work procedure

1. Wipe the joint surfaces of the bolt, bolt hole, and threads clean of water, grease, and oil. The contact surfaces should be dry.
2. Apply Loctite to the top 1/3 of the screw.
3. Tighten the bolt to the specified torque.



Important:

After tightening the bolt, do not apply excessive torque or try to rotate the bolt until at least one hour has passed, and the Loctite has hardened.

Procedure for using the plastigauge

Type	Measurable range mm {in}
PG-1 (Green)	0.025 — 0.076 {0.001 — 0.003}
PR-1 (Red)	0.051 — 0.152 {0.002 — 0.006}
PB-1 (Blue)	0.102 — 0.229 {0.004 — 0.009}

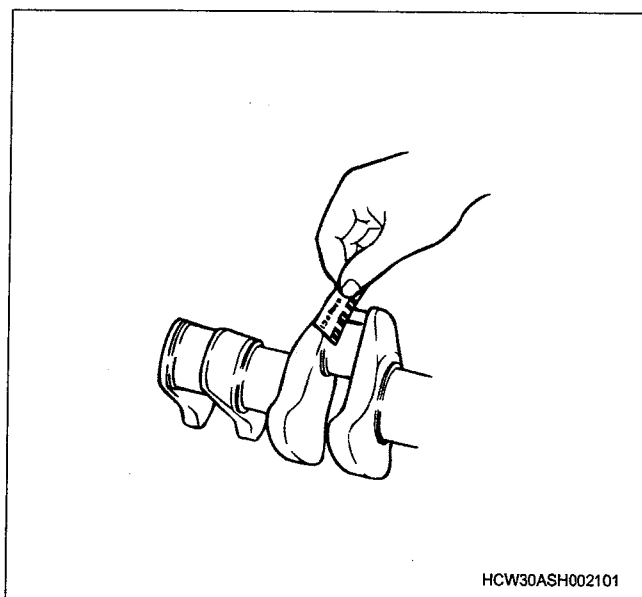
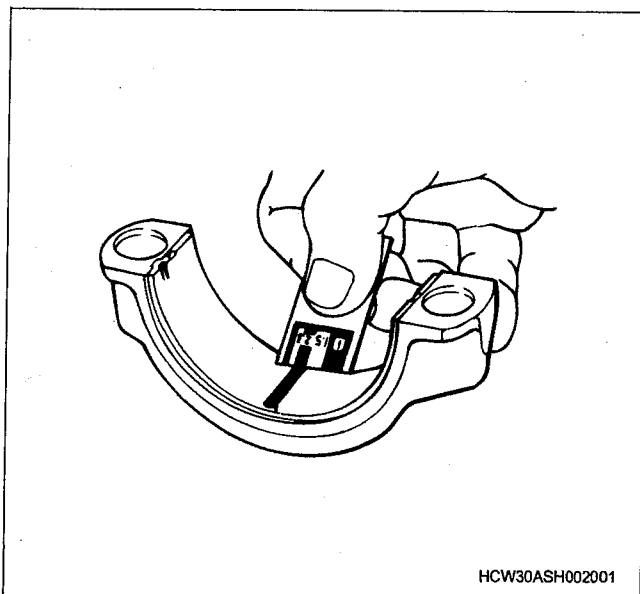
Example: Procedure for measuring the clearance between the connecting rod bearing and crank pin.

- Clean the connecting rod and bearing, and install the bearing to the rod.
- Cut the plastigauge to the same width as the crank pin, and while avoiding the oil hole of the crank pin lay the gauge parallel to the pin.
- Line up the marks on the connecting rod and cap, and install the crank pin. Apply molybdenum disulfide to the thread section and seating surface of the tightening bolt, and rotate both cap and bolt to the correct torque.

Important:

Do not move the connecting rod while using the plastigauge.

- Gently remove the cap and connecting rod, and measure the crushed width of the plastigauge (clearance between rod and pin) using the scale printed on the bag.



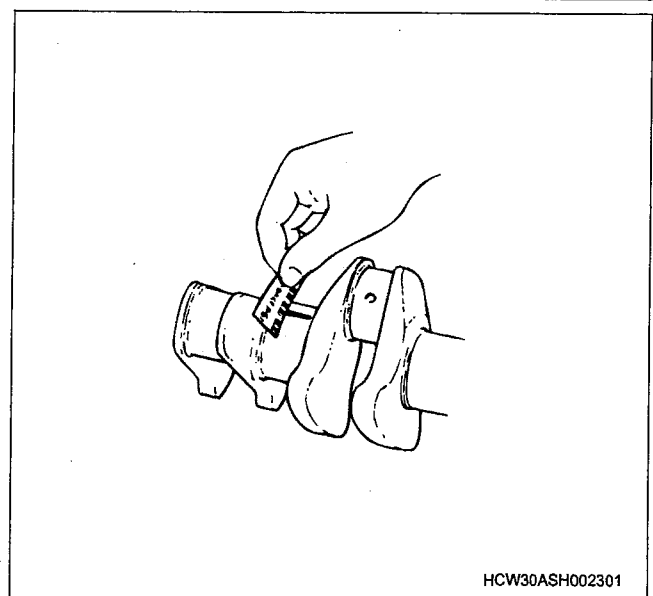
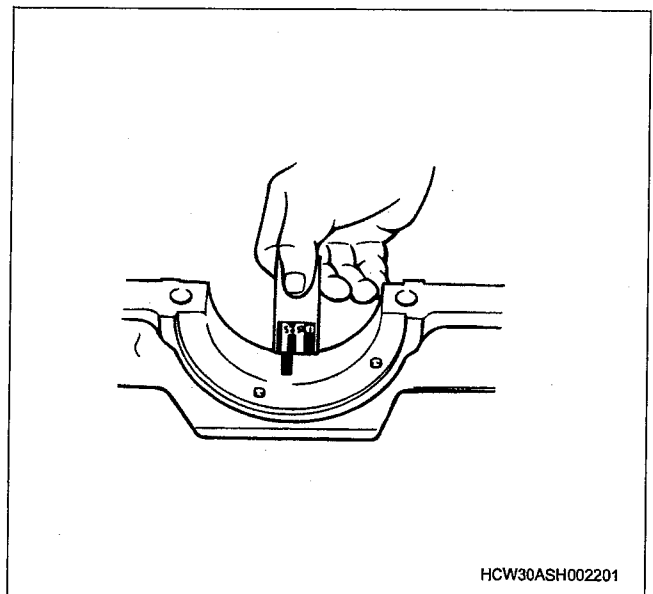
Example: Measuring the clearance between the crank bearing and crank journal

- Clean the clamp face of the cylinder block and crankcase bearing, and also the bearing, and install the cylinder block to the crankcase.
- Gently rest the crankshaft on the cylinder block, and rotate it approximately 30 degree to stabilize it.
- Cut the plastigauge to the same size as the journal width, and while avoiding the oil hole of the journal lay the gauge parallel to the journal.
- Gently rest the crankcase on the cylinder block, apply molybdenum disulfide to the thread section and seating surface of the tightening bolt, and tighten in sequence to the correct torque.

Important:

Do not rotate the crankshaft while using the plastigauge.

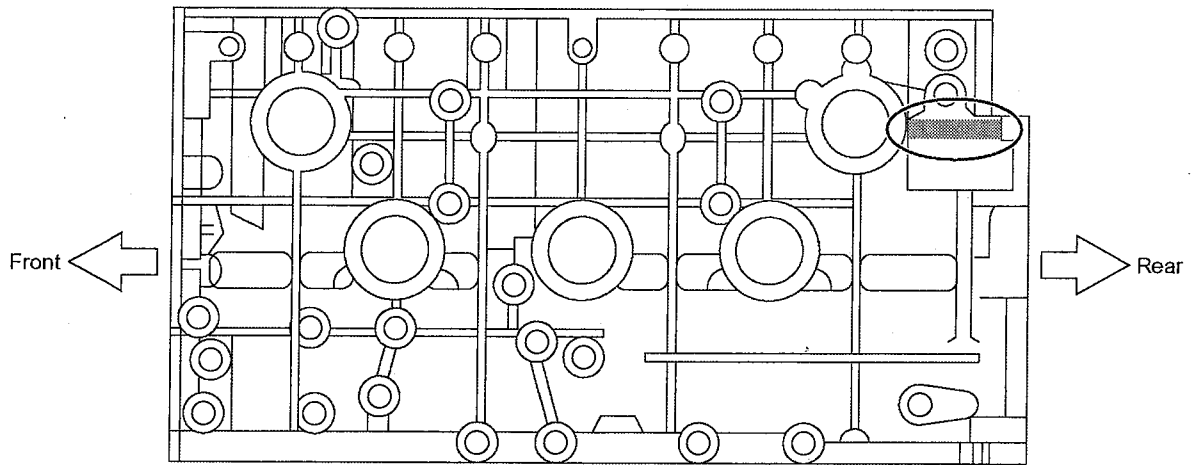
- Gently remove the crankcase, and measure the crushed width of the plastigauge (clearance between bearing and journal) using the scale printed on the bag.



