Product: Isuzu A1-4JJ1 Diesel Engine Workshop Service Repair Manual
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INDUSTRIAL DIESEL ENGINE

A1-4JJ1 MODEL

WORKSHOP MANUAL

ISUZU MOTORS LIMITED

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General Information

General Information

Contents

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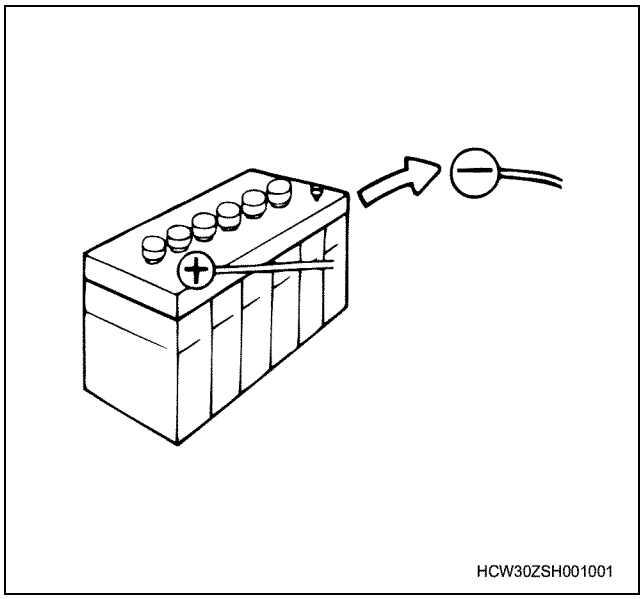
General Information

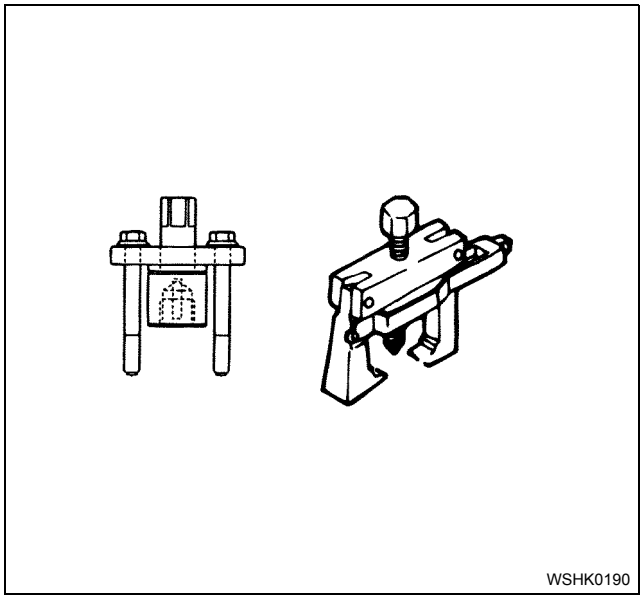
Service Precautions

In order to carry out work safely

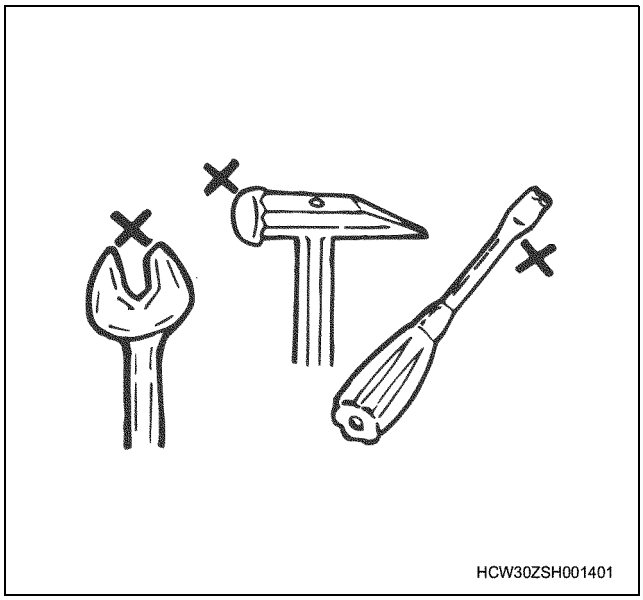
1. Always use an engine stand when taking the engine down from the vehicle.
   Do not place the engine directly onto the ground, or place in a manner that interferes with the oil pan.
2. If you are working together with others, always pay attention to each other's safety.
3. If you are repairing any 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.



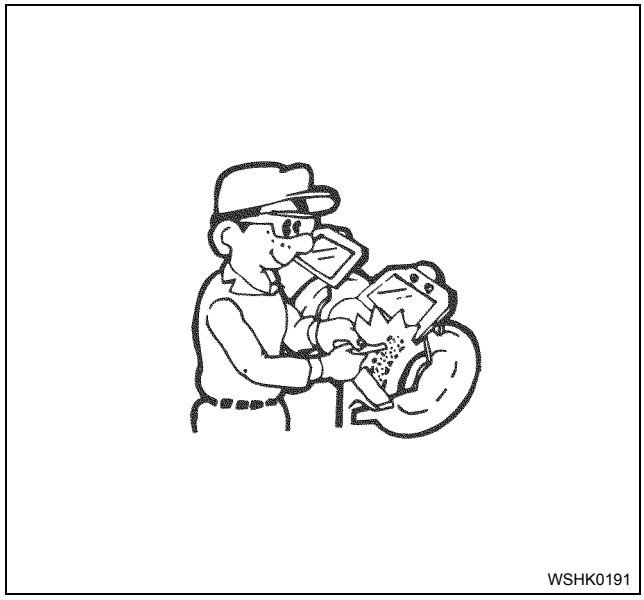
4. Do not perform painting work or leave the engine running for long periods of time in an enclosed or badly ventilated indoor workshop.
5. Always use the correct specialized tool indicated in the instructions. Using the incorrect tool may cause damage to the parts or injury to the person using the tool.



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.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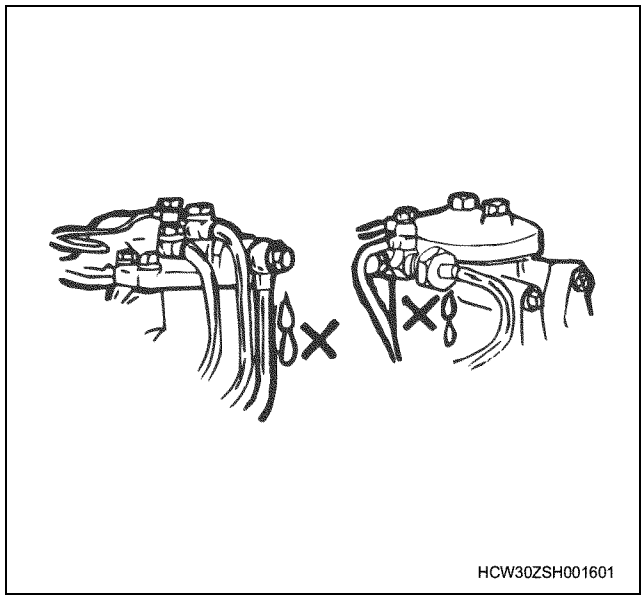
8. Always check that there are no fuel leaks when performing maintenance work on the fuel system. (It may cause a fire.)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9. Pay close attention to the risk of ignition if you are handling parts that carry a high voltage.
   Furthermore, any oil or grease spilt onto rubber parts must be wiped off immediately, as it will cause deterioration of the rubber.


WSHK0192

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. 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 Three Bond 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.
4. Make sure that there are no gaps when re-installing 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 5 minutes of applying the liquid gasket.

If more than 5 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	Three Bond
Between cylinder block and crank case	1207B	Three Bond
Between oil cooler ASM and gear case cover	1207B	Three Bond
Between gear case and cylinder head	1207B	Three Bond
Between gear case and gear case cover	1207B	Three Bond
Among gear case and cylinder block and crank case	1207B	Three Bond
Between gear case cover and lower timing chain cover	1207B	Three Bond
Among cylinder block and crank case and retainer	1207B	Three Bond
Between cylinder head and cam end packing	1207B	Three Bond
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.

