

GROUP 17

ENGINE AND EMISSION CONTROL

EMISSION CONTROL SYSTEM <DIESEL>

GENERAL

OUTLINE OF CHANGE(S)

The engine with the exhaust gas recirculation (EGR) system has been newly used. Therefore, service procedure has been added.

GENERAL INFORMATION

The electronically-controlled EGR system and the fuel injection timing control system (load timer) reduce the level of exhaust gases (NOx).

Item	Name	Specification
Exhaust emission control system	Exhaust gas recirculation system • EGR valve • EGR solenoid valve No.1 • EGR solenoid valve No.2	Electronically-controlled EGR system Single type Duty cycle solenoid valve ON-OFF solenoid valve

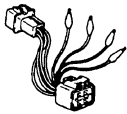
SERVICE SPECIFICATIONS

Item	Standard value	
EGR solenoid valve Nos.1 and 2 resistance (at 20°C) Ω	36 – 44	
Lever position sensor output voltage V	Idle position	0.8 – 1.0
	Fully open	3.7 – 5.0
Engine speed sensor resistance kΩ	1.3 – 1.9	
Engine coolant temperature sensor resistance kΩ	At 20°C	2.9 – 3.6
	At 80°C	0.26 – 0.35

SEALANT

Item	Specified sealant	Remark
Engine coolant temperature sensor threaded portion	3M Nut Locking Part No. 4171 or equivalent	Drying sealant

SPECIAL TOOL

Tool	Number	Name	Use
	MD998464	Test harness (4P, square)	Inspection of lever position sensor

EXHAUST GAS RECIRCULATION (EGR) SYSTEM

GENERAL INFORMATION

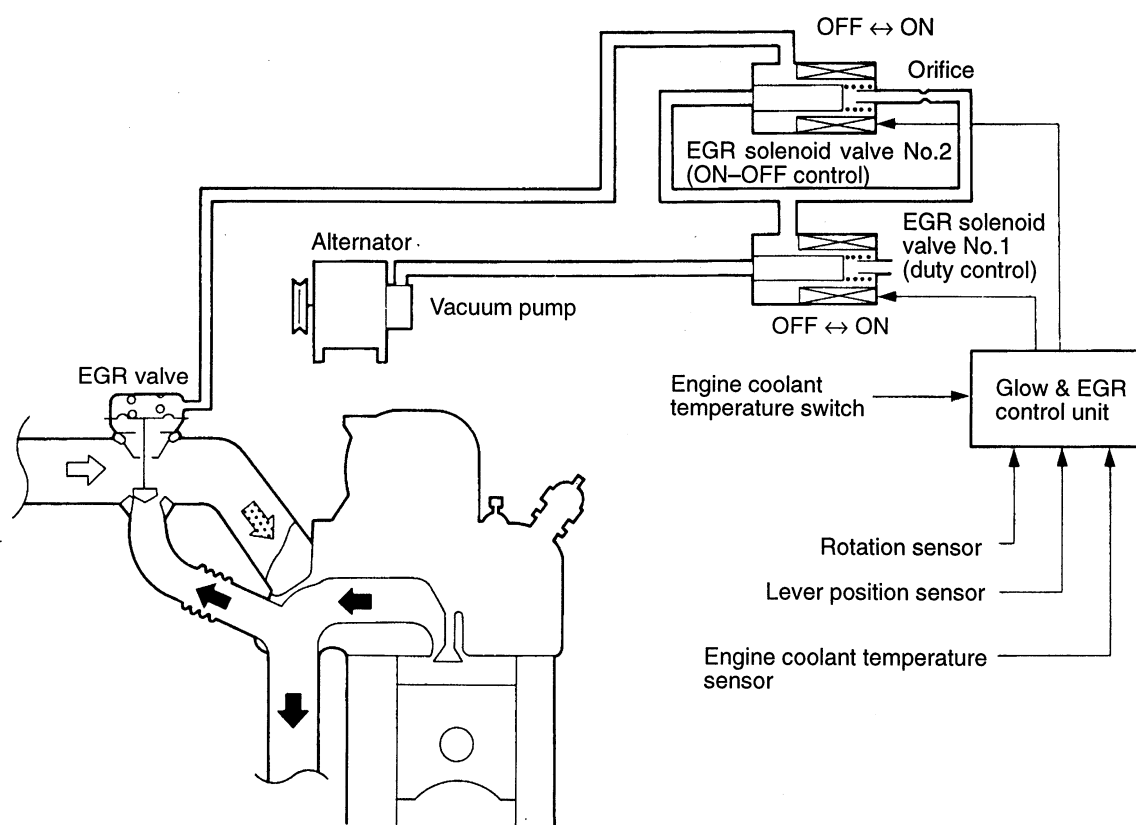
The electronically-controlled EGR system consists of an EGR valve, a vacuum pump, EGR solenoid valves Nos.1 and 2, a glow & EGR control unit and various sensors.