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Reading the Model

Engine number stamping position



General Information

Terminology, description of abbreviations

Terminology definitions

Maintenance standard

The generic name for reference values required for maintenance, such as nominal dimension, assembly specification, and limit.

Nominal dimension

Shows the standard value at the point of manufacture that does not include the common difference.

Assembly specification

Shows the standard value after assembling, repairing, or adjusting.

Service limit

When this value (dimensions) is reached, it shows that the part has reached its full limit and must be replaced or repaired.

Wear

Shows the difference between the dimension of non-worn part (nominal dimension unless there is such part) and that of the most worn part (the dimension of worn part).

Uneven wear

Shows the difference between the maximum and the minimum wear amount.

Front/Rear, Right/Left, Top/Bottom

These show each orientations of parts installed to the vehicle when looking from the vehicle's forward direction.

Unit

Units written to SI conventions (mainly torque, pressure, force)

[Example] Length: mm, Torque: N·m {kgf·m}

Warning

Items that carry the warning mark pose a danger to life or threat of serious injury if not strictly observed.

Caution

Items that carry the caution mark may cause injury or lead to accidents if not strictly observed.

Important

Items that carry the important mark may cause the vehicle to break down, or may prevent the guaranteed normal operation of the system or related parts if not strictly observed.

Note

Items that should receive special mention within a work procedure.

Description of abbreviations

Abbreviation	Description
AC	Alternating Current
ACC	Accessory
ACG	Alternating Current Generator
API	American Petrol Institute
ASM (Assy)	Assembly
ATDC	After Top Dead Center
BAT, BATT	Battery
BRG, Brg	Bearing
BKT, BRKT	Bracket
BTDC	Before Top Dead Center
CO	Carbon Oxide
CONN	Connector
CPU	Central Processing Unit
C/U	Control Unit
DC	Direct Current
DI	Direct Injection
ECU	Engine Control Unit/Electronic Control Unit
ECM	Engine Control Module
EGR	Exhaust Gas Recirculation
Exh, EXH	Exhaust
Ft, FRT	Front
FWD	Forward
F/C	Fuel Cut
GND	Ground
IC	Integrated Circuit
ID Plate	Identification Plate
IN	Intake, Inlet
ISO	International Organization for Standardization
I/PUMP	Injection Pump
JIS	Japanese Industrial Standard
L/H, LH	Left Hand
M/V	Magnetic Valve
NOx	Nitrogen Oxide
N-TDC	Number - Top Dead Center
OPT	Option
P	Pole(S)
PCV	Pump Control Valve/Positive Crankcase Ventilation

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Abbreviation	Description
PM	Particulate Matter
PS	Pre-Stroke
PTO	Power Take Off
QOS	Quick On System
Rr, RR	Rear
R/H, RH	Right Hand
R/L	Relay
STD	Standard
SW	Switch
TICS	Timing & Injection rate Control System
VGS Turbo	Variable Geometry turbocharger System
W/L	Warning Lamp

SI (International System of Units)

With regards the conversion to SI (International System of Units)

The introduction of the SI systems aims to internationally unify the metric system and the various units used by different countries (traditional weights and measures, the foot pound method etc.), and to curb the confusion that occurs between the different units (conversion calculations etc.).

The new calculating method which adopted SI units was completely adopted in Japan in 1992, and is standardized by JIS-Z-8203.

All of the units in this manual are written in line with the International System of Units SI units, and conventional units are written in { } brackets.

SI

Abbreviation of French word "Le Systeme International d'Unites"

Connection between main SI units and conventional units

	SI	Conventional unit	Item, unit conversion
Length	m	m	Same as the conventional unit
Weight (Mass)	kg	kg	Same as the conventional unit
Force	N	* kg, kgf	1 kgf = 9.80665 N
Torque	N·m	* kg·m, kgf·m	1 kgf·m = 9.80665 N·m
Pressure	Pa	* kg/cm ² , mmHg	1 kgf/cm ² = 9.80665 kPa, 1 mmHg = 133.3 Pa
Power output, horsepower	W	PS	1 PS = 0.74 kW
Capacity, air volume displacement	m ³	Liter, L, cc	1 Liter = 1 dm ³ , 1 cc = 1 m Liter = 1 cm ³
Fuel consumption	g/(kW·h)	g/(PS·h)	1 g/(PS·h) = 1.360 g/(kW·h)

*1 Published service data may conveniently use kg for force and mass (weight) instead of kgf.

*2 Some conversion results may be rounded off to 1 or 2 decimal places.

Converting expressions of quantity

When converting, prefixes such as k (kilo) or m (milli) are used.

M	Mega	10^6	1,000,000
k	Kilo	10^3	1,000
h	Hecto	10^2	100
d	Deci	10^{-1}	0.1
c	Centi	10^{-2}	0.01
m	Milli	10^{-3}	0.001
μ	Micro	10^{-6}	0.000001

- $200 \text{ kgf/cm}^2 = 19,620 \text{ kPa} = 19.6 \text{ MPa}$
- $40 \text{ mmHg} = 5,332 \text{ Pa} = 5.3 \text{ kPa}$

Conversion formula**Length**

- $\text{km} \times 0.6214 = \text{mile}$
- $\text{m} \times 3.281 = \text{ft}$
- $\text{mm} \times 0.03937 = \text{in}$

Pressure

- $\text{kPa} \times 0.0101972 = \text{kg/cm}^2$
- $\text{kPa} \times 0.145038 = \text{psi}$
- $\text{MPa} \times 10.197162 = \text{kg/cm}^2$
- $\text{MPa} \times 145.03774 = \text{psi}$

Tightening torque

- $\text{N}\cdot\text{m} \times 0.101972 = \text{kg}\cdot\text{m}$
- $\text{N}\cdot\text{m} \times 0.737562 = \text{lb}\cdot\text{ft}$

Speed

- $\text{km/h} \times 0.6214 = \text{MPH}$

Temperature

- $^{\circ}\text{C} \times 1.8 + 32 = ^{\circ}\text{F}$

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Table of Isuzu standard tightening torque

The tightening torque values in the table below apply to all situations unless a special tightening torque is specified.

Isuzu standard bolts, nuts

N·m {kgf·m}				
Strength classification	4.8 4T		7T	
	Hexagon head bolt	Flange bolt	Hexagon head bolt	Flange bolt
*M10 × 1.5	19.6 — 33.3 {2.0 — 3.4}	22.3 — 37.2 {2.3 — 3.8}	27.5 — 45.1 {2.8 — 4.6}	30.3 — 50.4 {3.1 — 5.1}
M12 × 1.25	49.0 — 73.5 {5.0 — 7.5}	54.9 — 82.3 {5.6 — 8.4}	60.8 — 91.2 {6.2 — 9.3}	68.1 — 102.1 {6.9 — 10.4}
*M12 × 1.75	45.1 — 68.6 {4.6 — 7.0}	51.0 — 76.5 {5.2 — 7.8}	56.9 — 84.3 {5.8 — 8.6}	62.7 — 94.0 {6.4 — 9.6}
M14 × 1.5	76.5 — 114.7 {7.8 — 11.7}	83.0 — 124.5 {8.5 — 12.7}	93.2 — 139.3 {9.5 — 14.2}	100.8 — 151.1 {10.3 — 15.4}
*M14 × 2	71.6 — 106.9 {7.3 — 10.9}	77.2 — 115.8 {7.9 — 11.8}	88.3 — 131.4 {9.0 — 13.4}	94.9 — 142.3 {9.7 — 14.5}
M16 × 1.5	104.0 — 157.0 {10.6 — 16.0}	115.6 — 173.3 {11.8 — 17.7}	135.3 — 204.0 {13.8 — 20.8}	150.1 — 225.2 {15.3 — 23.0}
*M16 × 2	100.0 — 149.1 {10.2 — 15.2}	109.4 — 164.2 {11.2 — 16.7}	129.4 — 194.2 {13.2 — 19.8}	142.5 — 213.8 {14.5 — 21.8}
M18 × 1.5	151.0 — 225.6 {15.4 — 23.0}	—	195.2 — 293.2 {19.9 — 29.9}	—
*M18 × 2.5	151.0 — 225.6 {15.4 — 23.0}	—	196.1 — 294.2 {20.0 — 30.0}	—
M20 × 1.5	206.0 — 310.0 {21.0 — 31.6}	—	269.7 — 405.0 {27.5 — 41.3}	—
*M20 × 2.5	190.2 — 286.4 {19.4 — 29.2}	—	249.1 — 374.6 {25.4 — 38.2}	—
M22 × 1.5	251.1 — 413.8 {25.6 — 42.2}	—	362.8 — 544.3 {37.0 — 55.5}	—
*M22 × 2.5	217.7 — 327.5 {22.2 — 33.4}	—	338.3 — 507.0 {34.5 — 51.7}	—
M24 × 2	358.9 — 539.4 {36.6 — 55.0}	—	430.5 — 711.0 {43.9 — 72.5}	—
*M24 × 3	338.3 — 507.0 {34.5 — 51.7}	—	406.0 — 608.0 {41.4 — 62.0}	—

