FOREWORD

This manual describes the service procedures for the 4JJ1 diesel engine (Interim Tier 4 compatible).
The contents of this manual are current at the date of issue, but may differ slightly from your engine due to specification changes or other modifications made thereafter.

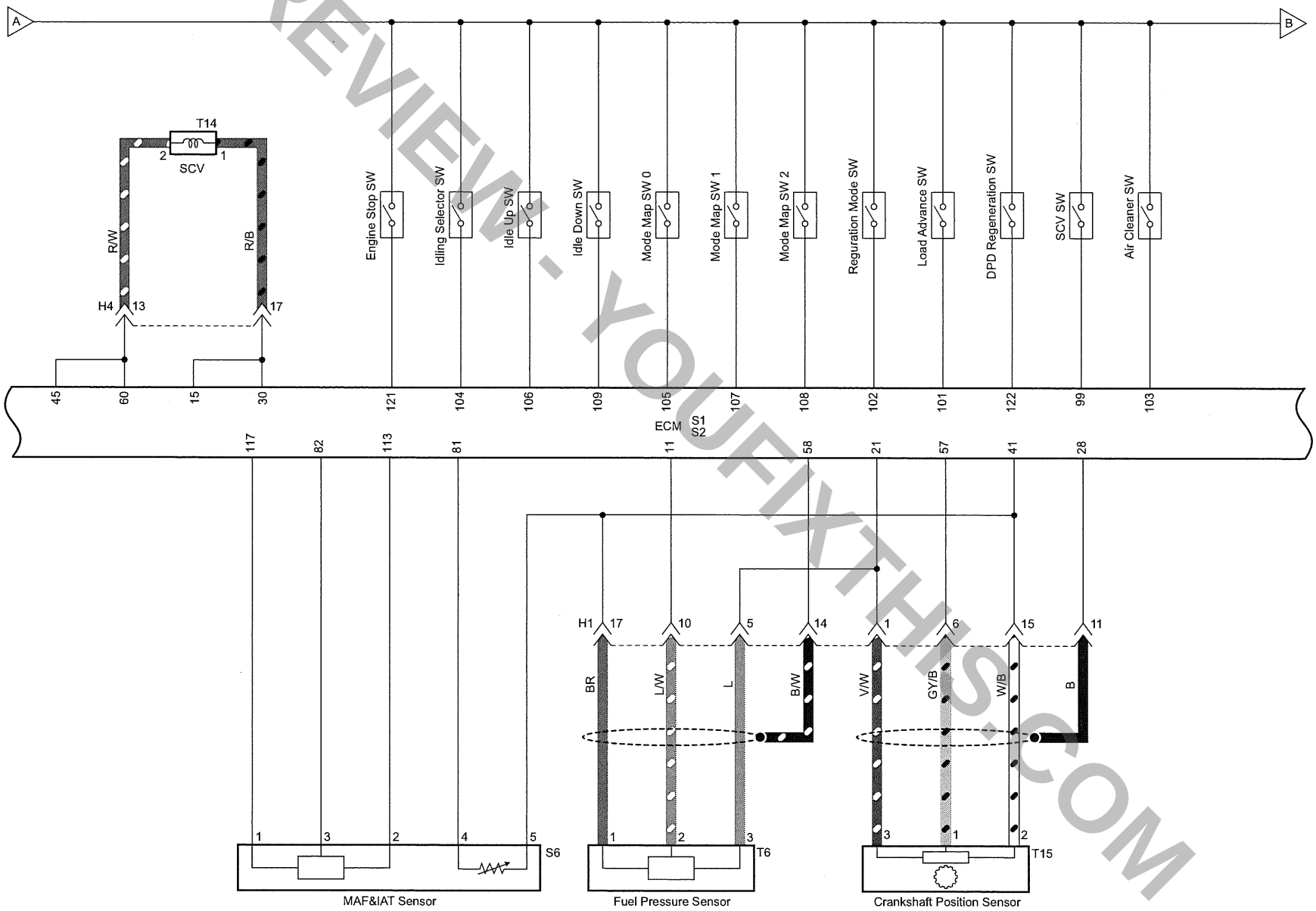
This manual consists of the following sub-sections.

Publication No.	Publication Name	Sub-sections	
IDE-2630G	ENGINE	0	Introduction
		14A	Service Information Guide
		15B	Maintenance Information
		15C	Functional Inspection
		15D	Sympton
		15E	DTC Information
		1A	Engine Control
		1B	Mechanical
		1C	Fuel System
		1D	Cooling
		1E	Lubrication
		1F	Induction
		1G	Exhaust
		1H	Aux. Emission Control Devices
		1J	Electrical
		–	Wiring Diagram

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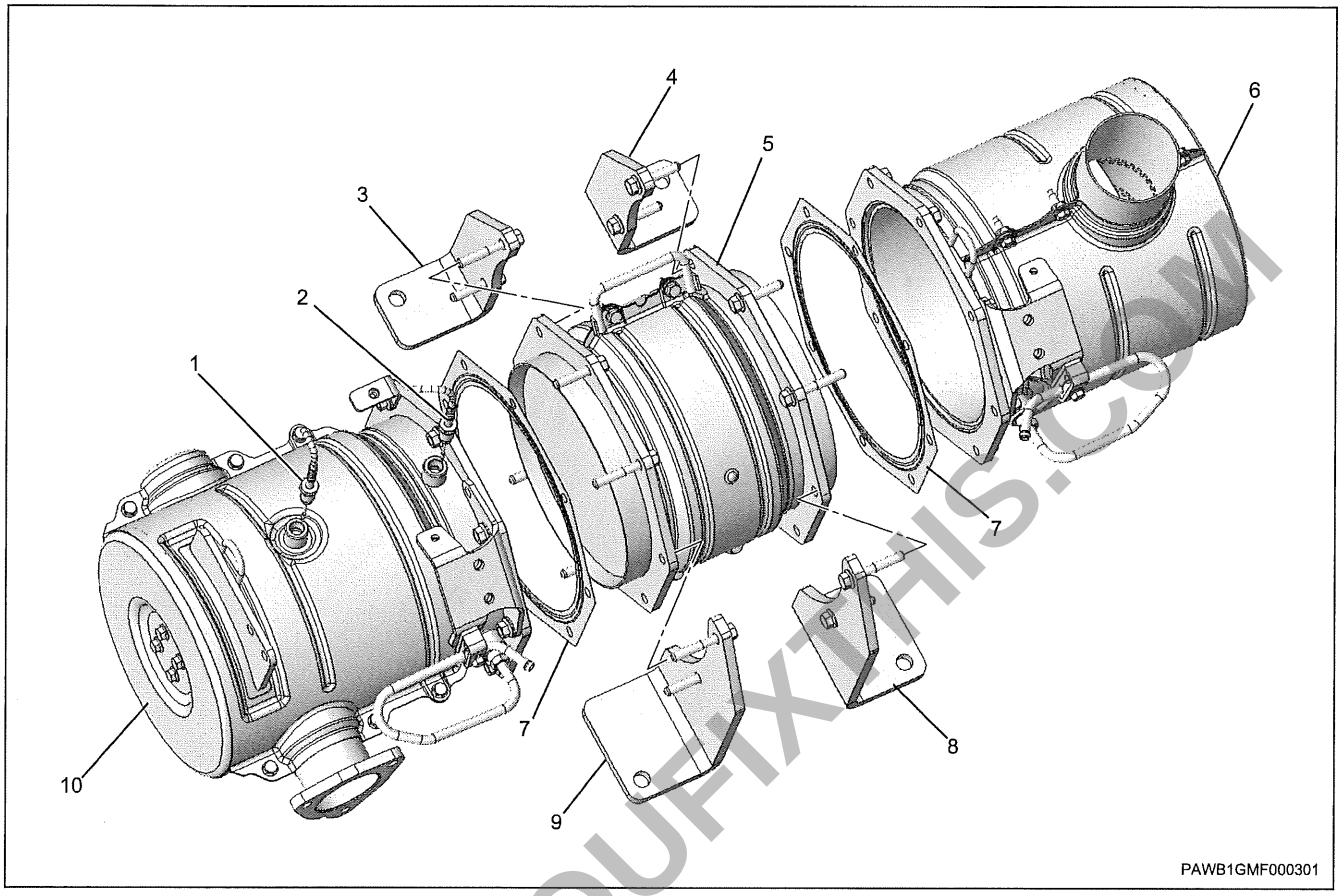
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(Specifications vary depending on each machine. Refer to the machine's manual.)



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1. Exhaust gas temperature sensor 2
2. Exhaust gas temperature sensor 1
3. Bracket 2
4. Bracket 1
5. Filter assembly
6. Silencer
7. Gasket
8. Bracket 4
9. Bracket 3
10. Oxidation catalyst assembly

2. Tightening Torque Views

Note :

- DPD assembly (Integrated-type bracket)

