

# FUEL

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NOTE

THE GROUPS MARKED BY  ARE NOT IN THIS MANUAL

# MULTIPOINT FUEL INJECTION (MPI)

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## GENERAL

### OUTLINE OF CHANGES

The service procedures have been established due to the following changes:

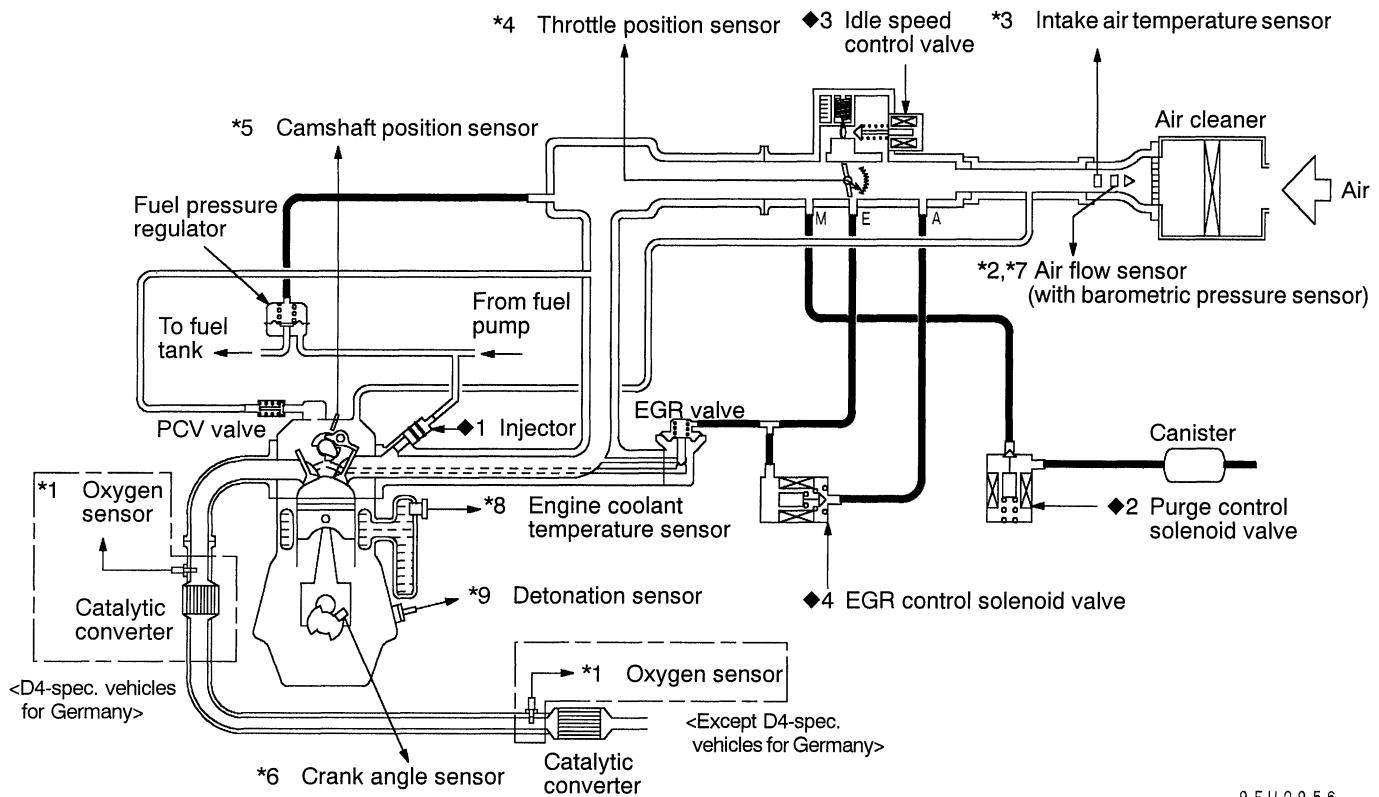
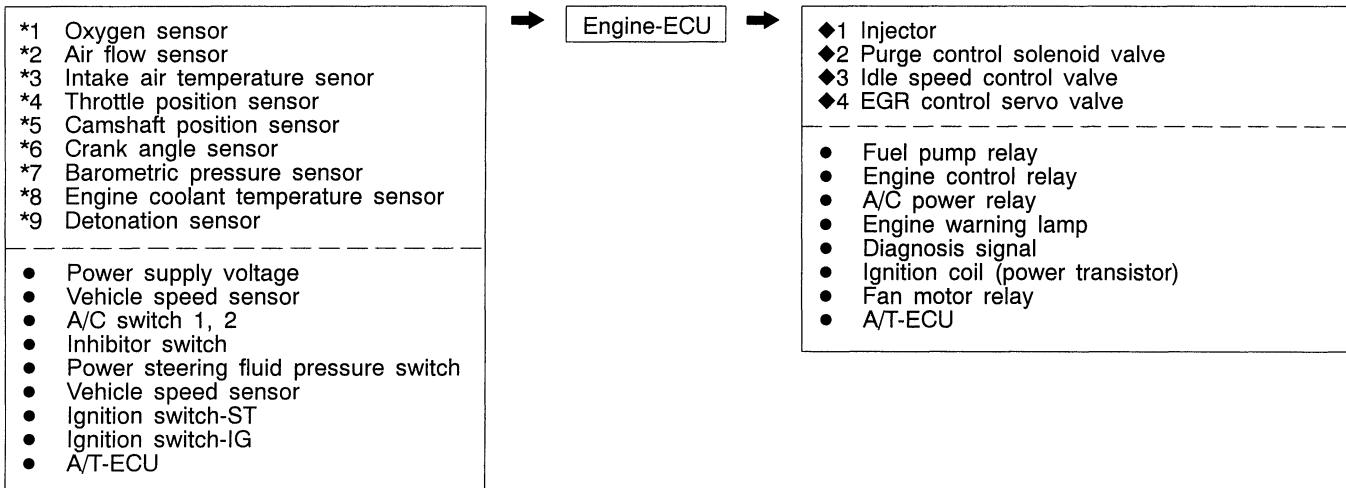
- The fixed SAS has been discontinued due to the change in the throttle body. The shape of the idle speed control (ISC) servo connector has been changed.
- The idle position switch has been discontinued.
- On D4-spec. engine vehicles for Germany, a quick-activated oxygen sensor has been adopted.
- The fuel pump module, which integrates the fuel pump, the fuel filter and the fuel gauge unit, has been adopted.

## GENERAL INFORMATION

### GENERAL SPECIFICATIONS

Items			specifications
Engine-ECU	Identification model No.	Except vehicles for Germany	E2T68483 <M/T> E2T68585 <A/T>
		Vehicles for Germany	E2T68484 <M/T> E2T68586 <A/T> E2T68486 <D4 spec.>

## MULTI-POINT FUEL INJECTION SYSTEM DIAGRAM

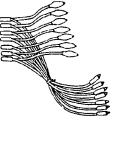


9 FU 0956

## SERVICE SPECIFICATIONS

Items	specifications
Throttle position sensor adjusting voltage mV	535 – 735

## SPECIAL TOOLS

Tools	Number	Name	Use
	MB991709	Test harness	<ul style="list-style-type: none"> <li>• Measurement of voltage during troubleshooting</li> <li>• Inspection using an analyzer</li> <li>• Inspection of idle speed control servo</li> </ul>

## TROUBLESHOOTING

### DIAGNOSIS TROUBLESHOOTING FLOW

#### NOTE

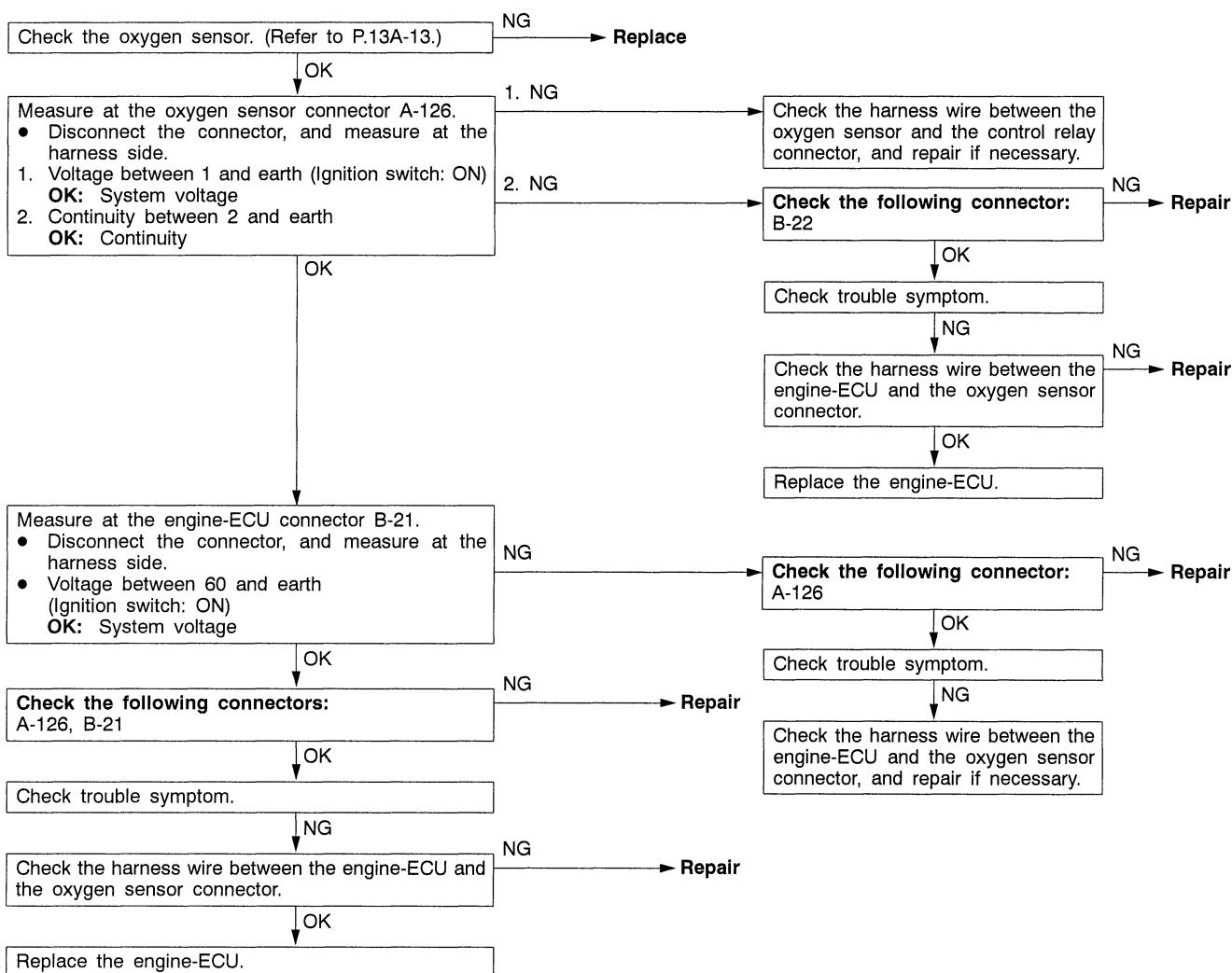
If the engine-ECU is replaced, the immobilizer-ECU and ignition key should be replaced together with it.

### INSPECTION CHART FOR DIAGNOSIS CODES

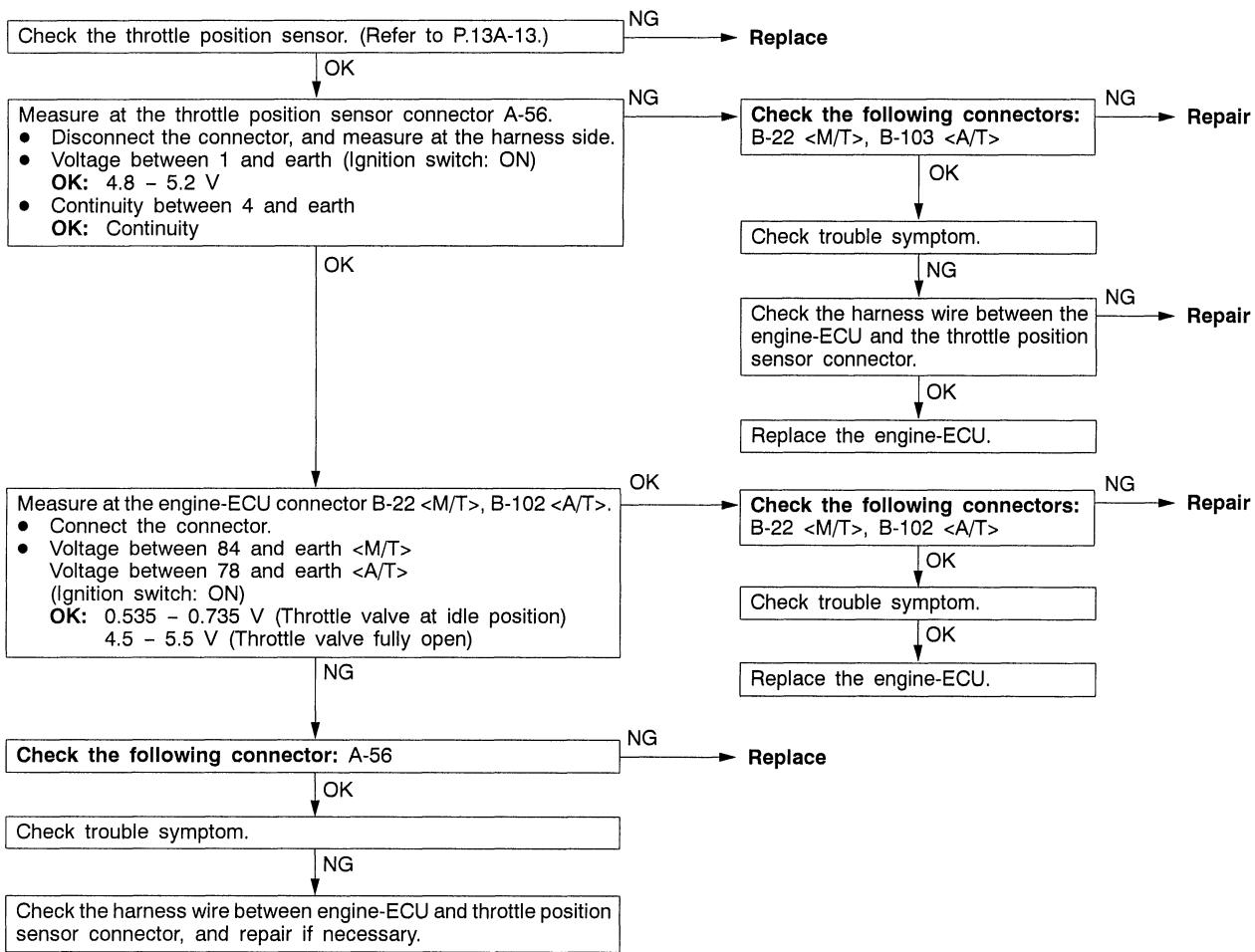
Code No.	Diagnosis item	Reference page
11	Oxygen sensor system <D4-spec. vehicles for Germany>	13A - 6
14	Throttle position sensor system	13A - 7
54	Immobilizer system	13A - 8

## INSPECTION PROCEDURE FOR DIAGNOSIS CODES

Code No. 11 Oxygen sensor system <D4-spec. vehicles for Germany>	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>3 minutes have passed after engine was started.</li> <li>Engine coolant temperature is approx. 80°C or more.</li> <li>Intake air temperature is 20 – 50°C.</li> <li>Engine speed is approx. 2,000 – 3,000 r/min</li> <li>Vehicle is moving at constant speed on a flat, level road surface</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>The oxygen sensor output voltage is around 0.6 V for 30 seconds (does not cross 0.6 V for 30 seconds).</li> <li>When the range of check operations given above which accompany starting of the engine are carried out four time in succession, a problem is detected after each operation.</li> </ul>	<ul style="list-style-type: none"> <li>Malfunction of the oxygen sensor</li> <li>Improper connector contact, open circuit or short-circuited harness wire</li> <li>Malfunction of the engine-ECU</li> </ul>



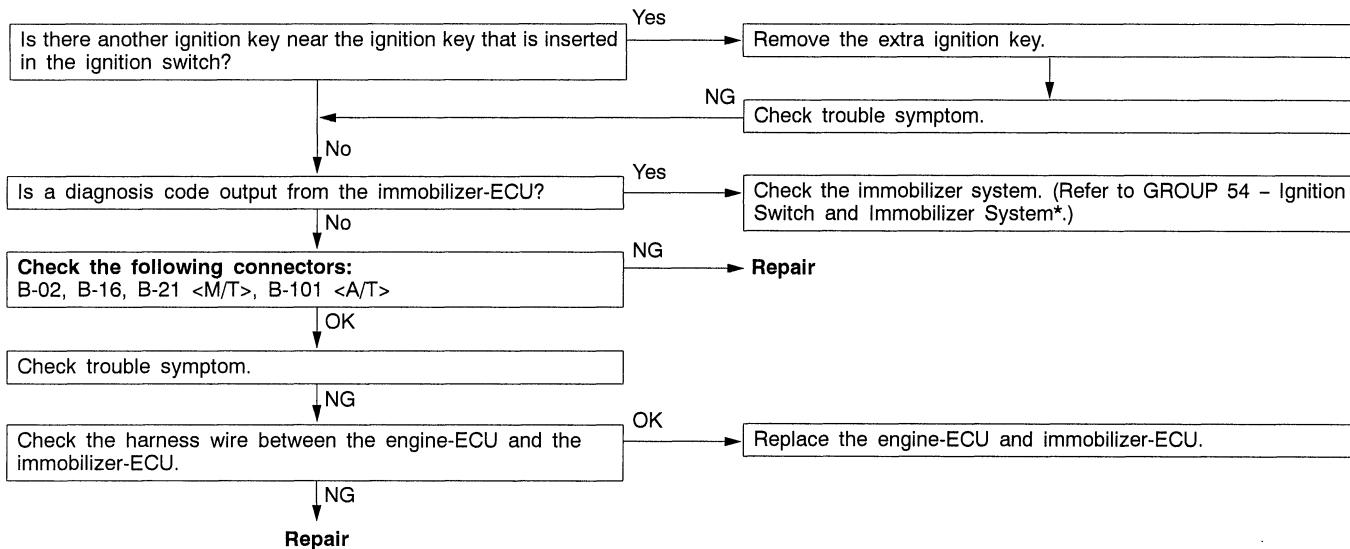
Code No. 14 Throttle position sensor system	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>Ignition switch: ON</li> <li>Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts.</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>Engine speed is 3,000 r/min or less, and volumetric efficiency is 30% or less, TPS output voltage is 4.6 V or more for 4 seconds.</li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>Engine speed is 2,000 r/min or more, and volumetric efficiency is 60% or more, TPS output voltage is 0.8 V or less for 4 seconds.</li> </ul>	<ul style="list-style-type: none"> <li>Malfunction of the throttle position sensor or maladjustment</li> <li>Improper connector contact, open circuit or short-circuited harness wire of the throttle position sensor circuit</li> <li>Malfunction of the engine-ECU</li> </ul>



Code No.54 Immobilizer system	Probable cause
Range of Check • Ignition switch: ON Set Conditions • Improper communication between the engine-ECU and immobilizer-ECU	• Radio interference of encrypted codes • Incorrect encrypted code • Malfunction of harness or connector • Malfunction of immobilizer-ECU • Malfunction of engine-ECU

## NOTE

- (1) If the ignition switches are close each other when starting the engine, radio interference may cause this code to be displayed.
- (2) This code may be displayed when registering the key encrypted code.



## NOTE

\*: Refer to '96 CARISMA Workshop Manual (Pub.No. PWDE9502).

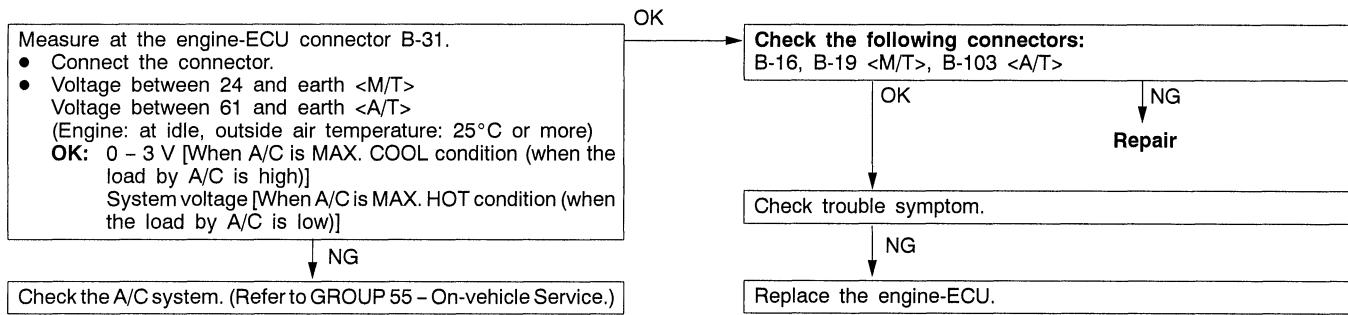
## INSPECTION CHART FOR DIAGNOSIS CODES

Trouble symptom	Inspection procedure No.	Reference page
Idling speed is improper when A/C is operating	50	13A-9

## INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

### INSPECTION PROCEDURE 50

Idling speed is improper when A/C is operating	Probable cause
<p>If the engine-ECU detects that the air conditioner is on, it activates the idle speed control (ISC) servo to control idle-up operation.</p> <p>The A/C-ECU judges if the load caused by air conditioner operation is high or low, and converts it to voltage signal (high or low voltage) and inputs the signal to the engine-ECU.</p> <p>Based on this voltage signal, the engine-ECU controls the idle-up speed (for high or low load).</p>	<ul style="list-style-type: none"> <li>Malfunction of the A/C control system</li> <li>Improper connector contact, open circuit or short-circuited harness wire</li> <li>Malfunction of the engine-ECU</li> </ul>



**DATA LIST REFERENCE TABLE**

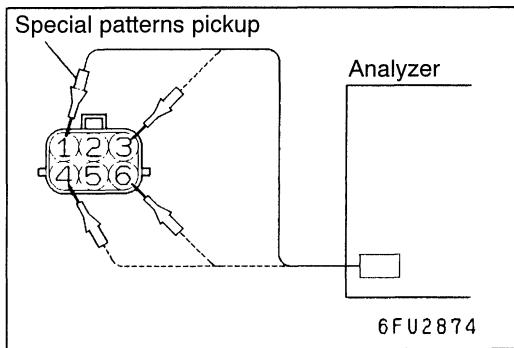
Item No.	Diagnosis item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
14	Throttle position sensor	Ignition switch: ON	Release the accelerator pedal.	535 – 735 mV	Code No.14	13A-7
			Depress the accelerator pedal gradually.	Increases in proportion to throttle opening angle		
			Depress the accelerator pedal fully.	4,500 – 5,000 mV		

**CHECK AT THE ENGINE-ECU TERMINALS****TERMINAL VOLTAGE CHECK CHART**

terminal No.<M/T>	terminal No.<A/T>	Check item	Check condition (Engine condition)		Normal condition
24	61	A/C switch 2	Refer to GROUP 55 – Troubleshooting “Check at the A/C-ECU terminal, engine-ECU output terminals.”		
84	78	Throttle position sensor	Ignition switch: ON	Release the accelerator pedal.	0.535 – 0.735 V
				Depress the accelerator pedal fully.	4.5 – 5.5 V
87	79	Idle position switch signal	Ignition switch: ON	Release the accelerator pedal.	0 – 1 V
				Depress the accelerator pedal fully.	4 V or more

**CHECK CHART FOR RESISTANCE AND CONTINUITY BETWEEN TERMINALS**

terminal No.<M/T>	terminal No.<A/T>	Check item	Standard value, normal value (Check condition)
60 - 12	3 - 41	Oxygen sensor heater <D-4spec. vehicles for Germany>	4.5 – 8.0 Ω (At 20°C)



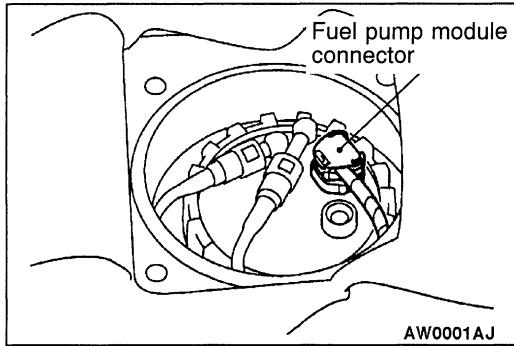
## INSPECTION PROCEDURE USING AN ANALYZER

### IDLE SPEED CONTROL (ISC) SERVO (STEPPER MOTOR)

The service procedure has been established due to the change in the ISC servo connector. The other procedures are the same as before.

#### Measurement method

1. Disconnect the ISC servo connector and connect the special tool (test harness: MB991709) in between. (All terminals should be connected.)
2. Connect the analyzer special patterns pickup to the ISC servo-side connector terminal 1, terminal 3, terminal 4, and terminal 6 respectively.

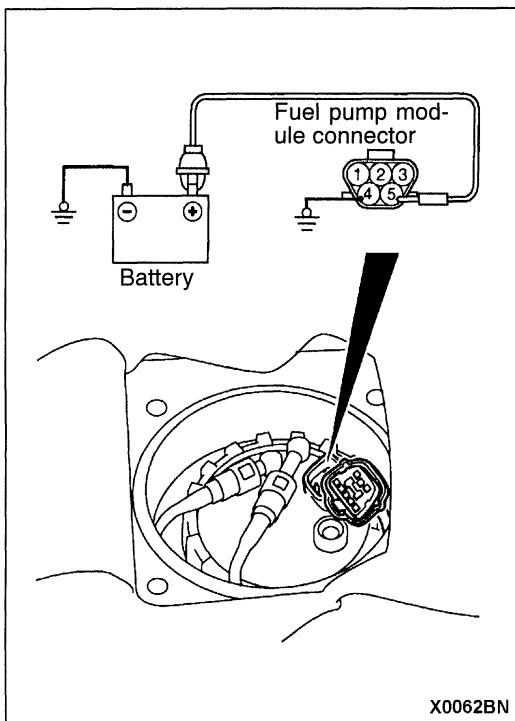


## ON-VEHICLE SERVICE

### FUEL PUMP CONNECTOR DISCONNECTION (HOW TO REDUCE THE FUEL PRESSURE)

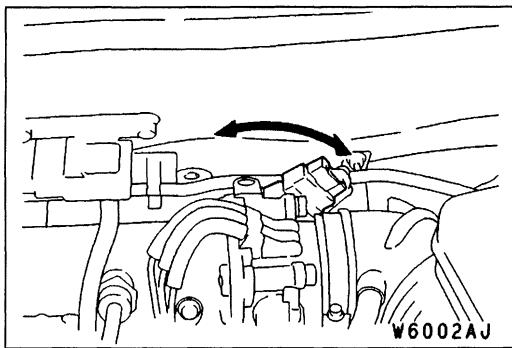
When removing the fuel pipe, hose, etc., since fuel pressure in the fuel pipe line is high, do the following operation so as to release the fuel pressure in the line and prevent fuel from running out.

- (1) Remove the rear seat cushion. (Refer to GROUP 52A.)
- (2) Remove the protector.
- (3) Disconnect the fuel pump module connector.
- (4) After starting the engine and letting it run until it stops naturally, turn the ignition switch to LOCK (OFF).
- (5) Connect the fuel pump module connector.
- (6) Install the protector and rear seat cushion.



## FUEL PUMP OPERATION CHECK

1. Check the operation of the fuel pump by using the MUT-II to force-drive the fuel pump.
2. If the fuel pump will not operate, check by using the following procedure, and if it is normal, check the drive circuit.
  - (1) Turn the ignition switch to LOCK(OFF).
  - (2) Remove the rear seat cushion.  
(Refer to GROUP 52A.)
  - (3) Remove the protector.
  - (4) Disconnect the fuel pump module connector. Apply a battery voltage to the terminal No.5 of the fuel pump module connector and connect the terminal No.4 to earth, and check that the fuel pump operation sound can be heard.
  - (5) Check the fuel pressure by pinching the fuel hose with the fingertip.
  - (6) Connect the fuel pump module connector.
  - (7) Install the protector and rear seat cushion.

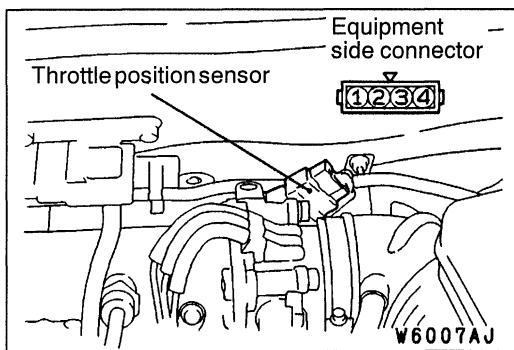


## THROTTLE POSITION SENSOR ADJUSTMENT

1. Connect the MUT-II to the diagnosis connector.
2. Turn the ignition switch to ON (but do not start the engine).
3. Check the throttle position sensor output voltage.
4. If not within the standard value, loosen the throttle position sensor mounting bolts, and then rotate the sensor body to adjust the output voltage.
5. Turn the ignition switch to LOCK(OFF).
6. Remove the MUT-II.
7. If a diagnosis code is displayed, erase the diagnosis code by using the MUT-II or disconnect the negative battery cable from the battery terminal and then leave it for at least ten seconds. After that, reconnect the battery cable, and then let the engine run at idle for approx. 10 minutes.

### Caution

**Turn off the ignition switch before disconnecting or connecting the MUT-II.**



## THROTTLE POSITION SENSOR CHECK

1. Disconnect the throttle position sensor connector.
2. Measure the resistance between the throttle position sensor side connector terminal 1 and terminal 4.

**Standard value: 3.5 – 6.5 kΩ**

3. Measure the resistance between the throttle position sensor side connector terminal 1 and terminal 3.

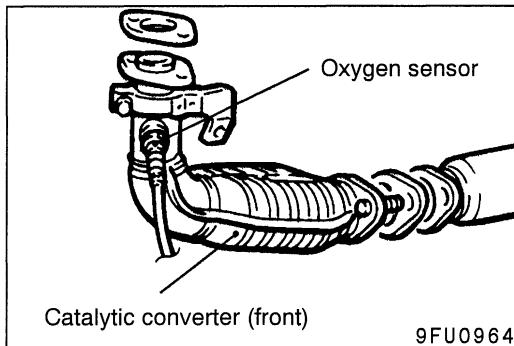
**Normal condition:**

Throttle valve slowly open until fully open from the idle position	Changes smoothly in proportion to the opening angle of the throttle valve
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4. If the resistance is outside the standard value, or if it doesn't change smoothly, replace the throttle position sensor.

**NOTE**

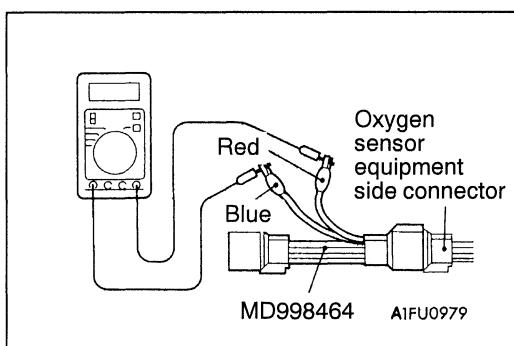
For the throttle position sensor adjustment procedure, refer to P.13A-12.



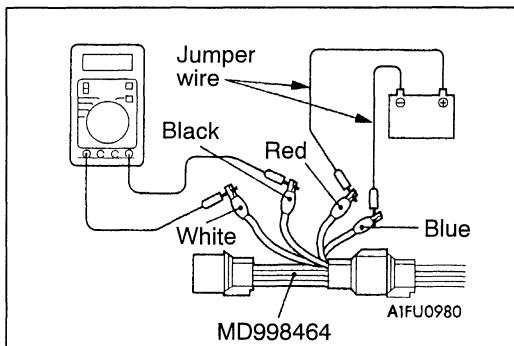
## OXYGEN SENSOR CHECK

### <D4-spec. vehicles for Germany>

1. Disconnect the oxygen sensor connector and connect the special tool (test harness) to the connector on the oxygen sensor side.
2. Make sure that there is continuity (4.5 – 8.0 Ω at 20°C) between terminal 1 (red clip of special tool) and terminal 3 (blue clip of special tool) on the oxygen sensor connector.



3. If there is no continuity, replace the oxygen sensor.
4. Warm up the engine until engine coolant is 80°C or higher.



5. Use a jumper wire to connect terminal 1 (red clip) of the oxygen sensor connector to the battery (+) terminal and terminal 3 (blue clip) to the battery (-) terminal.

**Caution**

**Be very careful when connecting the jumper wire; incorrect connection can damage the oxygen sensor.**

6. Connect a digital voltage meter between terminal 2 (black clip) and terminal 4 (white clip).
7. While repeatedly racing the engine, measure the oxygen sensor output voltage.

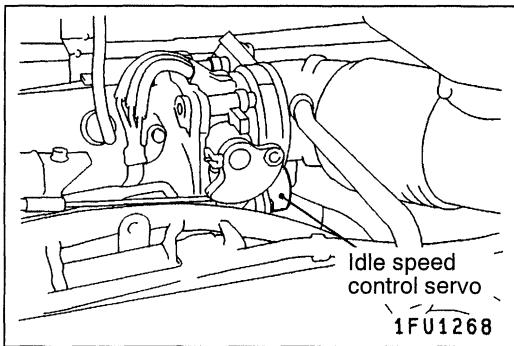
**Standard value:**

Engine	Oxygen sensor output voltage	Remarks
When racing the engine	0.6 – 1.0 V	If you make the air/fuel ratio rich by racing the engine repeatedly, a normal oxygen sensor will output a voltage of 0.6 – 1.0 V.

8. If the sensor is defective, replace the oxygen sensor.

**NOTE**

For removal and installation of the oxygen sensor, refer to GROUP 15 – Exhaust Pipe and Main Muffler.



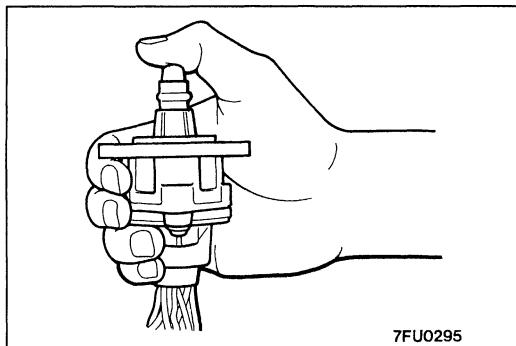
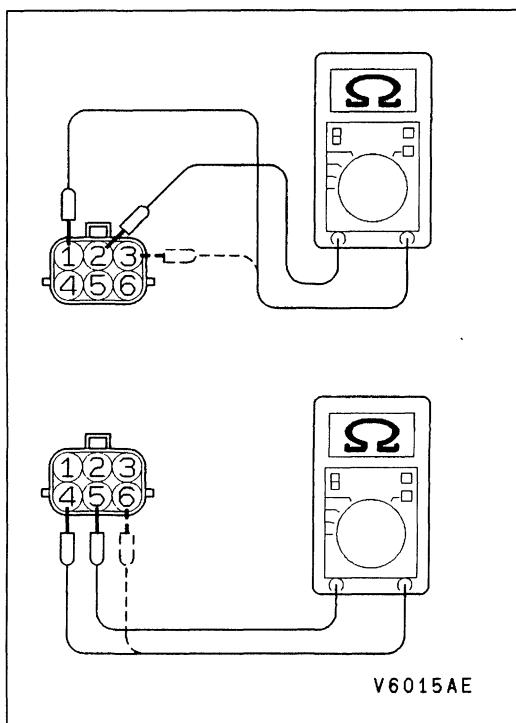
## IDLE SPEED CONTROL (ISC) SERVO (STEPPER MOTOR) CHECK

### Checking the Operation Sound

1. Check that the engine coolant temperature is 20°C or below.

**NOTE**

Disconnecting the engine coolant temperature sensor connector and connecting the harness-side of the connector to another engine coolant temperature sensor that is at 20°C or below is also okay.



2. Check that the operation sound of the stepper motor can be heard after the ignition is switched ON. (but without starting the motor.)
3. If the operation sound cannot be heard, check the stepper motor's activation circuit.  
If the circuit is normal, it is probable that there is a malfunction of the stepper motor or of the engine control unit.

#### Checking the Coil Resistance

1. Disconnect the idle speed control servo connector.
2. Measure the resistance between terminal 2 and either terminal 1 or terminal 3 of the connector at the idle speed control servo side.

**Standard value: 28 – 33 Ω (at 20°C)**

3. Measure the resistance between terminal 5 and either terminal 6 or terminal 4 of the connector at the idle speed control servo side.

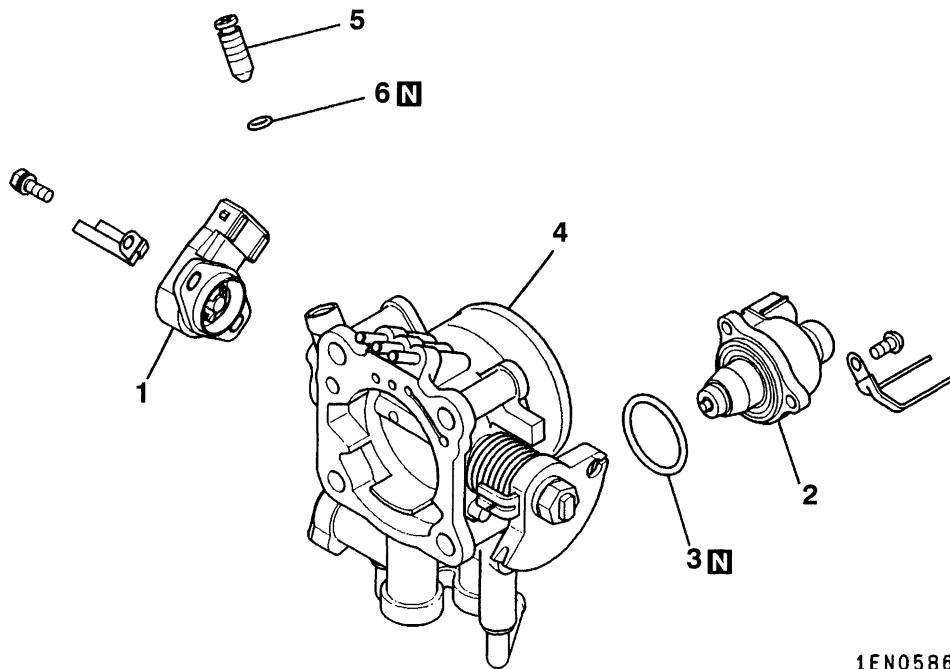
**Standard value: 28 – 33 Ω (at 20°C)**

#### Operation Check

1. Remove the throttle body.
2. Remove the idle speed control servo.
3. Connect the special tool (test harness set: MB991709) to the idle speed control servo connector.
4. Connect the positive (+) terminal of a power supply (approx. 6 V) to the terminals No.2 and No.5.
5. Hold the ISC servo as shown in the illustration. Connect the negative (-) terminal of the power supply to each clip as described in the following steps, and check whether or not a vibrating feeling (a feeling of very slight vibration of the stepper motor) is generated as a result of the activation of the stepper motor.
  - (1) Connect the negative (-) terminal of the power supply to the terminals No.1 and No.4.
  - (2) Connect the negative (-) terminal of the power supply to the terminals No.3 and No.4.
  - (3) Connect the negative (-) terminal of the power supply to the terminals No.3 and No.6.
  - (4) Connect the negative (-) terminal of the power supply to the terminals No.1 and No.6.
  - (5) Connect the negative (-) terminal of the power supply to the terminals No.1 and No.4.
  - (6) Repeat the tests in sequence from (5) to (1).
6. If, as a result of these tests, vibration is detected, the stepper motor can be considered to be normal.

## THROTTLE BODY

### DISASSEMBLY AND REASSEMBLY



#### Disassembly steps

►A◄

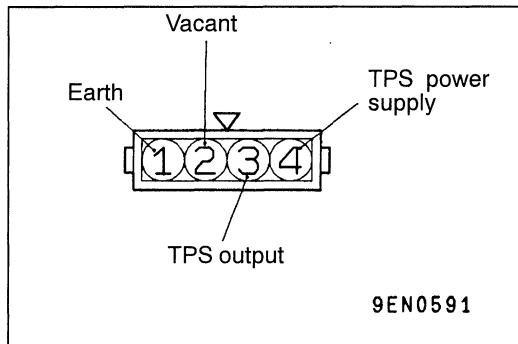
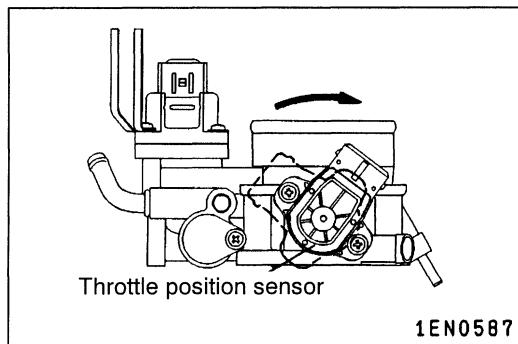
1. Throttle position sensor (TPS)
2. Idle speed control servo
3. O-ring
4. Throttle body
5. Speed adjusting screw
6. O-ring

#### NOTE

1. The speed adjusting screw is correctly adjusted at the factory and should not be removed.
2. If the speed adjusting screw should happen to have been removed, carry out speed adjusting screw adjustment.

## CLEANING THROTTLE BODY PARTS

1. Clean all throttle body parts.  
Do not use solvent to clean the following parts:
  - Throttle position sensor
  - Idle speed control servo assembly
 If these parts are immersed in solvent, their insulation will deteriorate.  
Wipe them with cloth only.
2. Check if the vacuum port or passage is clogged. Use compressed air to clean the vacuum passage.



## REASSEMBLY SERVICE POINT

### ►A◀ THROTTLE POSITION SENSOR (TPS) INSTALLATION

1. Install the TPS so that it faces as shown in the illustration, and then tighten it with the screw.
2. Connect a circuit tester between terminal No.4 (TPS power supply) and terminal No.3 (TPS output) of the TPS connector, and check that the resistance increases gradually as the throttle valve is opened slowly to the fully-open position.

**NOTES**

## GROUP 13F

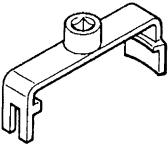
# FUEL SUPPLY

### GENERAL

#### OUTLINE OF CHANGE

On vehicles with 4G9 engine, the fuel pump module, which integrates the fuel pump <MPI> or the low-pressure fuel pump <GDI>, the fuel filter and the fuel gauge unit, has been adopted. Due to this change, the removal and installation procedure for the fuel tank has been revised.

#### SPECIAL TOOL

Tool	Number	Name	Use
	MB996009	Tank cap wrench	Removal and installation of tank cap

## FUEL TANK <4G9>

### REMOVAL AND INSTALLATION

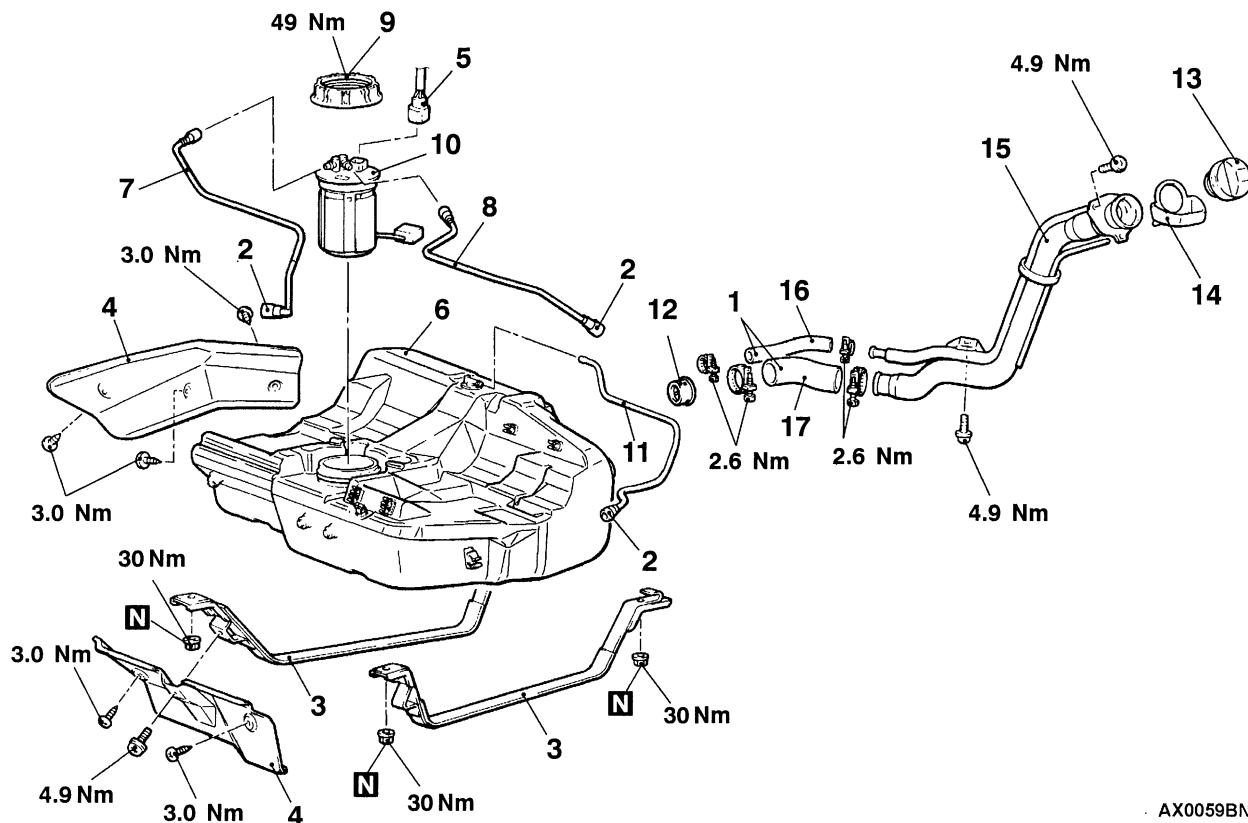
#### Pre-removal Operation

- Draining the Fuel
- Reduce the Inner Pressure of Fuel Line and Hose  
(MPI: Refer to GROUP 13A – On-vehicle Service.)  
(GDI: Refer to GROUP 13J – On-vehicle Service.)
- Removal of the Center Exhaust Pipe  
(Refer to GROUP 15.)

