

FUEL AND EMISSION CONTROL SYSTEMS

(WL, WL Turbo, WL-3, WLT-3)

ENGINE TUNE-UP	F2- 2	EGR CONTROL SOLENOID VALVE	
ENGINE TUNE-UP PREPARATION	F2- 2	INSPECTION	F2-33
IDLE SPEED ADJUSTMENT	F2- 2	INTAKE SHUTTER VALVE ACTUATOR	
IDLE-UP SPEED ADJUSTMENT	F2- 2	INSPECTION	F2-34
INJECTION TIMING ADJUSTMENT	F2- 4	EGR PIPE, EGR VALVE REMOVAL/	
INTAKE-AIR SYSTEM	F2- 5	INSTALLATION	F2-34
VACUUM HOSE ROUTING DIAGRAM	F2- 5	CONTROL SYSTEM	F2-37
INTAKE-AIR SYSTEM		COMPONENT PARTS	F2-37
REMOVAL/INSTALLATION	F2- 7	POWERTRAIN CONTROL MODULE (PCM)	
TURBOCHARGER INSPECTION	F2- 10	REMOVAL/INSTALLATION	F2-39
GLOW PLUG REMOVAL/INSTALLATION ..	F2- 11	POWERTRAIN CONTROL MODULE (PCM)	
GLOW PLUG INSPECTION	F2- 11	INSPECTION	F2-41
GLOW PLUG RELAY		MASS AIR FLOW (MAF)/INTAKE AIR	
REMOVAL/INSTALLATION	F2- 12	TEMPERATURE (IAT) SENSOR INSPECTION	
GLOW PLUG RELAY INSPECTION	F2-12		F2-49
GLOW PLUG CORD INSPECTION	F2-13	INTAKE AIR TEMPERATURE (IAT) SENSOR	
ACCELERATOR PEDAL		NO.2 INSPECTION	F2-50
REMOVAL/INSTALLATION	F2-13	NE SENSOR INSPECTION	F2-50
ACCELERATOR PEDAL COMPONENT		ENGINE COOLANT TEMPERATURE (ECT)	
DISASSEMBLY/ASSEMBLY	F2-14	SENSOR INSPECTION	F2-51
ACCELERATOR CABLE		FUEL TEMPERATURE SENSOR	
INSPECTION/ADJUSTMENT	F2-15	INSPECTION	F2-51
IDLING KNOB, IDLING CABLE INSPECTION	F2-15	PUMP SPEED SENSOR INSPECTION	F2-52
FUEL SYSTEM	F2-16	CONTROL SLEEVE (CS) SENSOR	
BEFORE REPAIR PROCEDURE	F2-16	INSPECTION	F2-52
AFTER REPAIR PROCEDURE	F2-16	TIMER POSITION SENSOR INSPECTION .	F2-53
FUEL TANK REMOVAL/INSTALLATION	F2-17	INJECTION PUMP EPROM INSPECTION .	F2-53
FUEL FILTER DISASSEMBLY/ASSEMBLY ..	F2-19	TDC SENSOR REMOVAL/INSTALLATION .	F2-54
FUEL FILTER AIR BLEEDING	F2-20	TDC SENSOR INSPECTION	F2-54
SEDIMENTOR WATER DRAINING	F2-20	EGR VALVE POSITION SENSOR	
SEDIMENTOR SWITCH INSPECTION	F2-20	INSPECTION	F2-55
FUEL WARMER INSPECTION	F2-21	BOOST SENSOR INSPECTION	F2-55
FUEL INJECTION PUMP (FIP) INSPECTION	F2-21	PCM CONTROL RELAY INSPECTION	F2-56
FUEL INJECTION PUMP (FIP)		ACCELERATOR POSITION SENSOR	
REMOVAL/INSTALLATION	F2-22	INSPECTION	F2-56
INJECTION NOZZLE		ACCELERATOR POSITION SENSOR	
REMOVAL/INSTALLATION	F2-23	ADJUSTMENT	F2-56
INJECTION NOZZLE		IDLE SWITCH INSPECTION	F2-57
DISASSEMBLY/ASSEMBLY	F2-24	IDLE SWITCH ADJUSTMENT	F2-58
INJECTION NOZZLE INSPECTION	F2-24	CONTROL LEVER POSITION SENSOR	
FUEL SHUT OFF (FSO) SOLENOID		INSPECTION	F2-59
INSPECTION	F2-25	CLUTCH SWITCH INSPECTION	F2-60
ELECTRONIC GOVERNOR INSPECTION ..	F2-26	NEUTRAL SWITCH INSPECTION	F2-61
FUEL CUT VALVE (FCV)		ON-BOARD DIAGNOSTIC SYSTEM	F2-62
REMOVAL/INSTALLATION	F2-26	DTC READING PROCEDURE	F2-62
FUEL CUT VALVE (FCV) INSPECTION	F2-26	AFTER REPAIR PROCEDURE	F2-62
FICD SOLENOID VALVE NO.1, NO.2		OBD READ/CLEAR DIAGNOSTIC TEST	
INSPECTION	F2-27	RESULTS	F2-66
TIMER CONTROL VALVE (TCV)		OBD PARAMETER IDENTIFICATION (PID)	
INSPECTION	F2-28	ACCESS	F2-66
EXHAUST SYSTEM	F2-29	ON-BOARD DIAGNOSTIC TEST	F2-67
EXHAUST SYSTEM INSPECTION	F2-29	TROUBLESHOOTING	F2-118
EXHAUST SYSTEM		FOREWORD	F2-118
REMOVAL/INSTALLATION	F2-29	INTERMITTENT CONCERN	
EMISSION SYSTEM	F2-31	TROUBLESHOOTING	F2-118
ROLLOVER VALVE INSPECTION	F2-31	TROUBLESHOOTING ITEM TABLE	F2-120
EVAPORATIVE CHAMBER INSPECTION ...	F2-31	QUICK DIAGNOSIS CHART	F2-121
EGR VALVE INSPECTION	F2-32	SYSTEM INSPECTION	F2-151
EGR SOLENOID VALVE INSPECTION	F2-32		
EGR SOLENOID VALVE (VENT) INSPECTION			
.....	F2-33		

ENGINE TUNE-UP

ENGINE TUNE-UP PREPARATION – WL/WL-TURBO

1. Warm up the engine to normal operating temperature.
2. Turn the all electrical loads off.
3. Connect a tachometer.

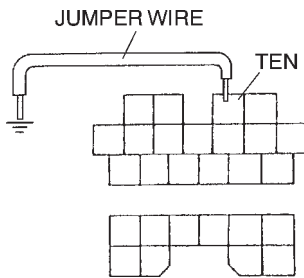
ENGINE TUNE-UP PREPARATION – WL-3/HLT-3 (EURO 3 REGULATION MODELS)

1. Warm up the engine to normal operating temperature.
2. Shift the transmission into neutral (MT) or P range (AT).
3. Turn off all electrical loads.
4. Turn on the test mode.

Caution

- Connecting to the wrong DLC terminal may cause a malfunction. Carefully connect only to the specified terminal.

Connect DLC terminal TEN to the body ground using a jumper wire.



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IDLE SPEED ADJUSTMENT

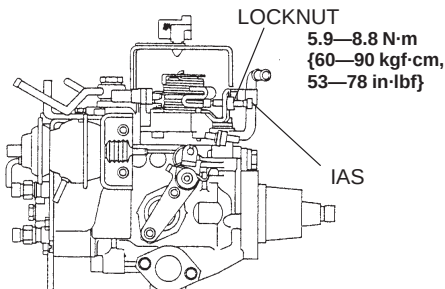
WL

1. Perform “Engine tune-up preparation”.
2. Verify that the idle speed is within the specification.

Specification

700—740 (720 ± 20) rpm

3. If not within the specification, adjust the idle speed by turning the IAS (idle adjustment screw).



4. After adjusting the idle speed, tighten the locknut securely.

WL Turbo

1. Perform “Engine tune-up preparation”.

2. Verify that the idle speed is within the specification.

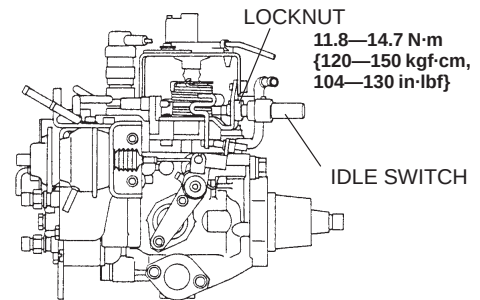
Specification

General (L.H.D.) : 760—800 (780 ± 20) rpm
Europe and UK : 700—740 (720 ± 20) rpm

Caution

- Turning the idle switch (Europe and UK only) with its connector connected can break the harness. Be sure to disconnect the connector when turning the idle switch more than one rotation.

3. If not as specified, loosen the idle switch locknut and adjust the idle speed by turning the idle switch.



4. After adjusting the idle speed, tighten the locknut securely.

WL-3/HLT-3 (EURO 3 REGULATION MODELS)

1. Perform “Engine tune-up preparation”.
2. Verify that the idle speed is within the specification.

Specification

695—745 (720 ± 25) rpm

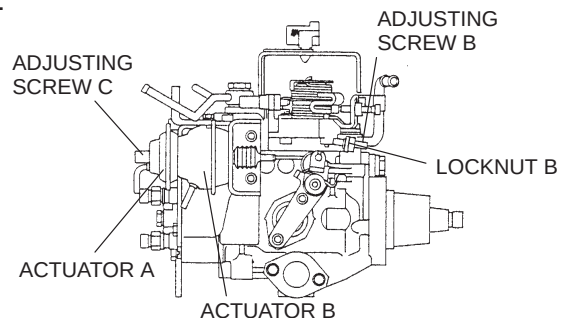
- If not as specified, inspect the following parts.
 - Accelerator position sensor
 - ECT sensor
 - TDC sensor
 - Pump speed sensor
 - If the parts are normal, replace the PCM.
3. Turn off the test mode.
Disconnect the jumper wire.

IDLE-UP SPEED ADJUSTMENT

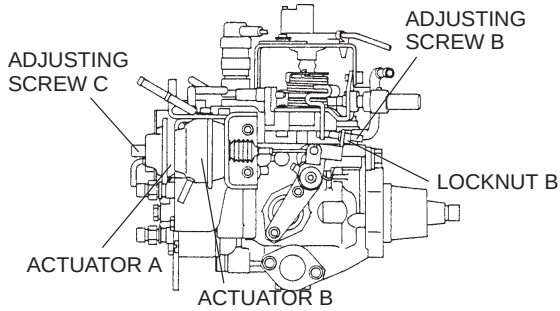
WL / WL Turbo

1. Perform “Engine tune-up preparation”.
2. Turn all electrical loads off in neutral shift position.
3. Apply vacuum of -53.3 kPa {-400 mmHg, -15.8 inHg} or over to actuator B, and measure the idle-up speed.

WL



WL, WL Turbo



Specification

1200—1500 (1,350 ± 150) rpm

4. If not within the specification, do as follows;
Loosen the locknut B.
Adjust the idle-up speed by turning the adjusting screw B.
Tighten the locknut B.

Tightening torque

5.9—8.8 N·m {60—90 kgf·cm, 53—78 in·lbf}

5. Release actuator B to atmosphere and apply vacuum of -53.3 kPa {-400 mmHg, -15.8 inHg} or over to actuator A, and measure the idle-up speed.

Specification

WL vehicle: 805—855 (830 ± 25) rpm

WL Turbo, WL (Europe only):

825—875 (850 ± 25) rpm

6. If not as specified, adjust the idle-up speed by turning adjusting screw C.

WL-3/WLT-3 (EURO 3 REGULATION MODELS)

1. Perform “**Engine tune-up preparation**”.
2. Inspect the idle-up speed.
Verify that the idle-up speed is within the specification under the following load condition.
(Excludes temporary idle speed drop just after the electrical loads turn on.)
 - If not as specified, replace the PCM.

Specification

Load condition	Idle-up speed (rpm)
	Neutral (MT) P range (AT)
A/C ON	725—775 (750 ± 25)

INJECTION TIMING ADJUSTMENT

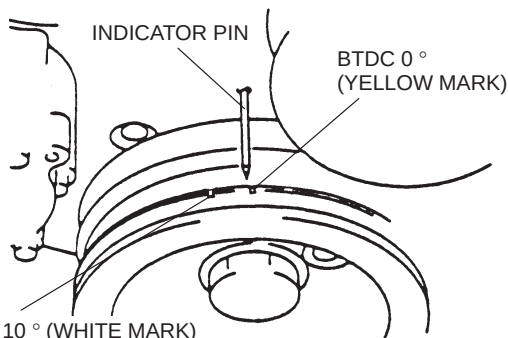
Warning

- **Fuel vapor is hazardous. It can very easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.**
- **Fuel line spills and leaks are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always observe the "Fuel Line Safety Procedures", "Fuel Hose Installation".**

Caution

- **After tightening the FIP mounting nuts and bolt after loosening them, be sure to inspect the timing belt tension. If the belt tension is not inspected, the timing belt and the camshaft may become damaged. (Refer to Section B2, TIMING BELT, TIMING BELT REMOVAL/INSTALLATION, Timing Belt Installation Note.)**

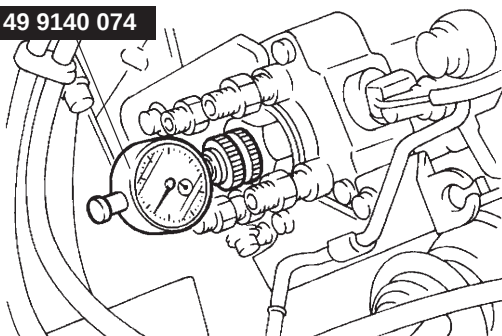
1. Remove the injection pipes (Refer to FUEL SYSTEM, FUEL INJECTION PUMP (FIP) REMOVAL/INSTALLATION.)
2. Remove the cooling fan (Refer to Section E, COOLING FAN, COOLING FAN REMOVAL/INSTALLATION.)
3. Turn the crankshaft pulley at slow rotation to align the timing mark (BTDC 0° : yellow mark) with indicator pin.



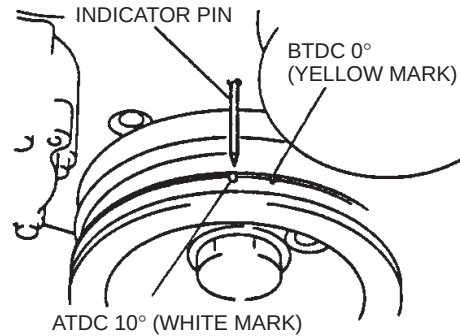
ATDC 10° (WHITE MARK)

4. Remove the hydraulic head plug from the injection pump.
5. Mount the **SST** into the plug hole on the hydraulic head so that the dial indicator probe touches the plunger end of the pump and the dial indicator indicates **approx. 2.0 mm {0.079 in}**.

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6. Turn the crankshaft counterclockwise to approx. 30° BTDC. (Align the **SST** installation hole on the crankshaft pulley.)
7. Turn the crankshaft lightly right and left, and verify that the dial gauge indicator does not move. Then set the indicator to 0 mm {0 in}.
8. Turn the crankshaft clockwise to position the indicator pin to 10° ATDC (white mark) and read the dial indicator.



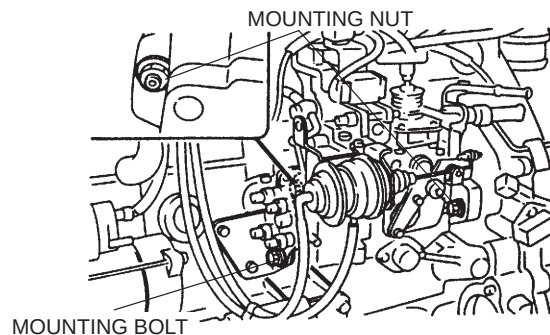
Specification

0.95—1.05 mm {0.038—0.041 in}
(1.0 ± 0.05 mm {0.039 ± 0.019 in})

9. If not as specified, adjust by loosening the FIP mounting nut and bolt and turn the FIP.
10. Tighten the FIP mounting nuts and then the bolt.

Tightening torque

19—25 N·m {1.9—2.6 kgf·m, 14—18 ft·lbf}



11. Remove the **SST**.
12. Install the hydraulic head plug and a new gasket.

Tightening torque

14—19 N·m {1.4—2.0 kgf·m, 11—14 ft·lbf}

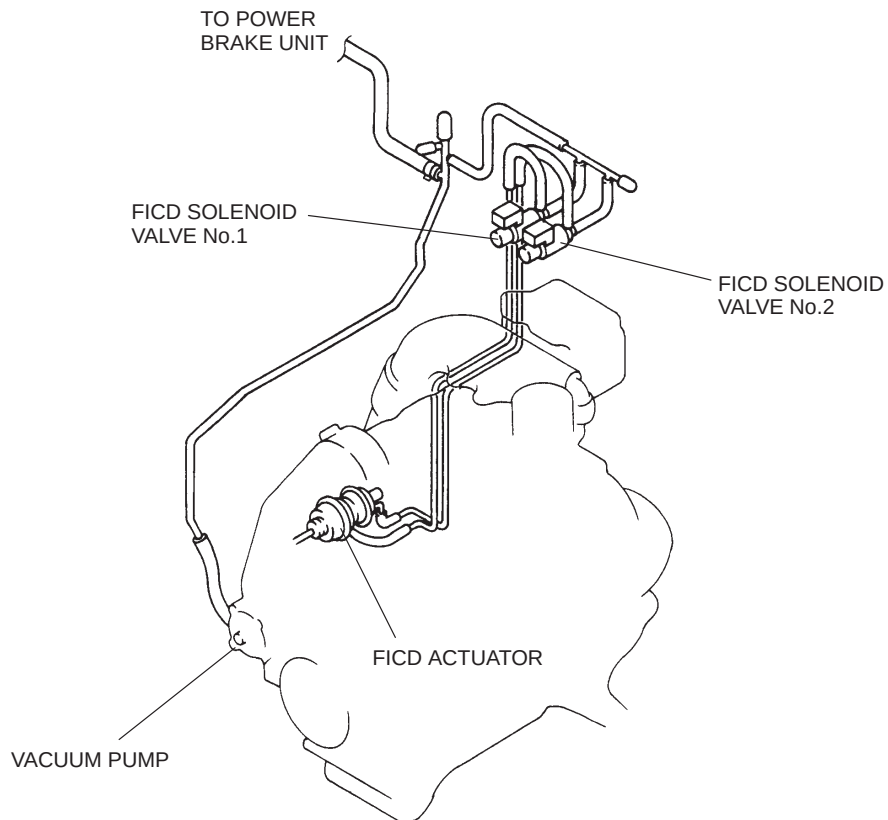
13. Connect the injection pipes. (Refer to FUEL SYSTEM, INJECTION NOZZLE REMOVAL/INSTALLATION.)
14. Bleed the air from the fuel filter. (Refer to FUEL SYSTEM, FUEL FILTER AIR BLEEDING.)
15. Inspect for fuel leakage.
16. Check the timing belt tension. (Refer to Section B2, TIMING BELT, TIMING BELT REMOVAL/INSTALLATION, Timing Belt Installation Note.)

INTAKE-AIR SYSTEM

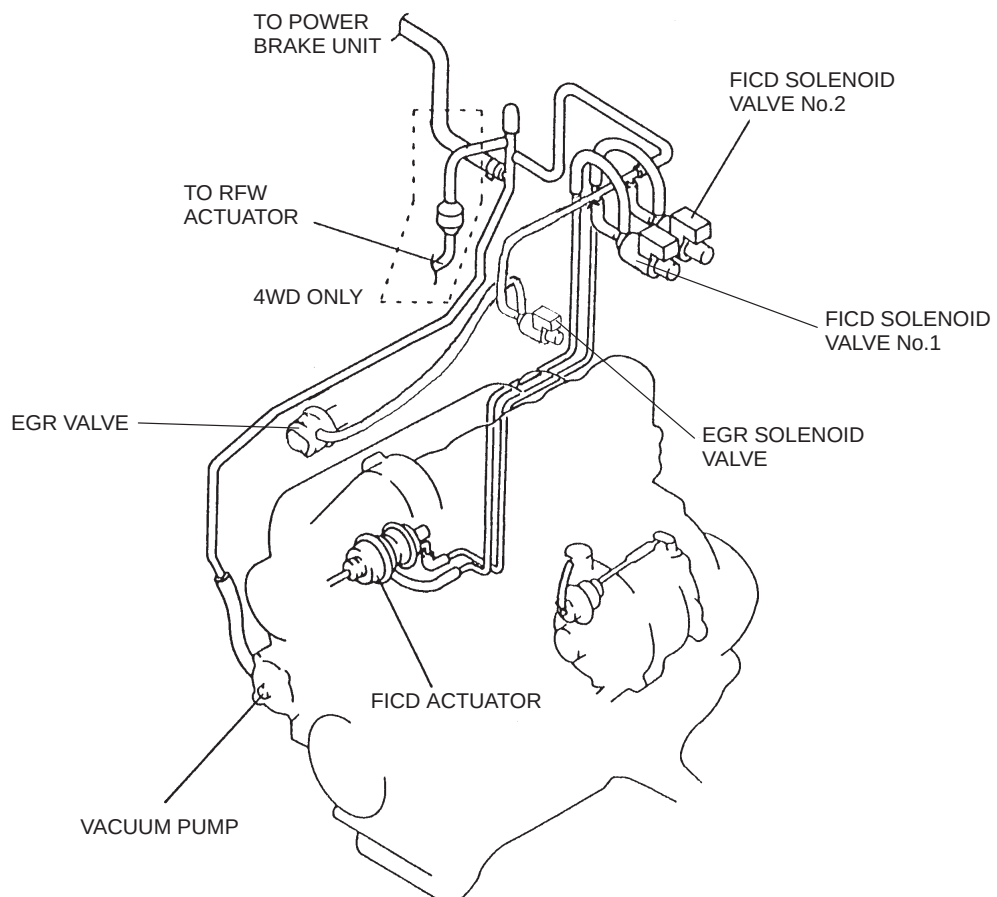
INTAKE-AIR SYSTEM

VACUUM HOSE ROUTING DIAGRAM

WL

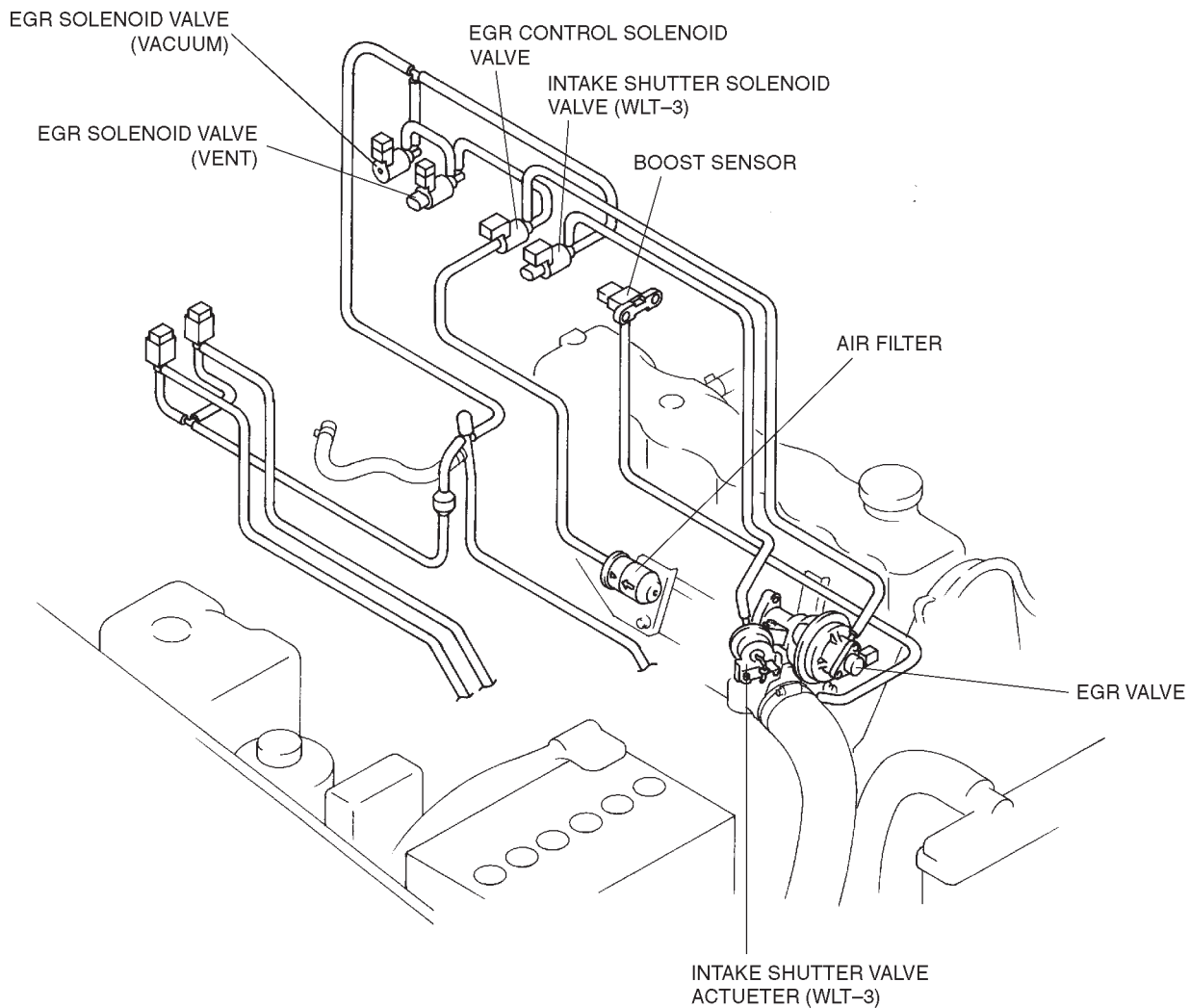


WL TURBO



INTAKE-AIR SYSTEM

WL-3 / WLT-3 (Euro 3 Regulation Models)



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INTAKE-AIR SYSTEM

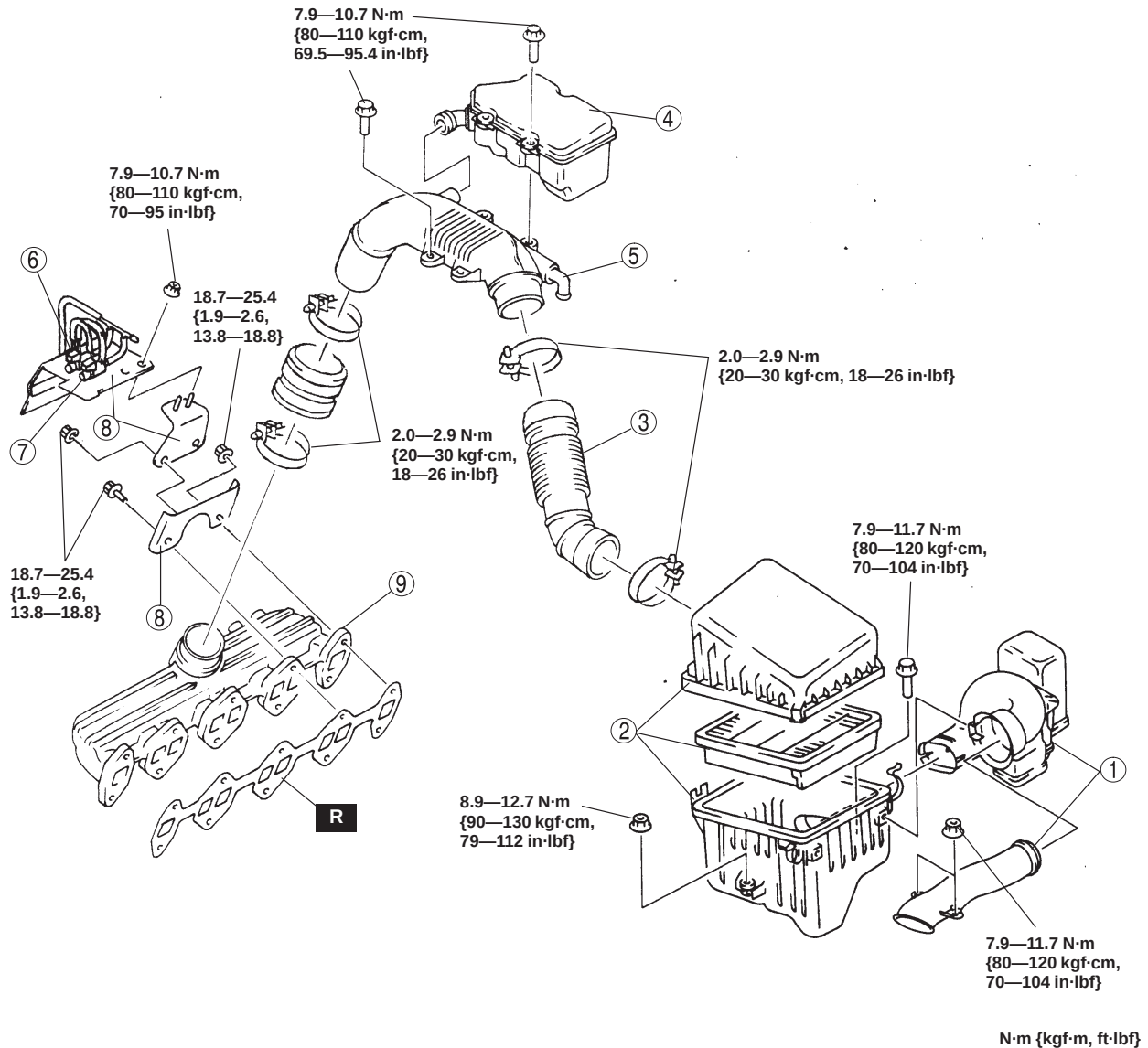
INTAKE-AIR SYSTEM REMOVAL/INSTALLATION

Warning

- When the engine and intake-air system are hot, they can badly burn. Turn off the engine and wait until they are cool before removing the intake-air system.

WL

1. Disconnect the negative battery cable.
2. Remove the injection pipe. (Refer to FUEL SYSTEM, INJECTION NOZZLE REMOVAL/INSTALLATION.)
3. Remove in the order indicated in the table.
4. Install in the reverse order of removal.



1	Fresh-air duct
2	Air cleaner
3	Air hose
4	Resonance chamber
5	Air intake pipe

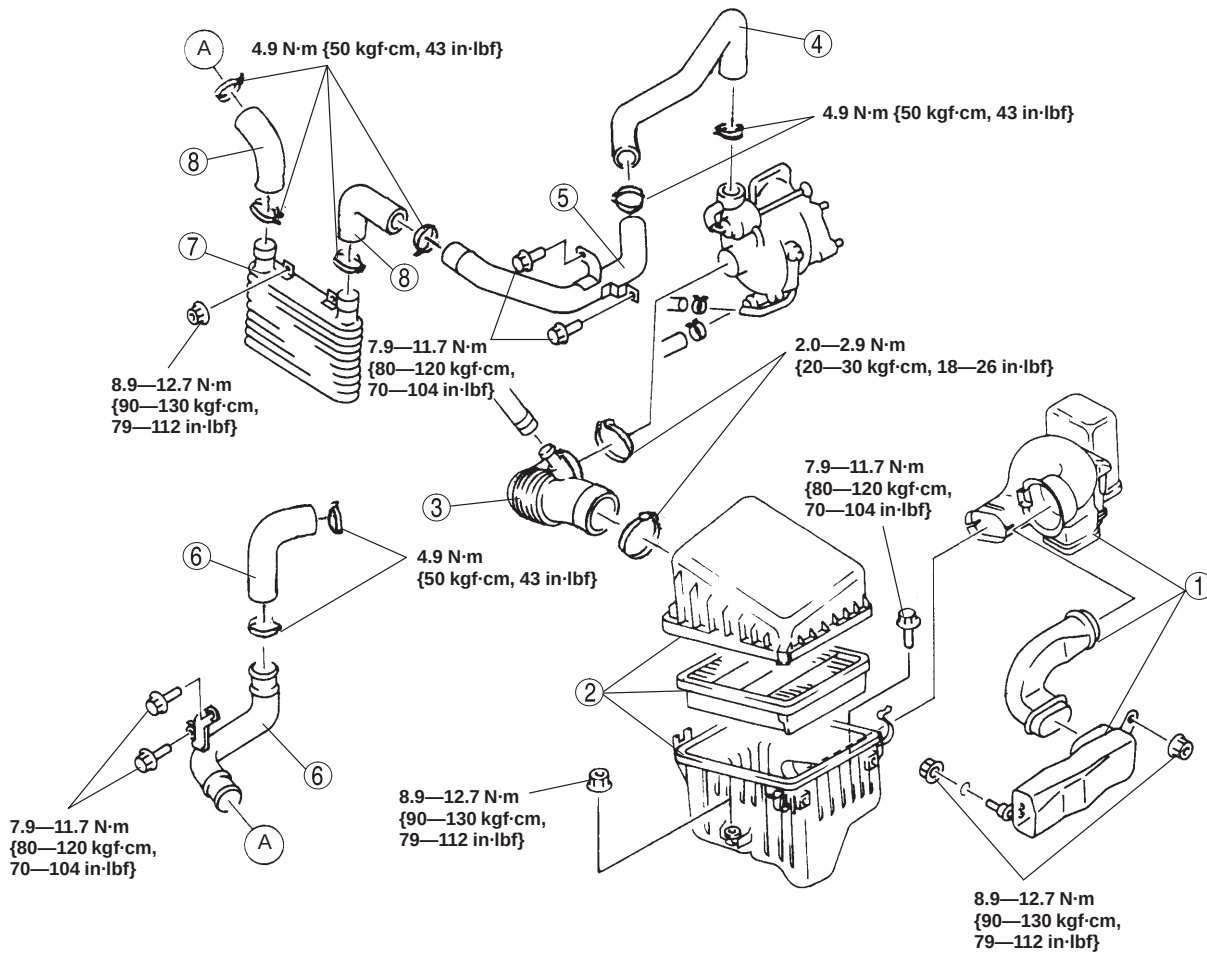
6	FICD solenoid valve No.1
7	FICD solenoid valve No.2
8	FICD solenoid valve bracket
9	Intake manifold

INTAKE-AIR SYSTEM

WL Turbo

1. Disconnect the negative battery cable.
2. Drain the engine coolant from radiator. (Refer to Section E, COOLING SYSTEM, ENGINE COOLANT REPLACEMENT.)
3. Remove the front mud guard. (Refer to Section S, FRONT FENDER PANEL, FRONT FENDER PANEL REMOVAL/INSTALLATION.)
4. Remove the injection pipe. (Refer to FUEL SYSTEM, INJECTION NOZZLE REMOVAL/INSTALLATION.)
5. Remove in the order indicated in the table.
6. Install in the reverse order of removal.
7. Refill the engine coolant to radiator. (Refer to Section E, COOLING SYSTEM, ENGINE COOLANT REPLACEMENT.)

STEP 1

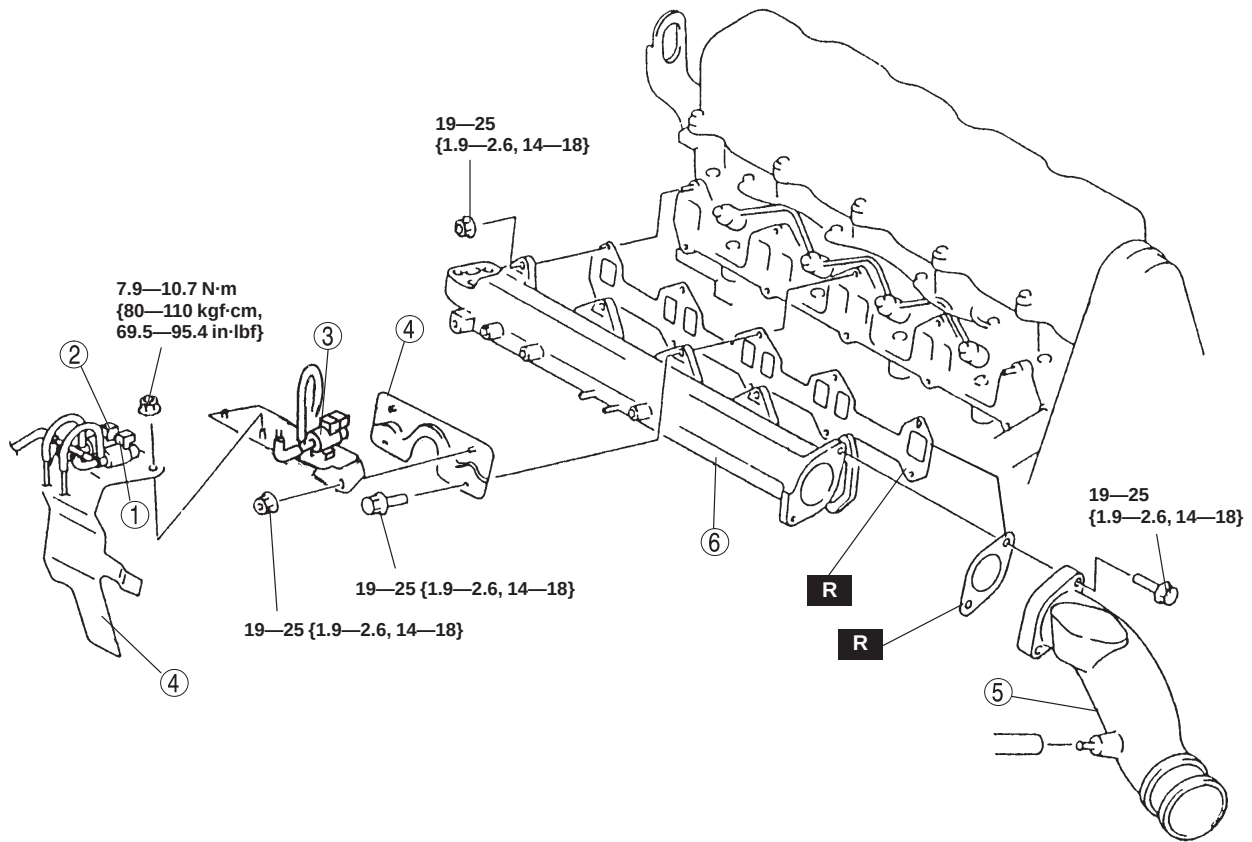


1	Fresh-air duct
2	Air cleaner
3	Air intake hose
4	Air hose

5	Air intake pipe
6	Air hose
7	Charge air cooler
8	Air hose

INTAKE-AIR SYSTEM

STEP 2



N·m {kgf·m, ft·lbf}

1	FICD solenoid valve No.1
2	FICD solenoid valve No.2
3	EGR solenoid valve

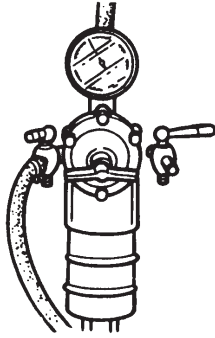
4	FICD solenoid valve bracket
5	Air intake pipe
6	Intake manifold

INTAKE-AIR SYSTEM

TURBOCHARGER INSPECTION Wastegate Actuator Inspection

Caution

- Compressed air used in the workshop is highly pressurized and can damage the actuator. Adjust the air pressure with a transformer, and inspect the actual pressure by using an air blower before actual use. Stop blowing air if the rod moved.

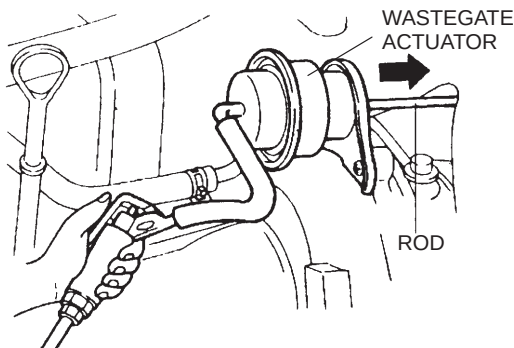


- Disconnect the air hose of the wastegate actuator on the compressor housing side.
- Apply the compressed air using the air gun.
- Note the air pressure when the wastegate actuator is moved.

Specification

107—115 kPa

{1.09—1.18 kgf/cm², 15.5—16.8 psi}



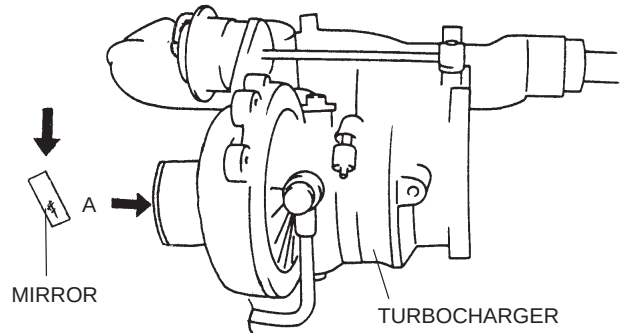
- If not within the specification, replace the turbocharger. (Refer to EXHAUST SYSTEM, EXHAUST SYSTEM REMOVAL/INSTALLATION.)

Compressor Wheels Inspection

- Remove the air hose. (Refer to INTAKE-AIR SYSTEM, INTAKE-AIR SYSTEM REMOVAL/INSTALLATION.)
- Remove the joint pipe. (Refer to EXHAUST SYSTEM, EXHAUST SYSTEM REMOVAL/INSTALLATION.)
- Set the small mirror as shown and inspect the compressor wheel from view A.

Note

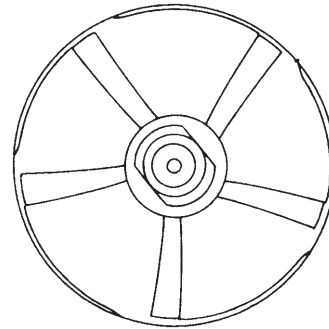
- To make work accurate, use a penlight to inspect.



- Inspect all fins of compressor wheel while rotating the compressor wheel by hand.
- If the compressor wheel is interfering with the housing, it is likely that more than two fins are damaged, cracked or bent. Replace the turbocharger.

Note

- If scratches are found inside the housing but the fins are okay, the turbocharger is okay. Scratches are made in the turbocharger made by factory.

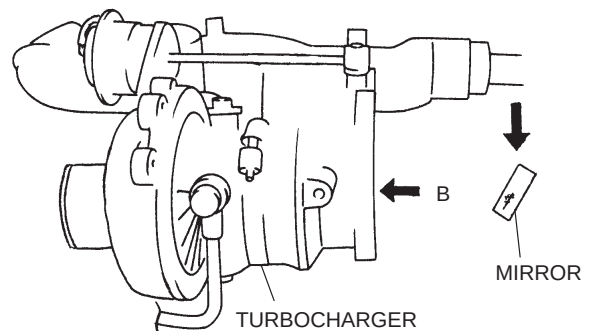


Turbine Wheels Inspection

- Remove the air hose. (Refer to INTAKE-AIR SYSTEM, INTAKE-AIR SYSTEM REMOVAL/INSTALLATION.)
- Remove the joint pipe. (Refer to EXHAUST SYSTEM, EXHAUST SYSTEM REMOVAL/INSTALLATION.)
- Set the small mirror as shown and inspect the turbine wheel from view B.

Note

- To make work accurate, use a penlight to inspect.



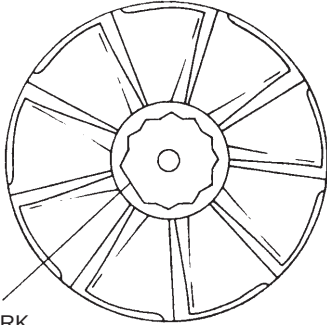
- Inspect all fins of turbine wheel while rotating the turbine wheel by hand.

INTAKE-AIR SYSTEM

- If the turbine wheel is interfering with the housing, it is likely that one or more fins are damaged, cracked or bent. Replace the turbocharger.

Note

- Grinding marks on the shaft are normal. This mark is for adjusting the shaft balance at the factory.



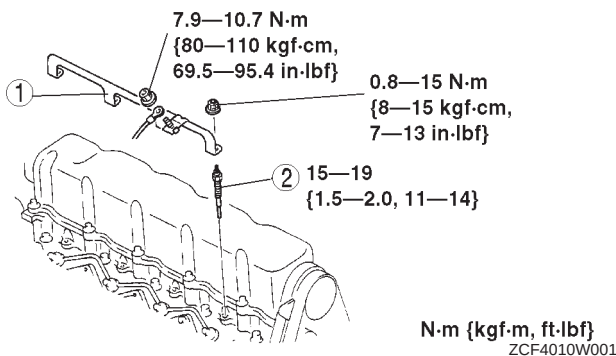
GRINDING MARK

GLOW PLUG REMOVAL/INSTALLATION

Caution

- Do not damage the heated section of the glow plug.
- Do not reuse a glow plug that has been dropped over a height of 10 cm, even when there are no scratches and resistance is normal (0.5 ohms at normal temperature).
- Do not remove the glow plug unless you are replacing it.

- Disconnect the negative battery cable.
- Remove in the order indicated in the table.
- Install in the reverse order of removal.



1	Glow plug cord
2	Glow plug (SeeGlow plug removal note) (SeeGlow plug installation note) (SeeGlow plug cleaning before installation note)

Glow plug removal note

- When removing the glow plug, first loosen it at least one pitch using a tool, then loosen by hand.

Glow plug installation note

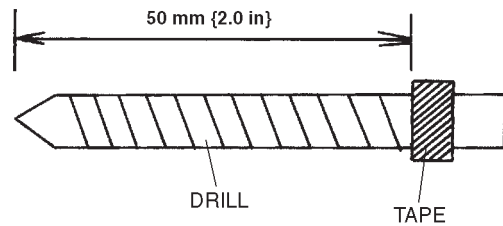
- Tighten the glow plug it at least one pitch by hand, and continue tightening with a tool.

Glow plug cleaning before installation note WL-3 / WLT-3 (Euro 3 Regulation Models)

Caution

- Carbon on the glow plug can damage the glow plug and engine. Remove carbon on the glow plug and fitting holes before installing the glow plug.

- Wrap tape on both a 5.5 mm and a 5.7 mm drills, starting from the tip to a point 50 mm from the tip.



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- Push in the 5.5 mm drill until the section covered with tape is fully inserted.
- Turn the drill by hand to remove the carbon on the fitting holes.
- Repeat steps 2. and 3. for the 5.7 mm drill.

GLOW PLUG INSPECTION

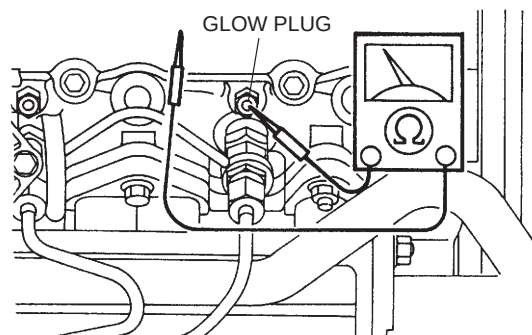
WL/ WL-T models

- Remove the glow plug cord.
- Inspect the resistance between the glow plug terminal and the cylinder head.

Specification

Glow plug resistance

Approx. 0.75 Ω [20 °C {68 °F}]



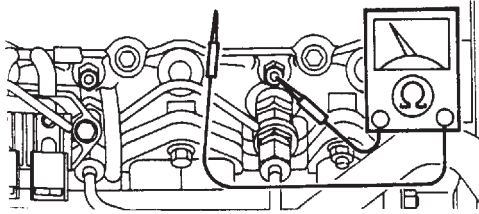
- If not as specified, replace the glow plug.

INTAKE-AIR SYSTEM

GLOW PLUG INSPECTION

WL-3 / WLT-3 (Euro 3 Regulation Models)

1. Remove the glow plug cord. (See GLOW PLUG REMOVAL/INSTALLATION.)
2. Inspect for continuity between the glow plug terminal and the cylinder head using an ohmmeter.



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- If there is no continuity, replace the glow plug.

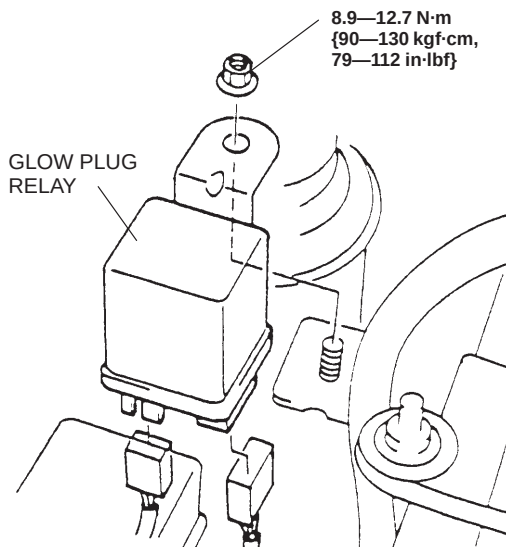
Glow plug resistance

Approx. 0.5 ohm [20°C {68°F}]

3. Install the glow plug cord.

GLOW PLUG RELAY REMOVAL/INSTALLATION

1. Disconnect the negative battery cable.
2. Remove glow plug relay.
3. Install the glow plug relay.



4. Connect the negative battery cable.

GLOW PLUG RELAY INSPECTION

System Inspection

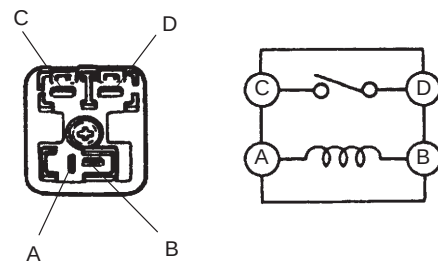
1. Carry out the "Glow system inspection". (Refer to TROUBLESHOOTING, SYSTEM INSPECTION, Glow System Inspection.)
2. If not as specified, perform the further inspection for the glow plug relay.

Continuity Inspection

Note

- Perform the following test only when directed.

1. Remove the glow plug relay.
2. Inspect for continuity between terminals C and D of the glow plug relay under the following conditions.



○—○ : Continuity

Step	A	B	C	D
1	B+	GND	○—○	○—○
2	○—○	○—○		

3. If there is no continuity, replace the glow plug relay. (Refer to GLOW PLUG RELAY REMOVAL/INSTALLATION.) If as specified but the System Inspection is failed, inspect following:

Open circuit

- Power circuit (Glow plug relay connector terminal A (1-pin: R/B) and battery)
- Power circuit (Glow plug relay connector terminal A (2-pin) and PCM connector terminal O)
- GND circuit (Glow plug relay connector terminal A (1-pin: R) and glow plug cord)
- GND circuit (Glow plug relay connector terminal B (2-pin) and engine GND)
- Signal circuit (Glow plug relay connector terminal A (1-pin: R) and PCM connector terminal I)

Short circuit

- Glow plug relay connector terminal A (1-pin: R/B) and battery to GND.
 - Glow plug relay connector terminal A (2-pin) and PCM connector terminal O to GND.
 - Glow plug relay connector terminal A (1-pin: R) and PCM connector terminal I to GND.
4. Repair or replace faulty areas.
 5. Install the glow plug relay.

INTAKE-AIR SYSTEM

GLOW PLUG CORD INSPECTION

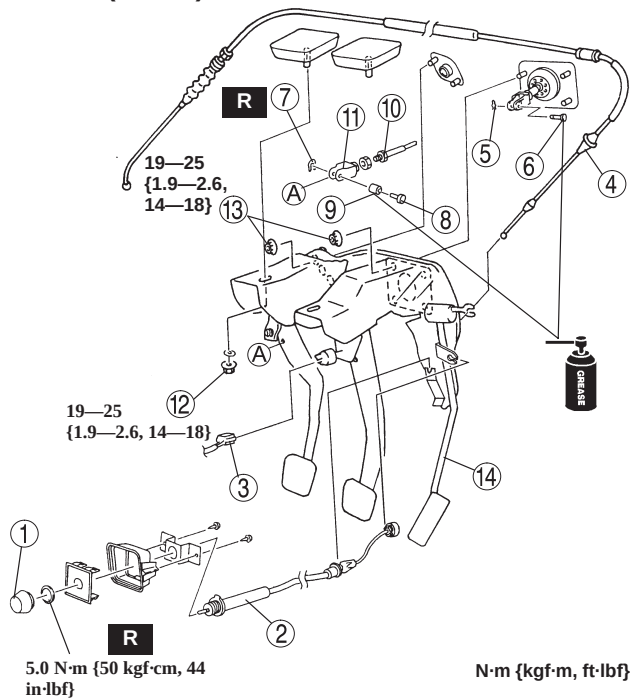
1. Remove the glow plug cord. (Refer to GLOW PLUG REMOVAL/INSTALLATION.)
2. Verify that the glow plug cord is not broken or bent.
3. Verify there is continuity at both ends of the glow plug cord.
4. If there is no continuity, replace the glow plug cord.

ACCELERATOR PEDAL REMOVAL/INSTALLATION

1. Disconnect the negative battery cable.
2. Remove the column cover. (Refer to Section N, MANUAL STEERING WHEEL AND COLUMN REMOVAL/INSTALLATION.)
3. Remove in the order indicated in the table.
4. Install in the reverse order of removal.

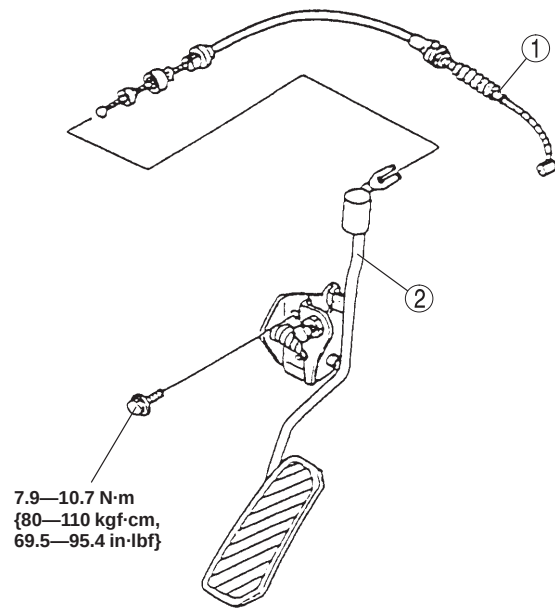
WL/ WL-T models

General (R.H.D.)



1	Idling knob
2	Idling cable
3	Brake switch connector
4	Accelerator cable + Installation Note
5	Spring pin
6	Clevis pin
7	E clip
8	Pin
9	Bushing
10	Push rod
11	Clevis
12	Nut
13	Nut
14	Pedal component + Installation Note

Except General (R.H.D.)

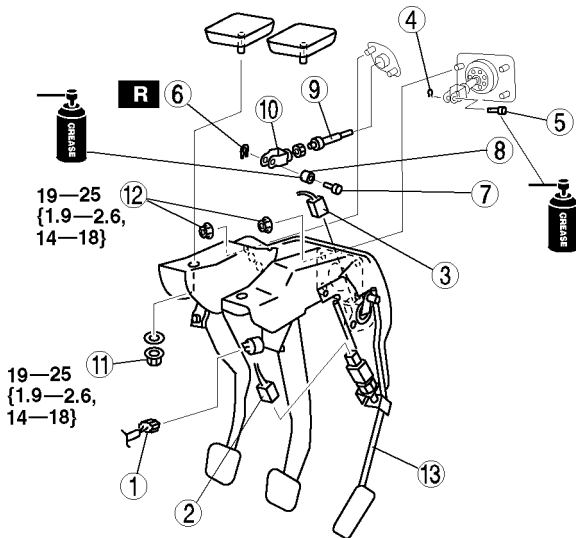


1	Accelerator cable + Installation Note
2	Accelerator pedal

INTAKE-AIR SYSTEM

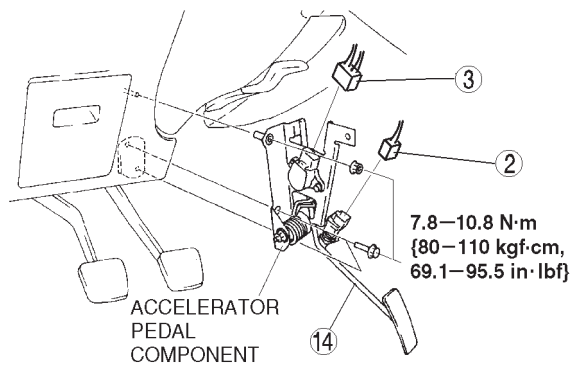
WL-3 / WLT-3 (Euro 3 Regulation Models)

R.H.D.



N·m {kgf·m, ft·lbf}
ZCF4010W013

L.H.D.



ZCF4010W005

1	Brake switch connector
2	Idle switch connector
3	Accelerator position sensor connector
4	Spring pin
5	Clevis pin
6	E clip
7	Pin
8	Bushing
9	Push rod
10	Clevis
11	Nut
12	Nut
13	Pedal component (See NO TAG Pedal component installation note)
14	Accelerator pedal component

Pedal Component Installation Note

- Carry out the "BRAKE PEDAL HEIGHT INSPECTION" procedure after installing the pedal component. (Refer to Section P, BRAKE PEDAL HEIGHT INSPECTION.)
- Carry out the "CLUTCH PEDAL INSPECTION" procedure after installing the pedal component. (Refer to Section H, CLUTCH PEDAL INSPECTION/ADJUSTMENT.)

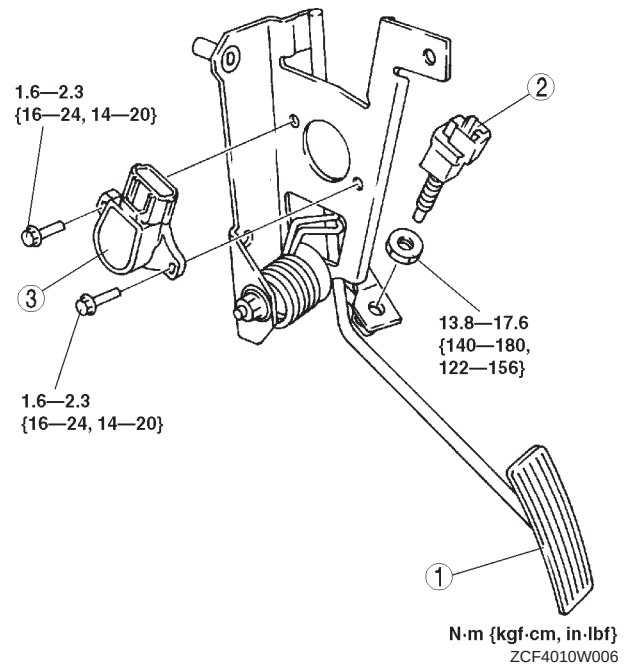
Accelerator Cable Installation Note

- Carry out the "ACCELERATOR CABLE INSPECTION/ADJUSTMENT" procedure after installing the accelerator cable. (Refer to ACCELERATOR CABLE INSPECTION/ADJUSTMENT.)