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Strength category	4.8 4T		7T	
Bolt head shape	Hex bolt	Flange bolt	Hex bolt	Flange bolt
M6 x 1	: 3.9 to 7.8 N・m { 0.4 to 0.8 kgf・m / 35 to 69 lb・in }	: 4.6 to 8.5 N・m { 0.5 to 0.9 kgf・m / 41 to 75 lb・in }	: 4.9 to 9.8 N・m { 0.5 to 1.0 kgf・m / 43 to 87 lb・in }	: 5.7 to 10.6 N・m { 0.6 to 1.1 kgf・m / 50 to 94 lb・in }
M8 x 1.25	: 7.8 to 17.7 N・m { 0.8 to 1.8 kgf・m / 69 to 157 lb・in }	: 10.5 to 19.6 N・m { 1.1 to 2.0 kgf・m / 93 to 173 lb・in }	: 11.8 to 22.6 N・m { 1.2 to 2.3 kgf・m / 9 to 17 lb・ft }	: 13.5 to 25.0 N・m { 1.4 to 2.5 kgf・m / 10 to 18 lb・ft }
M10 x 1.25	: 20.6 to 34.3 N・m { 2.1 to 3.5 kgf・m / 15 to 25 lb・ft }	: 23.1 to 38.5 N・m { 2.4 to 3.9 kgf・m / 17 to 28 lb・ft }	: 27.5 to 46.1 N・m { 2.8 to 4.7 kgf・m / 20 to 34 lb・ft }	: 31.0 to 51.7 N・m { 3.2 to 5.3 kgf・m / 23 to 38 lb・ft }
*M10 x 1.5	: 19.6 to 33.3 N・m { 2.0 to 3.4 kgf・m / 14 to 25 lb・ft }	: 22.3 to 37.2 N・m { 2.3 to 3.8 kgf・m / 16 to 27 lb・ft }	: 27.5 to 45.1 N・m { 2.8 to 4.6 kgf・m / 20 to 33 lb・ft }	: 30.3 to 50.4 N・m { 3.1 to 5.1 kgf・m / 22 to 37 lb・ft }
M12 x 1.25	: 49.0 to 73.5 N・m { 5.0 to 7.5 kgf・m / 36 to 54 lb・ft }	: 54.9 to 82.3 N・m { 5.6 to 8.4 kgf・m / 40 to 61 lb・ft }	: 60.8 to 91.2 N・m { 6.2 to 9.3 kgf・m / 45 to 67 lb・ft }	: 68.1 to 102.1 N・m { 6.9 to 10.4 kgf・m / 50 to 75 lb・ft }
*M12 x 1.75	: 45.1 to 68.6 N・m { 4.6 to 7.0 kgf・m / 33 to 51 lb・ft }	: 51.0 to 76.5 N・m { 5.2 to 7.8 kgf・m / 38 to 56 lb・ft }	: 56.9 to 84.3 N・m { 5.8 to 8.6 kgf・m / 42 to 62 lb・ft }	: 62.7 to 94.0 N・m { 6.4 to 9.6 kgf・m / 46 to 69 lb・ft }
M14 x 1.5	: 76.5 to 114.7 N・m { 7.8 to 11.7 kgf・m / 56 to 85 lb・ft }	: 83.0 to 124.5 N・m { 8.5 to 12.7 kgf・m / 61 to 92 lb・ft }	: 93.2 to 139.3 N・m { 9.5 to 14.2 kgf・m / 69 to 103 lb・ft }	: 100.8 to 151.1 N・m { 10.3 to 15.4 kgf・m / 74 to 111 lb・ft }
*M14 x 2	: 71.6 to 106.9 N・m { 7.3 to 10.9 kgf・m / 53 to 79 lb・ft }	: 77.2 to 115.8 N・m { 7.9 to 11.8 kgf・m / 57 to 85 lb・ft }	: 88.3 to 131.4 N・m { 9.0 to 13.4 kgf・m / 65 to 97 lb・ft }	: 94.9 to 142.3 N・m { 9.7 to 14.5 kgf・m / 70 to 105 lb・ft }
M16 x 1.5	: 104.0 to 157.0 N・m { 10.6 to 16.0 kgf・m / 77 to 116 lb・ft }	: 115.6 to 173.3 N・m { 11.8 to 17.7 kgf・m / 85 to 128 lb・ft }	: 135.3 to 204.0 N・m { 13.8 to 20.8 kgf・m / 100 to 150 lb・ft }	: 150.1 to 225.2 N・m { 15.3 to 23.0 kgf・m / 111 to 166 lb・ft }
*M16 x 2	: 100.0 to 149.1 N・m { 10.2 to 15.2 kgf・m / 74 to 110 lb・ft }	: 109.4 to 164.2 N・m { 11.2 to 16.7 kgf・m / 81 to 121 lb・ft }	: 129.4 to 194.2 N・m { 13.2 to 19.8 kgf・m / 95 to 143 lb・ft }	: 142.5 to 213.8 N・m { 14.5 to 21.8 kgf・m / 105 to 158 lb・ft }
M18 x 1.5	: 151.0 to 225.6 N・m { 15.4 to 23.0 kgf・m / 111 to 166 lb・ft }	-	: 195.2 to 293.2 N・m { 19.9 to 29.9 kgf・m / 144 to 216 lb・ft }	-
*M18 x 2.5	: 151.0 to 225.6 N・m { 15.4 to 23.0 kgf・m / 111 to 166 lb・ft }	-	: 196.1 to 294.2 N・m { 20.0 to 30.0 kgf・m / 145 to 217 lb・ft }	-
M20 x 1.5	: 206.0 to 310.0 N・m { 21.0 to 31.6 kgf・m / 152 to 229 lb・ft }	-	: 269.7 to 405.0 N・m { 27.5 to 41.3 kgf・m / 199 to 299 lb・ft }	-
*M20 x 2.5	: 190.2 to 286.4 N・m { 19.4 to 29.2 kgf・m / 140 to 211 lb・ft }	-	: 249.1 to 374.6 N・m { 25.4 to 38.2 kgf・m / 184 to 276 lb・ft }	-
M22 x 1.5	: 251.1 to 413.8 N・m { 25.6 to 42.2 kgf・m / 185 to 305 lb・ft }	-	: 362.8 to 544.3 N・m { 37.0 to 55.5 kgf・m / 268 to 401 lb・ft }	-
*M22 x 2.5	: 217.7 to 327.5 N・m { 22.2 to 33.4 kgf・m / 161 to 242 lb・ft }	-	: 338.3 to 507.0 N・m { 34.5 to 51.7 kgf・m / 250 to 374 lb・ft }	-

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DTC P0087 (Flash Code 225)
Fuel Rail/System Pressure - Too Low

1. DTC P0087 description of DTC

The general common rail system is comprised of the following two fuel pressure sections. The suction side between the fuel tank and the supply pump and the high-pressure side between the supply pump and the fuel injectors. The fuel is drawn from the fuel tank and supplied to the common rail by the 2 plungers located inside the supply pump. The common rail pressure is adjusted by the ECM through controlling the suction control valve based on the signal from the common rail pressure sensor. When the common rail pressure becomes in excess, the common rail pressure limiter valve opens to release the excessive pressure and return the fuel back to the fuel tank. The ECM sets the DTC when the common rail pressure increases more than necessary and then drops drastically. This DTC detects that the pressure limiter valve has been activated.

2. DTC P0087 condition for setting the DTC

DTCs P0192 and P0193 are not detected.
The ignition switch is ON.
The ECM detects that the pressure limiter valve operated due to an excessive pressure of 180 MPa {1835 kgf/cm2 / 26100 psi} or higher inside the common rail for 1 second or longer.

3. DTC P0087 action taken when the DTC sets

Failure is indicated in the monitor on the machine, or the diagnostic light is turned on.

Note :

- Depending on the manufacturer of the machine, the failure indication may not be shown.

Restrict the fuel injection amount.
Restrict the fuel flow.
Stop the EGR control.
Stop the DPD regeneration.

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Cylinder head assembly

removal

1. Battery ground cable disconnect
   1. Disconnect the battery ground cable from the battery.
2. Coolant drain
   1. Drain coolant from the radiator.

   Caution :
   - Do not loosen or remove the radiator cap when the coolant is hot.
   - Steam and boiling water can burst out, possibly causing burns or heat related injuries.
   - When opening the radiator cap, place a thick cloth over the cap when the coolant is cooled, and turn it gradually to release the pressure before opening it.

   Note :
   - Loosen the water drain plug on the rear right side of the engine, as well as the radiator drain plug.
   - Completely drain the coolant.
   - After completely draining the coolant, securely tighten the drain plug.
3. Engine oil drain
   1. Drain the engine oil from the oil pan.

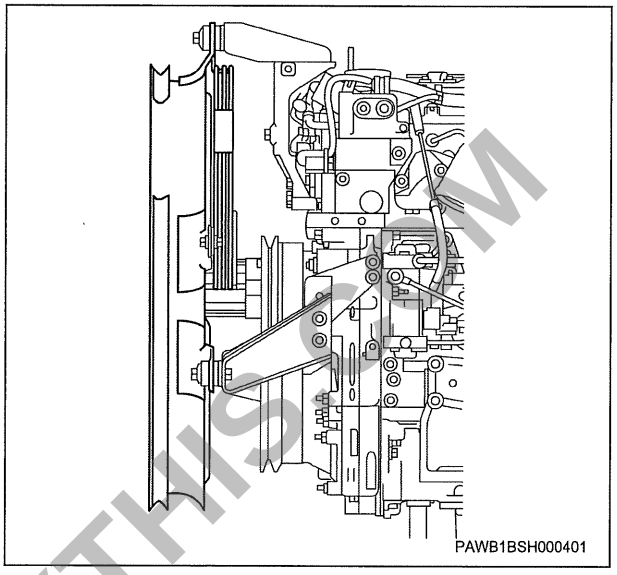
   Note :
   - After draining the oil, tighten the drain plug to the specified torque.

   tightening torque : 78 N・m { 8.0 kgf・m / 58 lb・ft } Drain plug

   tightening torque : 70 N・m { 7.1 kgf・m / 52 lb・ft } Drain cock

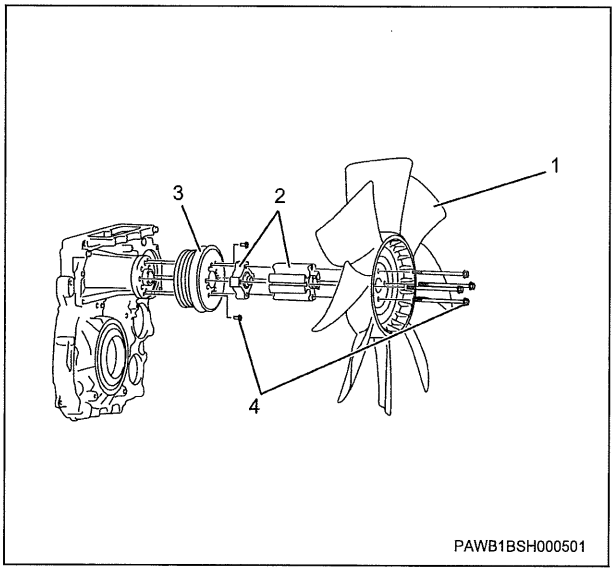
   Caution :
   - Do not forget to tighten the drain plug or drain cock.
4. Fan shroud removal
   1. Remove the fan shroud from the bracket.

   Note :
   - Remove the fan shroud and fan guard as a unit.