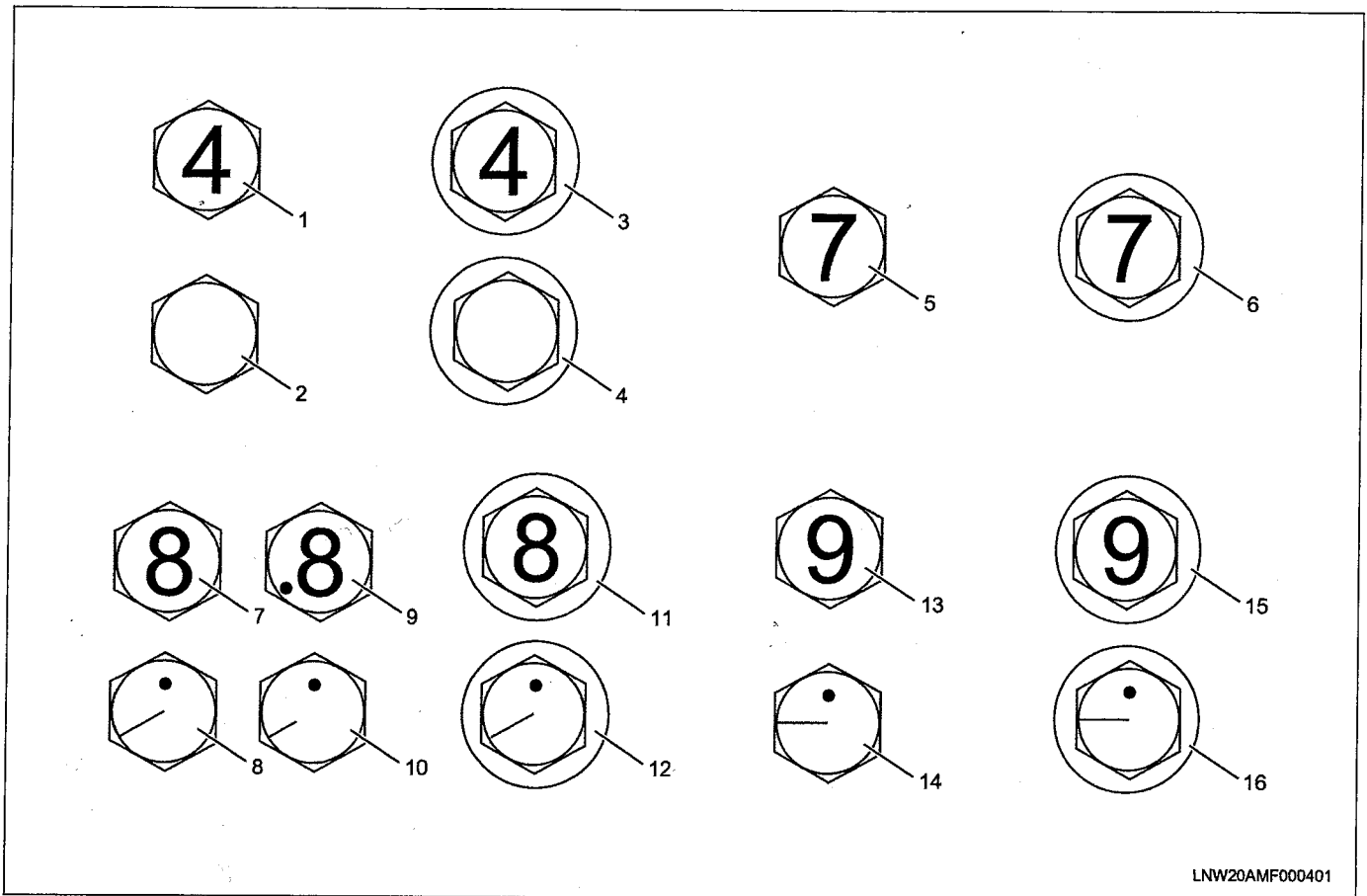
The * mark indicates where soft materials have been used for internal thread sections, such as castings.

N·m {kgf·m}				
Strength classification	8.8		9.8 9T	
	Hexagon head bolt	Flange bolt	Hexagon head bolt	Flange bolt
M6 × 1	5.6 — 11.2 {0.6 — 1.1}	6.6 — 12.2 {0.6 — 1.2}	—	—
M8 × 1.25	13.4 — 25.7 {1.4 — 2.6}	15.3 — 28.4 {1.6 — 2.9}	16.7 — 30.4 {1.7 — 3.1}	18.1 — 33.6 {1.9 — 3.4}
M10 × 1.25	31.3 — 52.5 {3.2 — 5.4}	35.4 — 58.9 {3.6 — 6.1}	37.3 — 62.8 {3.8 — 6.4}	42.3 — 70.5 {4.3 — 7.2}
*M10 × 1.5	31.3 — 51.4 {3.2 — 5.2}	34.5 — 57.5 {3.5 — 5.8}	36.3 — 59.8 {3.7 — 6.1}	40.1 — 66.9 {4.1 — 6.8}
M12 × 1.25	69.3 — 104.0 {7.1 — 10.6}	77.7 — 116.5 {7.9 — 11.9}	75.5 — 113.8 {7.7 — 11.6}	85.0 — 127.5 {8.7 — 13.0}
*M12 × 1.75	64.8 — 96.1 {6.6 — 9.8}	71.4 — 107.2 {7.3 — 10.9}	71.6 — 106.9 {7.3 — 10.9}	79.5 — 119.2 {8.1 — 12.2}
M14 × 1.5	106.2 — 158.8 {10.8 — 16.2}	114.9 — 172.3 {11.7 — 17.6}	113.8 — 170.6 {11.6 — 17.4}	123.4 — 185.1 {12.6 — 18.9}
*M14 × 2	100.6 — 149.8 {10.3 — 15.3}	108.2 — 162.2 {11.1 — 16.6}	106.9 — 160.0 {10.9 — 16.3}	115.5 — 173.3 {11.8 — 17.7}
M16 × 1.5	154.3 — 232.5 {15.7 — 23.7}	171.1 — 256.7 {17.4 — 26.2}	160.0 — 240.3 {16.3 — 24.5}	176.9 — 265.3 {18.0 — 27.1}
*M16 × 2	147.6 — 221.4 {15.0 — 22.6}	162.5 — 243.8 {16.6 — 24.9}	153.0 — 229.5 {15.6 — 23.4}	168.5 — 252.7 {17.2 — 25.8}
M18 × 1.5	222.5 — 334.3 {22.7 — 34.1}	—	229.5 — 345.2 {23.4 — 35.2}	—
*M18 × 2.5	223.6 — 335.4 {22.8 — 34.2}	—	230.5 — 346.2 {23.6 — 35.3}	—
M20 × 1.5	307.4 — 461.7 {31.4 — 47.1}	—	316.8 — 475.6 {32.3 — 48.5}	—
*M20 × 2.5	284.0 — 472.1 {29.0 — 43.5}	—	293.2 — 440.3 {29.2 — 44.9}	—
M22 × 1.5	413.6 — 620.5 {42.2 — 63.3}	—	424.6 — 636.5 {43.3 — 64.9}	—
*M22 × 2.5	385.7 — 578.0 {39.3 — 58.9}	—	394.2 — 592.3 {40.0 — 60.4}	—
M24 × 2	490.8 — 810.5 {50.0 — 82.7}	—	554.1 — 830.6 {56.5 — 84.7}	—
*M24 × 3	462.8 — 693.1 {47.2 — 70.7}	—	520.7 — 781.6 {53.1 — 79.7}	—

The * mark indicates where soft materials have been used for internal thread sections, such as castings.