ACCELERATOR PEDAL COMPONENT DISASSEMBLY/ASSEMBLY

WL-3 / WLT-3 (Euro 3 Regulation Models)

1. Disassemble in the order indicated in the table.
2. Assemble in the reverse order of disassembly.

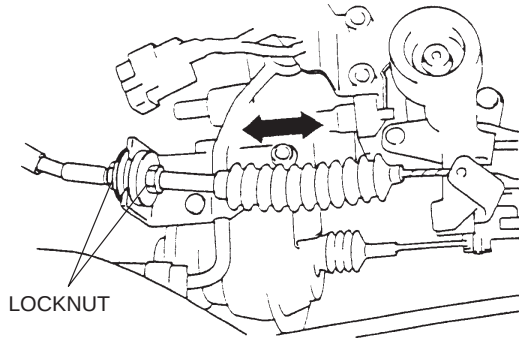


N·m {kgf·cm, in·lbf}
ZCF4010W006

1	Accelerator pedal
2	Idle switch (See NO TAG IDLE SWITCH ADJUSTMENT)
3	Accelerator position sensor (See NO TAG ACCELERATOR POSITION SENSOR ADJUSTMENT)

ACCELERATOR CABLE INSPECTION/ADJUSTMENT

1. Warm up the engine, then turn the engine switch off.
2. Measure the free play of the accelerator cable.

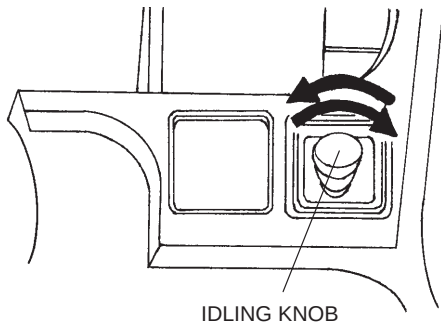


Free play
1—3 mm {0.04—0.11 in}

3. If not as specified, adjust by turning locknut.

IDLING KNOB, IDLING CABLE INSPECTION General (R.H.D.)

1. Verify that the accelerator pedal is in the idling position, when the idling knob is not turned.
2. Verify that the accelerator pedal moves in the direction that engine speed increases, when the idling knob is turned to the right.
3. Verify that the accelerator pedal returns to the idling position when the idling knob is turned to the left.



FUEL SYSTEM

BEFORE REPAIR PROCEDURE

Warning

- **Fuel vapor is hazardous. It can very easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.**
- Fuel in the fuel system is under high pressure when the engine is not running.

Warning

- **Fuel line spills and leaks are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete the following “Fuel Line Safety Procedures”.**

Fuel Line Safety Procedures

- Avoid fuel line spills and leaks by completing the following procedures.
 - (1) Remove the fuel-filler cap and release the pressure in the fuel tank.
 - (2) When disconnecting a fuel hose, wrap a rag around it to protect against fuel leakage.
 - (3) Plug the fuel hose after removal.

AFTER REPAIR PROCEDURE

Warning

- **Fuel line spills and leaks are dangerous. Fuel can ignite and cause serious injuries or death and damage. When installing the fuel hose, observe “Fuel Hose Installation” described below.**

Fuel Hose Installation

- Verify that there is no damage or deformation on the fuel hose and fuel pipe when installing.

FUEL SYSTEM

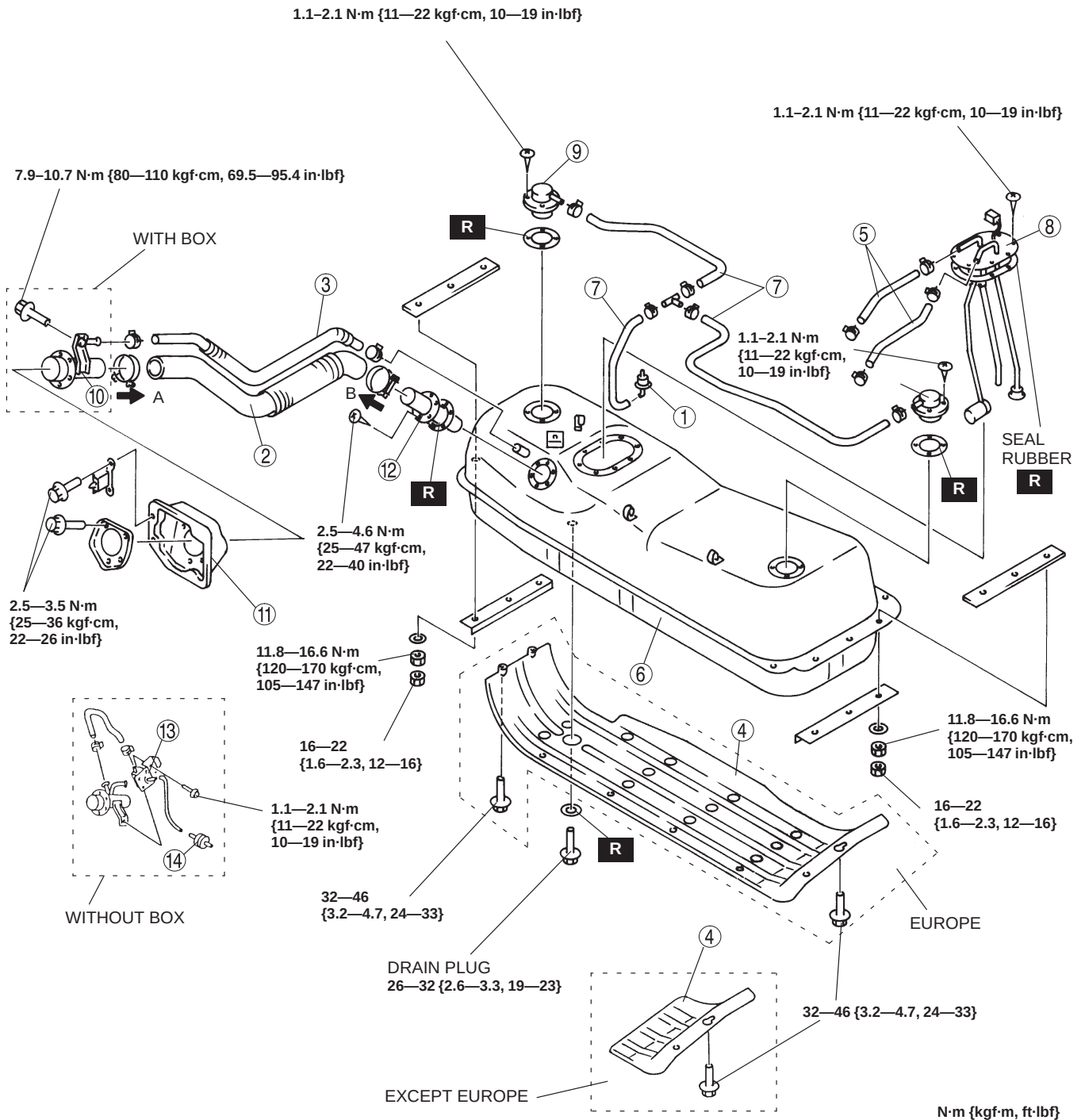
FUEL TANK REMOVAL/INSTALLATION

Warning

- Repairing a fuel tank that has not been properly steam cleaned can be dangerous. Explosion or fire may cause death or serious injury. Always properly steam clean a fuel tank before repairing it.

1. Disconnect the negative battery cable.
2. Complete the "BEFORE REPAIR PROCEDURE". (Refer to FUEL SYSTEM, BEFORE REPAIR PROCEDURE.)
3. Remove the drain plug and drain the fuel from the fuel tank.
4. Remove the rear flap.
5. Remove in the order indicated in the table.
6. Install in the reverse order of removal.
7. Complete the "AFTER REPAIR PROCEDURE". (Refer to FUEL SYSTEM, AFTER REPAIR PROCEDURE.)

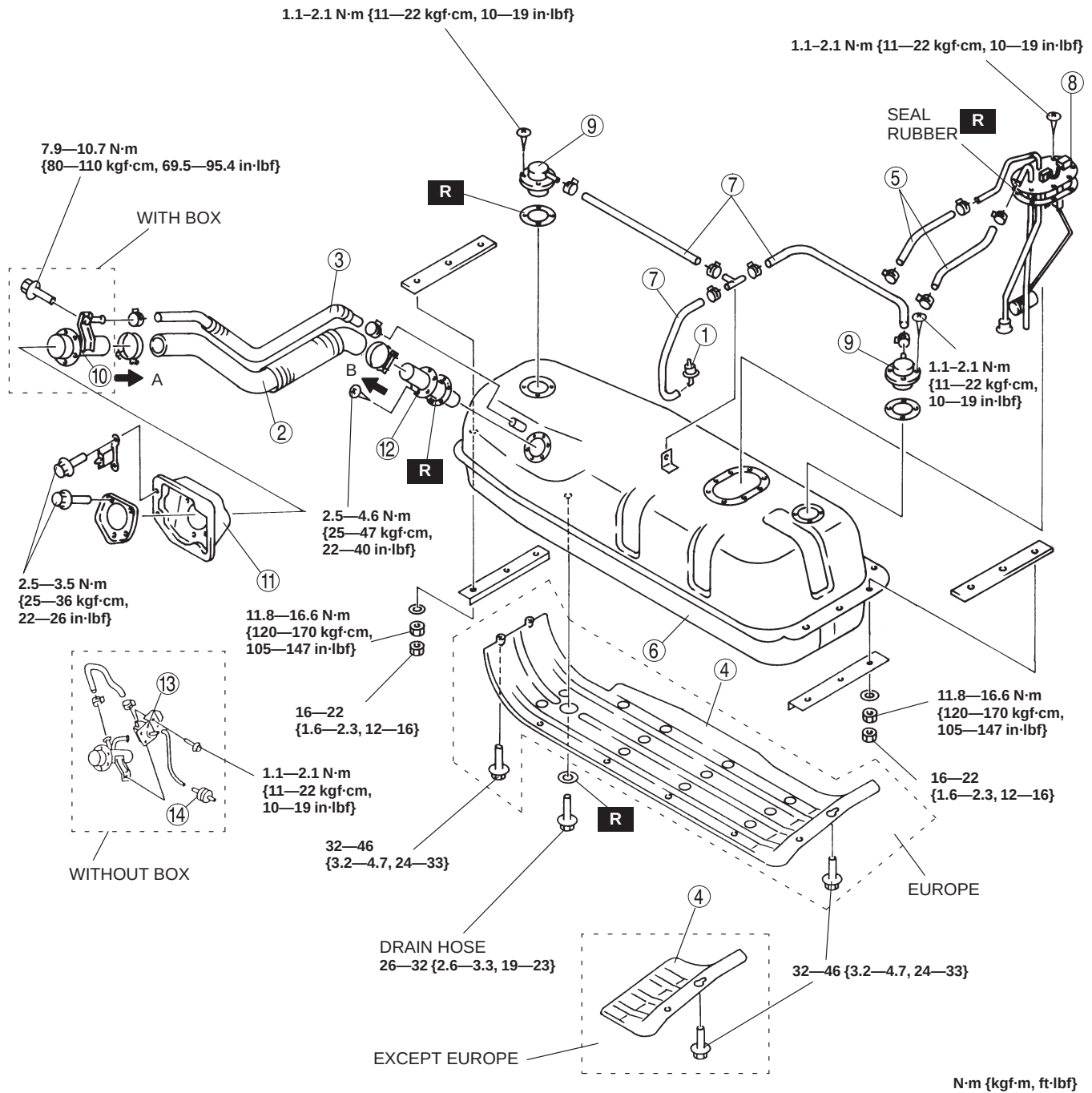
STRETCH CAB 2WD, DOUBLE CAB 2WD



N·m {kgf·m, ft·lbf}

FUEL SYSTEM

STRETCH CAB 4WD, DOUBLE CAB 4WD, REGULAR CAB



1	Evaporative chamber (If equipped)
2	Joint hose + Installation Note
3	Breather hose + Installation Note
4	Under guard
5	Fuel hose + Installation Note
6	Fuel tank

7	Evaporative hose + Installation Note
8	Fuel gauge sender unit
9	Rollover valve
10	Fuel-filler pipe
11	Dust cover
12	Fuel inlet pipe
13	Check valve (two-way)
14	Evaporative chamber

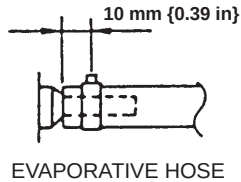
FUEL SYSTEM

Evaporative Hose Installation Note

- Fit each hose onto the respective fittings within the specification, and install clamps as shown.

Length

Evaporative hose: 25 mm {0.98 in}

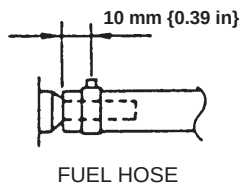


Fuel Hose Installation Note

- Fit each hose onto the respective fittings within the specification, and install clamp as shown.

Length

Fuel hose: 25 mm {0.98 in}

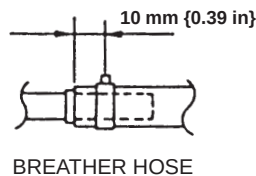


Breather Hose Installation Note

- Fit each hose onto the respective fittings within the specification, and install clamp as shown.

Length

Breather hose: 25 mm {0.98 in}

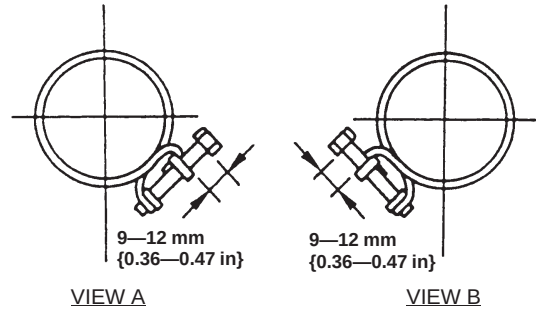


Joint Hose Installation Note

- Fit the joint hose onto the respective fittings within the specification, and install clamps as shown.

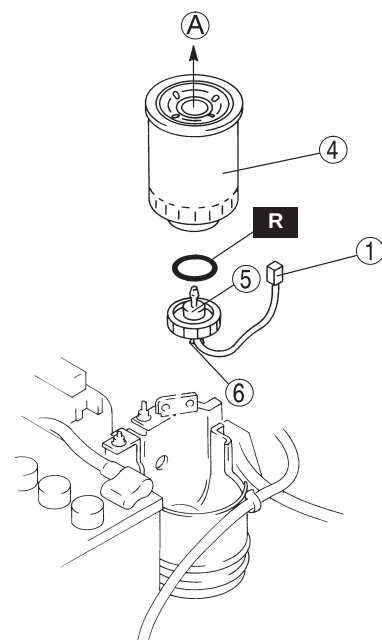
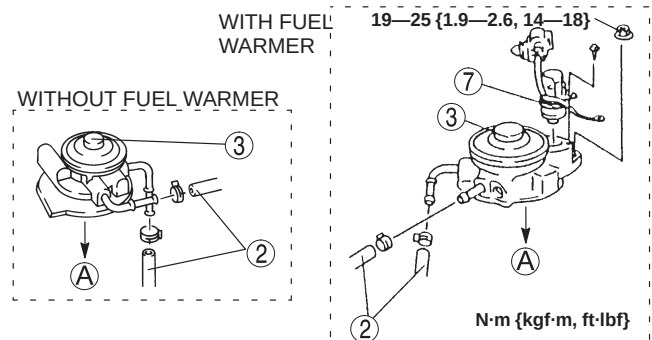
Length

Joint hose: 35 {1.4 in}



FUEL FILTER DISASSEMBLY/ASSEMBLY

- Disconnect the negative battery cable.
- Complete the "BEFORE REPAIR PROCEDURE". (Refer to FUEL SYSTEM, BEFORE REPAIR PROCEDURE.)
- Disassemble in the order indicated in the table.
- Assemble in the reverse order of removal.
- Complete the "AFTER REPAIR PROCEDURE". (Refer to FUEL SYSTEM, AFTER REPAIR PROCEDURE.)
- Bleed air from the fuel filter. (Refer to FUEL SYSTEM, FUEL FILTER AIR BLEEDING.)
- Start the engine and verify that fuel does not leak from the fuel system.
- If fuel leaks, reassemble the fuel filter.



FUEL SYSTEM

1	Connector
2	Fuel hose
3	Priming pump
4	Fuel filter + Assembly Note
5	Sedimentor switch + Assembly Note
6	Drain plug
7	Fuel warmer

Sedimentor Switch Assembly Note

- Apply a small amount of fuel to a new O-ring. Tighten the sedimentor switch enough to the fuel filter by hand.

Fuel Filter Assembly Note

- Apply a small amount of fuel to the fuel filter O-ring. Tighten the fuel filter approx. 3/4 by hand after the O-ring contacts the priming pump.

FUEL GAUGE SENDER UNIT

REMOVAL/INSTALLATION

(Refer to FUEL SYSTEM, FUEL TANK REMOVAL/INSTALLATION)

FUEL GAUGE SENDER UNIT INSPECTION

(Refer to Section T, WARNING AND INDICATOR SYSTEM, FUEL GAUGE SENDER UNIT INSPECTION.)

FUEL FILTER AIR BLEEDING

Caution

- Continuously cranking the engine for over 30 seconds can damage the battery and the starter.**
- Repeat cranking the engine for 30 seconds and stop for 5—10 seconds until the engine starts.

SEDIMENTOR WATER DRAINING

- Disconnect the negative battery cable.
- Complete the "BEFORE REPAIR PROCEDURE". (Refer to FUEL SYSTEM, BEFORE REPAIR PROCEDURE.)
- Loosen the drain plug located at the bottom of the fuel filter.
- Pump the priming pump and drain the water.
- After all the water has been drained, tighten the drain plug.
- Complete the "AFTER REPAIR PROCEDURE". (Refer to FUEL SYSTEM, AFTER REPAIR PROCEDURE.)
- Reconnect the negative battery cable.

SEDIMENTOR SWITCH INSPECTION

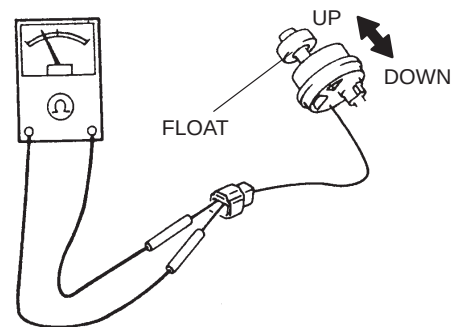
Continuity Inspection

Note

- Perform the following test only when directed.

- Disconnect the negative battery cable.
- Drain fuel from the fuel filter.
(Refer to FUEL SYSTEM, SEDIMENTOR WATER DRAINING.)
- Remove the sedimentor switch.
- Inspect continuity of the sedimentor switch by using an ohmmeter.

Float	Continuity
Up	Yes
Down	No

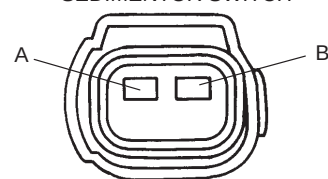


- If not as specified, replace the sedimentor switch. If as specified, inspect following:

Open circuit

- GND circuit (Sedimentor switch connector terminal B and body GND)
- Power circuit (Sedimentor switch connector terminal A and engine switch connector terminal C)

SEDIMENTOR SWITCH



HARNESS SIDE CONNECTOR
(VIEW FROM TERMINAL SIDE)

ENGINE SWITCH



HARNESS SIDE CONNECTOR
(VIEW FROM TERMINAL SIDE)

FUEL SYSTEM

Short circuit

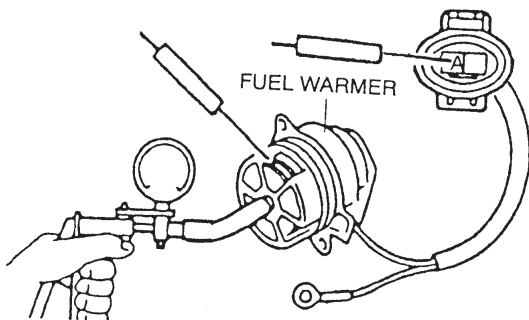
- GND circuit (Sedimentor switch connector terminal B and body GND to power circuit)
- Power circuit (Sedimentor switch connector terminal A and engine switch connector terminal C to GND)

6. Repair or replace faulty areas.
7. Install the sedimentor switch.
8. Reconnect the negative battery cable.
9. Bleed air from the fuel filter.(Refer to FUEL SYSTEM, FUEL FILTER AIR BLEEDING.)

FUEL WARMER INSPECTION

With fuel warmer

1. Disconnect the negative battery cable.
2. Complete the "BEFORE REPAIR PROCEDURE". (Refer to FUEL SYSTEM, BEFORE REPAIR PROCEDURE.)
3. Remove the fuel warmer. (Refer to FUEL SYSTEM, FUEL FILTER DISASSEMBLY/ASSEMBLY.)
4. Verify that the resistance between terminal A and the fuel warmer body is within the specification when vacuum of $-26.6\text{---}40.0\text{ kPa}$ $\{-200\text{---}300\text{ mmHg}, -7.9\text{---}11.8\text{ inHg}\}$ is applied to port A of the fuel warmer.



Specification

Water temperature °C {°F}	Resistance (Ω)
20 {68}	0.5—1.5

5. If not as specified, replace the fuel warmer.

FUEL INJECTION PUMP (FIP) INSPECTION

Caution

- FIP is sealed to maintain proper function. Special tools and testers are required when disassembling the FIP. Disassembling the FIP without special tools and testers will cause a malfunction.
- Consult your distributor for disassembly if any FIP internal parts are possibly malfunctioning.

WL-3 / WLT-3 (Euro 3 Regulation Models) Injection pump auxiliary parts inspection

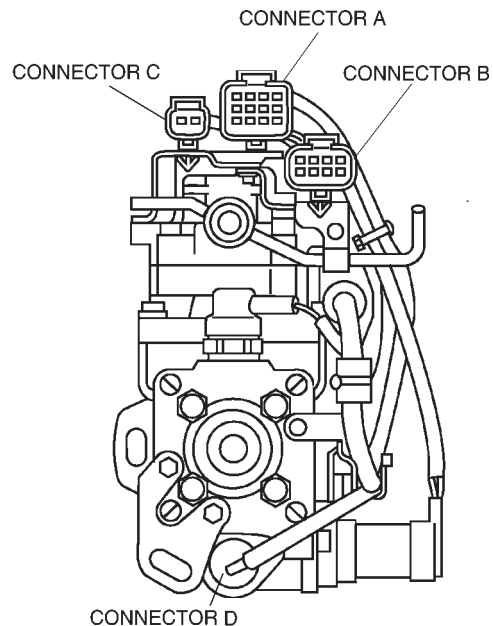
Caution

- Consult authorized BOSCH parts distributor for repair if any of the following injection

pump auxiliary parts are possibly malfunctioning:

1. Electronic governor
2. Timer position sensor
3. Control sleeve (CS) sensor
4. Fuel temperature sensor
5. Timer control valve (TCV)

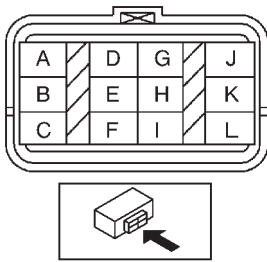
Location of the connectors on the injection pump



ZCF4012W003

FUEL SYSTEM

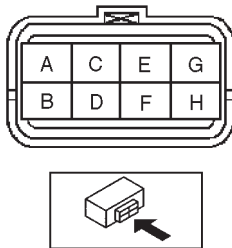
CONNECTOR A



ZCF4012W007

Terminal	Part name
A	-
B	TCV (-)
C	TCV (+)
D	-
E	Fuel temperature sensor (-)
F	CS sensor
G	CS sensor (+)
H	CS sensor (-)
I	Electronic governor (+)
J	FSO solenoid
K	Fuel temperature sensor (+)
L	Electronic governor (-)

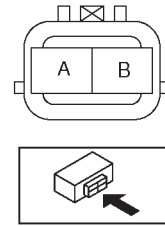
CONNECTOR B



ZCF4012W006

Terminal	Part name
A	Timer position sensor
B	Timer position sensor (-)
C	Timer position sensor (+)
D	Injection pump EPROM (VCC)
E	Injection pump EPROM (DI/DO)
F	Injection pump EPROM (CLK)
G	Injection pump EPROM (CS)
H	Injection pump EPROM (GND)

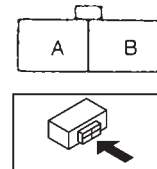
CONNECTOR C



ZCF4012W005

Terminal	Part name
A	Pump speed sensor (+)
B	Pump speed sensor (-)

CONNECTOR D



ZCF4012W010

Terminal	Part name
A	TCV body (+)
B	TCV body (-)

FUEL INJECTION PUMP (FIP) REMOVAL/INSTALLATION

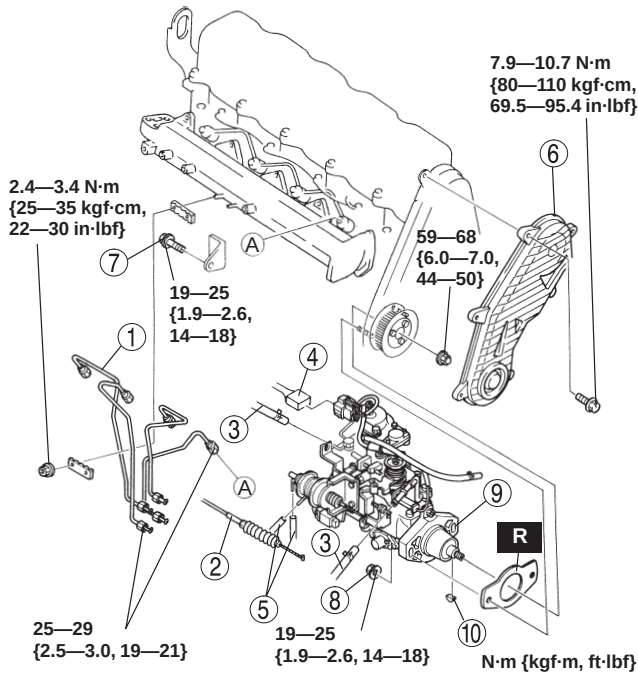
Caution

- After removing/installing the FIP, be sure to inspect the timing belt tension. If the belt tension is not inspected, the timing belt and the camshaft may become damaged. (Refer to section B2, TIMING BELT, TIMING BELT REMOVAL/INSTALLATION, Timing Belt Installation Note.)

- Disconnect the negative battery cable.
- Complete the "BEFORE REPAIR PROCEDURE". (Refer to FUEL SYSTEM, BEFORE REPAIR PROCEDURE.)
- Remove the FICD solenoid valve bracket. (Refer to INTAKE-AIR SYSTEM, INTAKE-AIR SYSTEM REMOVAL/INSTALLATION.)
- Remove the air intake pipe. (Refer to INTAKE-AIR SYSTEM, INTAKE-AIR SYSTEM REMOVAL/INSTALLATION.)
- Set the No.1 cylinder to TDC.
- Remove in the order indicated in the table.
- Install in the reverse order of removal.

FUEL SYSTEM

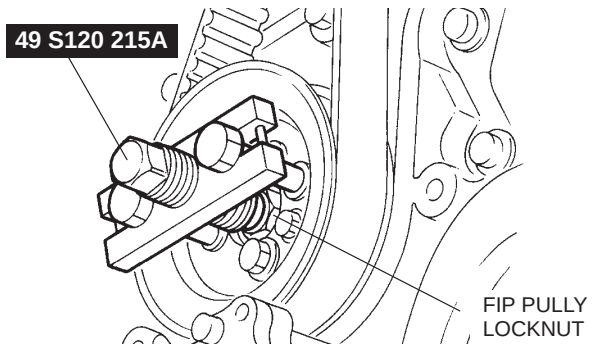
8. Complete the "AFTER REPAIR PROCEDURE". (Refer to FUEL SYSTEM, AFTER REPAIR PROCEDURE.)
9. Inspect injection timing. (Refer to ENGINE TUNE-UP, INJECTION TIMING ADJUSTMENT.)
10. Check the timing belt tension. (Refer to Section B2, TIMING BELT, TIMING BELT REMOVAL/INSTALLATION, Timing Belt Installation Note.)



1	Injection pipe
2	Accelerator cable
3	Fuel hose
4	Connector
5	Vacuum hose
6	Timing belt cover + Section B2, TIMING BELT, TIMING BELT REMOVAL/INSTALLATION, Timing Belt Cover Installation Note.
7	FIP mounting bolt
8	FIP mounting nut
9	FIP + Removal Note
10	Key

FIP Removal Note

1. Remove the two FIP pulley mounting bolts.
2. Loosen the FIP pulley locknut.
3. Remove the pulley with the SST.

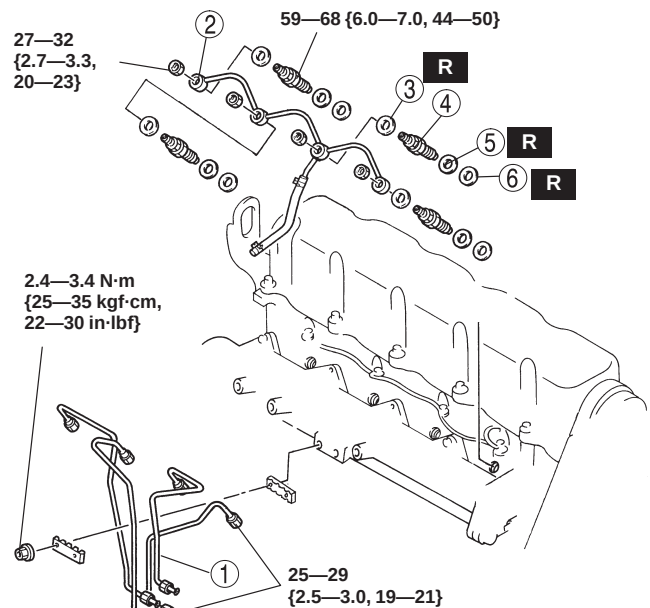


INJECTION NOZZLE REMOVAL/INSTALLATION

Caution

- Cover the outlet of the injection pipe and fuel hose with a rag.
- Catch the fuel with a rag.

1. Disconnect the negative battery cable.
2. Complete the "BEFORE REPAIR PROCEDURE". (Refer to FUEL SYSTEM, BEFORE REPAIR PROCEDURE.)
3. Remove the FICD solenoid valve bracket. (Refer to INTAKE-AIR SYSTEM, INTAKE-AIR SYSTEM REMOVAL/INSTALLATION.)
4. Remove in the order indicated in the table.
5. Install in the reverse order of removal.
6. Complete the "AFTER REPAIR PROCEDURE". (Refer to FUEL SYSTEM, AFTER REPAIR PROCEDURE.)



1	Injection pipe
2	Fuel leak pipe
3	Fuel leak washer
4	Injection nozzle + Installation Note

FUEL SYSTEM

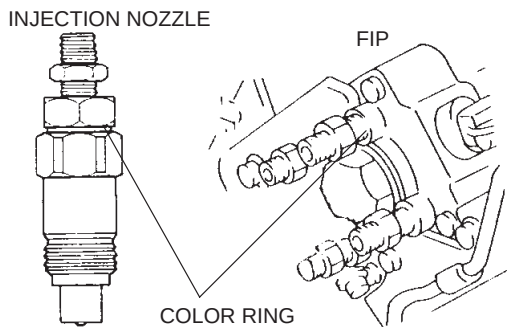
5	Nozzle washer
6	Corrugated gasket + Installation Note

Corrugated Gasket Installation Note

- Install the bead side facing combustion chamber.

Injection Nozzle Installation Note

- Install each injection nozzle onto the FIP, matching their identification color rings as shown.

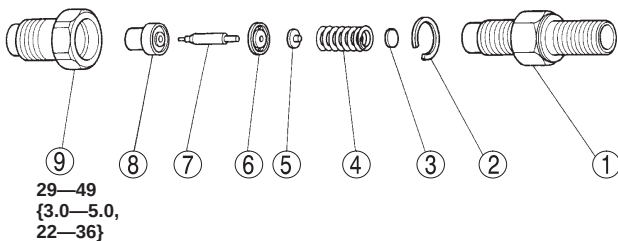


INJECTION NOZZLE DISASSEMBLY/ASSEMBLY

Caution

- The injection port is very small so it must be kept clean. Otherwise, foreign material may get stuck in the injection nozzle, causing damage.

- Disassemble in the order indicated in the table.
- Assemble in the reverse order of disassembly.



N·m {kgf·m, ft·lbf}

1	Nozzle holder body + Disassembly Note
2	Ring
3	Shim
4	Nozzle spring
5	Spring seat
6	Spacer
7	Needle valve + Assembly Note
8	Nozzle body
9	Retaining nut

Nozzle Holder Body Disassembly Note

- Secure the retaining nut in a vise and remove the nozzle holder body.

Needle Valve Assembly Note

- When the nozzle body or the needle valve is damaged, replace them as a set.

INJECTION NOZZLE INSPECTION

Caution

- Fuel and fuel tank used for the nozzle tester must be kept clean. Otherwise, foreign material may get stuck between the nozzle and the nozzle tester, causing damage.

Injection Starting Pressure

- Connect the injection nozzle to a nozzle tester.
- Bleed the air by pumping the nozzle tester handle several times.
- Slowly lower the nozzle tester handle and note the pressure when injection starts.

Injection starting pressure

11.4—12.1 MPa

{116—124 kgf/cm², 1650—1760 psi} (New)

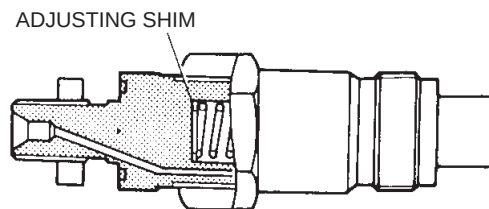
More than 10.0 MPa

{102 kgf/cm², 1450 psi} (Inspection)

- If the injection starting pressure is not within the specification, adjust it by installing the correct shim.

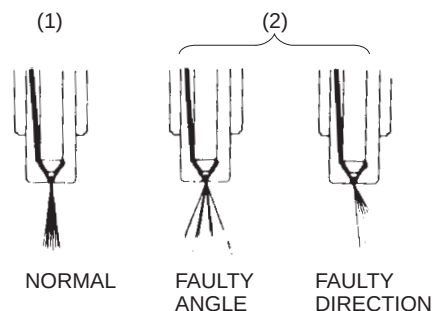
Note

- Adding/subtracting 0.02 mm {0.0008 in} thickness shim increases/decreases the starting pressure approx. 470 kPa {4.8 kgf/cm², 68 psi}.



Atomization

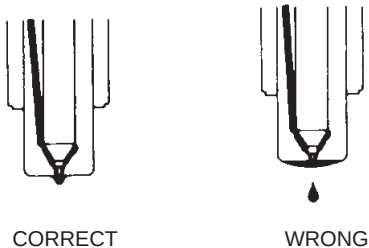
- Connect the injection nozzle to the nozzle tester.
- Bleed the air by pumping the nozzle tester handle several times.
- Lower the handle several times as quickly as possible so that a pulsating whistling sound is heard, and note the atomization pattern.
 - Uniform, proper atomization
 - Incorrect injection angle and direction



4. If necessary, disassemble and clean or replace the injection nozzle.

Nozzle Leakage

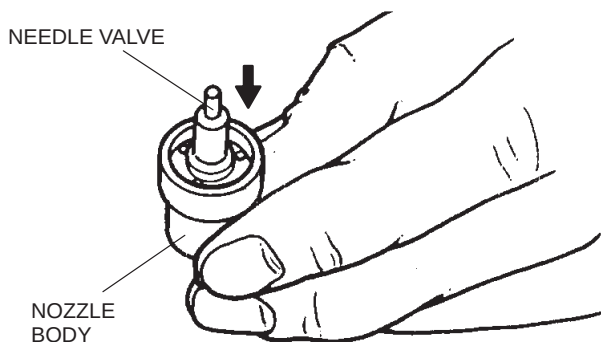
1. Connect the injection nozzle to the nozzle tester.
2. Bleed the air by pumping the nozzle tester handle several times.
3. Apply **8.8 MPa {90 kgf/cm², 1,280 psi}** pressure to the injection nozzle, and inspect for fuel leakage from the nozzle spray port.



4. If fuel leaks, disassemble and clean or replace the injection nozzle.

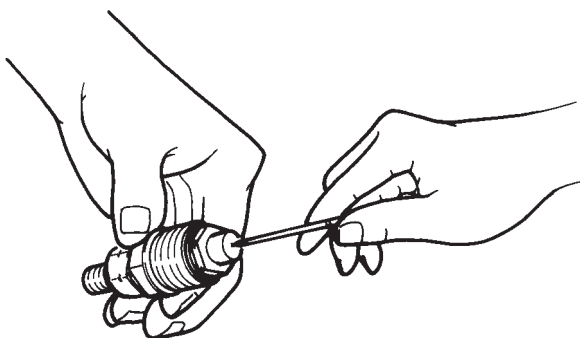
Operating Inspection

1. Verify that the needle valve and nozzle body are not damaged.
2. Verify that the nozzle body is not damaged. Hold the nozzle body upright and insert approximately two thirds of the needle valve; then see if the needle valve drops to the valve seat by its own weight when released.

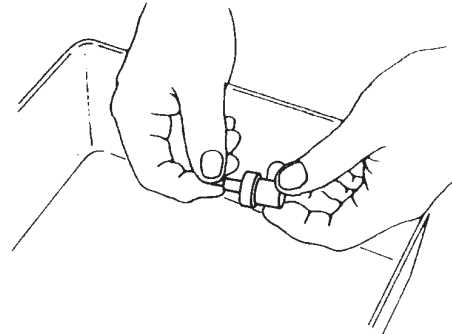


Injection Nozzle Cleaning

1. Inspect the outer and inner surfaces of the injection nozzle for carbon accumulation.
2. If carbon is observed on the outer surface, remove it by using a hard wood chip.
3. If carbon is observed inside of the nozzle, remove it by using a toothpick.



4. Remove the needle valve from the nozzle body.
5. Clean the needle valve and the nozzle body with clean light oil.
6. Verify that the needle valve moves smoothly in the nozzle body.
7. If not, replace the nozzle assembly.



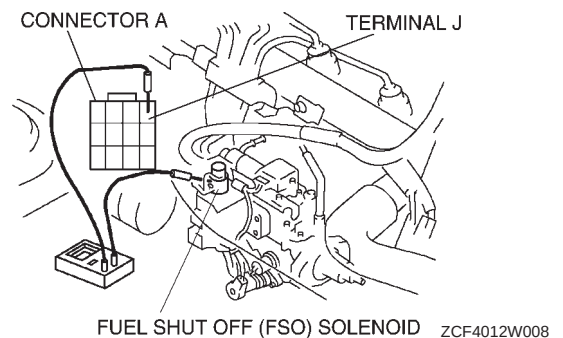
FUEL SHUT OFF (FSO) SOLENOID INSPECTION WL-3 / WLT-3 (Euro 3 Regulation models)

On-vehicle inspection Continuity inspection

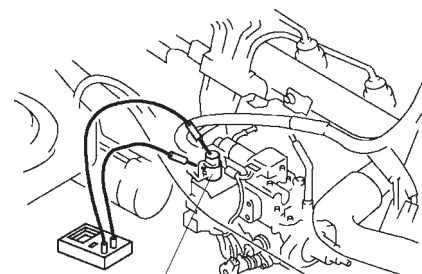
Note

- Perform the following test only when directed.

1. Disconnect the negative battery cable.
2. Disconnect the injection pump connector A.
3. Inspect for continuity between the terminals under the following conditions.



4. Remove the terminal cover of the FSO solenoid.
5. Verify that the resistance between the FSO solenoid terminal and the FSO solenoid body is within the specification.
 - If not as specified, replace the FSO solenoid.
 - If as specified, but the engine does not start, perform the following off-vehicle inspection.



FUEL SYSTEM

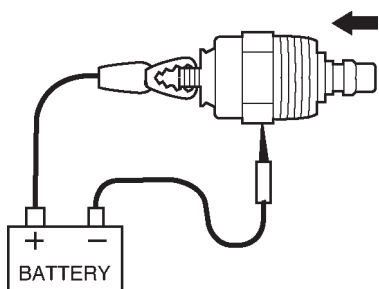
Specification

FSO temperature (°C {°F})	Resistance (ohm)
13—33 {55.4—91.4}	7.5—9.7

Off-vehicle inspection

Operation inspection

1. Remove the FSO solenoid.
2. Connect the battery positive voltage to the FSO solenoid terminal and ground the FSO solenoid body.
3. Verify that the valve stem is drawn into the valve.
 - If not as specified, replace the FSO solenoid.
 - If as specified, carry out the "Circuit Open/Short Inspection."



ZCF4012W002

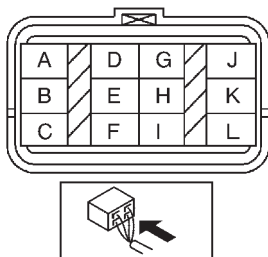
Circuit Open/Short Inspection

1. Inspect for an open or short circuit in the following wiring harnesses.
 - If there is an open or short circuit, repair or replace wiring harnesses.

Open circuit

- Power circuit (injection pump connector A terminal J and PCM connector terminal 4W)

CONNECTOR A
HARNESS SIDE CONNECTOR



ZCF4012W001

Short circuit

- Injection pump connector A terminal J and PCM connector terminal 4W to GND.

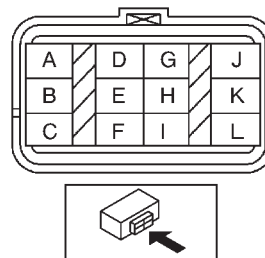
ELECTRONIC GOVERNOR INSPECTION WL-3 / WLT-3 (Euro 3 Regulation models) Resistance inspection

Note

- Perform the following test only when directed.

1. Disconnect the negative battery cable.
2. Disconnect the injection pump connector A.
3. Inspect for resistance between the terminals under the following conditions.
 - Consult authorized BOSCH parts distributor for repair if the electronic governor is possibly malfunctioning.

- If as specified, carry out the "Circuit Open/Short Inspection."



ZCF4012W004

Specification

Terminal	Atmospheric temperature (°C {°F})	Resistance (ohm)
I—L	18—28 {64.4—82.4}	0.58—0.84

Circuit Open/Short Inspection

1. Inspect for an open or short circuit in the following wiring harnesses.
 - If there is an open or short circuit, repair or replace wiring harnesses.

Open circuit

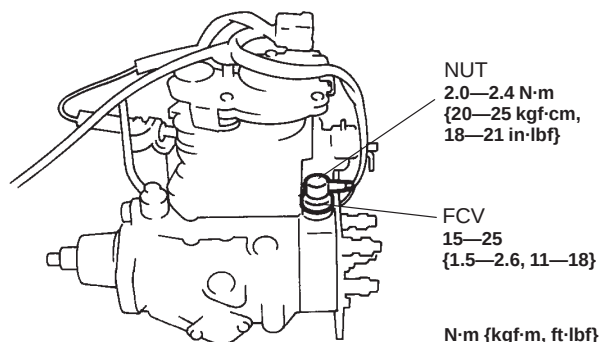
- Power circuit (Injection pump connector A terminal I and PCM connector terminal 4x)
- Signal circuit (Injection pump connector A terminal L and PCM connector terminal 4Y)

Short circuit

- Electronic governor connector terminal L and PCM connector terminal 4Y to GND.

FUEL CUT VALVE (FCV) REMOVAL/INSTALLATION Without immobilizer system

1. Disconnect the negative battery cable.
2. Complete the "BEFORE REPAIR PROCEDURE". (Refer to FUEL SYSTEM, BEFORE REPAIR PROCEDURE.)
3. Remove the FCV.
4. Install in the reverse order of removal.



FUEL CUT VALVE (FCV) INSPECTION Without immobilizer system On-vehicle Inspection

Note

- Perform the following test only when directed.

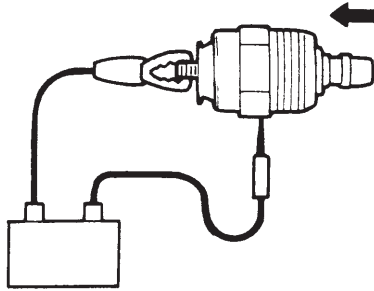
1. With the engine idling, disconnect the FCV connector and verify that the engine stops.

FUEL SYSTEM

- If the engine does not stop, carry out the following inspection.

Off-vehicle Inspection

- Disconnect the negative battery cable.
- Remove the FCV.
- Connect the battery positive voltage to the FCV terminal and GND the FCV body,
- Verify that the FCV stem is drawn into the FCV.



- Replace the FCV if not as specified.
If as specified, inspect following:

Open circuit

- GND circuit (FCV body and engine switch connector terminal IG1)
- Power circuit (FCV connector terminal and engine switch connector terminal IG1)

ENGINE SWITCH



HARNESS SIDE CONNECTOR
(VIEW FROM TERMINAL SIDE)

Short circuit

- GND circuit (FCV body and engine switch connector terminal IG1 to GND)
- Power circuit (FCV connector terminal and engine switch connector terminal IG1 to GND)

- Repair or replace faulty areas.
- Install the FCV.
- Reconnect the negative battery cable.

FICD SOLENOID VALVE NO.1, NO.2 INSPECTION

System Inspection

- Carry out the "FICD System Inspection". (Refer to TROUBLESHOOTING, SYSTEM INSPECTION, FICD System Inspection.)
- If not as specified, perform the further inspection for the FICD solenoid valve No.1, No.2.

Airflow Inspection

Note

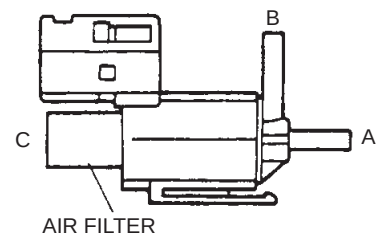
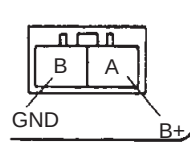
- Perform the following test only when directed.

- Disconnect the negative battery cable.

- Remove the FICD solenoid valve No.1, No.2.
(Refer to INTAKE-AIR SYSTEM, INTAKE-AIR SYSTEM REMOVAL/INSTALLATION.)
- Inspect for airflow between ports of the solenoid valve.

○—○ : Continuity ○=○ : Airflow

Step	Terminal		Port		
	A	B	A	B	C
1	○	○		○=○	○
2	B+	GND	○=○	○	



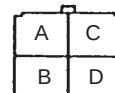
- If not as specified, replace the faulty FICD solenoid valve.
If as specified but the "System Inspection" is failed, inspect following:

Vacuum hose improper routing, kinks or leakage.

Open circuit

- GND circuit (FICD solenoid valve No.1 connector terminal B and PCM connector terminal C)
- GND circuit (FICD solenoid valve No.2 connector terminal B and PCM connector terminal P)
- Power circuit (FICD solenoid valve No.1 connector terminal A and engine switch connector terminal IG1)
- Power circuit (FICD solenoid valve No.2 connector terminal A and engine switch connector terminal IG1)

ENGINE SWITCH



HARNESS SIDE CONNECTOR
(VIEW FROM TERMINAL SIDE)

Short circuit

- GND circuit (FICD solenoid valve No.1 connector terminal B and PCM connector terminal IG1)
- GND circuit (FICD solenoid valve No.2 connector terminal B and PCM connector terminal P)
- Power circuit (FICD solenoid valve No.1 connector terminal A and engine switch connector terminal IG1 to GND)
- Power circuit (FICD solenoid valve No.2 connector terminal A and engine switch connector terminal IG1 to GND)

- Repair or replace faulty areas.

FUEL SYSTEM

6. Install the FICD solenoid valve No.1, No.2.
7. Reconnect the negative battery cable.

TIMER CONTROL VALVE (TCV) INSPECTION

Europe and UK

1. Carry out the "Timer Control Valve (TCV) Control Inspection". (Refer to TROUBLESHOOTING, SYSTEM INSPECTION, Timer Control Valve (TCV) Control Inspection.)
2. If not as specified, perform the further inspection for the TCV.

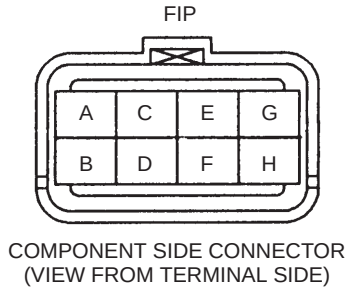
Continuity Inspection

WL / WLT Models

Note

- Perform the following test only when directed.

1. Disconnect the negative battery cable.
2. Disconnect the FIP connector (8-pin terminal).
3. Verify that there is continuity between the FIP connector terminal D and TCV body.



4. If not as specified, send TCV to a distributor for replacement. If the TCV is okay, but PCM terminal voltage is out of specification, inspect as follows and repair or replace as necessary.

Open circuit

- Power circuit (FIP connector terminal D and PCM connector terminal H)

Short circuit

- FIP connector terminal D and PCM connector terminal H to GND

5. Repair or replace faulty areas.
6. Reconnect the FIP connector.

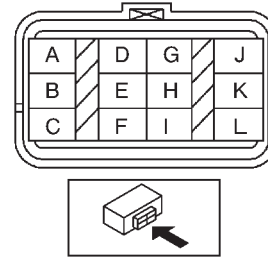
Euro3 Regulation models

Note

- Perform the following test only when directed.

1. Disconnect the negative battery cable.
2. Disconnect the injection pump connector A.
3. Inspect for continuity between the terminals B and C using an ohmmeter.

- If no continuity is detected, perform resistance inspection.



ZCF4012W004

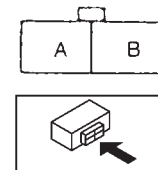
Resistance inspection

1. Disconnect the negative battery cable.
2. Disconnect the injection pump connector D.
 - Consult authorized BOSCH parts distributor for repair if the timer control valve (TCV) is possibly malfunctioning.
 - If as specified, carry out the "Circuit Open/Short Inspection."

Specification

Terminal	Atmospheric temperature ("C {°F})	Resistance (ohm)
A—B	10—30 {50—86}	10.3—11.7

CONNECTOR D



ZCF4012W010

Circuit Open/Short Inspection

1. Inspect for an open or short circuit in the following wiring harnesses.
 - If there is an open or short circuit, repair or replace wiring harnesses.

Open circuit

- Power circuit (Injection pump connector D terminal A and PCM control relay connector terminal D)
- Signal circuit (Injection pump connector D terminal B and PCM connector terminal 4U)

Short circuit

- Injection pump connector D terminal B and PCM connector terminal 4U to GND.

EXHAUST SYSTEM

EXHAUST SYSTEM

EXHAUST SYSTEM INSPECTION

1. Start the engine and inspect each exhaust system component for exhaust gas leakage.
2. If leakage is found, repair or replace as necessary.

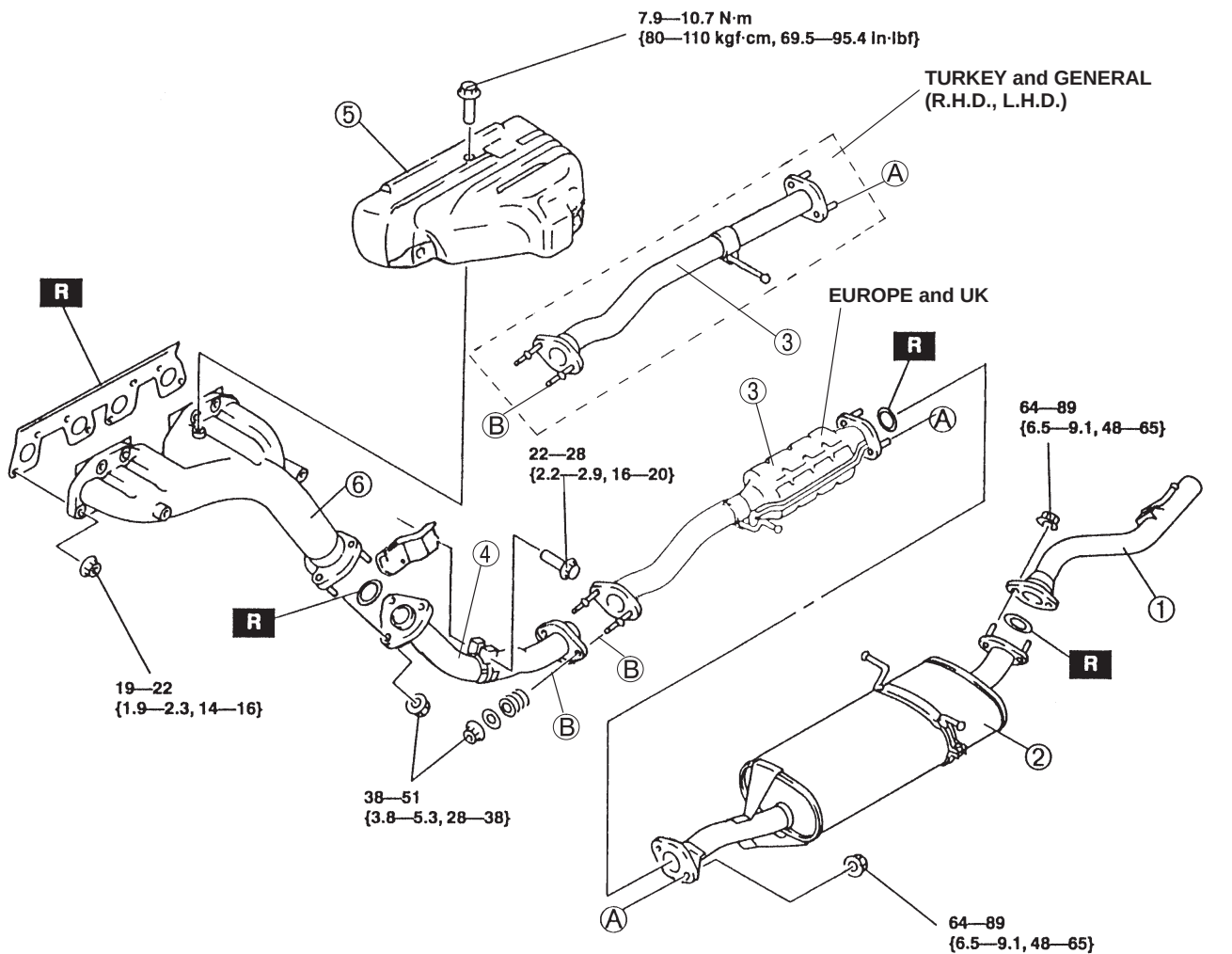
EXHAUST SYSTEM REMOVAL/INSTALLATION

Warning

- When the engine and exhaust system are hot, they can badly burn. Turn off the engine and wait until they are cool before removing the exhaust system.

1. Disconnect the negative battery cable.
2. Remove in the order indicated in the table.
3. Install in the reverse order of removal.

WL



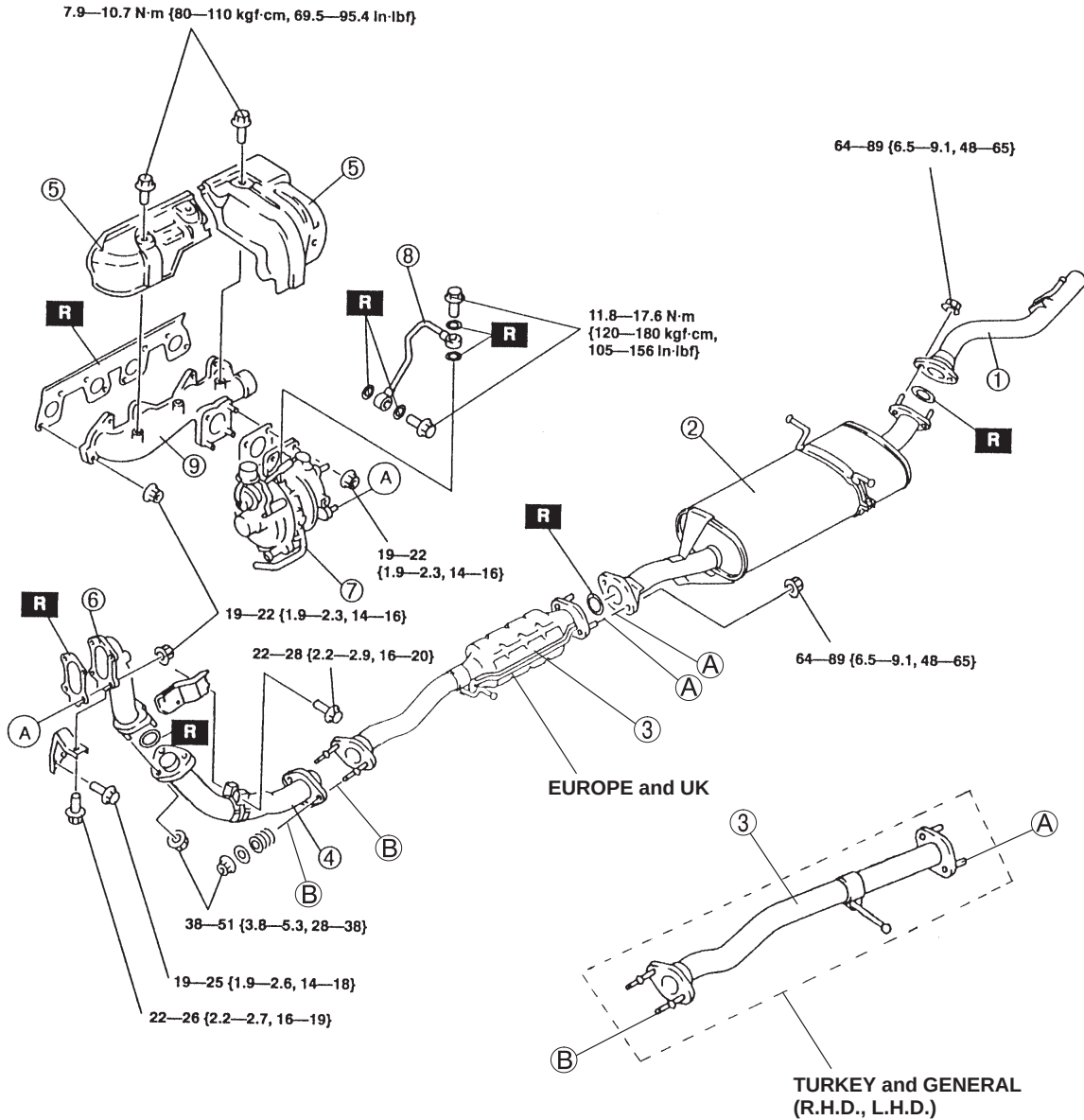
N·m {kgf·m, ft·lbf}

1	Tail pipe
2	Main silencer
3	• Middle pipe (Turkey and General (R.H.D., L.H.D.)) • OC (Europe and UK)

4	Front pipe
5	Exhaust manifold insulator
6	Exhaust manifold

EXHAUST SYSTEM

WL TURBO



N·m {kgf·m, ft·lbft}

1	Tail pipe
2	Main silencer
3	• Middle pipe (General (L.H.D.)) • OC (Europe and UK)
4	Front pipe
5	Exhaust manifold insulator

6	Joint pipe
7	Turbocharger + Removal Note
8	Oil pipe + Installation Note
9	Exhaust manifold

Oil Pipe Installation Note

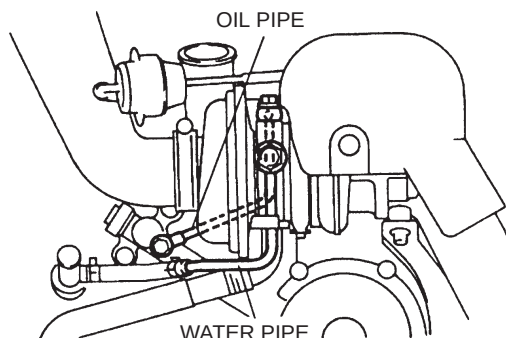
- Be sure to confirm that the turbocharger is installed correctly, then install the oil pipe.