5. Cooling fan removal
   1. Remove the cooling fan from the fan pulley.

   Note :
   - Remove the spacer at the same time.



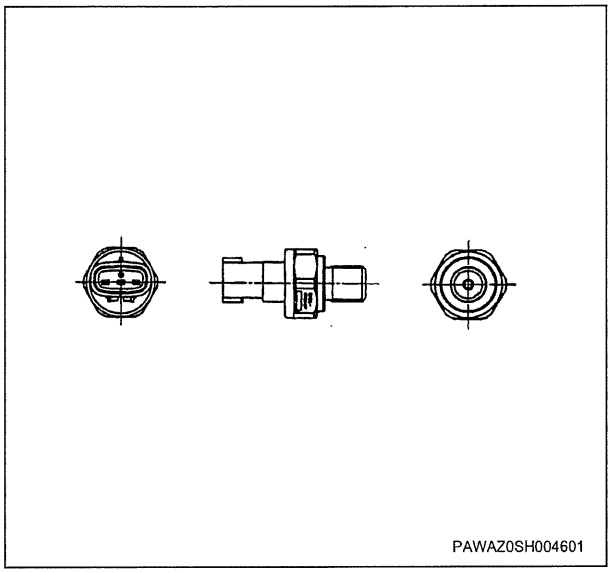
1. Cooling fan
2. Spacer
3. Fan pulley
4. Bolt

6. Cooling fan belt removal
   1. Remove the cooling fan belt from the pulley.

   Note :
   - Loosen the nuts fastening the bolts.
   - Loosen the generator adjust bolt to remove the belt.

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Accelerator position sensor
The accelerator position sensor is installed on the console panel of the machine to supply the voltage signal which varies in accordance with the accelerator volume angle to the ECM. The ECM calculates the accelerator pedal position from the voltage signal, and uses it for fuel injection control and many other controls.

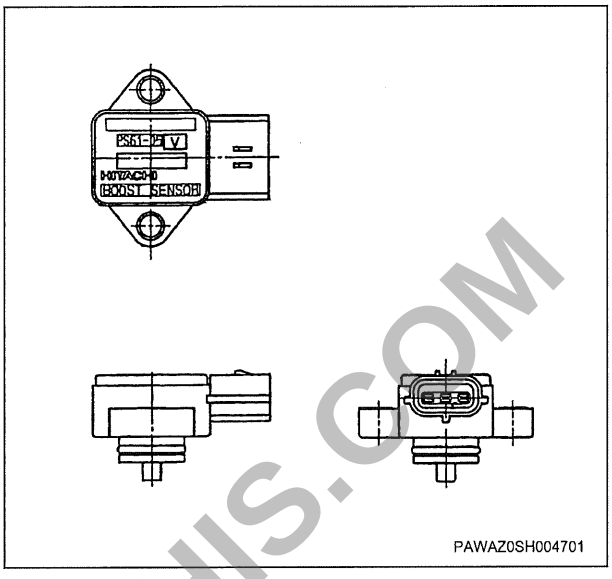
Note :

- As for the installation position of the accelerator position sensor, refer to the manual of the machine.

Barometric pressure sensor
The barometric pressure sensor is installed on the machine side, and it replaces the barometric pressure with the voltage signal. The ECM calculates the barometric pressure from the voltage signal, and uses the atmospheric pressure to correct the fuel injection amount.

Note :

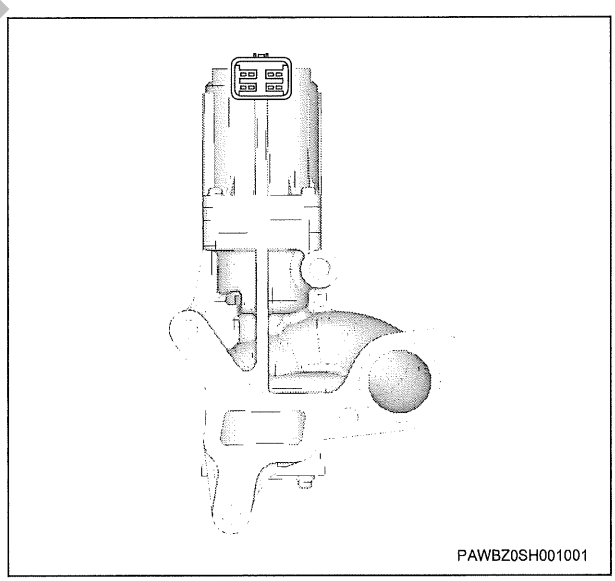
- As for the installation position of the atmospheric pressure sensor, refer to the manual of the machine.



EGR position sensor
This sensor is installed inside the EGR valve to detect the EGR valve lift amount.

Note :

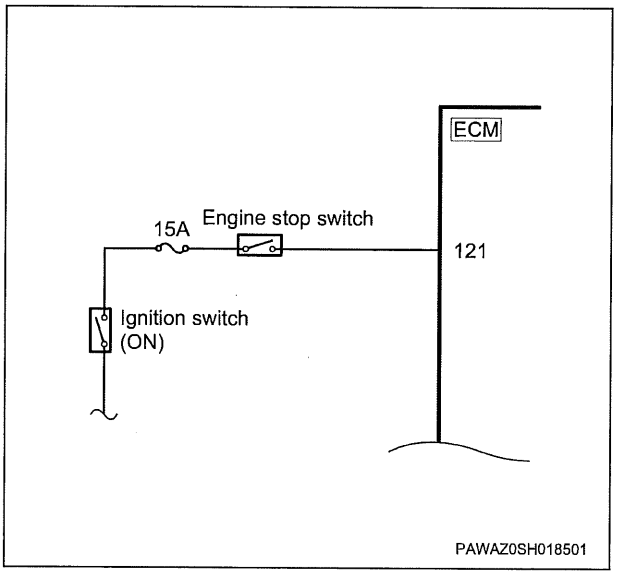
- Do not disassemble the EGR position sensor. When an abnormality is found, replace the EGR valve assembly.



Boost sensor
The boost sensor detects the boost of the intake manifold to convert into the voltage signal and sends it to the ECM. The voltage becomes higher when the pressure is higher, and it becomes lower when the pressure is lower. The ECM calculates the boost from the voltage signal sent from the sensor, and uses it to control the fuel injection, etc.

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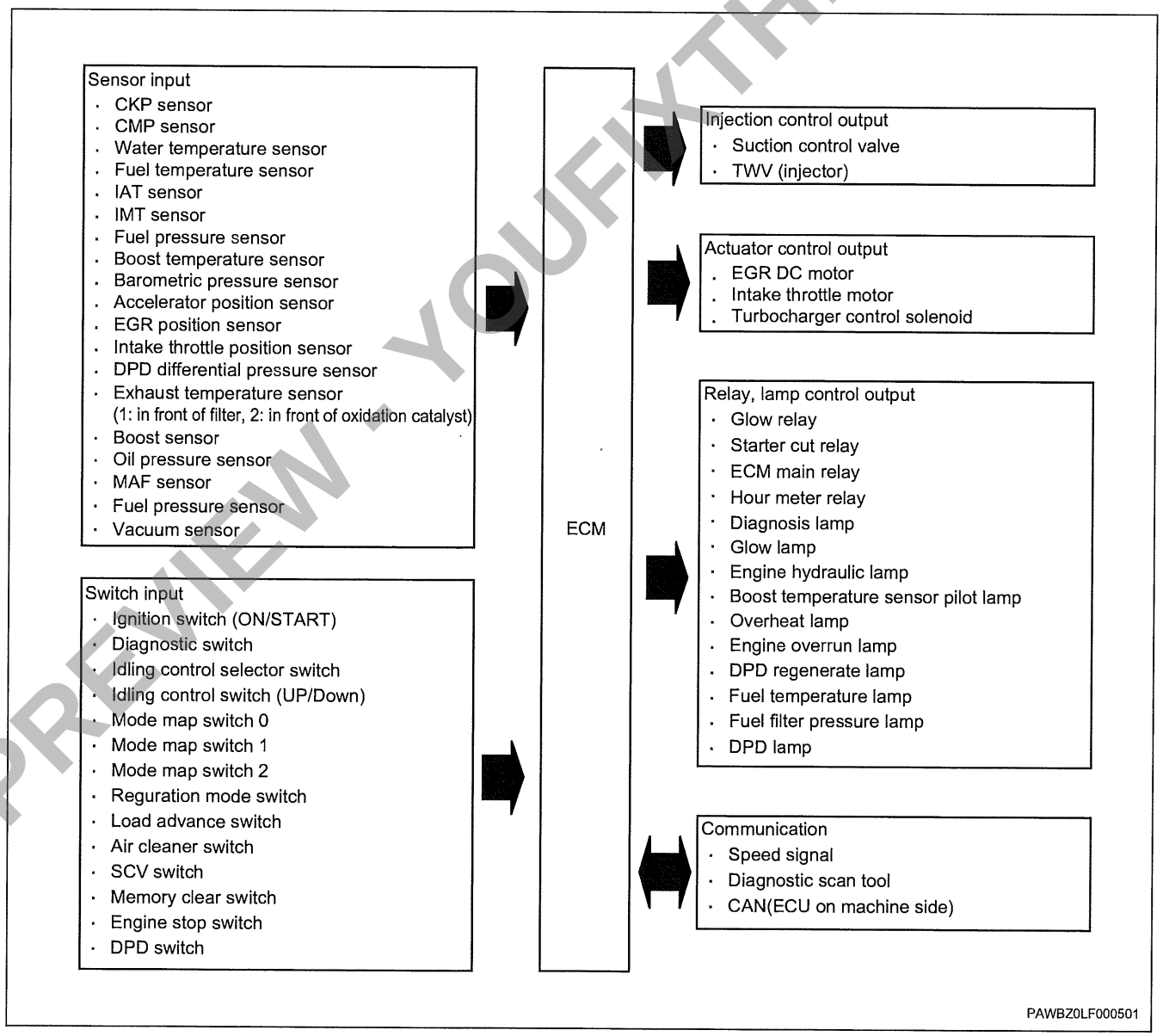


Decrease in engine oil pressure
When the engine oil pressure drops to 100 kPa {1.02 kgf/cm2 / 14 psi} or lower, an alarm for engine oil pressure decrease is issued and the engine is stopped.