0A-12 General Information

Designations for Isuzu standard bolt heads



LNW20AMF000401

Name

- | | |
|--|--|
| 1. Hexagon Head Bolt (4.8, 4T) | 9. Hexagon Head Bolt (Nonthermal Refined 8.8) |
| 2. Hexagon Head Bolt (4.8, 4T) | 10. Hexagon Head Bolt (Nonthermal Refined 8.8) |
| 3. Flange Bolt (4.8, 4T) | 11. Flange Bolt (8.8) |
| 4. Flange Bolt (4.8, 4T) | 12. Flange Bolt (8.8) |
| 5. Hexagon Head Bolt (7T) | 13. Hexagon Head Bolt (9.8, 9T) |
| 6. Flange Bolt (7T) | 14. Hexagon Head Bolt (9.8, 9T) |
| 7. Hexagon Head Bolt (Thermal Refined 8.8) | 15. Flange Bolt (9.8, 9T) |
| 8. Hexagon Head Bolt (Thermal Refined 8.8) | 16. Flange Bolt (9.8, 9T) |

Flare nut

	Pipe diameter	Tightening torque (for medium and large size vehicles)	Width across flats of flare nut (mm)	
			Old	New
Flare nut tightening torque (service standard value) N·m {kgf·m}	φ 4.76 mm	12.8 — 18.6 {1.3 — 1.9}	14	14
	φ 6.35 mm	23.5 — 49 {2.4 — 5.0}	17	17
	φ 8.0 mm	23.5 — 49 {2.4 — 5.0}	19	17
	φ 10.0 mm	44.1 — 93.2 {4.5 — 9.5}	22	19
	φ 12.0 mm	58.8 — 137.3 {6.0 — 14.0}	27	24
	φ 15.0 mm	78.5 — 156.9 {8.0 — 16.0}	30	30

Taper screw from connectors (brass)

				N·m {kgf·m}
Screw size	PT (R) 1/8	PT (R) 1/4	PT (R) 3/8	PT (R) 1/2
—	2.0 — 14.7 {0.2 — 1.5}	4.9 — 15.7 {0.5 — 1.6}	9.8 — 16.7 {1.0 — 1.7}	9.8 — 17.7 {1.0 — 1.8}

Special tool classification**A; Essential tool**

Servicing operation cannot be done with any other tools than the essential tool.

B; Recommend tool

Servicing work can be done with a general-purpose tool commercially available. However, it is advisable to use the recommended tool as much as possible for a reduced work time and an improved safety in work operations.

C; Available tool

Although it takes a more working time, servicing operations can be made with a tool commercially available as substitute for the available tool.

Engine

4JJ1 Engine Mechanical

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1A-2 4JJ1 Engine Mechanical

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ISUZU Diesel Engine

Service Precautions

Service precautions about maintenance

To prevent damage to the engine and ensure reliability of its performance, pay attention to the following in maintaining the engine: When taking down the engine on the ground, do not make the bearing surface of the oil pan touch directly the ground. Use a wood frame, for example, to support the engine with the engine foot and the flywheel housing.

Because there is only a small clearance between the oil pan and the oil pump strainer, it can damage the oil pan and the oil strainer.

- When the air duct or air cleaner is removed, cover the air intake port to prevent foreign matter from getting into the cylinder. If foreign matter gets in, it can considerably damage the cylinder and others while the engine is operating.
- When maintaining the engine, never fail to remove the battery ground cable. Otherwise, this may damage the wire harness or electrical parts. If you need electricity on for the purpose of inspection, for instance, watch out for short circuits and others.
- Apply engine oil to the sliding contact surfaces of the engine before reassembling it. This ensures adequate lubrication when the engine is first started.
- When valve train parts, pistons, piston rings, connecting rods, connecting rod bearings or crankshaft journal bearings are removed, put them in order and keep them.
- When installing them, put them back to the same location as they were removed.
- Gaskets, oil seals, O-rings, etc. must be replaced with new ones when the engine is reassembled.
- As for parts where a liquid gasket is used, remove an old liquid gasket completely and clean it up thoroughly so that no oil, water or dust may be clung to them. Then, apply the designated liquid gasket to each place anew before assembly.
- Surfaces covered with liquid gasket must be assembled within 7 minutes of gasket application. If more than 7 minutes have elapsed, remove the existing liquid gasket and apply new liquid gasket.
- When assembling or installing parts, fasten them with the specified tightening torque so that they may be installed properly.

Matters that require attention in specifically dealing with this engine.

Holes or clearances in the fuel system, which serve as a passage of fuel, including the inside of the injector, are made with extreme precision. They are therefore highly sensitive to foreign matter and the entry of foreign matter could cause serious damage. Take extreme care not to allow foreign matter to enter.

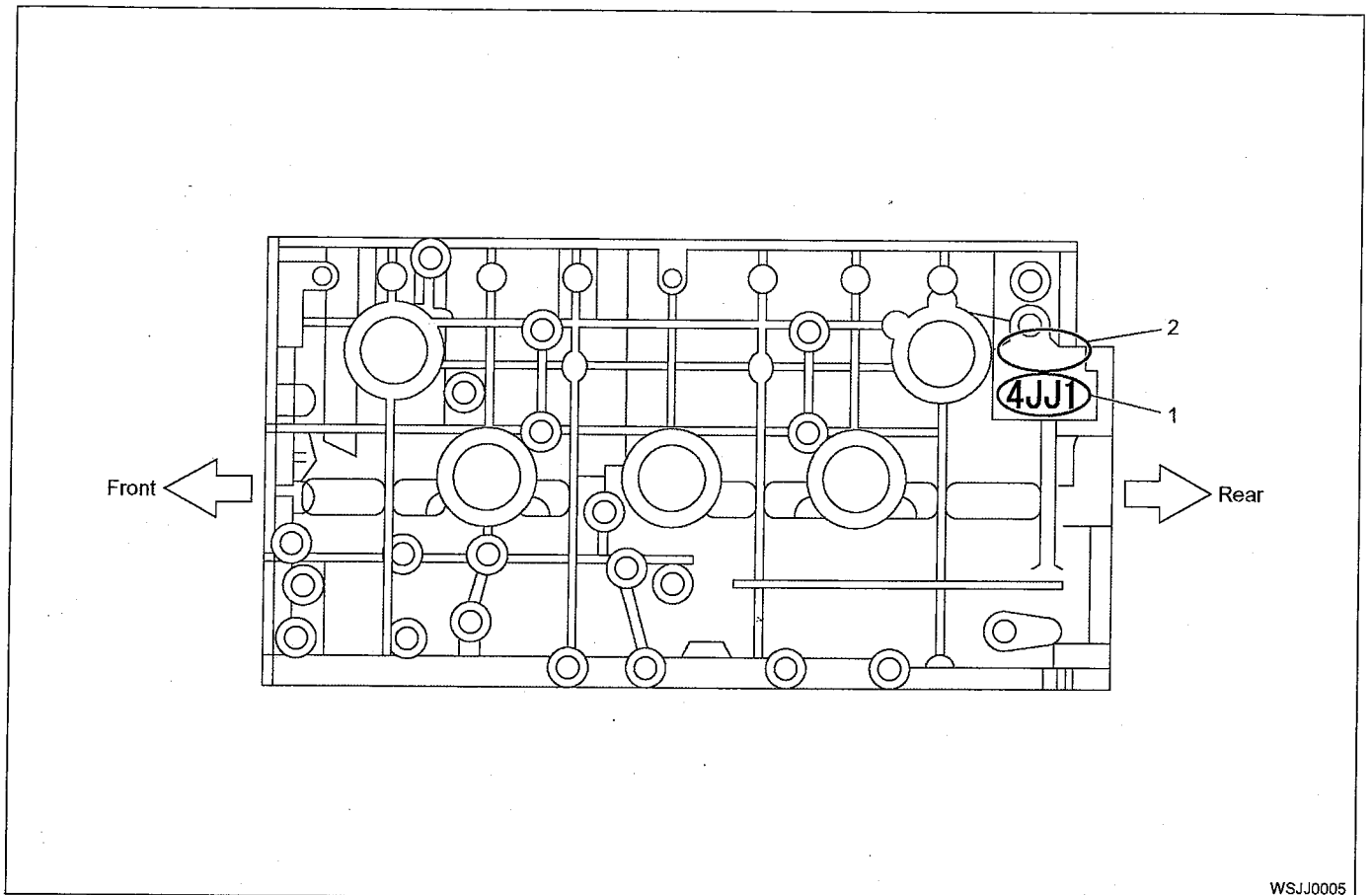
When servicing the fuel system, every precaution must be taken to prevent the entry of foreign material into the system.

- Before beginning the service procedure, wash the fuel line and the surrounding area.
- Perform the service procedures with clean hands. Do not wear work gloves.
- Immediately after removing the fuel hose and/or fuel pipe, carefully tape vinyl bags over the exposed ends of the hose or pipe.
- Always replace the high-pressure pipe in fuel system with new one if it has been removed. Reuse of it causes damage to the seal surface, resulting in fuel leakage.
- If parts are to be replaced (fuel hose, fuel pipe, etc.), do not open the new part packaging until installation.

