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# MULTIPOINT FUEL INJECTION (MPI)

Click on the applicable bookmark to selected the required model year.

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# MULTIPOINT FUEL INJECTION (MPI)

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13109000737

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## GENERAL INFORMATION

13100010739

The Multipoint Fuel Injection System consists of sensors which detect the engine conditions, the engine-ECU which controls the system based on signals from these sensors, and actuators which operate under the control of the engine-ECU. The engine-ECU carries out

activities such as fuel injection control, idle speed control and ignition timing control. In addition, the engine-ECU is equipped with several diagnosis modes which simplify troubleshooting when a problem develops.

### FUEL INJECTION CONTROL

The injector drive times and injector timing are controlled so that the optimum air/fuel mixture is supplied to the engine to correspond to the continually-changing engine operation conditions.

A single injector is mounted at the intake port of each cylinder. Fuel is sent under pressure from the fuel tank by the fuel pump, with the pressure being regulated by the fuel pressure regulator. The fuel thus regulated is distributed to each of the injectors.

Fuel injection is normally carried out once for each cylinder for every two rotations of the crankshaft. The firing order is 1-2-3-4-5-6.

This is called sequential fuel injection. The engine-ECU provides a richer air/fuel mixture by carrying out "open-loop" control when the engine is cold or operating under high load conditions in order to maintain engine performance. In addition, when the engine is warm or operating under normal conditions, the engine-ECU controls the air/fuel mixture by using the oxygen sensor signal to carry out "closed-loop" control in order to obtain the theoretical air/fuel mixture ratio that provides the maximum cleaning performance from the three way catalyst.

### IDLE AIR CONTROL

The idle speed is kept at the optimum speed by controlling the amount of air that bypasses the throttle valve in accordance with changes in idling conditions and engine load during idling. The engine-ECU drives the idle speed control (ISC) motor to keep the engine running at the pre-set idle target speed in accordance with the engine coolant temperature and air

conditioner load. In addition, when the air conditioner switch is turned off and on while the engine is idling, the ISC motor operates to adjust the throttle valve bypass air amount in accordance with the engine load conditions in order to avoid fluctuations in the engine speed.

### IGNITION TIMING CONTROL

The power transistor located in the ignition primary circuit turns ON and OFF to control the primary current flow to the ignition coil. This controls the ignition timing in order to provide the optimum ignition timing with respect to the

engine operating conditions. The ignition timing is determined by the engine-ECU from the engine speed, intake air volume, engine coolant temperature and atmospheric pressure.

### SELF-DIAGNOSIS FUNCTION

1. When an abnormality is detected in one of the sensors or actuators related to emission control, the engine warning lamp (check engine lamp) illuminates as a warning to the driver.
2. When an abnormality is detected in one of the sensors or actuators, a diagnosis code corresponding to the abnormality is output.

3. The RAM data inside the engine-ECU that is related to the sensors and actuators can be read by means of the MUT-II. In addition, the actuators can be force-driven under certain circumstances.

**OTHER CONTROL FUNCTIONS**

1. Fuel Pump Control  
Turns the fuel pump relay ON so that current is supplied to the fuel pump while the engine is cranking or running.
2. A/C Relay Control  
Turns the compressor clutch of the A/C ON and OFF.
3. Purge Control Solenoid Valve Control  
Refer to GROUP 17.
4. EGR Control Solenoid Valve Control  
Refer to GROUP 17.

**GENERAL SPECIFICATIONS**

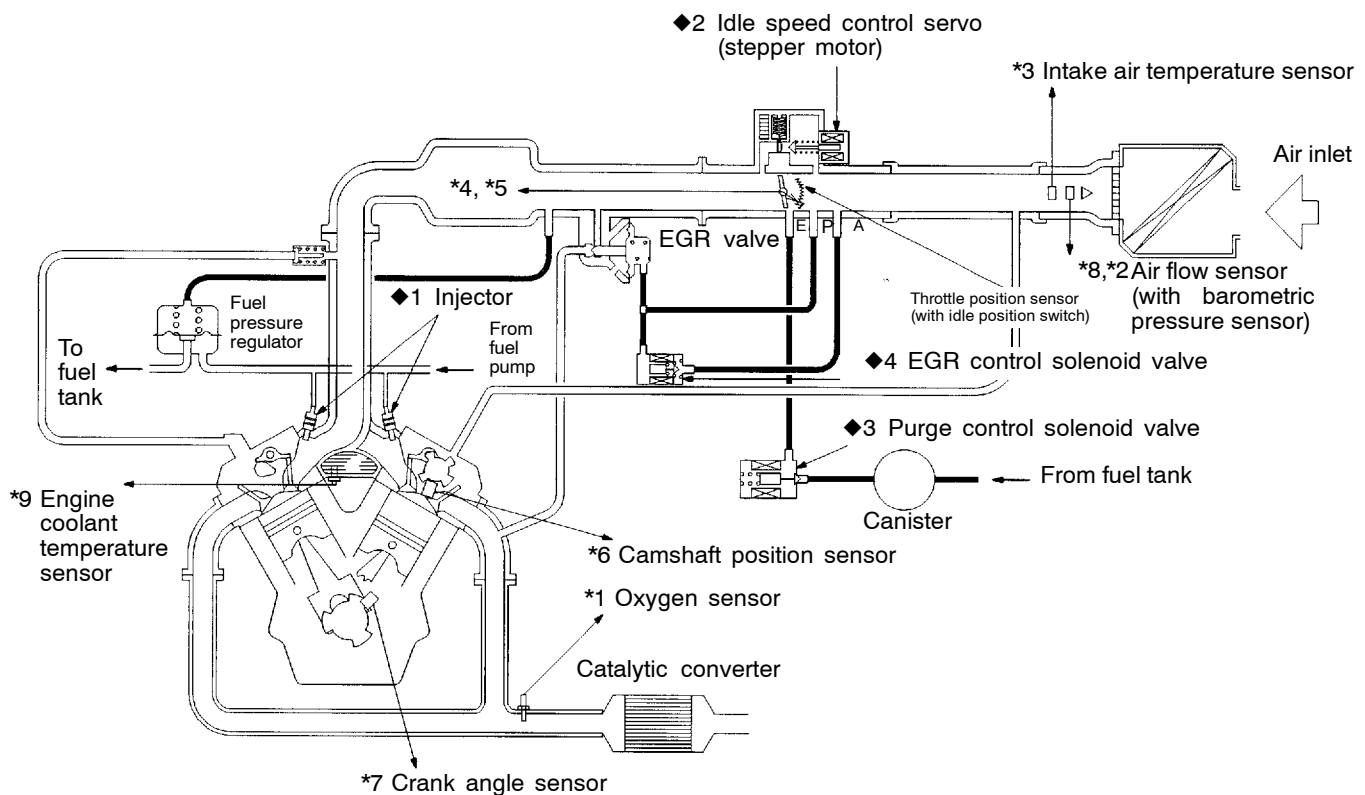
Items		Specifications
Throttle body	Throttle bore mm	60
	Throttle position sensor	Variable resistor type
	Idle speed control servo	Stepper motor type (Stepper motor type by-pass air control system with the air volume limiter)
	Idle position switch	Rotary contact type, within throttle position sensor
Engine-ECU	Identification model No.	E2T63687
Sensors	Air flow sensor	Karman vortex type
	Barometric pressure sensor	Semiconductor type
	Intake air temperature sensor	Thermistor type
	Engine coolant temperature sensor	Thermistor type
	Oxygen sensor	Zirconia type
	Vehicle speed sensor	Magnetic resistive element type
	Camshaft position sensor	Hall element type
	Crank angle sensor	Hall element type
	Power steering fluid pressure switch	Contact switch type
Actuators	Control relay type	Contact switch type
	Fuel pump relay type	Contact switch type
	Injector type and number	Electromagnetic type, 6
	Injector identification mark	EDH210
Fuel pressure regulator	Regulator pressure kPa	329

## SYSTEM DIAGRAM

- \*1. Oxygen sensor
  - \*2. Air flow sensor
  - \*3. Intake air temperature sensor
  - \*4. Throttle position sensor
  - \*5. Idle position switch
  - \*6. Camshaft position sensor
  - \*7. Crank angle sensor
  - \*8. Barometric pressure sensor
  - \*9. Engine coolant temperature sensor
- 
- Power supply
  - Vehicle speed sensor
  - A/C switch
  - Power steering fluid pressure switch
  - Ignition switch-ST
  - Ignition switch-IG

⇒ Engine-ECU ⇒

- ◆1 Injector
  - ◆2 Idle speed control servo
  - ◆3 Purge control solenoid valve
  - ◆4 EGR control solenoid valve
- 
- Fuel pump relay
  - Control relay
  - A/C power relay
  - Condenser fan relay
  - Engine warning lamp
  - Diagnosis signal
  - Ignition coil, power transistor



7FU2382

## SERVICE SPECIFICATIONS

13100030513

Items		Specifications
Basic idle speed r/min		700 ± 50
Throttle position sensor adjusting voltage mV		400 – 1,000
Throttle position sensor resistance kΩ		3.5 – 6.5
Idle speed control servo coil resistance Ω		28 – 33 (at 20°C)
Intake air temperature sensor resistance kΩ	At 20°C	2.3 – 3.0
	At 80°C	0.30 – 0.42
Engine coolant temperature sensor resistance kΩ	At 20°C	2.1 – 2.7
	At 80°C	0.26 – 0.36
Oxygen sensor output voltage V		0.6 – 1.0
Fuel pressure kPa	Vacuum hose disconnection	324 – 343 at kerb idle
	Vacuum hose connection	Approx. 265 at kerb idle
Injector coil resistance Ω		13 – 16 (at 20°C)

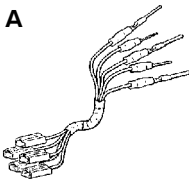



## SEALANT

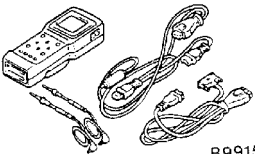
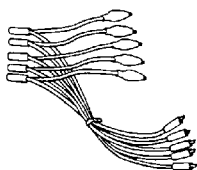
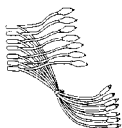

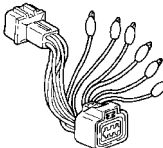
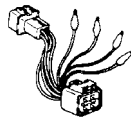

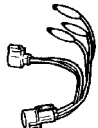
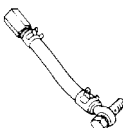
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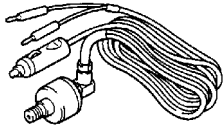

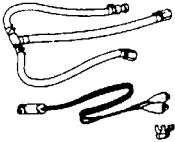
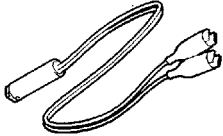
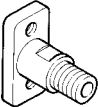
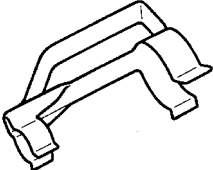
Item	Specified sealant	Remark
Engine coolant temperature sensor threaded portion	3M Nut Locking Part No. 4171 or equivalent	Drying sealant

## SPECIAL TOOLS

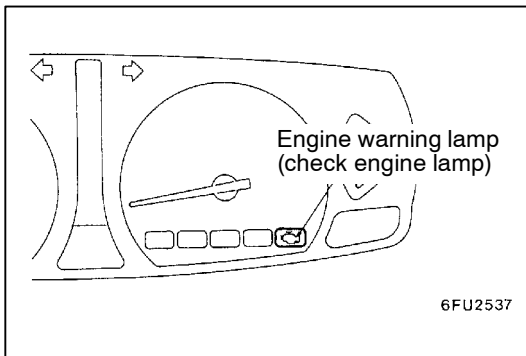
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Tool	Number	Name	Use
<b>A</b>  <b>B</b>  <b>C</b>  <b>D</b> 	MB991223 A: MB991219 B: MB991220 C: MB991221 D: MB991222	Harness set A: Test harness B: LED harness C: LED harness adapter D: Probe	Measurement of terminal voltage A: Connector pin contact pressure inspection B: Power circuit inspection C: Power circuit inspection D: Commercial tester connection

Tool	Number	Name	Use
 B991502	MB991502	MUT-II sub assembly	<ul style="list-style-type: none"> <li>• Reading diagnosis code</li> <li>• MPI system inspection</li> <li>• Measurement of fuel pressure</li> </ul>
	MB991348 MB991658	Test harness set	<ul style="list-style-type: none"> <li>• Adjustment of idle position switch and throttle position sensor</li> <li>• Inspection using an analyzer</li> </ul>
 MB991709	MB991709	Test harness	<ul style="list-style-type: none"> <li>• Trouble shooting-voltage measurement</li> <li>• Inspection using an analyzer</li> </ul>
	MB991529	Diagnosis code check harness	<ul style="list-style-type: none"> <li>• Reading diagnosis code</li> <li>• Adjustment of basic idle speed</li> </ul>
	MD998463	Test harness (6-pin, square)	<ul style="list-style-type: none"> <li>• Inspection of idle speed control servo</li> <li>• Inspection using an analyzer</li> </ul>
	MD998464	Test harness (4-pin, square)	Inspection of oxygen sensor
	MD998474	Test harness (8 pin, square)	Inspection using an analyzer
	MD998478	Test harness (3 pin, triangle)	
	MD998709	Adaptor hose	Measurement of fuel pressure

Tool	Number	Name	Use
 B991637	MB991637	Fuel pressure gauge set	Measurement of fuel pressure
	MD998742	Hose adaptor	
	MD998706	Injector test set	Checking the spray condition of injectors
 MB991607	MB991607	Injector test harness	
 MD998741	MD998741	Injector test adaptor	
	MB991692	Clip	





## TROUBLESHOOTING

13100850485

### DIAGNOSIS TROUBLESHOOTING FLOW

Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points.

#### NOTE

When replacing the engine-ECU, replace immobilizer-ECU and ignition key as well at the same time.

### DIAGNOSIS FUNCTION

13100860679

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

If an abnormality occurs in any of the following items related to the Multipoint Fuel Injection (MPI) system, the engine warning lamp will illuminate.

If the lamp remains illuminated or if the lamp illuminates while the engine is running, check the diagnosis code output.

#### Engine warning lamp inspection items

Engine-ECU
Oxygen sensor
Air flow sensor
Intake air temperature sensor
Throttle position sensor
Engine coolant temperature sensor
Crank angle sensor
Camshaft position sensor
Barometric pressure sensor
Injector
Ignition coil, power transistor
Immobilizer system

#### METHOD OF READING AND ERASING DIAGNOSIS CODES

Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points.

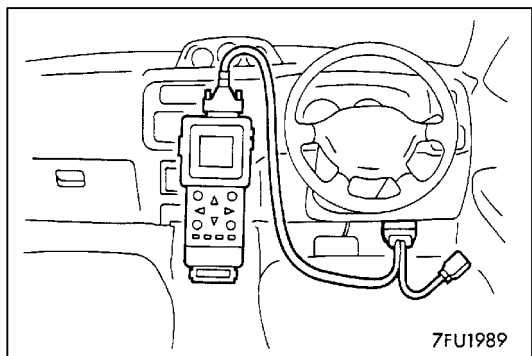
**DIAGNOSIS USING DIAGNOSIS 2 MODE**

1. Switch the diagnosis mode of the engine control unit to DIAGNOSIS 2 mode using the MUT-II.
2. Carry out a road test.
3. Take a reading of the diagnosis code and repair the problem location.
4. Turn the ignition switch to OFF and then back to ON again.

**NOTE**

By turning the ignition switch to OFF, the ENGINE-ECU will switch the diagnosis mode from DIAGNOSIS 2 mode to DIAGNOSIS 1 mode.

5. Erase the diagnosis codes.

**INSPECTION USING MUT-II DATA LIST AND ACTUATOR TESTING**

1. Carry out inspection by means of the data list and the actuator test function.  
If there is an abnormality, check and repair the chassis harnesses and components.
2. After repairing, re-check using the MUT-II and check that the abnormal input and output have returned to normal as a result of the repairs.
3. Erase the diagnosis code memory.
4. Remove the MUT-II.
5. Start the engine again and carry out a road test to confirm that the problem has disappeared.

**FAIL-SAFE FUNCTION REFERENCE TABLE**

13100910428

When the main sensor malfunctions are detected by the diagnosis function, the vehicle is controlled by means of the pre-set control logic to maintain safe conditions for driving.

Malfunctioning item	Control contents during malfunction
Air flow sensor	<ol style="list-style-type: none"><li>1. Uses the throttle position sensor signal and engine speed signal (crank angle sensor signal) to take reading of the basic injector drive time and basic ignition timing from the pre-set mapping.</li><li>2. Fixes the ISC servo in the appointed position so idle control is not performed.</li></ol>
Intake air temperature sensor	Controls as if the intake air temperature is 25°C.
Throttle position sensor (TPS)	No increase in fuel injection amount during acceleration due to the throttle position sensor signal.
Engine coolant temperature sensor	Controls as if the engine coolant temperature is 80°C.
Camshaft position sensor	Injects fuel to all cylinders simultaneously. (However, after the ignition switch is turned to ON, the No. 1 cylinder top dead centre is not detected at all.)
Barometric pressure sensor	Controls as if the barometric pressure is 101 kPa.
Ignition coil, power transistor unit	Cut off the fuel supply to cylinders with an abnormal ignition signal.
Oxygen sensor	Air/fuel ratio feed back control (closed loop control) is not performed.

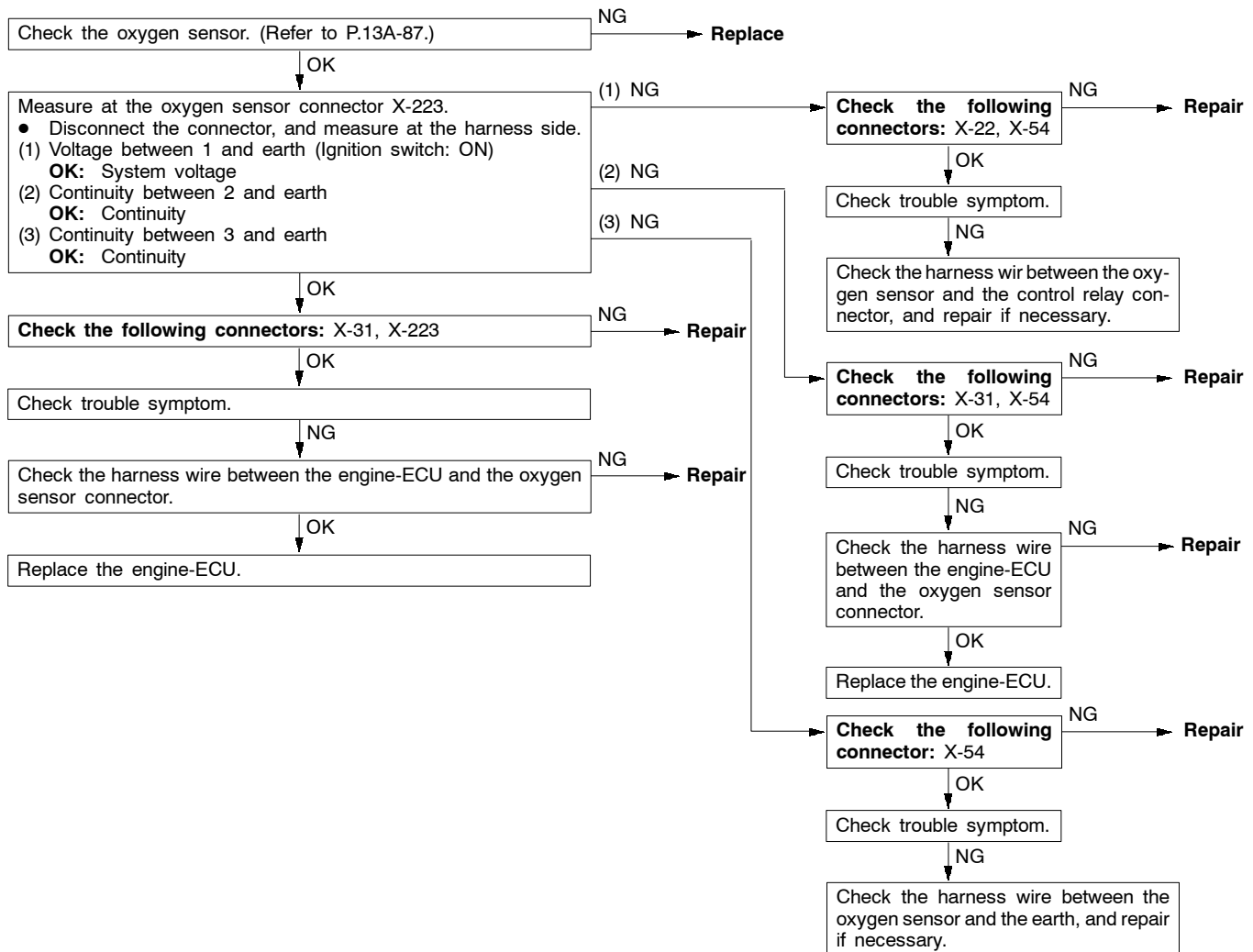
## INSPECTION CHART FOR DIAGNOSIS CODES

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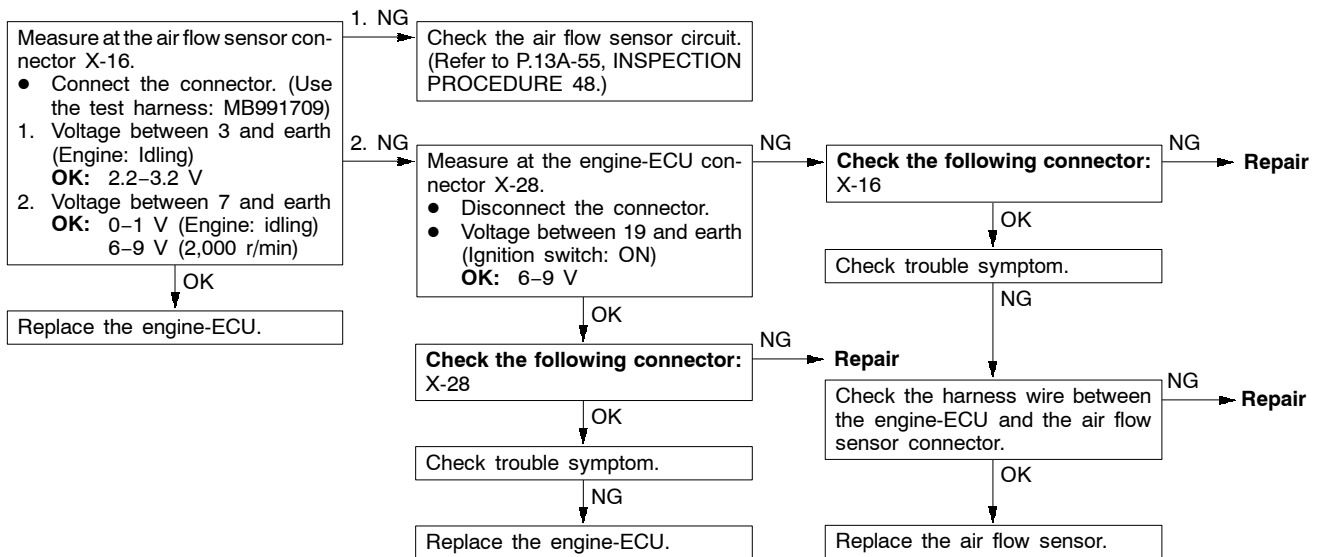
Code No.	Diagnosis item	Reference page
11	Oxygen sensor system	13A-13
12	Air flow sensor system	13A-14
13	Intake air temperature sensor system	13A-14
14	Throttle position sensor system	13A-15
21	Engine coolant temperature sensor system	13A-16
22	Crank angle sensor system	13A-17
23	Camshaft position sensor system	13A-18
24	Vehicle speed sensor system	13A-19
25	Barometric pressure sensor system	13A-20
41	Injector system	13A-21
44	Ignition coil and power transistor unit system (for No. 1 and No. 4 cylinders)	13A-22
52	Ignition coil and power transistor unit system (for No. 2 and No. 5 cylinders)	13A-22
53	Ignition coil and power transistor unit system (for No. 3 and No. 6 cylinders)	13A-22
54	Immobilizer system	13A-23

## INSPECTION PROCEDURE FOR DIAGNOSIS CODES

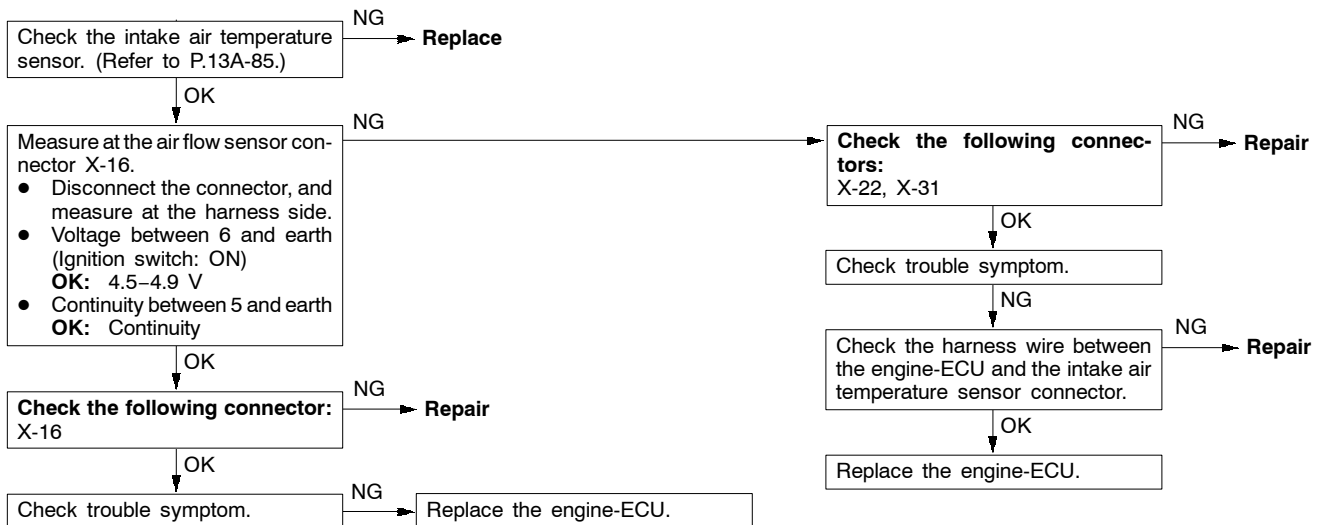
Code No.11 Oxygen sensor system	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>3 minutes have passed after engine was started.</li> <li>Engine coolant temperature is approx. 80°C or more.</li> <li>Intake air temperature is 20 – 50°C</li> <li>Engine speed is approx. 2,000 – 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>



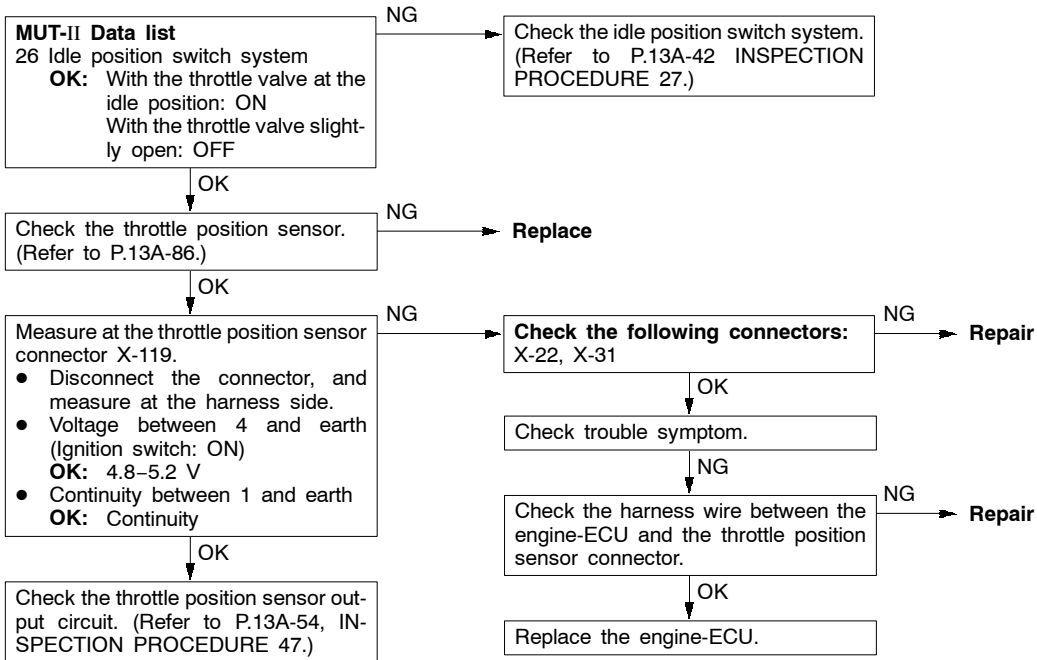
Code No. 12 Air flow sensor system	Probable cause
Range of Check • Engine speed is 500 r/min or more. Set conditions • Sensor output frequency is 3 Hz or less for 4 seconds.	• Malfunction of the air flow sensor • Improper connector contact, open circuit or short-circuited harness wire of the air flow sensor • Malfunction of the engine-ECU



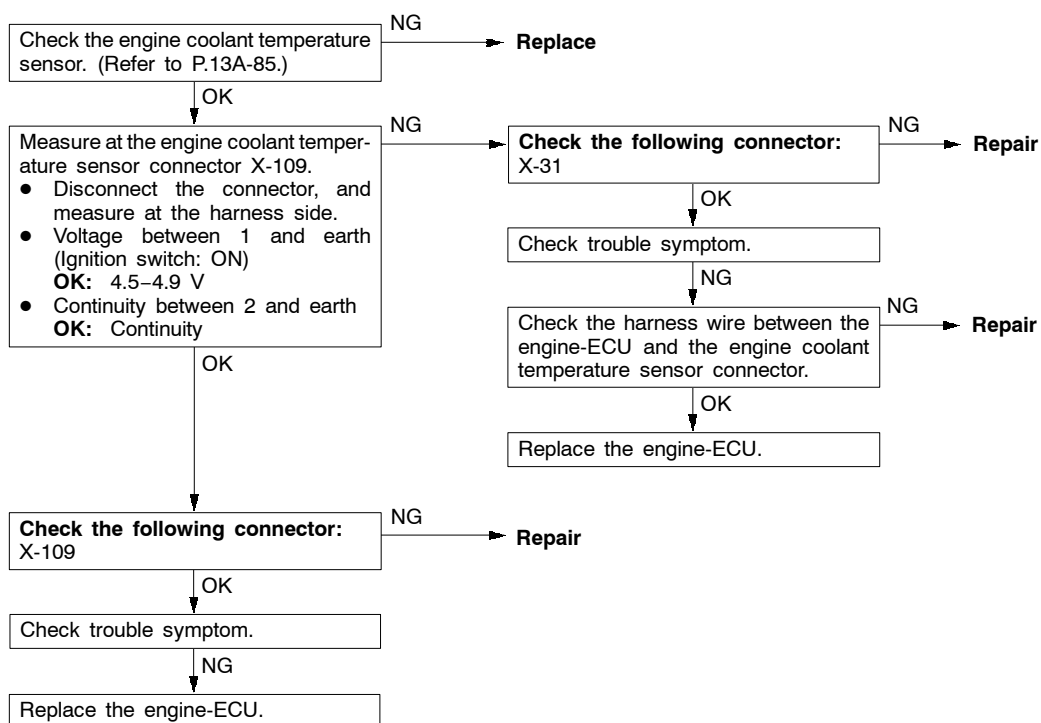
Code No. 13 Intake air temperature sensor system	Probable cause
Range of Check • Ignition switch: ON • Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts. Set conditions • Sensor output voltage is 4.6 V or more (corresponding to an intake air temperature of $-45^{\circ}\text{C}$ or less) for 4 seconds. or • Sensor output voltage is 0.2V or less (corresponding to an intake air temperature of $125^{\circ}\text{C}$ or more) for 4 seconds.	• Malfunction of the intake air temperature sensor • Improper connector contact, open circuit or short-circuited harness wire of the intake air temperature sensor circuit • Malfunction of the engine-ECU



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>When the idle position switch is ON, the sensor output voltage is 2 V or more for 4 seconds.</li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>The sensor output voltage is 0.2 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>Improper "ON" state of idle position switch</li> <li>Short circuit of the idle position switch signal line</li> <li>Malfunction of the engine-ECU</li> </ul>

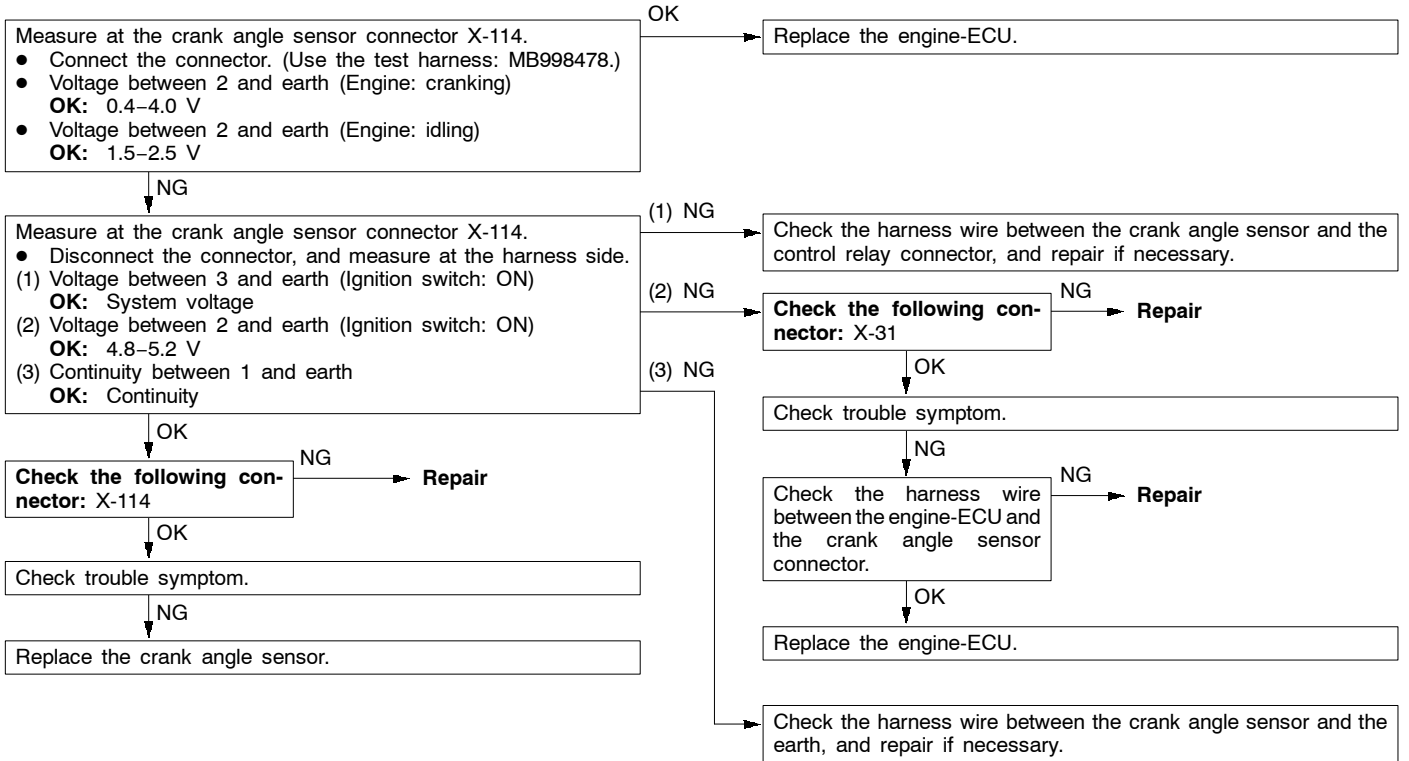


Code No. 21 Engine coolant temperature sensor system	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>Ignition switch: ON</li> <li>Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts.</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>Sensor output voltage is 4.6 V or more (corresponding to an engine coolant temperature of <math>-45^{\circ}\text{C}</math> or less) for 4 seconds.</li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>Sensor output voltage is 0.1 V or less (corresponding to an engine coolant temperature of <math>140^{\circ}\text{C}</math> or more) for 4 seconds.</li> </ul>	<ul style="list-style-type: none"> <li>Malfunction of the engine coolant temperature sensor</li> <li>Improper connector contact, 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>Ignition switch: ON</li> <li>Engine speed is approx. 50 r/min or more</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>The sensor output voltage increases from 1.6 V or less (corresponding to an engine coolant temperature of <math>40^{\circ}\text{C}</math> or more) to 1.6 V or more (corresponding to an engine coolant temperature of <math>40^{\circ}\text{C}</math> or less).</li> <li>After this, the sensor output voltage is 1.6 V or more for 5 minutes.</li> </ul>	

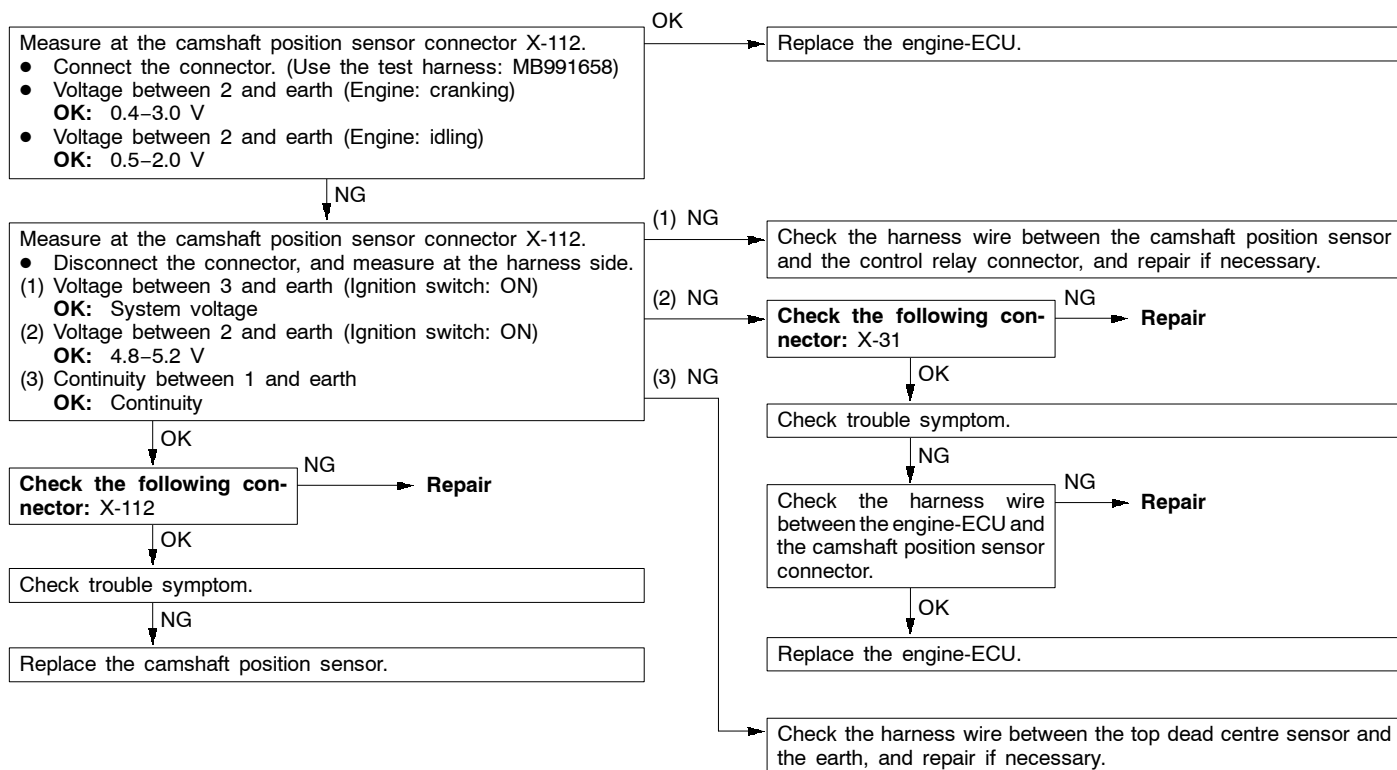




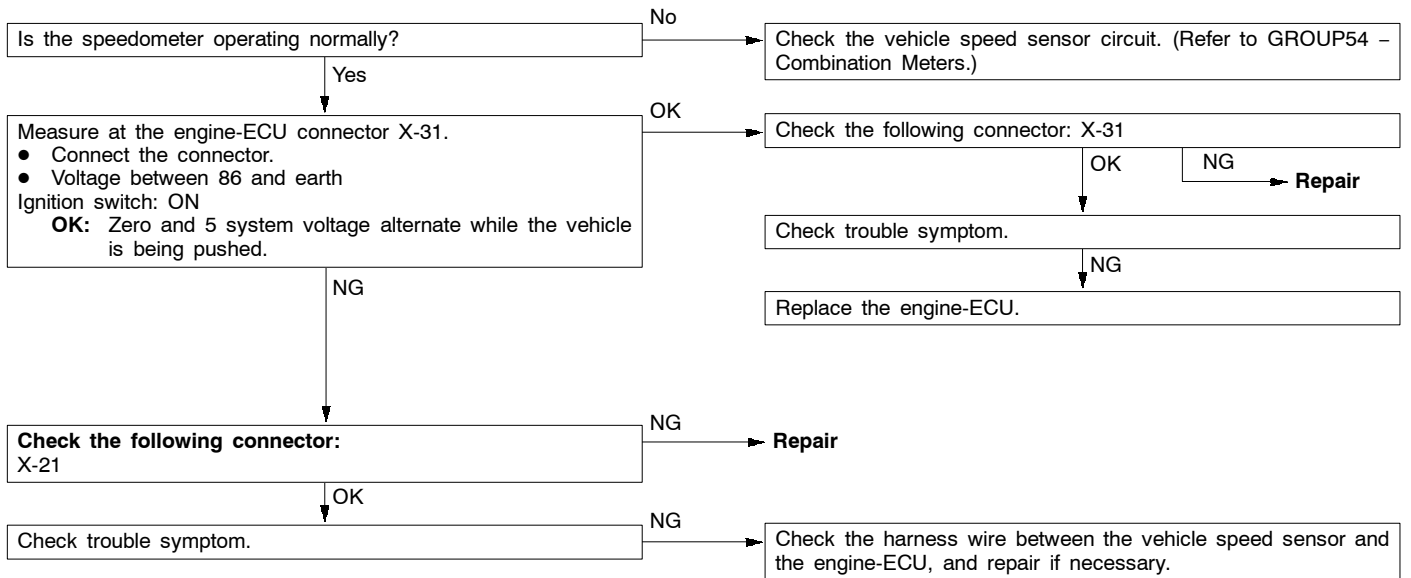
Code No. 22 Crank angle sensor system	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>Engine is cranking.</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>Sensor output voltage does not change for 4 seconds (no pulse signal input.)</li> </ul>	<ul style="list-style-type: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



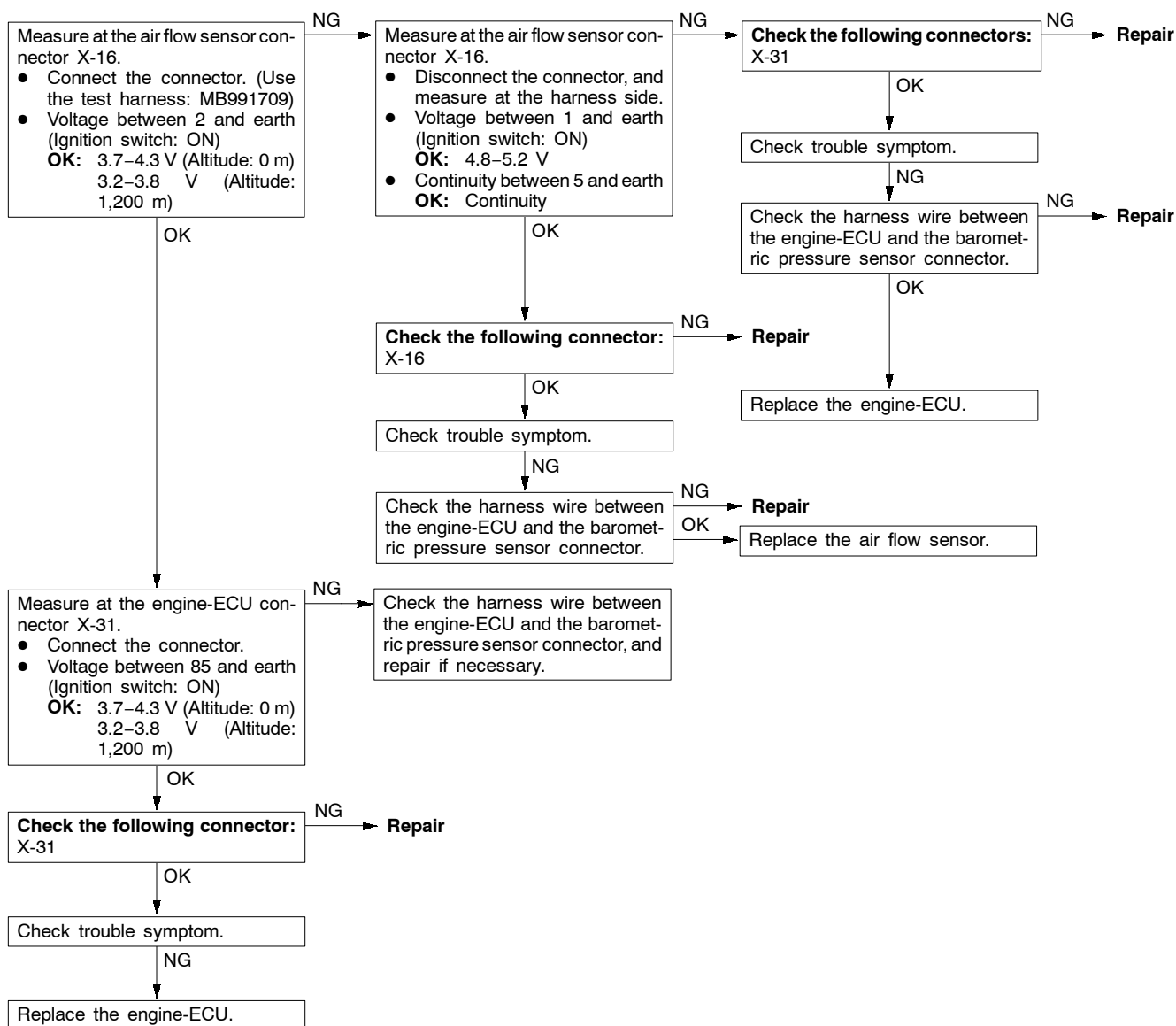
Code No. 23 Camshaft position sensor system	Probable cause
Range of Check • Ignition switch: ON • Engine speed is approx. 50 r/min or more. Set conditions • Sensor output voltage does not change for 4 seconds (no pulse signal input.)	• Malfunction of the camshaft position sensor • Improper connector contact, open circuit or short-circuited harness wire of the camshaft position sensor circuit • Malfunction of the engine-ECU



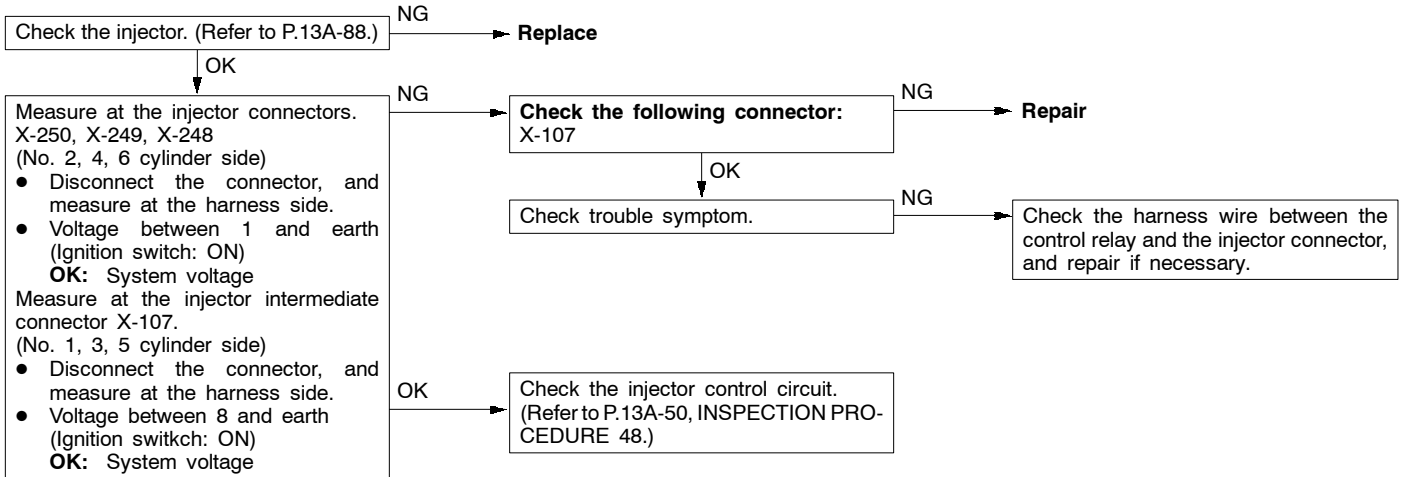
Code No.24 Vehicle speed sensor system	Probable cause
Range of Check <ul style="list-style-type: none"> <li>Excluding 60 seconds after the engine starts.</li> <li>Idle position switch: Off</li> <li>Engine speed is 3,000 r/min.</li> <li>Driving under high engine load conditions.</li> </ul> Set condition <ul style="list-style-type: none"> <li>Sensor output voltage does not changes 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</li> <li>Malfunction of the engine-ECU</li> </ul>



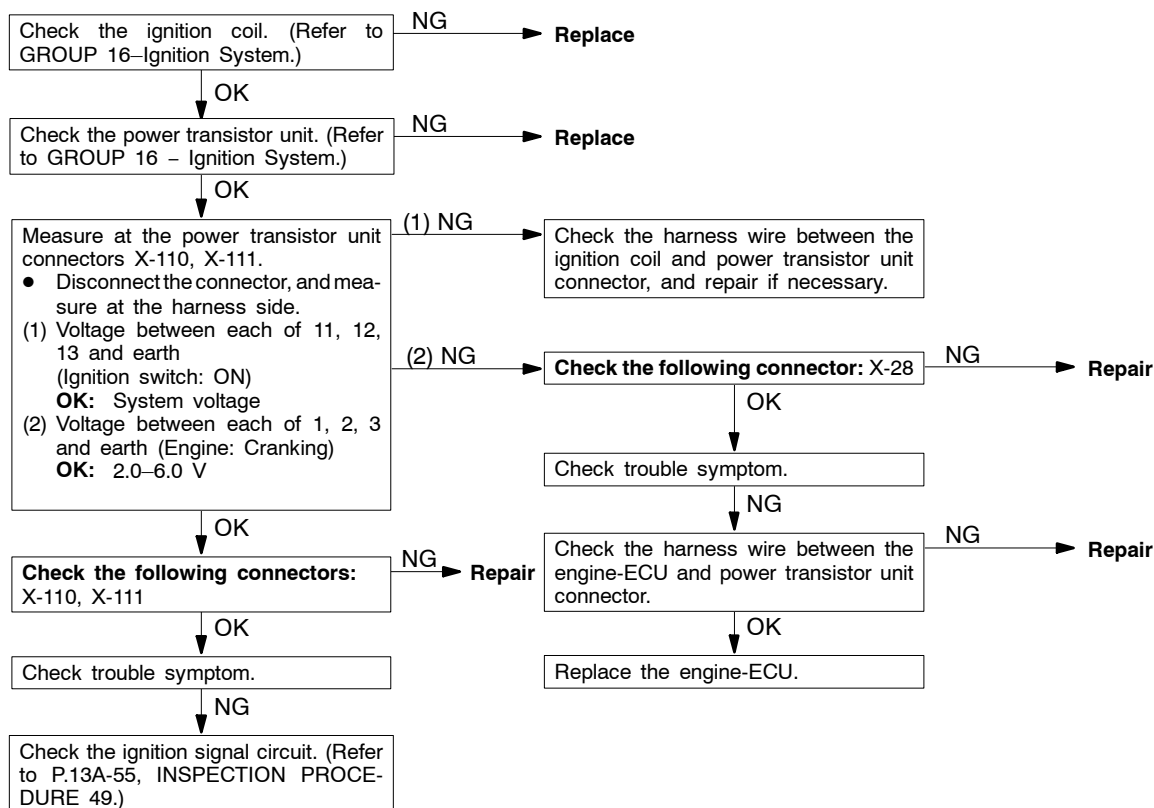
Code No. 25 Barometric pressure sensor system	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>Ignition switch: ON</li> <li>Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts.</li> <li>Battery voltage is 8 V or more.</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>Sensor output voltage is 4.5 V or more (corresponding to a barometric pressure of 114 kPa or more) for 4 seconds.</li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>Sensor output voltage is 0.2 V or less (corresponding to a barometric pressure of 5.33 kPa or less) for 4 seconds.</li> </ul>	<ul style="list-style-type: none"> <li>Malfunction of the barometric pressure sensor</li> <li>Improper connector contact, open circuit or short-circuited harness wire of the barometric pressure sensor circuit</li> <li>Malfunction of the engine-ECU</li> </ul>



Code No. 41 Injector system	Probable cause
Range of Check <ul style="list-style-type: none"> <li>Engine speed is approx. 50–1,000 r/min</li> <li>The throttle position sensor output voltage is 1.15 V or less.</li> <li>Actuator test by MUT-II is not carried out.</li> </ul> Set conditions <ul style="list-style-type: none"> <li>Surge voltage of injector coil is not detected for 4 seconds.</li> </ul>	<ul style="list-style-type: none"> <li>Malfunction of the injector</li> <li>Improper connector contact, open circuit or short-circuited harness wire of the injector circuit</li> <li>Malfunction of the engine-ECU</li> </ul>



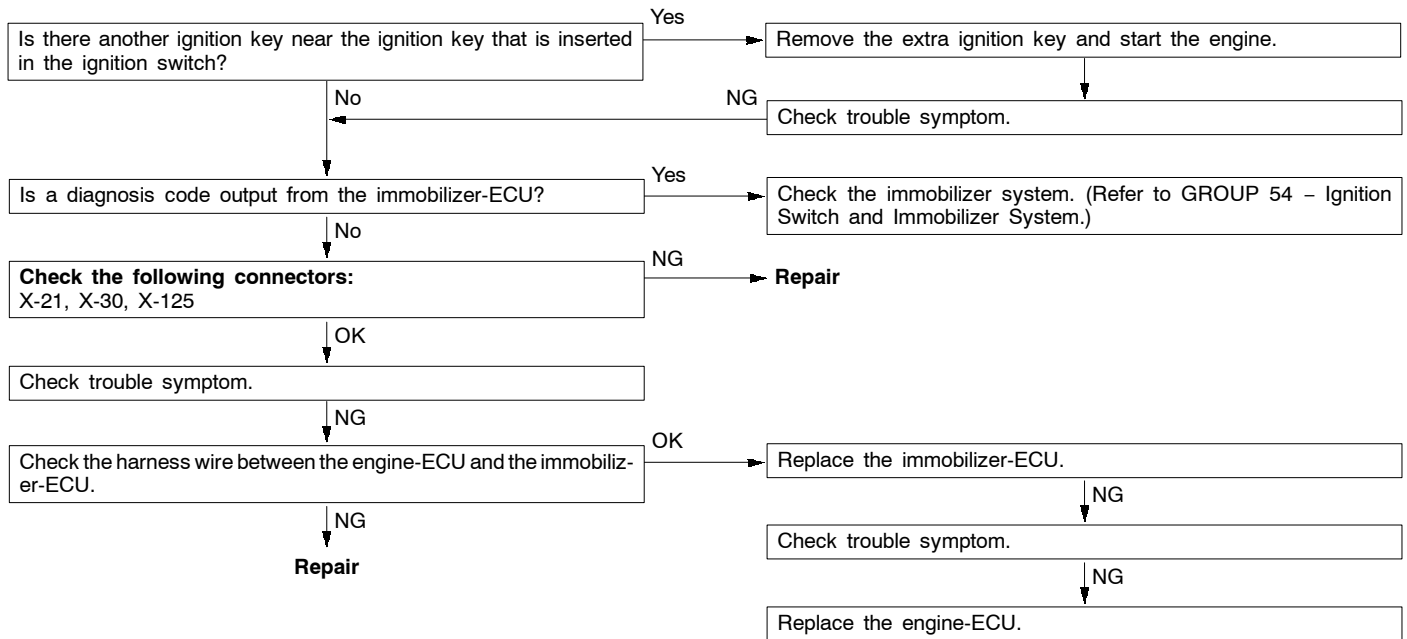
Code No. 44, 52, 53 Ignition coil and power transistor unit system	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>Engine speed is approx. 50 – 4,000 r/min.</li> <li>Engine is not cranking.</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>The ignition signal from the same coil is not input for 4 seconds.</li> </ul> <p>However, this excludes cases where no ignition signal is input from any coils.</p>	<ul style="list-style-type: none"> <li>Malfunction of the ignition coil</li> <li>Improper connector contact, open circuit or short-circuited harness wire of the ignition primary circuit</li> <li>Malfunction of the power transistor unit</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 ID codes • Incorrect ID 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 ID code.



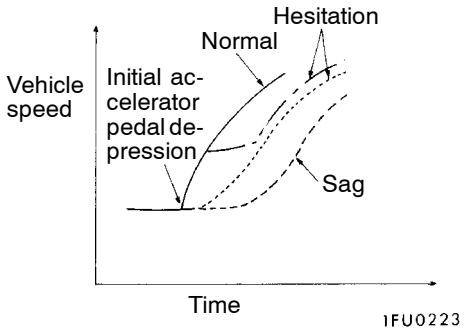
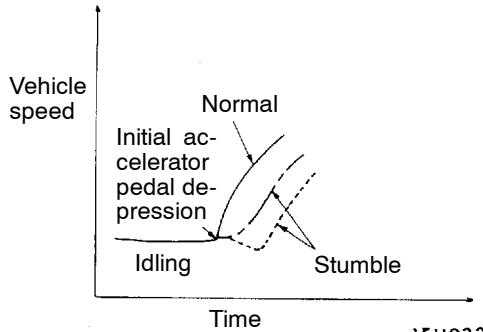
## INSPECTION CHART FOR TROUBLE SYMPTOMS

13100880712

Trouble symptom		Inspection procedure No.	Reference page
Communication with MUT-II is impossible.	Communication with all systems is not possible.	1	13A-26
	Communication with engine-ECU only is not possible.	2	13A-26
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	13A-27
	The engine warning lamp remains illuminating and never goes out.	4	13A-28
Starting	No initial combustion (starting impossible)	5	13A-28
	Initial combustion but no complete combustion (starting impossible)	6	13A-29
	Long time to start (improper starting)	7	13A-30
Idling stability (Improper idling)	Unstable idling (Rough idling, hunting)	8	13A-31
	Idling speed is high. (Improper idling speed)	9	13A-32
	Idling speed is low. (Improper idling speed)	10	13A-32
Idling stability (Engine stalls)	When the engine is cold, it stalls at idling. (Die out)	11	13A-33
	When the engine becomes hot, it stalls at idling. (Die out)	12	13A-34
	The engine stalls when starting the car. (Pass out)	13	13A-35
	The engine stalls when decelerating.	14	13A-35
Driving	Hesitation, sag or stumble	15	13A-36
	The feeling of impact or vibration when accelerating	16	13A-36
	The feeling of impact or vibration when decelerating	17	13A-37
	Poor acceleration	18	13A-37
	Surge	19	13A-38
	Knocking	20	13A-38
Dieseling		21	13A-38
Too high CO and HC concentration when idling		22	13A-39
Idling speed is improper when A/C is operating		23	13A-40
A/C condensor fan is inoperative		24	13A-40



**PROBLEM SYMPTOMS TABLE (FOR YOUR INFORMATION)**

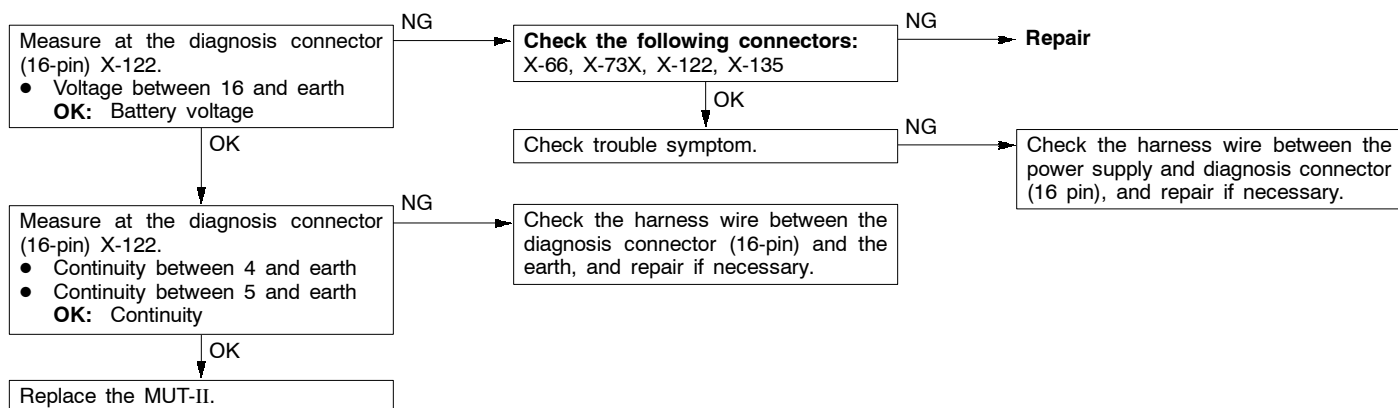
Items		Symptom
Starting	Won't start	The starter is used to crank the engine, but there is no combustion within the cylinders, and the engine won't start.
	Fires up and dies	There is combustion within the cylinders, but then the engine soon stalls.
	Hard starting	Engine starts after cranking a while.
Idling stability	Hunting	Engine speed doesn't remain constant; changes at idle.
	Rough idle	Usually, a judgement can be based upon the movement of the tachometer pointer, and the vibration transmitted to the steering wheel, shift lever, body, etc. This is called rough idle.
	Incorrect idle speed	The engine doesn't idle at the usual correct speed.
	Engine stall (Die out)	The engine stalls when the foot is taken from the accelerator pedal, regardless of whether the vehicles is moving or not.
	Engine stall (Pass out)	The engine stalls when the accelerator pedal is depressed or while it is being used.
Driving	Hesitation Sag	<p>"Hesitation" is the delay in response of the vehicle speed (engine speed) that occurs when the accelerator is depressed in order to accelerate from the speed at which the vehicle is now traveling, or a temporary drop in vehicle speed (engine speed) during such acceleration. Serious hesitation is called "sag".</p>  <p style="text-align: right;">1FU0223</p>
	Poor acceleration	Poor acceleration is inability to obtain an acceleration corresponding to the degree of throttle opening, even though acceleration is smooth, or the inability to reach maximum speed.
	Stumble	<p>Engine speed increase is delayed when the accelerator pedal is initially depressed for acceleration.</p>  <p style="text-align: right;">1FU0224</p>

Items		Symptom
Driving	Shock	The feeling of a comparatively large impact or vibration when the engine is accelerated or decelerated.
	Surge	This is repeated surging ahead during constant speed travel or during variable speed travel.
	Knocking	A sharp sound like a hammer striking the cylinder walls during driving and which adversely affects driving.
Stopping	Run on (“Dieseling”)	The condition in which the engine continues to run after the ignition switch is turned to OFF. Also called “Dieseling”.

## INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

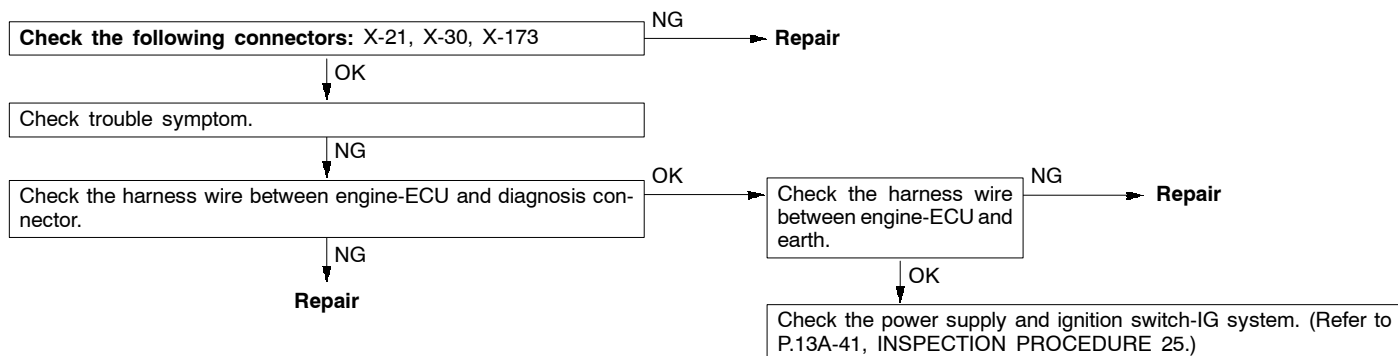
### INSPECTION PROCEDURE 1

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



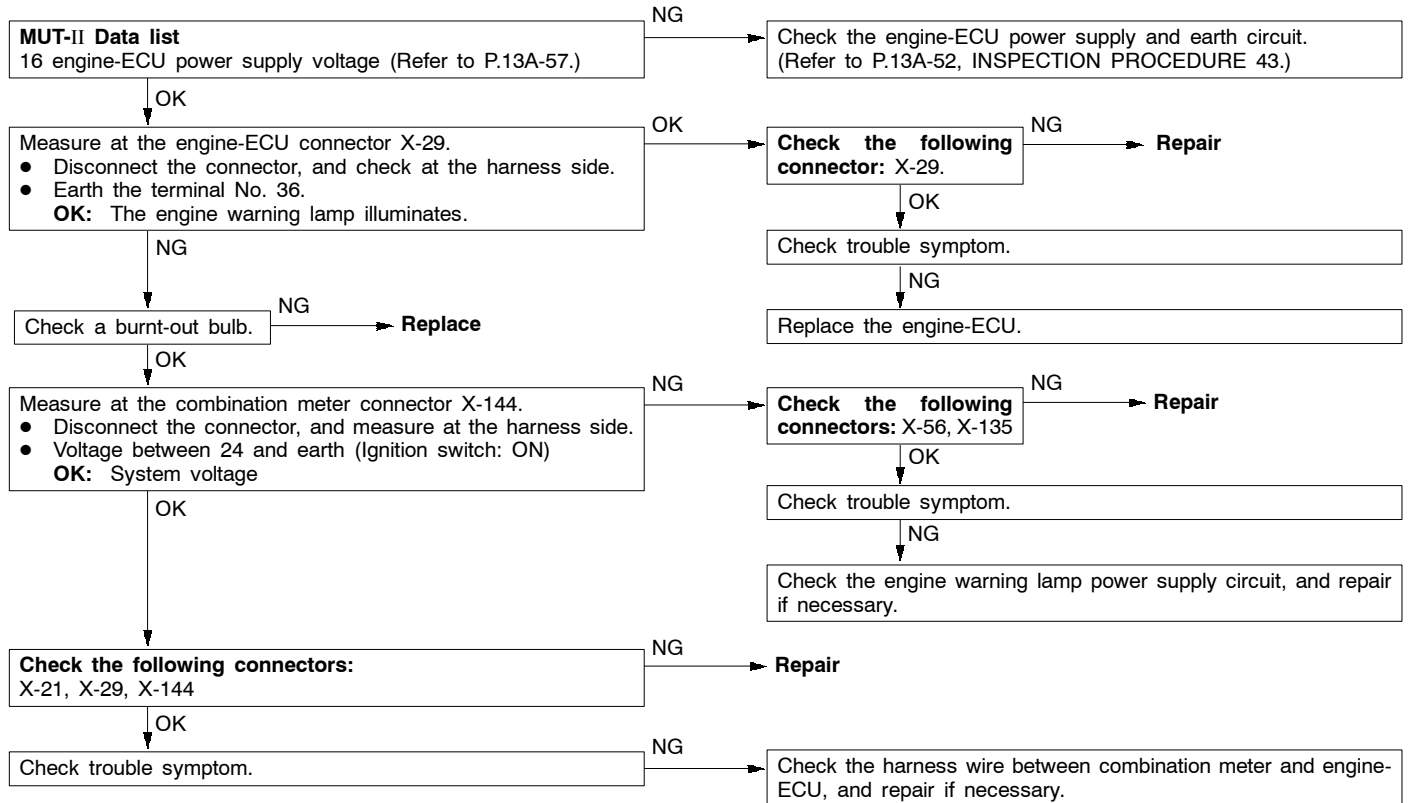
### INSPECTION PROCEDURE 2

MUT-II communication with engine-ECU is not possible.	Probable cause
One of the following causes may be suspected. <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 engine-ECU and diagnosis connector</li> </ul>



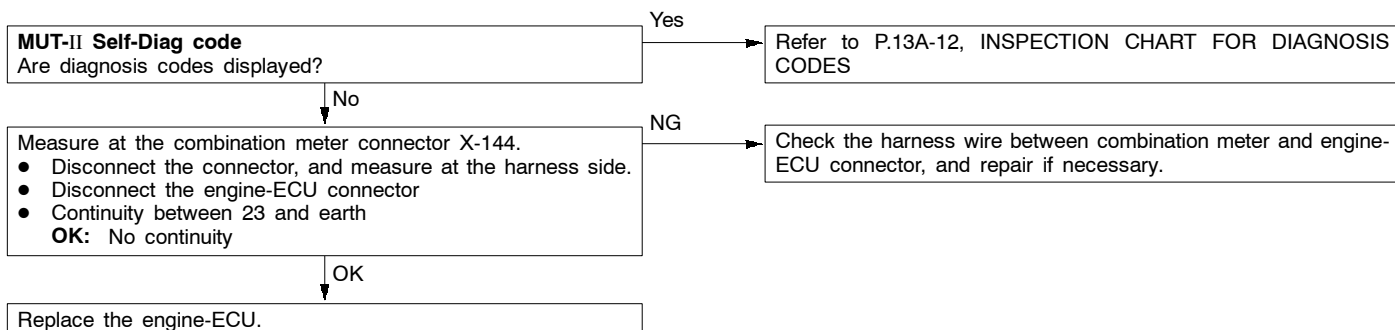
## INSPECTION PROCEDURE 3

The engine warning lamp does not illuminate right after the ignition switch is turned to the ON position.	Probable cause
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.	<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>



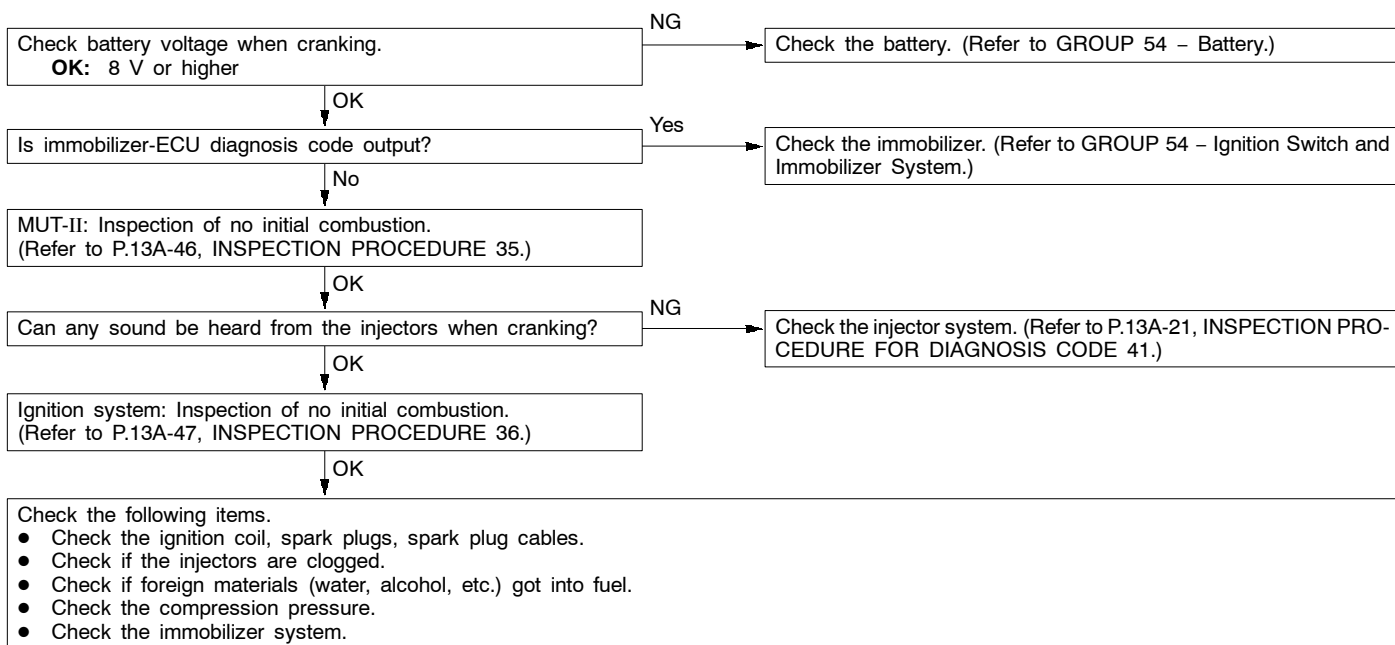
## INSPECTION PROCEDURE 4

The engine warning lamp remains illuminating and never goes out.	Probable cause
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.	<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>



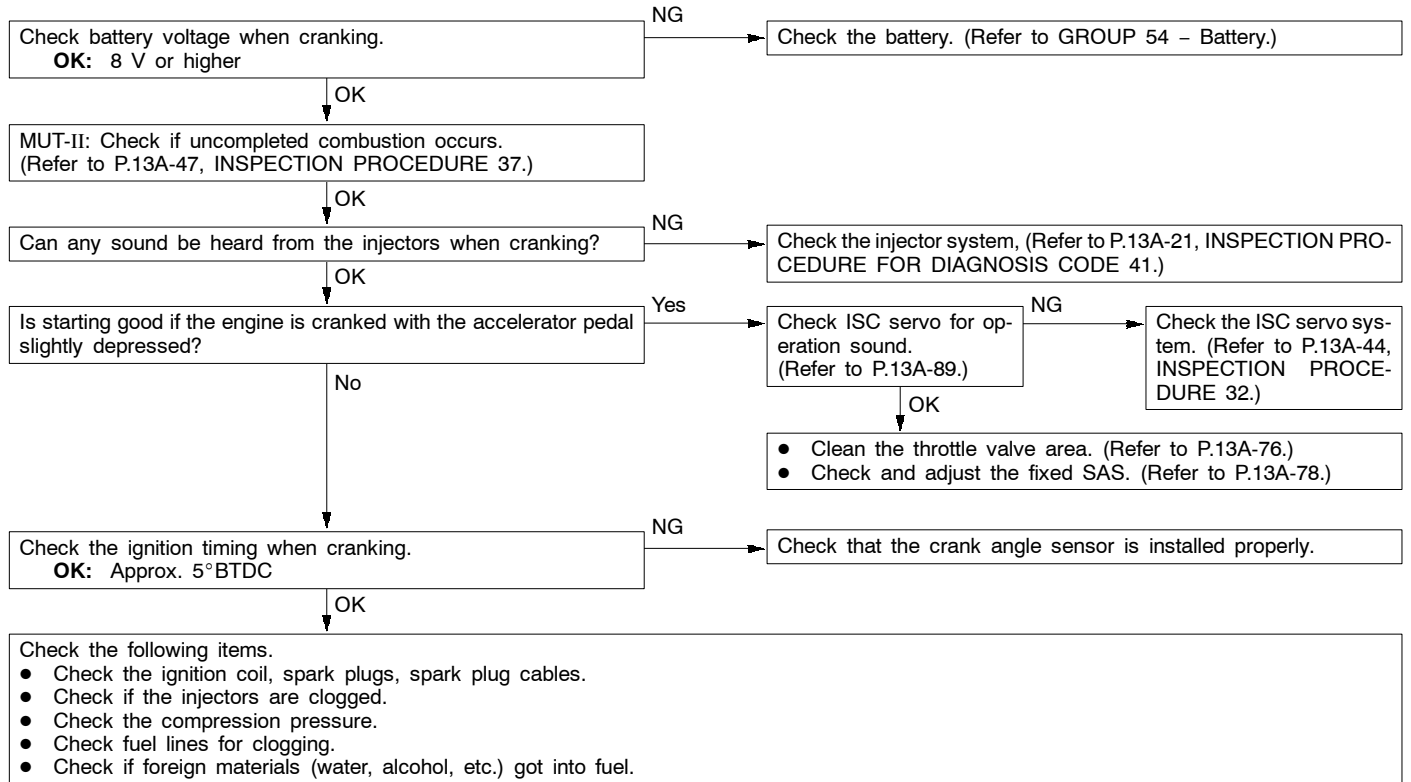
## INSPECTION PROCEDURE 5

No initial combustion (starting impossible)	Probable cause
In cases such as the above, the cause is probably that a spark plug is defective, or that the supply of fuel to the combustion chamber is defective. In addition, foreign materials (water, kerosene, etc.) may be mixed with the fuel.	<ul style="list-style-type: none"> <li>• Malfunction of the ignition system</li> <li>• Malfunction of the fuel pump system</li> <li>• Malfunction of the injectors</li> <li>• Malfunction of the engine-ECU</li> <li>• Malfunction of the immobilizer system</li> <li>• Foreign materials in fuel</li> </ul>



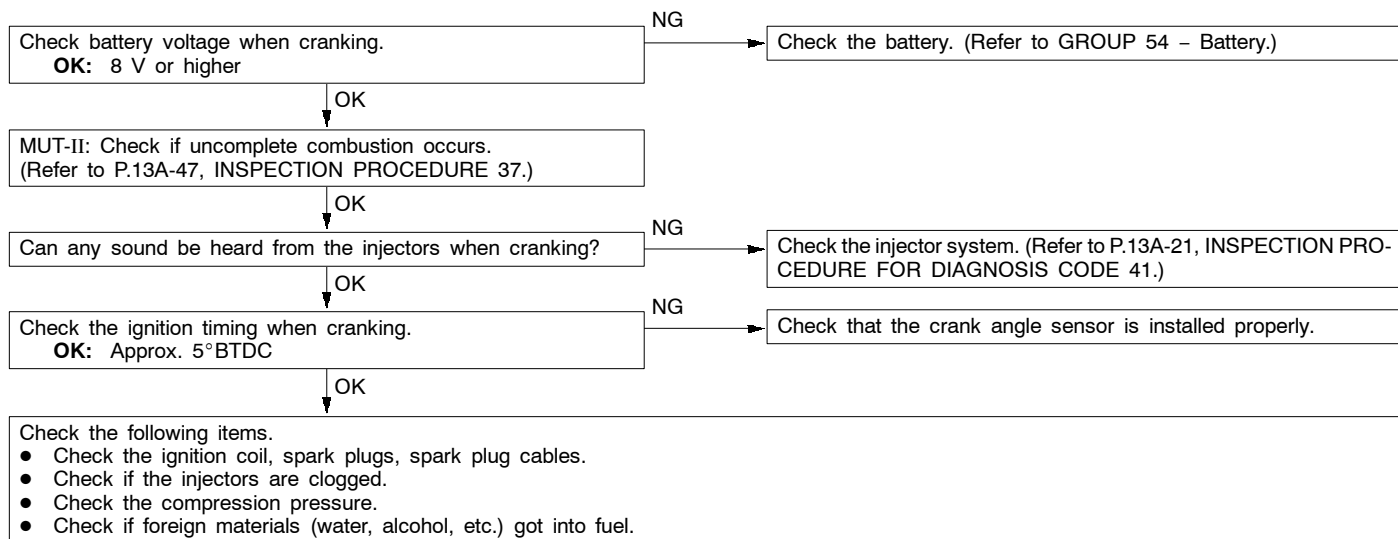
## INSPECTION PROCEDURE 6

Initial combustion but no complete combustion (starting impossible)	Probable cause
In such cases as the above, the cause is probably that the spark plugs are generating sparks but the sparks are weak, or the initial mixture for starting is not appropriate.	<ul style="list-style-type: none"> <li>• Malfunction of the ignition system</li> <li>• Malfunction of the injector system</li> <li>• Foreign materials in fuel</li> <li>• Poor compression</li> <li>• Malfunction of the engine-ECU</li> </ul>