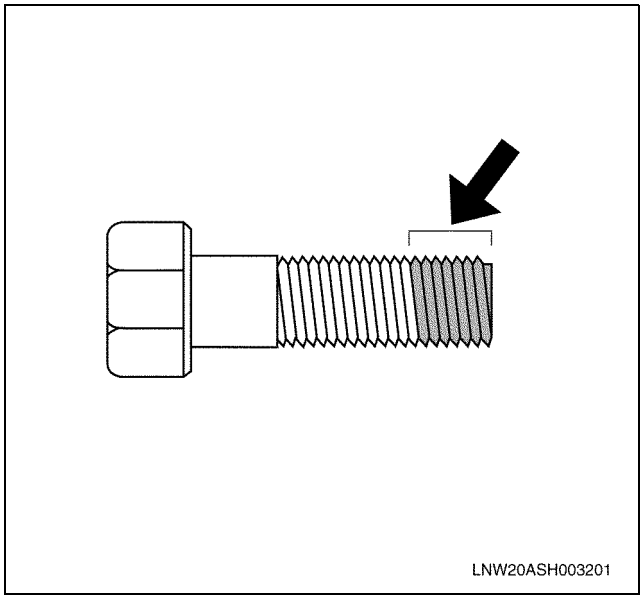
Application procedure

1. Wipe the contact surfaces clean of all water, grease or oil. 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.

Notes:
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 screw thread section 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 correct tightening 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

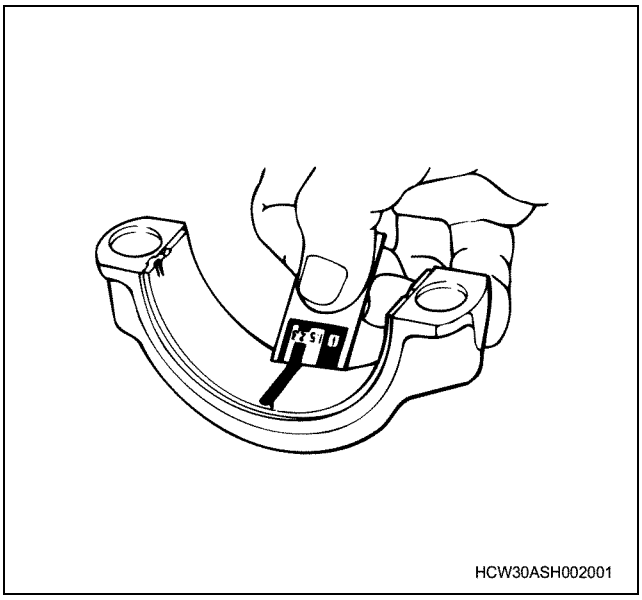
Type	Measurable range mm (in)
PG-1 (Green)	0.025 – 0.076 (0.001 – 0.003)
PR-1 (Red)	0.051 – 0.152 (0.002 – 0.006)
PB-1 (Blue)	0.102 – 0.229 (0.004 – 0.009)

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 pore 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 bearing surface of the fastening 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.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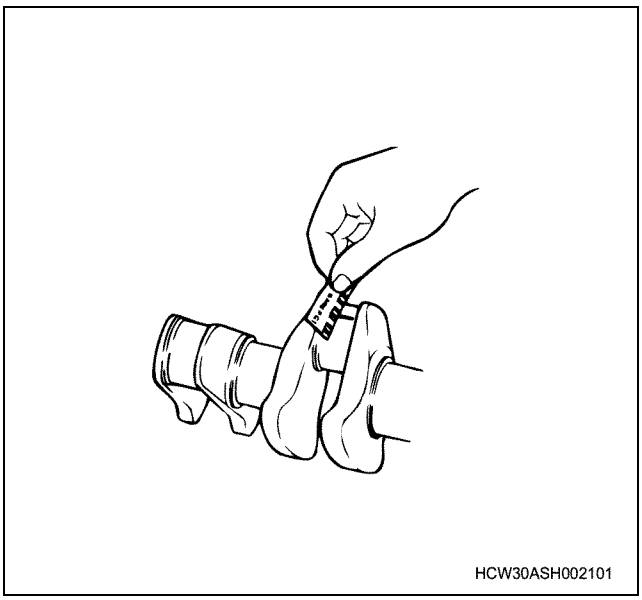
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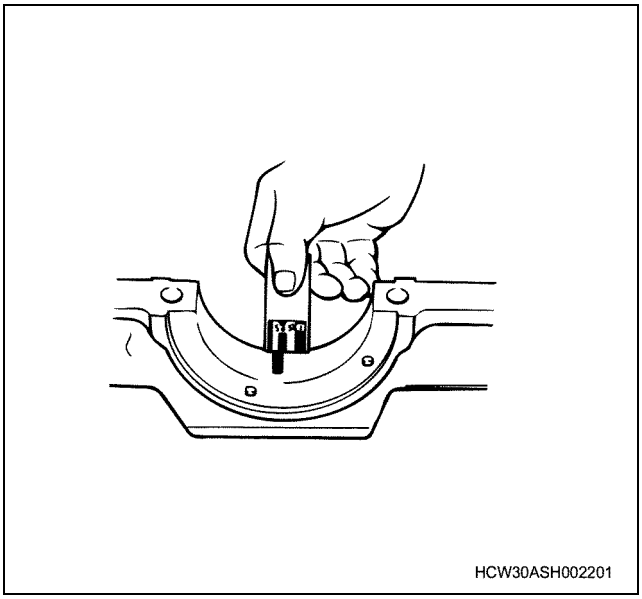
Example: Measuring the clearance between the crank bearing and crank journal

- 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 pore of the journal lay the gauge parallel to the journal.
- Gently rest the crank case on the cylinder block, apply molybdenum disulfide to the thread section and bearing surface of the fastening 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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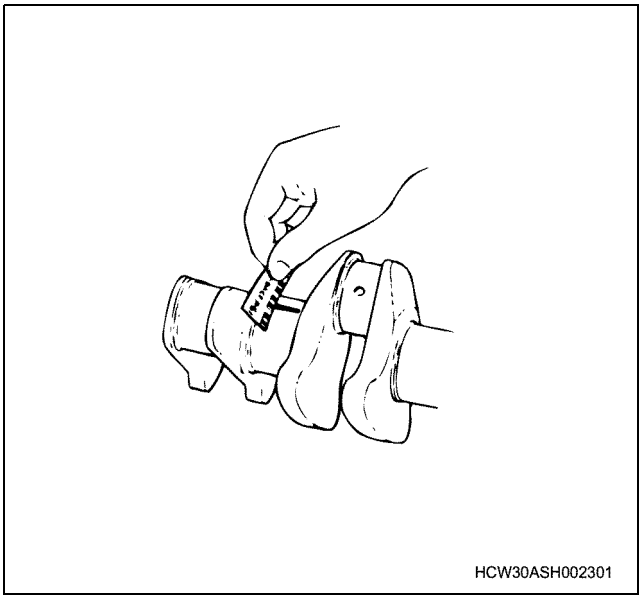
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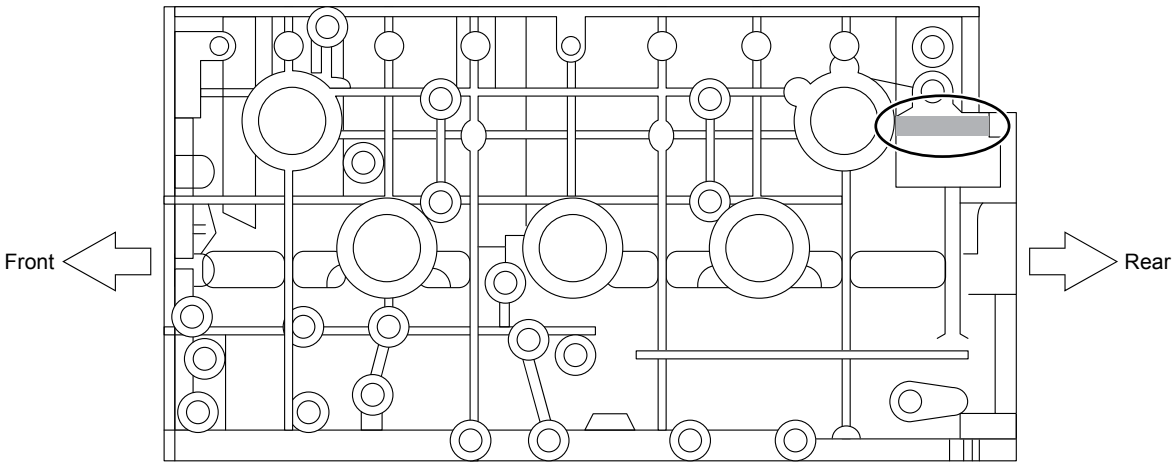
Reading the Model

Engine number stamping position



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General Information

Terminology, description of abbreviations

Terminology definitions

Term	Explanation
Maintenance standard	The generic name for reference values required for maintenance, such as nominal dimension, selection of a reference point, and limit.
Nominal dimension	Shows the standard value at the point of manufacture that does not include the common difference.
Selection of a reference point	Shows the standard value after assembling, repairing, or adjusting.
Limit	When this value (dimensions) is reached, it shows that the part has reached its full limit and must be replaced or repaired.
Front · rear, left · right, upper · lower	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.

Term	Explanation
Notes	Items that should receive special mention within a work procedure.