Work procedure

- The fuel opening must be quickly sealed when removing the fuel pipe, injection pipe, fuel injector, fuel supply pump, and common rail.
- The eyebolts and gasket must be stored in a clean parts box with a lid to prevent adhesion of foreign matter.
- Fuel leakage could cause fires. Therefore, after finishing the work, wipe off the fuel that has leaked out and make sure there is no fuel leakage after starting the engine.

How to Read the Model



WSJJ0005

Name

1. Stamped Engine Model

2. Stamped Engine Number

Explanations on Functions and Operation

Electronic engine control

With the control unit, the range from injection to air intake/exhaust, including fuel injection quantity, injection timing, EGR and idling speed, is controlled.

Cylinder block

The cylinder block is cast-iron with the center distance of each bore being equal, is of the highly rigid, and is linerless.

Piston

The piston is aluminum-alloy and a thermal-flow piston with a strut cast, while the combustion chamber is a round reentrant type.

Cylinder head

The cylinder head is aluminum-alloy and there are four valves per cylinder. The angular tightening method of the cylinder head bolt further increases reliability and durability.

Crankshaft

Do not grind the crankshaft to reuse, as tuffride treatment has been performed to the surface. Replace with new one if fault is present.

EGR system

Based upon data, including coolant temperature, engine speeds or engine loads, it is controlled via Engine Control Module (ECM) to purify exhaust by recycling part of it.

Its main components include an EGR valve, an EGR cooler and various sensors.

Connecting rod cap bolt

The angular tightening method of the connecting rod cap bolt further increases reliability and durability.

Common rail-type electronic control injection system

The common rail-type electronic control injection system is composed of a fuel supply pump that sets the target pressure of high-pressure fuel and supply it, a common rail that measures such high-pressure fuel and a fuel injector that turns it into a fine spray and injects it. Each is controlled via ECM based upon various signals, while injection timing or fuel injection quantity is controlled under every possible driving condition.

Fuel injector

The fuel injector is a 6-hole nozzle that adjusts fuel injection quantity or injection timing by opening or closing an electromagnetic valve on the head of the fuel injector.

ECM corrects the dispersion of fuel injection quantity among fuel injectors according to ID code data in memory. At the replacement of fuel injectors, ID code data should be stored in ECM.

Fuel filter with sedimenter

It is a fuel filter with sedimenter that gets rid of water by making use of the difference in specific gravity between diesel oil and water, which comes with an indicator that notifies you that it is filled with water.

Preheating system

The preheating system consists of the ECM, the glow relay, glow plugs and the glow indicator lamp. The preheating system is operated when the engine coolant temperature is low, and make the engine easy to start.

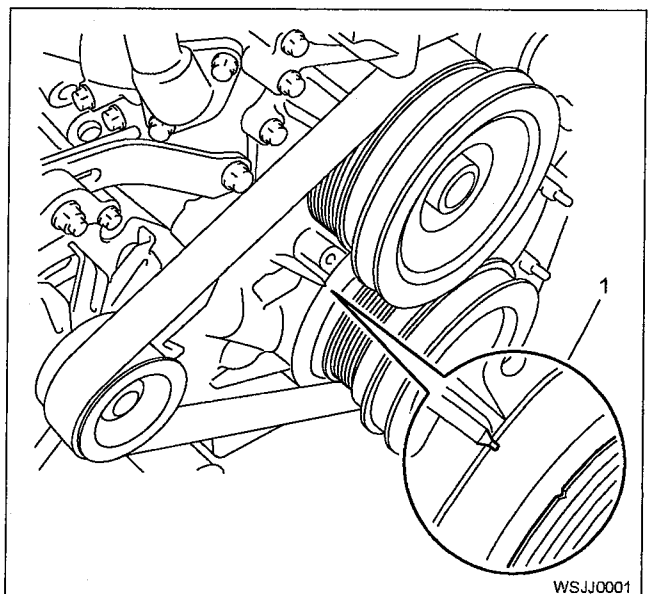
Lubrication system

It is an oil filter with full-flow bypass, which uses a water-cooled oil cooler and oil jet to cool the piston.

Function Check

Inspection/adjustment of valve clearance

1. Inspection of valve clearance
 - Disconnect the fuel injector connector.
 - Disconnect the leak-off hose.
 - Remove the cylinder head cover.
 - Rotate the crankshaft to make the No.1 cylinder meet the compression top dead center (TDC).



Name

1. TDC

- Insert a 0.15 mm {0.006 in} thickness gauge into a clearance between the rocker arm roller and the camshaft to check it and adjust it if needed. It is recommended to use a long thickness gauge.

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Valve clearance	mm {in}
Intake valve	0.15 {0.006}
Exhaust valve	0.15 {0.006}

CAUTION:

Perform adjustment when it is cold.

2. Adjustment of valve clearance

- Completely loosen all of the rocker arm adjusting nuts and adjusting screws (16 nuts and 16 screws).
- Place a 0.15 mm {0.006 in} thickness gauge between the No.1 cylinder rocker arm roller and the camshaft.
- With a thickness gauge kept inserted, tighten an adjusting screw of the rocker arm lightly and make sure that the tip of the adjusting screw touches the end of valve axis and the movement of the thickness gauge has become tight.
- Use a valve clearance adjust nut wrench to tighten the rocker arm lock nut.

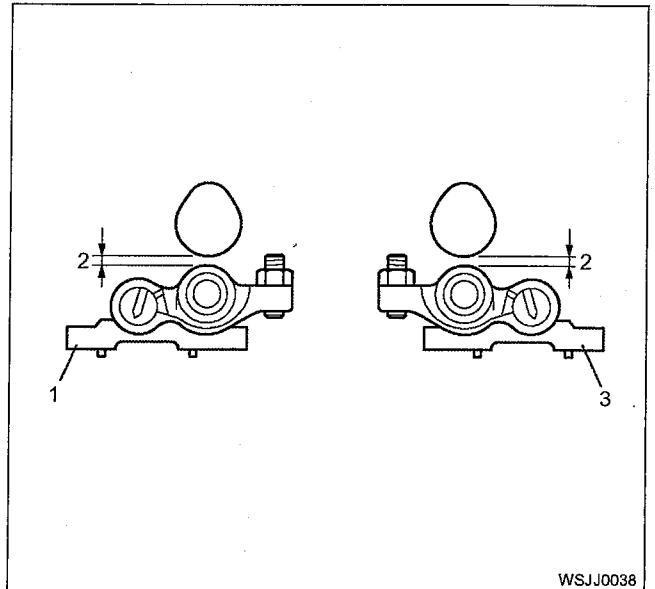
Special tool

Valve clearance adjust nut wrench:
5-8840-2822-0

- Remove the thickness gauge.
- Repeat above steps for the remaining cylinders.

Tightening torque:

18 N·m {1.8 kg·m/13 lb·ft}



WSJJ0038

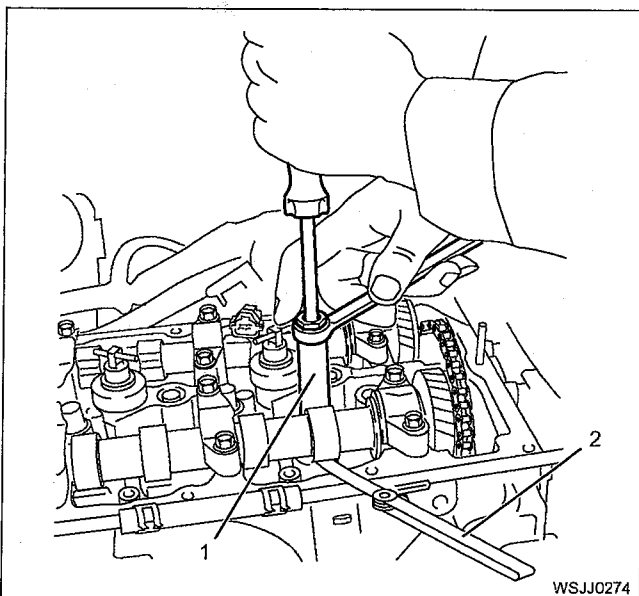
Name

- Exhaust Rocker Arm Shaft ASM
- Valve Clearance
- Intake Rocker Arm Shaft ASM

Adjustment table

Cylinder No.	1		2		3		4	
Valve arrangement	IN	EX	IN	EX	IN	EX	IN	EX
No.1 cylinder compression top dead center position	○	○	○			○		
No.4 cylinder compression top dead center position				×	×		×	×

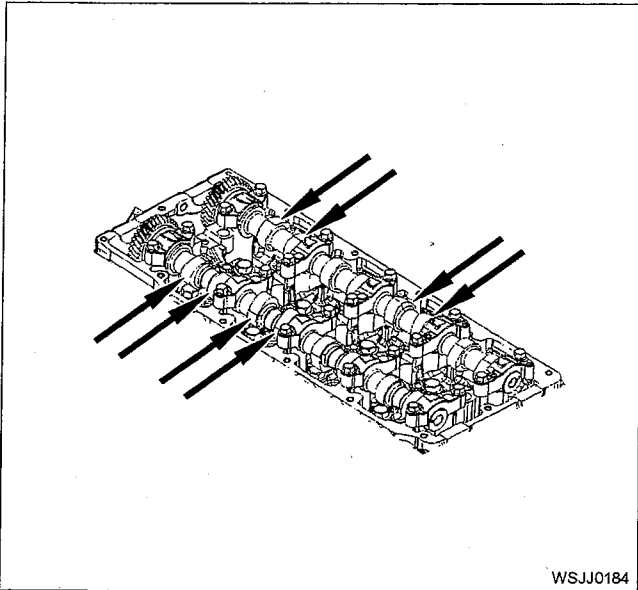
- If the No.1 cylinder is the compression TDC, adjust a valve clearance with ○ mark given on the table and if the No.4 cylinder is the compression top dead center, that with × mark.