Increase in engine coolant temperature
When the engine coolant temperature increases to 105° C {221° F} or higher, an alarm for engine coolant temperature increase is issued and the engine is stopped.

Overrun
When the engine speed reaches to the specified value, an alarm for overrun is issued and the engine is stopped.
It varies depending on the machine manufacturer.

I/O Table



Electronic control fuel injection system

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Engine start failure

1. Engine start failure description of symptom

Cranking speed is low.
Though cranking speed is normal, the engine does not start.
Through the engine starts, stable engine revolution cannot be maintained or it does not rev up.

2. Engine start failure diagnostics

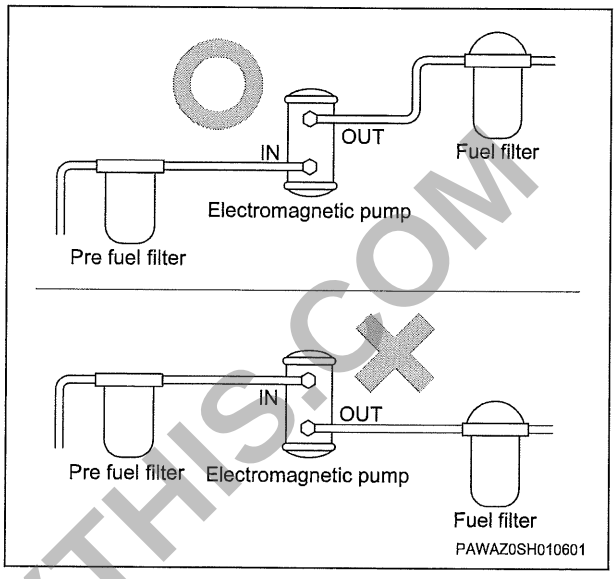
· Preliminary inspection

Before using this section, perform the functional inspection and OBD system check to check all of the following.
Check whether the machine has a significant load.
The ECM and diagnostic light are operating correctly.
DTC check.
The scan tool data is within the normal operating range.
Check the condition of the machine, and locate the appropriate symptom.
Check with the customers whether they are using the specified engine oil and fuel.

· Visual inspection

Careful visual inspection is required for several symptom procedures. This can lead to correcting a problem without further inspections, and can save valuable time.
The inspection includes the following.
Whether the fuel filter is clean and free from clogging.
Whether there is improper connection of the connector.
Especially for CKP sensor and CMP sensor.
Whether the battery terminal voltage has dropped.
Correct wiring connections, tightening, and disconnection.
Whether the power of any commercial accessories is being taken from the ECM power.
Whether the ECM ground is clean and securely installed in the correct location.
Correct connections, cracks, and twists in the pipes and hoses related to fuel, air or oil. Extensively check for any leaks or blockage.
Whether the structure allows for air deposit due to layout of the fuel filter, pre-filter and electromagnetic pump.

Check whether they are arranged to prevent air accumulation as Isuzu genuine pre-filters do not have any plugs for air removal. Also check whether the inlet and outlet of the electromagnetic pump have an appropriate layout. Fix layouts which have the electromagnetic pump inlet on the upper side or have an outlet toward the motion direction of the machine.
Whether there are any fuel leaks, pipe damage, or dents in the fuel system.
Abnormalities of the air intake system parts
Abnormalities of the exhaust system parts



· Diagnostic aids

Fuel out, fuel freezing, mixture of air into the fuel piping, filter defect, pipe defect, fuel quality and failure of fuel system such as fuel tank
Air intake system abnormalities such as clogged filter and air intake piping failure
Use of low-viscosity fuel such as kerosene will promote worn on the supply pump and plunger and cause discharge failure, leading to engine start failure. In this case, the supply pump must be replaced.
In the event of engine start failure, check the fuel used with the customer. If low-viscosity fuel such as kerosene is used, this recurs even after replacement of the supply pump. Therefore, it is necessary to instruct the customer not to use any low-viscosity fuel.
Mixture of long-storage fuel and biofuel containing organic matters are prone to be oxidized. Oxidized fuel will promote worn on camshaft related parts in the supply pump, causing engine start failure due to discharge failure. In this case, the supply pump must be replaced.
Since replacement of supply pump required due to use of mixture of long-storage fuel and biofuel containing organic matters will be charged, instruct customers not to use mixture of long-storage fuel and biofuel containing organic matters.
When fuel with high water content is used, add a large sedimenter to the pre-fuel filter to prevent water from entering into the fuel system.
Supply pump failure; fuel feeding without pressure
ECM determination for DTC of supply pump fuel feeding without pressure is not detected unless the conditions of engine speed below 900 r/min and absolute pressure below 15 MPa {153 kgf/cm2 / 2,175 psi} continue at least 3 seconds.

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Primary specifications

1. Primary specifications

Engine main specifications

Item		Engine model 4JJ1
Type		Diesel/4-cycle/Water cooled, Inline 4-cylinder DOHC
Shape of combustion chamber		Direct injection type
Cylinder liner type		No liner
Cylinder bore x stroke		95.4 mm {3.76 in} × 104.9 mm {4.13 in}
Displacement		2.999 L {183 cu・in}
Compression ratio		: 17.5
Compression pressure		: 3 MPa { 30.6 kgf/cm2 / 435 psi } 200 r/min
Idling rotation speed		: 800 r/min
Valve clearance	Intake	: 0.15 mm { 0.006 in } While cool
	Exhaust	: 0.15 mm { 0.006 in } While cool
Ignition method		Compression ignition
Injection order		1, 3, 4, 2
Lubricant system		
Lubricating type		Pressure type
Oil pump type		Gear type
Lubrication oil amount		: 15 L { 4 US gal / 3 Imp.gal }
Oil filter type		Full-flow filter (cartridge type)
Oil cooling type		Built-in type, water cooled
Cooling system		
Cooling type		Water cooling
Water pump type		Centrifugal, belt type
Thermostat type		Wax type unit
Open valve temperature of the thermostat valve		: 85.0 ℃ { 185 °F }
Coolant container		: 6.0 L { 1.6 US gal / 1.3 Imp.gal } 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
		8 holes
Charging system		
Generator type		AC type
Output		: 24 V /50 A
Regulator type		IC
Starting system		
Starter type		Reduction type
Output		: 24 V /4.0 kw
Preheat system		
Preheat system type		Glow plug
Glow plug standard voltage/current		: 23 V /3.8 A

Cooling system main specifications

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Maintenance precautions

1. Maintenance precautions

1. Precautions on maintenance

To prevent the engine from being damaged and to ensure the reliability of engine performance, be careful of the following points when performing maintenance works.
When placing the engine on the ground, make sure that the bearing surface of the oil pan does not directly contact the ground.
Use an appropriate wood frame, etc. to support the engine at the engine foot portion and the flywheel housing portion.
There is only a small gap between the oil pan and oil pump strainer, so be careful not to damage the oil pan and oil strainer.

・While the air duct or air cleaner is removed, cover the open section of the intake to prevent foreign matters from entering the cylinder.
If a foreign matter enters the cylinder, it may seriously damage the cylinder when the engine starts.

・When maintaining the engine, be sure to disconnect the negative battery cable. Failure to do this may cause the harness or electrical components to be damaged.
If energizing is required for inspection, be careful not to cause a short.

・Before assembly, apply the engine oil to the slide contact surface of the engine.
This work ensures appropriate lubrication when first starting the engine.

・When the valve train component, piston, piston ring, connecting rod, connecting rod bearing, and/or crankshaft journal bearing are removed, line them up in the correct order so that their original positions are clear.

・When installing, install it in the same position as when it was removed.

・When assembling the engine, replace the gasket, oil seal, and O-ring with new ones.

・For a component with the liquid gasket applied, carefully remove the old liquid gasket and clean the component so that no oil, water, and/or dust remain.
Then, apply the specified liquid gasket to each part before assembling.

・Be sure to assemble components within 5 minutes of applying the liquid gasket.
If 5 minutes have passed, remove the old liquid gasket and apply liquid gasket again.

・When assembling or installing a component, make sure to tighten them at the specified torque to ensure secure installation.

Important precautions for handling this engine
The holes and gaps in the fuel system including inside the injector where the fuel passes through are manufactured with high precision. Therefore, these are extremely sensitive to any foreign matter, and may be severely damaged due to foreign matter accidentally intruded. For this reason, extreme care must be taken to prevent any foreign matter from entering. When performing maintenance on the fuel system, take extreme care to prevent any foreign matter from entering the system.

・Before starting maintenance, clean the fuel line and its surroundings.

・Be sure to wash your hands before starting maintenance. Do not put on cotton work gloves.

・When the fuel hose or fuel pipe is removed, cover the opening with a plastic bag and fix it with a piece of tape.

・When the high-pressure piping of the fuel system is removed, be sure to replace it with a new one. If it is reused, the sealing surface may be damaged to cause fuel leakage.

・When replacing the fuel hose and/or fuel pipe, do not unpack new components before starting installation.

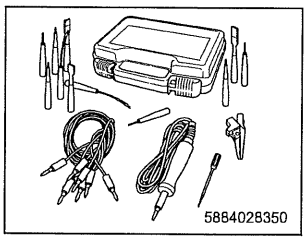
・When the fuel pipe, injection pipe, fuel injector, fuel supply pump, and/or common rail are removed, seal each opening immediately.

・Store the eyebolt and gasket in a clean parts box with a cover so that foreign matter does not attach to them.

・Fuel leakage may cause a fire. Therefore, be sure to wipe spilled fuel after completing the maintenance work and confirm that there is no fuel leakage before starting the engine.

2. Cautions on electronic system

Using tools for circuit test
Unless instructed in the diagnostic procedures, do not use a test light when diagnosing the powertrain electronic system. When a probe connector is required in the diagnostic procedures, use Connector Test Adapter Kit.



SST: 5-8840-2835-0 - connector test adapter kit

Commercial electronic equipment
Commercial electronic equipment refers to commercially available electronic equipment attached to the machine

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Introduction

Introduction

(All)

Table of Contents

Introduction.....0-2
safety information.....0-2

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Erasure by ECM
A DTC recorded in the ECM is erased if the same DTC has not been satisfied for 40 consecutive ignition cycles.