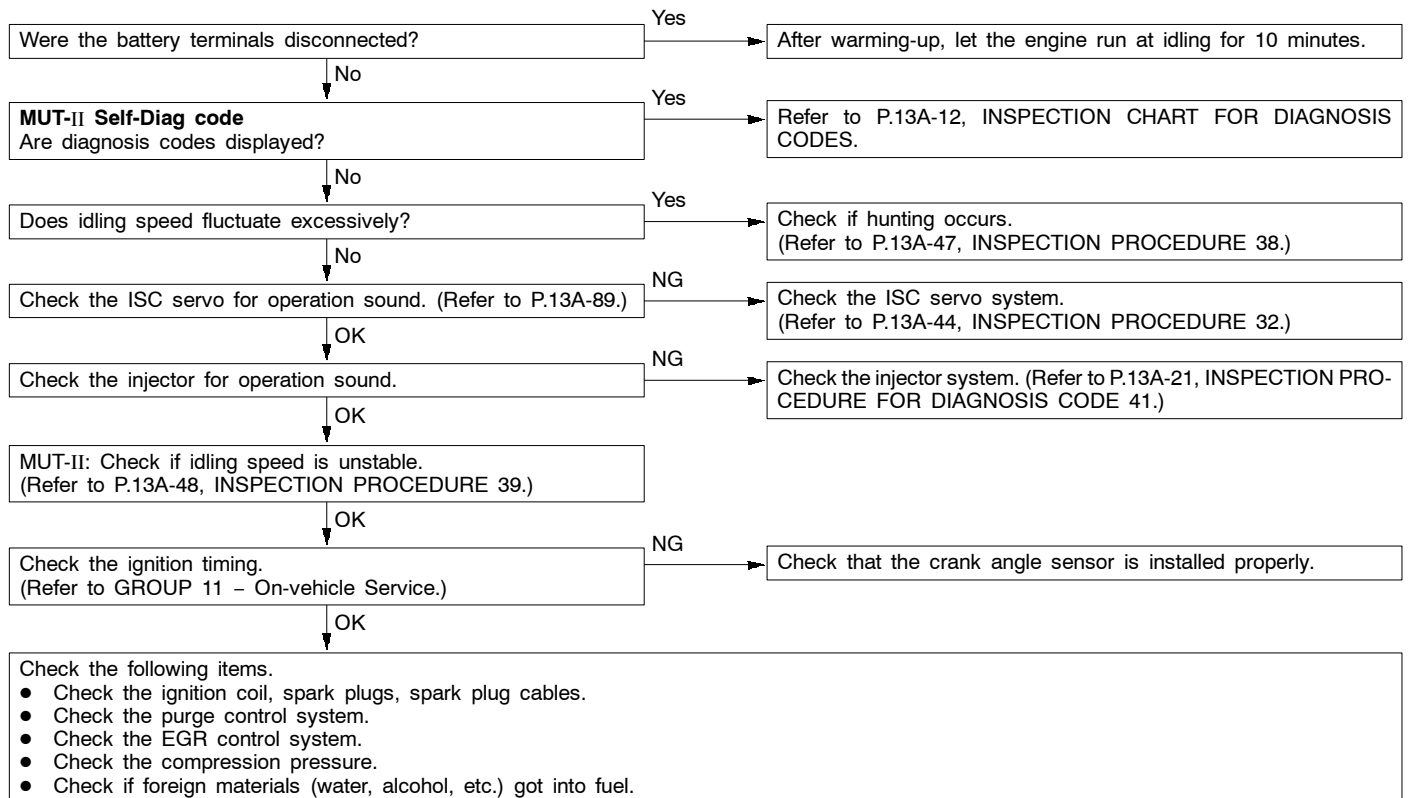
## INSPECTION PROCEDURE 7

It takes too long time to start. (Improper starting)	Probable cause
In cases such as the above, the cause is probably that the spark is weak and ignition is difficult, the initial mixture for starting is not appropriate, or sufficient compression pressure is not being obtained.	<ul style="list-style-type: none"> <li>● Malfunction of the ignition system</li> <li>● Malfunction of the injector system</li> <li>● Inappropriate gasoline use</li> <li>● Poor compression</li> </ul>



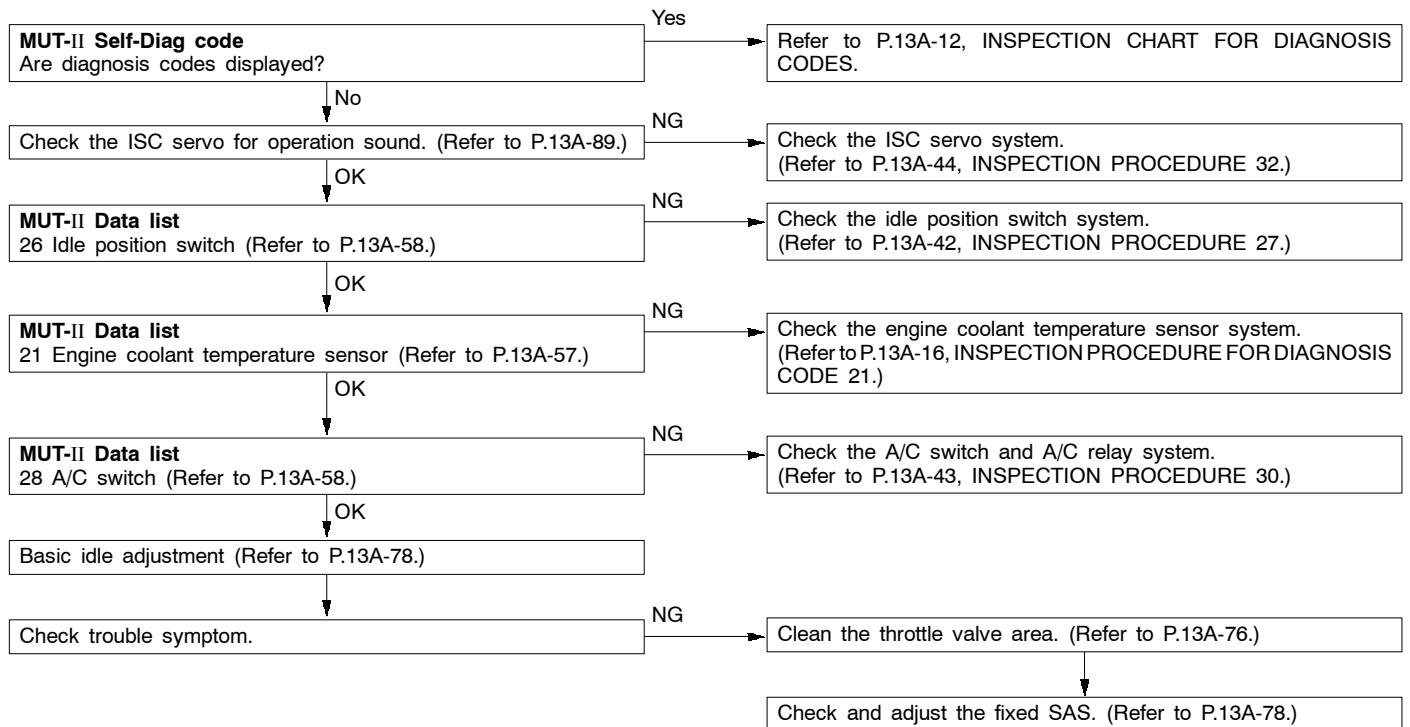
## INSPECTION PROCEDURE 8

Unstable idling (Rough idling, hunting)	Probable cause
In cases as the above, the cause is probably that the ignition system, air/fuel mixture, idle speed control (ISC) or compression pressure is defective. Because the range of possible causes is broad, inspection is narrowed down to simple items.	<ul style="list-style-type: none"> <li>• Malfunction of the ignition system</li> <li>• Malfunction of air-fuel ratio control system</li> <li>• Malfunction of the ISC system</li> <li>• Malfunction of the purge control solenoid valve system</li> <li>• Malfunction of the EGR control solenoid valve system</li> <li>• Poor compression</li> <li>• Drawing air into exhaust system</li> </ul>



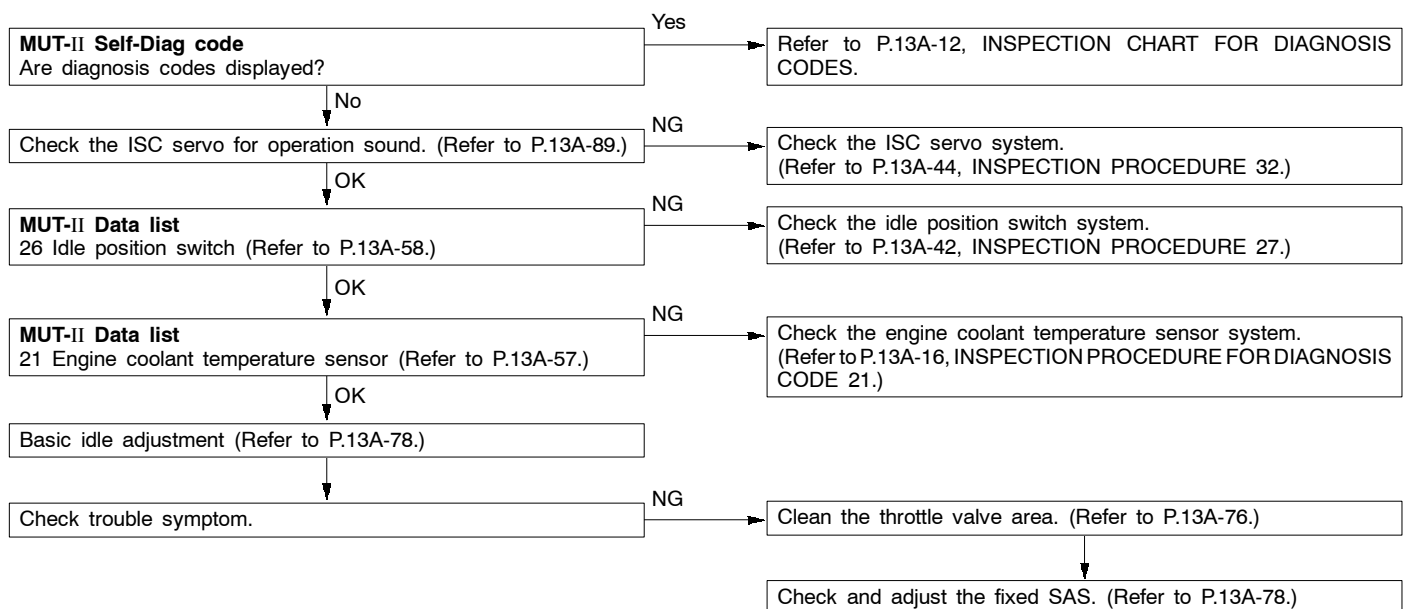
## INSPECTION PROCEDURE 9

Idling speed is high. (Improper idling speed)	Probable cause
In such cases as the above, the cause is probably that the intake air volume during idling is too great.	<ul style="list-style-type: none"> <li>Malfunction of the ISC servo system</li> <li>Malfunction of the throttle body</li> </ul>



## INSPECTION PROCEDURE 10

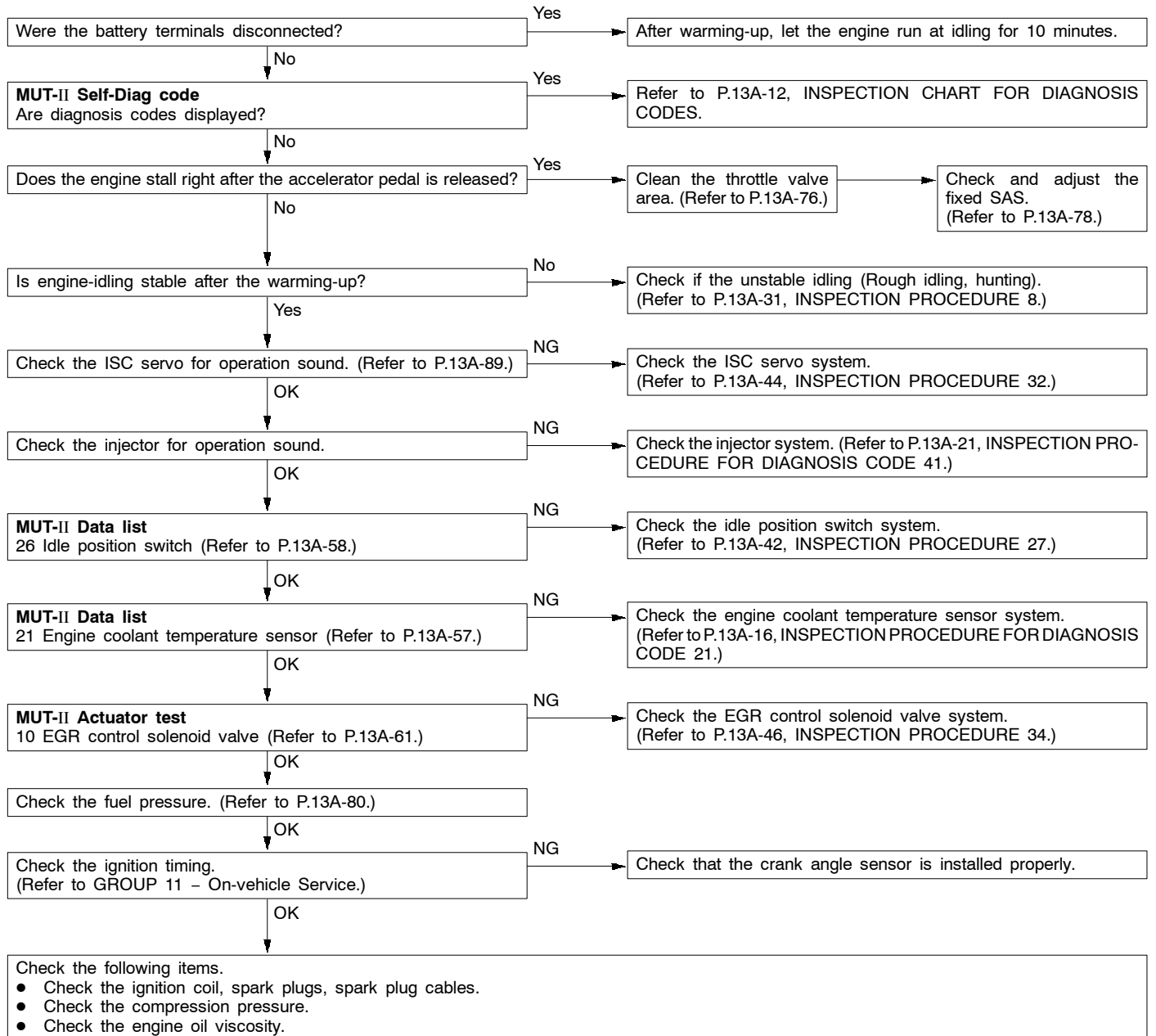
Idling speed is low. (Improper idling speed)	Probable cause
In cases such as the above, the cause is probably that the intake air volume during idling is too small.	<ul style="list-style-type: none"> <li>Malfunction of the ISC servo system</li> <li>Malfunction of the throttle body</li> </ul>





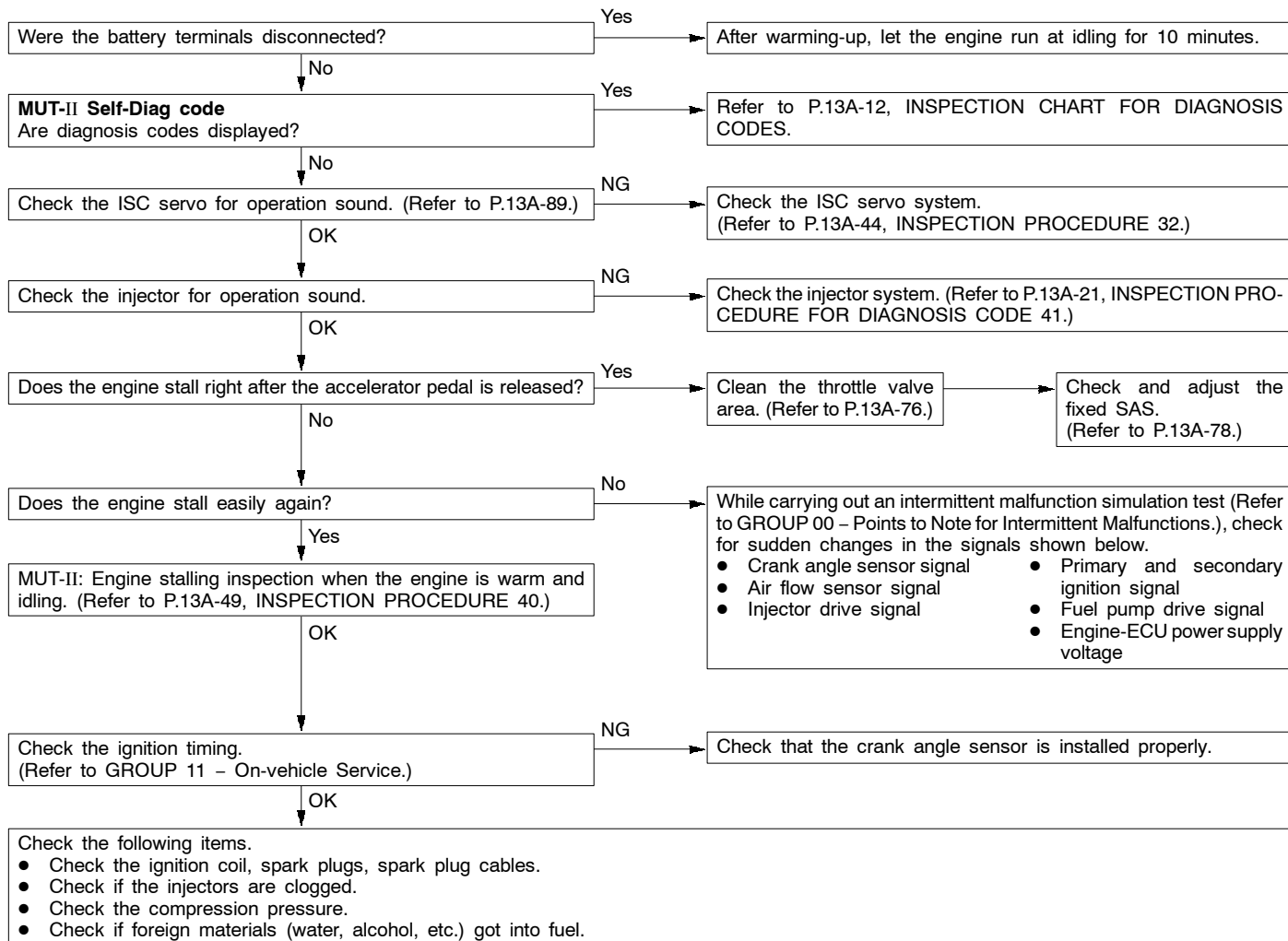
## INSPECTION PROCEDURE 11

When the engine is cold, it stalls at idling. (Die out)	Probable cause
In such cases as the above, the cause is probably that the air/fuel mixture is inappropriate when the engine is cold, or that the intake air volume is insufficient.	<ul style="list-style-type: none"> <li>• Malfunction of the ISC servo system</li> <li>• Malfunction of the throttle body</li> <li>• Malfunction of the injector system</li> <li>• Malfunction of the ignition system</li> </ul>



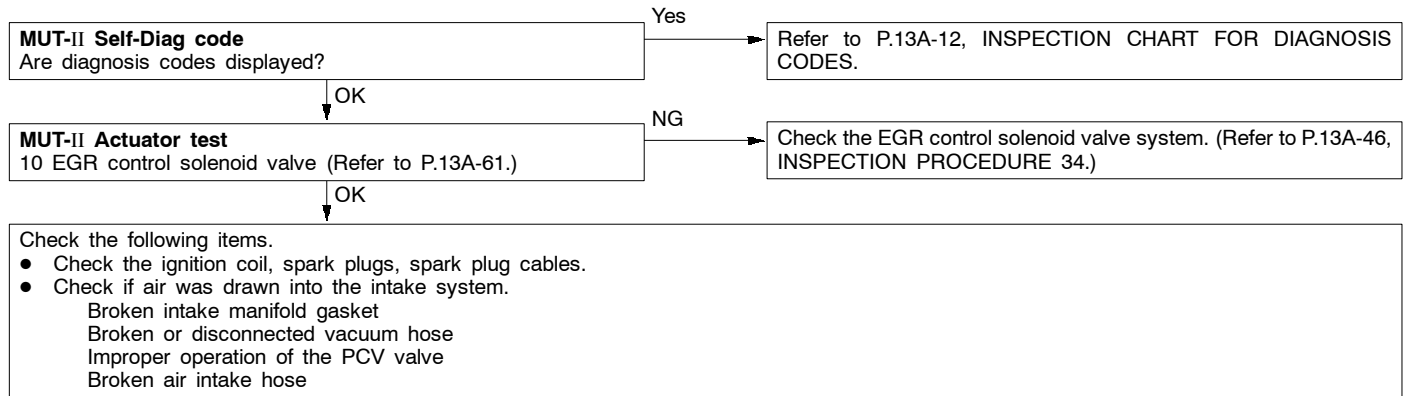
## INSPECTION PROCEDURE 12

When the engine becomes hot, it stalls at idling. (Die out)	Probable cause
In such cases as the above, the cause is probably that ignition system, air/fuel mixture, idle speed control (ISC) or compression pressure is defective. In addition, if the engine suddenly stalls, the cause may also be a defective connector contact.	<ul style="list-style-type: none"> <li>• Malfunction of the ignition system</li> <li>• Malfunction of air-fuel ratio control system</li> <li>• Malfunction of the ISC system</li> <li>• Drawing air into intake system</li> <li>• Improper connector contact</li> </ul>



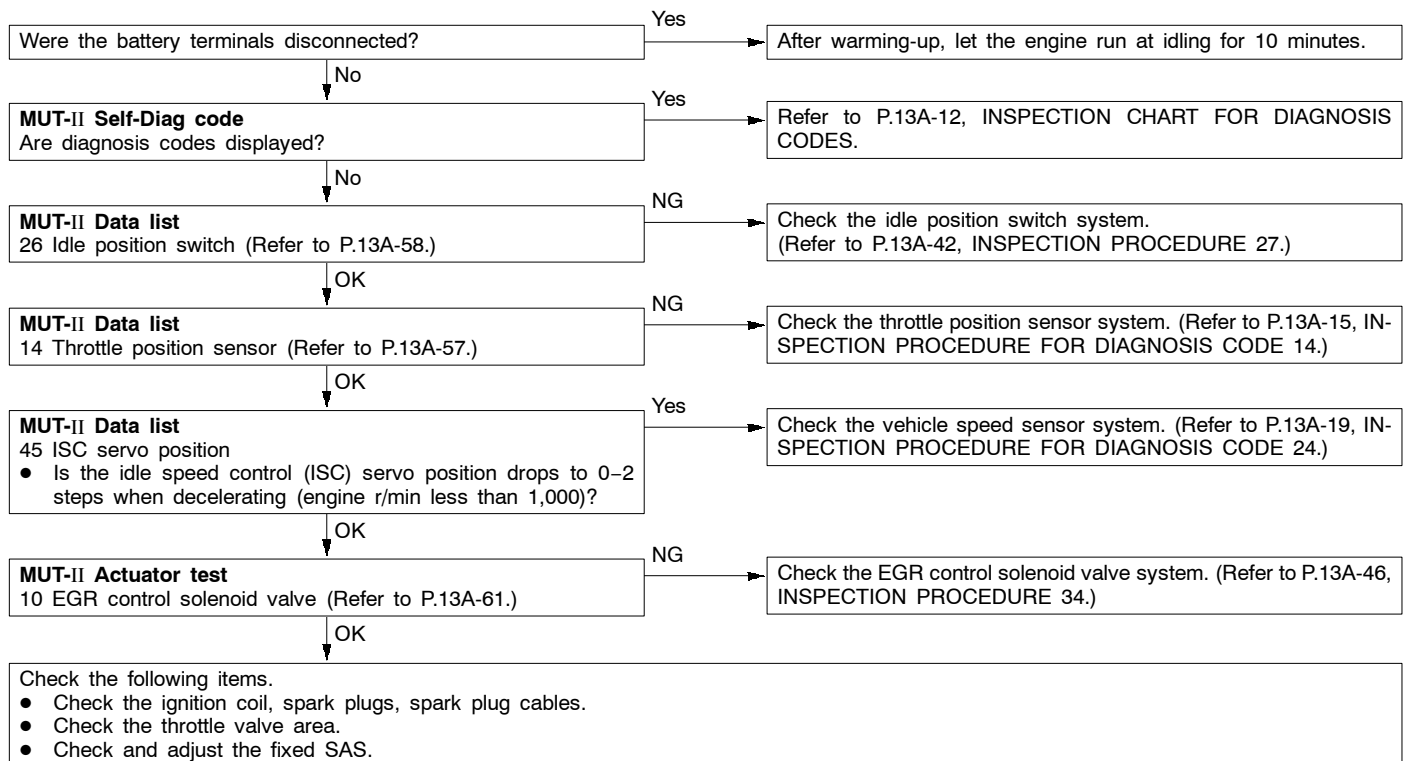
## INSPECTION PROCEDURE 13

The engine stalls when starting the car. (Pass out)	Probable cause
In cases such as the above, the cause is probably misfiring due to a weak spark, or an inappropriate air/fuel mixture when the accelerator pedal is depressed.	<ul style="list-style-type: none"> <li>Drawing air into intake system</li> <li>Malfunction of the ignition system</li> </ul>



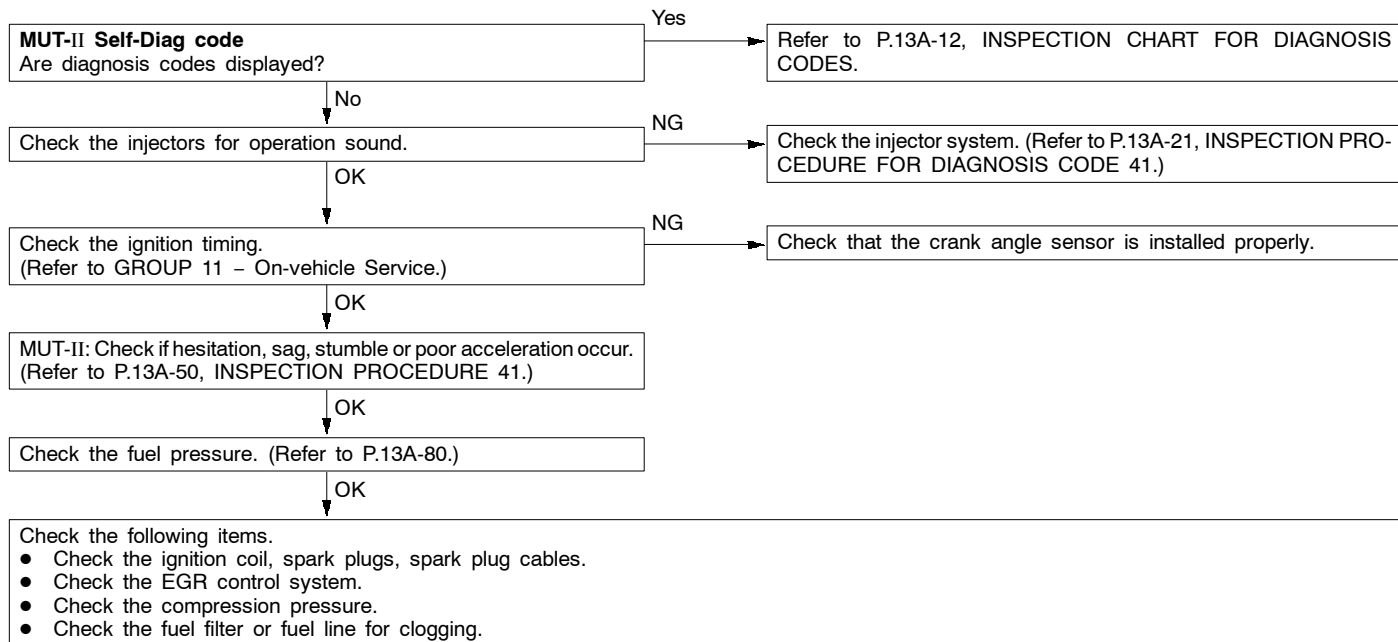
## INSPECTION PROCEDURE 14

The engine stalls when decelerating.	Probable cause
In cases such as the above, the cause is probably that the intake air volume is insufficient due to a defective idle speed control (ISC) servo system.	<ul style="list-style-type: none"> <li>Malfunction of the ISC system</li> </ul>



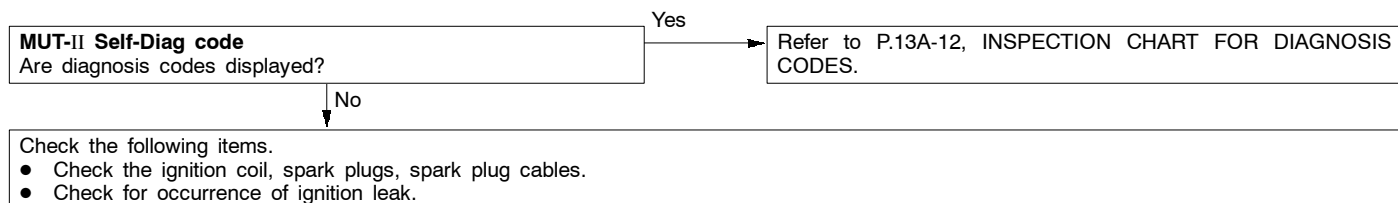
## INSPECTION PROCEDURE 15

Hesitation, sag or stumble	Probable cause
In cases such as the above, the cause is probably that ignition system, air/fuel mixture or compression pressure is defective.	<ul style="list-style-type: none"> <li>• Malfunction of the ignition system</li> <li>• Malfunction of air-fuel ratio control system</li> <li>• Malfunction of the fuel supply system</li> <li>• Malfunction of the EGR control solenoid valve system</li> <li>• Poor compression</li> </ul>



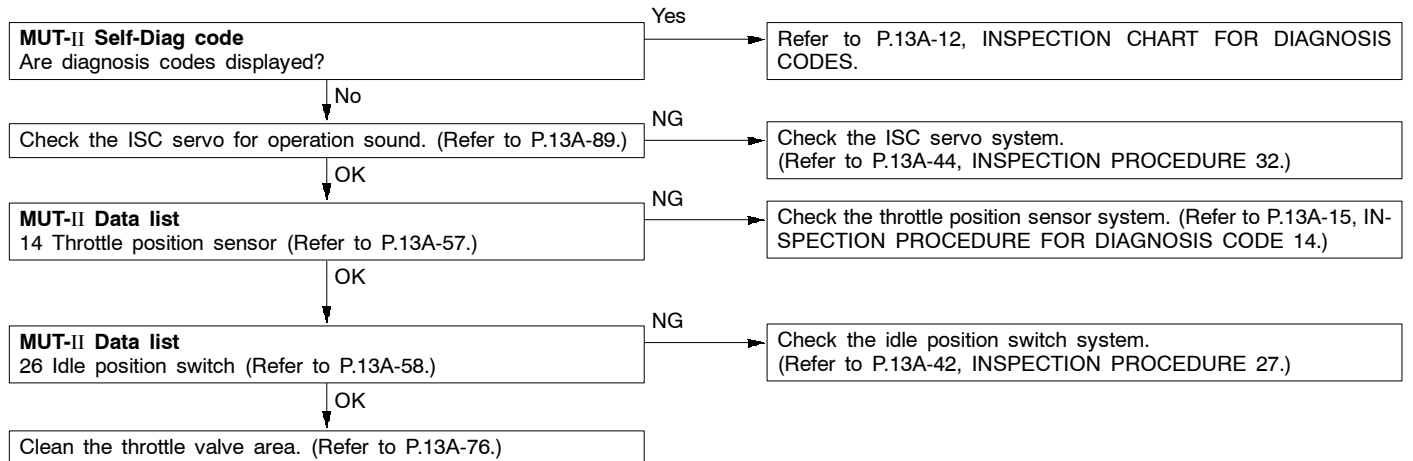
## INSPECTION PROCEDURE 16

The feeling of impact or vibration when accelerating	Probable cause
In cases such as the above, the cause is probably that there is an ignition leak accompanying the increase in the spark plug demand voltage during acceleration.	<ul style="list-style-type: none"> <li>• Malfunction of the ignition system</li> </ul>



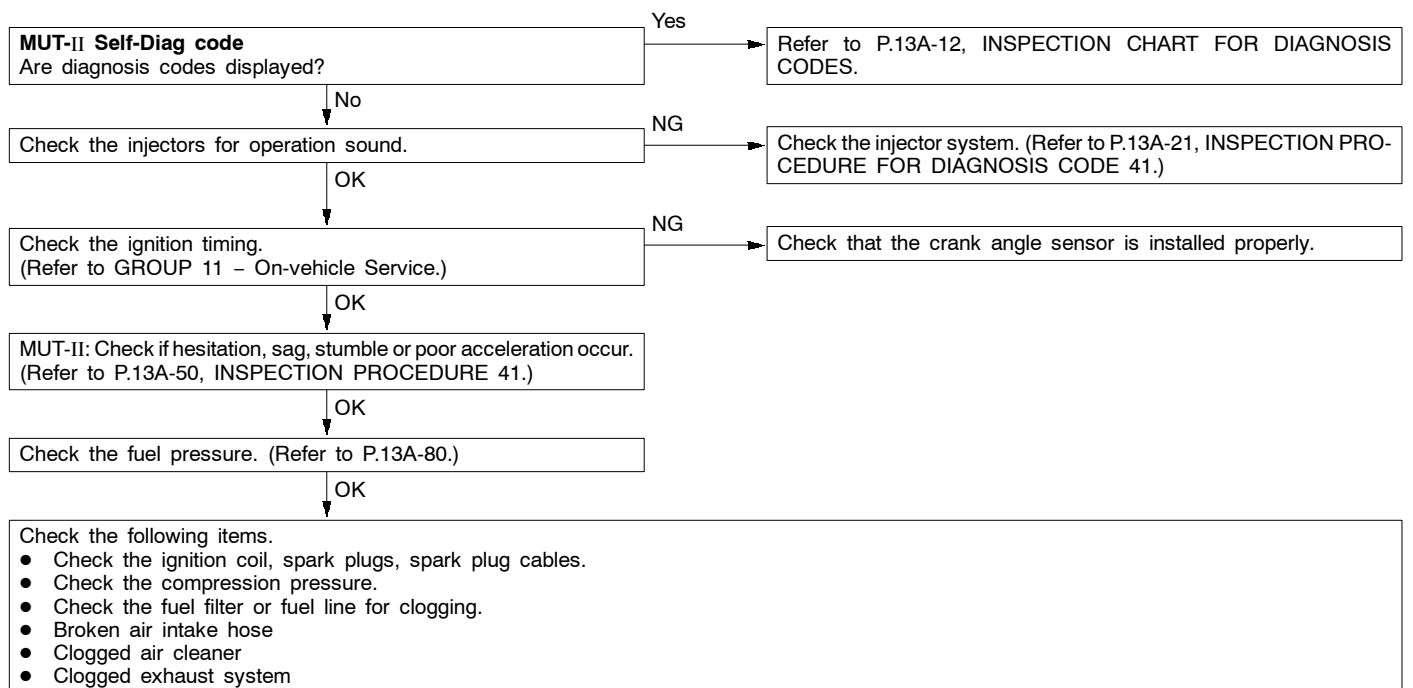
## INSPECTION PROCEDURE 17

The feeling of impact or vibration when decelerating.	Probable cause
Malfunction of the ISC system is suspected.	<ul style="list-style-type: none"> <li>Malfunction of the ISC system</li> </ul>



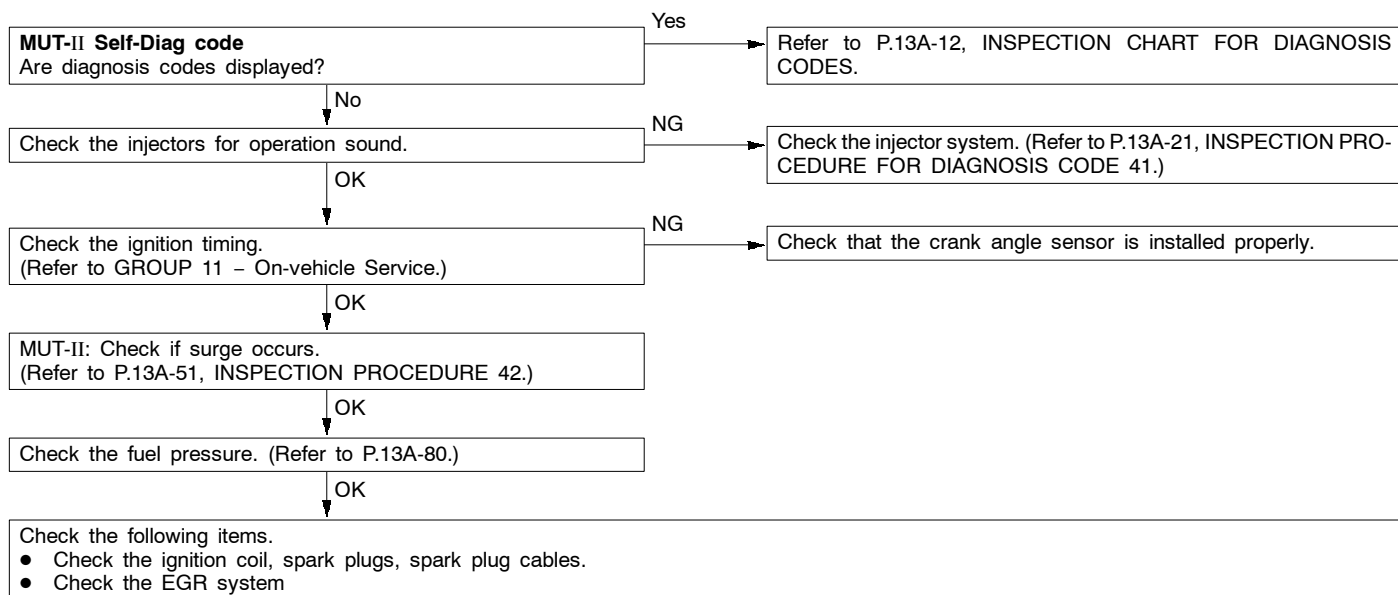
## INSPECTION PROCEDURE 18

Poor acceleration	Probable cause
Defective ignition system, abnormal air-fuel ratio, poor compression pressure, etc. are suspected.	<ul style="list-style-type: none"> <li>Malfunction of the ignition system</li> <li>Malfunction of air-fuel ratio control system</li> <li>Malfunction of the fuel supply system</li> <li>Poor acceleration</li> <li>Clogged exhaust system</li> </ul>



## INSPECTION PROCEDURE 19

Surge	Probable cause
Defective ignition system, abnormal air-fuel ratio, etc. are suspected.	<ul style="list-style-type: none"> <li>• Malfunction of the ignition system</li> <li>• Malfunction of air-fuel ratio control system</li> <li>• Malfunction of the EGR control solenoid valve system</li> </ul>



## INSPECTION PROCEDURE 20

Knocking	Probable cause
In cases as the above, the cause is probably that the heat value of the spark plug is inappropriate.	<ul style="list-style-type: none"> <li>• Inappropriate heat value of the spark plug</li> </ul>

Check the following items.

- Spark plugs
- Check if foreign materials (water, alcohol, etc.) got into fuel.

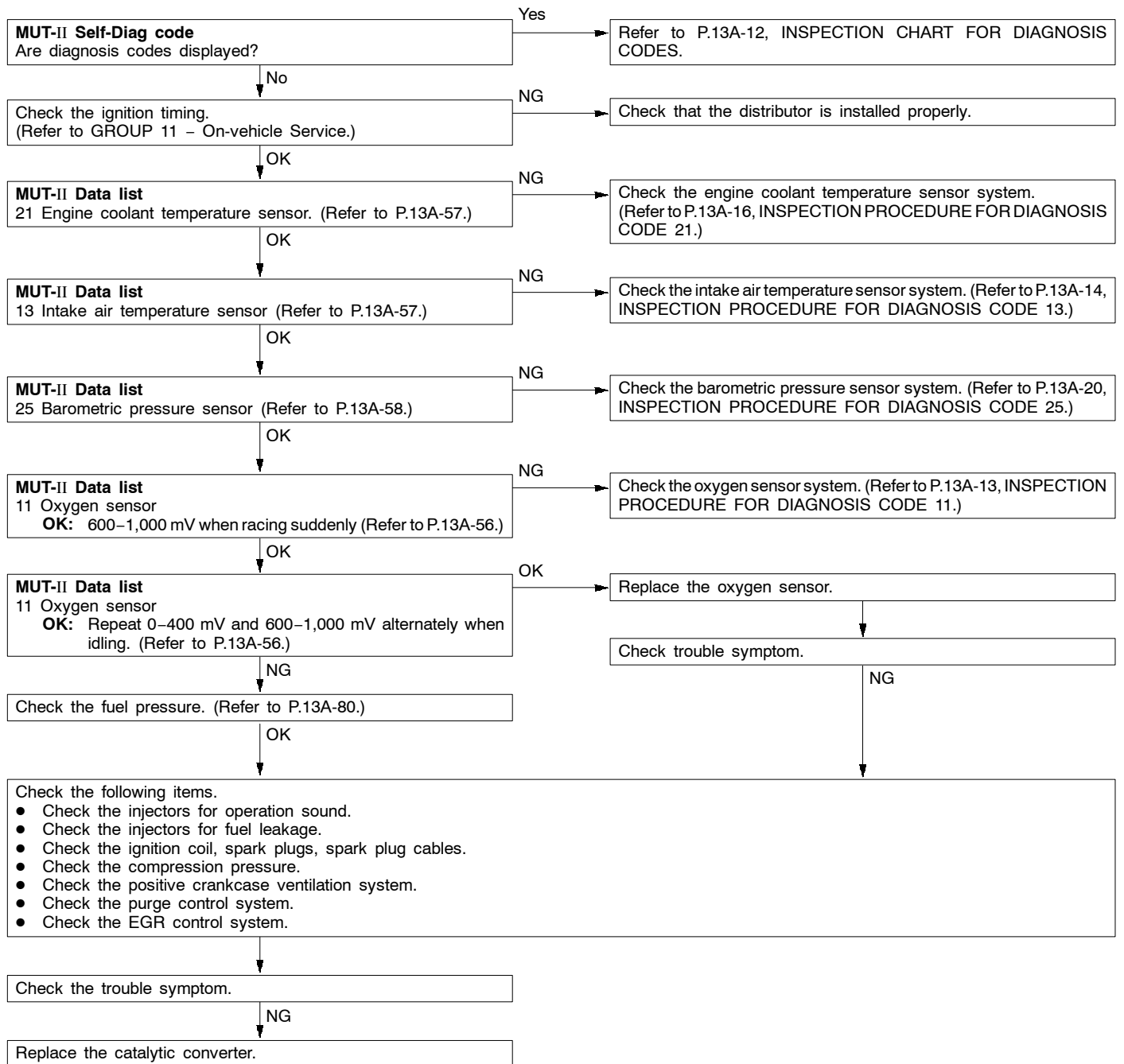
## INSPECTION PROCEDURE 21

Dieseling	Probable cause
Fuel leakage from injectors is suspected.	<ul style="list-style-type: none"> <li>• Fuel leakage from injectors</li> </ul>

Check the injectors for fuel leakage.

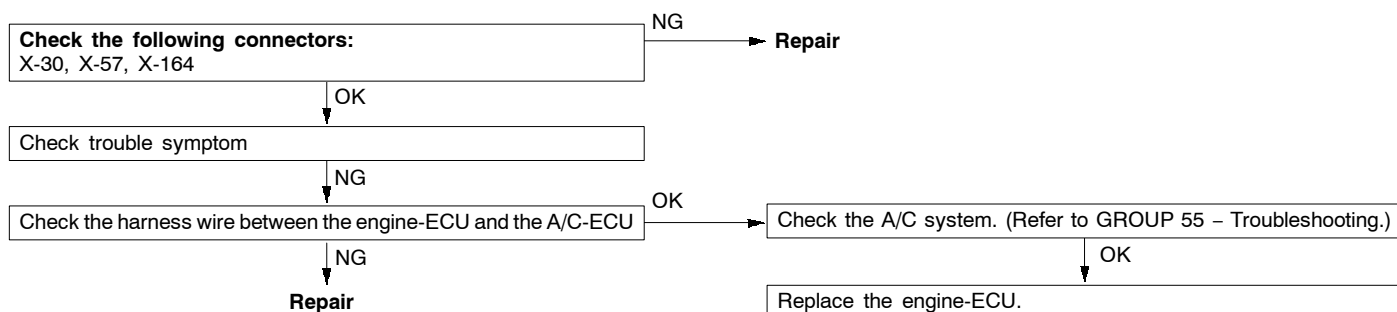
## INSPECTION PROCEDURE 22

Too high CO and HC concentration when idling	Probable cause
Abnormal air-fuel ratio is suspected.	<ul style="list-style-type: none"> <li>Malfunction of the air-fuel ratio control system</li> <li>Deteriorated catalyst</li> </ul>



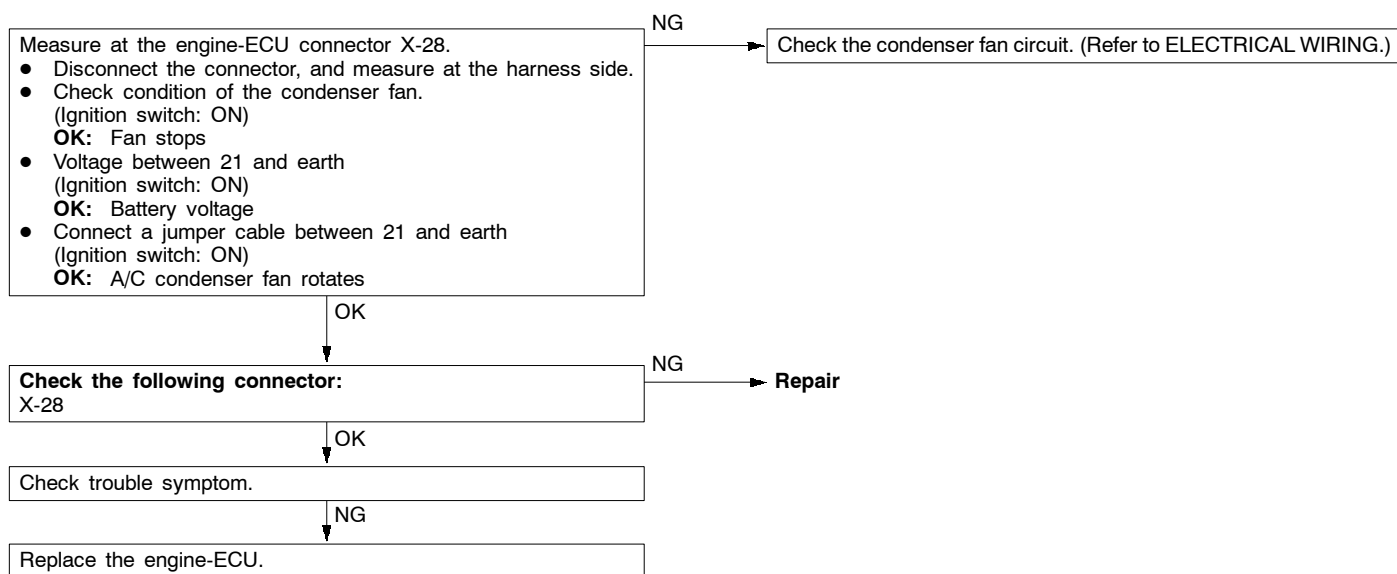
## INSPECTION PROCEDURE 23

Idling speed is improper when A/C is operating (A/C switch 2 signal)	Probable cause
The A/C-ECU judges if load caused by air conditioner is high or low, and converts it to A/C switch 2 signal to send the engine-ECU it. Based on this signal, the engine-ECU operates the throttle control servo to control the idle-up speed. If the load is lower than usual, the engine-ECU decreases the idle-up speed.	<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 24

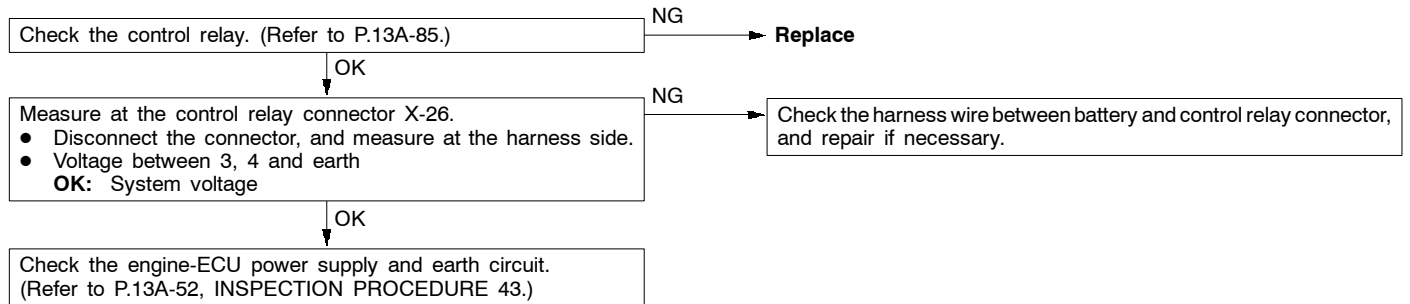
A/C condenser fan is inoperative	Probable cause
The fan motor relay is controlled by turning on and off the power transistor in the engine-ECU.	<ul style="list-style-type: none"> <li>• Malfunction of the A/C condenser fan relay</li> <li>• Malfunction of the condenser fan motor</li> <li>• Improper connector contact, open circuit or short-circuited harness wire</li> <li>• Malfunction of the engine-ECU</li> </ul>





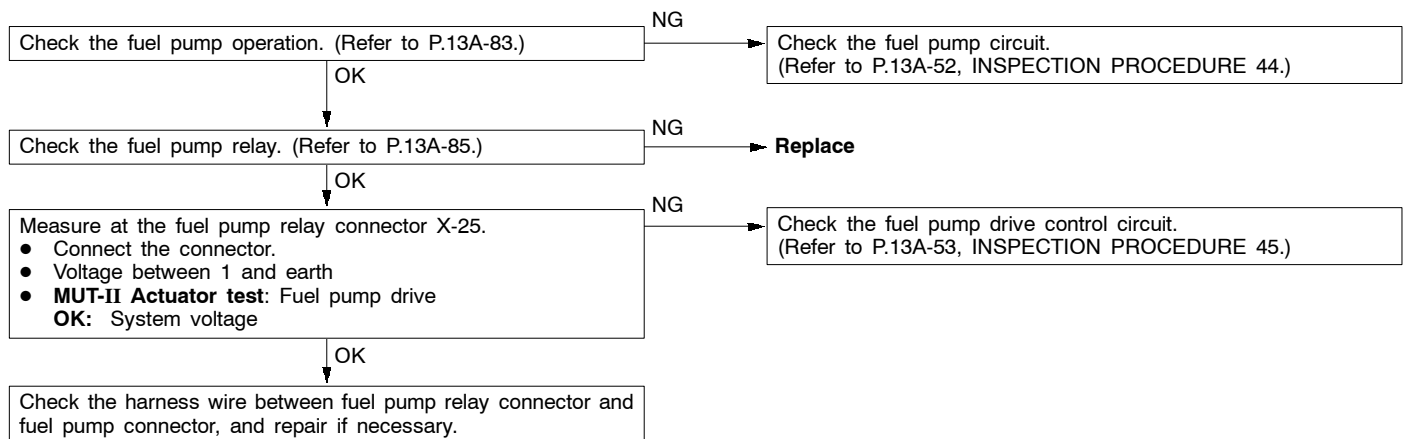
## INSPECTION PROCEDURE 25

Power supply system and ignition switch-IG system	Probable cause
When an ignition switch ON signal is input to the engine-ECU, the engine-ECU turns the control relay ON. This causes battery voltage to be supplied to the engine-ECU, injectors and air flow sensor.	<ul style="list-style-type: none"> <li>• Malfunction of the ignition switch</li> <li>• Malfunction of the control relay</li> <li>• Improper connector contact, open circuit or short-circuited harness wire</li> <li>• Disconnected engine-ECU earth wire</li> <li>• Malfunction of the engine-ECU</li> </ul>



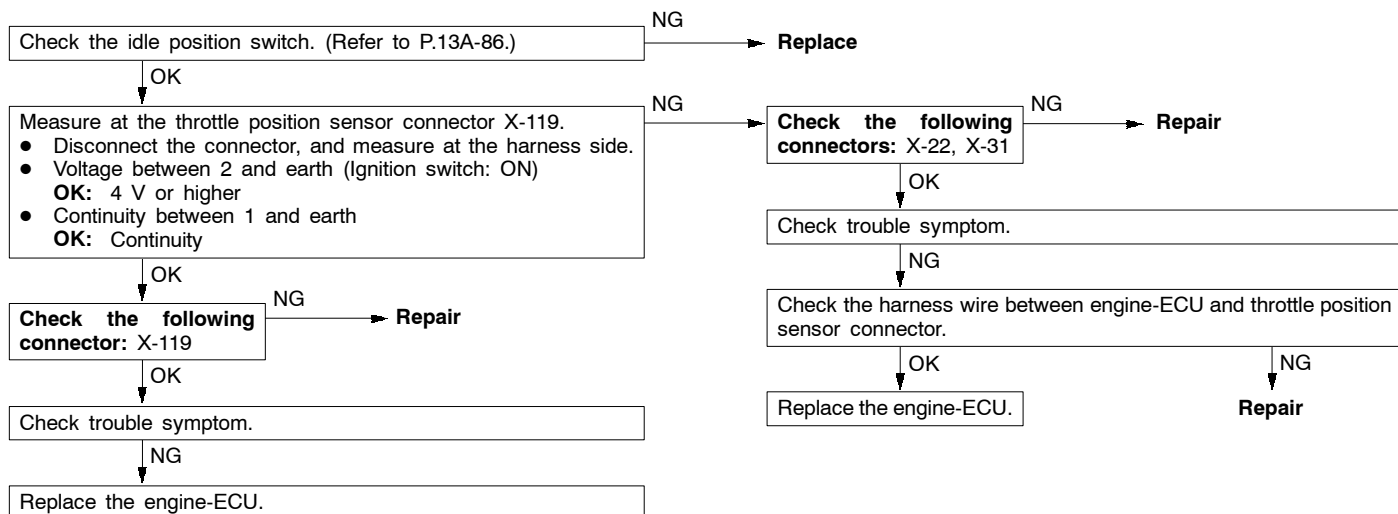
## INSPECTION PROCEDURE 26

Fuel pump system	Probable cause
The engine-ECU turns the control relay ON when the engine is cranking or running, and this supplies power to drive the fuel pump.	<ul style="list-style-type: none"> <li>• Malfunction of the fuel pump relay</li> <li>• Malfunction of the fuel pump</li> <li>• Improper connector contact, open circuit or short-circuited harness wire</li> <li>• Malfunction of the engine-ECU</li> </ul>



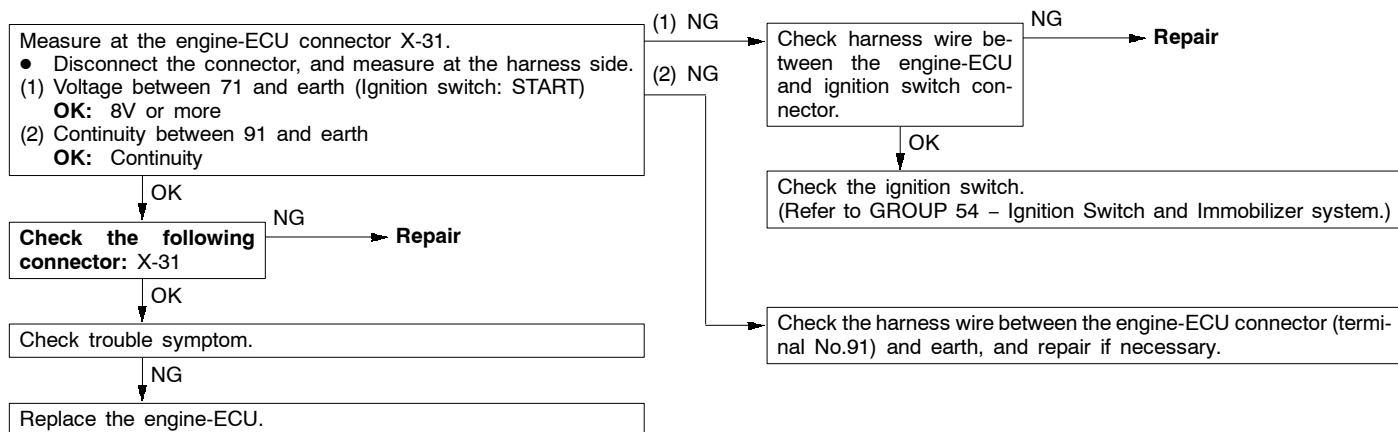
## INSPECTION PROCEDURE 27

Idle position switch system	Probable cause
<p>The idle position switch inputs the condition of the accelerator pedal, i.e. whether it is depressed or released (HIGH/LOW), to the engine-ECU.</p> <p>The engine-ECU controls the idle speed control servo based on this input.</p>	<ul style="list-style-type: none"> <li>• Maladjustment of the accelerator pedal</li> <li>• Maladjustment of the fixed SAS</li> <li>• Maladjustment of the idle position switch and throttle position sensor</li> <li>• Improper connector contact, open circuit or short-circuited harness wire</li> <li>• Malfunction of the engine-ECU</li> </ul>



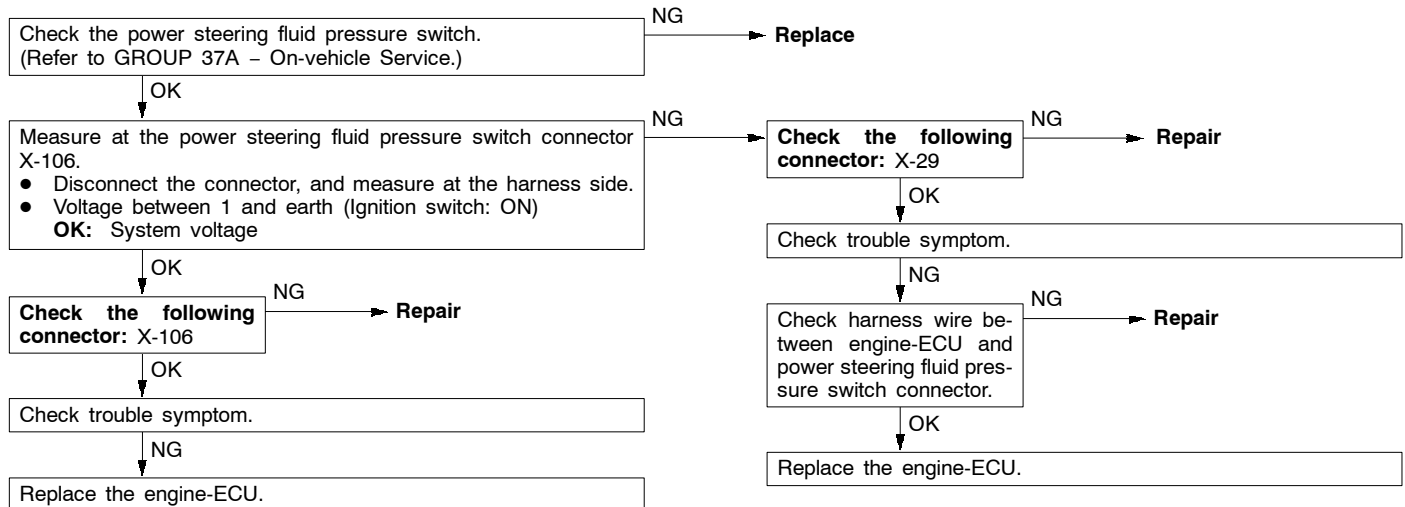
## INSPECTION PROCEDURE 28

Ignition switch-ST system	Probable cause
<p>The ignition switch-ST inputs a HIGH signal to the engine-ECU while the engine is cranking.</p> <p>The engine-ECU controls fuel injection, etc. during starting based on this input.</p>	<ul style="list-style-type: none"> <li>• Malfunction of ignition switch</li> <li>• Improper connector contact, open circuit or short-circuited harness wire</li> <li>• Malfunction of the engine-ECU</li> </ul>



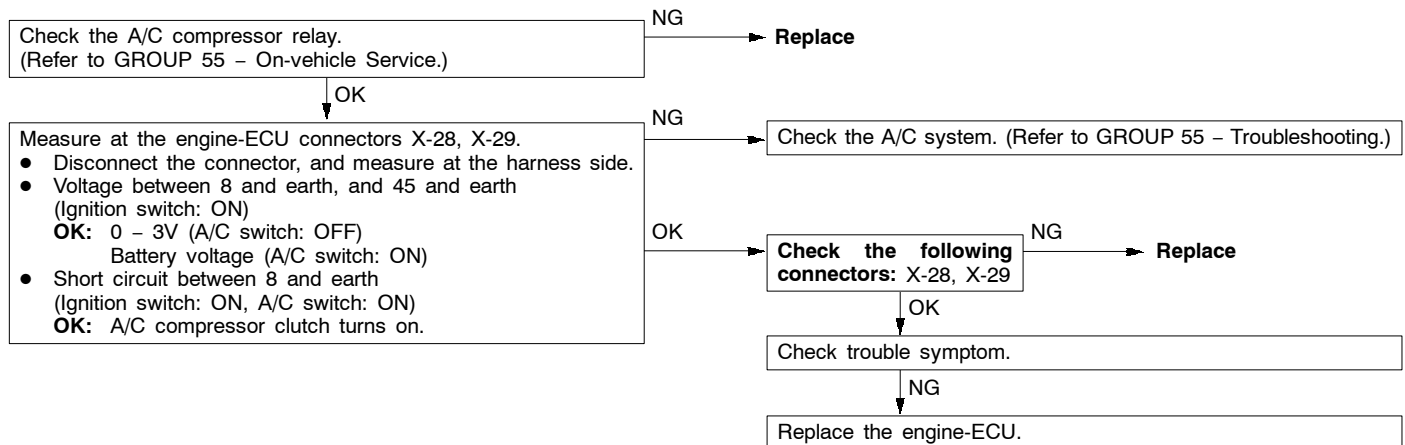
## INSPECTION PROCEDURE 29

Power steering fluid pressure switch system	Probable cause
The presence or absence of power steering load is input to the engine-ECU. The engine-ECU controls the idle speed control (ISC) servo based on this input.	<ul style="list-style-type: none"> <li>Malfunction of power steering fluid pressure switch</li> <li>Improper connector contact, open circuit or short-circuited harness wire</li> <li>Malfunction of the engine-ECU</li> </ul>



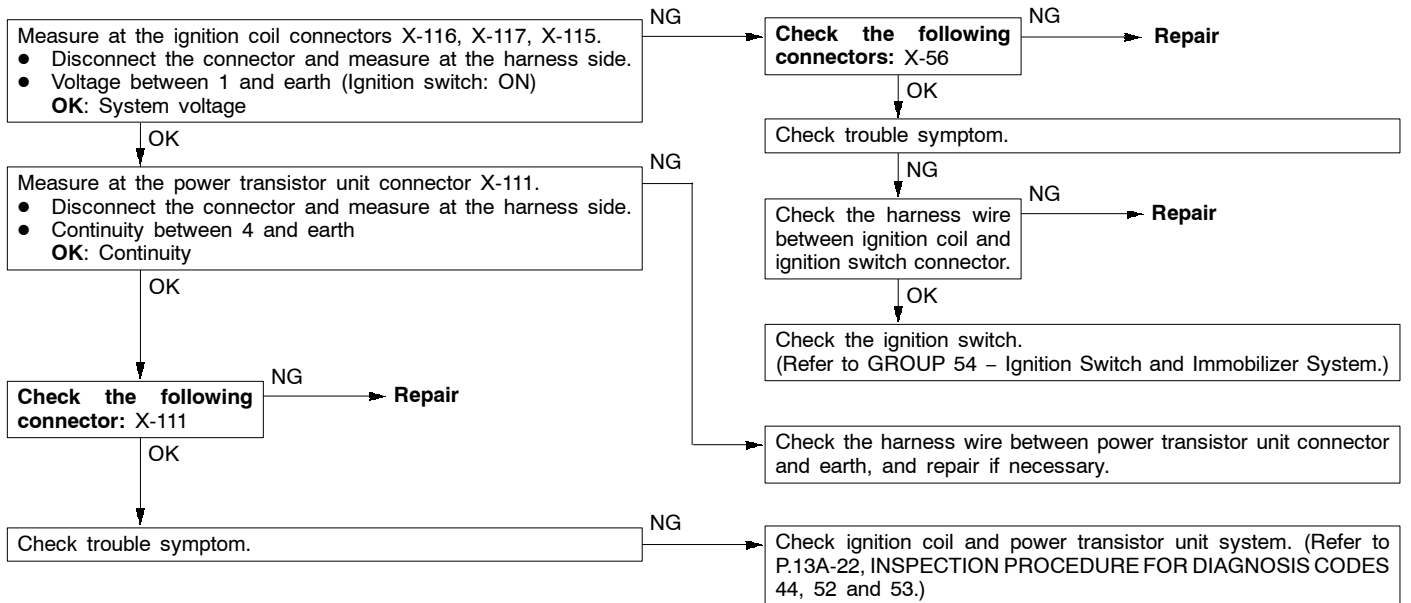
## INSPECTION PROCEDURE 30

A/C switch and A/C relay system	Probable cause
When an A/C ON signal is input to the engine-ECU, the engine-ECU carries out control of the idle speed control (ISC) servo, and also operates the A/C compressor magnetic clutch.	<ul style="list-style-type: none"> <li>Malfunction of A/C control system</li> <li>Malfunction of A/C switch</li> <li>Improper connector contact, open circuit or short-circuited harness wire</li> <li>Malfunction of the engine-ECU</li> </ul>



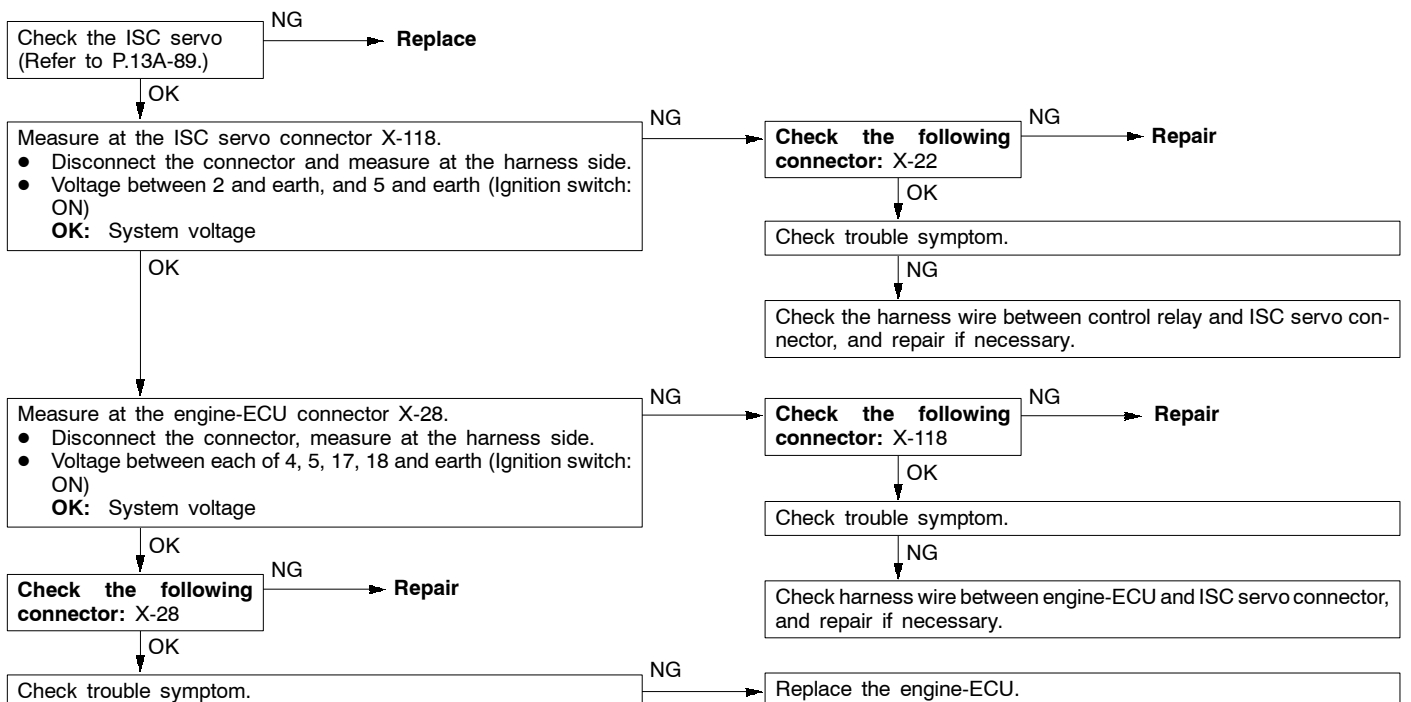
## INSPECTION PROCEDURE 31

Ignition circuit system	Probable cause
The engine-ECU interrupts the ignition coil primary current by turning the power transistor inside the engine-ECU ON and OFF.	<ul style="list-style-type: none"> <li>Malfunction of ignition switch.</li> <li>Malfunction of power transistor unit</li> <li>Improper connector contact, open circuit or short-circuited harness wire</li> <li>Malfunction of the engine-ECU</li> </ul>



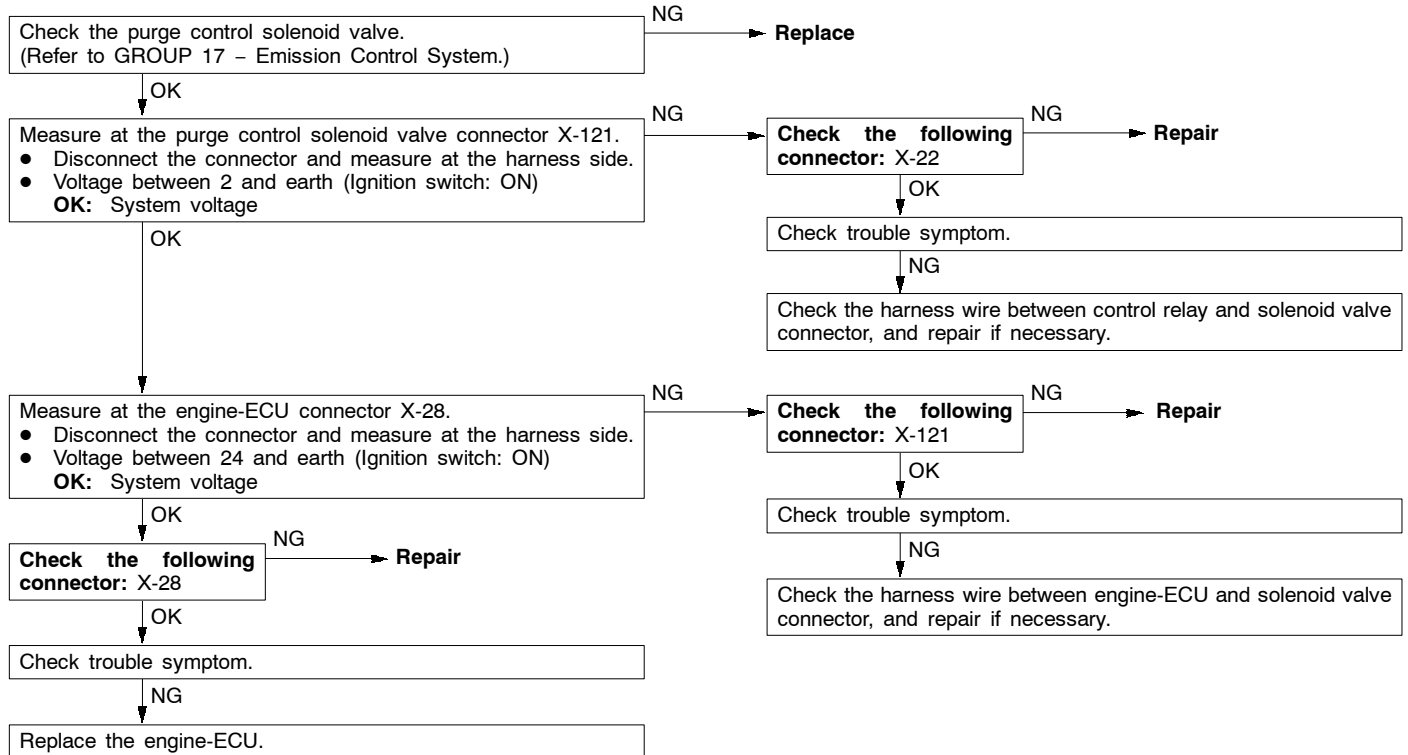
## INSPECTION PROCEDURE 32

Idle speed control (ISC) servo (Stepper motor) system	Probable cause
The engine-ECU controls the intake air volume during idling by opening and closing the servo valve located in the bypass air passage.	<ul style="list-style-type: none"> <li>Malfunction of ISC servo</li> <li>Improper connector contact, open circuit or short-circuited harness wire</li> <li>Malfunction of the engine-ECU</li> </ul>



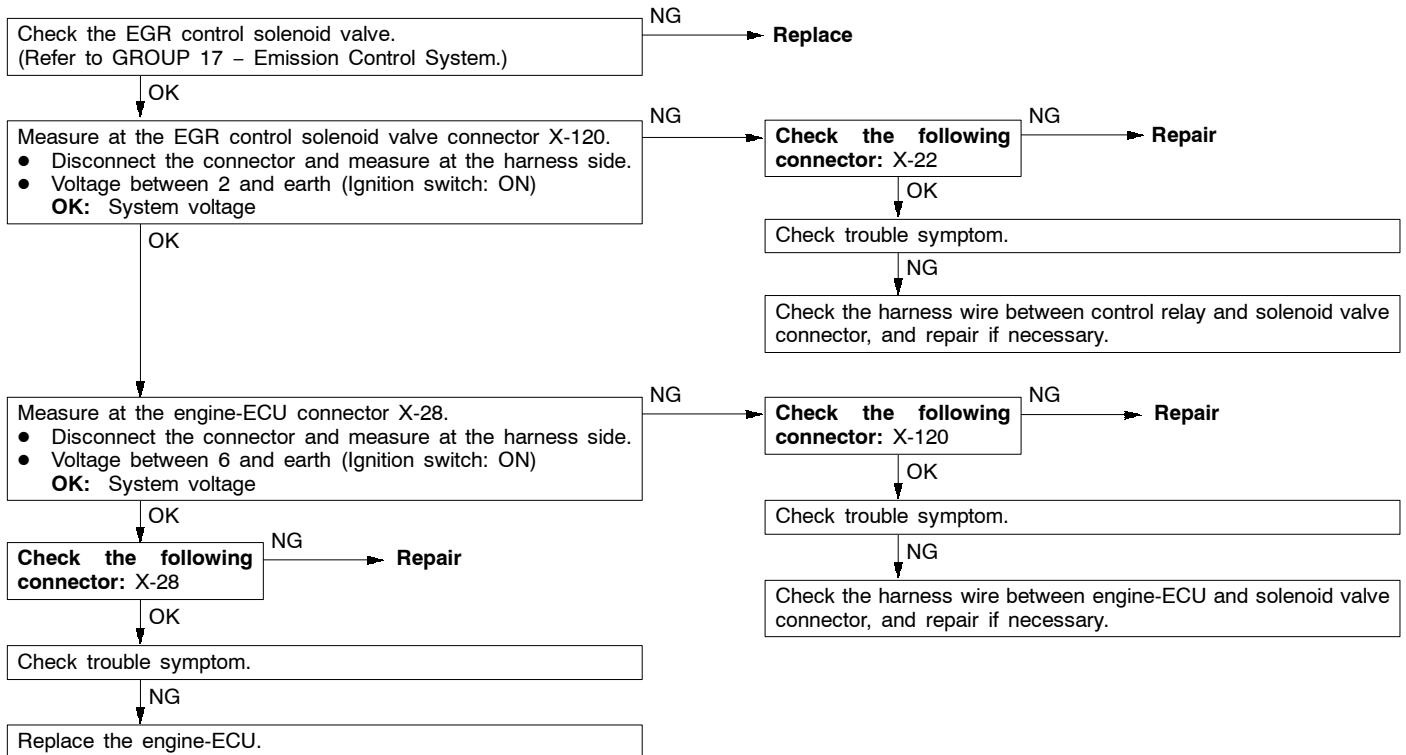
## INSPECTION PROCEDURE 33

Purge control solenoid valve system	Probable cause
The purge control solenoid valve controls the purging of air from the canister located inside the intake manifold.	<ul style="list-style-type: none"> <li>Malfunction of solenoid valve</li> <li>Improper connector contact, open circuit or short-circuited harness wire.</li> <li>Malfunction of the engine-ECU</li> </ul>



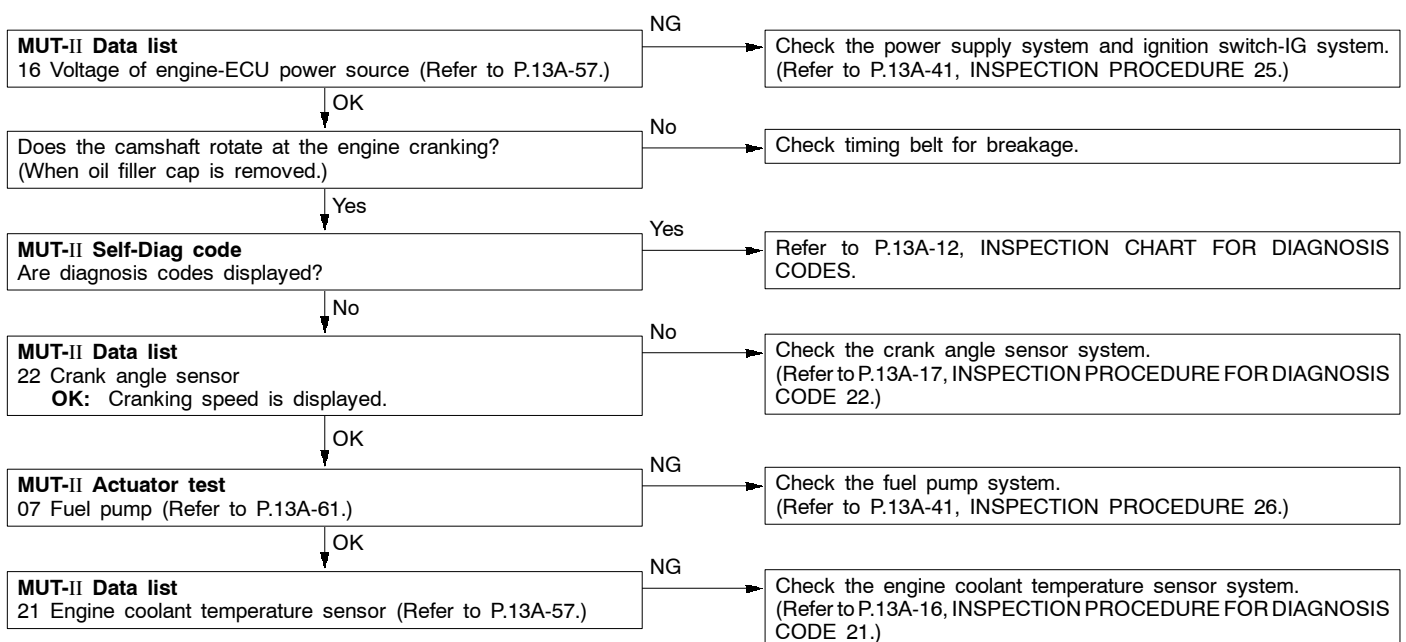
## INSPECTION PROCEDURE 34

EGR control solenoid valve system	Probable cause
The EGR control solenoid valve is controlled by the negative pressure resulting from EGR operation leaking to port "A" of the throttle body.	<ul style="list-style-type: none"> <li>Malfunction of solenoid valve</li> <li>Improper connector contact, open circuit or short-circuited harness wire.</li> <li>Malfunction of the engine-ECU</li> </ul>



## INSPECTION PROCEDURE 35

## MUT-II: Inspection of no initial combustion



**INSPECTION PROCEDURE 36****Ignition system: Inspection of no initial combustion.**

Measure at the power transistor connector X-111

- Connect the connector. (Use test harness: MB991348)
- Connect a primary voltage detection-type tachometer to terminals 11, 12, and 13 in that order.