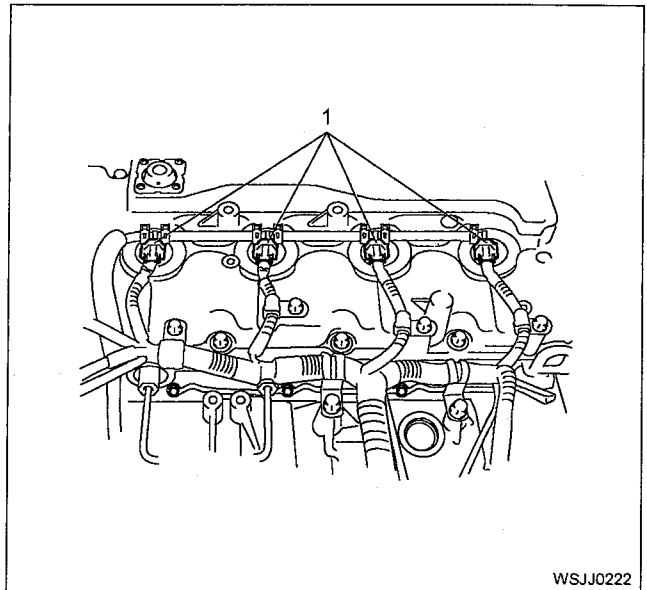
WSJJ0274

Name

- Valve Clearance Adjust Nut Wrench
- Thickness Gauge



WSJJ0184

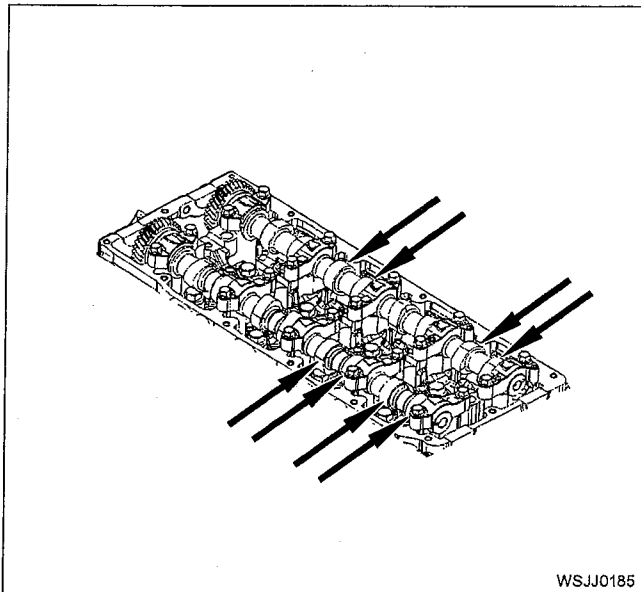


WSJJ0222

Name

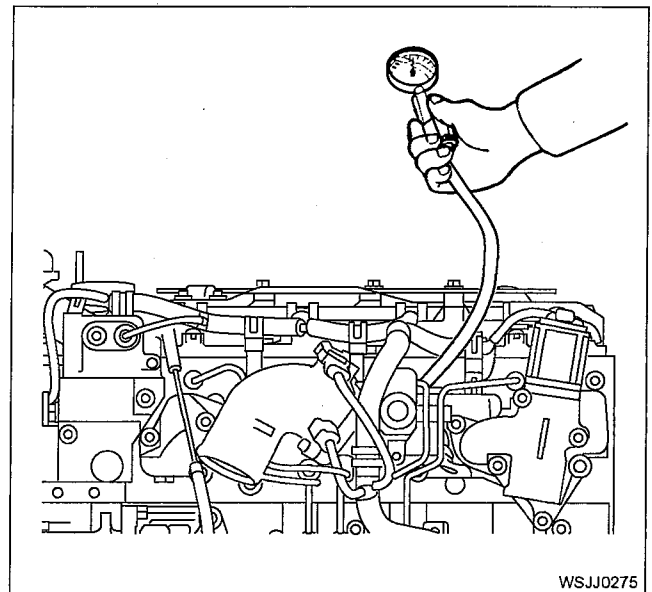
1. Fuel Injector Connector

- Install the negative terminal of the battery.
- Turn on the starter to emit foreign matter within the cylinders.
- Install an adapter and a gauge of a compression gauge (special tool).



WSJJ0185

- Install the cylinder head cover. Refer to 1A-16, "Installation, Cylinder Head Cover".
- Connect the leak-off hose.
- Connect the fuel injector connector.



WSJJ0275

Compression gauge:
5-8840-2675-0 (J-26999-12)
Compression gauge adapter:
5-8840-2815-0

- Turn on the starter to inspect compression pressure.

Compression pressure inspection

- Warm-up the engine.
- Remove a negative terminal of the battery and remove all the glow plugs.
- Remove the connector of the fuel injector (no fuel will be injected).

CAUTION:

When the harness connector is removed, ECM judges that it broke down and DTC is recorded. Upon completion of measurement, never fail to clear memory of ECM.

(For how to clear memory of ECM, refer to the Engine Control System section)

Compression pressure	MPa {psi} / 200 rpm
Standard	2.84 — 3.24 {412 — 469}
Limit	1.96 {284}
Differences among the cylinders	294 kPa {43}

1A-8 4JJ1 Engine Mechanical

- Measure each cylinder one by one.

CAUTION:

To keep engine speed at 200 rpm or more, use fully charged batteries.

- Remove a compression gauge (special tool).
- Remove a negative terminal of the battery.
- Connect the fuel injector connector.
- Install all the glow plugs.

Tightening torque:

15 — 20 N·m {1.5 — 2.0 kg·m/11 — 15 lb·ft}

- Install the negative terminal of the battery.