Description of abbreviations

Abbreviation	Description
AC	Alternating Current Alternating Current
ACC	Accessory Accessory
ACG	Alternating Current Generator Alternating current generator
API	American Petrol Institute American Petroleum Institute
ASM (Assy)	Assembly Assembly
ATDC	After Top Dead Center After Top Dead Center
BAT, BATT	Battery Battery
BRG, Brg	Bearing Bearing
BKT, BRKT	Bracket Bracket
BTDC	Before Top Dead Center Before Top Dead Center
CO	Carbon Oxide Carbon Monoxide
CONN	Connector Connector
CPU	Central Processing Unit Central processing unit
C/U	Control Unit Control unit
DC	Direct Current Direct current
DI	Direct Injection Direct injection
ECU	Engine Control Unit / Electronic Control Unit Engine control unit / control unit
ECM	Engine Control Module Engine control module
EGR	Exhaust Gas Recirculation Exhaust gas recirculation
Exh, EXH	Exhaust Exhaust
Ft, FRT	Front Front

Abbreviation	Description
FWD	Forward Forward
F/C	Fuel Cut Fuel Cut
GND	Ground Earth
IC	Integrated Circuit Integrated circuit
ID Plate	Identification plate Identification plate, ID plate
IN	Intake, Intake Intake
ISO	International Organization for Standardization International Organization for Standardization
I/PUMP	Injection Pump Injection Pump
JIS	Japanese Industrial Standard Japanese Industrial Standard
L/H, LH	Left Hand Left hand side
M/V	Magnetic Valve Magnetic valve
NOx	Nitrogen Oxide Nitrogen Oxide
N-TDC	Number - Top Dead Center Top dead center rotational frequency
OPT	Option Option
P	Pole(S) Pole
PCV	Pump Control Valve/ Positive Crankcase Ventilation Pump control valve/ Positive crankcase ventilation
PM	Particulate Matter Particulate matter
PS	Pre-Stroke Pre-stroke
PTO	Power Take Off Power take off
QOS	Quick On System Rapid preheating system
Rr, RR	Rear Rear

Abbreviation	Description
R/H, RH	Right Hand Right hand side
R/L	Relay Relay
STD	Standard Standard
SW	Switch Switch
TICS	Timing & Injection rate Control System A type of injection system
VGS Turbo	Variable Geometry turbocharger System Adjustable turbo, VGS turbo
W/L	Warning Lamp 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

French) Abbreviated name of 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, gf·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
Dynamic force, horsepower	W	PS	1 PS = 0.74 kW
Capacity, air volume displacement	m^3	Litle, L, cc	1 Litle = 1 dm^3, 1 cc = 1mLitle = 1cm^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 (mili) 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 kgf/cm^2 = 19,620 kPa = 19.6 MPa
- 40 mmHg = 5,332 Pa = 5.3 kPa

Table of standard Isuzu 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

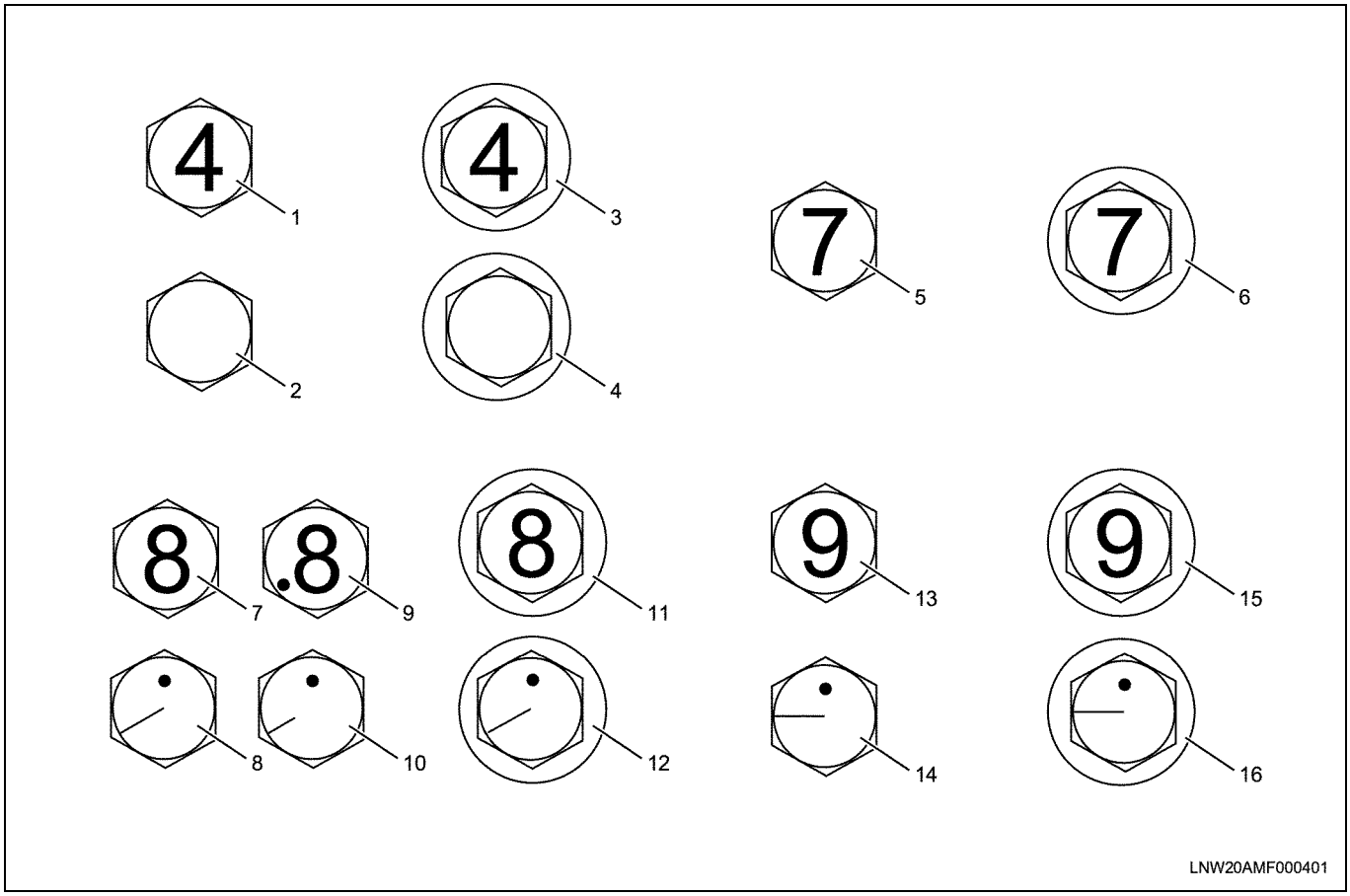
					N·m {kgf·m}
	Strength classification	4.8 4T		7T	
	Bolt head section shape	Hexagon head bolt	Flange bolt	Hexagon head bolt	Flange bolt
*	M10 × 1.5	19.6 ~ 33.3 {2.0 ~ 3.4}	22.3 ~ 37.2 {2.3 ~ 3.8}	27.5 ~ 45.1 {2.8 ~ 4.6}	30.3 ~ 50.4 {3.1 ~ 5.1}
	M12 × 1.25	49.0 ~ 73.5 {5.0 ~ 7.5}	54.9 ~ 82.3 {5.6 ~ 8.4}	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	
Bolt head section shape	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.

Designations for Isuzu standard bolt heads



Legend

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

Flare nut

	Pipe diameter	tightening torque (for medium and large size vehicles)	Flare nut 2 side width (mm)	
			Old	New
Flare nut tightening torque (service standard value) N·m {kgf·m}	ϕ4.76 mm	12.8 ~ 18.6 {1.3 ~ 1.9}	14	14
	ϕ6.35 mm	23.5 ~ 49 {2.4 ~ 5.0}	17	17
	ϕ8.0 mm	23.5 ~ 49 {2.4 ~ 5.0}	19	17
	ϕ10.0 mm	44.1 ~ 93.2 {4.5 ~ 9.5}	22	19
	ϕ12.0 mm	58.8 ~ 137.3 {6.0 ~ 14.0}	27	24
	ϕ15.0 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) 1/12
—	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; Recommended 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

Engine Mechanical (4JJ1)

Contents

Isuzu Diesel Engine (4JJ1)

Precautions on Service Work

Matters that require attention in terms of 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 opening 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 5 minutes of gasket application. If more than 5 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.