Water pipe

- Install the water pipe and tighten to the specified torque.

Tightening torque

24—35 N·m {2.4—3.6 kgf·m, 18—26 ft·lbf}



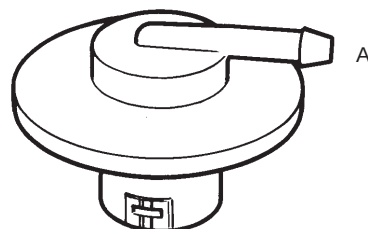
Turbocharger Removal Note

- Do not drop the turbocharger.
- Do not bend the wastegate actuator mounting or rod.
- Cover the intake, exhaust and oil passages to prevent dirt or other objects from entering.

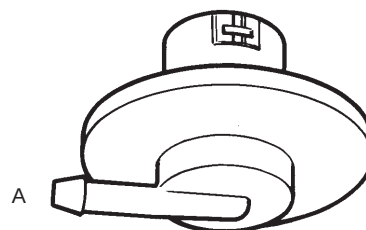
EMISSION SYSTEM

ROLLOVER VALVE INSPECTION

1. Remove the rollover valve. (Refer to FUEL SYSTEM, FUEL TANK REMOVAL/INSTALLATION.)
2. Blow from port A and verify that there is airflow.



3. Turn the valve over and blow from port A. Verify that there is no airflow.

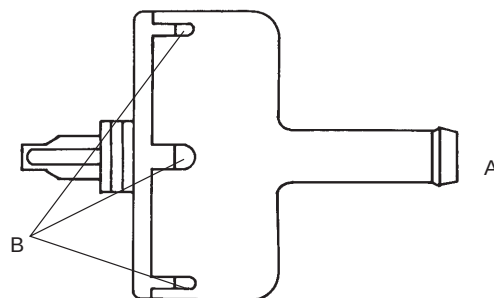


4. If not as specified, replace the rollover valve.

EVAPORATIVE CHAMBER INSPECTION

If equipped

1. Remove the evaporative chamber. (Refer to FUEL SYSTEM, FUEL TANK REMOVAL/INSTALLATION.)
2. Blow from port A and verify that there is airflow from port B.



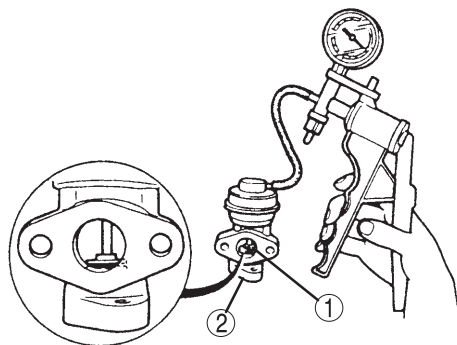
3. If not as specified, replace the evaporative chamber.

EGR VALVE INSPECTION WL Turbo for Europe and UK Airflow Inspection

Note

- Perform the following test only when directed.

- Remove the EGR valve.
- Inspect for airflow between 1 and 2 when vacuum is applied using a vacuum pump as shown in the figure.



Specification – WL Turbo for Europe and UK

Vacuum (kPa {mmHg, inHg})	Airflow
Below -21.3—-25.3 {-160—-190, -6.3—-7.4}	Yes
Except above	No

Specification – WLT-3 (Euro 3 Regulation Models)

Vacuum kPa {mmHg, inHg}	Airflow
Below -30.0—-36.6 {-225—-275, -8.9—-10.8}	Yes
Except above	No

- If not as specified, replace the EGR valve.

EGR SOLENOID VALVE INSPECTION WL Turbo for Europe and UK Airflow Inspection

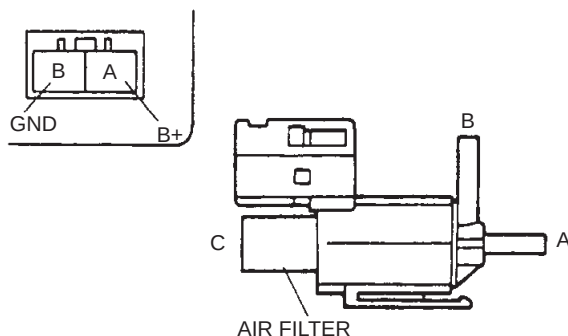
Note

- Perform the following test only when directed.

- Disconnect the negative battery cable.
- Remove the EGR solenoid valve (Refer to INTAKE-AIR SYSTEM, INTAKE-AIR SYSTEM REMOVAL/INSTALLATION, WL Turbo.)
- Inspect for airflow between ports of the solenoid valve.

○—○ : Continuity ○=○ : Airflow

Step	Terminal		Port		
	A	B	A	B	C
1	○—○	○—○		○=○	○=○
2	B+	GND	○=○	○=○	

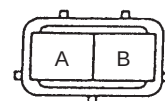


- If not as specified, replace the EGR solenoid valve. If the EGR solenoid valve is okay, but PCM terminal voltage is out of specification, inspect as follows and repair or replace as necessary.
- Vacuum hose improper routing, kinks or leakage.

Open circuit

- Power circuit (EGR solenoid valve connector terminal A and PCM connector terminal 1R)
- GND circuit (EGR solenoid valve connector terminal B and body GND through common connector)

EGR SOLENOID VALVE



HARNESS SIDE CONNECTOR
(VIEW FROM TERMINAL SIDE)

Short circuit

- EGR solenoid valve connector terminal A and PCM connector terminal 1R.
- Repair or replace faulty areas.
 - Install the EGR solenoid valve connector.

WLT-3 (Euro 3 Regulation Models)

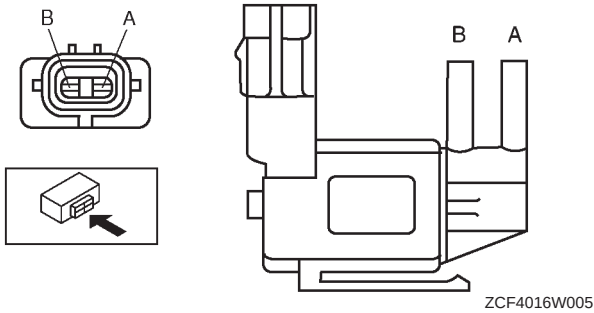
- Inspect airflow between the ports under the following conditions.
 - If not as specified, replace the EGR solenoid valve (vacuum).
 - If as specified, carry out the "Circuit Open/Short Inspection."

○=○ : Airflow

Step	Terminal		Port	
	A	B	A	B
1				
2	B+	GND	○=○	○=○

ZCF4016W004

EMISSION SYSTEM

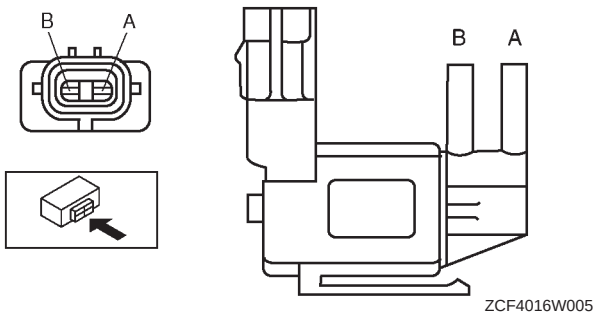


- If as specified, carry out the "Circuit Open/Short Inspection."

○—○ : Airflow

Step	Terminal		Port	
	A	B	A	B
1				
2	B+	GND	○—○	

ZCF4016W004



Circuit Open/Short Inspection

1. Inspect for an open or short circuit in the following wiring harnesses.
 - If there is an open or short circuit, repair or replace wiring harnesses.

Open circuit

- Power circuit (EGR solenoid valve (vacuum) connector terminal A and PCM control relay connector terminal D)
- GND circuit (EGR solenoid valve (vacuum) connector terminal B and PCM connector terminal 4T)

Short circuit

- EGR solenoid valve (vacuum) connector terminal A and PCM control relay connector terminal D to GND

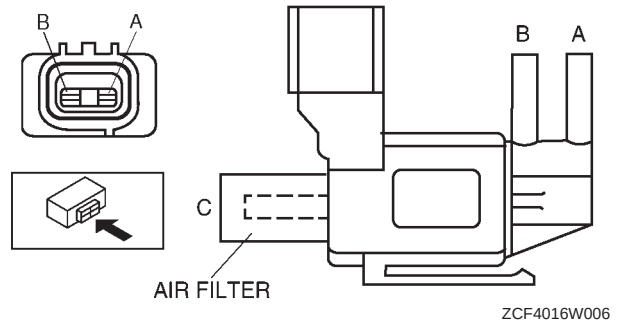
EGR SOLENOID VALVE (VENT) INSPECTION WL-3 / WLT-3 (Euro 3 Regulation Models)

1. Inspect airflow between the ports under the following conditions.
 - If not as specified, replace the EGR solenoid valve (vent).
 - If as specified, carry out the "Circuit Open/Short Inspection."

○—○ : Airflow

Step	Terminal		Port		
	A	B	A	B	C
1			○—○	○—○	○—○
2	B+	GND	○—○	○—○	

ZCF4016W003



Circuit Open/Short Inspection

1. Inspect for an open or short circuit in the following wiring harnesses.
 - If there is an open or short circuit, repair or replace wiring harnesses.

Open circuit

- Power circuit (EGR solenoid valve (vent) connector terminal A and PCM control relay connector terminal D)
- GND circuit (EGR solenoid valve (vent) connector terminal B and PCM connector terminal 4Q)

Short circuit

- EGR solenoid valve (vent) connector terminal A and PCM control relay connector terminal D to GND

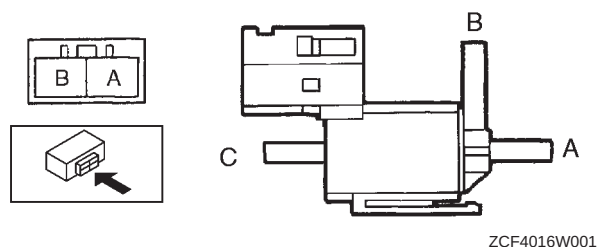
EGR CONTROL SOLENOID VALVE INSPECTION WL-3 / WLT-3 (Euro 3 Regulation Models)

1. Inspect airflow between the ports under the following conditions.
 - If not as specified, replace the EGR control solenoid valve.
 - If as specified, carry out the "Circuit Open/Short Inspection."

○—○ : Airflow

Step	Terminal		Port		
	A	B	A	B	C
1				○—○	○—○
2	B+	GND	○—○	○—○	

YTA4114W105



EMISSION SYSTEM

Circuit Open/Short Inspection

- Inspect for an open or short circuit in the following wiring harnesses.
 - If there is an open or short circuit, repair or replace wiring harnesses.

Open circuit

- Power circuit (EGR control solenoid valve connector terminal A and PCM control relay connector terminal D)
- GND circuit (EGR control solenoid valve connector terminal B and PCM connector terminal 4I)

Short circuit

- EGR control solenoid valve connector terminal A and PCM control relay connector terminal D to GND

- If as specified, carry out the "Circuit Open/Short Inspection."

○—○ : Airflow

Step	Terminal		Port		
	A	B	A	B	C
1				○—○	○—○
2	B+	GND	○—○	○—○	

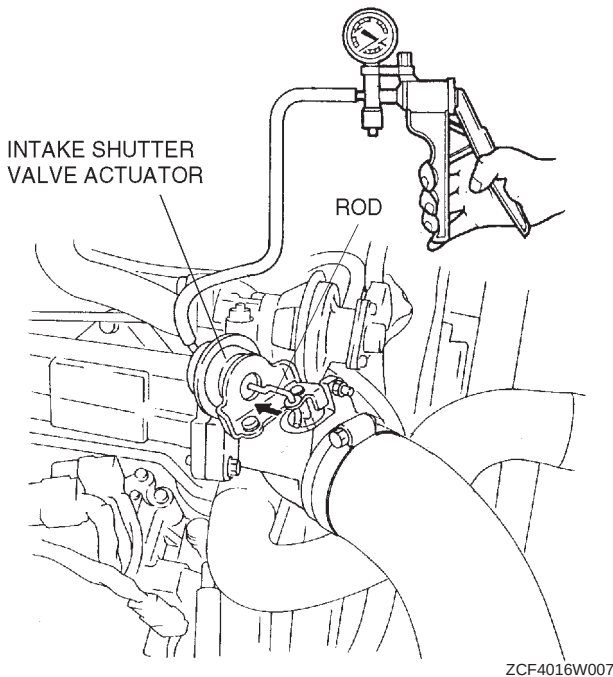
YTA4114W105

INTAKE SHUTTER VALVE ACTUATOR INSPECTION WL-3 / WLT-3 (Euro 3 Regulation Models)

- Disconnect the vacuum hose from the intake shutter valve actuator.
- Connect a vacuum pump to the intake shutter valve actuator.
- Apply vacuum and verify that the rod moves.
 - If the rod does not move, replace the intake shutter valve.

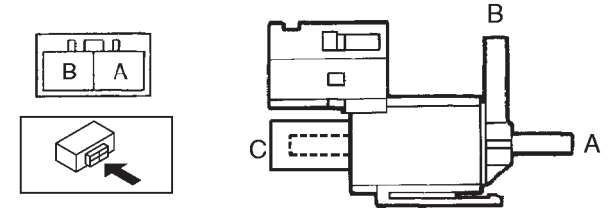
Specification

Vacuum kPa {mmHg, inHg}	Rod movement
Below -5.3 {-40, -1.57}	Starts to move
Above -26.6 {-200, -7.9}	Fully pulled



INTAKE SHUTTER SOLENOID VALVE INSPECTION WL-3 / WLT-3 (Euro 3 Regulation Models)

- Inspect airflow between the ports under the following conditions.
 - If not as specified, replace the intake shutter solenoid valve.



ZCF4016W002

Circuit Open/Short Inspection

- Inspect for an open or short circuit in the following wiring harnesses.
 - If there is an open or short circuit, repair or replace wiring harnesses.

Open circuit

- Power circuit (intake shutter solenoid valve connector terminal A and PCM control relay connector terminal D)
- GND circuit (intake shutter solenoid valve connector terminal B and PCM connector terminal 4Z)

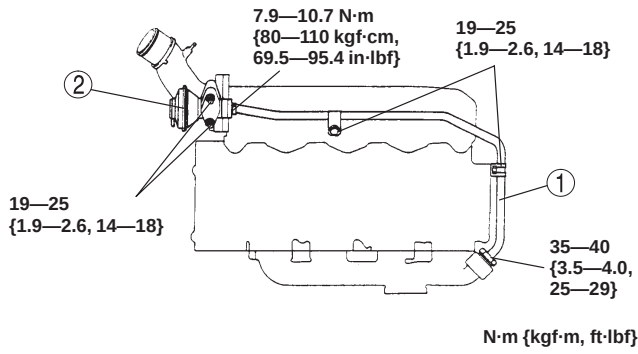
Short circuit

- Intake shutter solenoid valve connector terminal A and PCM control relay connector terminal D to GND

EGR PIPE, EGR VALVE REMOVAL/INSTALLATION WL Turbo for Europe and UK

- Disconnect the negative battery cable.
- Remove in the order indicated in the table.
- Install in the reverse order of removal.

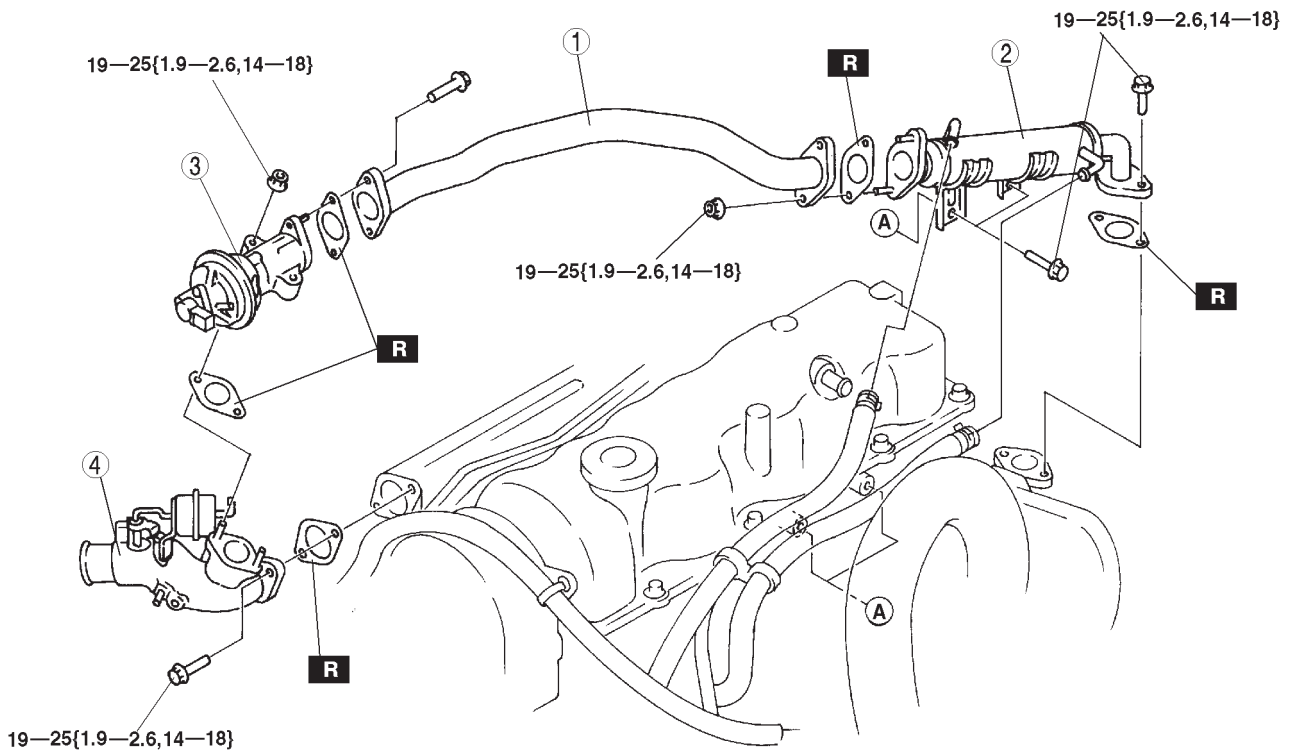
EMISSION SYSTEM



1	EGR pipe
2	EGR valve

WL-3 / WLT-3 (Euro 3 Regulation Models)

1. Disconnect the negative battery cable.
2. Remove in the order indicated in the table.
3. Install in the reverse order of removal.

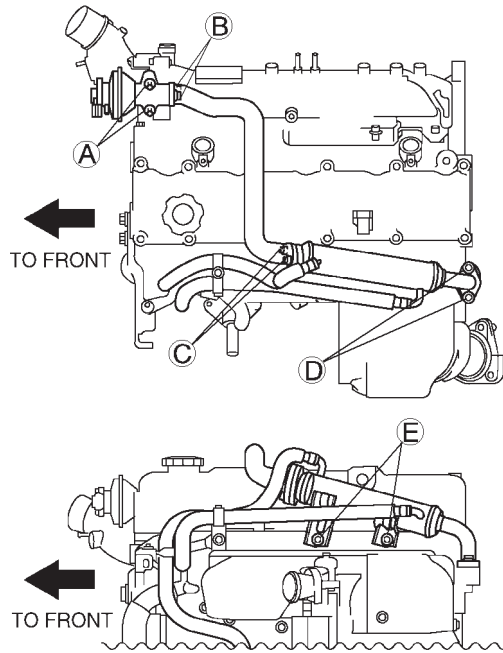


N·m {kgf·m, ft·lbf}
ZCF4016W009

1	EGR pipe
2	EGR water cooler
3	EGR valve
4	Intake shutter valve (WLT-3)

EGR system installation note

1. Temporarily tighten bolts and nuts in order of A to E.
2. Tighten the bolts and nuts in order of A to E.

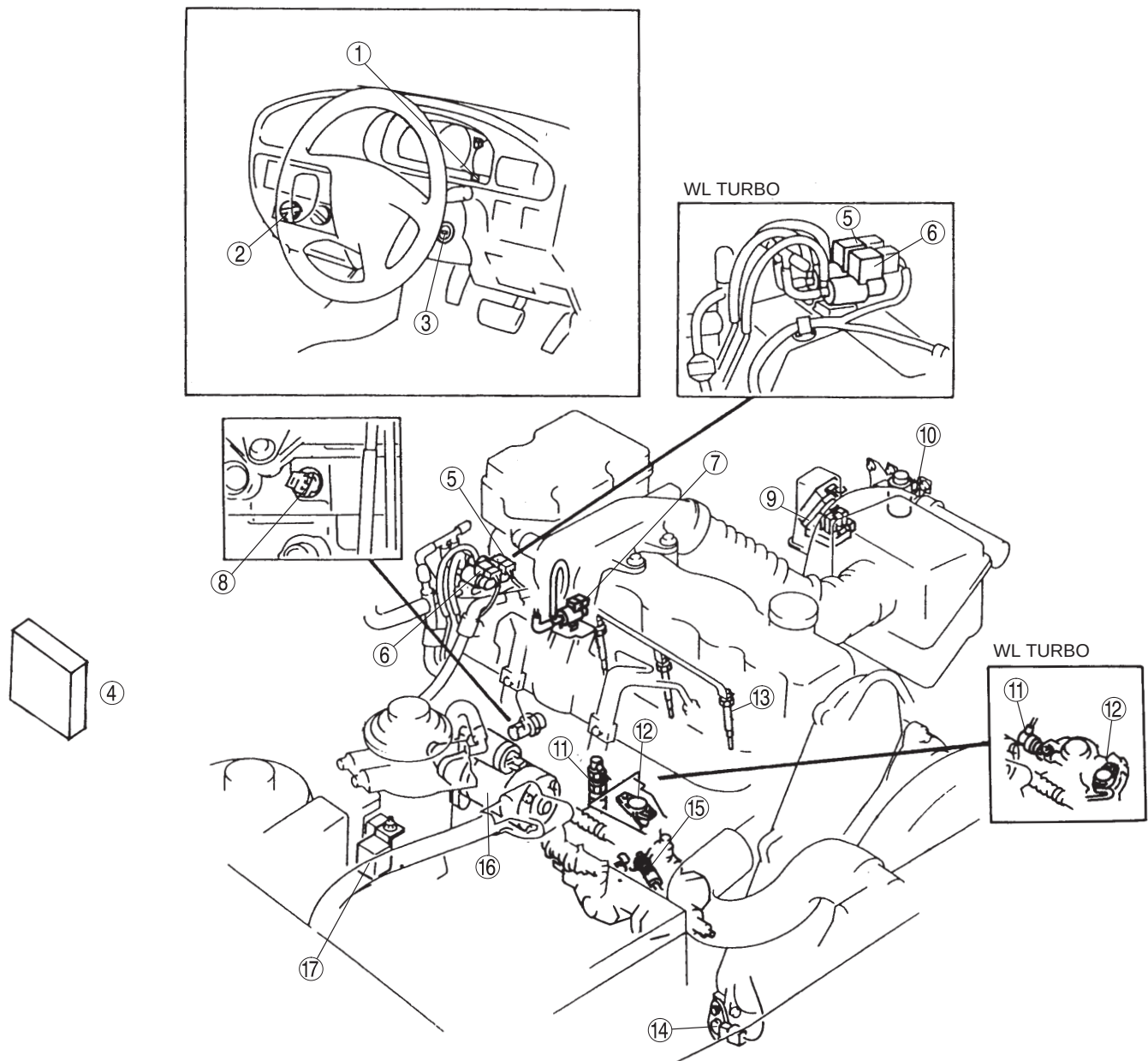


ZCF4016W010

CONTROL SYSTEM

CONTROL SYSTEM

COMPONENT PARTS



1	Glow indicator light
2	Temperature control dial
3	Engine switch
4	PCM
5	FICD solenoid valve No.2
6	FICD solenoid valve No.1
7	EGR solenoid valve* ¹
8	ECT sensor
9	DLC

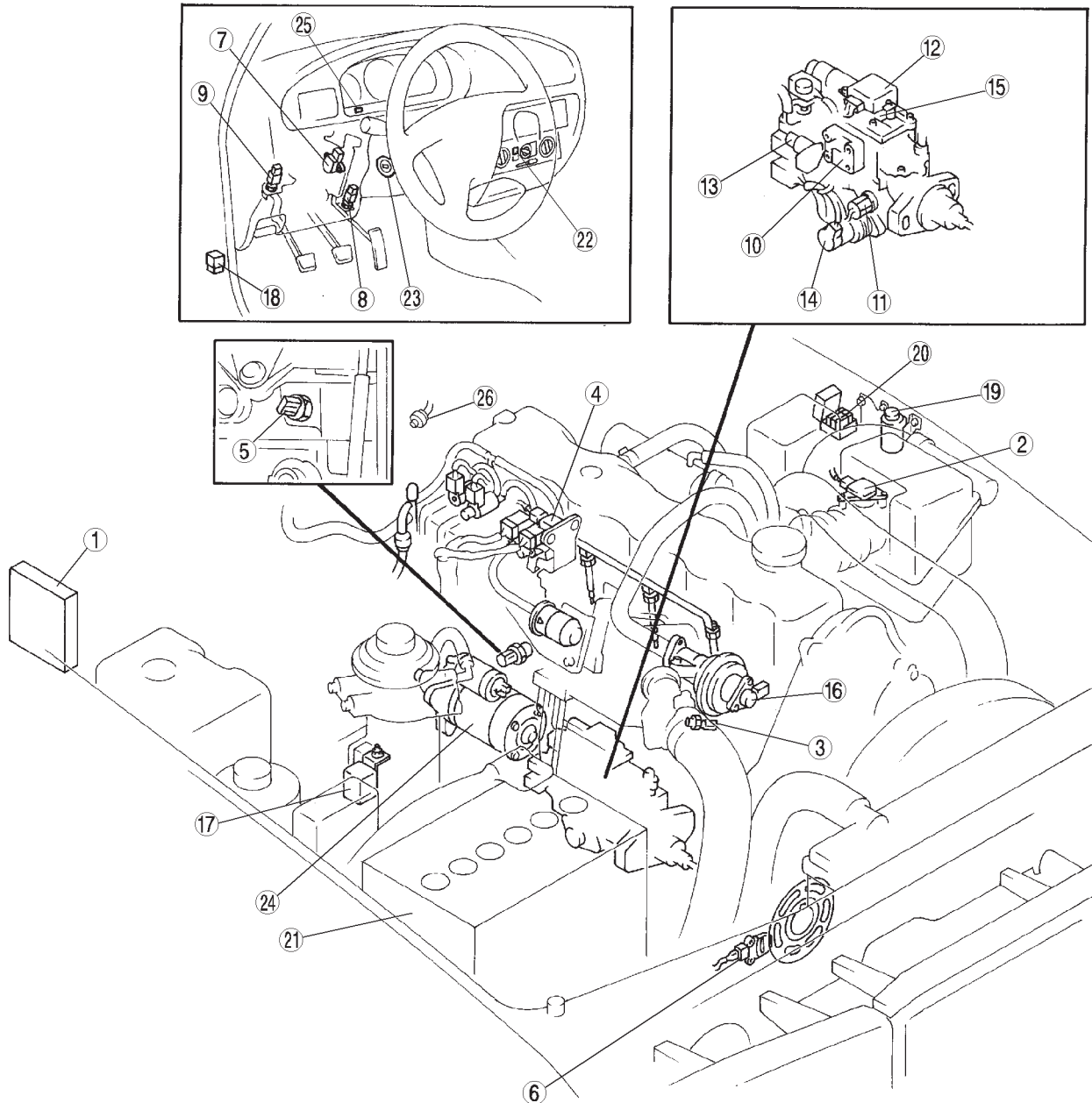
10	A/C relay
11	TCV* ²
12	Control lever position sensor* ²
13	Glow plug
14	NE sensor
15	Idle switch* ²
16	Starter
17	Glow plug relay

*¹: WL Turbo for Europe and UK

*²: Europe and UK

CONTROL SYSTEM

WL-3 / WLT-3 (Euro 3 Regulation Models)



ZCF4040W045

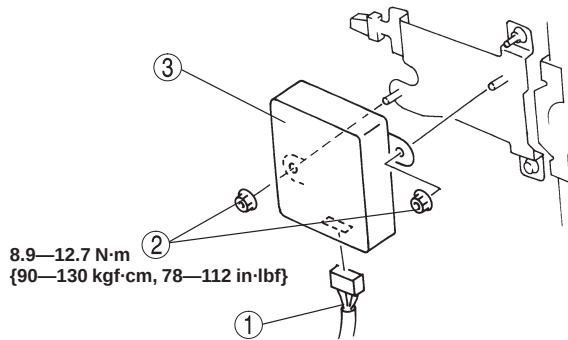
1	PCM
2	MAF/IAT sensor
3	IAT sensor No.2
4	Boost sensor
5	ECT sensor
6	TDC sensor
7	Accelerator position sensor
8	Idle switch
9	Clutch switch
10	Fuel temperature sensor
11	Pump speed sensor
12	Injection pump EPROM
13	TCV

14	Timer position sensor
15	Control sleeve (CS) sensor
16	EGR valve position sensor
17	Glow plug relay
18	PCM control relay
19	A/C relay
20	DLC
21	Battery
22	A/C switch
23	Engine switch
24	Starter
25	Glow indicator light
26	Neutral switch

POWERTRAIN CONTROL MODULE (PCM) REMOVAL/INSTALLATION

WL / WLT Models

1. Disconnect the battery negative cable.
2. Remove the driver's side front side trim. (Refer to Section S, TRIM, FRONT SIDE TRIM REMOVAL/INSTALLATION.)
3. Remove in the order indicated in the table.
4. Install in the reverse order of removal.



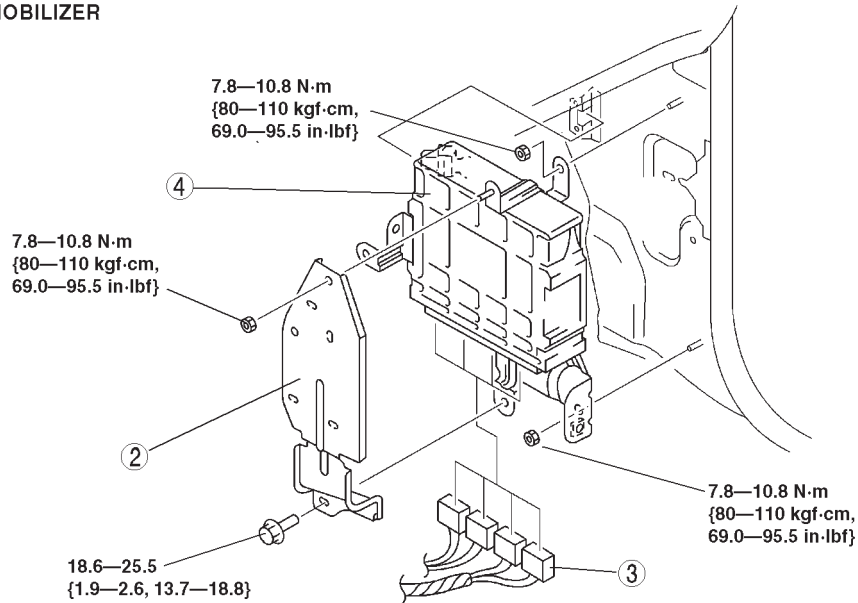
1	PCM connector
2	PCM installation nut
3	PCM

CONTROL SYSTEM

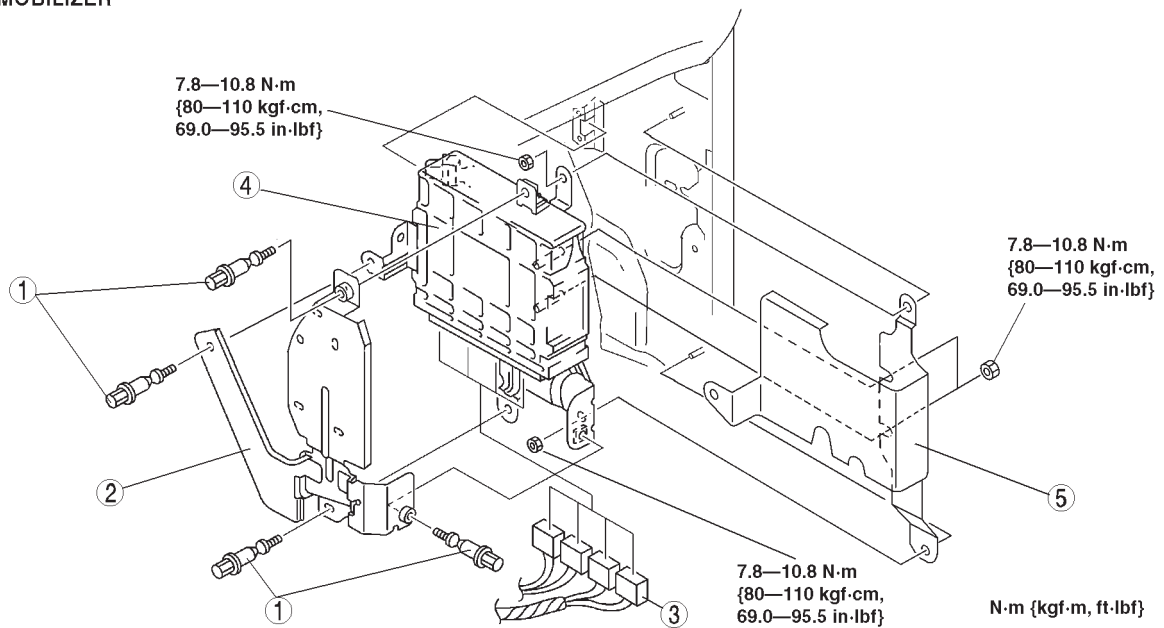
WL-3 / WLT-3 (Euro 3 Regulation Models)

1. Disconnect the battery negative cable.
2. Remove the passenger's side front side trim.
3. Remove in the order indicated in the table.

WITHOUT IMMOBILIZER



WITH IMMOBILIZER

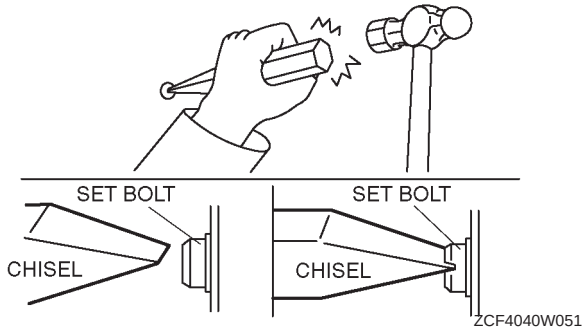


ZCF4040W050

1	Set bolt (with immobilizer) (SeeSet bolt removal note) (SeeSet bolt installation note)
2	PCM cover
3	PCM connector
4	PCM
5	Bracket

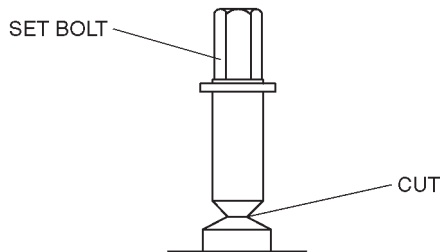
Set bolt removal note

1. Using a chisel and a hammer, cut a groove on the head of the set bolt so that a screwdriver can be inserted.
2. Loose the set bolt by using an impact screwdriver or pliers.



Set bolt installation note

1. Install new set bolt and tighten it until the neck of the bolt is cut.



POWERTRAIN CONTROL MODULE (PCM) INSPECTION

Caution

- The PCM terminal voltages vary with change in measuring conditions and vehicle conditions. Always carry out a total inspection of the input systems, output systems, and PCM to determine the cause of trouble. Otherwise, a wrong diagnosis will be made.

WL / WLT Models

1. Remove the driver's side front side trim. (Refer to Section S, TRIM, FRONT SIDE TRIM REMOVAL/INSTALLATION.)
2. Remove the PCM with the connector connected. (Refer to POWERTRAIN CONTROL MODULE (PCM) REMOVAL/INSTALLATION.)

Note

- With the PCM connector connected, body ground the voltmeter negative (-) lead and measure the voltage at each PCM terminal by inserting the voltmeter positive (+) lead.
3. Measure the voltage of each PCM terminals by using a voltmeter.
 4. If the output voltage is not normal while each input voltage is normal, inspect the related device systems. When they are normal, replace the PCM.

5. Install the PCM. (Refer to POWERTRAIN CONTROL MODULE (PCM) REMOVAL/INSTALLATION.)
6. Install the driver's side front side trim. (Refer to Section S, TRIM, FRONT SIDE TRIM REMOVAL/INSTALLATION.)

CONTROL SYSTEM

Terminal Voltage (Reference)

Europe and UK										Turkey and General (R.H.D. ,L.H.D.)									
SQOMKIGECA TRPNLJHFDDB										OMKIGECA PNLJHFDDB									
Termi- nal	Signal	Connected to	Test condition				Voltage (V)	Action											
A	—	—	—				—	—											
A*1	Constant voltage	- Control lever position sensor - EGR valve position sensor	Engine switch	ON			Approx. 5.0	● Inspect related harness.											
				OFF			Below 1.0	● Inspect PCM. ● Inspect related harness.											
			Idle						Approx. 5.0										
B	System ground	Ground	Constant				Below 1.0	● Inspect related harness.											
C	FICD control	FICD sole-noid valve No.1	Idle	ECT is below 20°C {68°F}.			Below 1.0	● Inspect FICD solenoid valve No.1. + FUEL SYSTEM, FICD SOLENOID VALVE No.1, No.2 INSPECTION											
				ECT is above 20°C {68°F}.			B+	● Inspect related harness											
D	Start	Engine switch (Starter)	Engine switch is on.				Below 1.0	● Inspect related harness											
			While cranking				Approx. 10												
E	ECT	ECT sensor	Engine switch is on.	ECT is 20°C {68°F}.			Approx. 3.1	● Inspect engine coolant temperature sensor. + ECT SENSOR INSPECTION											
				After warm-up			Approx. 0.8	● Inspect related harness											
F	Engine speed (Input)	NE sensor	Engine switch is on.				Approx. 0	● Inspect NE sensor. + NE SENSOR INSPECTION											
			Idle				Approx. 0.05	● Inspect related harness											
G	A/C (With A/C)	Temperature control dial	Engine switch is on.	Temperature control dial is off and fan switch is off.			B+	● Inspect microswitch. + Section U, CONTROL SYSTEM, HEATER CONTROL UNIT INSPECTION											
				Temperature control dial is at position other than off and fan switch is on.			Below 1.0	● Inspect fan switch. + Section U, CONTROL SYSTEM, HEATER CONTROL UNIT INSPECTION ● Inspect related harness											
H	—	—	—				—	—											
H*1	Idle (Control lever open or close)	Idle switch	Engine switch is on.	Accelerator pedal is de-pressed.			B+	● Inspect idle switch. + IDLE SWITCH INSPECTION											
				Accelerator pedal is re-leased.			Below 1.0	● Inspect related harness.											

*¹: Europe and UK

CONTROL SYSTEM

Terminal	Signal	Connected to	Test condition		Voltage (V)	Action
I	Glow plug voltage	Glow plug	ECT is below 60°C {140°F}.	For less than approx. 15 seconds after turning engine switch on.	B+	● Inspect related harness
				Over approx. 15 seconds after turning engine switch on.	Below 1.0	
				For less than 10 minutes after starting engine.	B+	
				Over 10 minutes after starting engine.	Below 1.0	
				While cranking	B+	
			ECT is above 60°C {140°F}.	For less than approx. 2 seconds after turning engine switch on.	B+	
				Over approx. 2 seconds after turning engine switch on.	Below 1.0	
				While cranking	B+	
J	Power supply	Engine switch	Engine switch	OFF	Below 1.0	● Inspect engine switch. + Section T, POWER SYSTEM, IGNITION SWITCH INSPECTION ● Inspect related harness.
			ON	B+		
J*1	Control lever position (Detection)	Control lever position sensor	Engine switch is on.	Accelerator pedal is fully open.	Approx. 4.2	● Inspect control lever position sensor. + CONTROL LEVER POSITION SENSOR INSPECTION ● Inspect related harness.
				Accelerator pedal is fully closed.	Approx. 0.8—1.5	
K	Engine speed (Output)	Instrument cluster	Engine switch is on.		B+	● Inspect related harness.
			Idle		6.9—7.1	
L*1	Power supply	Engine switch	Engine switch	OFF	Below 1.0	● Inspect engine switch. + Section T, POWER SYSTEM, IGNITION SWITCH INSPECTION ● Inspect related harness.
				ON	B+	
L*2	A/C control (With A/C)	A/C relay	Engine switch is on.		B+	● Inspect A/C relay. + Section U, CONTROL SYSTEM, A/C RELAY INSPECTION ● Inspect related harness.
			Idle	A/C is not operating	B+	
				A/C is operating	Below 1.0	
M	Glow indicator light control	Glow indicator light	Engine switch is off.		Below 1.0	● Inspect glow indicator light + Section T, WARNING AND INDICATOR SYSTEM, WARNING AND INDICATOR LIGHT BULB REPLACEMENT ● Inspect related harness.
			Engine switch is on and within approx. 4.5 sec. (25 °C {77 °F}).			
			Over 4.5 seconds (25 °C {77 °F}) after turning engine switch on.		B+	
N*1	A/C control (With A/C)	A/C relay	Engine switch is on.		B+	● Inspect A/C relay. + Section U, CONTROL SYSTEM, A/C RELAY INSPECTION ● Inspect related harness.
			Idle	A/C is not operating	B+	
				A/C is operating	Below 1.0	
N*2	—	—	—		—	—

*1: Europe and UK

*2: Turkey and General (R.H.D., L.H.D.)

CONTROL SYSTEM

Terminal	Signal	Connected to	Test condition		Voltage (V)	Action
O	Glow system	Glow plug relay	Engine coolant temperature is below 60°C {140°F}.	For less than approx. 15 seconds after turning engine switch on.	B+	- Inspect glow plug relay. + INTAKE-AIR SYSTEM, GLOW PLUG RELAY INSPECTION - Inspect related harness.
				Over approx. 15 seconds after turning engine switch on.	Below 1.0	
				For less than 10 minutes after starting engine.	B+	
				Over 10 minutes after starting engine.	Below 1.0	
				While cranking	B+	
			Engine coolant temperature is above 60°C {140°F}.	For less than approx. 2 seconds after turning engine switch on.	B+	
				Over approx. 2 seconds after turning engine switch on.	Below 1.0	
				While cranking	B+	
P	FICD control	FICD solenoid valve No.2	Idle	- Temperature control dial is not at OFF - Engine coolant temperature is below 60°C {140°F}.	Below 1.0	- Inspect FICD solenoid valve No.2. + FUEL SYSTEM, FICD SOLENOID VALVE No.1, No.2 INSPECTION - Inspect related harness.
				- Temperature control dial is not at OFF - Engine coolant temperature is above 60°C {140°F}.	B+	
Q	—	—	—		—	—
Q*1	Timer control	TCV	Engine switch is on.		B+	- Inspect TCV. + CONTROL SYSTEM, TIMER CONTROL VALVE (TCV) INSPECTION - Inspect related harness.
			Idle		Below 1.0	
R	—	—	—		—	—
R*3	EGR valve control	EGR solenoid valve	Engine switch is on.		B+	- Inspect EGR solenoid valve. + EMISSION SYSTEM, EGR SOLENOID VALVE INSPECTION - Inspect related harness.
			Idle		Below 1.0	
S	—	—	—		—	—
S*1	Diagnostic test mode	Data link connector (DLC) (Terminal TEN)	Engine switch is on.	Open terminal TEN	B+	Inspect related harness.
				Short terminal TEN	Below 1.0	
T	—	—	—		—	—
T*1	DTC output	Data link connector (DLC) (Terminal FEN)	No DTC output		Below 1.0	Inspect related harness.
			DTC output		0—B+	

*1: Europe and UK

*2: Turkey and General (R.H.D., L.H.D.)

*3: WL Turbo for Europe and UK

CONTROL SYSTEM

WL-3 / WLT-3 (Euro 3 Regulation Models)

Caution

- The PCM terminal voltages vary with change in measuring conditions and vehicle conditions. Always carry out a total inspection of the input systems, output systems, and PCM to determine the cause of trouble. Otherwise, diagnosis will be incorrect.

Note

- PIDs for the following parts are not available on this model. Go to the appropriate part inspection page.
 - Electronic governor
 - Pump speed sensor
 - Injection pump EPROM
 - EGR control solenoid valve
1. Connect the WDS or equivalent to the DLC. (See ON-BOARD DIAGNOSTIC TEST)
 2. Turn the engine switch on.
 3. Measure the value.
 - If value is not within the specification, follow the instructions in Action column.

PID Monitor Table

Monitor item (Definition)	Unit/ Condition			Condition/Specification	Action	PCM terminal
ACCS (A/C relay)	ON/OFF			Engine switch is on: OFF A/C switch is on and fan switch is on at idle: ON	Inspect following PIDs: TP, ECT, ACSW, PNP, VS, STARTER. Inspect A/C relay. (See Section U)	4L
ACSW (A/C switch)	ON/OFF			A/C switch and fan switch is on with engine switch on: ON A/C switch is off with engine switch on: OFF	Inspect refrigerant pressure switch. (See Section U)	3C
ARPMDES (Target engine speed)	rpm			A/C ON: 750 rpm Other: 720 rpm	Inspect A/C switch. (See Section U)	-
BARO (Barometric pressure in PCM)	kPa	Bar	psi	Elevation 0—400 m {0—1310 ft}: 100—103 kPa {1.00—1.03 Bar, 14.5—14.9 psi}	Replace PCM.	-
	V			Elevation 0—400 m {0—1310 ft}: approx. 4.0 V		
CS P (Control sleeve signal voltage)	V			Engine switch is off: below 1.0 V Engine switch is on or idle: approx. 2.5 V	Inspect control sleeve (CS) sensor. (See 52 CONTROL SLEEVE (CS) SENSOR INSPECTION)	1Q
ECT (Engine coolant temperature)	°C	°F		ECT is 20°C {68°F}: 20°C {68°F} ECT is 85°C {185°F}: 85°C {185°F}	Inspect ECT sensor. (See NO TAG ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION)	1T
	V			ECT is 20°C {68°F}: 3.0—3.2 V ECT is 85°C {185°F}: 0.7—0.9 V		
EGRA (EGR solenoid valve (vent))	%			Engine switch is on: 0—100% Idle: 0—100%	Inspect following PIDs: ECT, TP, IDLE SW, MAF, IAT, RPM, EGRVP. Inspect EGR solenoid valve (vent). (See NO TAG EGR SOLENOID VALVE (VENT) INSPECTION)	4Q
EGRV (EGR solenoid valve (vacuum))	%			Engine switch is on: 0—100% Idle: 0—100%	Inspect following PIDs: ECT, TP, IDLE SW, MAF, IAT, RPM, EGRVP. Inspect EGR solenoid valve (vent). (See NO TAG EGR SOLENOID VALVE (VACUUM) INSPECTION)	4T
EGRVP (EGR valve position)	V			Engine switch is on: approx. 0.6 V Idle: above 3.0 V	Inspect EGR valve position sensor. (See 55 EGR VALVE POSITION SENSOR INSPECTION)	1F
FLT (Fuel temperature sensor)	°C	°F		Fuel temperature is 20°C {68°F}: 20°C {68°F}:	Inspect fuel temperature sensor. (See 51 FUEL TEMPERATURE SENSOR INSPECTION)	1L
FLT V (Fuel temperature signal voltage)	V			Fuel temperature is 20°C {68°F}: 2.4—2.6 V Fuel temperature is 70°C {158°F}: 0.7—0.9 V	Inspect fuel temperature sensor. (See 51 FUEL TEMPERATURE SENSOR INSPECTION)	1L

CONTROL SYSTEM

Monitor item (Definition)	Unit/ Condition			Condition/Specification	Action	PCM terminal
FSOV (FSO solenoid control)	ON/OFF			Idle: ON Engine switch is on: ON Engine speed is above 5,100 rpm: OFF DTC P1182, P0251, P0606, P1226 is detected: OFF	Follow appropriate DTC troubleshooting (See NO TAG DTC TABLE)	4W
GPC (Glow plug control)	ON/OFF			ECT below 60°C {140°F} - For 15 s after engine switch on: ON - After 6.5 s—10 min elapse from engine switch on: OFF - For 6.5 s—10 min after engine started: ON - After 15 s elapse from engine started: OFF ECT above 60°C {140°F} - For 6.5 s after engine switch on: ON - After 6.5 s elapse from engine switch on: OFF	Inspect following PIDs: ECT, VSS, VPWR. Inspect glow plug relay. (See NO TAG RELAY INSPECTION)	4V
GPL (Glow indicator light)	ON/OFF			For 4 s after engine switch on (ECT is 20°C {68°F}): ON	Inspect instrument cluster. (See Section T)	4S
IASV (Intake shutter valve)	ON/OFF			Engine switch is on: OFF Idle: ON	Inspect following PIDs: RPM, BARO, ECT, IAT, VS Inspect intake shutter solenoid valve. (See NO TAG INTAKE SHUTTER SOLENOID VALVE INSPECTION)	4Z*
IAT (IAT sensor No.2)	°C	°F		IAT is 20°C {68°F}: 20°C {68°F} IAT is 30°C {86°F}: 30°C {86°F}	Inspect IAT sensor No.2. (See 50 INTAKE AIR TEMPERATURE (IAT) SENSOR NO.2 INSPECTION)	1J
	V			IAT is 20°C {68°F}: 2.3—2.5 V IAT is 30°C {86°F}: 1.8—2.0 V		
IATDC (IAT sensor No.1)	°C	°F		IAT is 20°C {68°F}: 20°C {68°F} IAT is 30°C {86°F}: 30°C {86°F}	Inspect MAF/IAT sensor. (See 49 MASS AIR FLOW (MAF)/INTAKE AIR TEMPERATURE (IAT) SENSOR INSPECTION)	3D
	V			IAT is 20°C {68°F}: 2.3—2.5 V IAT is 30°C {86°F}: 1.8—2.0 V		
IDLE SW (Idle switch)	ON/OFF			Accelerator pedal is released: ON Other: OFF	Inspect idle switch. (See NO TAG IDLE SWITCH INSPECTION)	3O
MAF (MAF sensor input voltage)	V			Engine switch is on: below 1.0 V Idle: 1.6—2.0 V	Inspect MAF/IAT sensor. (See 49 MASS AIR FLOW (MAF)/INTAKE AIR TEMPERATURE (IAT) SENSOR INSPECTION)	4E
MAINRLY (PCM control relay)	ON/OFF			Engine switch is on: ON Other: OFF	Inspect engine switch. (See Section T)	3B
MAP (Boost sensor)	kPa	Bar	psi	Idle: 101kPa {1.01 Bar, 14.7psi}	Inspect boost sensor. (See 55 BOOST SENSOR INSPECTION)	1P
	V			Idle: approx. 2.6V		
PNP (Neutral/clutch switch)	ON/OFF			Neutral position or clutch pedal is depressed: ON Others: OFF	Inspect neutral and clutch switch. (See 61 NEUTRAL SWITCH INSPECTION) (See 60 CLUTCH SWITCH INSPECTION)	1D
RPM (Engine speed)	rpm			A/C ON: 725—775rpm Other: 695—745rpm	Inspect following PIDs: TP V, MAP V, RPM	1H
STARTER (Engine switch)	ON/OFF			Engine switch at START: ON Other: OFF	Inspect engine switch. (See Section T)	1U
TPS (Timer position sensor signal)	%			Engine switch is ON: 0% Idle: 100%	Inspect timer position sensor. (See 53 TIMER POSITION SENSOR INSPECTION)	1K

CONTROL SYSTEM

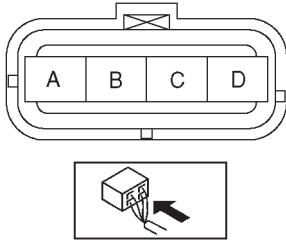
TEST (TEN terminal (in DLC))	ON/OFF		Terminal TEN (DLC) is shorted to GND: ON Terminal TEN (DLC) is open: OFF	Inspect wiring from DLC terminal TEN to PCM terminal 2A.	2A
TP V (Accelerator position signal voltage)	V		Accelerator pedal is depressed: 3.4—3.8 V Accelerator pedal is released: 0.5—0.7 V	Inspect accelerator position sensor. (See 56 ACCELERATOR POSITION SENSOR INSPECTION)	1R
TP2 V (Accelerator position signal voltage)	V		Accelerator pedal is depressed: 3.4—3.8 V Accelerator pedal is released: 0.5—0.7 V	Inspect accelerator position sensor. (See 56 ACCELERATOR POSITION SENSOR INSPECTION)	2C
VPWR (Battery positive voltage)	V		Engine switch is ON: B+ Other: below 1.0 V	Inspect PCM control relay. (See NO TAG RELAY INSPECTION)	4C
VSS (Vehicle speed)	km/h	mph	Vehicle speed is 20 km/h {12.5 mph}: 20 km/h {12.5 mph} Vehicle speed is 40 km/h {25 mph}: 40 km/h {25 mph}	Inspect Instrument cluster. (See Section T)	1N

CONTROL SYSTEM

Not using SSTs (WDS or equivalent) at constant voltage terminal inspection

1. Turn the engine switch to ON.
2. Measure the voltage between the accelerator position sensor connector (vehicle side) terminal A and body GND using a voltmeter.

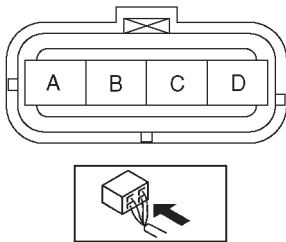
ACCELERATOR POSITION SENSOR
HARNESS SIDE CONNECTOR



ZCF4040W017

- (1) Measurement voltage is **0 V**.
 1. Turn the engine switch to OFF.
 2. Disconnect the accelerator position sensor connector (applied constant voltage).
 3. Verify there is no continuity between the accelerator position sensor connector (vehicle side) terminal A and body GND using an ohmmeter.
 - If there is continuity, repair the related harnesses.

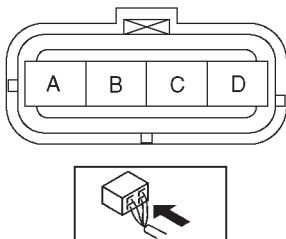
ACCELERATOR POSITION SENSOR
HARNESS SIDE CONNECTOR



ZCF4040W017

4. Inspect for continuity between the PCM connector (vehicle side) terminal 1A and accelerator position sensor connector (vehicle side) terminal A (applied constant voltage) using an ohmmeter.
 - If there is no continuity, repair the related harnesses.

ACCELERATOR POSITION SENSOR
HARNESS SIDE CONNECTOR

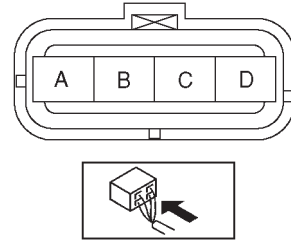


ZCF4040W017

- (2) Measurement voltage is **B+**.
 1. Turn the engine switch to OFF.
 2. Disconnect the battery positive harness and battery negative harness.

3. Verify there is no continuity between the accelerator position sensor connector (vehicle side) terminal A and battery positive harness using an ohmmeter.
 - If there is continuity, repair the related harnesses.

ACCELERATOR POSITION SENSOR
HARNESS SIDE CONNECTOR



ZCF4040W017

- (3) Measurement voltage is **approx. 5 V**.
 - Constant voltage terminal of PCM is okay.

Not using SSTs (WDS or equivalent) at GND terminal inspection

1. Turn the engine switch to OFF.
2. Disconnect the PCM connectors.
3. Inspect for continuity between the PCM GND terminals and body GND using an ohmmeter.
 - If there is no continuity, repair the related harnesses.

PCM GND terminal
1B
4A
4B

Not using SSTs (WDS or equivalent) at power supply terminal inspection

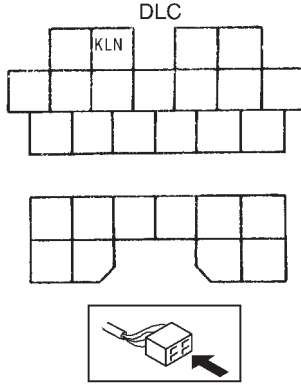
1. Turn the engine switch to ON.
2. Disconnect the PCM connectors.
3. Measure the voltage between the PCM battery power terminal connectors and body GND using an ohmmeter.
 - If not as specified, repair the related harnesses.

