

GLOW SYSTEM

16400010029

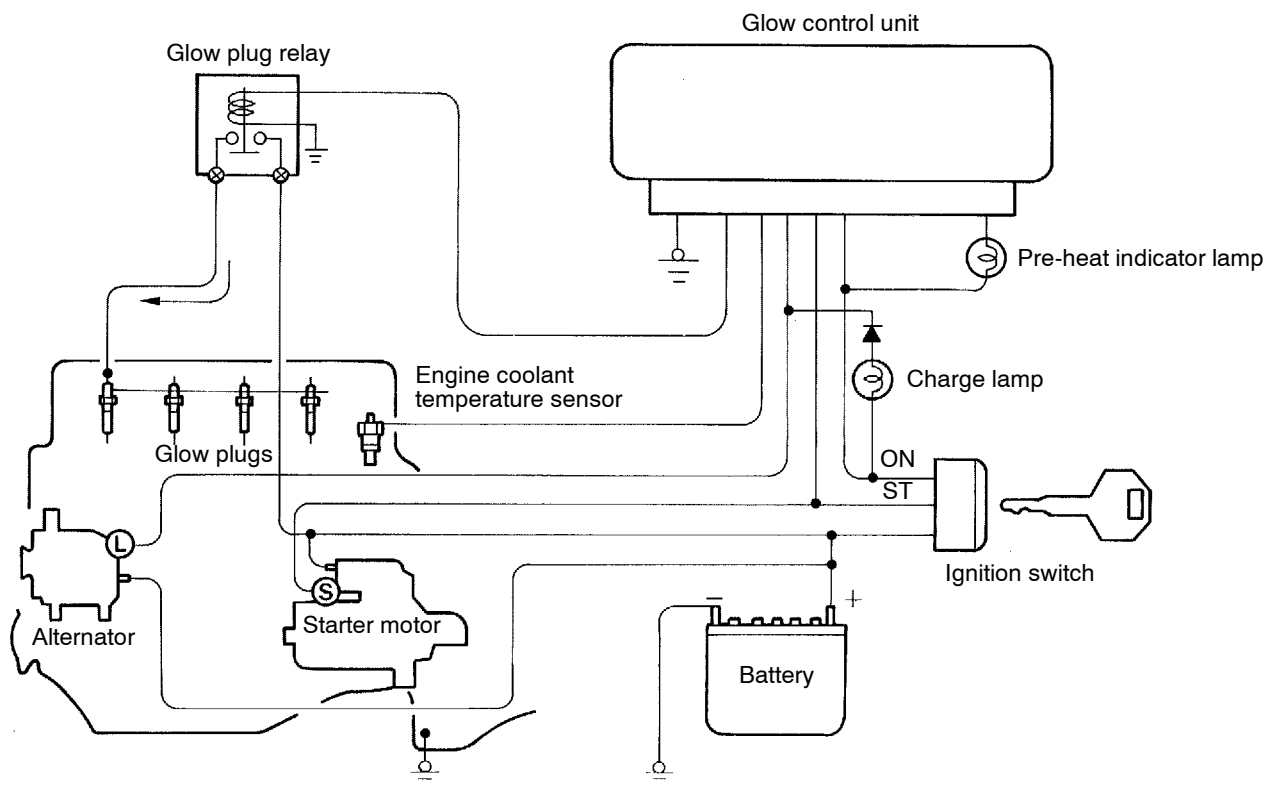
GENERAL INFORMATION

SELF-REGULATING GLOW SYSTEM

The self-regulating glow system reduces the time required for starting at low temperatures to provide a degree of starting and operation that is identical to petrol-engine vehicles by preheating the glow plugs at super-quick speed.

The glow control unit controls both the time during which current is supplied to the glow plugs after the ignition switch is turned to the ON position and

also the glow indicator lamp illumination time in accordance with the engine coolant temperature. The resistances of the heating coils which are built into the glow plugs increase as the glow plug temperatures become higher. As a result of this, the flow of current gradually decreases, thus stabilizing the glow plug temperature at the specified temperature.



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SERVICE SPECIFICATIONS

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Item		Standard value
Resistance between glow plug plate and glow plug body (parallel resistance for 4 glow plugs) (at 20 °C) Ω		0.15 – 0.25
Voltage between glow plug plate and glow plug body V	Immediately after ignition switch is turned to ON (without starting the engine)	9 – 11 (Drops to 0 V after 4 – 8 seconds have passed)
	While engine is cranking	6 or more
	While engine is warming up	12 – 15 (Drops to 0 V when the engine coolant temperature increases to 60 °C or more or if 180 seconds have passed since the engine was started)
Glow plug resistance (at 20 °C) Ω		0.6 – 1.0