#### Post-installation Operation

- Installation of Center Exhaust Pipe  
(Refer to GROUP 15.)
- Refilling the Fuel.
- Checking for Fuel Leaks

<MPI>



#### Removal steps

►A◄

1. Hoses connection
2. Hoses connection
3. Band
4. Protector
5. Fuel pump module connector
6. Fuel tank assembly
7. Fuel main hose
8. Fuel return hose
9. Cap

►A►

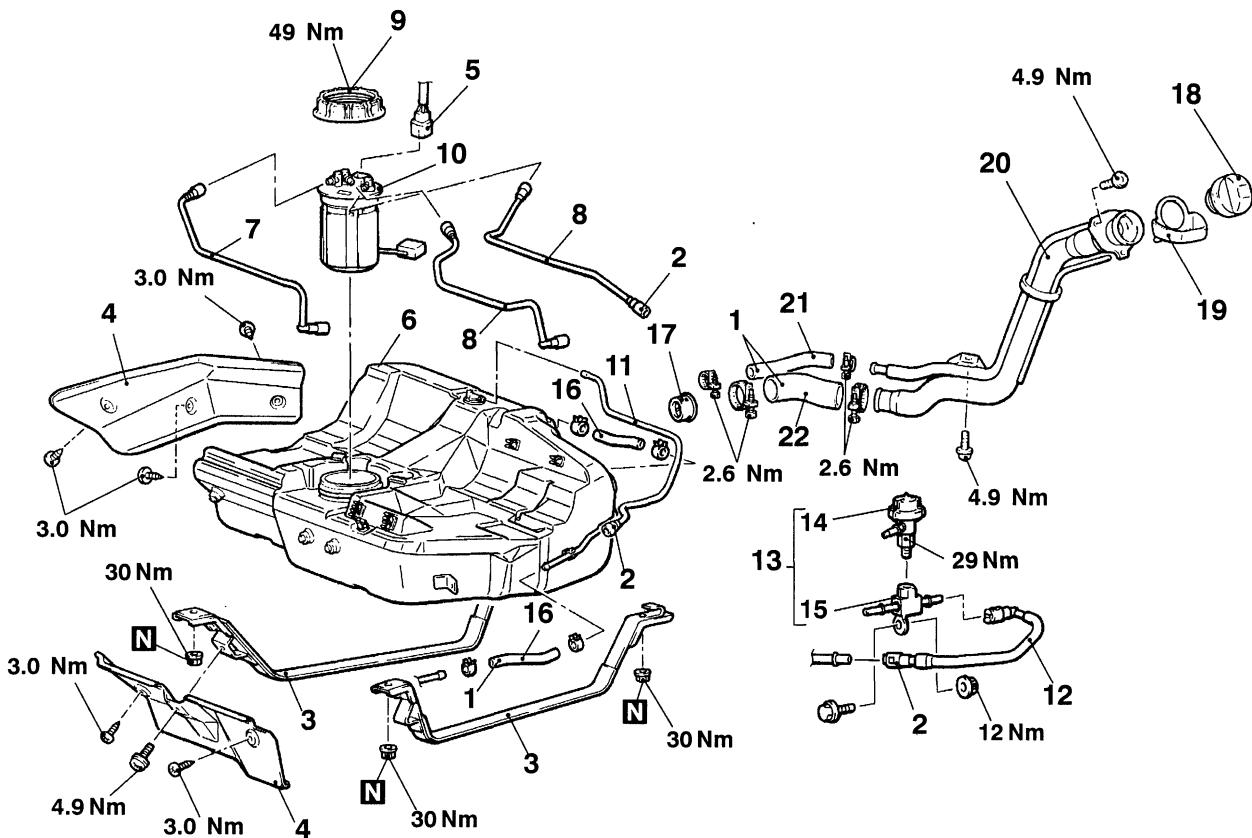
►A◄

►C◄

►B◄

10. Fuel pump module
11. Fuel vapor hose
12. Fuel shut-off valve
13. Fuel filler cap
14. Fuel rubber drain
15. Filler neck assembly
16. Leveling hose
17. Filler hose

## <GDI>

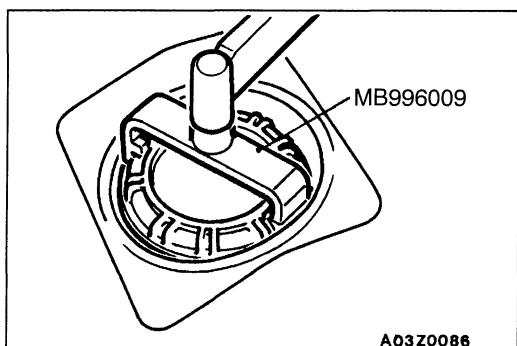


AX0060BN

## Removal steps

- A► 1. Hoses connection
- 2. Hoses connection
- 3. Band
- 4. Protector
- 5. Fuel pump module connector
- 6. Fuel tank assembly
- 7. Fuel main hose
- 8. Fuel return hose
- 9. Cap
- B► 10. Fuel pump module
- 11. Fuel vapor hose
- A► 12. Fuel pressure hose

13. Pressure regulator assembly (low pressure)
14. Pressure regulator (low pressure)
15. Connector
16. Fuel return hose
17. Fuel shut-off valve
18. Fuel filler cap
19. Fuel rubber drain
20. Filler neck assembly
21. Leveling hose
22. Filler hose



## **REMOVAL SERVICE POINT**

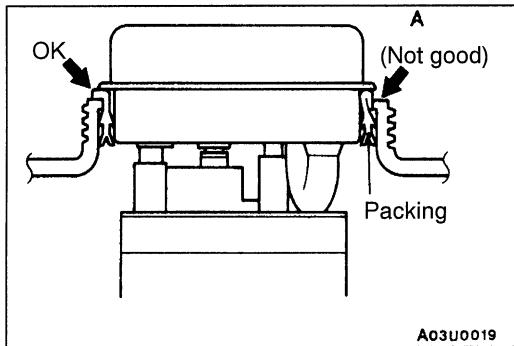
## ◀A▶ CAP REMOVAL

## INSTALLATION SERVICE POINTS

### ►A◀ FUEL PRESSURE HOSE/FUEL RETURN HOSE/FUEL MAIN HOSE/FUEL VAPOR HOSE INSTALLATION

#### Caution

After the connection, pull the pressure tube and suction tube gently in the direction of removal to check that they are firmly connected.



### ►B◀ FUEL PUMP MODULE INSTALLATION

1. Check to be sure that the fuel tank packing is not damaged or deformed, and then securely install the packing to the fuel tank.

#### Caution

If the packing is installed to the fuel pump module, packing lip will be damaged when installing the fuel pump module to the fuel tank and the fuel leak will result.

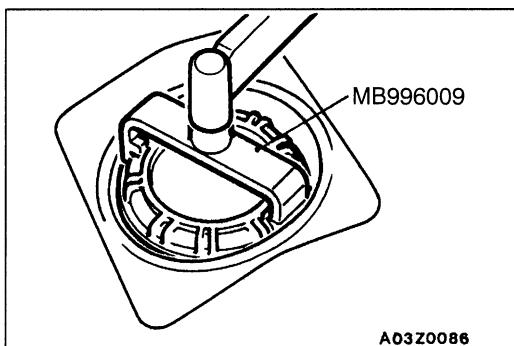
#### NOTE

If the packing is damaged or deformed, replace the defective packing with a new packing.

2. Apply soapy water to the inside of the packing, and then install the fuel pump module to the fuel tank.

#### Caution

- (1) Do not tilt the fuel pump module when installing.
- (2) The packing should not be folded over as shown by (A) in the illustration.



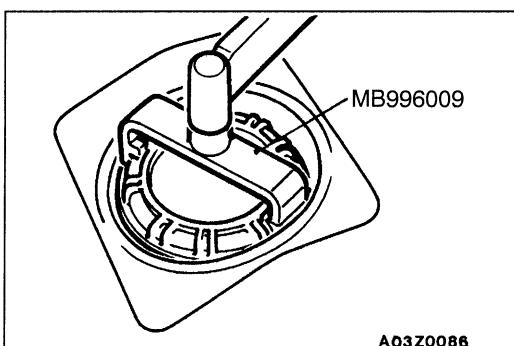
### ►C◀ CAP INSTALLATION

Apply soapy water to the cap thread, and the use the special tool as the same manner as for removal to tighten the cap to the specified torque.

**Tightening torque: 49 Nm**

#### Caution

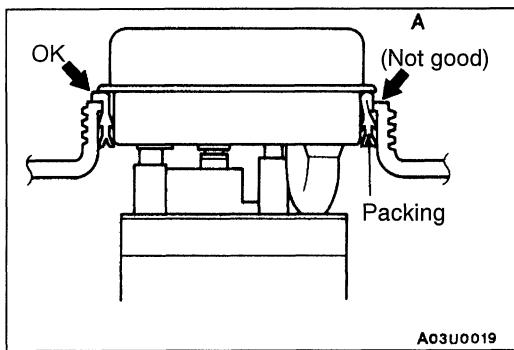
Prevent the fuel pump module from turning with the cap when tightening the cap.



## INSPECTION

### FUEL PUMP MODULE REPLACEMENT

1. Bleed the residual pressure from inside the fuel pipe line to prevent the fuel from spraying out.  
(MPI: Refer to GROUP 13A – On-vehicle Service.)  
(GDI: Refer to GROUP 13J – On-vehicle Service.)
2. Disconnect the fuel hoses.
3. Use the special tool to remove the cap, and then remove the fuel pump module.



- Check to be sure that the fuel tank packing is not damaged or deformed, and then securely install the packing to the fuel tank.

**Caution**

**If the packing is installed to the fuel pump module, packing lip will be damaged when installing the fuel pump module to the fuel tank and the fuel leak will result.**

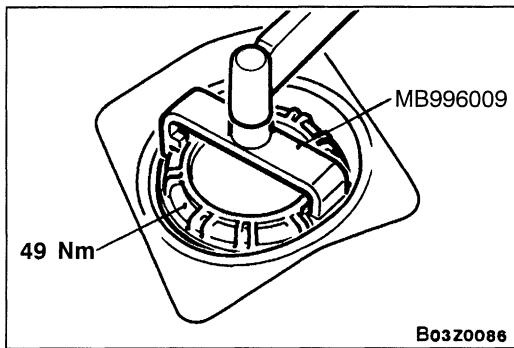
**NOTE**

If the packing is damaged or deformed, replace the defective packing with a new packing.

- Apply soapy water to the inside of the packing, and then install the fuel pump module to the fuel tank.

**Caution**

- (1) Do not tilt the fuel pump module when installing.**
- (2) The packing should not be folded over as shown by (A) in the illustration.**



- Use the special tool to tighten the cap to the specified torque.

**Tightening torque: 49 Nm**

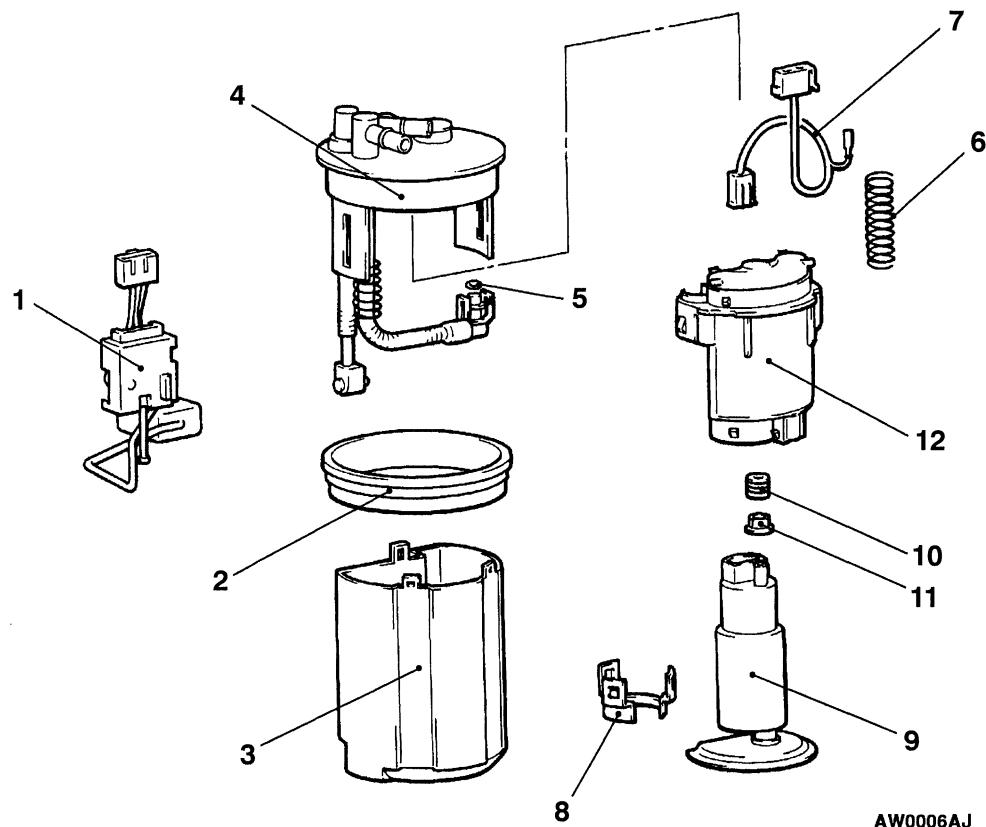
- Check for leaks from the installation section of the fuel pump module by the following procedure.
  - Apply soapy water to the circumference of the cap.
  - Choke the vapor hose and main hose, apply an internal pressure of 10 kPa or less from the return hose and check to be sure that no bubbles form in the soapy water.

#### FUEL GAUGE CHECK

Refer to GROUP 54 – Combination Meter.

## DISASSEMBLY AND REASSEMBLY

## FUEL PUMP MODULE



AW0006AJ

**Disassembly steps**

- 1. Fuel gauge unit
- 2. Packing
- 3. Reservoir cap
- 4. Pump support bracket assembly
- 5. O-ring
- 6. Spring
- 7. Pump harness
- 8. Lock bracket
- 9. Fuel pump <MPI>,  
Fuel pump (low pressure) <GDI>
- A◄ 10. Grommet
- 11. Spacer
- 12. Fuel filter

**REASSEMBLY SERVICE POINTS****►A◄ GROMMET/O-RING INSTALLATION**

Apply a unleaded petrol to the grommet and O-ring before installing them in order to prevent damage.

# GASOLINE DIRECT INJECTION (GDI)

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## GENERAL

### OUTLINE OF CHANGES

The service procedures have been established due to the following changes:

- An electronic-controlled throttle valve has been used.
- A 32-bit CPU type engine-ECU has been used.
- GDI ECO indication lamp has been used.
- The fuel pump module, which integrates the low-pressure fuel pump, the fuel filter and the fuel gauge unit, has been adopted.

## GENERAL INFORMATION

### THROTTLE VALVE OPENING ANGLE CONTROL

This system controls throttle valve opening angle electronically. The engine-ECU determines how deeply the accelerator pedal is depressed by means of the accelerator position sensor (APS). Then the engine-ECU sends a target value of the throttle valve opening angle to the throttle valve controller. The throttle valve control servo operates the throttle valve so that it reaches the target opening angle.

### IDLE SPEED CONTROL

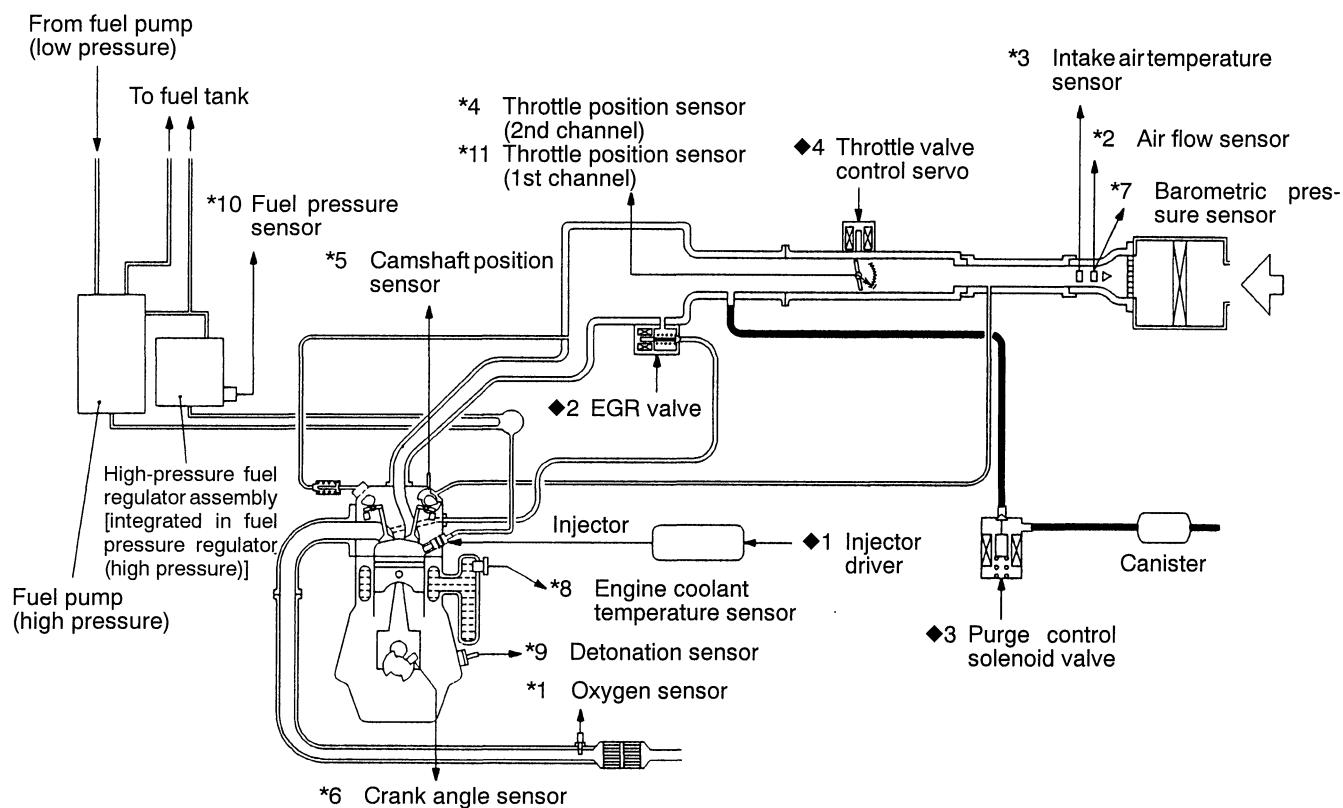
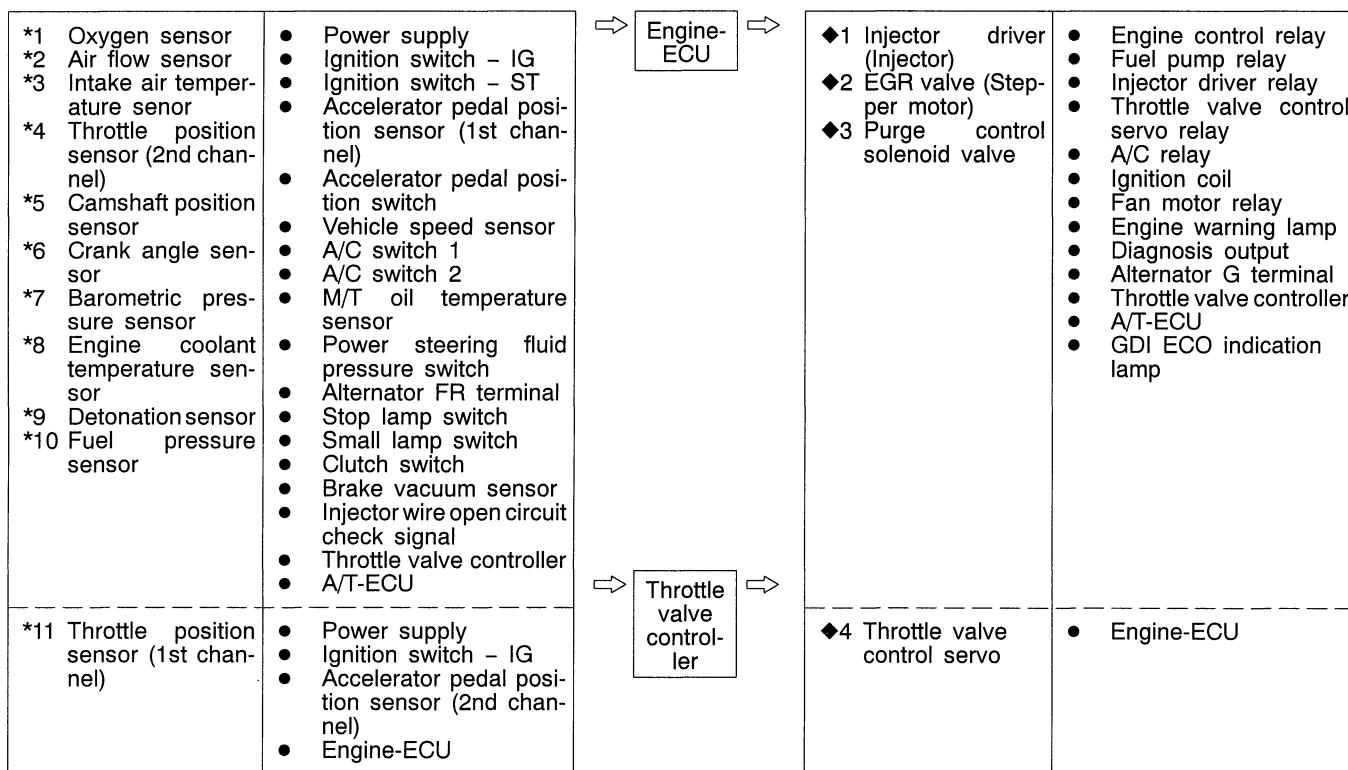
This system maintains engine idle speed at a predetermined condition by controlling the air flow that passes through the throttle valve according to engine idling condition and engine loads at idling.

The engine-ECU operates the throttle valve control servo so that engine speed is maintained within a map value. The map value is predetermined according to engine coolant temperature and air-conditioning load.

## GENERAL SPECIFICATIONS

Items		Specifications	
Throttle body	Throttle bore mm	60	
	Throttle position sensor	Variable resistor type (Dual system type)	
	Throttle valve control servo	Torque motor type	
Engine-ECU	Identification model No.	Except vehicles for Germany	E2T73375
		Vehicles for Germany	E2T73376 E2T73377 <D4-spec.>
Sensors	Accelerator pedal position sensor		Variable resistor type
	Accelerator pedal position switch		Rotary contact type, within accelerator pedal position sensor
Actuators	Throttle valve control servo relay		Contact switch type

## GASOLINE DIRECT INJECTION SYSTEM DIAGRAM



## SERVICE SPECIFICATIONS

Item	Standard value
Adjustment voltage of throttle position sensor (1st channel) V	0.4 – 0.6
Adjustment voltage of throttle position sensor (2nd channel) V	4.2 – 4.8
Resistance of throttle position sensor (1st and 2nd channel) kΩ	1.7 – 3.3
Adjustment voltage of accelerator pedal position sensor (1st and 2nd channels) V	0.985 – 1.085
Resistance of accelerator pedal position sensor (1st and 2nd channel) kΩ	3.5 – 6.5
Throttle valve control servo resistance Ω	1.35 – 1.65

## TROUBLESHOOTING

### DIAGNOSIS TROUBLESHOOTING FLOW

#### NOTE

If the engine-ECU is replaced, the immobilizer-ECU and ignition key should be replaced together with it.

### DIAGNOSIS FUNCTION

#### ENGINE WARNING LAMP (CHECK ENGINE LAMP)

##### Engine warning lamp inspection items

Engine-ECU
Oxygen sensor
Air flow sensor
Intake air temperature sensor
Throttle position sensor (1st channel)
Throttle position sensor (2nd channel)
Engine coolant temperature sensor
Crank angle sensor
Camshaft position sensor
Barometric pressure sensor
Detonation sensor
Injector
Abnormal combustion
Immobilizer system
Abnormal fuel pressure
Brake vacuum sensor
Fuel system malfunction
Accelerator pedal position sensor (1st channel)
Accelerator pedal position sensor (2nd channel)
Electronic-controlled throttle valve system
Throttle valve position feedback
Throttle valve control servo motor (Motor 1st phase malfunction)
Throttle valve control servo motor (Motor 2nd phase malfunction)
Communication line system with throttle valve controller

#### NOTE

The engine warming lamp flashes when the electronic-controlled throttle valve system is disabled.

## FAIL-SAFE FUNCTION REFERENCE TABLE

If the diagnosis system detects any sensor malfunction, the vehicle can be driven safely by using a default control logic instead of the faulty sensors.

Defective part or function	What to do when a sensor is defective
Air flow sensor	(1) Disables lean-mixture combustion. (2) Determines injector basic operating time and basic ignition timing according to map value, which has been predetermined by throttle position sensor and crank angle sensor signals.
Intake air temperature sensor	Controls as the intake air temperature is 25°C.
Throttle position sensor (1st channel)	(1) Disables lean-mixture combustion. (2) Controls throttle valve opening angle by closed loop control by using the throttle position sensor (2nd channel) signal. (3) Disables the throttle valve opening angle control when the throttle position sensor (2nd channel) signal is also defective.
Throttle position sensor (2nd channel)	(1) Disables lean-mixture combustion. (2) Controls throttle valve opening angle by closed loop control by using the throttle position sensor (1st channel) signal. (3) Disables the throttle valve opening angle control when the throttle position sensor (1st channel) signal is also defective.
Engine coolant temperature sensor	Controls as if the engine coolant temperature is 80°C. (Note that this control will continue until the ignition switch is turned off even if the sensor signal return to normal.)
Camshaft position sensor	Controls according to the conditions before a failure is detected.
Vehicle speed sensor	(1) Disables lean-mixture combustion. However, if a predetermined time elapses at an engine speed of 1,500 r/min or more, the lean-mixture combustion will return to normal. (2) Disables lean-mixture combustion during engine idling.
Barometric pressure sensor	Controls as if the barometric pressure is 101 kPa.
Detonation sensor	Holds the ignition timing at that for regular gasoline.
Injector	(1) Disables lean-mixture combustion. (2) Shuts down exhaust gas recirculation.
Abnormal combustion	Disables lean-mixture combustion.
Communication line with A/T-ECU	Disables ignition timing retard control (engine and transmission total control) during shaft change.
Alternator FR terminal	Disables inhibition control of the alternator output according to electrical load (treats the alternator as if it is conventional one).
Oxygen sensor	Air/fuel ratio closed loop control is not performed.
Fuel pressure sensor	(1) Controls as if the fuel pressure is 5 MPa (if there is open or short circuit). (2) Turns off the fuel pump relay (if the fuel pressure is excessively high). (3) Shuts off the fuel injection (If an excessively low pressure is detected or the engine speed exceeds 3,000 r/min).

Defective part or function	What to do when a sensor is defective
Accelerator pedal position sensor (1st channel)	<ol style="list-style-type: none"> <li>(1) Disables lean-mixture combustion.</li> <li>(2) Controls the throttle valve position by using the accelerator pedal position sensor (2nd channel) signal.</li> <li>(3) Disables the electronic-controlled throttle valve system if the accelerator pedal position sensor (2nd channel) signal is also defective, and holds the throttle valve at a predetermined angle where the vehicle can be driven safely although its performance is reduced.</li> </ol>
Accelerator pedal position sensor (2nd channel)	<ol style="list-style-type: none"> <li>(1) Disables lean-mixture combustion.</li> <li>(2) Controls the throttle valve position by using the accelerator pedal position sensor (1st channel) signal.</li> <li>(3) Disables the electronic-controlled throttle valve system if the accelerator pedal position sensor (1st channel) signal is also defective.</li> </ol>
Electronic-controlled throttle valve system	<ol style="list-style-type: none"> <li>(1) Disables the electronic-controlled throttle valve system.</li> <li>(2) Disables lean-mixture combustion.</li> <li>(3) Disables engine idle speed feedback control.</li> </ol>
Throttle valve position feedback	<ol style="list-style-type: none"> <li>(1) Disables the electronic-controlled throttle valve system.</li> <li>(2) Disables lean-mixture combustion.</li> <li>(3) Disables engine idle speed feedback control.</li> </ol>
Throttle valve control servo motor (Motor 1st phase malfunction)	Disables lean-mixture combustion.
Throttle valve control servo motor (Motor 2nd phase malfunction)	<ol style="list-style-type: none"> <li>(1) Disables the electronic-controlled throttle valve system.</li> <li>(2) Disables lean-mixture combustion.</li> <li>(3) Disables engine idle speed feedback control.</li> </ol>
Communication line with the throttle valve controller	<ol style="list-style-type: none"> <li>(1) Error in communication between the throttle valve controller and engine-ECU           <ul style="list-style-type: none"> <li>● Disables lean-mixture combustion.</li> <li>● Shuts off fuel supply when engine speed exceeds 3,000 r/min.</li> </ul> </li> <li>(1) Error in communication between the throttle valve controller and engine-ECU           <ul style="list-style-type: none"> <li>● Disables lean-mixture combustion.</li> <li>● Shuts off fuel supply when engine speed exceeds 3,000 r/min.</li> <li>● The throttle valve controller controls the throttle valve opening angle by using the accelerator pedal position sensor (2nd channel) signal.</li> </ul> </li> </ol>

**NOTE**

The engine warning lamp illuminates when the electronic-controlled throttle valve system is disabled.

## INSPECTION CHART FOR DIAGNOSIS CODES

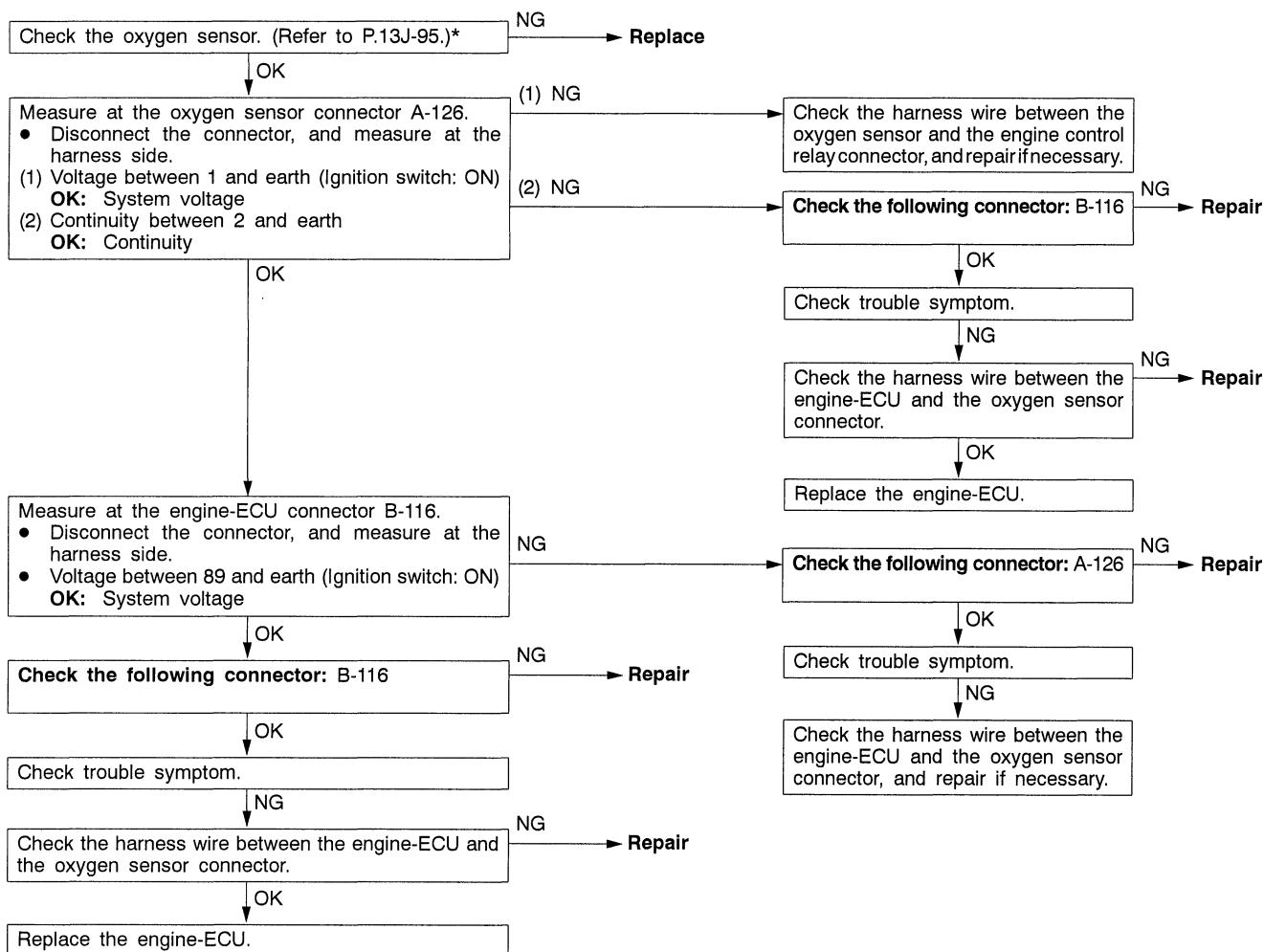
Code No.	Diagnosis item	Reference page
11	Oxygen sensor system	13J-9
12	Air flow sensor system	13J-10
13	Intake air temperature sensor system	13J-11
14	Throttle position sensor (2nd channel) system	13J-12
21	Engine coolant temperature sensor system	13J-13
22	Crank angle sensor system	13J-14
23	Camshaft position sensor system	13J-15
24	Vehicle speed sensor system	13J-16
25	Barometric pressure sensor system	13J-17
31	Detonation sensor system	13J-18
41	Injector system	13J-19
44	Abnormal combustion	13J-21
54	Immobilizer system	13J-22
56	Abnormal fuel pressure system	13J-23
61	Communication line with A/T-ECU system	13J-25
64	Alternator FR terminal system	13J-25
66	Brake vacuum sensor system	13J-26
77	Accelerator pedal position sensor (2nd channel) system	13J-27
78	Accelerator pedal position sensor (1st channel) system	13J-28
79	Throttle position sensor (1st channel) system	13J-29
89	Abnormal fuel system	13J-30
91	Electronic-controlled throttle valve system	13J-31
92	Throttle valve position feedback system	13J-31
94	Communication line system with throttle valve controller	13J-32
95	Throttle valve control servo motor (Motor 1st phase malfunction) system	13J-32
99	Throttle valve control servo motor (Motor 2nd phase malfunction) system	13J-33

## NOTE

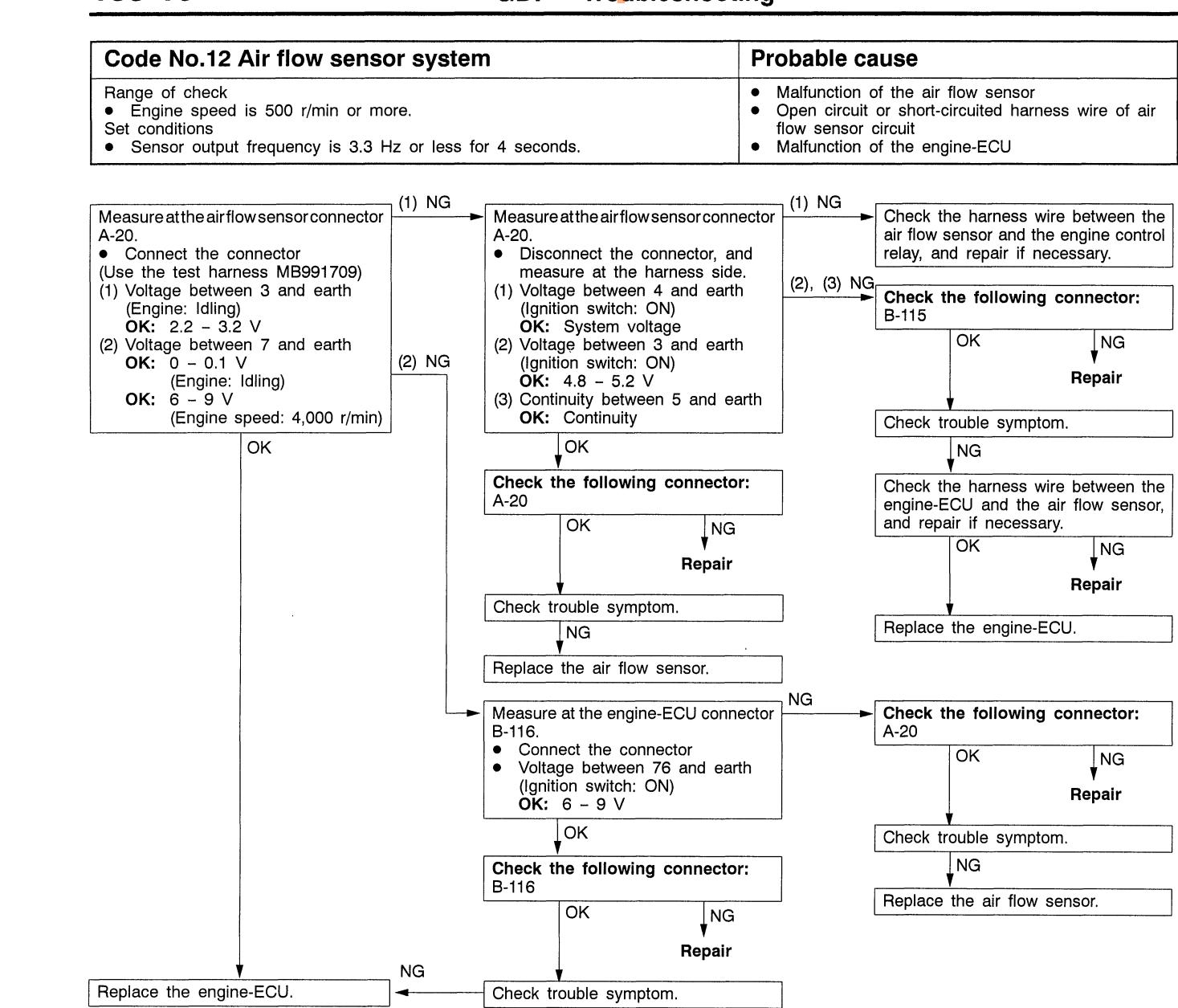
Code No. 56 may be also output when air is sucked in high-pressure fuel line due to no fuel supply.