About trouble diagnosis scan tool
This tool is effective for diagnosing electrical failures in engine control systems and performing system checks.
If you connect the SAE 16/19 adapter to the DLC installed in the machine, it performs communication with the control units of the machine, and enables various diagnoses and tests to be performed.

Functions of the trouble diagnosis scan tool.

Data Display

Snapshot

Programming

Actuator test

Caution :

- When conditions such as the running state of the machine or the engine, water temperature, switches and gear position are not met, or when a DTC has been detected, each test may possibly not operate.

ECM reflash
The ECM can be updated by overwriting the control program using the most up-to-date control data issued every 3 months.
Normal reflash
The ECM is reflashed by automatically searching for the ECM part number compatible with the part number currently reflashed.
Forced reflash
The ECM is reflashed by specifying an arbitrary ECM part number.
In this case, a password dedicated for forced reflash is necessary.
Campaign reflash
The ECM is reflashed by selecting the part number during a campaign carried out by the manufacturer.

Rewriting the injector QR code
This performs the rewrite of the injector QR code that is necessary when an injector is replaced. This allows fuel compensation to be performed on each injector to optimize the engine condition.

Engine replacement mode
This should be used when changing back to the old ECM part number which requires hardware changes such as addition of the machine wiring is performed along with engine replacement, etc.

ECM replacement
When replacing the ECM within the same model, data can be uploaded from the current ECM to a trouble diagnosis scan tool and then downloaded to the new ECM after replacement.

Factory shipment settings
Based on the engine serial number, data such as injector QR code can be downloaded to ECM.

Actuator test
The injector test, fuel injection test, rail pressure test, glow plug test, and EGR control test are performed to inspect the operation and function of each target component.

Caution :

- When conditions such as the running state of the machine or the engine, water temperature, switches and gear position are not met, or when a DTC has been detected, each test may possibly not operate.

Manual display
Links with the DTC to display the manual along with the failure diagnosis procedure.

Reading saved data
Read saved snapshot data and display a reproduction.

Caution :

- When using the trouble diagnosis scan tool, refer to the separate instruction manual for the trouble diagnosis scan tool.

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DTC P0523 (Flash Code 294)
Oil Pressure Sensor Circuit High

1. DTC P0523 description of DTC

The oil pressure sensor detects the engine oil pressure. The oil pressure sensor is installed near the starter motor of the cylinder block. The internal resistance of the oil pressure sensor changes in accordance with the change in the pressure. The resistance value is low when the pressure is high, and the resistance value is high when the pressure is low. The ECM is connected to the oil pressure sensor through the power supply circuit, signal circuit and GND circuit, and applies +5 V power to the power supply circuit.
The ECM detects the change in the signal voltage that is occurred according to the resistance change based on the pressure of the oil pressure sensor as a signal.

2. DTC P0523 condition for setting the DTC

DTC P060B has not been detected.
The battery voltage is between 18 and 32 V.
The ECM detects that the signal voltage of the oil pressure switch has been 4.85 V or higher for 4 seconds.

3. DTC P0523 action taken when the DTC sets

Failure is indicated in the monitor on the machine, or the diagnostic light is turned on.

Note :

- Depending on the manufacturer of the machine, the failure indication may not be shown.

The default value of engine oil pressure is substituted.

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DTC P0192 (Flash Code 245)
Fuel Rail Pressure Sensor Circuit Low

1. DTC P0192 priority DTC

   DTC P0641

2. DTC P0192 diagnostics
   1. Turn OFF the ignition switch.
   2. Disconnect the harness connector from the fuel pressure sensor.
   3. Check the fuel rail pressure sensor display with the trouble diagnosis scan tool.

      voltage : 4.5 V
   4. If the reading is less than or equal to the specified value, inspect to see if there is a short circuit to the GND with the signal circuit between the ECM and the fuel pressure sensor.
   5. If a problem is found, repair the signal circuit.
   6. Measure the voltage between the fuel pressure sensor 5 V power supply circuit and normal GND.

      voltage : 4.5 V
   7. If the reading is more than or equal to the specified value, inspect to see if there is poor connection with the fuel pressure sensor harness connector.
   8. If a problem is found, repair the harness connector.
   9. If the harness connector is normal, replace the fuel pressure sensor.

      Refer to "*1.Engine 1C.Fuel System(4JJ1) Common rail assembly removal*".

      Refer to "*1.Engine 1C.Fuel System(4JJ1) Common rail assembly installation*".

      Note :
      - Do not replace the fuel pressure sensor separately. When a problem is found, replace the common rail assembly.
   10. Inspect to see if there is an open circuit or high resistance with the 5 V power supply circuit between the ECM and fuel pressure sensor.

       Note :
       - The fuel pressure sensor shares the 5 V power supply circuit with other sensors.
       - The DTC set on a sensor which shares this circuit may be detected.
   11. If a problem is found, repair the 5 V power supply circuit.
   12. Inspect the ECM harness connector for poor connections.
   13. If a problem is found, repair the harness connector.
   14. If the harness connector is normal, replace the ECM.

       Refer to "*1.Engine 1J.Electrical(4JJ1) ECM removal*".

       Refer to "*1.Engine 1J.Electrical(4JJ1) ECM installation*".
   15. Set the injector ID code on the ECM.
   16. Perform the unit difference learning of the fuel supply pump to the ECM.
3. DTC P0192 confirm resolution
   1. Clear the DTC using the trouble diagnosis scan tool.
   2. Turn OFF the ignition switch for at least 30 seconds.
   3. Start the engine.
   4. Perform a test-run.
   5. Use the trouble diagnosis scan tool to confirm that a DTC has not been detected.

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28. Use the trouble diagnosis scan tool to confirm that the exhaust temperature (before the filter) display is at or below the specified value.

values : 130 ℃ { 266 °F }

29. If the reading is more than or equal to the specified value, idle the engine until it falls to or below the specified value.

30. Check the exhaust differential pressure display when the exhaust temperature (in front of the filter) display has reached the specified value with the engine revolution increased to the maximum revolution speed without load.

values : 150 ℃ { 302 °F }

31. Use the trouble diagnosis scan tool to check if the exhaust differential pressure display is at or above the specified value.

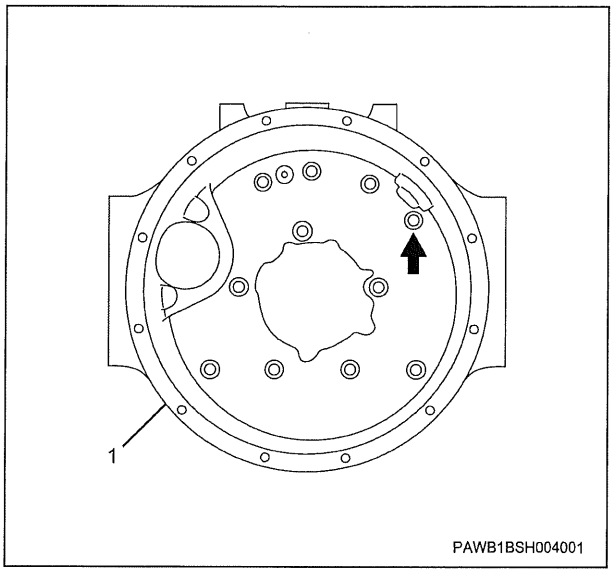
values : 0.6 kPa { 0.01 kgf/cm2 / 0.1 psi }

3. DTC P2452 confirm resolution

1. Turn ON the ignition switch.
2. Use the trouble diagnosis scan tool to confirm that a DTC has not been detected.

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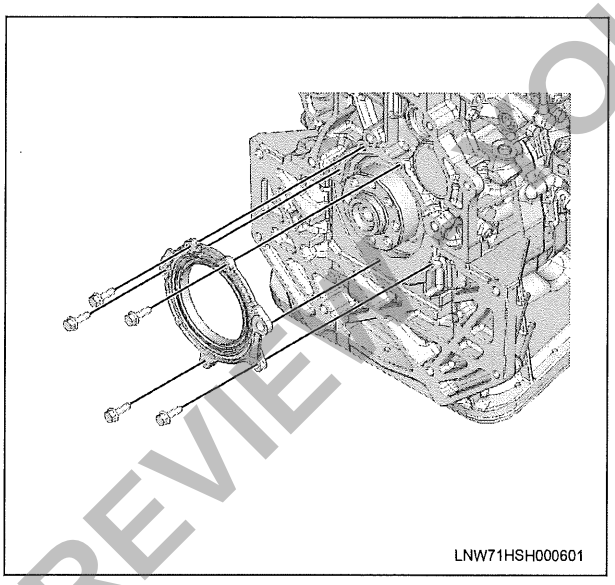
1. Flywheel housing

57. Oil seal retainer removal

1. Remove the oil seal retainer from the cylinder block and crankcase.

Note :

- Remove the retainer with the oil seal on.

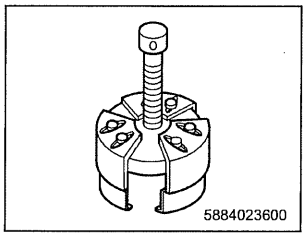


58. Crankshaft rear oil seal removal

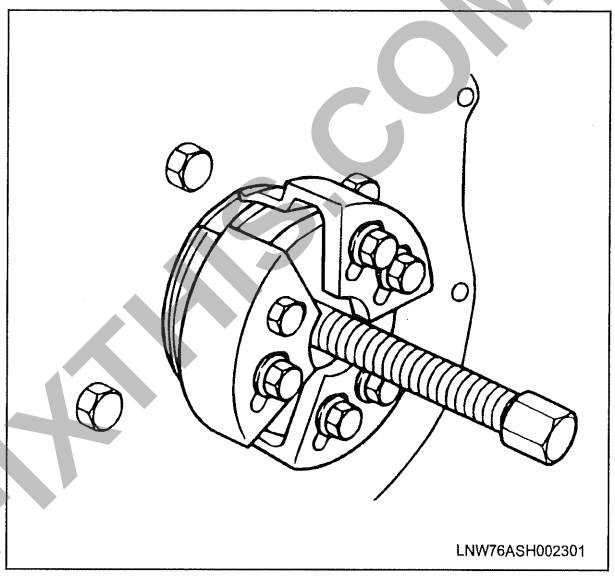
1. Remove the crankshaft rear oil seal from the oil seal retainer.
2. Remove the slinger from the crankshaft using special tool.