**OK:** Each terminal displays a speed on the engine tachometer that is 1/3 of the cranking speed.

NG

Check ignition circuit system.  
(Refer to P.13A-44, INSPECTION PROCEDURE 31.)

OK

Check the ignition timing when cranking.  
**OK:** Approx. 5° BTDC

NG

Check that the crank angle sensor is installed properly.

**INSPECTION PROCEDURE 37****MUT-II: Check if uncomplete combustion occurs.**

**MUT-II Self-Diag code**  
Are diagnosis codes displayed?

Yes

Refer to P.13A-12, INSPECTION CHART FOR DIAGNOSIS CODE

No

**MUT-II Actuator test**  
07 Fuel pump (Refer to P.13A-61.)

NG

Check the fuel pump system.  
(Refer to P.13A-41, INSPECTION PROCEDURE 26.)

OK

**MUT-II Data list**  
21 Engine coolant temperature sensor (Refer to P.13A-57.)

NG

Check the engine coolant temperature sensor system.  
(Refer to P.13A-16, INSPECTION PROCEDURES FOR DIAGNOSIS CODE 21.)

OK

**MUT-II Data list**  
18 Ignition switch-ST (Refer to P.13A-57.)

NG

Check the ignition switch-ST system.  
(Refer to P.13A-42, INSPECTION PROCEDURE 28.)

**INSPECTION PROCEDURE 38****Check if hunting occurs.**

Clean the throttle body. (Refer to P.13A-76.)

Check and adjust the fixed SAS. (Refer to P.13A-78.)

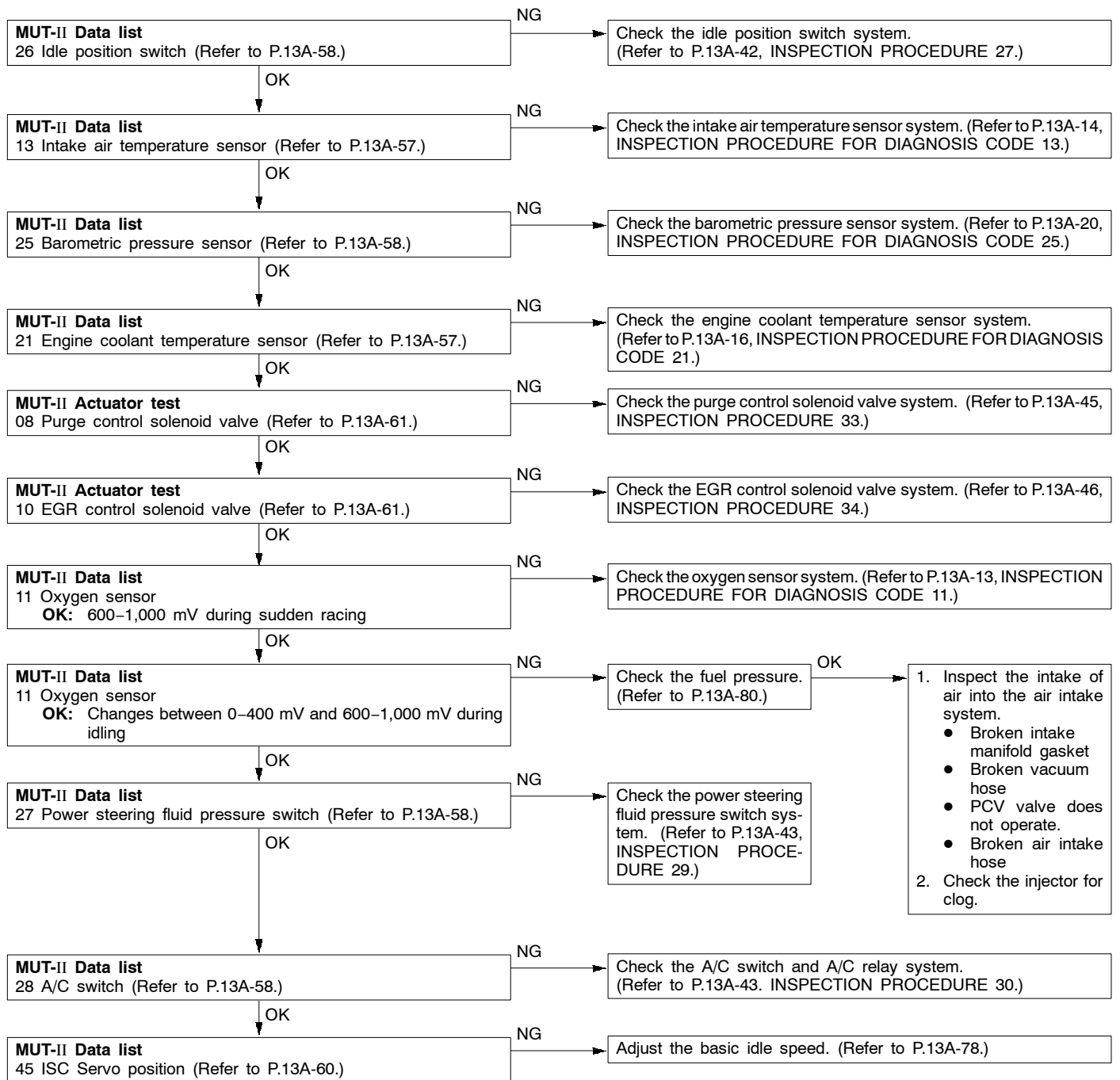
Check trouble symptom.

NG

Inspect the intake of air into the air intake system.

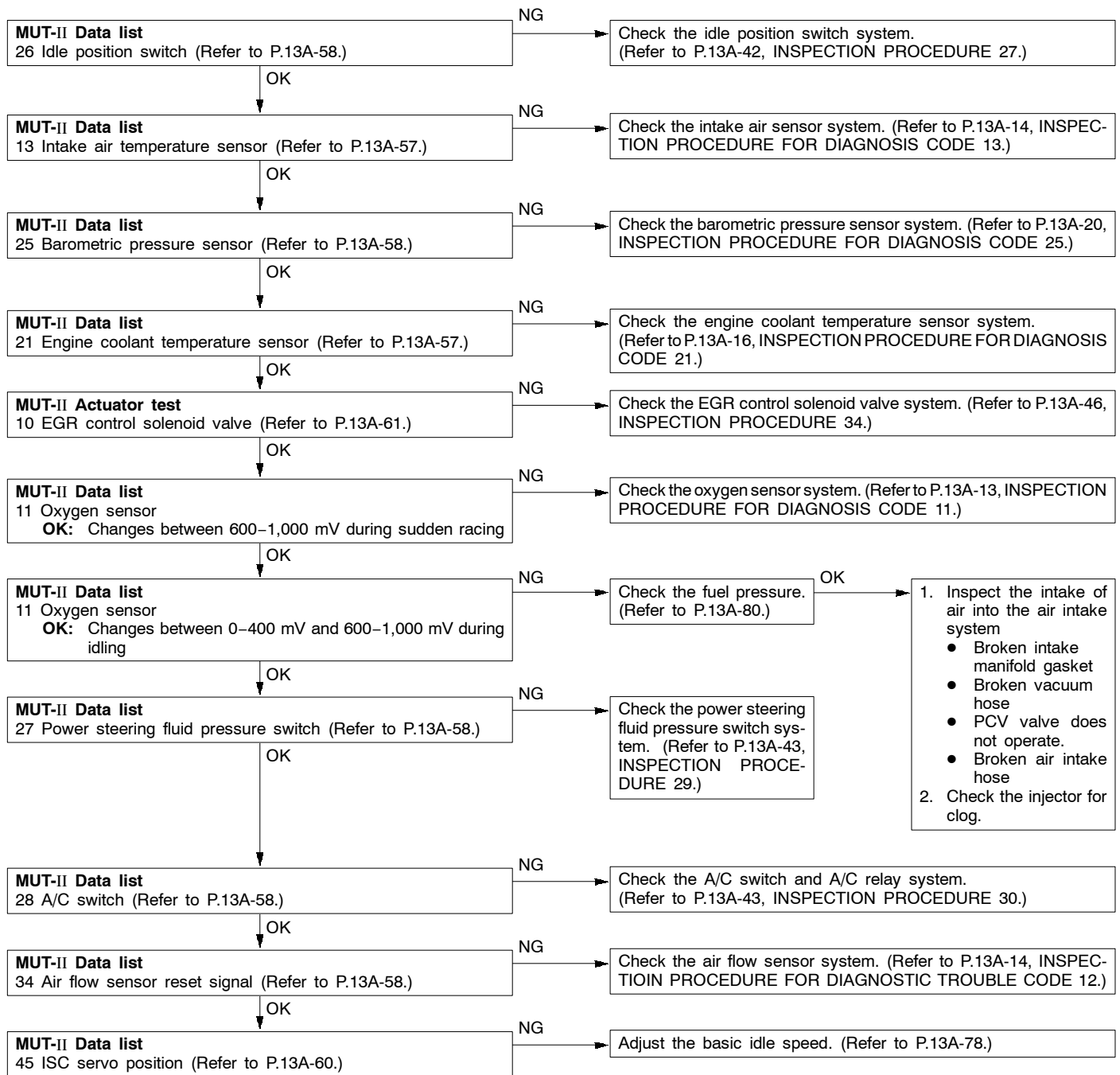
- Broken intake manifold gasket
- Broken air intake hose
- Broken vacuum hose
- Positive crankcase ventilation valve does not operate.

## INSPECTION PROCEDURE 39

**MUT-II: Check if idling speed is unstable.**

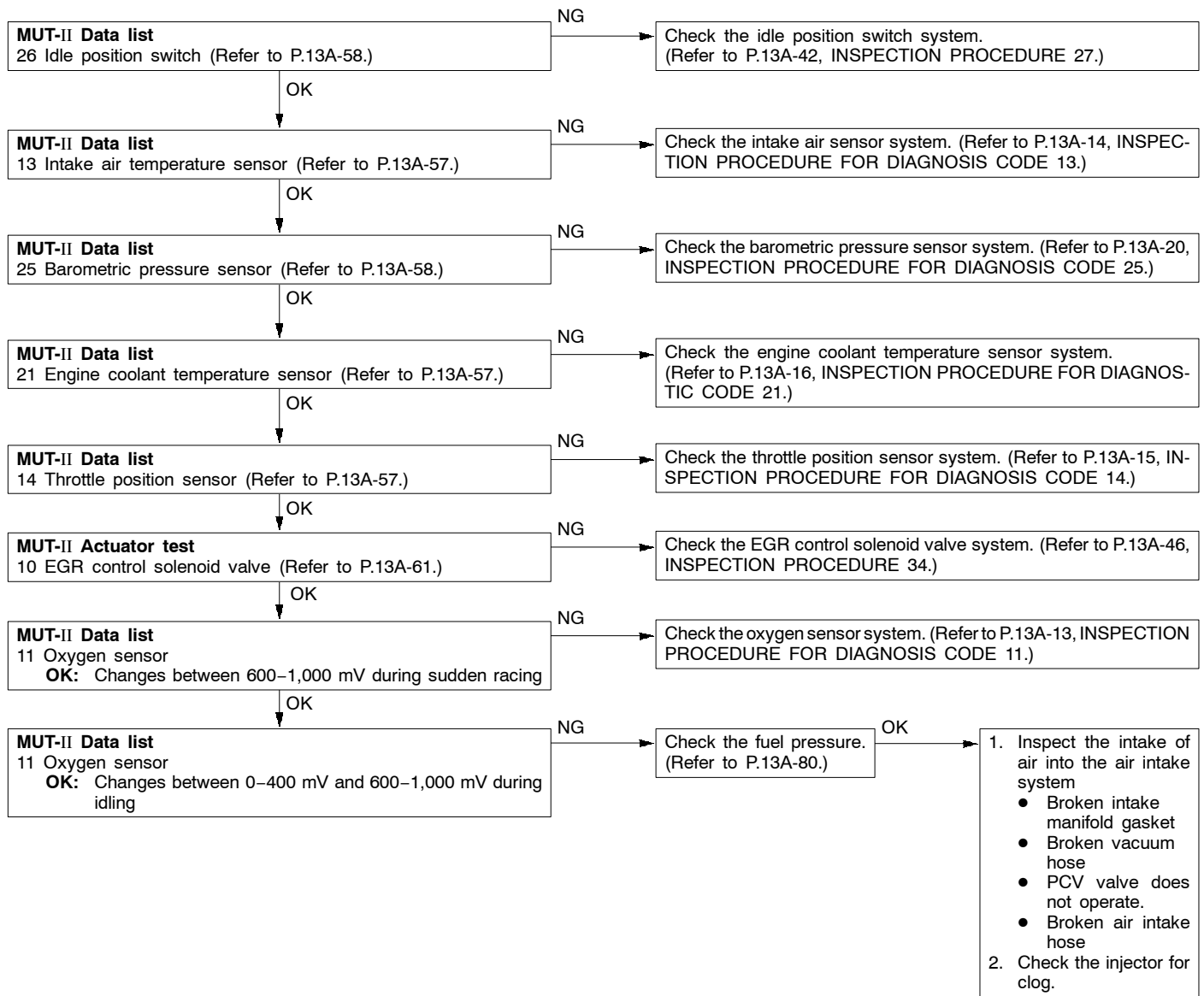


## INSPECTION PROCEDURE 40

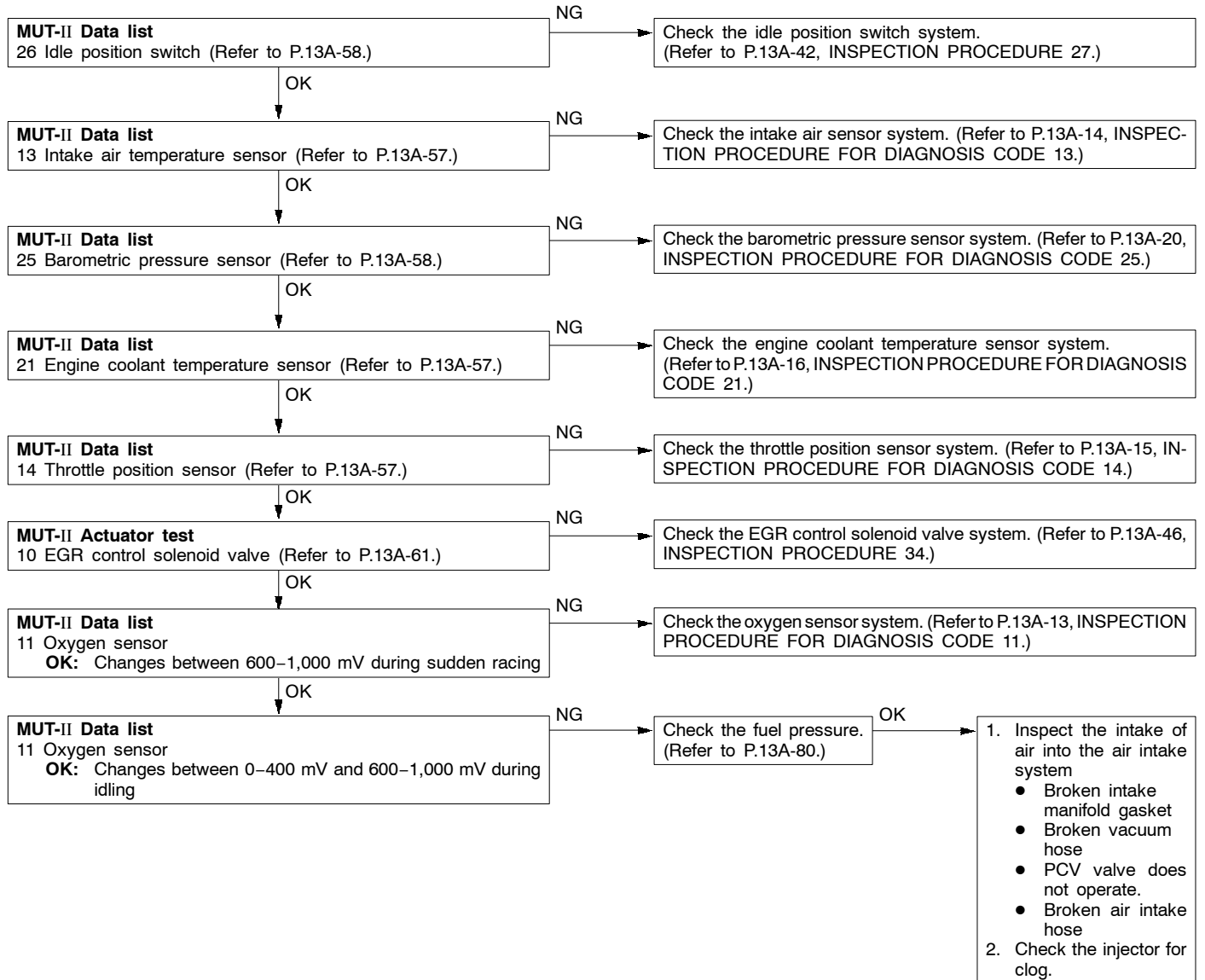
**MUT-II: Engine stalling inspection when the engine is warmed up and idling.**

## INSPECTION PROCEDURE 41

**MUT-II: Check if hesitation, sug, stumble or poor acceleration occurs.**

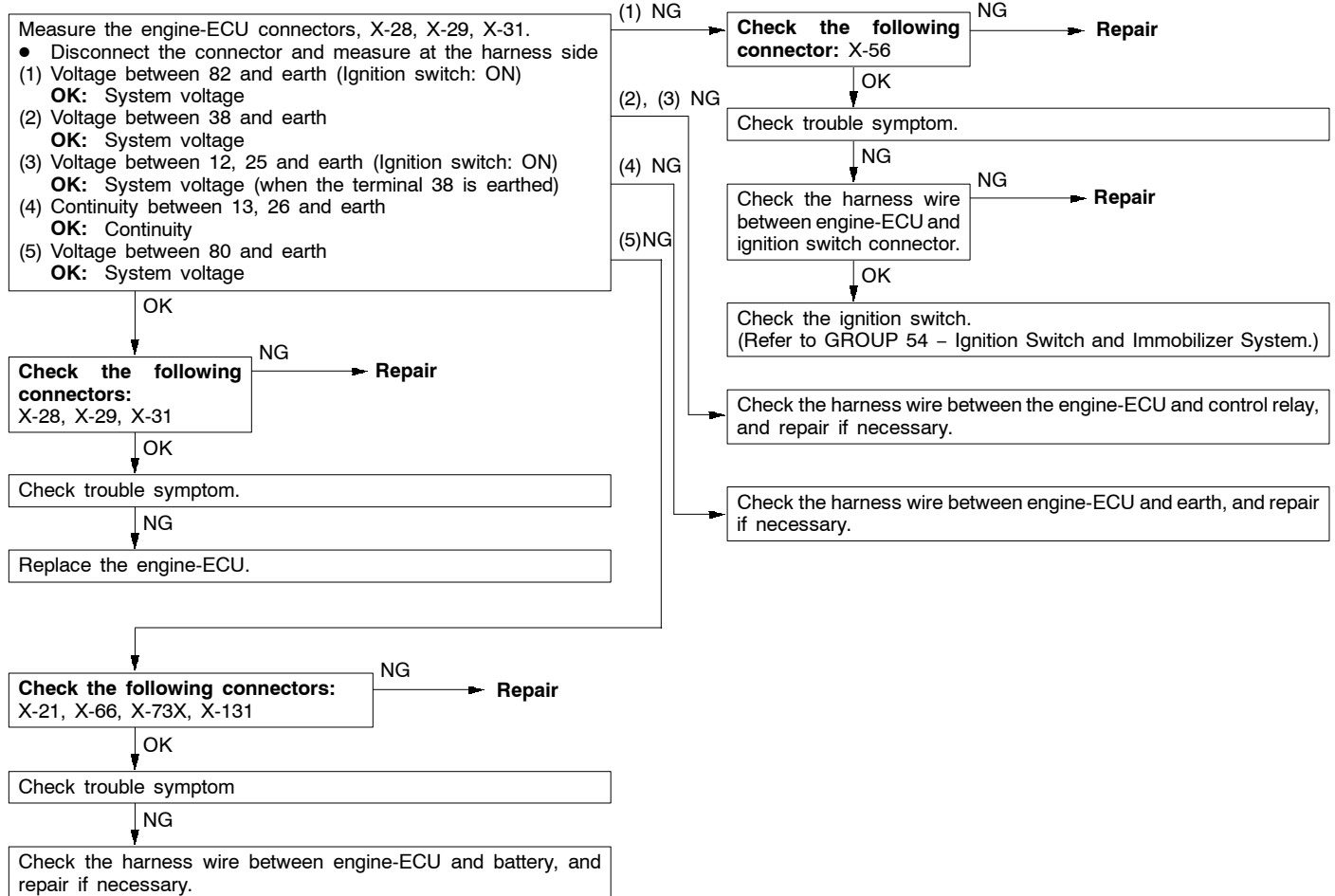


## INSPECTION PROCEDURE 42

**MUT-II: Check if surge occurs.**

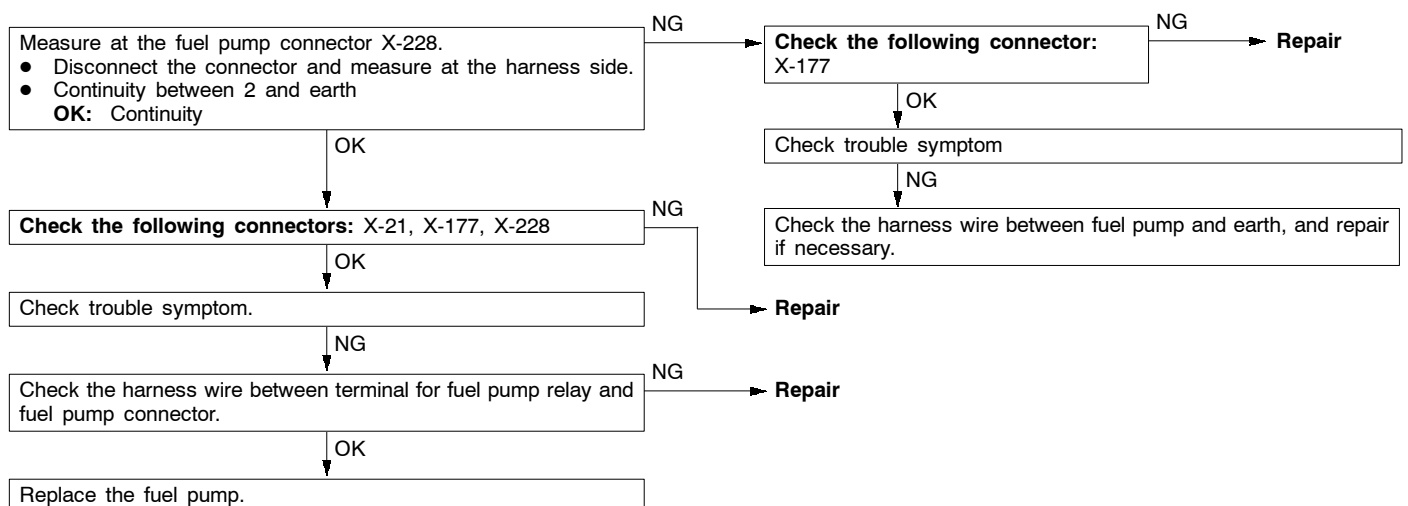
## INSPECTION PROCEDURE 43

## Check the engine-ECU power supply and earth circuit.



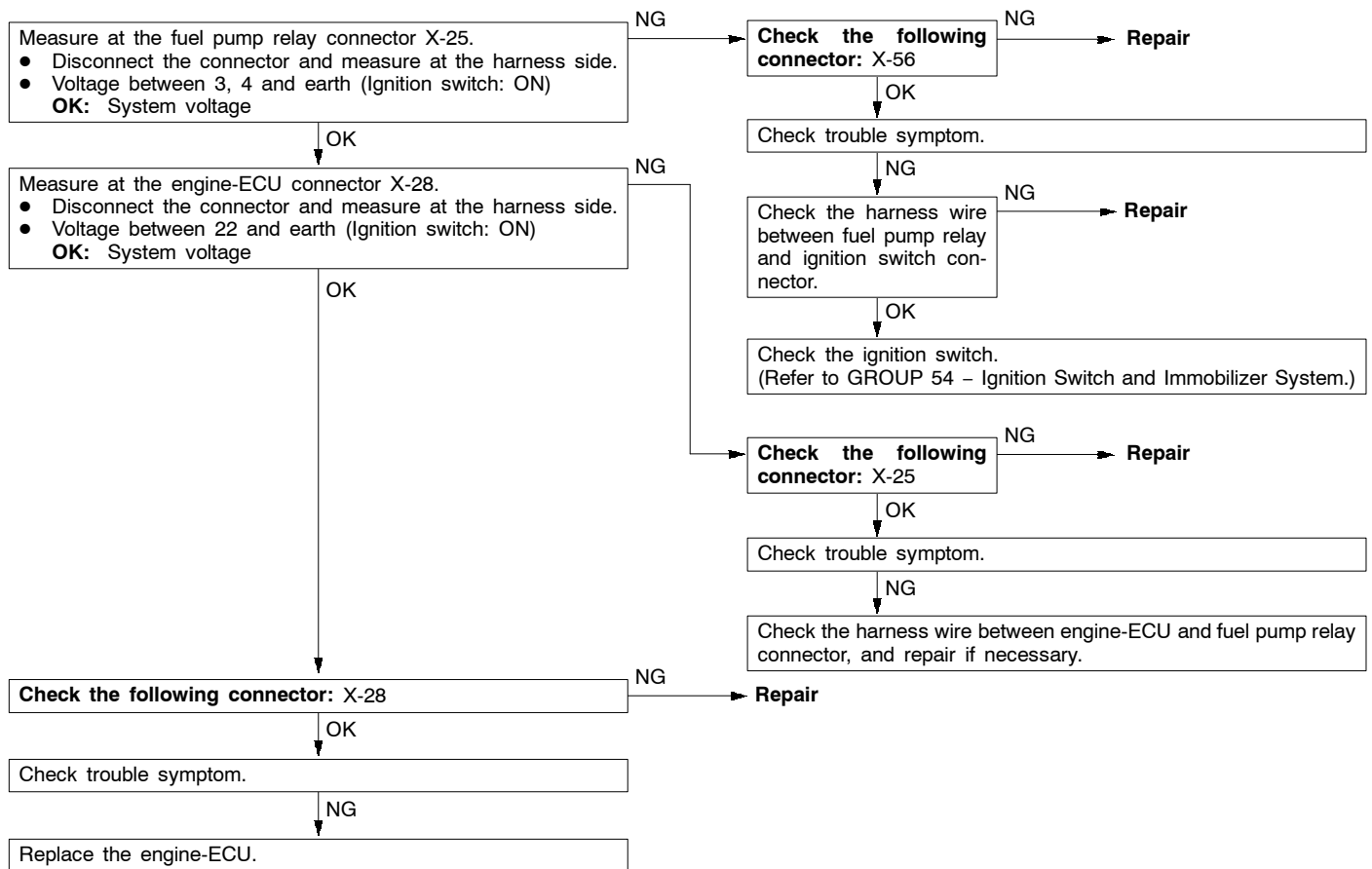
## INSPECTION PROCEDURE 44

## Check the fuel pump circuit.



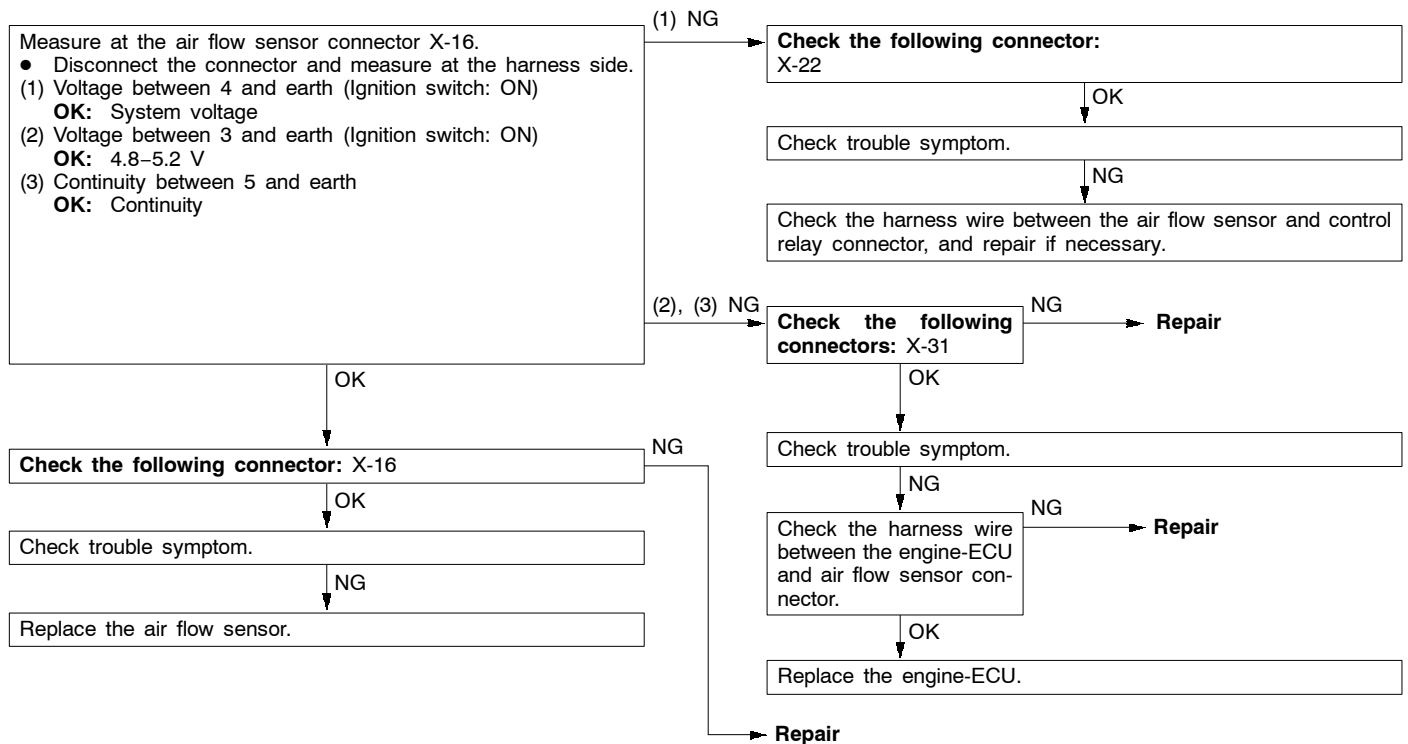
## INSPECTION PROCEDURE 45

## Check the fuel pump drive control circuit.



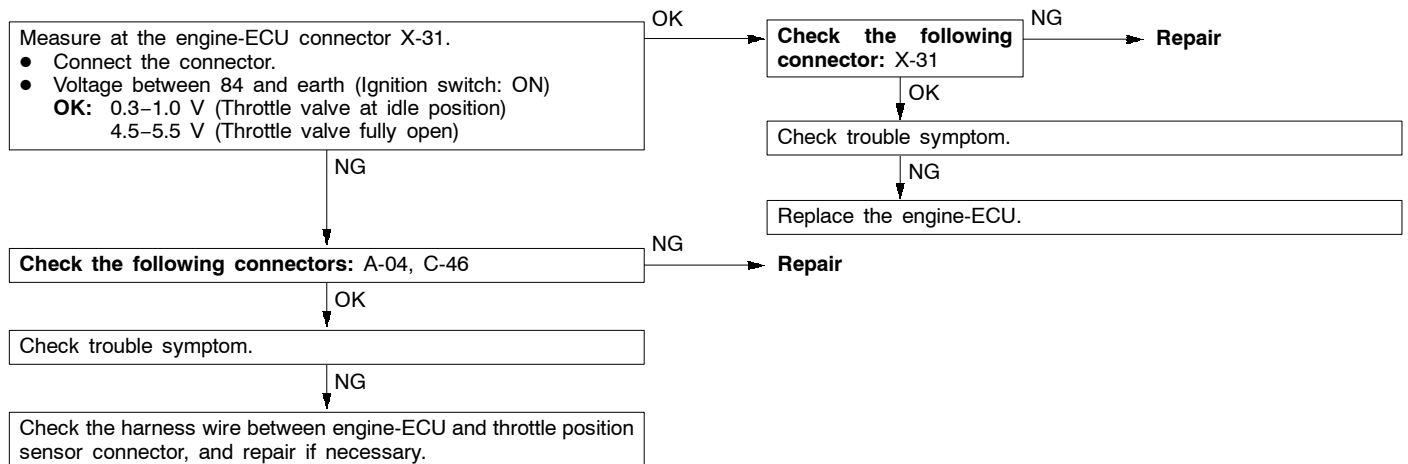
## INSPECTION PROCEDURE 46

## Check the air flow sensor (AFS) control circuit.



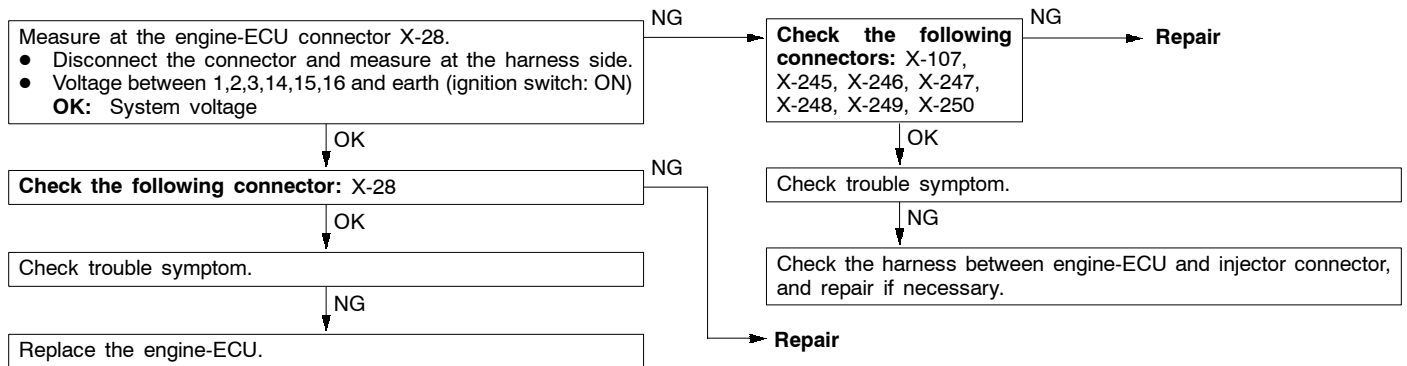
## INSPECTION PROCEDURE 47

## Check the throttle position sensor (TPS) output circuit.



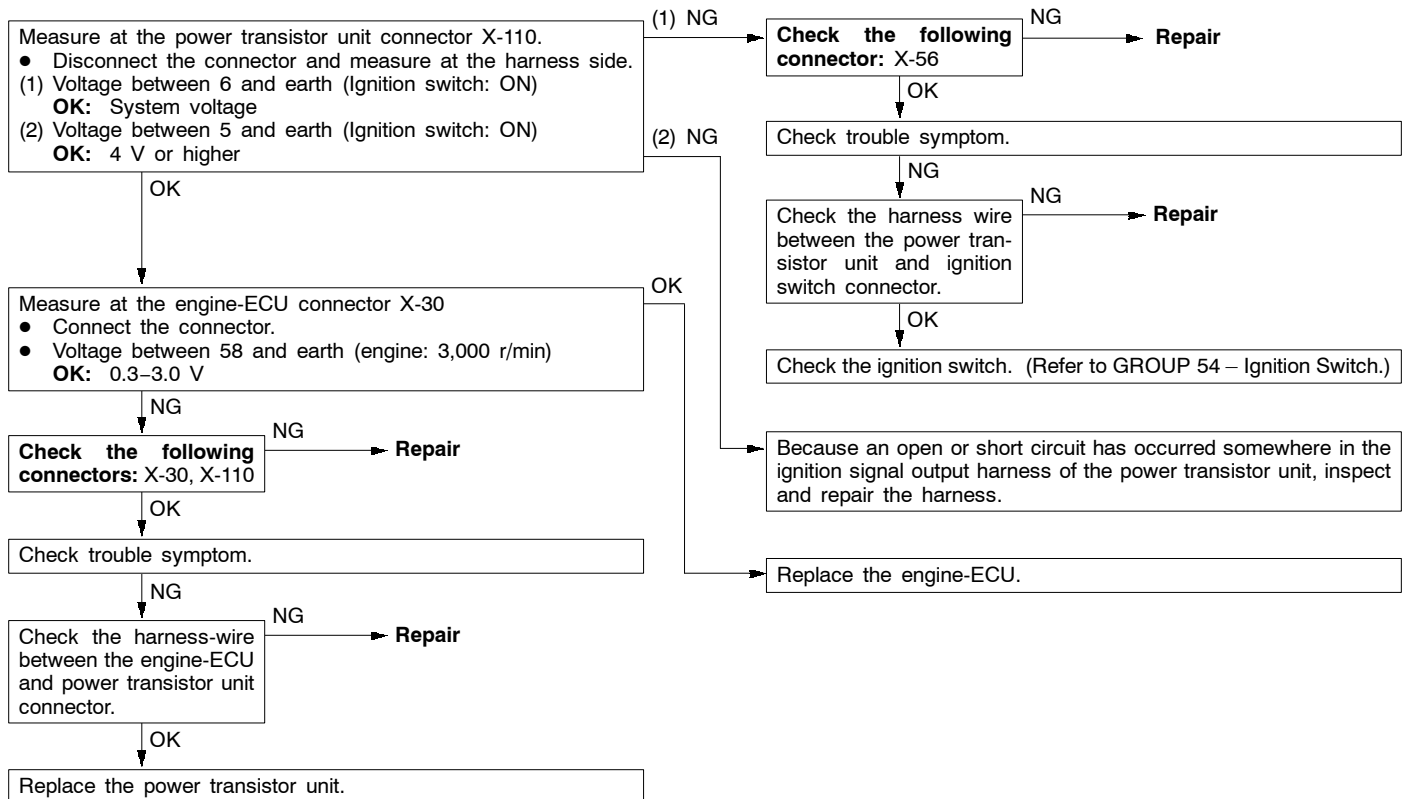
## INSPECTION PROCEDURE 48

## Check the injector control circuit.



## INSPECTION PROCEDURE 49

## Check the ignition signal circuit.



## DATA LIST REFERENCE TABLE

13100890593

**Caution**

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

**NOTE**

- \*1. In a new vehicle [driven approximately 500 km or less], the air flow sensor output frequency is sometimes 10% higher than the standard frequency.
- \*2. The idle position switch normally turns off when the voltage of the throttle position sensor is 50 – 100 mV higher than the voltage at the idle position. If the idle position switch turns back on after the throttle position sensor voltage has been by 100 mV and the throttle valve has been opened, the idle position switch and the throttle position sensor need to be adjusted.
- \*3. The injector drive time represents the time when the cranking speed is at 250 r/min or below when the power supply voltage is 11 V.
- \*4. In a new vehicle [driven approximately 500 km or less], the injector drive time is sometimes 10% longer than the standard time.
- \*5. In a new vehicle [driven approximately 500 km or less], the step of the stepper motor is sometimes 30 steps greater than the standard value.

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
11	Oxygen sensor	Engine:After having warmed up Air/fuel mixture is made leaner when decelerating, and is made richer when racing.	When at 4,000 r/min, engine is suddenly decelerated	200 mV or less	Code No. 11	13A-13
			When engine is suddenly raced	600 – 1,000 mV		
		Engine:After having warmed up The oxygen sensor signal is used to check the air/fuel mixture ratio, and control condition by the engine-ECU.	Engine is idling	400 mV or less ↑ (Changes) ↓ 600 – 1,000 mV		
			2,500 r/min	400 mV or less ↑ (Changes) ↓ 600 – 1,000 mV		
12	Air flow sensor*1	<ul style="list-style-type: none"> <li>● Engine coolant temperature: 80 – 95°C</li> <li>● Lamps and all accessories: OFF</li> <li>● Transmission: Neutral (A/T: P range)</li> </ul>	Engine is idling	25 – 51 Hz	–	–
			2,500 r/min	74 – 114 Hz		
			Engine is raced	Frequency increases in response to racing		



Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
13	Intake air temperature sensor	Ignition switch: ON or with engine running	When intake air temperature is -20°C	-20°C	Code No. 13	13A-14
			When intake air temperature is 0°C	0°C		
			When intake air temperature is 20°C	20°C		
			When intake air temperature is 40°C	40°C		
			When intake air temperature is 80°C	80°C		
14	Throttle position sensor	Ignition switch: ON	Set to idle position	300 – 1,000 mV	Code No. 14	13A-15
			Gradually open	Increases in proportion to throttle opening angle		
			Open fully	4,500 – 5,500 mV		
16	Power supply voltage	Ignition switch: ON		System voltage	Procedure No. 25	13A-41
18	Cranking signal (ignition switch-ST)	Ignition switch: ON	Engine: Stopped	OFF	Procedure No. 28	13A-42
			Engine: Cranking	ON		
21	Engine coolant temperature sensor	Ignition switch: ON or with engine running	When engine coolant temperature is -20°C	-20°C	Code No. 21	13A-16
			When engine coolant temperature is 0°C	0°C		
			When engine coolant temperature is 20°C	20°C		
			When engine coolant temperature is 40°C	40°C		
			When engine coolant temperature is 80°C	80°C		

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
22	Crank angle sensor	<ul style="list-style-type: none"> <li>Engine: Cranking</li> <li>Tachometer: Connected</li> </ul>	Compare the engine speed readings on the tachometer and the MUT-II.	Accord	Code No. 22	13A-17
			When engine coolant temperature is -20°C	1,275 – 1,475 r/min		
		<ul style="list-style-type: none"> <li>Engine: Idling</li> <li>Idle position switch: ON</li> </ul>	When engine coolant temperature is 0°C	1,225 – 1,425 r/min		
			When engine coolant temperature is 20°C	1,100 – 1,300 r/min		
			When engine coolant temperature is 40°C	950 – 1,150 r/min		
			When engine coolant temperature is 80°C	600 – 800 r/min		
25	Barometric pressure sensor	Ignition switch: ON	At altitude of 0 m	101 kPa	Code No. 25	13A-20
			At altitude of 600 m	95 kPa		
			At altitude of 1,200 m	88 kPa		
			At altitude of 1,800 m	81 kPa		
26	Idle position switch	Ignition switch: ON Check by operating accelerator pedal repeatedly	Throttle valve: Set to idle position	ON	Procedure No. 27	13A-42
			Throttle valve: Slightly open	OFF*2		
27	Power steering fluid pressure switch	Engine: Idling	Steering wheel stationary	OFF	Procedure No. 29	13A-43
			Steering wheel turning	ON		
28	A/C switch	Engine: Idling (when A/C switch is ON, A/C compressor should be operating.)	A/C switch: OFF	OFF	Procedure No. 30	13A-43
			A/C switch: ON	ON		
34	Air flow sensor reset signal	Engine: After having warmed up	Engine is idling	ON	Code No. 12	13A-14
			2,500 r/min	OFF		

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
37	Volumetric efficiency	<ul style="list-style-type: none"> <li>Engine coolant temperature: 80–95 °C</li> <li>Lamps 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.		—	—
41	Injectors*3	Engine: Cranking	When engine coolant temperature is 0°C (injection is carried out for all cylinders simultaneously)	13.8 – 20.6 ms	—	—
			When engine coolant temperature is 20°C	34 – 51 ms		
			When engine coolant temperature is 80°C	8.8 – 13.2 ms		
41	Injectors*4	<ul style="list-style-type: none"> <li>Engine coolant temperature: 80–95°C</li> <li>Lamps and all accessories: OFF</li> <li>Transmission: Neutral (A/T : P range)</li> </ul>	Engine is idling	2.6 – 3.8 ms	—	—
			2,500 r/min	2.3 – 3.5 ms		
			When engine is suddenly raced	Increases		
44	Ignition coils and power transistors	<ul style="list-style-type: none"> <li>Engine: After having warmed up</li> <li>Timing lamp is set. (The timing lamp is set in order to check actual ignition timing.)</li> </ul>	Engine is idling	7–23° BTDC	—	—
			2,500 r/min	27 – 47° BTDC		

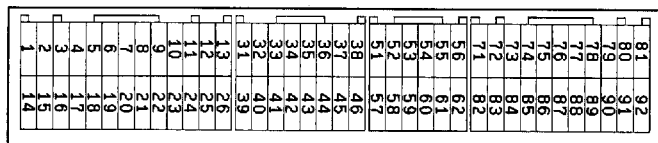
Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
45	ISC (stepper) motor position *5	<ul style="list-style-type: none"> <li>Engine coolant temperature: 80–95°C</li> <li>Lamps and all accessories: OFF</li> <li>Transmission: Neutral (A/T : P range)</li> <li>Idle position switch: ON</li> <li>Engine: Idling</li> <li>When A/C switch is ON, A/C compressor should be operating</li> </ul>	A/C switch: OFF	2–25 STEP	–	–
			A/C switch: OFF → ON	Increases by 10–70 steps		
			<ul style="list-style-type: none"> <li>A/C switch: OFF</li> <li>Select lever: N range → D range</li> </ul>	Increases by 5–50 steps		
49	A/C relay	Engine: After having warmed up/Engine is idling	A/C switch: OFF	OFF (Compressor clutch is not operating)	Procedure No. 30	13A-43
			A/C switch: ON	ON (Compressor clutch is operating)		

## 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	13A-21
02		Cut fuel to No. 2 injector					
03		Cut fuel to No. 3 injector					
04		Cut fuel to No. 4 injector					
05		Cut fuel to No. 5 injector					
06		Cut fuel to No. 6 injector					
07	Fuel pump	Fuel pump operates and fuel is recirculated.	<ul style="list-style-type: none"> <li>Engine: Cranking</li> <li>Fuel pump: Forced driving</li> </ul> Inspect according to both the above conditions.	Pinch the return hose with fingers to feel the pulse of the fuel being recirculated.  Listen near the fuel tank for the sound of fuel pump operation.	Pulse is felt.  Sound of operation is heard.	Procedure No. 26	13A-41
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.33	13A-45
10	EGR 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.34	13A-46
17	Basic ignition timing	Set to ignition timing adjustment mode	Engine: Idling Timing light is set		5° BTDC	–	–
21	Condenser fan	Drive the fan motor	<ul style="list-style-type: none"> <li>Ignition switch: ON</li> </ul>		Fan motor runs	Procedure No. 24	13A-40

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

13100920582

**Engine-ECU Connector Terminal Arrangement**

9FU0393

Terminal No.	Check item	Check condition (Engine condition)	Normal condition
1	No. 1 injector	While engine is idling after having warmed up, suddenly depress the accelerator pedal.	From 11 – 14 V, momentarily drops slightly
14	No. 2 injector		
2	No. 3 injector		
15	No. 4 injector		
3	No. 5 injector		
16	No. 6 injector		
4	Stepper motor coil <A1>	Engine: Soon after the warmed up engine is started	10 – 15 V ↔ 0 – 6 V (Changes repeatedly)
17	Stepper motor coil <A2>		
5	Stepper motor coil <B1>		
18	Stepper motor coil <B2>		
6	EGR control solenoid valve	Ignition switch: ON	System Voltage
		While engine is idling, suddenly depress the accelerator pedal.	From system voltage, momentarily drops
8	A/C relay	<ul style="list-style-type: none"> <li>Engine: Idle speed</li> <li>A/C switch: OFF → ON (A/C compressor is operating)</li> </ul>	System voltage or momentarily 6 V or more → 0 – 3 V
10	Power transistor unit (A)	Engine r/min: 3,000 r/min	0.3 – 3.0 V
11	Power transistor unit (B)		
23	Power transistor unit (C)		
12	Power supply	Ignition switch: ON	System voltage
25			
19	Air flow sensor reset signal	Engine: Idle speed	0 – 1 V
		Engine r/min: 3,000 r/min	6 – 9 V

Terminal No.	Check item	Check condition (Engine condition)		Normal condition
21	Fan motor relay	When the condenser fan is not operating		System voltage
		When the condenser fan is operating		0 – 3 V
22	Fuel pump relay	Ignition switch: ON		System voltage
		Engine: Idle speed		0 – 3 V
24	Purge control solenoid valve	Ignition switch: ON		System voltage
		Running at 3,000 r/min while engine is warming up after having been started.		0 – 3 V
36	Engine warning lamp	Ignition switch: OFF → ON		0 – 3 V → 9 – 13 V (After several seconds have elapsed)
37	Power steering fluid pressure switch	Engine: Idling after warming up	When steering wheel is stationary	System voltage
			When steering wheel is turned	0 – 3 V
38	Control relay (Power supply)	Ignition switch: OFF		System voltage
		Ignition switch: ON		0 – 3 V
44	Anti-lock brake signal	Engine: Idle speed		Battery voltage
		<ul style="list-style-type: none"> <li>After ignition switch is turned ON, at time of first departure</li> <li>Vehicle speed: 0 – 10 km/h</li> </ul>		Battery voltage → 0 – 3 V (momentarily)
45	A/C switch 1	Engine: Idle speed	Turn the A/C switch OFF	0 – 3 V
			Turn the A/C switch ON (A/C compressor is operating)	System voltage
57	A/C switch 2	<ul style="list-style-type: none"> <li>Engine: Idling</li> <li>Outside air temperature: 25°C or more</li> </ul>	When A/C is MAX. COOL condition (when the load by A/C is high)	0 – 3 V
			When A/C is MAX. HOT condition (When the load by A/C is low)	System voltage
71	Ignition switch – ST	Engine: Cranking		8 V or more

Terminal No.	Check item	Check condition (Engine condition)		Normal condition
72	Intake air temperature sensor	Ignition switch: ON	When intake air temperature is 0°C	3.2 – 3.8 V
			When intake air temperature is 20°C	2.3 – 2.9 V
			When intake air temperature is 40°C	1.5 – 2.1 V
			When intake air temperature is 80°C	0.4 – 1.0 V
76	Oxygen sensor	Engine: Running at 2,500 r/min after warmed up (Check using a digital type voltmeter)		0 ↔ 0.8 V (Changes repeatedly)
80	Backup power supply	Ignition switch: OFF		System voltage
81	Sensor impressed voltage	Ignition switch: ON		4.5 – 5.5 V
82	Ignition switch – IG	Ignition switch: ON		System voltage
83	Engine coolant temperature sensor	Ignition switch: ON	When engine coolant temperature is 0°C	3.2 – 3.8 V
			When engine coolant temperature is 20°C	2.3 – 2.9 V
			When engine coolant temperature is 40°C	1.3 – 1.9 V
			When engine coolant temperature is 80°C	0.3 – 0.9 V
84	Throttle position sensor	Ignition switch: ON	Set throttle valve to idle position	0.3 – 1.0 V
			Fully open throttle valve	4.5 – 5.5 V
85	Barometric pressure sensor	Ignition switch: ON	When altitude is 0 m	3.7 – 4.3 V
			When altitude is 1,200 m	3.2 – 3.8 V



Terminal No.	Check item	Check condition (Engine condition)		Normal condition
86	Vehicle speed sensor	<ul style="list-style-type: none"><li>● Ignition switch: ON</li><li>● Move the vehicle slowly forward</li></ul>		0 ↔ System voltage (Changes repeatedly)
87	Idle position switch	Ignition switch: ON	Set throttle valve to idle position	0 – 1 V
			Slightly open throttle valve	4V or more
88	Top dead centre sensor	Engine: Cranking		0.4 – 3.0 V
		Engine: Idle speed		0.5 – 2.0 V
89	Crank angle sensor	Engine: Cranking		0.4 – 4.0 V
		Engine: Idle speed		1.5 – 2.5 V
90	Air flow sensor	Engine: Idle speed		2.2 – 3.2 V
		Engine r/min: 2,500 r/min		

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

1. Turn the ignition switch to OFF.
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.

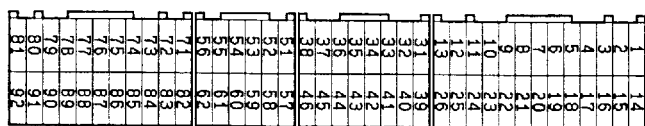
#### Caution

**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!**

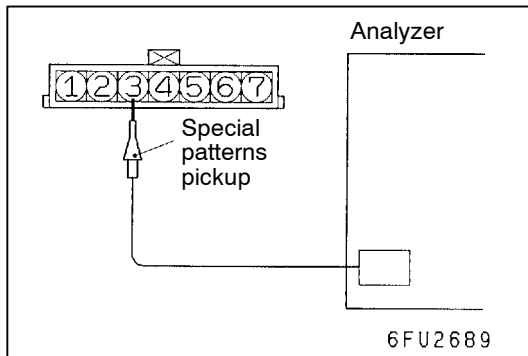
4. If the ohmmeter shows any deviation from the standard value, check the corresponding sensor, actuator and related electrical wiring, and then repair or replace.
5. After repair or replacement, recheck with the ohmmeter to confirm that the repair or replacement has corrected the problem.

## Engine-ECU Harness Side Connector Terminal Arrangement



9FU0392

Terminal No.	Inspection item	Normal condition (Check condition)
1 – 12	No. 1 injector	13 – 16 Ω (At 20°C)
14 – 12	No. 2 injector	
2 – 12	No. 3 injector	
15 – 12	No. 4 injector	13 – 16 Ω (At 20°C)
3 – 12	No. 5 injector	
16 – 12	No. 6 injector	
4 – 12	Stepper motor coil (A1)	28 – 33 Ω (At 20°C)
17 – 12	Stepper motor coil (A2)	
5 – 12	Stepper motor coil (B1)	
18 – 12	Stepper motor coil (B2)	
6 – 12	EGR control solenoid valve	36 – 44 Ω (At 20°C)
24 – 12	Purge control solenoid valve	36 – 44 Ω (At 20°C)
13 – Body earth	Engine-ECU earth	Continuity (0 Ω)
26 – Body earth	Engine-ECU earth	
72 – 92	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)
83 – 92	Engine coolant temperature sensor	5.1 – 6.5 kΩ (When coolant temperature is 0°C)
		2.1 – 2.7 kΩ (When coolant temperature is 20°C)
		0.9 – 1.3 kΩ (When coolant temperature is 40°C)
		0.26 – 0.36 kΩ (When coolant temperature is 80°C)
87 – 92	Idle position switch	Continuity (when throttle valve is at idle position)
		No continuity (when throttle valve is slightly open)



## INSPECTION PROCEDURE USING AN ANALYZER

### AIR FLOW SENSOR (AFS)

13100930400

#### Measurement Method

1. Disconnect the air flow sensor connector, and connect the special tool (test harness: MB991709) in between. (All terminals should be connected.)
2. Connect the analyzer special patterns pickup to air flow sensor connector terminal 3.

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

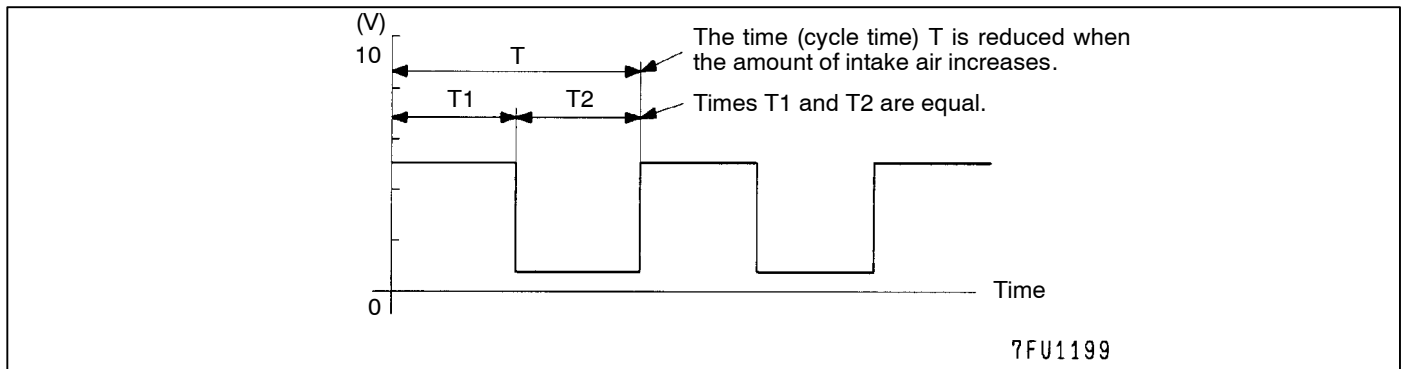
1. Connect the analyzer special patterns pickup to engine-ECU terminal 90.

#### Standard Wave Pattern

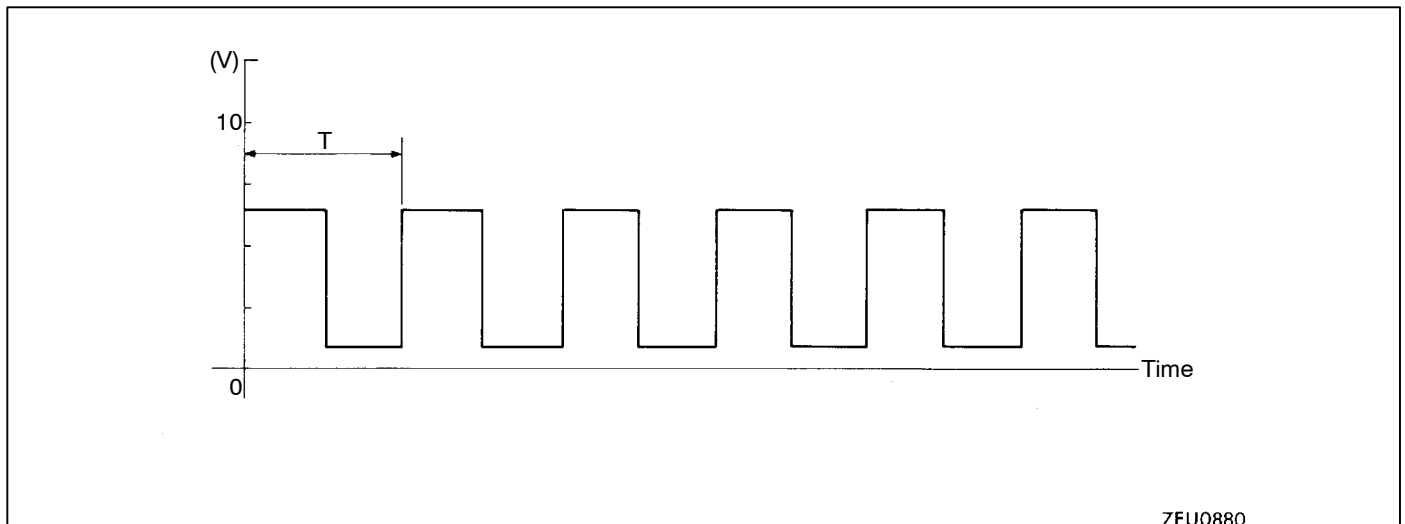
##### Observation conditions

Function	Special patterns
Pattern height	Low
Pattern selector	Display
Engine r/min	Idle speed

#### Standard wave pattern

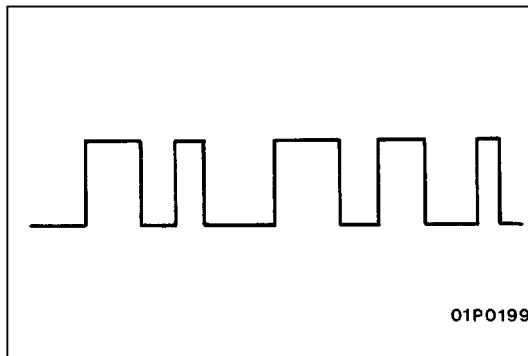


#### Observation conditions (from conditions above engine speed is increased by racing.)



#### Wave Pattern Observation Points

Check that cycle time T becomes shorter and the frequency increases when the engine speed is increased.



### Examples of Abnormal Wave Patterns

- Example 1

#### Cause of problem

Sensor interface malfunction

#### Wave pattern characteristics

Rectangular wave pattern is output even when the engine is not started.

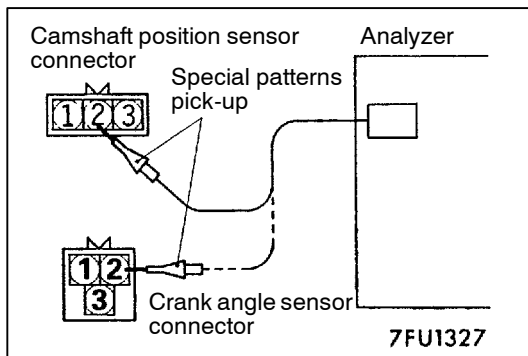
- Example 2

#### Cause of problem

Damaged rectifier or vortex generation column

#### Wave pattern characteristics

Unstable wave pattern with non-uniform frequency. However, when an ignition leak occurs during acceleration, the wave pattern will be distorted temporarily, even if the air flow sensor is normal.



### CAMSHAFT POSITION SENSOR AND CRANK ANGLE SENSOR

#### Measurement Method

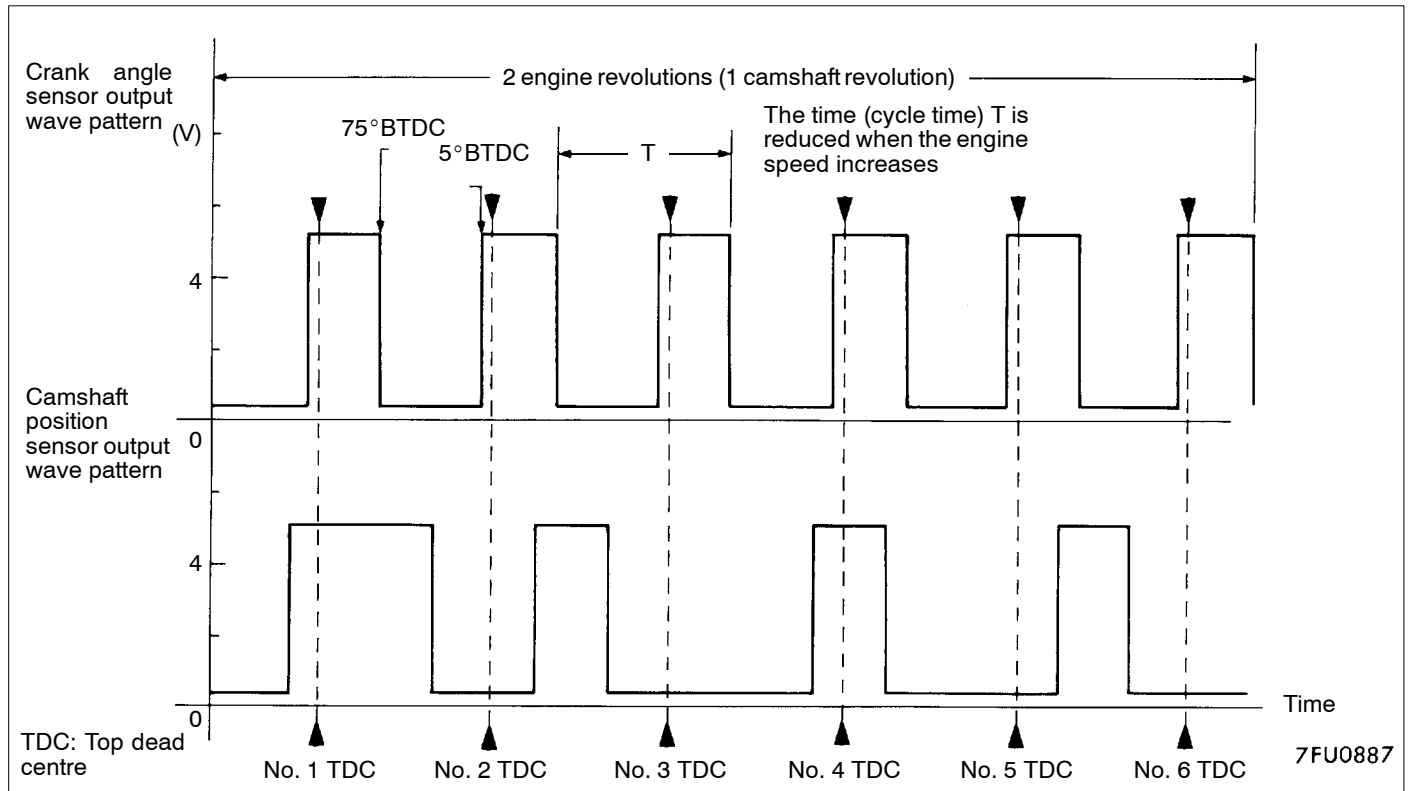
1. Disconnect the camshaft position sensor connector and connect the special tool (test harness: MB991658) in between. (All terminals should be connected.)
2. Connect the analyzer special patterns pickup to camshaft position sensor terminal 2.
3. Disconnect the crank angle sensor connector and connect the special tool (test harness: MD998478) in between.
4. Connect the analyzer special patterns pickup to crank angle sensor terminal 2.

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

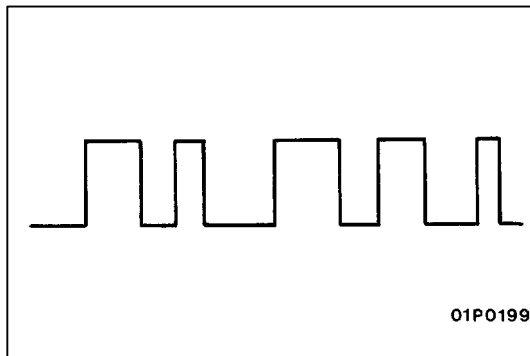
1. Connect the analyzer special patterns pickup to engine-ECU terminal 88. (When checking the top dead centre sensor signal wave pattern.)
2. Connect the analyzer special patterns pickup to engine-ECU terminal 89. (When checking the crank angle sensor signal wave pattern.)

**Standard Wave Pattern****Observation conditions**

Function	Special patterns
Pattern height	Variable
Variable knob	Adjust while viewing the wave pattern
Pattern selector	Display
Engine r/min	Idle speed

**Standard wave pattern****Wave Pattern Observation Points**

Check that cycle time T becomes shorter and the frequency increases when the engine speed increases.



### Examples of Abnormal Wave Patterns

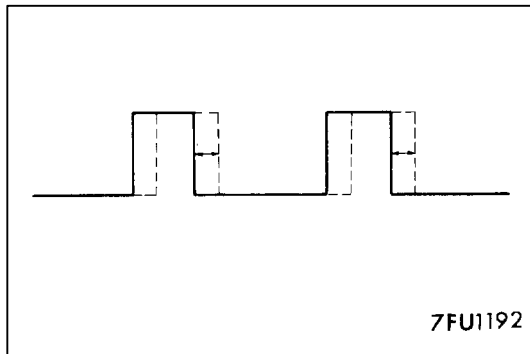
- Example 1

#### Cause of problem

Sensor interface malfunction

#### Wave pattern characteristics

Rectangular wave pattern is output even when the engine is not started.



- Example 2

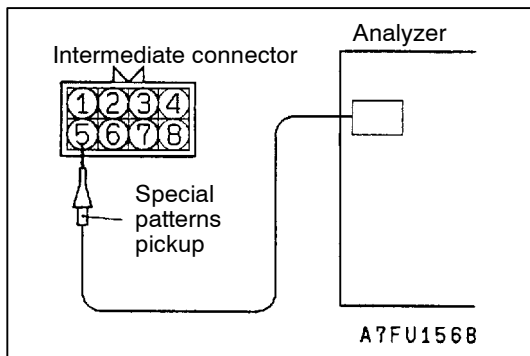
#### Cause of problem

Loose timing belt

Abnormality in sensor disk

#### Wave pattern characteristics

Wave pattern is displaced to the left or right.



## INJECTOR

### Measurement Method

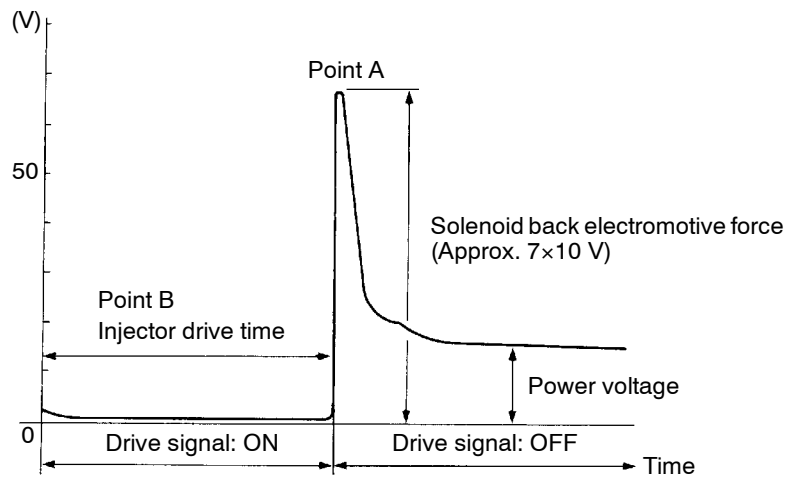
1. Disconnect the injector intermediate harness connector, and then connect the special tool (test harness: MD998474) in between. (Both the power supply side and engine-ECU side should be connected.)
2. To measure cylinder No. 1, connect the analyzer special patterns pickup to terminal 3 (red clip [red lead wire] of the special tool). For cylinder No. 2, connect to terminal 2 (yellow clip [yellow lead wire]). For cylinder No. 3, connect to terminal 1 (green clip [green lead wire]). For cylinder No. 4, connect to terminal 7 (white clip [white lead wire]). For cylinder No. 5, connect to terminal 6 (green clip [green and black lead wire]). For cylinder No. 6, connect to terminal 5 (yellow clip [red and yellow lead wire]).

### Alternate Method (Test harness not available)

1. Connect the analyzer special patterns pickup to engine-ECU terminal 1. (When checking the No. 1 cylinder.)
2. Connect the analyzer special patterns pickup to engine-ECU terminal 14. (When checking the No. 2 cylinder.)
3. Connect the analyzer special patterns pickup to engine-ECU terminal 2. (When checking the No. 3 cylinder.)
4. Connect the analyzer special patterns pickup to engine-ECU terminal 15. (When checking the No. 4 cylinder.)
5. Connect the analyzer special patterns pickup to engine-ECU terminal 3. (When checking the No. 5 cylinder.)
6. Connect the analyzer special patterns pickup to engine-ECU terminal 16. (When checking the No. 6 cylinder.)

**Standard Wave Pattern****Observation conditions**

Function	Special patterns
Pattern height	Variable
Variable knob	Adjust while viewing the wave pattern
Pattern selector	Display
Engine r/min	Idle speed

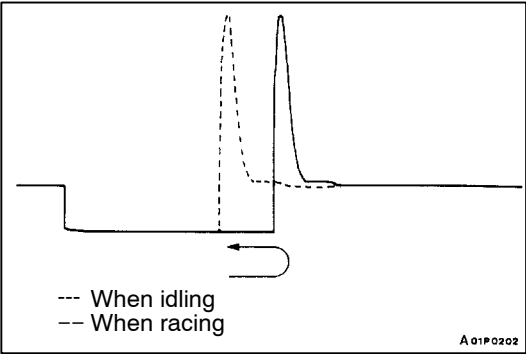
**Standard wave pattern**

7FU1202

**Wave Pattern Observation Points****Explanation of Wave Pattern**

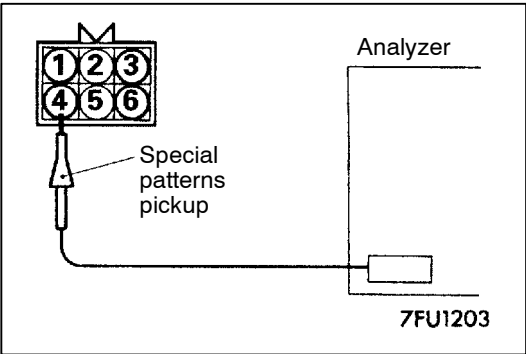
Point A: Height of solenoid back electromotive force

Contrast with standard wave pattern	Probable cause
Solenoid coil back electromotive force is low or doesn't appear at all.	Short in the injector solenoid



Point B: Injector drive time

- The injector drive time will be synchronized with the MUT-II tester display.
- When the engine is suddenly raced, the drive time will be greatly extended at first, but the drive time will soon match the engine speed.



**STEPPER MOTOR**

**Measurement Method**

1. Disconnect the stepper motor connector, and connect the special tool (test harness: MD998463) in between.
2. Connect the analyzer special patterns pickup to the stepper motor-side connector terminal 1 (red clip of special tool), terminal 3 (blue clip), terminal 4 (black clip) and terminal 6 (yellow clip) respectively.

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

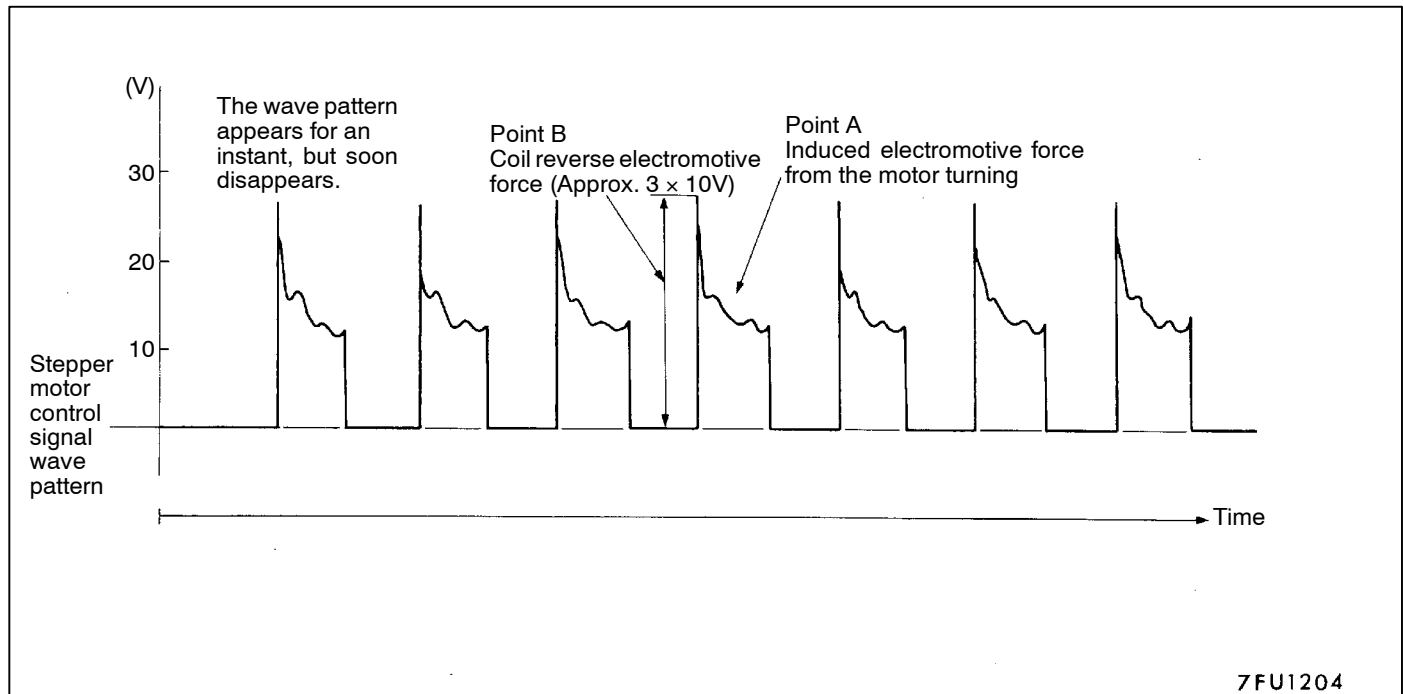
1. Connect the analyzer special patterns pickup to engine-ECU terminal 4, connection terminal 5, connection terminal 17, and connection terminal 18 respectively.

**Standard Wave Pattern**

**Observation conditions**

Function	Special patterns
Pattern height	High
Pattern selector	Display
Engine condition	When the engine coolant temperature is 20°C or below, turn the ignition switch from OFF to ON (without starting the engine).
	While the engine is idling, turn the A/C switch to ON.
	Immediately after starting the warm engine (approx. 1 minute)



**Standard wave pattern****Wave Pattern Observation Points**

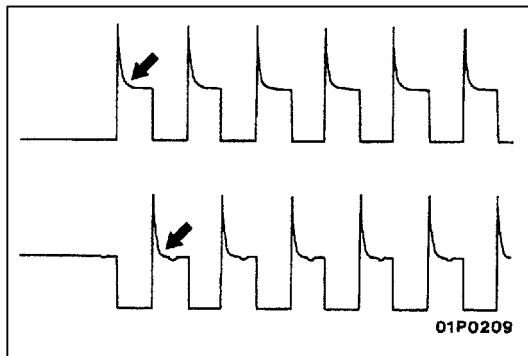
Check that the standard wave pattern appears when the stepper motor is operating.

Point A: Presence or absence of induced electromotive force from the motor turning. (Refer to the abnormal wave pattern.)

Contrast with standard wave pattern	Probable cause
Induced electromotive force does not appear or is extremely small.	Motor is malfunctioning

Point B: Height of coil reverse electromotive force

Contrast with standard wave pattern	Probable cause
Coil reverse electromotive force does not appear or is extremely small.	Short in the coil



### Examples of Abnormal Wave Pattern

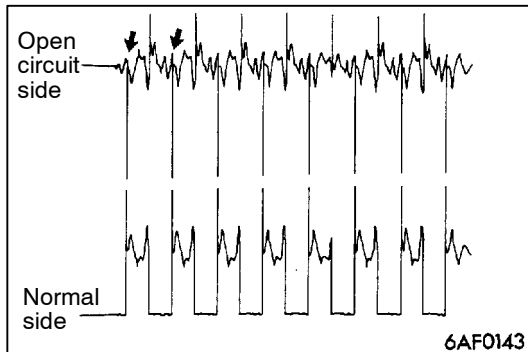
#### • Example 1

##### **Cause of problem**

Motor is malfunctioning. (Motor is not operating.)

##### **Wave pattern characteristics**

Induced electromotive force from the motor turning does not appear.



#### • Example 2

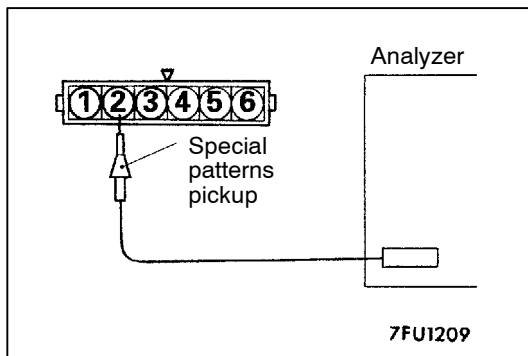
##### **Cause of problem**

Open circuit in the line between the stepper motor and the engine-ECU.

##### **Wave pattern characteristics**

Current is not supplied to the motor coil on the open circuit side. (Voltage does not drop to 0 V.)

Furthermore, the induced electromotive force waveform at the normal side is slightly different from the normal waveform.