## INSPECTION PROCEDURE FOR DIAGNOSIS CODES

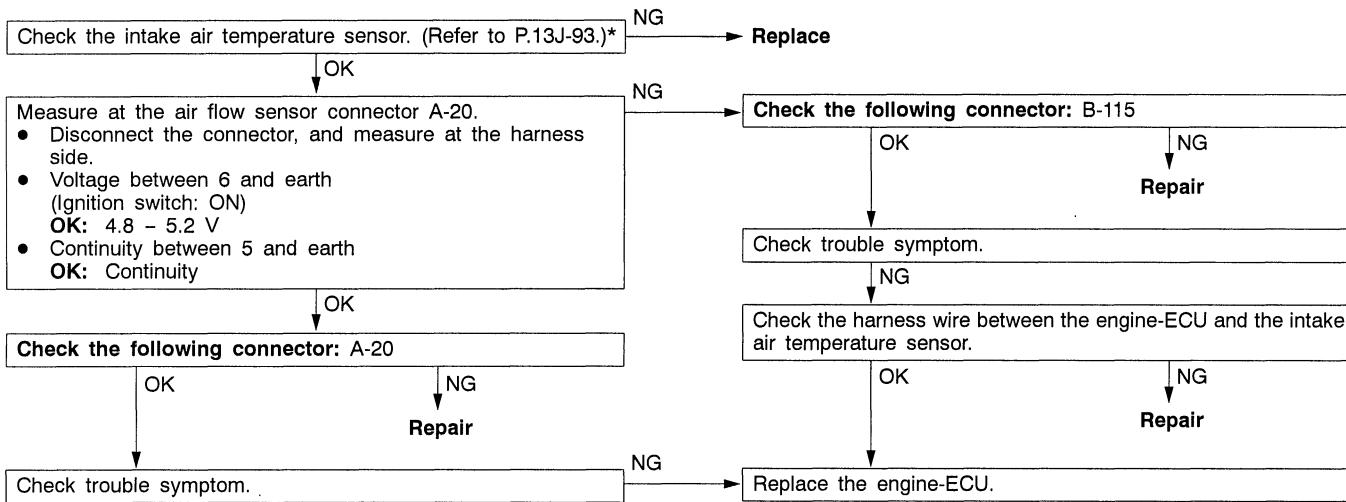
Code No. 11 Oxygen sensor system	Probable cause
<p>Range of check</p> <ul style="list-style-type: none"> <li>3 minutes have passed after engine was started.</li> <li>Engine coolant temperature is approx. 80°C or more.</li> <li>Intake air temperature is 20–50°C.</li> <li>Engine speed is approx. 2,000–3,000 r/min</li> <li>Vehicle is moving at constant speed on a flat, level road surface</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>The oxygen sensor output voltage is around 0.6 V for 30 seconds (does not cross 0.6 V for 30 seconds).</li> <li>When the range of check operations given above which accompany starting of the engine are carried out four time in succession, a problem is detected after each operation.</li> </ul>	<ul style="list-style-type: none"> <li>Malfunction of the oxygen sensor</li> <li>Improper connector contact, open circuit or short-circuited harness wire</li> <li>Malfunction of the engine-ECU</li> </ul>



\*: Refer to '98 CARISMA GDI Workshop Manual (Pub. No. PWDE9502-C)

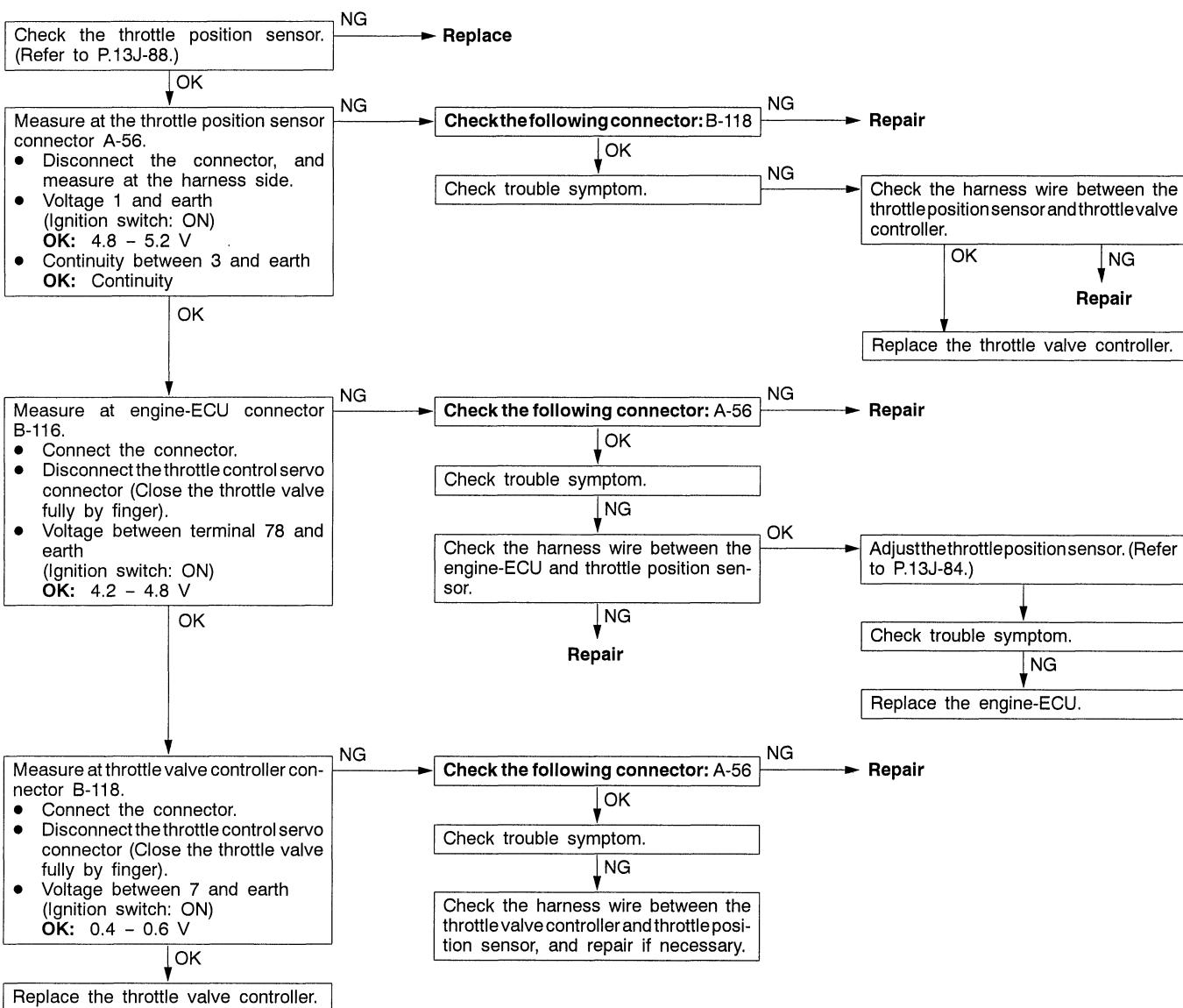


Code No.13 Intake air temperature sensor system	Probable cause
<p>Range of check</p> <ul style="list-style-type: none"> <li>After 60 seconds have passed since the engine have started</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>Sensor resistance is 0.14 kΩ or less for 4 seconds.</li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>Sensor resistance is 50 kΩ or more for 4 seconds.</li> </ul>	<ul style="list-style-type: none"> <li>Malfunction of the intake air temperature sensor</li> <li>Open circuit or short-circuited harness wire of the intake air temperature sensor circuit</li> <li>Malfunction of the engine-ECU</li> </ul>

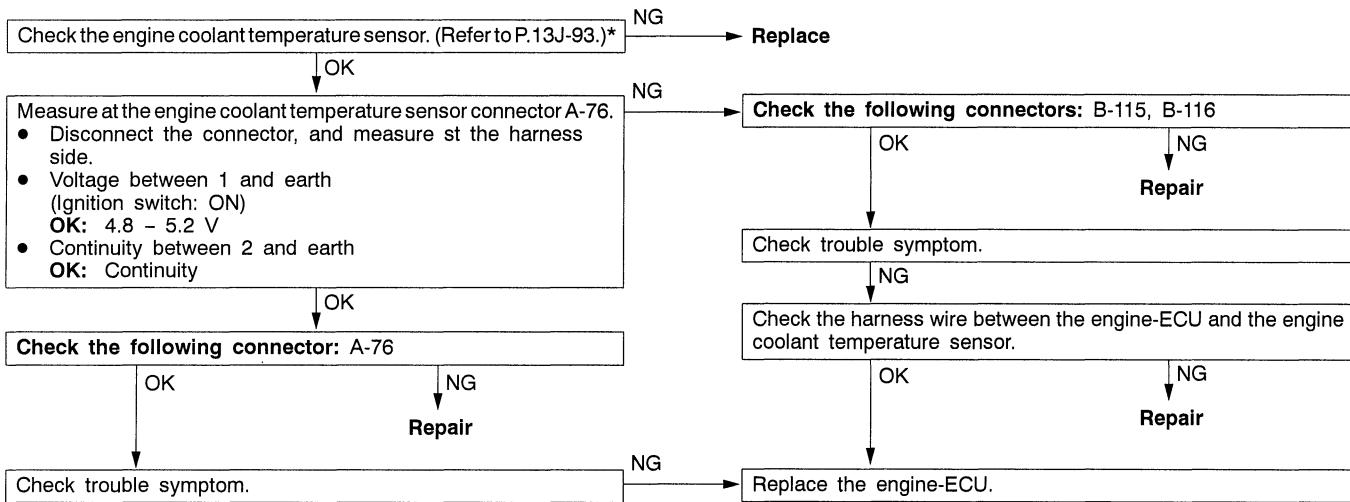


\*: Refer to '98 CARISMA GDI Workshop Manual (Pub. No. PWDE9502-C)

Code No.14 Throttle position sensor system (2nd channel)	Probable cause
<p>The throttle valve controller determines whether a failure is present or not, and sends a signal indicating its result to the engine-ECU.</p> <p>Range of check</p> <ul style="list-style-type: none"> <li>• Ignition switch: ON</li> <li>• Throttle position sensor (1st channel) is normal</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>• The throttle position sensor (1st channel) output voltage is 1.24 V or more, and the (2nd channel) output voltage is 4.6 V or more for one second.</li> <li>or</li> <li>• The throttle position sensor (1st channel) output voltage is 3.53 V or less, and the (2nd channel) output voltage is 0.2 V or less for one second.</li> <li>or</li> <li>• Throttle position sensor (1st and 2nd channels) output voltages are outside 4 to 6 V.</li> </ul>	<ul style="list-style-type: none"> <li>• Malfunction of throttle position sensor (2nd channel)</li> <li>• Open circuit or short-circuited harness wire in throttle position sensor (2nd channel) or poor connector contact</li> <li>• Faulty throttle valve controller</li> <li>• Malfunction of the engine-ECU</li> </ul>

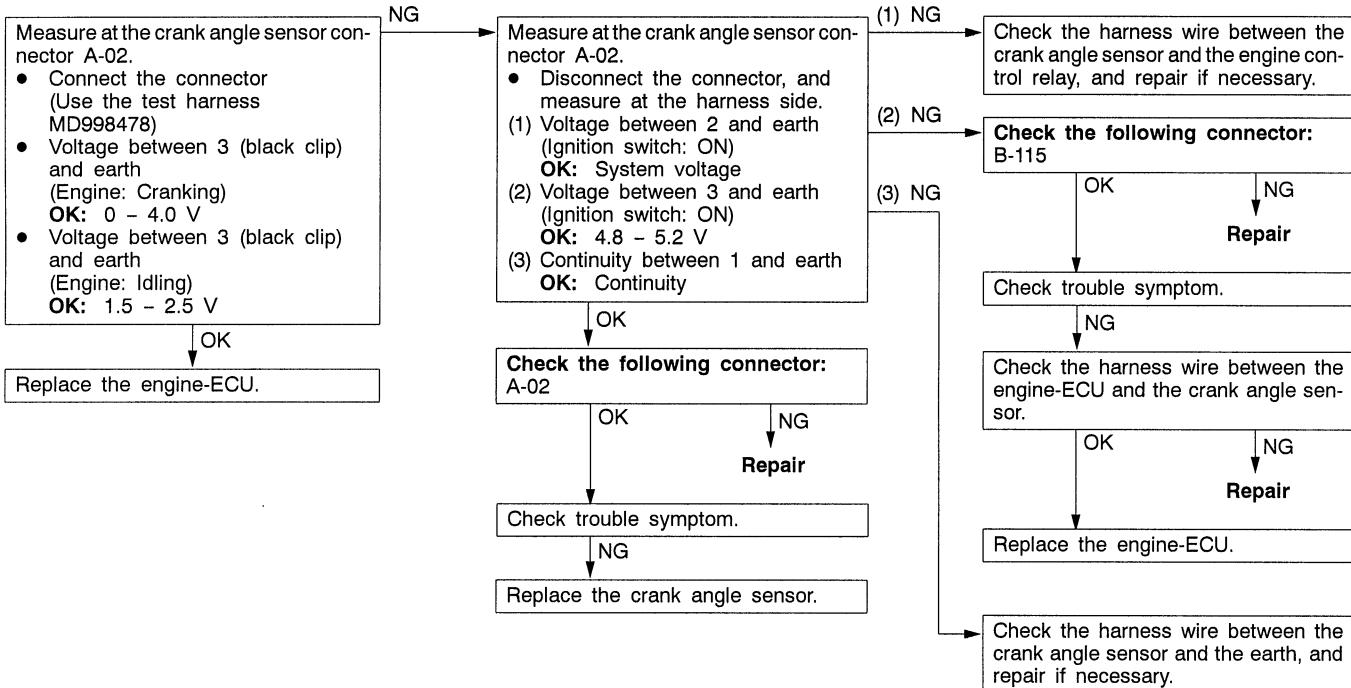


Code No.21 Engine coolant temperature sensor system	Probable cause
<p>Range of check</p> <ul style="list-style-type: none"> <li>After 60 seconds have passed since the engine have started</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>Sensor resistance is 50 Ω or less for 4 seconds.</li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>Sensor resistance is 72 kΩ or more for 4 seconds.</li> </ul>	<ul style="list-style-type: none"> <li>Malfunction of the engine coolant temperature sensor</li> <li>Open circuit or short-circuited harness wire of the engine coolant temperature sensor circuit</li> <li>Malfunction of the engine-ECU</li> </ul>
<p>Range of check</p> <ul style="list-style-type: none"> <li>After engine starts</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>After 5 minutes or more have passed since the engine coolant temperature after filtering has dropped from 40°C or more to less than this temperature</li> </ul>	

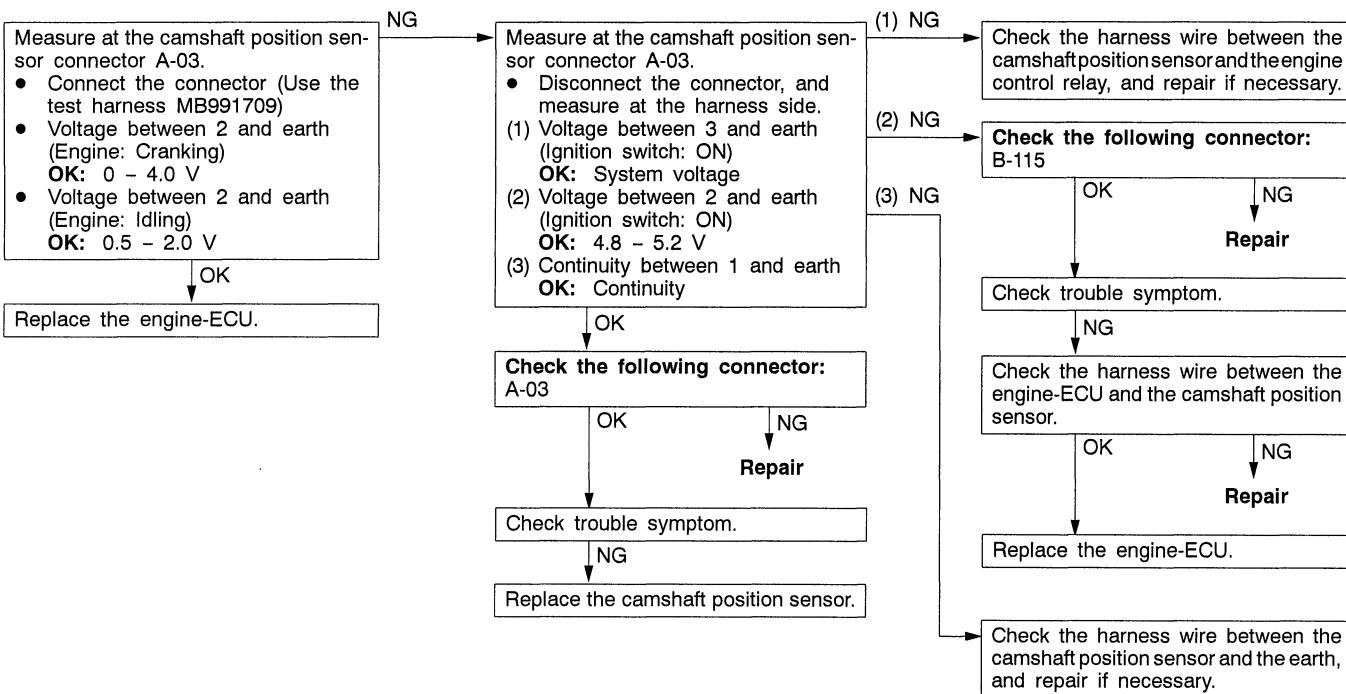


\*: Refer to '98 CARISMA GDI Workshop Manual (Pub. No. PWDE9502-C)

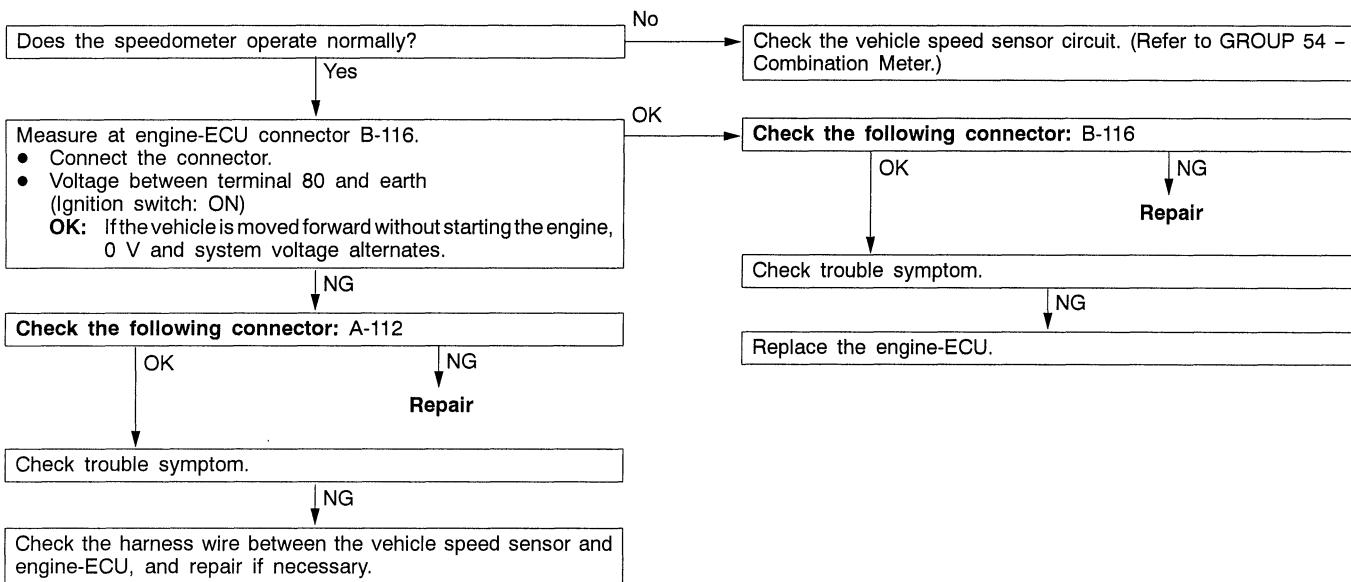
Code No.22 Crank angle sensor system	Probable cause
<p>Range of check</p> <ul style="list-style-type: none"> <li>• Engine: During cranking</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>• Sensor output voltage does not change for 4 seconds (no pulse signal is being input).</li> </ul>	<ul style="list-style-type: none"> <li>• Malfunction of the crank angle sensor</li> <li>• Open circuit or short-circuited harness wire of the crank angle sensor circuit</li> <li>• Malfunction of the engine-ECU</li> </ul>



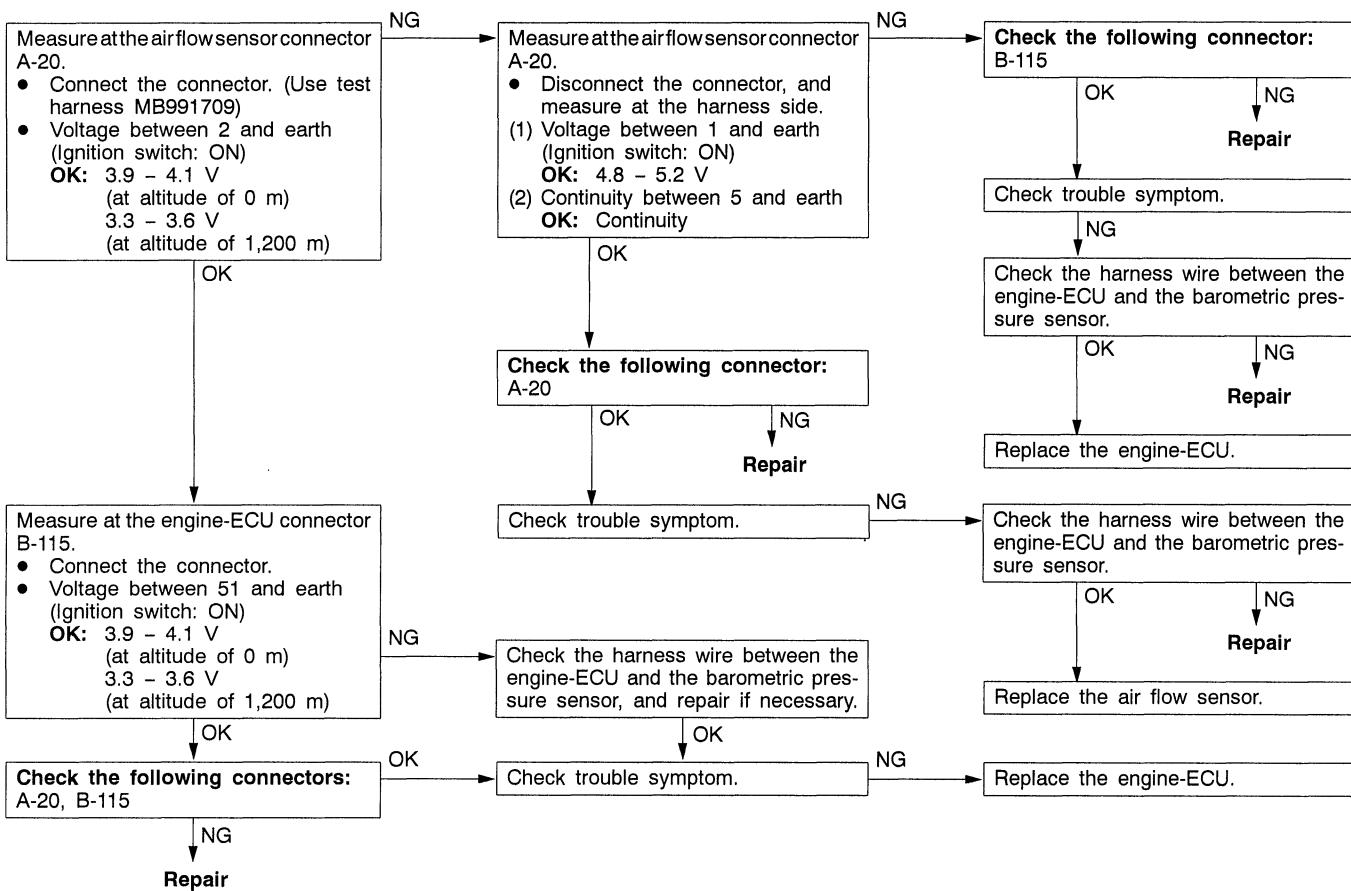
Code No.23 Camshaft position sensor system	Probable cause
<p>Range of check</p> <ul style="list-style-type: none"> <li>• While engine is cranking or running</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>• Sensor output voltage does not change for 4 seconds (no pulse signal is being input).</li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>• Abnormal pulse signal pattern is output.</li> </ul>	<ul style="list-style-type: none"> <li>• Malfunction of the camshaft position sensor</li> <li>• Open circuit or short-circuited harness wire of the camshaft position sensor</li> <li>• Malfunction of the engine-ECU</li> </ul>



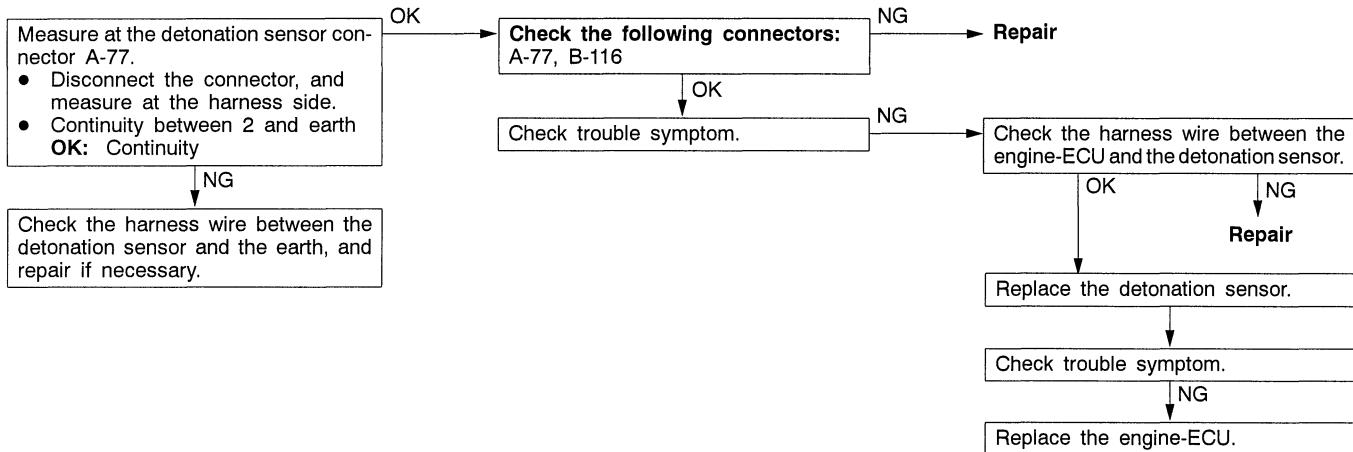
Code No. 24 Vehicles speed sensor system	Probable cause
<p>Range of check</p> <ul style="list-style-type: none"> <li>Ignition switch: ON</li> <li>Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts.</li> <li>Engine speed is 3,000 r/min or more.</li> <li>Driving under high engine load conditions.</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>Sensor output voltage does not change for 4 seconds (no pulse signal input).</li> </ul>	<ul style="list-style-type: none"> <li>Malfunction of the vehicle speed sensor</li> <li>Improper connector contact, open circuit or short-circuited harness wire of the vehicle speed sensor circuit</li> <li>Malfunction of the engine-ECU</li> </ul>



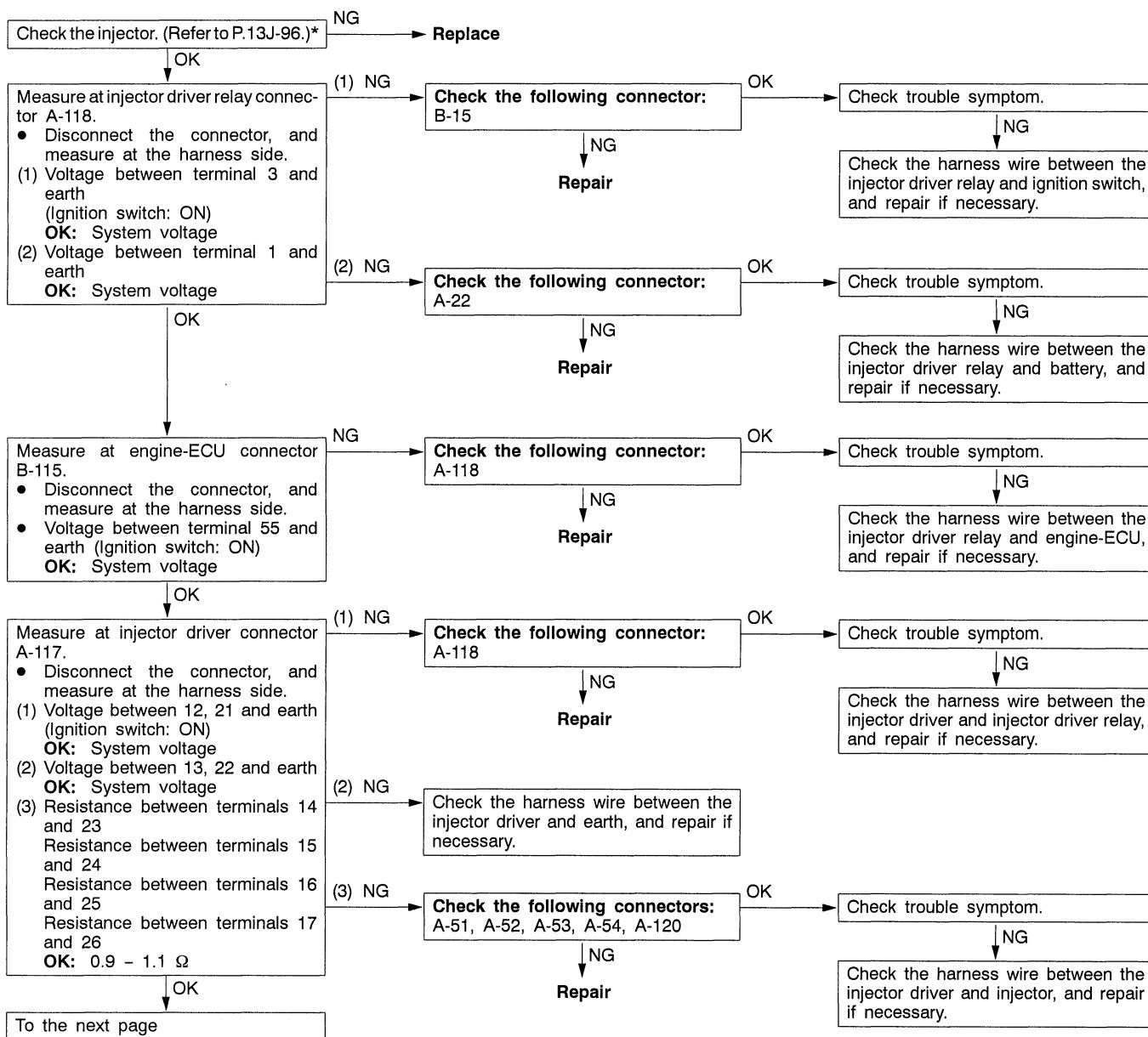
Code No.25 Barometric pressure sensor system	Probable cause
<p>Range of check</p> <ul style="list-style-type: none"> <li>After 60 seconds have passed since the engine have started</li> <li>Battery voltage is 8 V or more.</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>Sensor output voltage is 0.2 V or less for 4 seconds. or</li> <li>Sensor output voltage is 4.5 V or more for 4 seconds.</li> </ul>	<ul style="list-style-type: none"> <li>Malfunction of the barometric pressure sensor</li> <li>Open circuit or short-circuited harness wire of the barometric pressure sensor</li> <li>Malfunction of the engine-ECU</li> </ul>

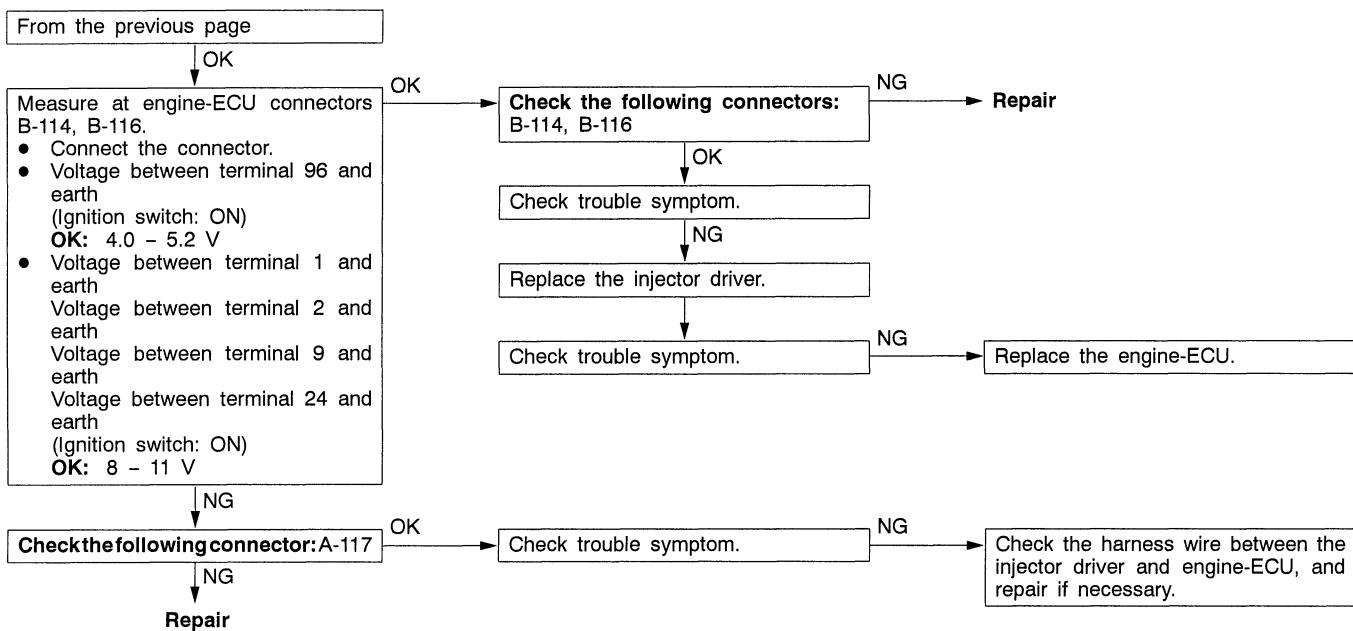


Code No.31 Detonation sensor system	Probable cause
<p>Range of check</p> <ul style="list-style-type: none"> <li>After 60 seconds have passed since the engine have started</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>Amount of change in the sensor output voltage (detonation sensor peak voltage for each half rotation of the crankshaft) is 0.06 V or less for 200 continuous times.</li> </ul>	<ul style="list-style-type: none"> <li>Malfunction of the detonation sensor</li> <li>Open circuit or short-circuited harness wire of the detonation sensor</li> <li>Malfunction of the engine-ECU</li> </ul>



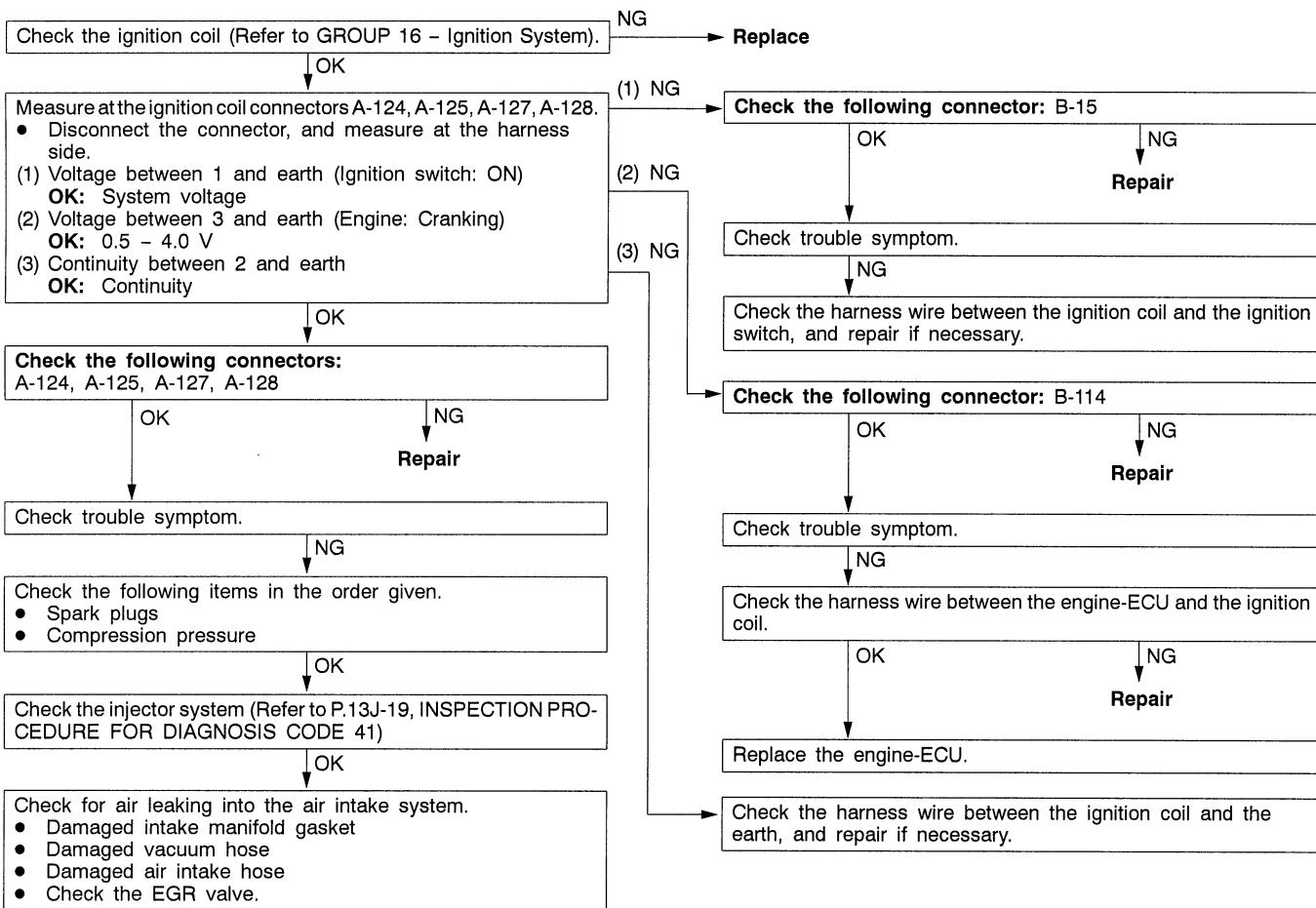
Code No.41 Injector system	Probable cause
<p>Range of check</p> <ul style="list-style-type: none"> <li>• Engine: while cranking, or running</li> <li>• Engine speed: 4,000 r/min or less</li> <li>• System voltage: 10 V or more</li> <li>• Fuel shut off, or forcible activating of injector (actuator test) is not in operation.</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>• Injector open circuit check signal is not output from the injector driver predetermined time(s).</li> </ul>	<ul style="list-style-type: none"> <li>• Malfunction of the injector</li> <li>• Faulty injector driver relay</li> <li>• Faulty injector driver</li> <li>• Open circuit or short-circuited harness wire in the injector drive circuit, or poor connector contact</li> <li>• Malfunction of the engine-ECU</li> </ul>





\*: Refer to '98 CARISMA GDI Workshop Manual (Pub. No. PWDE9502-C)

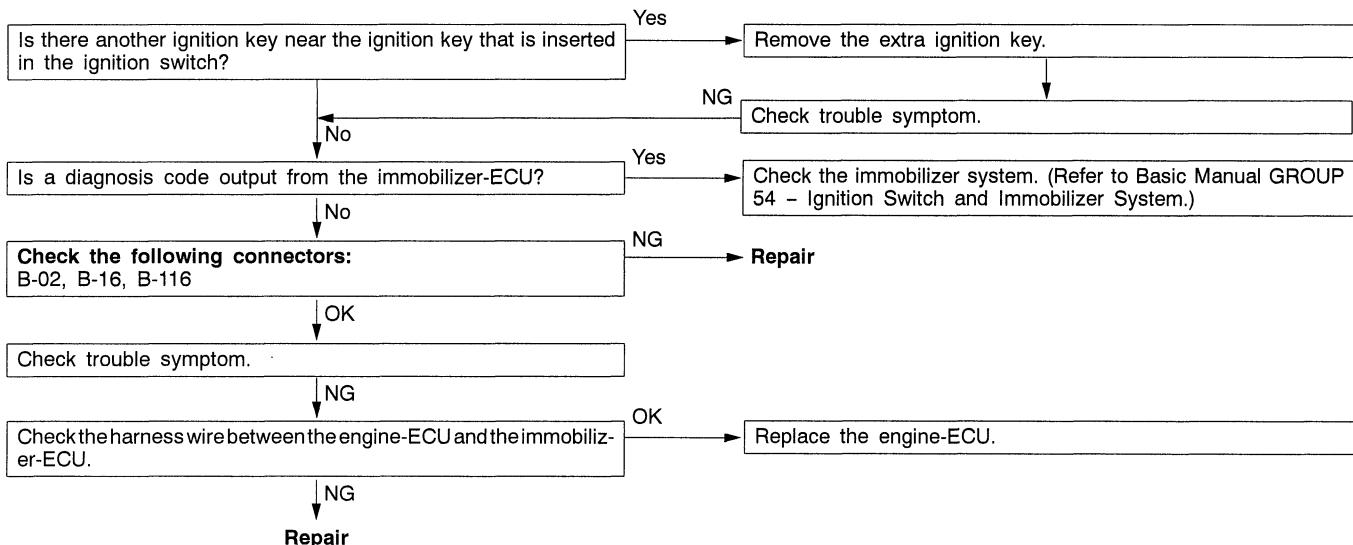
Code No.44 Abnormal combustion	Probable cause
<p>Range of check</p> <ul style="list-style-type: none"> <li>While engine is running during lean fuel combustion</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>Abnormal engine speed due to mis-firing is detected by the crank angle sensor</li> </ul>	<ul style="list-style-type: none"> <li>Malfunction of the ignition coil</li> <li>Malfunction of the spark plug</li> <li>Malfunction of the EGR valve</li> <li>Open circuit or short-circuit in ignition primary circuit</li> <li>Malfunction of the injector system</li> <li>Malfunction of the engine-ECU</li> </ul>



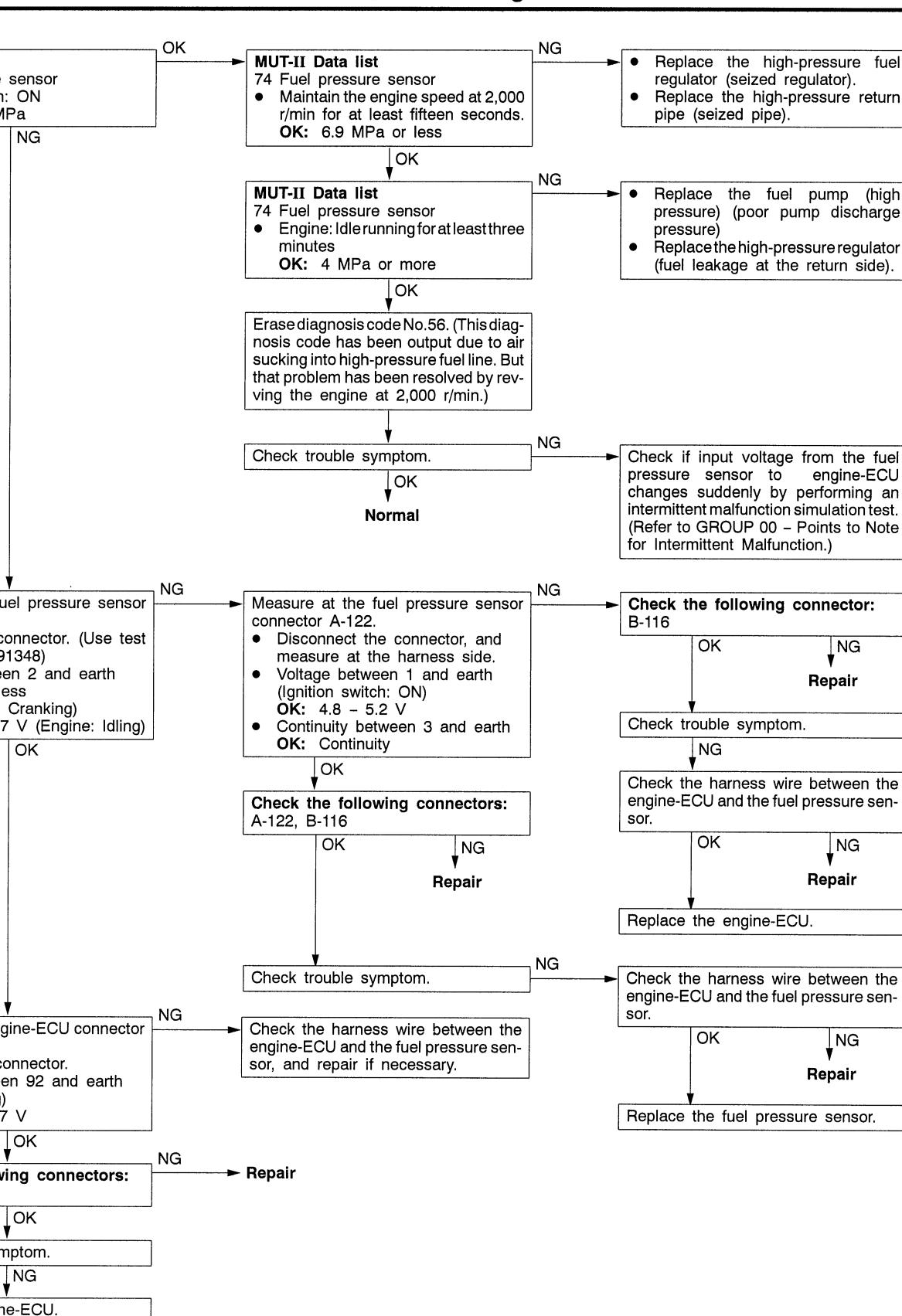
Code No.54 Immobilizer system	Probable cause
Range of Check • Ignition switch: ON Set Conditions • Improper communication between the engine-ECU and immobilizer-ECU	• Radio interference of encrypted codes • Incorrect encrypted code • Malfunction of harness or connector • Malfunction of immobilizer-ECU • Malfunction of engine-ECU

## NOTE

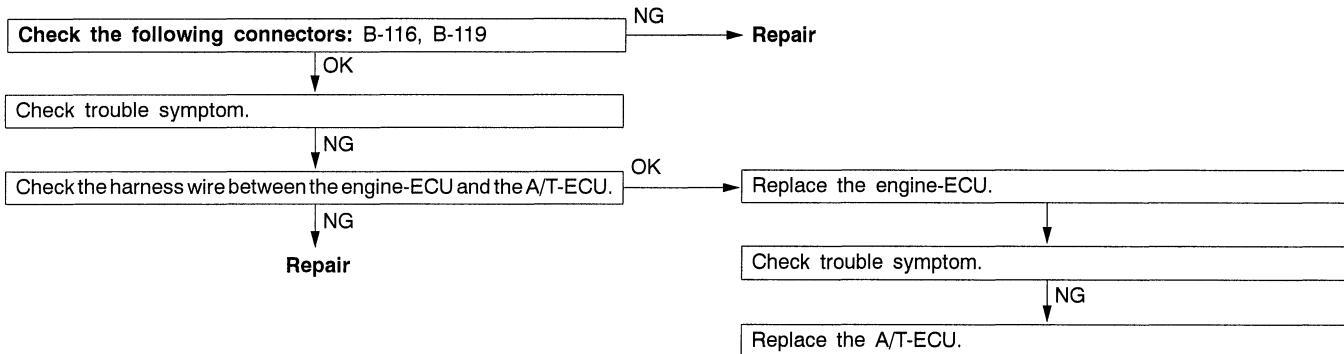
- (1) If the ignition switches are close each other when starting the engine, radio interference may cause this code to be displayed.
- (2) This code may be displayed when registering the key encrypted code.