The EGR valve is controlled by the negative pressure inside the valve, which is controlled by EGR solenoid valves Nos.1 and 2.

EGR solenoid valves Nos. 1 and 2 are optimally controlled by the glow & EGR control unit in response to the engine operation conditions, based on data received from each sensor.

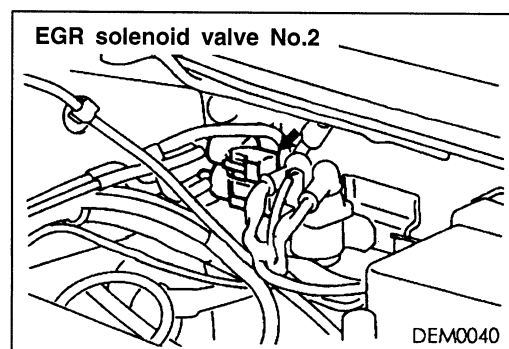
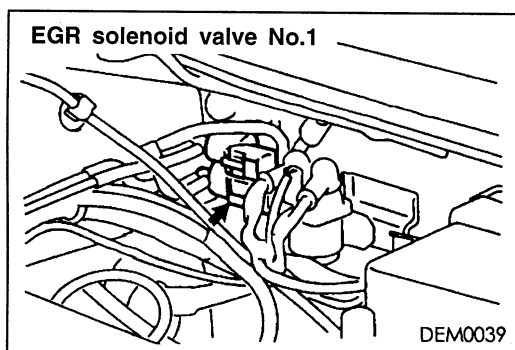
In this way, the EGR is controlled to reduce NO_x emissions while maintaining good engine performance.

SYSTEM DIAGRAM

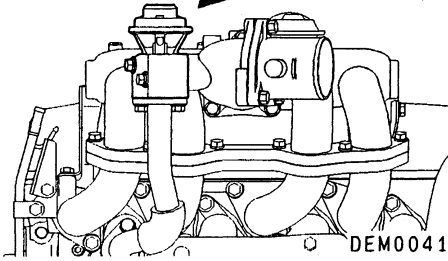


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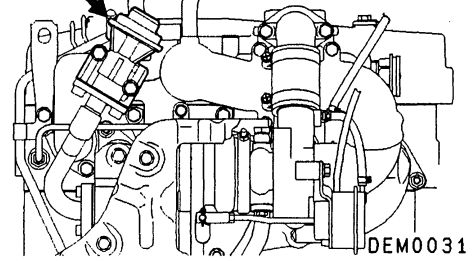
COMPONENT LOCATION