Power supply terminal voltage: B+

PCM power supply terminal
1C

Not using SSTs (WDS or equivalent) at serial communication terminal inspection

1. Turn the engine switch to OFF.
2. Disconnect the PCM connectors.
3. Verify there is continuity between the PCM connector terminal 2B and DLC KLN terminal.
 - If not as specified, repair the related harnesses.



ZCF4040W057

MASS AIR FLOW (MAF)/INTAKE AIR TEMPERATURE (IAT) SENSOR INSPECTION WL-3 / WLT-3 (Euro 3 Regulation Models)

Note

- Perform the following inspection only when directed.

MAF sensor voltage inspection

1. Turn the engine switch to ON.
2. Set the WDS or equivalent and monitor the MAF PID.
 - If not as specified, perform the "Circuit open/short inspection."

**MAF PID
below 1.0 V**

3. Start the engine and warm up the engine completely.
4. Monitor the MAF PID at idle.
 - If not as specified, perform the "Circuit open/short inspection."

**MAF PID
1.6—2.0 V**

Circuit open/short inspection

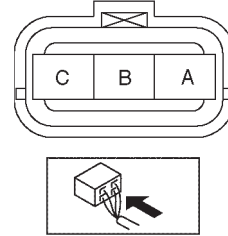
1. Inspect for an open or short circuit in the following wiring harnesses.
 - If there is an open or short circuit, repair or replace wiring harnesses.

Open circuit

- Power circuit (MAF/IAT sensor connector terminal A and PCM control relay connector terminal D)

- Signal circuit (MAF/IAT sensor connector terminal C and PCM connector terminal 4E)
- GND circuit (MAF/IAT sensor connector terminal B and PCM connector terminal 4A)

EGR VALVE POSITION SENSOR
HARNESS SIDE CONNECTOR



ZCF4040W009

Short circuit

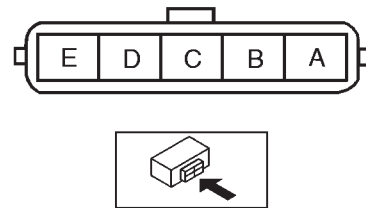
- MAF/IAT sensor connector terminal A and PCM control relay connector terminal D to GND
- MAF/IAT sensor connector terminal C and PCM connector terminal 4E to GND

IAT sensor No.1 resistance inspection

1. Disconnect the MAF/IAT sensor connector.
2. Measure the resistance between MAF/IAT sensor terminals D and E using an ohmmeter.
 - If not as specified, replace the MAF/IAT sensor.
 - If as specified, carry out the "Circuit open/short inspection."

Specification

Ambient temperature (°C {°F})	Resistance (kilo ohm)
20 {68}	2.2—2.7
30 {86}	1.4—1.9



ZCF4040W010

Circuit open/short inspection

1. Inspect for an open or short circuit in the following wiring harnesses.
 - If there is an open or short circuit, repair or replace wiring harnesses.

Open circuit

- Signal circuit (MAF/IAT sensor connector terminal D and PCM connector terminal 3D)
- GND circuit (MAF/IAT sensor connector terminal E and PCM connector terminal 1B)

Short circuit

- MAF/IAT sensor connector terminal D and PCM connector terminal 3D

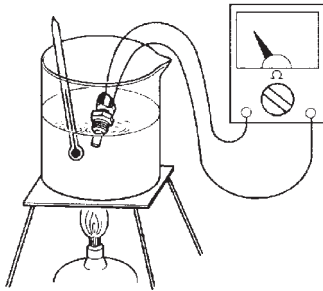
INTAKE AIR TEMPERATURE (IAT) SENSOR NO.2 INSPECTION

WL-3 / WLT-3 (Euro 3 Regulation Models) Inspection of resistance

Note

- Perform the following test only when directed.

- Place the IAT sensor No.2 in water with a thermometer, and heat the water gradually.



W5U140WZC

- Measure the resistance of the IAT sensor No.2 using an ohmmeter.
 - If not as specified, replace the IAT sensor No.2.
 - If IAT sensor No.2 is okay, but PID value is out of specification, perform the "Circuit open/short inspection."

Specification

Water temperature (°C {°F})	Resistance (kilohm)
20 {68}	2.21—2.69
80 {176}	0.29—0.354

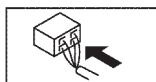
Circuit open/short inspection

- Inspect for an open or short circuit in the following wiring harnesses.
 - If there is an open or short circuit, repair or replace wiring harnesses.

Open circuit

- Signal circuit (IAT sensor No.2 connector terminal A and PCM connector terminal J)
- GND circuit (IAT sensor No.2 connector terminal B and PCM connector terminal B)

IAT SENSOR No.2
HARNESS SIDE CONNECTOR



ZCF4040W015

Short circuit

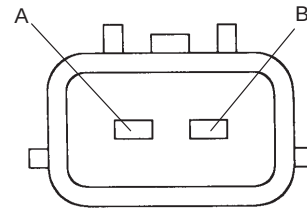
- IAT sensor No.2 connector terminal A and PCM connector terminal J to GND.

NE SENSOR INSPECTION

Note

- Perform the following test only when directed.

- Disconnect the NE sensor connector.
- Measure the resistance between the NE sensor connector terminals A and B by using an ohmmeter.



Specification 800—920 Ω

- If not as specified, replace the NE sensor.

Tightening torque

7.9—10.7 N·m
{80—110 kgf·cm, 69.5—95.4 in·lbf}

- If NE sensor is okay, but PCM terminal F voltage is out of specification, inspect the following:

Open circuit

- Engine speed (input) circuit (NE sensor connector terminal A and PCM connector terminal F)
- GND circuit (NE sensor connector terminal B and PCM connector terminal B)

Short circuit

- NE sensor connector terminal A and PCM connector terminal F to GND

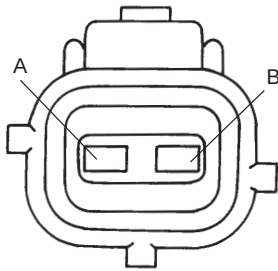
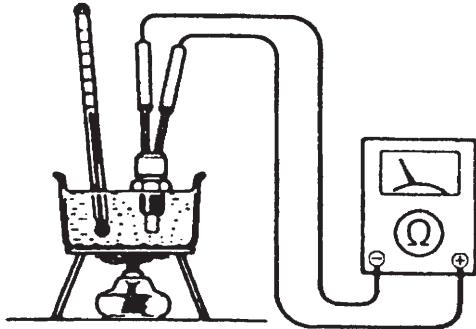
- Repair or replace faulty areas.
- Reconnect the NE sensor connector.

ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION

Note

- Perform the following test only when directed.

1. Drain the engine coolant from the radiator. (Refer to Section E, ENGINE COOLANT, ENGINE COOLANT REPLACEMENT.)
2. Disconnect the ECT sensor connector.
3. Remove the ECT sensor.
4. Place the sensor in water with a thermometer, and heat the water gradually.



5. Measure the resistance between engine coolant temperature sensor terminals A and B by using an ohmmeter.

Specification

Water temperature (°C {°F})	Resistance (kΩ)
20 {68}	2.27—2.73
80 {176}	0.29—0.34

6. If not as specified, replace the ECT sensor.
7. Refill the radiator with the specified engine coolant. (Refer to Section E, ENGINE COOLANT, ENGINE COOLANT REPLACEMENT.)
8. Install the ECT sensor.

Tightening torque

16—23 N·m {1.6—2.4 kgf·m, 12—17 in·lbf}

WL / WLT Models

9. If ECT sensor is okay, but PCM terminal E voltage is out of specification, inspect as follows:

Open circuit

- Reference voltage circuit (ECT sensor connector terminal A and PCM connector terminal E through common connector)
- GND circuit (ECT sensor connector terminal B and PCM connector terminal B through common connector)

Short circuit

- ECT sensor connector terminal A and PCM connector terminal E through common connector to GND

10. Repair or replace faulty areas.

11. Reconnect the ECT sensor connector.

WL-3 / WLT-3 (Euro 3 Regulation Models)

- If ECT sensor is okay, but PID value is out of specification, perform the "Circuit open/short inspection."

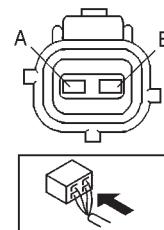
Circuit open/short inspection

1. Inspect for an open or short circuit in the following wiring harnesses.
 - If there is an open or short circuit, repair or replace wiring harness.

Open circuit

- Reference voltage circuit (ECT sensor connector terminal A and PCM connector terminal 1T)
- GND circuit (ECT sensor connector terminal B and PCM connector terminal 1B)

ECT SENSOR HARNESS SIDE CONNECTOR



ZCF4040W016

Short circuit

- ECT sensor connector terminal A and PCM connector terminal 1T to GND.

FUEL TEMPERATURE SENSOR INSPECTION

WL-3 / WLT-3 (Euro 3 Regulation Models)

Resistance Inspection

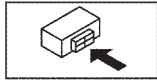
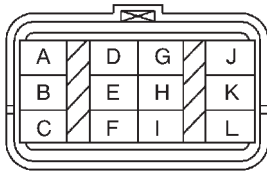
Note

- Perform the following test only when directed.

1. Disconnect the negative battery cable.
2. Disconnect the injection pump connector A.
3. Inspect the resistance between the terminals under the following condition.
 - Consult authorized BOSCH parts distributor for repair if the fuel temperature sensor is possibly malfunctioning.

CONTROL SYSTEM

- If fuel temperature sensor is okay, but PID value is out of specification, perform the "Circuit open/short inspection."



ZCF4040W001

Specification

Terminal	Atmospheric temperature °C {°F}	Resistance (ohm)
E—K	20—30 {68—86}	1.4—2.6

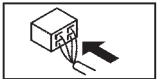
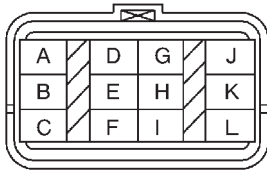
Circuit open/short inspection

1. Inspect for an open or short circuit in the following wiring harnesses.
 - If there is an open or short circuit, repair or replace wiring harnesses.

Open circuit

- Power supply circuit (Injection pump connector A terminal K and PCM connector terminal 1L)
- Ground circuit (Injection pump connector A terminal E and PCM connector terminal 1B)

CONNECTOR A
HARNESS SIDE CONNECTOR



ZCF4012W001

Short circuit

- Injection pump connector A terminal K and PCM connector terminal 1L to GND

PUMP SPEED SENSOR INSPECTION

WL-3 / WLT-3 (Euro 3 Regulation Models)

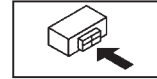
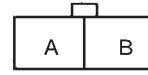
Resistance Inspection

Note

- Perform the following test only when directed.

1. Disconnect the negative battery cable.
2. Disconnect the connector C of the injection pump auxiliary part. (See NO TAG Injection pump auxiliary parts inspection)
3. Inspect the resistance between the terminals A and B under the following condition.

- Consult authorized BOSCH parts distributor for repair if the pump speed sensor is possibly malfunctioning:
- If pump speed sensor is okay, but PID value is out of specification, perform the "Circuit open/short inspection."



ZCF4040W002

Specification

Terminal	Atmospheric temperature °C {°F}	Resistance (ohm)
A—B	20—30 {68—86}	1.46—1.78

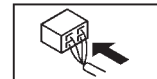
Circuit open/short inspection

1. Inspect for an open or short circuit in the following wiring harnesses.

Open circuit

- Power circuit (Pump speed sensor connector terminal A and PCM connector terminal 2K)
- GND circuit (Pump speed sensor connector terminal B and PCM connector terminal 2D)

CONNECTOR C
HARNESS SIDE CONNECTOR



ZCF4040W003

Short circuit

- Pump speed sensor connector terminal A and PCM connector terminal 2K to GND

CONTROL SLEEVE (CS) SENSOR INSPECTION

WL-3 / WLT-3 (Euro 3 Regulation Models)

Resistance inspection

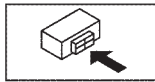
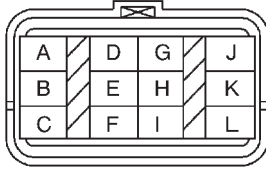
Note

- Perform the following test only when directed.

1. Disconnect the negative battery cable.
2. Disconnect the injection pump connector A.
3. Inspect the resistance between the terminals under the following condition.

CONTROL SYSTEM

- Consult authorized BOSCH parts distributor for repair if the CS sensor is possibly malfunctioning:
- If the CS sensor is okay, but PID value is out of specified, perform the "CS sensor circuit open/short inspection."



ZCF4040W001

Specification

Terminal	Atmospheric temperature °C {°F}	Resistance (ohm)
G—H	18—28 {66.4—82.4}	11.2—12.4
G—F	18—28 {66.4—82.4}	5.6—6.2
F—H	18—28 {66.4—82.4}	5.6—6.2

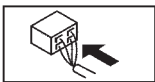
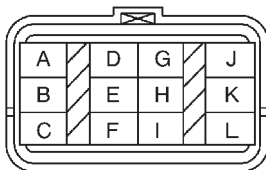
CS sensor circuit open/short inspection

1. Inspect for an open or short circuit in the following wiring harnesses.
 - if there is an open or short circuit, repair or replace wiring harnesses.

Open circuit

- Power circuit (Injection pump connector A terminal G and PCM connector terminal 1O)
- CS sensor signal circuit (CS sensor connector terminal F and PCM connector terminal 1Q)
- Ground circuit (Injection pump connector A terminal H and PCM connector terminal 1M)

CONNECTOR A
HARNESS SIDE CONNECTOR



ZCF4012W001

Short circuit

- Injection pump connector A terminal G and PCM connector terminal 1O to GND
- Injection pump connector A terminal F and PCM connector terminal 1Q to GND

TIMER POSITION SENSOR INSPECTION WL-3 / WLT-3 (Euro 3 Regulation Models) Resistance inspection

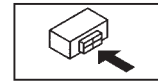
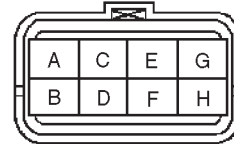
Note

- Perform the following test only when directed.

1. Disconnect the negative battery cable.
2. Disconnect the injection pump connector B.

3. Inspect the resistance between the terminals under the following condition.

- Consult authorized BOSCH parts distributor for repair if the timer position sensor is possibly malfunctioning:
- If timer position sensor is okay, but PID value is out of specification, perform the "Circuit open/short inspection."



ZCF4040W004

Specification

Terminal	Resistance (ohm)	Atmospheric temperature °C {°F}
A—B	76.3—87.7	15—35 {59—95}
A—C	76.3—87.7	15—35 {59—95}

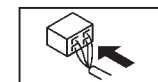
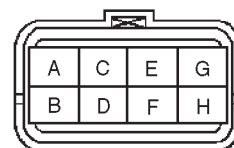
Circuit open/short inspection

1. Inspect for an open or short circuit in the following wiring harnesses.
 - If there is an open or short circuit, repair or replace wiring harnesses.

Open circuit

- Power circuit (Injection pump connector B terminal C and PCM connector terminal 1I)
- Timer position signal circuit (Injection pump connector B terminal A and PCM connector terminal 1K)
- Ground circuit (Injection pump connector B and PCM connector terminal 1G)

CONNECTOR B
HARNESS SIDE CONNECTOR



ZCF4040W005

Short circuit

- Injection pump connector B terminal C and PCM connector terminal 1I to GND
- Injection pump connector B terminal A and PCM connector terminal 1K to GND

INJECTION PUMP EPROM INSPECTION WL-3 / WLT-3 (Euro 3 Regulation Models)

Caution

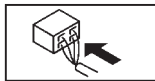
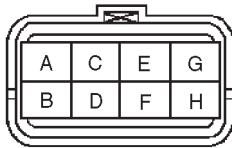
- Do not input voltage to B terminal in the injection pump EPROM. Doing so will cause a malfunction of the injection pump EPROM.

Note

- Perform the following test only when directed.

1. Disconnect the negative battery cable.
2. Disconnect the injection pump connector B.
3. Inspect for an open or short circuit in the following wiring harnesses.
 - If there is an open or short circuit, repair or replace wiring harnesses.
 - If the wiring harnesses are okay, but the injection pump EPROM is possibly malfunctioning, consult authorized BOSCH parts distributor for repair.

CONNECTOR B
HARNESS SIDE CONNECTOR



ZCF4040W005

Circuit open/short inspection

Open circuit

- Power Circuit (Injection pump connector B terminal D and PCM connector terminal 1A)
- Injection pump EPROM signal Circuit (Injection pump connector B terminal E and PCM connector terminal 1S)
- Injection pump EPROM signal Circuit (Injection pump connector B terminal F and PCM connector terminal 2E)
- Injection pump EPROM signal Circuit (Injection pump connector B terminal G and PCM connector terminal 2L)
- GND circuit (Injection pump connector B H and PCM connector terminal 1B)

Short circuit

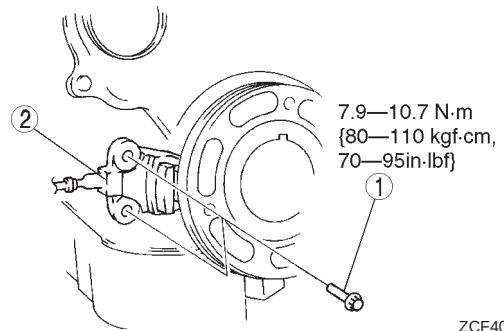
- Power Circuit (Injection pump connector B terminal D and PCM connector terminal 1A to GND)
- Injection pump EPROM signal Circuit (Injection pump connector B terminal E and PCM connector terminal 1S to GND)
- Injection pump EPROM signal Circuit (Injection pump connector B terminal F and PCM connector terminal 2E to GND)
- Injection pump EPROM signal Circuit (Injection pump connector B terminal G and PCM connector terminal 2L to GND)

TDC SENSOR REMOVAL/INSTALLATION

WL-3 / WLT-3 (Euro 3 Regulation Models)

1. Disconnect the negative battery cable.
2. Remove the crankshaft pulley.
3. Remove in the order indicated in the table.
4. Install in the reverse order of removal.

5. Verify that there is no interference between the TDC sensor and the plate.



ZCF4040W024

1	TDC sensor installation bolt
2	TDC sensor

TDC SENSOR INSPECTION

WL-3 / WLT-3 (Euro 3 Regulation Models)

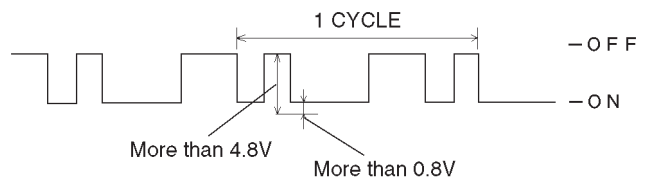
Wave profile Inspection

1. Set oscilloscope.

Measuring terminals

PCM terminal: 1H(+)↔1B(-)

2. Verify that output voltage when ON and OFF and output pattern are within the specification.

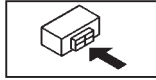
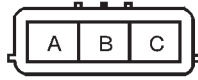


ZCF4040W043

3. If not as specified, perform the following inspections and repair or replace the malfunctioning part.

- When output voltage is approx. 5.0V constant
 - Open circuit between PCM terminal 1H and TDC sensor terminal B
- When output voltage is approx. 0V constant
 - Short circuit between PCM terminal 1H and TDC sensor terminal B
 - Open/Short circuit between power TDC sensor terminal A and PCM control relay terminal D
- When NE signal is ON and OFF with low output voltage or no oscillation

- TDC sensor plate read station has malfunction



ZCF4040W042

EGR VALVE POSITION SENSOR INSPECTION WL-3 / WLT-3 (Euro 3 Regulation Models)

Note

- Perform the following inspection only when directed.

EGR valve position sensor voltage inspection

1. Turn the engine switch to ON.
2. Set the WDS or equivalent and monitor the EGRVP PID.
 - If not as specified, perform the "Circuit open/short inspection."

EGRVP PID
approx. 0.6 V

3. Start the engine and warm up the engine completely.
4. Monitor the EGRVP PID.
 - If not as specified, perform the "Circuit open/short inspection."

EGRVP PID
above 3.0V

Circuit open/short inspection

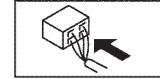
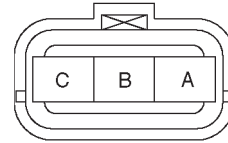
1. Inspect for an open or short circuit in the following wiring harnesses.
 - If there is an open or short circuit, repair or replace wiring harnesses.

Open circuit

- Power circuit (EGR valve position sensor connector terminal B and PCM connector terminal 1A)
- Signal circuit (EGR valve position sensor connector terminal C and PCM connector terminal 1F)

- GND circuit (EGR valve position sensor connector terminal A and PCM connector terminal 1B)

EGR VALVE POSITION SENSOR
HARNESS SIDE CONNECTOR



ZCF4040W009

Short circuit

- EGR valve position sensor connector terminal B and PCM connector terminal 1A to GND
- EGR valve position sensor connector terminal C and PCM connector terminal 1F to GND

BOOST SENSOR INSPECTION WL-3 / WLT-3 (Euro 3 Regulation Models)

Note

- Perform the following test only when detected.

1. Inspect the boost sensor for damage and cracks.
2. Inspect vacuum hose for improper routing, kinks or leakage.
 - If the above are okay, perform the "Circuit open/short inspection."
 - If the above open or short circuit are correct, replace the boost sensor.

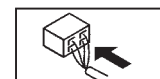
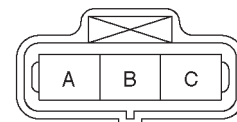
Circuit open/short inspection

1. Inspect for an open or short circuit in the following wiring harnesses.
 - If there is an open or short circuit, repair or replace wiring harnesses.

Open circuit

- Boost circuit (Boost sensor connector terminal B and PCM connector terminal 1P)
- Constant voltage circuit (Boost sensor connector terminal A and PCM connector terminal 1A)
- Ground circuit (Boost sensor connector terminal C and PCM connector terminal 1B)

BOOST SENSOR
HARNESS SIDE CONNECTOR



ZCF4040W011

Short circuit

- Boost circuit (Boost sensor connector terminal B and PCM connector terminal 1P to GND)
- Constant voltage circuit (Boost sensor connector terminal A and PCM connector terminal 1A to GND)

PCM CONTROL RELAY INSPECTION

WL-3 / WLT-3 (Euro 3 Regulation Models)

1. Inspect the PCM control relay. (See RELAY INSPECTION.)

ACCELERATOR POSITION SENSOR INSPECTION

WL-3 / WLT-3 (Euro 3 Regulation Models)

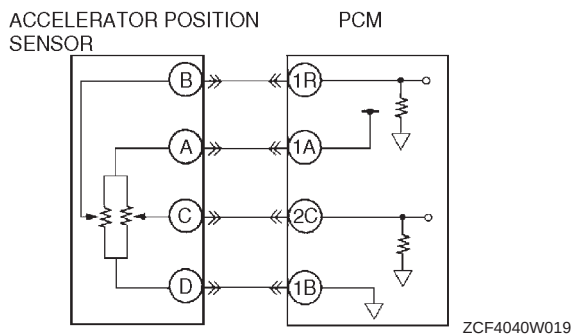
Note

- Perform the following test only when directed.

1. Visually inspect all accelerator pedal components for looseness.
2. Verify that the accelerator position sensor is installed to the accelerator pedal properly.
3. Check the power circuit voltage.
 - (1) Verify that the voltage between the PCM terminals 1A (power circuit) and 1B (ground circuit) is **4.75—5.25 V**.

Note

- Voltage at the PCM terminal 1R may deviate when the power circuit voltage is abnormal.



4. Verify that the voltage between the PCM terminals 1R (accelerator position detection signal) and 1B is as shown below according to the accelerator pedal conditions.
 - If not as specified, carry out the "Circuit Open/Short Inspection."
 - If the circuit is OK, replace the accelerator position sensor.

Specification

Accelerator pedal condition	Output voltage (V)
Fully released	0.5—0.7(Target value: 0.6)
Gradually depressed	Increases linearly
Fully depressed	3.4—3.8(Target value: 3.6)

Circuit Open/Short Inspection

1. Inspect for an open or short circuit in the following wiring harnesses.
 - If there is an open or short circuit, repair or replace wiring harnesses.

Open circuit

- Power circuit (Accelerator position sensor connector terminal A and PCM connector terminal 1A)

- Signal circuit (Accelerator position sensor connector terminal B and PCM connector terminal 1R)
- Signal circuit (Accelerator position sensor connector terminal C and PCM connector terminal 2C)
- GND circuit (Accelerator position sensor connector terminal D and PCM connector terminal 1B)

Short circuit

- Accelerator position sensor connector terminal B and PCM connector terminal 1R to GND.
- Accelerator position sensor connector terminal C and PCM connector terminal 2C to GND.

ACCELERATOR POSITION SENSOR ADJUSTMENT

WL-3 / WLT-3 (Euro 3 Regulation Models)

Caution

- **Adjusting the accelerator position sensor unnecessarily may adversely affect engine control. Therefore, adjust accelerator position sensor only when it is replaced.**

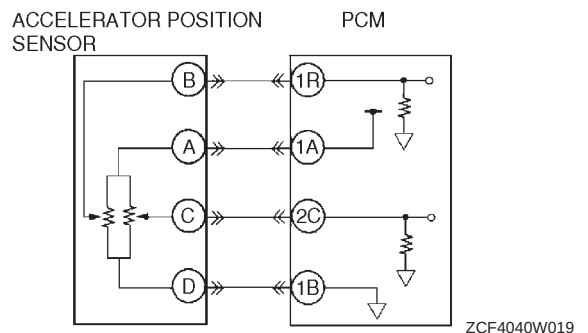
Note

- Perform the following test only when directed.
- Accelerator position sensor adjustment is based on the output voltage with the accelerator pedal fully released. Therefore, be sure to adjust according to the following procedure. (Begin adjustment with the accelerator pedal fully released.)

1. Visually inspect all accelerator pedal components for looseness.
2. Install the accelerator position sensor.
3. Check the power circuit voltage.
 - (1) Verify that the voltage between the PCM terminals 1A (power circuit) and 1B (ground circuit) is **4.75—5.25 V**.

Note

- Voltage at the PCM terminal 1R may deviate when the power circuit voltage is abnormal.



4. Adjust the output voltage when the accelerator pedal is fully released.
 - (1) Verify that the voltage between the PCM terminals 1R (accelerator position detection signal) and 1B is as shown below according to the accelerator pedal conditions.
 - If not as specified, move the accelerator position sensor to adjust the installation

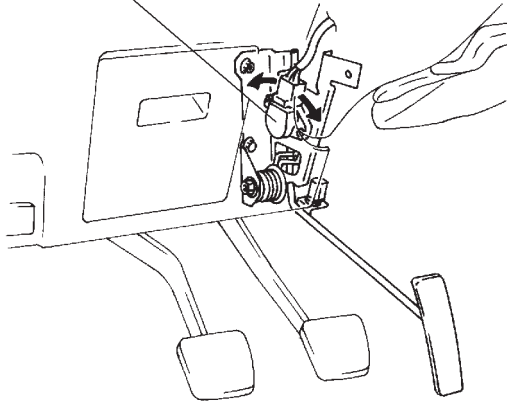
CONTROL SYSTEM

position of the accelerator position sensor so that the PCM terminal 1R voltage is within the specification.

Specification

Accelerator pedal condition	Output voltage (V)
Fully released	0.5—0.7 (Target value: 0.6)
Gradually depressed	Increases linearly

ACCELERATOR POSITION SENSOR



ZCF4040W020

- Verify that the output voltage when the accelerator pedal is fully depressed.

- Depress the accelerator pedal fully and verify that the voltage at the PCM terminal 1R is within the specification.

Specification

3.4—3.8V (Target value: 3.6 V)

- After completion of Steps 1. through 5, inspect the idle switch.

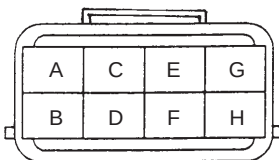
IDLE SWITCH INSPECTION

Europe and UK
Continuity Inspection
WL / WLT Models

Note

- Perform the following test only when directed.

- Disconnect the negative battery cable.
- Disconnect the 8-pin connector of FIP.
- Inspect for continuity between the idle switch terminal E and ground using an ohmmeter.



COMPONENT SIDE CONNECTOR
(VIEW FROM TERMINAL SIDE)

Specification

○—○ : Continuity

Measuring condition	Terminal	
	E	GND
Not accelerated	○—○	○—○
Other		

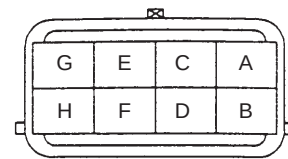
Caution

- Turning the idle switch with its connector connected can break the harness. Be sure to disconnect the connector when turning the idle switch more than one rotation.

- If not as specified, loosen the idle switch locknut and adjust the continuity by turning the idle switch.
- If not as specified, replace the idle switch. If the idle switch is okay, but PCM terminal voltage is out of specification, inspect as follows and repair or replace as necessary.

Open circuit

- Power supply circuit (Idle switch connector terminal E and PCM connector terminal 2H through common connector)
- GND circuit (Idle switch connector terminal and body GND)



HARNESS SIDE CONNECTOR
(VIEW FROM TERMINAL SIDE)

Short circuit

- Power supply circuit (Idle switch connector terminal E and PCM connector terminal H through common connector to GND)
- Repair or replace faulty areas.
 - Reconnect the 8-pin connector of FIP.

WL-3 / WLT-3 (Euro3 Regulation models)

Note

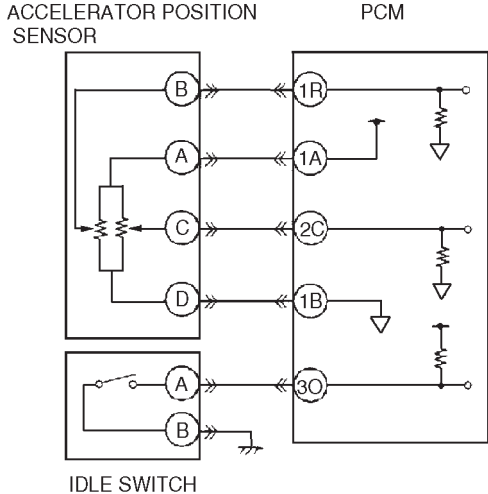
- Perform the following test only when directed.

- Verify that the accelerator position sensor is normal.
- Visually inspect all accelerator pedal components for looseness.
- Verify that the idle switch is installed to the accelerator pedal properly.
- Verify that the power circuit voltage.

- (1) Verify that the voltage between the PCM terminals 1A (power circuit) and 1B (ground circuit) is **4.75—5.25 V**.

Note

- Voltage at the PCM terminal 1R may deviate when the power circuit voltage is abnormal.



5. Verify that the voltage at the PCM terminal 3O (idle signal) is 1 V or less with the accelerator pedal fully released.
6. Depress the accelerator pedal gradually and hold the pedal when the PCM terminal 3O voltage changes to approximately **10 V**.
7. Verify that the voltage between the PCM terminals 1R (accelerator position detection signal) and 1B is within the specification.
 - If not as specified, carry out the "Circuit Open/Short Inspection."
 - If the circuit is OK, replace the idle switch.

Specification

1.0—1.2 V (Target value: 1.1 V)

Circuit Open/Short Inspection

1. Inspect for an open or short circuit in the following wiring harnesses.
 - If there is an open or short circuit, repair or replace wiring harnesses.

Open circuit

- Signal circuit (Idle switch connector terminal A and PCM connector terminal 3O)
- GND circuit (Idle switch connector terminal B and body GND)
- Power circuit (Accelerator position sensor connector terminal A and PCM connector terminal 1A)
- Signal circuit (Accelerator position sensor connector terminal B and PCM connector terminal 1R)
- Signal circuit (Accelerator position sensor connector terminal C and PCM connector terminal 2C)
- GND circuit (Accelerator position sensor connector terminal D and PCM connector terminal 1B)

Short circuit

- Idle switch connector terminal A and PCM connector terminal 3C to GND.
- Accelerator position sensor connector terminal B and PCM connector terminal 1R to GND.
- Accelerator position sensor connector terminal C and PCM connector terminal 2C to GND.

IDLE SWITCH ADJUSTMENT

WL-3 / WLT-3 (Euro3 Regulation models)

Caution

- **Adjusting the idle switch unnecessarily may adversely affect engine control. Therefore, adjust the idle switch only when it is replaced.**

Note

- Perform the following test only when directed.

1. Verify that the accelerator position sensor is normal.
2. Visually inspect all accelerator pedal components for looseness.
3. Loosen the locknut that secures the idle switch.
4. Verify that the power circuit voltage.
 - (1) Verify that the voltage between the PCM terminals 1A (power circuit) and 1B (ground circuit) is **4.75—5.25 V**.

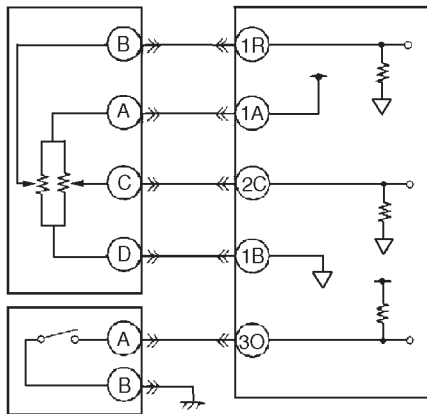
Note

- Voltage at the PCM terminal 1R may deviate when the power circuit voltage is abnormal.

CONTROL SYSTEM

ACCELERATOR POSITION SENSOR

PCM



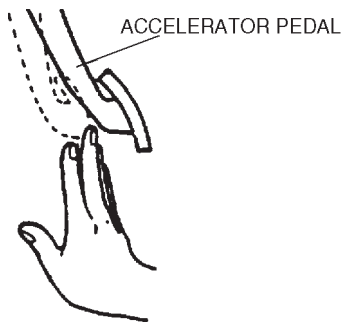
IDLE SWITCH

ZCF4040W025

- Depress the accelerator pedal by hand and secure it when the voltage between the PCM terminals 1R (accelerator position detection signal) and 1B is within the range specified below.

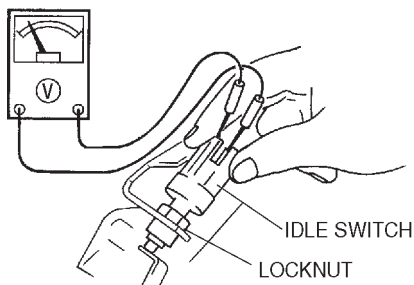
Voltage range

1.0—1.2V (Target value: 1.1 V)



ZCF4040W026

- Turn the idle switch under the condition in Step 5. Secure the idle switch when the continuity turns from OFF to ON, and tighten the locknut.



ZCF4040W028

- Release the accelerator pedal. Depress the accelerator pedal again and verify that the idle switch continuity changes from OFF to ON when the PCM terminal 1R voltage is within **1.0—1.2 V**.
 - If the continuity does not change, repeat Step 6.

CONTROL LEVER POSITION SENSOR INSPECTION

Europe and UK Output Voltage Inspection

Note

- Perform the following test only when directed.

- Verify that the FIP control lever is fully closed.
- Turn the engine switch on and measure the PCM terminal J voltage.

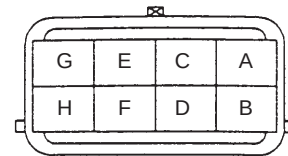
Specification

Measuring condition	Voltage (V)
Accelerator pedal is fully open.	Approx. 4.2
Accelerator pedal is fully closed.	Approx. 0.8—1.5

- If not as specified, replace the control lever position sensor. When the reading is out of specification, send the FIP with the control lever position sensor to a distributor to repair. If the PCM terminal voltage is out of specification, inspect as follows and repair or replace as necessary.

Open circuit

- Constant voltage circuit (Control lever position sensor connector terminal B and PCM connector terminal A through common connector)
- Control lever position signal circuit (Control lever position sensor connector terminal J and PCM connector terminal J through common connector)
- GND circuit (Control lever position sensor connector terminal C and PCM connector terminal B through common connector)

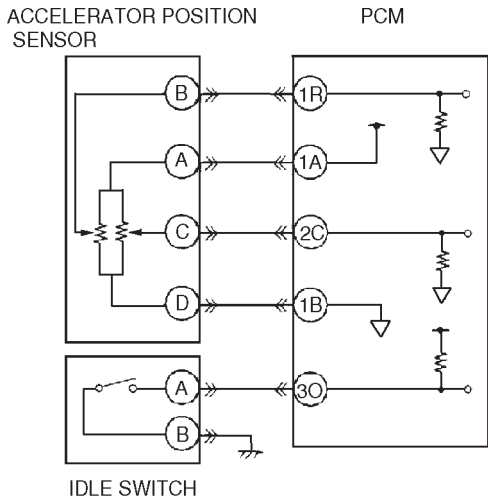


HARNESS SIDE CONNECTOR
(VIEW FROM TERMINAL SIDE)

Short circuit

- Control lever position sensor connector terminal B and PCM connector terminal A through common connector to GND
- Control lever position sensor connector terminal A and PCM connector terminal J through common connector to GND

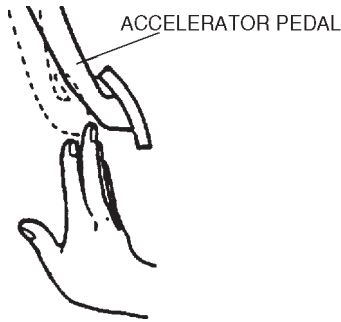
- Repair or replace faulty areas.
- Reconnect the 8-pin connector of FIP.



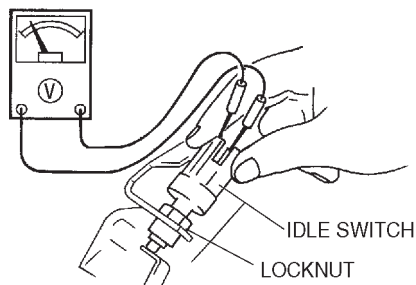
6. Depress the accelerator pedal by hand and secure it when the voltage between the PCM terminals 1R (accelerator position detection signal) and 1B is within the range specified below.

Voltage range

1.0—1.2V (Target value: 1.1 V)



7. Turn the idle switch under the condition in Step 5. Secure the idle switch when the continuity turns from OFF to ON, and tighten the locknut.



8. Release the accelerator pedal. Depress the accelerator pedal again and verify that the idle switch continuity changes from OFF to ON when the PCM terminal 1R voltage is within **1.0—1.2 V**.
- If the continuity does not change, repeat Step 6.

CLUTCH SWITCH INSPECTION WL-3 / WLT-3 (Euro3 Regulation models) Inspection of Continuity

Note

- Perform the following test only when directed.

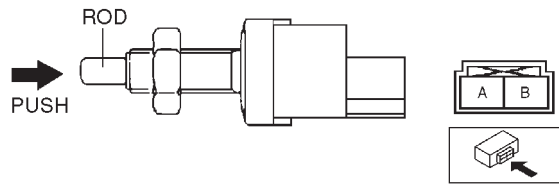
1. Inspect continuity between the clutch switch terminals using an ohmmeter.
 - If not as specified, replace the clutch switch.
 - If clutch switch is okay, but PID value is out of specification, perform the "Circuit open/short inspection."

Specification

○—○ : Continuity

Condition	Clutch pedal	Terminal	
		A	B
Push the rod	Released		
Except above	Depressed	○	○

ZCF4040W054



ZCF4040W007

2. Reconnect the clutch switch connector.

Circuit open/short inspection

1. Inspect for an open or short circuit in the following wiring harnesses.
 - If there is an open or short circuit, repair or replace wiring harnesses.

Open circuit

- Power circuit (Clutch switch connector terminal A and PCM connector terminal 1D)
- GND circuit (Clutch switch connector terminal B and GND.)

Short circuit

- Clutch switch connector terminal A and PCM connector terminal 1D to GND.

NEUTRAL SWITCH INSPECTION

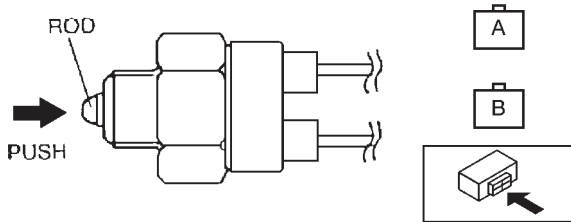
WL-3 / WLT-3 (Euro3 Regulation models)

Note

- Perform the following inspection only when directed.

Continuity inspection

1. Inspect for continuity between the neutral switch terminals using an ohmmeter.



ZCF4040W018

- If the neutral switch is okay, but the PNP PID is out of specification, carry out of the "Circuit open/short inspection."
- If not as specified, replace the neutral switch.

Specification

○—○ : Continuity

Condition	Transmission	Terminal	
		A	B
Rod pushed	In neutral	○—○	○—○
Except above	Others		

ZCF4040W047

Circuit open/short inspection

1. Inspect for an open or short circuit in the following wiring harnesses.
 - If there is an open or short circuit, repair or replace wiring harnesses.

Open circuit

- Power circuit (neutral switch terminal A and PCM terminal 1D)
- GND circuit (neutral switch terminal B and GND)

Short circuit

- Neutral switch terminal A and PCM connector terminal 1D to GND

ON-BOARD DIAGNOSTIC SYSTEM

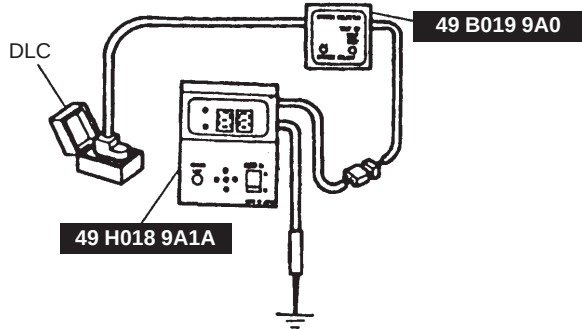
Europe and UK only

WL / WLT Models

DTC READING PROCEDURE

Using the SST (Self-Diagnosis Checker)

1. Connect the **SSTs** to the DLC located in the engine compartment and GND the black (negative) lead to the body.



2. Set the select switch on the **SST** (self-diagnosis checker) to A.
3. Turn the dial switch on the **SST** (system selector) to 1, and the test switch to SELF TEST.
4. Turn the engine switch on.
5. Verify that the buzzer sounds for approximately 3 seconds and code "88" flashes for 5 seconds. If DTC is not detected, "00" will then be indicated.

Note

- If the "88" does not flash, inspect +B terminal of the data link connector, and the related harnesses and connectors.
- If the "88" flashes and the buzzer sounds more than 20 seconds, inspect the harness between the PCM terminal and the DLC. If the harness is normal, replace the PCM and inspect.

6. If any DTCs are indicated, inspect the appropriate areas and repair as necessary.

Note

- A DTC consists of four numbers. They are flashed one by one in the right window on the display. ("1" is always shown on the left window.)
- When there are multiple malfunctions, the codes are displayed in numerical order.

7. After completion of repairs, erase all DTCs from the memory. (Refer to AFTER REPAIR PROCEDURE.)
8. Remove the **SSTs**.

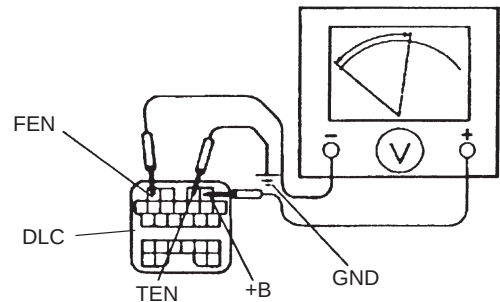
Using the Voltmeter

1. Turn the engine switch off.
2. Connect the DLC located in the engine compartment terminal TEN and GND using a jumper wire.

Caution

- **Connecting the wrong DLC terminals may possibly cause a malfunction. Carefully connect the specified terminals only.**

3. Connect the negative battery lead of voltmeter (20V range) to the DLC terminal FEN, and the positive lead to the DLC terminal +B.



4. turn the engine switch on.
5. The voltmeter indicates the battery positive voltage for approximately 3 seconds, then indicates 0V.
6. Read the DTCs indicated by the movement of the voltmeter's needle. If DTC is not detected, the needle does not move.
7. If any DTCs are indicated, inspect the appropriate areas and repair as necessary.
8. After completion of repairs, erase all DTCs from the memory. (Refer to AFTER REPAIR PROCEDURE.)
9. Remove the voltmeter and the jumper wire.

AFTER REPAIR PROCEDURE

1. After repairs, disconnect the negative battery cable for at least 20 seconds, and depress the brake pedal. Reconnect the negative battery cable.
2. Warm up the engine to normal operating temperature.

Note

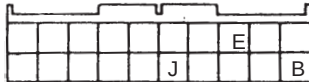
- If the engine will not start, keep the starter operated for 5-6 seconds.

3. Perform the "DTC READING PROCEDURE" again.
4. Verify that the DTC is not detected.

ON-BOARD DIAGNOSTIC SYSTEM

DTC INSPECTION DTC Table

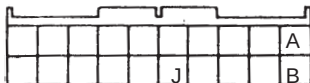
DTC No.	Indicator Pattern	Condition
09		Engine coolant temperature (ECT) sensor malfunction
12		Control lever position sensor malfunction
36		Glow plug relay malfunction

DTC 09		ENGINE COOLANT TEMPERATURE (ECT) SENSOR MALFUNCTION	
DETECTION CONDITION		Input value to PCM is excessively high or low for more than 2.0 sec.	
POSSIBLE CAUSE		- ECT sensor malfunction - Open or short circuit in wiring from ECT sensor terminal A to PCM terminal E - Open or short circuit in wiring from ECT sensor terminal B to PCM terminal B	
STEP	INSPECTION		ACTION
1	Does ECT sensor or PCM connector have poor connection?	Yes	Repair or replace connector, then go to Step 6.
		No	Go to next step.
2	Disconnect ECT sensor connector. Turn engine switch on. Is there 5 V at connector terminal A?	Yes	Go to next step.
		No	Inspect for open or short circuit in wiring harness. (PCM terminal B–ECT sensor terminal B)
3	Is there continuity between connector terminal A and PCM terminal E?	Yes	Go to next step.
		No	Repair or replace wiring harness, then go to Step 6.
4	Is ECT sensor okay? + CONTROL SYSTEM, ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION	Yes	Go to next step.
		No	Replace ECT sensor, then go to Step 6.
5	Clear DTC from memory. Is same code No. present after performing “After Repair Procedure”?	Yes	Go to Step 1.
		No	Intermittent poor connection in harnesses or connector. Repair connectors and/or harnesses, then go to next step.
6	Clear DTC from memory. Is there any DTC present after performing “After Repair Procedure”?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.
PCM (20 PIN)  HARNESS SIDE CONNECTOR (VIEW FROM HARNESS SIDE) ECT SENSOR  HARNESS SIDE CONNECTOR (VIEW FROM TERMINAL SIDE)			

ON-BOARD DIAGNOSTIC SYSTEM

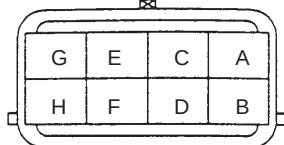
DTC 12		CONTROL LEVER POSITION SENSOR MALFUNCTION	
DETECTION CONDITION		• Input voltage from control lever position sensor is below 0.1 V or above 4.75 V when continued for 1.0 sec. • When idle switch is on, input voltage from control lever position sensor is below 0.35V or above 1.39V.	
POSSIBLE CAUSE		• Control lever position sensor malfunction • Idle switch malfunction • Open circuit in wiring from control lever position sensor (FIP connector: 8pin) terminal C to PCM terminal B • Open or short circuit in wiring from control lever position sensor (FIP connector: 8pin) terminal A to PCM terminal J • Open or short circuit in wiring from control lever position sensor (FIP connector: 8pin) terminal B to PCM terminal A • Open or short circuit wiring from idle switch (FIP connector: 8pin) terminal E to PCM terminal H	
STEP	INSPECTION		ACTION
1	Does control lever position sensor connector or PCM connector have poor connection?	Yes	Repair or replace connectors, then go to Step 7.
		No	Go to next step.
2	Disconnect control lever position sensor connector. Turn engine switch on. Is there 5 V at connector terminal B?	Yes	Go to next step.
		No	Inspect for open or short circuit in wiring harness. (PCM terminal A–control lever position sensor terminal B)
3	Is there continuity between connector terminal A and PCM terminal J?	Yes	Go to next step.
		No	Repair or replace wiring harness, then go to Step 7.
4	Is there continuity between connector terminal C and PCM terminal B?	Yes	Replace control lever position sensor, then go to Step 7.
		No	Repair or replace wiring harness, then go to Step 7.
5	Is there continuity between connector terminal E and PCM terminal H?	Yes	Go to next step.
		No	Repair or replace wiring harness, then go to Step 7.
6	Is idle switch okay? + CONTROL SYSTEM, IDLE SWITCH INSPECTION	Yes	Go to next step.
		No	Replace idle switch.
7	Clear DTC from memory. Is same code No. present after performing “After Repair Procedure”?	Yes	Go to Step 1.
		No	Intermittent poor connection in harness or connector. Repair connector and/or harness, then go to next step.
8	Clear DTC from memory. Is there any DTC present after performing “After Repair Procedure”?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

PCM (20 PIN)



HARNESS SIDE CONNECTOR
(VIEW FROM HARNESS SIDE)

CONTROL LEVER POSITION SENSOR

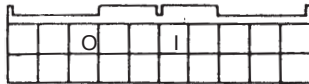


HARNESS SIDE CONNECTOR
(VIEW FROM TERMINAL SIDE)

ON-BOARD DIAGNOSTIC SYSTEM

DTC 36		GLOW PLUG RELAY MALFUNCTION	
DETECTION CONDITION		- When the glow plug relay is on, current voltage signal of the relay below 1.0 V is inputted to the PCM continuously for more than 1.0 sec. - When the glow plug relay is off, signal of the relay current voltage above 4.0 V is inputted to the PCM continuously for more than 1.0 sec.	
POSSIBLE CAUSE		- Glow plug relay malfunction - Open or short circuit in wiring from PCM terminal O to glow plug relay terminal A (BR) - Open or short circuit in wiring from PCM terminal I to glow plug relay terminal A (B) - Open or short circuit in wiring from glow plug relay terminal A (R) to glow fuse	
STEP	INSPECTION		ACTION
1	Does glow plug relay connector or PCM connector have poor connection?	Yes	Repair or replace connectors, then go to Step 5.
		No	Go to next step.
2	Remove glow plug relay. Is there continuity between connector terminal A and PCM terminal O? Is there continuity between connector terminal A (B) and PCM terminal I?	Yes	Go to next step.
		No	Repair or replace wiring harness.
3	Is there continuity between connector terminal B and body GND?	Yes	Go to next step.
		No	Repair or replace wiring harness.
4	Is there continuity between connector terminal A (R) and glow fuse?	Yes	Go to next step.
		No	Repair or replace wiring harness.
5	Is glow plug relay okay? + INTAKE-AIR SYSTEM, GLOW PLUG RELAY INSPECTION	Yes	Go to next step.
		No	Replace glow plug relay.
6	Clear DTC from memory. Is same code No. present after performing "After Repair Procedure"?	Yes	Go to Step 1.
		No	Intermittent poor connection in harnesses or connectors. Repair connectors and/or harnesses, then go to next step.
7	Clear DTC from memory. Is there any DTC present after performing "After Repair Procedure"?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

PCM (20 PIN)



HARNESS SIDE CONNECTOR
(VIEW FROM HARNESS SIDE)

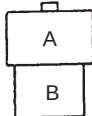
GLOW PLUG RELAY



(WIRE
COLOR: R)



(WIRE
COLOR: B)

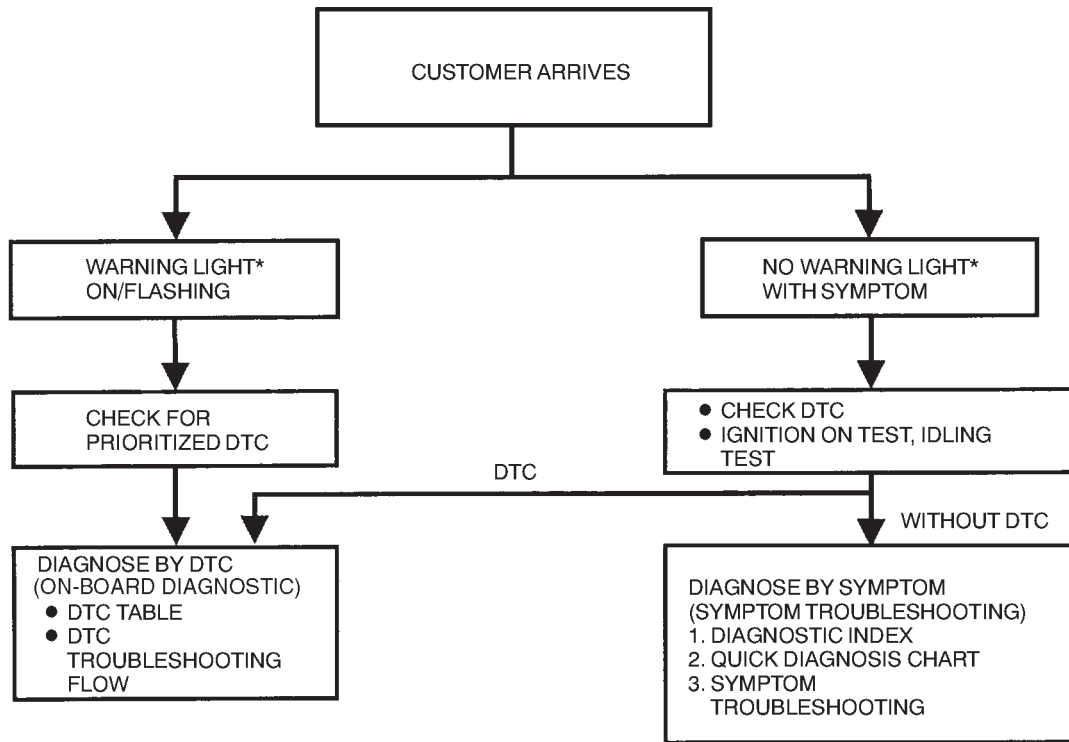


HARNESS SIDE CONNECTOR
(VIEW FROM TERMINAL SIDE)

ON-BOARD DIAGNOSTIC SYSTEM

Euro 3 Regulation Models

- When the customer reports a vehicle malfunction, check the warning light indication and diagnostic trouble code (DTC), then diagnose the malfunction according to following flowchart.
 - If a DTC exists, diagnose the applicable DTC inspection. (See 67 DTC TABLE.)
 - If no DTC exists and the warning light does not illuminate or flash, diagnose the applicable symptom troubleshooting. (See TROUBLESHOOTING ITEM TABLE)



YMU102WBX

*: Generator Warning Light, Security Light and Glow Indicator Light Flashing

OBD READ/CLEAR DIAGNOSTIC TEST RESULTS

Euro 3 Regulation Models

- This retrieves all stored DTCs in PCM and clears the DTC.

OBD PARAMETER IDENTIFICATION (PID) ACCESS

Euro 3 regulation Models

- The PID mode allows access to certain data values, analog and digital inputs/outputs, calculated values and system status information. Since PID values for output devices are PCM internal data values, inspect each device to identify which output device has a malfunction.

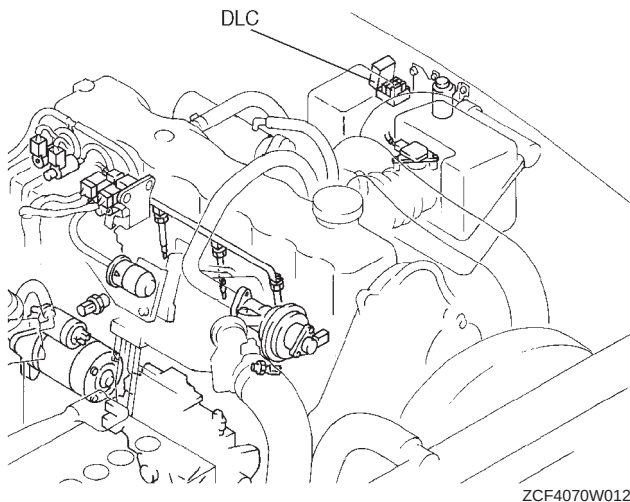
ON-BOARD DIAGNOSTIC SYSTEM

ON-BOARD DIAGNOSTIC TEST

Euro 3 Regulation Models

DTCs retrieving procedure

1. Perform the necessary vehicle preparation and visual inspection.
2. Connect WDS or equivalent to the vehicle DLC located the engine room.

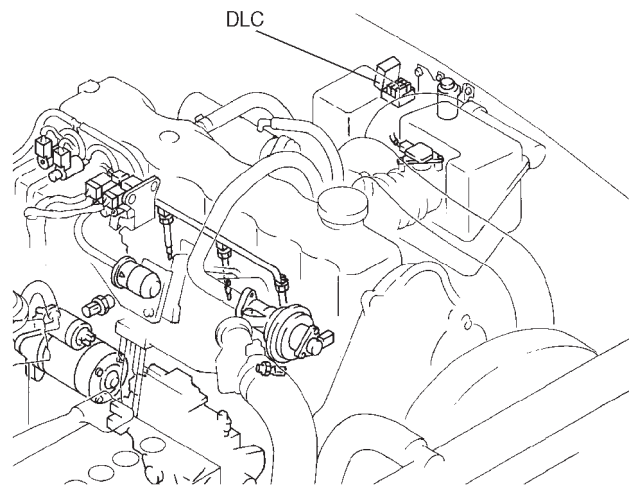


ZCF4070W012

3. Retrieve DTC by WDS or equivalent.

PID/DATA monitor and record procedure

1. Perform the necessary vehicle preparation and visual inspection.
2. Connect WDS or equivalent to the vehicle DLC located the engine room.