### IGNITION COIL AND POWER TRANSISTOR

- Ignition coil primary signal  
Refer to GROUP 16 – Ignition System
- Power transistor control signal

#### **Measurement Method**

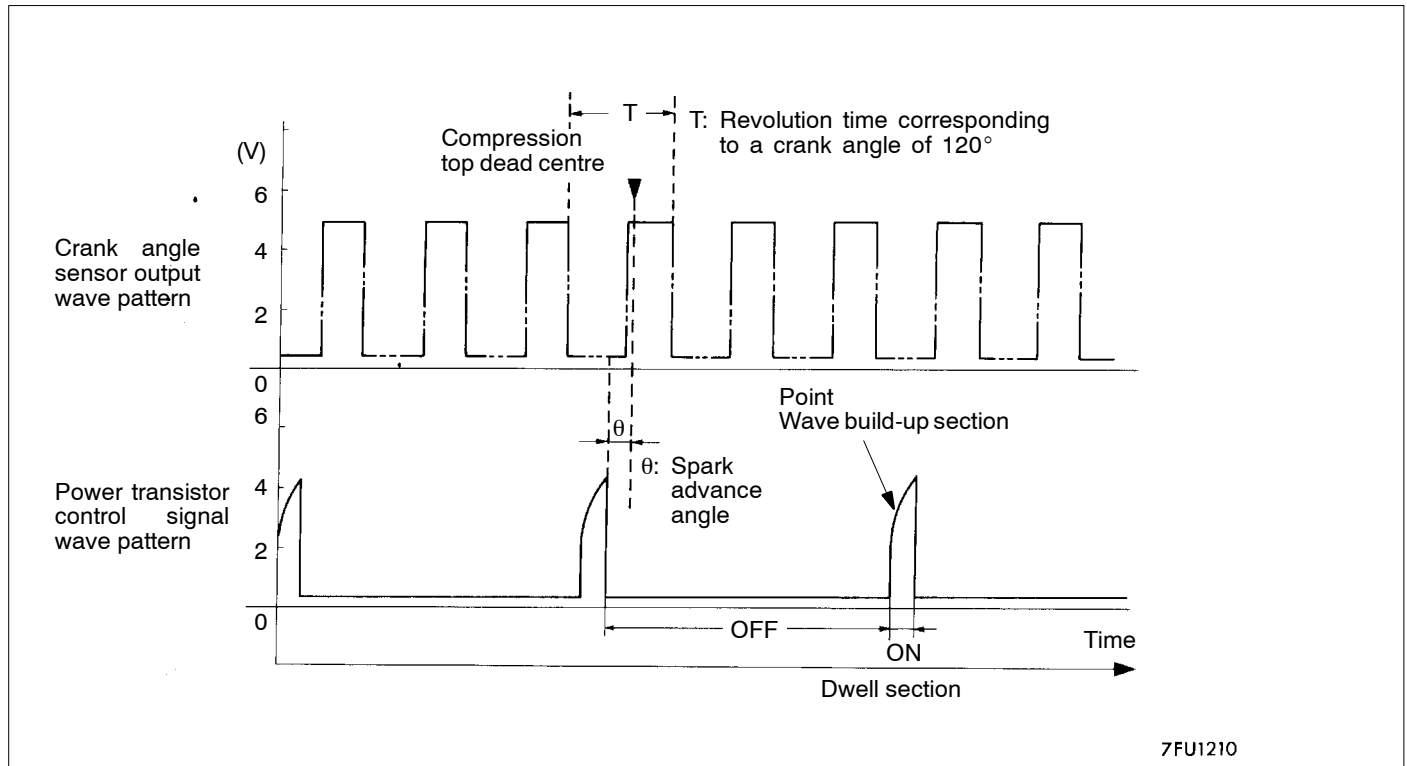
1. Disconnect the power transistor connector, and connect the special tool (test harness: MB991348) in between. (All terminals should be connected.)
2. Connect the analyzer special patterns pickup to the power transistor connector terminal 1 (No. 3 – No. 6), terminal 2 (No. 2 – No. 5) and terminal 3 (No. 1 – No. 4) respectively.

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

1. Connect the analyzer special patterns pickup to the engine ECU terminal 10 (No. 1 – No. 4), terminal 11 (No. 3 – No. 6), terminal 23 (No. 2 – No. 5) respectively.

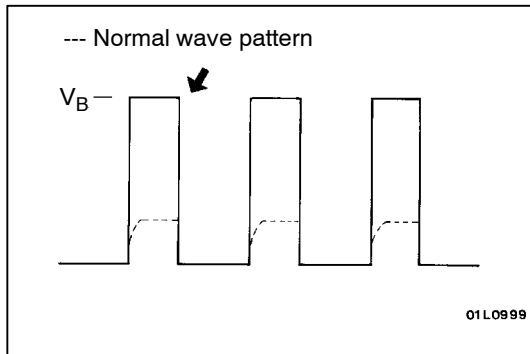
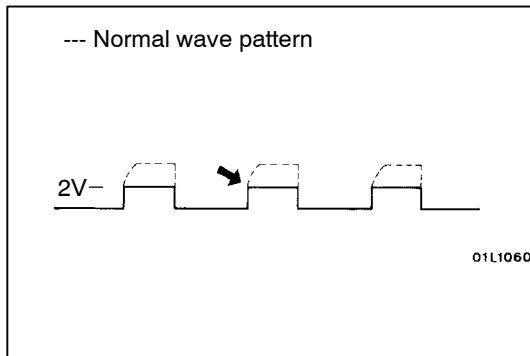
**Standard Wave Pattern****Observation condition**

Function	Special patterns
Pattern height	Low
Pattern selector	Display
Engine r/min	Approx. 1,200 r/min

**Standard wave pattern****Wave Pattern Observation Points**

Point: Condition of wave pattern build-up section and maximum voltage (Refer to abnormal wave pattern examples 1 and 2.)

Condition of wave pattern build-up section and maximum voltage	Probable cause
Rises from approx. 2V to approx. 4.5V at the top-right	Normal
2V rectangular wave	Open-circuit in ignition primary circuit
Rectangular wave at power voltage	Power transistor malfunction



### Examples of Abnormal Wave Patterns

- Example 1

Wave pattern during engine cranking

#### Cause of problem

Open-circuit in ignition primary circuit

#### Wave pattern characteristics

Top-right part of the build-up section cannot be seen, and voltage value is approximately 2 V too low.

- Example 2

Wave pattern during engine cranking

#### Cause of problem

Malfunction in power transistor

#### Wave pattern characteristics

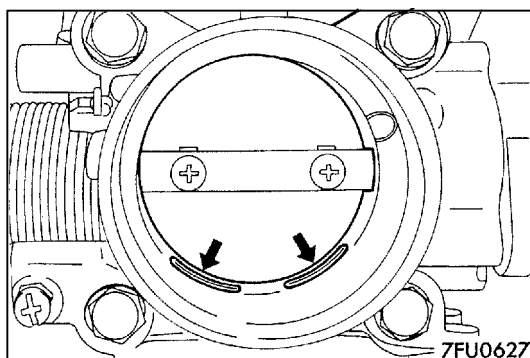
Power voltage results when the power transistor is ON.

## ON-VEHICLE SERVICE

13100100498

### THROTTLE BODY (THROTTLE VALVE AREA) CLEANING

1. Start the engine and warm it up until the coolant is heated to 80°C or higher and then stop the engine.
2. Remove the air intake hose from the throttle body.



3. Plug the bypass passage inlet of the throttle body.

#### Caution

**Do not allow cleaning solvent to enter the bypass passage.**

4. Spray cleaning solvent into the valve through the throttle body intake port and leave it for about 5 minutes.
5. Start the engine, race it several times and idle it for about 1 minute. If the idling speed becomes unstable (or if the engine stalls) due to the bypass passage being plugged, slightly open the throttle valve to keep the engine running.
6. If the throttle valve deposits are not removed, repeat steps 4 and 5.
7. Unplug the bypass passage inlet.
8. Attach the air intake hose.
9. Use the MUT-II to erase the self-diagnosis code.

10. Adjust the basic idle speed. (Refer to P.13A-78.)

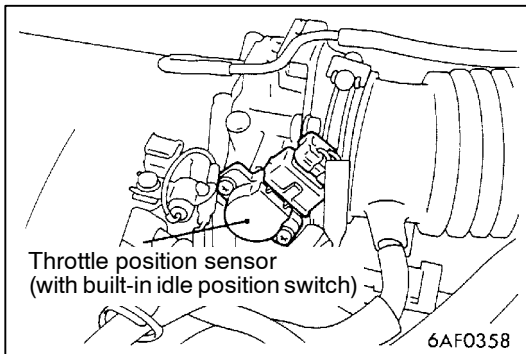
**NOTE**

If the engine hunts while idling after adjustment of the basic idle speed, disconnect the (–) cable from the battery for 10 seconds or more, and then reconnect it and run the engine at idle for about 10 minutes.

## IDLE POSITION SWITCH AND THROTTLE POSITION SENSOR ADJUSTMENT

13100330453

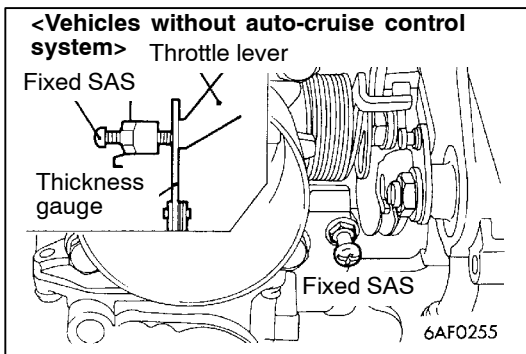
1. Connect the MUT-II to the diagnosis connector.



2. Insert a thickness gauge as follows:

### <Vehicles without auto-cruise control system>

Insert a thickness gauge with a thickness of 0.65 mm between the fixed SAS and the throttle lever.



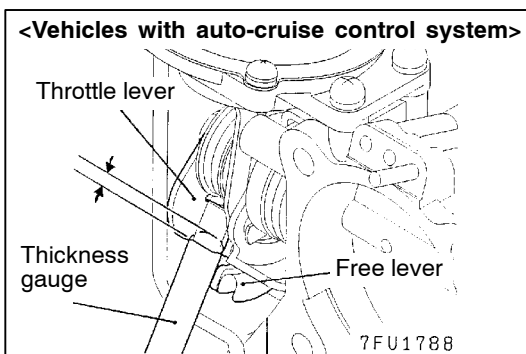
### <Vehicles with auto-cruise control system>

Insert a 1.4-mm thick thickness gauge up to approx. 3 mm between the levers shown in the figure.

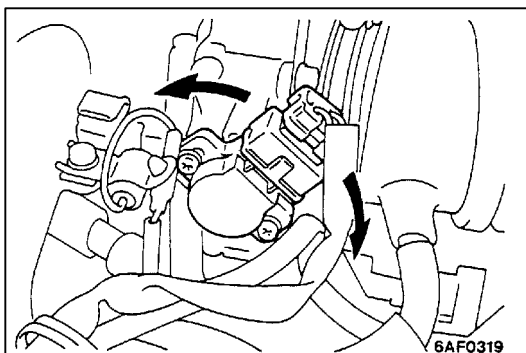
**NOTE**

Do not insert the thickness gauge 3 mm or more. If doing that, the throttle lever opening angle becomes larger than the predetermined angle, causing maladjustment.

3. Turn the ignition switch to ON (but do not start the engine).



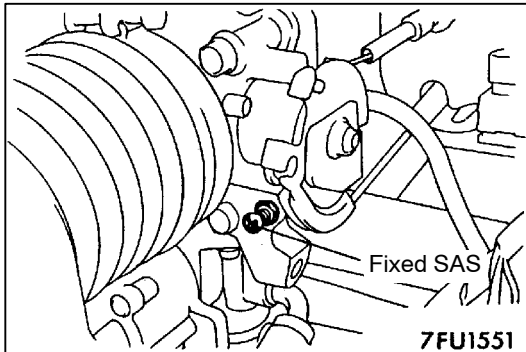
4. Loosen the throttle position sensor mounting bolt, and then turn the throttle position sensor clockwise as far as it will go.
5. Check that the idle position switch is ON at this position.
6. Slowly turn the throttle position sensor counterclockwise and find the point where the idle position switch turns off.
- Securely tighten the throttle position sensor mounting bolt at this point.



7. Check the throttle position sensor output voltage.

**Standard value: 400 – 1,000 mV**

8. If there is a deviation from the standard value, check the throttle position sensor and the related harness.
9. Remove the thickness gauge.
10. Turn the ignition switch to OFF.
11. Disconnect the MUT-II.



## FIXED SAS ADJUSTMENT

13100150462

### NOTE

- (1) The fixed SAS should not be moved unnecessarily; it has been precisely adjusted by the manufacturer.
- (2) If the adjustment is disturbed for any reason, readjust as follows.

1. Loosen the tension of the accelerator cable sufficiently.
2. Back out the fixed SAS lock nut.
3. Turn the fixed SAS counterclockwise until it is sufficiently backed out, and fully close the throttle valve.
4. Tighten the fixed SAS until the point where the throttle lever is touched (i.e., the point at which the throttle valve begins to open) is found.  
From that point, tighten the fixed SAS 1 1/4 turns.
5. While holding the fixed SAS so that it doesn't move, tighten the lock nut securely.
6. Adjust the tension of the accelerator cable.
7. Adjust the basic idling speed.
8. Adjust the idle position switch and the throttle position sensor (P.13A-77).

## BASIC IDLE SPEED ADJUSTMENT

13100180553

### NOTE

- (1) The standard idling speed has been adjusted, by the speed adjusting screw (SAS), by the manufacturer, and there should usually be no need for readjustment.
- (2) If the adjustment has been changed by mistake, the idle speed may become too high or the idle speed may drop too low when loads from components such as the A/C are placed on the engine. If this occurs, adjust by the following procedure.
- (3) The adjustment, if made, should be made after first confirming that the spark plugs, the injectors, the idle speed control servo, the compression pressure, etc., are all normal.

1. Before inspection and adjustment, set the vehicle to the pre-inspection condition.
2. Connect the MUT-II to the diagnosis connector.

**NOTE**

When the MUT-II is connected, the diagnosis control terminal should be earthed.

3. Start the engine and run at idle.
4. Select the item No. 30 of the MUT-II Actuator test.

**NOTE**

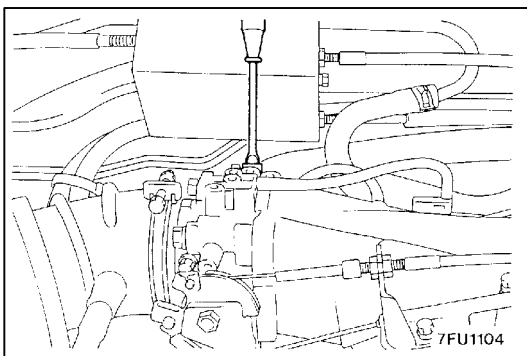
This holds the ISC servo at the basic step to adjust the basic idle speed.

5. Check the idle speed.

**Standard value: 700 ± 50 r/min**

**NOTE**

- (1) The engine speed may be 20 to 100 r/min lower than indicated above for a new vehicle [driven approximately 500 km or less], but no adjustment is necessary.
- (2) If the engine stalls or the engine speed is low even though the vehicle has been driven approximately 500 km or more, it is probable that deposits are adhered to the throttle valve, so clean it. (Refer to P.13A-76.)



6. If not within the standard value range, turn the speed adjusting screw (SAS) to make the necessary adjustment.

**NOTE**

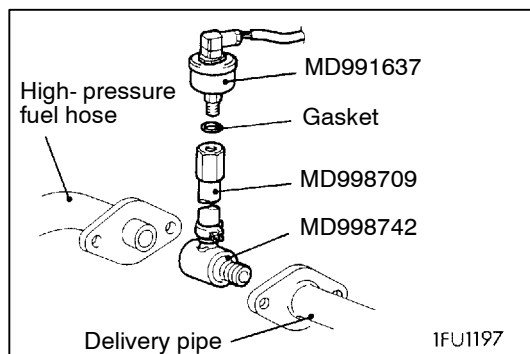
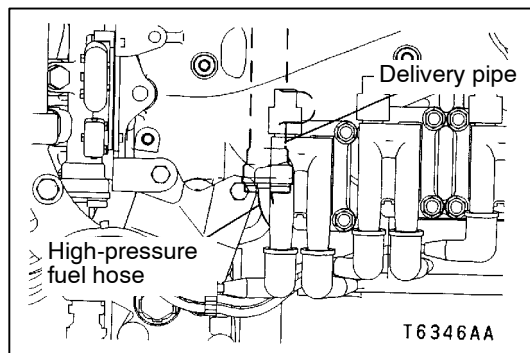
If the idling speed is higher than the standard value range even when the SAS is fully closed, check whether or not there is any indication that the fixed SAS has been moved. If there is an indication that it has been moved, adjust the fixed SAS.

7. Press the MUT-II clear key, and release the ISC servo from the Actuator test mode.

**NOTE**

Unless the ISC servo is released, the Actuator test mode will continue 27 minutes.

8. Switch OFF the ignition switch.
9. Disconnect the MUT-II.
10. Start the engine again and let it run at idle speed for about 10 minutes; check that the idling condition is normal.



## FUEL PRESSURE TEST

13100190563

1. Release residual pressure from the fuel pipe line to prevent fuel from gushing out. (Refer to P.13A-83.)
2. Disconnect the high-pressure fuel hose at the delivery pipe side.

### Caution

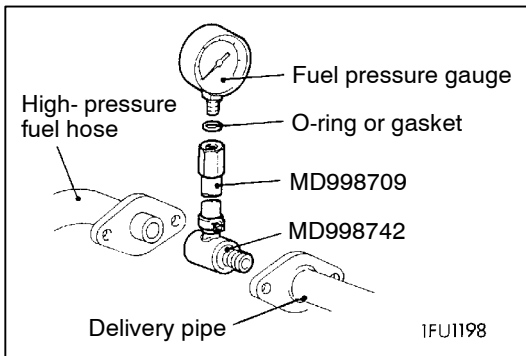
**Cover the hose connection with rags to prevent splash of fuel that could be caused by some residual pressure in the fuel pipe line.**

3. Change the fuel pressure measurement special tool adapter.
4. Attach the fuel pressure measurement special tool adapter.

### <When using the fuel pressure gauge set (special tool)>

- (1) Attach the fuel pressure measurement special tool between the delivery pipe and the high-pressure hose.
- (2) Pass a gasket over the fuel pressure special measurement tool and then install the tool into the fuel pressure gauge set (special tool).
- (3) Connect the fuel pressure gauge set lead wires to the power supply (cigarette lighter socket) and the MUT-II.



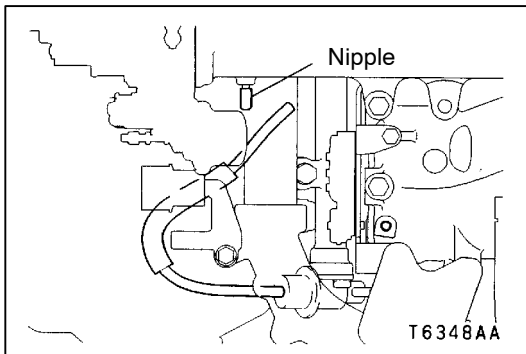


#### <When using the fuel pressure gauge>

- (1) Place an O-ring or gasket over the fuel pressure measurement special tool and then install the tool into the fuel pressure gauge.
- (2) Install the special tool assembled in 1. above between the delivery pipe and the high-pressure hose.
5. Connect the MUT-II to the diagnosis connector.
6. Turn the ignition switch to ON. (But do not start the engine.)
7. Select "Item No.07" from the MUT-II Actuator test to drive the fuel pump. Check that there are no fuel leaks from any parts.
8. Finish the actuator test or turn the ignition switch to OFF.
9. Start the engine and run at idle.
10. Measure fuel pressure while the engine is running at idle.

#### Standard value:

**Approx. 265 kPa at kerb idle**



11. Disconnect the vacuum hose from the fuel pressure regulator and measure fuel pressure with the hose end closed by a finger.

#### Standard value:

**324 – 343 kPa at kerb idle**

12. Check to see that fuel pressure at idle does not drop even after the engine has been raced several times.
13. Racing the engine repeatedly, hold the fuel return hose lightly with fingers to feel that fuel pressure is present in the return hose.

#### NOTE

If the fuel flow rate is low, there will be no fuel pressure in the return hose.

14. If any of fuel pressure measured in steps 10 to 13 is out of specification, troubleshoot and repair according to the table.

Symptom	Probable cause	Remedy
<ul style="list-style-type: none"> <li>Fuel pressure too low</li> <li>Fuel pressure drops after racing</li> <li>No fuel pressure in fuel return hose</li> </ul>	Clogged fuel filter	Replace fuel filter
	Fuel leaking to return side due to poor fuel regulator valve seating or settled spring	Replace fuel pressure regulator
	Low fuel pump delivery pressure	Replace fuel pump
Fuel pressure too high	Binding valve in fuel pressure regulator	Replace fuel pressure regulator
	Clogged fuel return hose or pipe	Clean or replace hose or pipe
Same fuel pressure when vacuum hose is connected and when disconnected	Damaged vacuum hose or clogged nipple	Replace vacuum hose or clean nipple

15. Stop the engine and check change of fuel pressure gauge reading. Normal if the reading does not drop within 2 minutes. If it does, observe the rate of drop and troubleshoot and repair according to the table below.

Symptom	Probable cause	Remedy
Fuel pressure drops gradually after engine is stopped	Leaky injector	Replace injector
	Leaky fuel regulator valve seat	Replace fuel pressure regulator
Fuel pressure drops sharply immediately after engine is stopped	Check valve in fuel pump is held open	Replace fuel pump

16. Release residual pressure from the fuel pipe line. (Refer to P.13A-83.)  
 17. Remove the fuel pressure gauge and special tool from the delivery pipe.

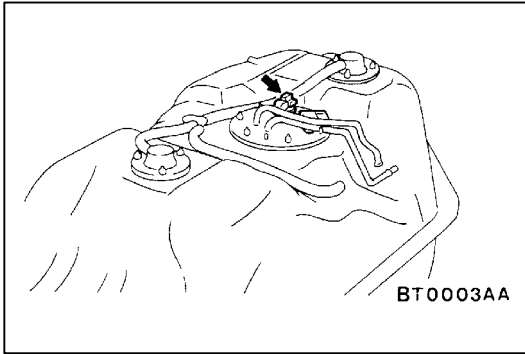
#### Caution

**Cover the hose connection with rags to prevent splash of fuel that could be caused by some residual pressure in the fuel pipe line.**

18. Replace the O-ring at the end of the fuel high pressure hose with a new one. Furthermore, apply engine oil to the new O-ring before replacement.  
 19. Fit the fuel high pressure hose over the delivery pipe and tighten the bolt to specified torque.

#### Tightening torque: 5 Nm

20. Check for any fuel leaks by following the procedure in step 5.  
 21. Disconnect the MUT-II

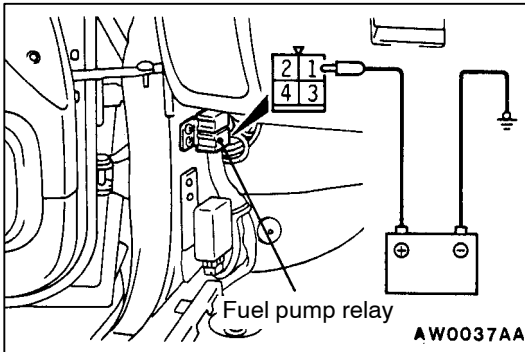


## FUEL PUMP CONNECTOR DISCONNECTION (HOW TO REDUCE FUEL LINE PRESSURE)

1310090375

When removing the fuel pipe, hose, etc., release fuel pressure to prevent fuel splay.

1. Disconnect the fuel pump connector.
2. Start the engine and let it run until it stops naturally. Turn the ignition switch OFF.
3. Connect the fuel pump connector.



## FUEL PUMP OPERATION CHECK

13100200372

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. If normal, check the fuel pump drive circuit.
  - (1) Turn OFF the ignition switch.
  - (2) When the connector terminal No.1 at the harness side of the fuel pump relay has been connected to the battery, check if the sound of the fuel pump operation can be heard.

### NOTE

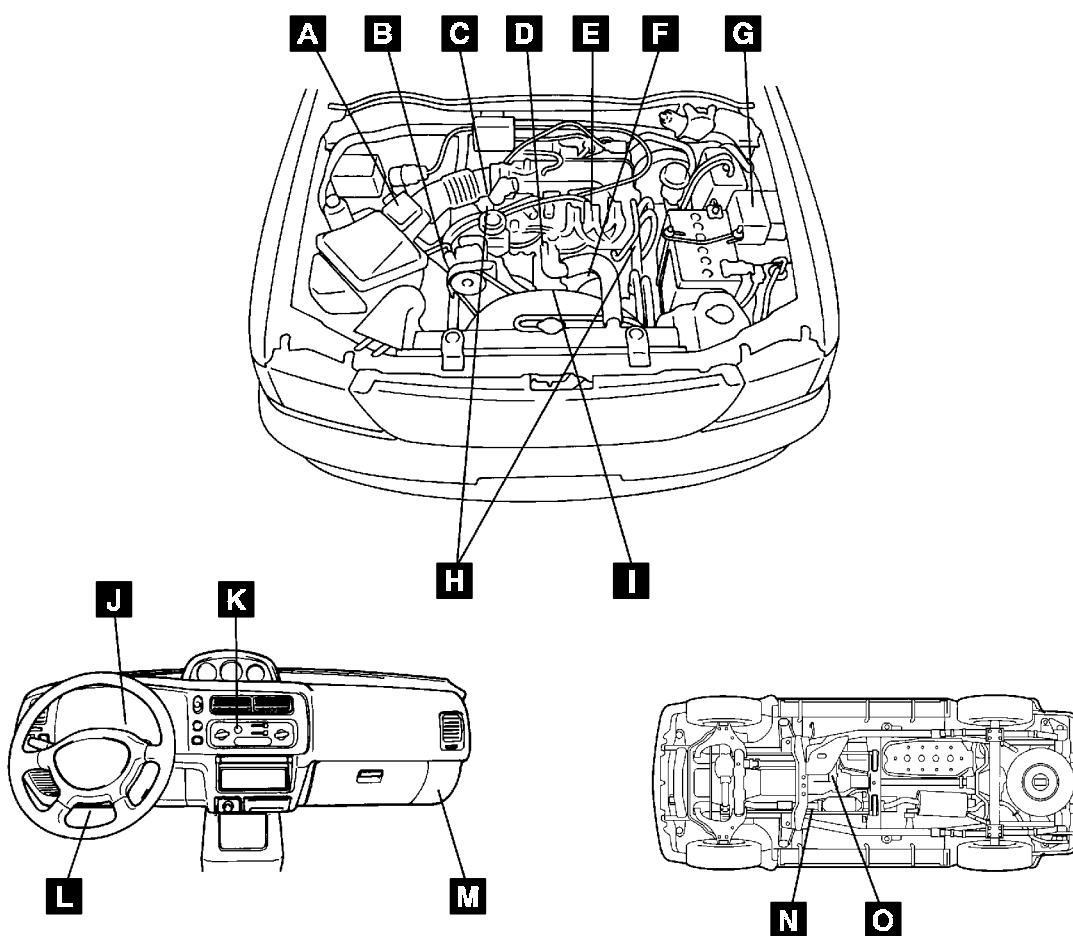
As the fuel pump is an in-tank type, the fuel pump sound is hard to hear. Remove the fuel tank filler cap and check from the tank inlet

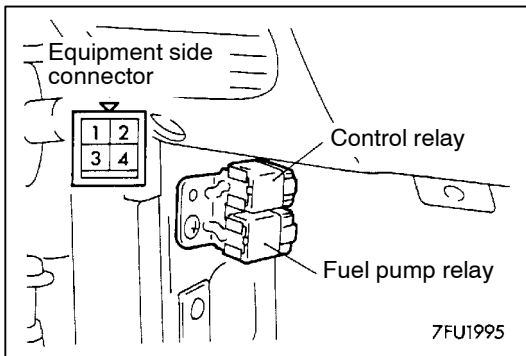
- (3) Check for fuel pressure by pinching the fuel hose with the fingertips.

## COMPONENT LOCATION

13100210658

Name	Symbol	Name	Symbol
A/C relay	G	Engine warning lamp (check engine lamp)	J
A/C switch	K		
Air flow sensor (with intake air temperature sensor and barometric pressure sensor)	A	Idle speed control servo	C
Camshaft position sensor	F	Ignition coil and power transistor unit	E
Control relay and fuel pump relay	M	Injector	H
Crank angle sensor	I	Oxygen sensor	N
Diagnosis connector	L	Power steering fluid pressure switch	B
Engine coolant temperature sensor	D	Throttle position sensor (with idle position switch)	C
Engine-ECU	M	Vehicle speed sensor	O

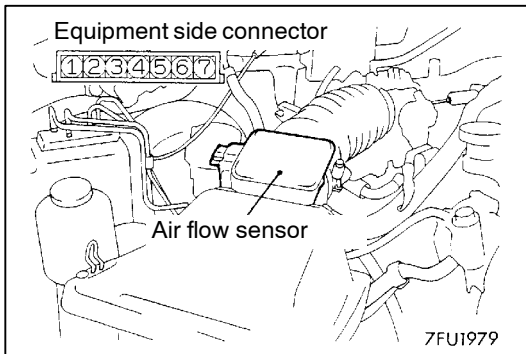




## CONTROL RELAY AND FUEL PUMP RELAY CONTINUITY CHECK

13100990262

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

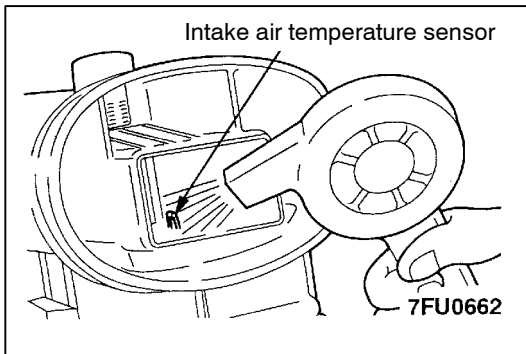


## INTAKE AIR TEMPERATURE SENSOR CHECK

13100280321

1. Disconnect the air flow sensor connector.
2. Measure resistance between terminals 4 and 6.

### Standard value:

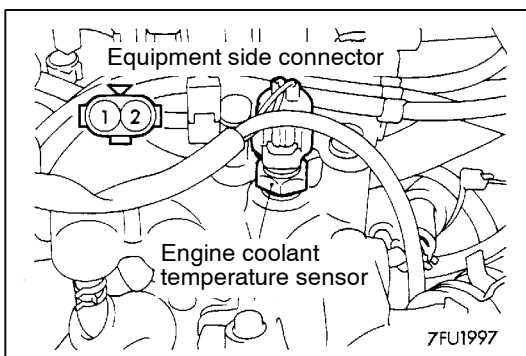
2.3 – 3.0 k $\Omega$  (at 20°C)0.30 – 0.42 k $\Omega$  (at 80°C)

3. Measure resistance while heating the sensor using a hair drier.

### Normal condition:

Temperature (°C)	Resistance (k $\Omega$ )
Higher	Smaller

4. If the value divides from the standard value or the resistance remains unchanged, replace the air flow sensor.



## ENGINE COOLANT TEMPERATURE SENSOR CHECK

13100310327

### Caution

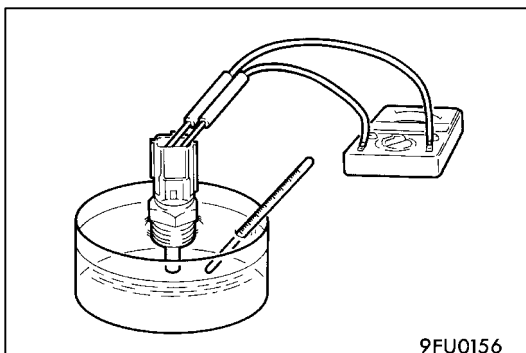
Be careful not to touch the connector (resin section) with the tool when removing and installing.

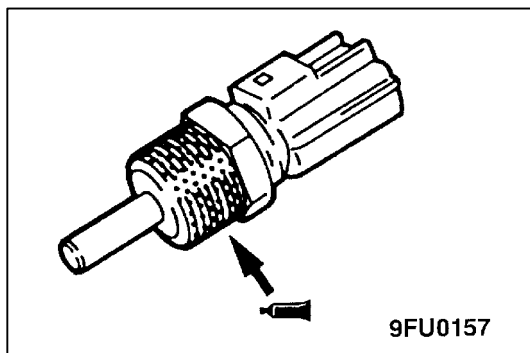
1. Remove the engine coolant temperature sensor.
2. With temperature sensing portion of engine coolant temperature sensor immersed in hot water, check resistance.

### Standard value:

2.1 – 2.7 k $\Omega$  (at 20°C)0.26 – 0.36 k $\Omega$  (at 80°C)

3. If the resistance deviates from the standard value greatly, replace the sensor.





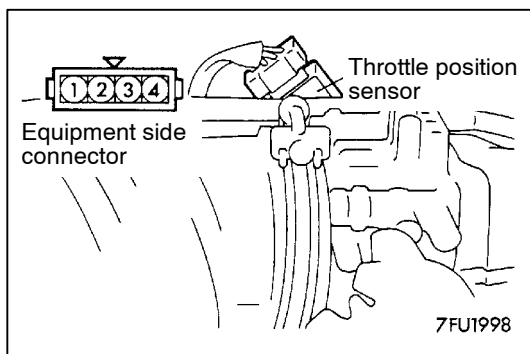
4. Apply sealant to threaded portion.

**Specified sealant:**

**3M Nut Locking Part No.4171 or equivalent**

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

**Tightening torque: 29 Nm**



## THROTTLE POSITION SENSOR CHECK

1310320467

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.

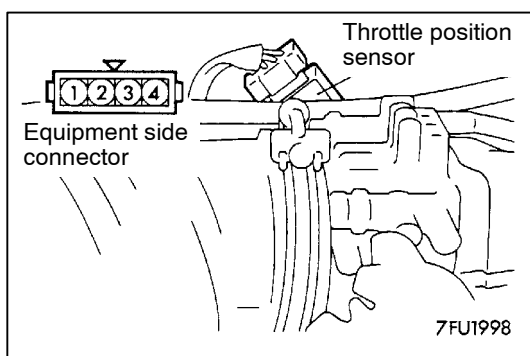
**Normal condition:**

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

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-77.



## IDLE POSITION SWITCH CHECK

13100330446

1. Disconnect the throttle position sensor connector.
2. Check the continuity between the throttle position sensor connector side terminal 1 and terminal 2.

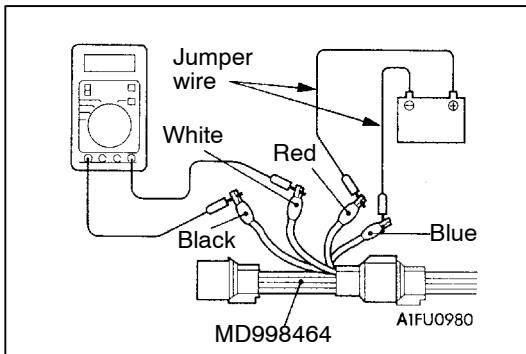
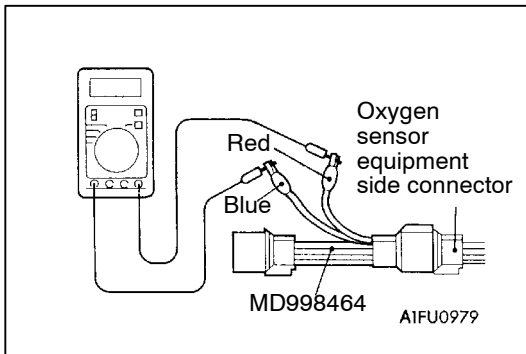
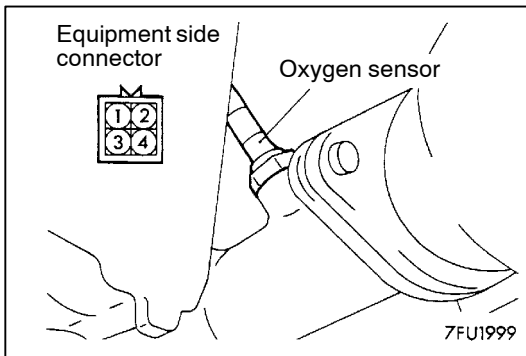
**Normal condition:**

Accelerator pedal	Continuity
Depressed	Non-conductive
Released	Conductive (0 Ω)

3. If out of specification, replace the throttle position sensor.

**NOTE**

After replacement, the idle position switch and throttle position sensor should be adjusted. (Refer to P.13A-77.)



## OXYGEN SENSOR CHECK

13100510239

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 ( $11 - 18 \Omega$  at  $20^\circ\text{C}$ ) 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  $80^\circ\text{C}$  or higher.
5. Use the 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.
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.

### Caution

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

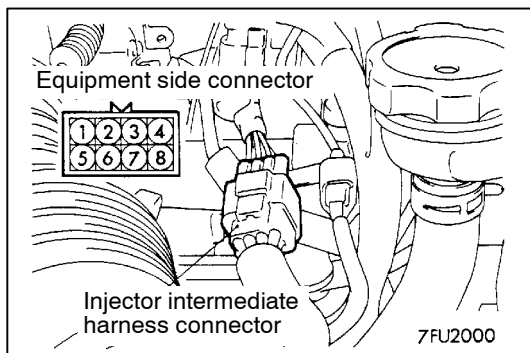
### Standard value:

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.



## INJECTOR CHECK

13100520423

### Measurement of Resistance between Terminals

1. Disconnect the injector intermediate harness connectors.
2. Measure the resistance between terminals.

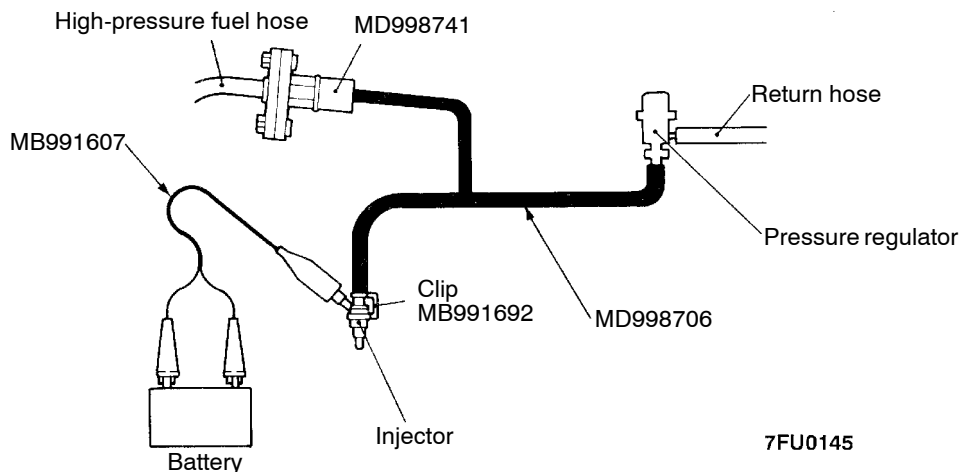
**Standard value: 13 – 16  $\Omega$  (at 20°C)**

Injector	Measurement terminal
No. 1 cylinder	8 – 3
No. 2 cylinder	8 – 2
No. 3 cylinder	8 – 1
No. 4 cylinder	8 – 7
No. 5 cylinder	8 – 6
No. 6 cylinder	8 – 5

3. Connect the injector intermediate harness connectors.

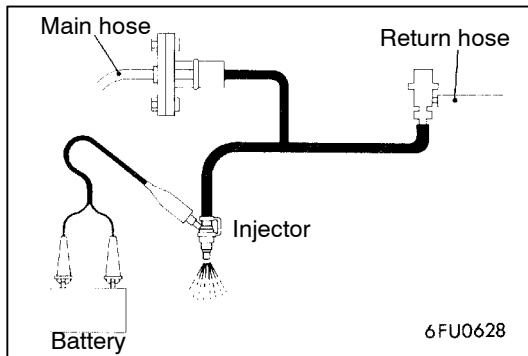
### Checking the Injection Condition

1. Following the steps below, bleed out the residual pressure within the fuel pipe line to prevent flow of the fuel. (Refer to P.13A-83.)
2. Remove the injector.
3. Arrange the special tools (injector test set, adapter, injector test clip), the fuel pressure regulator and the injector as shown in the illustration below.

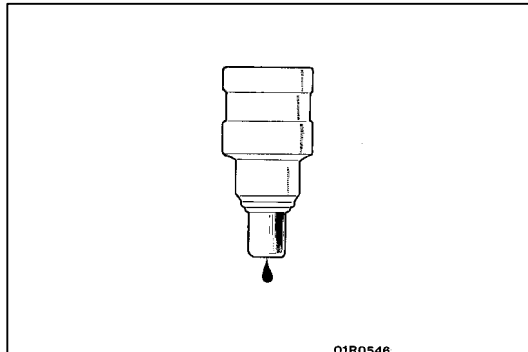


4. Connect the MUT-II to the diagnosis connector.
5. Turn the ignition switch to ON. (But do not start the engine.)
6. Select "Item No.07" from the MUT-II Actuator test to drive the fuel pump.





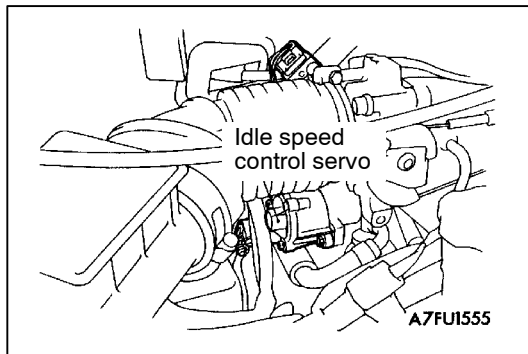
7. Activate the injector and check the atomized spray condition of the fuel.  
The condition can be considered satisfactory unless it is extremely poor.



8. Stop the actuation of the injector, and check for leakage from the injector's nozzle.

**Standard value: 1 drop or less per minute**

9. Activate the injector without activating the fuel pump; then, when the spray emission of fuel from the injector stops, disconnect the special tool and restore it to its original condition.
10. Disconnect the MUT-II.



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

13100540405

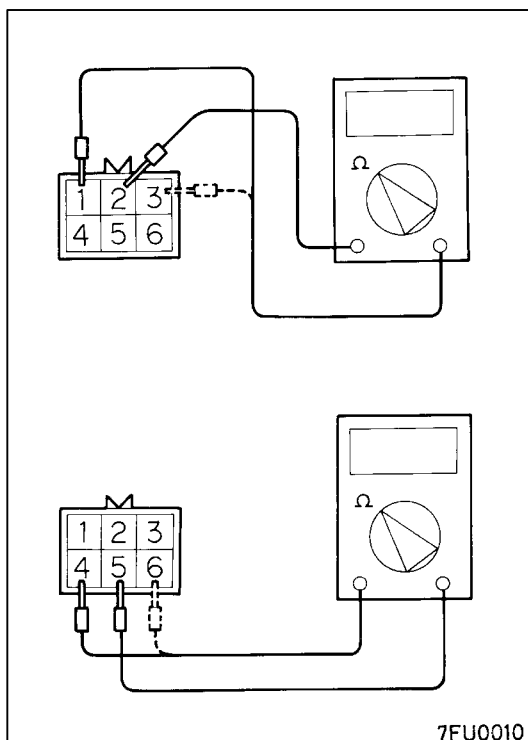
### Checking the Operation Sound

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.



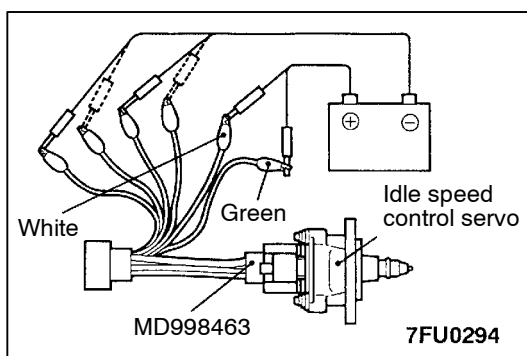
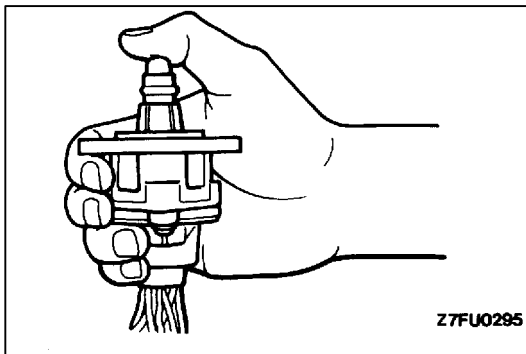
**Checking the Coil Resistance**

1. Disconnect the idle speed control servo connector and connect the special tool (test harness).
2. Measure the resistance between terminal 2 (white clip of the special tool) and either terminal 1 (red clip) or terminal 3 (blue clip) of the connector at the idle speed control servo side.

**Standard value: 28 – 33  $\Omega$  (at 20°C)**

3. Measure the resistance between terminal 5 (green clip of the special tool) and either terminal 6 (yellow clip) or terminal 4 (black clip) of the connector at the idle speed control servo side.

**Standard value: 28 – 33  $\Omega$  (at 20°C)**

**Operational Check**

1. Remove the throttle body.
2. Remove the idle speed control servo.
3. Connect the special tool (test harness) to the idle speed control servo connector.
4. Connect the positive (+) terminal of a power supply (approx. 6V) to the white clip and the green clip.
5. With the idle speed control 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 red and black clip.
  - (2) Connect the negative (–) terminal of the power supply to the blue and black clip.
  - (3) Connect the negative (–) terminal of the power supply to the blue and yellow clip.
  - (4) Connect the negative (–) terminal of the power supply to the red and yellow clip.
  - (5) Connect the negative (–) terminal of the power supply to the red and black clip.
  - (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.

**PURGE CONTROL SOLENOID VALVE CHECK**

13100560111

Refer to GROUP 17 – Emission Control System.

**EGR CONTROL SOLENOID VALVE CHECK**

13100570107

Refer to GROUP 17 – Emission Control System.

# INJECTOR

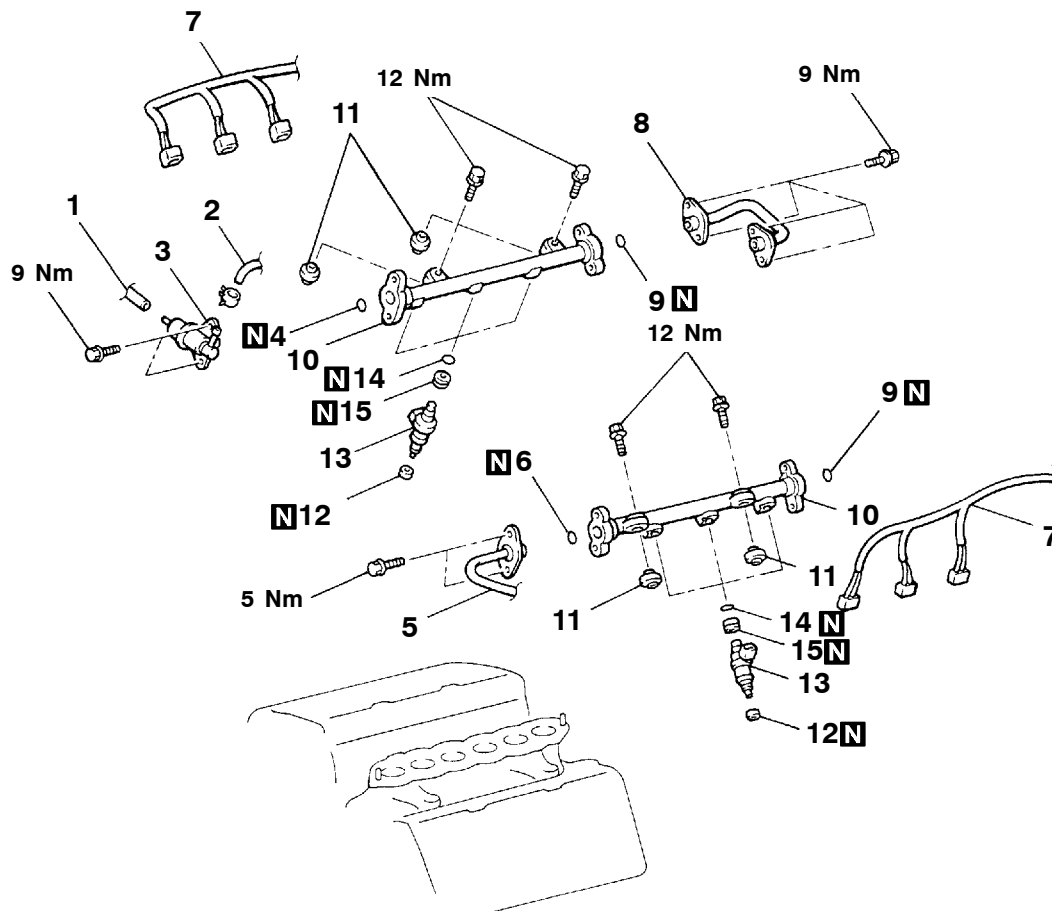
## REMOVAL AND INSTALLATION

### Pre-removal Operation

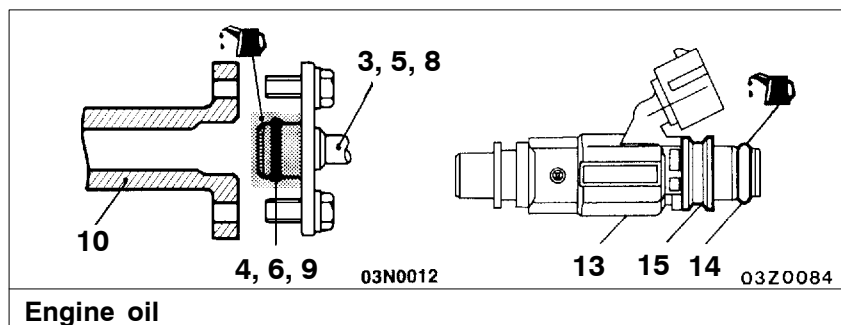
- Fuel Line Pressure Reduction (Refer to P.13A-82.)
- Intake Manifold Plenum Removal (Refer to GROUP 15 – Intake Manifold.)

### Post-installation Operation

- Intake Manifold Plenum Removal (Refer to GROUP 15 – Intake Manifold.)
- Accelerator Cable Adjustment (Refer to GROUP 17 – On-vehicle Service.)
- Fuel Leakage Inspection



03V0047  
00005876



### Removal steps

1. Vacuum hose
2. Fuel return hose connection
3. Fuel pressure regulator
4. O-ring
5. High-pressure fuel hose connection
6. O-ring
7. Injector connectors
8. Fuel pipe



9. O-rings
10. Delivery pipes
11. Insulators
12. Insulators
13. Injectors
14. O-rings
15. Grommets



**REMOVAL SERVICE POINT****◀A▶ DELIVERY PIPES/INJECTORS REMOVAL**

Remove the delivery pipes (with the injectors attached).

**Caution**

**Do not drop the injector(s).**

**INSTALLATION SERVICE POINTS****▶A◀ INJECTORS/FUEL PRESSURE  
REGULATOR/HIGH-PRESSURE FUEL HOSE  
INSTALLATION**

1. Apply a drop of new engine oil to the O-ring.

**Caution**

**Do not let the engine oil get into the delivery pipes or the injectors will be damaged.**

2. Turn the injectors. To the right and left to install to the delivery pipes. Repeat for fuel pressure regulator and high-pressure fuel hose.  
Be careful not to damage the O-ring. After installing, check that the item turns smoothly.
3. If it does not turn smoothly, the O-ring may be trapped, remove the item, re-install it into the delivery pipes and check again.
4. Tighten the high-pressure fuel hose and fuel pressure regulator to the specified torque.

**Tightening torque:**

**9 Nm <Fuel pressure regulator>**

**5 Nm <High-pressure fuel hose>**

# THROTTLE BODY

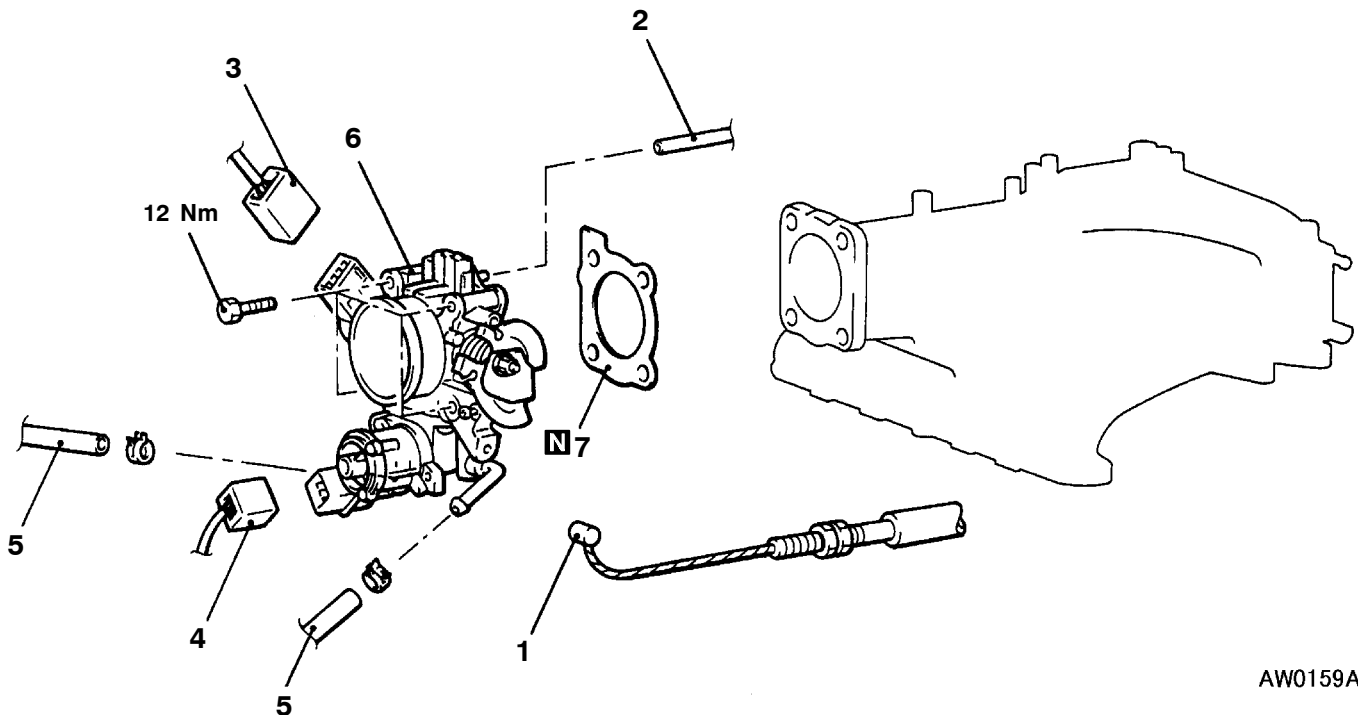
## REMOVAL AND INSTALLATION

### Pre-removal Operation

- Engine Coolant Draining (Refer to GROUP 14 – On-vehicle Service.)
- Air Cleaner Removal (Refer to GROUP 15 – Air Cleaner.)

### Post-installation Operation

- Air Cleaner Installation (Refer to GROUP 15 – Air Cleaner.)
- Engine Coolant Refilling (Refer to GROUP 14 – On-vehicle Service.)
- Accelerator Cable Adjustment (Refer to GROUP 17 – On-vehicle Service.)

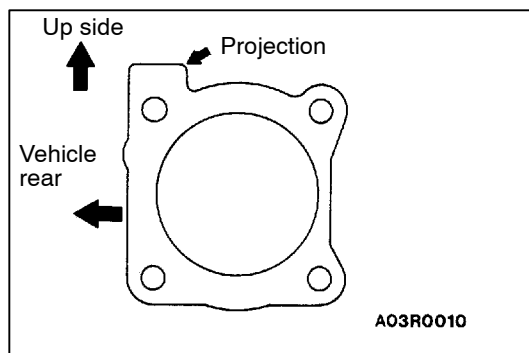


AW0159AA

### Removal steps

1. Accelerator cable connection
2. Vacuum hose connection
3. Throttle position sensor connector
4. Idle speed control servo connector

5. Heater hose connector
6. Throttle body
7. Throttle body gasket



### INSTALLATION SERVICE POINT

#### ▶◀ THROTTLE BODY GASKET INSTALLATION

Install the throttle body gasket as shown in the illustration.

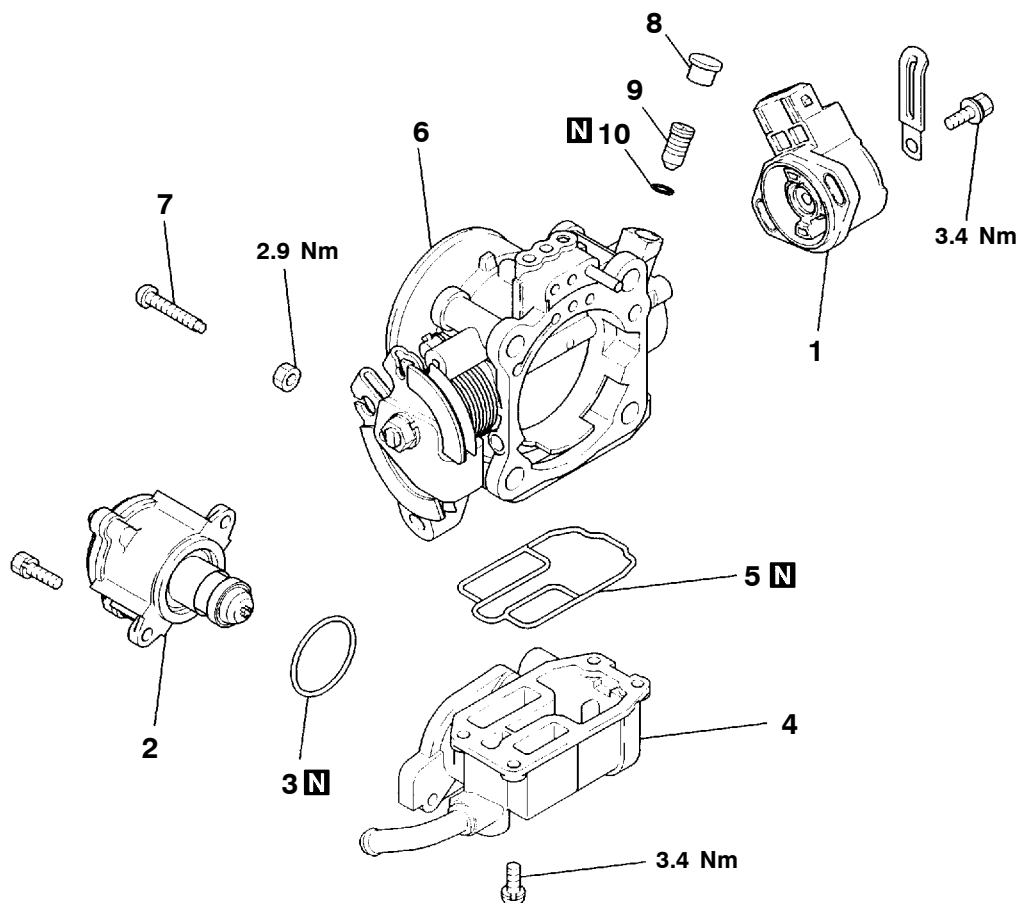
#### Caution

Poor idling etc. may result if the throttle body gasket is installed incorrectly.

## DISASSEMBLY AND REASSEMBLY

13100970587

&lt;VEHICLES WITHOUT AUTO-CRUISE CONTROL SYSTEM&gt;



7EN1437

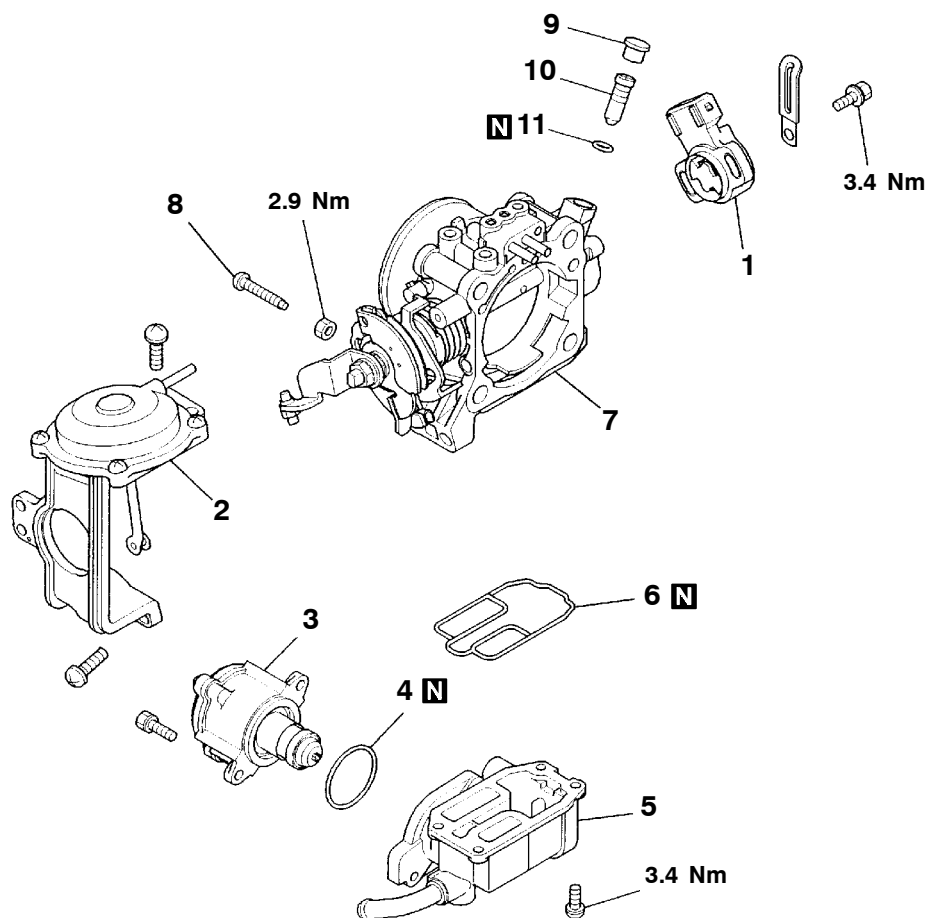
**Removal steps**

1. Throttle position sensor
2. Idle air control motor
3. O-ring
4. Idle speed control servo (Stepper motor)
5. O-ring
6. Throttle body
7. Fixed SAS
8. Cap
9. Speed adjusting screw
10. O-ring

**NOTE**

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

## &lt;VEHICLES WITH AUTO-CRUISE CONTROL SYSTEM&gt;



7EN1438

**Removal steps**

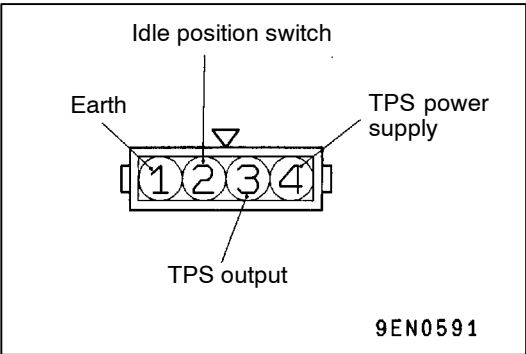
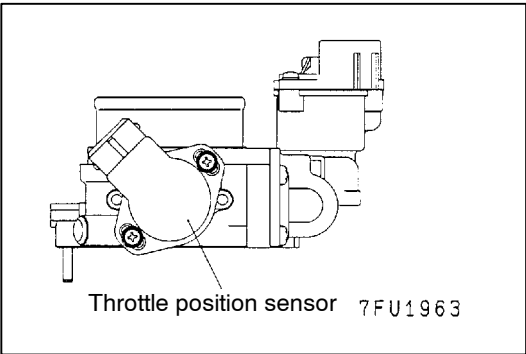
1. Throttle position sensor
2. Lever assembly
3. Idle air control motor
4. O-ring
5. Idle speed control servo (Stepper motor)
6. O-ring
7. Throttle body
8. Fixed SAS
9. Cap
10. Speed adjusting screw
11. O-ring

**NOTE**

1. The fixed SAS is correctly adjusted at the factory and should not be removed.
2. If the fixed SAS should happen to have been removed, carry out fixed SAS adjustment.
3. 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
  - Accelerator pedal position sensor
  - Idle speed control body assemblyIf 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 multimeter between terminal (4) (TPS power supply) and terminal (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.
- 3. Check the continuity between terminal (2) (idle position switch) and terminal (1) (earth) of the TPS connector when the throttle valve is fully closed and fully open.

Normal condition:

Throttle valve condition	Continuity
Fully closed	Continuity
Fully open	No continuity

- If there is no continuity when the throttle valve is fully closed, turn the TPS body anti-clockwise and then check again.
- 4. If there is an abnormality, replace the TPS.



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# Service Bulletins


Click on the applicable bookmark to select the Service Bulletin.

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# SERVICE BULLETIN

QUALITY INFORMATION ANALYSIS  
OVERSEAS SERVICE DEPT. MITSUBISHI MOTORS CORPORATION

<b>SERVICE BULLETIN</b>		No.: MSB-99E13-501	
		Date: 1999-11-15	<b>&lt;Model&gt;</b> (EC) PAJERO SPORT (K9)
<b>Subject:</b> CORRECTION OF CONNECTOR NOS.		<b>&lt;M/Y&gt;</b> 99-10	
<b>Group:</b> FUEL	<b>Draft No.:</b> 99SY521640		
<b>CORRECTION</b>	INTERNATIONAL CAR ADMINISTRATION OFFICE	 T.NITTA - PROJECT LEADER AFTER SALES SERVICE & CS PROMOTION	

## 1. Description:

Typographical errors in connector numbers, found in the Group 13A – Troubleshooting, have been corrected.

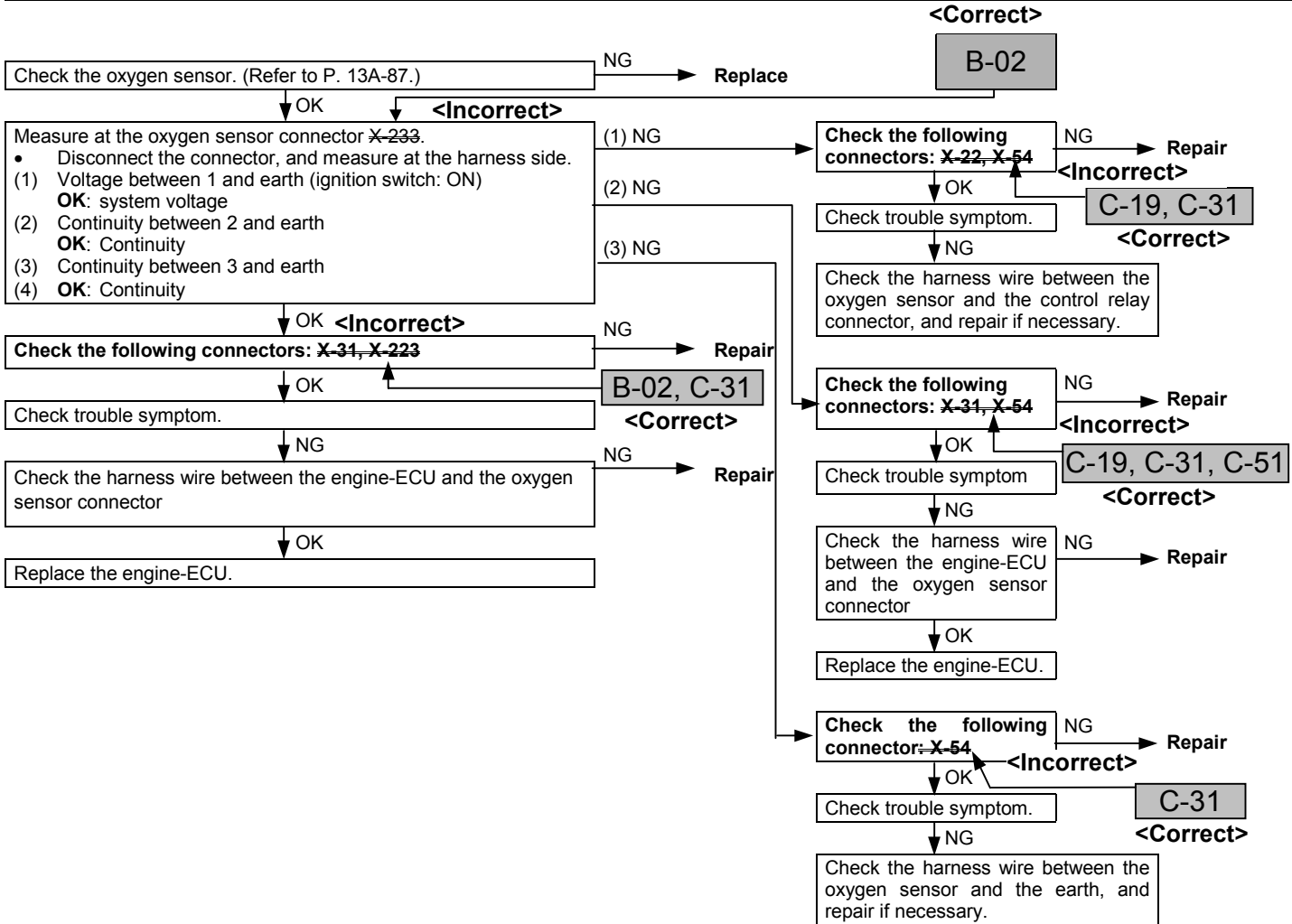
## 2. Applicable Manuals:

Manual	Pub. No.	Language	Page(s)
'99 PAJERO SPORT Workshop Manual chassis	PWJE9812	(English)	13A-13 to 23,
	PWJS9813	(Spanish)	26 to 28, 40 to 47,
	PWJF9814	(French)	52 to 55
	PWJG9815	(German)	

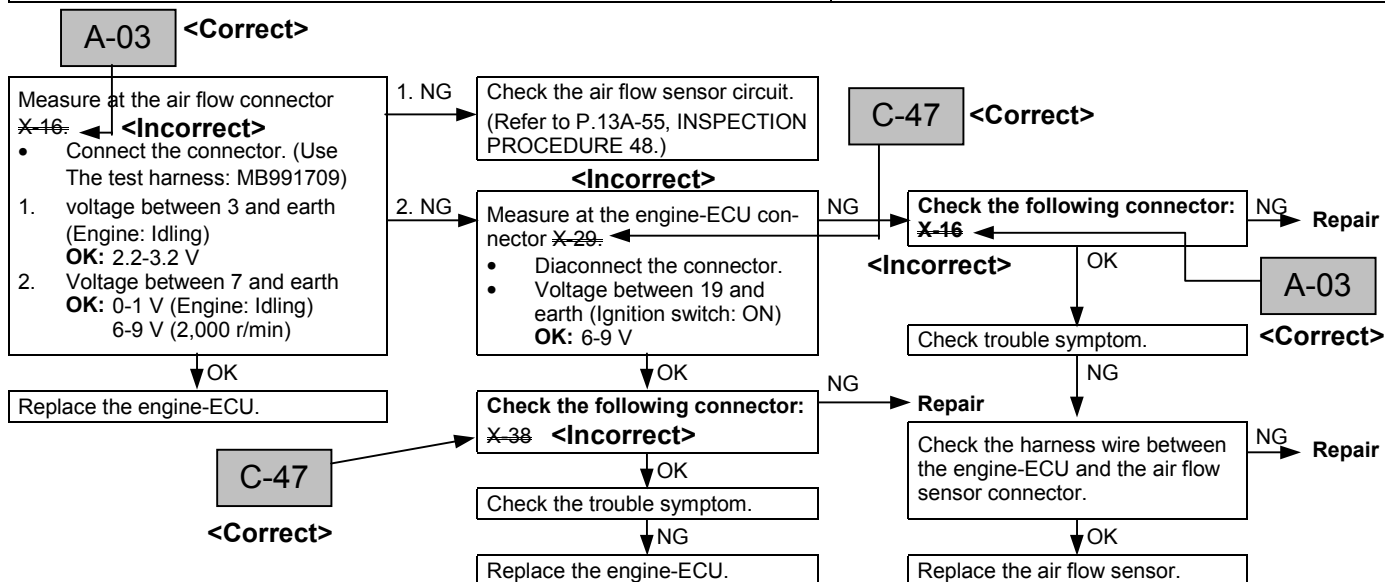
## 3. Details:

## INSPECTION PROCEDURE FOR DIAGNOSIS CODES

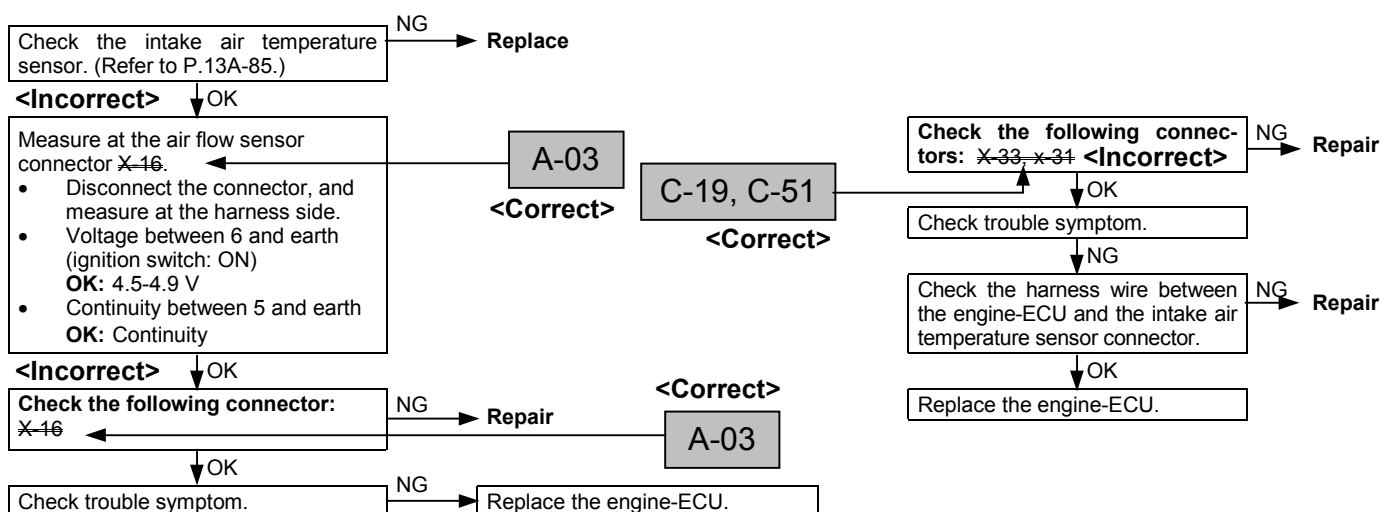
Code No. 11 Oxygen sensor system	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>3 minutes have passed after engine was started.</li> <li>Engine coolant temperature is approx. 80°C or more</li> <li>Intake air temperature is 20 – 50°C</li> <li>Engine speed is approx. 2,000– 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>



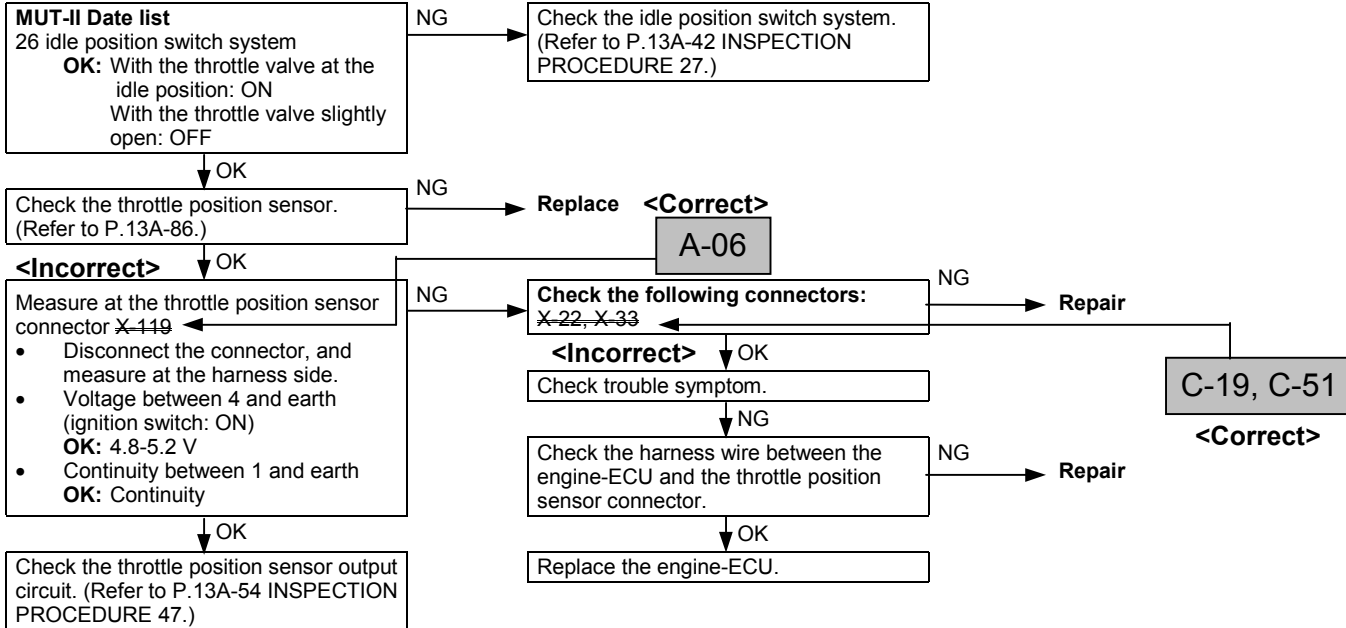
Code No. 12 Air flow sensor system	Probable cause
Range of Check <ul style="list-style-type: none"> <li>Engine speed is 500 r/min or more.</li> </ul> Set conditions <ul style="list-style-type: none"> <li>Sensor output frequency is 3 Hz or less for 4 seconds</li> </ul>	<ul style="list-style-type: none"> <li>Malfunction of the air flow sensor</li> <li>Improper connector contact, open circuit or short-circuited harness wire of the air flow sensor</li> <li>Malfunction of the engine-ECU</li> </ul>