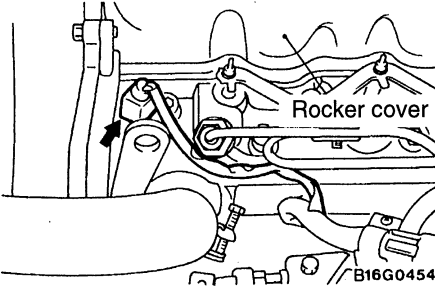
EGR valve <2WD>



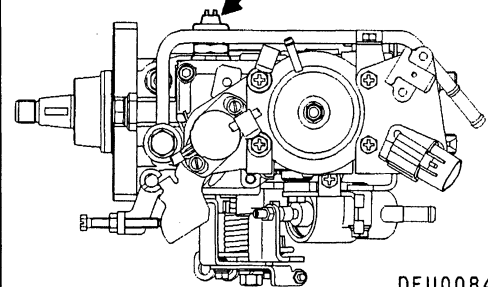
EGR valve <4WD>



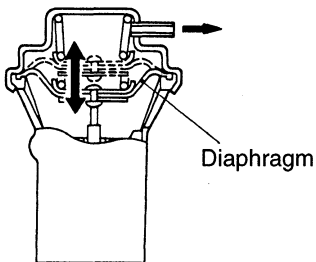
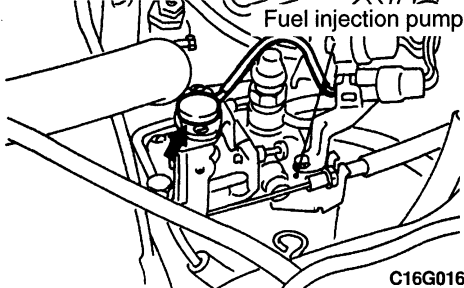
Engine coolant temperature sensor



Engine speed sensor



Lever position sensor (LPS)



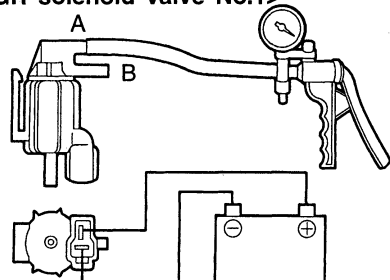
FUNCTION INSPECTION

1. Start the engine and warm it up until the engine coolant temperature reaches 65°C or above.
2. Race the engine by suddenly depressing the accelerator pedal, then check that the EGR valve diaphragm lifts.

EGR SOLENOID VALVE OPERATION INSPECTION

1. Remove EGR solenoid valve Nos. 1 and 2 connectors and vacuum hoses.
2. Attach a vacuum pump to each nipple of the EGR solenoid valve Nos. 1 and 2 connectors and apply negative pressure. Check that the valves are airtight both when voltage is applied to each terminal of the EGR solenoid valve Nos. 1 and 2 and when it is not applied.

<EGR solenoid valve No.1>

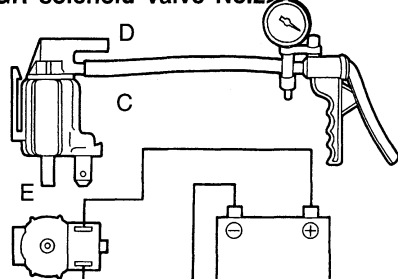


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EGR solenoid valve No.1

Battery voltage	Normal condition
When current is flowing	Vacuum leaks (Vacuum is maintained when nipple B is plugged)
When current is not flowing	Vacuum is maintained

<EGR solenoid valve No.2>



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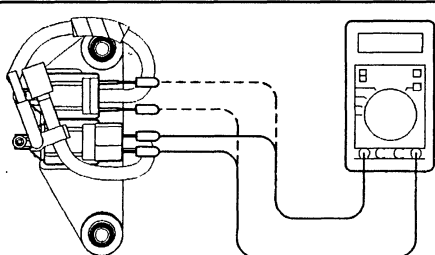
EGR solenoid valve No.2

Battery voltage	Normal condition
When current is flowing	Vacuum leaks (Vacuum is maintained when nipple D is plugged)
When current is not flowing	Vacuum leaks (Vacuum is maintained when nipple E is plugged)

EGR SOLENOID VALVE RESISTANCE INSPECTION

Measure terminal resistance of EGR solenoid valves Nos.1 and 2 with a circuit tester.