Note :

- Use a slinger puller to remove.

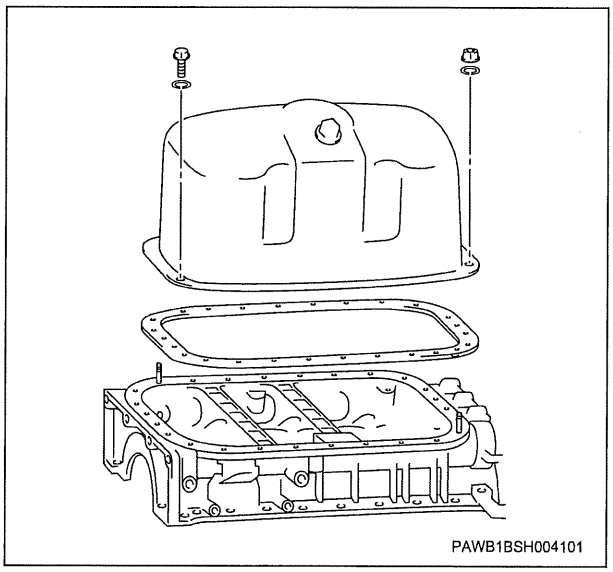


SST: 5-8840-2360-0 - rear oil seal remover



59. Oil pan removal

1. Remove the oil pan from the crankcase.



60. Crankcase removal

1. Remove the crankcase from the cylinder block.

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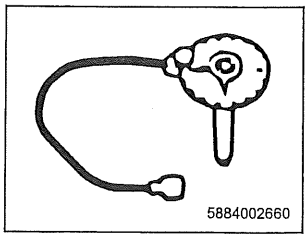
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tightening torque : 29.4 N • m { 3.0 kgf • m / 22 lb • ft }

8. Tighten the bolt using special tool.

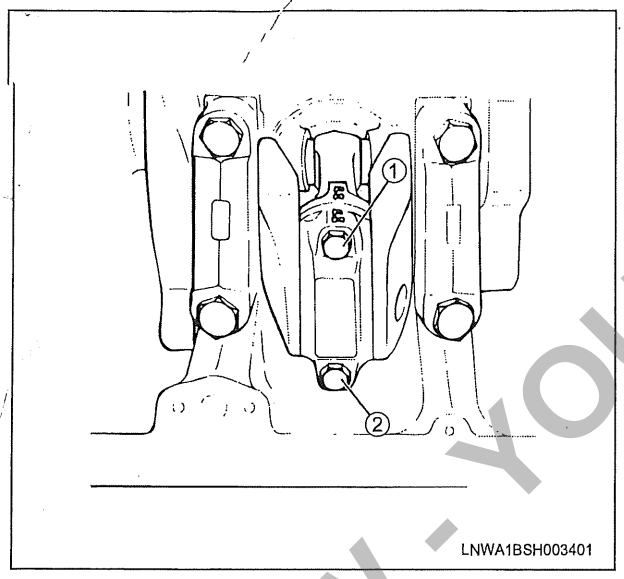
Note :

- Tighten at the specified angle in the order shown in the diagram.



SST: 5-8840-0266-0 - angle gauge

specified angle : 45 °

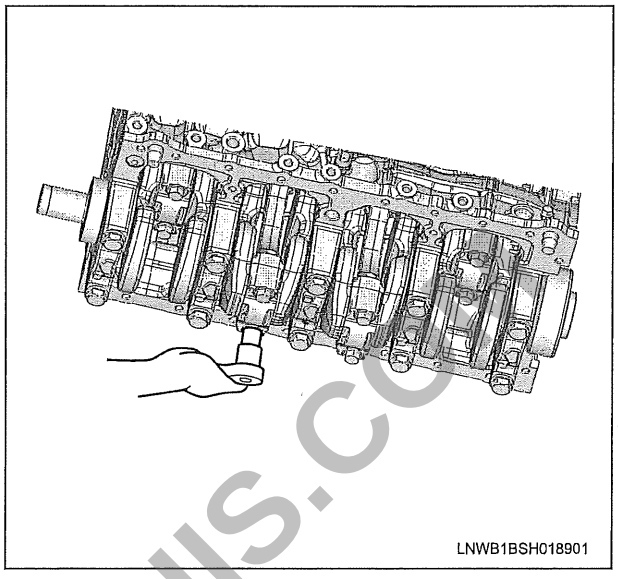


Caution :

- Perform tightening of the connecting rod bearing cap at the lower dead center of each cylinder.

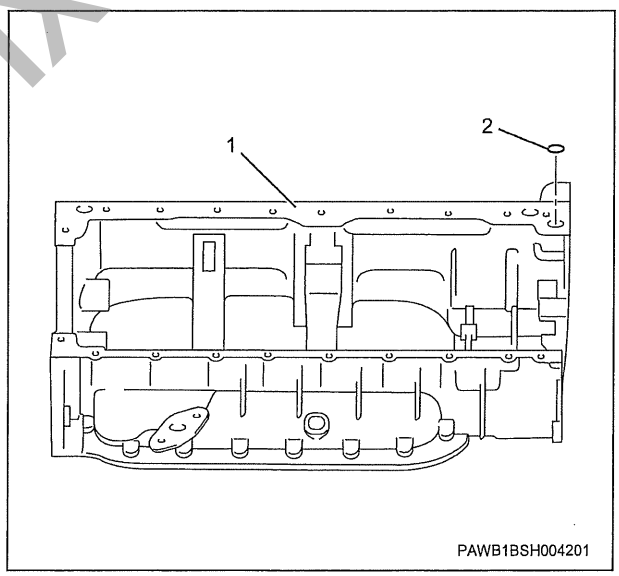
Note :

- Confirm that the crankshaft turns smoothly.



4. Crankcase installation

1. Apply the engine oil to the O-ring.
2. Install the O-ring to the crankcase.



1. Crankcase
2. O-ring

3. Apply the liquid gasket to the crankcase.

Note :

- As shown in the diagram, apply ThreeBond 1207B or equivalent liquid gasket.

Caution :

- Apply the appropriate amount of liquid gasket so that it does not protrude into the oil path indicated with arrows.

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inspection

1. CMP sensor inspection

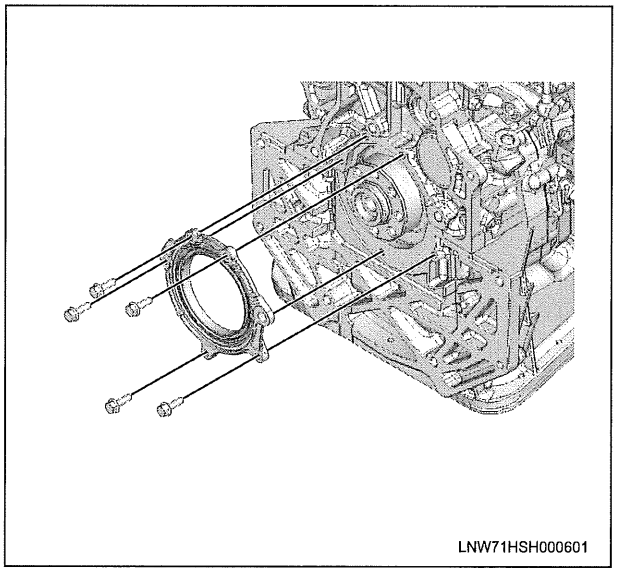
1. Inspect the CMP sensor.

Note :

- Inspect whether the CMP sensor is securely installed.
- Inspect the sensor and connector sections for damage or debris.

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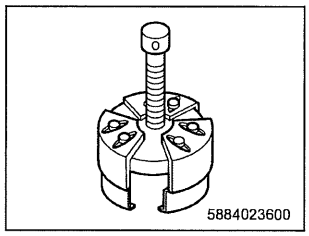


57. Crankshaft rear oil seal removal

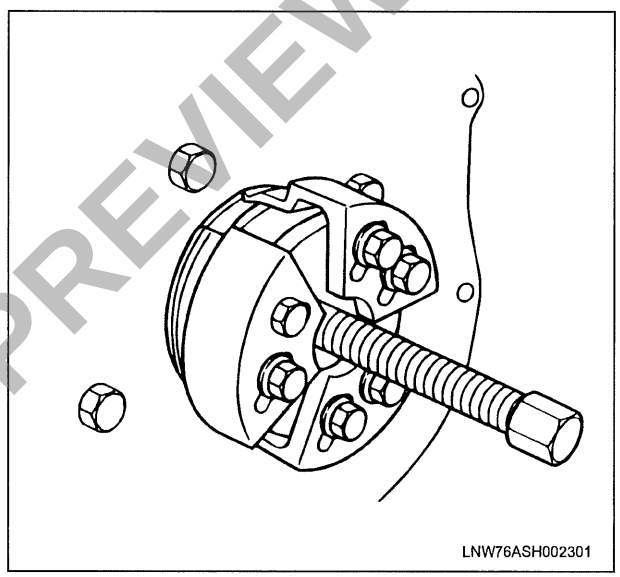
1. Remove the crankshaft rear oil seal from the oil seal retainer.
2. Remove the slinger from the crankshaft using special tool.

Note :

- Use a slinger puller to remove.