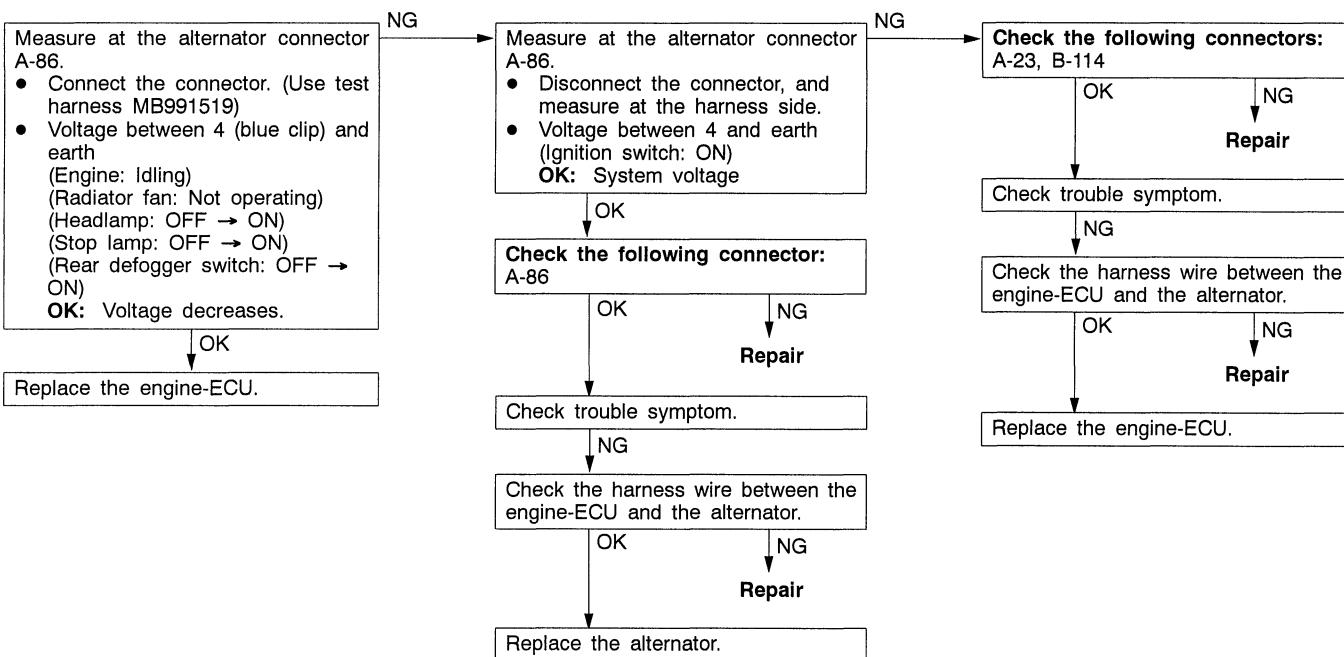
Code No.56 Abnormal fuel pressure system	Probable cause
<p>Range of check</p> <ul style="list-style-type: none"> <li>Ignition switch: ON</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>Sensor output voltage is 4.8 V or more for four seconds. or</li> <li>Sensor output voltage is 0.2 V or less for four seconds.</li> </ul> <p>Range of check</p> <ul style="list-style-type: none"> <li>After the engine is started, the following conditions have been detected:           <ul style="list-style-type: none"> <li>(1) Engine speed: 1,000 r/min or more</li> <li>(2) Fuel pressure: 2 MPa or more</li> </ul> </li> <li>While engine is running</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>Fuel pressure is 6.9 MPa or more for four seconds. or</li> <li>Fuel pressure is 2 MPa or less for four seconds.</li> </ul> <p>This diagnosis code is also output when air is sucked in high-pressure fuel line due to no fuel supply. In this case, air can be bled by letting the engine run at 2,000 r/min for at least fifteen seconds. After the air bleeding, the diagnosis code must be erased by the MUT-II.</p>	<ul style="list-style-type: none"> <li>Malfunction of the fuel pressure sensor</li> <li>Open circuit or short-circuited harness wire of the fuel pressure sensor</li> <li>Malfunction of the engine-ECU</li> <li>Malfunction of the fuel pump (high pressure)</li> <li>Malfunction of the fuel pressure regulator (high pressure)</li> <li>Clogged high-pressure fuel line</li> </ul> <ul style="list-style-type: none"> <li>Air sucking due to no fuel supply</li> </ul>



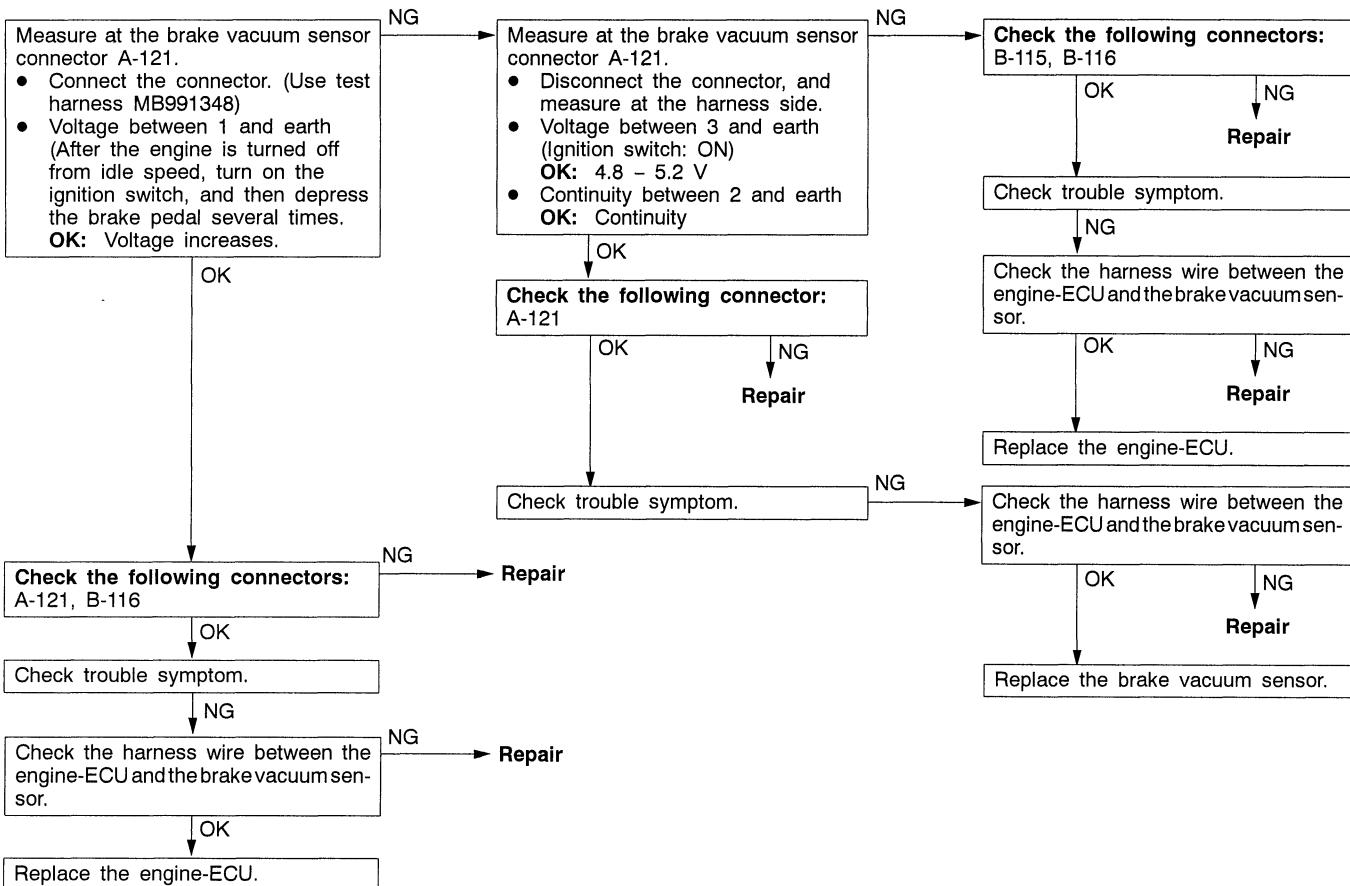
Code No.61 Communication wire with A/T-ECU system	Probable cause
<p>Range of check</p> <ul style="list-style-type: none"> <li>After 60 seconds have passed since the engine have started</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>Torque reduction request signal from A/T-ECU is input continuously for 1.5 seconds or more.</li> </ul>	<ul style="list-style-type: none"> <li>Short circuit in ECU communication circuit</li> <li>Malfunction of the engine-ECU</li> <li>Malfunction of the A/T-ECU</li> </ul>



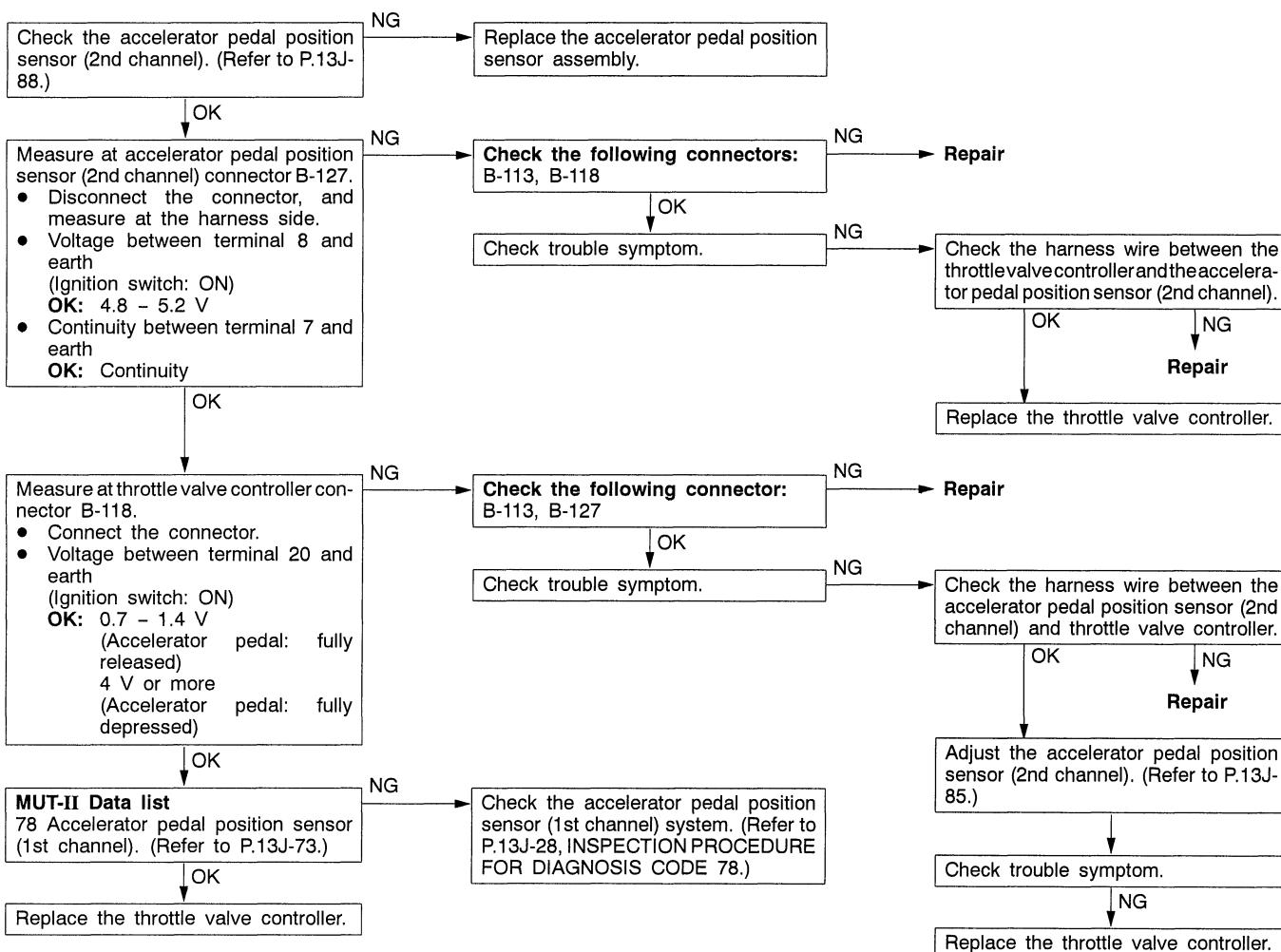
Code No.64 Alternator FR terminal system	Probable cause
<p>Range of check</p> <ul style="list-style-type: none"> <li>Engine speed is 50 r/min or more.</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>Input voltage from the alternator FR terminal is system voltage for 20 seconds.</li> </ul>	<ul style="list-style-type: none"> <li>Open circuit in alternator FR terminal circuit</li> <li>Malfunction of the engine-ECU</li> </ul>



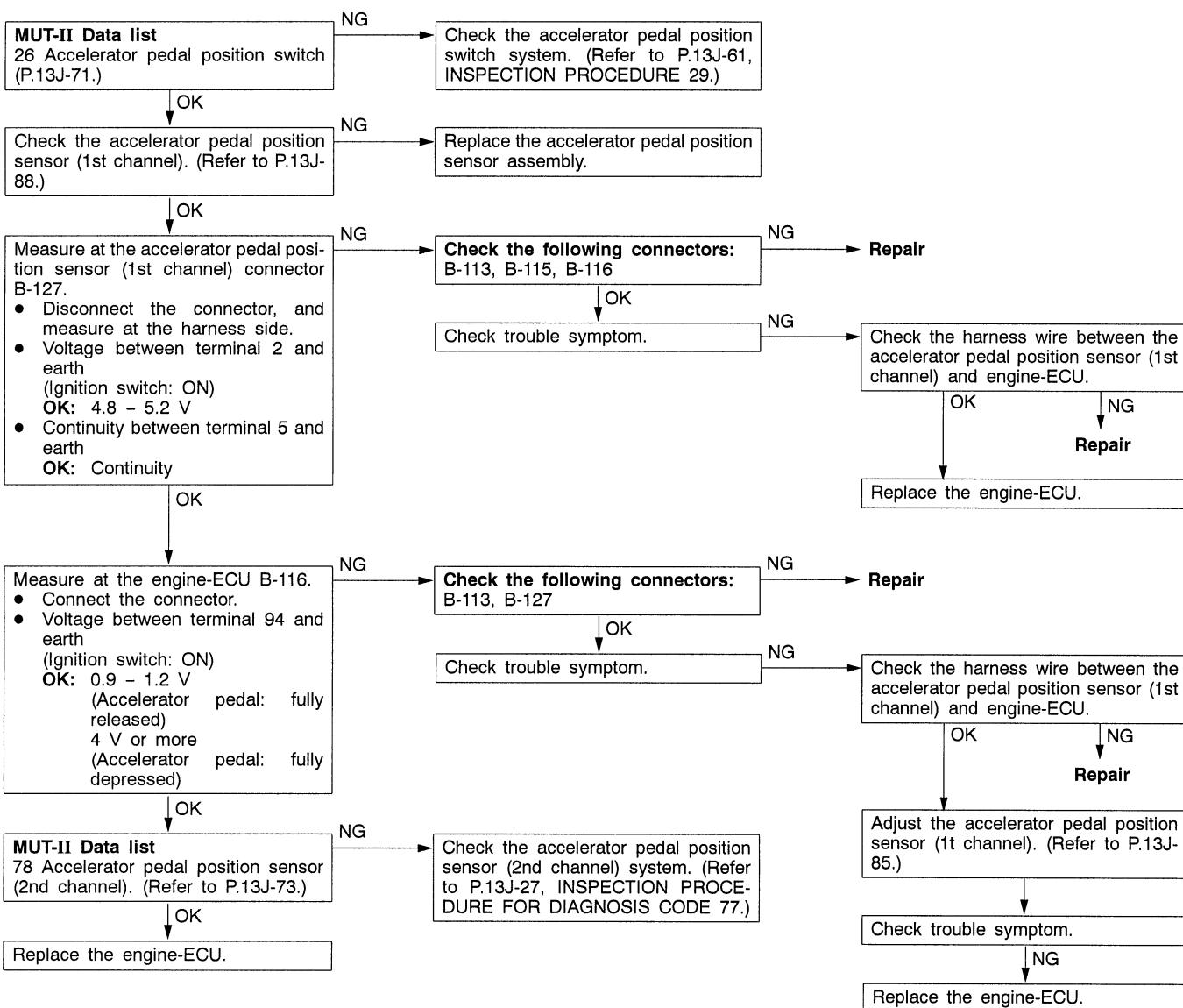
Code No.66 Brake vacuum sensor system	Probable cause
<p>Range of check</p> <ul style="list-style-type: none"> <li>• Ignition switch: ON</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>• Sensor output voltage is 4.8 V or more.</li> <li>or</li> <li>• Sensor output voltage is 0.2 V or less.</li> </ul>	<ul style="list-style-type: none"> <li>• Malfunction of the brake vacuum sensor</li> <li>• Improper connector contact, open circuit or short-circuited harness wire of the brake vacuum sensor</li> <li>• Malfunction of the engine-ECU</li> </ul>



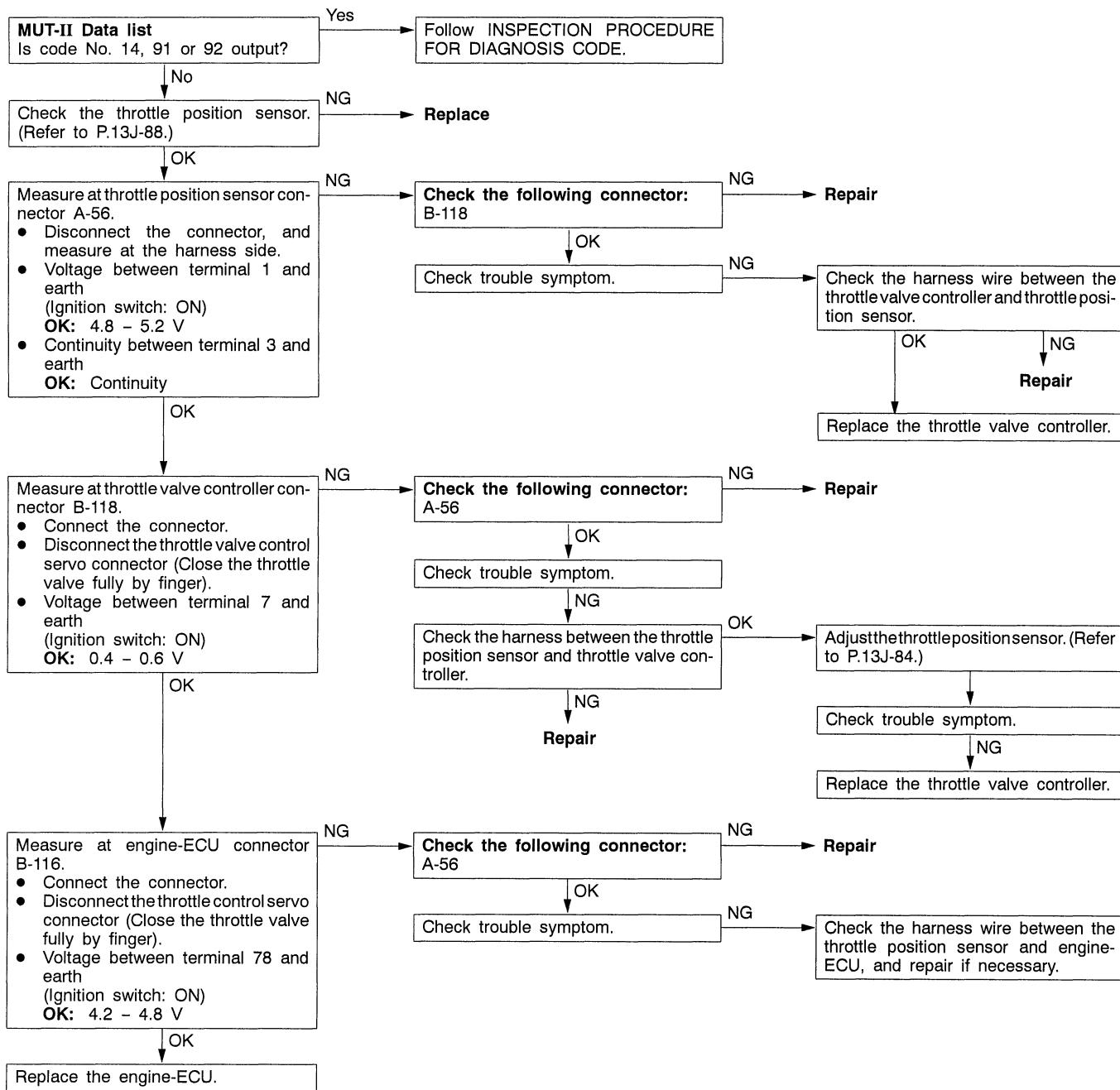
Code No.77 Accelerator pedal position sensor (2nd channel) system	Probable cause
<p>Range of check</p> <ul style="list-style-type: none"> <li>Accelerator pedal position sensor (1st channel) system is normal.</li> <li>Communication between the engine-ECU and throttle valve controller is normal.</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>Output voltage of accelerator position sensor (2nd channel) system is 0.2 V or less for one second.</li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>Output voltage of the accelerator pedal position sensor (1st channel) is 2.5 V or less, and output voltage of the accelerator pedal position sensor (2nd channel) is 4.5 V or more for one second.</li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>Difference between the accelerator pedal position sensor output voltages (1st and 2nd channels) exceeds 1.0V (i.e. when the throttle valve opening angle changes slightly).</li> </ul>	<ul style="list-style-type: none"> <li>Malfunction of the accelerator pedal position sensor (2nd channel)</li> <li>Open circuit or short-circuited harness wire in the accelerator pedal position sensor (2nd channel) system, or poor connector contact</li> <li>Malfunction of the throttle valve controller</li> <li>Malfunction of the engine-ECU</li> </ul>



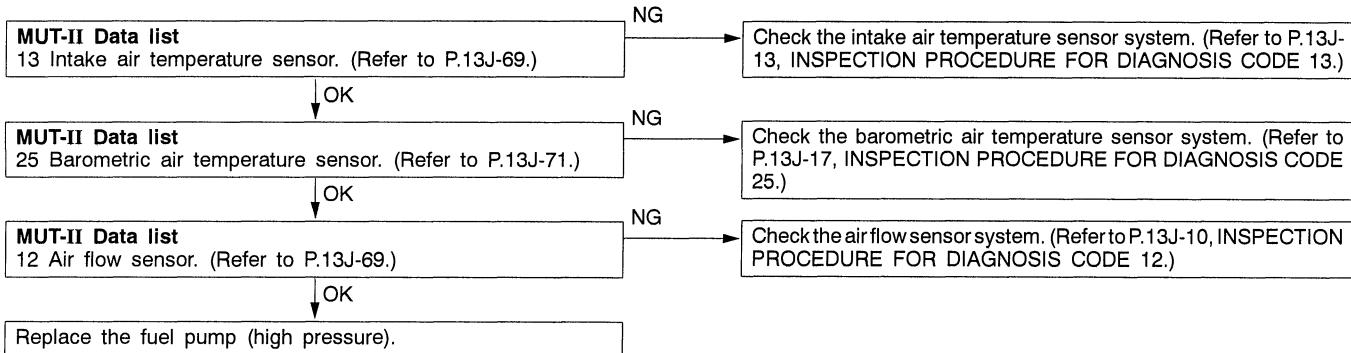
Code No.78 Accelerator pedal position sensor (1st channel) system	Probable cause
<p>Range of check</p> <ul style="list-style-type: none"> <li>Accelerator pedal position sensor (2nd channel) system is normal.</li> <li>Communication between the engine-ECU and throttle valve controller is normal.</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>Output voltage of accelerator position sensor (1st channel) system is 0.2 V or less for one second.</li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>Output voltage of the accelerator pedal position sensor (2nd channel) is 2.5 V or less, and (1st channel) output voltage of the accelerator pedal position sensor is 4.5 V or more for one second.</li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>Difference between the accelerator pedal position sensor (1st and 2nd channels) output voltages exceeds 1.0 V (i.e. when the throttle valve opening angle changes slightly).</li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>Although the accelerator pedal position switch is on, 1st-channel output voltage of the accelerator pedal position sensor exceeds 1.1 V for one second.</li> </ul>	<ul style="list-style-type: none"> <li>Malfunction of the accelerator pedal position sensor (1st channel)</li> <li>Open circuit or short-circuited harness wire in the accelerator pedal position sensor (1st channel) system, or poor connector contact</li> <li>ON-seizure of the accelerator pedal position switch</li> <li>Malfunction of the throttle valve controller</li> <li>Malfunction of the engine-ECU</li> </ul>



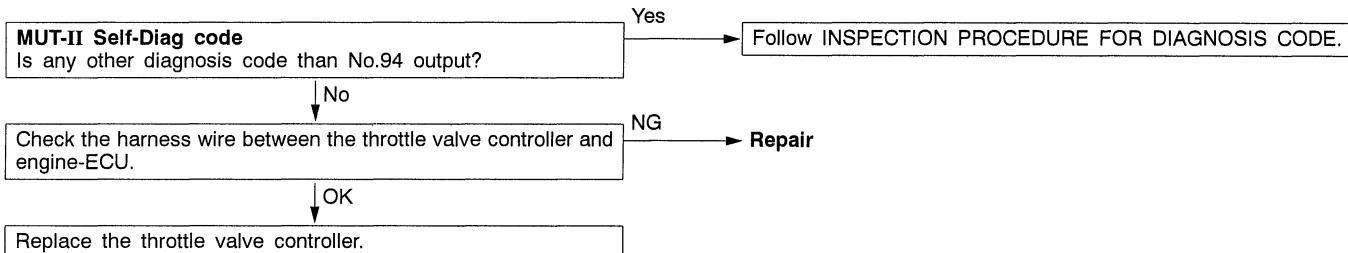
Code No.79 Throttle position sensor (1st channel) system	Probable cause
<p>The throttle valve controller determines a failure, and sends its result to the engine-ECU.</p> <p>Range of check</p> <ul style="list-style-type: none"> <li>• Ignition switch: ON</li> <li>• System voltage: 8 V or more</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>• Output voltage of the sensor remains 0.2 V for one second. or</li> <li>• Output voltage of the sensor remains 4.9 V for one second. or</li> <li>• Output voltage of the throttle position sensor (1st and 2nd channels) remains outside 4 – 6 V for four seconds.</li> </ul>	<ul style="list-style-type: none"> <li>• Malfunction of the throttle position sensor (1st channel)</li> <li>• Open circuit or short-circuited harness wire in the throttle position sensor (1st channel), or poor connector contact</li> <li>• Malfunction of the throttle valve controller</li> <li>• Malfunction of the engine-ECU</li> </ul>



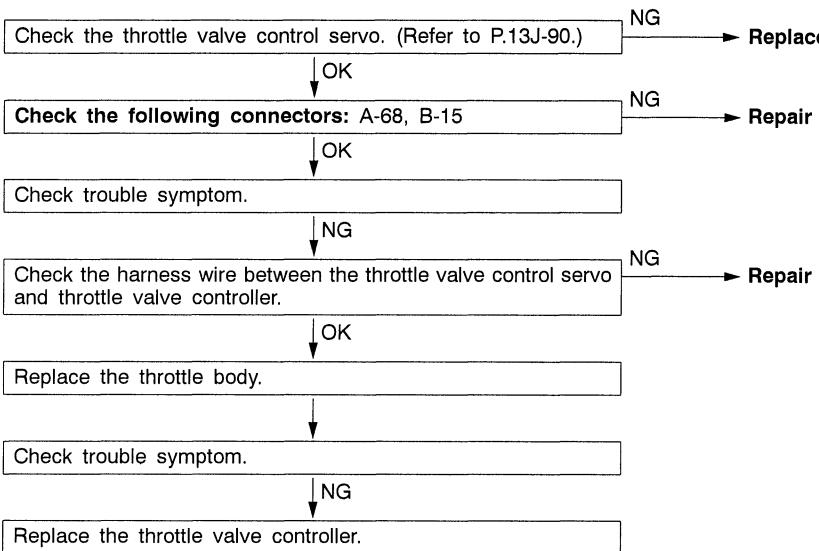
Code No.89 Abnormal fuel system	Probable cause
Range of check • Engine: Idling (during stoichio-feedback operation) Set conditions • Fuel injection correction value remains excessively low for ten seconds or more. or • Fuel injection correction value remains excessively high for ten seconds or more.	• Malfunction of the fuel pump (high pressure) • Malfunction of the intake air temperature sensor • Malfunction of the barometric pressure sensor • Malfunction of the air flow sensor • Malfunction of the engine-ECU



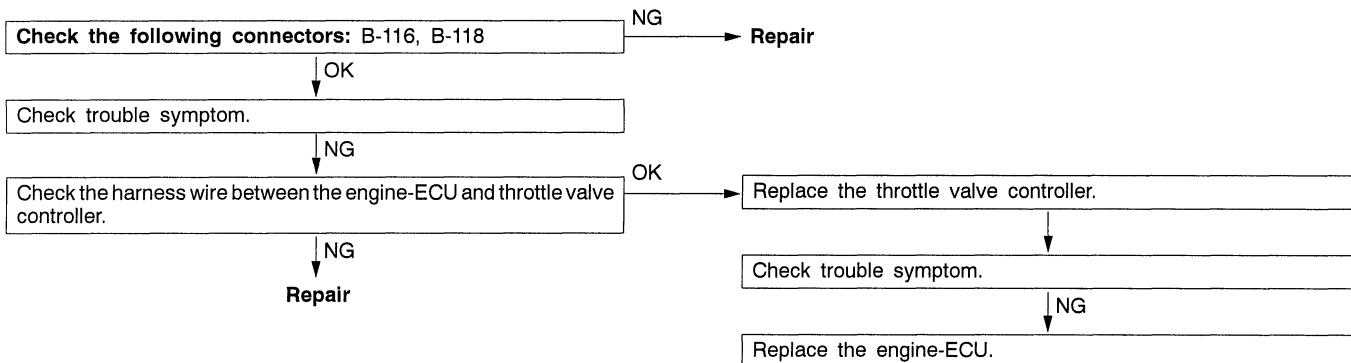
Code No.91 Electronic-controlled throttle valve system	Probable cause
<p>Range of check</p> <ul style="list-style-type: none"> <li>• Ignition switch: ON</li> <li>• Error in communication between the engine-ECU and throttle valve controller</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>• Output voltage of the throttle position sensor (2nd channel) fluctuates significantly (approx. 1 V or more) from an expected value.</li> </ul> <p>Range of check</p> <ul style="list-style-type: none"> <li>• Ignition switch: ON</li> <li>• Error in communication between the throttle valve controller and engine-ECU</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>• The throttle valve opening angle (voltage) which the engine-ECU requested of the throttle valve controller is significantly different from output voltage of the (2nd channel) throttle position sensor (approx. one volt).</li> </ul>	<ul style="list-style-type: none"> <li>• Short in communication line</li> <li>• Malfunction of the engine-ECU</li> <li>• Malfunction of the throttle valve controller</li> </ul>



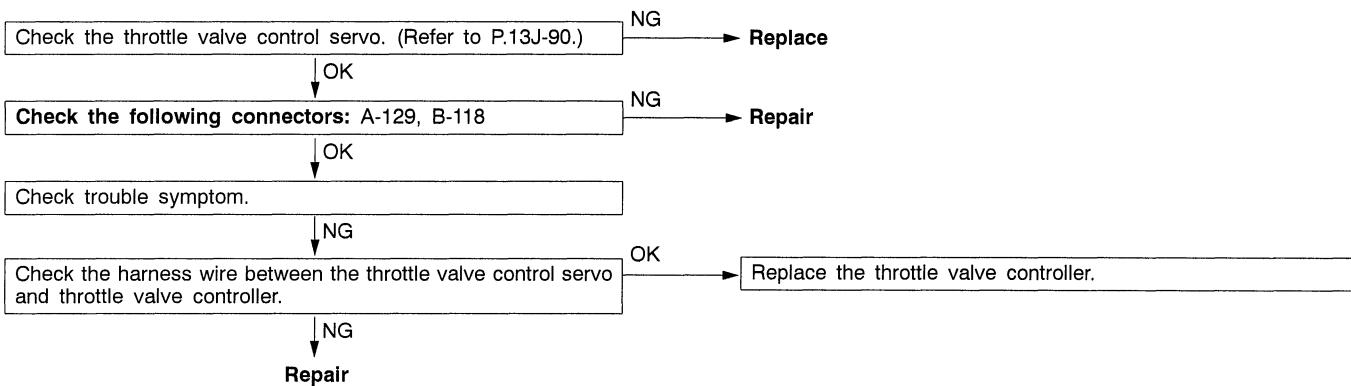
Code No.92 Throttle valve position feedback system	Probable cause
<p>The throttle valve controller determines if a failure is present, and sends its result to the engine-ECU.</p> <p>Range of check</p> <ul style="list-style-type: none"> <li>• Ignition switch: ON</li> <li>• System voltage: 8 V or more</li> </ul> <p>Set condition</p> <ul style="list-style-type: none"> <li>• Motor position feedback system is defective (System detects a motor overcurrent, or that actual and projected opening angles of the throttle position sensor (1st channel) are different by 1.0 V or more.</li> </ul>	<ul style="list-style-type: none"> <li>• Malfunction of the throttle position sensor (1st channel)</li> <li>• Open circuit or short-circuited harness wire in the throttle position sensor system (1st channel), or poor connector contact</li> <li>• Malfunction of the throttle valve controller</li> </ul>



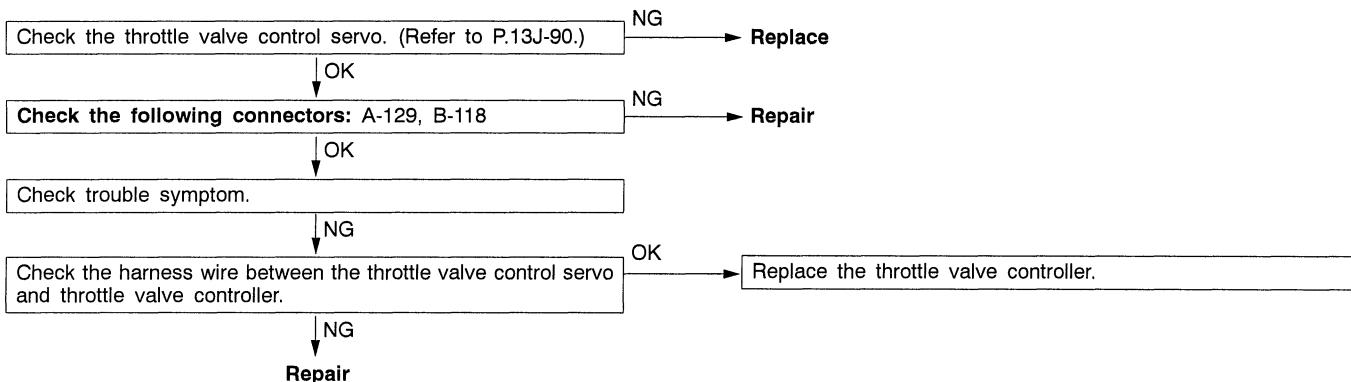
Code No.94 Communication line system with throttle valve controller	Probable cause
<p>Range of check</p> <ul style="list-style-type: none"> <li>• Ignition switch: ON</li> <li>• System voltage: 8 V or more</li> <li>• Engine: not cranking</li> </ul> <p>Set condition</p> <ul style="list-style-type: none"> <li>• System detects an error in communication line between the engine-ECU and throttle valve controller.</li> </ul>	<ul style="list-style-type: none"> <li>• Short circuit in communication line</li> <li>• Malfunction of the engine-ECU</li> <li>• Malfunction of the throttle valve controller</li> </ul>



Code No.95 Throttle valve control servo motor (Motor 1st phase malfunction) system	Probable cause
<p>Range of check</p> <ul style="list-style-type: none"> <li>• Throttle valve control servo relay: ON</li> <li>• System voltage: 8 V or more</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>• Throttle valve control servo drive circuit is shorted to earth.</li> <li>• Other power source interferences with throttle valve control servo drive circuit.</li> <li>• Throttle valve control servo drive circuit is open circuit.</li> </ul>	<ul style="list-style-type: none"> <li>• Malfunction of the throttle valve control servo</li> <li>• Open circuit or short-circuited harness wire in throttle valve control servo system, or poor connector contact</li> <li>• Malfunction of the throttle valve controller</li> </ul>



Code No.99 Throttle valve control servo motor (Motor 2nd phase malfunction) system	Probable cause
<p>Range of check</p> <ul style="list-style-type: none"> <li>• Throttle valve control servo relay: ON</li> <li>• System voltage: 8V or more</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>• Throttle valve control servo drive circuit is shorted to earth.</li> <li>• Other power source interferes with throttle valve control servo drive circuit.</li> <li>• Throttle valve control servo drive circuit is open-circuited.</li> </ul>	<ul style="list-style-type: none"> <li>• Malfunction of the throttle valve control servo</li> <li>• Open circuit or short-circuited harness wire in the throttle valve control servo system, or poor connector contact</li> <li>• Malfunction of the throttle valve controller</li> </ul>



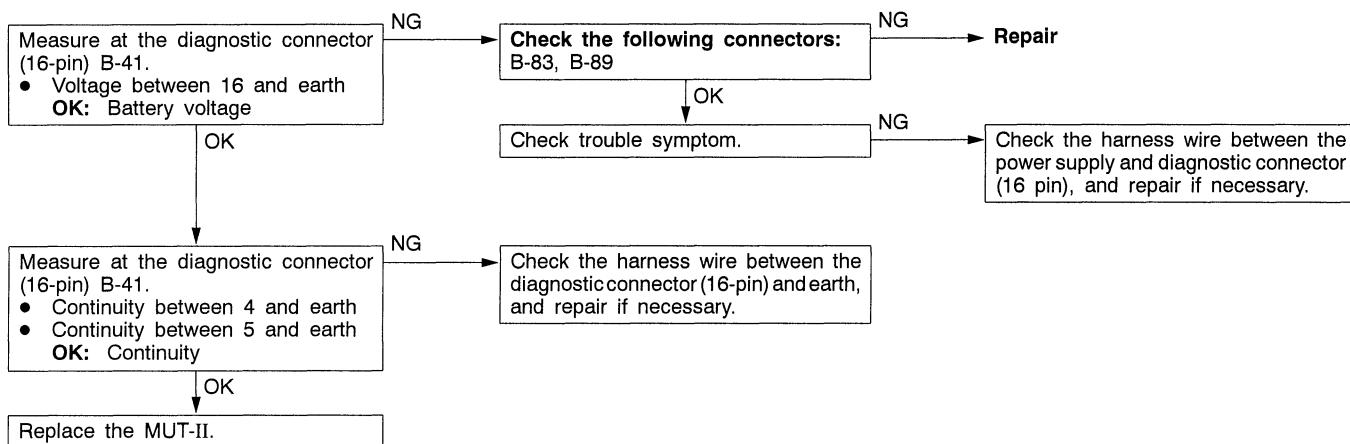
## INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom		Inspection procedure No.	Reference page
Communication with MUT-II is impossible.	Communication with all systems is not possible.	1	13J-35
	Communication with engine-ECU only is not possible.	2	13J-35
Engine warning lamp and related parts	The engine warning lamp does not illuminate right after the ignition switch is turned to the ON position.	3	13J-36
	The engine warning lamp remains illuminating and never goes out.	4	13J-36
Starting	No initial combustion (starting impossible)	5	13J-37
	Initial combustion but no complete combustion (starting impossible)	6	13J-39
	Long time to start (improper starting)		
Idling stability (Improper idling)	Unstable idling (Rough idling, hunting)	7	13J-41
	Idling speed is high. (Improper idling speed)	8	13J-43
	Idling speed is low. (Improper idling speed)		
Idling stability (Engine stalls)	When the engine is cold, it stalls at idling. (Die out)	9	13J-44
	When the engine is hot, it stalls at idling. (Die out)	10	13J-45
	The engine stalls when starting the car. (Pass out)	11	13J-47
	The engine stalls when decelerating.	12	13J-48
Driving	Hesitation, sag or stumble	13	13J-49
	Poor acceleration		
	Surge		
	The feeling of impact or vibration when accelerating	14	13J-50
	The feeling of impact or vibration when decelerating	15	13J-51
	Knocking	16	13J-51
Dieseling		17	13J-51
Too high CO and HC concentration when idling		18	13J-52
Low alternator output voltage (approx. 12.3 V)		19	13J-54
Engine idle speed is incorrect while the A/C is on.		20	13J-54
Fans (radiator fan, A/C condenser fan) are inoperative		21	13J-55
GDI ECO indication lamp system	The GDI ECO indication lamp does not illuminate.	22	13J-56
	The GDI ECO indication lamp remains on (does not extinguish).	23	13J-57
Malfunction of the clutch switch system <M/T>		24	13J-57

## INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

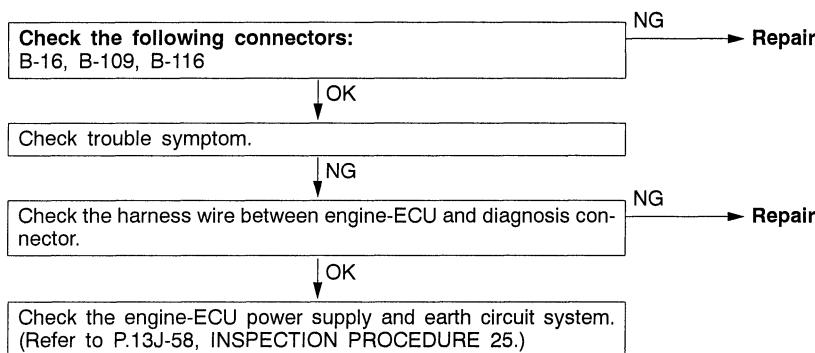
## INSPECTION PROCEDURE 1

Communication with MUT-II is not possible. (Communication with all systems is not possible.)	Probable cause
<p>The cause is probably a defect in the power supply system (including earth) for the diagnosis line.</p>	<ul style="list-style-type: none"> <li>• Malfunction of the connector</li> <li>• Malfunction of the harness wire</li> </ul>



## INSPECTION PROCEDURE 2

MUT-II communication with engine-ECU is impossible.	Probable cause
<p>One of the following causes may be suspected.</p> <ul style="list-style-type: none"> <li>• No power supply to engine-ECU.</li> <li>• Defective earth circuit of engine-ECU.</li> <li>• Defective engine-ECU.</li> <li>• Improper communication line between engine-ECU and MUT-II</li> </ul>	<ul style="list-style-type: none"> <li>• Malfunction of engine-ECU power supply circuit</li> <li>• Malfunction of engine-ECU</li> <li>• Open circuit between the engine-ECU and diagnosis connector</li> </ul>

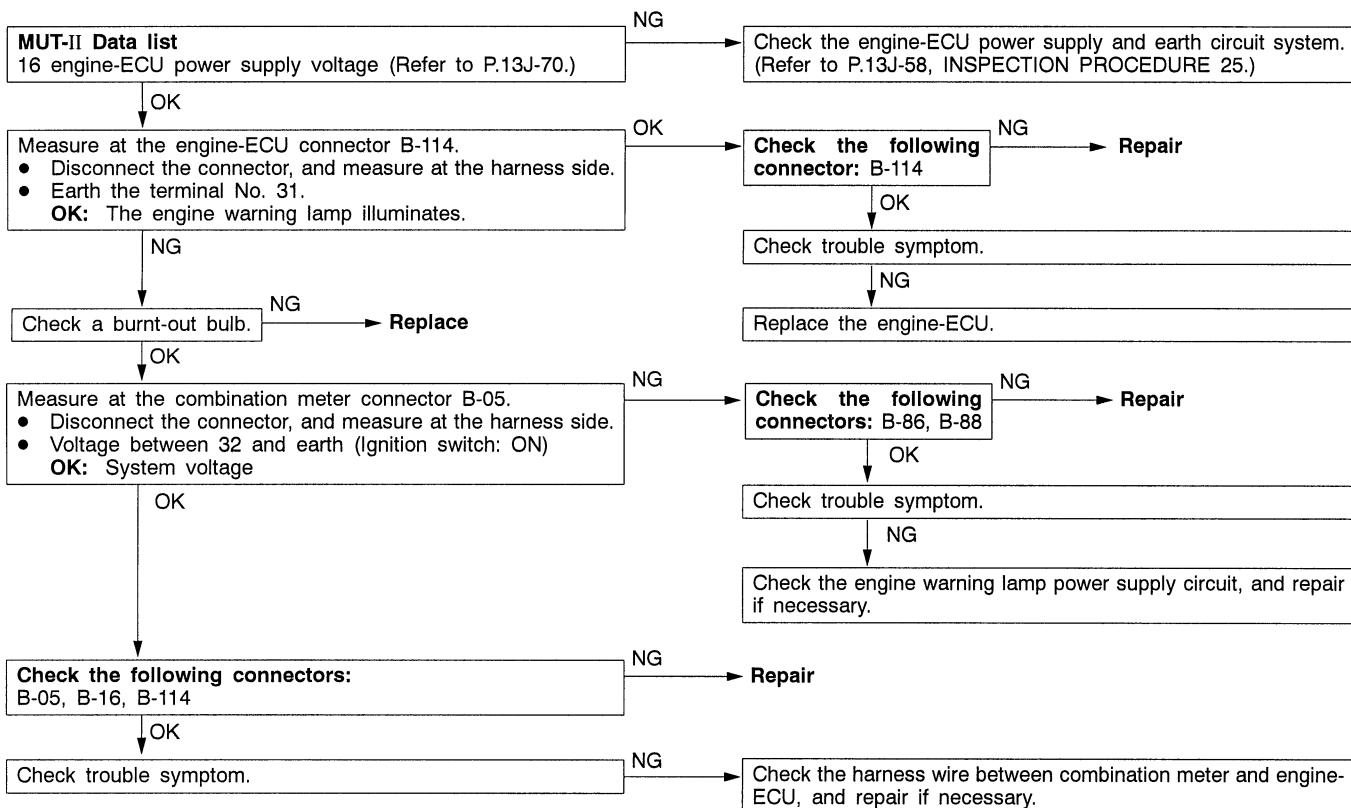


## NOTE

On-vehicles with the multi-center display, if a malfunction cannot be resolved after the procedure above, check the multi-center display and replace if necessary. (Refer to GROUP 54 – Multi-center display.)