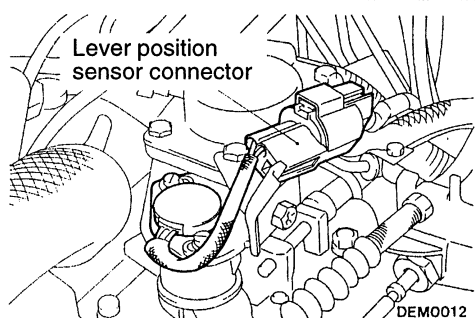
Standard value: 36 – 44 Ω (at 20°C)



DEM0042

LEVER POSITION SENSOR (LPS) ADJUSTMENT

1. Run the engine until the engine coolant temperature reaches 80°C or above, and then release the fast idle.
2. Loosen the accelerator cable tension sufficiently.
3. Connect the special tool (test harness) to the lever position sensor connector, as shown.

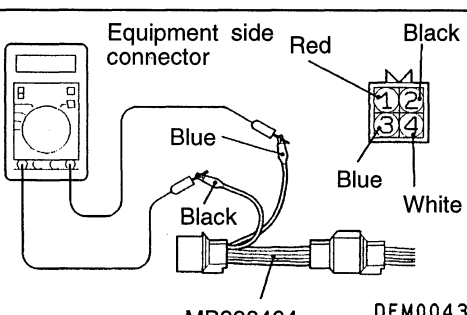


DEM0012

4. Connect a digital-type voltmeter between lever position sensor terminals 1 (red clip) and 3 (blue clip).
5. Turn the ignition switch "ON". (Do not start the engine.)
6. Measure output voltage of the lever position sensor.

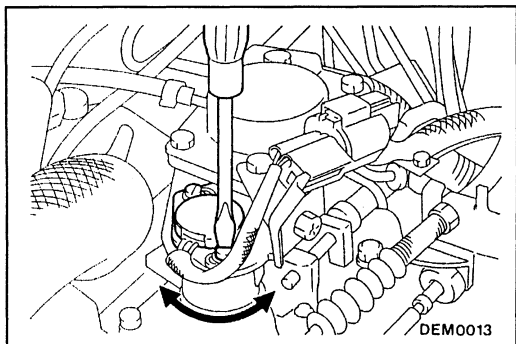
Standard value:

Lever condition	Voltage V
Idle position	0.8 – 1.0
Fully open	3.7 – 5.0



MB998464

DEM0043

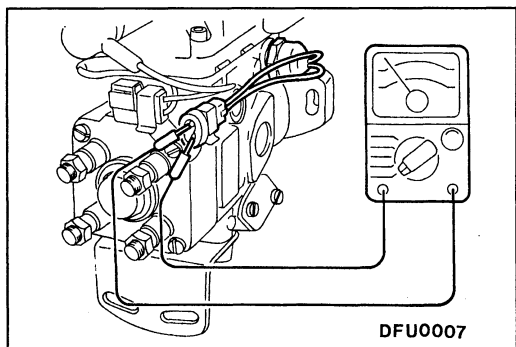


7. If the voltage is outside the standard value, adjust by loosening the lever position sensor mounting screw and turning the lever position sensor body. After adjustment, tighten the screw.

NOTE

Voltage increases when the lever position sensor body is turned clockwise.

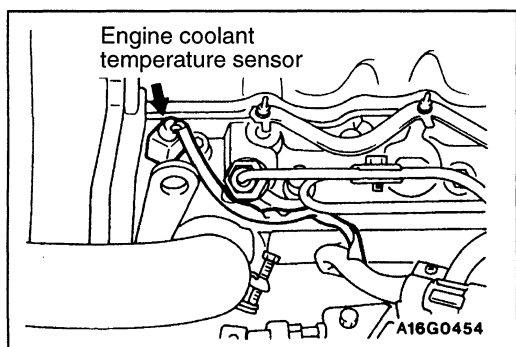
8. Turn the ignition switch off.
9. Adjust the accelerator cable play.