Specifications

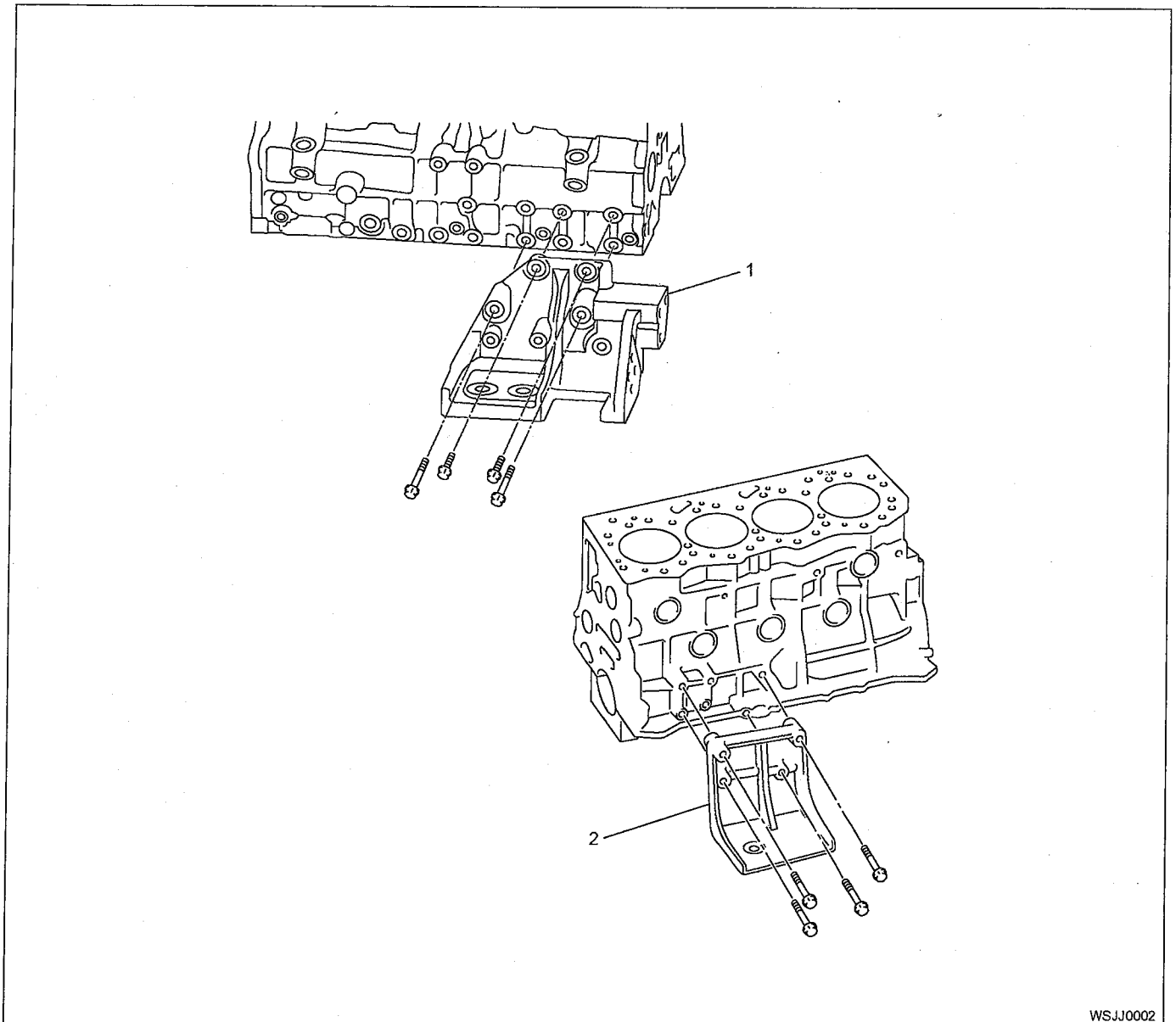
Item		Engine model 4JJ1 (24V model)
Type		Diesel/4-cycle/water cooled-type, inline four-cylinder DOHC
Combustion chamber form		Direct injection type
Cylinder liner type		Linerless
Number of cylinders – cylinder bore × strokes	mm {in}	4 – 95.4 {3.76} × 104.9 {4.13}
Displacement	cc {cu.in}	2999 {183}
Compression ratio		17.5
Compression pressure	MPa {psi}/rpm	3 {435}/200
Idle speed	rpm	800 ± 25
Valve clearance	Intake	0.15 {0.006} (cold)
	Exhaust	0.15 {0.006} (cold)
	mm {in}	
Ignition type		Compressed ignition
Injection order		1 - 3 - 4 - 2
Lubricating system		
Lubricating type		Pressure type
Oil pump type		Gear type
Volume of lubricating oil	L {qts}	15.0 {15.8}
Oil filter type		Full flow filter (cartridge type)
Oil cooling type		Built-in, water-cooling
Cooling system		
Cooling type		Water cooling type
Water pump type		Centrifugal, belt type
Thermostat type		Wax-type unit
Thermostat valve-opening temperature	°C {°F}	85 {185}
Volume of coolant	L {qts}	6 {6.3} (Engine only)
Fuel system		
Injection pump type		Electronic control common rail type
Governor type		Electronic type
Timer type		Electronic type
Injection nozzle type		Multi-hole type 6-hole
Charging system		
Generator type		AC type
Power output	V/A	24 - 50
Regulator type		IC
Starting system		
Starter type		Reduction type
Power output	V-kw	24 - 4.0
Preheat system type		Glow plug
Glow plug standard voltage/electric current	V/A	23 - 3.8

1A-10 4JJ1 Engine Mechanical

Item		Engine model 4JJ1 (12V model)
Type		Diesel/4-cycle/water cooled-type, inline four-cylinder DOHC
Combustion chamber form		Direct injection type
Cylinder liner type		Linerless
Number of cylinders – cylinder bore x strokes	mm {in}	4 – 95.4 {3.76} x 104.9 {4.13}
Displacement	cc {cu.in}	2999 {183}
Compression ratio		17.5
Compression pressure	MPa {psi}/rpm	3 {435}/200
Idle speed	rpm	800 ± 25
Valve clearance	Intake	0.15 {0.006} (cold)
	Exhaust	0.15 {0.006} (cold)
	mm {in}	
Ignition type		Compressed ignition
Injection order		1 - 3 - 4 - 2
Lubricating system		
Lubricating type		Pressure type
Oil pump type		Gear type
Volume of lubricating oil	L {qts}	15.0 {15.8}
Oil filter type		Full flow filter (cartridge type)
Oil cooling type		Built-in, water-cooling
Cooling system		
Cooling type		Water cooling type
Water pump type		Centrifugal, belt type
Thermostat type		Wax-type unit
Thermostat valve-opening temperature	°C {°F}	85 {185}
Volume of coolant	L {qts}	6 {6.3} (Engine only)
Fuel system		
Injection pump type		Electronic control common rail type
Governor type		Electronic type
Timer type		Electronic type
Injection nozzle type		Multi-hole type 6-hole
Charging system		
Generator type		AC type
Power output	V/A	12 - 110
Regulator type		IC
Starting system		
Starter type		Reduction type
Power output	V-kw	12 - 2.5
Preheat system type		Glow plug
Glow plug standard voltage/electric current	V/A	11 - 4.9

Engine Foot

Components



WSJJ0002

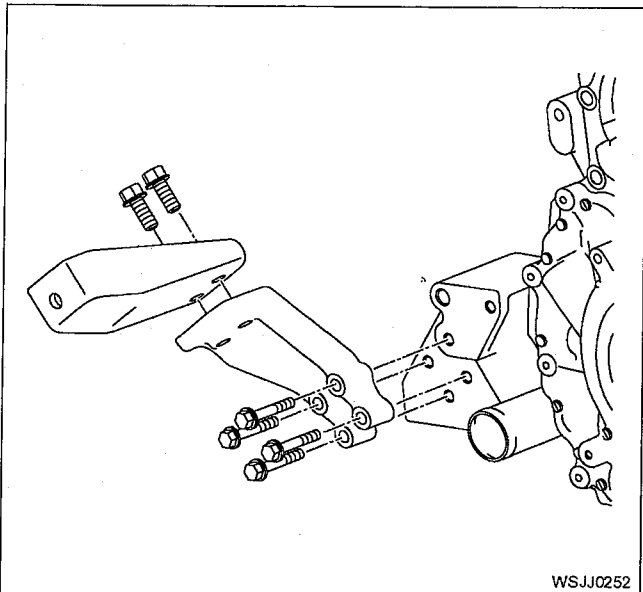
Name

1. Engine Foot RH

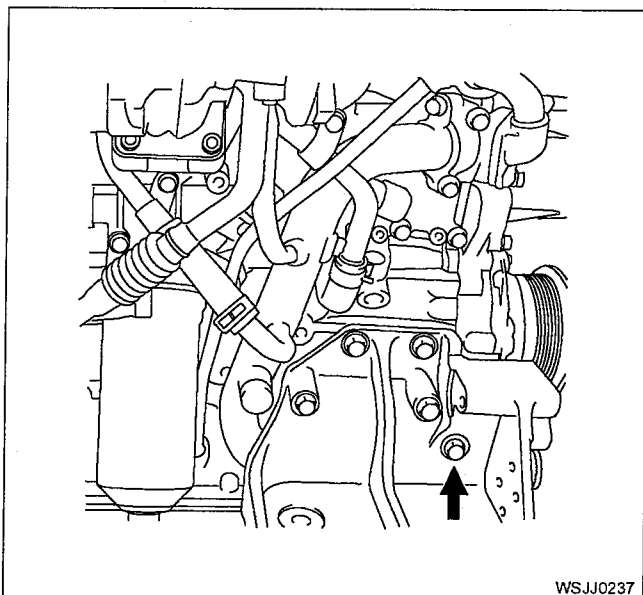
2. Engine Foot LH

Removal

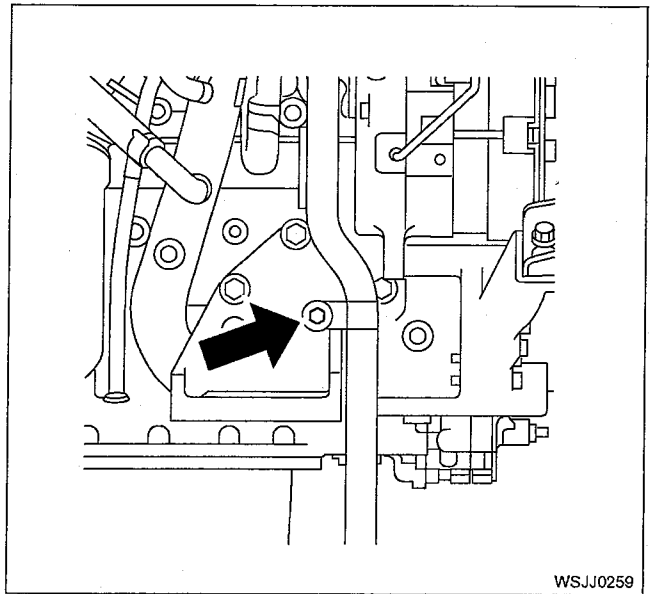
1. Lower the engine ASM.
2. Remove the fan shroud and fan guard.
Refer to 1B-9, "Removal, Water Pump".
3. Remove the generator.
24V model: Refer to 1D-6, "Removal, Generator (24V model)".
12V model: Refer to 1D-15, "Removal, Generator (12V model)".
4. Remove the fan shroud bracket RH and fan shroud stay RH.