SEALANT

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

ON-VEHICLE SERVICE

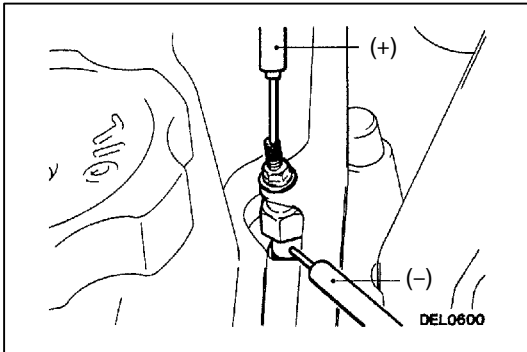
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SELF-REGULATING GLOW SYSTEM CHECK

1. Check that the battery voltage is 11 – 13 V.
2. Check that the engine coolant temperature is 40 °C or less.

NOTE

If the engine coolant temperature is too high, disconnect the engine coolant temperature sensor connector.



3. Measure the resistance between the glow plug plate and the glow plug body (earth).

Standard value: 0.15 – 0.25 Ω (at 20 °C)

NOTE

The resistance value is the parallel resistance value for the four glow plugs.

4. Connect a voltmeter between the glow plug plate and the glow plug body (earth).
5. Measure the voltage immediately after the ignition switch is turned to ON (without starting the engine).

Standard value:

9 – 11 V (Drops to 0 V after 4 – 8 seconds have passed)

In addition, check to be sure that the glow indicator lamp (red) illuminates immediately after the ignition switch is turned to ON.

NOTE

The time during which the voltage appears (energizing time) will depend on the engine coolant temperature.

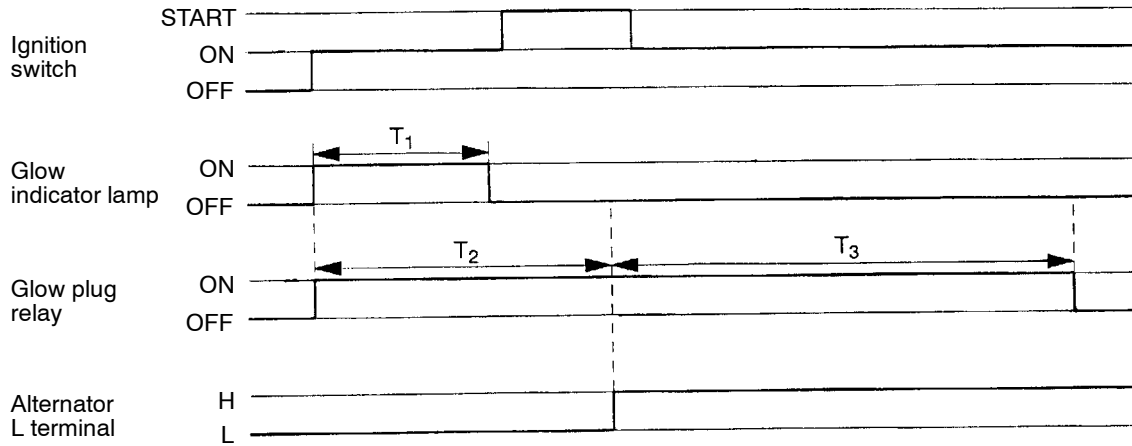
6. Measure the voltage while the engine is cranking.
7. Start the engine and measure the voltage while the engine is warming up.

However, if the engine coolant temperature rises above 60 °C or when 180 seconds have passed since the engine was started, the voltage will always return to 0 V. (Refer to the Glow Plug Energization Timing Chart.)

Standard value: 12 – 15 V

<Reference>

Glow Plug Energization Timing Chart



T_1 : Glow indicator lamp
 T_2 : Glow plug relay drive time after ignition switch is turned ON
 T_3 : Glow plug relay drive time after engine starts (after glow)

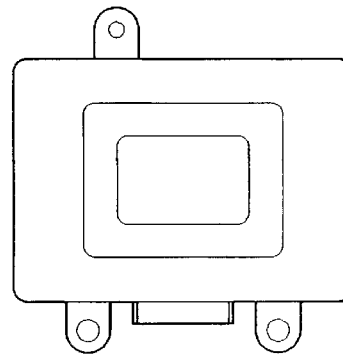
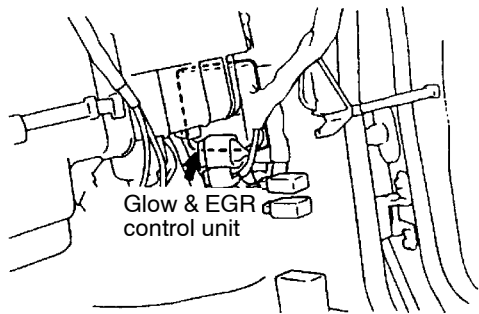
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NOTE

After glow time T_3 becomes longer as the engine coolant temperature drops.