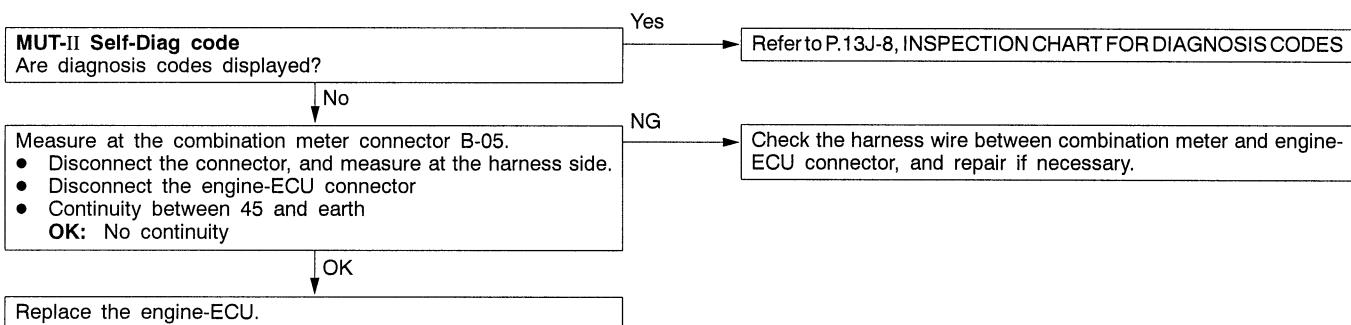
## INSPECTION PROCEDURE 3

The engine warning lamp does not illuminate right after the ignition switch is turned to the ON position.	Probable cause
<p>Because there is a burnt-out bulb, the engine-ECU causes the engine warning lamp to illuminate for five seconds immediately after the ignition switch is turned to ON. If the engine warning lamp does not illuminate immediately after the ignition switch is turned to ON, one of the malfunctions listed at right has probably occurred.</p>	<ul style="list-style-type: none"> <li>• Burnt-out bulb</li> <li>• Defective warning lamp circuit</li> <li>• Malfunction of the engine-ECU</li> </ul>

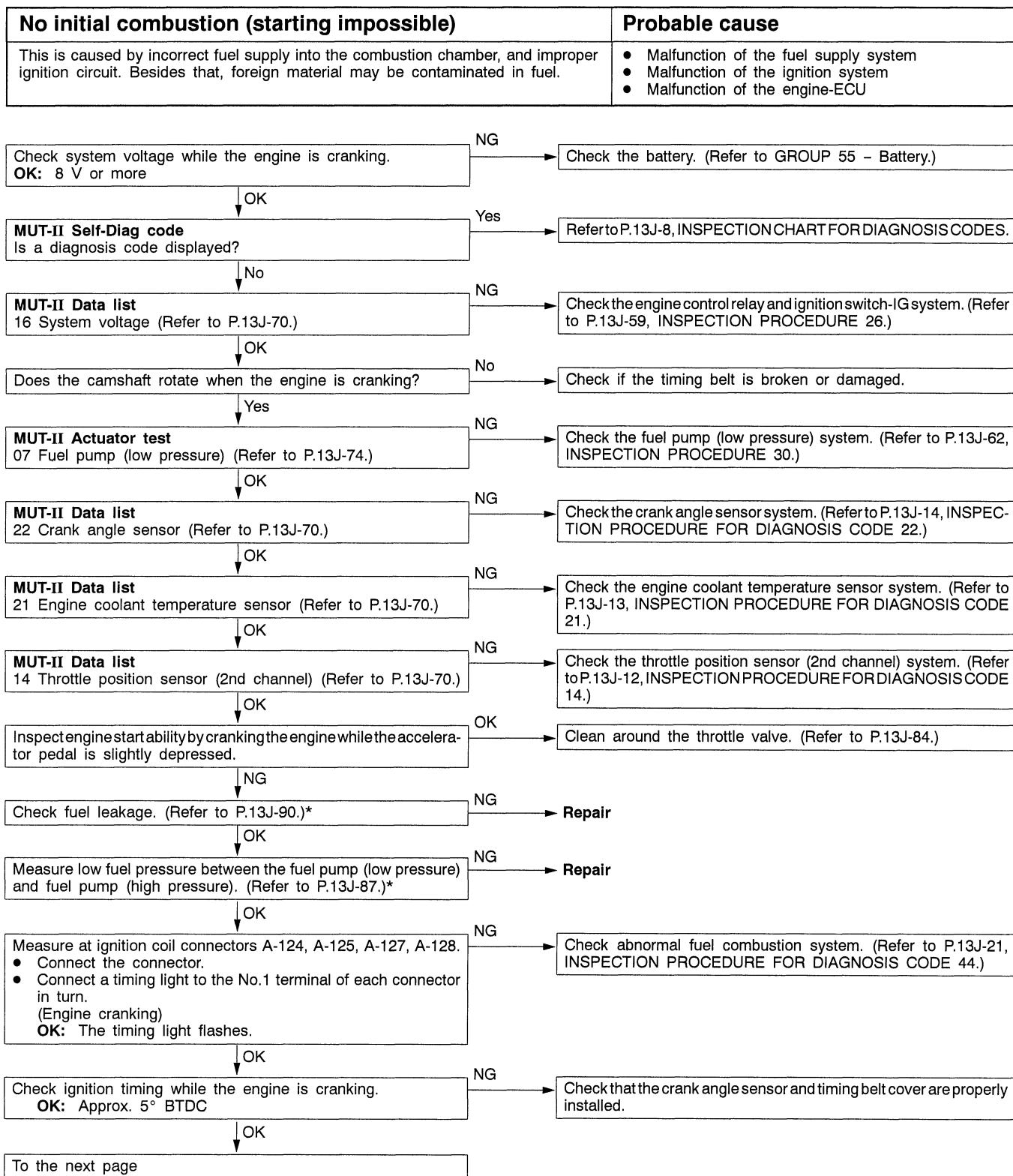


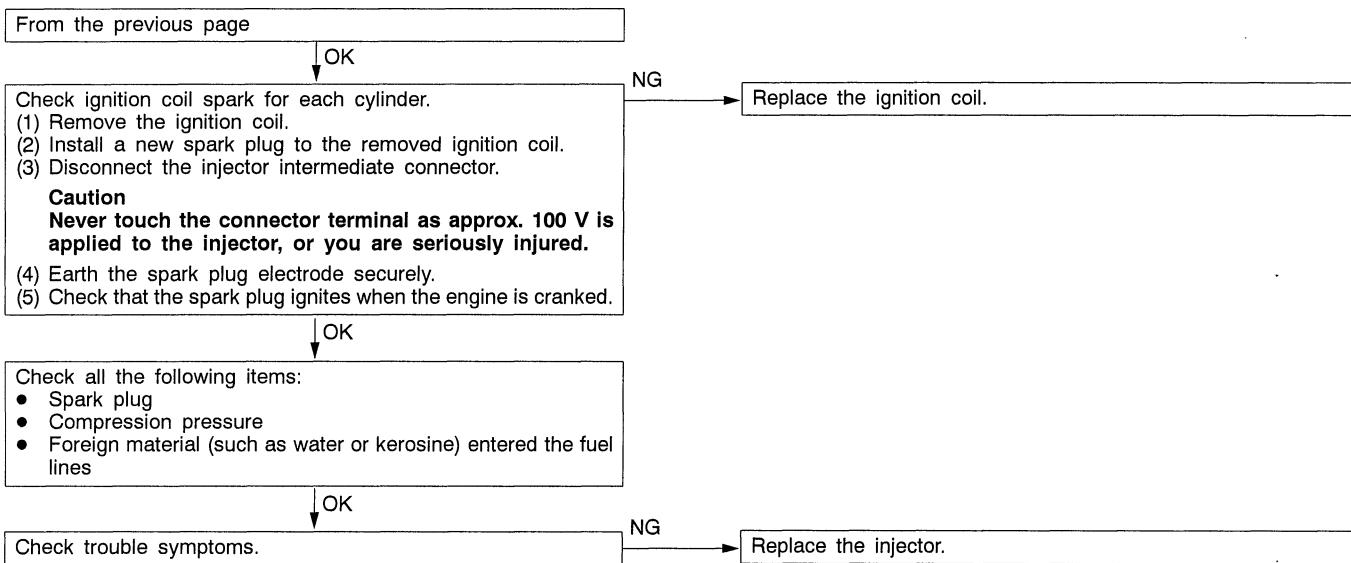
## INSPECTION PROCEDURE 4

The engine warning lamp remains illuminating and never goes out.	Probable cause
<p>In cases such as the above, the cause is probably that the engine-ECU is detecting a problem in a sensor or actuator, or that one of the malfunctions listed at right has occurred.</p>	<ul style="list-style-type: none"> <li>• Short-circuit between the engine warning lamp and engine-ECU</li> <li>• Malfunction of the engine-ECU</li> </ul>



## INSPECTION PROCEDURE 5

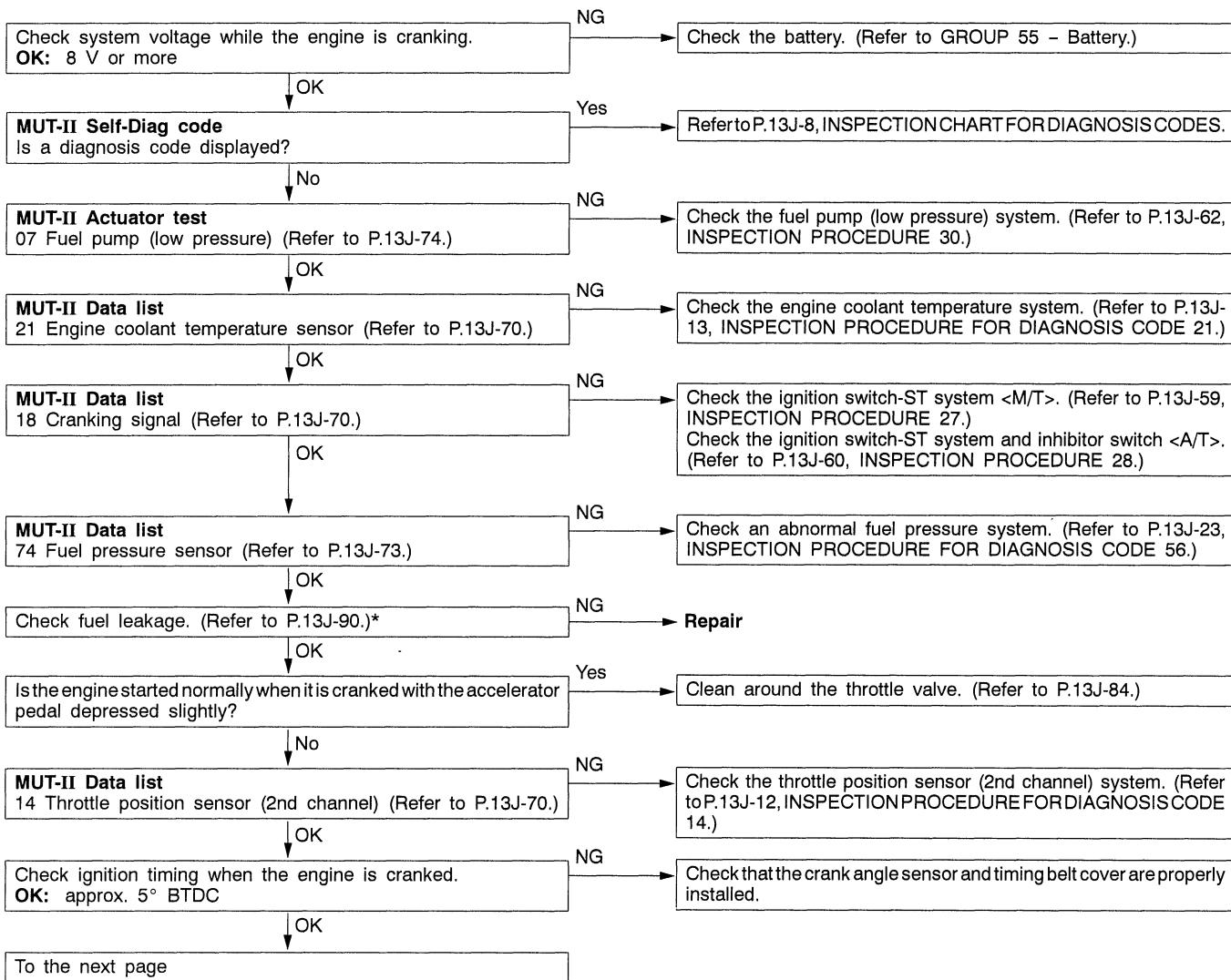


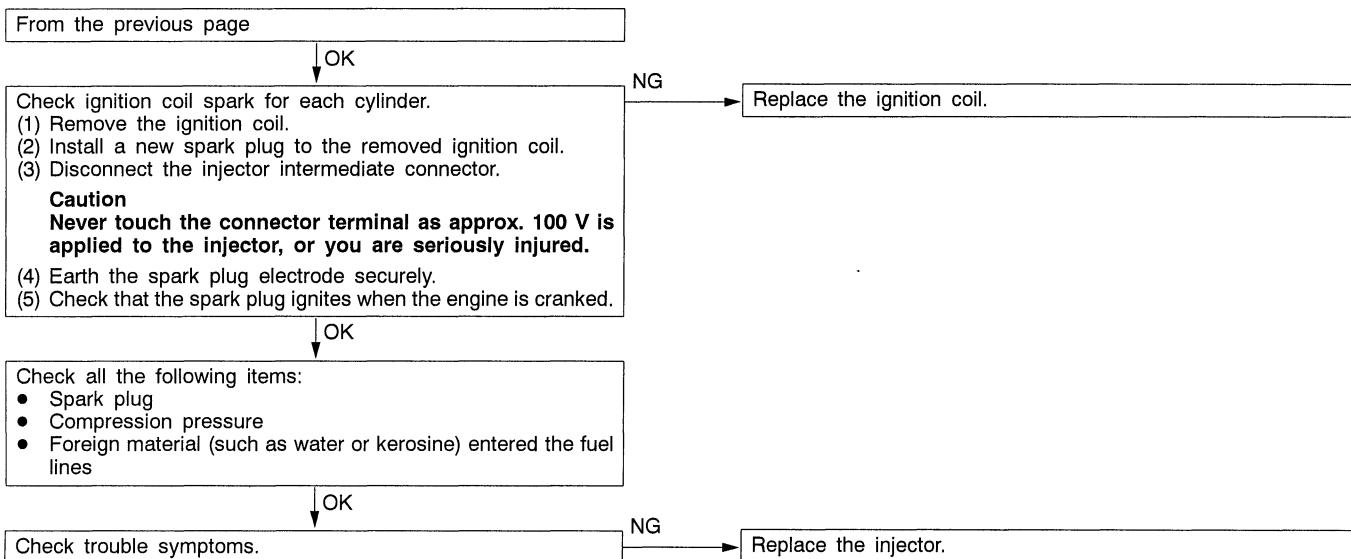


\*: Refer to '98 CARISMA GDI Workshop Manual (Pub. No. PWDE9502-C)

## INSPECTION PROCEDURE 6

Initial combustion takes place, but does not complete (start impossible), too long time to start (poor start)	Probable cause
<p>This may be caused by improper spark plug ignition (poor spark), improper mixture during engine cranking, improper fuel pressure.</p>	<ul style="list-style-type: none"> <li>• Malfunction of the fuel supply system</li> <li>• Malfunction of the fuel pressure sensor</li> <li>• Malfunction of the ignition system</li> <li>• Malfunction of the electronic-controlled throttle valve system</li> <li>• Malfunction of the engine-ECU</li> </ul>

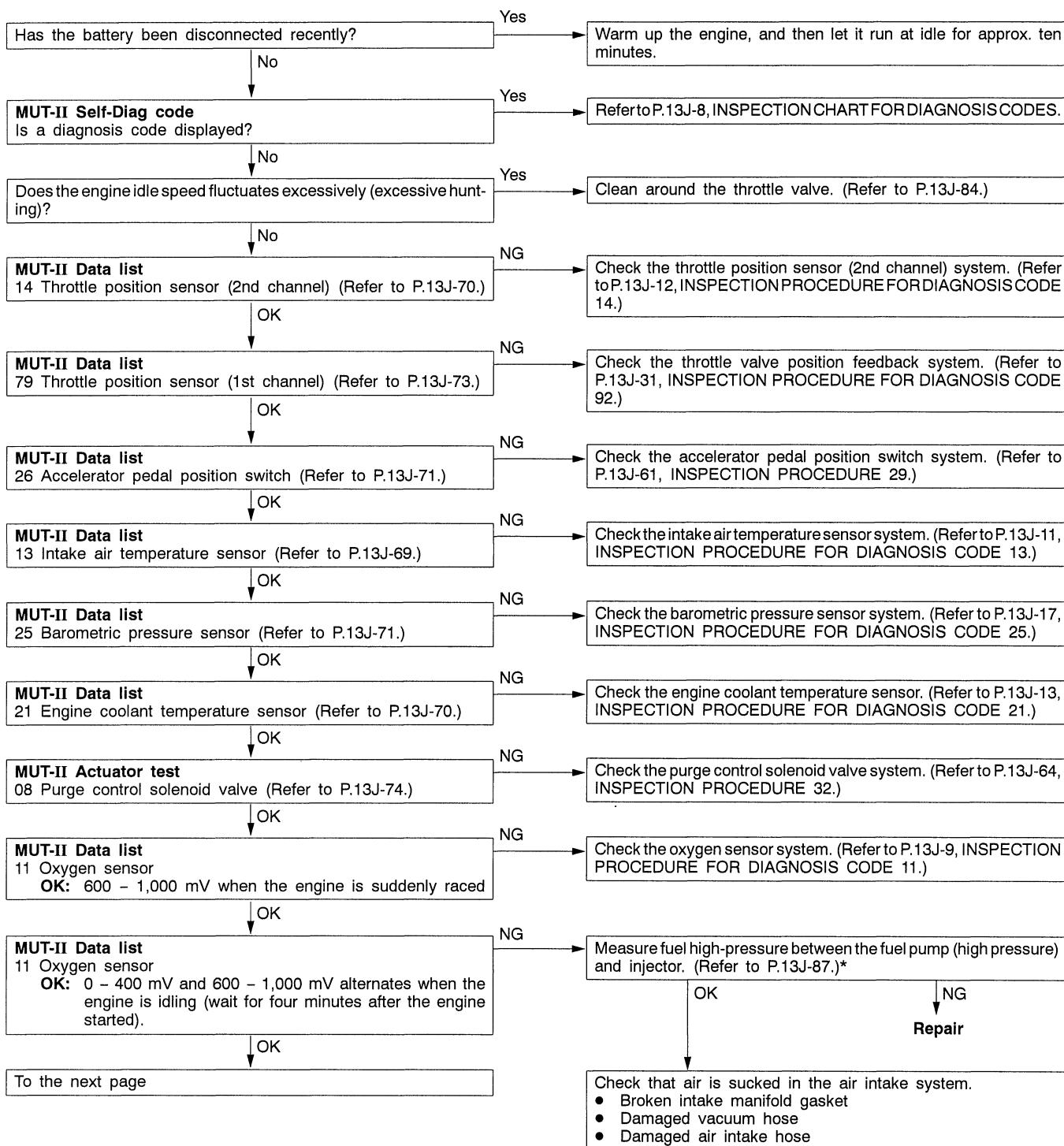


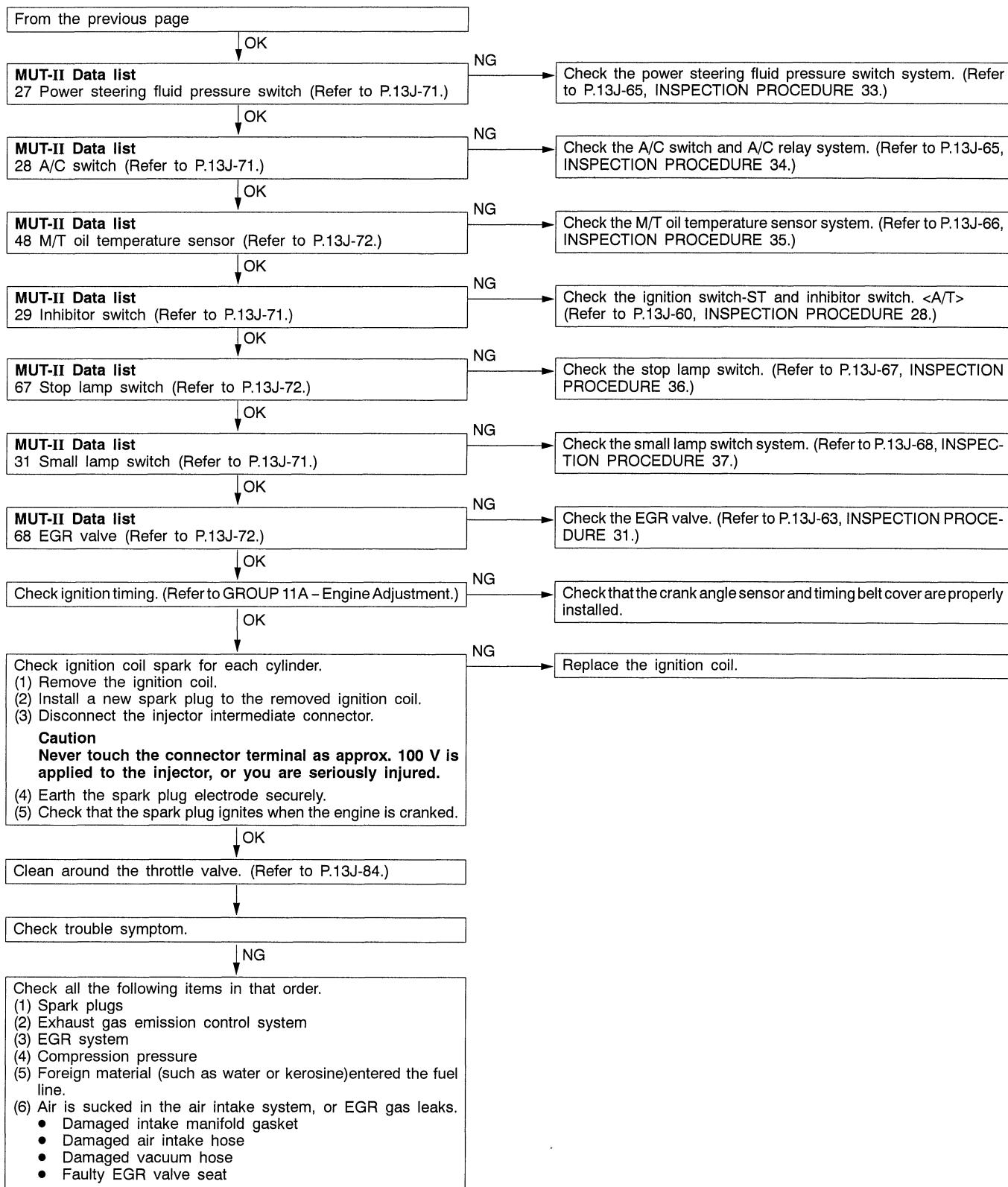


\*: Refer to '98 CARISMA GDI Workshop Manual (Pub. No. PWDE9502-C)

## INSPECTION PROCEDURE 7

Unstable idling (rough idle, hunting)	Probable cause
<p>This malfunction is probably caused by a faulty ignition system, improper air/fuel ratio, a faulty electronic-controlled throttle valve system, improper compression pressure, etc. As many causes can be suspected, diagnose from easier items.</p>	<ul style="list-style-type: none"> <li>• Malfunction of the ignition system</li> <li>• Malfunction of the air/fuel ratio control system</li> <li>• Malfunction of the electronic-control throttle valve system</li> <li>• Improper compression pressure</li> <li>• Air sucking into the air intake system</li> </ul>

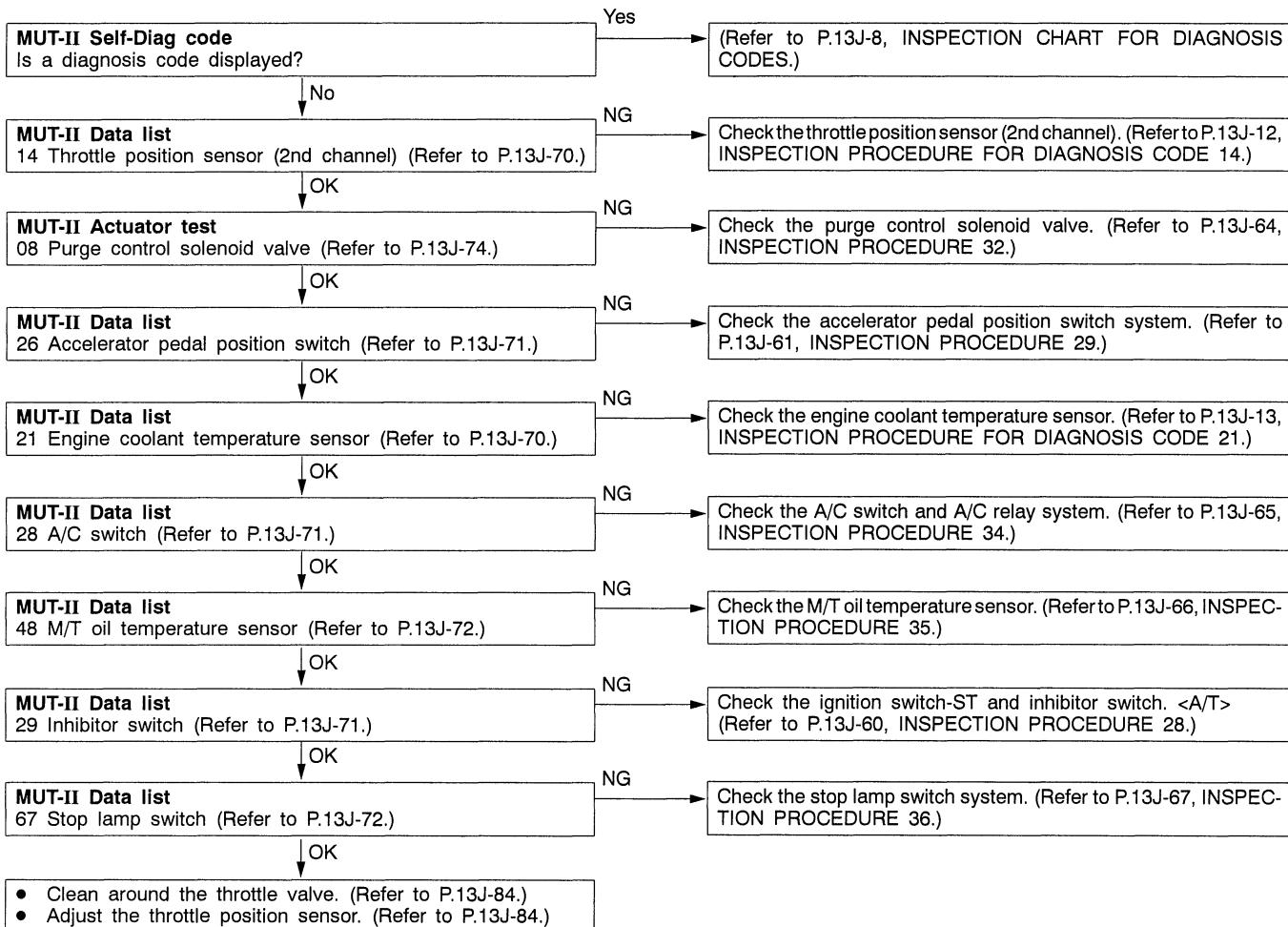




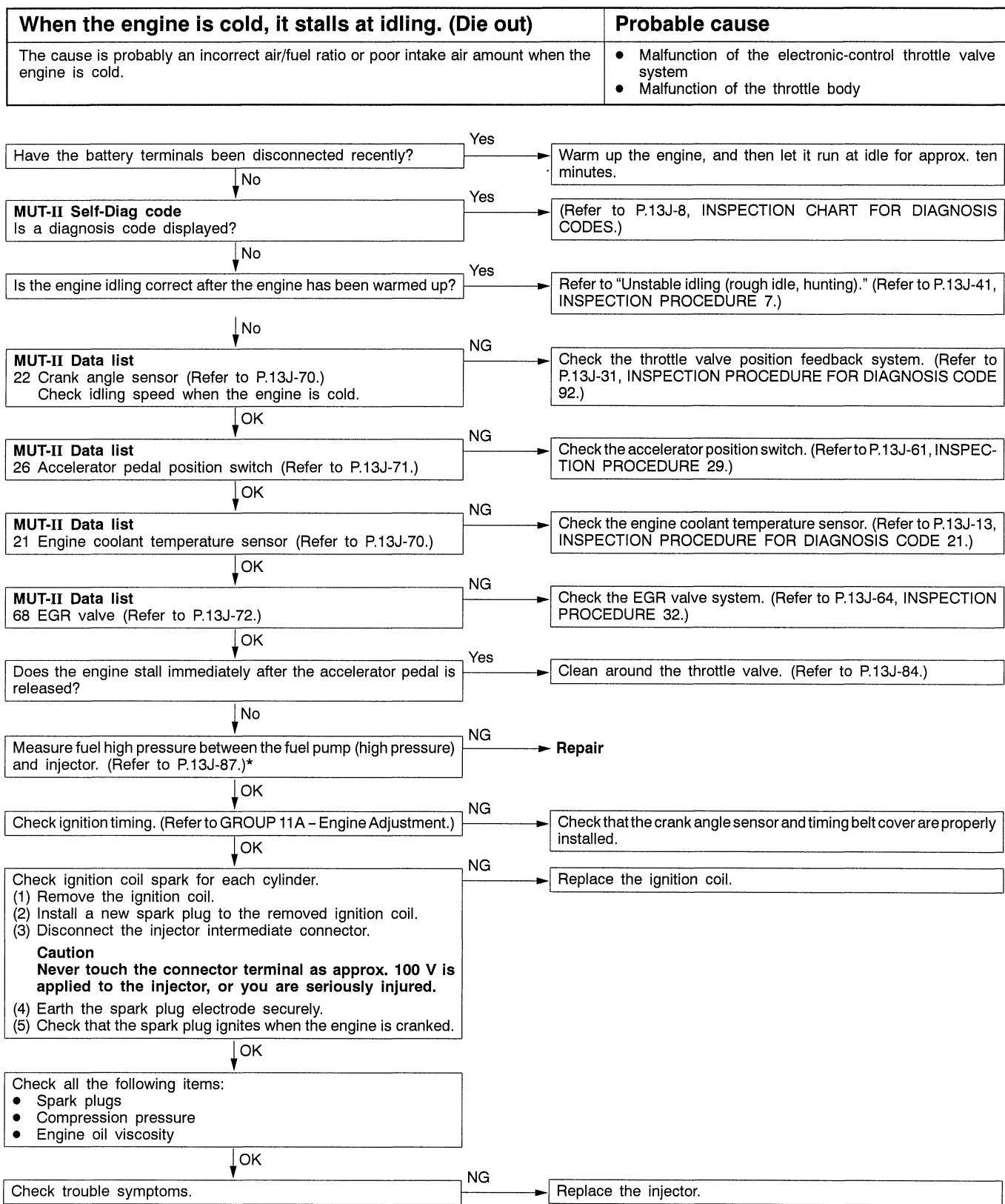
\*: Refer to '98 CARISMA GDI Workshop Manual (Pub. No. PWDE9502-C)

## INSPECTION PROCEDURE 8

Idle speed is high or low (Improper idling)	Probable cause
The cause is probably that the intake air amount during idling is too great or too small.	<ul style="list-style-type: none"> <li>Malfunction of the electronic-controlled throttle valve system</li> <li>Malfunction of the throttle body</li> </ul>



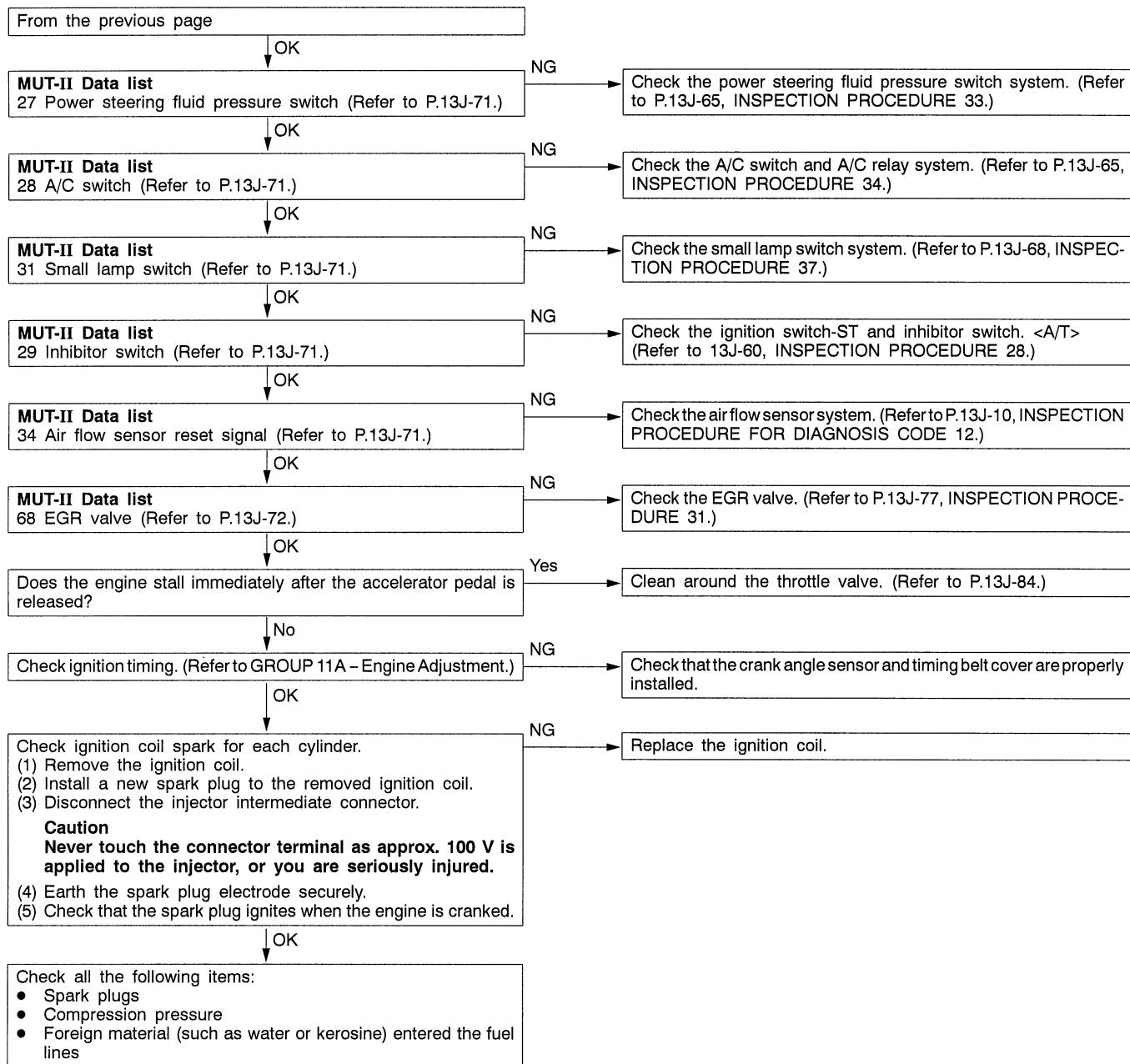
## INSPECTION PROCEDURE 9



\*: Refer to '98 CARISMA GDI Workshop Manual (Pub. No. PWDE9502-C)

## INSPECTION PROCEDURE 10

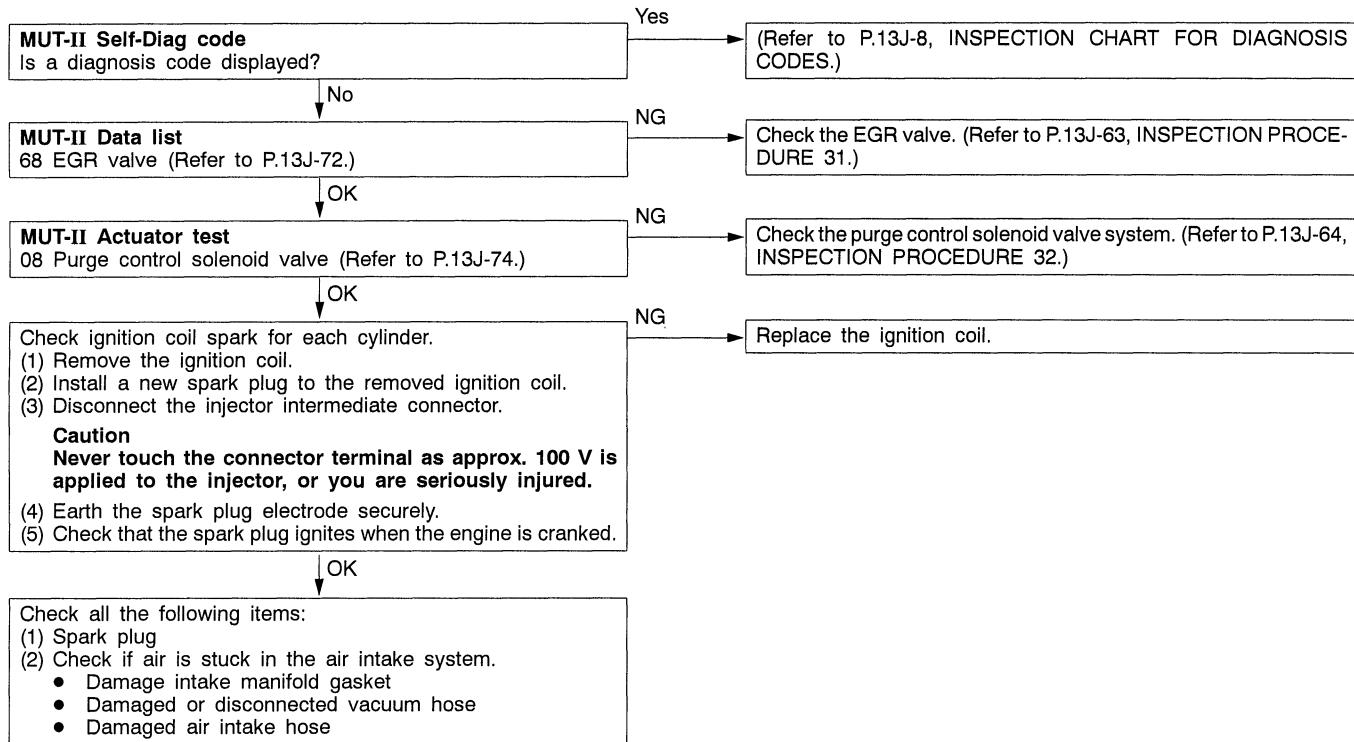
When the engine is hot, it stalls at idling. (Die out)	Probable cause
The cause is probably an improper air/fuel ratio, faulty electronic-controlled throttle valve system, compression pressure. In addition, if the engine stalls suddenly, another possible cause might be a poor connector contact.	<ul style="list-style-type: none"> <li>• Malfunction of the ignition system</li> <li>• Malfunction of the air/fuel ratio control system</li> <li>• Malfunction of the electronic-controlled throttle valve system</li> <li>• Malfunction of the throttle body</li> <li>• Poor connector contact</li> <li>• Improper compression pressure</li> <li>• Air stuck in the air intake system</li> </ul>
Have the battery terminals been disconnected recently?	<p>Yes → Warm up the engine, and then let it run at idle for approx. ten minutes.</p>
MUT-II Self-Diag code Is a diagnosis code displayed?	<p>Yes → Refer to P.13J-8, INSPECTION CHART FOR DIAGNOSIS CODES.</p>
MUT-II Data list 79 Throttle position sensor (1st channel) (Refer to P.13J-73.)	<p>NG → Check the throttle position sensor (1st channel) system. (Refer to P.13J-29, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 79.)</p>
Is it easy to reproduce the engine stall?	<p>No → While carrying out an intermittent malfunction simulation test. (Refer to GROUP 00 – Points to Note for Intermittent Malfunction.), check for sudden changes in the following signals.           <ul style="list-style-type: none"> <li>• Crank angle sensor signal</li> <li>• Injector drive signal</li> <li>• Fuel pump (low pressure) drive signal</li> <li>• Air flow sensor</li> <li>• Primary ignition signal</li> <li>• Power supply to the engine-ECU</li> </ul> </p>
MUT-II Data list 26 Accelerator pedal position switch (Refer to P.13J-71.)	<p>NG → Check the accelerator pedal position switch. (Refer to P.13J-61, INSPECTION PROCEDURE 29.)</p>
MUT-II Data list 13 Intake air temperature sensor (Refer to P.13J-69.)	<p>NG → Check the intake air temperature sensor. (Refer to P.13J-11, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 13.)</p>
MUT-II Data list 25 Barometric pressure sensor (Refer to P.13J-71.)	<p>NG → Check the barometric pressure sensor. (Refer to P.13J-17, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 25.)</p>
MUT-II Data list 21 Engine coolant temperature sensor (Refer to P.13J-70.)	<p>NG → Check the engine coolant temperature sensor. (Refer to P.13J-13, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 21.)</p>
MUT-II Data list 11 Oxygen sensor OK: 600 – 1,000 mV when the engine is suddenly raced	<p>NG → Check the oxygen sensor system. (Refer to P.13J-9, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 11.)</p>
MUT-II Data list 11 Oxygen sensor OK: 0 – 400 mV and 600 – 1,000 mV alternates when the engine is idling (wait for four minutes after the engine started).	<p>NG → Measure fuel high-pressure between the fuel pump (high pressure) and injector. (Refer to P.13J-87.)*</p> <p>OK → Repair</p>
To the next page	<p>Check that air is sucked in the air intake system.</p> <ul style="list-style-type: none"> <li>• Broken intake manifold gasket</li> <li>• Damaged vacuum hose</li> <li>• Damaged air intake hose</li> </ul>



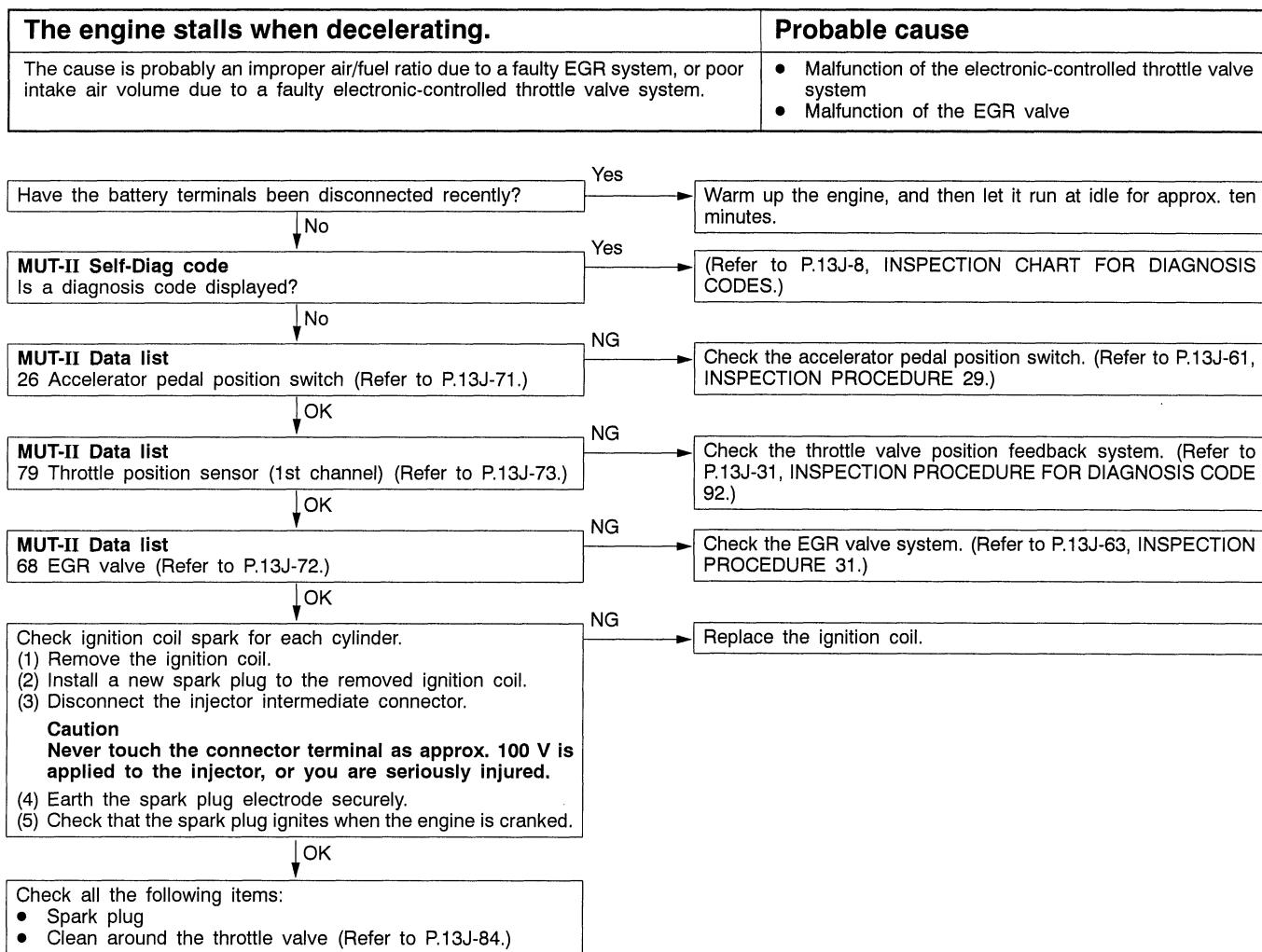
\*: Refer to '98 CARISMA GDI Workshop Manual (Pub. No. PWDE9502-C)