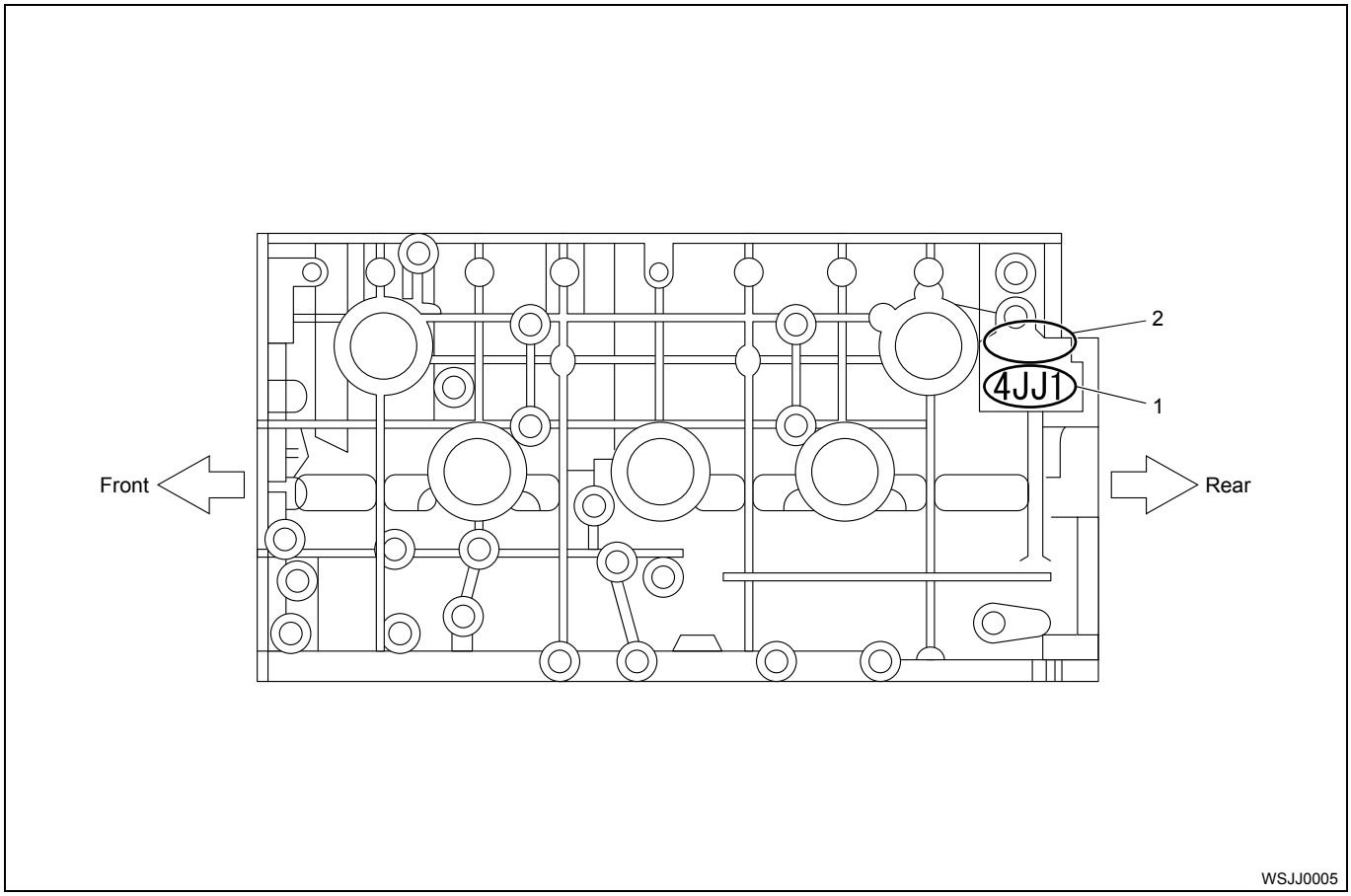
Holes or clearances in the fuel system, which serve as a passage of fuel, including the inside of the injector, are made with extreme precision. They are therefore highly sensitive to foreign matter and the entry of foreign matter could cause serious damage. Take extreme care not to allow foreign matter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



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 4 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 tufftride 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 light oil and water, which comes with an indicator that notifies you that it is filled with water.

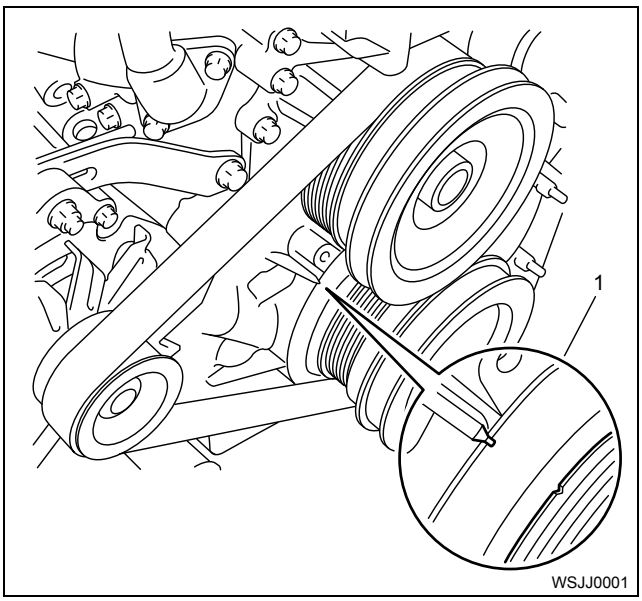
Preheating system
The preheating system consists of the ECM, the glow relay, glow plugs and the glow indicator lamp. The preheating system is operated when the engine coolant temperature is low, and make the engine easy to start.

Lubrication system
It is an oil filter with full-flow bypass, which uses a water-cool 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.

Valve clearance	mm (in)
Intake valve	0.15 (0.006)
Exhaust valve	0.15 (0.006)

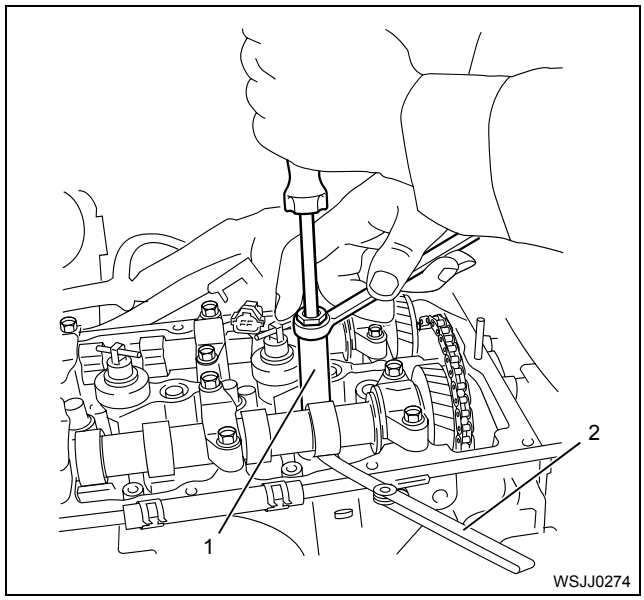
Caution:
Perform adjustment when it is cold.

2. Adjustment of valve clearance
   a. Completely loosen all of the rocker arm adjusting nuts and adjusting screws (16 nuts and 16 screws).
   b. Place a 0.15 mm (0.006 in) thickness gauge between the No. 1 cylinder rocker arm roller and the camshaft.
   c. 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.
   d. Use a valve clearance adjusting nut wrench to tighten the rocker arm lock nut.

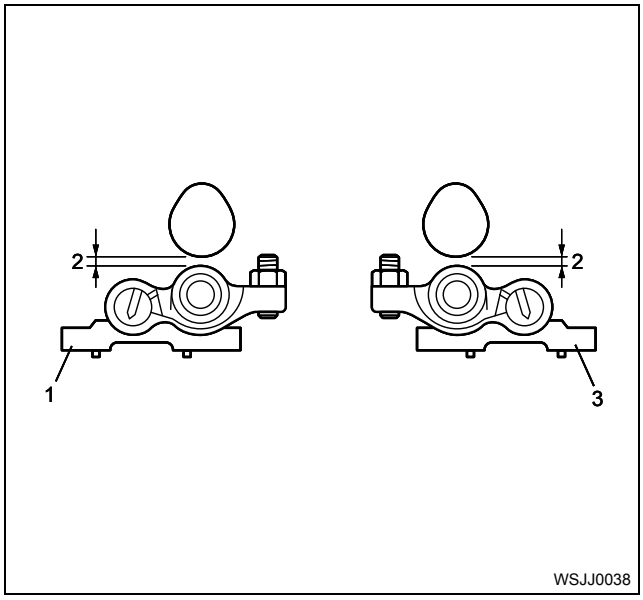
Special tool
Valve clearance adjusting nut wrench:
5-8840-2822-0

   e. Remove the thickness gauge.
   f. Repeat above steps for the remaining cylinders.

Tightening torque: 18 N·m (1.8 kg·m/13 lb ft)



Name
1. Valve Clearance Adjusting Nut Wrench
2. Thickness Gauge



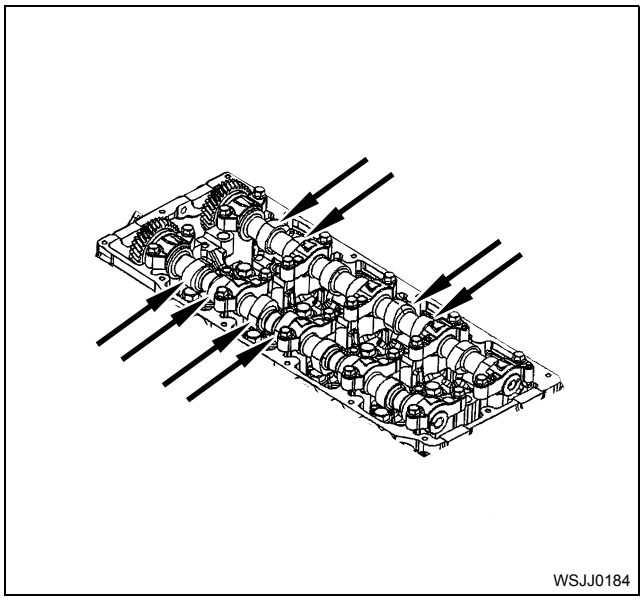
Name

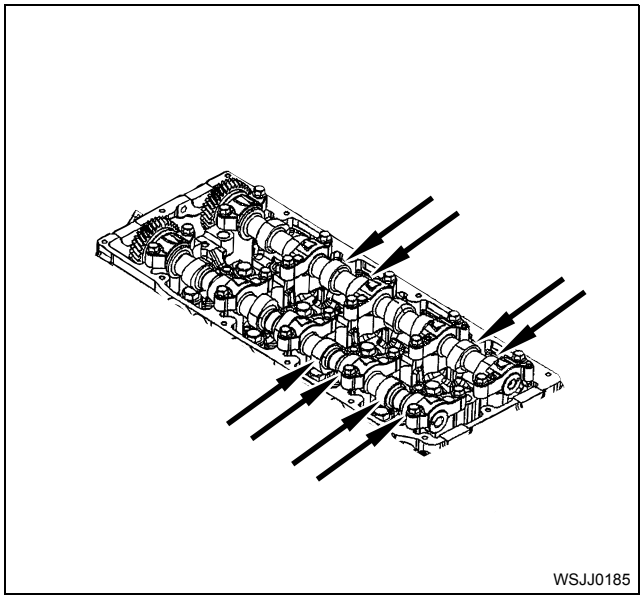
1. Exhaust Rocker Arm Shaft ASM
2. Valve Clearance
3. Intake Rocker Arm Shaft ASM

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.