GLOW & EGR CONTROL UNIT CHECK

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Glow & EGR control unit

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1	2	3	4	5	6	7	8	9	10	11	12	13
14	15	16	17	18	19	20	21	22	23	24	25	26

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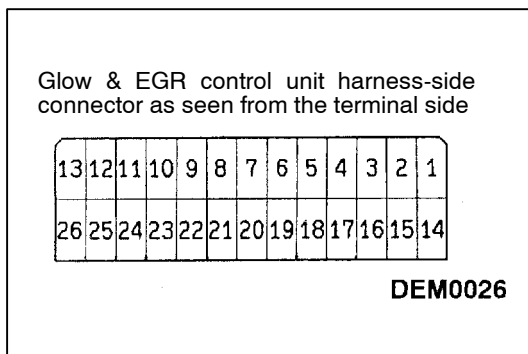
1. Measure the voltage at the control unit terminals.

NOTE

- (1) Inspect with the control unit connector connected.
- (2) When measuring the voltage, connect the control unit terminal (26) to the earth.

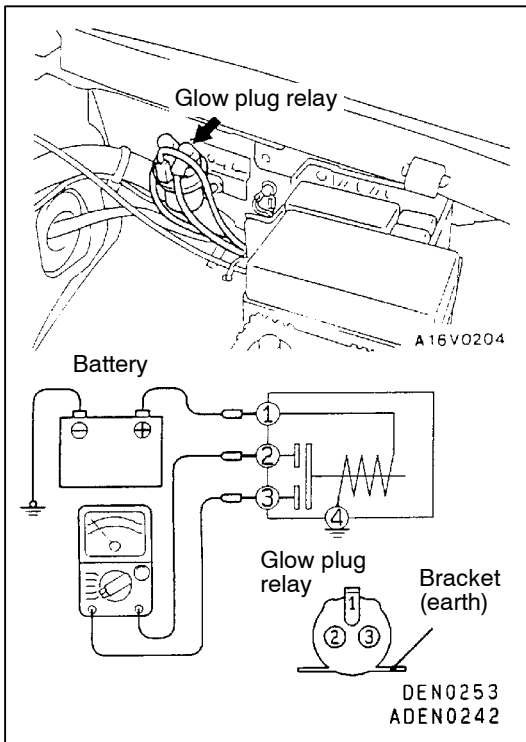
Terminal Voltage Reference Table

Inspection terminal	Inspection item	Inspection condition	Standard value	
5	Engine coolant temperature sensor (Engine coolant temperature detection)	Ignition switch "ON" → "OFF"	Engine coolant temperature: -20 °C	4.3 – 4.5 V
			Engine coolant temperature: 0 °C	3.7 – 3.9 V
			Engine coolant temperature: 20 °C	2.8 – 3.0 V
			Engine coolant temperature: 40 °C	1.9 – 2.1 V
			Engine coolant temperature: 80 °C	0.5 – 0.7 V
12	Ignition switch (power supply)	Ignition switch "OFF" → "START"	8 V or more	
14	Glow plug relay (glow time control)	Ignition switch "OFF" → "ON" Engine coolant temperature: 40 °C or less (Pre-glow function inspection)	9 – 12 V 0 – 0.5 V after approx. 8 sec. (when engine coolant temperature is 20 °C)	
17	Glow indicator lamp	Ignition switch "OFF" → "ON" Engine coolant temperature: 40 °C or less	0 – 1 V 11 – 13 V after approx. 1 sec. (when engine coolant temperature is 20 °C)	
23	Alternator charging signal ("L" terminal)	Ignition switch "OFF" → "ON"	1 – 4 V	
		Engine is idling	11 V or more	
26	Earth	-	-	



2. Remove the control unit connector and check the continuity between the harness-side connector terminals.

Inspection terminal	Inspection item	Continuity (resistance value)
14 – 26	Glow plug relay	Continuity (approx. 20Ω)



GLOW PLUG RELAY CHECK

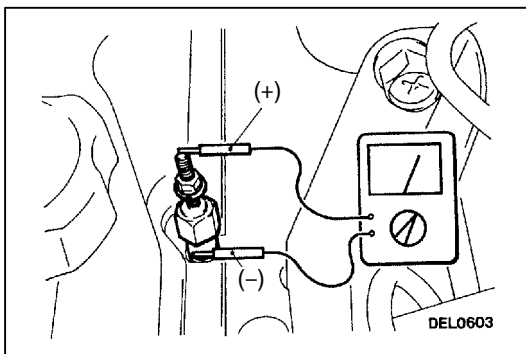
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1. Check to be sure that there is continuity (approx. 20 Ω) between glow plug relay terminal (1) and the bracket (earth).
2. Use jumper cables to connect terminal (1) of the glow plug relay to the battery (+) terminal and the bracket to the battery (-) terminal