ZCF4070W012

3. Access and monitor PIDs by WDS or equivalent.

DTC TABLE

DTC	Output pattern	Possible cause	Page
P0100	 WALTPX0100	MAF circuit malfunction	(See 69 DTC P0100)
P0105	 WALTPX0105	Boost sensor circuit malfunction	(See 72 DTC P0105)
P0110	 WALTPX0110	IAT No.1 circuit malfunction	(See 74 DTC P0110)
P0115	 WALTPX0115	ECT circuit malfunction	(See 77 DTC P0115)
P0120	 WALTPX0120	Accelerator position sensor circuit malfunction	(See 80 DTC P0120)
P0180	 WALTPX0180	Fuel temperature sensor malfunction	(See 83 DTC P0180)
P0251	 WALTPX0251	Injection amount control system malfunction	(See 86 DTC P0251)
P0335	 WALTPX0335	TDC sensor circuit malfunction	(See 88 DTC P0335)
P0400	 WALTPX0400	EGR system malfunction	(See 89 DTC P0400)
P0500	 WALTPX0500	Vehicle speed sensor (VSS) circuit malfunction	(See 91 DTC P0500)

ON-BOARD DIAGNOSTIC SYSTEM

DTC	Output pattern	Possible cause	Page
P0510	 WALTPX0510	Idle switch malfunction	(See 93 DTC P0510)
P0606	 WALTPX0606	PCM malfunction	(See 94 DTC P0606)
P1110	 WALTPX1110	IAT No.2 circuit malfunction	(See 95 DTC P1110)
P1182	 WALTPX1182	Fuel shut off (FSO) solenoid malfunction	(See 98 DTC P1182)
P1189	 WALTPX1189	Pump speed sensor circuit malfunction	(See 99 DTC P1189)
P1195	 WALTPX1195	BARO circuit malfunction	(See 100 DTC P1195)
P1226	 WALTPX1226	Control sleeve (CS) sensor circuit malfunction	(See 101 DTC P1226)
P1312	 WALTPX1312	Timer control valve circuit malfunction	(See 103 DTC P1312)
P1318	 WALTPX1318	Timer position sensor circuit malfunction	(See 105 DTC P1318)
P1402	 WALTPX1402TIF	EGR valve position sensor circuit malfunction	(See 107 DTC P1402)
P1602 *	 WALTPX1602	Immobilizer unit-PCM communication error	(See 110 DTC P1602)
P1603 *	 WALTPX1603	Code word is not registered in PCM	(See 112 DTC P1603)
P1604 *	 WALTPX1604	Key ID numbers are not registered in PCM	(See 113 DTC P1604)
P1621 *	 WALTPX1621	Code word does not match after engine cranking	(See 113 DTC P1621)
P1622 *	 WALTPX1622	Key ID number does not match	(See 114 DTC P1622)
P1623 *	 WALTPX1623	Code word or key ID number read/write error in PCM	(See 114 DTC P1623)

ON-BOARD DIAGNOSTIC SYSTEM

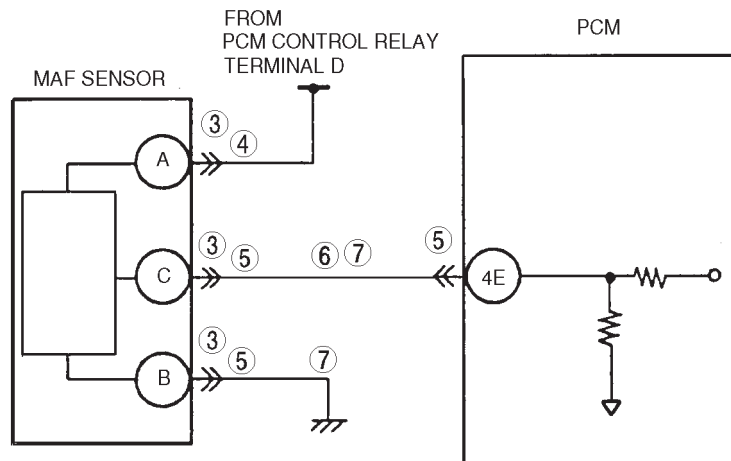
DTC	Output pattern	Possible cause	Page
P1624 *		Immobilizer system communication counter = 0	(See 115 DTC P1624)
P1649		Injection pump EPROM circuit malfunction	(See 115 DTC P1649)

* : With immobilizer system

DTC P0100

DTC P0100	MAF circuit malfunction
DETECTION CONDITION	- PCM monitors input voltage from MAF/IAT sensor when engine is running. If PCM detects either of following conditions, PCM determines that MAF circuit has a malfunction. - Input voltage at PCM terminal 4E is below 0.25 V. - Input voltage at PCM terminal 4E is above 4.90 V.
POSSIBLE CAUSE	- MAF/IAT sensor malfunction - Connector or terminal malfunction - Short to GND in wiring between MAF/IAT sensor terminal C and PCM terminal 4E - Open circuit in wiring between MAF/IAT sensor terminal C and PCM terminal 4E - Open circuit in wiring between MAF/IAT sensor terminal B and PCM terminal body GND - PCM malfunction - Open circuit in wiring between MAF/IAT sensor terminal A and PCM control relay terminal D

LOW INPUT

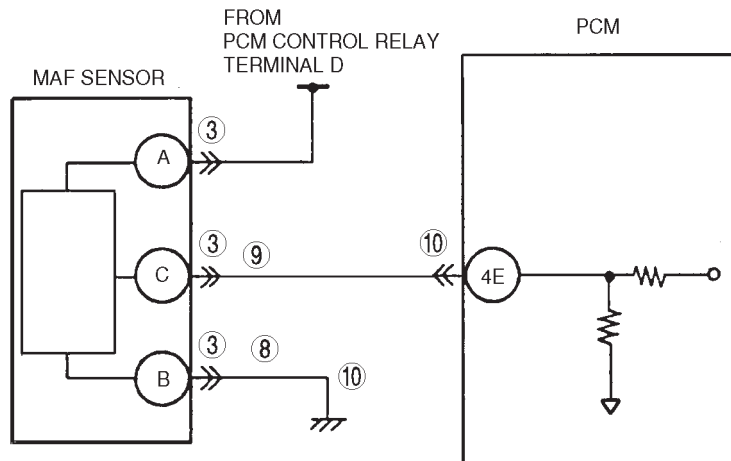


ZCF4070W001

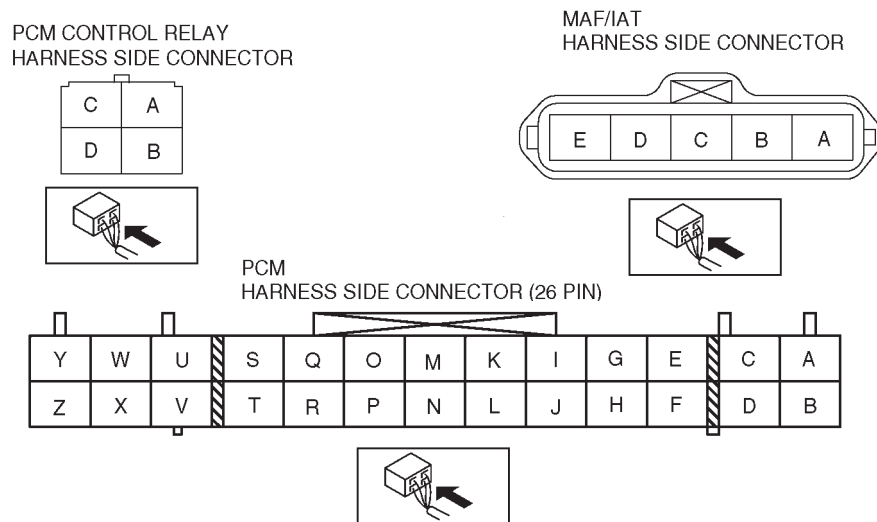
ON-BOARD DIAGNOSTIC SYSTEM

DTC P0100	MAF circuit malfunction
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HIGH INPUT



ZCF4070W002



ZCF4070W003

Diagnostic procedure

STEP	INSPECTION	ACTION
1	VERIFY RELATED SERVICE INFORMATION AVAILABILITY - Check for related Service Information availability. - Is any related Service Information available?	Yes Perform repair or diagnosis according to available Service Information. If vehicle is not repaired, go to next step.
		No Go to next step.
2	VERIFY CURRENT INPUT SIGNAL STATUS - Turn engine switch (engine OFF). - Connect WDS or equivalent. - Start engine. - Access MAF PID using WDS or equivalent. - Is MAF PID within 0.25— 4.90 V?	Yes Go to Step 11.
		No Go to next step.
3	INSPECT MAF/IAT SENSOR CONNECTOR FOR POOR CONNECTION - Turn engine switch to OFF. - Disconnect MAF/IAT sensor connector. - Check for poor connection (damaged, pulled-out terminals, corrosion, etc.). - Is there a malfunction?	Yes Repair or replace terminals, then go to Step 9.
		No If MAF PID is below 0.25 V in previous step, go to next step. If MAF PID is above 4.90 V in previous step, go to Step 8.
4	CHECK POWER SUPPLY CIRCUIT FOR OPEN CIRCUIT - Turn engine switch to ON (Engine OFF). - Check voltage at MAF/IAT sensor terminal A (harness-side). - Is voltage B+?	Yes Go to next step.
		No Inspect for open circuit in wiring harness between MAF/IAT sensor terminal A (harness-side) and PCM control relay terminal D (harness-side). Repair or replace harness, then go to Step 11.

ON-BOARD DIAGNOSTIC SYSTEM

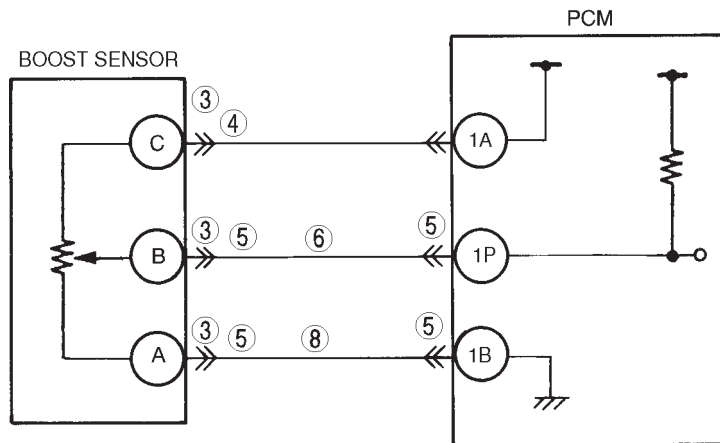
STEP	INSPECTION	ACTION	
5	INSPECT PCM CONNECTOR FOR POOR CONNECTION ● Turn engine switch to OFF. ● Disconnect PCM connector. ● Check for poor connection (damaged, pulled-out terminals, corrosion, etc.). ● Is there a malfunction?	Yes	Repair terminal, then go to Step 11.
		No	Go to next step.
6	INSPECT MAF SENSOR SIGNAL CIRCUIT FOR OPEN CIRCUIT ● Check for continuity between MAF/IAT sensor terminal C (harness-side) and PCM connector terminal 4E (harness-side). ● Is there continuity?	Yes	Go to next step.
		No	Repair or replace suspected harness, then go to Step 11.
7	INSPECT MAF SENSOR SIGNAL CIRCUIT FOR SHORTS ● Check for continuity between following circuits: — MAF/IAT sensor terminal C (harness-side) and body GND — MAF/IAT sensor connector terminals B and C (harness-side) ● Is there continuity?	Yes	Repair or replace suspected harness, then go to Step 11.
		No	Inspect MAF/IAT sensor, then go to Step 11. (See NO TAG MASS AIR FLOW (MAF)/INTAKE AIR TEMPERATURE (IAT) SENSOR INSPECTION)
8	INSPECT MAF SENSOR GROUND CIRCUIT FOR OPEN CIRCUIT ● Check for continuity between MAF/IAT sensor terminal B (harness-side) and body GND. ● Is there continuity?	Yes	Go to next step.
		No	Repair or replace suspected harness, then go to Step 11.
9	INSPECT MAF SENSOR SIGNAL CIRCUIT FOR SHORT TO POWER CIRCUIT ● Turn engine switch to ON (Engine OFF). ● Measure voltage between MAF/IAT sensor terminal C (harness-side) and body GND. ● Is voltage 0 V?	Yes	Go to next step.
		No	Repair or replace suspected harness, then go to Step 11.
11	INSPECT POOR CONNECTION OF PCM CONNECTOR ● Turn engine switch to OFF. ● Disconnect PCM connector. ● Check for poor connection at terminals 4E and 4A (damaged, pulled-out terminals, corrosion, etc.). ● Is there a malfunction?	Yes	Repair terminal, then go to next step.
		No	Inspect MAF/IAT sensor, then go to next step. (See NO TAG MASS AIR FLOW (MAF)/INTAKE AIR TEMPERATURE (IAT) SENSOR INSPECTION)
12	VERIFY TROUBLESHOOTING OF DTC P0100 COMPLETED ● Make sure to reconnect all disconnected connectors. ● Turn engine switch to ON (engine OFF). ● Clear DTC from PCM memory using WDS or equivalent. ● Start engine. ● Is same DTC present?	Yes	Replace PCM, then go to next step.
		No	Go to next step.
13	VERIFY AFTER REPAIR PROCEDURE ● Perform "AFTER REPAIR PROCEDURE". (See Section F2) ● Is there any DTC present?	Yes	Go to applicable DTC inspection. (See 67 DTC TABLE)
		No	Troubleshooting completed.

ON-BOARD DIAGNOSTIC SYSTEM

DTC P0105

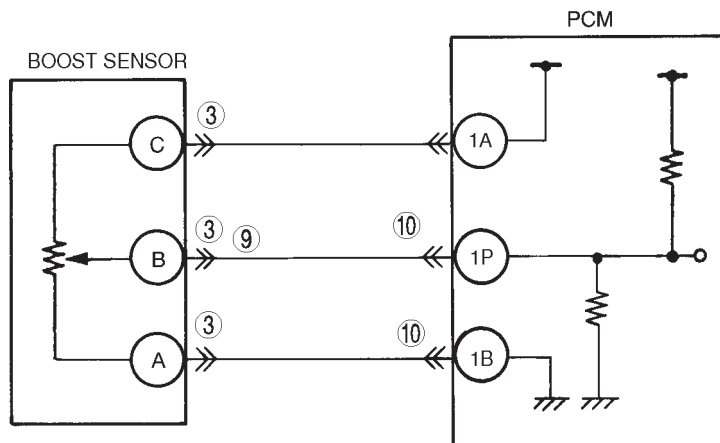
DTC P0105	Boost sensor circuit malfunction
DETECTION CONDITION	- PCM monitors input voltage from boost sensor when engine switch is turned ON. If PCM detects either of following conditions, PCM determines that boost sensor circuit has a malfunction. - Input voltage at PCM terminal 1P is below 0.19 V. - Input voltage at PCM terminal 1P is above 4.90 V.
POSSIBLE CAUSE	- Boost sensor malfunction - Connector or terminal malfunction - Short to GND in wiring between boost sensor terminal B and PCM terminal 1P - Open circuit in wiring between boost sensor terminal B and PCM terminal 1P - Open circuit in wiring between boost sensor terminal A and PCM terminal 1B - Open circuit in wiring between boost sensor terminal C and PCM terminal 1A - PCM malfunction

LOW INPUT



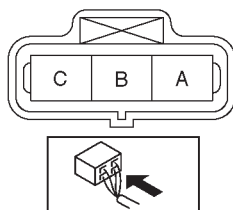
ZCF4070W004

HIGH INPUT

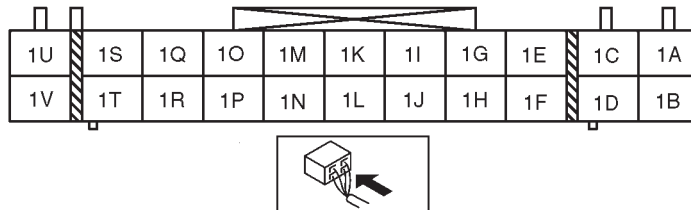


ZCF4070W005

BOOST SENSOR
HARNESS SIDE CONNECTOR



PCM
HARNESS SIDE CONNECTOR (22 PIN)



ZCF4070W006

ON-BOARD DIAGNOSTIC SYSTEM

Diagnostic procedure

STEP	INSPECTION	ACTION	
1	VERIFY RELATED SERVICE INFORMATION AVAILABILITY - Check for related Service Information availability. - Is any related Service Information available?	Yes	Perform repair or diagnosis according to available Service Information. If vehicle is not repaired, go to next step.
		No	Go to next step.
2	VERIFY CURRENT INPUT SIGNAL STATUS - Turn engine switch to ON (engine OFF). - Connect WDS or equivalent. - Start engine. - Access MAP PID using WDS or equivalent. - Is MAP PID within 0.19— 4.90 V?	Yes	Go to Step 11.
		No	Go to next step.
3	INSPECT POOR CONNECTION OF BOOST SENSOR CONNECTOR - Turn engine switch to OFF. - Disconnect boost sensor connector. - Check for poor connection (damaged, pulled-out terminals, corrosion, etc.). - Is there a malfunction?	Yes	Repair or replace terminals, then go to Step 9.
		No	If MAP PID is below 0.19 V in previous step, go to next step. If MAP PID is above 4.90 V in previous step, go to Step 8.
4	CHECK POWER SUPPLY CIRCUIT FOR OPEN CIRCUIT - Turn engine switch to ON (Engine OFF). - Check voltage at boost sensor terminal C (harness-side). - Is voltage B+?	Yes	Go to next step.
		No	Inspect for open circuit in wiring harness between boost sensor terminal C (harness-side) and PCM terminal 1A (harness-side). Repair or replace harness, then go to Step 11.
5	INSPECT PCM CONNECTOR FOR POOR CONNECTION - Turn engine switch to OFF. - Disconnect PCM connector. - Check for poor connection (damaged, pulled-out terminals, corrosion, etc.). - Is there a malfunction?	Yes	Repair terminal, then go to Step 11.
		No	Go to next step.
6	INSPECT BOOST SENSOR SIGNAL CIRCUIT FOR OPEN CIRCUIT - Check for continuity between boost sensor terminal B (harness-side) and PCM connector terminal 1P (harness-side). - Is there continuity?	Yes	Go to next step.
		No	Repair or replace suspected harness, then go to Step 11.
7	INSPECT BOOST SENSOR SIGNAL CIRCUIT FOR SHORTS - Check for continuity between following circuits: - Boost sensor terminal B (harness-side) and body GND - Boost sensor connector terminals A and B (harness-side) - Is there continuity?	Yes	Repair or replace suspected harness, then go to Step 11.
		No	Inspect boost sensor, then go to Step 11. (See NO TAG BOOST SENSOR INSPECTION)
8	INSPECT BOOST SENSOR GROUND CIRCUIT FOR OPEN CIRCUIT - Check for continuity between boost sensor terminal A (harness-side) and PCM connector terminal 1B (harness-side). - Is there continuity?	Yes	Replace boost sensor, then go to Step 11.
		No	Repair or replace suspected harness, then go to Step 11.
9	INSPECT BOOST SENSOR SIGNAL CIRCUIT FOR SHORT TO POWER CIRCUIT - Turn engine switch to ON (Engine OFF). - Measure voltage between boost sensor terminal B (harness-side) and body GND. - Is voltage 0 V?	Yes	Go to next step.
		No	Repair or replace suspected harness, then go to Step 11.
10	INSPECT PCM CONNECTOR FOR POOR CONNECTION - Turn engine switch to OFF. - Disconnect PCM connector. - Check for poor connection at terminals 1A, 1B and 1P (damaged, pulled-out terminals, corrosion, etc.). - Is there a malfunction?	Yes	Repair terminal, then go to next step.
		No	Inspect boost sensor, then go to next step. (See NO TAG BOOST SENSOR INSPECTION)

ON-BOARD DIAGNOSTIC SYSTEM

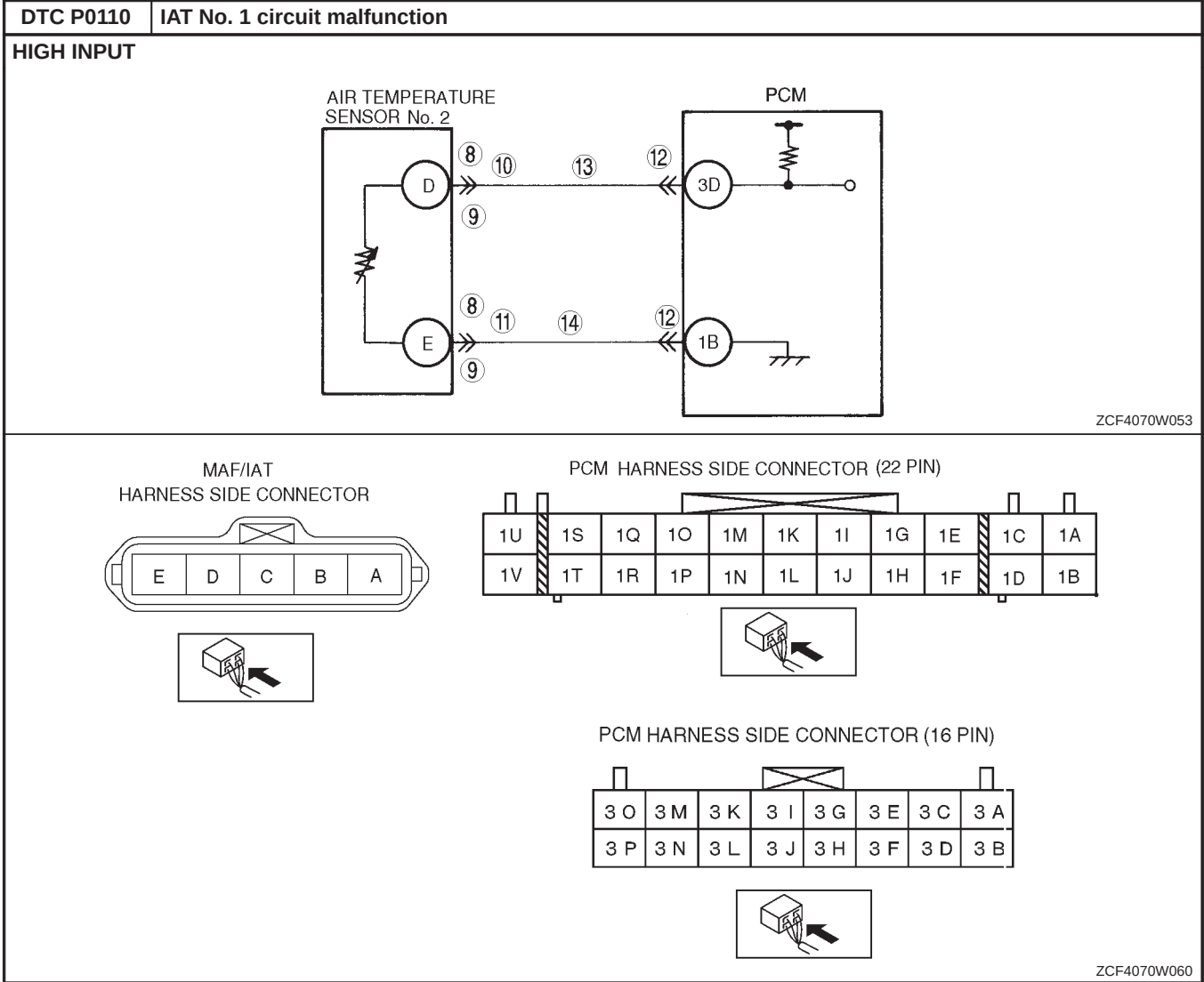
STEP	INSPECTION	ACTION	
11	VERIFY TROUBLESHOOTING OF DTC P0105 COMPLETED - Make sure to reconnect all disconnected connectors. - Turn engine switch to ON (engine OFF). - Clear DTC from PCM memory using WDS or equivalent. - Start engine. - Is same DTC present?	Yes	Replace PCM, then go to next step.
		No	Go to next step.
12	VERIFY AFTER REPAIR PROCEDURE - Perform "AFTER REPAIR PROCEDURE". (See Section F2) - Is there any DTC present?	Yes	Go to applicable DTC inspection. (See 67 DTC TABLE)
		No	Troubleshooting completed.

DTC P0110

DTC P0110	IAT No. 1 circuit malfunction
DETECTION CONDITION	PCM monitors IAT sensor No. 1 signal at PCM terminal 1J. If voltage at PCM terminal 1J is below 0.13 V or above 4.90 V, PCM determines that IAT sensor No. 1 circuit has a malfunction.
POSSIBLE CAUSE	- IAT sensor No. 1 malfunction - Short to GND circuit between IAT sensor No. 1 terminal D and PCM terminal 3D - IAT No. 1 signal and IAT GND circuit are shorted each other. - Poor connection at IAT sensor No. 1 or PCM connector - PCM malfunction - Open circuit between IAT sensor No. 1 terminal D and PCM terminal 3D - Short to power circuit between IAT sensor No. 1 terminal D and PCM terminal 3D - Open circuit between IAT sensor No. 1 terminal E and PCM terminal 1B - Short to power circuit between IAT sensor No. 1 terminal E and PCM terminal 1B
LOW INPUT	

ZCF4070W052

ON-BOARD DIAGNOSTIC SYSTEM



Diagnostic procedure

STEP	INSPECTION	ACTION
1	VERIFY RELATED SERVICE INFORMATION AVAILABILITY - Check for related Service Information availability. - Is any related Service Information available?	Yes Perform repair or diagnosis according to available Service Information. If vehicle is not repaired, go to next step.
		No Go to next step.
2	CLASSIFY IF INTERMITTENT CONCERN OR CONTINUOUS CONCERN - Clear DTC from PCM memory. - Turn engine switch to OFF then ON (Engine OFF). - Is same DTC present?	Yes Go to next step.
		No Intermittent concern exists. Go to INTERMITTENT CONCERN TROUBLESHOOTING procedure. (See NO TAG INTERMITTENT CONCERN TROUBLESHOOTING)
3	VERIFY CURRENT INPUT SIGNAL STATUS-HIGH OR LOW INPUT - Start engine. - Access IATDC PID using WDS or equivalent. - Is IATDC PID within 0.13—4.90 V?	Yes Go to Step 16.
		No - IF IATDC PID is below 0.13 V, go to next step. - IF IATDC PID is above 4.90 V, go to Step 9.
4	INSPECT IAT SENSOR No. 1 TERMINAL - Turn engine switch to OFF. - Disconnect IAT sensor No. 1 connector. - Check for bent terminal of IAT sensor No. 1 terminals D and E (part-side). - Is there a malfunction?	Yes Repair or replace terminal, then go to Step 16.
		No Go to next step.

ON-BOARD DIAGNOSTIC SYSTEM

STEP	INSPECTION		ACTION
5	CLASSIFY IF IAT SENSOR No. 1 MALFUNCTION OR HARNESS MALFUNCTION - Turn engine switch to ON (Engine OFF). - Access IATDC PID using WDS or equivalent. - Is IATDC PID below 0.13 V?	Yes	Go to next step.
		No	Go to Step 10.
6	INSPECT IAT SENSOR No. 1 SIGNAL CIRCUIT FOR SHORT TO GND - Turn engine switch to OFF. - Disconnect PCM connector. - Check for continuity between IAT sensor No. 1 terminal D (harness-side) and body GND. - Is there continuity?	Yes	Repair or replace shorted harness, then go to Step 16.
		No	Go to next step.
7	INSPECT IAT SENSOR No. 1 CIRCUITS FOR SHORT - Check for continuity between IAT sensor No. 1 terminals D and E (harness-side). - Is there continuity?	Yes	Repair or replace shorted harness, then go to Step 16.
		No	Go to Step 16.
8	INSPECT IAT SENSOR No. 1 CONNECTOR FOR POOR CONNECTION - Turn engine switch to OFF. - Disconnect IAT sensor No. 1 connector. - Check for poor connection (damaged, pulled-out pins, corrosion, etc.). - Is there a malfunction?	Yes	Repair or replace terminal, then go to Step 16.
		No	Go to next step.
9	INSPECT IAT SENSOR No. 1 - Inspect IAT sensor No. 1. (See NO TAG MASS AIR FLOW (MAF)/INTAKE AIR TEMPERATURE (IAT) SENSOR INSPECTION) - Is it okay ?	Yes	Go to next step.
		No	Replace IAT sensor No. 1, then go to Step 16.
10	INSPECT IAT SENSOR No. 1 SIGNAL CIRCUIT FOR SHORT TO POWER - Turn engine switch to ON (Engine OFF). - Measure voltage between IAT sensor No. 1 terminal D (harness-side) and body GND. - Is voltage B+?	Yes	Repair or replace shorted harness, then go to Step 16.
		No	Go to next step.
11	INSPECT IAT SENSOR No. 1 GND CIRCUIT FOR SHORT TO POWER - Measure voltage between IAT sensor No. 1 terminal E (harness-side) and body GND. - Is voltage B+?	Yes	Repair or replace shorted harness, then go to Step 16.
		No	Go to next step.
12	INSPECT PCM CONNECTOR FOR POOR CONNECTION - Turn engine switch to OFF. - Disconnect PCM connector. - Inspect PCM terminals 3D and 1B (damaged, pulled-out pins, corrosion, etc.). - Is there a malfunction?	Yes	Repair or replace terminal, then go to Step 16.
		No	Go to next step.
13	INSPECT IAT SENSOR No. 1 SIGNAL CIRCUIT FOR OPEN - Check for continuity between IAT sensor No. 1 terminal D (harness-side) and PCM terminal 3D. - Is there continuity?	Yes	Go to next step.
		No	Repair or replace open harness, then go to Step 16.
14	INSPECT IAT SENSOR No. 1 GND CIRCUIT FOR OPEN - Check for continuity between IAT sensor No. 1 terminal E (harness-side) and PCM terminal 1B (harness-side). - Is there continuity?	Yes	Go to next step.
		No	Repair or replace open harness, then go to next step.

ON-BOARD DIAGNOSTIC SYSTEM

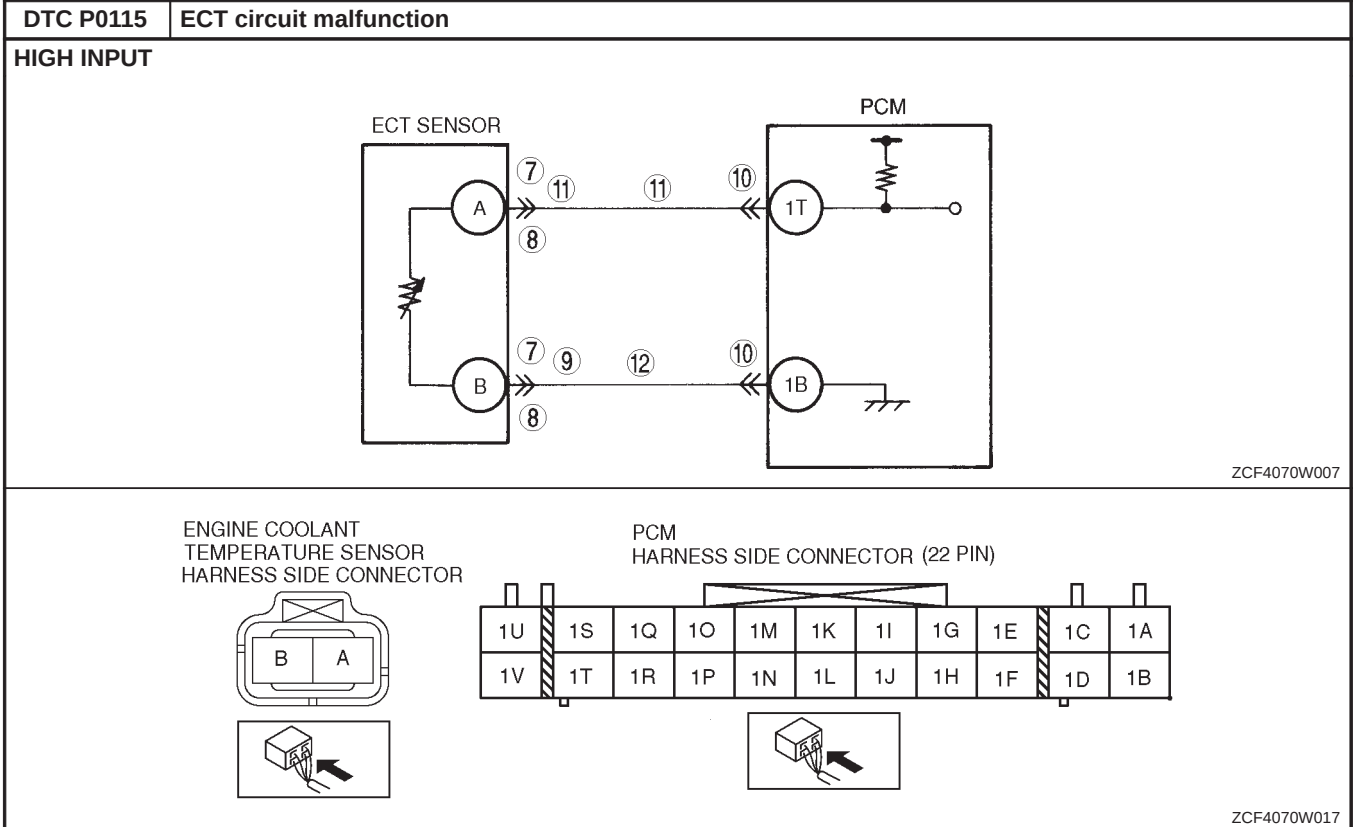
STEP	INSPECTION		ACTION
15	VERIFY TROUBLESHOOTING OF DTC P1110 COMPLETED - Make sure to reconnect all disconnected connectors. - Clear DTC from PCM memory. - Start engine. - Is same DTC present?	Yes	Replace PCM, then go to next step.
		No	Go to next step.
16	VERIFY AFTER REPAIR PROCEDURE - Perform "AFTER REPAIR PROCEDURE". (See Section F2) - Is there any DTC present?	Yes	Go to applicable DTC inspection. (See 67 DTC TABLE)
		No	Troubleshooting completed.

DTC P0115

DTC P0115	ECT circuit malfunction
DETECTION CONDITION	PCM monitors ECT sensor signal at PCM terminal 1T. If voltage at PCM terminal 1T is below 0.19 V or above 4.90 V, PCM determines that ECT sensor circuit has a malfunction.
POSSIBLE CAUSE	- ECT sensor malfunction - Short to GND circuit between ECT sensor terminal A and PCM terminal 1T - ECT signal and ECT GND circuit are shorted each other. - Poor connection at ECT sensor or PCM connector - PCM malfunction - Open circuit between ECT sensor terminal A and PCM terminal 1T - Short to power circuit between ECT sensor terminal A and PCM terminal 1T - Open circuit between ECT sensor terminal B and PCM terminal 1B - Short to power circuit between ECT sensor terminal B and PCM terminal 1B
LOW INPUT	

ZCF4070W016

ON-BOARD DIAGNOSTIC SYSTEM



Diagnostic procedure

STEP	INSPECTION	ACTION	
1	VERIFY RELATED REPAIR INFORMATION AVAILABILITY - Check for related Service Information availability. - Is any related Service information available?	Yes	Perform repair or diagnosis according to available Service information. If vehicle is not repaired, go to next step.
		No	Go to next step.
2	CLASSIFY INTERMITTENT CONCERN OR CONTINUOUS CONCERN - Turn engine switch ON (engine OFF). - Connect the WDS or equivalent. - Clear DTC from PCM memory. - Turn engine switch to OFF then ON (Engine OFF). - Is same DTC present?	Yes	Go to next step.
		No	Intermittent concern is existing. Go to INTERMITTENT CONCERN TROUBLESHOOTING procedure. (See NO TAG INTERMITTENT CONCERN TROUBLESHOOTING)
3	VERIFY CURRENT INPUT SIGNAL STATUS—CIRCUIT MALFUNCTION - Start engine. - Access ECT PID using WDS or equivalent. - Is ECT PID within 0.19—4.90 V?	Yes	Go to Step 13.
		No	- If ECT PID is below 0.19 V, go to next step. - If ECT PID is above 4.90 V, go to Step 7.
4	INSPECT TERMINAL FOR BENDING - Turn engine switch to OFF. - Disconnect ECT sensor connector. - Check for bent of ECT sensor terminals A and B (part-side). - Is there any concerns?	Yes	Repair or replace terminal, then go to Step 13.
		No	Go to next step.
5	INSPECT ECT SIGNAL CIRCUIT FOR SHORT TO GND - Turn engine switch to OFF. - Disconnect PCM connector. - Check continuity between ECT sensor terminal A (harness-side) and body GND. - Is there continuity?	Yes	Repair or replace shorted harness, then go to Step 13.
		No	Go to next step.
6	INSPECT ECT CIRCUIT FOR SHORT - Check continuity between ECT sensor terminals A and B (harness-side). - Is there continuity?	Yes	Repair or replace shorted harness, then go to step 13.
		No	Go to Step 13.

ON-BOARD DIAGNOSTIC SYSTEM

STEP	INSPECTION	ACTION	
7	INSPECT ECT SENSOR CONNECTOR FOR POOR CONNECTION ● Turn engine switch to OFF. ● Disconnect ECT sensor connector. ● Check for poor connection (damaged, pulled-out terminals, corrosion, etc.). ● Are there any concerns?	Yes	Repair or replace terminal, then go to Step 13.
		No	Go to next step.
8	CLASSIFY ECT SENSOR OR HARNESS MALFUNCTION ● Connect jumper wire between terminals A and B (harness-side). ● Access ECT PID using WDS or equivalent. ● Is ECT PID approx. 0 V?	Yes	Replace ECT sensor, then go to Step 13.
		No	Go to next step.
9	INSPECT ECT SENSOR SIGNAL CIRCUIT FOR SHORT TO POWER ● Turn engine switch to ON (Engine OFF). ● Measure voltage between ECT sensor terminal A (harness-side) and body GND. ● Is voltage B+?	Yes	Repair or replace shorted harness, then go to Step 13.
		No	Go to next step.
10	INSPECT PCM CONNECTOR FOR POOR CONNECTION ● Disconnect PCM connector. ● Check for poor connection at terminals 1T and 1B (damaged, pulled-out terminals, corrosion, etc.). ● Are there any concerns?	Yes	Repair or replace terminal, then go to Step 13.
		No	Go to next step.
11	INSPECT ECT SENSOR SIGNAL CIRCUIT FOR OPEN CIRCUIT ● Check continuity between ECT sensor terminal A (harness-side) and PCM terminal 1T. ● Is there continuity?	Yes	Go to next step.
		No	Repair or replace open harness, then go to Step 13.
12	INSPECT ECT SENSOR GROUND CIRCUIT FOR OPEN CIRCUIT ● Check continuity between ECT sensor terminal B (harness-side) and PCM terminal 1B. ● Is there continuity?	Yes	Go to next step.
		No	Repair or replace open harness, then go to next step.
13	VERIFY TROUBLESHOOTING OF DTC P0115 COMPLETED ● Make sure to reconnect all disconnected connectors. ● Turn engine switch to ON (engine OFF). ● Clear DTC from PCM memory using WDS or equivalent. ● Start engine. ● Is same DTC present?	Yes	Replace PCM, then go to next step.
		No	Go to next step.
14	VERIFY AFTER REPAIR PROCEDURE ● Perform "After Repair Procedure" (See Section F2) ● Is there any DTC present?	Yes	Go to applicable DTC inspection. (See 67 DTC TABLE)
		No	Troubleshooting completed.

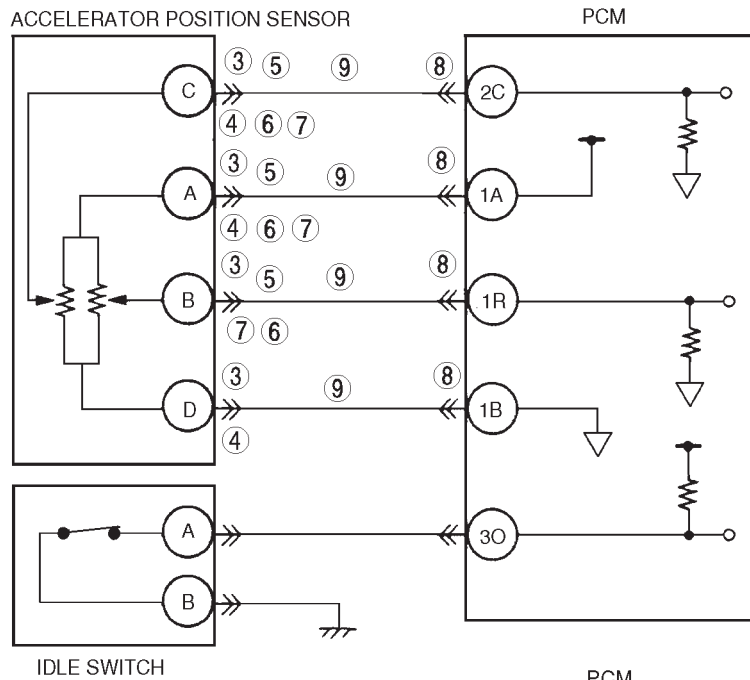
ON-BOARD DIAGNOSTIC SYSTEM

DTC P0120

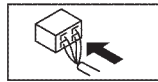
DTC P0120	Accelerator position sensor circuit malfunction
DETECTION CONDITION	- PCM monitors accelerator position sensor signal at PCM terminal 1R. If PCM detects either of following conditions, PCM determines that accelerator position sensor circuit has a malfunction. - Input voltage at PCM terminal 1R is below 0.29 V. - Input voltage at PCM terminal 1R is above 4.80 V. - Input voltage at PCM terminal 1R is above 1.35 V with idle switch ON. - PCM monitors difference voltage between main circuit and monitor circuit of accelerator position sensor. If difference voltage between PCM terminal 1R and 2C is above 0.90 V, PCM determines that accelerator position sensor has a malfunction.
POSSIBLE CAUSE	- Accelerator position sensor malfunction - Poor connection at accelerator position sensor or PCM connector - Open circuit between accelerator position sensor terminal B and PCM terminal 1R - Short to GND circuit between accelerator position sensor terminal B and PCM terminal 1R - Open circuit between accelerator position sensor terminal A and PCM terminal 1A - Short to GND circuit between accelerator position sensor terminal A and PCM terminal 1A - Open circuit between accelerator position sensor terminal C and PCM terminal 2C - Short to GND circuit between accelerator position sensor terminal C and PCM terminal 2C - PCM malfunction - Open circuit between accelerator position sensor terminal D and PCM terminal 1B - Short to reference voltage (Vref) supply circuit between accelerator position sensor terminal B and PCM terminal 1R - Short to reference voltage (Vref) supply circuit between accelerator position sensor terminal C and PCM terminal 2C - Electrical corrosion in accelerator position signal circuit - Voltage drops in reference voltage (Vref) supply circuit - Idle switch malfunction

ON-BOARD DIAGNOSTIC SYSTEM

DTC P0120 Accelerator position sensor circuit malfunction

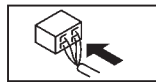
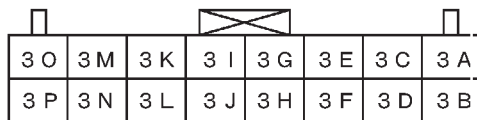


PCM
HARNESS SIDE
CONNECTOR (12 PIN)

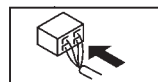
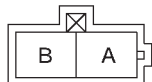


PCM

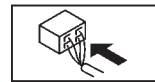
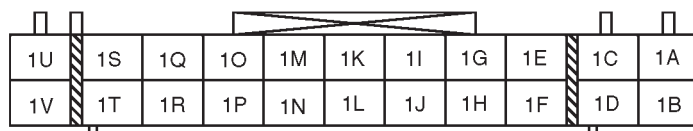
HARNESS SIDE CONNECTOR (16 PIN)



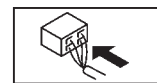
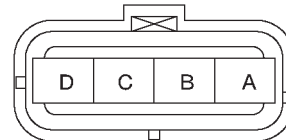
IDLE SWITCH
HARNESS SIDE CONNECTOR



PCM
HARNESS SIDE CONNECTOR (22 PIN)



ACCELERATOR POSITION SENSOR
HARNESS SIDE CONNECTOR



ZCF4070W18

Diagnostic procedure

STEP	INSPECTION		ACTION
1	VERIFY RELATED SERVICE INFORMATION AVAILABILITY - Check for related Service Information availability. - Is any related Service Information available?	Yes	Perform repair or diagnosis according to available Service Information. If vehicle is not repaired, go to next step.
		No	Go to next step.

ON-BOARD DIAGNOSTIC SYSTEM

STEP	INSPECTION		ACTION
2	CLASSIFY IF INTERMITTENT CONCERN OR CONTINUOUS CONCERN ● Turn engine switch ON (engine OFF). ● Connect the WDS or equivalent. ● Clear DTC from PCM memory. ● Turn engine switch to OFF then ON (Engine OFF). ● Is same DTC present?	Yes	Go to next step.
		No	Intermittent concern exists. Go to INTERMITTENT CONCERN TROUBLESHOOTING procedure. (See NO TAG INTERMITTENT CONCERN TROUBLESHOOTING)
3	INSPECT ACCELERATOR POSITION SENSOR CONNECTOR FOR POOR CONNECTION ● Turn engine switch to OFF. ● Disconnect accelerator position sensor connector. ● Check for poor connection (damaged, pulled-out pins, corrosion, etc.). ● Is there a malfunction?	Yes	Repair or replace connector, then go to next step.
		No	Go to next step.
4	INSPECT ACCELERATOR POSITION SENSOR TERMINAL ● Check for bent terminal of accelerator position sensor terminals (part-side). ● Is there a malfunction?	Yes	Repair or replace terminal, then go to Step 11.
		No	Go to next step.
5	CHECK TERMINAL VOLTAGE AT ACCELERATOR POSITION SENSOR ● Check voltage at accelerator position sensor terminals A, B and C (part-side). ● Is voltage approx. 5 V?	Yes	Go to next step.
		No	● If voltage is approx. B+, repair or replace appropriate harnesses. Then, go to Step 11. ● If voltage is approx. 0V, go to Step 8
6	VERIFY ACCELERATOR POSITION SENSOR CIRCUIT FOR SHORT TO REFERENCE VOLTAGE (VREF) SUPPLY CIRCUIT ● Check continuity between following terminals: — Accelerator position sensor terminals A and B (part-side) — Accelerator position sensor terminals A and C (part-side) ● Is there continuity?	Yes	Repair or replace appropriate harnesses, then go to Step 11.
		No	Go to next step.
7	VERIFY ACCELERATOR POSITION SENSOR CIRCUIT FOR SHORT TO GND ● Check continuity between following terminals: — Accelerator position sensor terminal A (part-side) and body GND — Accelerator position sensor terminal B (part-side) and body GND — Accelerator position sensor terminal C (part-side) and body GND ● Is there continuity?	Yes	Repair or replace appropriate harnesses, then go to Step 11.
		No	Go to next step.
8	INSPECT PCM CONNECTOR FOR POOR CONNECTION ● Disconnect PCM connector. ● Inspect PCM terminals 1A, 1R, 1B and 2C (damaged, pulled-out pins, corrosion, etc.). ● Is there a malfunction?	Yes	Repair or replace terminal, then go to Step 11.
		No	Go to next step.
9	VERIFY ACCELERATOR POSITION SENSOR MAIN CIRCUIT, MONITOR CIRCUIT AND GND CIRCUIT FOR OPEN CIRCUIT ● Check continuity between following terminals: — Accelerator position sensor terminal A (harness-side) and PCM terminal 1A — Accelerator position sensor terminal B (harness-side) and PCM terminal 1R — Accelerator position sensor terminal C (harness-side) and PCM terminal 2C — Accelerator position sensor terminal D (harness-side) and PCM terminal 1B ● Is there continuity?	Yes	Go to next step.
		No	Repair or replace appropriate harnesses, then go to Step 11.

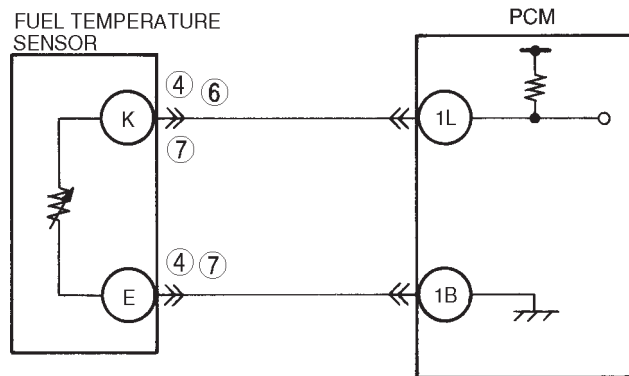
ON-BOARD DIAGNOSTIC SYSTEM

STEP	INSPECTION		ACTION
10	INSPECT ACCELERATOR POSITION SENSOR - Make sure to reconnect all disconnected connectors. - Inspect accelerator position sensor. (See NO TAG ACCELERATOR POSITION SENSOR INSPECTION) - Is it okay?	Yes	Go to next step.
		No	Replace accelerator position sensor, then go to Step 11.
11	VERIFY TROUBLESHOOTING OF DTC P0120 COMPLETED - Make sure to reconnect all disconnected connectors. - Turn engine switch ON (engine OFF). - Connect the WDS or equivalent. - Clear DTC from PCM memory. - Start engine. - Is same DTC present?	Yes	Replace PCM, then go to next step.
		No	Go to next step.
12	VERIFY AFTER REPAIR PROCEDURE - Perform "AFTER REPAIR PROCEDURE". (See Section F2) - Is there any DTC present?	Yes	Go to applicable DTC inspection. (See 67 DTC TABLE)
		No	Troubleshooting completed.

DTC P0180

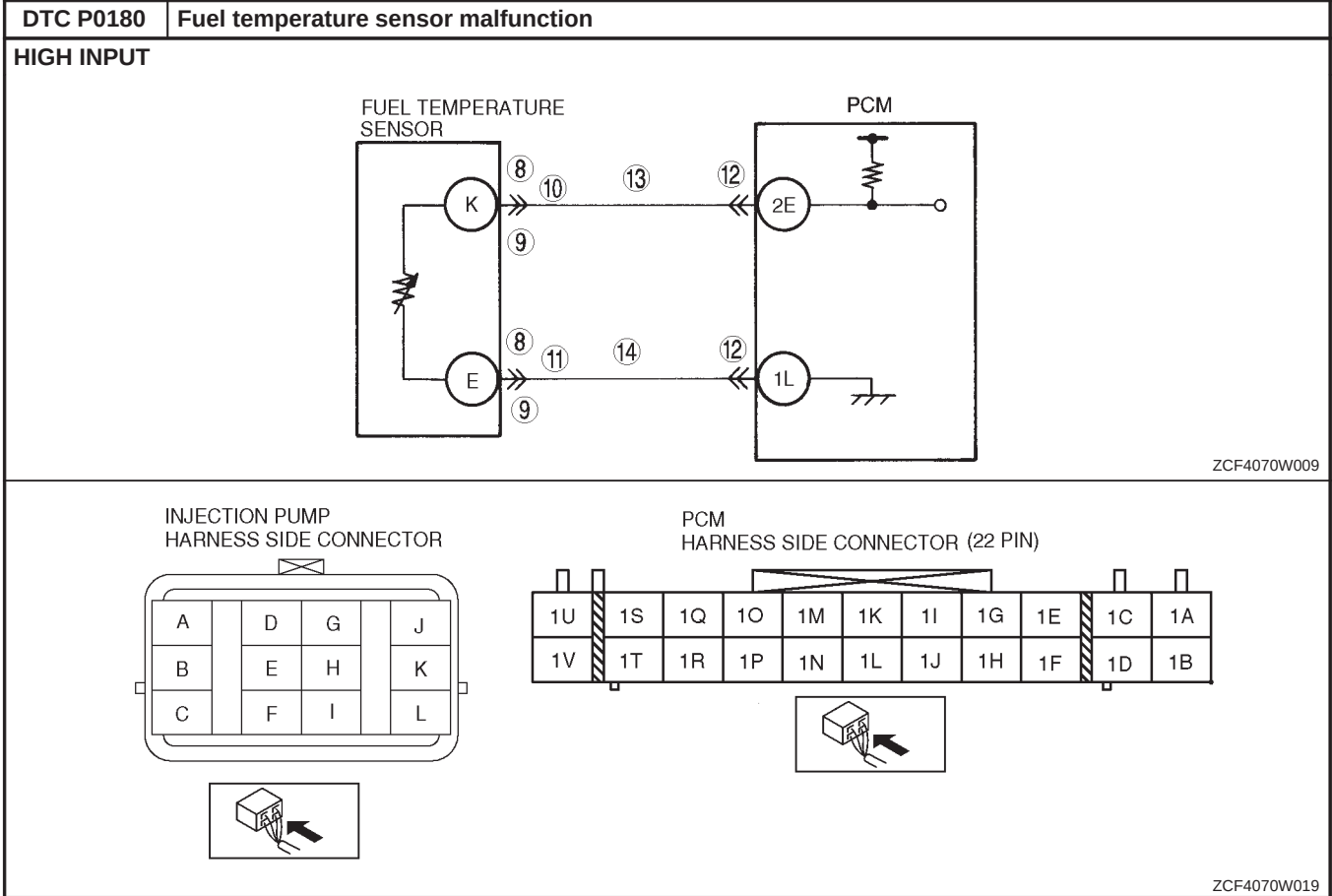
DTC P0180	Fuel temperature sensor malfunction
DETECTION CONDITION	PCM monitors fuel temperature sensor signal at PCM terminal 1L. If voltage at PCM terminal 1L is below 0.19 V or above 4.59 V, PCM determines that fuel temperature sensor circuit has malfunction.
POSSIBLE CAUSE	- Fuel temperature sensor malfunction - Short to GND circuit between fuel temperature sensor terminal K and PCM terminal 1L - Fuel temperature signal and fuel temperature GND circuit are shorted each other. - Poor connection at fuel temperature sensor or PCM connector - PCM malfunction - Open circuit between fuel temperature sensor terminal K and PCM terminal 1L - Short to power circuit between fuel temperature sensor terminal K and PCM terminal 1L - Open circuit between fuel temperature sensor terminal E and PCM terminal 1B - Short to power circuit between fuel temperature sensor terminal E and PCM terminal 1B

LOW INPUT



ZCF4070W008

ON-BOARD DIAGNOSTIC SYSTEM



Diagnostic procedure

STEP	INSPECTION		ACTION
	VERIFY RELATED SERVICE INFORMATION AVAILABILITY - Check for related Service Information availability. - Is any related Service Information available?	Yes	Perform repair or diagnosis according to available Service Information. If vehicle is not repaired, go to next step.
		No	Go to next step.
2	CLASSIFY INTERMITTENT CONCERN OR CONTINUOUS CONCERN - Turn engine switch to ON (engine OFF). - Connect the WDS or equivalent. - Clear DTC from PCM memory. - Turn engine switch to OFF then ON (Engine OFF). - Is same DTC present?	Yes	Go to next step.
		No	Intermittent concern exists. Go to INTERMITTENT CONCERN TROUBLESHOOTING procedure. (See NO TAG INTERMITTENT CONCERN TROUBLESHOOTING)
3	VERIFY CURRENT INPUT SIGNAL STATUS-HIGH OR LOW INPUT - Start engine. - Access FLT V PID using WDS or equivalent. - Is FLT V PID within 0.19—4.59 V?	Yes	Go to Step 15.
		No	- IF FLT V PID is below 0.19 V, go to next step. - IF FLT V PID is above 4.59 V, go to Step 8.
4	INSPECT FUEL TEMPERATURE SENSOR TERMINAL - Turn engine switch to OFF. - Disconnect fuel temperature sensor connector. - Check for bent terminal of fuel temperature sensor terminals K and E (part-side). - Is there a malfunction?	Yes	Repair or replace terminal, then go to Step 15.
		No	Go to next step.
5	CLASSIFY FUEL TEMPERATURE SENSOR MALFUNCTION OR HARNESS MALFUNCTION - Turn engine switch to ON (Engine OFF). - Access FLT V PID using WDS or equivalent. - Is FLT V PID below 0.19 V?	Yes	Go to next step.
		No	Inspect fuel temperature sensor, then go to Step 15. (See NO TAG FUEL TEMPERATURE SENSOR INSPECTION)

ON-BOARD DIAGNOSTIC SYSTEM

STEP	INSPECTION	ACTION	
6	INSPECT FUEL TEMPERATURE SENSOR SIGNAL CIRCUIT FOR SHORT TO GND • Turn engine switch to OFF. • Disconnect PCM connector. • Check for continuity between fuel temperature sensor terminal K (harness-side) and body GND. • Is there continuity?	Yes	Repair or replace shorted harness, then go to Step 15.
		No	Go to next step.
7	INSPECT FUEL TEMPERATURE SENSOR CIRCUITS FOR SHORT • Check for continuity between fuel temperature sensor terminals K and E (harness-side). • Is there continuity?	Yes	Repair or replace shorted harness, then go to Step 15.
		No	Go to Step 16.
8	INSPECT FUEL TEMPERATURE SENSOR CONNECTOR FOR POOR CONNECTION • Turn engine switch to OFF. • Disconnect fuel temperature sensor connector. • Check for poor connection (damaged, pulled-out pins, corrosion, etc.). • Is there a malfunction?	Yes	Repair or replace terminal, then go to Step 15.
		No	Go to next step.
9	INSPECT FUEL TEMPERATURE SENSOR • Inspect fuel temperature sensor. (See NO TAG FUEL TEMPERATURE SENSOR INSPECTION) • Is it okay ?	Yes	Go to next step.
		No	Replace fuel temperature sensor, then go to Step 15.
10	INSPECT FUEL TEMPERATURE SENSOR SIGNAL CIRCUIT FOR SHORT TO POWER • Turn engine switch to ON (Engine OFF). • Measure voltage between fuel temperature sensor terminal K (harness-side) and body GND. • Is voltage B+?	Yes	Repair or replace shorted harness, then go to Step 15.
		No	Go to next step.
11	INSPECT FUEL TEMPERATURE SENSOR GND CIRCUIT FOR SHORT TO POWER • Measure voltage between fuel temperature sensor terminal E (harness-side) and body GND. • Is voltage B+?	Yes	Repair or replace shorted harness, then go to Step 15.
		No	Go to next step.
12	INSPECT PCM CONNECTOR FOR POOR CONNECTION • Turn engine switch to OFF. • Disconnect PCM connector. • Inspect PCM terminals 1L and 2E(damaged, pulled-out pins, corrosion, etc.). • Is there a malfunction?	Yes	Repair or replace terminal, then go to Step 15.
		No	Go to next step.
13	INSPECT FUEL TEMPERATURE SENSOR SIGNAL CIRCUIT FOR OPEN CIRCUIT • Check for continuity between fuel temperature sensor terminal K (harness-side) and PCM terminal 2E. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace open harness, then go to Step 15.
14	INSPECT FUEL TEMPERATURE SENSOR GND CIRCUIT FOR OPEN CIRCUIT • Check for continuity between fuel temperature sensor terminal E (harness-side) and PCM terminal 1L (harness-side). • Is there continuity?	Yes	Go to next step.
		No	Repair or replace open harness, then go to next step.