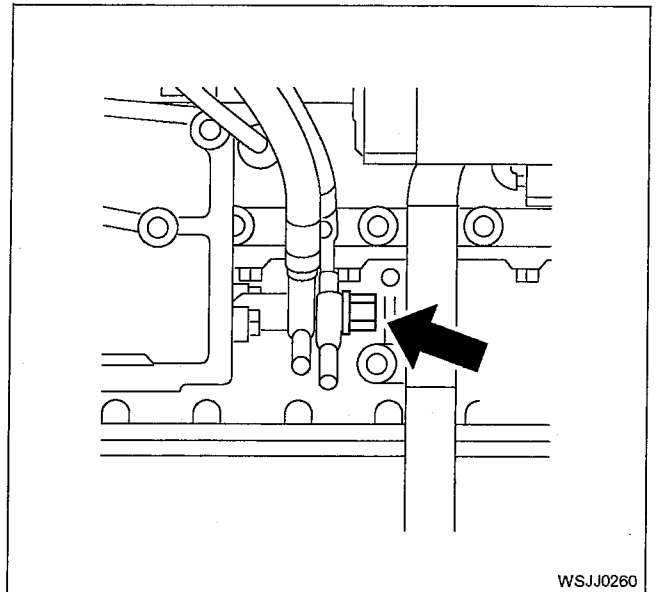
5. Remove the bolt with arrow mark which holds the water intake pipe to the engine foot RH.



6. Remove the bolt with arrow mark which holds the blow-by hose to the engine foot RH.



7. Remove the relief valve.



8. Remove the engine foot.

Installation

1. Install the engine foot.
 - Temporarily tighten the engine foot bolt.
 - Install the bolt which holds the water intake pipe to the engine foot RH.
 - Tighten each bolt to the specified torque.

Tightening torque:

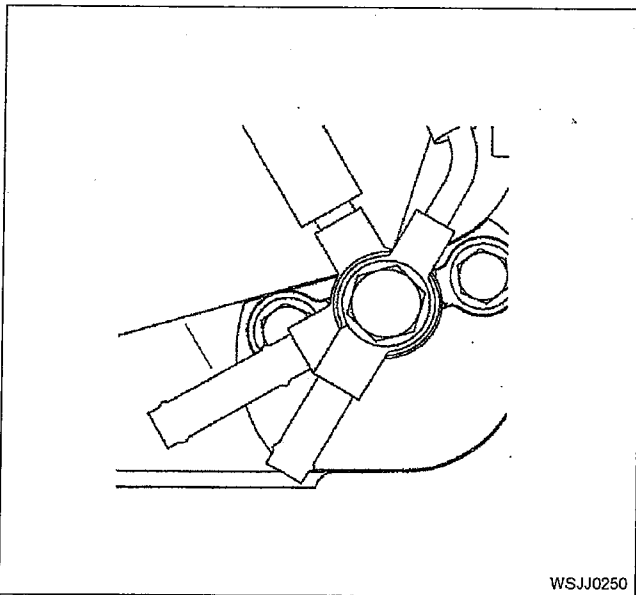
M8 bolt: 25 N·m {2.5 kg·m/18 lb·ft}

M10 bolt: 51 N·m {5.2 kg·m/38 lb·ft}

2. Install the relief valve.
 - Install so as not to let the pipe stick out of the bottom of the engine foot.

Tightening torque:

25 N·m {2.5 kg·m/18 lb·ft}



3. Install the bolt which holds the blow-by hose to the engine foot LH.

Tightening torque:

25 N·m {2.5 kg·m/18 lb·ft}

4. Install the fan shroud bracket RH and fan shroud stay RH.

Tightening torque:

M8 bolt: 25 N·m {2.5 kg·m/18 lb·ft}

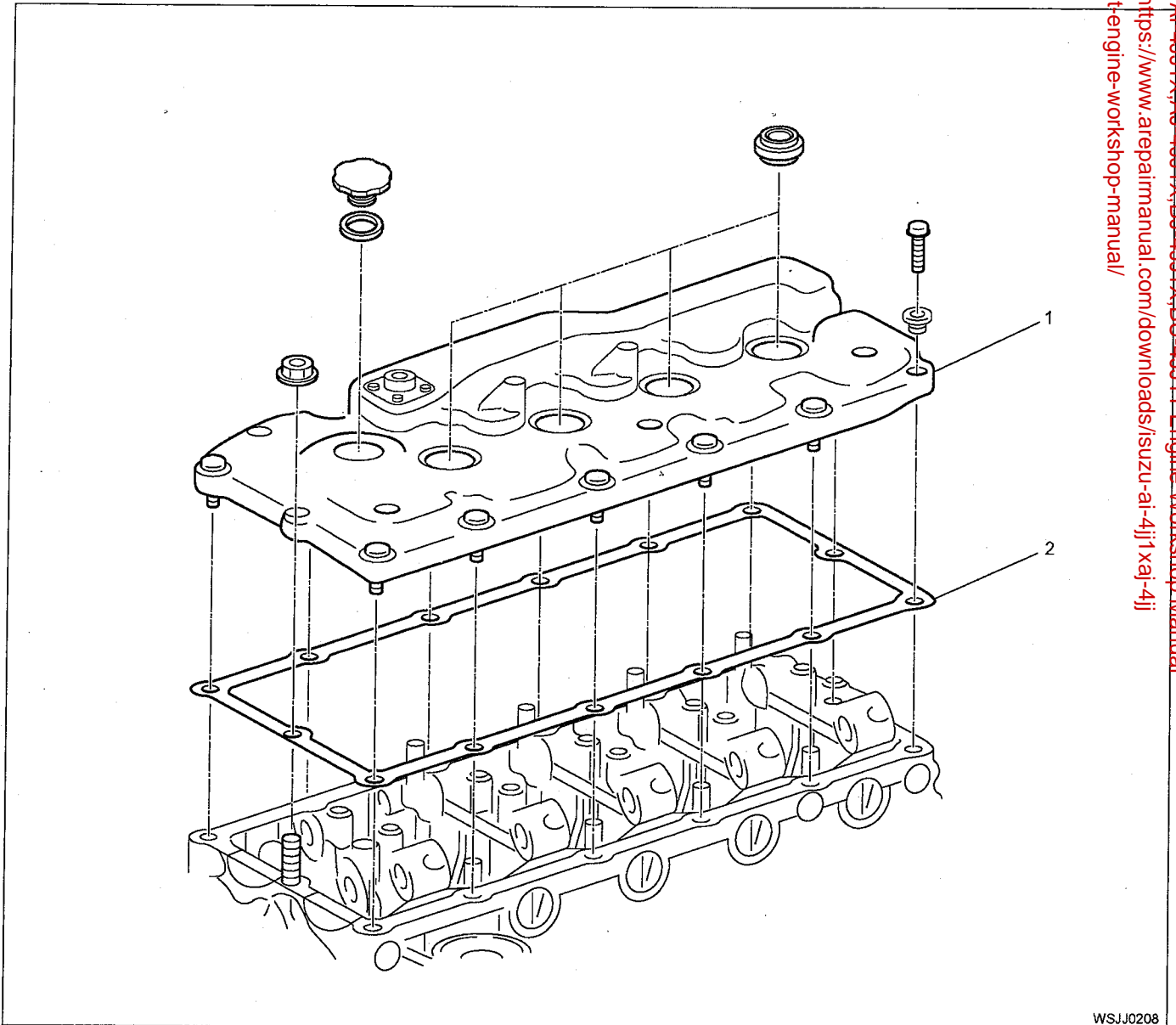
M10 bolt: 51 N·m {5.2 kg·m/38 lb·ft}

Nut: 25 N·m {2.5 kg·m/18 lb·ft}

5. Install the fan shroud and fan guard.
Refer to 1B-10, "Installation, Water Pump".
6. Install the generator.
24V model: Refer to 1D-6, "Installation, Generator (24V model)".
12V model: Refer to 1D-15, "Installation, Generator (12V model)".
7. Put the engine ASM on.

Cylinder Head Cover

Components



Name

1. Head Cover

2. Head Cover Packing

WSJJ0208