ENGINE SPEED SENSOR INSPECTION

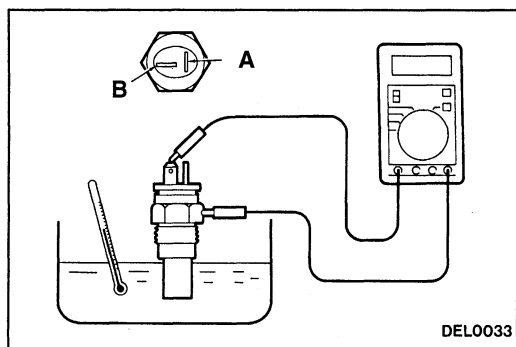
1. Disconnect the engine speed sensor connector.
2. Measure resistance between the engine speed sensor terminals.

Standard value: 1.3 – 1.9 kΩ



ENGINE COOLANT TEMPERATURE SENSOR INSPECTION

1. Remove the engine coolant temperature sensor.



2. Measure resistance between terminal (B) and the body earth when the temperature sensing portion of the engine coolant temperature sensor is immersed in hot water.

Temperature (°C)	Resistance (kΩ)
0	7.7 – 9.5
20	2.9 – 3.6
40	1.3 – 1.7
80	0.26 – 0.35

3. If the resistance deviates from the standard value greatly, replace the sensor.
4. Apply sealant to the threaded portion.

Specified sealant: 3M NUT Locking Part No. 4171 or equivalent

5. Install the engine coolant temperature sensor and tighten it to the specified torque.

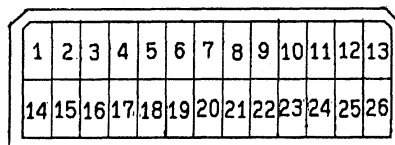
Sensor tightening torque: 35 Nm

6. Connect the wiring harness connectors.

CHECK AT THE GLOW & EGR CONTROL UNIT

TERMINAL VOLTAGE CHECK CHART

Glow & EGR Control Unit Connector Terminal Arrangement

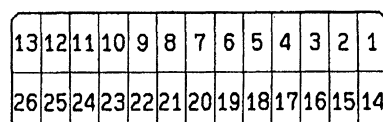


DEM0029

Terminal No.	Check item	Check condition (Engine condition)	Normal condition
3	EGR solenoid valve No.1	Ignition switch: ON	Battery voltage
		While engine is idle after having warmed up, suddenly depress the accelerator pedal.	Momentarily increases
6	Lever position sensor	Ignition switch: ON	Set throttle lever to idle position
		Fully open throttle lever	0.8 – 1.0 V 3.5 – 5.0 V
7	Sensor impressed voltage	Ignition switch: ON	4.5 – 5.5 V
16	EGR solenoid valve No.2	Ignition switch: ON	Battery voltage
		While engine is idle after having warmed up, suddenly depress the accelerator pedal.	Momentarily decreases

HARNESS-SIDE CONNECTOR TERMINAL RESISTANCE AND CONTINUITY CHECK CHART

Glow & EGR Control Unit Harness-Side Connector Terminal Arrangement



DEM0026

Terminal No.	Check item	Normal condition (Check condition)
3 – 1	EGR solenoid valve No.1	36 – 44 Ω (At 20°C)
5 – Body earth	Engine coolant temperature sensor	7.7 – 9.5 kΩ (Coolant temperature at 0°C)
		2.9 – 3.6 kΩ (Coolant temperature at 20°C)
		1.3 – 1.7 kΩ (Coolant temperature at 40°C)
		0.26 – 0.35 kΩ (Coolant temperature at 80°C)
11 – 24	Engine speed sensor	1.3 – 1.9 kΩ
16 – 1	EGR solenoid valve No.2	36 – 44 Ω (At 20°C)