ON-BOARD DIAGNOSTIC SYSTEM

STEP	INSPECTION	ACTION
15	VERIFY TROUBLESHOOTING OF DTC P0180 COMPLETED - Make sure to reconnect all disconnected connectors. - Turn engine switch to ON (engine OFF). - Clear DTC from PCM memory using WDS or equivalent. - Start engine. - Is same DTC present?	Yes Replace PCM, then go to next step.
		No Go to next step.
16	VERIFY AFTER REPAIR PROCEDURE - Perform "AFTER REPAIR PROCEDURE". (See Section F2) - Is there any DTC present?	Yes Go to applicable DTC inspection. (See 67 DTC TABLE)
		No Troubleshooting completed.

DTC P0251

DTC P0251	Injection amount control system malfunction
DETECTION CONDITION	PCM monitors difference voltage between target injection amount and actual injection amount while engine running. If difference voltage is above threshold for 0.5 s, PCM determines that injection amount control system is malfunctioning.
POSSIBLE CAUSE	- Connector or terminal malfunction - Open circuit in wiring between injection pump connector A terminal I and PCM control relay terminal D - Open circuit in wiring between injection pump connector A terminal I and PCM terminal 4X - Open or Short to GND in wiring between injection pump connector A terminal L and PCM terminal 4Y - Electronic governor malfunction - Injection pump (injection amount control) malfunction - PCM malfunction
FROM PCM CONTROL RELAY TERMINAL D PCM ELECTRONIC GOVERNOR INJECTION PUMP CONNECTOR A HARNESS SIDE CONNECTOR PCM HARNESS SIDE CONNECTOR	

ZFC4070W205

Diagnostic procedure

STEP	INSPECTION	ACTION
1	VERIFY RELATED SERVICE INFORMATION AVAILABILITY - Check for related Service Information availability. - Is any related Service Information available?	Yes Perform repair or diagnosis according to Service Information. If vehicle is not repaired, go to next step.
		No Go to next step.

ON-BOARD DIAGNOSTIC SYSTEM

STEP	INSPECTION		ACTION
2	VERIFY CURRENT INPUT SIGNAL STATUS—IS CONCERN INTERMITTENT OR CONSTANT? • Turn engine switch to ON (Engine OFF). • Clear DTC from PCM memory using WDS or equivalent. • Start engine. • Is same DTC present?	Yes	Go to next step.
		No	Intermittent concern exists. Go to INTERMITTENT CONCERN TROUBLESHOOTING Procedure. (See NO TAG INTERMITTENT CONCERN TROUBLESHOOTING)
3	VERIFY OTHER DTC IS PRESENT • Is other DTC present?	Yes	Perform appropriate DTC troubleshooting procedure. (See 67 DTC TABLE) then go to Step 8.
		No	Go to next step.
4	INSPECT INJECTION PUMP CONNECTOR FOR POOR CONNECTION • Turn engine switch to OFF. • Disconnect injection pump connector A. • Check for poor connection (damaged, pulled-out pins, corrosion, etc.). • Is there a malfunction?	Yes	Repair or replace terminal, then go to Step 9.
		No	Go to next step.
5	INSPECT ELECTRONIC GOVERNOR POWER CIRCUIT • Turn engine switch to ON (Engine OFF). • Measure voltage between injection pump connector A terminal I (harness-side) and body GND. • Is voltage B+?	Yes	Go to next step.
		No	Repair or replace electronic governor power circuit for open, then go to Step 9.
6	INSPECT ELECTRONIC GOVERNOR CONTROL CIRCUIT FOR SHORT TO GND • Turn engine switch to OFF. • Check for continuity between injection pump connector A terminal L (harness-side) and body GND. • Is there continuity?	Yes	Repair or replace electronic governor control circuit for short to GND, then go to Step 9.
		No	Go to next step.
7	INSPECT PCM CONNECTOR FOR POOR CONNECTION • Disconnect PCM connector. • Check for poor connection (damaged, pulled-out pins, corrosion, etc.). • Is there a malfunction?	Yes	Repair or replace terminal, then go to Step 9.
		No	Go to next step.
8	INSPECT ELECTRONIC GOVERNOR CONTROL CIRCUIT FOR OPEN CIRCUIT • Check for continuity between injection pump connector A terminal L (harness-side) and PCM terminal 4Y (harness-side). • Is there continuity?	Yes	Injection pump may have malfunction. Consult your distributor for inspection of injection pump. Go to next step.
		No	Repair or replace electronic governor control circuit for open, then go to next step.
9	INSPECT ELECTRONIC GOVERNOR • Perform electronic governor inspection. (See NO TAG ELECTRONIC GOVERNOR INSPECTION) • Is electronic governor okay?	Yes	Injection pump may have mechanical malfunction. Consult your distributor for inspection of injection pump. Then go to next step.
		No	Consult your distributor for replacement of electronic governor. Then go to next step.
10	VERIFY TROUBLESHOOTING OF DTC P0251 COMPLETED • Make sure to reconnect all disconnected connectors. • Turn engine switch to ON (Engine OFF). • Clear DTC from PCM memory using WDS or equivalent. • Start engine. • Is same DTC present?	Yes	Replace PCM, then go to next step.
		No	Go to next step.
11	VERIFY AFTER REPAIR PROCEDURE • Perform "AFTER REPAIR PROCEDURE". (See Section F2) • Is there any DTC present?	Yes	Go to applicable DTC inspection. (See 67 DTC TABLE)
		No	Troubleshooting completed.

ON-BOARD DIAGNOSTIC SYSTEM

DTC P0335

DTC P0335	TDC sensor circuit malfunction
DETECTION CONDITION	● If PCM does not receive input signal from TDC sensor when engine is running, PCM determines that TDC sensor circuit has a malfunction.
POSSIBLE CAUSE	● TDC sensor malfunction ● Poor connection at TDC sensor or PCM connector ● PCM malfunction ● Short to GND circuit between TDC sensor terminal B and PCM terminal 1H ● Open circuit between TDC sensor terminal B and PCM terminal 1H ● Open circuit between TDC sensor terminal A and PCM control relay terminal D ● Open circuit between TDC sensor terminal C and PCM terminal 1B ● TDC sensor pulse wheel malfunction
TDC SENSOR PCM PCM CONTROL RELAY TDC SENSOR	

ZCF4070W050

ZCF4070W050

Diagnostic procedure

STEP	INSPECTION	ACTION	
1	VERIFY RELATED SERVICE INFORMATION AVAILABILITY - Check for related Service Information availability. - Is any related Service Information available?	Yes	Perform repair or diagnosis according to available Service Information.
		No	Go to next step.
2	INSPECT TDC SENSOR - Inspect TDC sensor. (See NO TAG TDC SENSOR INSPECTION) - Is it okay?	Yes	Check for poor connection (damage/pulled-out terminals, corrosion, etc), bent terminals of TDC sensor connector or plate.
		No	Repair if necessary, then go to Step 9
3	INSPECT PCM CONNECTOR FOR POOR CONNECTION - Turn engine switch to OFF. - Disconnect PCM connector. - Check for poor connection at terminals 1B and 1H (damaged, pulled-out terminals, corrosion, etc.). - Is there a malfunction?	Yes	Replace TDC sensor, then go to Step 9.
		No	Repair or replace terminal, then go to Step 9.
		No	Go to next step.

ON-BOARD DIAGNOSTIC SYSTEM

STEP	INSPECTION	ACTION
4	INSPECT TDC SENSOR TERMINAL - Turn engine switch OFF. - Disconnect TDC sensor connector. - Check bent terminal of TDC sensor terminals A, B and C (part-side). - Is there a malfunction?	Yes Repair or replace terminal, then go to Step 9.
		No Inspect for open circuit in wiring harness between TDC sensor terminal A (harness-side) and PCM control relay terminal D (harness-side). Repair or replace harness, then go to Step 9.
5	CHECK POWER SUPPLY CIRCUIT FOR OPEN CIRCUIT - Turn engine switch to ON (Engine OFF). - Check voltage at TDC sensor terminal A (harness-side). - Is voltage B+?	Yes Go to next step.
		No Inspect for open circuit in wiring harness between TDC sensor terminal A (harness-side) and PCM control relay terminal D (harness-side). Repair or replace harness, then go to Step 9.
6	INSPECT TDC CIRCUIT FOR OPEN CURCUIT - Check for continuity between TDC sensor terminal B (harness-side) and PCM connector terminal 1H (harness-side). - Is there continuity?	Yes Go to next step.
		No Repair or replace suspected harness, then go to Step 9.
7	INSPECT TDC CIRCUIT FOR SHORT TO GND - Check for continuity between TDC sensor terminal B (harness-side) and body GND. - Is there continuity?	Yes Repair or replace suspected harness, then go to Step 9.
		No Go to next step.
8	INSPECT TDC SENSOR GROUND CIRCUIT FOR OPEN CIRCUIT - Check for continuity between TDC sensor terminal C (harness-side) and PCM connector terminal 1B (harness-side). - Is there continuity?	Yes Go to next step.
		No Repair or replace suspected harness, then go to Step 9.
9	VERIFY TROUBLESHOOTING OF DTC P0335 COMPLETED - Make sure to reconnect all disconnected connectors. - Turn engine switch to ON (engine OFF). - Clear DTC from PCM memory using WDS or equivalent. - Start engine. - Is same DTC present?	Yes Replace PCM, then go to next step.
		No Go to next step.
10	VERIFY AFTER REPAIR PROCEDURE - Perform "AFTER REPAIR PROCEDURE". (See Section F2) - Is there any DTC present?	Yes Go to applicable DTC inspection. (See 67 DTC TABLE)
		No Troubleshooting completed.

DTC P0400

DTC P0400	EGR system malfunction
DETECTION CONDITION	PCM monitors EGR valve position sensor signal at PCM terminal 1F. If voltage at PCM terminal 1F is below 0.66 V when engine is idle, PCM determines that EGR system has a malfunction.
POSSIBLE CAUSE	- EGR valve malfunction - EGR solenoid valve (vacuum) malfunction - EGR solenoid valve (vent) malfunction - EGR control solenoid valve malfunction - PCM malfunction

Diagnostic procedure

STEP	INSPECTION	ACTION
1	VERIFY RELATED REPAIR INFORMATION AVAILABILITY - Check for related Service Bulletins and/or on-line repair information availability. - Is any related repair information available?	Yes Perform repair or diagnosis according to available repair information. If vehicle is not repaired, go to next step.
		No Go to next step.

ON-BOARD DIAGNOSTIC SYSTEM

STEP	INSPECTION	ACTION	
2	INSPECT FOR APPROPRIATE SOLENOID VALVES - Inspect for following solenoid valves. - EGR solenoid valve (vacuum) (See NO TAG EGR SOLENOID VALVE (VACUUM) INSPECTION) - EGR solenoid valve (vent) (See NO TAG EGR SOLENOID VALVE (VENT) INSPECTION) - EGR control solenoid valve (See NO TAG EGR CONTROL SOLENOID VALVE INSPECTION) - Are solenoid valves okay?	Yes	Go to next step.
		No	Replace appropriate solenoid valves, then go to next step.
3	INSPECT VACUUM HOSE CONDITION - Inspect vacuum hoses for clogging, any damages, freeze, or vacuum leakage. - Is there any concern?	Yes	Replace vacuum hoses, then go to Step 5.
		No	Go to next step.
4	INSPECT EGR VALVE MALFUNCTION - Turn ignition key to OFF. - Remove EGR valve. - Inspect EGR valve. (See NO TAG EGR VALVE INSPECTION) - Is EGR valve okay?	Yes	Go to next step.
		No	Replace EGR valve, then go to Step 5.
5	VERIFY TROUBLESHOOTING OF DTC P0400 COMPLETED - Make sure to reconnect all disconnected connectors. - Turn engine switch ON (engine OFF). - Clear DTC from memory using WDS or equivalent. - Start the engine. - Warm-up engine until ECT PID is above 70 °C {158 °F}. - Is same DTC present?	Yes	Go to next step.
		No	Replace PCM, then go to next step.
5	VERIFY AFTER REPAIR PROCEDURE - Perform "AFTER REPAIR PROCEDURE" (See section F2) - Is there any DTC present?	Yes	Go to applicable DTC inspection. (See 67 DTC TABLE)
		No	Troubleshooting completed.

ON-BOARD DIAGNOSTIC SYSTEM

DTC P0500

DTC P0500	Vehicle speed sensor (VSS) circuit malfunction
DETECTION CONDITION	- PCM detects after following conditions, PCM determines that VSS sensor circuit has a malfunction: — Gear is in position other than neutral. — Engine speed is above 4,000 rpm. — Vehicle speed is below 3.76 km/h {2.33 mph}.
POSSIBLE CAUSE	• PCM malfunction • Instrument cluster (vehicle speedometer sensor) malfunction • Open circuit between PCM terminal 1N and instrument cluster terminal 1M • Short to ground between PCM terminal 1N and instrument cluster terminal 1M • VSS malfunction • Open circuit between vehicle speed sensor terminal A and instrument cluster terminal 1L • Short to ground between vehicle speed sensor terminal A and instrument cluster terminal 1L • Open circuit between vehicle speed sensor terminal B and instrument cluster terminal 1M • Short to ground between vehicle speed sensor terminal B and instrument cluster terminal 1M
INSTRUMENT CLUSTER PCM PCM HARNESS SIDE CONNECTOR (22 PIN) INSTRUMENT CLUSTER HARNESS SIDE CONNECTOR	
ZCF4070W059	

Diagnostic procedure

STEP	INSPECTION	ACTION
1	VERIFY RELATED SERVICE INFORMATION AVAILABILITY • Check for related Service Information availability. • Is any related Service information available?	Yes Perform repair or diagnosis according to available Service information. • If vehicle is not repaired, go to next step.
		No Go to next step.
2	CHECK SPEEDOMETER • Check speedometer. • Does vehicle speedometer needle move?	Yes Go to next step.
		No Inspect speedometer, then go to next step. (See Section T.)

ON-BOARD DIAGNOSTIC SYSTEM

STEP	INSPECTION	ACTION	
3	CLASSIFY INTERMITTENT CONCERN OR CONTINUOUS CONCERN ● Turn engine switch ON (engine OFF). ● Clear DTC from PCM using WDS or equivalent. ● Turn engine switch to OFF then ON (engine OFF). ● Is same DTC present?	Yes	Go to next step.
		No	Intermittent concern exists. Go to INTERMITTENT CONCERN TROUBLESHOOTING procedure. (See NO TAG INTERMITTENT CONCERN TROUBLESHOOTING.)
4	INSPECT POOR CONNECTION OF PCM CONNECTOR ● Disconnect PCM connector. ● Check for poor connection at terminal 1N (damaged/pulled-out terminals, corrosion, etc.). ● Are there any concerns?	Yes	Repair or replace terminal, then go to Step 8.
		No	Go to next step.
5	INSPECT INSTRUMENT CLUSTER CIRCUIT FOR OPEN CIRCUIT ● Check continuity between PCM terminal 1N and instrument cluster 1M (harness-side). ● Is there continuity?	Yes	Go to next step.
		No	Repair or replace harness, then go to Step 8.
6	INSPECT INSTRUMENT CLUSTER CIRCUIT FOR SHORT TO GROUND ● Check for continuity between PCM terminal 1N (harness-side) and body ground. ● Is there continuity?	Yes	Repair or replace harness, then go to Step 8.
		No	Go to next step.
7	INSPECT INSTRUMENT CLUSTER CONNECTOR FOR POOR CONNECTION ● Disconnect instrument cluster connector. ● Check for poor connection at terminal 1M (damaged/pulled-out terminals, corrosion, etc.). ● Are there any concerns?	Yes	Repair or replace terminal, then go to Step 8.
		No	Go to next step.
8	VERIFY TROUBLESHOOTING OF DTC P0500 COMPLETED ● Make sure to reconnect all disconnected connectors. ● Turn engine switch ON (engine OFF). ● Clear DTC from memory using WDS or equivalent. ● Start engine. ● Warm up engine. ● Drive vehicle under following conditions for 10 seconds or more. — Engine speed: 4,000 rpm or above — Gear: other than neutral. — Vehicle speed: 3.76 km/h {2.33 mph} or above ● Is same DTC present?	Yes	Replace PCM, then go to next step.
		No	Go to next step.
9	VERIFY AFTER REPAIR PROCEDURE ● Perform "After Repair Procedure". (See Section F2.) ● Is there any DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

ON-BOARD DIAGNOSTIC SYSTEM

DTC P0510

DTC P0510	Idle switch malfunction
DETECTION CONDITION	- PCM detects after following conditions, PCM determines that idle switch has a malfunction: - Output voltage from accelerator position sensor is above 1.35 V with idle switch ON. - Output voltage from accelerator position sensor is below 0.86 V with idle switch OFF.
POSSIBLE CAUSE	- Idle switch malfunction - Short to GND circuit between idle switch terminal A and PCM terminal 3O - Poor connection at idle switch or PCM connector - PCM malfunction - Open circuit between idle switch terminal A and PCM terminal 3O - Open circuit between idle switch terminal B and body GND

ZFC4070W051

Diagnostic procedure

STEP	INSPECTION		ACTION
1	VERIFY RELATED SERVICE INFORMATION AVAILABILITY - Check for related Service Information availability. - Is any related Service Information available?	Yes	Perform repair or diagnosis according to available Service Information. If vehicle is not repaired, go to next step.
		No	Go to next step.
2	CLASSIFY IF INTERMITTENT CONCERN OR CONTINUOUS CONCERN - Clear DTC from PCM memory. - Turn engine switch to OFF then ON (Engine OFF). - Is same DTC present?	Yes	Go to next step.
		No	Intermittent concern exists. Go to INTERMITTENT CONCERN TROUBLESHOOTING procedure. (See NO TAG INTERMITTENT CONCERN TROUBLESHOOTING)
3	CHECK IDLE SWITCH - Inspect idle switch. (See NO TAG IDLE SWITCH INSPECTION) - Is it okay?	Yes	Go to next step.
		No	Replace idle switch, then go to Step 9
4	INSPECT IDLE SWITCH TERMINAL - Turn engine switch to OFF. - Disconnect idle switch connector. - Check for bent terminal of idle switch terminals A and B (part-side). - Is there a malfunction?	Yes	Repair or replace terminal, then go to Step 9.
		No	Go to next step.

ON-BOARD DIAGNOSTIC SYSTEM

STEP	INSPECTION		ACTION
5	INSPECT IDLE SWITCH SIGNAL CIRCUIT FOR SHORT TO GND - Turn engine switch to OFF. - Disconnect PCM connector. - Check for continuity between idle switch terminal A (harness-side) and body GND. - Is there continuity?	Yes	Repair or replace shorted harness, then go to Step 9.
		No	Go to next step.
6	INSPECT PCM CONNECTOR FOR POOR CONNECTION - Turn engine switch to OFF. - Disconnect PCM connector. - Inspect PCM terminals 3O (damaged, pulled-out pins, corrosion, etc.). - Is there a malfunction?	Yes	Repair or replace terminal, then go to Step 9.
		No	Go to next step.
7	INSPECT IDLE SWITCH SIGNAL CIRCUIT FOR OPEN CIRCUIT - Check for continuity between idle switch terminal A (harness-side) and PCM terminal 3O. - Is there continuity?	Yes	Go to next step.
		No	Repair or replace open harness, then go to Step 9.
8	INSPECT IDLE SWITCH GND CIRCUIT FOR OPEN CIRCUIT - Check for continuity between idle switch terminal B (harness-side) and body GND. - Is there continuity?	Yes	Go to next step.
		No	Repair or replace open harness, then go to next step.
9	VERIFY TROUBLESHOOTING OF DTC P0510 COMPLETED - Make sure to reconnect all disconnected connectors. - Turn engine switch ON (engine OFF). - Clear DTC from PCM memory using WDS or equivalent. - Start engine. - Is same DTC present?	Yes	Replace PCM, then go to next step.
		No	Go to next step.
10	VERIFY AFTER REPAIR PROCEDURE - Perform "AFTER REPAIR PROCEDURE". (See Section F2) - Is there any DTC present?	Yes	Go to applicable DTC inspection. (See 67 DTC TABLE)
		No	Troubleshooting completed.

DTC P0606

DTC P0606	PCM malfunction
DETECTION CONDITION	PCM detects internal malfunction.
POSSIBLE CAUSE	PCM malfunction

Diagnostic procedure

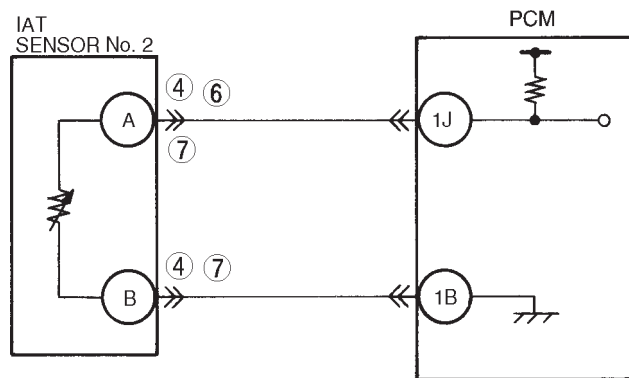
STEP	INSPECTION		ACTION
1	VERIFY RELATED SERVICE INFORMATION AVAILABILITY - Check for related Service Information availability. - Is any related Service Information available?	Yes	Perform repair or diagnosis according to Service Information. If vehicle is not repaired, go to next step.
		No	Go to next step.
2	VERIFY DTC P0606 DETECTED AGAIN - Clear DTC from memory using WDS or equivalent. - Turn engine switch to OFF, then start engine. - Is same DTC present?	Yes	Replace PCM, then go to next step.
		No	Go to next step.
3	VERIFY AFTER REPAIR PROCEDURE - Perform "AFTER REPAIR PROCEDURE". (See Section F2) - Is there any DTC present?	Yes	Go to applicable DTC inspection. (See 67 DTC TABLE)
		No	Troubleshooting completed.

ON-BOARD DIAGNOSTIC SYSTEM

DTC P1110

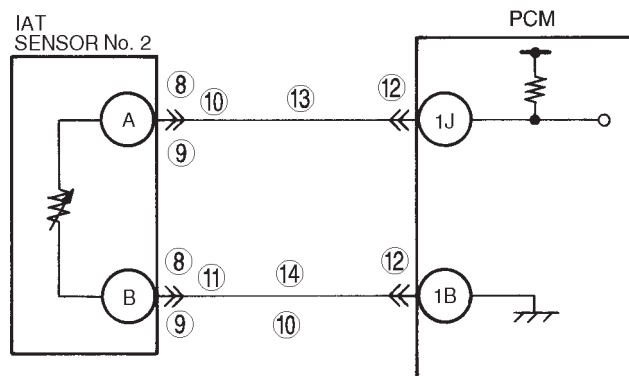
DTC P1110	IAT sensor No.2 circuit malfunction
DETECTION CONDITION	PCM monitors IAT sensor No.2 signal at PCM terminal 1J. If voltage at PCM terminal 1J is below 0.14 V or above 4.90 V, PCM determines that IAT sensor No.2 circuit has a malfunction.
POSSIBLE CAUSE	- IAT sensor No.2 malfunction - Short to GND circuit between IAT sensor No.2 terminal A and PCM terminal 1J - IAT No.2 signal and IAT GND circuit are shorted each other - Poor connection at IAT sensor No.2 or PCM connector - PCM malfunction - Open circuit between IAT sensor No.2 terminal A and PCM terminal 1J - Short to power circuit between IAT sensor No.2 terminal A and PCM terminal 1J - Open circuit between IAT sensor No.2 terminal B and PCM terminal 1B - Short to power circuit between IAT sensor No.2 terminal B and PCM terminal 1B

LOW INPUT



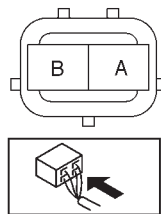
ZCF4070W013

HIGH INPUT

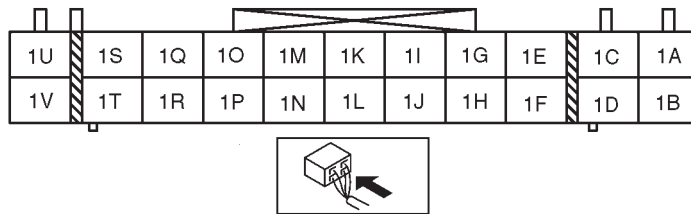


ZCF4070W014

IAT SENSOR No. 2
HARNESS SIDE CONNECTOR



PCM
HARNESS SIDE CONNECTOR (22 PIN)



ZCF4070W015

Diagnostic procedure

STEP	INSPECTION		ACTION
1	VERIFY RELATED SERVICE INFORMATION AVAILABILITY - Check for related Service Information availability. - Is any related Service Information available?	Yes	Perform repair or diagnosis according to available Service Information. If vehicle is not repaired, go to next step.
		No	Go to next step.

ON-BOARD DIAGNOSTIC SYSTEM

STEP	INSPECTION		ACTION
2	CLASSIFY IF INTERMITTENT CONCERN OR CONTINUOUS CONCERN ● Turn engine switch ON (engine OFF). ● Connect the WDS or equivalent. ● Clear DTC from PCM memory. ● Turn engine switch to OFF then ON (Engine OFF). ● Is same DTC present?	Yes	Go to next step.
		No	Intermittent concern exists. Go to INTERMITTENT CONCERN TROUBLESHOOTING procedure. (See NO TAG INTERMITTENT CONCERN TROUBLESHOOTING)
3	VERIFY CURRENT INPUT SIGNAL STATUS-HIGH OR LOW INPUT ● Start engine. ● Access IAT PID using WDS or equivalent. ● Is IAT PID within 0.14—4.90 V?	Yes	Go to Step 15.
		No	● If IAT PID is below 0.14 V, go to next step. ● If IAT PID is above 4.90 V, go to Step 8.
4	INSPECT IAT SENSOR No.2 TERMINAL ● Turn engine switch to OFF. ● Disconnect IAT sensor No.2 connector. ● Check for bent terminal of IAT sensor No.2 terminals A and B (part-side). ● Is there a malfunction?	Yes	Repair or replace terminal, then go to Step 17.
		No	Go to next step.
5	CLASSIFY IAT SENSOR No.2 MALFUNCTION OR HARNESS MALFUNCTION ● Turn engine switch to ON (Engine OFF). ● Access IAT PID using WDS or equivalent. ● Is IAT PID below 0.14 V?	Yes	Go to next step.
		No	Go to Step 9.
6	INSPECT IAT SENSOR No.2 SIGNAL CIRCUIT FOR SHORT TO GND ● Turn engine switch to OFF. ● Disconnect PCM connector. ● Check for continuity between IAT sensor No.2 terminal A (harness-side) and body GND. ● Is there continuity?	Yes	Repair or replace shorted harness, then go to Step 15.
		No	Go to next step.
7	INSPECT IAT SENSOR No.2 CIRCUITS FOR SHORT ● Check for continuity between IAT sensor No.2 terminals A and B (harness-side). ● Is there continuity?	Yes	Repair or replace shorted harness, then go to Step 15.
		No	Go to Step 15.
8	INSPECT IAT SENSOR No.2 CONNECTOR FOR POOR CONNECTION ● Turn engine switch to OFF. ● Disconnect IAT sensor No.2 connector. ● Check for poor connection (damaged, pulled-out pins, corrosion, etc.). ● Is there a malfunction?	Yes	Repair or replace terminal, then go to Step 15.
		No	Go to next step.
9	INSPECT IAT SENSOR No.2 ● Inspect IAT sensor No.2. (See NO TAG MASS AIR FLOW (MAF)/INTAKE AIR TEMPERATURE (IAT) SENSOR INSPECTION) ● Is it okay ?	Yes	Go to next step.
		No	Replace IAT sensor No.2, then go to Step 15.
10	INSPECT IAT SENSOR No.2 SIGNAL CIRCUIT FOR SHORT TO POWER ● Turn engine switch to ON (Engine OFF). ● Measure voltage between IAT sensor No.2 terminal A (harness-side) and body GND. ● Is voltage B+?	Yes	Repair or replace shorted harness, then go to Step 15.
		No	Go to next step.
11	INSPECT IAT SENSOR No.2 GND CIRCUIT FOR SHORT TO POWER ● Measure voltage between IAT sensor No.2 terminal B (harness-side) and body GND. ● Is voltage B+?	Yes	Repair or replace shorted harness, then go to Step 15.
		No	Go to next step.

ON-BOARD DIAGNOSTIC SYSTEM

STEP	INSPECTION	ACTION	
12	INSPECT PCM CONNECTOR FOR POOR CONNECTION ● Turn engine switch to OFF. ● Disconnect PCM connector. ● Inspect PCM terminals 1J and 1B (damaged, pulled-out pins, corrosion, etc.). ● Is there a malfunction?	Yes	Repair or replace terminal, then go to Step 15.
		No	Go to next step.
13	INSPECT IAT SENSOR No.2 SIGNAL CIRCUIT FOR OPEN CIRCUIT ● Check for continuity between IAT sensor No.2 terminal A (harness-side) and PCM terminal 1J. ● Is there continuity?	Yes	Go to next step.
		No	Repair or replace open harness, then go to Step 15.
14	INSPECT IAT SENSOR No.2 GND CIRCUIT FOR OPEN CIRCUIT ● Check for continuity between IAT sensor No.2 terminal B (harness-side) and PCM terminal 1B (harness-side). ● Is there continuity?	Yes	Go to next step.
		No	Repair or replace open harness, then go to next step.
15	VERIFY TROUBLESHOOTING OF DTC P0110 COMPLETED ● Make sure to reconnect all disconnected connectors. ● Turn engine switch to ON (engine OFF). ● Clear DTC from PCM memory using WDS or equivalent. ● Start engine. ● Is same DTC present?	Yes	Replace PCM, then go to next step.
		No	Go to next step.
16	VERIFY AFTER REPAIR PROCEDURE ● Perform "AFTER REPAIR PROCEDURE". (See Section F2) ● Is there any DTC present?	Yes	Go to applicable DTC inspection. (See 67 DTC TABLE)
		No	Troubleshooting completed.

ON-BOARD DIAGNOSTIC SYSTEM

DTC P1182

DTC P1182	Fuel shut off (FSO) solenoid malfunction
DETECTION CONDITION	When the engine switch is turned off while the engine is running, if the decrease in engine speed is 200 rpm or less 2 seconds after the engine switch is turned off, PCM determines that FSO solenoid has malfunction.
POSSIBLE CAUSE	- FSO solenoid malfunction - Short to power circuit between injection pump connector A terminal J and PCM terminal 4W - PCM malfunction
INJECTION PUMP CONNECTOR A HARNESS SIDE CONNECTOR PCM HARNESS SIDE CONNECTOR (26-PIN) 4Y 4W 4U 4S 4Q 4O 4M 4K 4I 4G 4E 4C 4A 4Z 4X 4V 4T 4R 4P 4N 4L 4J 4H 4F 4D 4B	

ZCF4070W102

Diagnostic procedure

STEP	INSPECTION	ACTION
1	VERIFY RELATED SERVICE INFORMATION AVAILABILITY - Check for related Service Information availability. - Is any related Service Information available?	Yes Perform repair or diagnosis according to available Service Information. If vehicle is not repaired, go to next step.
		No Go to next step.
2	CLASSIFY IF INTERMITTENT CONCERN OR CONTINUOUS CONCERN - Clear DTC from PCM memory. - Start engine. - Turn engine switch to OFF and wait for 2 seconds or more, then ON (Engine OFF). - Is same DTC present?	Yes Go to next step.
		No Intermittent concern exists. Go to INTERMITTENT CONCERN TROUBLESHOOTING procedure. (See NO TAG INTERMITTENT CONCERN TROUBLESHOOTING)
3	INSPECT FSO SOLENOID CIRCUIT FOR SHORT TO POWER - Inspect the voltage between injection pump connector A terminal J and body ground. - Is voltage B+?	Yes Repair or replace harness, then go to Step 5.
		No Go to next step.
4	INSPECT FSO SOLENOID - Perform FSO solenoid inspection. (See NO TAG FUEL SHUT OFF (FSO) SOLENOID INSPECTION) - Is FSO solenoid okay?	Yes Go to next step.
		No Replace FSO solenoid, then go to next step.

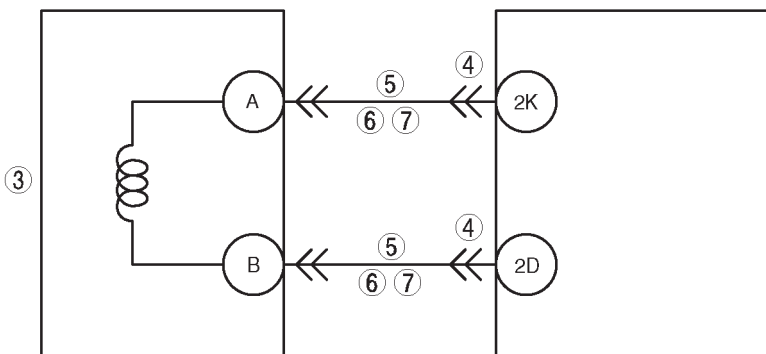
ON-BOARD DIAGNOSTIC SYSTEM

STEP	INSPECTION	ACTION	
5	VERIFY TROUBLESHOOTING OF DTC P0110 COMPLETED - Make sure to reconnect all disconnected connectors. - Clear DTC from PCM memory. - Start engine. - Is same DTC present?	Yes	Replace PCM, then go to next step.
		No	Go to next step.
6	VERIFY AFTER REPAIR PROCEDURE - Perform "AFTER REPAIR PROCEDURE". (See Section F2) - Is there any DTC present?	Yes	Go to applicable DTC inspection. (See 67 DTC TABLE)
		No	Troubleshooting completed.

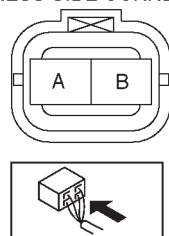
DTC P1189

DTC P1189	Pump speed sensor circuit malfunction
DETECTION CONDITION	- PCM monitors pump speed sensor signal at PCM terminal 2D and 2K. If difference between engine speeds detected by the pump speed sensor and the TDC sensor is 500 rpm or more for 1 second continuously under the following conditions, PCM determines that pump speed sensor circuit has malfunction. - Engine speed detected by the pump speed sensor is lower than that detected by the TDC sensor - Engine is running
POSSIBLE CAUSE	- Pump speed sensor malfunction - Poor connection at pump speed sensor or PCM connector - Pump speed sensor circuits are shorted each other. - Short to GND circuit between pump speed sensor terminal A and PCM terminal 2K - Short to GND circuit between pump speed sensor terminal B and PCM terminal 2D - Open circuit between pump speed sensor terminal A and PCM terminal 2K - Open circuit between pump speed sensor terminal B and PCM terminal 2D - PCM malfunction

PUMP SPEED SENSOR

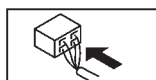


PUMP SPEED SENSOR HARNESS SIDE CONNECTOR



PCM HARNESS SIDE CONNECTOR (12-PIN)

2K	2I	2G	2E	2C	2A
2L	2J	2H	2F	2D	2B



ZCF4070W100

ZCF4070W100

Diagnostic procedure

STEP	INSPECTION	ACTION	
1	VERIFY RELATED SERVICE INFORMATION AVAILABILITY - Check for related Service Information availability. - Is any related Service Information available?	Yes	Perform repair or diagnosis according to available Service Information. If vehicle is not repaired, go to next step.
		No	Go to next step.

ON-BOARD DIAGNOSTIC SYSTEM

STEP	INSPECTION		ACTION
2	VERIFY PUMP SPEED SENSOR VOLTAGE - Disconnect pump speed sensor connector. - Connect voltmeter pump speed sensor terminals A and B (part-side). - Check voltage in AC range while cranking engine. - Is any voltage reading?	Yes	Go to Step 4.
		No	Go to next step.
3	VERIFY PUMP SPEED SENSOR - Perform pump speed sensor inspection. (See NO TAG PUMP SPEED SENSOR INSPECTION) - Is pump speed sensor okay?	Yes	Check for poor connection (damaged, pulled-out terminals, corrosion, etc.) or bent terminal of pump speed sensor. Repair or replace if necessary, then go to Step 8.
		No	Go to next step.
4	INSPECT PCM CONNECTOR POOR CONNECTION - Turn engine switch OFF. - Disconnect PCM connector. - Check for poor connection at terminals 2K and 2D (damaged, pulled-out terminals, corrosion, etc.). - Is there any malfunction?	Yes	Repair or replace terminal, then go to Step 8.
		No	Go to next step.
5	INSPECT PUMP SPEED SENSOR CIRCUIT FOR OPEN CIRCUIT - Inspect the following terminals for continuity: - Between pump speed sensor terminal A and PCM terminal 2K - Between pump speed sensor terminal B and PCM terminal 2D - Is there continuity?	Yes	Go to next step.
		No	Repair or replace open harness, then go to Step 8.
6	INSPECT PUMP SPEED SENSOR CIRCUIT FOR SHORT TO GROUND - Inspect the following terminals for continuity: - Between pump speed sensor terminal A and body ground - Between pump speed sensor terminal B and body ground - Is there continuity?	Yes	Repair or replace harness, then go to Step 8.
		No	Go to next step.
7	INSPECT PUMP SPEED SENSOR CIRCUIT FOR SHORT TO EACH OTHER - Check continuity between pump speed sensor terminals A and B (harness-side). - Is there continuity?	Yes	Repair or replace harness, then go to next step.
		No	Go to next step.
8	VERIFY TROUBLESHOOTING OF DTC P1189 COMPLETED - Make sure to reconnect all disconnected connectors. - Clear DTC from PCM memory. - Start engine. - Is same DTC present?	Yes	Replace PCM, then go to next step.
		No	Go to next step.
9	VERIFY AFTER REPAIR PROCEDURE - Perform "AFTER REPAIR PROCEDURE". (See Section F2) - Is there any DTC present?	Yes	Go to applicable DTC inspection. (See 67 DTC TABLE)
		No	Troubleshooting completed.

DTC P1195

DTC P1195	BARO circuit malfunction
DETECTION CONDITION	PCM monitors input voltage from BARO sensor integrated in PCM. If input voltage from BARO sensor is below 1.50 V or above 4.50 V, PCM determines that BARO sensor circuit is malfunctioning.
POSSIBLE CAUSE	- BARO sensor malfunction (integrated in PCM) - PCM malfunction

ON-BOARD DIAGNOSTIC SYSTEM

Diagnostic procedure

STEP	INSPECTION	ACTION
1	VERIFY RELATED SERVICE INFORMATION AVAILABILITY - Check for related Service Information availability. - Is any related Service Information available?	Yes Perform repair or diagnosis according to Service Information. If vehicle is not repaired, go to next step.
		No Go to next step.
2	VERIFY DTC P1195 DETECTED AGAIN - Clear DTC from memory using WDS or equivalent. - Turn engine switch to OFF, then start engine. - Is same DTC present?	Yes Replace PCM, then go to next step.
		No Go to next step.
3	VERIFY AFTER REPAIR PROCEDURE - Perform "AFTER REPAIR PROCEDURE". (See Section F2) - Is there any DTC present?	Yes Go to applicable DTC inspection. (See 67 DTC TABLE)
		No Troubleshooting completed.

DTC P1226

DTC P1226	Control sleeve (CS) sensor circuit malfunction
DETECTION CONDITION	PCM monitors input voltage from CS sensor. If input voltage from CS sensor is below 0.23 V or above 4.68 V, PCM determines that CS sensor circuit is malfunctioning.
POSSIBLE CAUSE	- CS sensor malfunction - PCM malfunction - Connector or terminal malfunction - Open or short to ground circuit between CS sensor terminal (injection pump connector A) F and PCM terminal 1Q - Open or short to ground circuit between CS sensor terminal (injection pump connector A) G and PCM terminal 1O - Open circuit between CS sensor terminal (injection pump connector A) H and PCM terminal 1M
CS SENSOR INJECTION PUMP CONNECTOR A HARNESS SIDE CONNECTOR PCM PCM HARNESS SIDE CONNECTOR (22-PIN)	

ZCF4070W101

ON-BOARD DIAGNOSTIC SYSTEM

Diagnostic procedure

STEP	INSPECTION	ACTION	
1	VERIFY RELATED SERVICE INFORMATION AVAILABILITY - Check for related Service Information availability. - Is any related Service Information available?	Yes	Perform repair or diagnosis according to Service Information. If vehicle is not repaired, go to next step.
		No	Go to next step.
2	VERIFY DTC P1226 DETECTED AGAIN - Clear DTC from memory using WDS or equivalent. - Turn engine switch to OFF, then start engine. - Is same DTC present?	Yes	Go to next step.
		No	Intermittent concern exists. Go to INTERMITTENT CONCERN TROUBLESHOOTING procedure. (See NO TAG INTERMITTENT CONCERN TROUBLESHOOTING)
3	INSPECT CS SENSOR CONNECTOR POOR CONNECTION - Turn engine switch to OFF. - Disconnect CS sensor connector. - Check for poor connection (damaged, pulled-out pins, corrosion, etc.). - Is there a malfunction?	Yes	Repair or replace terminal, then go to Step 8.
		No	Go to next step.
4	INSPECT PCM CONNECTOR POOR CONNECTION - Turn engine switch to OFF. - Disconnect PCM connector. - Check for poor connection (damaged, pulled-out pins, corrosion, etc.). - Is there a malfunction?	Yes	Repair or replace terminal, then go to Step 8.
		No	Go to next step.
5	INSPECT CS SENSOR CIRCUIT FOR SHORT TO GROUND - Inspect the following terminals for continuity: - Between injection pump connector A terminal F and body ground - Between injection pump connector A terminal G and body ground - Is there continuity?	Yes	Repair or replace harness, then go to Step 8.
		No	Go to next step.
6	INSPECT CS SENSOR CIRCUIT FOR OPEN CIRCUIT - Inspect the following terminals for continuity: - Between injection pump connector A terminal F and PCM terminal 1Q - Between injection pump connector A terminal G and PCM terminal 1O - Between injection pump connector A terminal H and PCM terminal 1M - Is there continuity?	Yes	Go to next step.
		No	Repair or replace open harness, then go to Step 8.
7	INSPECT CS SENSOR - Perform CS sensor inspection. (See NO TAG CONTROL SLEEVE (CS) SENSOR INSPECTION) - Is CS sensor okay?	Yes	Injection pump may have a malfunction. Consult your distributor for inspection of injection pump. Then go to next step.
		No	Consult your distributor for replace of CS sensor. Then go to next step.
8	VERIFY TROUBLESHOOTING OF DTC P1226 COMPLETED - Turn engine switch to OFF and ON (Engine OFF). - Clear DTC from memory using WDS or equivalent. - Start engine. - Is same DTC present?	Yes	Replace PCM, then go to next step.
		No	Go to next step.
9	VERIFY AFTER REPAIR PROCEDURE - Perform "AFTER REPAIR PROCEDURE". (See Section F2) - Is there any DTC present?	Yes	Go to applicable DTC inspection. (See 67 DTC TABLE)
		No	Troubleshooting completed.

ON-BOARD DIAGNOSTIC SYSTEM

DTC P1312

DTC P1312	Timer control valve circuit malfunction
DETECTION CONDITION	PCM monitors difference voltage between target injection timing and actual injection timing while ECT is above 80°C {176°F} and engine running. If difference voltage is above threshold for 5 s, PCM determines that injection timing control system is malfunctioning.
POSSIBLE CAUSE	- Connector or terminal malfunction - Open circuit in wiring between injection pump connector A terminal C and PCM control relay terminal D - Short to GND in wiring between injection pump connector A terminal B and PCM terminal 4U - Open circuit in wiring between injection pump connector A terminal B and PCM terminal 4U - TCV malfunction - Injection pump (injection timing control) malfunction - PCM malfunction
FROM PCM CONTROL RELAY TERMINAL D TCV PCM INJECTION PUMP CONNECTOR A HARNESS SIDE CONNECTOR PCM HARNESS SIDE CONNECTOR	

ZCF4070W201

Diagnostic procedure

STEP	INSPECTION	ACTION
1	VERIFY RELATED SERVICE INFORMATION AVAILABILITY - Check for related Service Information availability. - Is any related Service Information available?	Yes Perform repair or diagnosis according to Service Information. If vehicle is not repaired, go to next step.
		No Go to next step.
2	VERIFY IF CURRENT INPUT SIGNAL STATUS-IS CONCERN INTERMITTENT OR CONSTANT? - Turn engine switch to ON (Engine OFF). - Clear DTC from PCM memory using WDS or equivalent. - Start engine. - Access ECT PID using WDS or equivalent. - Wait until ECT PID is above 80°C {176°F}. - Is same DTC present?	Yes Go to next step.
		No Intermittent concern exists. Go to INTERMITTENT CONCERN TROUBLESHOOTING Procedure. (See NO TAG INTERMITTENT CONCERN TROUBLESHOOTING)
3	VERIFY OTHER DTC IS PRESENT Is other DTC present?	Yes Perform appropriate DTC troubleshooting procedure. (See 67 DTC TABLE) then go to Step 8.
		No Go to next step.

ON-BOARD DIAGNOSTIC SYSTEM

STEP	INSPECTION	ACTION	
4	INSPECT INJECTION PUMP CONNECTOR POOR CONNECTION ● Turn engine switch to OFF. ● Disconnect injection pump connector A. ● Check for poor connection (damaged, pulled-out pins, corrosion, etc.). ● Is there a malfunction?	Yes	Repair or replace terminal, then go to Step 9.
		No	Go to next step.
5	INSPECT TCV POWER CIRCUIT ● Turn engine switch to ON (Engine OFF). ● Measure voltage between injection pump connector A terminal C (harness-side) and body GND. ● Is voltage B+?	Yes	Go to next step.
		No	Repair or replace TCV power circuit for open, then go to Step 9.
6	INSPECT TCV CONTROL CIRCUIT FOR SHORT TO GND ● Turn engine switch to OFF. ● Check for continuity between injection pump connector A terminal C (harness-side) and body GND. ● Is there continuity?	Yes	Repair or replace TCV control circuit for short to GND, then go to Step 9.
		No	Go to next step.
7	INSPECT PCM CONNECTOR POOR CONNECTION ● Disconnect PCM connector. ● Check for poor connection (damaged, pulled-out pins, corrosion, etc.). ● Is there a malfunction?	Yes	Repair or replace terminal, then go to Step 9.
		No	Go to next step.
8	INSPECT TCV CONTROL CIRCUIT FOR OPEN ● Check for continuity between injection pump connector A terminal C (harness-side) and PCM terminal 4U (harness-side). ● Is there continuity?	Yes	Injection pump may have malfunction. Consult your distributor for inspection of injection pump. Go to next step.
		No	Repair or replace TCV control circuit for open, then go to next step.
9	INSPECT TCV ● Perform TCV Inspection. (See NO TAG TIMER CONTROL VALVE (TCV) INSPECTION) ● Is TCV okay?	Yes	Injection pump may have mechanical malfunction. Consult your distributor for inspection of injection pump. Then go to next step.
		No	Consult your distributor for replacement of TCV. Then go to next step.
10	VERIFY TROUBLESHOOTING OF DTC P1312 COMPLETED ● Make sure to reconnect all disconnected connectors. ● Turn engine switch to ON (Engine OFF). ● Clear DTC from PCM memory using WDS or equivalent. ● Start engine. ● Access ECT PID using WDS or equivalent. ● Wait until ECT PID is above 80°C {176°F}. ● Is same DTC present?	Yes	Replace PCM, then go to next step.
		No	Go to next step.
11	VERIFY AFTER REPAIR PROCEDURE ● Perform "AFTER REPAIR PROCEDURE". (See Section F2) ● Is there any DTC present?	Yes	Go to applicable DTC inspection. (See 67 DTC TABLE)
		No	Troubleshooting completed.

ON-BOARD DIAGNOSTIC SYSTEM

DTC P1318

DTC P1318	Timer position sensor circuit malfunction
DETECTION CONDITION	PCM monitors input voltage from timer position sensor. If input voltage from timer position sensor is below 0.25 V or above 4.90 V, PCM determines that timer position sensor circuit is malfunctioning.
POSSIBLE CAUSE	- Timer position sensor malfunction - PCM malfunction - Connector or terminal malfunction - Open or short to ground circuit between timer position sensor terminal (injection pump connector B) A and PCM terminal 1K - Open or short to ground circuit between timer position sensor terminal (injection pump connector B) C and PCM terminal 1I - Open circuit between timer position sensor terminal (injection pump connector B) B and PCM terminal 1G
TIMER POSITION SENSOR INJECTION PUMP CONNECTOR B PCM PCM	

ZCF4070W203

Diagnostic procedure

STEP	INSPECTION	ACTION
1	VERIFY RELATED SERVICE INFORMATION AVAILABILITY - Check for related Service Information availability. - Is any related Service Information available?	Yes Perform repair or diagnosis according to Service Information. If vehicle is not repaired, go to next step.
		No Go to next step.
2	VERIFY DTC P1318 DETECTED AGAIN - Clear DTC from memory using WDS or equivalent. - Turn engine switch to OFF, then start engine. - Is same DTC present?	Yes Go to next step.
		No Intermittent concern exists. Go to INTERMITTENT CONCERN TROUBLESHOOTING procedure. (See NO TAG INTERMITTENT CONCERN TROUBLESHOOTING)
3	INSPECT TIMER POSITION SENSOR CONNECTOR FOR POOR CONNECTION - Turn engine switch to OFF. - Disconnect timer position sensor connector. - Check for poor connection (damaged, pulled-out pins, corrosion, etc.). - Is there a malfunction?	Yes Repair or replace terminal, then go to Step 8.
		No Go to next step.

ON-BOARD DIAGNOSTIC SYSTEM

STEP	INSPECTION	ACTION	
4	INSPECT PCM CONNECTOR FOR POOR CONNECTION ● Turn engine switch to OFF. ● Disconnect PCM connector. ● Check for poor connection (damaged, pulled-out pins, corrosion, etc.). ● Is there a malfunction?	Yes	Repair or replace terminal, then go to Step 8.
		No	Go to next step.
5	INSPECT TIMER POSITION SENSOR CIRCUIT FOR SHORT TO GROUND ● Inspect the following terminals for continuity: — Between injection pump connector B terminal A and body ground — Between injection pump connector B terminal C and body ground ● Is there continuity?	Yes	Repair or replace harness, then go to Step 8.
		No	Go to next step.
6	INSPECT TIMER POSITION SENSOR CIRCUIT FOR OPEN ● Inspect the following terminals for continuity: — Between injection pump connector B terminal A and PCM terminal 1K — Between injection pump connector B terminal C and PCM terminal 1I — Between injection pump connector B terminal B and PCM terminal 1G ● Is there continuity?	Yes	Go to next step.
		No	Repair or replace open harness, then go to Step 8.
7	INSPECT TIMER POSITION SENSOR ● Perform timer position sensor inspection. (See NO TAG TIMER POSITION SENSOR INSPECTION) ● Is timer position sensor okay?	Yes	Injection pump may have a malfunction. Consult your distributor for inspection of injection pump. Then go to next step.
		No	Consult your distributor for replace of timer position sensor. Then go to next step.
8	VERIFY TROUBLESHOOTING OF DTC P1318 COMPLETED ● Turn engine switch to OFF and ON (Engine OFF). ● Clear DTC from memory using WDS or equivalent. ● Start engine. ● Is same DTC present?	Yes	Replace PCM, then go to next step.
		No	Go to next step.
9	VERIFY AFTER REPAIR PROCEDURE ● Perform "AFTER REPAIR PROCEDURE". (See Section F2) ● Is there any DTC present?	Yes	Go to applicable DTC inspection. (See 67 DTC TABLE)
		No	Troubleshooting completed.

ON-BOARD DIAGNOSTIC SYSTEM

DTC P1402

DTC P1402	EGR valve position sensor circuit malfunction
DETECTION CONDITION	If PCM detects EGR valve position sensor voltage at PCM terminal 1F below 0.10 V or above 4.90 V after engine start, PCM determines that EGR valve position circuit has a malfunction.
POSSIBLE CAUSE	- EGR valve position sensor malfunction - Connector or terminal malfunction - Open circuit between EGR valve position sensor terminal C and PCM terminal 1F. - Short to ground circuit between EGR valve position sensor terminal C and PCM terminal 1F. - Open circuit between EGR valve position sensor terminal B and PCM terminal 1A. - Short to ground circuit between EGR valve position sensor terminal B and PCM terminal 1A. - Open circuit between EGR valve position sensor terminal A and PCM terminal 1B. - Short to reference voltage (Vref) supply circuit between EGR valve position sensor terminal C and PCM terminal 1F - PCM malfunction - MAF sensor malfunction - Electrical corrosion in EGR valve position signal circuit - Voltage drops in ground circuit or reference voltage (Vref) supply circuit
EGR VALVE POSITION SENSOR PCM EGR VALVE POSITION SENSOR HARNESS SIDE CONNECTOR PCM HARNESS SIDE CONNECTOR	

ZCF4070W202

Diagnostic procedure

STEP	INSPECTION	ACTION
1	VERIFY RELATED SERVICE INFORMATION AVAILABILITY - Check for related Service Information availability. - Is any related Service Information available?	Yes
		Perform repair or diagnosis according to Service Information. If vehicle is not repaired, go to next step.
2	CLASSIFY IF INTERMITTENT CONCERN OR CONTINUOUS CONCERN - Turn engine switch to OFF then ON (Engine OFF). - Is same DTC present?	Yes
		Go to next step.
		No
		Intermittent concern is existing. Go to INTERMITTENT CONCERN TROUBLESHOOTING procedure. (See NO TAG INTERMITTENT CONCERN TROUBLESHOOTING)

ON-BOARD DIAGNOSTIC SYSTEM

STEP	INSPECTION	ACTION	
3	INSPECT EGR VALVE POSITION SENSOR CONNECTOR • Turn engine switch to OFF. • Disconnect EGR valve position sensor connector. • Check for poor connection (damaged, pulled-out pins, corrosion, etc.). • Are there any concerns?	Yes	Repair terminal, then go to Step 18.
		No	Go to next step.
4	CHECK POWER SUPPLY CIRCUIT VOLTAGE AT EGR VALVE POSITION SENSOR CONNECTOR • Turn engine switch to ON (Engine OFF). • Measure voltage between EGR valve position sensor terminal B (harness-side) and body ground. • Is voltage within 4.5— 5.5 V?	Yes	Go to Step 9.
		No	• If voltage is B+, repair or replace shorted harness, then go to Step 18. • If voltage is approx. 0 V, go to next step.
5	INSPECT EGR VALVE POSITION SENSOR POWER SUPPLY CIRCUIT FOR SHORT TO GROUND • Check continuity between EGR valve position sensor terminal B (harness-side) and body ground. • Is there continuity?	Yes	Repair or replace shorted harness, then go to Step 18.
		No	Go to next step.
6	INSPECT EGR VALVE POSITION SENSOR POWER SUPPLY AND GROUND CIRCUIT FOR SHORT TO EACH OTHER • Check continuity between EGR valve position sensor terminals B (harness-side) and A (harness-side). • Is there continuity?	Yes	Repair or replace shorted harness, then go to Step 18.
		No	Go to next step.
7	CHECK PCM CONNECTOR • Disconnect PCM connector. • Check for poor connection at terminal 1A (damaged, pulled-out pins, corrosion, etc.). • Is there any concern?	Yes	Repair terminal, then go to Step 18.
		No	Go to next step.
8	VERIFY EGR VALVE POSITION SENSOR POWER SUPPLY CIRCUIT FOR OPEN CIRCUIT • Check continuity between EGR valve position sensor terminal B (harness-side) and PCM terminal 1A (harness-side). • Is there continuity?	Yes	Go to Step 18.
		No	Repair or replace suspected harness, then go to Step 18.
9	CHECK SIGNAL CIRCUIT VOLTAGE AT EGR VALVE POSITION SENSOR CONNECTOR • Turn engine switch to ON (Engine OFF). • Measure voltage between EGR valve position sensor terminal C (harness-side) and body ground. • Is voltage within 4.5— 5.5 V?	Yes	Go to Step 15.
		No	• If voltage is B+, repair or replace shorted harness, then go to Step 18. • If voltage is approx. 0 V, go to Step 11.
10	INSPECT EGR VALVE POSITION SENSOR POWER SUPPLY AND SIGNAL CIRCUIT FOR SHORT TO EACH OTHER • Check continuity between EGR valve position sensor terminals B (harness-side) and C (harness-side). • Is there continuity?	Yes	Repair or replace shorted harness, then go to Step 18.
		No	Go to next step.
11	INSPECT EGR VALVE POSITION SENSOR SIGNAL CIRCUIT FOR SHORT TO GROUND • Check continuity between EGR valve position sensor terminal C (harness-side) and body ground. • Is there continuity?	Yes	Repair or replace shorted harness, then go to Step 18.
		No	Go to next step.

ON-BOARD DIAGNOSTIC SYSTEM

STEP	INSPECTION		ACTION
12	INSPECT EGR VALVE POSITION SENSOR SIGNAL AND GROUND CIRCUIT FOR SHORT EACH OTHER - Check continuity between EGR valve position sensor terminals C (harness-side) and A (harness-side). - Is there continuity?	Yes	Repair or replace shorted harness, then go to Step 18.
		No	Go to next step.
13	CHECK PCM CONNECTOR - Disconnect PCM connector. - Check for poor connection at terminal 1F (damaged, pulled-out pins, corrosion, etc.). - Is there any concern?	Yes	Repair terminal, then go to Step 18.
		No	Go to next step.
14	VERIFY EGR VALVE POSITION SENSOR SIGNAL CIRCUIT FOR OPEN CIRCUIT - Disconnect PCM connector. - Check continuity between EGR valve position sensor terminal C (harness-side) and PCM terminal 1F (harness-side). - Is there continuity?	Yes	Go to Step 18.
		No	Repair or replace suspected harness, then go to Step 18.
15	CHECK PCM CONNECTOR - Disconnect PCM connector. - Check for poor connection at terminal 1B (damaged, pulled-out pins, corrosion, etc.). - Is there any concern?	Yes	Repair terminal, then go to Step 18.
		No	Go to next step.
16	VERIFY EGR VALVE POSITION SENSOR GROUND CIRCUIT FOR OPEN CIRCUIT - Check continuity between EGR valve position sensor terminal A (harness-side) and PCM terminal 1B (harness-side). - Is there continuity?	Yes	Go to next step.
		No	Repair or replace suspected harness, then go to Step 18.
17	INSPECT EGR VALVE POSITION SENSOR - Perform EGR valve position sensor inspection. (See section F2) - Is EGR position sensor okay?	Yes	Go to next step.
		No	Replace EGR valve position sensor, then go to next step.
18	VERIFY TROUBLESHOOTING OF DTC P1402 COMPLETED - Make sure to reconnect all disconnected connectors. - Start engine. - Clear DTC from PCM memory using WDS or equivalent. - Is same DTC present?	Yes	Replace PCM, then go to next step.
		No	Go to next step.
19	VERIFY AFTER REPAIR PROCEDURE - Perform "After Repair Procedure" (See Section F2) - Is there any DTC present?	Yes	Go to applicable DTC inspection. (See 67 DTC TABLE)
		No	Troubleshooting completed.