## INSPECTION PROCEDURE 11

The engine stalls when starting the car. (Pass out)	Probable cause
The cause is probably poor ignition due to a malfunctioning spark plug (weak spark), or an incorrect air/fuel ratio when the accelerator is depressed.	<ul style="list-style-type: none"> <li>Malfunction of the ignition system</li> <li>Malfunction of the EGR valve</li> <li>Air stuck in the air intake system</li> </ul>

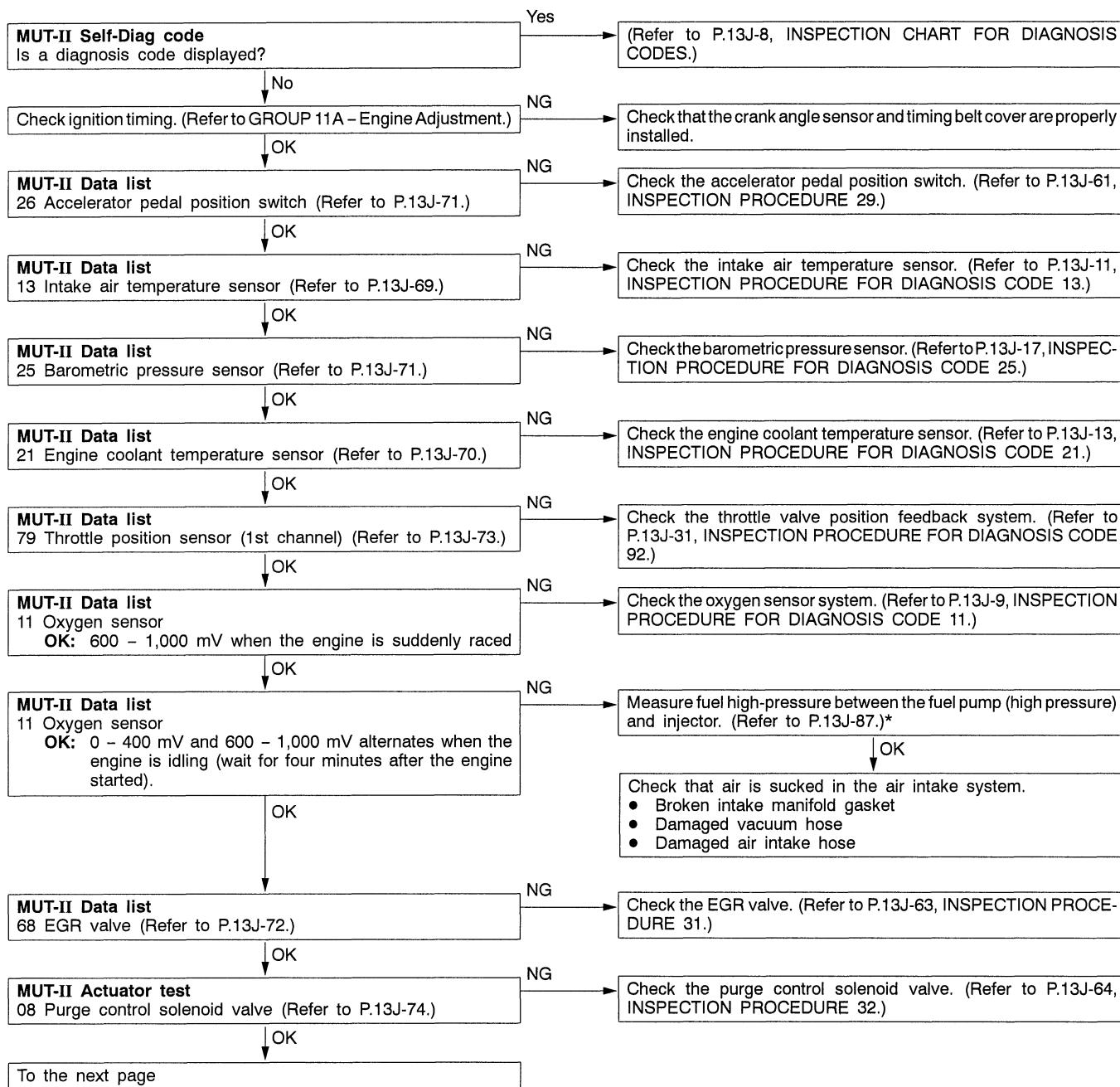


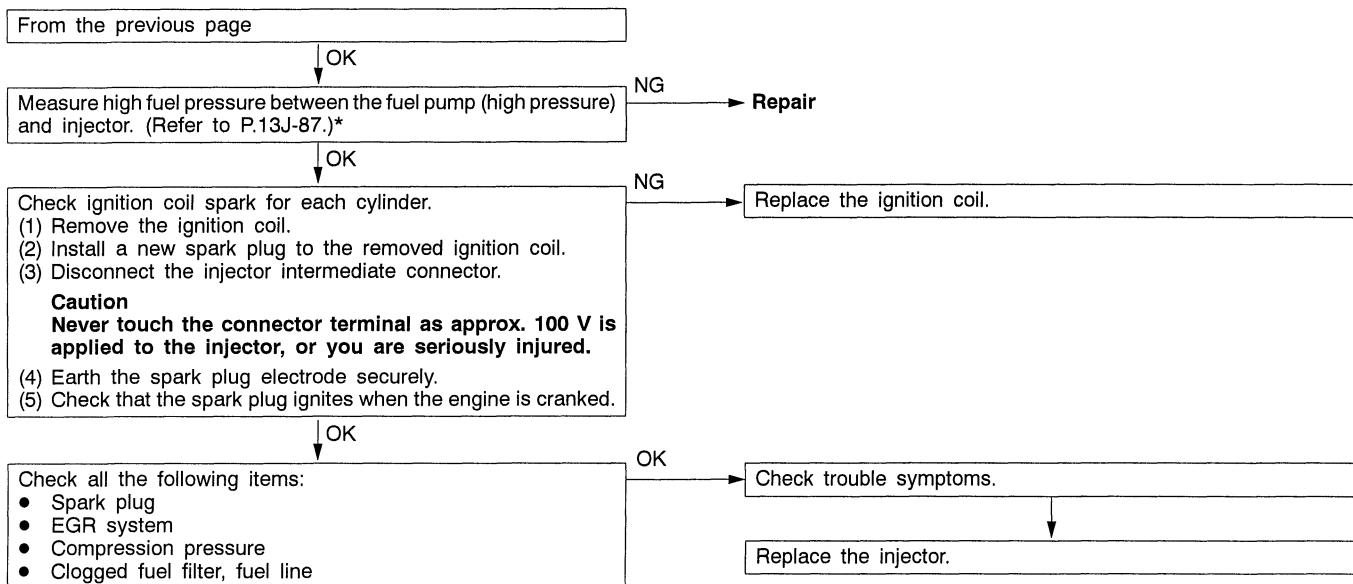
## INSPECTION PROCEDURE 12



## INSPECTION PROCEDURE 13

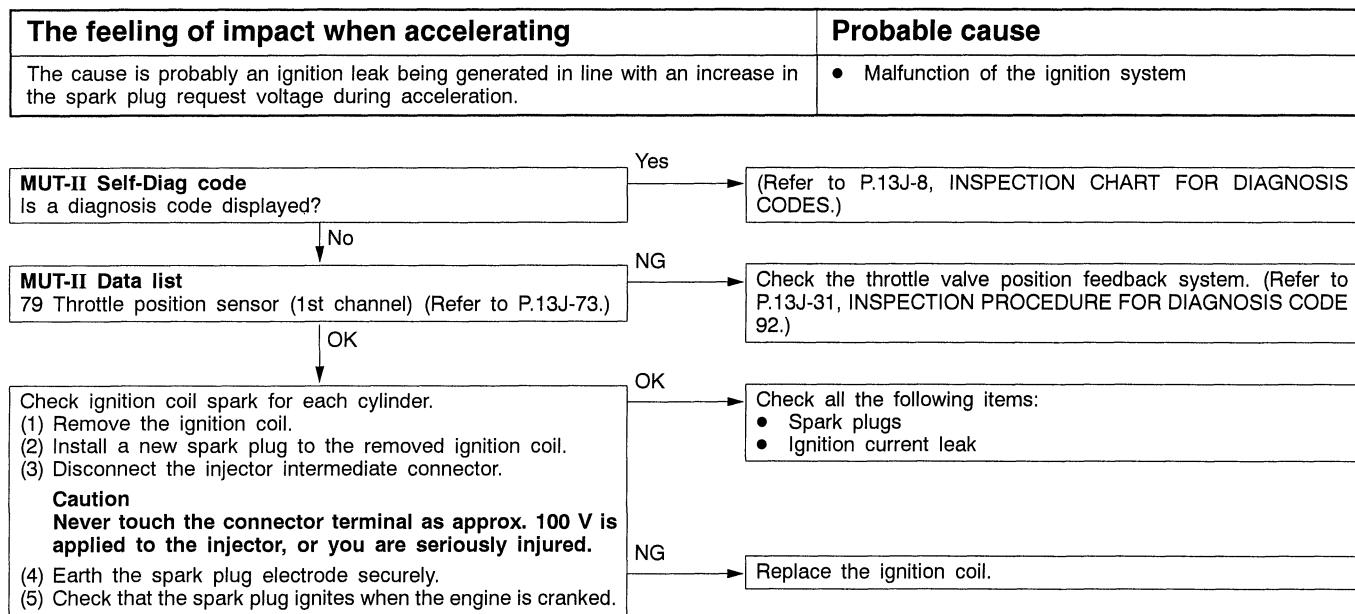
Hesitation, sag, stumble, poor acceleration or surge	Probable cause
The cause is probably a malfunction of the ignition system, electronic-controlled throttle valve system, compression pressure, etc.	<ul style="list-style-type: none"> <li>Malfunction of the ignition system</li> <li>Malfunction of the air/fuel ratio control system</li> <li>Malfunction of the electronic-controlled throttle valve system</li> <li>Improper compression pressure</li> <li>Air stuck in the air intake system</li> </ul>





\*: Refer to '98 CARISMA GDI Workshop Manual (Pub. No. PWDE9502-C)

## INSPECTION PROCEDURE 14



## INSPECTION PROCEDURE 15

The feeling of impact when decelerating	Probable cause
The cause is probably insufficient intake air due to a faulty electronic-controlled throttle valve system.	<ul style="list-style-type: none"> <li>Malfunction of the electronic-controlled throttle valve system</li> </ul>

```

graph TD
    A[MUT-II Self-Diag code  
Is a diagnosis code displayed?] -- Yes --> B["(Refer to P.13J-8, INSPECTION CHART FOR DIAGNOSIS CODES.)"]
    A -- No --> C[MUT-II Data list  
79 Throttle position sensor (1st channel) (Refer to P.13J-73.)]
    C -- OK --> D[MUT-II Data list  
26 Accelerator pedal position switch (Refer to P.13J-71.)]
    C -- NG --> E["Check the throttle valve position feedback system. (Refer to P.13J-31, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 92.)"]
    D -- OK --> E
    D -- NG --> F["Check the accelerator pedal position switch system. (Refer to P.13J-61, INSPECTION PROCEDURE 29.)"]
    F --> G["Clean around the throttle valve. (Refer to P.13J-84.)"]
  
```

## INSPECTION PROCEDURE 16

Knocking	Probable cause
The cause is probably incorrect detonation control or improper heat range of the spark plugs.	<ul style="list-style-type: none"> <li>Malfunction of the detonation sensor</li> <li>Improper heat range of the spark plugs</li> </ul>

```

graph TD
    A[MUT-II Self-Diag code  
Is a diagnosis code displayed?] -- Yes --> B["(Refer to P.13J-8, INSPECTION CHART FOR DIAGNOSIS CODES.)"]
    A -- No --> C[Does knocking occur when the vehicle is driven with the detonation sensor disconnected?  
(At this time, use the MUT-II to check whether the ignition timing is retarded from when the detonation sensor connector is connected.)]
    C -- No --> D["Check the detonation sensor system. (Refer to P.13J-18, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 31.)"]
    C -- Yes --> E["Check all the following items:  
• Spark plug  
• Foreign material (such as water or kerosine) entered the fuel lines"]
  
```

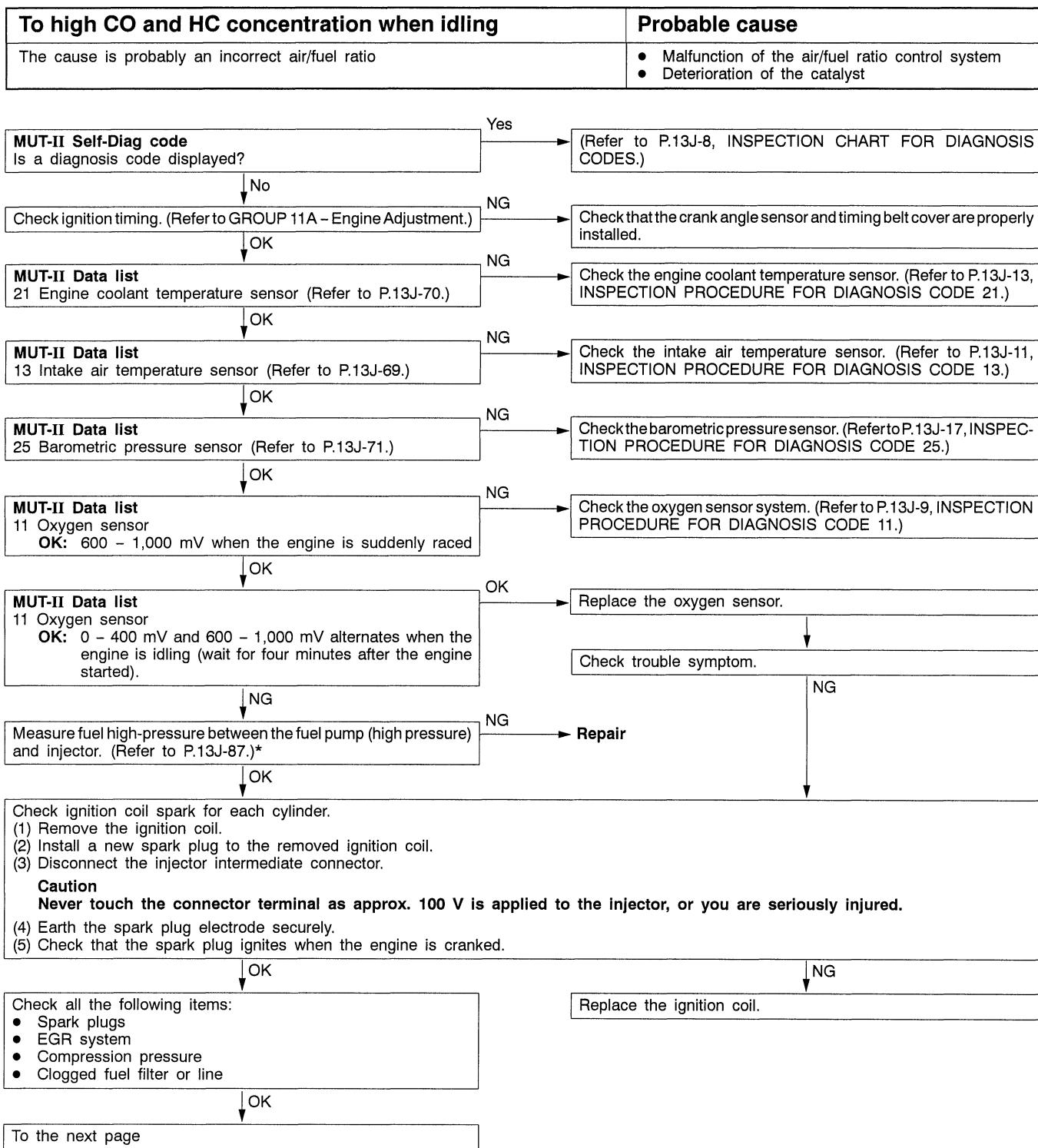
## INSPECTION PROCEDURE 17

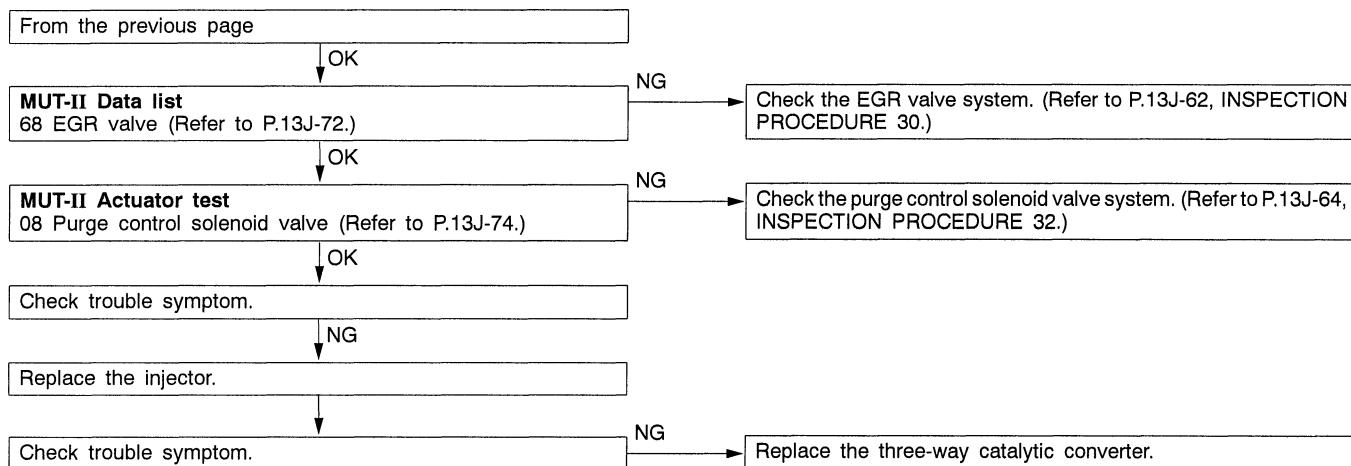
Run-on (dieseling)	Probable cause
The cause is probably fuel leak from injector(s)	<ul style="list-style-type: none"> <li>Malfunction of the injector</li> </ul>

Replace the injector.

## INSPECTION PROCEDURE 18

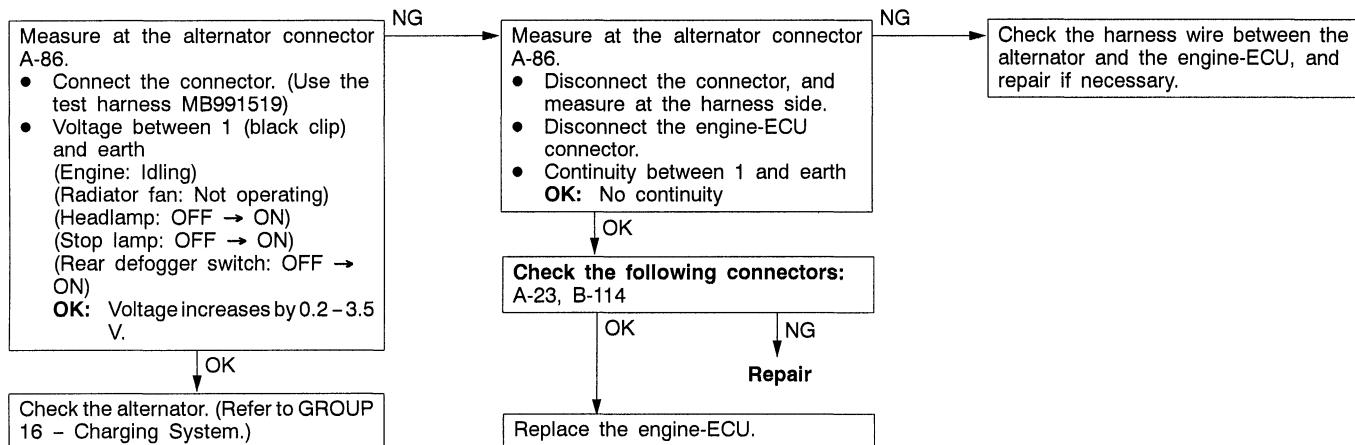




\*: Refer to '98 CARISMA GDI Workshop Manual (Pub. No. PWDE9502-C)

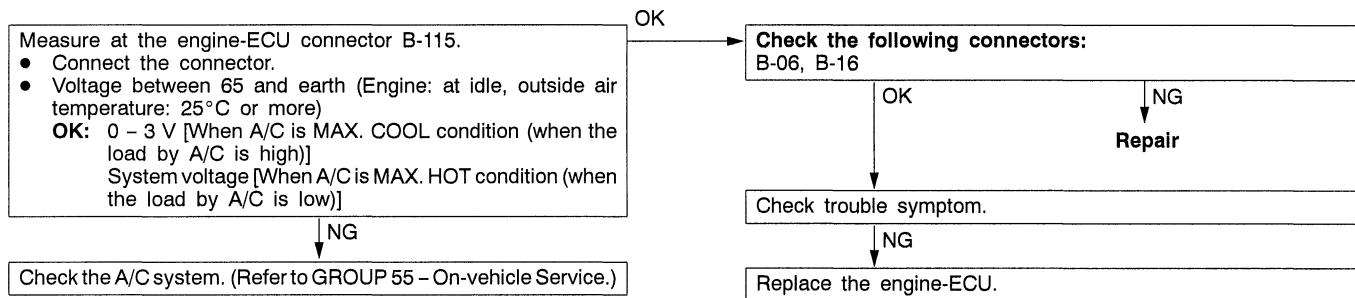
## INSPECTION PROCEDURE 19

Low alternator output voltage (approx. 12.3 V)	Probable cause
The cause is probably a malfunction of the alternator or one of the problems listed at right.	<ul style="list-style-type: none"> <li>Malfunction of the charging system</li> <li>Open circuit between the alternator G terminal and the engine-ECU</li> <li>Malfunction of the engine-ECU</li> </ul>



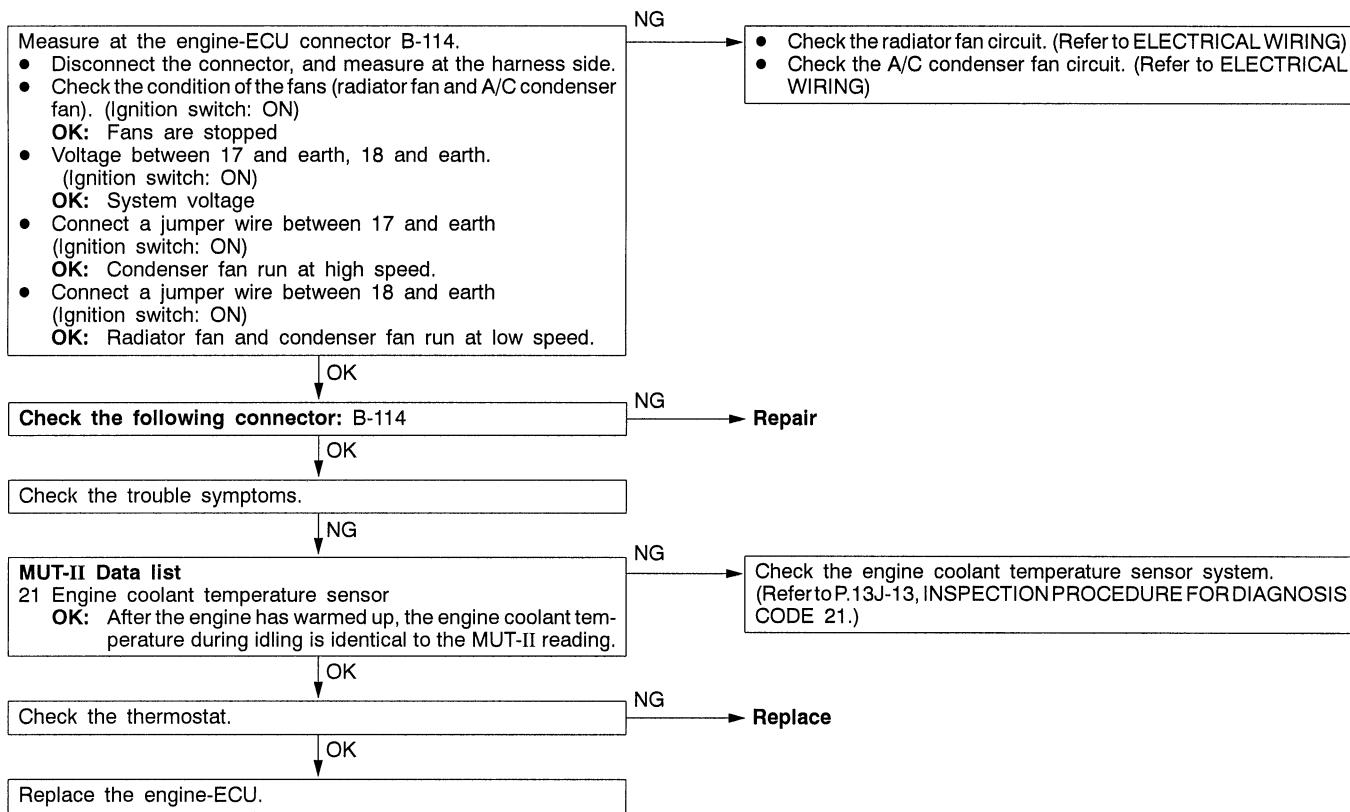
## INSPECTION PROCEDURE 20

Idling speed is improper when A/C is operating	Probable cause
<p>If the engine-ECU detects that the air conditioner is on, it activates the idle speed control (ISC) servo to control idle-up operation.</p> <p>The A/C-ECU judges if the load caused by air conditioner operation is high or low, and converts it to voltage signal (high or low voltage) and inputs the signal to the engine-ECU.</p> <p>Based on this voltage signal, the engine-ECU controls the idle-up speed (for high or low load).</p>	<ul style="list-style-type: none"> <li>Malfunction of the A/C control system</li> <li>Improper connector contact, open circuit or short-circuited harness wire</li> <li>Malfunction of the engine-ECU</li> </ul>



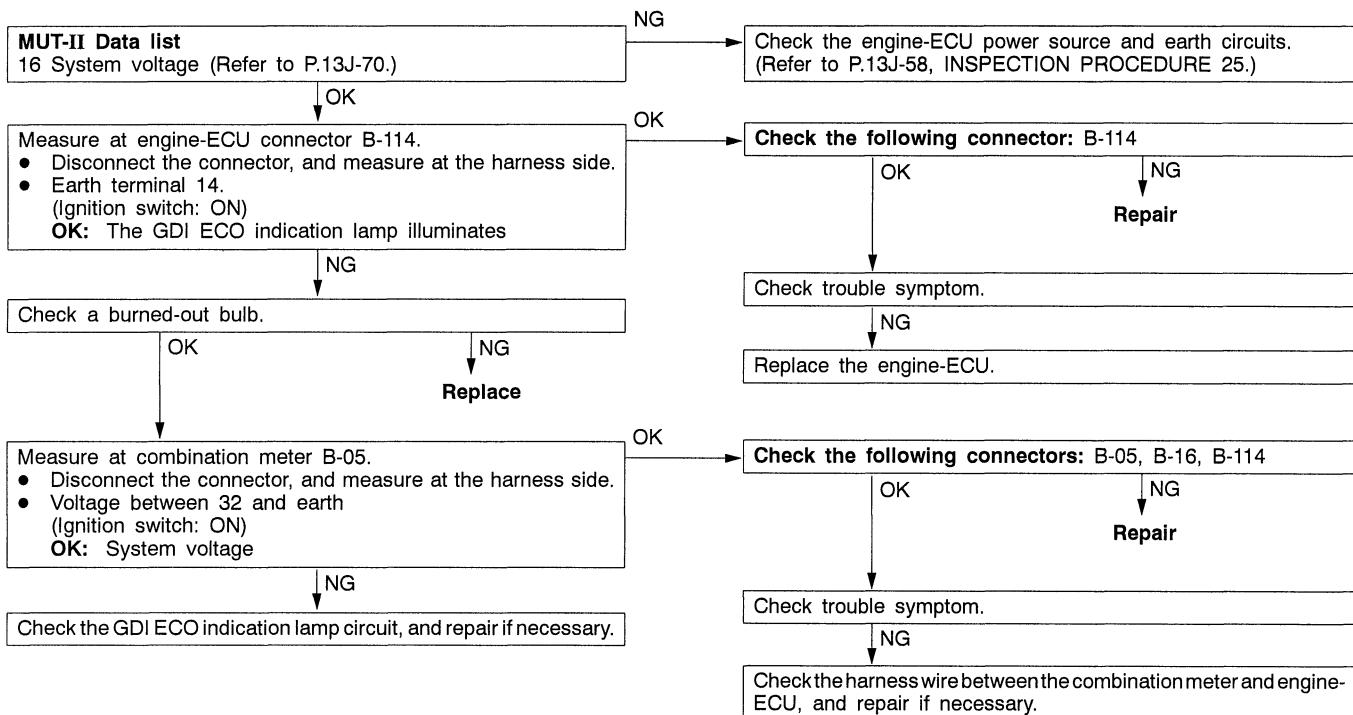
## INSPECTION PROCEDURE 21

Fans (radiator fan, A/C condenser fan) are inoperative	Probable cause
<p>The fan motor relay is controlled by the power transistor inside the engine-ECU turning ON and OFF.</p>	<ul style="list-style-type: none"> <li>• Malfunction of the fan motor relay</li> <li>• Malfunction of the fan motor</li> <li>• Malfunction of the thermostat</li> <li>• Improper connector contact, open circuit or short-circuited harness wire</li> <li>• Malfunction of the engine-ECU</li> </ul>



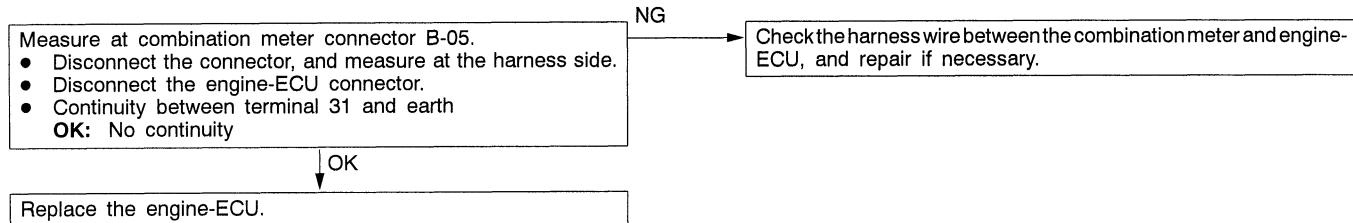
## INSPECTION PROCEDURE 22

The GDI ECO indication lamp does not illuminate.	Probable cause
If the GDI ECO indication lamp does not illuminate after turning on the ignition switch, the causes listed in the right column are suspected.	<ul style="list-style-type: none"> <li>• Burned-out GDI ECO indication lamp bulb</li> <li>• Open circuit or short-circuited harness wire in the GDI ECO indication lamp circuit</li> <li>• Malfunction of the engine-ECU</li> </ul>



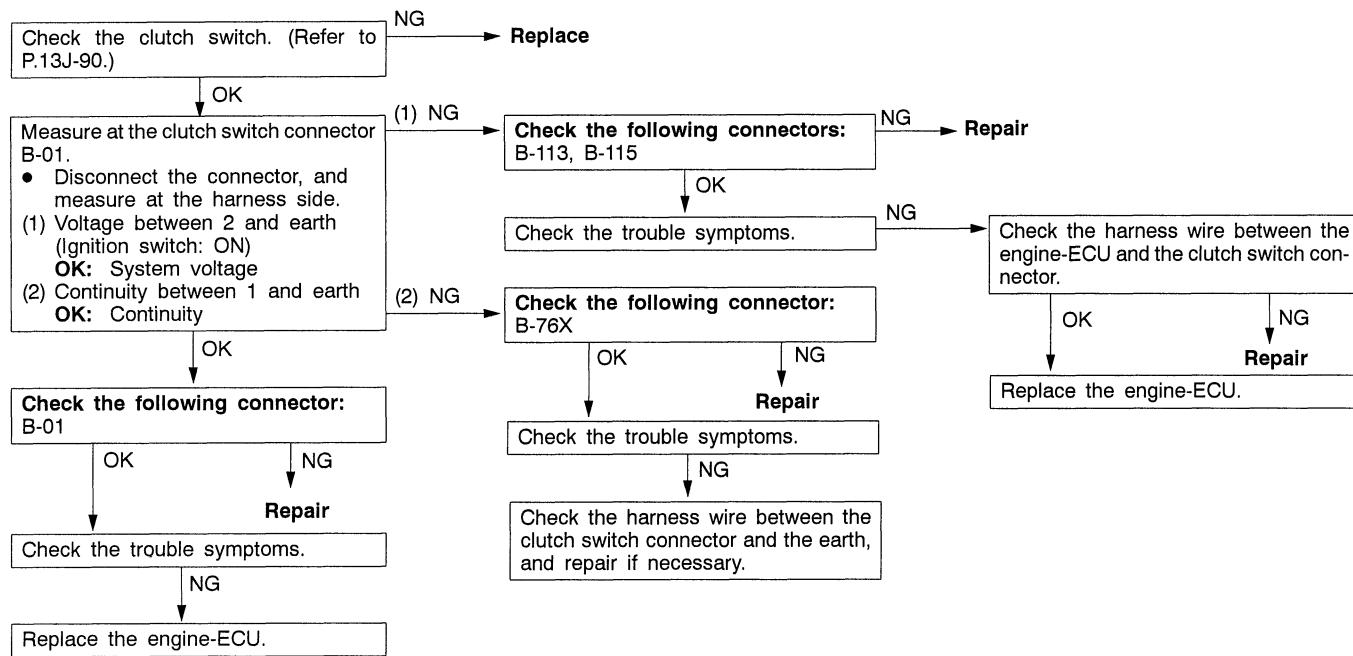
## INSPECTION PROCEDURE 23

The GDI ECO indication lamp remains on (does not extinguish).	Probable cause
If the GDI ECO indication lamp does not extinguish during high load operation, the causes listed in the right column are suspected.	<ul style="list-style-type: none"> <li>Short circuit between the GDI ECO indication lamp and engine-ECU</li> <li>Malfunction of the engine-ECU</li> </ul>



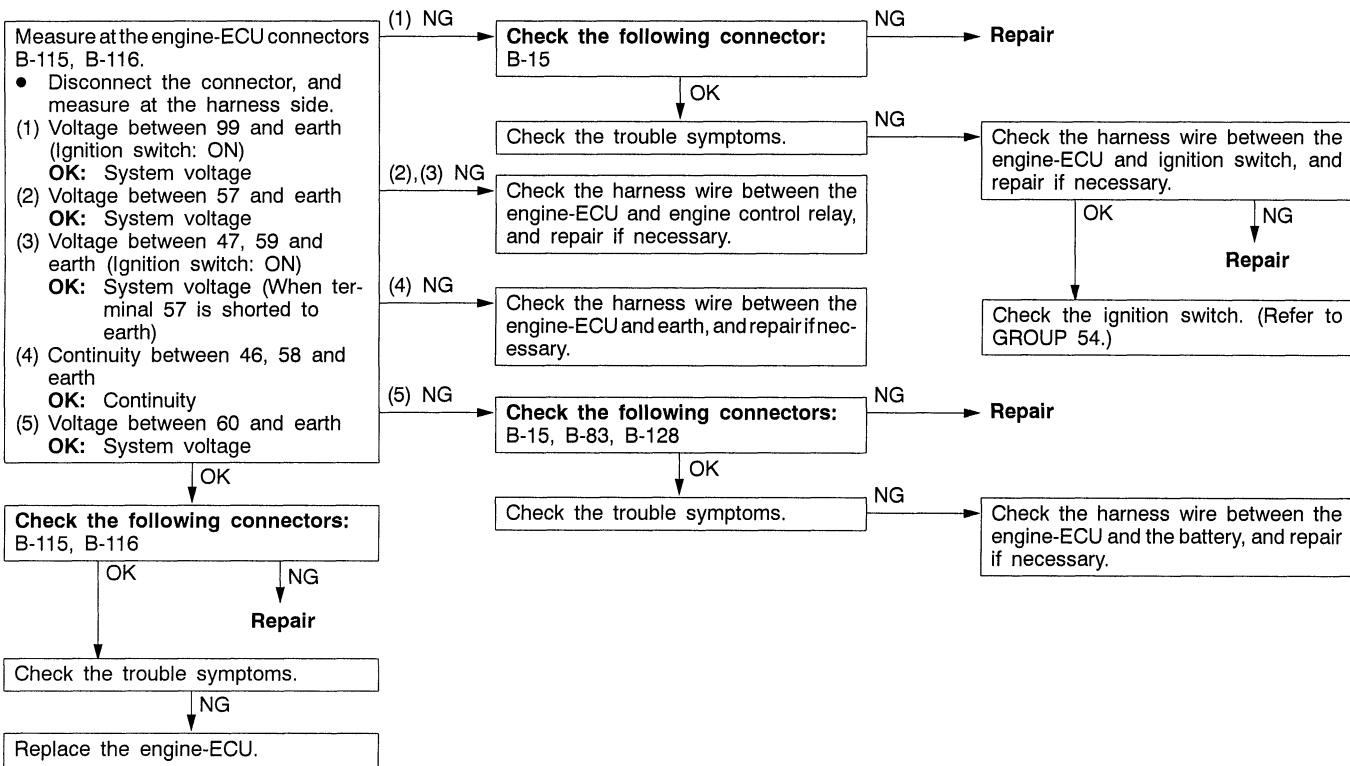
## INSPECTION PROCEDURE 24

Malfunction of the clutch switch system <M/T>	Probable cause
When the clutch pedal is depressed, the clutch switch sends a signal to the engine-ECU, and the engine-ECU controls the fuel injection properly based on this signal. Due to this, engine speed fluctuation is reduced at shifting.	<ul style="list-style-type: none"> <li>Malfunction of the clutch switch</li> <li>Open circuit or short-circuited harness wire in the clutch switch circuit</li> <li>Malfunction of the engine-ECU</li> </ul>



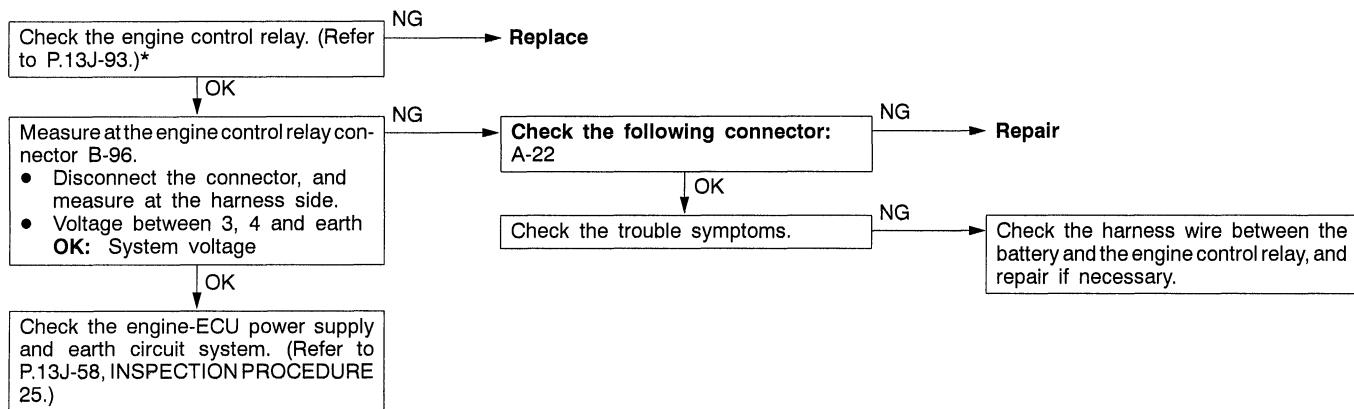
## INSPECTION PROCEDURE 25

Engine-ECU power supply and earth circuit system	Probable cause
<p>The cause is probably a malfunction of the engine-ECU or one of the problems listed at right.</p> <ul style="list-style-type: none"> <li>• Open circuit or short-circuited harness wire in the engine-ECU power supply circuit</li> <li>• Open circuit or short-circuited harness wire in the engine-ECU earth circuit</li> <li>• Malfunction of the engine-ECU</li> </ul>	



## INSPECTION PROCEDURE 26

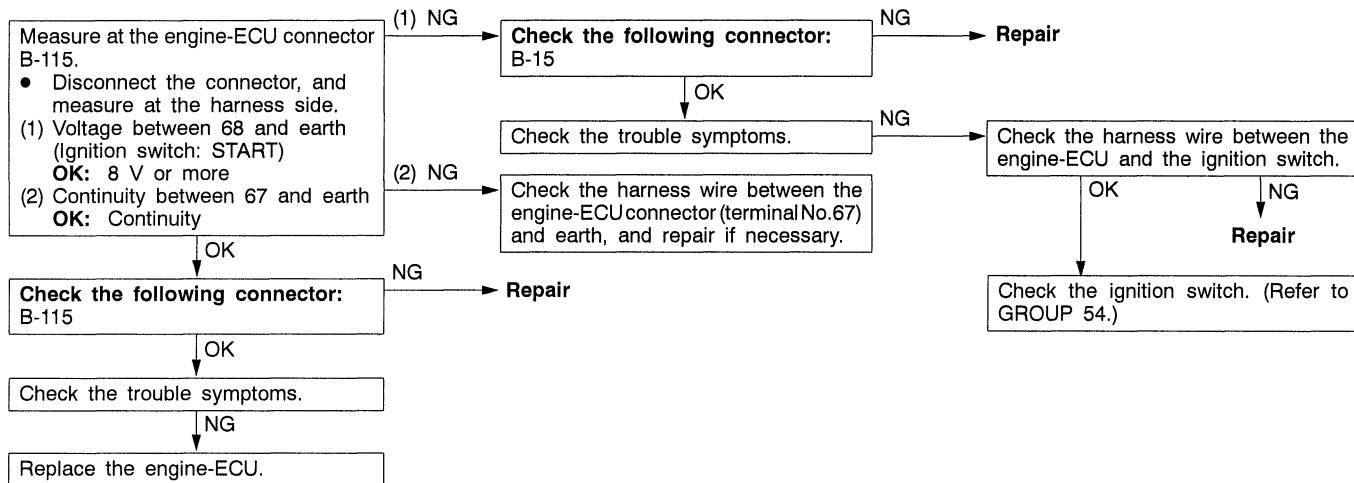
Engine control relay and ignition switch-IG system	Probable cause
<p>When the ignition switch ON signal is input to the engine-ECU, the engine-ECU turns on the engine control relay. This causes system voltage to be supplied to the engine-ECU and to the sensors and actuators.</p>	<ul style="list-style-type: none"> <li>• Malfunction of the ignition switch</li> <li>• Malfunction of the engine control relay</li> <li>• Open circuit or short-circuited harness wire of the engine control relay circuit</li> <li>• Malfunction of the engine-ECU</li> </ul>