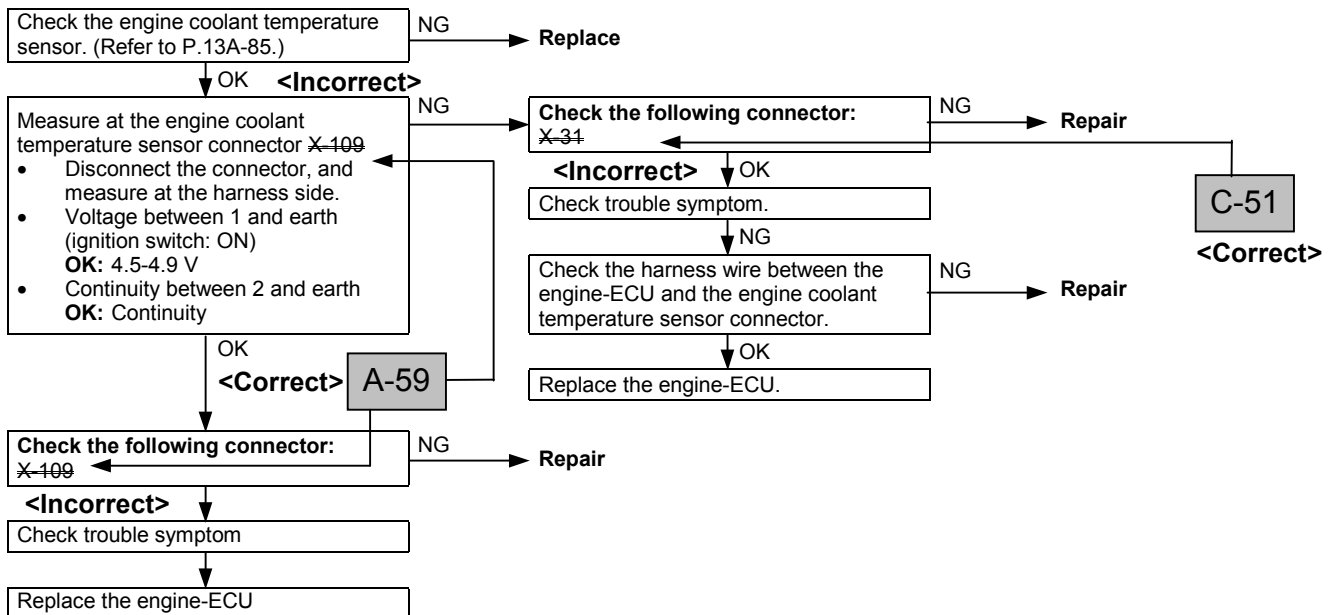
Code No. 13 Intake air temperature sensor system	Probable cause
Range of Check <ul style="list-style-type: none"> <li>Ignition switch: ON</li> <li>Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts.</li> </ul> Set conditions <ul style="list-style-type: none"> <li>Sensor output frequency is 4.6 V or more (corresponding to an intake air temperature of -45°C or less) for 4 seconds</li> </ul> or <ul style="list-style-type: none"> <li>Sensor output voltage is 0.2 V or less (corresponding to an intake air temperature of 125°C or more) for 4 seconds</li> </ul>	<ul style="list-style-type: none"> <li>Malfunction of the intake air temperature sensor</li> <li>Improper connector contact, open circuit or short-circuited harness wire of the intake air temperature sensor</li> <li>Malfunction of the engine-ECU</li> </ul>



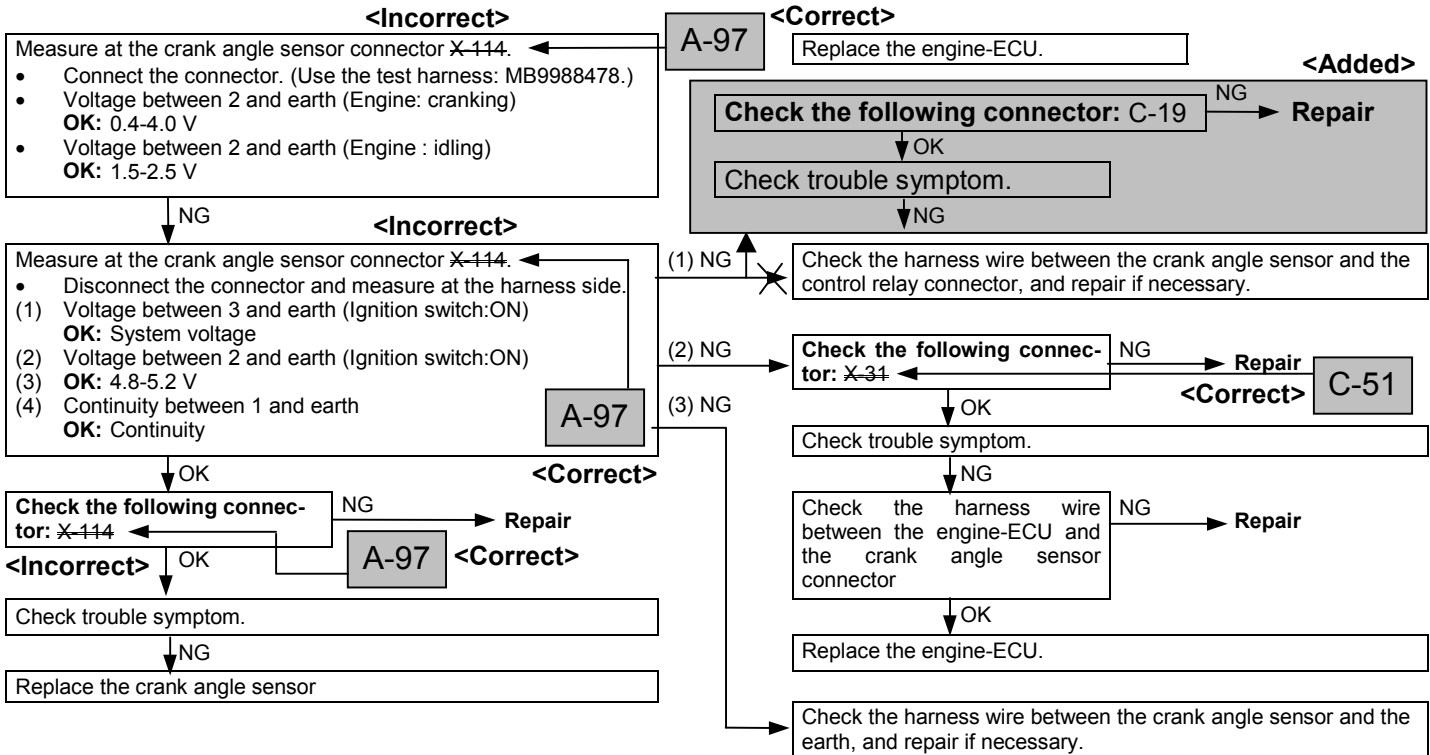
Code No. 14 Throttle position sensor system	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>Ignition switch: ON</li> <li>Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts.</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>When the Idle position switch is ON, the sensor output voltage is 2 V or more for 4 seconds.</li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>The sensor output voltage is 0.2 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>Improper "ON" state of idle position switch</li> <li>Short circuit of the idle position switch signal line</li> <li>Malfunction of the engine-ECU</li> </ul>



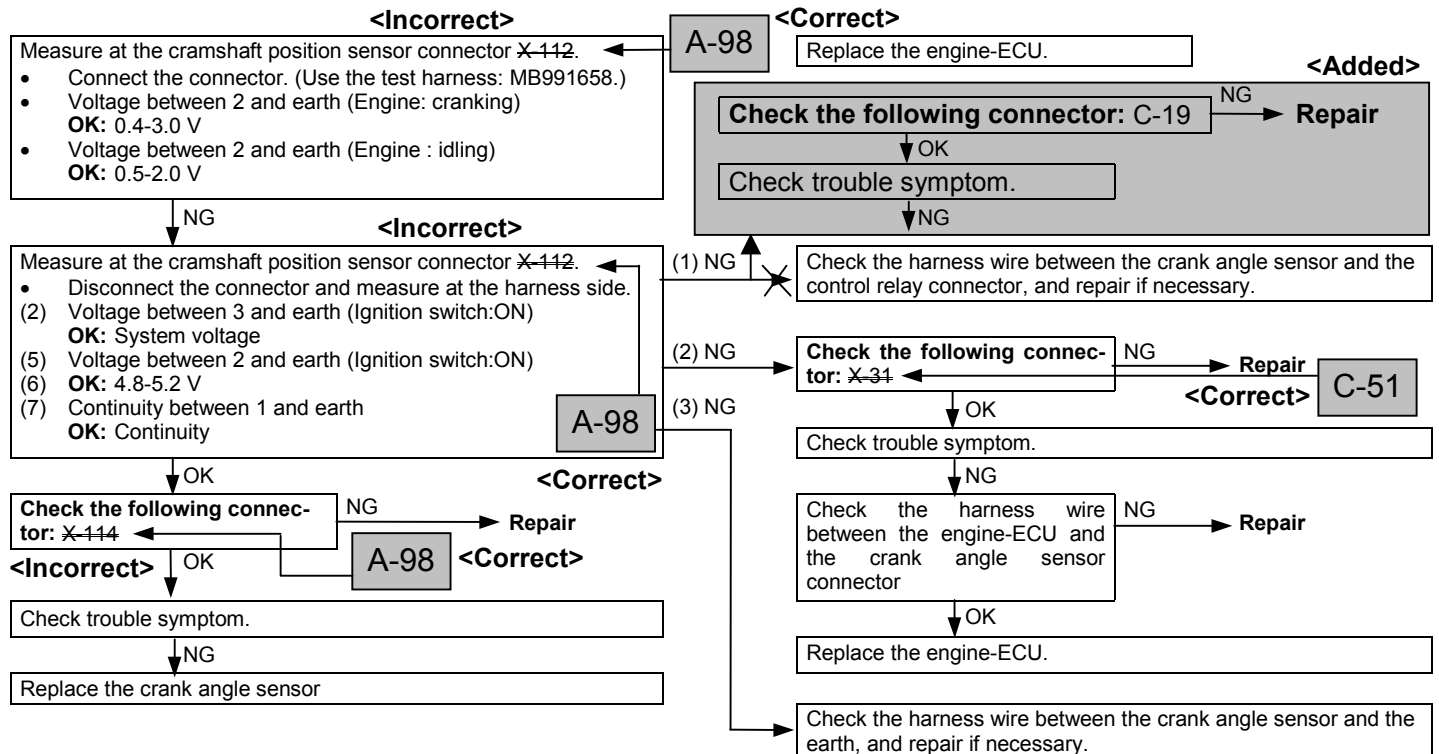
Code No. 21 Engine coolant temperature sensor system	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>Ignition switch: ON</li> <li>Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts.</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>Sensor output frequency is 4.6 V or more (corresponding to an engine coolant temperature of <math>-45^{\circ}\text{C}</math> or less) for 4 seconds.</li> </ul> <p>Or</p> <ul style="list-style-type: none"> <li>Sensor output frequency is 0.1 V or less (corresponding to an engine coolant temperature of <math>140^{\circ}\text{C}</math> or more) for 4 seconds</li> </ul>	<ul style="list-style-type: none"> <li>Malfunction of the engine coolant temperature sensor</li> <li>Improper connector contact, 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>Ignition switch: ON</li> <li>Engine speed is approx. 50 r/min or more.</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>The sensor output voltage increases from 1.6 V or less (corresponding to an engine coolant temperature of <math>40^{\circ}\text{C}</math> or more) to 1.6 V or more (corresponding to an engine coolant temperature of <math>4^{\circ}\text{C}</math> or less)</li> <li>After this, the sensor output voltage is 1.6V or more for 5 minutes.</li> </ul>	



Code No. 22 Crank angle sensor system	Probable cause
Range of Check • Engine is cranking Set conditions • Sensor output voltage does not change for 4 seconds (no pulse signal input.)	• Malfunction of the crank angle sensor • Improper connector contact, open circuit or short-circuited harness wire of crank angle sensor circuit • Malfunction of the engine-ECU

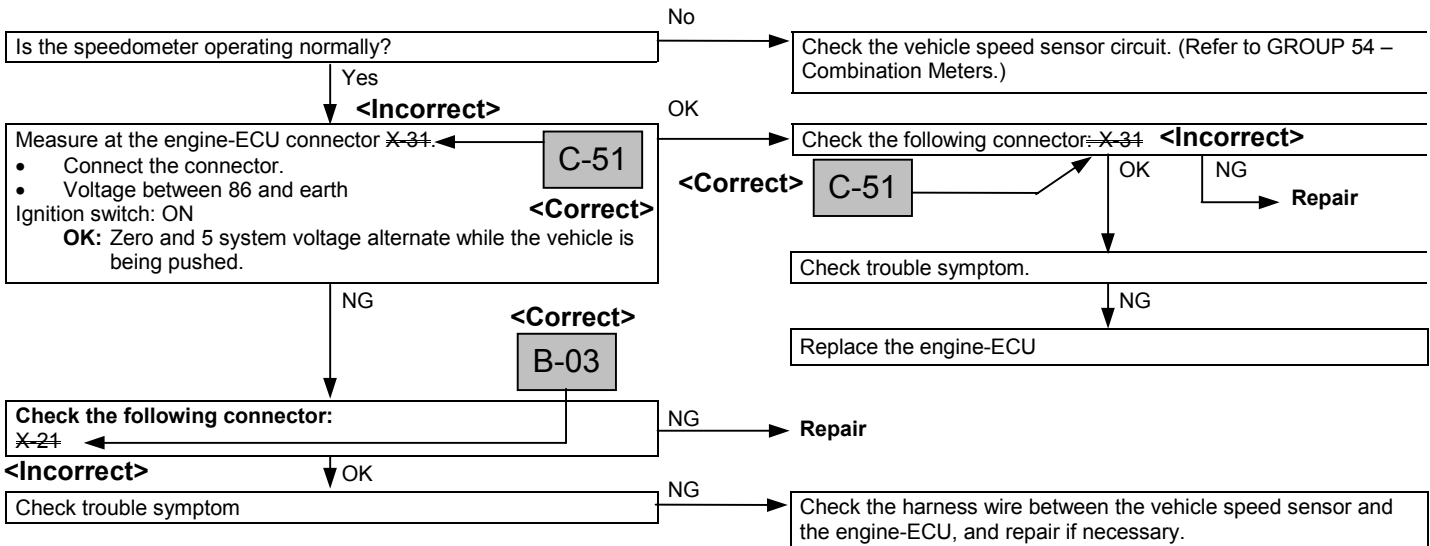


Code No. 23 Crankshaft position sensor system	Probable cause
Range of Check <ul style="list-style-type: none"> <li>Ignition switch: ON</li> <li>Engine speed is approx 50 r/min or more.</li> </ul> Set conditions <ul style="list-style-type: none"> <li>Sensor output voltage does not change for 4 seconds (no pulse signal input.)</li> </ul>	<ul style="list-style-type: none"> <li>Malfunction of the crankshaft position sensor</li> <li>Improper connector contact, open circuit or short-circuited harness wire of crankshaft position sensor circuit</li> <li>Malfunction of the engine-ECU</li> </ul>

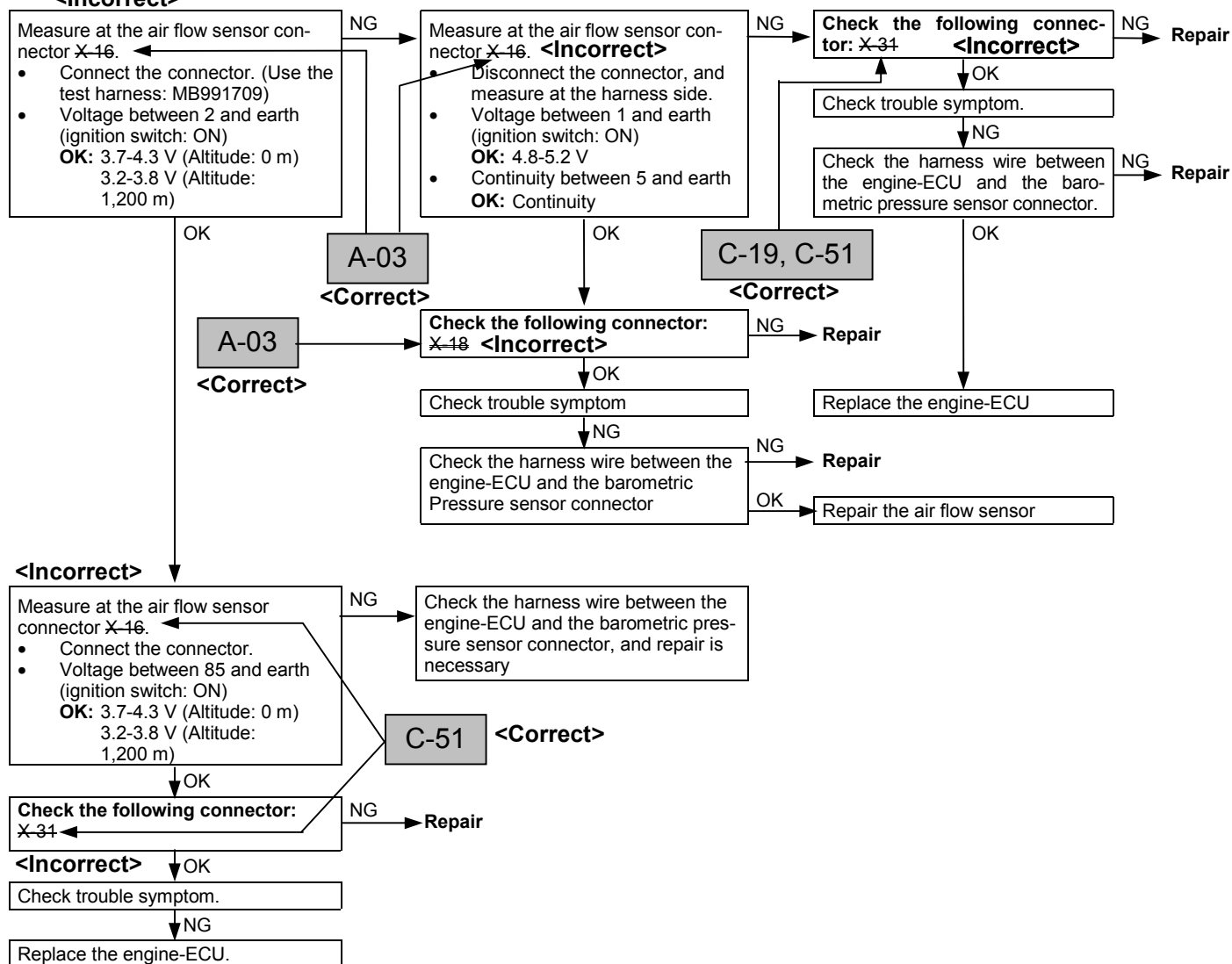




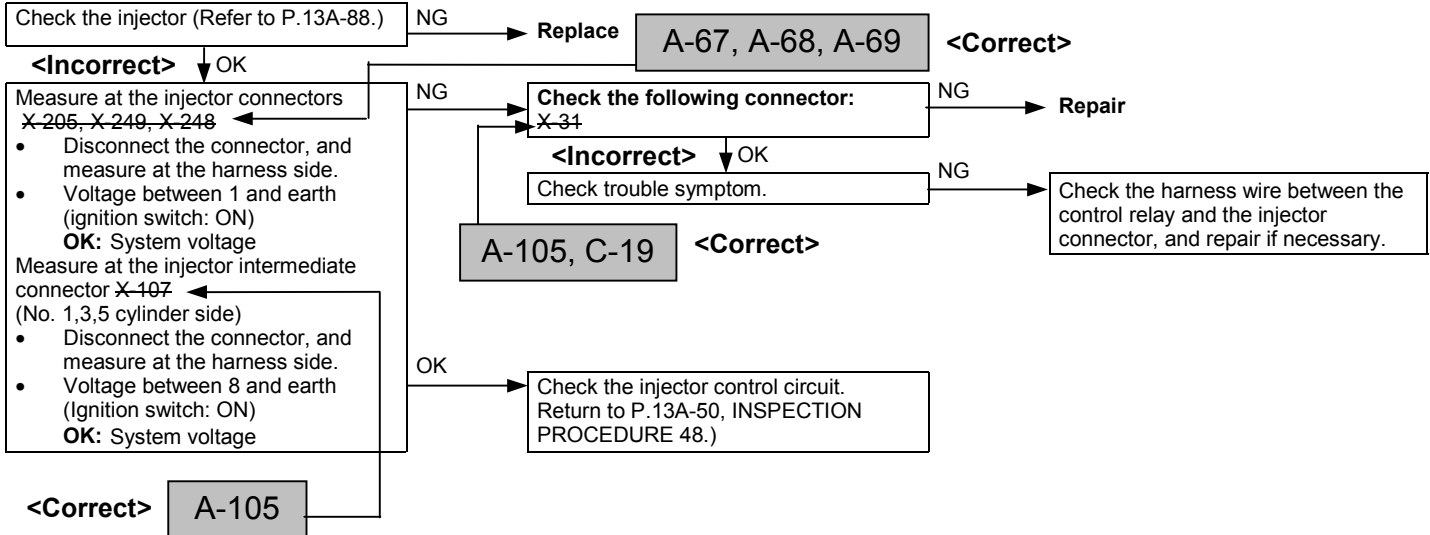
Code No. 24 Vehicle speed sensor system	Probable cause
Range of Check <ul style="list-style-type: none"> <li>Excluding 60 seconds after the engine starts</li> <li>Idle position switch: Off</li> <li>Engine speed is 3,000 r/min.</li> <li>Driving under high engine load conditions.</li> </ul> Set conditions <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 vehicle speed sensor</li> <li>Malfunction of the engine-ECU</li> </ul>



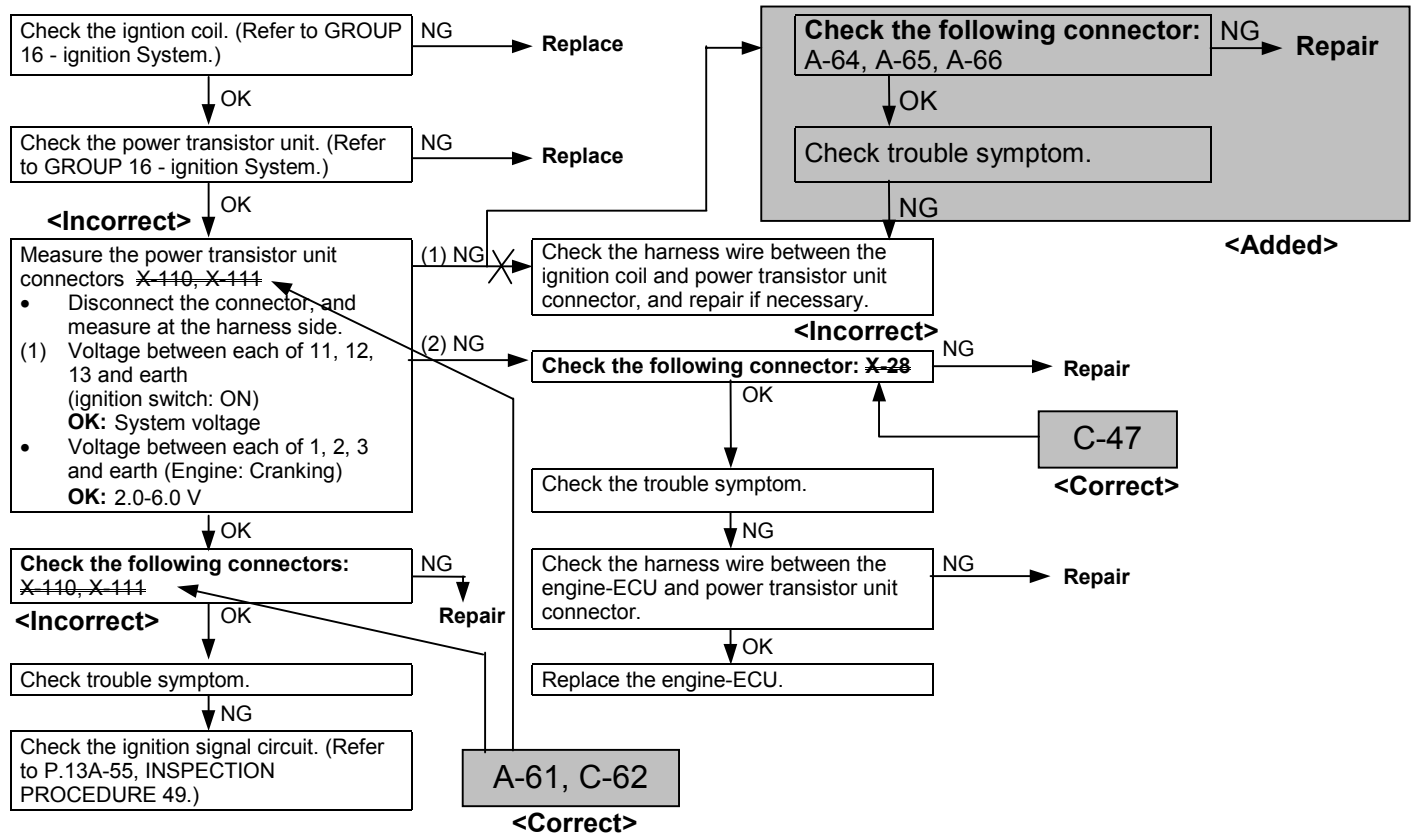
Code No. 25 Barometric pressure sensor system	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>Ignition switch: ON</li> <li>Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts.</li> <li>Battery voltage is 8 V or more.</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>Sensor output voltage is 4.5 V or more (corresponding to a barometric pressure of 114 kPa or more) for 4 seconds</li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>Sensor output voltage is 0.2 V or less (corresponding a barometric pressure of 5.33 kPa or less) for 4 seconds</li> </ul>	<ul style="list-style-type: none"> <li>Malfunction of the barometric pressure sensor</li> <li>Improper connector contact, open circuit or short-circuited harness wire of the barometric pressure sensor</li> <li>Malfunction of the engine-ECU</li> </ul>

**<Incorrect>**

Code No. 21 Engine coolant temperature sensor system	Probable cause
Range of Check <ul style="list-style-type: none"> <li>Engine speed is approx. 50-1,000 r/min</li> <li>The throttle position sensor output voltage is 1.15 V or less.</li> <li>Actuator test by MUT-II is not carried out.</li> </ul> Set conditions <ul style="list-style-type: none"> <li>Surge voltage of injector coil is not detected for 4 seconds.</li> </ul>	<ul style="list-style-type: none"> <li>Malfunction of the injector</li> <li>Improper connector contact, open circuit or short-circuited harness wire of the injector circuit</li> <li>Malfunction of the engine-ECU</li> </ul>



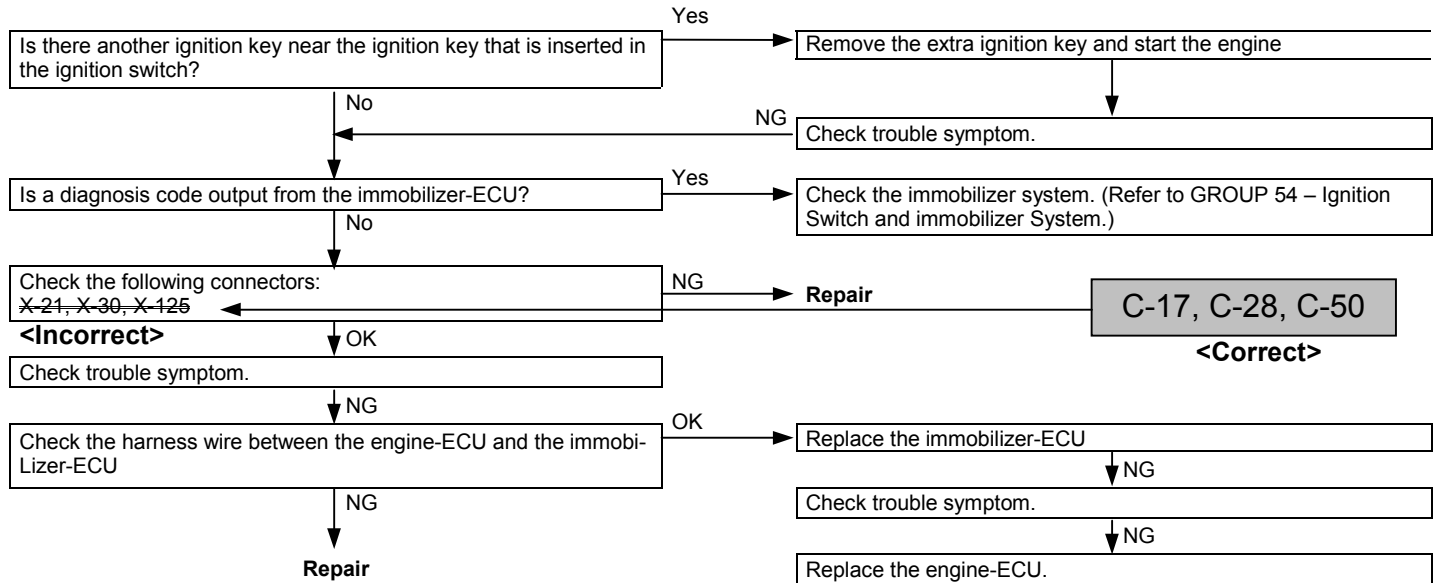
Code No. 44, 52, 53 Ignition coil and power transistor unit system	Probable cause
Range of Check <ul style="list-style-type: none"> <li>Engine speed is approx. 50-4,000 r/min</li> <li>Engine is not cranking</li> </ul> Set conditions <ul style="list-style-type: none"> <li>The ignition signal from the same coil is not input for 4 seconds.</li> </ul> However, this excludes cases where no ignition is input from any coils.	<ul style="list-style-type: none"> <li>Malfunction of the ignition coil</li> <li>Improper connector contact, open circuit or short-circuited harness wire of the ignition primary circuit</li> <li>Malfunction of the power transistor unit</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	<ul style="list-style-type: none"> <li>• Radio interference of ID codes</li> <li>• Incorrect ID code</li> <li>• Malfunction of harness or connector</li> <li>• Malfunction of immobilizer-ECU</li> <li>• Malfunction of the engine-ECU</li> </ul>

## 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 ID code.

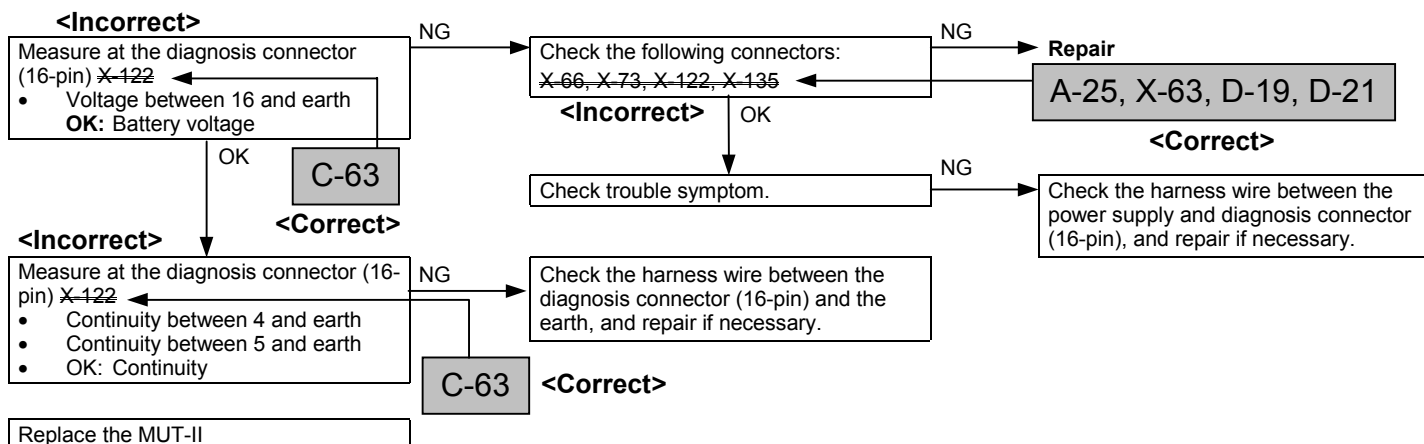


Items		Symptom
Driving	Shock	The feeling of a comparatively large impact or vibration when the engine is accelerated or decelerated.
	Surge	This is repeated surging ahead during constant speed travel or during variable speed travel.
	Knocking	A sharp sound like a hammer striking the cylinder walls during driving and which adversely affects driving.
Stopping	Run on ("Dieseling")	The condition in which the engine continues to run after the ignition switch is turned to OFF. Also called "Dieseling".

## INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

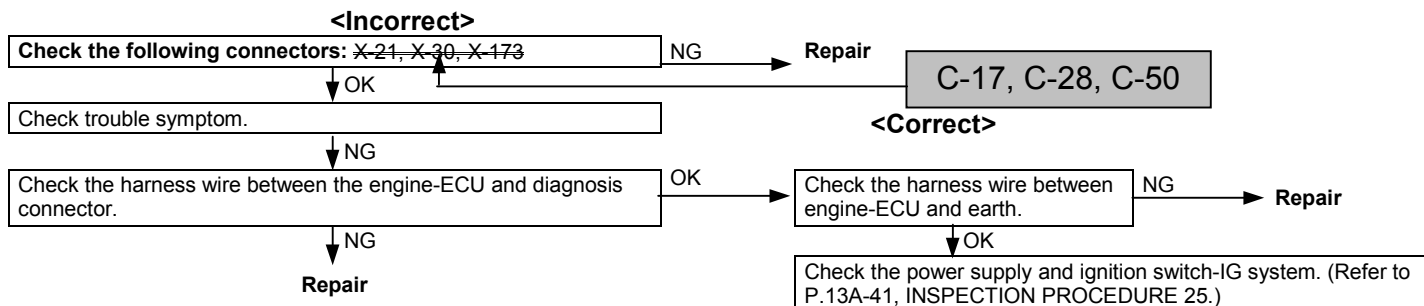
### INSPECTION PROCEDURE 1

Communication with MUT-II is not possible. (Communication with all systems is not possible)	Probable cause
The cause is probably a defect in the power supply system (including earth) for the diagnosis line.	<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 not possible	Probable cause
One of the following causes may be suspected	<ul style="list-style-type: none"> <li>Malfunction of engine-ECU power supply circuit</li> <li>Malfunction of the engine-ECU</li> <li>Open circuit between engine-ECU and diagnosis connector</li> </ul>
<ul style="list-style-type: none"> <li>No power 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>	



**The engine warning lamp does not illuminate right after the Ignition switch is turned to the ON position**

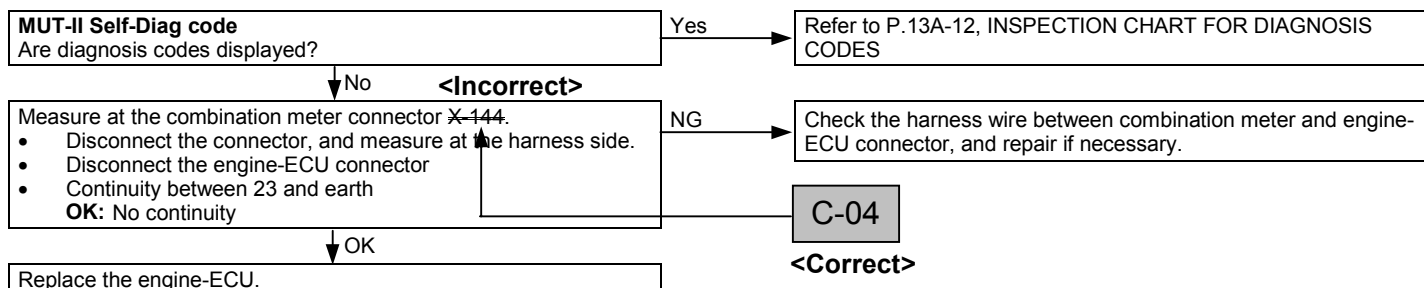
### Probable cause

- Burnt-out bulb
- Defective warning lamp circuit
- Malfunction of the engine-ECU



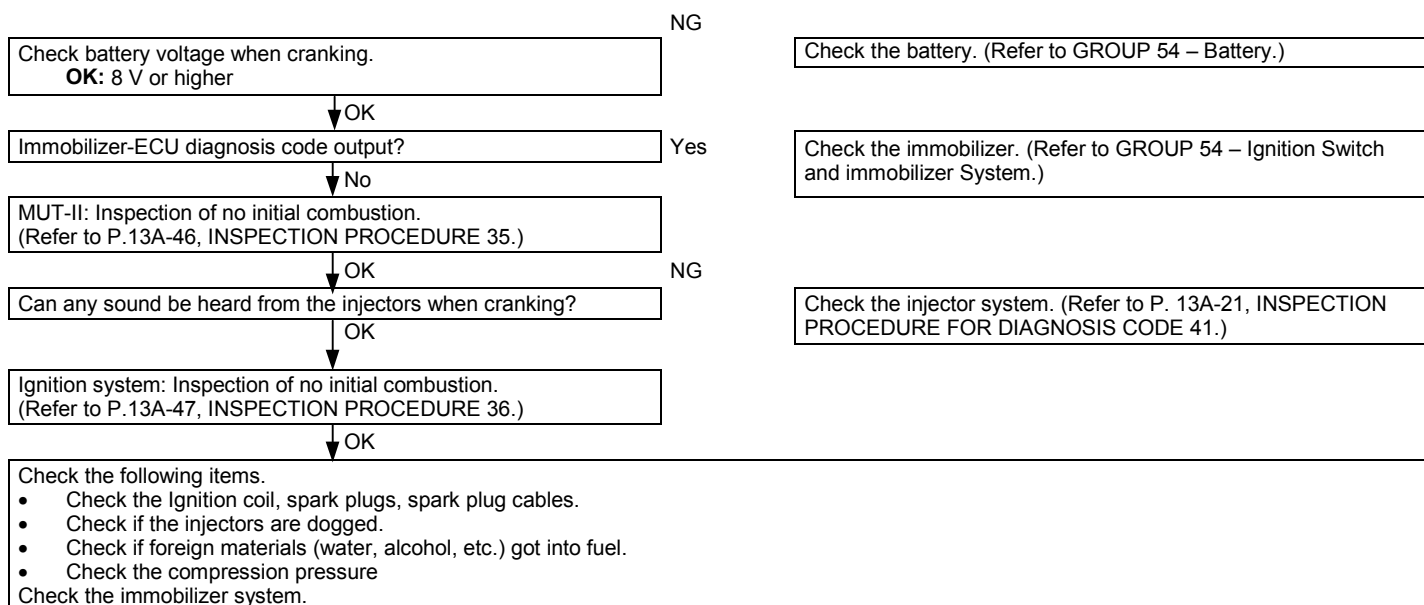
## INSPECTION PROCEDURE 4

The engine warning lamp remains illuminating and never goes out	Probable cause
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.	<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

No initial combustion (starting impossible)	Probable cause
In cases such as the above, the cause is probably that a spark plug is defective, or that the supply of fuel to the combustion chamber is defective. In addition, foreign materials (water, kerosene, etc.) may be mixed with the fuel.	<ul style="list-style-type: none"> <li>Malfunction of the ignition system</li> <li>Malfunction of the fuel pump system</li> <li>Malfunction of the injectors</li> <li>Malfunction of the engine-ECU</li> <li>Malfunction of the immobilizer system</li> <li>Foreign materials in fuel</li> </ul>





## INSPECTION PROCEDURE 23

**Idling speed is improper when A/C is operating  
(A/C switch 2 signal)**

In cases such as the above, the cause is probably that a spark plug is defective, or that the supply of fuel to the combustion chamber is defective.  
In addition, foreign materials (water, kerosene, etc.) may be mixed with the fuel.

**Probable cause**

- Malfunction of the ignition system
- Malfunction of the fuel pump system
- Malfunction of the injectors
- Malfunction of the engine-ECU
- Malfunction of the immobilizer system
- Foreign materials in fuel

C-09, C-50, D-14 **<Correct>**

The following connectors:

X-30, X-57, X-154

**<Incorrect>**

Check the trouble symptom

Check the harness wire between the engine-ECU and the A/C-ECU

NG → **Repair**

OK

NG

OK

NG  
Repair

Check the A/C system. (Refer to GROUP 55 – Troubleshooting.)

OK

Replace the engine-ECU.

## INSPECTION PROCEDURE 24

**A/C condenser fan is inoperative**

The fan motor relay is controlled by turning on and off the power transistor in the engine-ECU.

**Probable cause**

- Malfunction of the A/C condenser fan relay
- Malfunction of the condenser fan motor
- Improper connector contact, open circuit or short-circuited harness wire
- Malfunction of the engine-ECU

**<Correct>** C-47

Measure at the engine-ECU connector X-29 **<Incorrect>**

- Disconnect the connector, and measure at the harness side.  
(Ignition switch: ON)  
**OK:** Fan stops
- Voltage between 21 and earth  
(Ignition switch: ON)  
**OK:** Battery voltage
- Connect a jumper cable between 21 and earth  
(Ignition switch: ON)  
**OK:** A/C condenser fan rotates

NG

Check the condenser fan circuit. (Refer to ELECTRICAL WIRING.)

OK

C-47 **<Correct>**

The following connector:

X-28

**<Incorrect>**

Check the trouble symptom

Replace the engine-ECU

NG

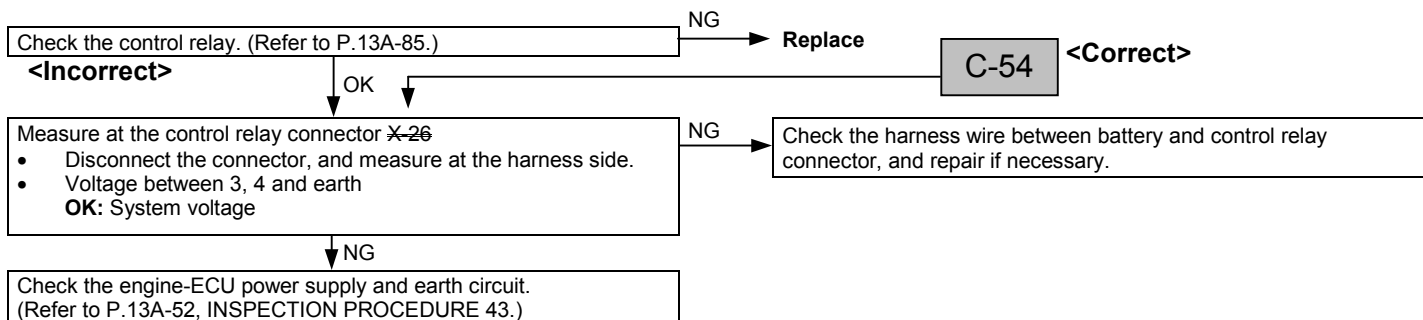
Repair

OK

NG

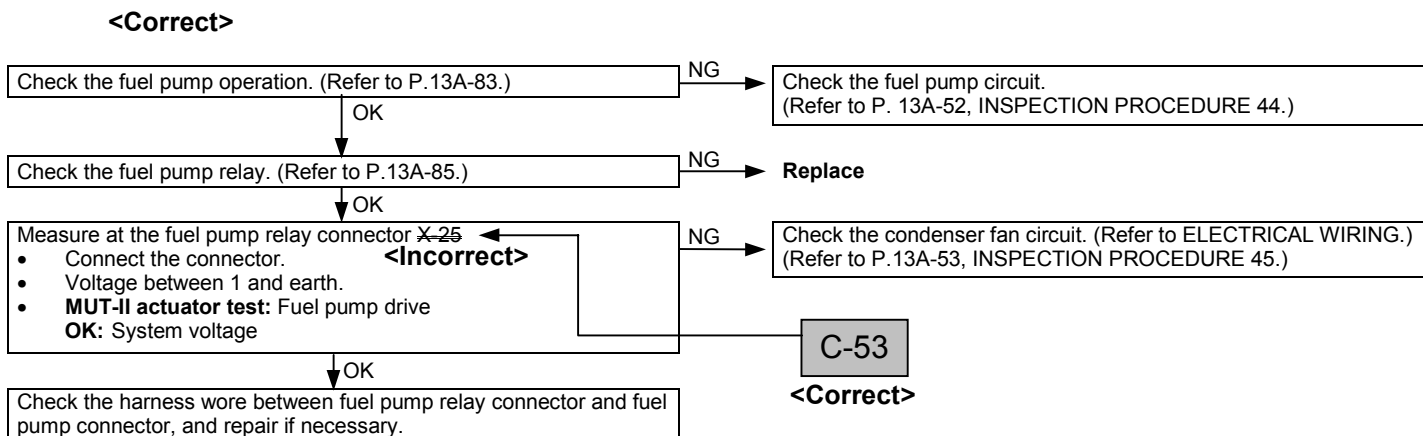
## INSPECTION PROCEDURE 25

Power supply system and ignition switch-IG system	Probable cause
When an ignition switch ON signal is input to the engine-ECU, the engine-ECU turns the control relay ON. This causes battery voltage to be supplied to the engine-ECU, injectors and air flow sensor.	<ul style="list-style-type: none"> <li>• Malfunction of the ignition switch</li> <li>• Malfunction of the control relay</li> <li>• Improper connector contact, open circuit or short-circuited harness wire</li> <li>• Disconnect engine-ECU earth wire</li> <li>• Malfunction of the engine-ECU</li> </ul>



## INSPECTION PROCEDURE 26

Fuel pump system	Probable cause
The engine-ECU turns the control relay ON when the engine is cranking or running, and this supplies power to drive the fuel pump.	<ul style="list-style-type: none"> <li>• Malfunction of the fuel pump relay</li> <li>• Malfunction of the fuel pump</li> <li>• Improper connector contact, open circuit or short-circuited harness wire</li> <li>• Malfunction of the engine-ECU</li> </ul>



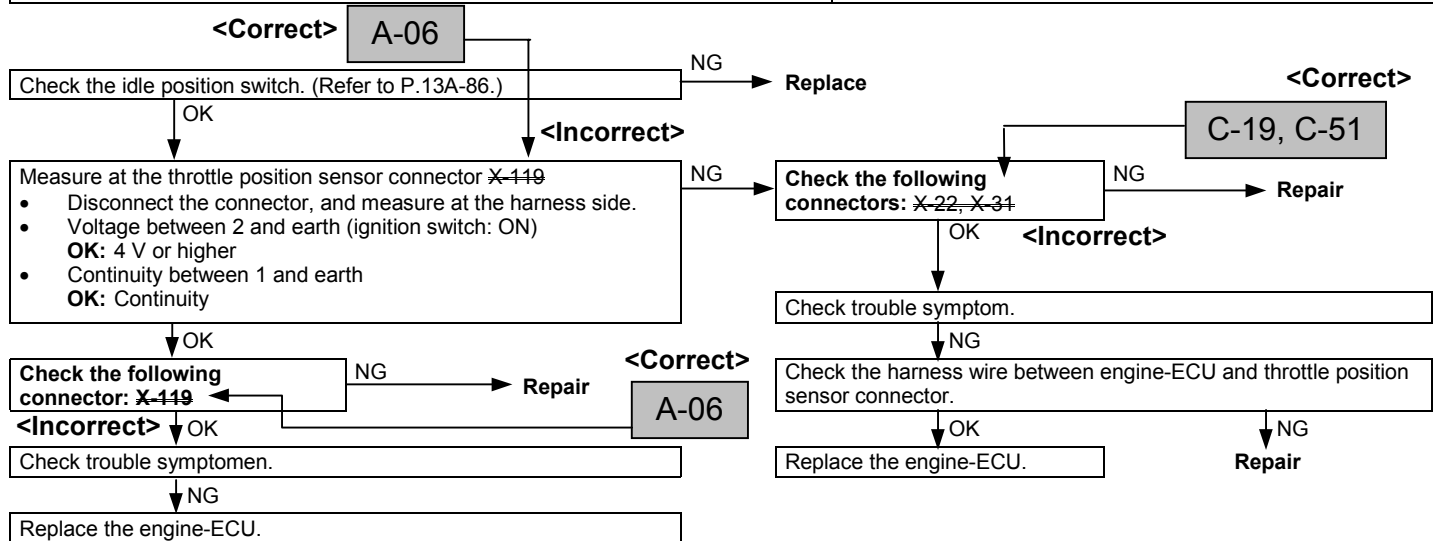
## INSPECTION PROCEDURE 27

## Idle position switch system

The idle position switch inputs the condition of the accelerator pedal, i.e. whether it is depressed or released (HIGH/LOW), to the engine-ECU.  
The engine-ECU controls the idle speed control servo based on this input.

## Probable cause

- Malfunction of the accelerator pedal
- Malfunction of the fixed SAS
- Maladjustment of the idle position switch and throttle position sensor
- Improper connector contact, open circuit or short-circuited harness wire
- Malfunction of the engine-ECU



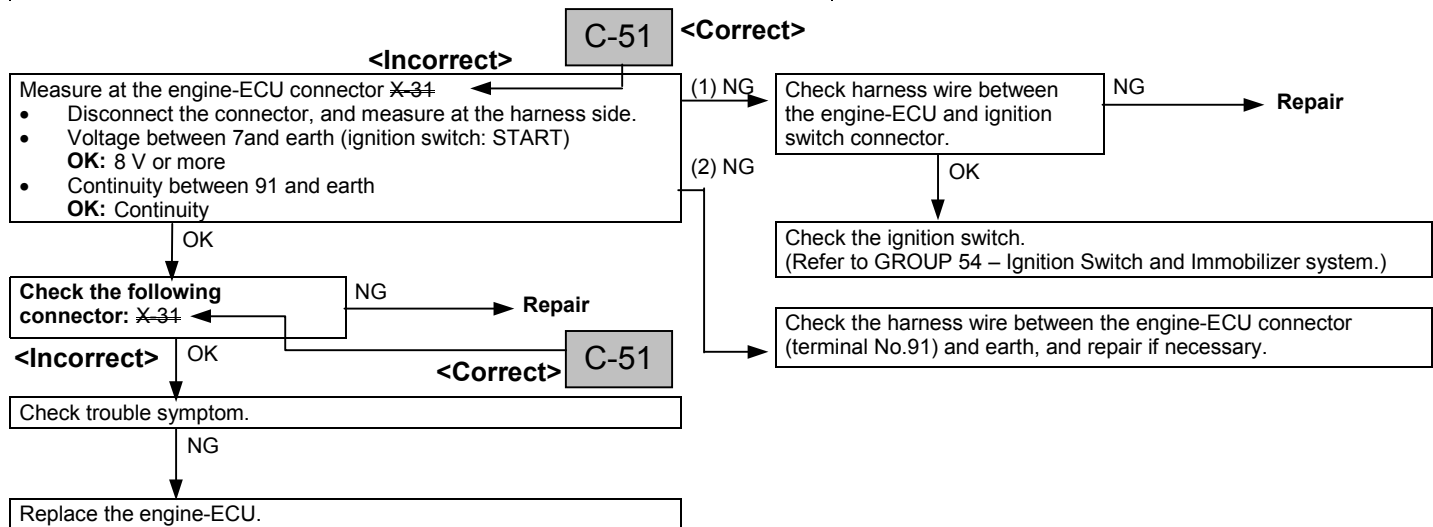
## INSPECTION PROCEDURE 28

## Ignition switch-ST system

The ignition switch-ST inputs a HIGH signal to the engine-ECU while the engine is cranking.  
The engine-ECU controls fuel injection, etc. during starting based on this input.

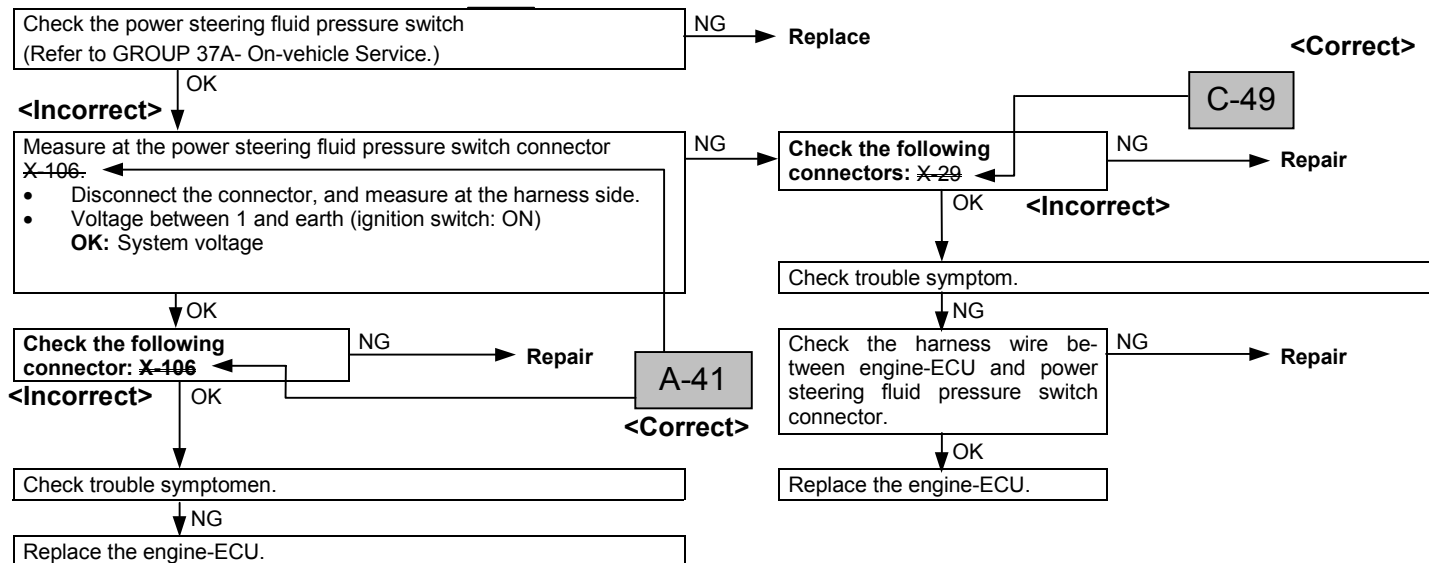
## Probable cause

- Malfunction of the ignition switch
- Improper connector contact, open circuit or short-circuited harness wire
- Malfunction of the engine-ECU



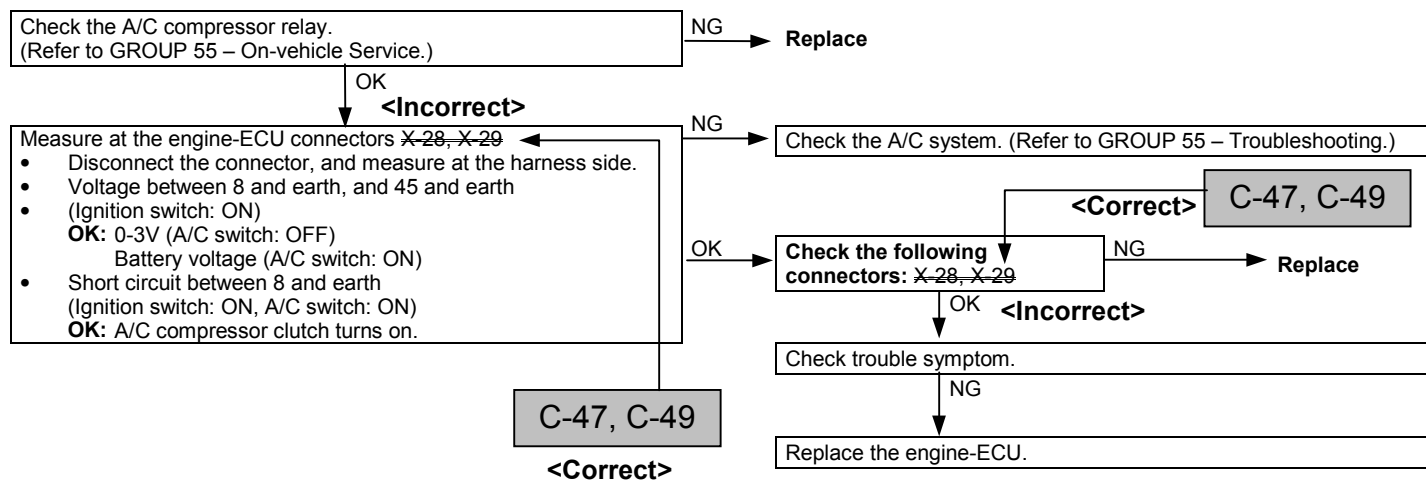
## INSPECTION PROCEDURE 29

Power steering fluid pressure switch system	Probable cause
The presence or absence of power steering load is input to the engine-ECU. The engine-ECU control the idle speed control (ESC) servo based on this input.	<ul style="list-style-type: none"> <li>Malfunction of the power steering fluid pressure switch</li> <li>Improper connector contact, open circuit or short-circuited harness wire</li> <li>Malfunction of the engine-ECU</li> </ul>



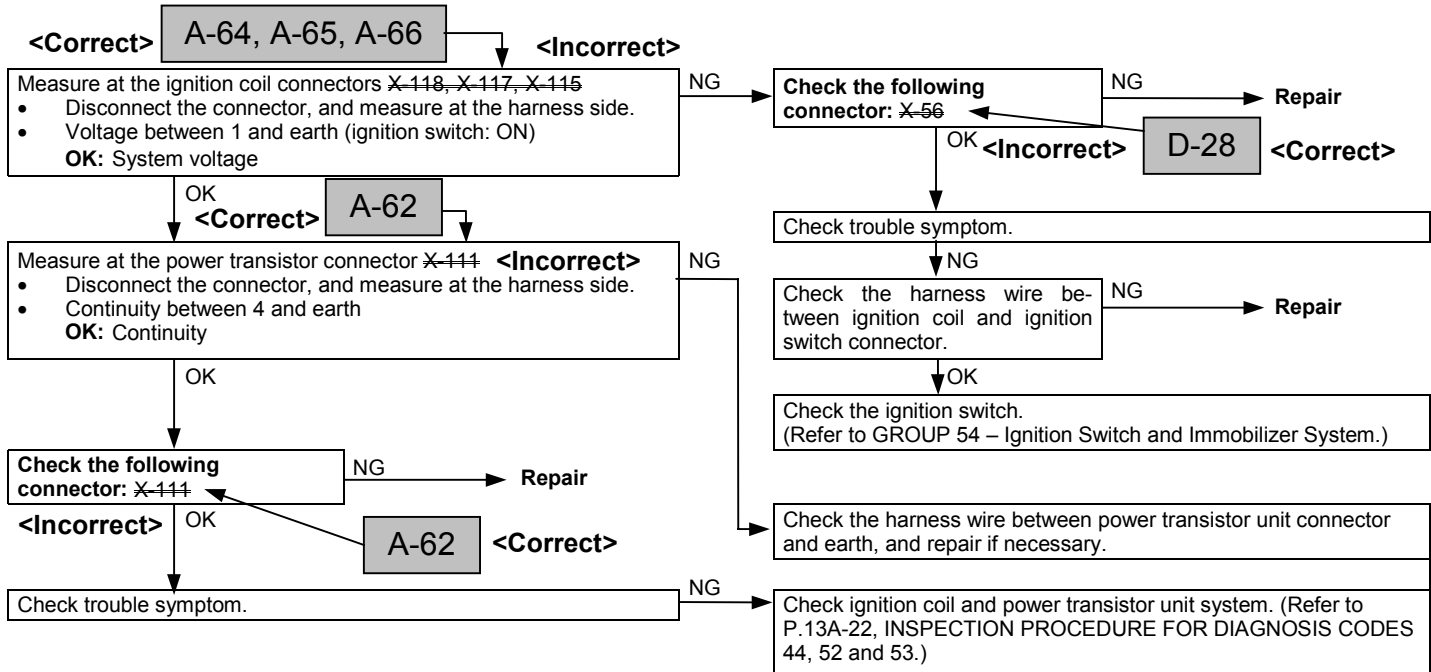
## INSPECTION PROCEDURE 30

A/C switch and A/C relay system	Probable cause
When an A/C ON signal is input to the engine-ECU, the engine-ECU carries out control of the idle speed control (ESC) servo, and also operates the A/C compressor magnetic clutch.	<ul style="list-style-type: none"> <li>Malfunction of A/C control system</li> <li>Malfunction of A/C switch</li> <li>Improper connector contact, open circuit or short-circuited harness wire</li> <li>Malfunction of the engine-ECU</li> </ul>



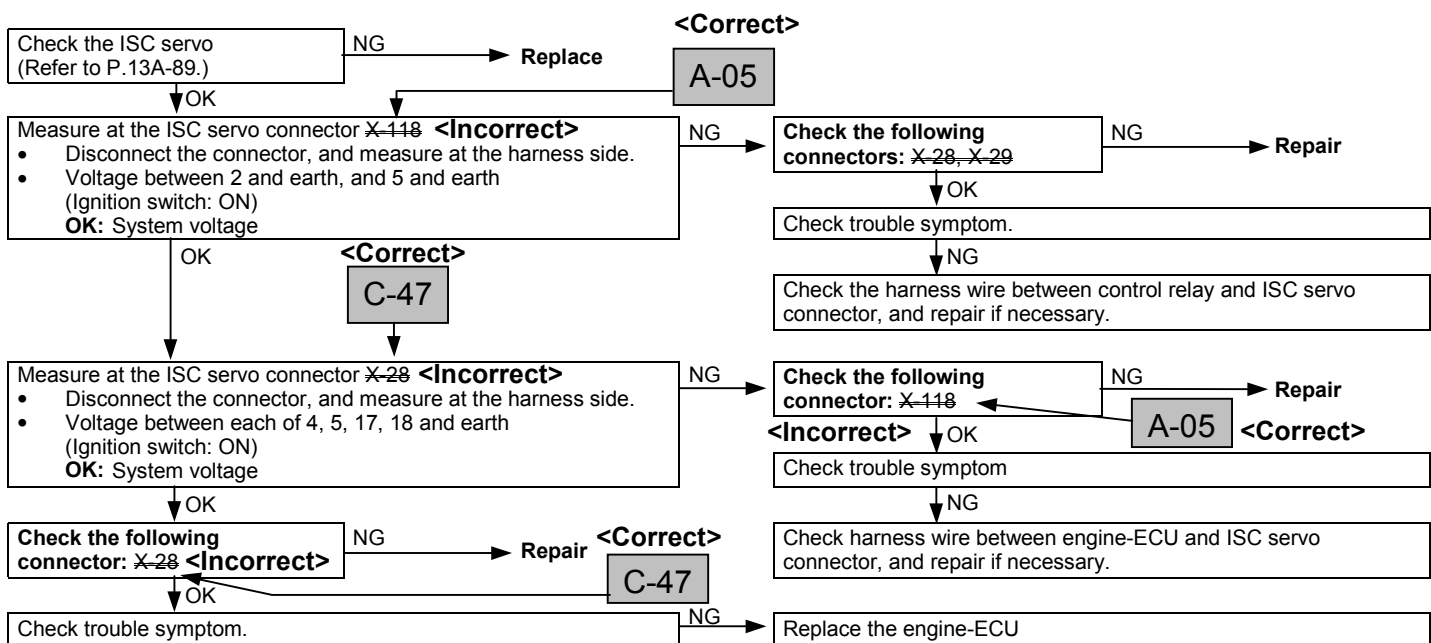
## INSPECTION PROCEDURE 31

Ignition circuit system	Probable cause
The engine-ECU interrupts the ignition coil primary current by turning the power transistor inside the engine-ECU ON and OFF.	<ul style="list-style-type: none"> <li>Malfunction of ignition switch</li> <li>Malfunction of power transistor unit</li> <li>Improper connector contact, open circuit or short-circuited harness wire</li> <li>Malfunction of the engine-ECU</li> </ul>



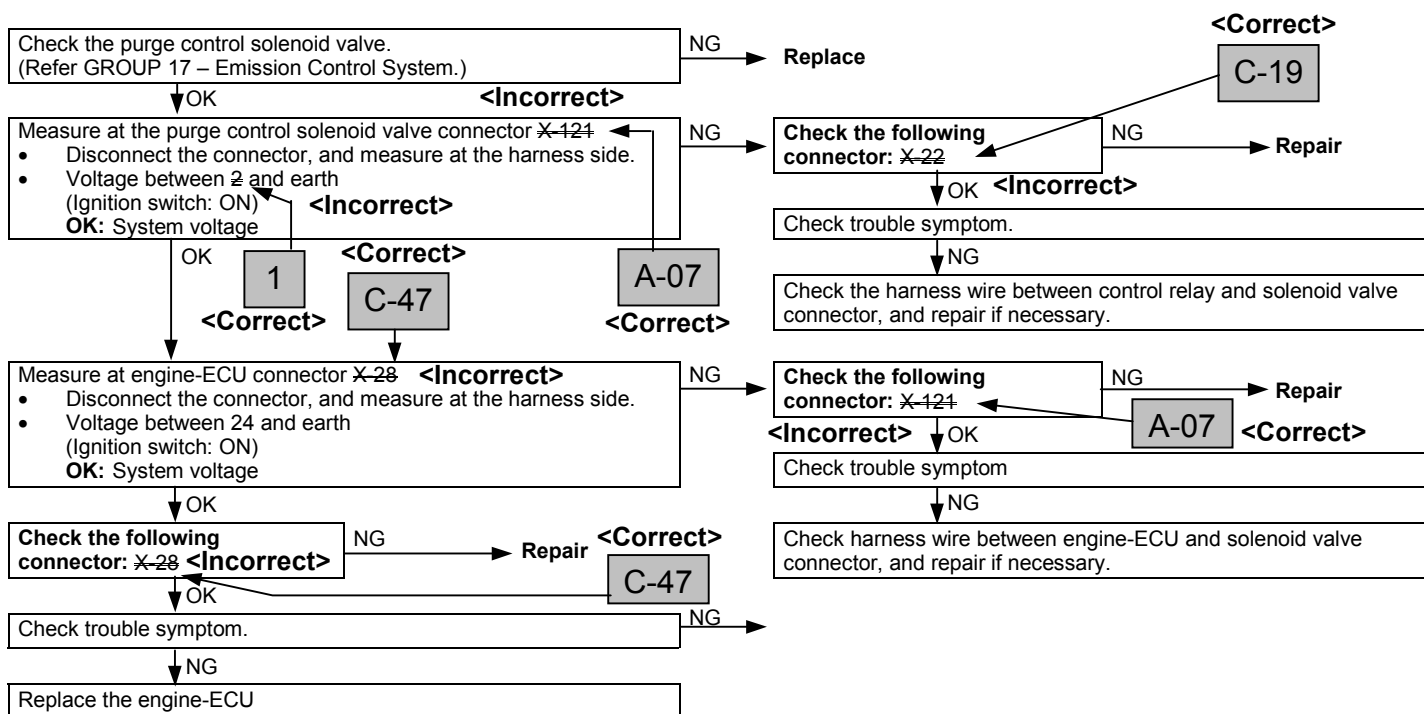
## INSPECTION PROCEDURE 32

Idle speed control (ESC) servo (Stepper motor) system	Probable cause
The engine-ECU controls the intake air volume during idling by opening and closing the servo valve located in the bypass air passage.	<ul style="list-style-type: none"> <li>Malfunction of ISC servo</li> <li>Improper connector contact, open circuit or short-circuited harness wire</li> <li>Malfunction of the engine-ECU</li> </ul>



## INSPECTION PROCEDURE 33

Purge control solenoid valve system	Probable cause
The purge control solenoid valve controls the purging of air from the canister located inside the intake manifold.	<ul style="list-style-type: none"> <li>Malfunction of solenoid valve</li> <li>Improper connector contact, open circuit or short-circuited harness wire</li> <li>Malfunction of the engine-ECU</li> </ul>



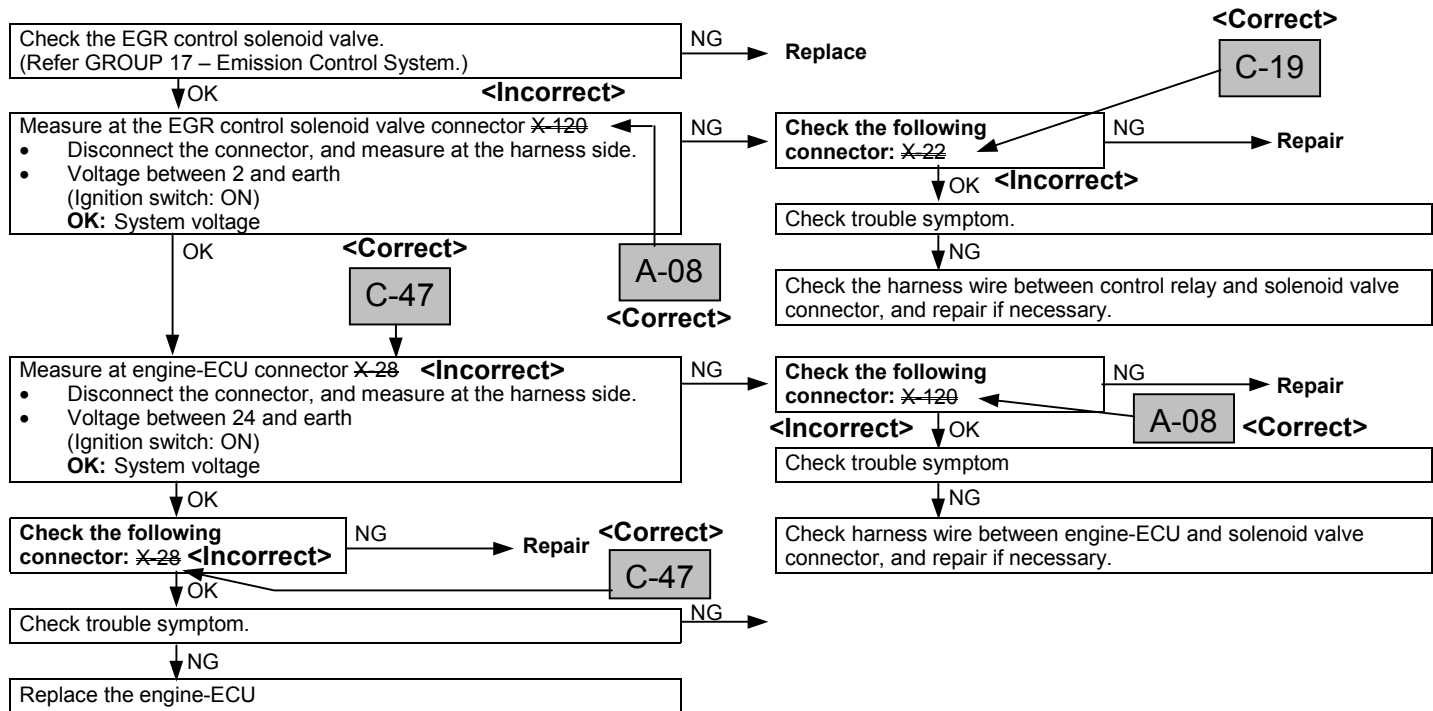
## INSPECTION PROCEDURE 34

**EGR control solenoid valve system**

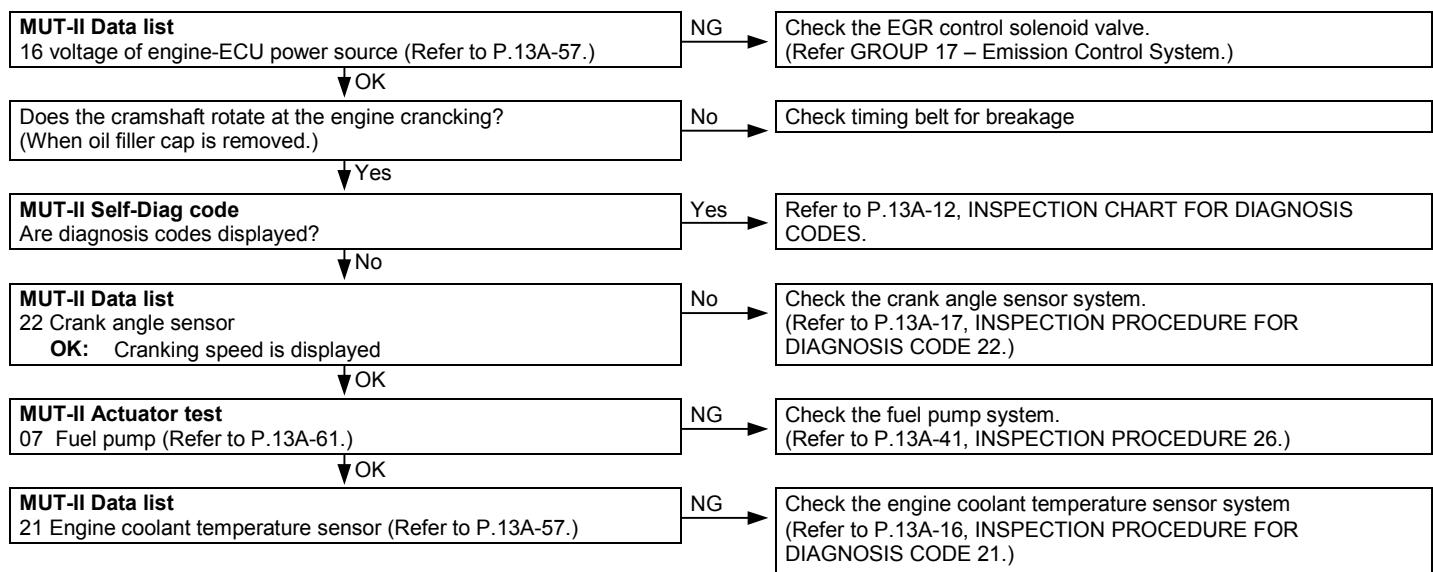
The EGR control solenoid valve is controlled by the negative pressure resulting from EGR operation leaking to port "A" of the throttle body.