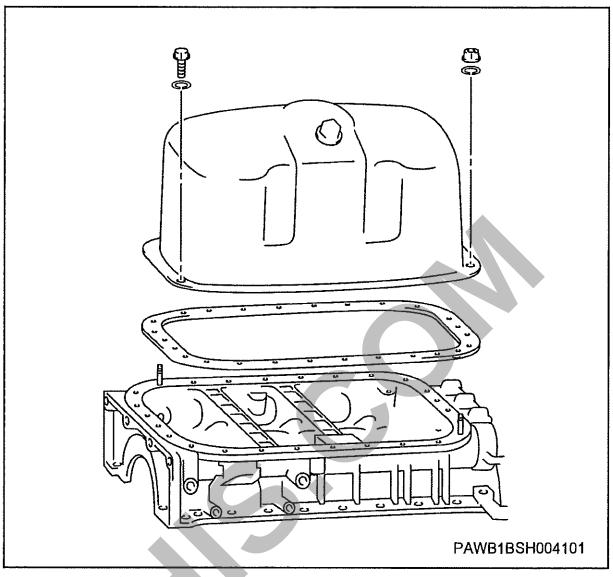


SST: 5-8840-2360-0 - rear oil seal remover



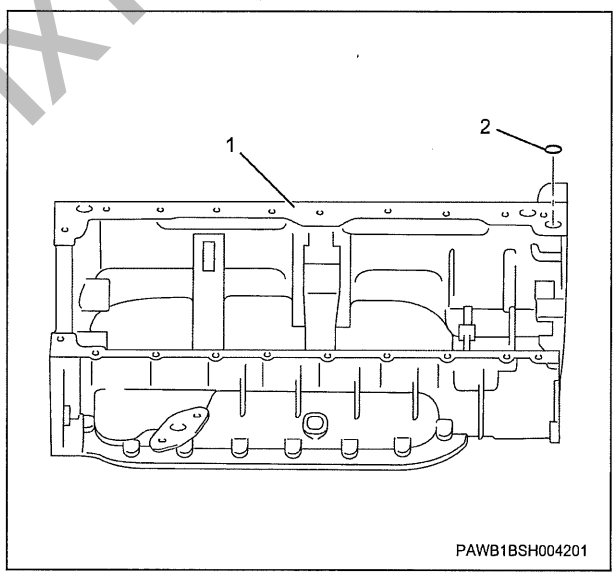
58. Oil pan removal

1. Remove the oil pan from the crankcase.



59. Crankcase removal

1. Remove the crankcase from the cylinder block.



1. Crankcase
2. O-ring

Caution :

- Do not damage the O-ring.

60. Piston removal

1. Remove the connecting rod bearing cap from the connecting rod.
2. Remove the connecting rod bearing from the connecting rod bearing cap.

Note :

- Organize the removed bearings by the cylinders using tags, etc.

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Common rail assembly

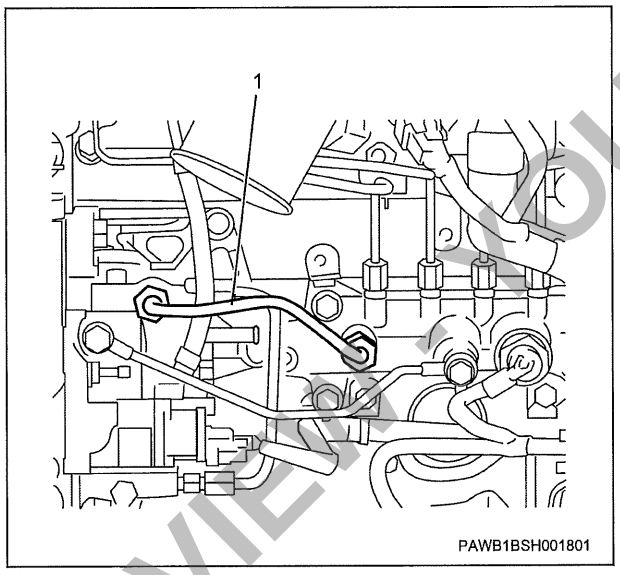
removal

1. Injector safety information

   Caution :

   - Including the inside of the injector, the holes and gaps that are to be used as the fuel paths for the fuel system have an extremely precise finish.
   - Because there is the possibility of damage due to foreign material contamination, cover the cap after removing parts, etc., to prevent the intrusion of foreign material.

2. Battery ground cable disconnect
   1. Disconnect the battery ground cable from the battery.
3. Fuel pipe removal
   1. Remove the fuel pipe from the fuel supply pump and the common rail assembly.



1. Fuel pipe

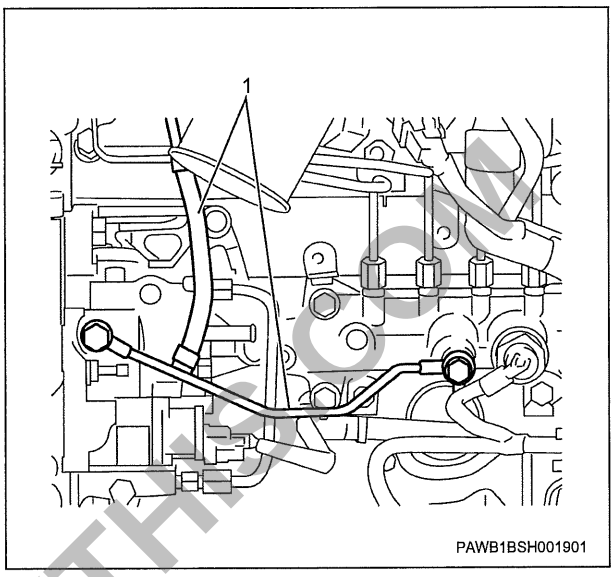
Caution :

- Do not reuse the fuel pipe.

4. Leak-off pipe removal
   1. Remove the fuel leak-off pipe from the fuel supply pump and common rail assembly.

Note :

- Do not reuse the gasket.

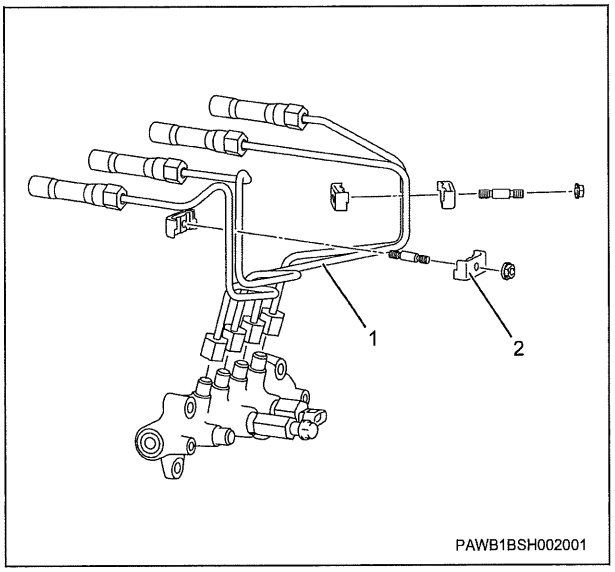


1. Leak-off pipe, hose

5. Injection pipe removal
   1. Remove the injection pipe from the injector and the common rail assembly.

Caution :

- Do not reuse the injection pipe.

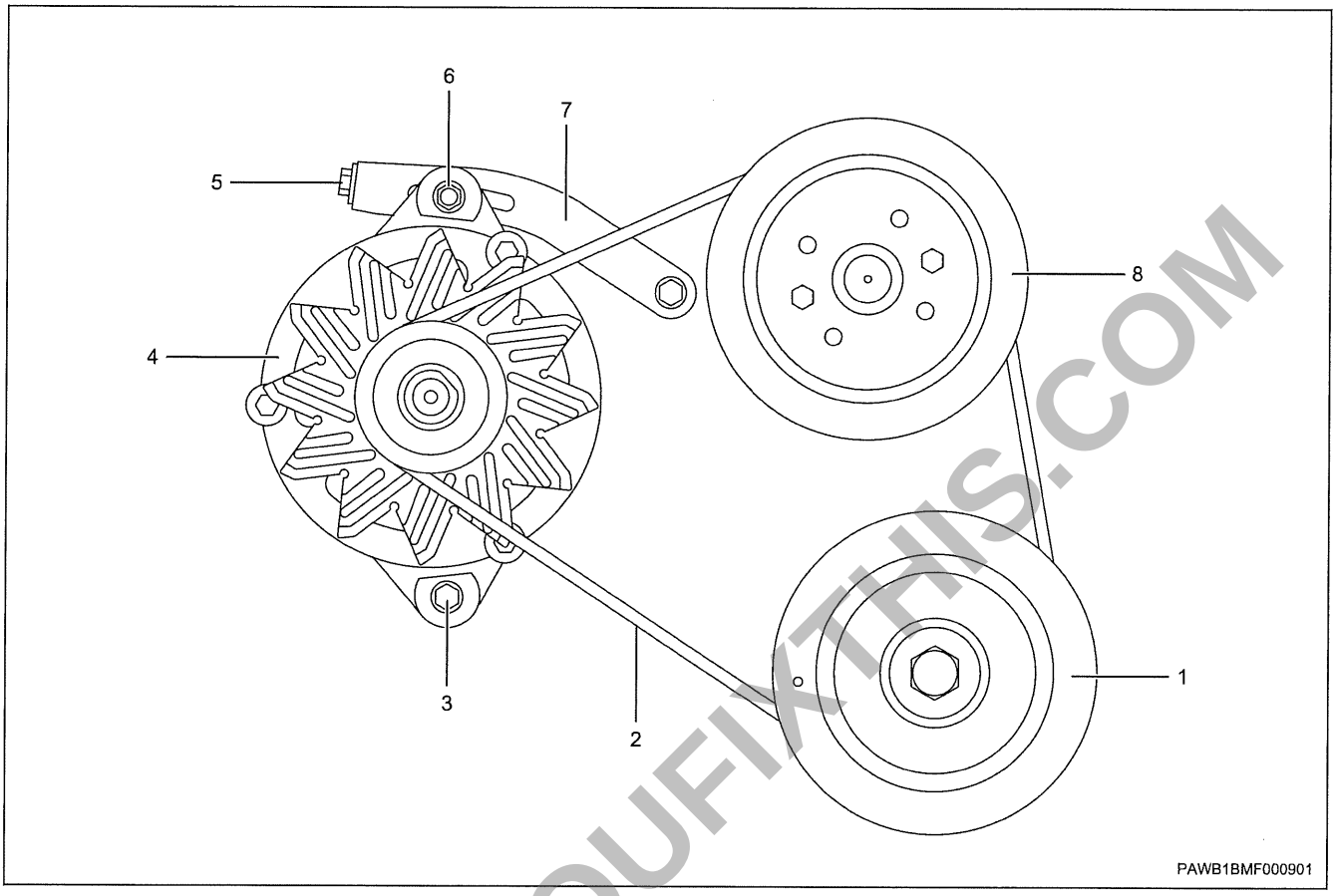


1. Injection pipe
2. Clip

6. Common rail assembly removal
   1. Disconnect the harness connector from the fuel pressure sensor.
   2. Remove the common rail assembly from the cylinder block.