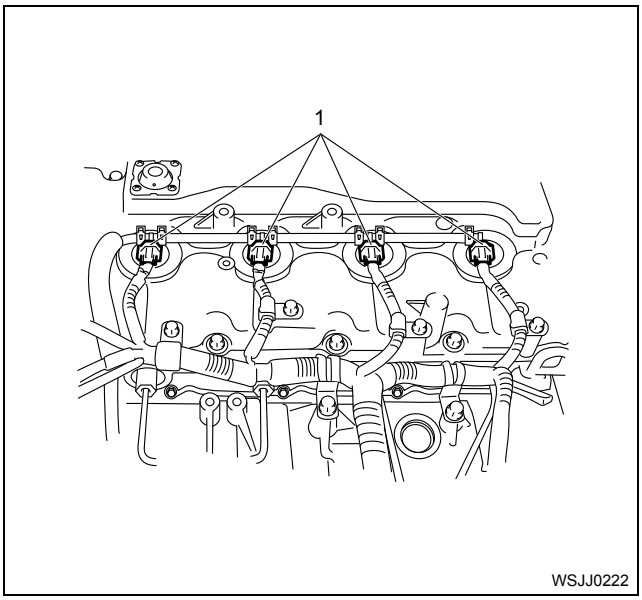
- Install the cylinder head cover.
  Refer to the “Cylinder Head Cover”.
- Connect the leak off hose.
- Connect the fuel injector connector.

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.

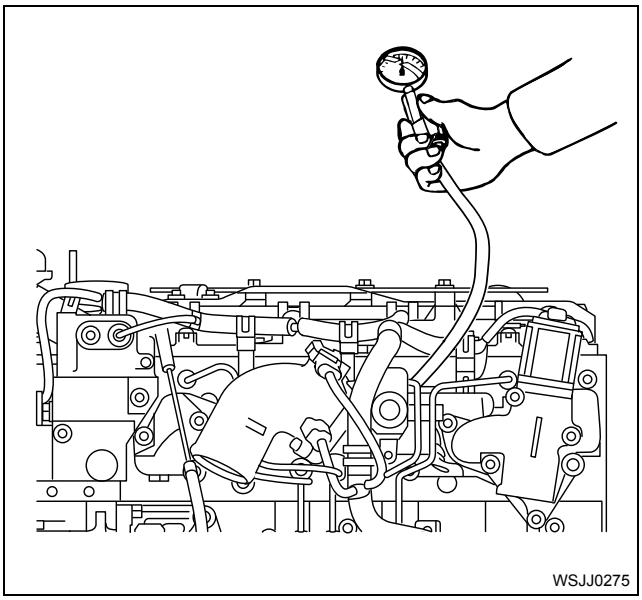
(For how to clear memory of ECM, refer to the Engine Control System Section)



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).



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	MPa (psi) / 200 rpm
Standard	2.84 — 3.24 (412 — 469)
Limit	1.96 (284)
Differences among the cylinders	294 kPa (43)

- 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)

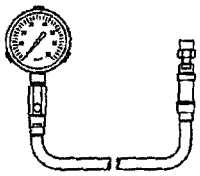
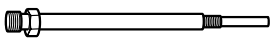
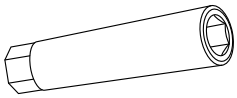
- Install the negative terminal of the battery.

Main Data and Specifications

Items			Engine model 4JJ1
Type			Diesel/4-cycle/water cooled-type, in-line 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)
mm (in)	Exhaust		0.15 (0.006) (cold)
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

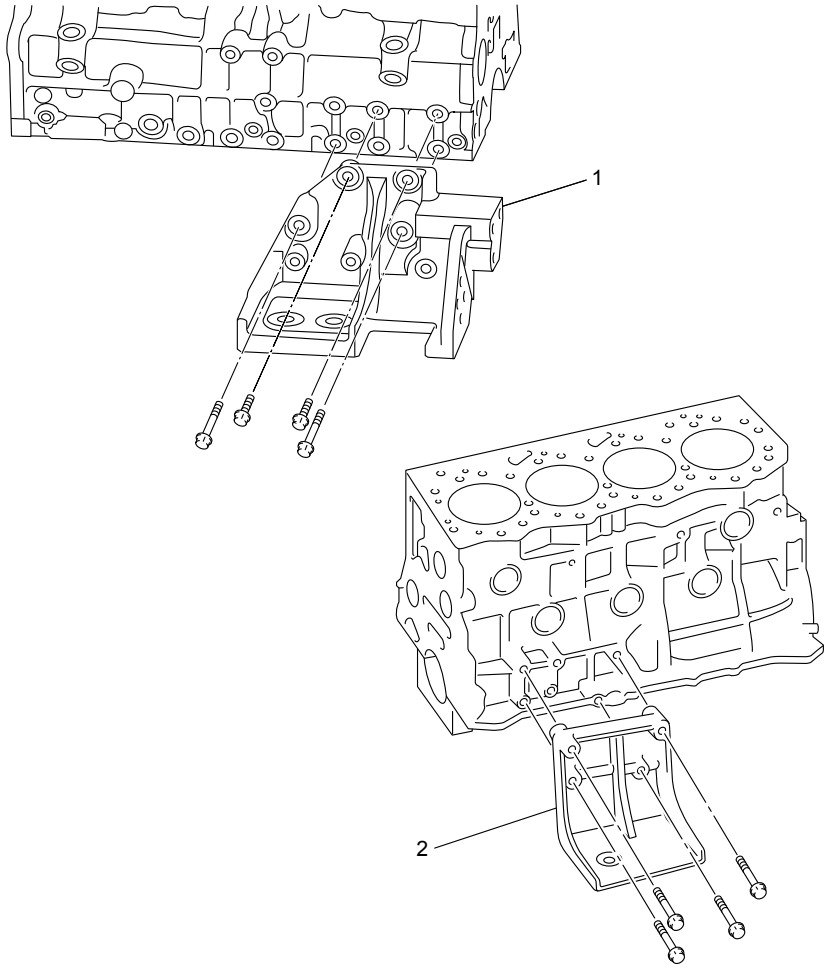
Items		Engine model 4JJ1
Starting system		
Starter type		Reduction type
Power output	V-kw	24 - 4.0
Preheat system type		Glow plug
Glow plug standard voltage/electric current	V/A	23 - 3.8

Special tool

Illustration	Tool Number/Description / Special Tool Rank
 5884026750	5-8840-2675-0 J-26999-12 Compression gauge Rank B
 5884028150	5-8840-2815-0 Compression gauge adapter Rank A
 5884028220	5-8840-2822-0 Valve clearance adjust nut wrench Rank A