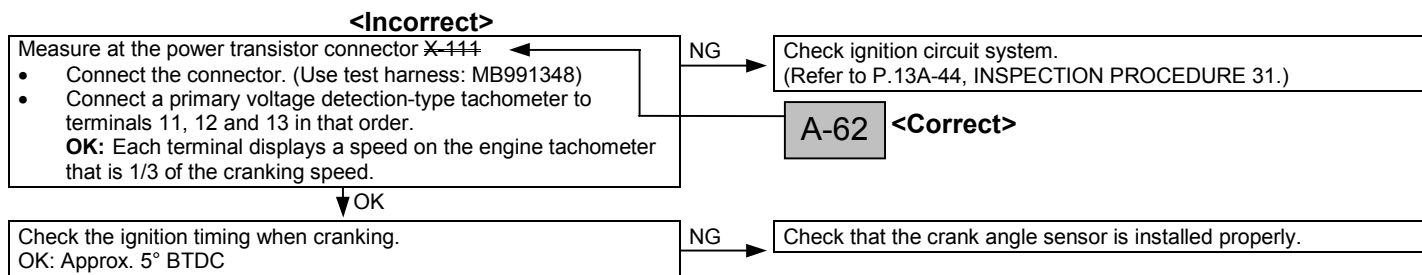
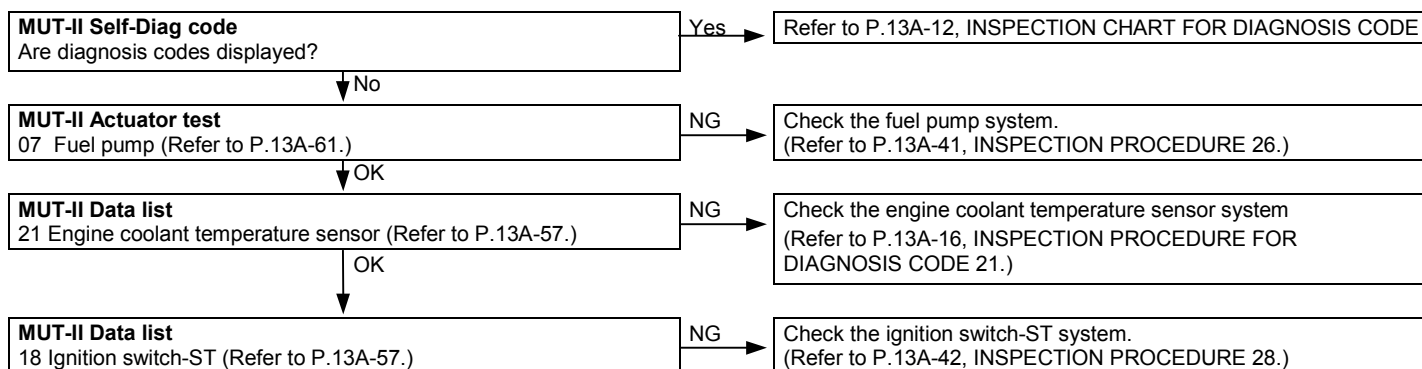
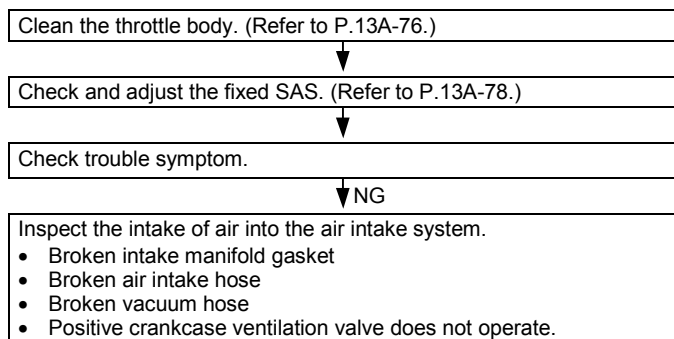
**Probable cause**

- Malfunction of solenoid valve
- Improper connector contact, open circuit or short-circuited harness wire
- Malfunction of the engine-ECU



## INSPECTION PROCEDURE 35

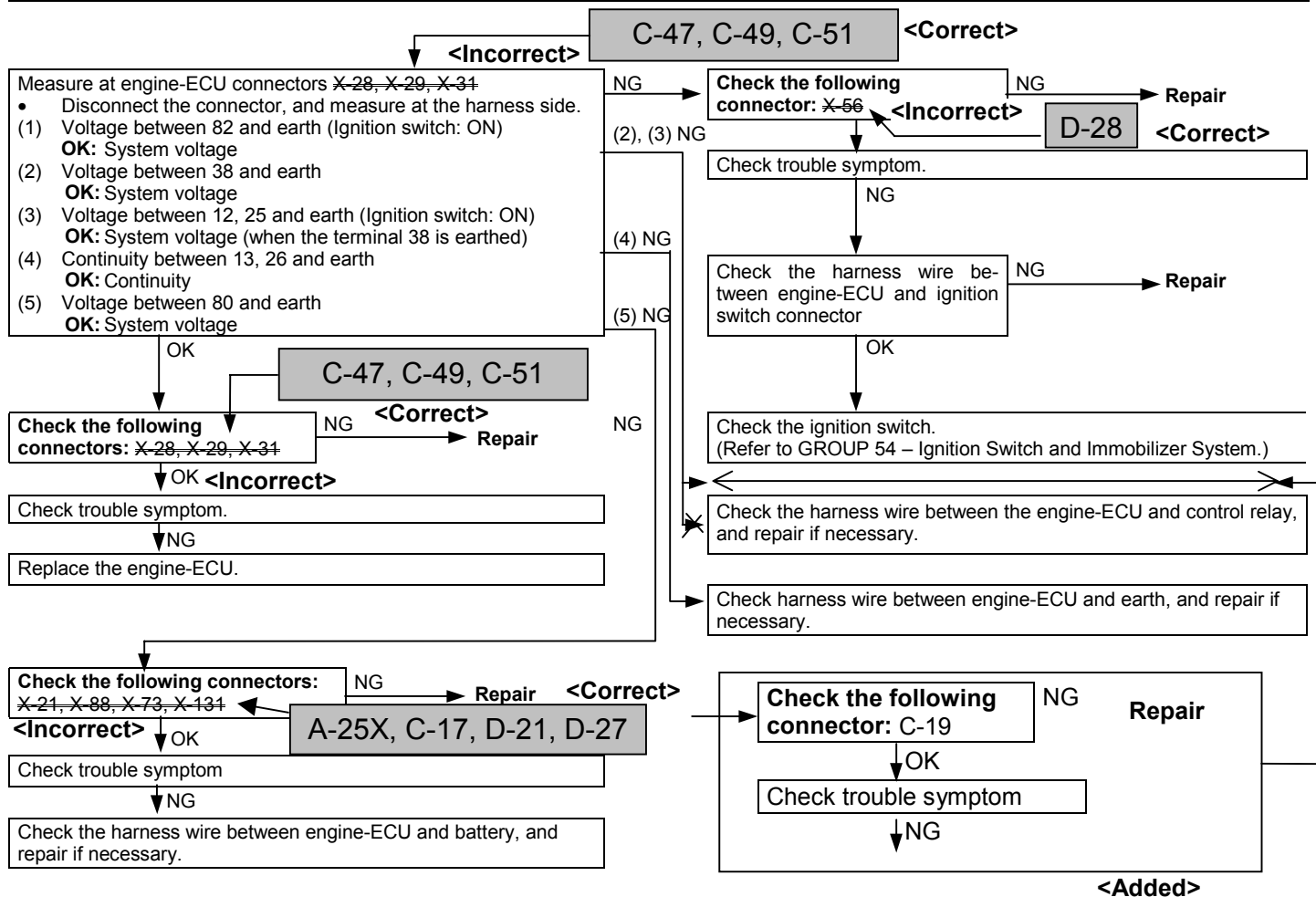
**MUT-II: Inspection of no initial combustion**

**INSPECTION PROCEDURE 36****Ignition system: Inspection of no initial combustion.****INSPECTION PROCEDURE 37****MUT-II: Check if incomplete combustion occurs.****INSPECTION PROCEDURE 38****Check if hunting occurs.**



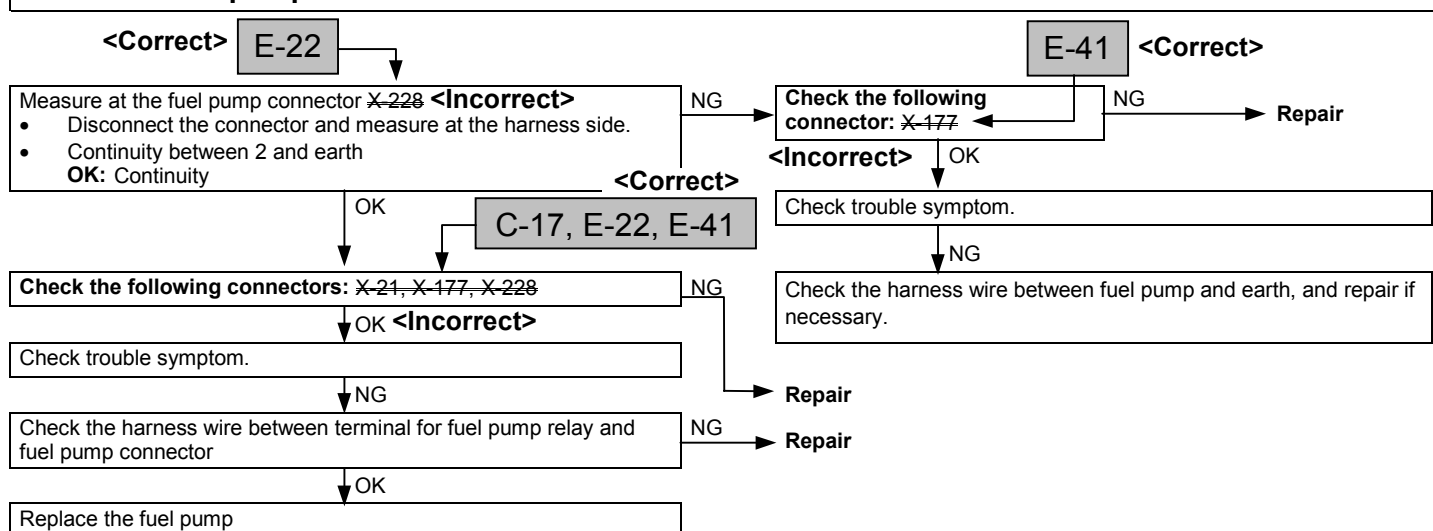
## INSPECTION PROCEDURE 43

## Check the engine-ECU power supply and earth circuit



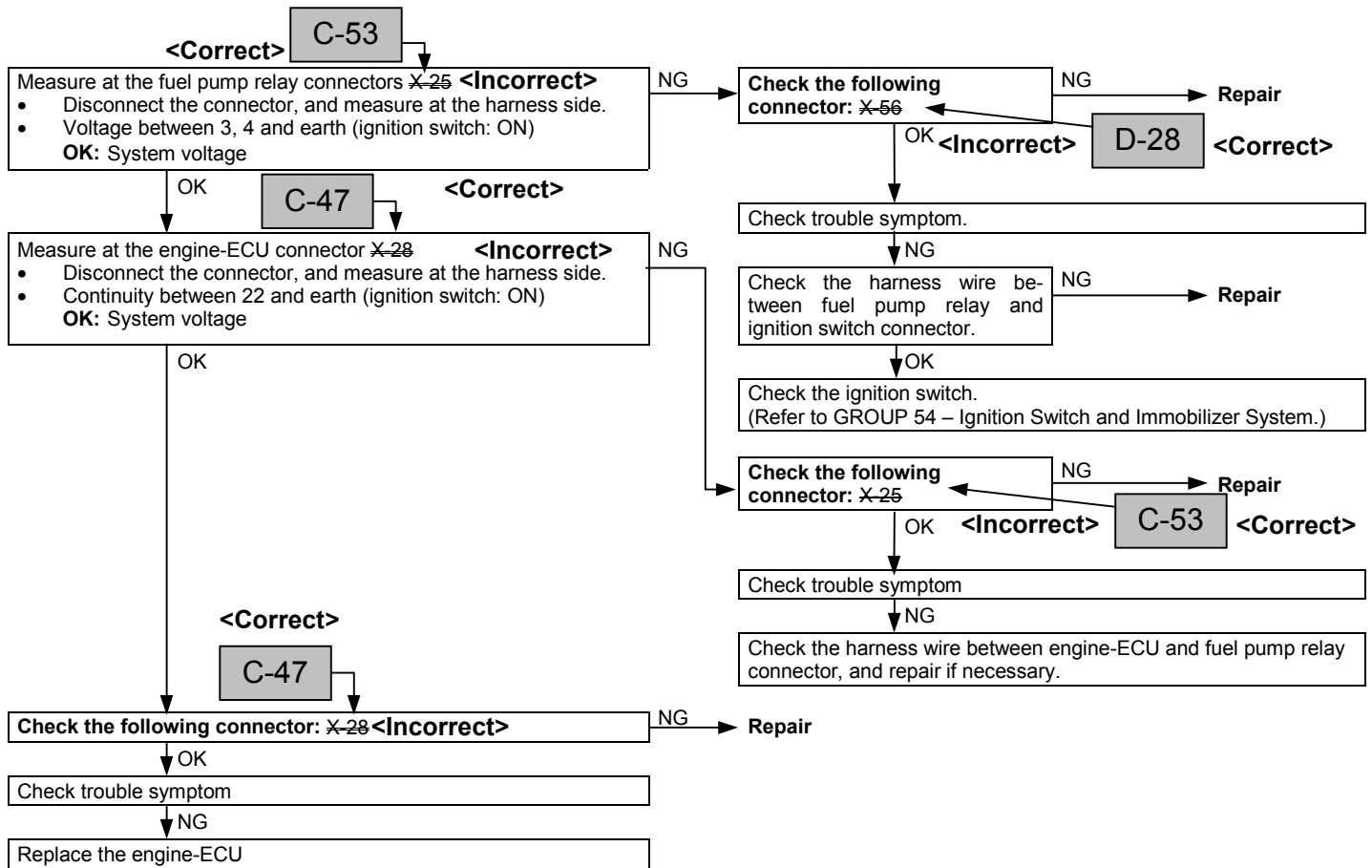
## INSPECTION PROCEDURE 44

## Check the fuel pump circuit.



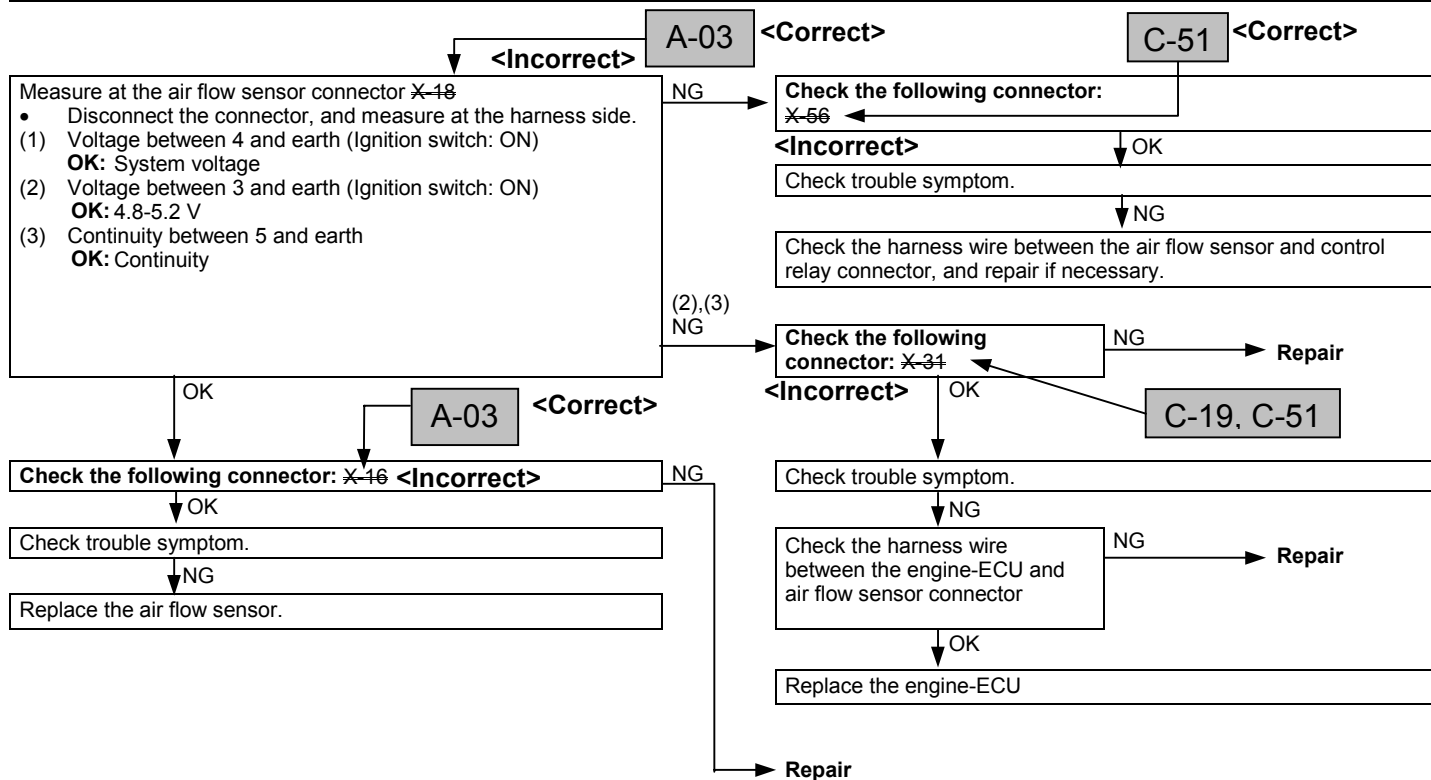
## INSPECTION PROCEDURE 45

## Check the fuel pump drive control circuit.



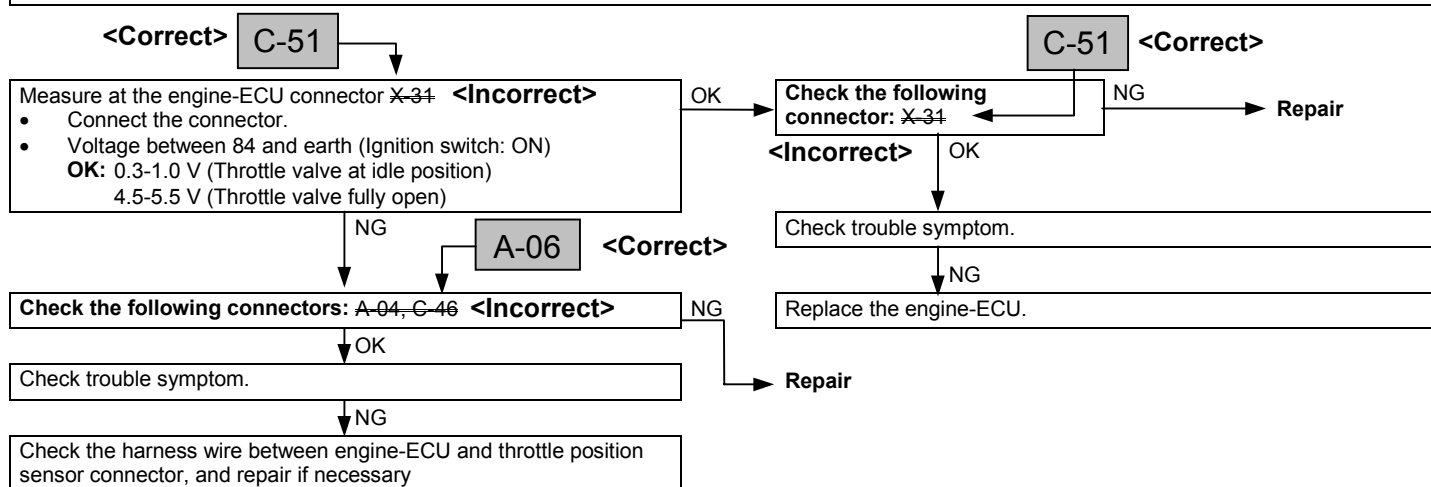
## INSPECTION PROCEDURE 46

## Check the air flow sensor (AFS) control circuit



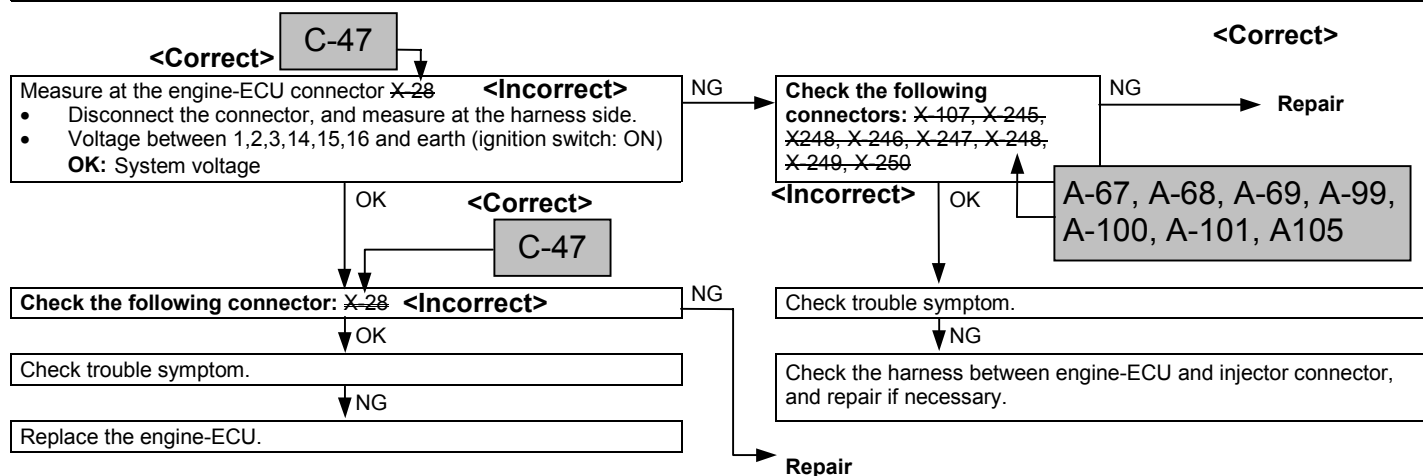
## INSPECTION PROCEDURE 47

## Check the throttle position sensor (TPS) output circuit.



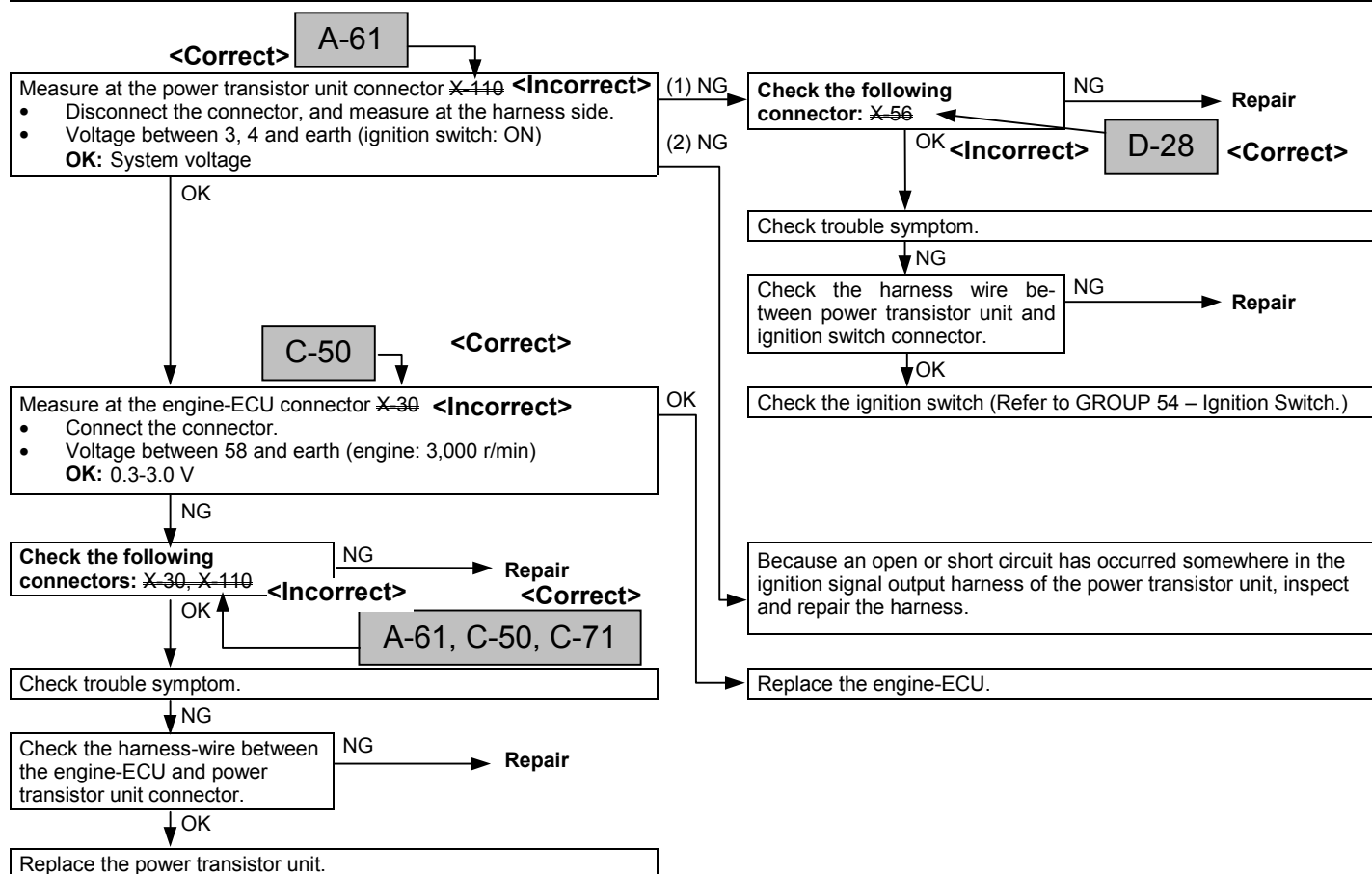
## INSPECTION PROCEDURE 48

## Check the injector control circuit.



## INSPECTION PROCEDURE 49

## Check the ignition signal circuit.



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# MULTIPOINT FUEL INJECTION (MPI) ■

## CONTENTS

<b>GENERAL .....</b>	<b>2</b>	<b>TROUBLESHOOTING .....</b>	<b>2</b>
Outline of changes .....	2		

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## GENERAL

### OUTLINE OF CHANGES

- The following service procedure has been added to the addition of vehicles with 6G72-A/T.

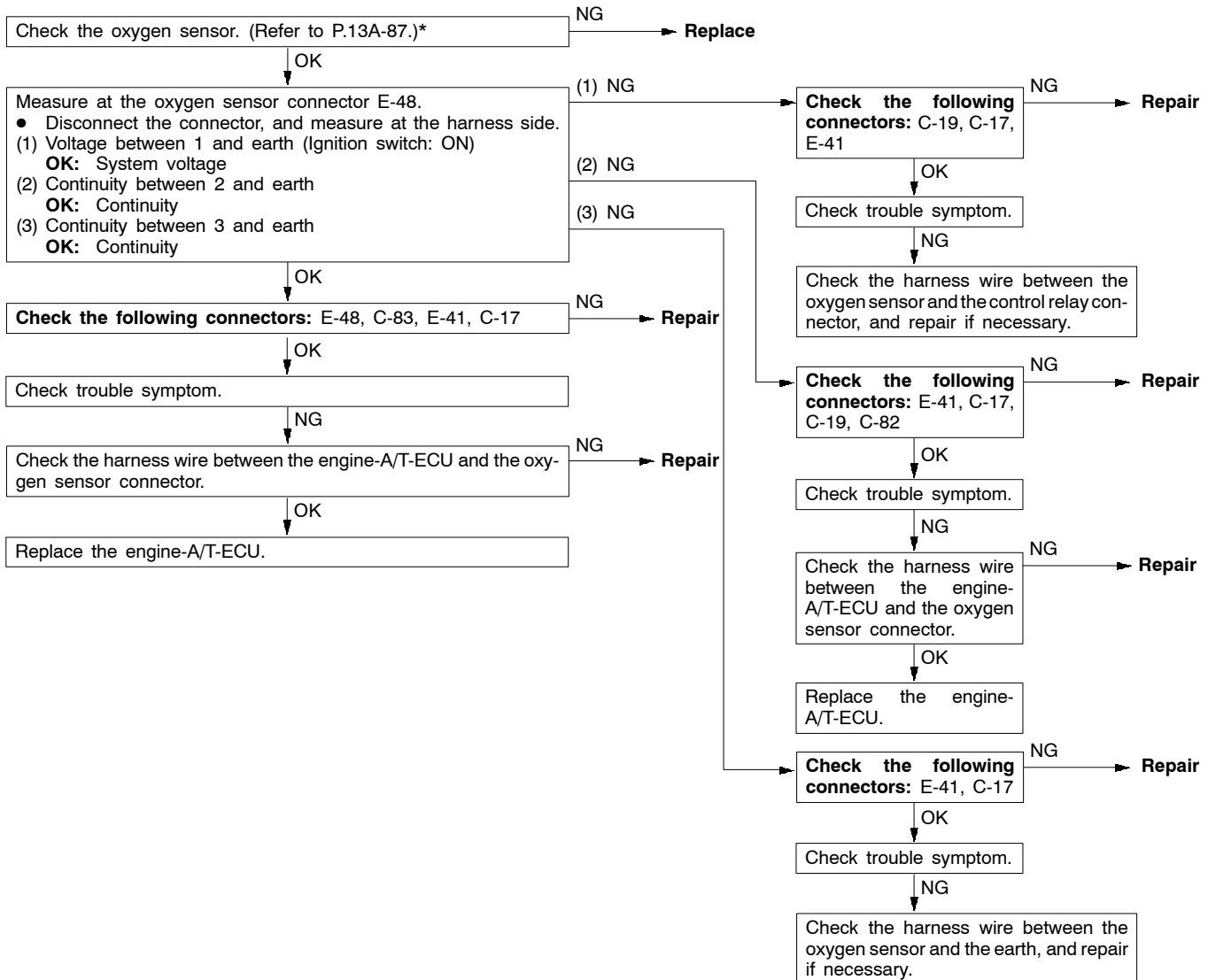
## TROUBLESHOOTING

### INSPECTION CHART FOR DIAGNOSIS CODES

Code No.	Diagnosis item	Reference page
11	Oxygen sensor system	13A-3
12	Air flow sensor system	13A-4
13	Intake air temperature sensor system	13A-4
14	Throttle position sensor system	13A-5
21	Engine coolant temperature sensor system	13A-6
22	Crank angle sensor system	13A-7
23	Camshaft position sensor system	13A-8
24	Vehicle speed sensor system	13A-9
25	Barometric pressure sensor system	13A-10
41	Injector system	13A-11
44	Ignition coil and power transistor unit system (for No. 1 and No. 4 cylinders)	13A-12
52	Ignition coil and power transistor unit system (for No. 2 and No. 5 cylinders)	13A-12
53	Ignition coil and power transistor unit system (for No. 3 and No. 6 cylinders)	13A-12
54	Immobilizer system	13A-13

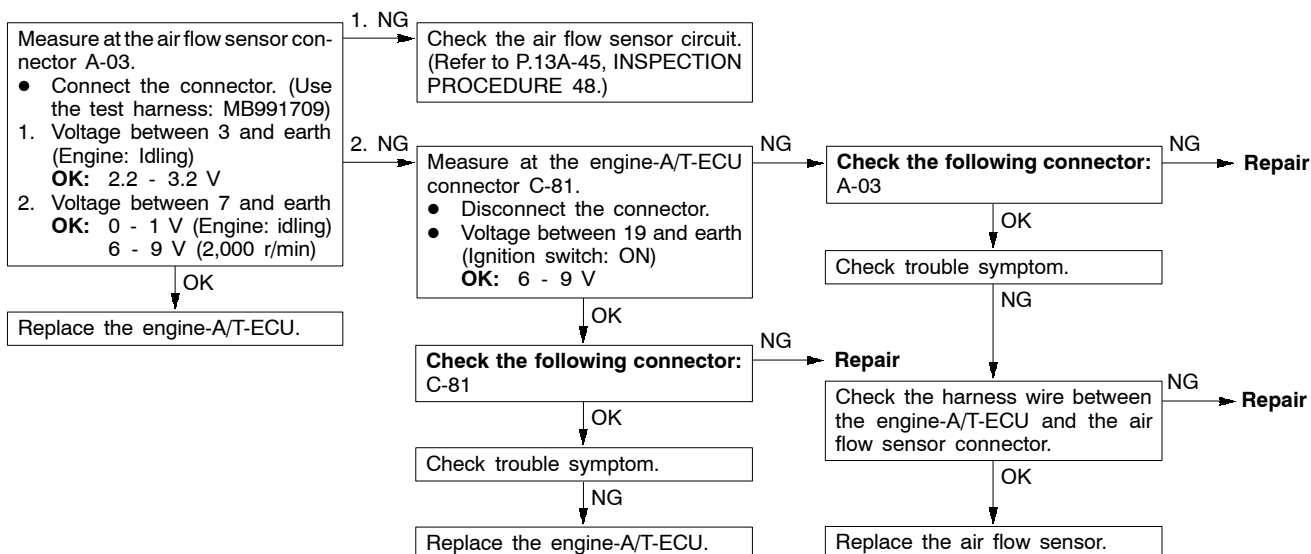
## INSPECTION PROCEDURE FOR DIAGNOSIS CODES

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-A/T-ECU</li> </ul>

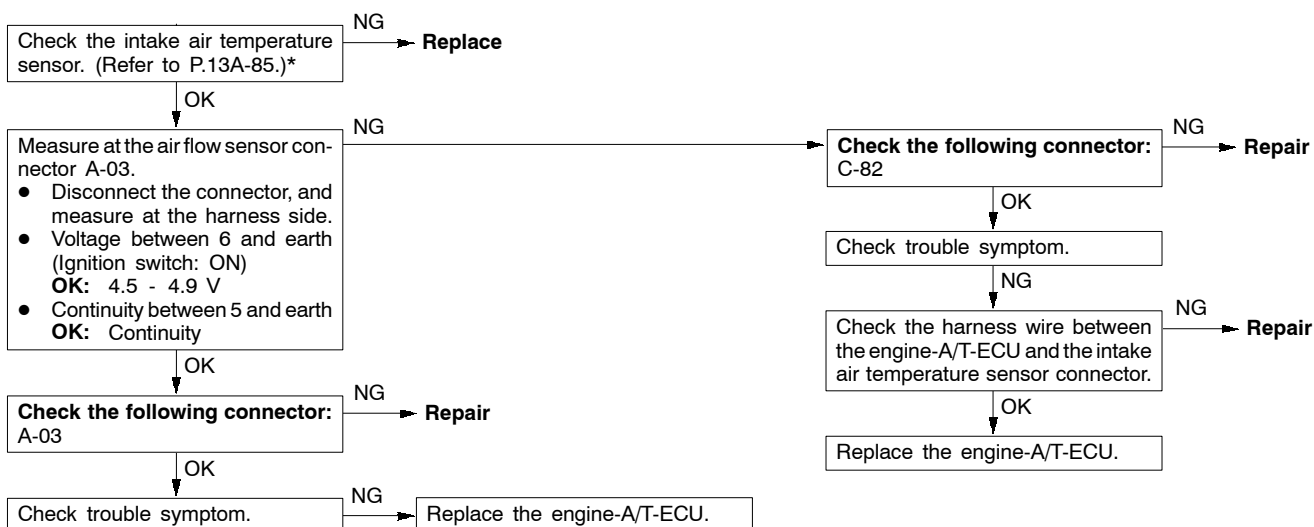


\*: Refer to '99 PAJERO SPORT Workshop Manual (Pub. No. PWJE9812).

Code No. 12 Air flow sensor system	Probable cause
Range of Check <ul style="list-style-type: none"> <li>Engine speed is 500 r/min or more.</li> </ul> Set conditions <ul style="list-style-type: none"> <li>Sensor output frequency is 3 Hz or less for 4 seconds.</li> </ul>	<ul style="list-style-type: none"> <li>Malfunction of the air flow sensor</li> <li>Improper connector contact, open circuit or short-circuited harness wire of the air flow sensor</li> <li>Malfunction of the engine-A/T-ECU</li> </ul>



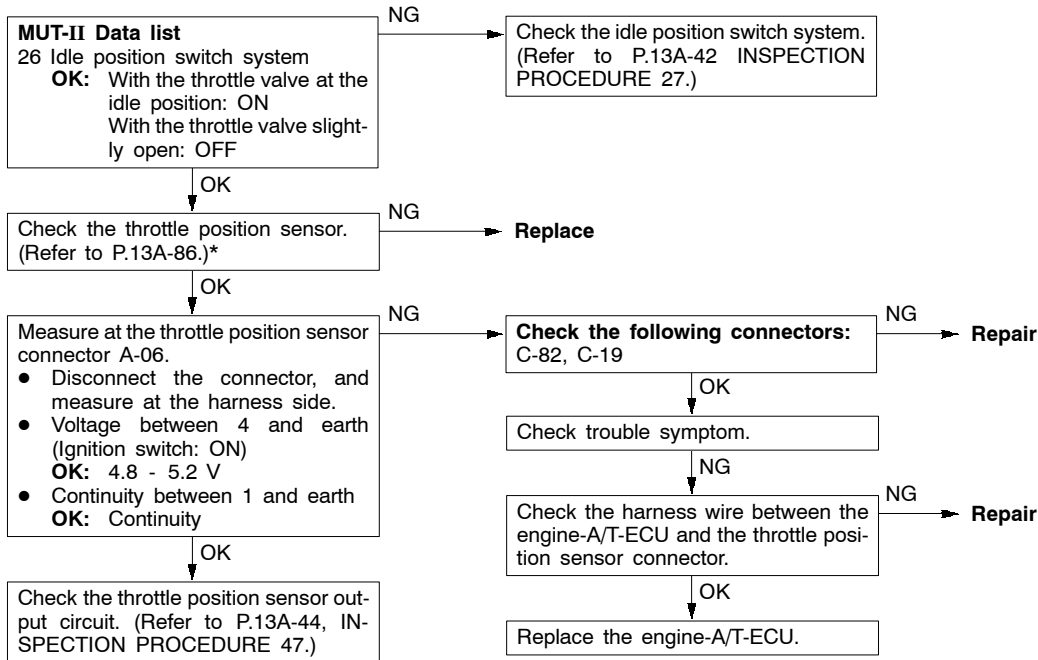
Code No. 13 Intake air temperature sensor system	Probable cause
Range of Check <ul style="list-style-type: none"> <li>Ignition switch: ON</li> <li>Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts.</li> </ul> Set conditions <ul style="list-style-type: none"> <li>Sensor output voltage is 4.6 V or more (corresponding to an intake air temperature of -45°C or less) for 4 seconds.</li> </ul> or <ul style="list-style-type: none"> <li>Sensor output voltage is 0.2V or less (corresponding to an intake air temperature of 125°C or more) for 4 seconds.</li> </ul>	<ul style="list-style-type: none"> <li>Malfunction of the intake air temperature sensor</li> <li>Improper connector contact, open circuit or short-circuited harness wire of the intake air temperature sensor circuit</li> <li>Malfunction of the engine-A/T-ECU</li> </ul>



\*: Refer to '99 PAJERO SPORT Workshop Manual (Pub. No. PWJE9812).

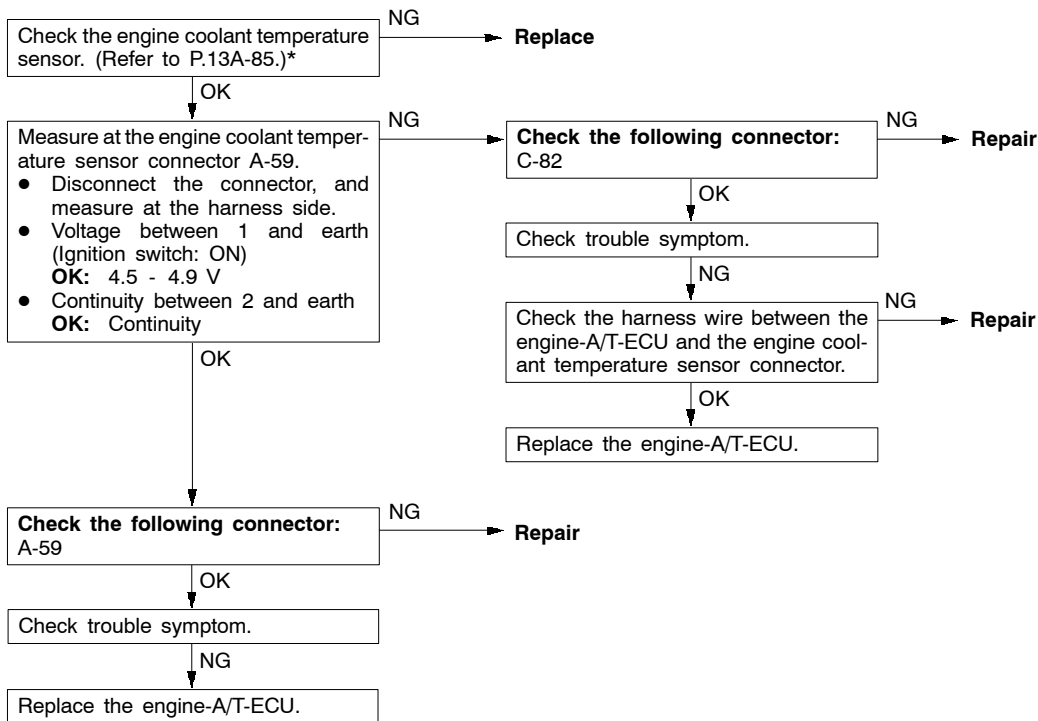


Code No. 14 Throttle position sensor system	Probable cause
Range of Check <ul style="list-style-type: none"> <li>Ignition switch: ON</li> <li>Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts.</li> </ul> Set conditions <ul style="list-style-type: none"> <li>When the idle position switch is ON, the sensor output voltage is 2 V or more for 4 seconds.</li> </ul> or <ul style="list-style-type: none"> <li>The sensor output voltage is 0.2 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>Improper "ON" state of idle position switch</li> <li>Short circuit of the idle position switch signal line</li> <li>Malfunction of the engine-A/T-ECU</li> </ul>



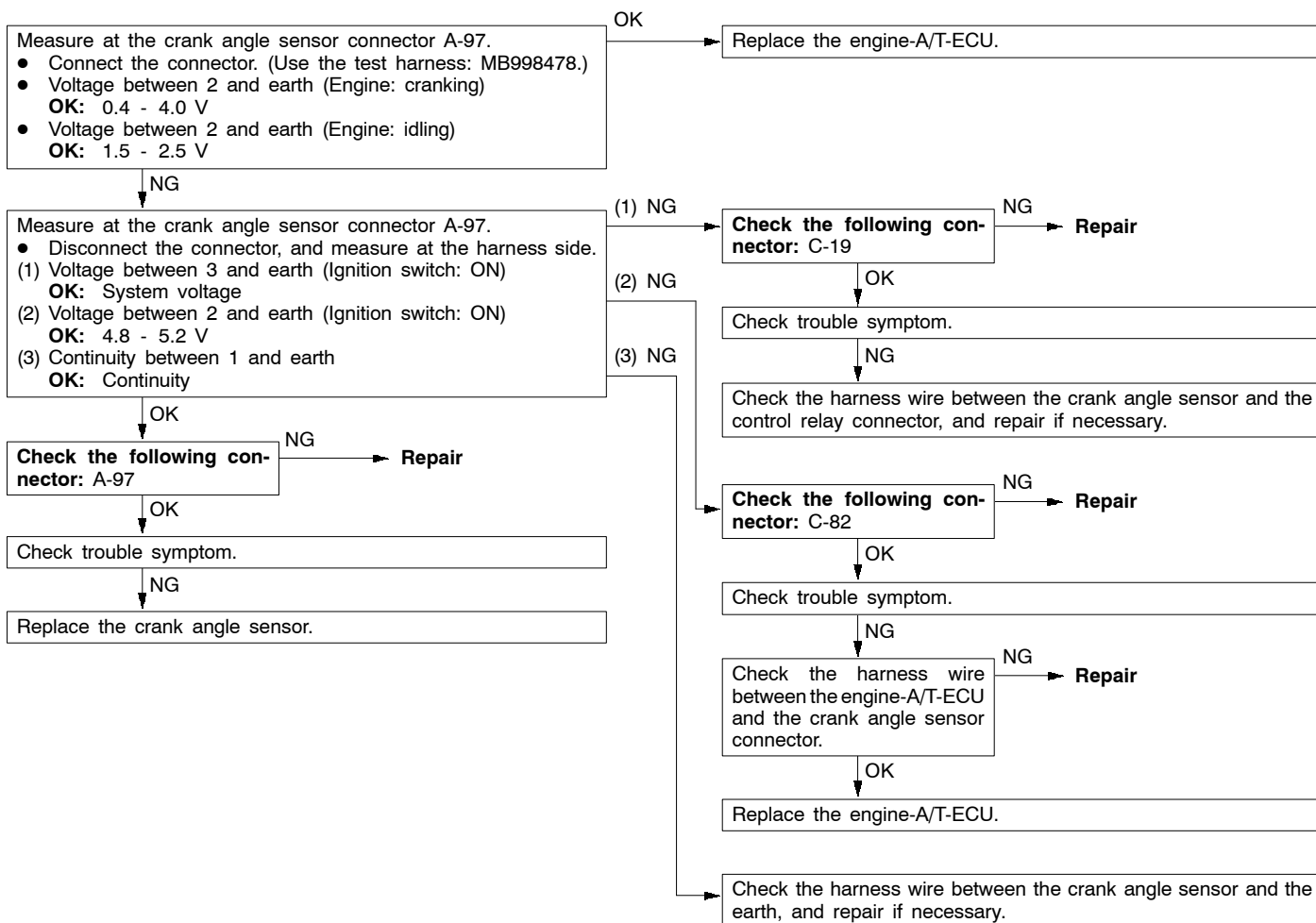
\*: Refer to '99 PAJERO SPORT Workshop Manual (Pub. No. PWJE9812).

Code No. 21 Engine coolant temperature 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>Sensor output voltage is 4.6 V or more (corresponding to an engine coolant temperature of -45°C or less) for 4 seconds.</li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>Sensor output voltage is 0.1 V or less (corresponding to an engine coolant temperature of 140°C or more) for 4 seconds.</li> </ul>	<ul style="list-style-type: none"> <li>Malfunction of the engine coolant temperature sensor</li> <li>Improper connector contact, open circuit or short-circuited harness wire of the engine coolant temperature sensor circuit</li> <li>Malfunction of the engine-A/T-ECU</li> </ul>
<p>Range of Check</p> <ul style="list-style-type: none"> <li>Ignition switch: ON</li> <li>Engine speed is approx. 50 r/min or more.</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>The sensor output voltage increases from 1.6 V or less (corresponding to an engine coolant temperature of 40°C or more) to 1.6 V or more (corresponding to an engine coolant temperature of 40°C or less).</li> <li>After this, the sensor output voltage is 1.6 V or more for 5 minutes.</li> </ul>	

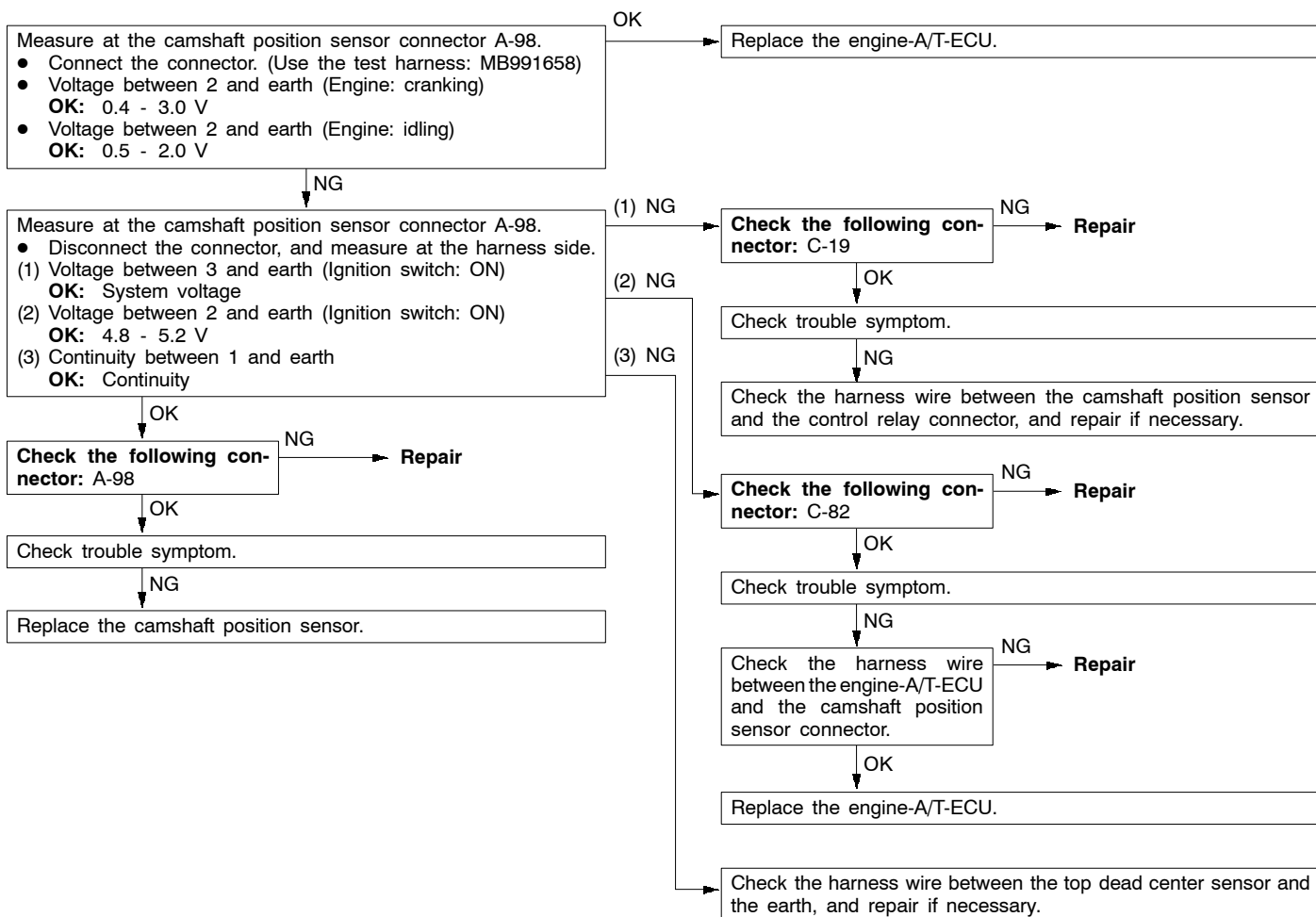


\*: Refer to '99 PAJERO SPORT Workshop Manual (Pub. No. PWJE9812).

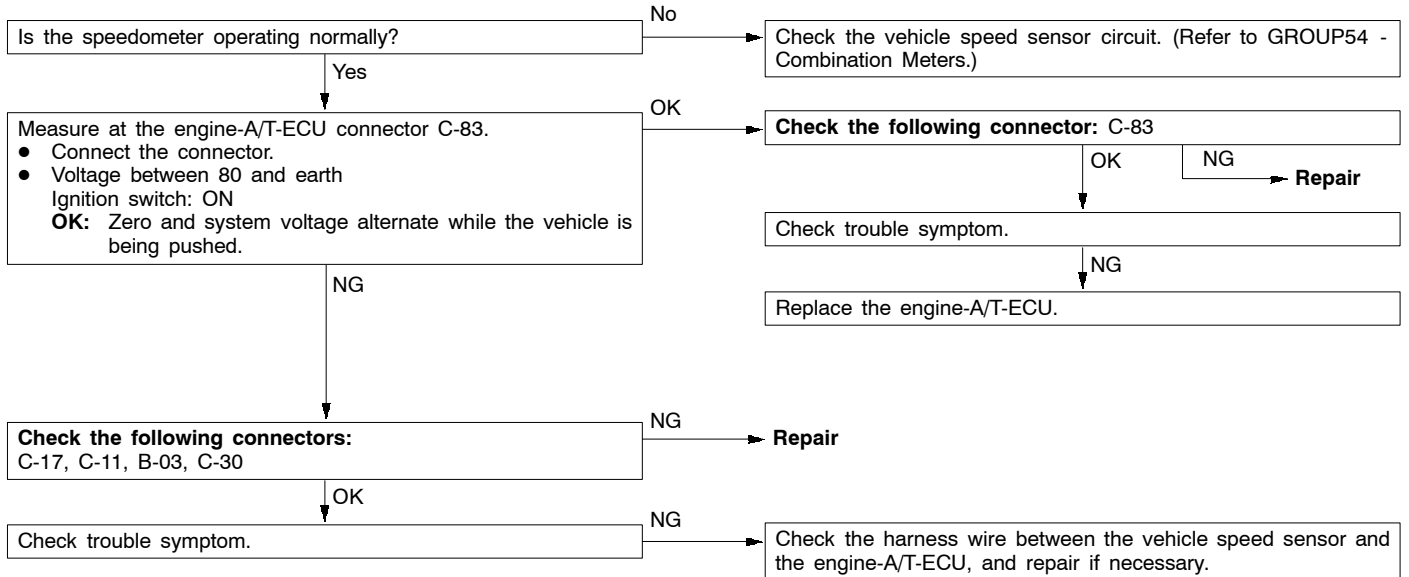
Code No. 22 Crank angle sensor system	Probable cause
Range of Check <ul style="list-style-type: none"> <li>Engine is cranking.</li> </ul> Set conditions <ul style="list-style-type: none"> <li>Sensor output voltage does not change for 4 seconds (no pulse signal input.)</li> </ul>	<ul style="list-style-type: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



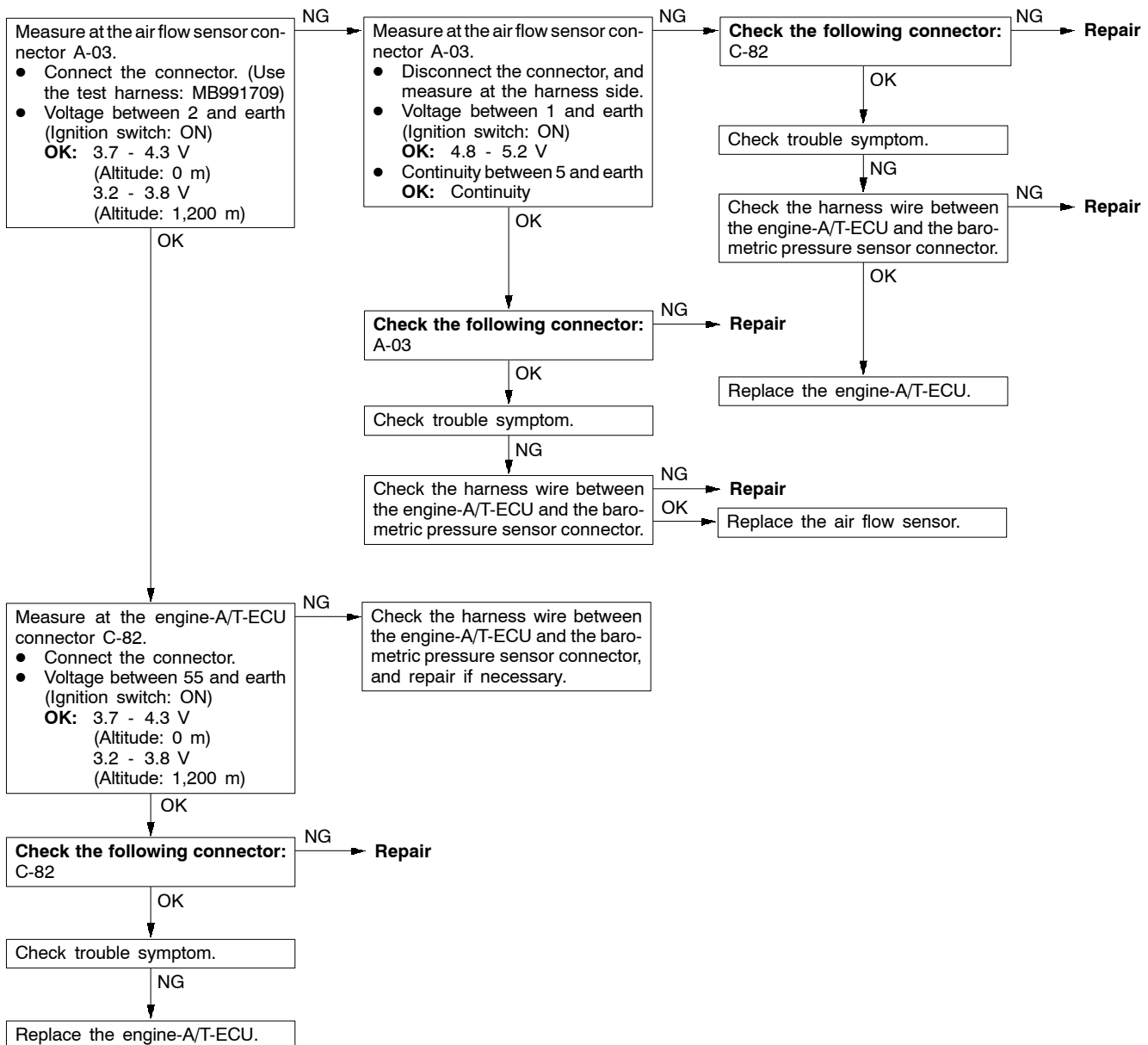
Code No. 23 Camshaft position sensor system	Probable cause
Range of Check <ul style="list-style-type: none"> <li>Ignition switch: ON</li> <li>Engine speed is approx. 50 r/min or more.</li> </ul> Set conditions <ul style="list-style-type: none"> <li>Sensor output voltage does not change for 4 seconds (no pulse signal input.)</li> </ul>	<ul style="list-style-type: none"> <li>Malfunction of the camshaft position sensor</li> <li>Improper connector contact, open circuit or short-circuited harness wire of the camshaft position sensor circuit</li> <li>Malfunction of the engine-A/T-ECU</li> </ul>



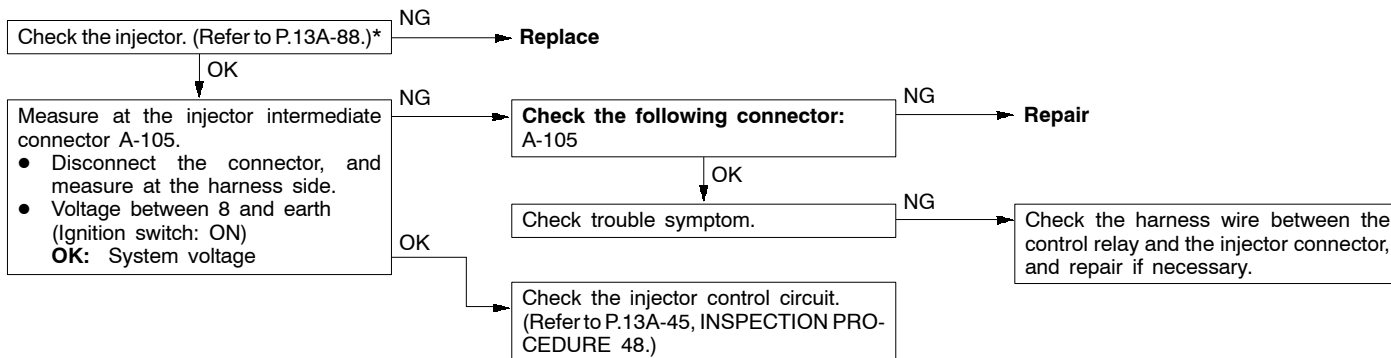
Code No. 24 Vehicle speed sensor system	Probable cause
Range of Check <ul style="list-style-type: none"> <li>Excluding 60 seconds after the engine starts.</li> <li>Idle position switch: OFF</li> <li>Engine speed is 3,000 r/min.</li> <li>Driving under high engine load conditions.</li> </ul> Set condition <ul style="list-style-type: none"> <li>Sensor output voltage does not changes 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</li> <li>Malfunction of the engine-A/T-ECU</li> </ul>



Code No. 25 Barometric pressure 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>Battery voltage is 8 V or more.</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>Sensor output voltage is 4.5 V or more (corresponding to a barometric pressure of 114 kPa or more) for 4 seconds.</li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>Sensor output voltage is 0.2 V or less (corresponding to a barometric pressure of 5.33 kPa or less) for 4 seconds.</li> </ul>	<ul style="list-style-type: none"> <li>Malfunction of the barometric pressure sensor</li> <li>Improper connector contact, open circuit or short-circuited harness wire of the barometric pressure sensor circuit</li> <li>Malfunction of the engine-A/T-ECU</li> </ul>

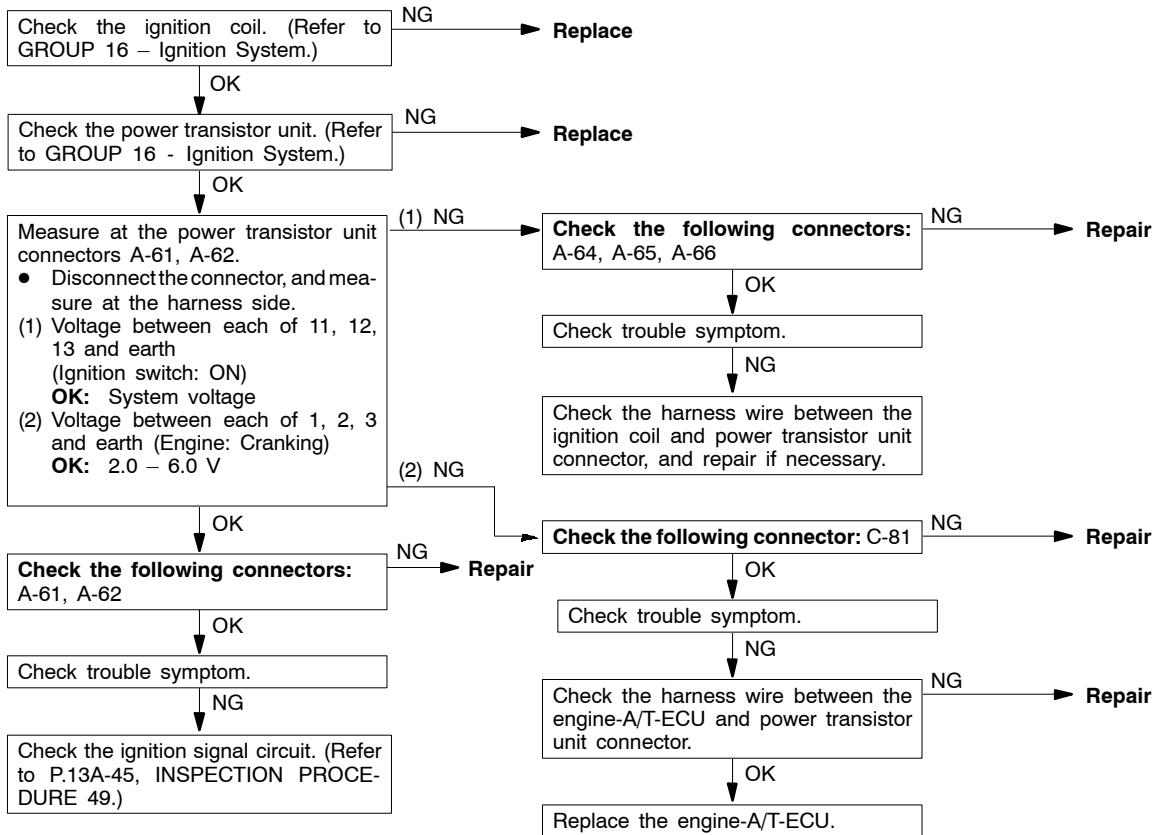


Code No. 41 Injector system	Probable cause
Range of Check <ul style="list-style-type: none"> <li>Engine speed is approx. 50 - 1,000 r/min</li> <li>The throttle position sensor output voltage is 1.15 V or less.</li> <li>Actuator test by MUT-II is not carried out.</li> </ul> Set conditions <ul style="list-style-type: none"> <li>Surge voltage of injector coil is not detected for 4 seconds.</li> </ul>	<ul style="list-style-type: none"> <li>Malfunction of the injector</li> <li>Improper connector contact, open circuit or short-circuited harness wire of the injector circuit</li> <li>Malfunction of the engine-A/T-ECU</li> </ul>



\*: Refer to '99 PAJERO SPORT Workshop Manual (Pub. No. PWJE9812).

Code No. 44, 52, 53 Ignition coil and power transistor unit system	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>Engine speed is approx. 50 - 4,000 r/min.</li> <li>Engine is not cranking.</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>The ignition signal from the same coil is not input for 4 seconds.</li> </ul> <p>However, this excludes cases where no ignition signal is input from any coils.</p>	<ul style="list-style-type: none"> <li>Malfunction of the ignition coil</li> <li>Improper connector contact, open circuit or short-circuited harness wire of the ignition primary circuit</li> <li>Malfunction of the power transistor unit</li> <li>Malfunction of the engine-A/T-ECU</li> </ul>

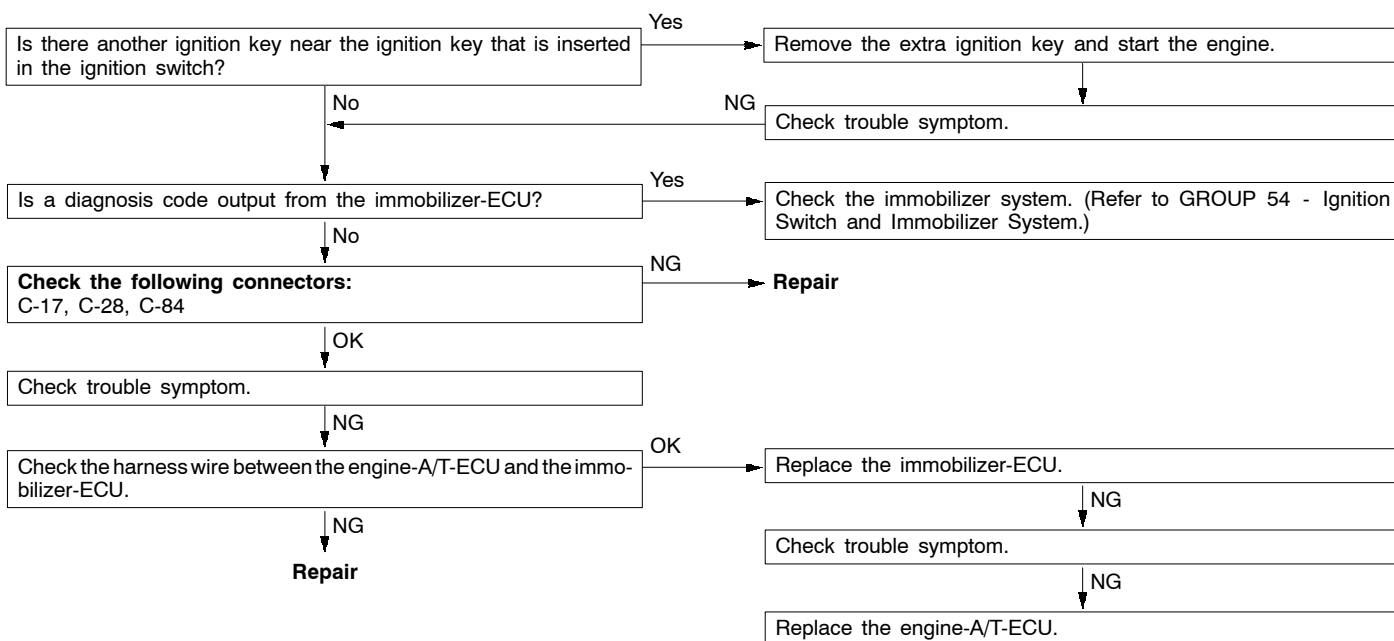




Code No. 54 Immobilizer system	Probable cause
Range of Check • Ignition switch: ON Set Conditions • Improper communication between the engine-ECU and immobilizer-ECU	• Radio interference of ID codes • Incorrect ID code • Malfunction of harness or connector • Malfunction of immobilizer-ECU • Malfunction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



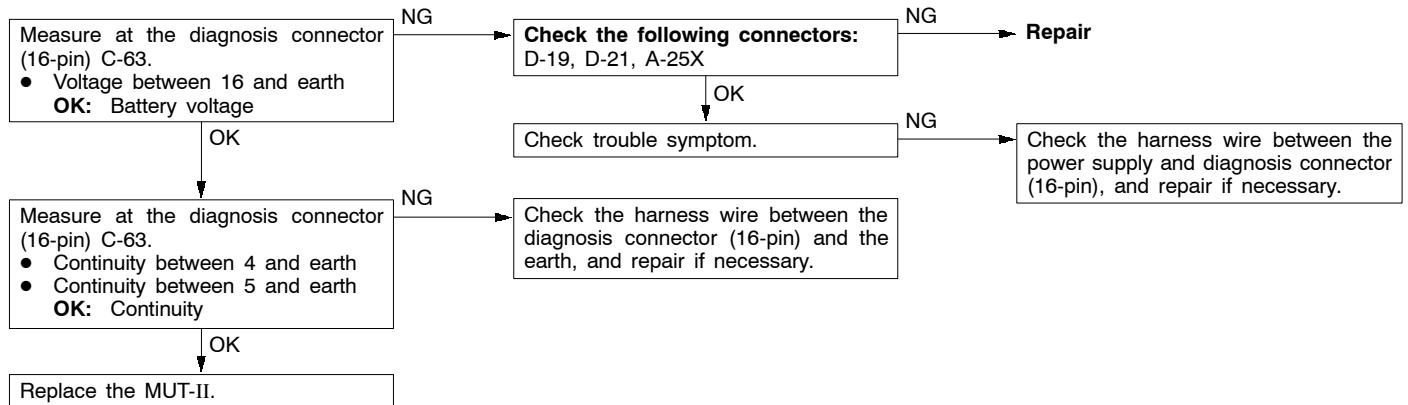
## INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom		Inspection procedure No.	Reference page
Communication with MUT-II is impossible	Communication with all systems is not possible.	1	13A-15
	Communication with engine-A/T-ECU only is not possible.	2	13A-15
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	13A-16
	The engine warning lamp remains illuminating and never goes out.	4	13A-17
Starting	No initial combustion (starting impossible)	5	13A-17
	Initial combustion but no complete combustion (starting impossible)	6	13A-18
	Long time to start (improper starting)	7	13A-19
Idling stability (Improper idling)	Unstable idling (Rough idling, hunting)	8	13A-20
	Idling speed is high. (Improper idling speed)	9	13A-21
	Idling speed is low. (Improper idling speed)	10	13A-21
Idling stability (Engine stalls)	When the engine is cold, it stalls at idling. (Die out)	11	13A-22
	When the engine becomes hot, it stalls at idling. (Die out)	12	13A-23
	The engine stalls when starting the car. (Pass out)	13	13A-24
	The engine stalls when decelerating.	14	13A-24
Driving	Hesitation, sag or stumble	15	13A-25
	The feeling of impact or vibration when accelerating	16	13A-25
	The feeling of impact or vibration when decelerating	17	13A-26
	Poor acceleration	18	13A-26
	Surge	19	13A-27
	Knocking	20	13A-27
Dieseling		21	13A-27
Too high CO and HC concentration when idling		22	13A-28
Idling speed is improper when A/C is operating		23	13A-29
A/C condensor fan is inoperative		24	13A-29

## INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

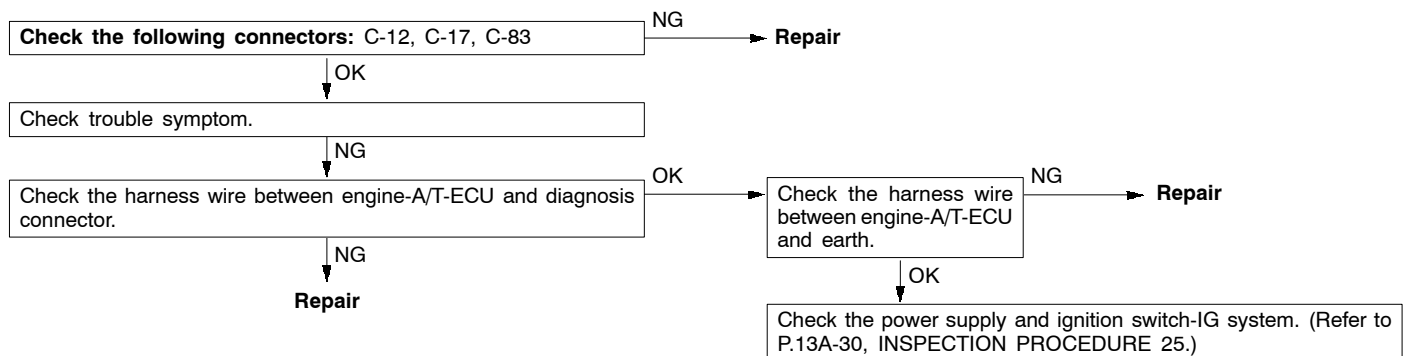
## INSPECTION PROCEDURE 1

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



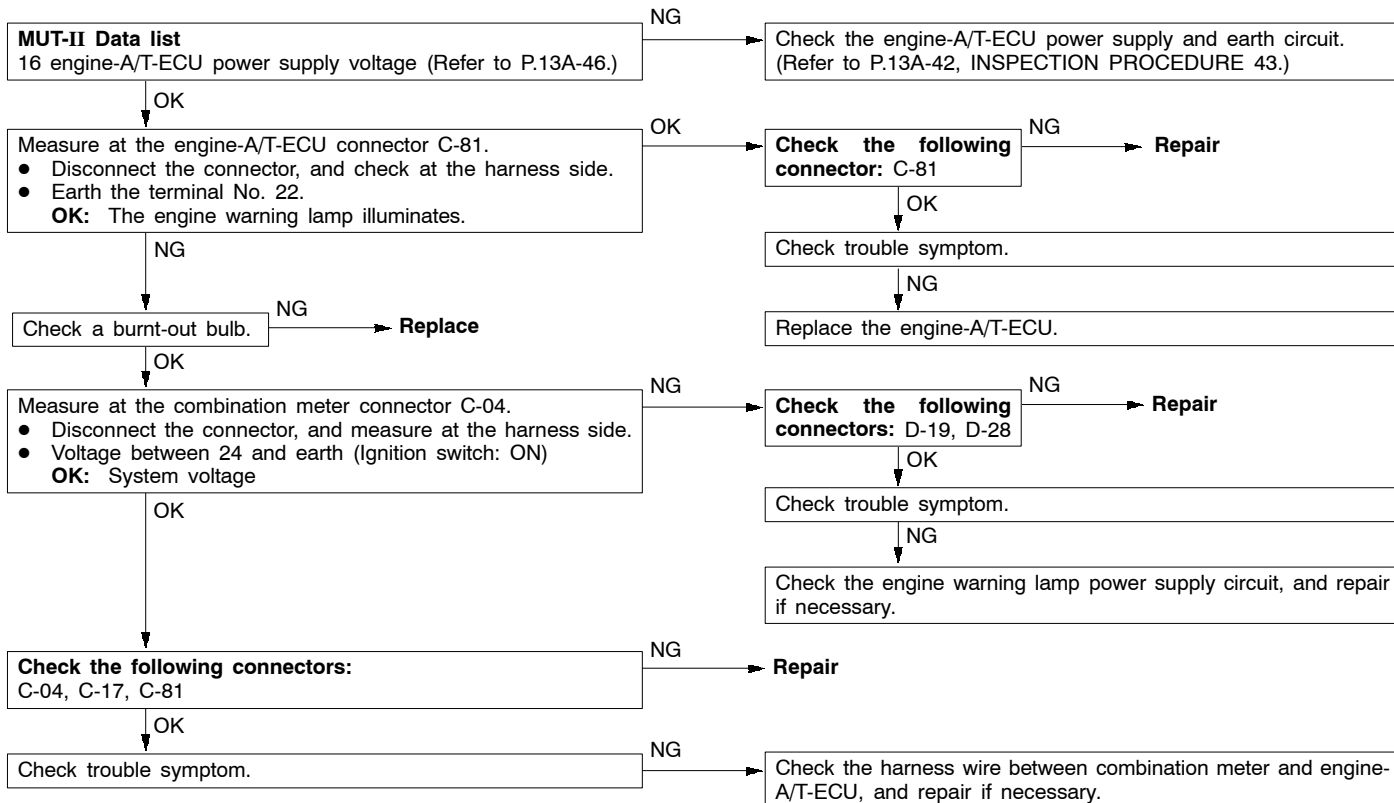
## INSPECTION PROCEDURE 2

MUT-II communication with engine-ECU is not possible.	Probable cause
One of the following causes may be suspected. <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-A/T-ECU power supply circuit</li> <li>• Malfunction of engine-A/T-ECU</li> <li>• Open circuit between engine-A/T-ECU and diagnosis connector</li> </ul>



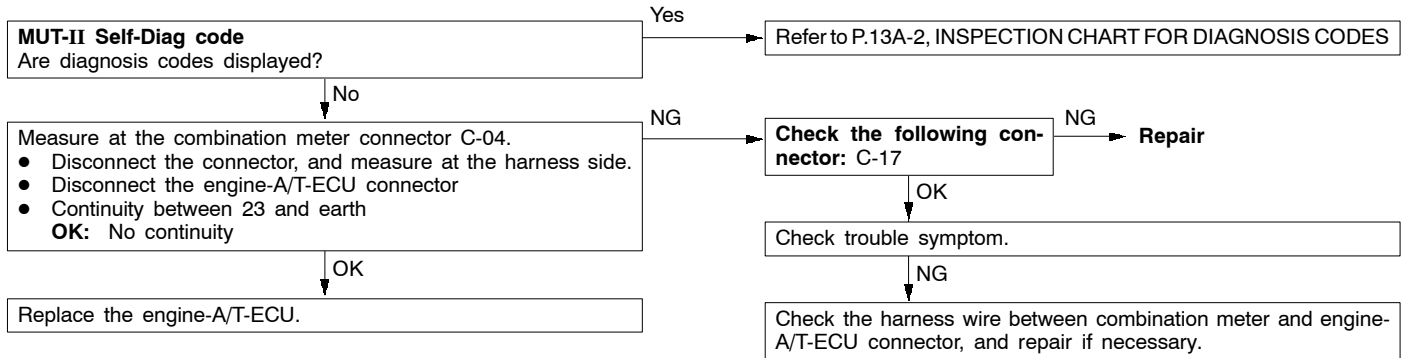
## INSPECTION PROCEDURE 3

The engine warning lamp does not illuminate right after the ignition switch is turned to the ON position.	Probable cause
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.	<ul style="list-style-type: none"> <li>• Burnt-out bulb</li> <li>• Defective warning lamp circuit</li> <li>• Malfunction of the engine-A/T-ECU</li> </ul>



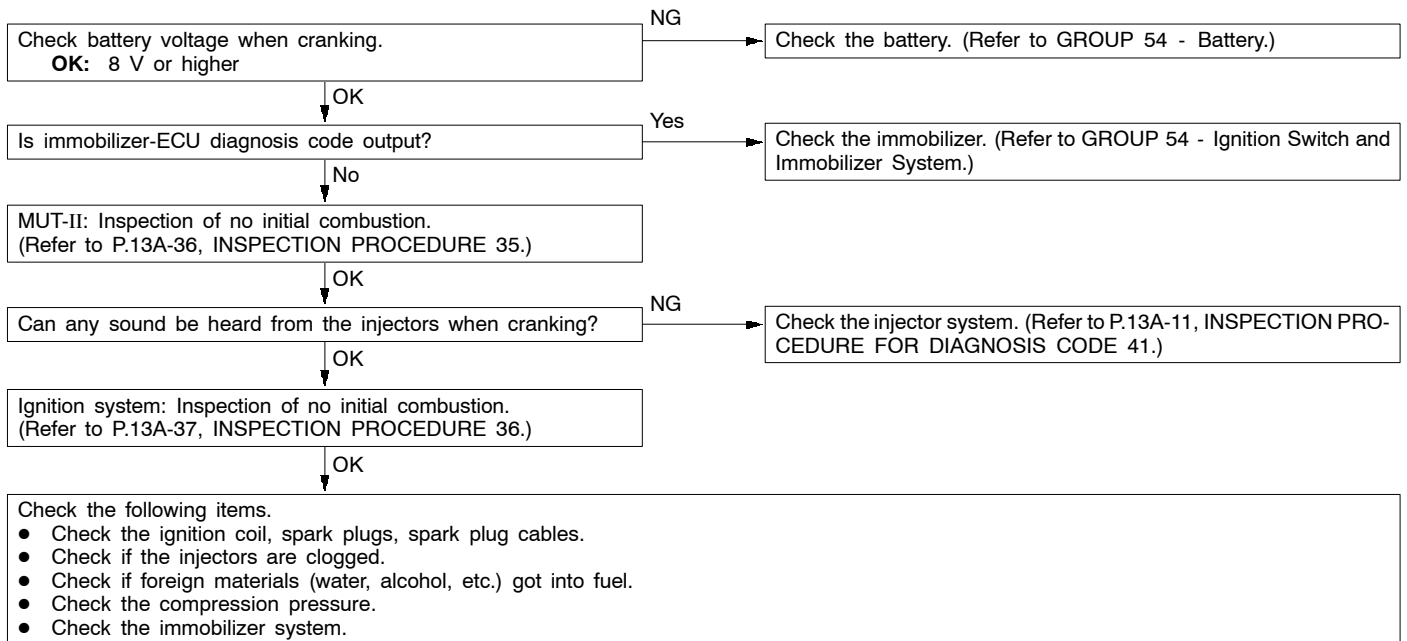
## INSPECTION PROCEDURE 4

The engine warning lamp remains illuminating and never goes out.	Probable cause
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.	<ul style="list-style-type: none"> <li>Short-circuit between the engine warning lamp and engine-A/T-ECU</li> <li>Malfunction of the engine-A/T-ECU</li> </ul>



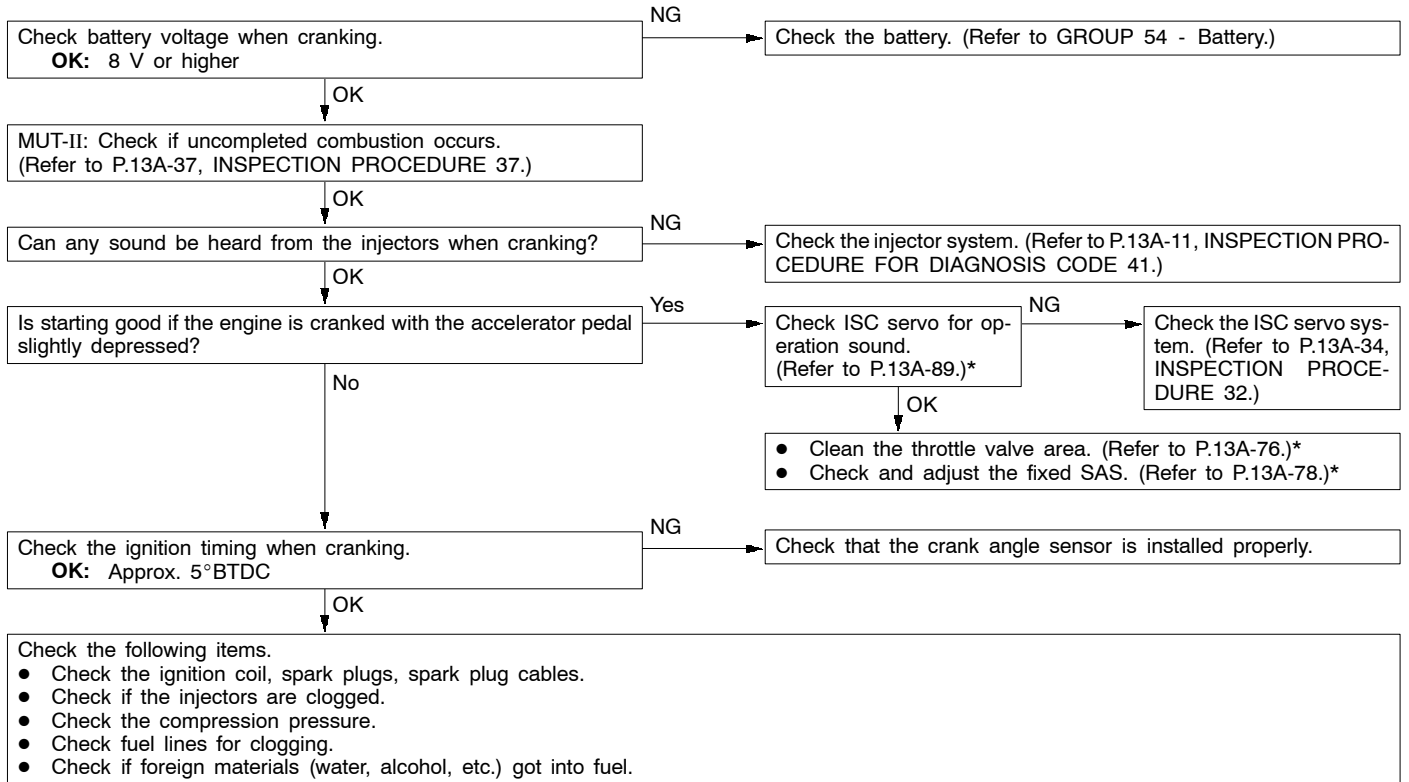
## INSPECTION PROCEDURE 5

No initial combustion (starting impossible)	Probable cause
In cases such as the above, the cause is probably that a spark plug is defective, or that the supply of fuel to the combustion chamber is defective. In addition, foreign materials (water, kerosene, etc.) may be mixed with the fuel.	<ul style="list-style-type: none"> <li>Malfunction of the ignition system</li> <li>Malfunction of the fuel pump system</li> <li>Malfunction of the injectors</li> <li>Malfunction of the engine-A/T-ECU</li> <li>Malfunction of the immobilizer system</li> <li>Foreign materials in fuel</li> </ul>



## INSPECTION PROCEDURE 6

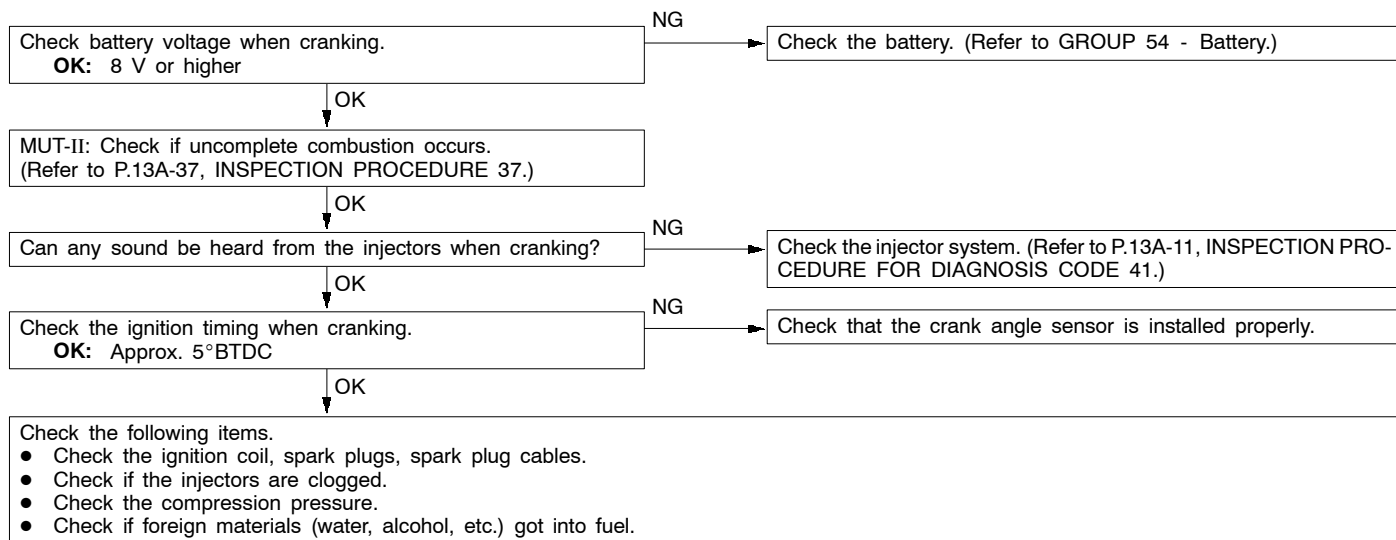
Initial combustion but no complete combustion (starting impossible)	Probable cause
In such cases as the above, the cause is probably that the spark plugs are generating sparks but the sparks are weak, or the initial mixture for starting is not appropriate.	<ul style="list-style-type: none"> <li>● Malfunction of the ignition system</li> <li>● Malfunction of the injector system</li> <li>● Foreign materials in fuel</li> <li>● Poor compression</li> <li>● Malfunction of the engine-A/T-ECU</li> </ul>



\*: Refer to '99 PAJERO SPORT Workshop Manual (Pub. No. PWJE9812).