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1. Crankshaft pulley
2. Cooling fan belt
3. Bolt
4. Generator
5. Tension adjust bolt
6. Lock nut
7. Generator adjust plate
8. Water pump pulley

2. Tightening Torque Views

Note :

- Water pump assembly

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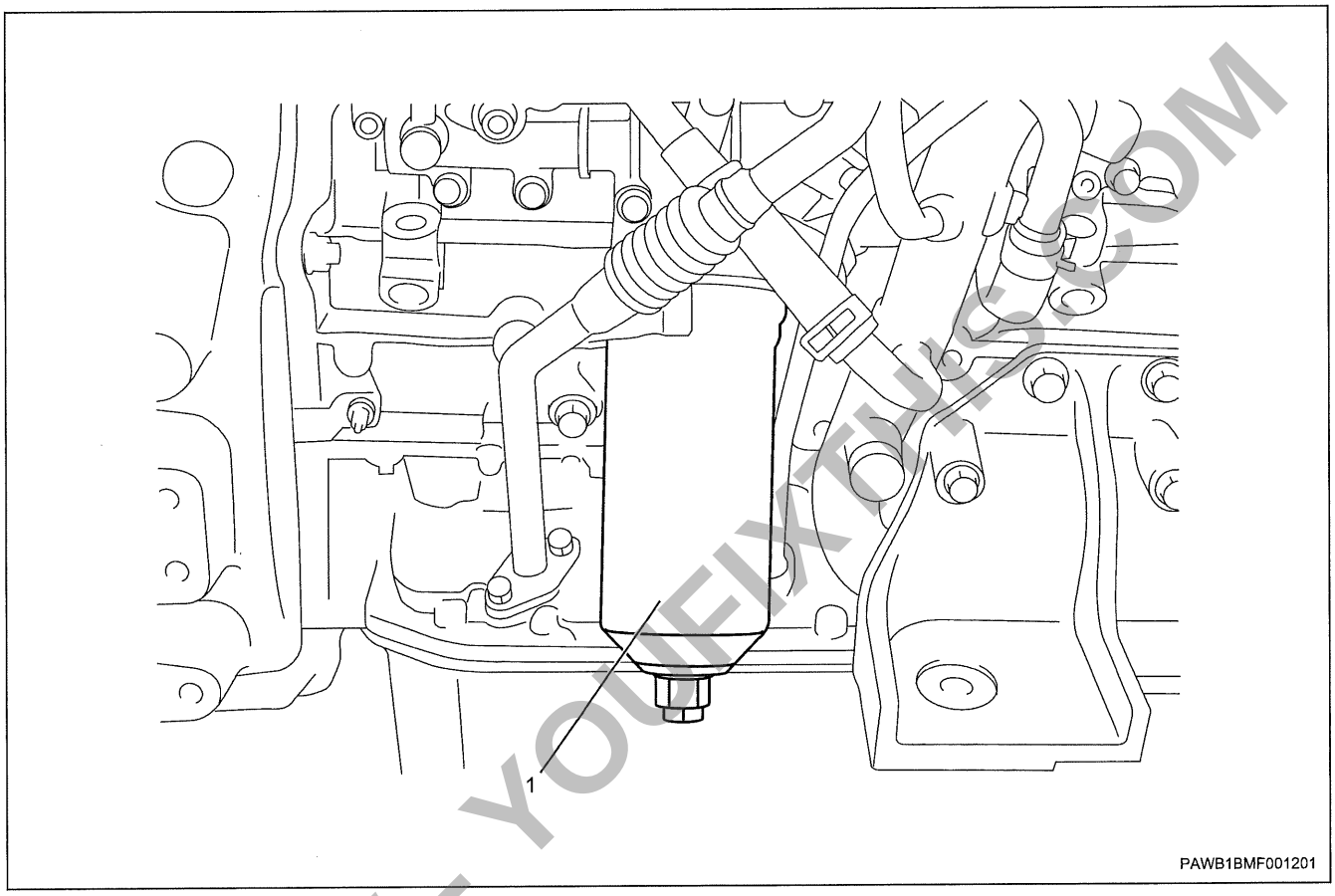
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Supplementary Information

1. Component Views

Note :

- Oil filter



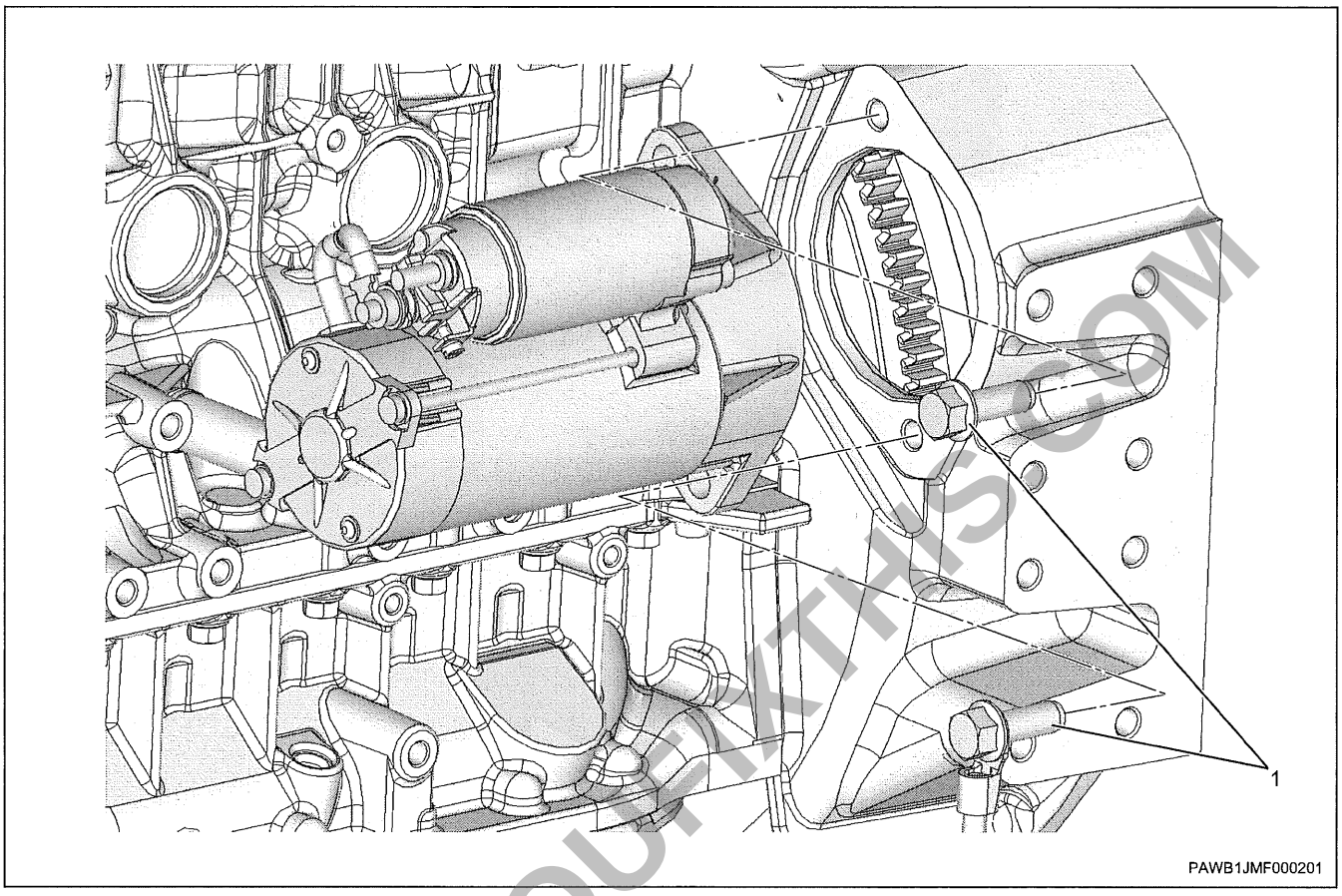
1. Oil filter

Note :

- Oil pan and crankcase

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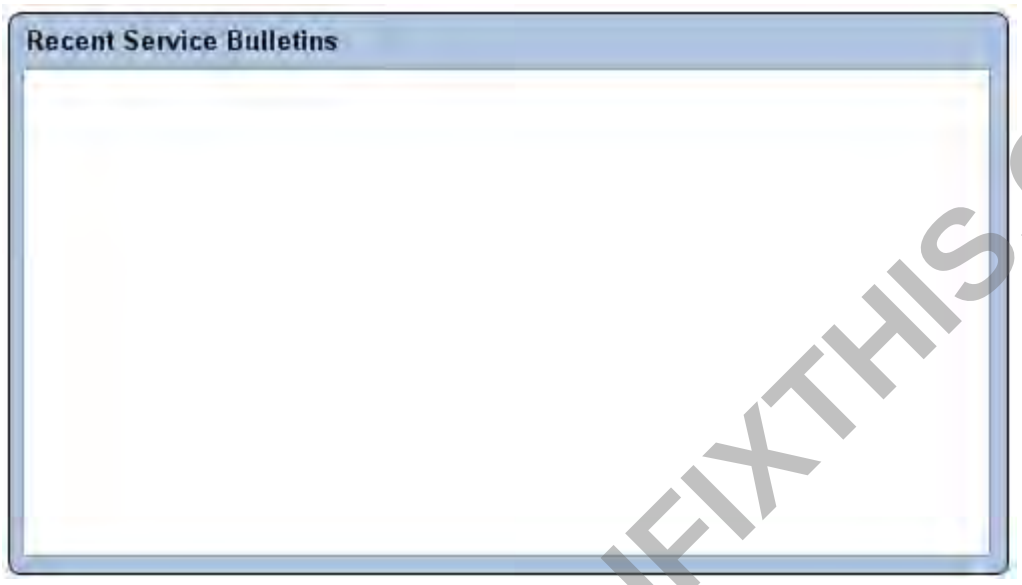
1 : 97 N・m { 9.9 kgf・m / 72 lb・ft }

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