ON-BOARD DIAGNOSTIC SYSTEM

DTC P1602

DTC P1602	Immobilizer unit-PCM communication error
DETECTION CONDITION	- Command transmission from the PCM to the immobilizer unit exceeds limit. - No response from immobilizer unit
POSSIBLE CAUSE	- Immobilizer unit malfunction - Coil (immobilizer system) malfunction - Key (transponder) malfunction - PCM malfunction - Open circuit in wiring between immobilizer unit terminal A and PCM terminal 2L - Open circuit in wiring between immobilizer unit terminal C and body ground - Open circuit in wiring between immobilizer unit terminal F and coil terminal A - Open circuit in wiring between immobilizer unit terminal D and coil terminal C - Short to ground circuit in wiring between immobilizer unit terminal A and PCM terminal 2L - Short to ground circuit in wiring between immobilizer unit terminal F and coil terminal A - Short to ground circuit in wiring between immobilizer unit terminal D and coil terminal C
The diagram illustrates the electrical connections between the COIL, IMMOBILIZER UNIT, and PCM. The COIL has terminals C and A. The IMMOBILIZER UNIT has terminals D, J, A, F, and C. The PCM has terminal 2L. Wires are labeled with numbers in circles: 12, 5, 11, 7, 13, 16, 3, 17, 9, 8, 18, 4. Below the diagram are three connector pin layouts: COIL HARNESS SIDE CONNECTOR (C, A), IMMOBILIZER UNIT HARNESS SIDE CONNECTOR (M, K, E, C, A, N, L, J, H, F, D, B), and PCM HARNESS SIDE CONNECTOR (2K, 2I, 2G, 2E, 2C, 2A, 2L, 2J, 2H, 2F, 2D, 2B). Each layout includes a small icon of the connector with an arrow pointing to the relevant pins.	

ZCF4070W301

Diagnostic procedure

STEP	INSPECTION	ACTION
1	VERIFY RELATED REPAIR INFORMATION AVAILABILITY - Check for related Service Information availability. - Is any related repair information available?	Yes Perform repair or diagnosis according to available repair information. If vehicle is not repaired, go to next step.
		No Go to next step.
2	CLASSIFY IF NO DTC DETECTED OR SOME DTC DETECTED - Clear DTC from memory using WDS or equivalent. - Turn ignition key to OFF and ON (Engine OFF). - Has DTC P1624 been detected?	Yes Go to step 10.
		No Go to next step.
3	INSPECT IMMOBILIZER UNIT CONNECTOR FOR POOR CONNECTION - Turn ignition key to OFF. - Disconnect immobilizer unit connector. - Check for poor connection (damaged, pulled-out terminals, corrosion, etc.). - Is there any malfunction?	Yes Repair or replace terminals, then go to Step 19.
		No Go to next step.

ON-BOARD DIAGNOSTIC SYSTEM

STEP	INSPECTION		ACTION
4	INSPECT GROUND CIRCUIT OF IMMOBILIZER UNIT FOR OPEN CIRCUIT - Measure resistance between immobilizer unit terminal C (harness-side) and body ground. - Is there any continuity?	Yes	Go to next step.
		No	Repair or replace harness for open, then go to Step 19.
5	INSPECT COIL TERMINAL - Disconnect coil connector. - Check for bent terminals. - Is there any malfunction?	Yes	Repair or replace terminals, then go to Step 19.
		No	Go to next step.
6	INSPECT COIL FOR SHORT CIRCUIT - Check continuity between coil terminal A (part-side) and body ground. - Is there any continuity?	Yes	Replace coil, then go to Step 19.
		No	Go to next step.
7	INSPECT COIL CIRCUIT FOR SHORT - Connect coil connector. - Check continuity between immobilizer unit terminal F (harness-side) and body ground. - Is there any continuity?	Yes	Repair or replace harness for short circuit, then go to Step 19.
		No	Go to next step.
8	INSPECT PCM CONNECTOR FOR POOR CONNECTION - Disconnect PCM connector. - Check for poor connection (damaged, pulled-out terminals, corrosion, etc.). - Is there any malfunction?	Yes	Repair or replace harness, then go to Step 19.
		No	Go to next step.
9	INSPECT COMMUNICATION LINE FOR OPEN CIRCUIT - Connect break out box with PCM disconnected. - Measure continuity between immobilizer unit terminal A (harness-side) and PCM terminal 2L. - Is there any continuity?	Yes	Go to step 19.
		No	Repair or replace harness for open circuit, then go to Step 19.
10	CLASSIFY MALFUNCTION BY ANOTHER DETECTED DTCS Has DTC P1602 detected?	Yes	Go to Step 14.
		No	Go to next step.
11	INSPECT COIL CONNECTOR FOR POOR CONNECTION - Disconnect coil connector. - Check for poor connection (damaged, pulled-out terminals, corrosion, etc.). - Are there any malfunctions?	Yes	Repair or replace harness, then go to Step 19.
		No	Go to next step.
12	INSPECT COIL FOR OPEN CIRCUIT - Disconnect coil connector. - Measure resistance between coil terminals (part-side). - Is there any continuity?	Yes	Go to next step.
		No	Replace coil, then go to Step 19.
13	INSPECT COIL CIRCUIT FOR OPEN CIRCUIT - Connect coil connector. - Measure the resistance between immobilizer connector F and D (harness-side). - Is there any continuity?	Yes	Go to Step 19.
		No	Repair or replace harness for open circuit, then go to Step 19.
14	CLASSIFY MALFUNCTION BY ANOTHER DETECTED DTCS. Has immobilizer unit DTC 03 detected?	Yes	Key has not transponder, change to registered key. Then go to Step 19.
		No	Go to next step.
15	CLASSIFY MALFUNCTION BY ANOTHER DETECTED DTCS. Has immobilizer unit DTC 01 detected?	Yes	Key that using for ignition is not registered. Reprogram key or using another registered key, then go to next step. (See NO TAG IMMOBILIZER SYSTEM REPROGRAM PROCEDURE)
		No	Go to next step.

ON-BOARD DIAGNOSTIC SYSTEM

STEP	INSPECTION		ACTION
16	INSPECT IMMOBILIZER UNIT CONNECTOR FOR POOR CONNECTION ● Turn ignition key to OFF. ● Disconnect immobilizer unit connector. ● Check for poor connection (damaged, pulled-out terminals, corrosion, etc.). ● Are there any malfunctions?	Yes	Repair or replace harness, then go to next step.
		No	Go to next step.
17	INSPECT IMMOBILIZER UNIT POWER CIRCUIT FOR OPEN CIRCUIT ● Turn ignition key to ON (Engine OFF). ● Measure voltage between immobilizer connector J (harness-side) and body ground. ● Is there voltage B+?	Yes	Go to next step.
		No	Repair or replace harness for open circuit, then go to Step 19.
18	INSPECT COMMUNICATION LINE FOR SHORT HARNESS ● Measure resistance between immobilizer unit terminal A (harness-side) and body ground. ● Is there any continuity?	Yes	Repair or replace harness for short, then go to next step.
		No	Go to next step.
19	VERIFY TROUBLESHOOTING OF DTC P1602 COMPLETED ● Make sure to reconnect all disconnected connectors. ● Clear DTC from memory using WDS or equivalent. ● Turn ignition key to OFF, then start engine. ● Is same DTC present?	Yes	Replace PCM, then go to next step.
		No	Go to next step.
20	VERIFY AFTER REPAIR PROCEDURE ● Perform "After Repair Procedure" (See Section F2) ● Is there any DTC present?	Yes	Go to applicable DTC inspection. (See 67 DTC TABLE.)
		No	Troubleshooting completed.

DTC P1603

DTC P1603	Code word is not registered in PCM
DETECTION CONDITION	● Code word is not registered in PCM.
POSSIBLE CAUSE	● Immobilizer system reprogram procedure (code word) was not performed after replacing PCM.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	VERIFY RELATED REPAIR INFORMATION AVAILABILITY ● Check for related Service Information availability. ● Is any repair information available?	Yes	Perform repair or diagnosis according to available repair information. ● If vehicle is not repaired, go to next step.
		No	Go to next step.
2	VERIFY DTC P1603 DETECTED AGAIN ● Clear DTC from memory using WDS or equivalent. ● Turn ignition key to OFF, then start engine. ● Is same DTC present?	Yes	Perform code word reprogram procedure. (See NO TAG IMMOBILIZER SYSTEM REPROGRAM PROCEDURE)
		No	Go to next step.
3	VERIFY TROUBLESHOOTING OF DTC P1603 COMPLETED ● Clear DTC from memory using WDS or equivalent. ● Turn ignition key to OFF, then start engine. ● Is same DTC present?	Yes	Replace PCM, then go to next step.
		No	Go to next step.
4	VERIFY AFTER REPAIR PROCEDURE ● Perform "After Repair Procedure" (See Section F2) ● Is there any DTC present?	Yes	Go to applicable DTC inspection. (See 67 DTC TABLE.)
		No	Troubleshooting completed.

ON-BOARD DIAGNOSTIC SYSTEM

DTC P1604

DTC P1604	Key ID numbers are not registered in PCM
DETECTION CONDITION	Key ID numbers are not registered in PCM.
POSSIBLE CAUSE	Immobilizer system reprogram procedure (key IDs) was not performed after replacing PCM.

Diagnostic procedure

STEP	INSPECTION	ACTION
1	VERIFY RELATED REPAIR INFORMATION AVAILABILITY - Check for related Service Information availability. - Is any repair information available?	Yes Perform repair or diagnosis according to available repair information. If vehicle is not repaired, go to next step.
		No Go to next step.
2	VERIFY DTC P1604 DETECTED AGAIN - Clear DTC from memory using WDS or equivalent. - Turn ignition key to OFF, then start engine. - Is same DTC present?	Yes Perform key ID number reprogram procedure. (See NO TAG IMMOBILIZER SYSTEM REPROGRAM PROCEDURE)
		No Go to next step.
3	VERIFY TROUBLESHOOTING OF DTC P1604 COMPLETED - Clear DTC from memory using WDS or equivalent. - Turn ignition key to OFF, then start engine. - Is same DTC present?	Yes Replace PCM, then go to next step.
		No Go to next step.
4	VERIFY AFTER REPAIR PROCEDURE - Perform "After Repair Procedure" (See Section F2) - Is there any DTC present?	Yes Go to applicable DTC inspection. (See 67 DTC TABLE.)
		No Troubleshooting completed.

DTC P1621

DTC P1621	Code word does not match after engine cranking
DETECTION CONDITION	Code word stored in PCM and immobilizer unit does not match
POSSIBLE CAUSE	Immobilizer system reprogram procedure (code word) was not performed correctly after replacing immobilizer unit or PCM.

Diagnostic procedure

STEP	INSPECTION	ACTION
1	VERIFY RELATED REPAIR INFORMATION AVAILABILITY - Check for related Service Information availability. - Is any repair information available?	Yes Perform repair or diagnosis according to available repair information. If vehicle is not repaired, go to next step.
		No Go to next step.
2	VERIFY DTC P1621 DETECTED AGAIN - Clear DTC from memory using WDS or equivalent. - Turn ignition key to OFF, then start engine. - Is same DTC present?	Yes Perform code word reprogram procedure. (See NO TAG IMMOBILIZER SYSTEM REPROGRAM PROCEDURE)
		No Go to next step.
3	VERIFY TROUBLESHOOTING OF DTC P1621 COMPLETED - Clear DTC from memory using WDS or equivalent. - Turn ignition key to OFF, then start engine. - Is same DTC present?	Yes Replace PCM, then go to next step.
		No Go to next step.
4	VERIFY AFTER REPAIR PROCEDURE - Perform "After Repair Procedure" (See Section F2) - Is there any DTC present?	Yes Go to applicable DTC inspection. (See 67 DTC TABLE.)
		No Troubleshooting completed.

ON-BOARD DIAGNOSTIC SYSTEM

DTC P1622

DTC P1622	Key ID number does not match
DETECTION CONDITION	ID number stored in immobilizer unit (IU) and PCM does not match. This DTC is indicated only after immobilizer unit is replaced and reprogramming system.
POSSIBLE CAUSE	Transformation of key ID number stored in PCM.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	VERIFY RELATED REPAIR INFORMATION AVAILABILITY - Check for related Service Information availability. - Is any repair information available?	Yes	Perform repair or diagnosis according to available repair information. If vehicle is not repaired, go to next step.
		No	Go to next step.
2	VERIFY DTC P1622 DETECTED AGAIN - Clear DTC from memory using WDS or equivalent. - Turn ignition key to OFF, then start engine. - Is same DTC present?	Yes	Go to next step.
		No	Go to Step 4.
3	CHECK IF ENGINE STARTS NORMALLY USING ANOTHER REGISTERED KEY Does engine start with another registered key?	Yes	Previous key is defective. Discard it.
		No	Go to next step.
4	VERIFY TROUBLESHOOTING OF DTC P1622 COMPLETED - Clear DTC from memory using WDS or equivalent. - Turn ignition key to OFF, then start engine. - Is same DTC present?	Yes	Replace PCM, then go to next step.
		No	Go to next step.
5	VERIFY AFTER REPAIR PROCEDURE - Perform "After Repair Procedure" (See Section F2) - Is there any DTC present?	Yes	Go to applicable DTC inspection. (See 67 DTC TABLE.)
		No	Troubleshooting completed.

DTC P1623

DTC P1623	Code word or key ID number read/write error in PCM
DETECTION CONDITION	PCM internal EEPROM damaged.
POSSIBLE CAUSE	PCM internal EEPROM damaged.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	VERIFY RELATED REPAIR INFORMATION AVAILABILITY - Check for related Service Information availability. - Is any repair information available?	Yes	Perform repair or diagnosis according to available repair information. If vehicle is not repaired, go to next step.
		No	Go to next step.
2	VERIFY DTC P1623 DETECTED AGAIN - Clear DTC from memory using WDS or equivalent. - Turn ignition key to OFF, then start engine. - Is same DTC present?	Yes	Replace PCM, then go to next step.
		No	Go to next step.
3	VERIFY AFTER REPAIR PROCEDURE - Perform "After Repair Procedure" (See Section F2) - Is there any DTC present?	Yes	Go to applicable DTC inspection. (See 67 DTC TABLE.)
		No	Troubleshooting completed.

ON-BOARD DIAGNOSTIC SYSTEM

DTC P1624

DTC P1624	Immobilizer system communication counter = 0
DETECTION CONDITION	PCM detected immobilizer system communication malfunction three times or more
POSSIBLE CAUSE	- Attempted to start engine three times or more under malfunction. - Code word mismatch

Diagnostic procedure

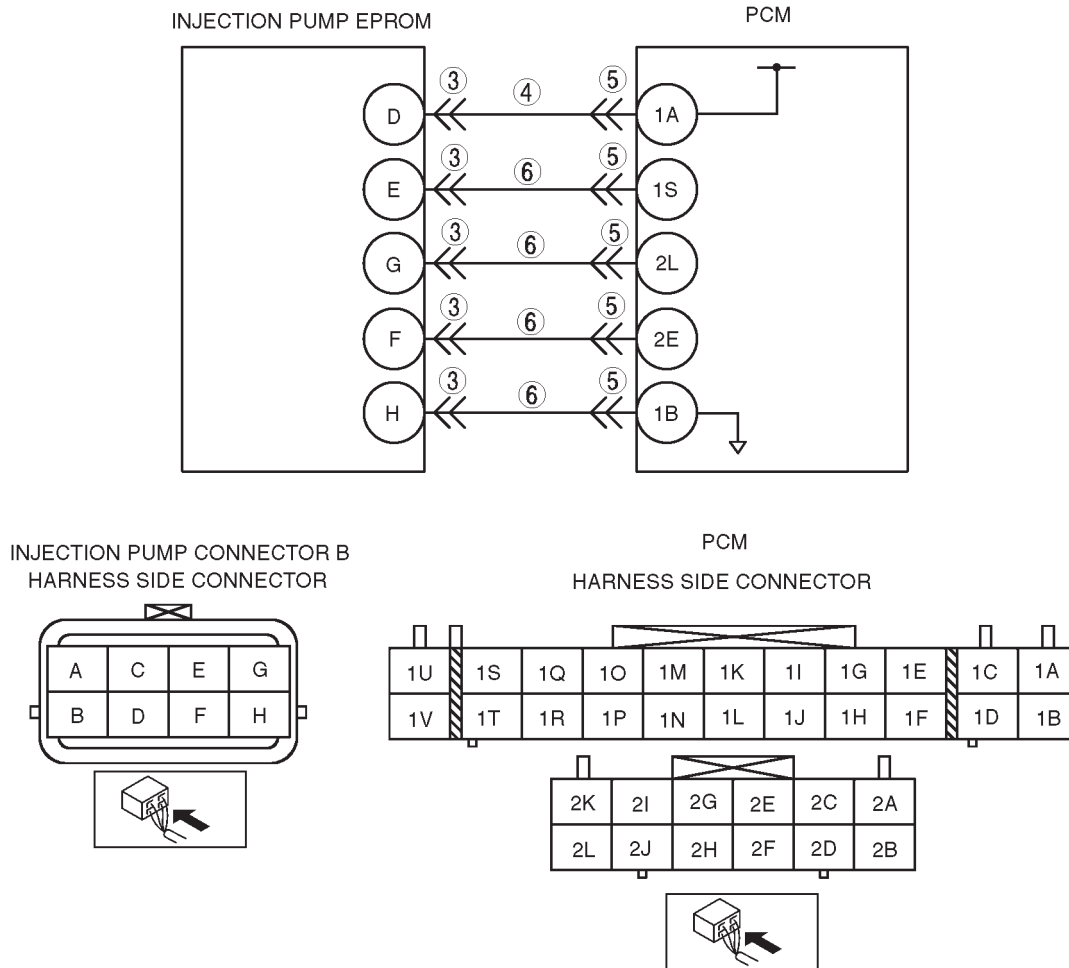
STEP	INSPECTION		ACTION
1	VERIFY RELATED REPAIR INFORMATION AVAILABILITY - Check for related Service Information availability. - Is any repair information available?	Yes	Perform repair or diagnosis according to available repair information. If vehicle is not repaired, go to next step.
		No	Go to next step.
2	FOLLOW OTHER DETECTED DTC FIRST - Turn ignition key to OFF and to START. - Has P1602 been detected?	Yes	Go to DTC P1602 inspection. (See 110 DTC P1602.)
		No	Go to next step.
3	INSPECT IMMOBILIZER UNIT CONNECTOR FOR POOR CONNECTION Has P1621 been detected?	Yes	Go to DTC P1621 inspection. (See 113 DTC P1621.)
		No	Go to next step.
4	VERIFY TROUBLESHOOTING OF DTC P1624 COMPLETED - Make sure to reconnect all disconnected connectors. - Clear DTC from memory using WDS or equivalent. - Turn ignition key to OFF, then start engine. - Is same DTC present?	Yes	Replace PCM, then go to next step.
		No	Go to next step.
5	VERIFY AFTER REPAIR PROCEDURE - Perform "After Repair Procedure" (See Section F2) - Is there any DTC present?	Yes	Go to applicable DTC inspection. (See 67 DTC TABLE.)
		No	Troubleshooting completed.

DTC P1649

DTC P1649	Injection pump EPROM circuit malfunction
DETECTION CONDITION	If PCM cannot access to injection pump EPROM, PCM determines that the injection pump EPROM circuit has malfunction.
POSSIBLE CAUSE	- Injection pump EPROM malfunction - PCM malfunction - Connector or terminal malfunction - Open circuit between injection pump EPROM terminal (injection pump connector B) D and PCM terminal 1A - Open or short to ground circuit between injection pump EPROM terminal (injection pump connector B) F and PCM terminal 2E - Open or short to ground circuit between injection pump EPROM terminal (injection pump connector B) G and PCM terminal 2L - Open or short to ground circuit between injection pump EPROM terminal (injection pump connector B) E and PCM terminal 1S - Open circuit between injection pump EPROM terminal (injection pump connector B) H and PCM terminal 1B

ON-BOARD DIAGNOSTIC SYSTEM

DTC P1649 Injection pump EPROM circuit malfunction



ZCF4070W204

Diagnostic procedure

STEP	INSPECTION	ACTION
1	VERIFY RELATED SERVICE INFORMATION AVAILABILITY - Check for related Service Information availability. - Is any related Service Information available?	Yes Perform repair or diagnosis according to Service Information. ● If vehicle is not repaired, go to next step.
		No Go to next step.
2	VERIFY DTC P1649 DETECTED AGAIN - Clear DTC from memory using WDS or equivalent. - Turn engine switch to OFF, then start engine. - Is same DTC present?	Yes Go to next step.
		No Intermittent concern exists. Go to INTERMITTENT CONCERN TROUBLESHOOTING procedure. (See NO TAG INTERMITTENT CONCERN TROUBLESHOOTING)
3	INSPECT INJECTION PUMP EPROM CONNECTOR FOR POOR CONNECTION - Turn engine switch to OFF. - Disconnect injection pump EPROM connector. - Check for poor connection (damaged, pulled-out pins, corrosion, etc.). - Is there a malfunction?	Yes Repair or replace terminal, then go to Step 9.
		No Go to next step.
4	INSPECT INJECTION PUMP EPROM POWER CIRCUIT FOR OPEN CIRCUIT - Measure voltage between injection pump connector B terminal D (harness-side) and body GND. - Is voltage approx. 5V?	Yes Go to next step.
		No Repair or replace open harness, then go to Step 9.

ON-BOARD DIAGNOSTIC SYSTEM

STEP	INSPECTION	ACTION	
5	INSPECT PCM CONNECTOR FOR POOR CONNECTION ● Turn engine switch to OFF. ● Disconnect PCM connector. ● Check for poor connection (damaged, pulled-out pins, corrosion, etc.). ● Is there a malfunction?	Yes	Repair or replace terminal, then go to Step 9.
		No	Go to next step.
6	INSPECT INJECTION PUMP EPROM CIRCUIT FOR SHORT TO GND ● Inspect the following terminals for continuity: — Between injection pump connector B terminal F and body ground — Between injection pump connector B terminal G and body ground — Between injection pump connector B terminal E and body ground ● Is there continuity?	Yes	Repair or replace harness, then go to Step 9.
		No	Go to next step.
7	INSPECT INJECTION PUMP EPROM CIRCUIT FOR OPEN CIRCUIT ● Inspect the following terminals for continuity: — Between injection pump connector B terminal F and PCM terminal 2E — Between injection pump connector B terminal G and PCM terminal 2L — Between injection pump connector B terminal E and PCM terminal 1S — Between injection pump connector B terminal H and PCM terminal 1B ● Is there continuity?	Yes	Go to next step.
		No	Repair or replace open harness, then go to Step 9.
8	INSPECT INJECTION PUMP EPROM ● Perform injection pump EPROM inspection. (See NO TAG INJECTION PUMP EPROM INSPECTION) ● Is injection pump EPROM okay?	Yes	Injection pump may have a malfunction. Consult your distributor for inspection of injection pump. Then go to next step.
		No	Consult your distributor for replace of injection pump EPROM. Then go to next step.
9	VERIFY TROUBLESHOOTING OF DTC P1649 COMPLETED ● Turn engine switch to OFF and ON (Engine OFF). ● Clear DTC from memory using WDS or equivalent. ● Start engine. ● Is same DTC present?	Yes	Replace PCM, then go to next step.
		No	Go to next step.
10	VERIFY AFTER REPAIR PROCEDURE ● Perform "AFTER REPAIR PROCEDURE". (See Section F2) ● Is there any DTC present?	Yes	Go to applicable DTC inspection. (See 67 DTC TABLE)
		No	Troubleshooting completed.

TROUBLESHOOTING

FOREWORD

- Before proceeding with the following troubleshooting:
 - See Section GI to understand the basic troubleshooting procedure.
 - Perform the DTC inspection.
 - If a DTC is displayed, proceed with inspection steps for the code.
 - When the engine can be started, perform "ENGINE TUNE-UP." (See ENGINE TUNE-UP.)

INTERMITTENT CONCERN TROUBLESHOOTING Vibration Method

- If malfunction occurs or becomes worse while driving on a rough road or when engine is vibrating, perform the steps below.

Note

- There are several reasons vehicle or engine vibration could cause an electrical malfunction. Some of the things to check for are:
 - Connectors not fully seated.
 - Wire harnesses not having full play.
 - Wires laying across brackets or moving parts.
 - Wires routed too close to hot parts.
- An improperly routed, improperly clamped, or loose harness can cause wiring to become pinched between parts.
- The connector joints, points of vibration, and places where wire harnesses pass through the fire wall, body panels, etc. are the major areas to be checked.

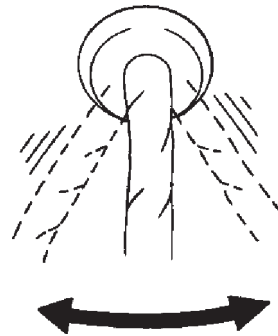
Inspection Method for Switch Connectors or Wires

1. Connect **SSTs** (WDS or equivalent) to DLC.
2. Turn engine switch to ON (Engine OFF).

Note

- If engine starts and runs, perform the following steps at idle.

3. Access PIDs for the switch you are inspecting.
4. Turn switch on manually.
5. Shake each connector or wire harness a bit vertically and horizontally while monitoring the PID.
 - If PID value is unstable, check for poor connection.



Y3U103WN3

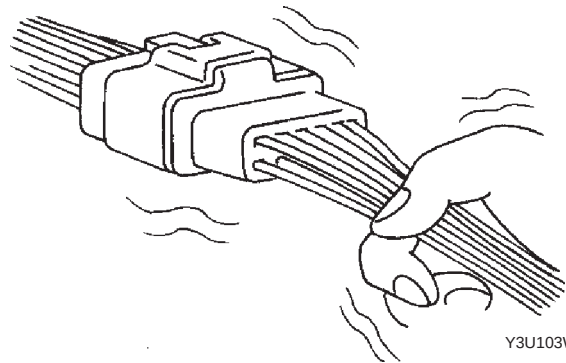
Inspection Method for Sensor Connectors or Wires

1. Connect **SSTs** (WDS or equivalent) to DLC.
2. Turn engine switch to ON (Engine OFF).

Note

- If engine starts and runs, perform the following steps at idle.

3. Access PIDs for the switch you are inspecting.
4. Shake each connector or wire harness a bit vertically and horizontally while monitoring the PID.
 - If PID value is unstable, check for poor connection.



Y3U103WN4

Inspection Method for Sensors

1. Connect **SSTs** (WDS or equivalent) to DLC.
2. Turn engine switch to ON (Engine OFF).

Note

- If engine starts and runs, perform the following steps at idle.

3. Access PIDs for the switch you are inspecting.
4. Vibrate the sensor slightly with your finger.
 - If PID value is unstable or malfunction occurs, check for poor connection and/or poorly mounted sensor.

Inspection Method for Actuators or Relays

1. Connect **SSTs** (WDS or equivalent) to DLC.
2. Turn engine switch to ON (Engine OFF).

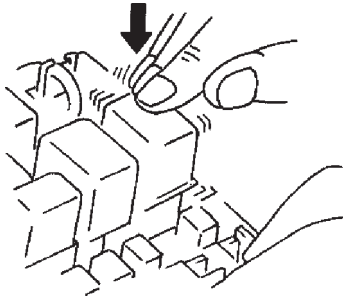
Note

- If engine starts and runs, perform the following steps at idle.

3. Prepare the SIMULATION TEST for actuators or relays that you are inspecting.
4. Vibrate the actuator or relay with your finger for **3 s** after SIMULATION TEST is activated.

TROUBLESHOOTING

- If variable click sound is heard, check for poor connection and/or poorly mounted actuator or relay.



Y3U103WN5

Note

- Vibrating relays too strongly may result in open relays.

Water Sprinkling Method

If malfunction occurs only during high humidity or rainy/snowy weather, perform the following steps.

Caution

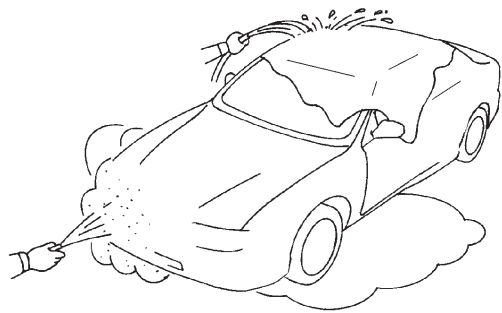
- Indirectly change the temperature and humidity by spraying water onto the front of the radiator.
- If a vehicle is subject to water leakage, the leakage may damage the control module.

When testing a vehicle with a water leakage problem, special caution must be used.

1. Connect **SSTs** (WDS or equivalent) to DLC if you are inspecting sensors or switches.
2. Turn engine switch to ON (Engine OFF).

Note

- If engine starts and runs, perform the following steps at idle.
3. Access PIDs for sensor or switch if you are inspecting sensors or switches.
 4. If you are inspecting the switch, turn it on manually.
 5. Spray water onto the vehicle or run it through a car wash.
 - If PID value is unstable or malfunction occurs, repair or replace part as necessary.



Y3U103WTJ

TROUBLESHOOTING

TROUBLESHOOTING ITEM TABLE

- Confirm trouble symptom by using the following diagnostic index, then go to appropriate troubleshooting chart.
- If a diagnostic trouble code is displayed, proceed with inspection steps for the code.

No.	TROUBLESHOOTING ITEM		DESCRIPTION
1	Melting of main or other fuses		Starter does not work.
2	Will not crank		Starter does not work.
3	Hard to start/long crank/erratic start/erratic crank		Starter cranks engine at normal speed but engine requires excessive cranking time before starting.
4	Engine stalls.	After start/at idle	Engine stops unexpectedly at idle and/or after start.
5	Crank normally but will not start		Starter cranks engine at normal speed but engine will not run.
6	Slow return to idle/fast idle		Engine takes more time than normal to return to idle speed. Engine speed continues at fast idle after warm-up.
7	Engine runs rough/rolling idle		Engine speed fluctuates between specified idle speed and lower speed and engine shakes excessively. Idle speed is too slow and engine shakes excessively.
8	Runs on		Engine runs after engine switch is turned off.
9	Engine stalls/quits.	Acceleration/cruise	Engine stops unexpectedly at beginning of acceleration, during acceleration or while cruising.
	Engine runs rough.	Acceleration/cruise	Engine speed fluctuates during acceleration or cruising.
	Misses	Acceleration/cruise	Engine misses during acceleration or cruising.
	Buck/jerk	Acceleration/cruise/ deceleration	Vehicle bucks/jerks during acceleration, cruising, or deceleration.
	Hesitation/stumble	Acceleration	Momentary pause at beginning of acceleration or during acceleration
	Surges	Acceleration/cruise	Momentary minor irregularity in engine output
10	Lack/loss of power	Acceleration/cruise	Performance is poor under load (e.g., power down when climbing hills).
11	Poor fuel economy		Fuel economy is unsatisfactory.
12	High oil consumption/leakage		Oil consumption is excessive.
13	Cooling system concerns	Overheating	Engine runs at higher than normal temperature/overheats.
14	Cooling system concerns	Runs cold	Engine does not reach normal operating temperature.
15	Excessive black smoke		Excessive black smoke is observed in exhaust gas.
16	Engine noise		Engine noise from under hood
17	Vibration concerns (engine)		Vibration from under hood or drive line
18	A/C does not work sufficiently.		A/C does not work sufficiently.
19	A/C is always on or A/C compressor runs continuously.		A/C compressor magnetic clutch does not disengage.
20	Intermittent concerns		Intermittent concerns
21	Constant voltage		Incorrect constant voltage

TROUBLESHOOTING

QUICK DIAGNOSIS CHART

× : Applicable

Troubleshooting item			Possible factor																			
			Starter motor malfunction (Mechanical or electrical)	Starter circuit including engine switch open	Improper engine oil level	Low or dead battery	Charging system malfunction	Improper engine compression	Improper valve timing	Hydrolocked engine	Improper engine oil viscosity	Improper dipstick	Base engine malfunction	Flywheel is seized.	Turbocharger malfunction	Improper tension or damaged drive belts	Improper engine coolant level	Water and anti-freeze mixture is improper.	Cooling system malfunction (including thermostat)	Cooling fan system malfunction Engine or transmission mounts are improperly installed.	Condenser fan or cooling fan malfunction	Fuel quality
1	Melting of main or other fuses																					
2	Will not crank		×	×		×	×		×			×	×									
3	Hard to start/long crank/erratic start/erratic crank		×	×				×	×			×									×	
4	Engine stalls.	After start/at idle						×	×			×									×	
5	Cranks normally but will not start							×	×			×									×	
6	Slow return to idle/fast idle																	×				
7	Engine runs rough/rolling idle							×	×			×									×	
8	Runs on																					
9	Engine stalls/quits.	Acceleration/cruise						×	×			×		×								
	Engine runs rough.	Acceleration/cruise						×	×			×		×								
	Misses	Acceleration / cruise						×	×			×		×								
	Buck/jerk	Acceleration/cruise/ deceleration						×	×			×		×								
	Hesitation/stumble	Acceleration						×	×			×		×								
	Surges	Acceleration/cruise						×	×			×		×								
10	Lack/loss of power	Acceleration/cruise						×	×			×		×								
11	Poor fuel economy							×	×			×		×		×		×			×	
12	High oil consumption/leakage				×			×		×	×	×		×								
13	Cooling system concerns	Overheating										×			×	×	×	×	×	×		
14	Cooling system concerns	Runs cold																×	×		×	
15	Excessive black smoke							×	×			×										
16	Engine noise								×			×		×	×							
17	Vibration concerns (engine)														×				×	×		
18	A/C does not work.																					
19	A/C is always on or A/C compressor runs continuously.																					
20	Intermittent concerns																		×			
21	Constant voltage																					

Y6E4080W002

TROUBLESHOOTING

× : Applicable

Troubleshooting item		Possible factor															
		Engine overheating	Air cleaner element clogging or restriction	intake-air system restriction	Air leakage from intake-air system (Loose tubes, cracks, gaskets breakage)	Incorrect idle speed	Incorrect injection timing	Injection pump malfunction	Fuel filter restriction or clogging	Fuel system restriction	Injection nozzle and/or gasket malfunction	Fuel leakage from fuel system	Restriction in exhaust system	EGR system malfunction	Intake shutter valve malfunction	PCM control relay malfunction	Pump speed sensor
1	Melting of main or other fuses																
2	Will not crank																
3	Hard to start/long crank/erratic start/erratic crank			×		×	×	×	×	×	×	×	×	×			×
4	Engine stalls.	After start/at idle	×	×		×	×	×	×	×	×	×		×		×	×
5	Cranks normally but will not start			×			×	×	×	×	×	×		×		×	×
6	Slow return to idle/fast idle					×	×										
7	Engine runs rough/rolling idle		×	×		×	×	×	×	×	×	×		×		×	×
8	Runs on																
9	Engine stalls/quits.	Acceleration/cruise	×	×	×	×	×	×	×	×	×		×	×		×	×
	Engine runs rough.	Acceleration/cruise	×	×	×	×	×	×	×	×	×		×	×		×	×
	Misses	Acceleration/cruise	×	×	×	×	×	×	×	×	×		×	×		×	×
	Buck/jerk	Acceleration/cruise/deceleration	×	×	×	×	×	×	×	×	×		×	×		×	×
	Hesitation/stumble	Acceleration	×	×	×	×	×	×	×	×	×		×	×		×	×
	Surges	Acceleration/cruise	×	×	×	×	×	×	×	×	×		×	×		×	×
10	Lack/loss of power	Acceleration/cruise	×	×	×	×	×	×	×	×	×		×	×	×	×	×
11	Poor fuel economy		×			×	×	×			×	×	×	×		×	×
12	High oil consumption/leakage																
13	Cooling system concerns	Overheating	×											×			×
14	Cooling system concerns	Runs cold															
15	Excessive black smoke		×				×	×			×			×	×		×
16	Engine noise						×	×			×			×			×
17	Vibration concerns (engine)																
18	A/C does not work.																
19	A/C is always on or A/C compressor runs continuously.																
20	Intermittent concerns						×							×		×	×
21	Constant voltage																

ZCF4080W001

TROUBLESHOOTING

× : Applicable

Troubleshooting item			Possible factor																		
			IAT sensor No.2 malfunction	VSS malfunction	Improper starting signal	TDC sensor malfunction	A/C switch malfunction	Glow system malfunction	Injection pump EPROM malfunction	Fuel temperature sensor malfunction	TCV malfunction	FSO solenoid and/or relay malfunction	Neutral switch malfunction	Immobilizer system activation	A/C system malfunction (including improper refrigerant amount)	Clutch slippage	Brake dragging	Loose parts	Improper balance of wheels & tires	Drive line malfunction	Suspension malfunction
1	Melting of main or other fuses																				
2	Will not crank																				
3	Hard to start/long crank/erratic start/erratic crank				×	×		×	×		×										
4	Engine stalls.	After start/at idle	×	×	×	×		×		×	×	×		×	×						
5	Cranks normally but will not start				×			×			×	×		×							
6	Slow return to idle/fast idle										×										
7	Engine runs rough/rolling idle		×	×		×		×		×	×		×		×						
8	Runs on											×									
9	Engine stalls/quits.	Acceleration/cruise	×			×	×	×		×	×				×	×					
	Engine runs rough.	Acceleration/cruise	×			×	×	×		×	×				×	×					
	Misses	Acceleration/cruise	×			×	×	×		×	×				×	×					
	Buck/jerk	Acceleration/cruise/deceleration	×			×	×	×		×	×				×	×					
	Hesitation/stumble	Acceleration	×			×	×	×		×	×				×	×					
	Surges	Acceleration/cruise	×			×	×	×		×	×				×	×					
10	Lack/loss of power	Acceleration/cruise				×	×		×	×	×	×			×	×	×				
11	Poor fuel economy					×				×							×				
12	High oil consumption/leakage																				
13	Cooling system concerns	Overheating					×								×						
14	Cooling system concerns	Runs cold																			
15	Excessive black smoke		×			×	×		×	×	×										
16	Engine noise		×							×								×			
17	Vibration concerns (engine)																	×	×	×	×
18	A/C does not work.						×								×						
19	A/C is always on or A/C compressor runs continuously.						×								×						
20	Intermittent concerns		×	×		×	×	×	×	×	×	×	×								
21	Constant voltage																				

ZCF4080W002

TROUBLESHOOTING

NO.1 MELTING OF MAIN OR OTHER FUSES

1	Melting of main or other fuses
[TROUBLESHOOTING HINTS] Inspect condition of fuse.	
Shorted harness ↓ Repair shorted harness and replace fuse. Fuse Deterioration ↓ Replace fuse	
Y6E4080W001	
Damaged fuse	Related wiring harness
MAIN (80 A)	MAIN fuse • Generator • Engine switch — ENG fuse • Blower relay — Blower fan motor • A/C relay — Refrigerant pressure switch • FIP fuse
BTN (30 A)	BTN fuse • ROOM fuse
GLOW (60 A)	GLOW fuse • Glow plug relay — Glow plug
ENG (15 A)	ENG fuse • PCM
FIP (15 A)	FIP fuse • PCM control relay — PCM
ROOM (10 A)	ROOM fuse • PCM

NO.2 WILL NOT CRANK

2	Will not crank
DESCRIPTION	• Starter does not work.
POSSIBLE CAUSE	• Open starter circuit between battery and starter through engine switch • Starter malfunction • Seized/hydrolocked engine or flywheel

Diagnostic procedure

STEP	INSPECTION	ACTION
1	• Verify following: — Battery connection — Battery condition — Fuses • Are all items okay?	Yes Go to next step.
		No Service as necessary. Repeat Step 1.
2	• Is clicking sound heard from starter when engine switch is turned to START?	Yes Go to next step.
		No Go to Step 6.

TROUBLESHOOTING

STEP	INSPECTION	ACTION
3	Do any other electrical accessories work?	Yes Go to next step.
		No Inspect charging system. (See Section G)
4	- Disconnect battery negative cable. - Disconnect engine switch and starter connectors. - Inspect for electrical connections, loose wire, bent or corroded terminals. - Inspect for continuity on following circuits - Engine switch and starter - Battery cable and starter magnetic switch - Are all circuits okay?	Yes Go to next step.
		No Repair or replace open circuits.
5	- Inspect engine switch. (See Section T) - Are all circuits okay?	Yes Go to next step.
		No Replace engine switch.
6	- Inspect starting system. (See section G) - Is starting system okay?	Yes Inspect for seized/hydrolocked engine, flywheel or drive plate. (See Section H)
		No Repair or replace components as required.
7	Verify test results. If okay, return to diagnostic index to service any additional symptoms.	

NO.3 HARD TO START/LONG CRANK/ERRATIC START/ERRATIC CRANK

3	Hard to start/long crank/erratic start/erratic crank	
DESCRIPTION	- Starter cranks engine at normal speed but engine requires excessive cranking time before start. - Battery is in normal condition.	
POSSIBLE CAUSE	- Poor fuel quality - Starting system malfunction - Intake–air system restriction - Incorrect idle speed - Engine overheating - Glow system malfunction - Fuel filter clogging - Fuel line restriction - Fuel leakage - Exhaust system restriction - Incorrect fuel injection timing - Injection pump malfunction - Injection nozzle malfunction - Low engine compression - Injection pump EPROM malfunction - EGR system malfunction	

Diagnostic procedure

STEP	INSPECTION	ACTION
1	- Inspect for following: - Fuel quality including water contamination - Fuel line/fuel filter clogging - Intake–air system restriction - Are all items okay?	Yes Go to next step.
		No Service as necessary. Repeat Step 1.
2	Is engine overheating?	Yes Go to symptom troubleshooting “NO.13 COOLING SYSTEM CONCERNS–OVERHEATING.”
		No Go to next step.
3	- Connect WDS or equivalent to DLC. - Turn engine switch to ON position. - Retrieve any DTC. - Is DTC displayed?	Yes DTC is displayed: Go to appropriate DTC test.
		No No DTC is displayed: Go to next step.
4	Does engine start normally after warm–up?	Yes Inspect glow plug and glow plug relay. (See NO TAG GLOW PLUG INSPECTION) (See Section F2) Replace any malfunctioning part as necessary. If glow system is okay, go to next step.
		No Go to next step.

TROUBLESHOOTING

STEP	INSPECTION	ACTION
5	Is idle speed correct?	Yes Go to next step.
		No Adjust idle speed. (See NO TAG ENGINE TUNE-UP)
6	Is there any restriction in exhaust system?	Yes Repair or replace as necessary.
		No Go to next step.
7	- Inspect for fuel leakage from fuel pipe. - Is any fuel leakage found on fuel pipe?	Yes Repair or replace as necessary.
		No Go to next step.
8	- Measure engine compression. - Is compression okay?	Yes Go to Step 10.
		No Go to next step.
9	- Inspect timing belt for following: - Chipping of gear teeth - Breakage, damage or cracks - Low tension - Is timing belt okay?	Yes Inspect for following: - Burnt valve - Worn piston, piston ring or cylinder - Damaged cylinder head gasket - Damaged valve seat - Worn valve stem or valve guide Repair or replace as necessary.
		No If timing is incorrect, adjust timing If timing belt is not okay, replace timing belt.
10	- Inspect injection timing. - Is injection timing okay?	Yes Go to next step.
		No Inspect TCV. (See TIMER CONTROL VALVE (TCV) INSPECTION) If TCV is okay, adjust injection timing.
11	- Remove and inspect injection nozzle for following: - Clogged nozzle - Faulty nozzle gasket - Incorrect valve opening pressure - Is injection nozzle okay?	Yes Inspect following: Starting signal (PCM terminal 1U) If okay, remove and inspect injection pump.
		No Repair or replace injection nozzle.
12	Verify test results. If okay, return to diagnostic index to service any additional symptoms.	

NO.4 ENGINE STALLS-AFTER START/AT IDLE

4	Engine stalls—after start/at idle
DESCRIPTION	Engine stops unexpectedly at idle and/or after start.
POSSIBLE CAUSE	- Poor fuel quality - Intake—air system restriction - Incorrect idle speed - Engine overheating - A/C system improper operation - Immobilizer system activation or malfunction - FSO solenoid malfunction - PCM control relay malfunction - Glow system malfunction - Fuel leakage - Fuel line restriction - Fuel filter clogging - Incorrect fuel injection timing - Injection pump malfunction - Injection nozzle malfunction - Low engine compression - EGR system malfunction - MAF/IAT sensor malfunction - IAT sensor NO.2 malfunction - VSS malfunction

TROUBLESHOOTING

Diagnostic procedure

STEP	INSPECTION		ACTION
1	Note - Following test should be performed on vehicles with immobilizer system. - Go to Step 12 for vehicles without immobilizer system.	Yes	Both conditions appear: Go to Step 4.
		No	Either or other condition appear: Go to next step.
2	Does engine stall approx. 2 s after engine is started?	Yes	Go to next step.
		No	Immobilizer system is okay. Go to Step 12.
3	Is immobilizer unit connector securely connected to immobilizer unit?	Yes	Go to next step.
		No	Connect immobilizer unit connector securely. Return to Step 2.
4	Does immobilizer indicator light flash and indicate any of following immobilizer system DTCs? — DTC: 01, 02, 03, 11, 21	Yes	Go to "ON-BOARD DIAGNOSTIC FUNCTION" of immobilizer system. (See DTC TABLE)
		No	Go to next step.
5	Does immobilizer indicator light illuminate?	Yes	Go to Step 8.
		No	Go to next step.
6	Does immobilizer indicator light flash and indicate following immobilizer system DTC more than 135 s after engine switch is turned to ON? — DTC: 24, 30	Yes	Go to "ON-BOARD DIAGNOSTIC FUNCTION" of immobilizer system. (See DTC TABLE)
		No	Go to next step.
7	- Turn engine switch to OFF. - Disconnect immobilizer unit connector. - Connect jumper wire between immobilizer unit connector terminal M and GND. - Turn engine switch to ON. - Does immobilizer indicator light illuminate?	Yes	Reconnect immobilizer unit connector. Go to next step.
		No	Inspect for open circuit between immobilizer unit connector terminal M and instrument cluster. If okay, inspect immobilizer indicator light bulb. Repair or replace if necessary. Reconnect immobilizer unit connector, then return to Step 4.
8	- Connect WDS or equivalent to DLC and retrieve DTC. - Is any of following DTC displayed? — DTC: P1602, P1603, P1604, P1621, P1622, P1624	Yes	Go to appropriate DTC test.
		No	Go to next step.
9	- Disconnect accelerator position sensor connector. - Inspect continuity between GND terminal at accelerator position sensor vehicle harness connector and body GND. - Is there continuity?	Yes	Go to next step.
		No	Access PCM connector. Inspect for continuity between PCM connector 4A and 4B terminals and body GND. Repair or replace as necessary.
10	- Turn engine switch to ON. - Access B+ PID. - Is B+ PID okay?	Yes	Go to next step.
		No	Repair or replace wiring harness.
11	B+ PID Battery positive voltage - Disconnect immobilizer unit connector. - Turn engine switch to ON. - Is there battery voltage at immobilizer unit connector terminal J?	Yes	Inspect for open circuit between PCM connector terminal 2I and immobilizer unit connector terminal A.
		No	Repair or replace wiring harness between immobilizer unit connector terminal J and fuse panel.

TROUBLESHOOTING

STEP	INSPECTION		ACTION
12	- Inspect for following: - Fuel quality including water contamination - Fuel line restriction - Loose bands on intake–air system - Cracks on intake–air system parts - Intake–air system restriction - Are all items okay?	Yes	Go to next step.
		No	Service as necessary. Repeat Step 12.
13	Is engine overheating?	Yes	Go to symptom troubleshooting "NO.13 COOLING SYSTEM CONCERNS–OVERHEATING."
		No	Go to next step.
14	Note - Ignore DTC P0120 while performing this test. - Disconnect accelerator position sensor connector. - Measure voltage at accelerator position sensor connector VREF terminal with engine switch ON. Specification 4.5—5.5 V - Is voltage okay?	Yes	Go to next step.
		No	Go to symptom troubleshooting "NO.21 CONSTANT VOLTAGE."
15	- Connect WDS or equivalent to DLC. - Turn engine switch to ON. - Retrieve any DTC. - Is DTC displayed?	Yes	DTC is displayed: - Go to appropriate DTC test. Communication error message is displayed: - Inspect for following: - Open circuit between PCM control relay and PCM terminal 4C - Open PCM control relay GND circuit - PCM control relay is stuck open - Open PCM GND circuit (terminal 4A or 4B) - Poor connection of vehicle body GND
		No	No DTC is displayed: Go to next step.
16	Does engine run normal after warm–up?	Yes	Go to next step.
		No	Go to Step 18.
17	- Inspect for glow plug and glow plug relay. (See NO TAG GLOW PLUG INSPECTION) (See Section F2) - Is glow system operation normal?	Yes	Go to next step.
		No	Repair or replace any malfunctioning parts according to glow system operation results.
18	- Access RPM PID. - Is RPM PID indicating engine speed during cranking engine?	Yes	Go to next step.
		No	Inspect for following: - Open or short circuit in pump speed sensor - Open or short circuit in pump speed sensor harnesses - Open or short circuit between pump speed sensor and PCM terminals 2K and 2D
19	Note - The following test should be performed on the vehicles with A/C system. If the following test cannot be performed due to engine stalls, go to next step. - Go to next step for the vehicles without A/C system. - Connect pressure gauge to A/C lines. - Turn blower switch on. - Is pressure within specifications? (See Section U)	Yes	Go to next step.
		No	A/C is always on: - Go to symptom troubleshooting "NO.19 A/C IS ALWAYS ON OR A/C COMPRESSOR RUNS CONTINUOUSLY." Other symptoms: - Inspect following: - Refrigerant charging amount - Cooling fan and/or condenser fan operation
20	- Depress accelerator pedal slightly. - Crank engine. - Does engine start now?	Yes	Inspect and adjust idle speed. (See ENGINE TUNE–UP) If symptom still appears, go to next step.
		No	Go to next step.

TROUBLESHOOTING

STEP	INSPECTION		ACTION
21	- Perform FSO solenoid inspection. (See NO TAG FUEL SHUT OFF (FSO) SOLENOID INSPECTION) - Is FSO solenoid okay?	Yes	Go to next step.
		No	Inspect for following: - Stuck FSO solenoid - Open circuit in FSO solenoid - Poor GND of FSO solenoid - Open circuit between FSO solenoid and PCM connector terminal 4W Repair or replace any malfunctioning parts.
22	- Inspect fuel leakage from fuel pipe. - Is any fuel leakage found on fuel pipe?	Yes	Repair or replace as necessary.
		No	Go to next step.
23	- Access EGR PID. - Read EGR PID during cranking engine. (See PCM INSPECTION) - Is EGR PID okay?	Yes	Go to next step.
		No	Inspect following: - EGR solenoid valve (vent) - EGR solenoid valve (vacuum) - EGR valve - Vacuum hose connections - Wiring harness between EGR solenoid valve (vacuum) and PCM terminal 4T Repair or replace as necessary.
24	- Inspect injection timing. - Is injection timing okay?	Yes	Go to next step.
		No	Inspect TCV. (See TIMER CONTROL VALVE (TCV) INSPECTION) If TCV is okay, adjust injection timing.
25	- Inspect fuel filter for clogging. - Is fuel filter okay?	Yes	Go to next step.
		No	Replace fuel filter cartridge.
26	- Remove injection nozzle. - Inspect injection nozzle for following: - Clogged nozzle - Seized needle valve - Incorrect valve opening pressure - Faulty nozzle gasket - Is injection nozzle okay?	Yes	Go to next step.
		No	Repair or replace injection nozzle.
27	- Measure engine compression. - Is compression okay?	Yes	Go to Step 29.
		No	Go to next step.
28	- Inspect timing belt for following: - Chipping of gear teeth - Low tension - Breakage, damage or cracks - Is timing belt okay?	Yes	Inspect for following: - Burnt valve - Worn piston, piston ring or cylinder - Damaged cylinder head gasket - Damaged valve seat - Worn valve seat or valve guide Repair or replace as necessary.
		No	If timing is incorrect, adjust timing. If timing belt is not okay, replace timing belt.
29	Is valve clearance correct?	Yes	Inspect following: - Idle switch - Neutral switch - Start signal (PCM terminal 1U) - MAF/IAT sensor - IAT sensor No.2 - VSS - Pump speed sensor If okay, remove and inspect injection pump.
		No	Adjust valve clearance.
30	Verify test results. If okay, return to diagnostic index to service any additional symptoms.		

TROUBLESHOOTING

NO.5 CRANKS NORMALLY BUT WILL NOT START

5	Cranks normally but will not start
DESCRIPTION	- Starter cranks engine at normal speed but engine will not run. - Refer to "No.4 ENGINE STALLS" if this symptom appears after engine stall. - Fuel is in tank. - Battery is in normal condition.
POSSIBLE CAUSE	- Poor fuel quality - Intake–air system restriction - Fuel line restriction - EGR system malfunction - FSO solenoid malfunction - Glow system malfunction - Fuel leakage - Fuel filter clogging - Incorrect fuel injection timing - Injection pump malfunction - Injection nozzle malfunction - Immobilizer system activation or malfunction - Low engine compression - PCM control relay malfunction

Diagnostic procedure

STEP	INSPECTION	ACTION
1	Note - The following test should be performed on the vehicles with immobilizer system. - Go to Step 12 for vehicles without immobilizer system.	Both conditions appear: Go to Step 4.
	- Connect WDS or equivalent to DLC. - Do following conditions appear? — Engine is not completely started. — DTC P1624 is displayed.	Either of other condition appears: Go to next step.
2	Does engine stall after approx. 2 s since engine is started?	Yes Go to next step.
		No Immobilizer system is okay. Go to Step 12.
3	Is immobilizer unit connector securely connected to immobilizer unit?	Yes Go to next step.
		No Connect immobilizer unit connector securely. Return to Step 2.
4	Does immobilizer indicator light flash and indicate any of following immobilizer system DTC? — DTC: 01, 02, 03, 11, 21	Yes Go to "ON-BOARD DIAGNOSTIC FUNCTION" of immobilizer system. (See DTC TABLE)
		No Go to next step.
5	Does immobilizer indicator light illuminate?	Yes Go to Step 8.
		No Go to next step.
6	Does immobilizer indicator light flash and indicate any of following immobilizer system DTCs after more than 135 s after engine switch is turned to ON? — DTC: 24, 30	Yes Go to "ON-BOARD DIAGNOSTIC FUNCTION" of immobilizer system. (See DTC TABLE)
		No Go to next step.
7	- Turn engine switch to OFF. - Disconnect immobilizer unit connector. - Connect jumper wire between immobilizer unit connector terminal M and GND. - Turn engine switch to ON. - Does immobilizer indicator light illuminate?	Yes Reconnect immobilizer unit connector. Go to next step.
		No Inspect for open circuit between immobilizer unit connector terminal M and instrument cluster. If okay, inspect immobilizer indicator light bulb. Repair or replace if necessary. Reconnect immobilizer unit connector, then return to Step 4.
8	- Connect WDS or equivalent to DLC and retrieve DTC. - Is any of following DTC displayed? — DTC: P1602, P1603, P1604, P1621, P1622, P1624	Yes Go to appropriate DTC test.
		No Go to next step.

TROUBLESHOOTING

STEP	INSPECTION		ACTION
9	- Disconnect accelerator position sensor connector. - Inspect for continuity between GND terminal at accelerator position sensor vehicle harness connector and body GND. - Is there continuity?	Yes	Go to next step.
		No	Access PCM connector. Inspect for continuity between PCM connector 4A/4B terminals and body GND. Repair or replace as necessary.
10	- Turn engine switch to ON. - Access B+ PID. - Is B+ PID okay? B+ PID Battery positive voltage	Yes	Go to next step.
		No	Repair or replace wiring harness.
11	- Disconnect immobilizer unit connector. - Turn engine switch to ON. - Is there battery voltage at immobilizer unit connector terminal J?	Yes	Inspect for open circuit between PCM connector terminal 2I and immobilizer unit connector terminal A.
		No	Repair or replace wiring harness between immobilizer unit connector terminal J and fuse panel.
12	- Inspector for following: - Fuel quality including water contamination - Fuel line restriction - Loose bands on intake–air system - Cracks on intake–air system parts - Intake–air system restriction - Inspect fuses. - Are all items okay?	Yes	Go to next step.
		No	Service as necessary. Repeat Step 12.
13	Note - Ignore DTC P0120 while performing this test. - Turn engine switch to ON. - Disconnect accelerator position sensor connector. - Measure voltage at accelerator position sensor connector VREF terminal. Specification 4.5—5.5 V - Is voltage okay?	Yes	Go to next step.
		No	Go to symptom troubleshooting "NO.21 CONSTANT VOLTAGE."
14	- Connect WDS or equivalent to DLC. - Turn engine switch to ON position. - Retrieve any DTC. - Is DTC displayed?	Yes	DTC is displayed: Go to appropriate DTC test.
		No	No DTC is displayed: Go to next step.
15	- Turn engine switch to ON. - Is FSO solenoid operation sound heard?	Yes	Go to Step.
		No	Inspect for following: - Stuck FSO solenoid - Open circuit in FSO solenoid - Poor GND of FSO solenoid - Open circuit between FSO solenoid and PCM connector terminal 4W Repair or replace any malfunctioning parts.
16	- Inspect glow plug and glow plug relay. (See NO TAG GLOW PLUG INSPECTION) (See Section F2) - Is glow system operation normal?	Yes	Go to next step.
		No	Repair or replace any malfunctioning part according to glow system operation results.
17	- Inspect for fuel leakage from fuel pipe. - Is any fuel leakage found on fuel pipe?	Yes	Repair or replace as necessary.
		No	Go to next step.
18	- Measure engine compression. - Is compression okay?	Yes	Go to Step 20.
		No	Go to next step.