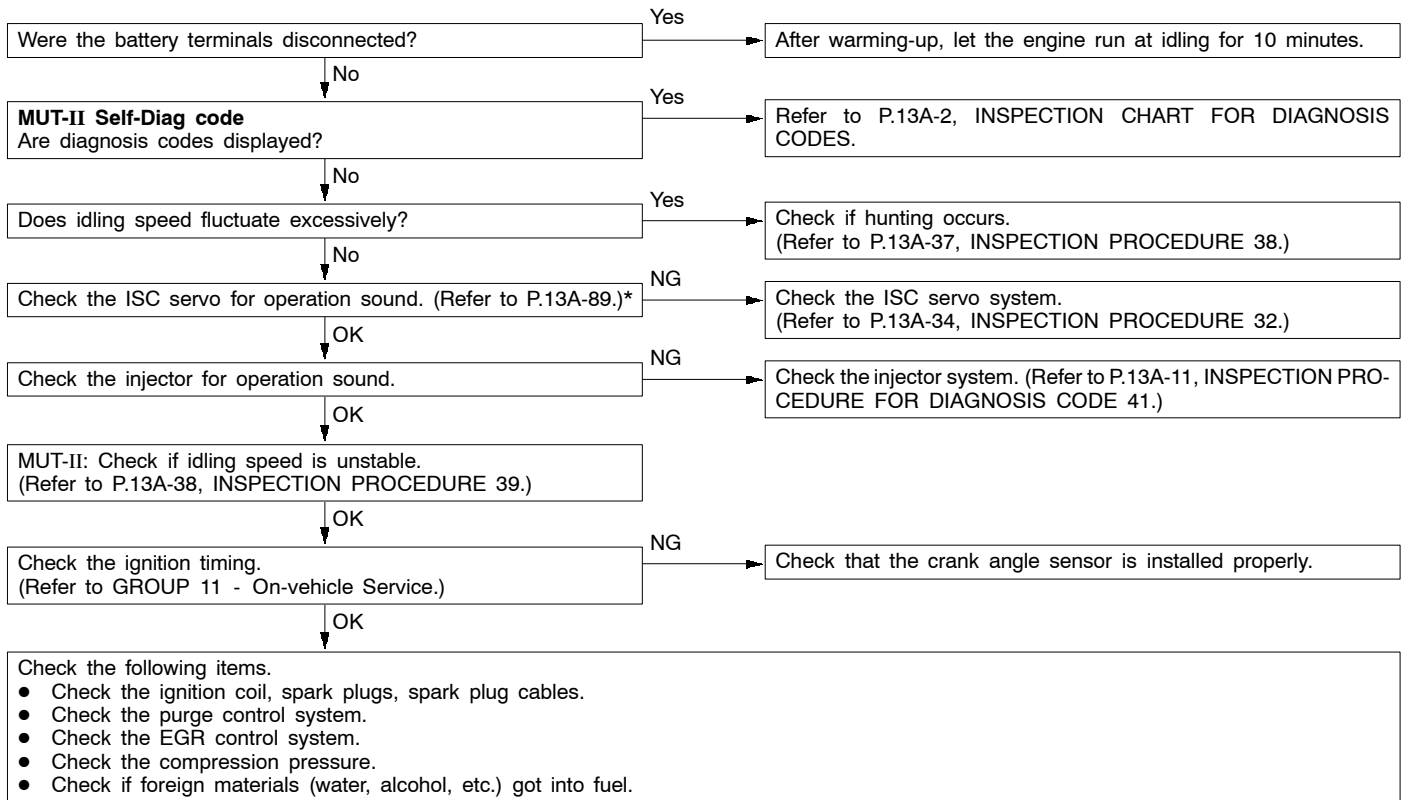
## INSPECTION PROCEDURE 7

It takes too long time to start. (Improper starting)	Probable cause
In cases such as the above, the cause is probably that the spark is weak and ignition is difficult, the initial mixture for starting is not appropriate, or sufficient compression pressure is not being obtained.	<ul style="list-style-type: none"> <li>● Malfunction of the ignition system</li> <li>● Malfunction of the injector system</li> <li>● Inappropriate gasoline use</li> <li>● Poor compression</li> </ul>



## INSPECTION PROCEDURE 8

Unstable idling (Rough idling, hunting)	Probable cause
In cases as the above, the cause is probably that the ignition system, air/fuel mixture, idle speed control (ISC) or compression pressure is defective. Because the range of possible causes is broad, inspection is narrowed down to simple items.	<ul style="list-style-type: none"> <li>● Malfunction of the ignition system</li> <li>● Malfunction of air-fuel ratio control system</li> <li>● Malfunction of the ISC system</li> <li>● Malfunction of the purge control solenoid valve system</li> <li>● Malfunction of the EGR control solenoid valve system</li> <li>● Poor compression</li> <li>● Drawing air into exhaust system</li> </ul>

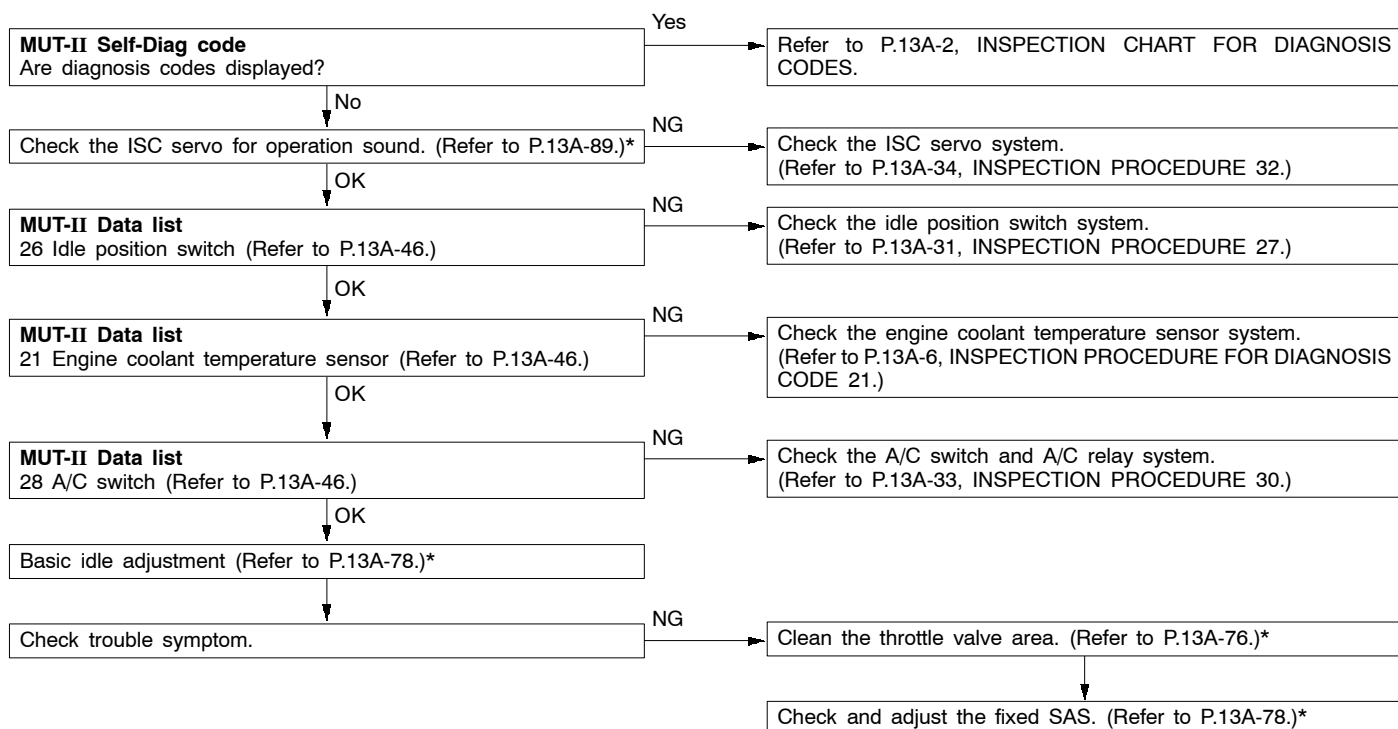


\*: Refer to '99 PAJERO SPORT Workshop Manual (Pub. No. PWJE9812).



## INSPECTION PROCEDURE 9

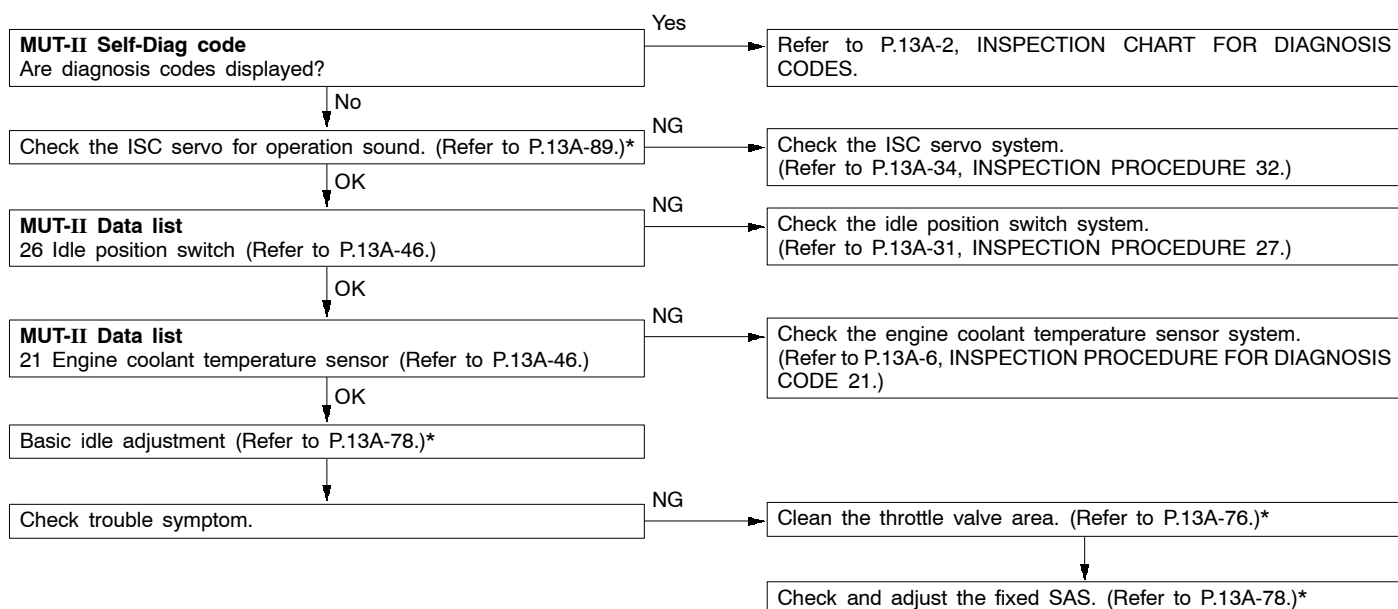
Idling speed is high. (Improper idling speed)	Probable cause
In such cases as the above, the cause is probably that the intake air volume during idling is too great.	<ul style="list-style-type: none"> <li>• Malfunction of the ISC servo system</li> <li>• Malfunction of the throttle body</li> </ul>



\*: Refer to '99 PAJERO SPORT Workshop Manual (Pub. No. PWJE9812).

## INSPECTION PROCEDURE 10

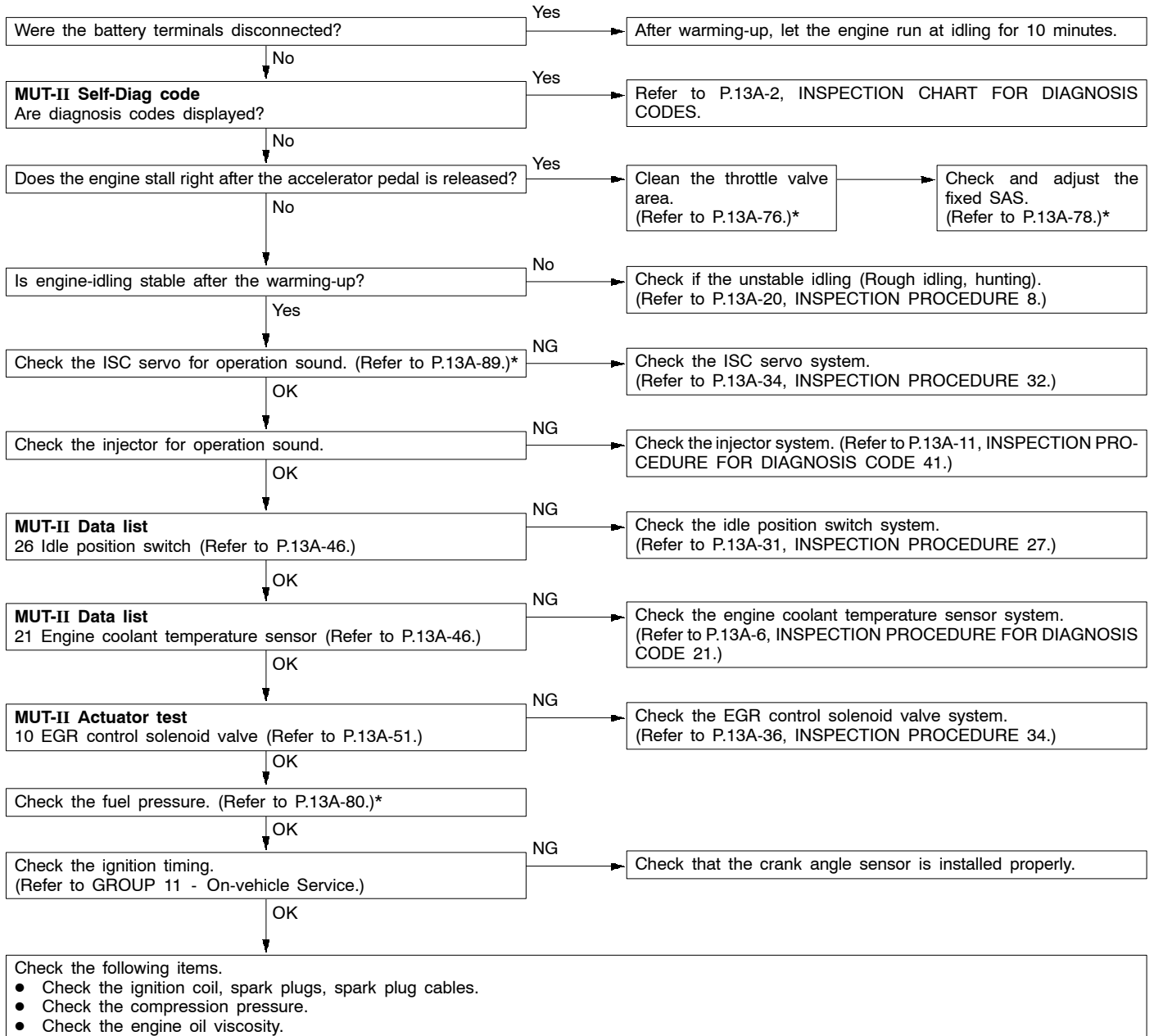
Idling speed is low. (Improper idling speed)	Probable cause
In cases such as the above, the cause is probably that the intake air volume during idling is too small.	<ul style="list-style-type: none"> <li>• Malfunction of the ISC servo system</li> <li>• Malfunction of the throttle body</li> </ul>



\*: Refer to '99 PAJERO SPORT Workshop Manual (Pub. No. PWJE9812).

## INSPECTION PROCEDURE 11

When the engine is cold, it stalls at idling. (Die out)	Probable cause
In such cases as the above, the cause is probably that the air/fuel mixture is inappropriate when the engine is cold, or that the intake air volume is insufficient.	<ul style="list-style-type: none"> <li>• Malfunction of the ISC servo system</li> <li>• Malfunction of the throttle body</li> <li>• Malfunction of the injector system</li> <li>• Malfunction of the ignition system</li> </ul>



\*: Refer to '99 PAJERO SPORT Workshop Manual (Pub. No. PWJE9812).

## INSPECTION PROCEDURE 12

When the engine becomes hot, it stalls at idling. (Die out)	Probable cause
In such cases as the above, the cause is probably that ignition system, air/fuel mixture, idle speed control (ISC) or compression pressure is defective. In addition, if the engine suddenly stalls, the cause may also be a defective connector contact.	<ul style="list-style-type: none"> <li>● Malfunction of the ignition system</li> <li>● Malfunction of air-fuel ratio control system</li> <li>● Malfunction of the ISC system</li> <li>● Drawing air into intake system</li> <li>● Improper connector contact</li> </ul>

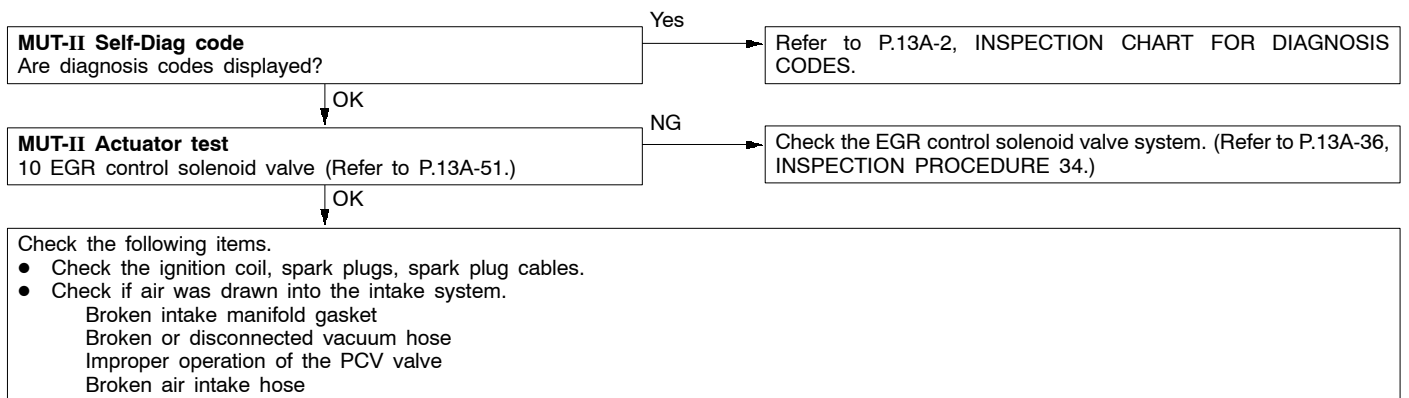
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graph TD
    Q1[Were the battery terminals disconnected?] -- Yes --> A1[After warming-up, let the engine run at idling for 10 minutes.]
    Q1 -- No --> Q2[MUT-II Self-Diag code  
Are diagnosis codes displayed?]
    Q2 -- Yes --> A2[Refer to P.13A-2, INSPECTION CHART FOR DIAGNOSIS CODES.]
    Q2 -- No --> Q3[Check the ISC servo for operation sound. (Refer to P.13A-89.)*]
    Q3 -- NG --> A3[Check the ISC servo system.  
(Refer to P.13A-34, INSPECTION PROCEDURE 32.)]
    Q3 -- OK --> Q4[Check the injector for operation sound.]
    Q4 -- NG --> A4[Check the injector system. (Refer to P.13A-11, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 41.)]
    Q4 -- OK --> Q5[Does the engine stall right after the accelerator pedal is released?]
    Q5 -- Yes --> A5[Clean the throttle valve area.  
(Refer to P.13A-76.)*]
    A5 --> A6[Check and adjust the fixed SAS.  
(Refer to P.13A-78.)*]
    Q5 -- No --> Q6[Does the engine stall easily again?]
    Q6 -- Yes --> A7[MUT-II: Engine stalling inspection when the engine is warm and idling. (Refer to P.13A-39, INSPECTION PROCEDURE 40.)]
    A7 --> A8[While carrying out an intermittent malfunction simulation test (Refer to GROUP 00 - Points to Note for Intermittent Malfunctions.), check for sudden changes in the signals shown below.  
● Crank angle sensor signal  
● Air flow sensor signal  
● Injector drive signal  
● Primary and secondary ignition signal  
● Fuel pump drive signal  
● Engine-A/T-ECU power supply voltage]
    Q6 -- No --> Q7[Check the ignition timing.  
(Refer to GROUP 11 - On-vehicle Service.)]
    Q7 -- NG --> A9[Check that the crank angle sensor is installed properly.]
    Q7 -- OK --> A10[Check the following items.  
● Check the ignition coil, spark plugs, spark plug cables.  
● Check if the injectors are clogged.  
● Check the compression pressure.  
● Check if foreign materials (water, alcohol, etc.) got into fuel.]
  
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\*: Refer to '99 PAJERO SPORT Workshop Manual (Pub. No. PWJE9812).

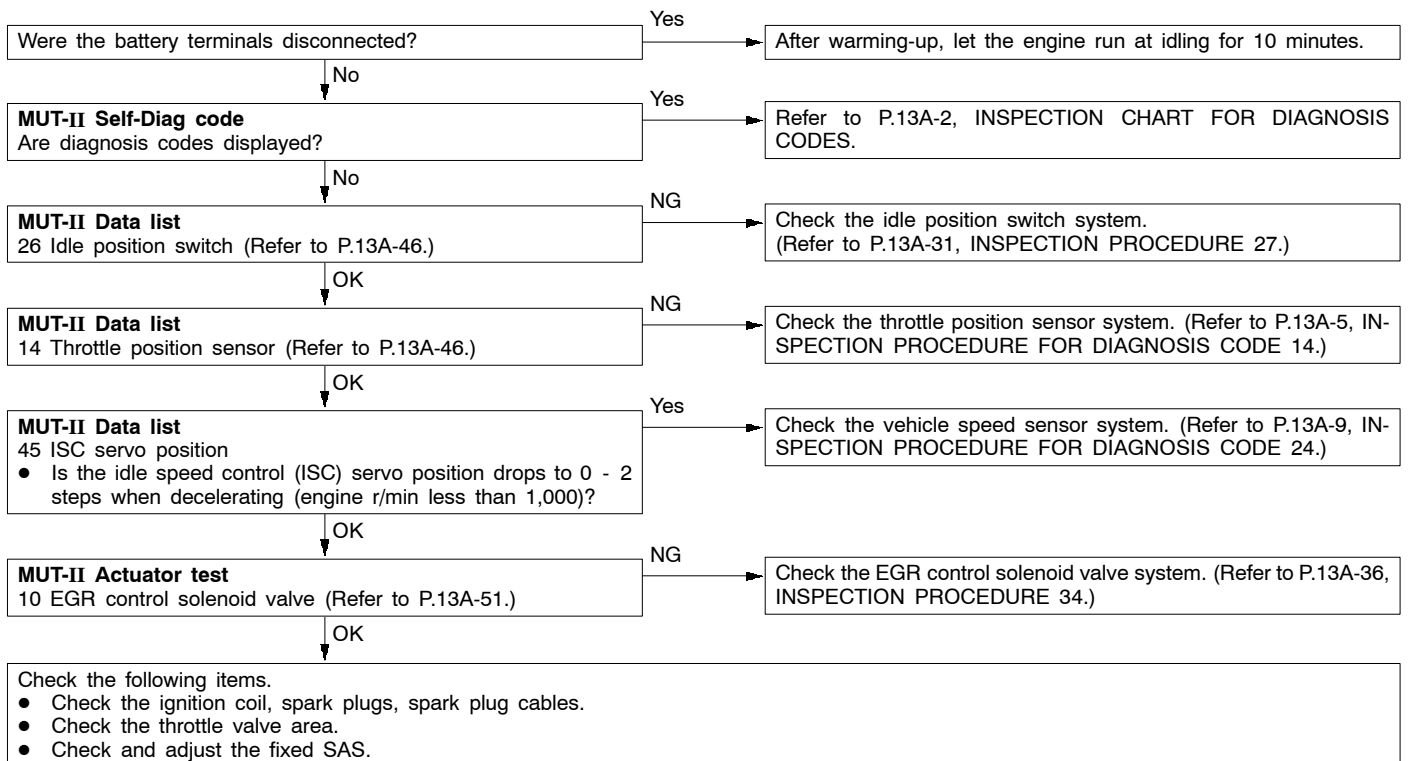
## INSPECTION PROCEDURE 13

The engine stalls when starting the car. (Pass out)	Probable cause
In cases such as the above, the cause is probably misfiring due to a weak spark, or an inappropriate air/fuel mixture when the accelerator pedal is depressed.	<ul style="list-style-type: none"> <li>• Drawing air into intake system</li> <li>• Malfunction of the ignition system</li> </ul>



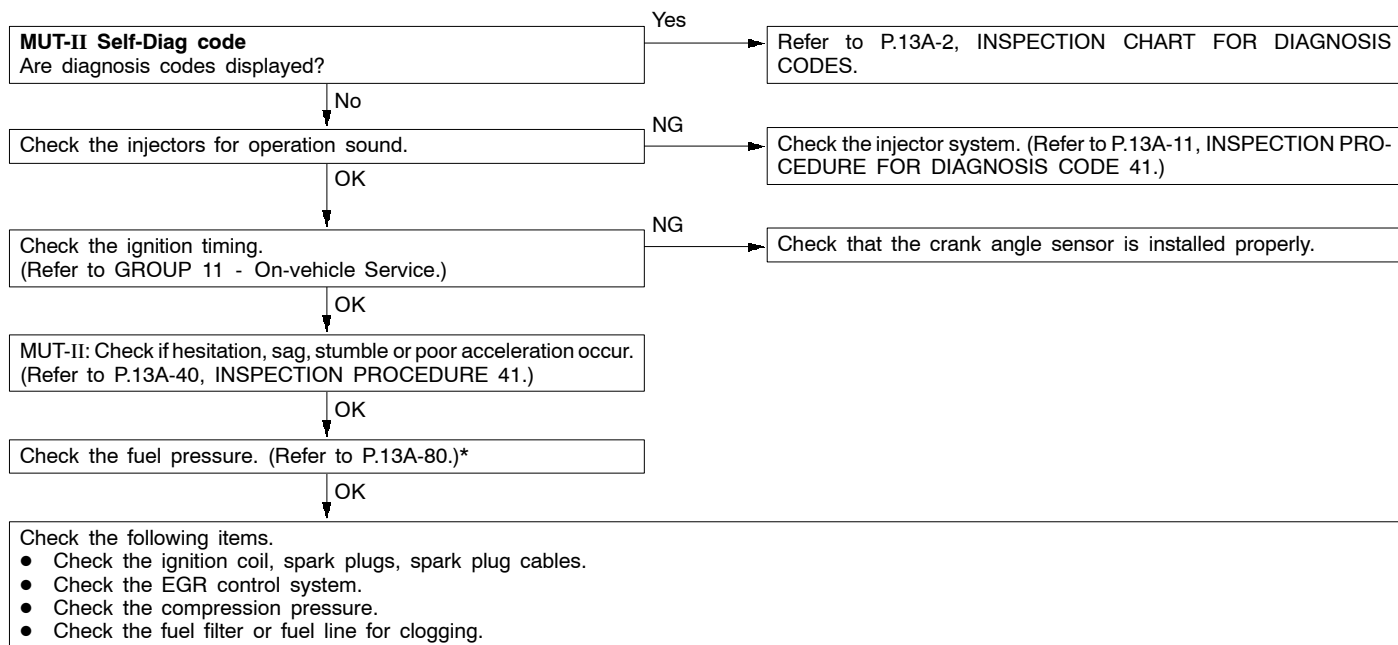
## INSPECTION PROCEDURE 14

The engine stalls when decelerating.	Probable cause
In cases such as the above, the cause is probably that the intake air volume is insufficient due to a defective idle speed control (ISC) servo system.	<ul style="list-style-type: none"> <li>• Malfunction of the ISC system</li> </ul>



## INSPECTION PROCEDURE 15

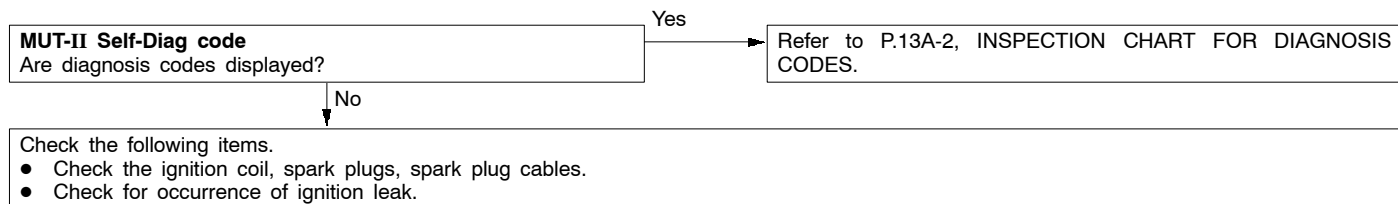
Hesitation, sag or stumble	Probable cause
In cases such as the above, the cause is probably that ignition system, air/fuel mixture or compression pressure is defective.	<ul style="list-style-type: none"> <li>● Malfunction of the ignition system</li> <li>● Malfunction of air-fuel ratio control system</li> <li>● Malfunction of the fuel supply system</li> <li>● Malfunction of the EGR control solenoid valve system</li> <li>● Poor compression</li> </ul>



\*: Refer to '99 PAJERO SPORT Workshop Manual (Pub. No. PWJE9812).

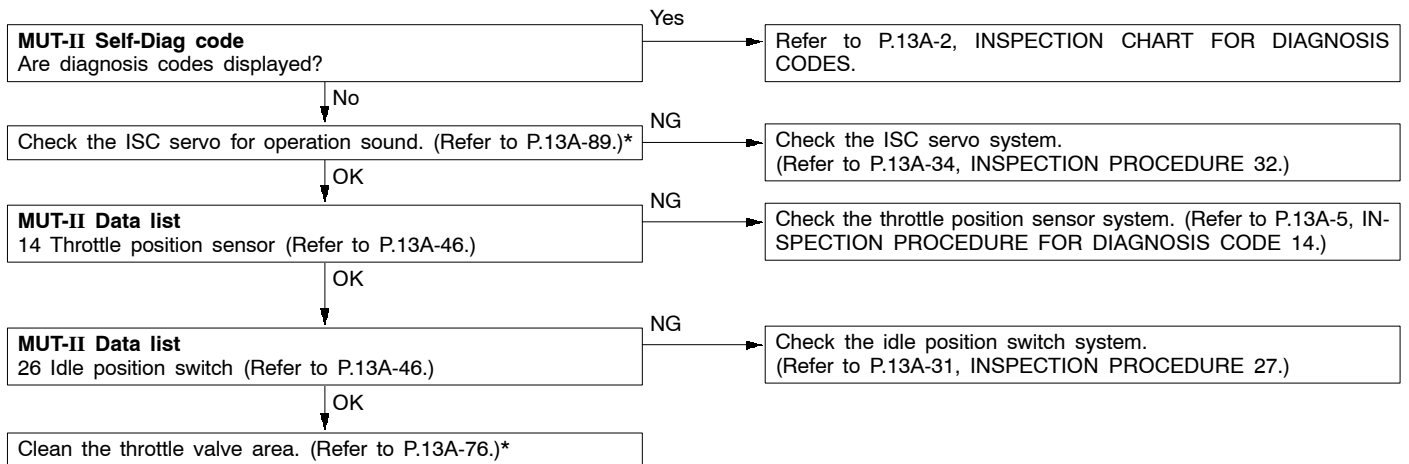
## INSPECTION PROCEDURE 16

The feeling of impact or vibration when accelerating	Probable cause
In cases such as the above, the cause is probably that there is an ignition leak accompanying the increase in the spark plug demand voltage during acceleration.	<ul style="list-style-type: none"> <li>● Malfunction of the ignition system</li> </ul>



## INSPECTION PROCEDURE 17

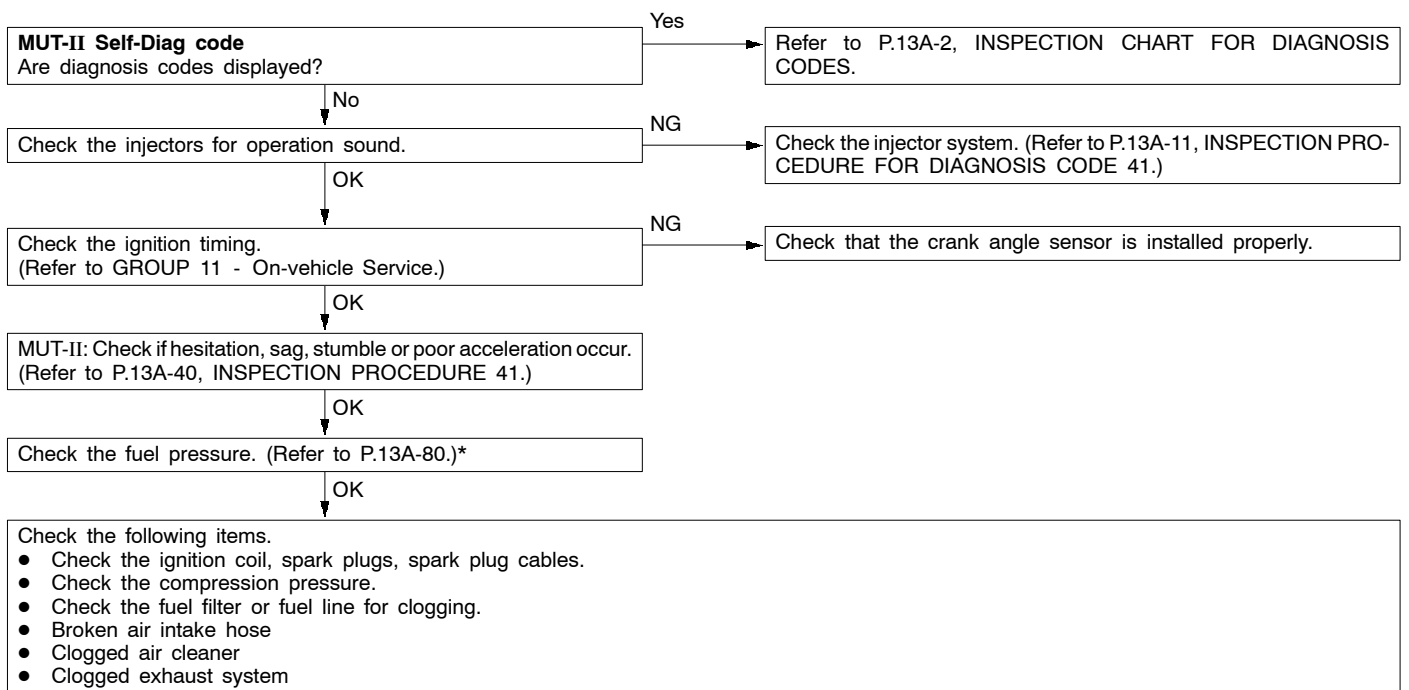
The feeling of impact or vibration when decelerating.	Probable cause
Malfunction of the ISC system is suspected.	<ul style="list-style-type: none"> <li>Malfunction of the ISC system</li> </ul>



\*: Refer to '99 PAJERO SPORT Workshop Manual (Pub. No. PWJE9812).

## INSPECTION PROCEDURE 18

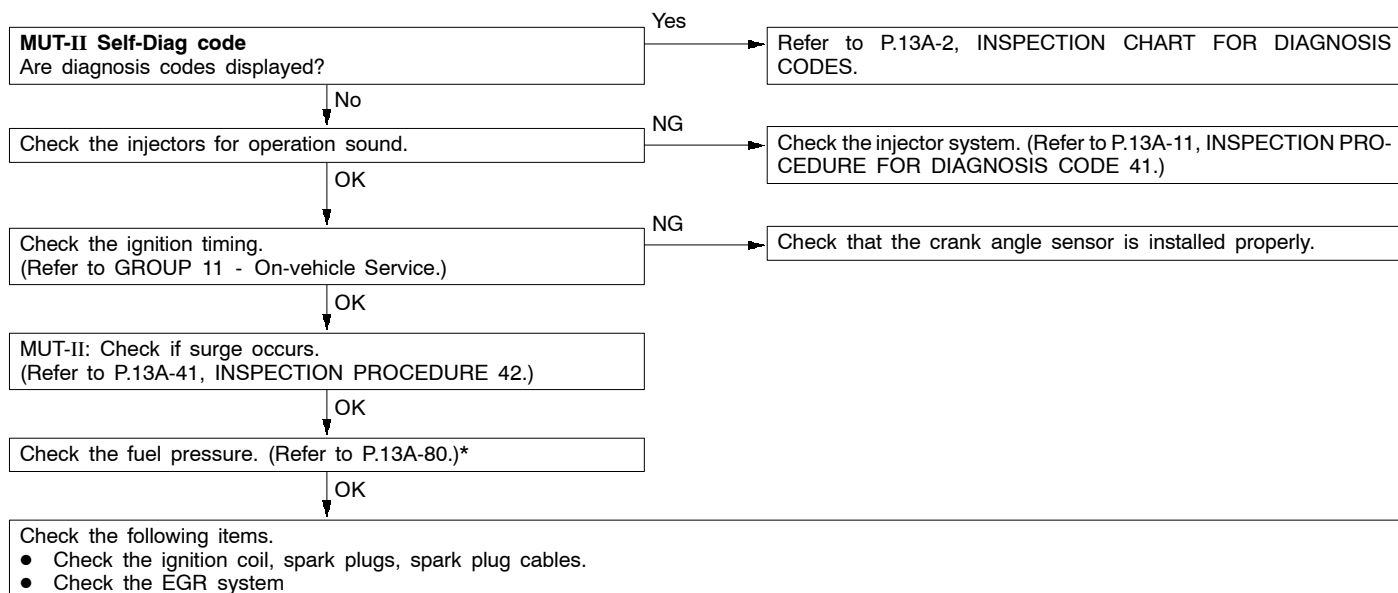
Poor acceleration	Probable cause
Defective ignition system, abnormal air-fuel ratio, poor compression pressure, etc. are suspected.	<ul style="list-style-type: none"> <li>Malfunction of the ignition system</li> <li>Malfunction of air-fuel ratio control system</li> <li>Malfunction of the fuel supply system</li> <li>Poor acceleration</li> <li>Clogged exhaust system</li> </ul>



\*: Refer to '99 PAJERO SPORT Workshop Manual (Pub. No. PWJE9812).

## INSPECTION PROCEDURE 19

Surge	Probable cause
Defective ignition system, abnormal air-fuel ratio, etc. are suspected.	<ul style="list-style-type: none"> <li>• Malfunction of the ignition system</li> <li>• Malfunction of air-fuel ratio control system</li> <li>• Malfunction of the EGR control solenoid valve system</li> </ul>



\*: Refer to '99 PAJERO SPORT Workshop Manual (Pub. No. PWJE9812).

## INSPECTION PROCEDURE 20

Knocking	Probable cause
In cases as the above, the cause is probably that the heat value of the spark plug is inappropriate.	<ul style="list-style-type: none"> <li>• Inappropriate heat value of the spark plug</li> </ul>

Check the following items.

- Spark plugs
- Check if foreign materials (water, alcohol, etc.) got into fuel.

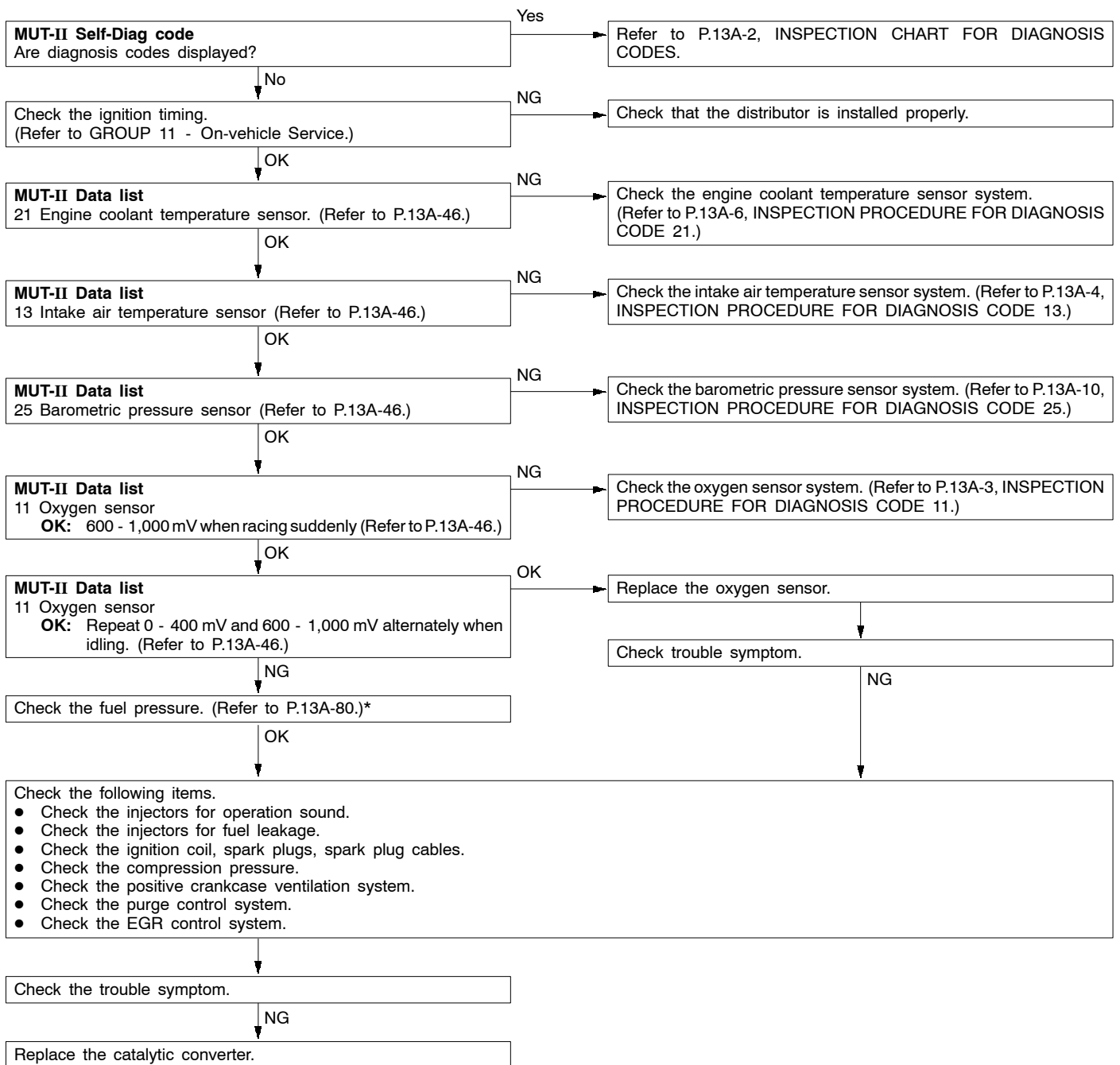
## INSPECTION PROCEDURE 21

Dieseling	Probable cause
Fuel leakage from injectors is suspected.	<ul style="list-style-type: none"> <li>• Fuel leakage from injectors</li> </ul>

Check the injectors for fuel leakage.

## INSPECTION PROCEDURE 22

Too high CO and HC concentration when idling	Probable cause
Abnormal air-fuel ratio is suspected.	<ul style="list-style-type: none"> <li>• Malfunction of the air-fuel ratio control system</li> <li>• Deteriorated catalyst</li> </ul>

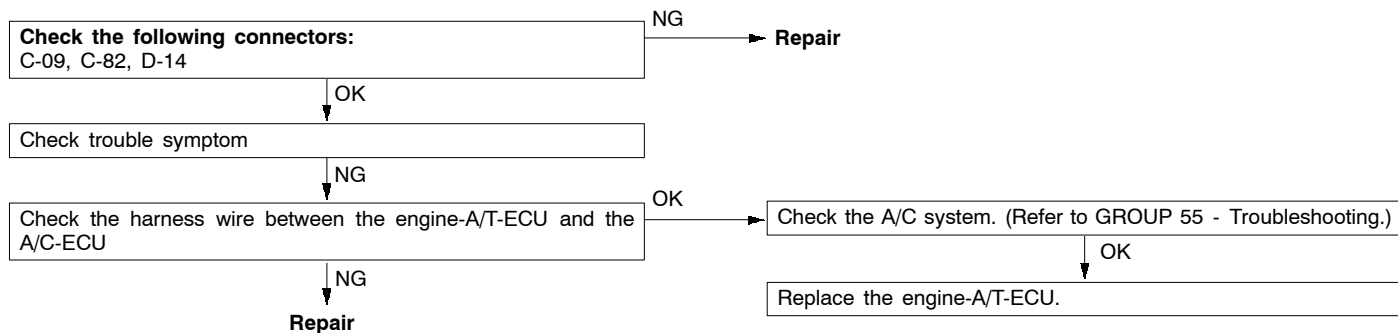


\*: Refer to '99 PAJERO SPORT Workshop Manual (Pub. No. PWJE9812).



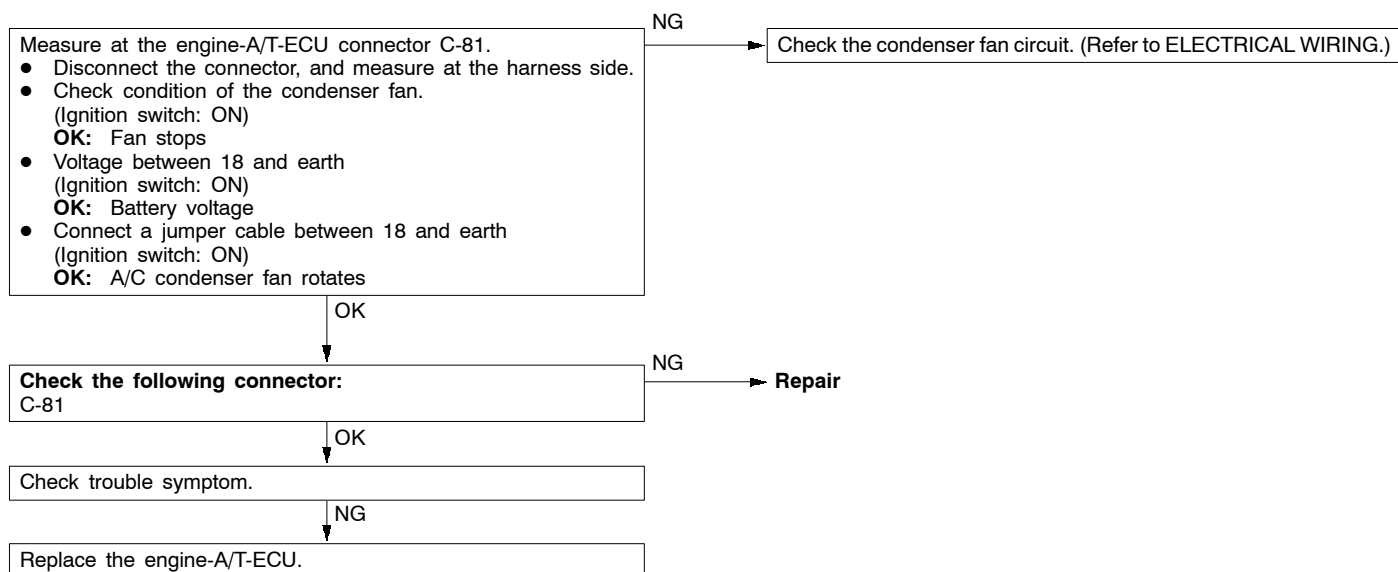
## INSPECTION PROCEDURE 23

Idling speed is improper when A/C is operating (A/C switch 2 signal)	Probable cause
The A/C-ECU judges if load caused by air conditioner is high or low, and converts it to A/C switch 2 signal to send the engine-ECU it. Based on this signal, the engine-ECU operates the throttle control servo to control the idle-up speed. If the load is lower than usual, the engine-ECU decreases the idle-up speed.	<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-A/T-ECU</li> </ul>



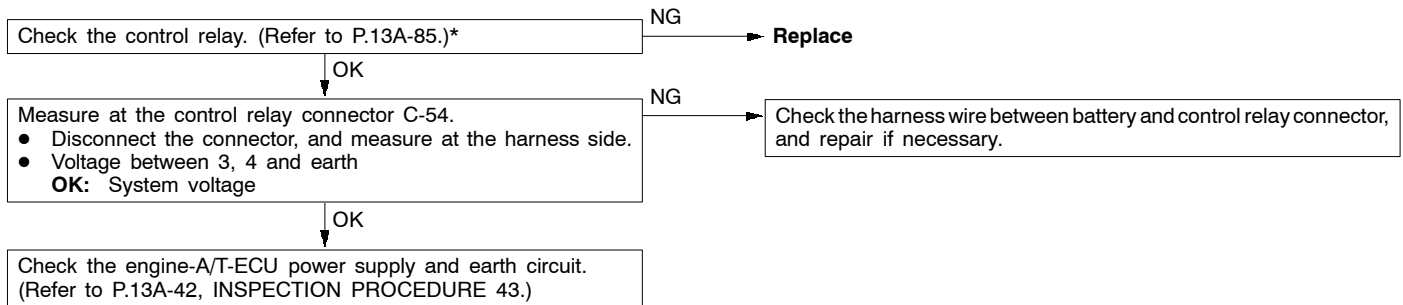
## INSPECTION PROCEDURE 24

A/C condenser fan is inoperative	Probable cause
The fan motor relay is controlled by turning on and off the power transistor in the engine-ECU.	<ul style="list-style-type: none"> <li>• Malfunction of the A/C condenser fan relay</li> <li>• Malfunction of the condenser fan motor</li> <li>• Improper connector contact, open circuit or short-circuited harness wire</li> <li>• Malfunction of the engine-A/T-ECU</li> </ul>



## INSPECTION PROCEDURE 25

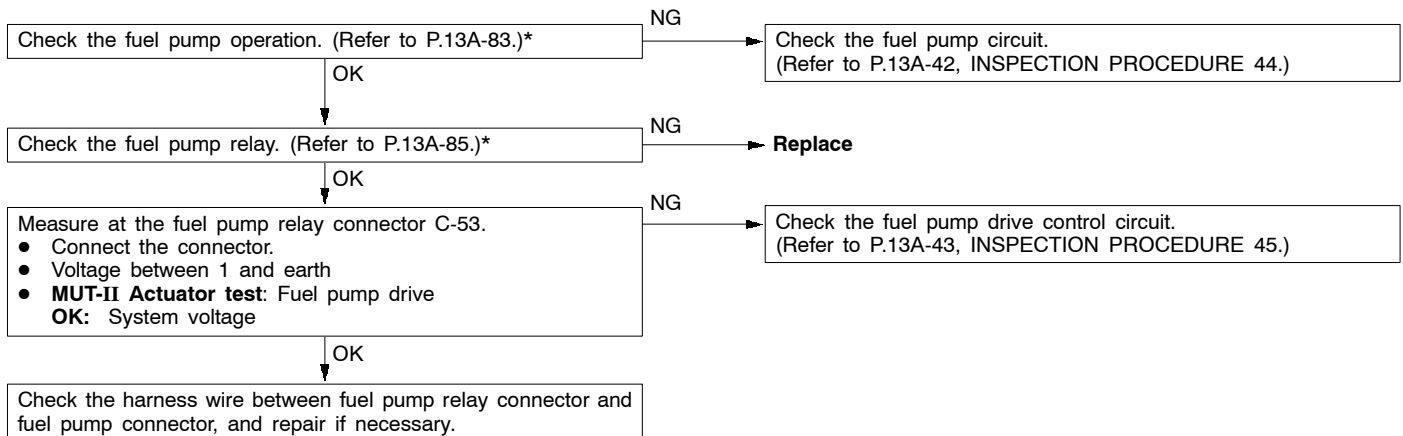
Power supply system and ignition switch-IG system	Probable cause
When an ignition switch ON signal is input to the engine-ECU, the engine-ECU turns the control relay ON. This causes battery voltage to be supplied to the engine-ECU, injectors and air flow sensor.	<ul style="list-style-type: none"> <li>• Malfunction of the ignition switch</li> <li>• Malfunction of the control relay</li> <li>• Improper connector contact, open circuit or short-circuited harness wire</li> <li>• Disconnected engine-A/T-ECU earth wire</li> <li>• Malfunction of the engine-A/T-ECU</li> </ul>



\*: Refer to '99 PAJERO SPORT Workshop Manual (Pub. No. PWJE9812).

## INSPECTION PROCEDURE 26

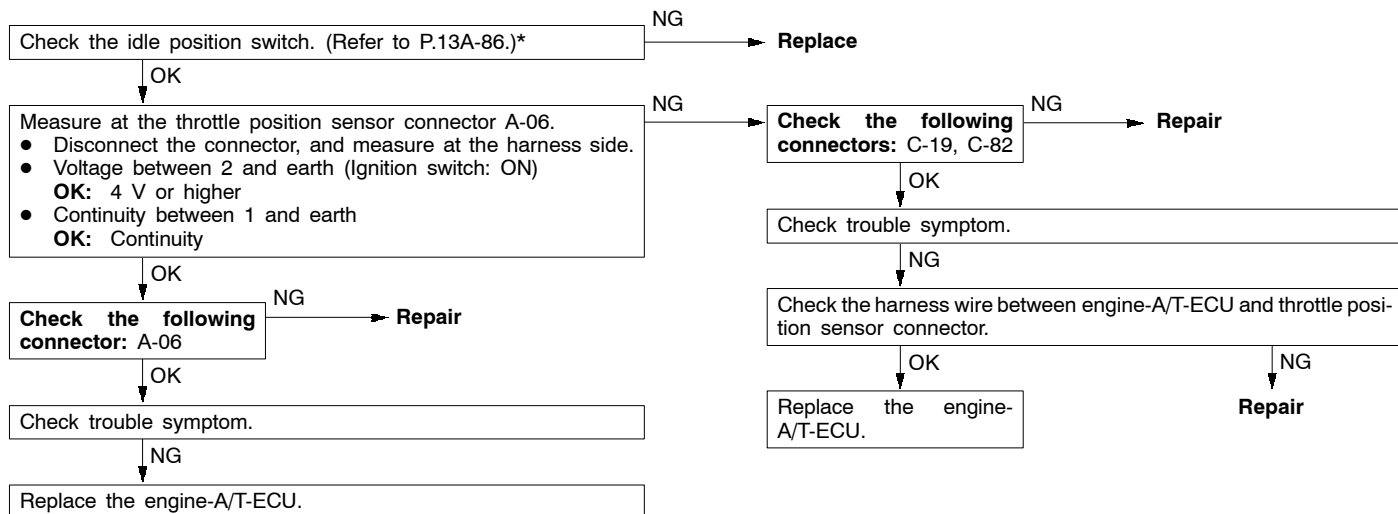
Fuel pump system	Probable cause
The engine-ECU turns the control relay ON when the engine is cranking or running, and this supplies power to drive the fuel pump.	<ul style="list-style-type: none"> <li>• Malfunction of the fuel pump relay</li> <li>• Malfunction of the fuel pump</li> <li>• Improper connector contact, open circuit or short-circuited harness wire</li> <li>• Malfunction of the engine-A/T-ECU</li> </ul>



\*: Refer to '99 PAJERO SPORT Workshop Manual (Pub. No. PWJE9812).

## INSPECTION PROCEDURE 27

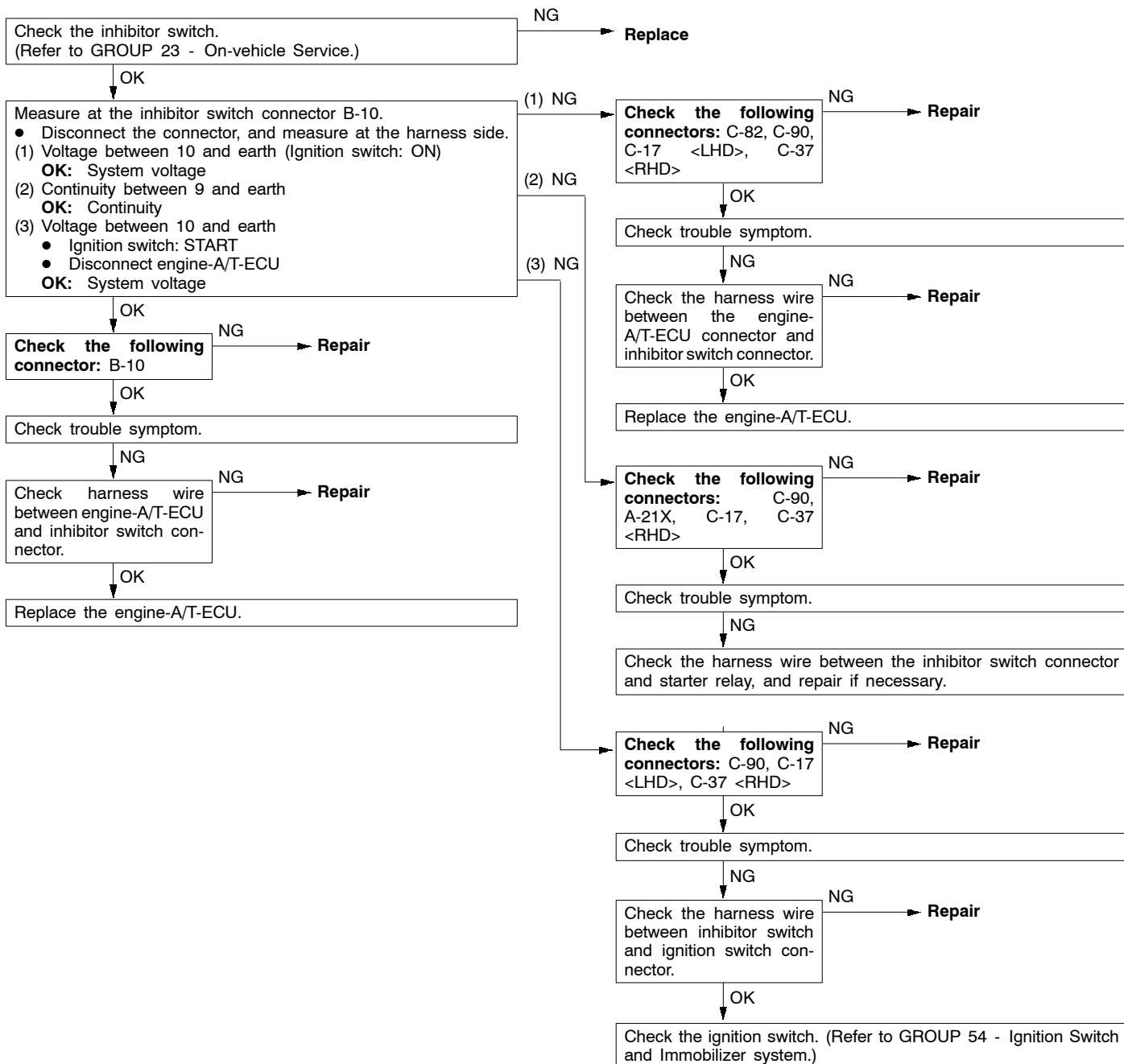
Idle position switch system	Probable cause
<p>The idle position switch inputs the condition of the accelerator pedal, i.e. whether it is depressed or released (HIGH/LOW), to the engine-ECU.</p> <p>The engine-ECU controls the idle speed control servo based on this input.</p>	<ul style="list-style-type: none"> <li>● Maladjustment of the accelerator pedal</li> <li>● Maladjustment of the fixed SAS</li> <li>● Maladjustment of the idle position switch and throttle position sensor</li> <li>● Improper connector contact, open circuit or short-circuited harness wire</li> <li>● Malfunction of the engine-A/T-ECU</li> </ul>



\*: Refer to '99 PAJERO SPORT Workshop Manual (Pub. No. PWJE9812).

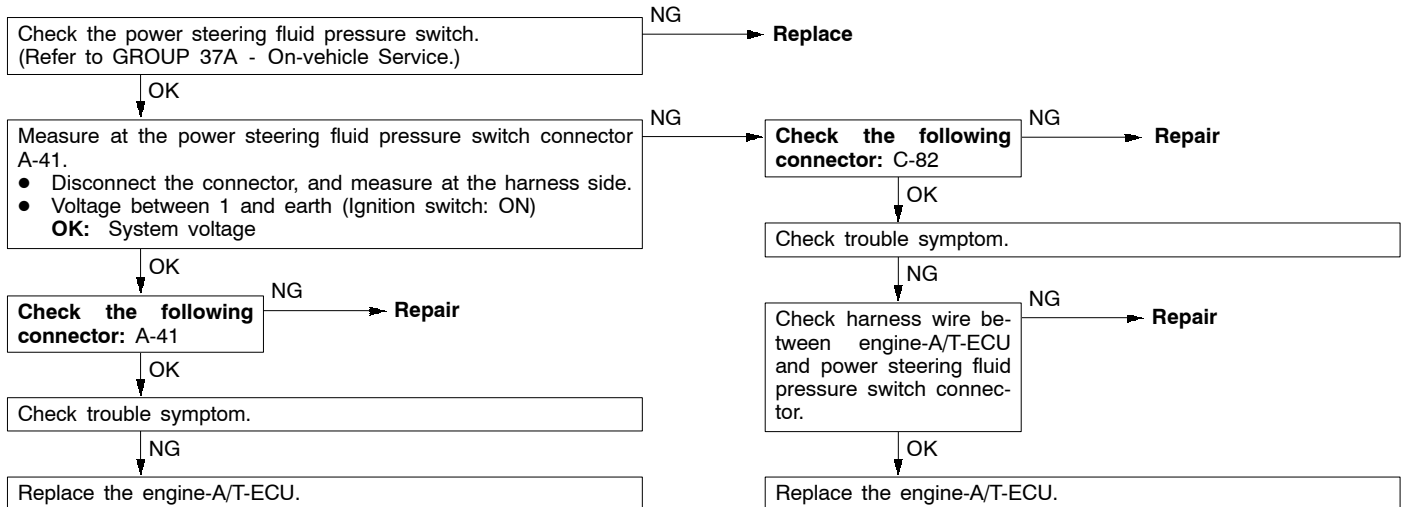
## INSPECTION PROCEDURE 28

Ignition switch-ST and inhibitor switch system <A/T>	Probable cause
<ul style="list-style-type: none"> <li>The ignition switch-ST inputs a HIGH signal to the engine-ECU while the engine is cranking. The engine-ECU controls fuel injection, etc. during starting based on this input.</li> <li>The inhibitor switch inputs the condition of the select lever, i.e. whether it is in P or N range or in some other range, to the engine-ECU. The engine-ECU controls the idle speed control (ISC) servo based on this input.</li> </ul>	<ul style="list-style-type: none"> <li>Malfunction of ignition switch</li> <li>Malfunction of inhibitor switch</li> <li>Improper connector contact, open circuit or short-circuited harness wire</li> <li>Malfunction of the engine-A/T-ECU</li> </ul>



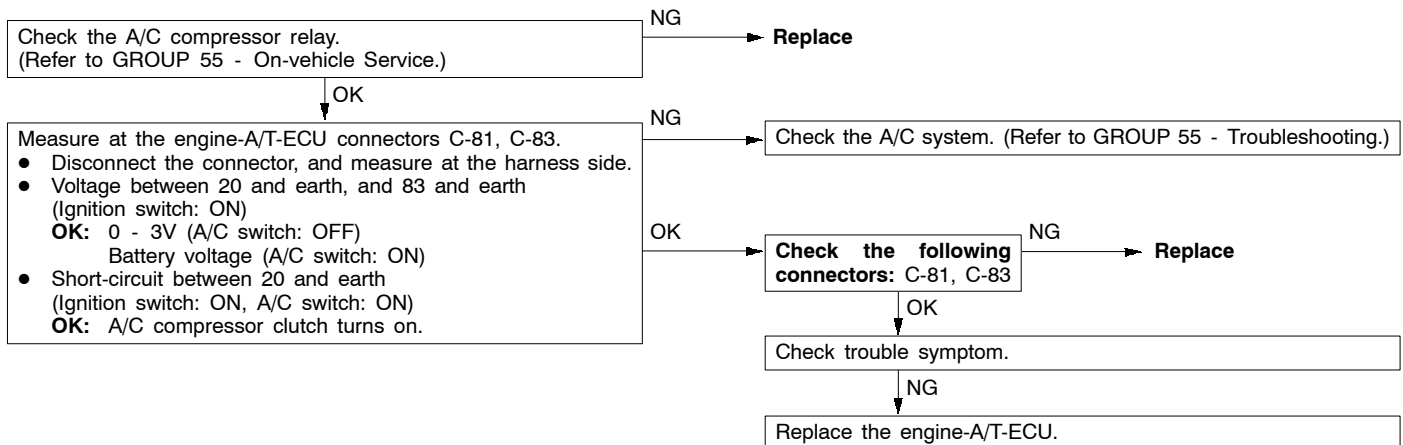
## INSPECTION PROCEDURE 29

Power steering fluid pressure switch system	Probable cause
The presence or absence of power steering load is input to the engine-ECU. The engine-ECU controls the idle speed control (ISC) servo based on this input.	<ul style="list-style-type: none"> <li>• Malfunction of power steering fluid pressure switch</li> <li>• Improper connector contact, open circuit or short-circuited harness wire</li> <li>• Malfunction of the engine-A/T-ECU</li> </ul>



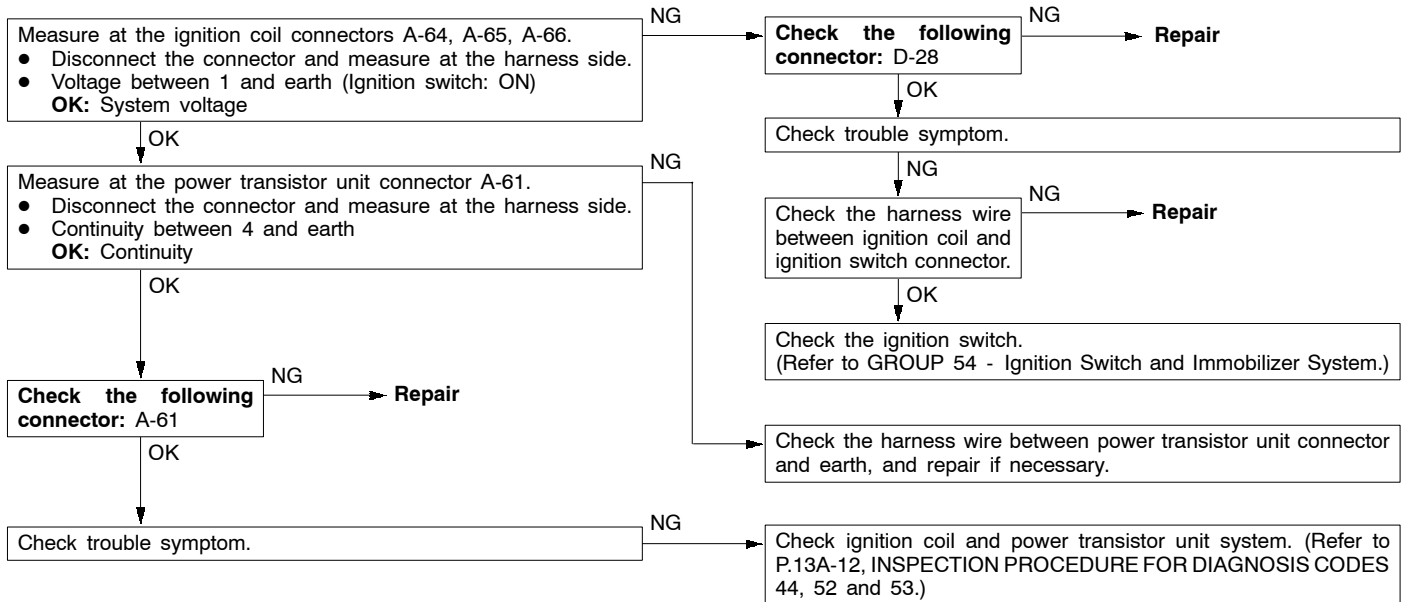
## INSPECTION PROCEDURE 30

A/C switch and A/C relay system	Probable cause
When an A/C ON signal is input to the engine-ECU, the engine-ECU carries out control of the idle speed control (ISC) servo, and also operates the A/C compressor magnetic clutch.	<ul style="list-style-type: none"> <li>• Malfunction of A/C control system</li> <li>• Malfunction of A/C switch</li> <li>• Improper connector contact, open circuit or short-circuited harness wire</li> <li>• Malfunction of the engine-A/T-ECU</li> </ul>



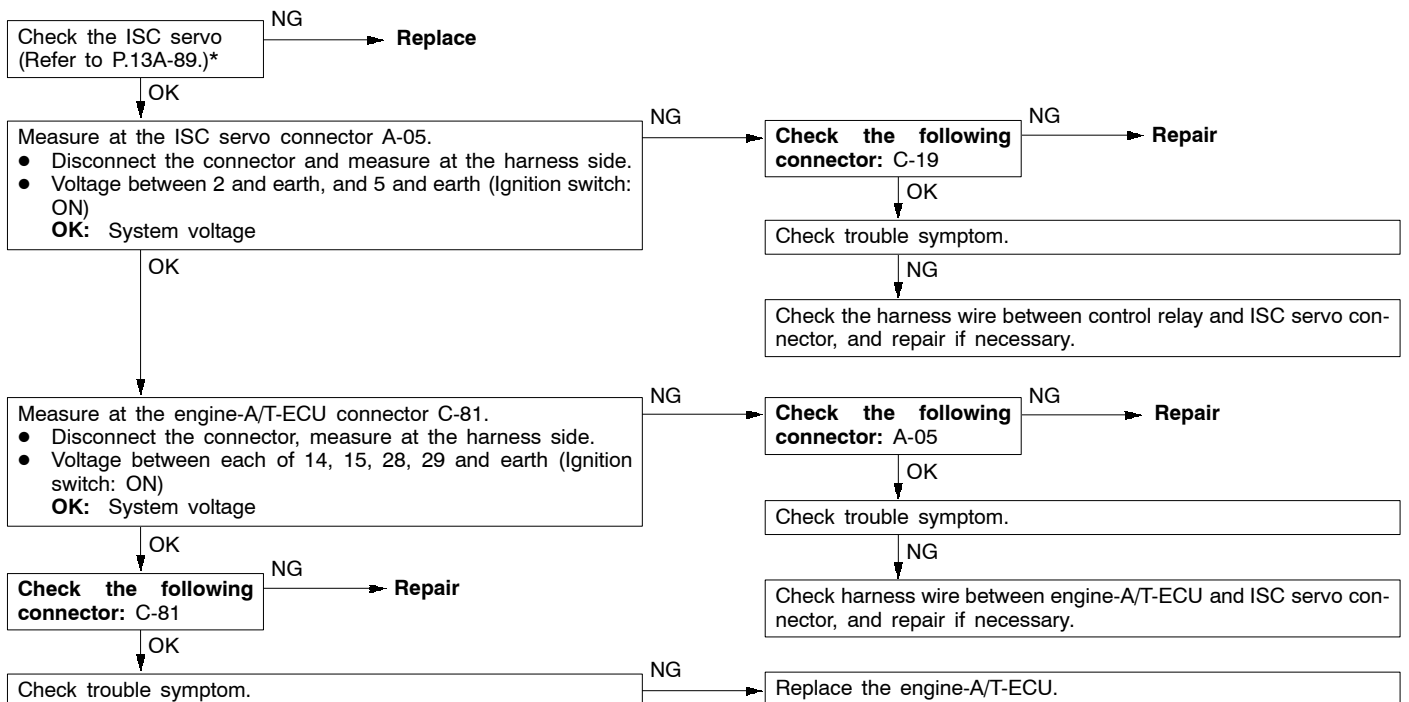
## INSPECTION PROCEDURE 31

Ignition circuit system	Probable cause
The engine-ECU interrupts the ignition coil primary current by turning the power transistor inside the engine-ECU ON and OFF.	<ul style="list-style-type: none"> <li>● Malfunction of ignition switch.</li> <li>● Malfunction of power transistor unit</li> <li>● Improper connector contact, open circuit or short-circuited harness wire</li> <li>● Malfunction of the engine-A/T-ECU</li> </ul>



## INSPECTION PROCEDURE 32

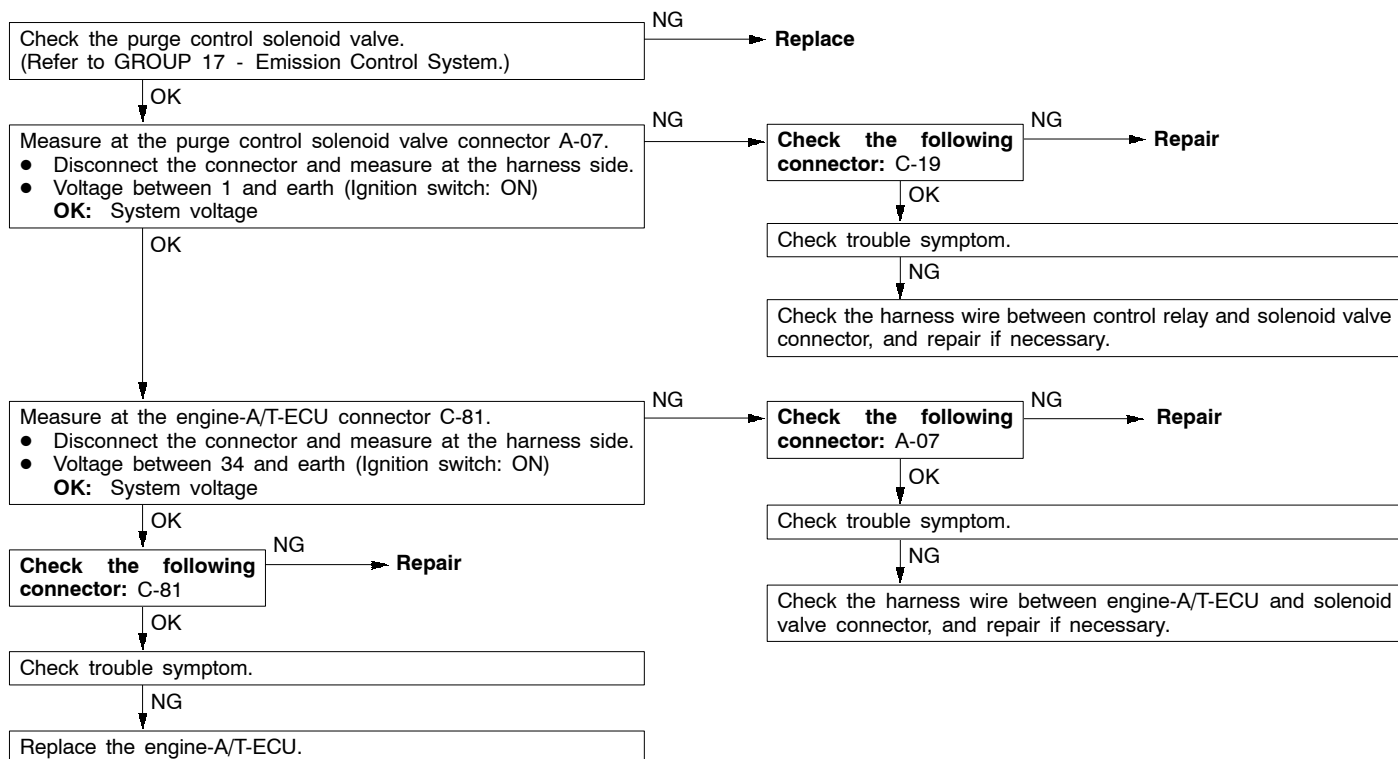
Idle speed control (ISC) servo (Stepper motor) system	Probable cause
<p>The engine-ECU controls the intake air volume during idling by opening and closing the servo valve located in the bypass air passage.</p>	<ul style="list-style-type: none"> <li>● Malfunction of ISC servo</li> <li>● Improper connector contact, open circuit or short-circuited harness wire</li> <li>● Malfunction of the engine-A/T-ECU</li> </ul>



\*: Refer to '99 PAJERO SPORT Workshop Manual (Pub. No. PWJE9812).