Engine Foot

Components

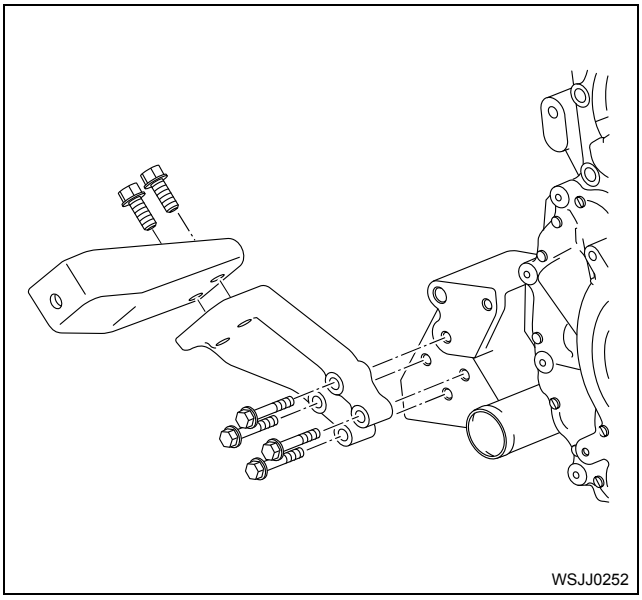


Name

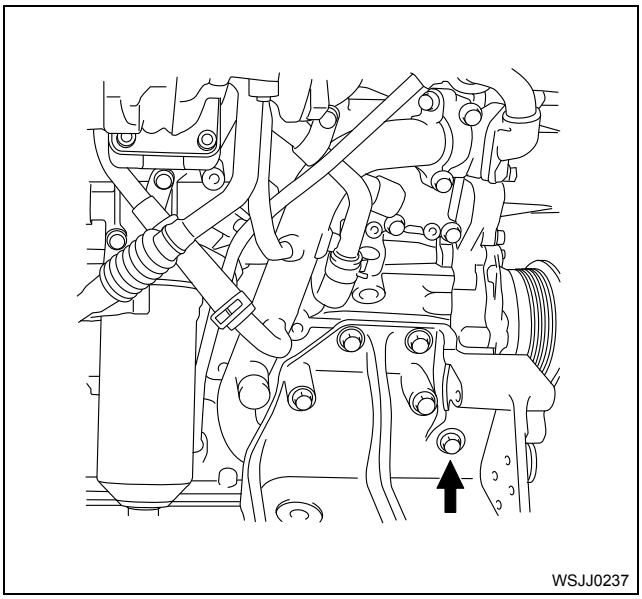
1. Engine Foot RH
2. Engine Foot LH

Removal

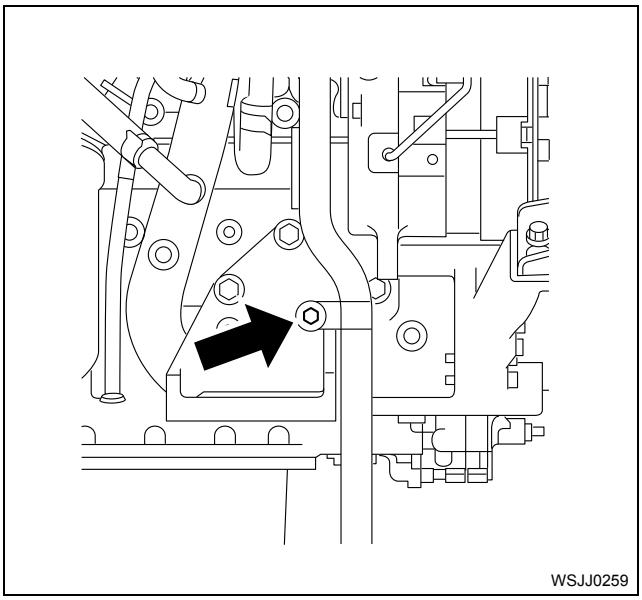
1. Lower the engine ASM.
2. Remove the fan shroud and fan guard.
   Refer to the “Water Pump” in the Cooling System Section.
3. Remove the generator.
   Refer to “Generator” in Engine Electrical section.
4. Remove the fan shroud bracket RH and fan shroud stay RH.


WSJJ0252

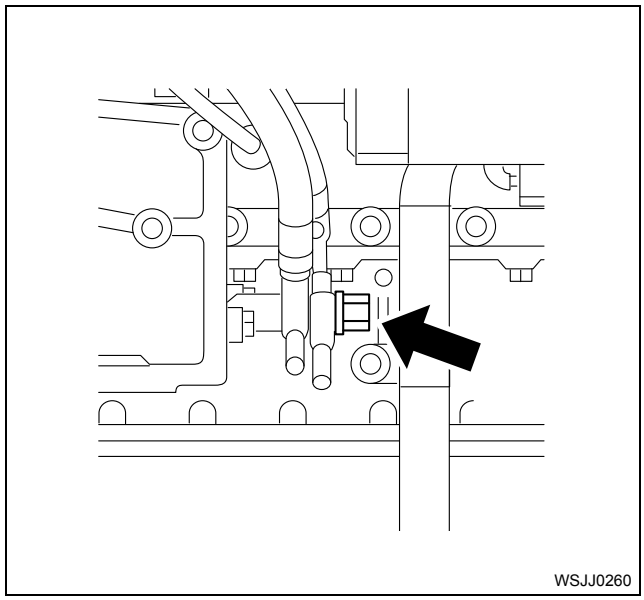
5. Remove the bolt with arrow mark which holds the water intake pipe to the engine foot RH.


WSJJ0237

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


WSJJ0259

7. Remove the relief valve.


WSJJ0260

8. Remove the engine foot.

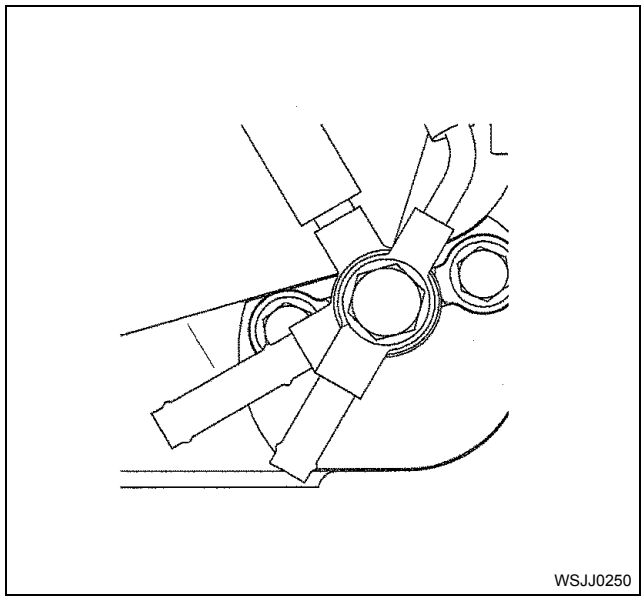
Installation

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)


WSJJ0250

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)

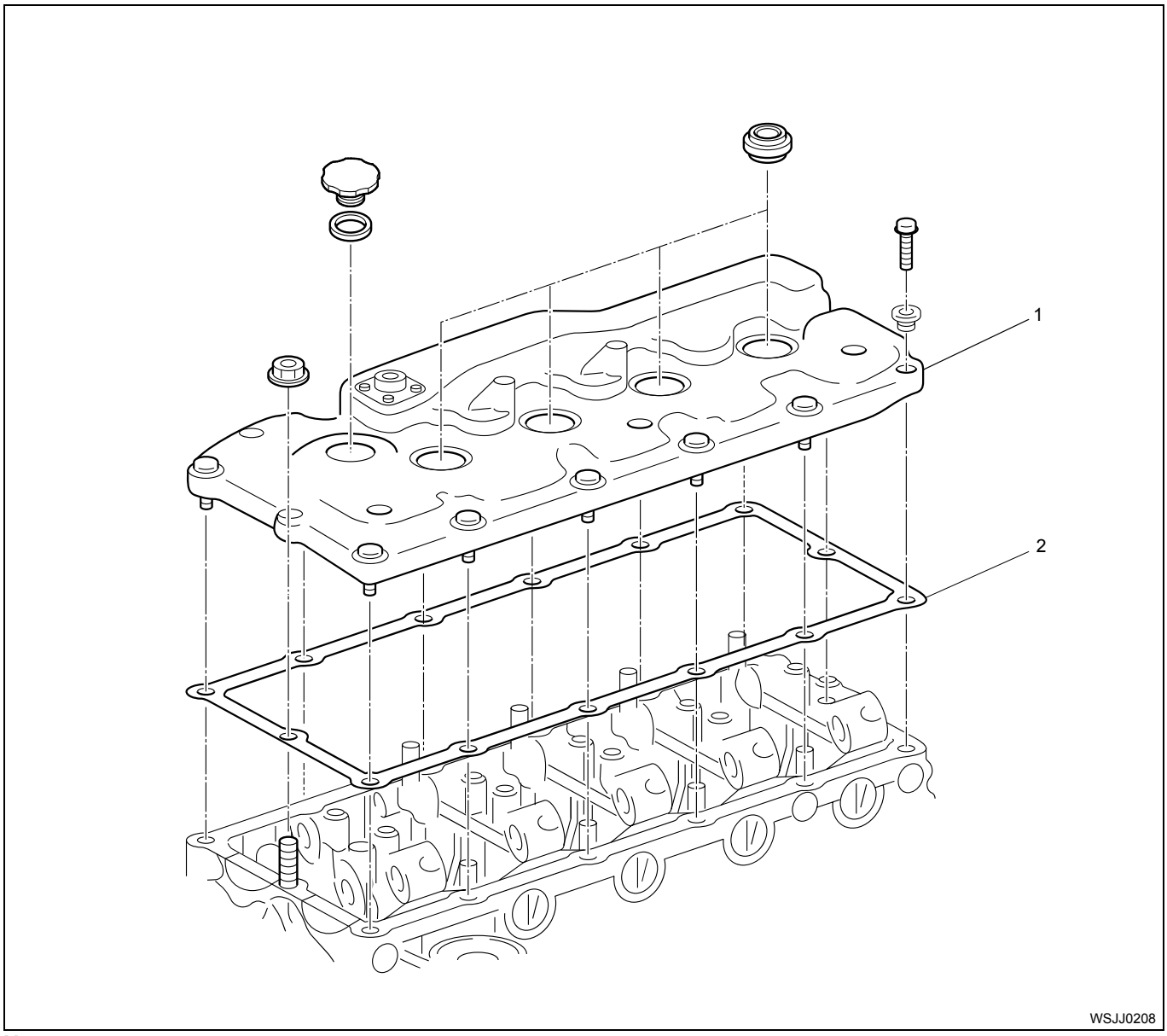
4. Install the fan shroud bracket RH and fan shroud stay RH.

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 the “Water Pump” in the Cooling System Section.
6. Install the generator.
   Refer to “Generator” in Engine Electrical section.
7. Put the engine ASM on.