TROUBLESHOOTING

STEP	INSPECTION	ACTION
19	- Inspect timing belt for following - Chipping of gear teeth - Low tension - Breakage, damage or cracks - Is timing belt okay?	Yes Inspector for following: - Burnt valve - Worn piston, piston ring or cylinder - Damaged cylinder head gasket - Damaged valve seat - Worn valve system or valve guide Repair or replace as necessary.
		No If timing is incorrect, adjust timing. If timing belt is not okay, replace timing belt.
20	- Inspect injection timing - Is injection timing okay?	Yes Go to next step.
		No Inspect TCV. (See TIMER CONTROL VALVE (TCV) INSPECTION) If TCV is okay, adjust injection timing.
21	- Inspect fuel filter for clogging. - Is fuel filter okay?	Yes Go to next step.
		No Replace fuel filter cartridge.
22	- Access EGR PID. - Read EGR PID during cranking engine. (See NO TAG PCM INSPECTION) - Is PID value okay?	Yes Go to next step.
		No Inspect following: - EGR solenoid valve (vent) - EGR solenoid valve (vacuum) - EGR valve - Vacuum hose between EGR solenoid valve - Wiring harness between EGR solenoid valve (vacuum) and PCM terminal 4T Repair or replace as necessary.
23	- Remove injection nozzle. - Inspect injection nozzle for following: - Clogged nozzle - Seized needle valve - Incorrect valve operating pressure - Faulty nozzle okay? - Is injection nozzle okay?	Yes Go to next step.
		No Repair or replace injection nozzle.
24	Is valve clearance correct?	Yes Inspect following: Pump speed sensor If okay, remove and inspect injection pump.
		No Adjust valve clearance.
25	Verify test results. If okay, return to diagnostic index to service any additional symptoms.	

NO.6 SLOW RETURN TO IDLE/FAST IDLE

6	Slow return to idle/fast idle
DESCRIPTION	- Engine takes more time than normal to return to idle speed. - Engine speed continues at fast idle after warm-up
POSSIBLE CAUSE	- Malfunction of ECT sensor - Thermostat is stuck open. - Air leakage from intake-air system - Fuel injection timing is incorrect. - Incorrect adjustment of accelerator cable free play - Incorrect adjustment of idle speed

Diagnostic procedure

STEP	INSPECTION	ACTION
1	- Connect WDS or equivalent to DLC. - Turn engine switch to ON. - Retrieve any DTC. - Is DTC displayed?	No No DTC is displayed: Go to next step.
		Yes DTC is displayed: Go to appropriate DTC test.
2	- Inspect injection timing. - Is injection timing okay?	Yes Go to next step.
		No Inspect TCV. (See TIMER CONTROL VALVE (TCV) INSPECTION) If TCV is okay, adjust injection timing.
3	- Inspect for air leakage from intake-air system components while racing engine to higher speed. - Is there any air leakage?	Yes Repair or replace as necessary.
		No Go to next step.

TROUBLESHOOTING

STEP	INSPECTION		ACTION
4	- Remove thermostat and inspect operation. (See Section E) - Is thermostat okay?	Yes	Inspect and adjust idle speed. (See ENGINE TUNE-UP)
		No	Replace thermostat.
5	Verify test results. If okay, return to diagnostic index to service any additional symptoms.		

NO.7 ENGINE RUNS ROUGH/ROLLING IDLE

7	Engine runs rough/rolling idle		
DESCRIPTION	- Engine speed fluctuates between specified idle speed and lower speed and engine shakes excessively. - Idle speed is too slow and engine shakes excessively.		
POSSIBLE CAUSE	- Poor fuel quality - Air leakage from intake–air system - Intake–air system restriction - Incorrect idle speed - Engine overheating - A/C system improper operation - EGR system improper operation - Glow system malfunction - Fuel leakage - Fuel filter clogging - Fuel line restriction - Incorrect fuel injection timing - Injection pump malfunction - Injection nozzle malfunction - Low engine compression		

Diagnostic procedure

STEP	INSPECTION		ACTION
1	- Inspect for following: - Proper fuel quality including water contamination - Loose bands on intake–air system - Cracks on intake–air system parts - Intake–air system restriction - Are all items okay?	Yes	Go to next step.
		No	Service as necessary. Repeat Step 1.
2	Is engine overheating?	Yes	Go to symptom troubleshooting "NO.13 COOLING SYSTEM CONCERNS–OVERHEATING."
		No	Go to next step.
3	- Connect WDS or equivalent to DLC. - Turn engine switch to ON. - Retrieve any DTC. - Is DTC displayed?	Yes	No DTC is displayed: Go to next step.
		No	DTC is displayed: Go to appropriate DTC test.
4	Does engine run normal after warm–up?	Yes	Go to next step.
		No	Go to step 6.
5	- Inspect glow plug and glow plug relay. (See NO TAG GLOW PLUG INSPECTION) (See Section F2) - Is glow system operation normal?	Yes	Go to step 7.
		No	Repair or replace any malfunctioning part according to glow system operation results.
6	Note - The following test should be performed on the vehicles with A/C system. If the following test cannot be performed due to engine stalls, go to next step. - Go to next step for the vehicle without A/C system. - Connect pressure gauge to A/C lines. - Turn blower switch on. - Is pressure within specifications? (See Section U)	Yes	Go to next step.
		No	A/C is always on: - Go to symptom troubleshooting "NO 19. A/C IS ALWAYS ON OR A/C COMPRESSOR RUNS CONTINUOUSLY." For other symptoms: - Inspect following: - Refrigerant charging amount - Cooling fan and/or condenser fan operation

TROUBLESHOOTING

STEP	INSPECTION		ACTION
7	- Depress accelerator pedal slightly. - Crank engine. - Does engine start now?	Yes	Inspect and adjust idle speed. (See ENGINE TUNE-UP) If symptom still appears, go to next step.
		No	Go to next step.
8	- Inspect fuel leakage from fuel pipe. - Is any fuel leakage found on fuel pipe?	Yes	Repair or replace as necessary.
		No	Go to next step.
9	- Perform EGR system inspection. - Is EGR system okay?	Yes	Go to next step.
		No	Inspect following: - EGR solenoid valve (vent) - EGR solenoid valve (vacuum) - EGR valve - Vacuum hose connection - Wiring harness between EGR solenoid valve (vacuum) and PCM terminal 4T Repair or replace as necessary.
10	- Measure engine compression. - Is compression okay?	Yes	Go to Step 12.
		No	Go to next step.
11	- Inspect timing belt for following: - Chipping of gear teeth - Low tension - Breakage, damage or cracks - Is timing belt okay?	Yes	Inspect for following: - Burnt valve - Worn piston, piston ring or cylinder - Damaged cylinder head gasket - Damaged valve seat - Worn valve stem or valve guide Repair or replace as necessary
		No	If timing is incorrect, adjust timing. If timing belt is not okay, replace timing belt.
12	- Inspect injection timing. - Is injection timing okay?	Yes	Go to next step.
		No	Inspect TCV. (See TIMER CONTROL VALVE (TCV) INSPECTION) If TCV is okay, adjust injection timing.
13	- Inspect fuel filter for clogging. - Is fuel filter okay?	Yes	Go to next step.
		No	Replace fuel filter cartridge.
14	- Inspect fuel line for restriction. - Is any restriction found in fuel line?	Yes	Repair or replace as necessary.
		No	Go to next step.
15	- Remove injection nozzle. - Inspect injection nozzle for following: - Clogged nozzle - Seized needle valve - Incorrect valve opening pressure - Faulty nozzle gasket - Is injection nozzle okay?	Yes	Go to next step.
		No	Repair or replace injection nozzle.
16	Is valve clearance correct?	Yes	Inspect following: - VSS - Pump speed sensor If okay, remove and inspect injection pump.
		No	Adjust valve clearance.
17	Verify test results. If okay, return to diagnostic index to service any additional symptoms.		

NO.8 RUNS ON

8	Runs on
DESCRIPTION	Engine runs after engine switch is turned to OFF.
POSSIBLE CAUSE	FSO solenoid malfunction.

TROUBLESHOOTING

Diagnostic procedure

STEP	INSPECTION		ACTION
1	- Run engine at idle speed. - Disconnect FSO solenoid connector. - Make sure engine stops. - Does engine stop?	Yes	Inspect for following: Short to power line between engine switch and FSO solenoid Inspect circuit between FSO solenoid and PCM terminal 4W. Repair or replace wiring harness.
		No	Inspect FSO solenoid for being stuck open.
2	Verify test results. If okay, return to diagnostic index to service any additional symptoms.		

NO.9 ENGINE STALLS/QUITS, ENGINE RUNS ROUGH, MISSES, BUCK/JERK, HESITATION/STUMBLE, SURGES

9	Engine stalls/quits—acceleration/cruise Engine runs rough—acceleration/cruise Misses—acceleration/cruise Buck/jerk—acceleration/cruise/deceleration Hesitation/stumble—acceleration Surges—acceleration/cruise		
DESCRIPTION	- Engine stops unexpectedly at beginning of acceleration or during acceleration or while cruising. - Engine speed fluctuates during acceleration or cruising. - Engine misses during acceleration or cruising. - Vehicle bucks/jerks during acceleration, cruising or deceleration. - Momentary pause at beginning of acceleration or during acceleration - Momentary minor irregularity in engine output		
POSSIBLE CAUSE	- Poor fuel quality - Glow system malfunction - Air leakage from intake—air system - Purge solenoid valve malfunction - Intake—air system restriction - Air cleaner restriction - Engine overheating - A/C system improper operation - Turbocharger malfunction - EGR system malfunction - Fuel line restriction - Fuel filter clogging - Incorrect fuel injection timing - Incorrect idle speed - Injection pump malfunction - Injection nozzle malfunction - Low engine compression - Exhaust system restriction - Clutch slippage		

Diagnostic procedure

STEP	INSPECTION		ACTION
1	Is idle speed stable?	Yes	Go to next step.
		No	Go to symptom troubleshooting "NO.7 ENGINE RUNS ROUGH/ROLLING IDLE."
2	Is engine overheating?	Yes	Go to symptom troubleshooting "NO.13 COOLING SYSTEM OVERHEATING."
		No	Go to next step.
3	- Connect WDS or equivalent to DLC. - Turn engine switch to ON. - Retrieve any DTC. - Is DTC displayed?	Yes	DTC is displayed: Go to appropriate DTC test.
		No	No DTC is displayed: Go to next step.
4	Does symptom disappear after warm-up?	Yes	Go to next step.
		No	Go to Step 6.
5	- Inspect glow plug and glow plug relay. (See NO TAG GLOW PLUG INSPECTION) (See Section F2) - Is glow system operation normal?	Yes	Go to next step.
		No	Repair or replace any malfunctioning part according to glow system operation results.

TROUBLESHOOTING

STEP	INSPECTION		ACTION
6	Note - The following test should be performed on the vehicles with A/C system. - Go to next step for the vehicles without A/C system. - Connect pressure gauge to A/C lines. - Turn blower switch on. - Is pressure within specifications? (See Section U)	Yes	Go to next step
		No	A/C is always on: - Go to symptom troubleshooting "NO.19 A/C IS ALWAYS ON OR A/C COMPRESSOR RUNS CONTINUOUSLY." For other symptoms: - Inspect following: - Refrigerant charging amount - Cooling fan and condenser fan operation
7	- Inspect air cleaner and/or intake–air system for clogging or restriction. - Are air cleaner and intake–air system okay?	Yes	Go to next step.
		No	Clean or replace as necessary.
8	Note - The following test should be performed on the vehicles with turbocharger system. - Inspect hose bands between following parts: - Turbocharger compressor housing and air cleaner - Turbocharger compressor housing and charge air cooler - Are hose bands loose?	Yes	Retighten hose bands. If concern is resolved, complete inspection. If concern still exists, go to next step.
		No	Turbocharger is okay. Go to next step.
9	- Perform EGR system inspection. - Is EGR system okay?	Yes	Go to next step.
		No	Inspect following: - EGR solenoid (vent) - EGR solenoid (vacuum) - EGR valve - Vacuum hose connections - Wiring harnesses between EGR solenoids and PCM terminals Repair or replace as necessary.
10	Is there any restriction in exhaust system?	Yes	Repair or replace as necessary.
		No	Go to next step.
11	- Remove injection nozzle. - Inspect injection nozzle for following: - Clogged nozzle - Seized needle valve - Incorrect valve opening pressure - Faulty nozzle gasket - Is injection nozzle okay?	Yes	Go to next step.
		No	Repair or replace injection nozzle.
12	- Inspect fuel line for restriction. - Is any restriction found in fuel line?	Yes	Repair or replace as necessary.
		No	Go to next step.
13	- Inspect fuel filter for clogging. - Is fuel filter okay?	Yes	Go to next step.
		No	Replace fuel filter cartridge.
14	- Measure engine compression. - Is compression okay?	Yes	Go to Step 16.
		No	Go to next step.
15	- Inspect timing belt for following: - Chipping of gear teeth - Low tension - Breakage damage or cracks - Is timing belt okay?	Yes	Inspect for following: - Burnt valve - Worn piston, piston ring or cylinder - Damaged cylinder head gasket - Damaged valve seat - Worn valve stem and valve guide Repair or replace as necessary.
		No	If timing is incorrect, adjust timing. If timing belt is not okay, replace timing belt.

TROUBLESHOOTING

STEP	INSPECTION		ACTION
16	- Inspect injection timing. - Is injection timing okay?	Yes	Inspect following: - Clutch for slippage - Pump speed sensor If okay, remove and inspect injection pump.
		No	Inspect TCV. (See TIMER CONTROL VALVE (TCV) INSPECTION) If TCV is okay, adjust injection timing.
17	Verify test results. If okay, return to diagnostic index to service any additional symptoms.		

NO.10 LACK/LOSS OF POWER

10	Lack/loss of power—acceleration/cruise
DESCRIPTION	Performance is poor under load (e.g., power down when climbing hills).
POSSIBLE CAUSE	- Poor fuel quality - Air leakage from intake–air system - Intake–air system restriction - Air cleaner restriction - Engine overheating - A/C system improper operation - EGR system malfunction - Clutch slippage - Exhaust system restriction - Fuel line restriction - Fuel filter clogging - Incorrect fuel injection timing - Incorrect idle speed - Injection pump malfunction - Injection nozzle malfunction - Low engine compression pressure - Turbocharger malfunction - Brake system dragging - Intake shutter valve malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	Is idle speed stable?	Yes	Go to next step.
		No	Go to symptom troubleshooting "NO.7 ENGINE RUNS ROUGH/ROLLING IDLE."
2	Is engine overheating?	Yes	Go to symptom troubleshooting "NO.13 COOLING CONCERNS–OVERHEATING."
		No	Go to next step.
3	Is engine overheating?	Yes	Go to symptom troubleshooting "No.16 COOLING SYSTEM CONCERNS–OVERHEATING."
		No	Go to next step.
4	- Connect WDS or equivalent to DLC. - Turn engine switch to ON. - Retrieve any DTC. - Is DTC displayed?	Yes	Go to next step.
		No	A/C is always on: - Go to symptom troubleshooting "NO.19 A/C IS ALWAYS ON OR A/C COMPRESSOR RUNS CONTINUOUSLY." For other symptoms: - Inspect following: - Refrigerant charging amount - Cooling fan and condenser fan operation
5	- Inspect A/C cut–off operation. - Does A/C cut–off work properly?	Yes	Go to next step.
		No	Inspect A/C cut–off system components.
6	- Inspect air cleaner and/or intake–air system for clogging or restriction. - Are air cleaner and intake–air system okay?	Yes	Go to next step.
		No	Clean or replace as necessary.

TROUBLESHOOTING

STEP	INSPECTION	ACTION
7	Note - The following test should be performed on the vehicles with turbocharger system. - Go to Step 16 for the vehicles without turbocharger system. - Inspect hose bands between following parts: - Turbocharger compressor housing and air cleaner - Turbocharger compressor housing and charge air cooler - Are hose bands loose?	Yes Retighten hose bands. If concern is resolved, complete inspection. If concern still exists, go to next step.
		No Turbocharger is okay. Go to next step.
8	- Remove parts necessary to inspect turbocharger. Do not remove turbocharger. - Inspect if turbocharger compressor wheel is bent, damaged, or interfering with housing on vehicle. (See NO TAG TURBOCHARGER INSPECTION) - Is there any problem?	Yes Replace turbocharger.
		No Go to next step.
9	- Inspect if turbocharger compressor wheel locknut is loose or has fallen down inside turbocharger. - Is there any problem?	Yes Replace turbocharger.
		No Go to next step.
10	- Turn turbocharger compressor wheel by hand. - Does wheel turn easily and smoothly?	Yes Go to next step.
		No Replace turbocharger.
11	- Inspect if turbocharger turbine wheel is damaged, cracked or interfering with housing on vehicle. Note - Inspect all fins on each turbine wheel. - Is there any problem?	Yes Replace turbocharger.
		No Go to next step.
12	Is any engine oil found inside turbocharger turbine housing?	Yes Excessive amount of oil is found: - Replace turbocharger. Small amount of oil is found: - Wipe oil out of vehicle, then go to next step.
		No Go to next step.
13	Is any engine oil found inside turbocharger compressor housing?	Yes Wipe oil out of vehicle and install all removed parts in Step 8. Then, go to next step.
		No Turbocharger is okay. Install all removed parts in Step 8. Then, go to next step.
14	- Perform EGR system inspection. - Is EGR system okay?	Yes Go to next step.
		No Inspect following: - EGR solenoid (vent) - EGR solenoid (vacuum) - EGR valve - Vacuum hose connections - Wiring harnesses between EGR solenoids and PCM terminals Repair or replace as necessary.
15	Is there any restriction in exhaust system?	Yes Repair or replace as necessary.
		No Go to next step.

TROUBLESHOOTING

STEP	INSPECTION		ACTION
16	- Remove injection nozzle. - Inspect injection nozzle for following: — Clogged nozzle — Seized needle valve — Incorrect valve opening pressure — Faulty nozzle gasket - Is injection nozzle okay?	Yes	Go to next step.
		No	Repair or replace injection nozzle.
17	- Inspect fuel filter for clogging. - Is fuel filter okay?	Yes	Go to next step.
		No	Replace fuel filter cartridge.
18	- Measure engine compression. - Is compression okay?	Yes	Go to Step 20.
		No	Go to next step.
19	- Inspect timing belt for following: — Chipping of gear teeth — Low tension — Breakage, damage or cracks - Is timing belt okay?	Yes	Inspect following: - Burnt valve - Worn piston, piston ring or cylinder - Damaged cylinder head gasket - Damaged valve seat - Worn valve stem and valve guide Repair or replace as necessary.
		No	If timing is incorrect, adjust timing. If timing belt is not okay, replace timing belt.
20	- Inspect injection timing. - Is injection timing okay?	Yes	Inspect following: - Boost sensor - Brake system for dragging - Clutch for slippage If okay, remove and inspect injection pump.
		No	Inspect TCV. (See TIMER CONTROL VALVE (TCV) INSPECTION) If TCV is okay, adjust injection timing.
21	Verify test results. If okay, return to diagnostic index to service any additional symptoms.		

NO.11 POOR FUEL ECONOMY

11	Poor fuel economy
DESCRIPTION	Fuel economy is unsatisfactory.
POSSIBLE CAUSE	- Incorrect adjustment of idle speed - Accelerator pedal misadjustment - Air cleaner restriction - Engine cooling system malfunction - Poor fuel quality - Improper coolant level - Turbocharger malfunction - Improper engine compression - Exhaust system clogging - Injection timing is incorrect - Injection nozzle malfunction - Injection pump malfunction - Fuel leakage - Brake dragging - EGR system malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	- Inspect for following: — Fuel quality including water contamination — Air cleaner element restriction - Inspect coolant level - Are all items okay?	Yes	Go to next step.
		No	Service as necessary. Repeat Step 1.
2	- Connect WDS or equivalent to DLC. - Turn engine switch to ON. - Retrieve any DTC. - Is DTC displayed?	Yes	DTC is displayed: Go to appropriate DTC test.
		No	No DTC is displayed: Go to next step.

TROUBLESHOOTING

STEP	INSPECTION		ACTION
3	- Access ECT PID. - Drive vehicle while monitoring PID. (See PCM INSPECTION) - Is PID within specification?	Yes	Go to next step.
		No	Inspect for coolant leakage, cooling fan and condenser fan operations or thermostat operation.
4	- Inspect idle speed. (See ENGINE TUNE-UP) - Is idle speed okay?	Yes	Go to next step.
		No	Go to symptom troubleshooting "NO.6 SLOW RETURN TO IDLE/FAST IDLE."
5	- Perform EGR system inspection. - Is EGR system okay?	Yes	Go to next step.
		No	Inspect following: - EGR solenoid (vent) - EGR solenoid (vacuum) - EGR valve - Vacuum hose connections - Wiring harness between EGR solenoids and PCM terminals Repair or replace as necessary.
6	- Inspect fuel leakage from fuel pipe. - Is any fuel leakage found on fuel pipe?	Yes	Repair or replace as necessary.
		No	Go to next step.
7	- Remove injection nozzle. - Inspect injection nozzle for following: - Clogged nozzle - Seized needle valve - Incorrect valve opening pressure - Faulty nozzle gasket - Is injection nozzle okay?	Yes	Go to next step.
		No	Repair or replace injection nozzle.
8	Note - The following test should be performed on the vehicles with turbocharger system. - Perform turbocharger inspection. (See TURBOCHARGER INSPECTION) - Is turbocharger okay?	Yes	Go to next step.
		No	Replace turbocharger.
9	Is there restriction in exhaust system?	Yes	Inspect exhaust system.
		No	Go to next step.
10	Is brake system functioning properly?	Yes	Go to next step.
		No	Inspect for cause.
11	- Measure engine compression. - Is compression okay?	Yes	Go to Step 13.
		No	Go to next step.
12	- Inspect timing belt for following: - Chipping or gear teeth - Low tension - Breakage, damage or cracks - Is timing belt okay?	Yes	Inspect for following: - Burnt valve - Worn piston, piston ring or cylinder - Damaged cylinder head gasket - Damaged valve seat - Worn valve stem and valve guide Repair or replace as necessary.
		No	If timing is incorrect, adjust timing. If timing belt is not okay, replace timing belt.
13	- Inspect injection timing. - Is injection timing okay?	Yes	Inspect following: - Boost sensor - Injection pump
		No	Adjust injection timing.
14	Verify test results. If okay, return to diagnostic index to service any additional symptoms.		

TROUBLESHOOTING

NO.12 HIGH OIL CONSUMPTION/LEAKAGE

12	High oil consumption/leakage
DESCRIPTION	Oil consumption is excessive.
POSSIBLE CAUSE	- Improper engine oil level - Improper dipstick - Improper engine oil viscosity - Engine internal parts malfunction - Oil leakage - Turbocharger malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	- Verify following: — Proper dipstick — Proper engine viscosity — Engine oil level - Are all items okay?	Yes	Go to next step.
		No	Service as necessary. Repeat Step 1.
2	Note - The following test should be performed on the vehicles with turbocharger system. - Remove parts necessary to inspect turbocharger. - Do not remove turbocharger. - Inspect if turbocharger compressor wheel is bent, damaged, or interfering with housing on vehicle. - Is there any problem?	Yes	Replace turbocharger.
		No	Go to next step.
3	- Inspect if turbocharger compressor wheel locknut is loose or has fallen down inside turbocharger. - Is there any problem?	Yes	Replace turbocharger.
		No	Go to next step.
4	- Turn turbocharger compressor wheel by hand. - Does wheel turn easily and smoothly?	Yes	Go to next step.
		No	Replace turbocharger.
5	- Inspect if turbocharger turbine wheel is damaged, cracked or interfering with housing on vehicle. Note - Inspect all fins on each turbine wheel. - Is there any problem?	Yes	Replace turbocharger.
		No	Go to next step.
6	Is any engine oil found inside turbocharger turbine housing?	Yes	Excessive amount of oil is found: - Replace turbocharger. Small amount of oil is found: - Wipe oil of vehicle, then go to next step.
		No	Go to next step.
7	Is any engine oil found inside turbocharger compressor housing?	Yes	Wipe oil out of vehicle, then go to next step.
		No	Go to next step.
8	Is any engine oil found around oil pipes attached on turbocharger centre housing?	Yes	If oil leaks from damaged pipe, replace oil pipe. Then, go to next step.
		No	Go to next step.
9	Is any engine oil found inside air intake pipes or hoses?	Yes	Wipe engine oil out.
		No	Turbocharger is okay. Install all removed parts in Step 2. Then go to next step.

TROUBLESHOOTING

STEP	INSPECTION		ACTION
10	- Measure engine compression. - Is compression okay?	Yes	Inspect oil leakage from outside of engine.
		No	Inspect for following: - Damaged valve seat - Worn valve stem and valve guide - Worn or stuck piston ring - Worn piston, piston ring or cylinder Service as necessary.
11	Verify test results. If okay, return to diagnostic index to service any advice additional symptoms.		

NO.13 COOLING SYSTEM CONCERNS-OVERHEATING

13	Cooling system concerns-overheating
DESCRIPTION	Engine runs at higher than normal temperature/overheats.
POSSIBLE CAUSE	- Cooling fan malfunction - Condenser fan malfunction - Low drive belt tension - Drive belt damage - Improper coolant level - Thermostat malfunction - Radiator clogging - Improper water/anti-freeze mixture - Improper or damaged radiator cap - Radiator hose damage - Coolant leakage (engine internal, turbocharger, external) - A/C system malfunction - EGR system malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	- Inspect following: - Engine coolant level - Coolant leakage - Water and anti-freeze mixture - Radiator condition - Collapsed or restricted radiator hoses - Radiator pressure cap - Drive belt tension - Drive belt - Fan rotational direction - Cooling fan - Are all items okay?	Yes	Go to next step.
		No	Service as necessary. Repeat Step 1.
2	- Connect WDS or equivalent to DLC. - Turn engine switch to ON. - Retrieve any DTCs. - Is DTC displayed?	Yes	DTC is displayed: Go to appropriate DTC test.
		No	No DTC is displayed: Go to next step.
3	Note - The following test should be performed on the vehicles with A/C system. Go to Step 5 for vehicles without A/C system. - Start engine and run it at idle speed. - Turn A/C switch off. - Does A/C compressor disengage?	Yes	Go to next step.
		No	Go to symptom troubleshooting "NO.19 A/C IS ALWAYS ON OR A/C COMPRESSOR RUNS CONTINUOUSLY."
4	- Start engine and run it at idle speed. - Turn A/C switch on if equipped. - Do condenser fan and/or cooling fan operate?	Yes	Go to next step.
		No	Condenser fan does not operate: - Inspect for following: - Condenser fan relay is stuck open. - Condenser fan motor malfunction - Condenser fan motor GND open - Open circuit between condenser fan motor and relay - Open circuit between condenser fan relay and PCM terminal 3C - Open battery power circuit of condenser fan relay
5	Is drive belt okay?	Yes	Go to next step.
		No	Replace drive belt.

TROUBLESHOOTING

STEP	INSPECTION	ACTION
6	Is there any leakage around heater unit in passenger compartment?	Yes Inspect and service heater for leakage.
		No Go to next step.
7	Is there any leakage at coolant hoses and/or radiator?	Yes Replace malfunctioning parts.
		No Go to next step.
8	- Perform EGR system inspection. - Is EGR system okay?	Yes Go to next step.
		No Inspect following: - EGR solenoid (vent) - EGR solenoid (vacuum) - EGR valve - Vacuum hose connections - Wiring harness between EGR solenoid and PCM terminals Repair or replace as necessary.
9	- Cool down engine. - Remove thermostat and inspect operation. - Is thermostat okay?	Yes Thermostat is okay. Inspect cylinder block for leakage or blockage.
		No Replace thermostat.
10	Verify test results. If okay, return to diagnostic index to service any additional symptoms	

NO.14 COOLING SYSTEM CONCERNS-RUNS COLD

14	Cooling system concerns—runs cold
DESCRIPTION	Engine normal operating temperature.
POSSIBLE CAUSE	- Thermostat malfunction - Condenser fan system malfunction - Cooling fan system malfunction

Diagnostic procedure

STEP	INSPECTION	ACTION
1	Is customer complaint "Lack of passenger compartment heat" only?	Yes Inspect A/C and heater system.
		No Go to next step.
2	Does engine speed continue at fast idle?	Yes Go to symptom troubleshooting "NO.6 SLOW RETURN TO IDLE/FAST IDLE."
		No Go to next step.
3	- Remove thermostat and inspect operation. (See Section E) - Is thermostat okay?	Yes Inspect cooling fan and condenser fan operation. If both or either fan operate abnormally, inspect for following: - Condenser fan relay is stuck closed - Short to GND between condenser fan relay and PCM terminal 3C - Circuit between condenser fan relay and fan motor shorts to battery supply line
		No Replace thermostat.
4	Verify test results. If okay, return to diagnostic index to service any additional symptoms.	

NO.15 EXCESSIVE BLACK SMOKE

15	Excessive black smoke
DESCRIPTION	Excessive black smoke is observed in exhaust gas.
POSSIBLE CAUSE	- Air cleaner element restriction - Incorrect fuel injection timing - Injection nozzle malfunction - Injection pump malfunction - Low engine compression - EGR System Malfunction - Intake shutter valve malfunction

Diagnostic procedure

STEP	INSPECTION	ACTION
1	- Connect WDS or equivalent to DTC. - Turn engine switch to ON. - Retrieve any DTC. - Is DTC displayed?	Yes DTC is displayed: Go to appropriate DTC test.
		No No DTC is displayed: Go to next step.

TROUBLESHOOTING

STEP	INSPECTION		ACTION
2	Does any other symptom exist?	Yes	Go to appropriate flow chart.
		No	Go to next step.
3	- Inspect air cleaner element for clogging. - Is air cleaner element okay?	Yes	Go to next step.
		No	Repair or replace air cleaner element.
4	- Inspect injection timing. - Is injection timing okay?	Yes	Go to next step.
		No	Inspect TCV. (See TIMER CONTROL VALVE (TCV) INSPECTION) If TCV is okay, adjust injection timing.
5	- Remove injection nozzle. - Inspect injection nozzle for following: — Clogged nozzle — Seized needle valve — Incorrect valve opening pressure — Faulty nozzle gasket - Is injection nozzle okay?	Yes	Go to next step.
		No	Repair or replace injection nozzle.
6	- Perform EGR system inspection. - Is EGR system okay?	Yes	Go to next step.
		No	Inspect following: - EGR solenoid (vent) - EGR solenoid (vacuum) - EGR valve - Vacuum hose connections - Wiring harness between EGR solenoids and PCM terminals Repair or replace as necessary.
7	- Measure engine compression. - Is compression okay?	Yes	Inspect following: - Boost sensor - Injection pump
		No	Inspect following: - Damaged valve seat - Worn valve stem and valve guide - Worn or stuck piston ring - Worn piston, piston ring or cylinder Service as necessary.
8	Verify test results. If okay, return to diagnostic index to service any additional symptoms.		

NO.16 ENGINE NOISE

16	Engine noise
DESCRIPTION	Engine noise from under hood
POSSIBLE CAUSE	- Engine internal damage - Timing belt displacement - Injection nozzle malfunction - Loose attaching bolts or worn parts - Improper drive belt tension - Air leakage from intake–air system - Turbocharger operating noise - Improper injection timing - ECT sensor malfunction - EGR system malfunction - IAT sensor No.2 malfunction - Injection pump malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	Is squeal, click or chirp sound present?	Yes	Inspect engine oil level or drive belts.
		No	Go to next step.
2	Is rumble or grind sound present?	Yes	Inspect drive belt.
		No	Go to next step.
3	Is rattle sound present?	Yes	Inspect location of rattle for loose parts.
		No	Go to next step.

TROUBLESHOOTING

STEP	INSPECTION	ACTION
4	● Is hiss sound present?	Yes
		No
5	● Is rap or roar sound present?	Yes
		No
6	● Connect WDS or equivalent to DTC. ● Turn engine switch to ON. ● Retrieve any DTC. ● Is DTC displayed?	Yes
		No
7	● Access ECT PID. ● Inspect ECT PID while warming up engine. ● Is PID value correct?	Yes
		No
8	● Access IAT PID. ● Inspect IAT PID while running engine. ● Is PID value correct?	Yes
		No
9	● Inspect injection timing. ● Is injection timing okay?	Yes
		No
10	● Perform EGR system inspection. - Is EGR system okay?	Yes
		No
11	Note ● The following test should be performed on the vehicles with turbocharger system. ● Remove parts necessary to inspect turbocharger. ● Inspect if turbocharger compressor wheel is bent, damaged, or interfering with casing on vehicle. ● Is there any problem?	Yes
		No
12	● Inspect if turbocharger compressor wheel locknut is loose or has fallen down inside turbocharger. ● Is there any problem?	Yes
		No
13	● Turn turbocharger compressor wheel by hand. ● Does wheel turn easily and smoothly?	Yes
		No
14	● Inspect if turbocharger turbine wheel is damaged, cracked or interfering with housing on vehicle. ● Is there any problem?	Yes
		No
15	● Is any engine oil found inside turbocharger turbine housing?	Yes
		No
16	● Is any engine oil found inside turbocharger compressor housing?	Yes
		No
17	● Is any exhaust gas leakage found around location where turbocharger is attached to exhaust manifold?	Yes
		No

TROUBLESHOOTING

STEP	INSPECTION		ACTION
18	Are any centre housing and turbine housing attaching bolts loose?	Yes	Retighten loose bolts. If a bolt is found to be missing, attach appropriate new bolt.
		No	Turbocharger is okay. Install all removed parts in Step 11. Go to next step.
19	- Remove injection nozzle. - Inspect for following: - Clogged nozzle - Seized needle valve - Incorrect valve opening pressure - Faulty nozzle gasket - After-dripping - Is injection nozzle okay?	Yes	Inspect for following: - Metal flow - Bent connecting rod - Damaged valve seat
		No	Replace injection nozzle or gasket.
20	Verify test results. If okay, return to diagnostic index to service any additional symptoms.		

NO.17 VIBRATION CONCERNS (ENGINE)

17	Vibration concerns (engine)
DESCRIPTION	Vibration from under hood or driveline
POSSIBLE CAUSE	- Loose attaching bolts or worn parts - Components malfunction such as worn parts

Diagnostic procedure

STEP	INSPECTION		ACTION
1	- Inspect following components for loose attaching bolts or worn parts: - Cooling fan - Drive belt and pulley - Engine mounts - Exhaust system - All items okay?	Yes	Inspect following systems: - Wheels - Transmission and amounts - Driveline - Suspension Service as necessary.
		No	Readjust or retighten engine mount installation position. Service as necessary for other parts.
2	Verify test results. If okay, return to diagnostic index to service any additional symptoms.		

NO.18 A/C DOES NOT WORK SUFFICIENTLY

18	A/C does not work sufficiently.
DESCRIPTION	A/C compressor magnetic clutch does not engage when A/C switch is turned on.
POSSIBLE CAUSE	- Improper refrigerant charging amount - Open A/C magnetic clutch - Open circuit in related wire harnesses - Poor GND of A/C magnetic clutch - A/C low/high pressure switch is stuck open. - A/C relay is stuck open. - Seized A/C compressor - ECT sensor malfunction - Improper magnetic clutch clearance - Accelerator position sensor malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	- Connect WDS or equivalent to DLC. - Turn engine switch to ON. - Retrieve any DTC. - Is DTC displayed?	Yes	DTC is displayed: Go to appropriate DTC test.
		No	No DTC is displayed: Go to next step.

TROUBLESHOOTING

STEP	INSPECTION	ACTION
2	- Turn engine switch on. - Set the fan switch to 1st, 2nd, 3rd, or 4th position. - Verify the blower motor is operating. - Is blower motor okay?	Yes Go to next step.
		No Inspect for following: - Poor ground of fan switch - Open circuit in blower resistor - Poor contact of fan switch - Blower relay is stuck open - Open circuit in blower relay coil - Seized blower motor - Open circuit in blower motor coil - Open circuit between blower motor and resistor - Open circuit between fan switch and resistor Repair or replace as necessary.
3	- Connect WDS or equivalent to DTC. - Access ACSW PID. - Turn engine switch on. - Set the fan switch to 1st, 2nd, 3rd, or 4th position. - Turn A/C switch on. - Dose ACSW PID read ON?	Yes Go to next step.
		No Inspect for following: - Frost switch is stuck open. - Poor contact of microswitch in heater control unit - Open circuit between PCM connector terminal 3C and frost switch connector terminal - Open circuit between frost switch connector terminal and fan switch connector terminal Repair or replace as necessary.
4	- Start the engine and run it at idle speed. - Set the fan switch to 1st position. - Measure the voltage at terminal of A/C relay connector terminal C. Specification More than 10.5 V - Is voltage correct?	Yes Go to next step.
		No Inspect for following: - Open circuit A/C relay coil - Poor connect in A/C relay - A/C relay stuck open - Open circuit between PCM connector terminal 4L and A/C relay connector terminal - Open circuit in battery supply line - Open circuit between engine switch and A/C relay connector terminal - Engine coolant temperature sensor malfunction Repair or replace as necessary.
5	- Disconnect the A/C magnetic clutch connector. - Measure the A/C magnetic clutch connector terminal voltage. Specification More than 10.5 V - Is voltage correct?	Yes Inspect for following: - Poor ground of A/C magnetic clutch - Open circuit in magnetic clutch coil - Refrigerant charging amount Repair or replace as necessary.
		No Inspect for following: - Open circuit between pressure switch connector terminal and A/C magnetic clutch connector terminal - Refrigerant changing amount - A/C pressure switch is stuck open. - Magnetic clutch clearance - A/C compressor is seized Repair or replace as necessary.
6	Verify test results. If okay, return to diagnostic index to service any additional symptoms.	

NO.19 A/C ALWAYS ON OR A/C COMPRESSOR RUNS CONTINUOUSLY

19	A/C always ON or A/C compressor runs continuously
DESCRIPTION	A/C compressor magnetic clutch does not disengage.
POSSIBLE CAUSE	- Improper magnetic clutch clearance - Short to GND circuit between PCM and A/C relay - Short to GND circuit between PCM and A/C switch - Short to power line between A/C relay and pressure switch - A/C low/high pressure switch is stuck closed. - A/C relay is stuck closed.

Diagnostic procedure

STEP	INSPECTION	ACTION
1	- Connect WDS or equivalent to DLC. - Turn engine switch to ON. - Retrieve any DTC. - Is DTC displayed?	Yes DTC is displayed: Go to appropriate DTC test.
		No No DTC is displayed: Go to next step.

TROUBLESHOOTING

STEP	INSPECTION	ACTION
2	- Connect WDS or equivalent to DLC. - Access ACSW PID. - Turn engine switch on. - Turn blower switch off. - Dose ACSW PID read ON?	Yes Go to next step.
		No Inspect for following: - Short to ground circuit between PCM connector terminal 3C and frost switch - Short to ground circuit between frost switch and blower switch connector terminal Repair or replace as necessary.
3	- Start engine and run it at idle speed. - Turn blower switch off. - Measure the voltage at terminal of A/C relay connector terminal C. Specification 0 V - Is voltage correct?	Yes Inspect for magnetic clutch clearance. Adjust it as necessary.
		No Inspect for following: - Short to ground circuit between PCM connector terminal 4L and A/C relay terminal C - A/C relay is stuck to close. - Short to power line between A/C relay connector terminal C and A/C pressure switch - Short to power line between pressure switch and A/C compressor magnetic clutch connector Repair or replace as necessary.
4	Verify test results. If okay, return to diagnostic index to service any additional symptoms.	

NO.20 INTERMITTENT CONCERNS

20	Intermittent concerns
DESCRIPTION	Symptom occurs randomly and is difficult diagnose.
POSSIBLE CAUSE	—

Diagnostic procedure

STEP	INSPECTION	ACTION
1	- Talk to customer. - Retrieve vehicle service history. - Does vehicle have a number of previous repairs and components replaced for a certain symptom?	Yes Go to appropriate flow chart.
		No Go to next step.
2	- Connect WDS or equivalent to DLC. - If input is switch-type component, turn on manually. - Turn engine switch to ON. - Access PIDs for suspect component. - Lightly tap on suspect component, wiggle and pull each wire/connector at suspect component or PCM. - Are any PID values out of range, or do they suddenly change and go back into range?	Yes Inspect each wire for corrosion, bent or loose terminal crimps.
		No Go to Symptom Index.
3	- Start engine. - Lightly tap on suspect component, wiggle and pull each wire/connector at suspect component or PCM. - Are any PID values out of range, or do they suddenly change and go back into range?	Yes Inspect each wire for corrosion, bent or loose terminals and poor wire terminal crimps.
		No Go to next step.
4	- Accurately spray water on suspect component wire, component or vacuum line related to possible fault area. - Are any PID values out of range, or suddenly change and go back into range, or was there a noticeable engine misfire/stumble?	Yes Fault occurred while spraying on component: - Replace part and verify repair. Fault occurred while spraying wiring: - Inspect each wire for corrosion, bent or loose terminals and poor wire terminal crimps. Fault occurred while spraying vacuum line: - Repair vacuum hoses.
		No Inspect wire and connector at suspect component for corrosion, bent or loose terminals, poor wire terminal crimps and high tension of wire. Repair as necessary.

TROUBLESHOOTING

NO.21 CONSTANT VOLTAGE

21	Constant voltage
DESCRIPTION	Incorrect constant voltage
POSSIBLE CAUSE	- Constant voltage circuit malfunction Note - Accelerator position sensor and boost sensor use constant voltage.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	- Disconnect accelerator position sensor connector. - Turn engine switch to ON position. - Measure voltage between following accelerator position sensor connector terminals: — Constant voltage terminal and GND terminal - Is constant voltage above 6.0 V?	Yes	Repair constant voltage circuit short to power in harness.
		No	Go to next step.
2	Is voltage across battery terminals above 10.5 V?	Yes	Go to next step.
		No	Inspect charging system.
3	- Turn engine switch to OFF. - Disconnect sensor where constant voltage inspection failed. - Measure voltage between battery positive post and GND circuit at appropriate sensor vehicle harness connector. - Is voltage above 10.5 V and within 1.0 V of battery voltage?	Yes	Go to next step.
		No	Go to Step 9.
4	- Turn engine switch to ON. - Connect WDS or equivalent to DTC. - Attempt to access ECT PID. - Can ECT PID be accessed?	Yes	Inspect for open constant voltage supply circuit between PCM connector terminal 1A and suspect sensor connector.
		No	Go to next step.
5	- Turn engine switch to OFF. - Disconnect accelerator position sensor connector. - Disconnect EGR solenoid valve (vacuum) connector. - Turn engine switch to ON. - Measure voltage between power supply circuit at EGR solenoid valve (vacuum) connector and battery negative post. - Is voltage above 10.5 V?	Yes	Reconnect EGR solenoid valve (vacuum). Go to next step.
		No	Battery power is not present. Inspect following: - MAIN fuse and/or PCM fuse - PCM control relay - Open circuit between MAIN fuel and PCM control relay - Open circuit between PCM control relay and EGR solenoid valve (vacuum) - Open circuit between PCM control relay and PCM terminal 3B - Open circuit between PCM control relay and PCM terminal 4C/4D
6	- Turn engine switch to OFF. - Leave accelerator position sensor disconnected. - Disconnect MAF/IAT sensor connector. - Turn engine switch to ON. - Measure voltage between following accelerator position sensor connector terminals: — Constant voltage terminal and GND terminal - Is voltage 4.0—6.0 V?	Yes	Replace MAF/IAT sensor.
		No	Go to next step.

TROUBLESHOOTING

STEP	INSPECTION		ACTION
7	● Turn engine switch to OFF. ● Leave accelerator position sensor and MAF/IAT sensor connectors disconnected. ● Disconnect boost sensor connector. ● Turn engine switch to ON. ● Measure voltage between constant voltage and GND terminals at accelerator position sensor connector. ● Is voltage 4.0—6.0 V?	Yes	Replace boost sensor.
		No	Go to next step.
8	● Turn engine switch to OFF. ● Leave accelerator position sensor disconnected. ● Disconnect MAF/IAT sensor and boost sensor connectors. ● Turn engine switch to ON. ● Connect WDS or equivalent to DLC. ● Access B+ PID. ● Is B+ PID above 10.5 V?	Yes	Inspect constant voltage circuit for shorting to GND.
		No	Inspect for open battery power supply circuit between PCM control relay and PCM terminal 4C/4D.
9	● Turn engine switch to ON. ● Connect WDS or equivalent to DLC. ● Attempt to access ECT PID. ● Can ECT PID be accessed?	Yes	Go to next step.
		No	Go to Step 11.
10	● Are DTCs present for two or more following sensors connected to PCM 1B terminal? ● Boost sensor ● MAF/IAT sensor ● Accelerator position sensor ● ECT sensor ● IAT sensor No.2 ● Fuel temperature sensor ● EGR position sensor	Yes	Go to next step.
		No	Inspect for poor GND circuit of sensor where constant voltage inspection failed.
11	● Turn engine switch to OFF. ● Disconnect WDS or equivalent from DLC. ● Disconnect sensor where constant voltage inspection failed. ● Inspect for continuity between GND circuit at appropriate sensor connector and body GND. ● Is there continuity?	Yes	Go to next step.
		No	Inspect for open GND circuit between following terminals: ● PCM connector 4A/4B terminals and GND ● PCM connector 4A/4B and 1B terminals

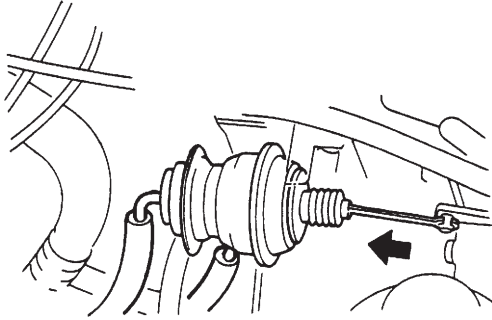
TROUBLESHOOTING

SYSTEM INSPECTION

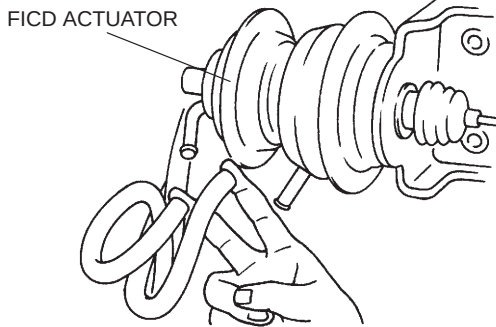
FICD System Inspection

Fast-Idle Function

1. Verify that the FICD actuator rod is not pulled.
2. Verify that the engine is cold (ECT is below 20 °C {68 °F}).
3. Turn fan switch off.
4. Start the engine.
5. Verify that the FICD actuator rod is pulled.



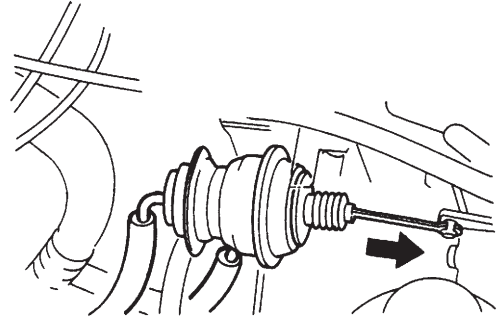
6. If not, disconnect the vacuum hoses from the FICD actuator and inspect if there is vacuum as shown.



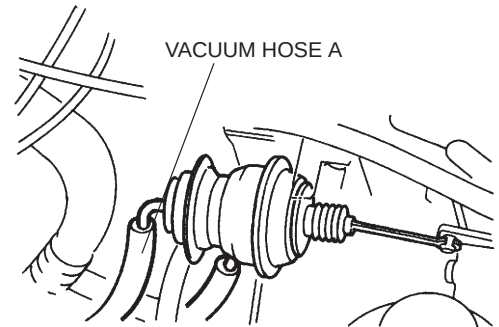
Caution

- **FIP is sealed to maintain proper function. Special tools and testers are required when disassembling the FIP. Disassembling the FIP without special tools and testers will cause a malfunction.**

7. If there is vacuum, consult your distributor for replacement of the FICD actuator.
8. If there is no vacuum, inspect the following.
 - FICD solenoid valve No.1 and No.2
 - Loose or damaged vacuum hoses between FICD actuator, FICD solenoid valve No.1 and No.2, and vacuum pump.
 - PCM terminal C, E and P voltages (Refer to CONTROL SYSTEM, POWERTRAIN CONTROL MODULE (PCM) INSPECTION.)
 - Wiring harness between FICD solenoid valve No.1 and PCM terminal C.
 - Wiring harness between FICD solenoid valve No.2 and PCM terminal P.
9. Warm up the engine. (ECT above 20 °C {68 °F}).
10. Verify that the FICD actuator rod returns for one notch.



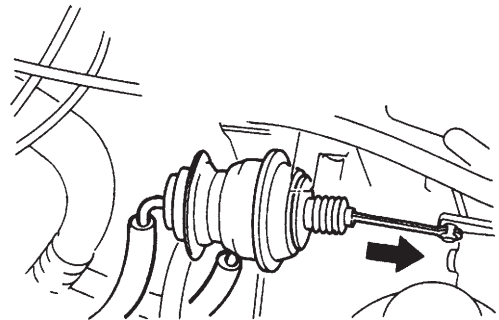
11. If not, disconnect vacuum hose A from the FICD actuator and inspect if there is vacuum.



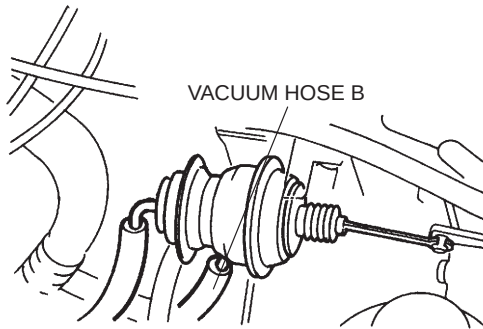
Caution

- **FIP is sealed to maintain proper function. Special tools and testers are required when disassembling the FIP. Disassembling the FIP without special tools and testers will cause a malfunction.**

12. If there is no vacuum, consult your distributor for replacement of the FICD actuator.
13. If there is vacuum, inspect the following.
 - FICD solenoid valve No.1
 - PCM terminal C, E voltages (Refer to CONTROL SYSTEM, POWERTRAIN CONTROL MODULE (PCM) INSPECTION.)
 - Wire harness between FICD solenoid valve No.1 and PCM terminal C
14. Warm up the engine (ECT is above 60 °C {140 °F}).
15. Verify that the FICD actuator rod returns completely.



16. If not, disconnect vacuum hose B from the FICD actuator and inspect if there is vacuum.



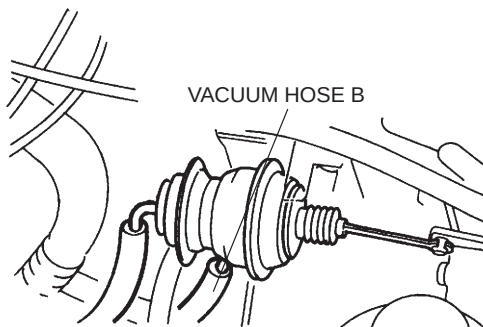
Caution

- FIP is sealed to maintain proper function. Special tools and testers are required when disassembling the FIP. Disassembling the FIP without special tools and testers will cause a malfunction.

17. If there is no vacuum, consult your distributor for replacement of the FICD actuator.
18. If there is vacuum, inspect the following.
 - FICD solenoid valve No.2
 - PCM terminal E, G and P voltages (Refer to CONTROL SYSTEM, POWERTRAIN CONTROL MODULE (PCM) INSPECTION.)
 - Wiring harness between FICD solenoid valve No.2 and PCM terminal P.

A/C Idle-up Function

1. Start the engine.
2. Warm up the engine to normal operating temperature and run it at idle speed.
3. Set the fan switch at 1st position.
4. Verify that the FICD rod is pulled for one notch.
5. If not, disconnect the vacuum hose B from the FICD actuator and inspect if there is vacuum as shown.



Caution

- FIP is sealed to maintain proper function. Special tools and testers are required when disassembling the FIP. Disassembling the FIP without special tools and testers will cause a malfunction.

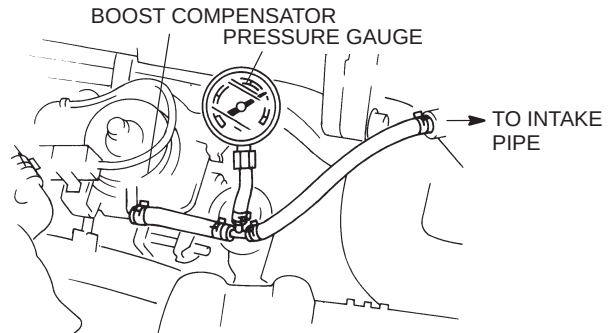
6. If there is vacuum, consult your distributor for replacement of the FICD actuator.

7. If there is no vacuum, inspect the following:

- FICD solenoid valve No.2
- PCM terminal G and P voltages (Refer to CONTROL SYSTEM, POWERTRAIN CONTROL MODULE (PCM) INSPECTION)
- Wiring harness between FICD solenoid valve No.2 connector terminal B and PCM terminal P

Turbocharger Boost Pressure

1. Disconnect the air hose between the intake pipe and the boost compensator.
2. Connect a pressure gauge (range of measurement is 93.3 kPa {700 mmHg, 27.6 inHg}).



3. Warm up the engine.
4. With the accelerator at the wide open throttle, increase the engine speed to 4800—5000 rpm and verify that the boost pressure is within the specification.

Specification

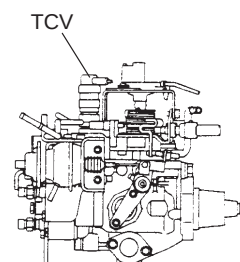
60.0—73.3 kPa
{0.62—0.74 kgf/cm², 8.82—10.52 psi}

5. If not as specified, inspect the exhaust system. (Refer to EXHAUST SYSTEM, EXHAUST SYSTEM INSPECTION.)
6. If the exhaust system is normal, inspect the wastegate actuator. (Refer to INTAKE-AIR SYSTEM, TURBOCHARGER INSPECTION, Wastegate Actuator Inspection.)
7. If the wastegate actuator is normal, inspect the turbocharger. (Refer to INTAKE-AIR SYSTEM, TURBOCHARGER INSPECTION.)

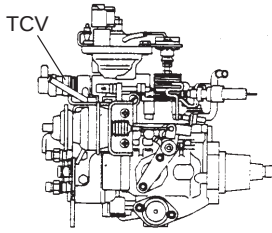
TCV Control Inspection (Europe and UK)

1. Crank the engine and verify that the TCV operation sound is heard.

WL



WL Turbo



2. If no operation sound is heard, inspect the TCV (in the FIP).
3. If the TCV is normal, inspect the following:
 - PCM terminal Q voltage (Refer to CONTROL SYSTEM, POWERTRAIN CONTROL MODULE (PCM) INSPECTION)
 - Wire harness between TCV and PCM terminal Q

EGR System Inspection (if equipped)

1. Make sure that all hoses are securely connected in the proper position.
2. Disconnect the vacuum hose from the EGR valve.
3. Start the engine at cold condition.
4. Verify that there is no vacuum at vacuum hose.
5. If there is vacuum, inspect the following:
 - EGR solenoid valve
 - PCM terminal R voltage (Refer to CONTROL SYSTEM, POWERTRAIN CONTROL MODULE (PCM) INSPECTION.)
 - Wire harness between EGR solenoid valve and PCM terminal R
6. Warm up the engine to the normal operating temperature and run it at idle speed.
7. Verify that there is vacuum at vacuum hose.
8. If there is no vacuum, inspect the following:
 - EGR solenoid valve
 - PCM terminal R voltage (Refer to CONTROL SYSTEM, POWERTRAIN CONTROL MODULE (PCM) INSPECTION.)
 - Wire harness between EGR solenoid valve and PCM terminal R
9. Connect the vacuum pump to the EGR valve.
10. Apply the vacuum to the EGR valve and inspect if the engine speed becomes unstable or the engine stalls.
11. If the engine speed does not change, stop the engine and inspect the EGR valve.

TROUBLESHOOTING

Glow System Inspection

STEP	INSPECTION	RE-SULTS	ACTION
1	Connect NGS tester to DTC. Turn engine switch on and retrieve DTC. Are any of the following DTCs displayed? • 09 (ECT sensor) • 12 (Control lever position sensor) • 36 (Glow plug relay)	Yes	Go the appropriate DTC test. After repair is completed, go to next step.
		No	Go to next step.
2	Turn engine switch on while engine is cold. Does glow indicator light illuminate for approx. 1—9 seconds.?	Yes	Go to next step.
		No	Inspect the following according to indication condition of glow indicator light: 1. Will not go out • Short circuit between glow indicator light and PCM connector terminal M • Short circuit in instrument cluster print plate 2. Illuminates for approx. 1 second (same condition after engine is warmed up and cold) • Extremely low resistance of engine coolant temperature sensor • Short circuit between engine coolant temperature sensor and PCM connector terminal E 3. Will not illuminate • Glow indicator light • Open circuit between glow indicator light and PCM connector terminal M • Open circuit in instrument cluster print plate 4. Illuminates for approx. 9 seconds (same condition after engine is warmed up and cold) • Extremely high resistance of engine coolant temperature sensor • Open circuit between engine coolant temperature sensor and PCM connector terminal E
3	Leave engine switch on while engine is cold. Does glow plug voltage indicate B+ for approx. 15 seconds.?	Yes	Go to next step.
		No	Inspect for open or short circuit in harnesses and connectors between battery, glow plug relay, and glow plug. Inspect if glow plug relay is stuck open or closed. Inspect glow plug relay ground circuit. Inspect for open circuit between glow relay and PCM terminal O.
4	Does glow plug voltage indicate B+ while cranking engine?	Yes	Go to next step.
		No	Inspect for open or short to ground circuit in harness and connectors between engine switch (starter) and PCM connector terminal D.
5	Is power supplied to the glow plug for maximum 10 minutes after engine started when engine is cold?	Yes	Go to next step.
		No	Inspect for open or short circuit in harnesses and connectors between NE sensor and PCM connector terminal F.
6	Remove the glow plug wire from glow plugs. Measure resistance between glow plug and body ground. Is glow plug resistance approx. 1 Ω or less? + INTAKE-AIR SYSTEM, GLOW PLUG INSPECTION	Yes	Glow system is okay.
		No	Replace glow plug.