Caution

- (1) Always be sure to disconnect the harnesses connected to glow plug relay terminals (2) and (3) before using the jumper cables.
 - (2) The terminals of the disconnected harnesses must not be shorted to earth.
 - (3) When connecting the jumper cables, be very careful not to make a mistake in connecting the terminals, as this will cause damage to the relay.
3. Check the continuity between glow plug relay terminals (2) and (3) while disconnecting and connecting the jumper cable at the battery (+) terminal

Jumper cable at battery (+) terminal	Continuity between terminals (2) – (3)
Connected	Continuity (0.01 Ω or less)
Disconnected	No continuity (infinite resistance)



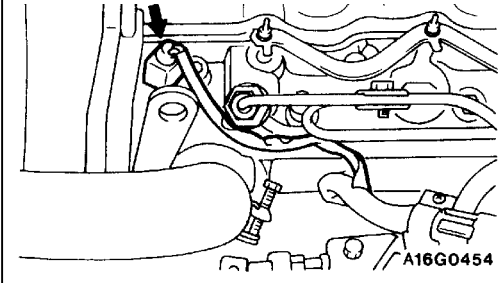
GLOW PLUG CHECK

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1. Remove the glow plug plate.
2. Measure the resistance between the glow plug terminals and the body.

Standard value: 0.6 – 1.0 Ω (at 20 °C)

Engine coolant temperature gauge unit
(engine coolant temperature sensor)

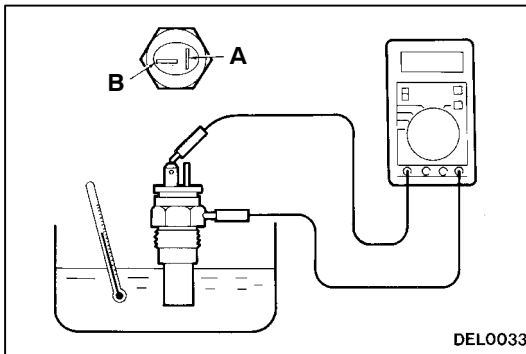


ENGINE COOLANT TEMPERATURE SENSOR CHECK

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1. Remove the engine coolant temperature sensor.

2. While the sensor section of the engine coolant temperature sensor is immersed, measure the resistance between (B) terminal and the body.



Temperature (°C)	Resistance value (kΩ)
0	8.6
20	3.25 ± 0.33
40	1.5
80	0.3

3. After applying specified sealant to the threaded portion, tighten to the specified torque.

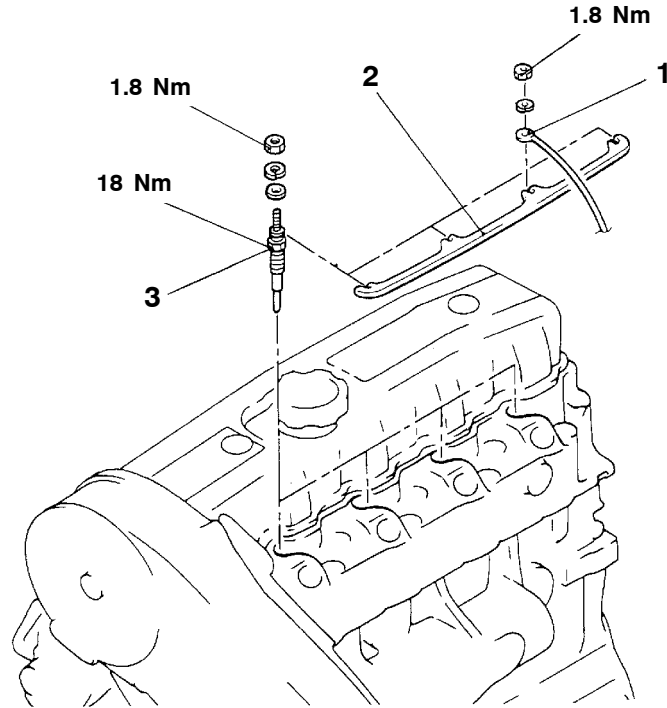
Specified sealant:

3M Nut Locking Part No. 4171 or equivalent

Tightening torque: 35 Nm

GLOW PLUG

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REMOVAL AND INSTALLATION

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Removal steps

1. Connector connection
2. Glow plug plate
3. Glow plug

**REMOVAL SERVICE POINT****◀A▶ GLOW PLUG REMOVAL**

Remove glow plug by hand after loosening with tool as its ceramic part is fragile.

INSPECTION

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- Check for rust on glow plug plate.
- Check glow plug for damage.

Caution

Do not use a plug that has been dropped from a height of 10 cm or more.