Cylinder Head Cover

Components

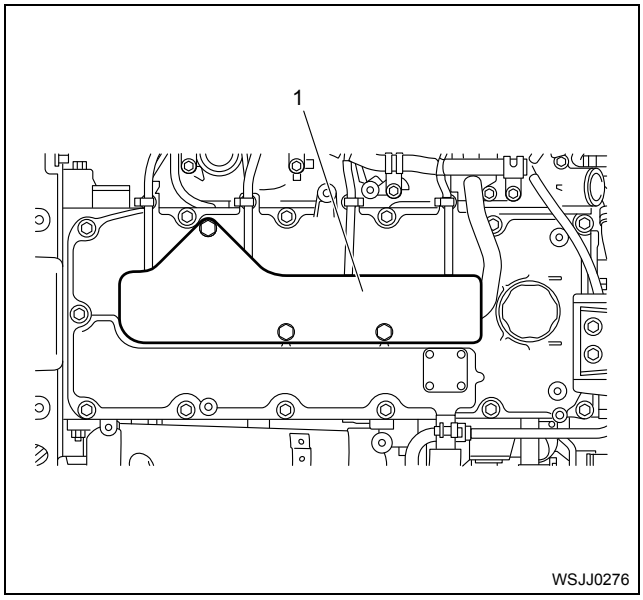


Name

1. Head Cover
2. Head Cover Packing

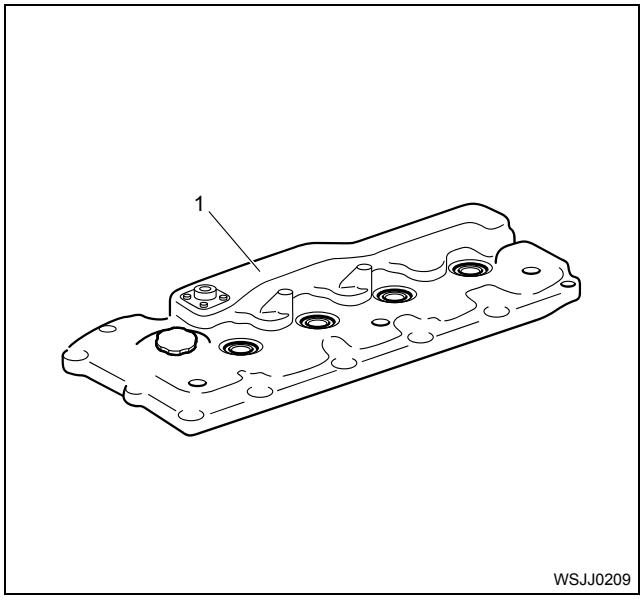
Removal

1. Remove the air intake duct.
2. Disconnect the connector of the fuel injector.
   - Remove the cover. (Varies depending on the machine.)



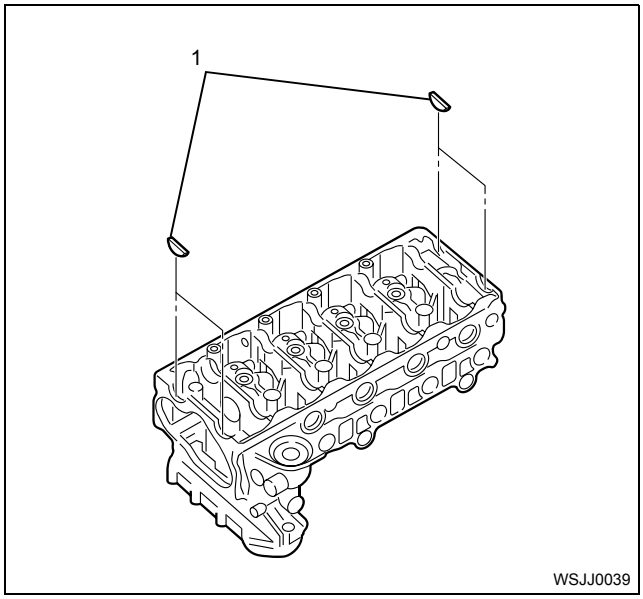
Name
1. Cover

3. Disconnect the leak-off hose.
4. Disconnect the blow-by hose.
5. Remove the head cover.



Name
1. Head Cover

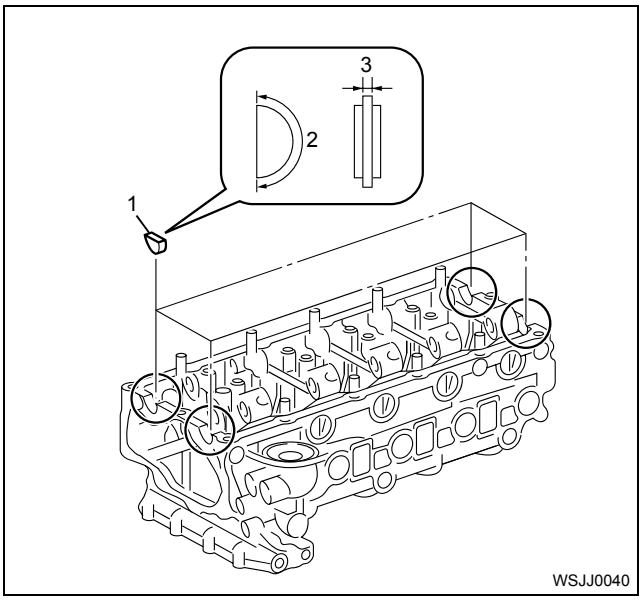
6. Remove the packing.
7. Remove the cam end packing.



Name
1. Cam End Packing

Installation

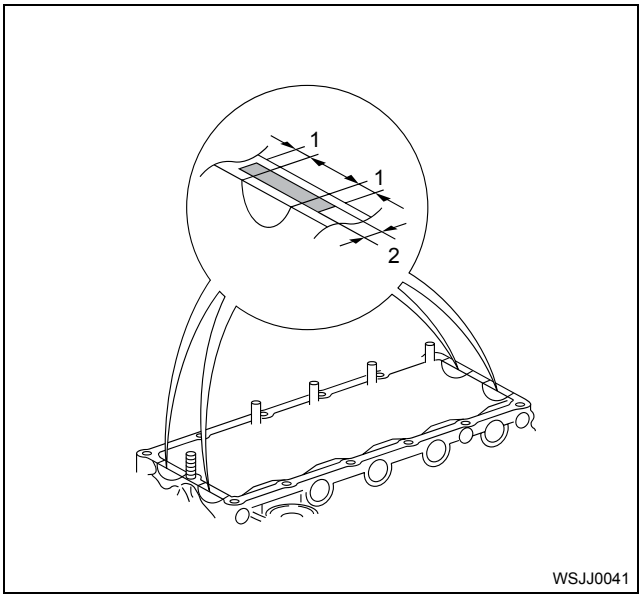
1. Install the cam end packing.
   - Apply liquid gasket (ThreeBond 1207B or equivalent).
   - Install within five minutes after applying liquid gasket.



Name

1. Cam End Packing
2. Liquid Gasket Applied Area.
3. 2.0 — 3.0 mm (0.079 — 0.118 in)

- Install the cam end packing.
  Apply liquid gasket (ThreeBond 1207B or equivalent) as shown in the illustration.
- Install within five minutes after applying liquid gasket.



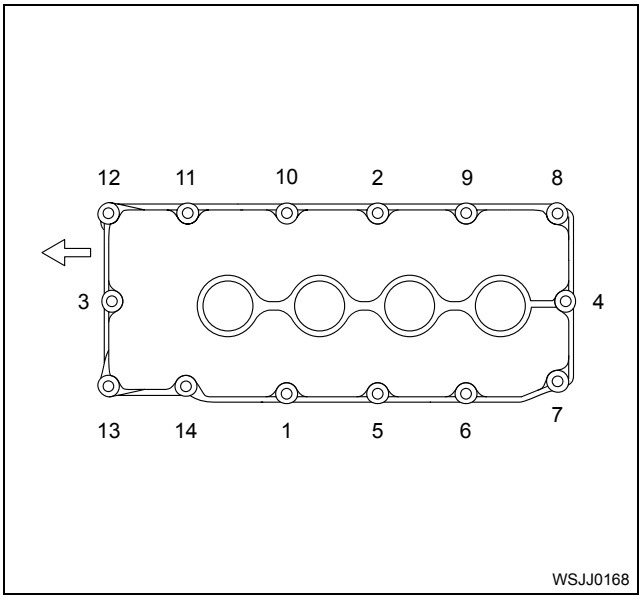
Name

1. 3.0 — 5.0 mm (0.118 — 0.179 in)
2. 3.0 — 5.0 mm (0.118 — 0.179 in)

---

2. Install the packing on the head cover.
3. Install the head cover and tighten up according to the order shown in the illustration.