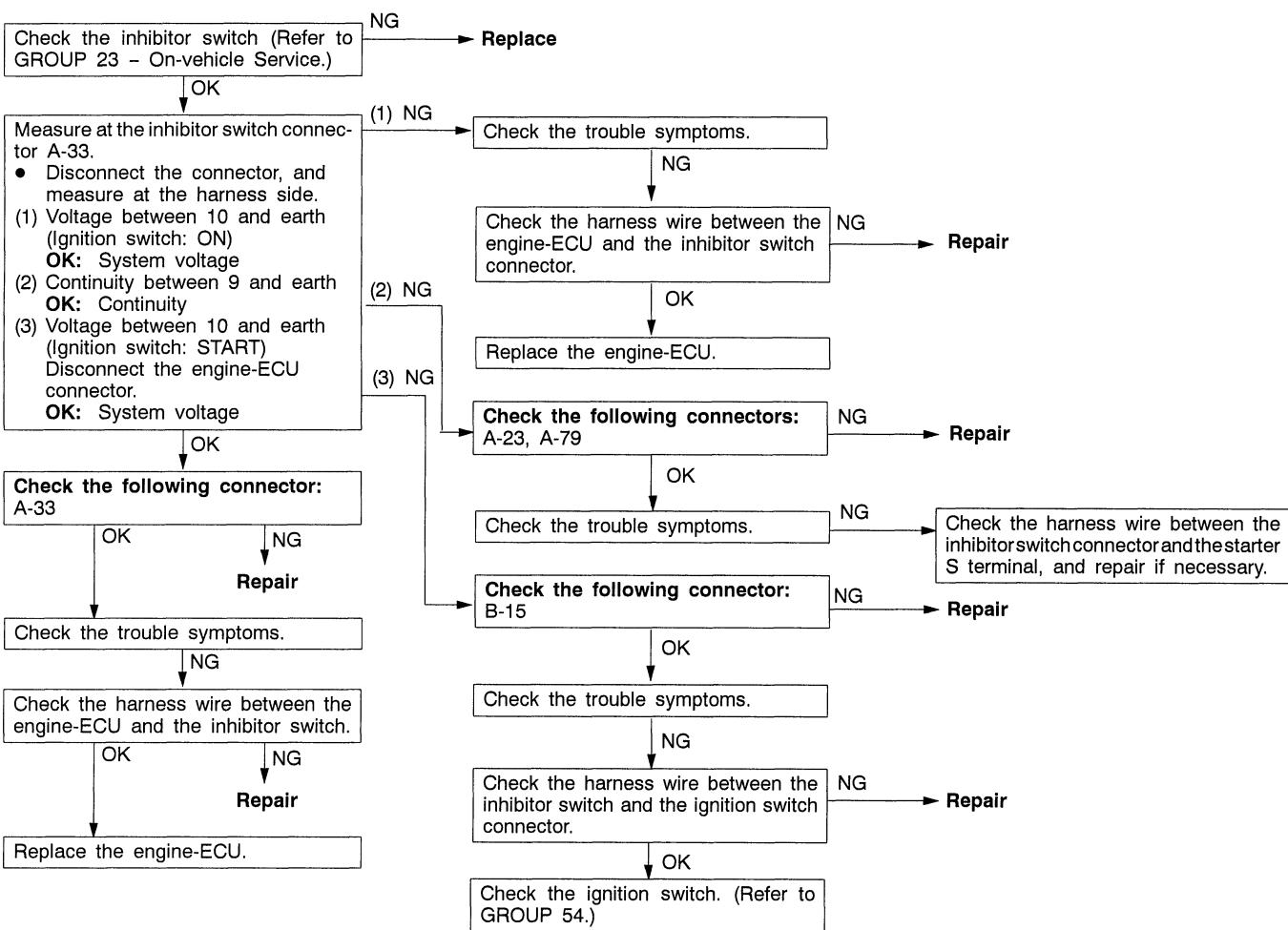
\*: Refer to '98 CARISMA GDI Workshop Manual (Pub. No. PWDE9502-C)

## INSPECTION PROCEDURE 27

Ignition switch-ST system <M/T>	Probable cause
<p>The ignition switch-ST outputs a HIGH signal to the engine-ECU while the engine is cranking. The engine-ECU uses this signal to carry out functions such as fuel injection control during starting.</p>	<ul style="list-style-type: none"> <li>• Malfunction of the ignition switch</li> <li>• Open circuit or short-circuited harness wire of the ignition switch circuit</li> <li>• Malfunction of the engine-ECU</li> </ul>

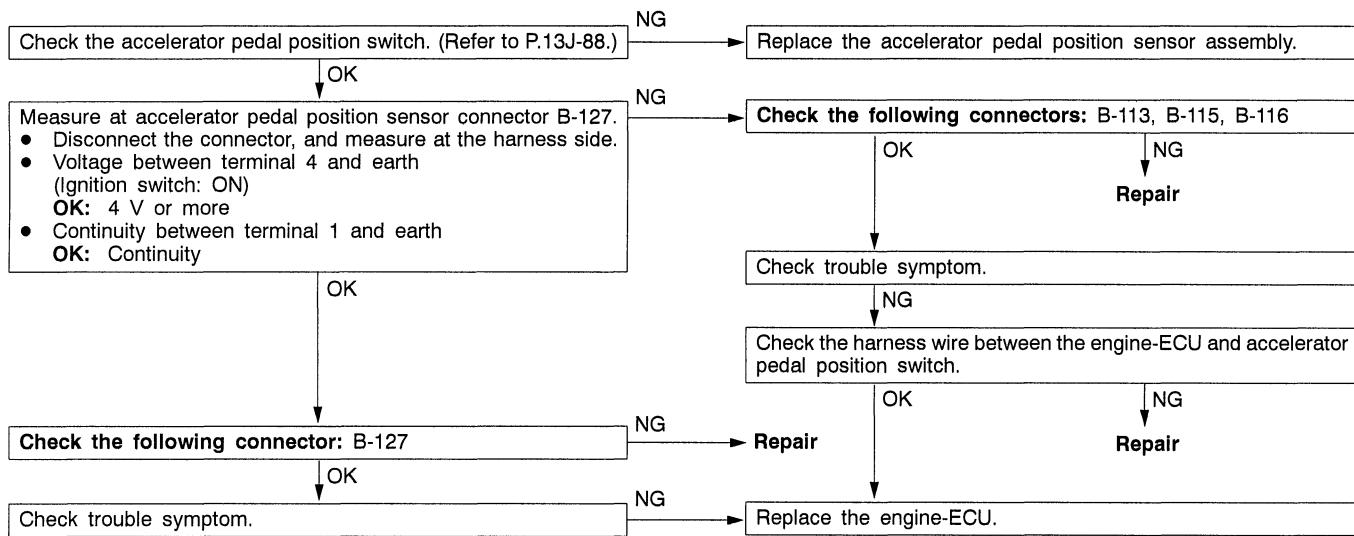


Ignition switch-ST and inhibitor switch system <A/T>	Probable cause
<p>The ignition switch-ST outputs a HIGH signal to the engine-ECU while the engine is cranking, and the engine-ECU uses this signal to carry out functions such as fuel injection control during starting.</p> <p>The inhibitor switch inputs the position of the selector lever to the engine-ECU. The engine-ECU uses this signal to carry out idle speed control.</p>	<ul style="list-style-type: none"> <li>• Malfunction of the ignition switch</li> <li>• Malfunction of the inhibitor switch</li> <li>• Open circuit or short-circuited harness wire between ignition switch and inhibitor switch</li> <li>• Malfunction of the engine-ECU</li> </ul>



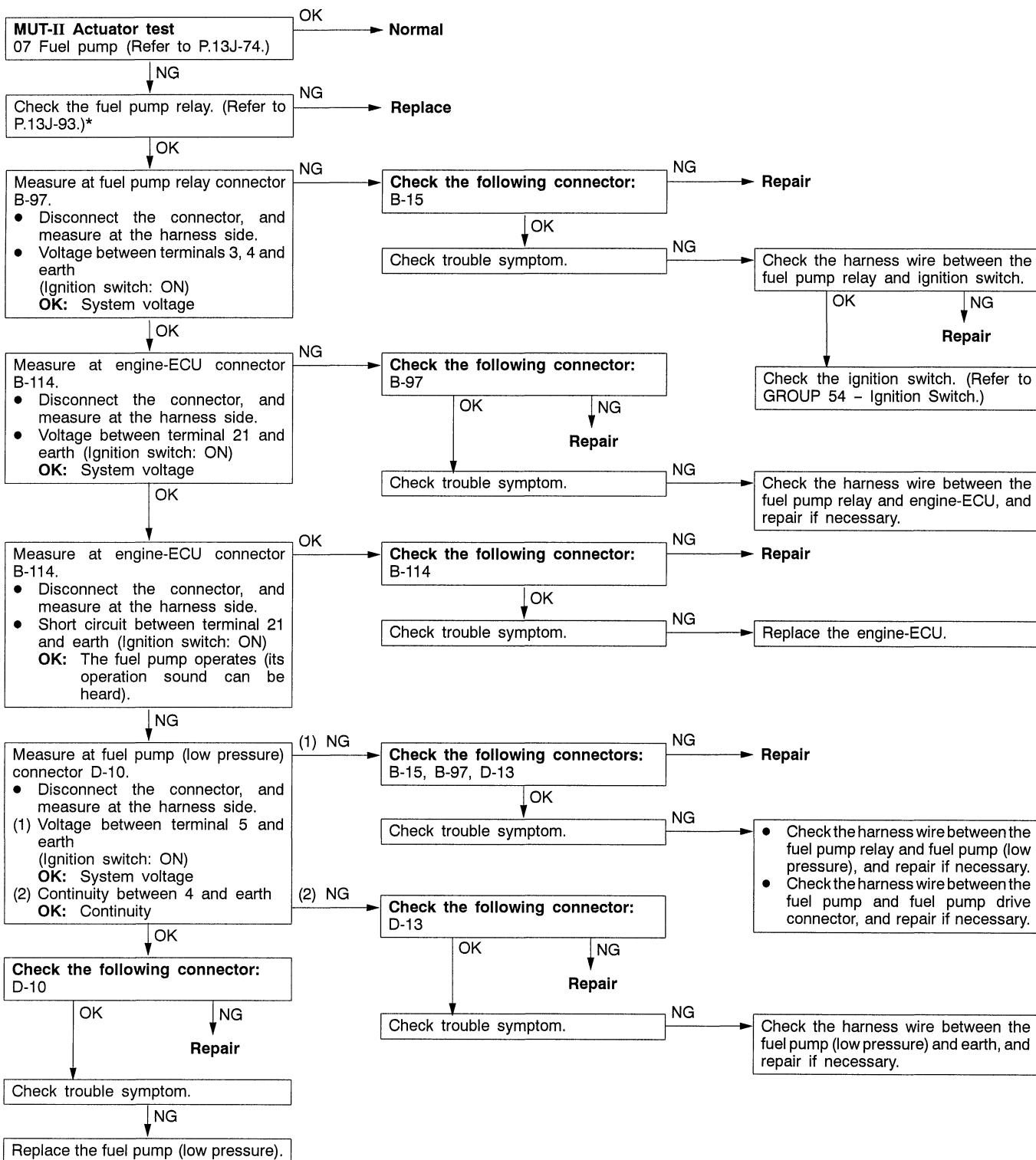
## INSPECTION PROCEDURE 29

Accelerator pedal position switch system	Probable cause
<p>The accelerator pedal position switch detects that the accelerator pedal is fully closed, and sends a signal to the engine-ECU. The engine-ECU judges if the accelerator pedal position sensor is faulty, based on this signal.</p>	<ul style="list-style-type: none"> <li>• Maladjustment of the accelerator cable</li> <li>• Maladjustment of the accelerator pedal position switch</li> <li>• Open circuit or short-circuited harness wire in the accelerator pedal position switch system, or poor connector contact</li> <li>• Malfunction of the engine-ECU</li> </ul>



## INSPECTION PROCEDURE 30

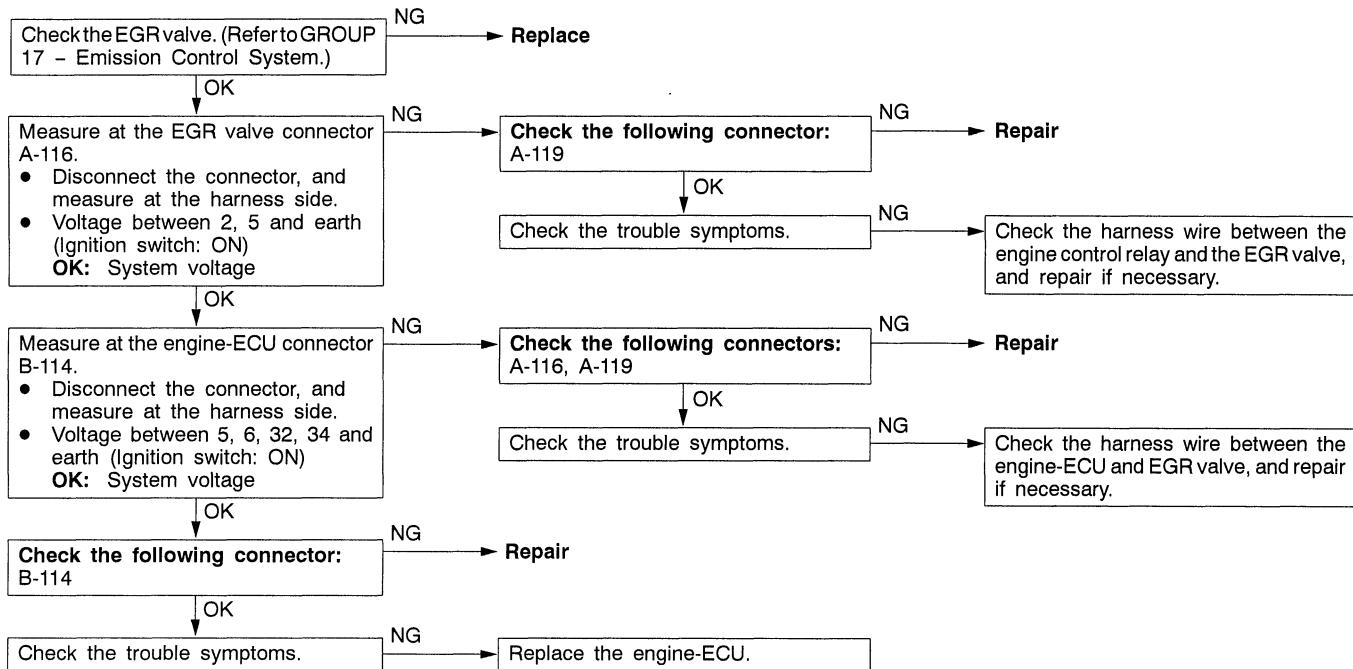
Fuel pump (low pressure) system	Probable cause
The engine-ECU turns on the fuel pump relay while the engine is cranking or running, and supplies power source to the fuel pump (low pressure).	<ul style="list-style-type: none"> <li>• Malfunction of the fuel pump relay</li> <li>• Malfunction of the fuel pump (low pressure)</li> <li>• Open circuit or short-circuited harness wire in the fuel pump (low pressure) circuit, or poor connector contact</li> <li>• Malfunction of the engine-ECU</li> </ul>



\*: Refer to '98 CARISMA GDI Workshop Manual (Pub. No. PWDE9502-C)

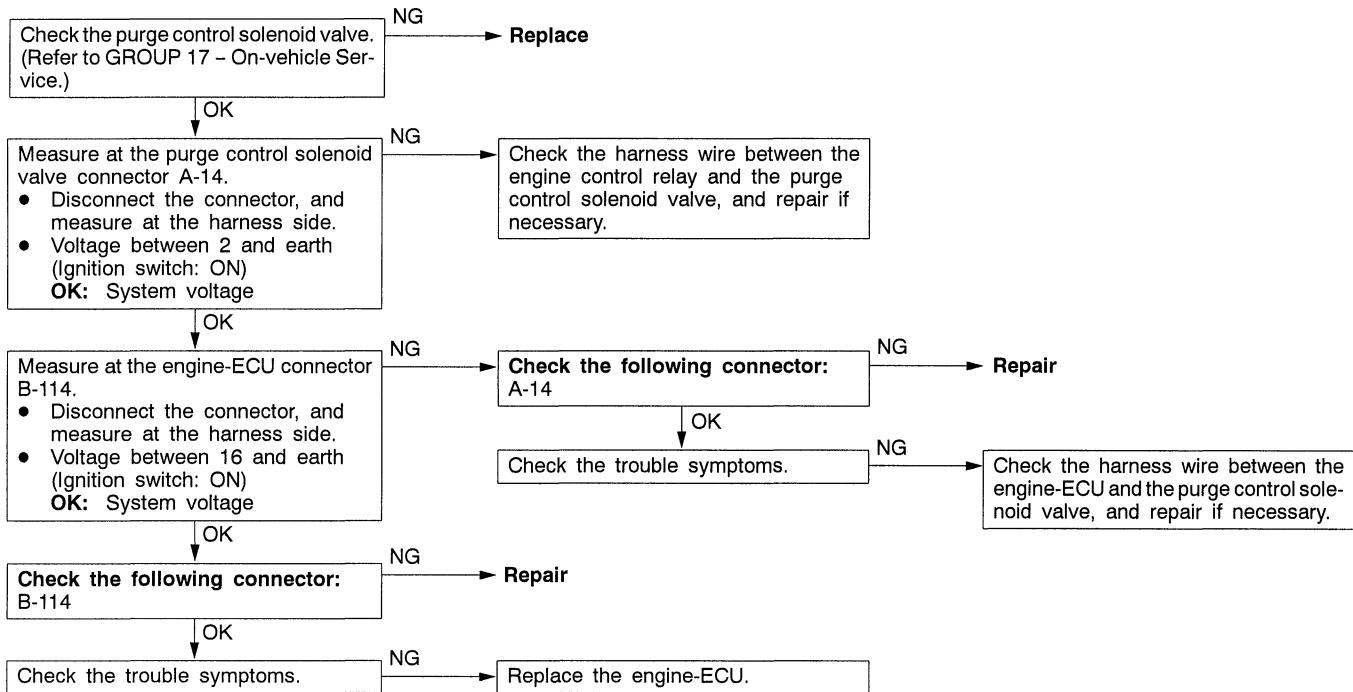
## INSPECTION PROCEDURE 31

EGR valve (stepper motor) system	Probable cause
<p>The engine-ECU controls the EGR valve (stepper motor) in order to control the amount of exhaust gas mixed in the intake air.</p>	<ul style="list-style-type: none"> <li>• Malfunction of the EGR valve</li> <li>• Open circuit or short-circuited harness wire in the EGR valve circuit</li> <li>• Malfunction of the engine-ECU</li> </ul>



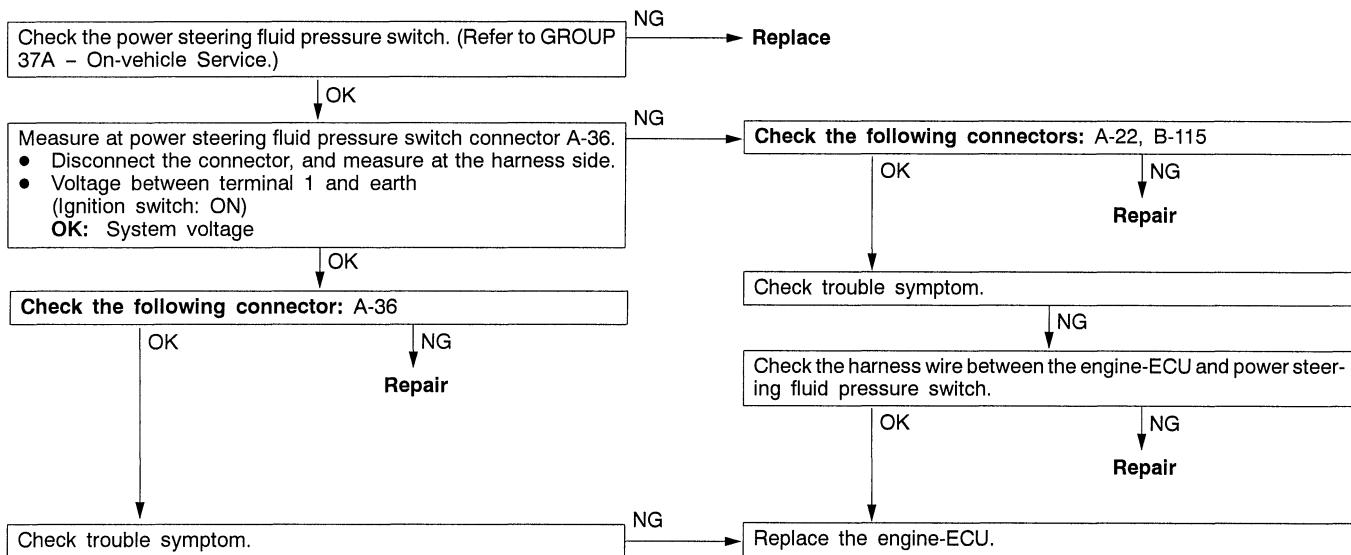
## INSPECTION PROCEDURE 32

Purge control solenoid valve system	Probable cause
<p>The engine-ECU controls the purge control solenoid valve in order to control the purge air coming from the canister.</p>	<ul style="list-style-type: none"> <li>• Malfunction of the purge control solenoid valve</li> <li>• Open circuit or short-circuited harness wire in the purge control solenoid valve circuit</li> <li>• Malfunction of the engine-ECU</li> </ul>



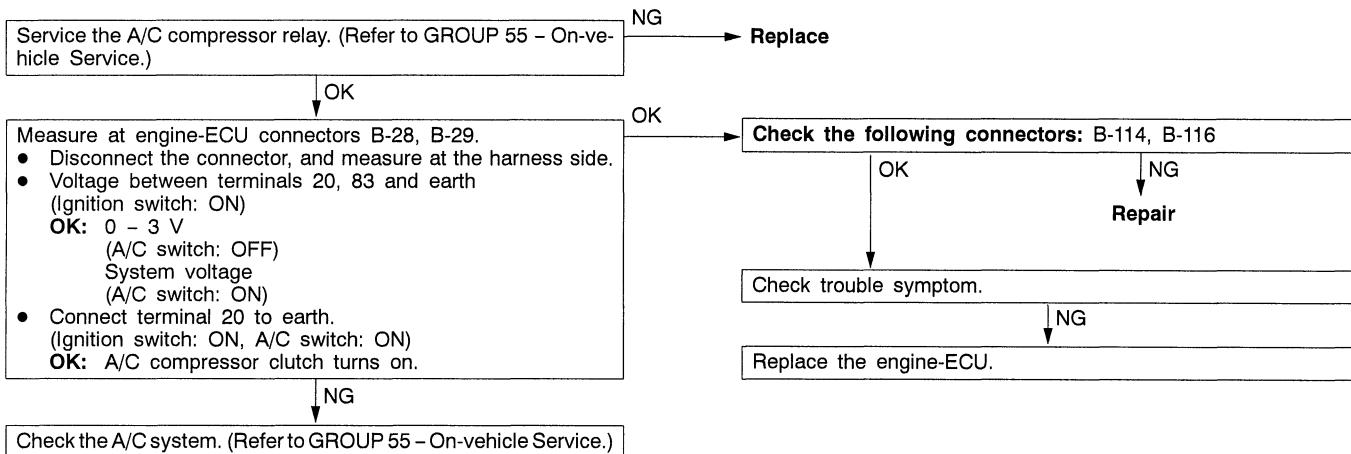
## INSPECTION PROCEDURE 33

Power steering fluid pressure switch system	Probable cause
<p>The power steering fluid pressure switch sends a signal to the engine-ECU according to power steering load. Based on this signal, the engine-ECU controls the throttle control servo so that idle speed increases when the power steering is in operation.</p>	<ul style="list-style-type: none"> <li>Malfunction of the power steering fluid pressure switch</li> <li>Open circuit or short-circuited harness wire in the power steering fluid pressure switch circuit, or poor connector contact</li> <li>Malfunction of the engine-ECU</li> </ul>



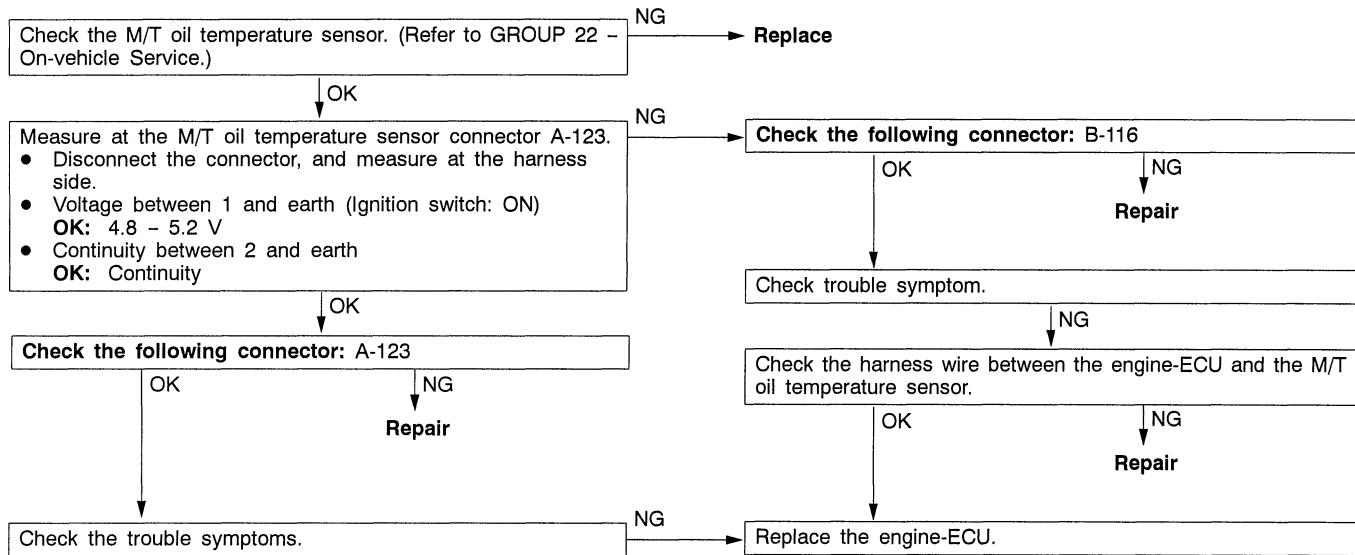
## INSPECTION PROCEDURE 34

A/C switch and A/C relay system	Probable cause
<p>If the engine-ECU receives a 'A/C on' signal, it operates the throttle control servo and A/C compressor magnetic clutch so that idle speed increases.</p>	<ul style="list-style-type: none"> <li>Malfunction of the A/C control system</li> <li>Malfunction of the A/C switch</li> <li>Open circuit or short-circuited harness wire in the A/C switch circuit, or poor connector contact</li> <li>Malfunction of the engine-ECU</li> </ul>



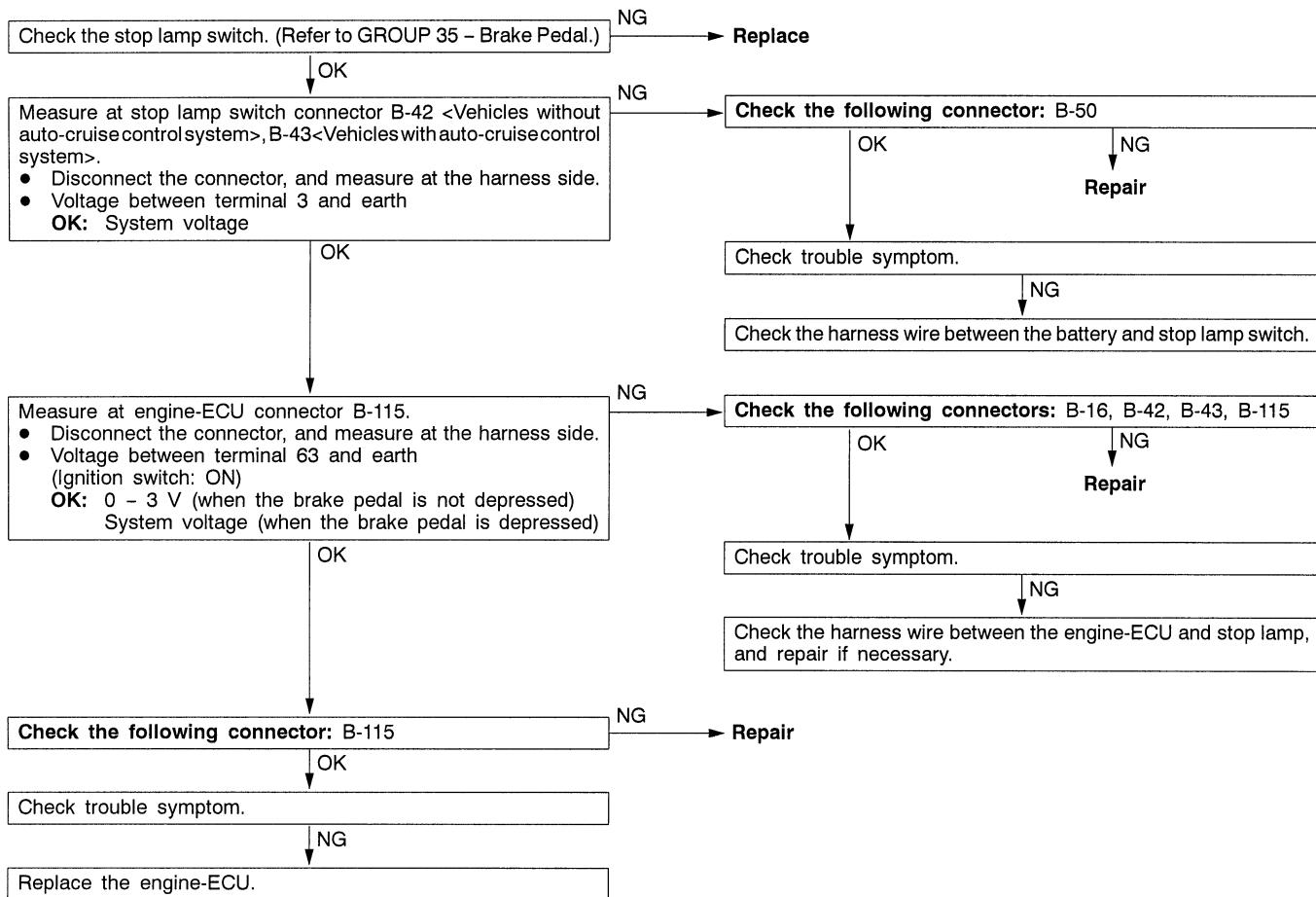
## INSPECTION PROCEDURE 35

M/T oil temperature sensor system < M/T >	Probable cause
<p>This sensor inputs the manual transmission oil temperature to the engine-ECU. The engine-ECU uses this input to control the idle speed control servo so that the idle speed is increased when the manual transmission oil temperature becomes low.</p>	<ul style="list-style-type: none"> <li>• Malfunction of the M/T oil temperature sensor</li> <li>• Open circuit or short-circuited harness wire in the M/T oil temperature sensor circuit</li> <li>• Malfunction of the engine-ECU</li> </ul>



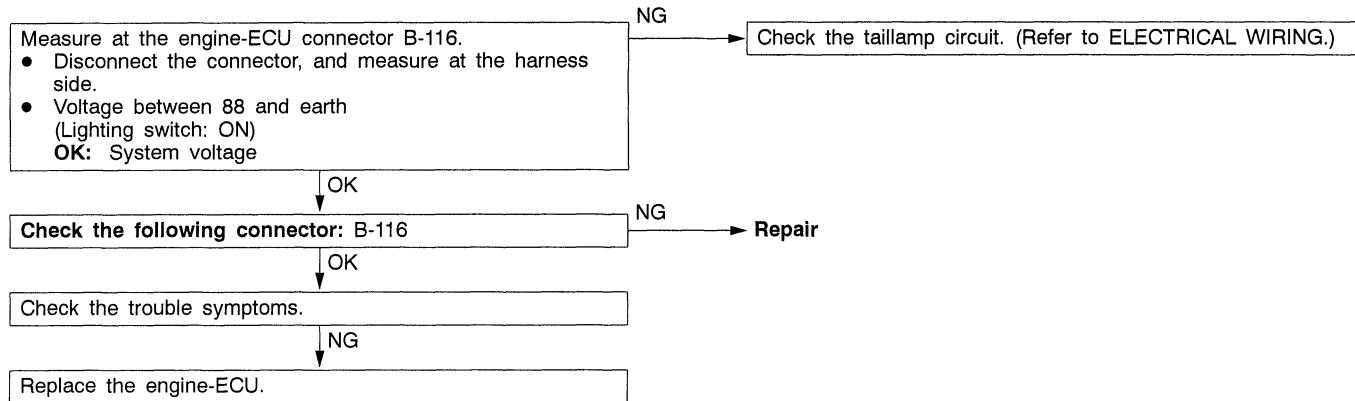
## INSPECTION PROCEDURE 36

Stop lamp switch system	Probable cause
<p>The engine-ECU determines whether the brake pedal is depressed or not, by means of the stop lamp switch input signal.</p>	<ul style="list-style-type: none"> <li>• Malfunction of the stop lamp switch</li> <li>• Open circuit or short-circuited harness wire in the stop lamp circuit, or poor connector contact</li> <li>• Malfunction of the engine-ECU</li> </ul>



## INSPECTION PROCEDURE 37

Small lamp switch	Probable cause
<p>The engine-ECU determines whether the small lamp switch is on or off. According to that information, the engine-ECU controls alternator output current when the vehicle is started.</p>	<ul style="list-style-type: none"><li>Improper connector contact, open circuit or short-circuited harness wire in the taillamp circuit</li><li>Malfunction of the engine-ECU</li></ul>



## DATA LIST REFERENCE TABLE

### Caution

When shifting the select lever to D range, the brakes should be applied so that the vehicle does not move forward.

### NOTE

- \*1: Within four minutes after starting the engine
- \*2: Transmission oil temperature is 50 °C or more
- \*3: In a new vehicle [driven approximately 500 km or less], the injector drive time is sometimes 10% longer than the standard time.
- \*4: The accelerator pedal position switch normally turns off when the voltage of the accelerator pedal position sensor (1st channel) is 300 – 500 mV higher than the voltage at the idle position. If the accelerator pedal position switch turns back on after the accelerator pedal position sensor voltage has risen by 500 mV and the throttle valve has opened, the accelerator pedal position switch and the accelerator pedal position sensor (1st channel) need to be adjusted.

Item No.	Check items	Requirements	Normal condition	Inspection procedure No.	Reference page	
11	Oxygen sensor	Engine: After warm-up	Idling	0 mV *1	Code No.11	13J-9
			Sudden racing	600 – 1,000 mV		
			2,500 r/min	400 mV or less and 600 – 1,000 mV alternates.		
12	Air flow sensor	<ul style="list-style-type: none"> <li>● Engine coolant temperature: 80 – 95°C</li> <li>● Lamps, electric cooling fan and all accessories: OFF</li> <li>● Transmission: Neutral (A/T: P range)</li> </ul>	Idling	20 – 55 Hz	–	–
			2,500 r/min	65 – 85 Hz		
			Racing	Frequency increases in response to racing.		
13	Intake air temperature sensor	Ignition switch: ON	Intake air temperature: -20°C	-20°C	Code No.13	13J-11
			Intake air temperature: 0°C	0°C		
			Intake air temperature: 20°C	20°C		
			Intake air temperature: 40°C	40°C		
			Intake air temperature: 80°C	80°C		

Item No.	Check items	Requirements	Normal condition	Inspection procedure No.	Reference page	
14	Throttle position sensor (2nd channel)	• Engine coolant temperature: 80 – 95°C	Release the accelerator pedal.	4,500 – 5,500 mV	Code No.14	13J-12
		• Ignition switch: ON (Engine stopped)	Depress the accelerator pedal gradually.	Voltage decreases in response to the pedal depression.		
			Depress the accelerator pedal fully.	400 – 600 mV		
16	Power supply voltage	Ignition switch: ON		System voltage	Procedure No.25	13J-58
18	Cranking signal (Ignition switch – ST)	Transmission: Neutral (A/T: P range)	Engine: Stopped	OFF	Procedure No.27 <M/T> Procedure No.28 <A/T>	13J-59 <M/T> 13J-60 <A/T>
			Engine: Cranking	ON		
21	Engine coolant temperature sensor	Ignition switch: ON	Engine coolant temperature: -20°C	-20°C	Code No.21	13J-13
			Engine coolant temperature: 0°C	0°C		
			Engine coolant temperature: 20°C	20°C		
			Engine coolant temperature: 40°C	40°C		
			Engine coolant temperature: 80°C	80°C		
22	Crank angle sensor	• Engine: cranking • Tachometer: Connected	Compare the engine speed readings on the tachometer and the MUT-II.		-	-
			Engine coolant temperature: -20°C	1,200 – 1,400 r/min		
		• Engine: Idling • Accelerator pedal position switch: ON	Engine coolant temperature: 0°C	1,100 – 1,300 r/min		
			Engine coolant temperature: 20°C	1,000 – 1,200 r/min		
			Engine coolant temperature: 40°C	900 – 1,100 r/min		
			Engine coolant temperature: 80°C	500 – 700 r/min <M/T>*1,*2 550 – 750 r/min <A/T>*1		

Item No.	Check items	Requirements	Normal condition	Inspection procedure No.	Reference page	
25	Barometric pressure sensor	Ignition switch: ON	Altitude: 0 m	101 kPa	Code No.25	13J-17
			Altitude: 600 m	95 kPa		
			Altitude: 1,200 m	88 kPa		
			Altitude: 1,800 m	81 kPa		
26	Accelerator pedal position switch	Ignition switch: ON (Depress and release the accelerator pedal several times)	Release the accelerator pedal.	ON	Procedure No.29	13J-61
			Depress the accelerator pedal slightly.	OFF		
27	Power steering fluid pressure switch	Engine: Idling	Steering wheel stationary	OFF	Procedure No.33	13J-65
			Steering wheel turning	ON		
28	A/C switch	Engine: Idling (The A/C compressor is running when the A/C switch is on.)	A/C switch: OFF	OFF	Procedure No.34	13J-65
			A/C switch: ON	ON		
29	Inhibitor switch	Ignition switch: ON	Selector lever: P or N	P, N	Procedure No.28	13J-60
			Selector lever: D, 2, L or R	D, 2, L, R		
31	Small lamp switch	Engine: Idling	Lighting switch: OFF	OFF	Procedure No.37	13J-68
			Lighting switch: ON	ON		
34	Air flow sensor reset signal	Engine: After having warmed up	Engine is idling	ON	Code No.12	13J-10
			3,000 r/min	OFF		
37	Volumetric efficiency	<ul style="list-style-type: none"> <li>● Engine coolant temperature: 80 – 95°C</li> <li>● Lamps, electric cooling fan and all accessories: OFF</li> <li>● Transmission: Neutral (A/T: P range)</li> </ul>	Engine is idling	15 – 35%	–	–
			2,500 r/min	15 – 35%		
			Engine is suddenly raced	Volumetric efficiency increases in response to racing		
38	Crank angle sensor	<ul style="list-style-type: none"> <li>● Engine: Cranking [reading is possible at 2,000 r/min or less]</li> <li>● Tachometer: Connected</li> </ul>	Engine speeds displayed on the MUT-II and tachometer are identical.	–	–	–

Item No.	Check items	Requirements	Normal condition	Inspection procedure No.	Reference page	
41	Injector drive time * <sup>3</sup>	<ul style="list-style-type: none"> <li>• Engine coolant temperature: 80 – 95°C</li> <li>• Lamps, electric cooling fan and all accessories: OFF</li> <li>• Transmission: Neutral (A/T: P range)</li> </ul>	Idling	0.5 – 0.7 ms* <sup>1</sup>	–	
			2,500 r/min	0.6 – 0.8 ms		
			Sudden racing	Increases		
44	Ignition advance	<ul style="list-style-type: none"> <li>• Engine: After warm-up</li> <li>• Set a timing light.</li> </ul>	Idling	12 – 20°BTDC * <sup>1</sup>	Code No.44	
			2,500 r/min	20 – 40°BTDC		
48	M/T oil temperature sensor	Drive after the engine has warmed up.	Drive for 15 minutes or more.	Gradually increases to 50 – 90°C.	Procedure No.35	13J-66
49	A/C relay	Engine: After warm-up, idling	A/C switch: OFF	OFF (compressor clutch is not operating)	Procedure No.34	13J-65
			A/C switch: ON	ON (compressor clutch is operating)		
66	Brake vacuum sensor	<ul style="list-style-type: none"> <li>• Engine coolant temperature: 80 – 95°C</li> <li>• Lamps, electric cooling fan and all accessories: OFF</li> <li>• Transmission: Neutral (A/T: P range)</li> </ul>	Stop the engine from idling speed, and then depress the brake pedal several times with the ignition switch on.	Displayed pressure increases.	Code No.66	13J-26
67	Stop lamp switch	Ignition switch: ON	Brake pedal: Depressed	OFF	Procedure No.36	13J-67
			Brake pedal: Released	ON		
68	EGR valve	<ul style="list-style-type: none"> <li>• Engine coolant temperature: 80 – 95°C</li> <li>• Lamps, electric cooling fan and all accessories: OFF</li> <li>• Transmission: Neutral (A/T: P range)</li> </ul>	Idling	5 – 15 STEP	Procedure No.31	13J-63
			2,500 r/min	0 – 10 STEP		

Item No.	Check items	Requirements	Normal condition	Inspection procedure No.	Reference page	
74	Fuel pressure sensor	<ul style="list-style-type: none"> <li>• Engine coolant temperature: 80 – 95°C</li> <li>• Lamps, electric cooling fan and all accessories: OFF</li> <li>• Transmission: Neutral (A/T: P range)</li> </ul>	Leave the engine running at the idle speed for more than three minutes	4 – 6.9 MPa	Code No.56	13J-23
77	Accelerator pedal position sensor (2nd channel)	Ignition switch: ON	<p>Release the accelerator pedal.</p> <p>Depress the accelerator pedal gradually.</p> <p>Depress the accelerator pedal fully.</p>	<p>935 – 1,135 mV</p> <p>Increases in response to the pedal depression stroke.</p> <p>4,000 mV or more</p>	Code No.77	13J-27
78	Accelerator pedal position sensor (1st channel)* <sup>3</sup>	Ignition switch: ON	<p>Release the accelerator pedal.</p> <p>Depress the accelerator pedal gradually.</p> <p>Depress the accelerator pedal fully.</p>	<p>935 – 1,135 mV</p> <p>Increases in response to pedal depression stroke.</p> <p>4,000 mV or more</p>	Code No.78	13J-28
79	Throttle position sensor (1st channel)	<ul style="list-style-type: none"> <li>• Engine coolant temperature: 80 – 95°C</li> <li>• Ignition switch: ON (Engine stopped)</li> </ul>	<p>Release the accelerator pedal.</p> <p>Depress the accelerator pedal gradually.</p> <p>Depress the accelerator pedal fully.</p>	<p>450 – 800 mV</p> <p>Increases in response to pedal depression stroke.</p> <p>4,200 – 4,900 mV</p>	Code No.79	13J-29
		Engine: After warm-up, idling	No load	450 – 1,000 mV		
			A/C switch: OFF → ON	Increases by 100 – 600 mV.		
			Selector lever: N → D range	Increases by 0 – 200 mV.		
99	Fuel injection mode	Engine: After warm up	<p>Idling (for several minutes after engine start)</p> <p>2,500 r/min</p> <p>Sudden racing after idle position</p>	<p>Lean compression</p> <p>Stoichio metric feedback</p> <p>Open loop</p>	–	–

## ACTUATOR TEST REFERENCE TABLE

Item No.	Inspection item	Drive contents	Inspection contents	Normal condition	Inspection procedure No.	Reference page
01	Injectors	Cut fuel to No. 1 injector	Engine: After having warmed up/Engine is idling (Cut the fuel supply to each injector in turn and check cylinders which don't affect idling.)	Idling condition becomes different (becomes unstable).	Code No. 41	13J-19
02		Cut fuel to No. 2 injector				
03		Cut fuel to No. 3 injector				
04		Cut fuel to No. 4 injector				
07	Fuel pump (low pressure)	Fuel pump operates and fuel is recirculated.	Ignition switch: ON	Sound of operation is heard.	Procedure No. 30	13J-62
08	Purge control solenoid valve	Solenoid valve turns from OFF to ON.	Ignition switch: ON	Sound of operation can be heard when solenoid valve is driven.	Procedure No. 32	13J-64
17	Basic ignition timing	Set the engine-ECU to ignition timing adjustment mode	Idling after engine warm up	5°BTDC	-	-
20	Fan motor relay	Drive the fan motor	Ignition switch: ON	Condenser fan motor operates	Procedure No.21	13J-55
21	Fan motor relay	Drive the fan motor	Ignition switch: ON	Condenser fan motor and radiator fan motor operates	Procedure No.21	13J-55
34	Electronic-controlled throttle valve system	Close the throttle valve fully	Ignition switch: ON	Operation sound can be heard	Code No.91	13J-31

**CHECK AT THE ENGINE-ECU TERMINALS****TERMINAL VOLTAGE CHECK CHART****Engine-ECU Connector Terminal Arrangement**

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74	83	95
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	80	93
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27	69	80
26	70	81
25	71	82
24	72	83
23	73	84
22	74	85
21	75	86
20	76	87
19	77	88
18	78	89
17	79	90
16	80	91
15	81	92
14	82	93
13	83	94
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Terminal No.	Check item	Check requirements (engine condition)	Normal condition
1	No.1 injector	Engine: Warm up, and then depress the accelerator pedal suddenly from the idle speed.	Decreases slightly for short time from 9 – 13 V.
9	No.2 injector		
24	No.3 injector		
2	No.4 injector		
3	No.1 ignition coil	Engine: 3,000 r/min	0.1 – 2.0 V
13	No.2 ignition coil		
12	No.3 ignition coil		
4	No.4 ignition coil		
5	EGR valve (D)	Ignition switch: Immediately after turning ON	5 – 8 V (fluctuates for approx. three seconds)
6	EGR valve (C)		
32	EGR valve (B)		
34	EGR valve (A)		
8	Alternator G terminal	<ul style="list-style-type: none"> <li>• Engine: Warm up, and then idling</li> <li>• Radiator fan: not operating</li> <li>• Headlamp: OFF → ON</li> <li>• Stop lamp: OFF → ON</li> <li>• Rear defogger switch: OFF → ON</li> </ul>	Voltage increases by 0.2 – 3.5 V
52	Alternator FR terminal	<ul style="list-style-type: none"> <li>• Engine: Warm up, and then idling</li> <li>• Radiator fan: not operating</li> <li>• Headlamp: OFF → ON</li> <li>• Stop lamp: OFF → ON</li> <li>• Rear defogger: OFF → ON</li> </ul>	Voltage decreases
14	GDI ECO indication lamp	Constant speed driving at 40 km/h Engine: Depress the accelerator pedal suddenly from the idle speed.	0 – 3 V System voltage

Terminal No.	Check item	Check requirements (engine condition)		Normal condition
16	Purge control solenoid valve	<ul style="list-style-type: none"> <li>• Engine coolant temperature: 80 – 95°C</li> <li>• Ignition switch: ON</li> </ul>	Engine: stopped	System voltage
			Engine: Start the engine, and then increase engine speed up to 3,500 r/min.	Voltage decreases.
17	Fan motor relay (HI)	Radiator fan is not operating (Engine coolant temperature is 90°C or less)		System voltage
		Radiator fan is not operating (Engine coolant temperature is 105°C or more)		0 – 3 V
18	Fan motor relay (LO)	Radiator fan and condenser fan are not operating (Engine coolant temperature is 90°C or less)		System voltage
		Radiator fan and condenser fan are not operating (Engine coolant temperature is 90 – 105°C or less)		0 – 3 V
20	A/C relay	<ul style="list-style-type: none"> <li>• Engine: idling</li> <li>• A/C switch: OFF → ON (Compressor is operating)</li> </ul>		System voltage, or changes from momentarily 6 V or more to 0 → 3 V
21	Fuel pump relay	Ignition switch: ON	Engine: stopped	System voltage
			Engine: Idling	0 – 3 V
31	Engine warning lamp	Ignition switch: OFF → ON		0 – 3 V → System voltage (after several seconds)
41	Sensor power supply	Ignition switch: ON		4.5 – 5.5 V
42	Power supply to accelerator pedal position sensor (1st channel)	Ignition switch: ON		4.5 – 5.5 V
43	Crank angle sensor	Engine: Cranking		0.4 – 4.0 V
		Engine: Idling		1.5 – 2.5 V
44	Engine coolant temperature sensor	Ignition switch: ON	Engine coolant temperature: 0°C	3.2 – 3.8 V
			Engine coolant temperature: 20°C	2.3 – 2.9 V
			Engine coolant temperature: 40°C	1.3 – 1.9 V
			Engine coolant temperature: 80°C	0.3 – 0.9 V
45	Tachometer output	Engine: 3,000 r/min		2.0 – 9.0 V
47	Power supply	Ignition switch: ON		System voltage
59				

Terminal No.	Check item	Check requirements (engine condition)		Normal condition
50	Camshaft position sensor	Engine: Cranking		0.3 – 3.0 V
		Engine: Idling		0.5 – 3.5 V
51	Barometric pressure sensor	Ignition switch: ON	Altitude: 0 m	3.7 – 4.3 V
			Altitude: 1,200 m	3.2 – 3.8 V
54	Power steering fluid pressure switch	Engine: Warm up, and then idling	Steering wheel stationary	System voltage
			Steering wheel turning	0 – 3 V
55	Injector driver relay	Ignition switch: OFF		0 – 0.1 V
		Ignition switch: ON		0.5 – 1.0 V
56	Throttle valve control servo relay	Ignition switch: OFF		0 – 0.3 V
		Ignition switch: ON		0.5 – 1.0 V
57	Engine control relay	Ignition switch: OFF		0 – 3 V
		Ignition switch: ON		System voltage
60	Back-up power source	Ignition switch: OFF		System voltage
61	Air flow sensor	Engine: Idling		2.2 – 3.2 V
		Engine: 2,500 r/min		
62	Intake air temperature sensor	Ignition switch: ON	Intake air temperature: 0°C	3.2 – 3.8 V
			Intake air temperature: 20°C	2.3 – 2.9 V
			Intake air temperature: 40°C	1.5 – 2.1 V
			Intake air temperature: 80°C	0.4 – 1.0 V
63	Stop lamp switch	Depress the brake pedal.		System voltage
		Release the brake pedal.		0 – 3 V
65	A/C switch (2nd channel)	Refer to GROUP 55 – Troubleshooting “Check at the A/C-ECU terminals, engine-ECU output terminals.”		
66	Clutch switch <M/T>	Depress the clutch pedal		0 – 3 V
		Release the clutch pedal		System voltage
67	Inhibitor switch <A/T>	Ignition switch: ON	Selector lever: P or N range	0 – 3 V
			Selector lever: Other than P or N range	8 – 14 V
68	Ignition switch – ST	Engine: Cranking		8 V or more

Terminal No.	Check item	Check requirements (engine condition)		Normal condition
71	Oxygen sensor	Engine: Warm up, and then hold the engine speed at 2,500 r/min (Use a digital voltmeter).		0 ↔ 0.8 V alternates.
73	M/T oil temperature sensor <M/T>	M/T oil temperature: 25°C		2.4 – 2.7 V
		M/T oil temperature: 80°C		0.5 – 0.8 V
74	Brake vacuum sensor	Engine: Stop the engine from idle speed, turn the ignition switch ON, and then depress the brake pedal several times.		Voltage increases
76	Air flow sensor reset signal	Engine: idling		0 – 1 V
		Engine: 3,000 r/min		6 – 9 V
78	Throttle position sensor (2nd channel)	Ignition switch: ON	Release the accelerator pedal.	4.5 – 5.5 V
			Depress the accelerator pedal fully.	0.4 – 0.6 V
79	Accelerator pedal position switch	Ignition switch: ON	Release the accelerator pedal.	0 – 1 V
			Depress the accelerator pedal slightly.	4 V or more
80	Vehicle speed sensor	<ul style="list-style-type: none"> <li>Ignition switch: ON</li> <li>Move the vehicle forward.</li> </ul>		0 V ↔ system voltage alternates.
83	A/C switch (1st channel)	Engine: idling	A/C switch: OFF	0 – 3 V
			A/C switch: ON (Compressor is operating)	System voltage
88	Small lamp switch	Lighting switch: OFF		0 – 3 V
		Lighting switch: ON (Taillamp: ON)		System voltage
89	Oxygen sensor heater	Engine: idling		0 – 3 V
		Engine: 3,500 r/min		System voltage
92	Fuel pressure sensor	Engine: Idling		0.3 – 4.7 V
94	Accelerator pedal position sensor (1st channel)	Ignition switch: ON	Release the accelerator pedal.	0.9 – 1.2 V
			Depress the accelerator pedal fully.	4 V or more
96	Injector open circuit check signal	Engine: Increase engine speed from idle speed to 4,000 r/min.		Decreases slightly (approx.0.7 V) from 4.5 V – 5.0 V.
99	Ignition switch – IG	Ignition switch: ON		System voltage

**CHECK CHART FOR RESISTANCE AND CONTINUITY  
BETWEEN TERMINALS**

1. Turn the ignition switch to LOCK(OFF) position.
2. Disconnect the engine-ECU connector.
3. Measure the resistance and check for continuity between the terminals of the engine-ECU harness-side connector while referring to the check chart.

**NOTE**

- (1) When measuring resistance and checking continuity, a harness for checking contact pin pressure should be used instead of inserting a test probe.
- (2) Checking need not be carried out in the order given in the chart.

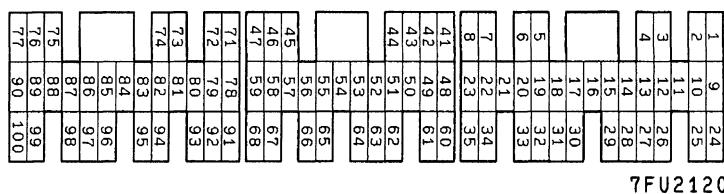
**Caution**

**If the terminals that should be checked are mistaken, or if connector terminals are not correctly shorted to earth, damage may be caused to the vehicle wiring, sensors, engine-ECU and/or ohmmeter.**

**Be careful to prevent this!**

4. If the ohmmeter shows any deviation from the standard value, check the corresponding sensor, actuator and related electrical wiring, and then repair or replace.
5. After repair or replacement, recheck with the ohmmeter to confirm that the repair or replacement has corrected the problem.

## Engine-ECU Harness Side Connector Terminal Arrangement

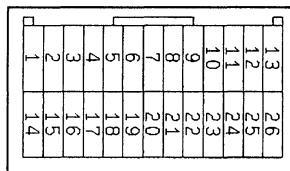


Terminal No.	Check item	Standard value, normal condition (check requirements)
16 – 47	Purge control solenoid valve	36 – 44 Ω (at 20°C)
89 – 47	Oxygen sensor (front) heater	11 – 18 Ω (at 20°C)
46 – Body earth	Earth	Continuity (0 Ω)
58 – Body earth		
5 – 47	EGR valve (B)	15 – 20 Ω (at 20°C)
6 – 47	EGR valve (C)	
32 – 47	EGR valve (B)	
34 – 47	EGR valve (A)	
72 – 79	Accelerator pedal position switch	Continuity (when the accelerator pedal is released) No continuity (when the accelerator pedal is slightly depressed)
62 – 72	Intake air temperature sensor	5.3 – 6.7 kΩ (when intake air temperature is 0°C) 2.3 – 3.0 kΩ (when intake air temperature is 20°C) 1.0 – 1.5 kΩ (when intake air temperature is 40°C) 0.30 – 0.42 kΩ (when intake air temperature is 80°C)
44 – 72	Engine coolant temperature sensor	5.1 – 6.5 kΩ (when engine coolant temperature is 0°C) 2.1 – 2.7 kΩ (when engine coolant temperature is 20°C) 0.9 – 1.3 kΩ (when engine coolant temperature is 40°C) 0.26 – 0.36 kΩ (when engine coolant temperature is 80°C)
67 – Body earth	Inhibitor switch <A/T>	Continuity (when the selector lever is at P or N range) No continuity (when the selector lever is at a range other than P or N)

## CHECK AT THE THROTTLE VALVE CONTROLLER TERMINALS

### TERMINAL VOLTAGE CHECK CHART

#### Throttle Valve Controller Terminal Arrangement



7FU2121

Terminal No.	Check items	Requirements		Normal value
1	Throttle valve control servo (A+)	<ul style="list-style-type: none"> <li>Ignition switch: ON</li> <li>Accelerator pedal: Fully opened → fully closed</li> </ul>		Decreases slightly from system voltage.
9	Throttle valve control servo (B+)			
14	Throttle valve control servo (A-)	<ul style="list-style-type: none"> <li>Ignition switch: ON</li> <li>Accelerator pedal: Fully closed → fully opened</li> </ul>		Decreases slightly (approx. 2 V) from system voltage.
15	Throttle valve control servo (B-)			
2	Power supply to throttle valve control servo	Ignition switch: ON		System voltage
5	Power supply	Ignition switch: ON		System voltage
6	Sensor voltage	Ignition switch: ON		4.5 – 5.5 V
7	Throttle position sensor (1st channel)	Ignition switch: ON	Release the accelerator pedal.	0.4 – 0.8 V
			Depress the accelerator pedal fully.	4.2 – 4.9 V
20	Accelerator pedal position sensor (2nd channel)	Ignition switch: ON	Release the accelerator pedal.	0.9 – 1.2 V
			Depress the accelerator pedal fully.	4 V or more
22	Ignition switch – IG	Ignition switch: ON		System voltage

## INSPECTION PROCEDURE USING AN ANALYZER

The following service procedures have been established due to the change on the engine-ECU connector terminal layout. The other procedures are the same as before.

### AIR FLOW SENSOR (AFS)

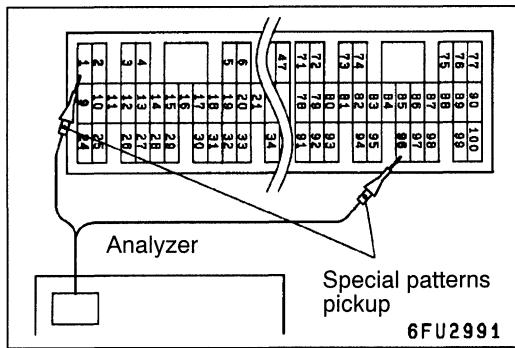
#### Alternate Method (Test harness not available)

1. Connect the analyzer special patterns pickup to engine-ECU terminal 61.

### CAMSHAFT POSITION SENSOR AND CRANK ANGLE SENSOR

#### Alternate Method (Test harness not available)

1. Connect the analyzer special patterns pickup to engine-ECU terminal 50. (When checking the camshaft position sensor signal wave pattern.)
2. Connect the analyzer special patterns pickup to engine-ECU terminal 43. (When checking the crank angle sensor signal wave pattern.)



### INJECTORS AND INJECTOR OPEN CIRCUIT CHECK SIGNAL

#### Measurement Method

1. Connect the analyzer special patterns pickup to terminal 1 (No.1 injector) of the engine-ECU connector.
2. Connect the analyzer special patterns pickup to terminal 96 (injector open circuit check signal) of the engine-ECU connector.
3. After checking terminal 1 (No.1 injector), check terminal 9 (No.2 injector), terminal 24 (No.3 injector) and terminal 2 (No.4 injector).

### IGNITION COIL AND POWER TRANSISTOR

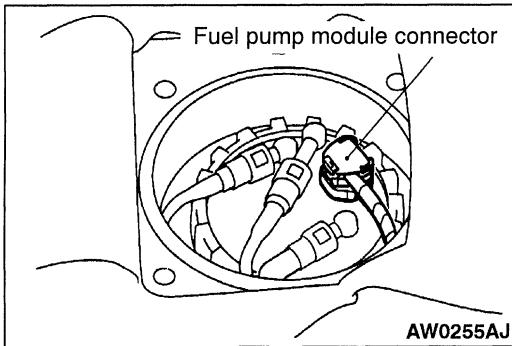
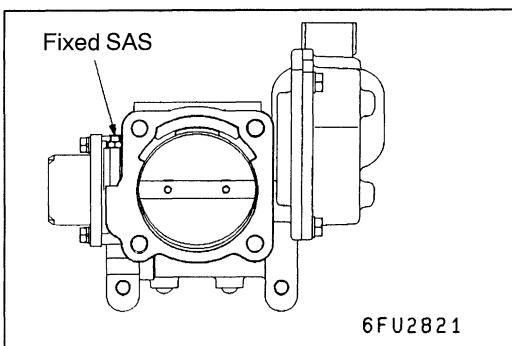
#### Alternate Method (Test harness not available)

1. Connect the analyzer special patterns pickup to engine-ECU terminal 3 (No. 1 ignition coil), terminal 13 (No. 2 ignition coil), terminal 12 (No. 3 ignition coil), terminal 4 (No. 4 ignition coil) respectively.

### EGR VALVE (STEPPER MOTOR)

#### Alternate Method (Test harness not available)

1. Connect the analyzer special patterns pickup to engine-ECU terminal 5, connection terminal 6, connection terminal 32, and connection terminal 34 respectively.



## ON-VEHICLE SERVICE

### Caution

1. Never attempt to tamper the fixed SAS. The fixed SAS is precisely adjusted at factory.
2. Should it be tampered, the full closed position of the throttle valve will be changed. This causes the engine-ECU to learn a wrong position of the throttle valve.

## FUEL PUMP CONNECTOR DISCONNECTION (HOW TO REDUCE FUEL PRESSURE)

When removing the fuel pipe, hose, etc., since fuel pressure in the fuel pipe line is high, do the following operation so as to release fuel pressure in the line and prevent fuel from running out.

- (1) Remove the rear seat cushion. (Refer to GROUP 52A.)
- (2) Remove the protector.
- (3) Disconnect the fuel pump module connector.
- (4) Connect the MUT-II to the diagnosis connector.

### Caution

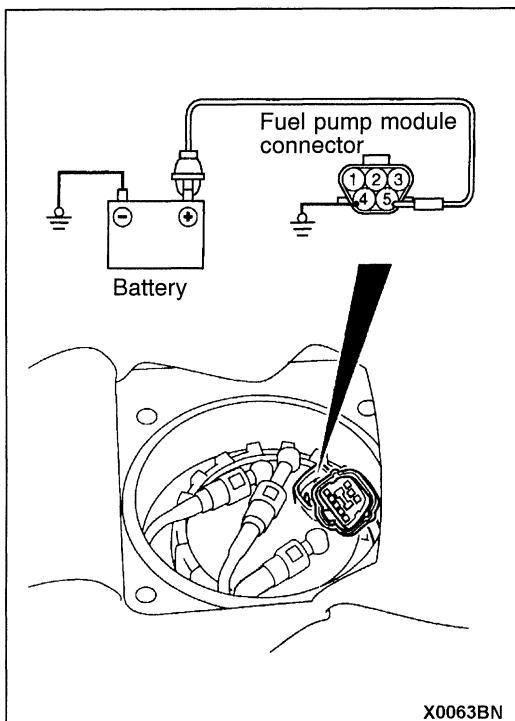
**Turn off the ignition switch before disconnecting or connecting the MUT-II.**

- (5) Turn on the ignition switch.
- (6) Select "Item No.74" from the MUT-II Data list.
- (7) Crank the engine for at least two seconds.
- (8) If the engine is not be started, use the MUT-II to make sure that the fuel pressure is 0.5 MPa or less. Then turn off the ignition switch.
- (9) If the engine is started, release fuel pressure by the following procedure:
  - 1) Turn off the ignition switch, and then stop the engine.
  - 2) Disconnect one of the ignition coil connectors.
  - 3) Crank the engine for at least two seconds.
  - 4) If the engine can not be started, use the MUT-II to make sure that the fuel pressure is 0.5 MPa or less. Then turn off the ignition switch.
  - 5) If the engine is started, stop it by racing and use the MUT-II to make sure that the fuel pressure is 0.5 MPa or less. Then turn off the ignition switch.
  - 6) Reconnect the ignition coil connector.

### Caution

**Clean the spark plug which corresponds to the disconnected ignition coil connector.**

- (10) Remove the MUT-II.
- (11) Reconnect the fuel pump module connector.
- (12) Install the protector and rear seat cushion.

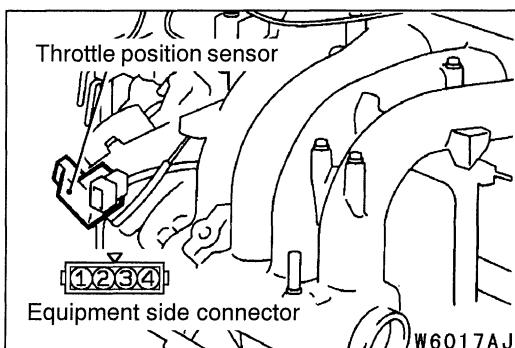


## FUEL PUMP (LOW PRESSURE) OPERATION CHECK

1. Check the operation of the fuel pump (low pressure) by using the MUT-II to force-drive the fuel pump.
2. If the fuel pump (low pressure) will not operate, check by using the following procedure, and if it is normal, check the drive circuit.
  - (1) Turn the ignition switch to LOCK(OFF).
  - (2) Remove the rear seat cushion. (Refer to GROUP 52A.)
  - (3) Remove the protector.
  - (4) Disconnect the fuel pump module connector. Listen to a fuel pump operation sound while connecting battery voltage to No.5 terminal of the fuel pump module, and No.4 terminal to earth.
  - (5) Check fuel pressure by pinching the fuel hose with your finger.
  - (6) Connect the fuel pump module connector.
  - (7) Install the protector and rear seat cushion.

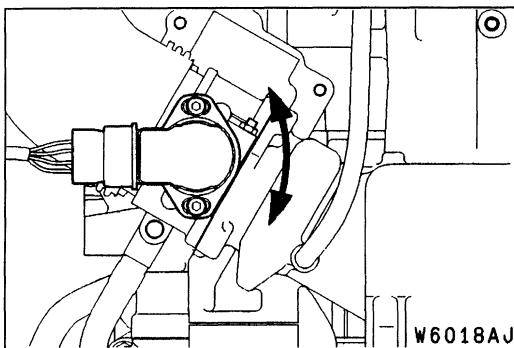
## THROTTLE BODY (THROTTLE VALVE AREA) CLEANING

1. Start the engine, and warm it up until engine coolant temperature reaches 80°C. Then stop the engine.
2. Remove the air intake hose at the throttle body side.
3. Apply cleaning agent to the throttle valve through the intake port of the throttle valve, and then leave it for approx. five minutes.
4. Start the engine, race it several times, and then let it run at idle for approx. one minute.
5. If carbon deposits are not removed from the throttle vale area, repeat steps (3) and (4).
6. Install the air intake hose.
7. Use the MUT-II or disconnect the negative battery cable from the battery terminal in order to erase a diagnosis code. Wait for at least ten seconds, and then let the engine run at idle again for approx. ten minutes.

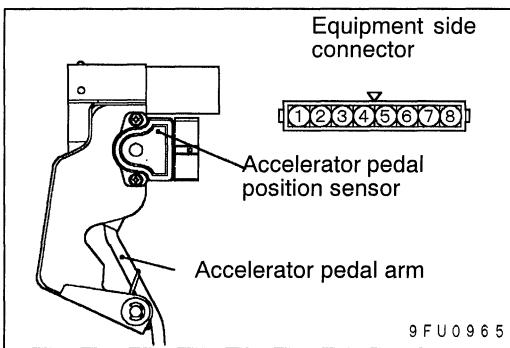


## THROTTLE POSITION SENSOR ADJUSTMENT

1. Connect the MUT-II to the diagnosis connector.
2. Disconnect the throttle valve control servo connector.
3. Turn on the ignition switch (but do not start the engine).



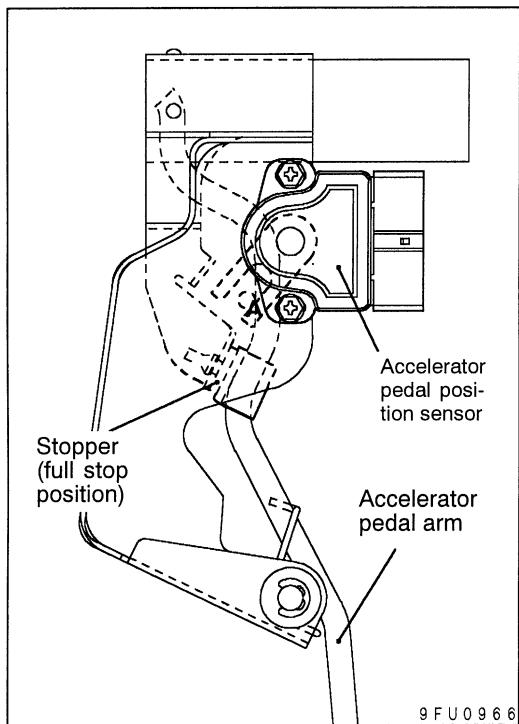
4. Check the output voltage of the throttle position sensor (1st channel) when the throttle valve is fully closed by your finger.  
**Standard value: 0.4 – 0.6 V**
5. If not within the standard value, loosen the throttle position sensor mounting bolts. Then rotate the sensor body to adjust.
6. Check the output voltage of the throttle position sensor (2nd channel) when the throttle valve is fully closed by your finger.  
**Standard value: 4.2 – 4.8 V**
7. If not within the standard value, replace the throttle position sensor.
8. Turn the ignition switch to LOCK(OFF).
9. Reconnect the throttle valve control servo connector.
10. Remove the MUT-II.
11. If a diagnosis code is displayed, erase the diagnosis code by using the MUT-II or disconnect the negative battery cable from the battery terminal and then leave it for at least ten seconds. After that, reconnect the battery cable.
12. Turn on the ignition switch, wait for at least 10 seconds, and then off again. In addition, if the battery cable is disconnected at step 11, let the engine run at idle for approx. ten minutes.



## ACCELERATOR PEDAL POSITION SENSOR ADJUSTMENT

### Caution

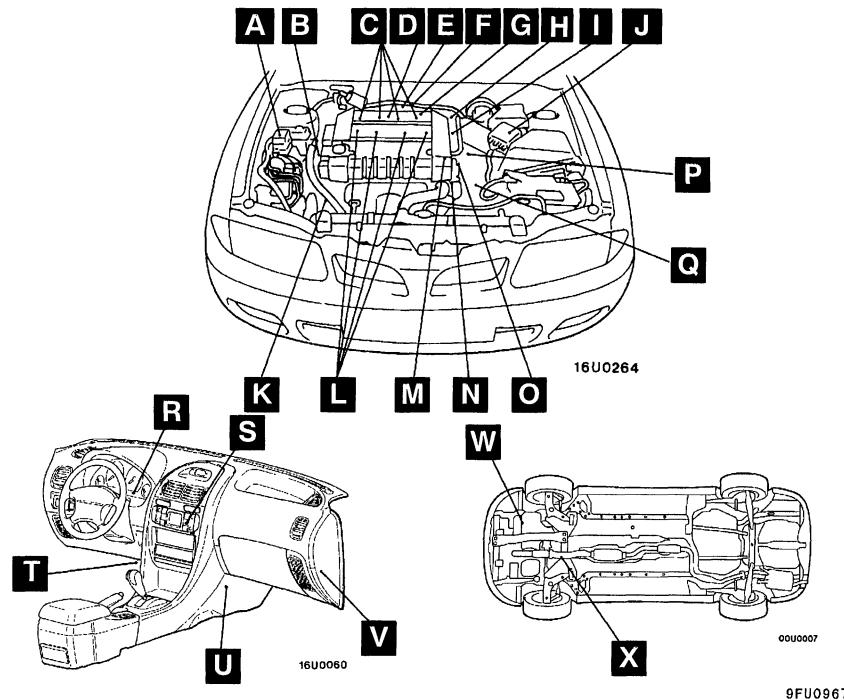
- (1) **Never attempt to tamper the accelerator pedal position sensor. The sensor position is precisely adjusted at factory.**
- (2) **Should it be tampered, follow the procedure below:**
  1. Remove the accelerator pedal complete.
  2. Connect the MUT-II to the diagnosis connector.
  3. Loosen the accelerator pedal position sensor attaching bolts to allow it to be loosely fitted.

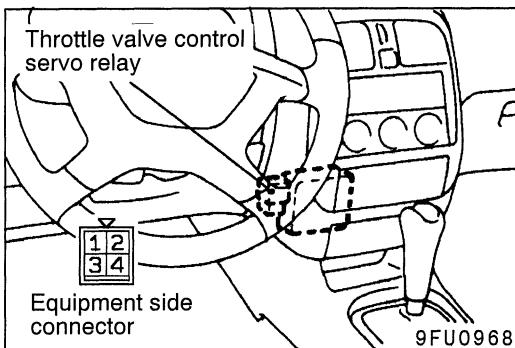


4. Ensure that the accelerator pedal arm contacts the full-stop position stopper.
5. Turn the ignition switch to the ON position (but do not start the engine).
6. Rotate the accelerator pedal position sensor to adjust sensor output voltage to the standard value.  
**Standard value: 0.985 – 1.085 V**
7. Tighten the sensor mounting bolts securely.
8. Install the accelerator pedal complete.

## COMPONENT LOCATION

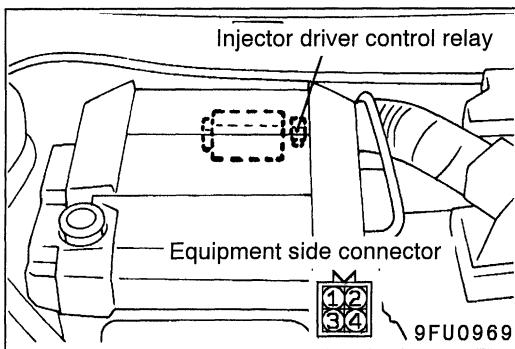
Name	Symbol	Name	Symbol
A/C relay	A	Fuel pump relay	U
A/C switch	S	GDI ECO indication lamp	R
Accelerator pedal position sensor (1st and 2nd channels)	T	Ignition coil	L
		Inhibitor switch <A/T>	Q
Air flow sensor (with intake air temperature sensor and barometric pressure sensor)	J	Injectors	C
		Injector driver	E
Camshaft position sensor	M	Injector driver relay	F
Clutch switch <M/T>	T	M/T oil temperature sensor <M/T>	W
Crank angle sensor	B	Oxygen sensor	X
Detonation sensor	D	Power steering fluid pressure switch	K
Diagnosis connector	T	Purge control solenoid valve	G
EGR valve	G	Throttle position sensor	H
Engine control relay	U	Throttle valve controller	U
Engine coolant temperature sensor	N	Throttle valve control servo	I
Engine-ECU	V	Throttle valve control servo relay	U
Engine warning lamp (CHECK ENGINE lamp)	R	Vehicle speed sensor	P
Fuel pressure sensor	O		





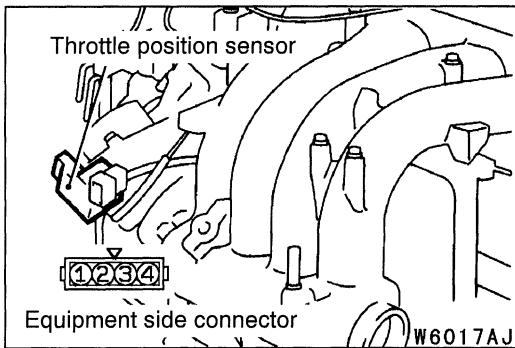
## THROTTLE VALVE CONTROL SERVO RELAY CONTINUITY CHECK

Battery voltage	Terminal No.			
	1	2	3	4
Not supplied		○		○
Supplied	○	○	○	○



## INJECTOR DRIVER RELAY CONTINUITY CHECK

Battery voltage	Terminal No.			
	1	2	3	4
Not supplied			○	○
Supplied	○	○	○	○



## THROTTLE POSITION SENSOR CHECK

1. Disconnect the throttle position sensor connector.
2. Measure the resistance between throttle position sensor side connector terminal 1 and terminal 3.

**Standard value: 1.7 – 3.3 kΩ**

3. Measure resistance between terminal Nos. 1 and 2 as well as 1 and 4 of the throttle position sensor connector, respectively.

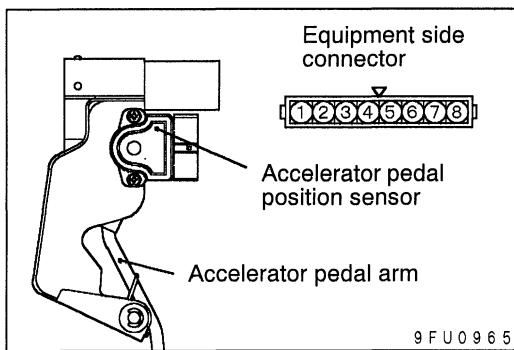
**Normal condition:**

Throttle valve slowly open until fully open from the idle position	Changes smoothly in proportion to the opening angle of the throttle valve
--	---

4. If the resistance is outside the standard value, or if it doesn't change smoothly, replace the throttle position sensor.

### NOTE

For the throttle position sensor adjustment procedure, refer to P.13J-84.



## ACCELERATOR PEDAL POSITION SENSOR (1ST AND 2ND CHANNELS) CHECK

1. Disconnect the accelerator pedal position sensor connector.
2. Measure resistance between terminal Nos.2 (1st channel power supply) and 1 (1st channel earth) as well as between terminal Nos.8 (2nd channel power supply) and terminal No.7 (2nd channel earth) of the sensor connector.
3. Measure resistance between terminal Nos.2 (1st channel power supply) and 3 (1st channel output) as well as between terminal Nos.8 (2nd channel power supply) and terminal No.6 (2nd channel output) of the sensor connector.

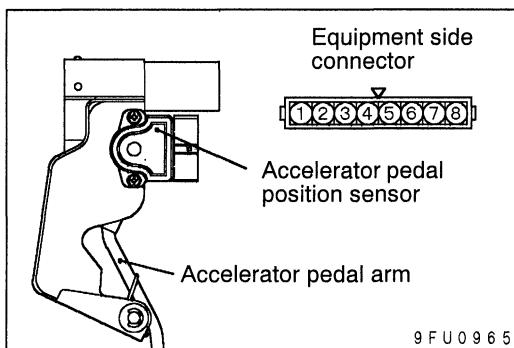
### Normal condition:

Depress the accelerator pedal slowly.	Resistance value changes in accordance with the accelerator pedal depression smoothly.
---------------------------------------	--

4. If not within the standard value, or resistance value does not change smoothly, replace the accelerator pedal position sensor.

### NOTE

After replacement, adjust the accelerator pedal position sensor. (Refer to P.13J-85.)



## ACCELERATOR PEDAL POSITION SWITCH CHECK

1. Disconnect the accelerator pedal position sensor connector.
2. Check continuity between terminal Nos. 4 (accelerator pedal position switch) and 5 (earth) of the connector.

### Normal condition

Accelerator pedal	Continuity
Depressed	No continuity
Released	Continuity ( $0\ \Omega$ )

3. If defective, replace the accelerator pedal position sensor.

### NOTE

After replacement, adjust the accelerator pedal position sensor. (Refer to P.13J-85.)

## THROTTLE VALVE CONTROL SERVO CHECK

### Operation Check

1. Disconnect the air intake hose from the throttle body.
2. Turn on the ignition switch.
3. Check that the throttle valve opens or closes in response to the accelerator pedal depression.

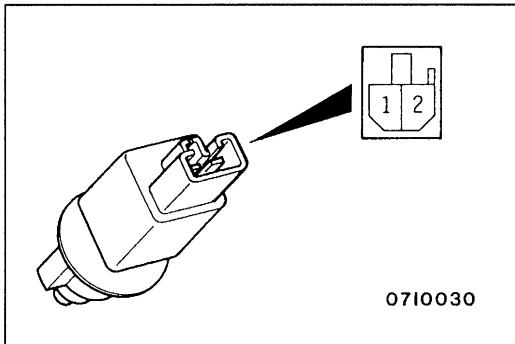
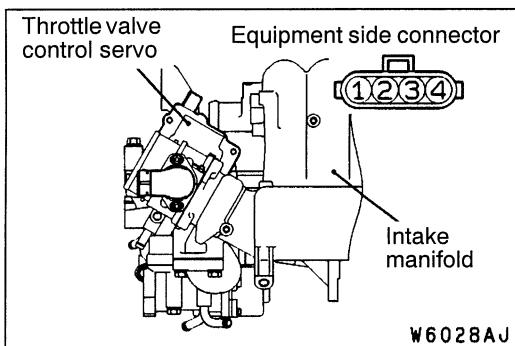
### Check of Coil Resistance

1. Disconnect the throttle valve control servo connector.
2. Measure resistance between the throttle valve control servo connector terminals.

#### Standard value:

Terminals to be measured	Resistance value ( $\Omega$ )
1 – 3	1.35 – 1.65 (at 20°C)
2 – 4	

3. Check that there is no continuity between the terminals and body.



## CLUTCH SWITCH CHECK

1. Disconnect the connector.
2. Check for continuity between the terminals of the switch.

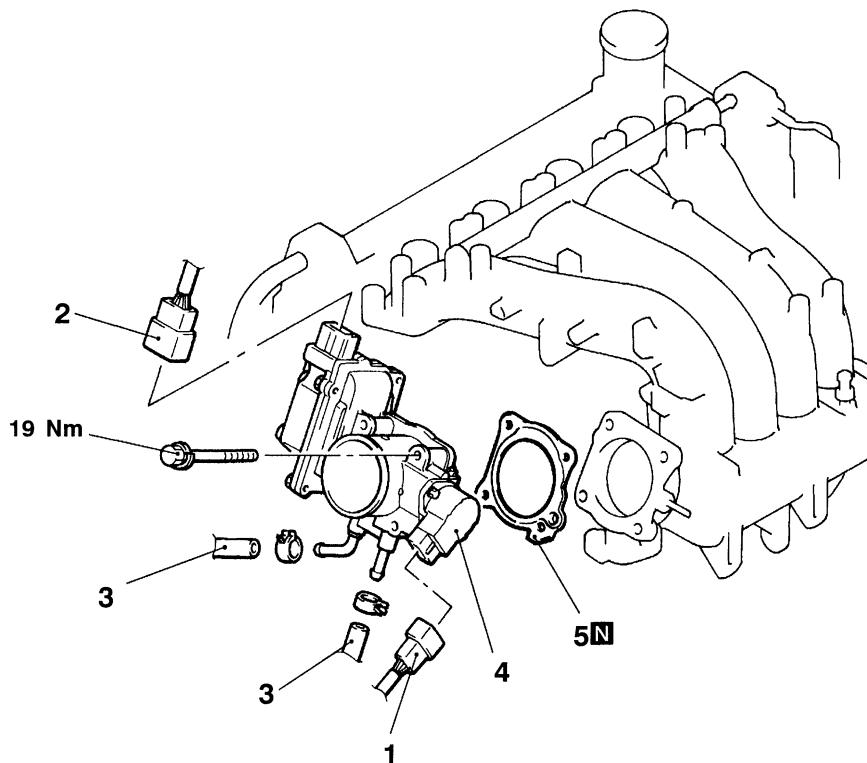
Measurement conditions	Terminal No.	
	1	2
When clutch pedal is depressed.	<input type="circle"/>	<input type="circle"/>
When clutch pedal is not depressed.		

## THROTTLE BODY

### REMOVAL AND INSTALLATION

**Pre-removal and Post-installation Operation**

- Engine Coolant Draining and Supplying
- Air Intake Hose Removal and Installation
- Initialization (Refer to P.13J-92.)  
<after installation only>

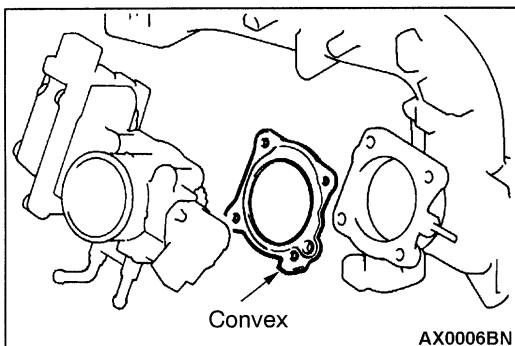


AX0005BN

**Removal steps**

1. Throttle position sensor connector
2. Throttle control servo connector
3. Water hose connection

►A◀ 4. Throttle body  
5. Throttle body gasket



## INSTALLATION SERVICE POINT

### ►A◀ THROTTLE BODY GASKET INSTALLATION

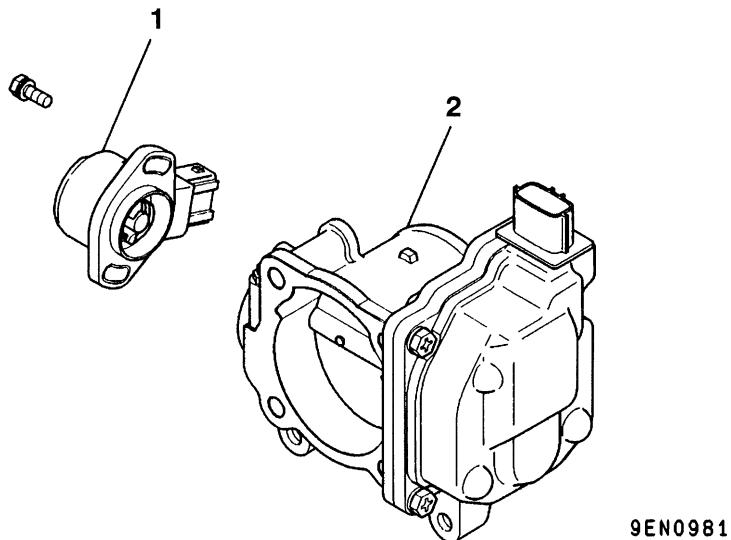
Place the gasket so that the projecting part is positioned as shown in the illustration, and then install it between the intake manifold and the throttle body.

## INITIALIZATION

When replacing the throttle body, initialize the electronic-controlled throttle valve system as follows:

1. Turn the ignition switch to ON, and then turn it to LOCK(OFF) within one second. Hold the ignition switch at LOCK(OFF) position for for ten seconds or more.

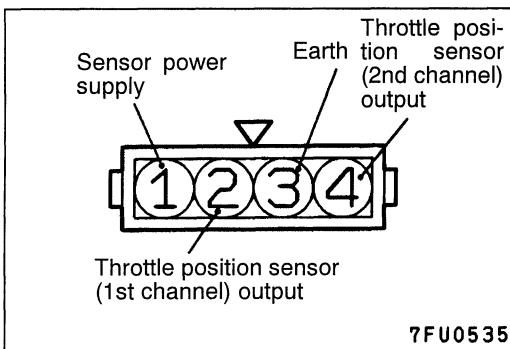
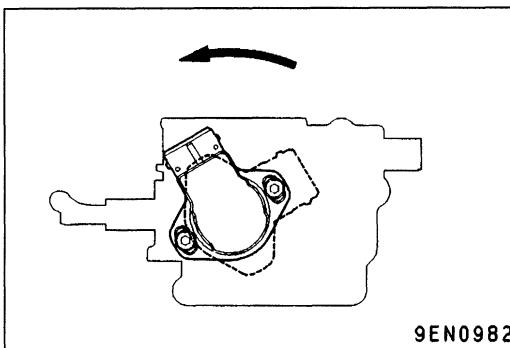
## DISASSEMBLY AND REASSEMBLY



### Disassembly steps

►A◀

1. Throttle position sensor
2. Throttle body



## REASSEMBLY SERVICE POINTS

### ►A◄ THROTTLE POSITION SENSOR

- (1) Position the throttle position sensor on the throttle body along the dotted line as shown in the illustration.
- (2) Rotate the throttle position sensor anticlockwise as shown in the illustration, and then tighten the screws.

- (3) Measure resistance value between terminal Nos. 1 (sensor power supply) and 2 (throttle position sensor 1st-channel output) as well as 1 (sensor power supply) and 4 (throttle position sensor 2nd-channel output).

#### Normal condition

Open the throttle valve slowly from the idle position to full-open position.

Resistance value changes smoothly in response to throttle valve opening angle.

- (4) If the resistance value does not change smoothly, replace the throttle position sensor.

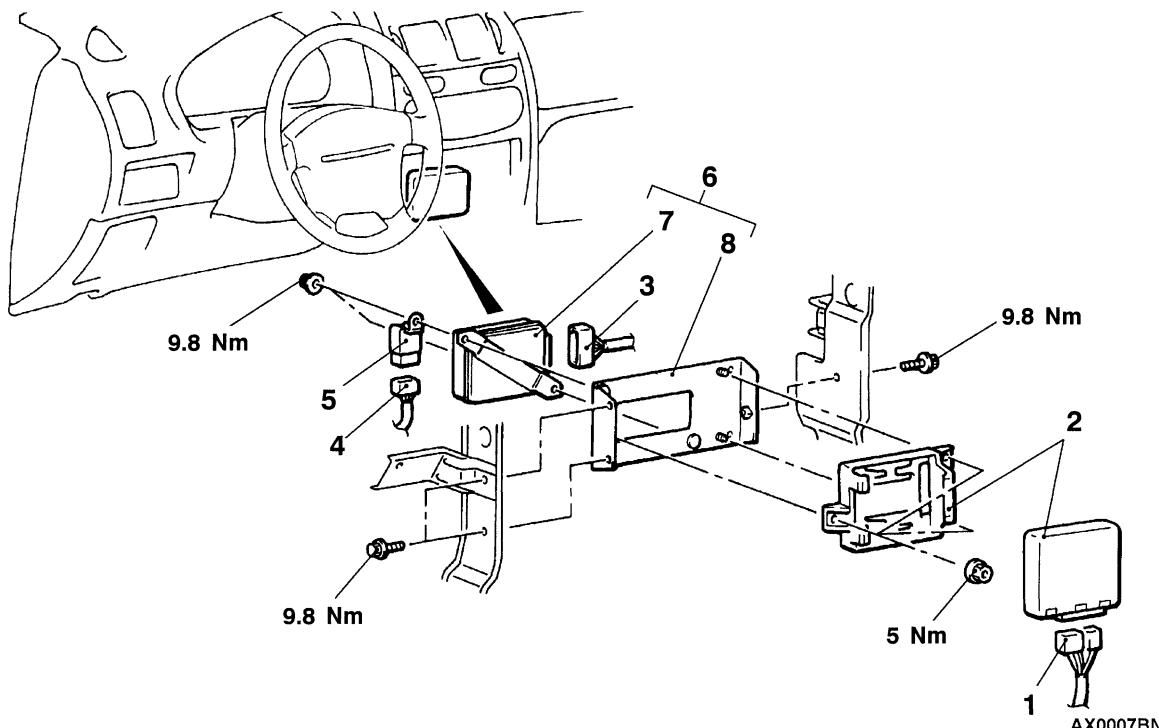
## THROTTLE VALVE CONTROLLER

### REMOVAL AND INSTALLATION

#### Pre-removal and Post-installation Operation

- Front Floor Console Assembly Removal
- Initialization (Refer to P.13J-94.)

<After installation only>



#### Removal steps

1. Keyless entry receiver-ECU connector
2. Keyless entry receiver-ECU and bracket
3. Throttle valve controller connector
4. Throttle control servo relay connector
5. Throttle control servo relay
6. Throttle valve controller and ECU bracket
7. Throttle valve controller
8. ECU bracket

## INITIALIZATION

When replacing the throttle valve controller, initialize the electronic-controlled throttle valve system as follows:

1. Turn the ignition switch to ON, and then turn it to LOCK(OFF) within one second. Hold the ignition switch at LOCK(OFF) position for for ten seconds or more.