Tightening torque: 10 N·m (1.0 kg·m/87 lb in)



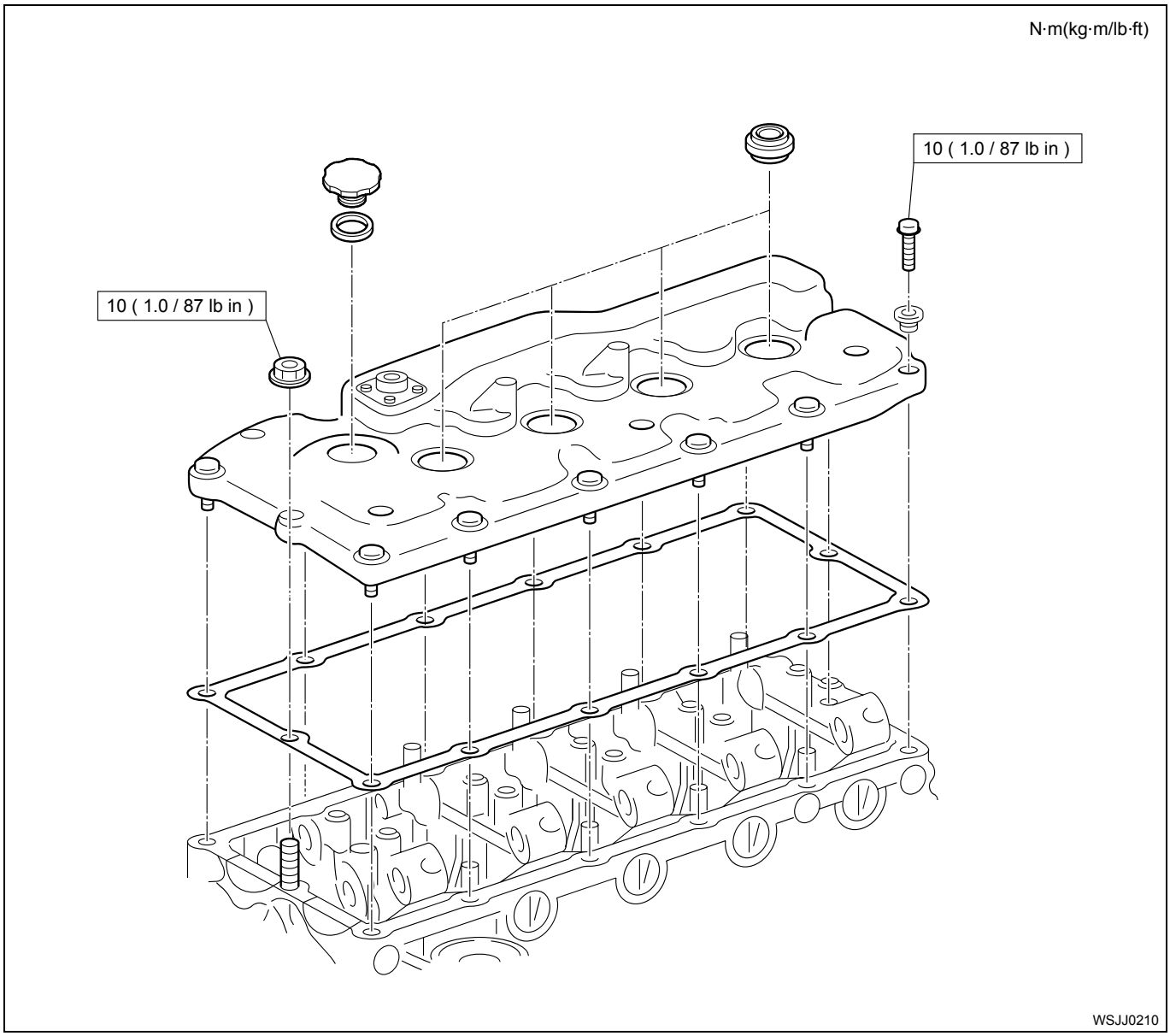
4. Connect the blow-by hose.
5. Connect the leak-off hose.
6. Connect the fuel injector connector.

Caution:
Push it in thoroughly until the claw of the lock is lifted.

- Install the cover.

7. Install the air intake duct.

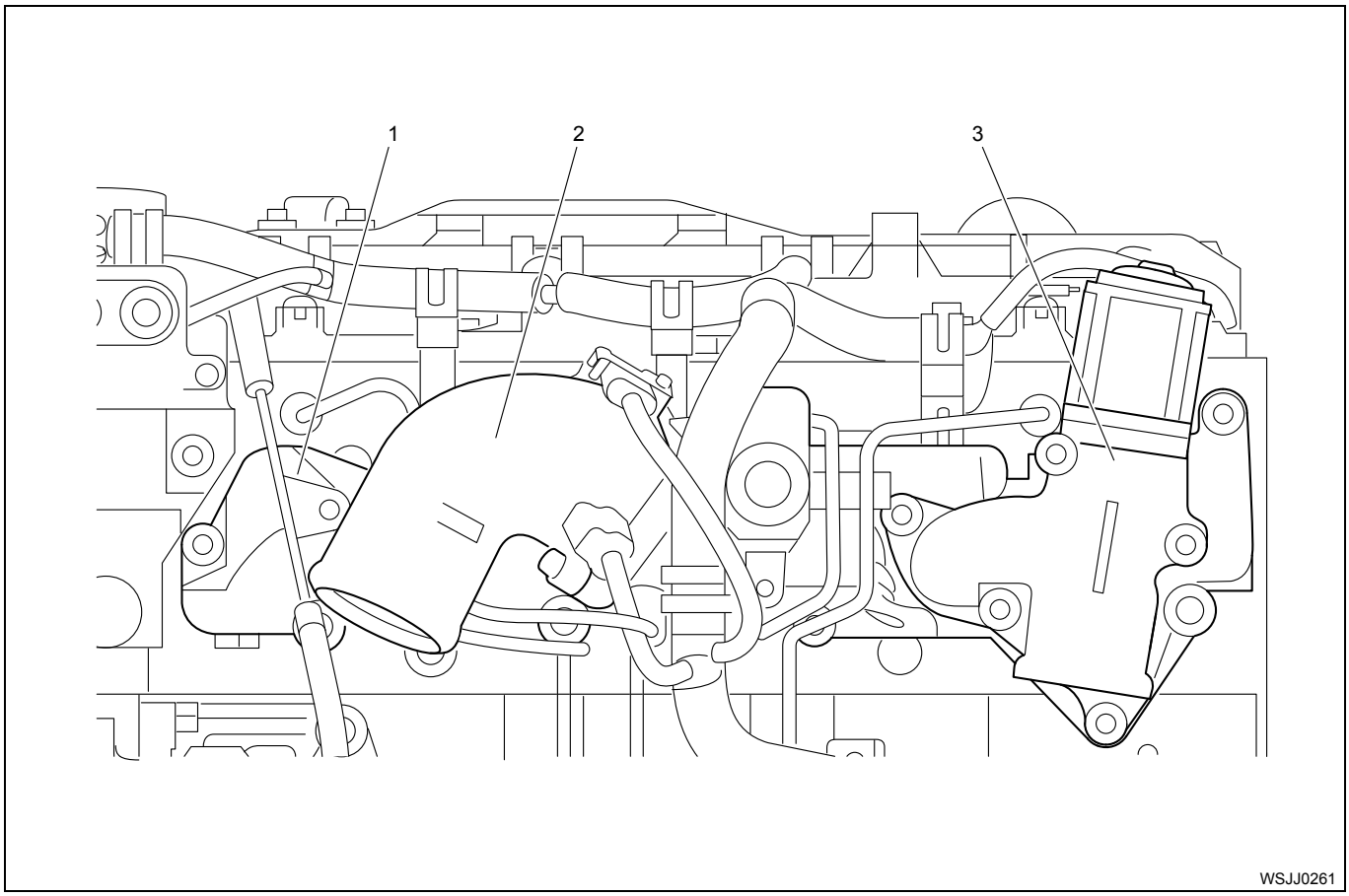
Torque Specifications



Product: Isuzu A1-4JJ1 Diesel Engine Workshop Service Repair Manual
Full Download: https://www.arepairmanual.com/downloads/isuzu-a1-4jj1-diesel-engine-workshop-service-repair-manual/

Intake Manifold

Components

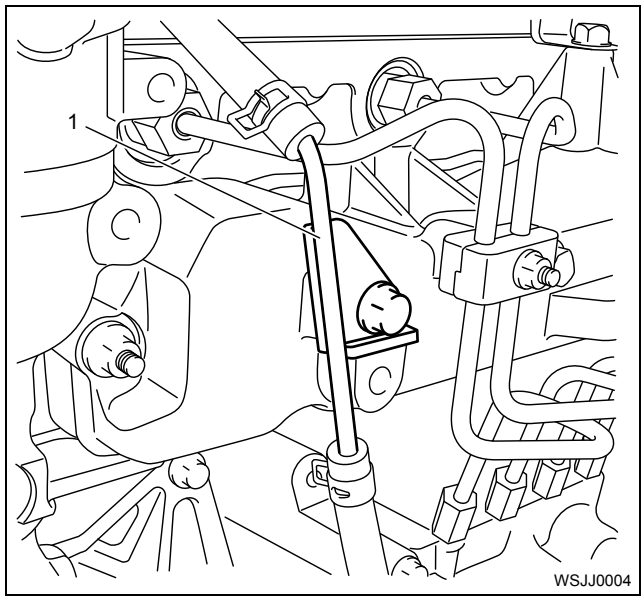


Name

1. Intake Manifold
2. Air Intake Pipe
3. EGR Valve

Removal

1. Remove the fuel injector, EGR valve, glow plug, boost pressure sensor and boost temperature sensor connector.
2. Remove the air intake duct.
3. Remove the leak-off pipe.



Name

1. Leak-Off Pipe

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