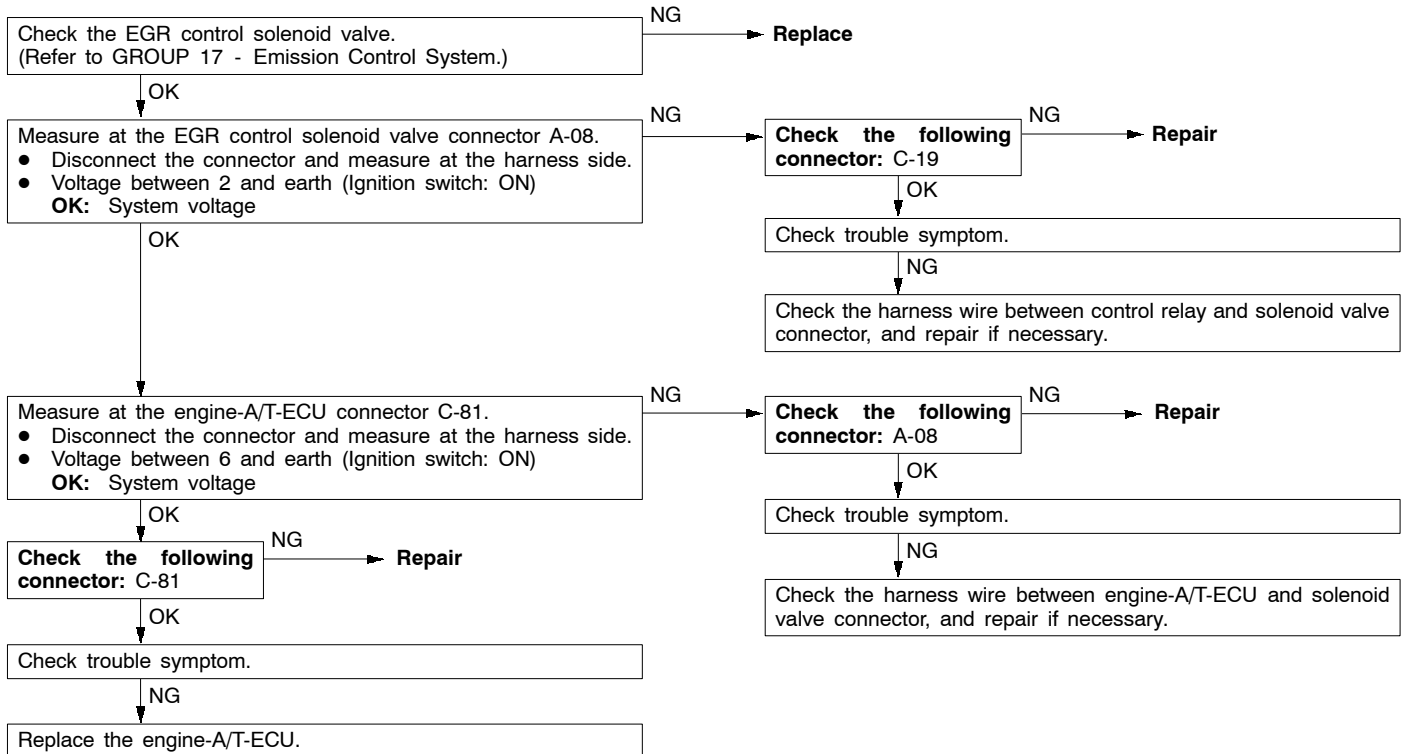
## INSPECTION PROCEDURE 33

Purge control solenoid valve system	Probable cause
The purge control solenoid valve controls the purging of air from the canister located inside the intake manifold.	<ul style="list-style-type: none"> <li>• Malfunction of solenoid valve</li> <li>• Improper connector contact, open circuit or short-circuited harness wire.</li> <li>• Malfunction of the engine-A/T-ECU</li> </ul>



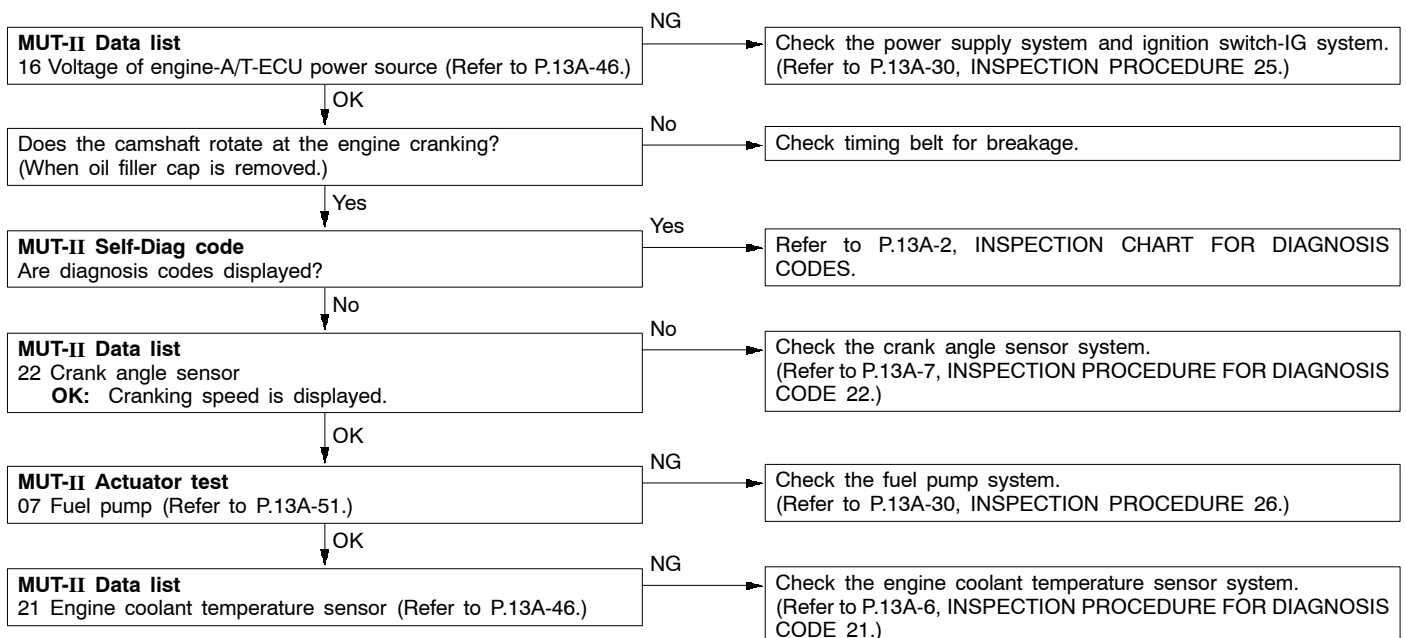
## INSPECTION PROCEDURE 34

EGR control solenoid valve system	Probable cause
The EGR control solenoid valve is controlled by the negative pressure resulting from EGR operation leaking to port "A" of the throttle body.	<ul style="list-style-type: none"> <li>• Malfunction of solenoid valve</li> <li>• Improper connector contact, open circuit or short-circuited harness wire.</li> <li>• Malfunction of the engine-A/T-ECU</li> </ul>

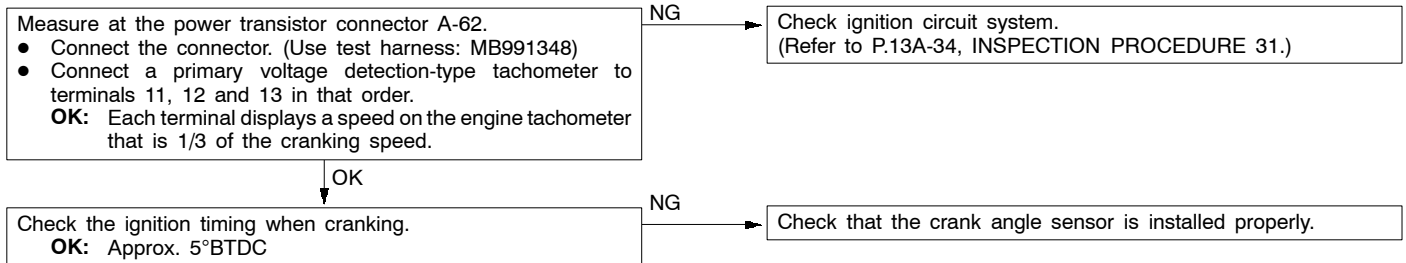
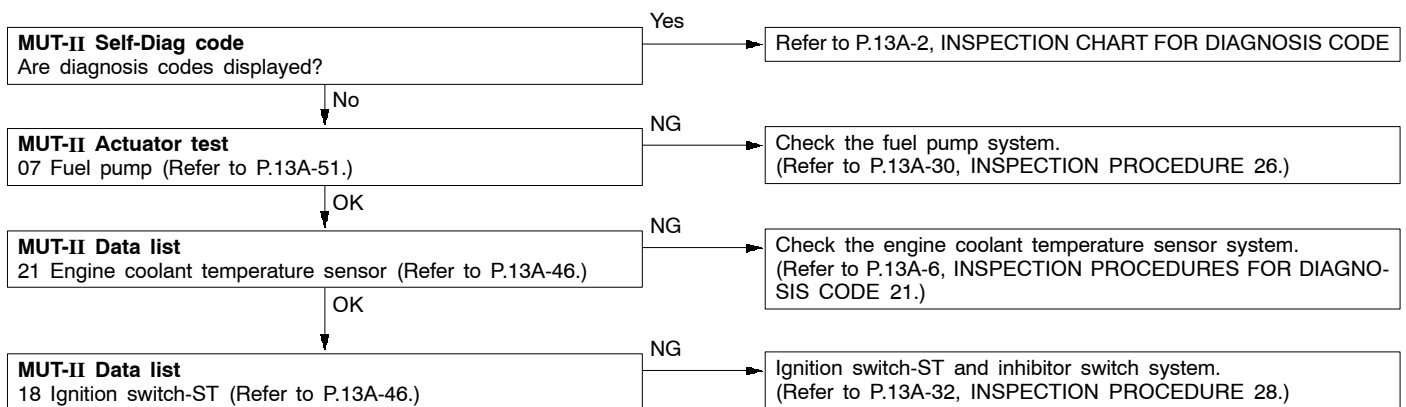
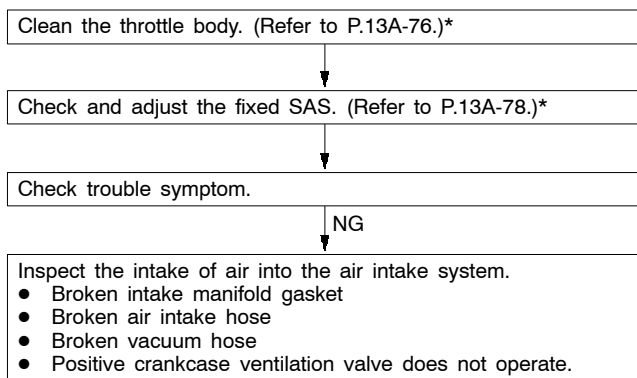


## INSPECTION PROCEDURE 35

## MUT-II: Inspection of no initial combustion

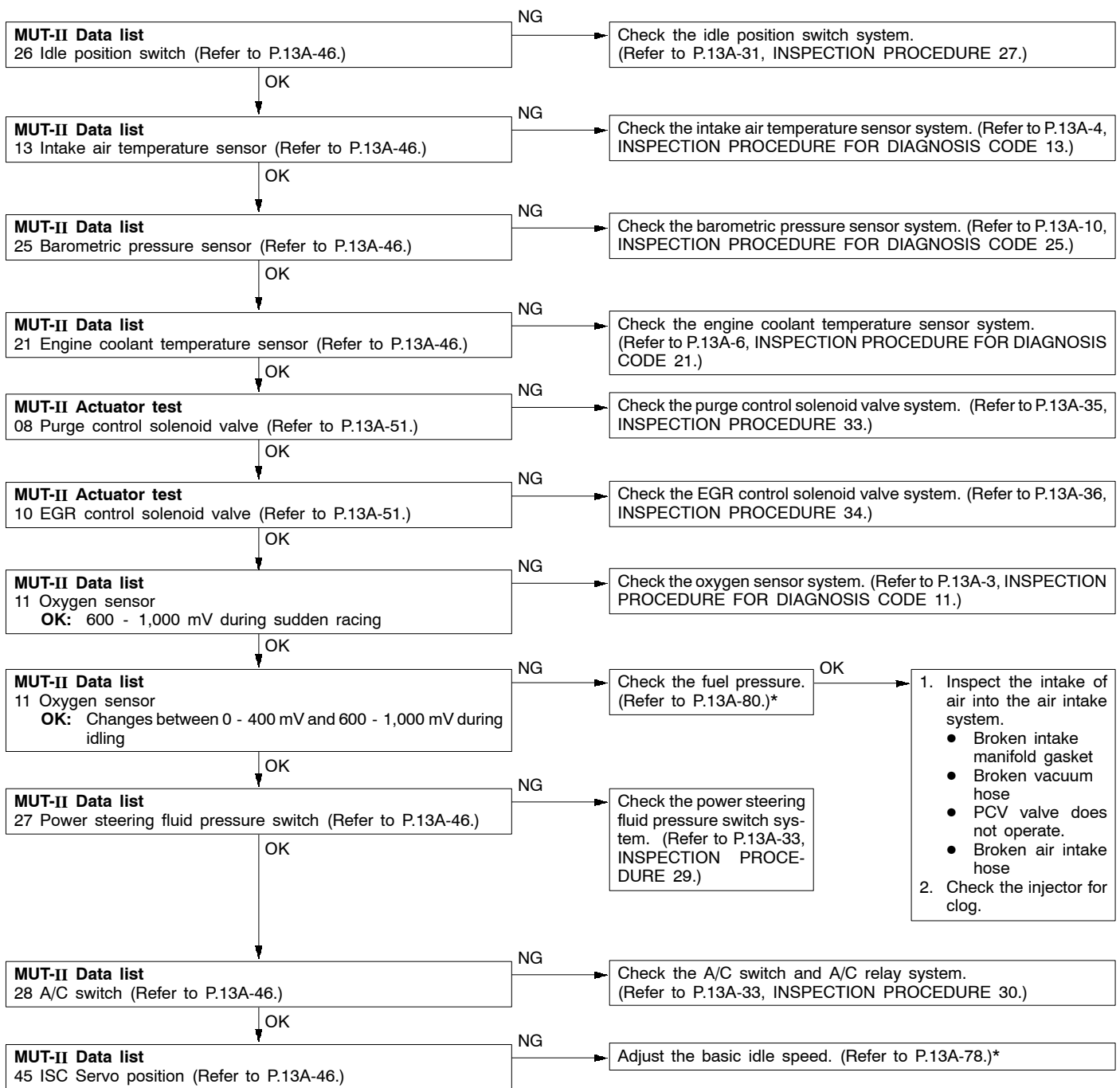




**INSPECTION PROCEDURE 36****Ignition system: Inspection of no initial combustion.****INSPECTION PROCEDURE 37****MUT-II: Check if incomplete combustion occurs.****INSPECTION PROCEDURE 38****Check if hunting occurs.**

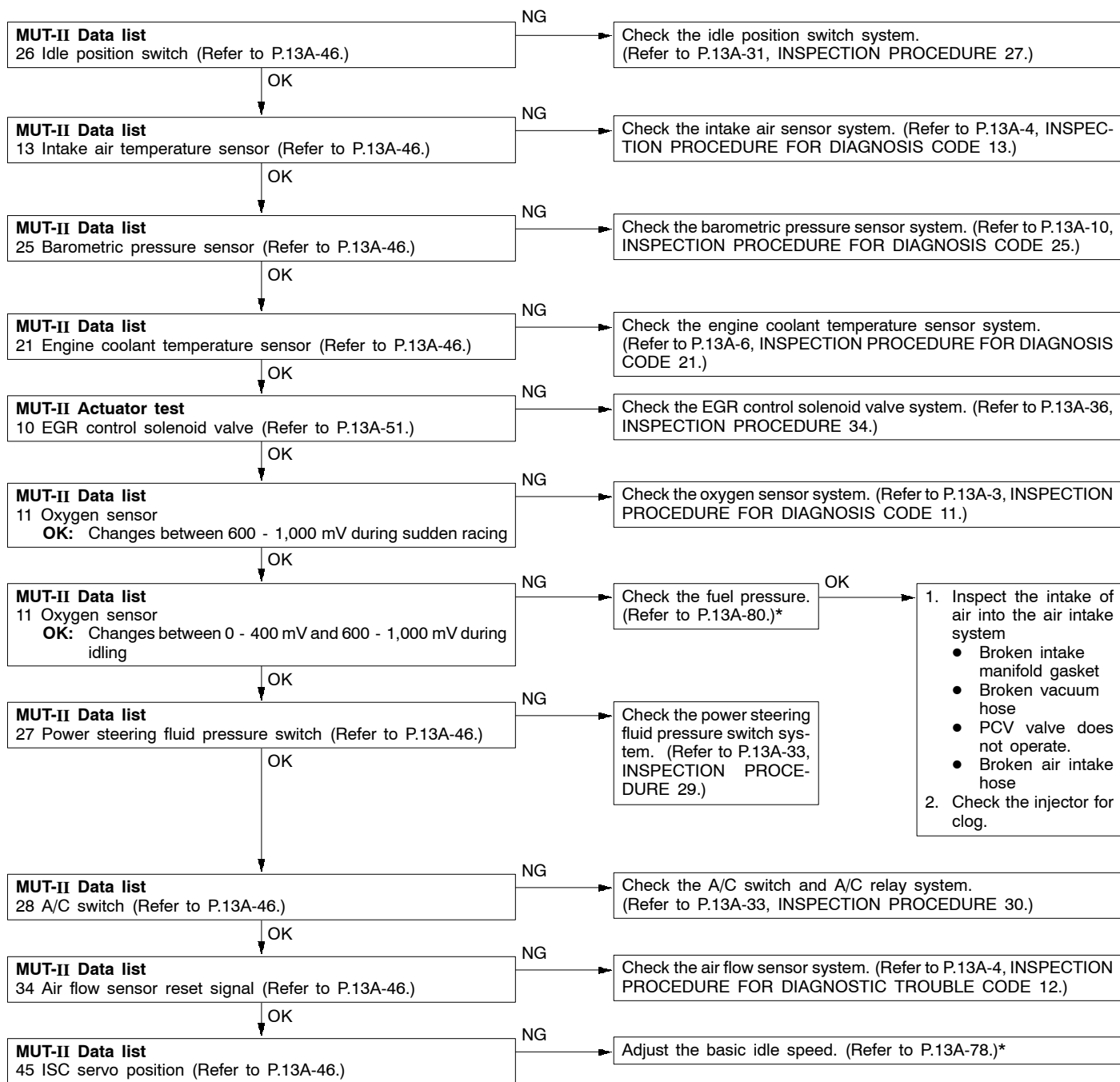
\*: Refer to '99PAJERO SPORT Workshop Manual (Pub. No. PWJE9812).

## INSPECTION PROCEDURE 39

**MUT-II: Check if idling speed is unstable.**

\*: Refer to '99 PAJERO SPORT Workshop Manual (Pub. No. PWJE9812).

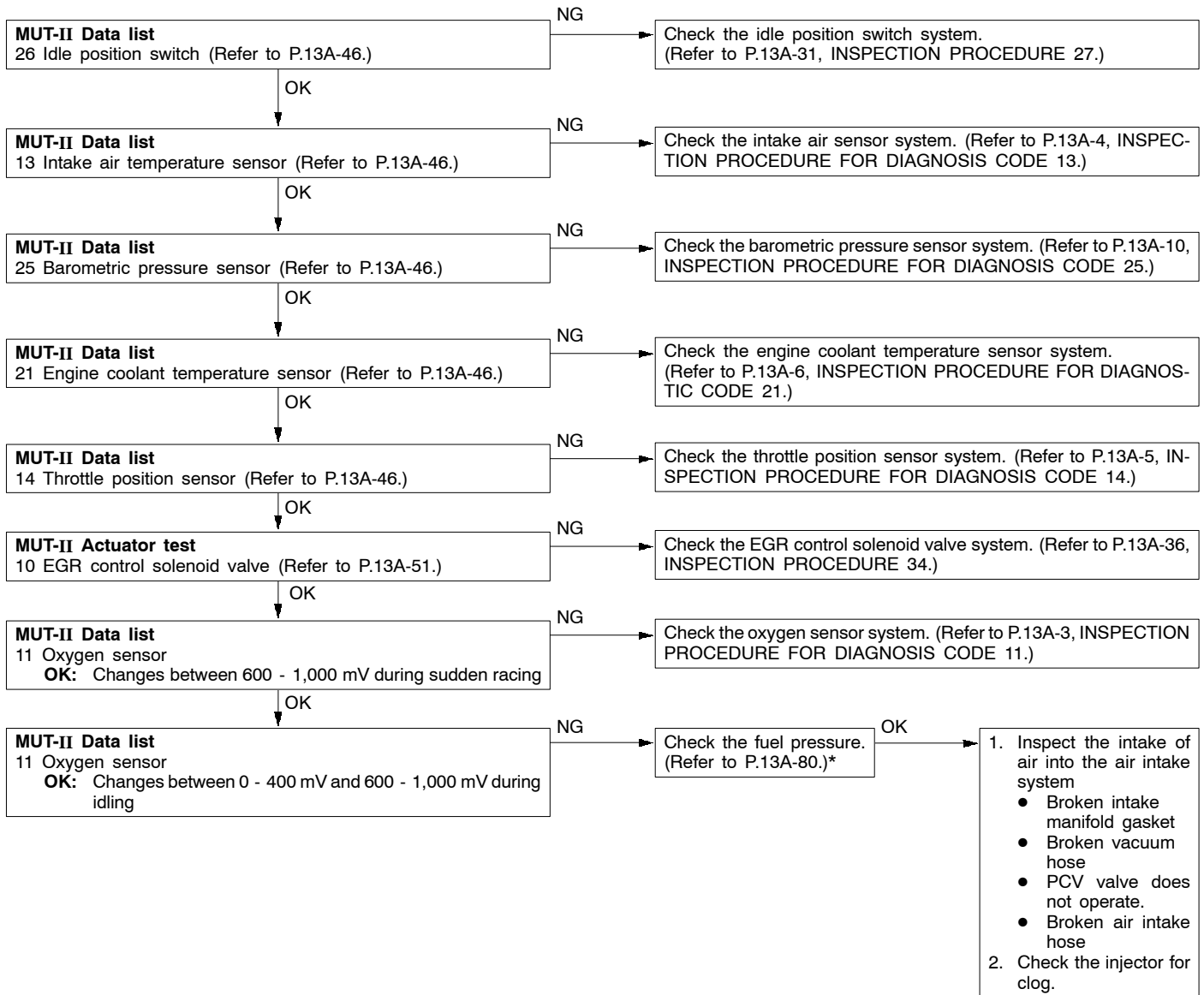
## INSPECTION PROCEDURE 40

**MUT-II: Engine stalling inspection when the engine is warmed up and idling.**

\*: Refer to '99 PAJERO SPORT Workshop Manual (Pub. No. PWJE9812).

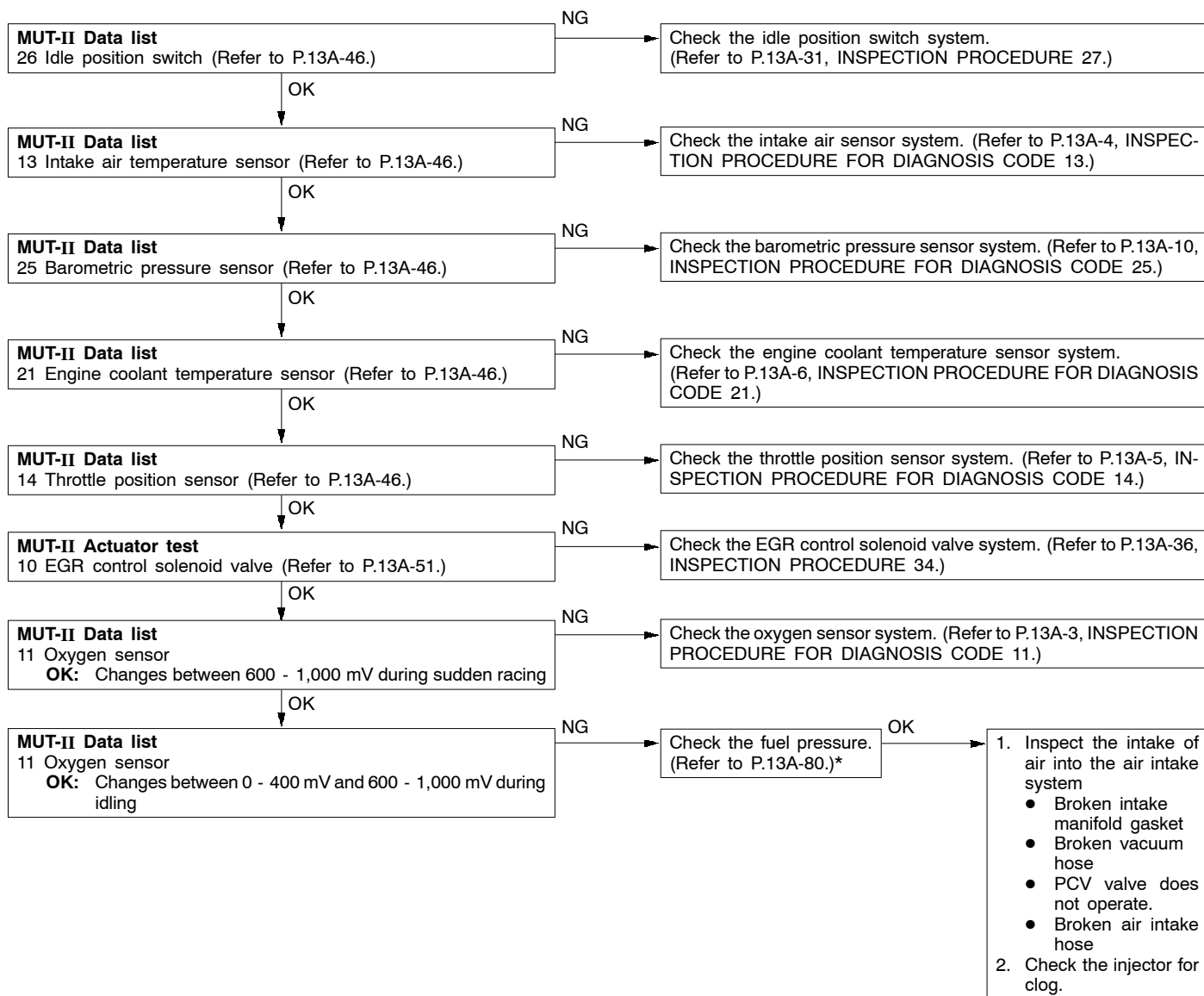
## INSPECTION PROCEDURE 41

**MUT-II: Check if hesitation, sug, stumble or poor acceleration occurs.**



\*: Refer to '99 PAJERO SPORT Workshop Manual (Pub. No. PWJE9812).

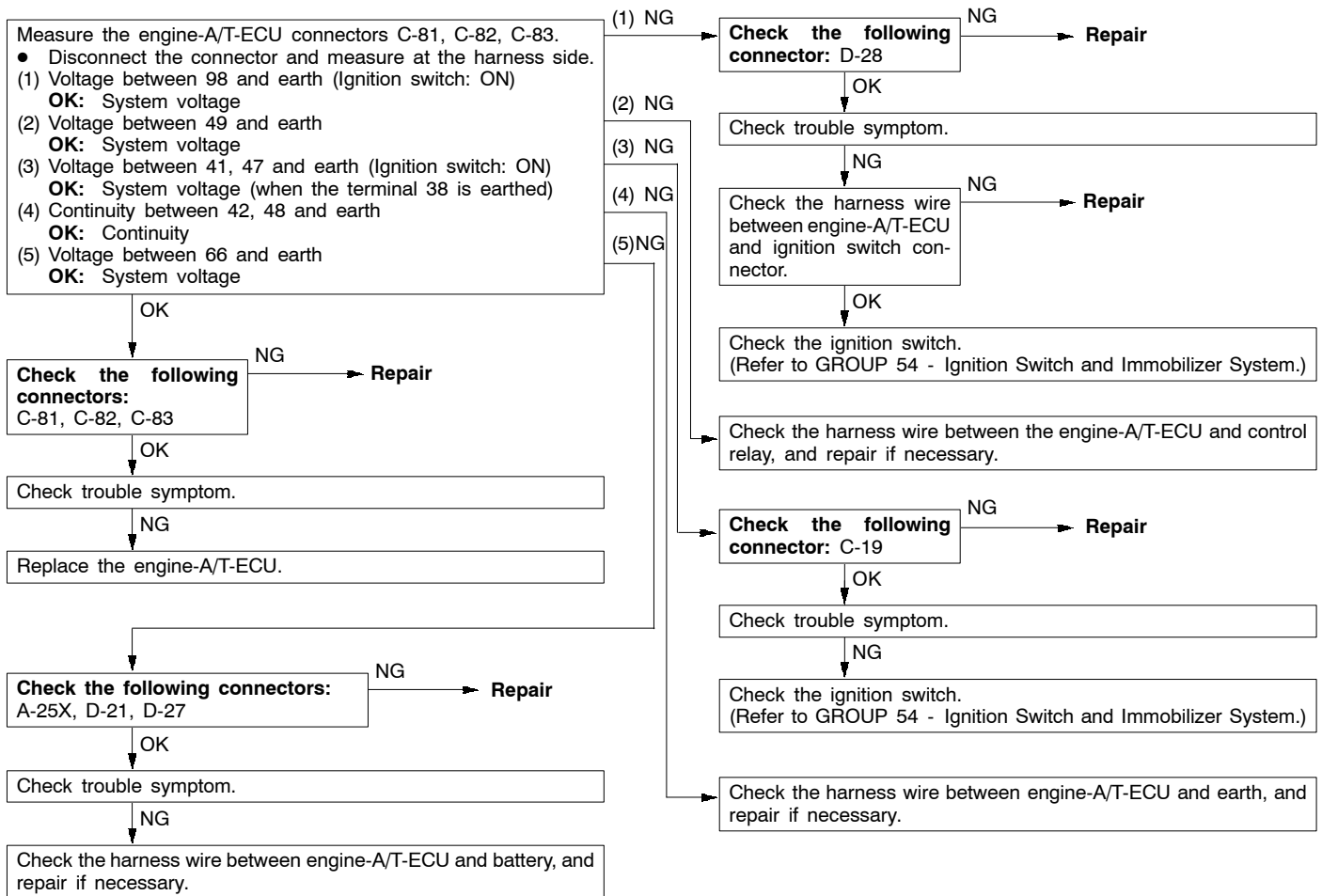
## INSPECTION PROCEDURE 42

**MUT-II: Check if surge occurs.**

\*: Refer to '99 PAJERO SPORT Workshop Manual (Pub. No. PWJE9812).

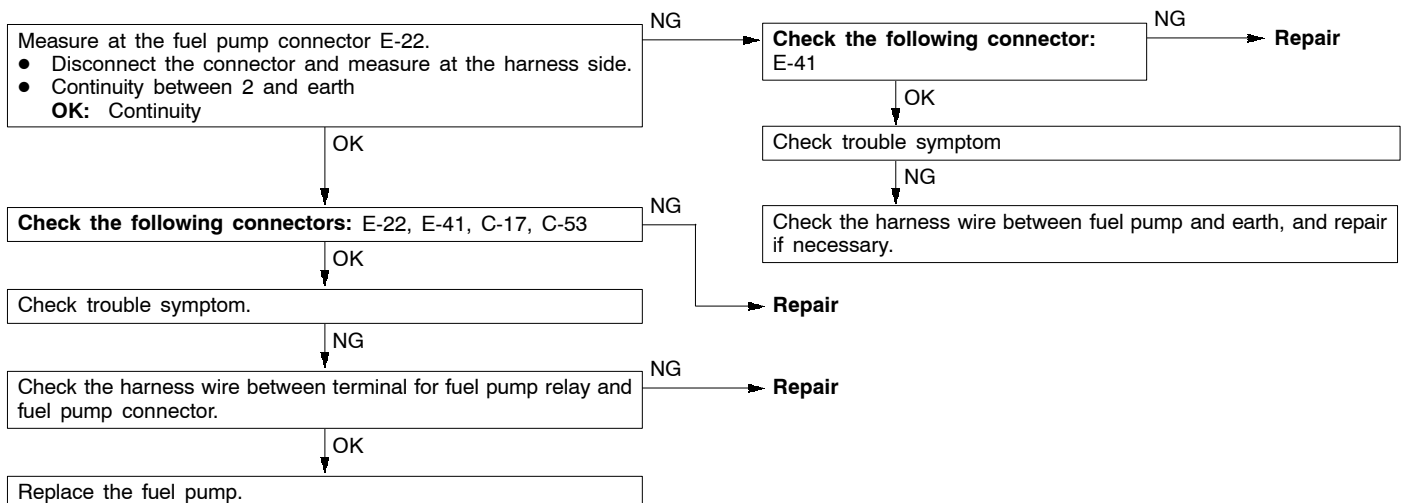
## INSPECTION PROCEDURE 43

**Check the engine-ECU power supply and earth circuit.**



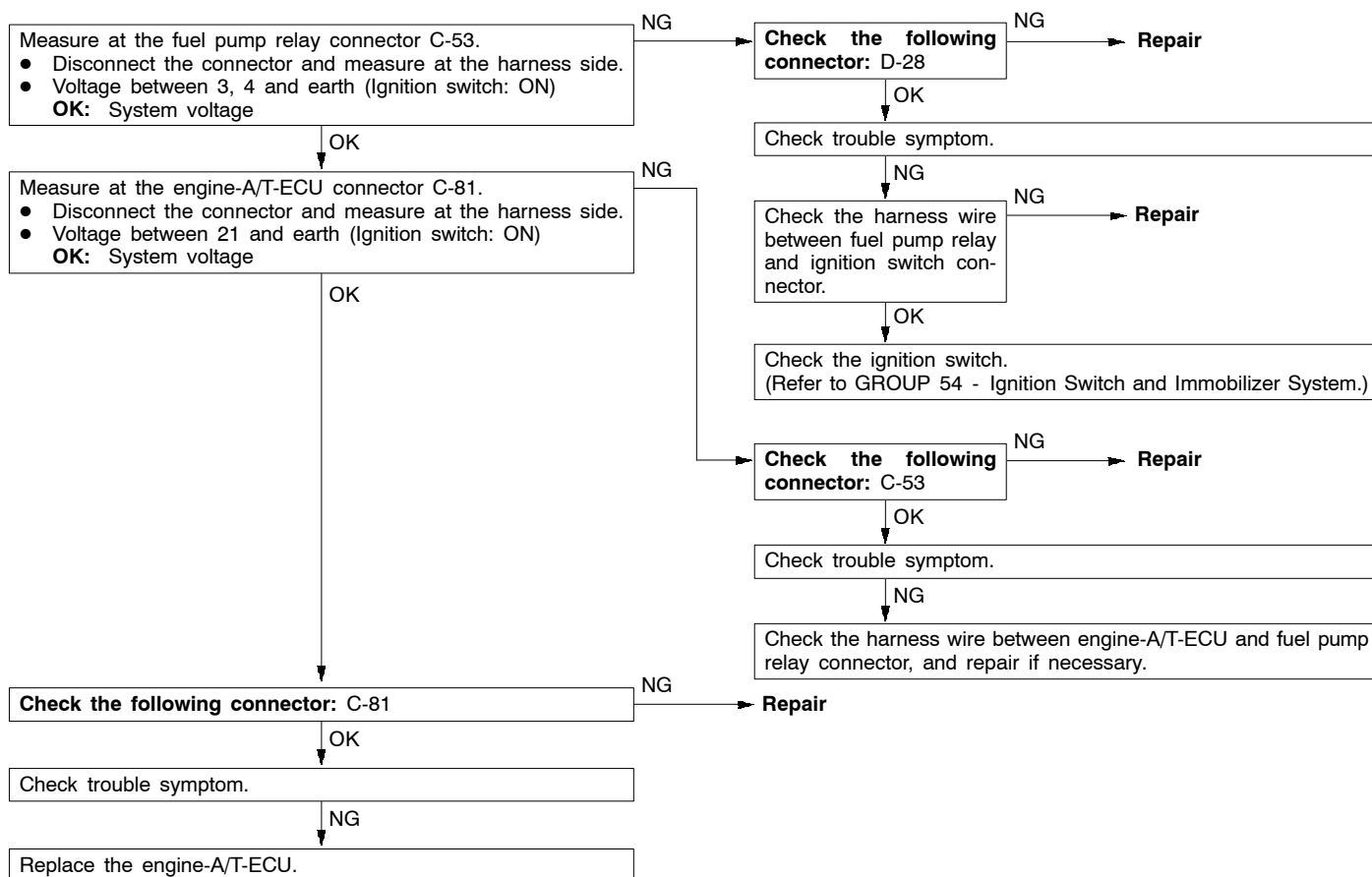
## INSPECTION PROCEDURE 44

**Check the fuel pump circuit.**



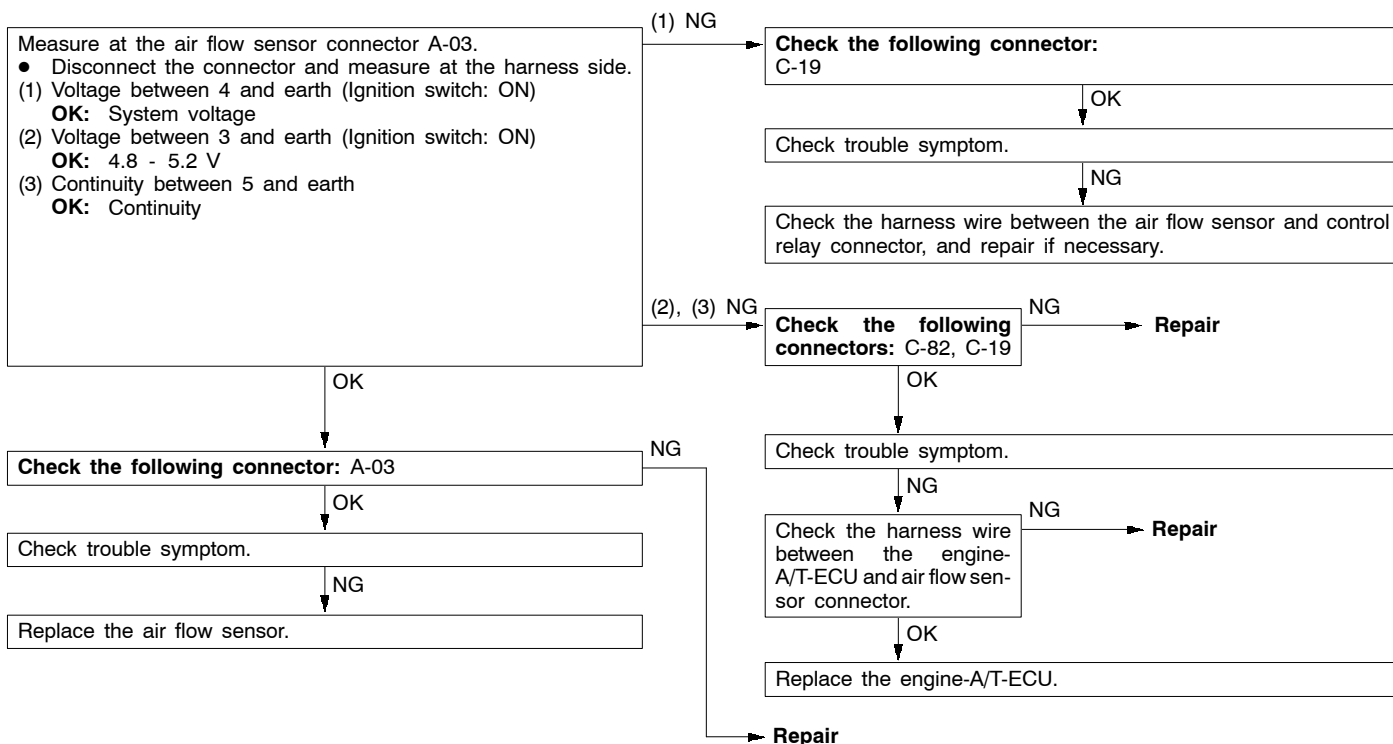
## INSPECTION PROCEDURE 45

## Check the fuel pump drive control circuit.



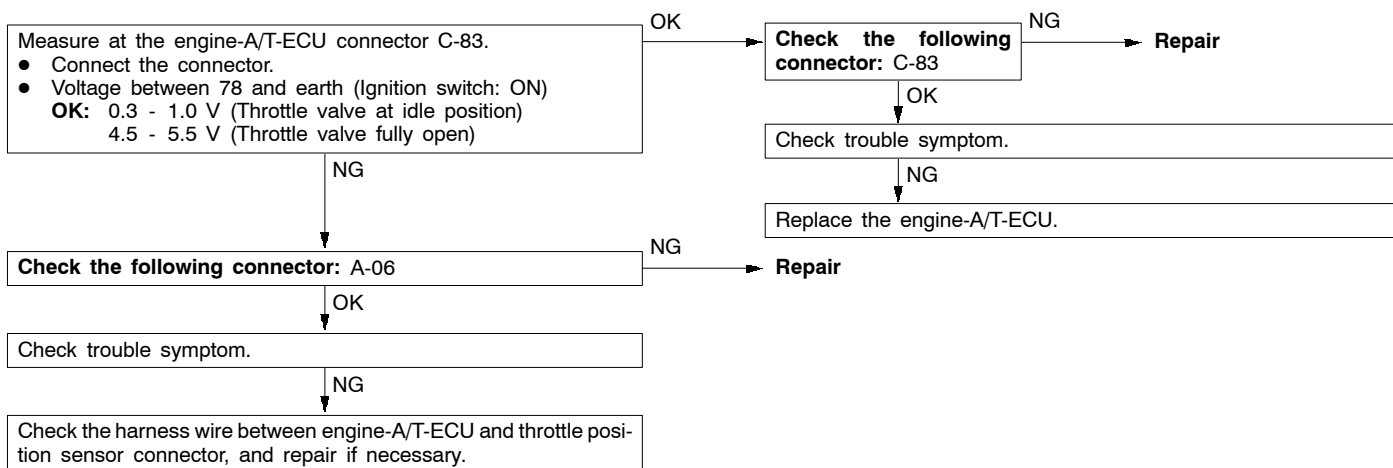
## INSPECTION PROCEDURE 46

## Check the air flow sensor (AFS) control circuit.



## INSPECTION PROCEDURE 47

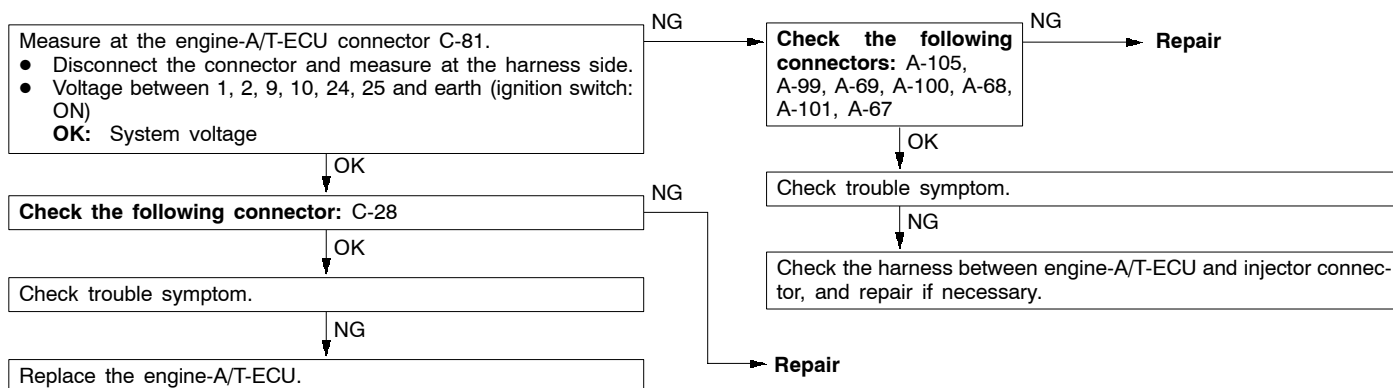
## Check the throttle position sensor (TPS) output circuit.





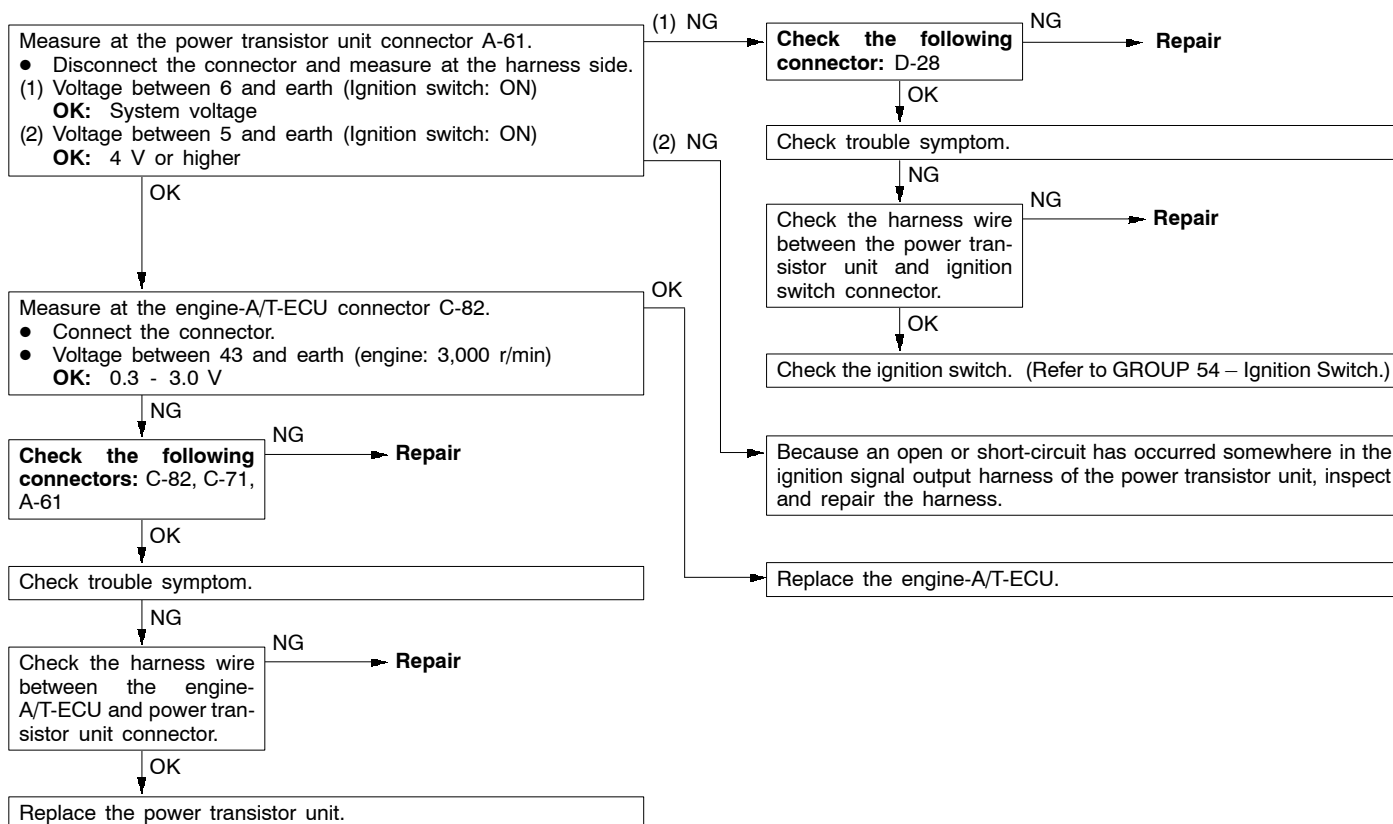
## INSPECTION PROCEDURE 48

## Check the injector control circuit.



## INSPECTION PROCEDURE 49

## Check the ignition signal circuit.



## 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. In a new vehicle [driven approximately 500 km or less], the air flow sensor output frequency is sometimes 10 % higher than the standard frequency.
- \*2. The idle position switch normally turns off when the voltage of the throttle position sensor is 50 - 100 mV higher than the voltage at the idle position. If the idle position switch turns back on after the throttle position sensor voltage has been by 100 mV and the throttle valve has been opened, the idle position switch and the throttle position sensor need to be adjusted.
- \*3. The injector drive time represents the time when the cranking speed is at 250 r/min or below when the power supply voltage is 11 V.
- \*4. In a new vehicle [driven approximately 500 km or less], the injector drive time is sometimes 10 % longer than the standard time.
- \*5. In a new vehicle [driven approximately 500 km or less], the step of the stepper motor is sometimes 30 steps greater than the standard value.

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
11	Oxygen sensor	Engine: After having warmed up Air/fuel mixture is made leaner when decelerating, and is made richer when racing.	When at 4,000 r/min, engine is suddenly decelerated	200 mV or less	Code No. 11	13A-3
			When engine is suddenly raced	600 - 1,000 mV		
		Engine: After having warmed up The oxygen sensor signal is used to check the air/fuel mixture ratio, and control condition by the engine-ECU.	Engine is idling	400 mV or less ↑ (Changes) ↓ 600 - 1,000 mV		
			2,500 r/min	400 mV or less ↑ (Changes) ↓ 600 - 1,000 mV		
12	Air flow sensor*1	<ul style="list-style-type: none"> <li>● Engine coolant temperature: 80 - 95°C</li> <li>● Lamps and all accessories: OFF</li> <li>● Transmission: P range</li> </ul>	Engine is idling	25 - 51 Hz	-	-
			2,500 r/min	74 - 114 Hz		
			Engine is raced	Frequency increases in response to racing		

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
13	Intake air temperature sensor	Ignition switch: ON or with engine running	When intake air temperature is -20°C	-20°C	Code No. 13	13A-4
			When intake air temperature is 0°C	0°C		
			When intake air temperature is 20°C	20°C		
			When intake air temperature is 40°C	40°C		
			When intake air temperature is 80°C	80°C		
14	Throttle position sensor	Ignition switch: ON	Set to idle position	300 - 1,000 mV	Code No. 14	13A-5
			Gradually open	Increases in proportion to throttle opening angle		
			Open fully	4,500 - 5,500 mV		
16	Power supply voltage	Ignition switch: ON		System voltage	Procedure No. 25	13A-30
18	Cranking signal (ignition switch-ST)	Ignition switch: ON	Engine: Stopped	OFF	Procedure No. 28	13A-32
			Engine: Cranking	ON		
21	Engine coolant temperature sensor	Ignition switch: ON or with engine running	When engine coolant temperature is -20°C	-20°C	Code No. 21	13A-6
			When engine coolant temperature is 0°C	0°C		
			When engine coolant temperature is 20°C	20°C		
			When engine coolant temperature is 40°C	40°C		
			When engine coolant temperature is 80°C	80°C		

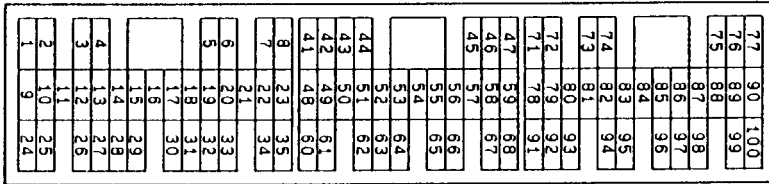
Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
22	Crank angle sensor	<ul style="list-style-type: none"> <li>Engine: Cranking</li> <li>Tachometer: Connected</li> </ul>	Compare the engine speed readings on the tachometer and the MUT-II.	Accord	Code No. 22	13A-7
		<ul style="list-style-type: none"> <li>Engine: Idling</li> <li>Idle position switch: ON</li> </ul>	When engine coolant temperature is -20°C	1,275 - 1,475 r/min		
			When engine coolant temperature is 0°C	1,225 - 1,425 r/min		
			When engine coolant temperature is 20°C	1,100 - 1,300 r/min		
			When engine coolant temperature is 40°C	950 - 1,150 r/min		
			When engine coolant temperature is 80°C	600 - 800 r/min		
25	Barometric pressure sensor	Ignition switch: ON	At altitude of 0 m	101 kPa	Code No. 25	13A-10
			At altitude of 600 m	95 kPa		
			At altitude of 1,200 m	88 kPa		
			At altitude of 1,800 m	81 kPa		
26	Idle position switch	Ignition switch: ON Check by operating accelerator pedal repeatedly	Throttle valve: Set to idle position	ON	Procedure No. 27	13A-31
			Throttle valve: Slightly open	OFF*2		
27	Power steering fluid pressure switch	Engine: Idling	Steering wheel stationary	OFF	Procedure No. 29	13A-33
			Steering wheel turning	ON		
28	A/C switch	Engine: Idling (when A/C switch is ON, A/C compressor should be operating.)	A/C switch: OFF	OFF	Procedure No. 30	13A-33
			A/C switch: ON	ON		
34	Air flow sensor reset signal	Engine: After having warmed up	Engine is idling	ON	Code No. 12	13A-4
			2,500 r/min	OFF		

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
37	Volumetric efficiency	<ul style="list-style-type: none"> <li>Engine coolant temperature: 80 - 95°C</li> <li>Lamps and all accessories: OFF</li> <li>Transmission: 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.	—	—
41	Injectors* <sup>3</sup>	Engine: Cranking	When engine coolant temperature is 0°C (injection is carried out for all cylinders simultaneously)	13.8 - 20.6 ms	-	-
			When engine coolant temperature is 20°C	34 - 51 ms		
			When engine coolant temperature is 80°C	8.8 - 13.2 ms		
41	Injectors* <sup>4</sup>	<ul style="list-style-type: none"> <li>Engine coolant temperature: 80 - 95°C</li> <li>Lamps and all accessories: OFF</li> <li>Transmission: P range</li> </ul>	Engine is idling	2.6 - 3.8 ms	-	-
			2,500 r/min	2.3 - 3.5 ms		
			When engine is suddenly raced	Increases		
44	Ignition coils and power transistors	<ul style="list-style-type: none"> <li>Engine: After having warmed up</li> <li>Timing lamp is set. (The timing lamp is set in order to check actual ignition timing.)</li> </ul>	Engine is idling	7 - 23° BTDC	-	-
			2,500 r/min	27 - 47° BTDC		

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
45	ISC (stepper) motor position*5	<ul style="list-style-type: none"> <li>Engine coolant temperature: 80 - 95°C</li> <li>Lamps and all accessories: OFF</li> <li>Transmission: P range</li> <li>Idle position switch: ON</li> <li>Engine: Idling</li> <li>When A/C switch is ON, A/C compressor should be operating</li> </ul>	A/C switch: OFF	2 - 25 STEP	-	-
			A/C switch: OFF → ON	Increases by 10 - 70 steps		
			<ul style="list-style-type: none"> <li>A/C switch: OFF</li> <li>Select lever: N range → D range</li> </ul>	Increases by 5 - 50 steps		
49	A/C relay	Engine: After having warmed up/Engine is idling	A/C switch: OFF	OFF (Compressor clutch is not operating)	Procedure No. 30	13A-33
			A/C switch: ON	ON (Compressor clutch is operating)		

## 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	13A-11
02		Cut fuel to No. 2 injector					
03		Cut fuel to No. 3 injector					
04		Cut fuel to No. 4 injector					
05		Cut fuel to No. 5 injector					
06		Cut fuel to No. 6 injector					
07	Fuel pump	Fuel pump operates and fuel is recirculated.	<ul style="list-style-type: none"> <li>Engine: Cranking</li> <li>Fuel pump: Forced driving</li> </ul> Inspect according to both the above conditions.	Pinch the return hose with fingers to feel the pulse of the fuel being recirculated.	Pulse is felt.	Procedure No. 26	13A-30
				Listen near the fuel tank for the sound of fuel pump operation.	Sound of operation is heard.		
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. 33	13A-35
10	EGR 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. 34	13A-36
17	Basic ignition timing	Set to ignition timing adjustment mode	Engine: Idling Timing light is set		5° BTDC	-	-
21	Condenser fan	Drive the fan motor	<ul style="list-style-type: none"> <li>Ignition switch: ON</li> </ul>		Fan motor runs	Procedure No. 24	13A-29

**CHECK AT THE Engine-A/T-ECU TERMINALS****TERMINAL VOLTAGE CHECK CHART****Engine-A/T-ECU Connector Terminal Arrangement**

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Terminal No.	Check item	Check condition (Engine condition)	Normal condition
1	No. 1 injector	While engine is idling after having warmed up, suddenly depress the accelerator pedal.	From 11 - 14 V, momentarily drops slightly
9	No. 2 injector		
24	No. 3 injector		
2	No. 4 injector		
10	No. 5 injector		
25	No. 6 injector		
6	EGR control solenoid valve	Ignition switch: ON	System Voltage
		While engine is idling, suddenly depress the accelerator pedal.	From system voltage, momentarily drops
11	Power transistor unit (A)	Engine r/min: 3,000 r/min	0.3 - 3.0 V
13	Power transistor unit (B)		
12	Power transistor unit (C)		
14	Stepper motor coil (A1)	Engine: Soon after the warmed up engine is started	10 - 15 V ↔ 0 - 6 V (Changes repeatedly)
28	Stepper motor coil (A2)		
15	Stepper motor coil (B1)		
29	Stepper motor coil (B2)		
18	Fan motor relay	When the condenser fan is not operating	System voltage
		When the condenser fan is operating	0 - 3 V
19	Air flow sensor reset signal	Engine: Idle speed	0 - 1 V
		Engine r/min: 3,000 r/min	6 - 9 V
20	A/C relay	<ul style="list-style-type: none"> <li>Engine: Idle speed</li> <li>A/C switch: OFF → ON (A/C compressor is operating)</li> </ul>	System voltage or momentarily 6 V or more → 0 - 3 V
21	Fuel pump relay	Ignition switch: ON	System voltage
		Engine: Idle speed	0 - 3 V



Terminal No.	Check item	Check condition (Engine condition)		Normal condition
22	Engine warning lamp	Ignition switch: OFF → ON		0 - 3 V → 9 - 13 V (After several seconds have elapsed)
34	Purge control solenoid valve	Ignition switch: ON		System voltage
		Running at 3,000 r/min while engine is warming up after having been started.		0 - 3 V
41	Power supply	Ignition switch: ON		System voltage
47				
44	Engine coolant temperature sensor	Ignition switch: ON	When engine coolant temperature is 0°C	3.2 - 3.8 V
			When engine coolant temperature is 20°C	2.3 - 2.9 V
			When engine coolant temperature is 40°C	1.3 - 1.9 V
			When engine coolant temperature is 80°C	0.3 - 0.9 V
45	Crank angle sensor	Engine: Cranking		0.4 - 4.0 V
		Engine: Idle speed		1.5 - 2.5 V
46	Sensor impressed voltage	Ignition switch: ON		4.5 - 5.5 V
49	Control relay (Power supply)	Ignition switch: OFF		System voltage
		Ignition switch: ON		0 - 3 V
52	Power steering fluid pressure switch	Engine: Idling after warming up	When steering wheel is stationary	System voltage
			When steering wheel is turned	0 - 3 V
55	Barometric pressure sensor	Ignition switch: ON	When altitude is 0 m	3.7 - 4.3 V
			When altitude is 1,200 m	3.2 - 3.8 V
56	Top dead centre sensor	Engine: Cranking		0.4 - 3.0 V
		Engine: Idle speed		0.5 - 2.0 V
58	Ignition switch - ST	Engine: Cranking		8 V or more

Terminal No.	Check item	Check condition (Engine condition)		Normal condition
61	A/C switch 2	<ul style="list-style-type: none"><li>● Engine: Idling</li><li>● Outside air temperature: 25°C or more</li></ul>	When A/C is MAX. COOL condition (when the load by A/C is high)	0 - 3 V
			When A/C is MAX. HOT condition (When the load by A/C is low)	System voltage
64	Intake air temperature sensor	Ignition switch: ON	When intake air temperature is 0°C	3.2 - 3.8 V
			When intake air temperature is 20°C	2.3 - 2.9 V
			When intake air temperature is 40°C	1.5 - 2.1 V
			When intake air temperature is 80°C	0.4 - 1.0 V
65	Air flow sensor	Engine: Idle speed		2.2 - 3.2 V
		Engine r/min: 2,500 r/min		
66	Backup power supply	Ignition switch: OFF		System voltage
71	Oxygen sensor	Engine: Running at 2,500 r/min after warmed up (Check using a digital type voltmeter)		0 ↔ 0.8 V (Changes repeatedly)
78	Throttle position sensor	Ignition switch: ON	Set throttle valve to idle position	0.3 - 1.0 V
			Fully open throttle valve	4.5 - 5.5 V
79	Idle position switch	Ignition switch: ON	Set throttle valve to idle position	0 - 1 V
			Slightly open throttle valve	4 V or more

Terminal No.	Check item	Check condition (Engine condition)		Normal condition
80	Vehicle speed sensor	<ul style="list-style-type: none"> <li>Ignition switch: ON</li> <li>Move the vehicle slowly forward</li> </ul>		0 ↔ System voltage (Changes repeatedly)
83	A/C switch 1	Engine: Idle speed	Turn the A/C switch OFF	0 - 3 V
			Turn the A/C switch ON (A/C compressor is operating)	System voltage
98	Ignition switch - IG	Ignition switch: ON		System voltage

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

1. Turn the ignition switch to OFF.
2. Disconnect the engine-A/T-ECU connector.
3. Measure the resistance and check for continuity between the terminals of the engine-A/T-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-A/T-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-A/T-ECU Harness Side Connector Terminal Arrangement

1	9	24
2	10	25
3	11	
4	12	
5	13	
6	14	
7	15	
8	16	
9	17	30
10	18	31
11	19	32
12	20	33
13	21	34
14	22	35
15	23	
16	24	
17	25	
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Terminal No.	Inspection item	Normal condition (Check condition)
1 - 41	No. 1 injector	13 - 16 $\Omega$ (At 20°C)
9 - 41	No. 2 injector	
24 - 41	No. 3 injector	
2 - 41	No. 4 injector	
10 - 41	No. 5 injector	
25 - 41	No. 6 injector	
6 - 41	EGR control solenoid valve	36 - 44 $\Omega$ (At 20°C)
14 - 41	Stepper motor coil (A1)	28 - 33 $\Omega$ (At 20°C)
28 - 41	Stepper motor coil (A2)	
15 - 41	Stepper motor coil (B1)	
29 - 41	Stepper motor coil (B2)	
34 - 41	Purge control solenoid valve	36 - 44 $\Omega$ (At 20°C)
42 - Body earth	Engine-A/T-ECU earth	Continuity (0 $\Omega$ )
48 - Body earth	Engine-A/T-ECU earth	
44 - 47	Engine coolant temperature sensor	5.1 - 6.5 k $\Omega$ (When coolant temperature is 0°C)
		2.1 - 2.7 k $\Omega$ (When coolant temperature is 20°C)
		0.9 - 1.3 k $\Omega$ (When coolant temperature is 40°C)
		0.26 - 0.36 k $\Omega$ (When coolant temperature is 80°C)
64 - 47	Intake air temperature sensor	5.3 - 6.7 k $\Omega$ (When intake air temperature is 0°C)
		2.3 - 3.0 k $\Omega$ (When intake air temperature is 20°C)
		1.0 - 1.5 k $\Omega$ (When intake air temperature is 40°C)
		0.30 - 0.42 k $\Omega$ (When intake air temperature is 80°C)
79 - 47	Idle position switch	Continuity (when throttle valve is at idle position)
		No continuity (when throttle valve is slightly open)

## **INSPECTION PROCEDURE USING AN ANALYZER**

- Measurement procedure at the engine-A/T-ECU has been added due to the addition of vehicles with A/T.

### **AIR FLOW SENSOR (AFS)**

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

Connect the analyzer special patterns pickup to engine-A/T-ECU terminal 65.

## **CAMSHAFT POSITION SENSOR AND CRANK ANGLE SENSOR**

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

1. Connect the analyzer special patterns pickup to engine-A/T-ECU terminal 56. (When checking the top dead sensor signal wave pattern.)
2. Connect the analyzer special patterns pickup to engine-A/T-ECU terminal 45. (when checking the crank angle sensor signal wave pattern.)

## **INJECTOR**

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

1. Connect the analyzer special patterns pickup to engine-A/T-ECU terminal 1. (when checking the No. 1 cylinder.)
2. Connect the analyzer special patterns pickup to engine-A/T-ECU terminal 9. (when checking the No. 2 cylinder.)
3. Connect the analyzer special patterns pickup to engine-A/T-ECU terminal 24. (when checking the No. 3 cylinder.)
4. Connect the analyzer special patterns pickup to engine-A/T-ECU terminal 2. (when checking the No. 4 cylinder.)
5. Connect the analyzer special patterns pickup to engine-A/T-ECU terminal 10. (when checking the No. 5 cylinder.)
6. Connect the analyzer special patterns pickup to engine-A/T-ECU terminal 25. (when checking the No. 6 cylinder.)

**STEPPER MOTOR****Alternate Method (Test harness not available)**

Connect the analyzer special patterns pickup to engine-A/T-ECU terminal 14, connection terminal 15, connection terminal 28, connection terminal 29 respectively.

**IGNITION COIL AND POWER TRANSISTOR****Alternate Method (Test harness not available)**

Connect the analyzer special patterns pickup to the engine-A/T-ECU terminal 11 (No. 1 - No. 4), terminal 12 (No. 2 - No. 5), terminal 13 (No. 3 - No. 6) respectively.

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# MULTIPOINT FUEL INJECTION (MPI)

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# MULTIPOINT FUEL INJECTION (MPI) <6G7>

## GENERAL

### OUTLINE OF CHANGES

Due to the changes shown below, the service procedures regarding the different description from the previous version have been established.

- On-board Diagnostics System has been adopted to expand the diagnostic items and to change diagnosis code numbering system.
- The oxygen sensor has been changed.

## GENERAL INFORMATION

### SELF-DIAGNOSIS FUNCTION

Following functions have been added.

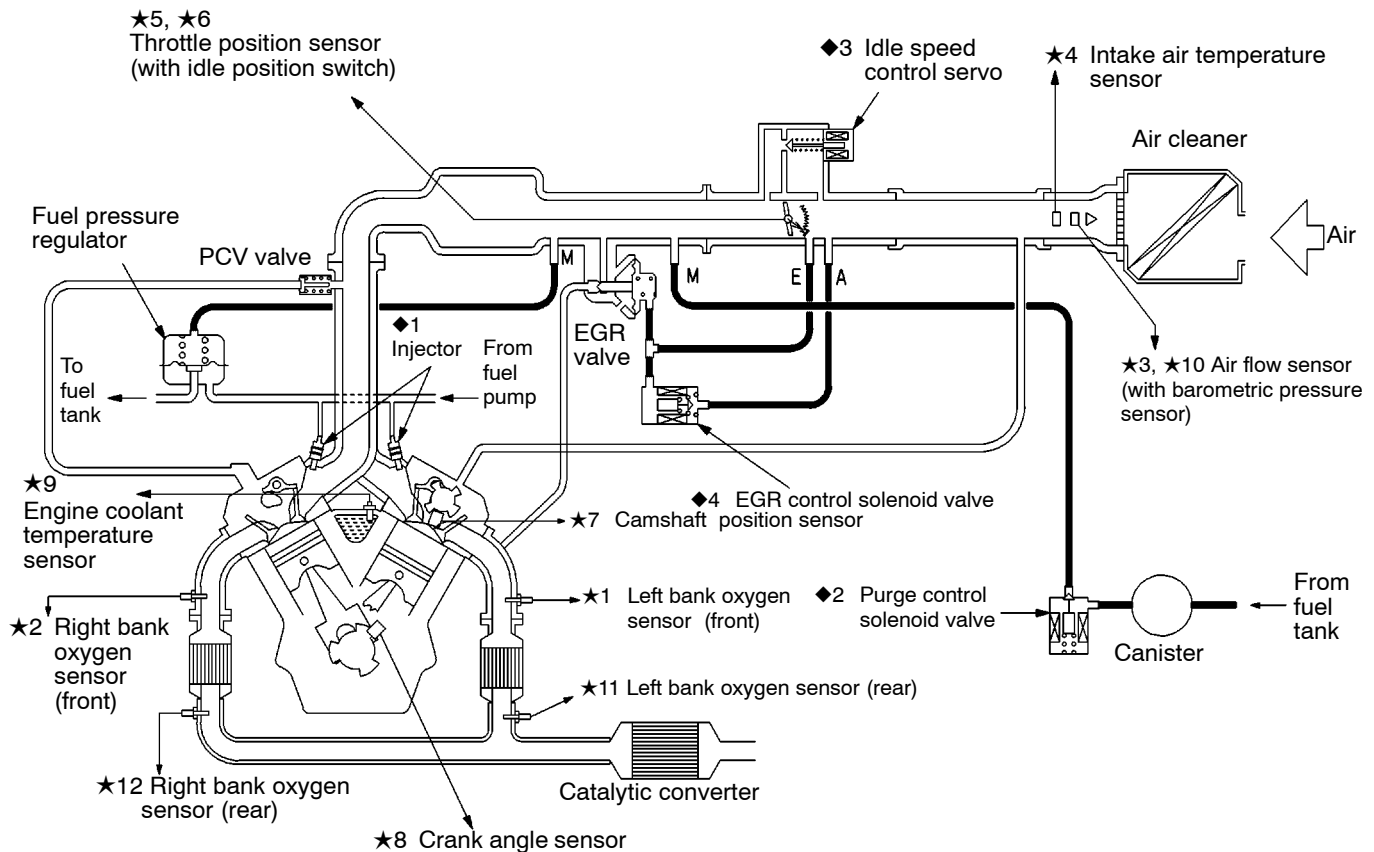
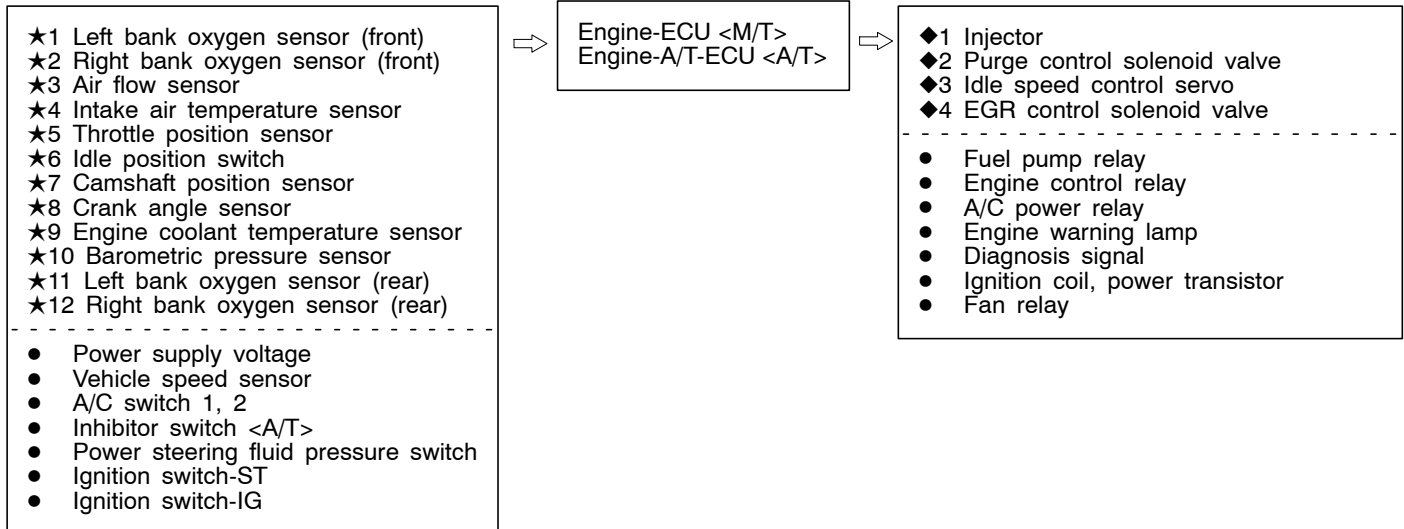
- This engine-ECU <M/T> or engine-A/T-ECU <A/T> records the engine operating condition when the diagnosis code is set.  
This data is called "freeze frame" data.  
This data can be read by using the MUT-II, are can then be used in simulation tests for troubleshooting.

## GENERAL SPECIFICATIONS

Items		Specifications
Engine-ECU	Identification model No.	E6T32671 <M/T>
Engine-A/T-ECU	Identification model No.	E6T32575 <A/T>

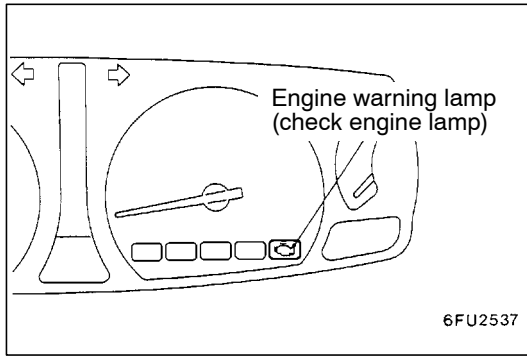


## MULTIPOINT FUEL INJECTION SYSTEM DIAGRAM



**SERVICE SPECIFICATIONS**

Items		Standard value
Oxygen sensor output voltage V		0.6 - 1.0
Oxygen sensor heater coil resistance front (at 20°C) Ω	Front	4.5 - 8
	Rear	11 - 18



## TROUBLESHOOTING

### DIAGNOSIS FUNCTION

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

If an abnormality occurs in any of the following items related to the MPI system, the engine warning lamp will illuminate or flash. If the lamp remains illuminated or if the lamp illuminates while the engine is running, check the diagnosis code output.

However, the warning lamp will illuminate as bulb check for five seconds whenever the ignition switch is turned to the ON position.

#### Engine warning lamp inspection items

Code No.	Diagnosis item
-	Engine-ECU <M/T> or Engine-A/T-ECU <A/T>
P0100	Air flow sensor system
P0105	Barometric pressure sensor system
P0110	Intake air temperature sensor system
P0115	Engine coolant temperature sensor system
P0120	Throttle position sensor system
P0125	Feedback system
P0130	Oxygen sensor (front) system <Bank 1 sensor 1>
P0135	Oxygen sensor heater (front) system <Bank 1 sensor 1>
P0136	Oxygen sensor (rear) system <Bank 1 sensor 2>
P0141	Oxygen sensor heater (rear) system <Bank 1 sensor 2>
P0150	Oxygen sensor (front) <Bank 2 sensor 1>
P0155	Oxygen sensor heater (front) <Bank 2 sensor 1>
P0156	Oxygen sensor (rear) <Bank 2 sensor 2>
P0161	Oxygen sensor heater (rear) <Bank 2 sensor 2>
P0170	Abnormal fuel system (Bank 1)
P0173	Abnormal fuel system (Bank 2)
P0201	No. 1 injector system
P0202	No. 2 injector system
P0203	No. 3 injector system
P0204	No. 4 injector system
P0205	No. 5 injector system
P0206	No. 6 injector system

Code No.	Diagnosis item
P0300★	Random misfire detected
P0301	No. 1 cylinder misfire detected
P0302	No. 2 cylinder misfire detected
P0303	No. 3 cylinder misfire detected
P0304	No. 4 cylinder misfire detected
P0305	No. 5 cylinder misfire detected
P0306	No. 6 cylinder misfire detected
P0335	Crank angle sensor system
P0340	Camshaft position sensor system
P0403	EGR control solenoid valve system
P0421	Catalyst malfunction (Bank 1)
P0431	Catalyst malfunction (Bank 2)
P0443	Purge control solenoid valve system
P0505	Idle speed control system
P0510	Idle position switch system
P0551	Power steering fluid pressure switch system

## NOTE

1. If the engine warning lamp illuminates because of a malfunction of the engine-ECU <M/T> or engine-A/T-ECU <A/T>, communication between MUT-II and the engine-ECU <M/T> or engine-A/T-ECU <A/T> is impossible. In this case, the diagnosis code cannot be read.
2. After the engine-ECU <M/T> or engine-A/T-ECU <A/T> has detected a malfunction, the engine warning lamp illuminates when the engine is next turned on and the same malfunction is re-detected. However, for items marked with a “★” in the diagnosis code number column, the engine warning lamp illuminates only on the first detection of the malfunction.
3. After the engine warning lamp illuminates, it will be switched off under the following conditions.
  - (1) When the engine-ECU <M/T> or engine-A/T-ECU <A/T> monitored the power train malfunction three times\* and met set condition requirements, it detected no malfunction.  
\*: In this case, “one time” indicates from engine start to stop.
  - (2) For misfiring malfunction, when driving conditions (engine speed, engine coolant temperature, etc.) are similar to those when the malfunction was first recorded.
4. Sensor 1 indicates the sensor mounted at a position closest to the engine, and sensor 2 indicates the sensor mounted at the position second closest to the engine.

**METHOD OF READING AND ERASING DIAGNOSIS CODES**

Refer to GROUP 00 - How to Use Troubleshooting/Inspection Service Points.

**DIAGNOSIS USING DIAGNOSIS 2 MODE**

1. Switch the diagnosis mode of the engine control unit to DIAGNOSIS 2 mode using the MUT-II.
2. Carry out a road test.
3. Take a reading of the diagnosis code and repair the problem location.
4. Turn the ignition switch to OFF and then back to ON again.

**NOTE**

By turning the ignition switch to OFF, the engine-ECU <M/T> or engine-A/T-ECU <A/T> will switch the diagnosis mode from DIAGNOSIS 2 mode to DIAGNOSIS 1 mode.

5. Erase the diagnosis codes.

**INSPECTION USING MUT-II DATA LIST AND ACTUATOR TESTING**

1. Carry out inspection by means of the data list and the actuator test function. If there is an abnormality, check and repair the chassis harnesses and components.
2. After repairing, re-check using the MUT-II and check that the abnormal input and output have returned to normal as a result of the repairs.
3. Erase the diagnosis code memory.
4. Remove the MUT-II, and then start the engine again and carry out a road test to confirm that the problem has disappeared.

**FREEZE FRAME DATA**

When the engine-ECU <M/T> or engine-A/T-ECU <A/T> detects a malfunction and stores a diagnosis code, it also stores a current status of the engine. This function is called "Freeze frame data." By analyzing this "freeze frame" data with the MUT-II, an effective troubleshooting can be performed.

The display items of freeze frame data are shown below.

**Display item list**

Data item		Unit
Engine coolant temperature sensor		°C
Engine speed		r/min
Vehicle speed		km/h
Long-term fuel compensation (long-term fuel trim)		%
Short-term fuel compensation (short-term fuel trim)		%
Fuel control condition	Open loop	OL
	Closed loop	CL
	Open loop owing to drive condition	OL-DRV.
	Open loop owing to system malfunction	OL-SYS.
	Closed loop based on one oxygen sensor	CL-H02S
Calculation load value		%
Diagnosis code during data recording		-

**NOTE**

If malfunctions have been detected in multiple systems, store one malfunction only, which has been detected first.

**READINESS TEST STATUS**

The engine-ECU <M/T> or engine-A/T-ECU <A/T> monitors the following main diagnosis items, judges if these items are in good condition or not, and stores its history. This history can be read out by using MUT-II. (If the ECU has judged a item before, the MUT-II displays "Complete.") In addition, if diagnosis codes are erased or the battery cable is disconnected, this history will also be erased (the memory will be reset).

- Catalyst: P0421, P0431
- Oxygen sensor: P0130, P0150
- Oxygen sensor heater: P0135, P0141, P0155, P0161

**FAIL-SAFE FUNCTION REFERENCE TABLE**

When the main sensor malfunctions are detected by the diagnosis function, the vehicle is controlled by means of the pre-set control logic to maintain safe conditions for driving.

Malfunctioning item	Control contents during malfunction
Air flow sensor	<ol style="list-style-type: none"> <li>1. Uses the throttle position sensor signal and engine speed signal (crank angle sensor signal) to take reading of the basic injector drive time and basic ignition timing from the pre-set mapping.</li> <li>2. Fixes the ISC servo in the appointed position so idle control is not performed.</li> </ol>
Intake air temperature sensor	Controls as if the intake air temperature is 25°C.
Throttle position sensor (TPS)	No increase in fuel injection amount during acceleration due to the throttle position sensor signal.
Engine coolant temperature sensor	Controls as if the engine coolant temperature is 80°C.
Camshaft position sensor	<ol style="list-style-type: none"> <li>1. Controls maintaining the condition before determined as failure.</li> <li>2. Fuel will be cut-off 4 seconds after a malfunction is detected.(However, only if No. 1 cylinder TDC has never been detected after the ignition switch is turned to the ON position)</li> </ol>
Barometric pressure sensor	Controls as if the barometric pressure is 101 kPa.
Detonation sensor	Switches the ignition timing from ignition timing for super petrol to ignition timing for standard petrol.
Right bank oxygen sensor (front) and Left bank oxygen sensor (front)	Air/fuel ratio feedback control (closed loop control) is not performed.
Right bank oxygen sensor (rear) and Left bank oxygen sensor (rear)	Performs the feedback control (closed loop control) of the air/fuel ratio by using only the signal of the oxygen sensor (front) installed on the front of the catalytic converter.
Misfiring	If the detected misfiring causes damage to the catalyst, the misfiring cylinder will be shut down.

## INSPECTION CHART FOR DIAGNOSIS CODES

Code No.	Diagnosis item	Reference page
P0100	Air flow sensor system	13A-12
P0105	Barometric pressure sensor system	13A-14
P0110	Intake air temperature sensor system	13A-16
P0115	Engine coolant temperature sensor system	13A-17
P0120	Throttle position sensor 1 system	13A-20
P0125	Feedback system	13A-21
P0130	Oxygen sensor (front) system <Bank 1 sensor 1>	13A-24
P0135	Oxygen sensor heater (front) system <Bank 1 sensor 1>	13A-26
P0136	Oxygen sensor (rear) system <Bank 1 sensor 2>	13A-27
P0141	Oxygen sensor heater (rear) system <Bank 1 sensor 2>	13A-29
P0150	Oxygen sensor (front) <Bank 2 sensor 1>	13A-30
P0155	Oxygen sensor heater (front) <Bank 2 sensor 1>	13A-32
P0156	Oxygen sensor (rear) <Bank 2 sensor 2>	13A-33
P0161	Oxygen sensor heater (rear) <Bank 2 sensor 2>	13A-35
P0170	Abnormal fuel system (Bank 1)	13A-36
P0173	Abnormal fuel system (Bank 2)	13A-37
P0201	No. 1 injector system	13A-38
P0202	No. 2 injector system	13A-38
P0203	No. 3 injector system	13A-38
P0204	No. 4 injector system	13A-38
P0205	No. 5 injector system	13A-38
P0206	No. 6 injector system	13A-38
P0300★	Random misfire detected	13A-39
P0301	No. 1 cylinder misfire detected	13A-41
P0302	No. 2 cylinder misfire detected	13A-41
P0303	No. 3 cylinder misfire detected	13A-41
P0304	No. 4 cylinder misfire detected	13A-41
P0305	No. 5 cylinder misfire detected	13A-41
P0306	No. 6 cylinder misfire detected	13A-41
P0335	Crank angle sensor system	13A-42
P0340	Camshaft position sensor system	13A-44
P0403	EGR control solenoid valve system	13A-45



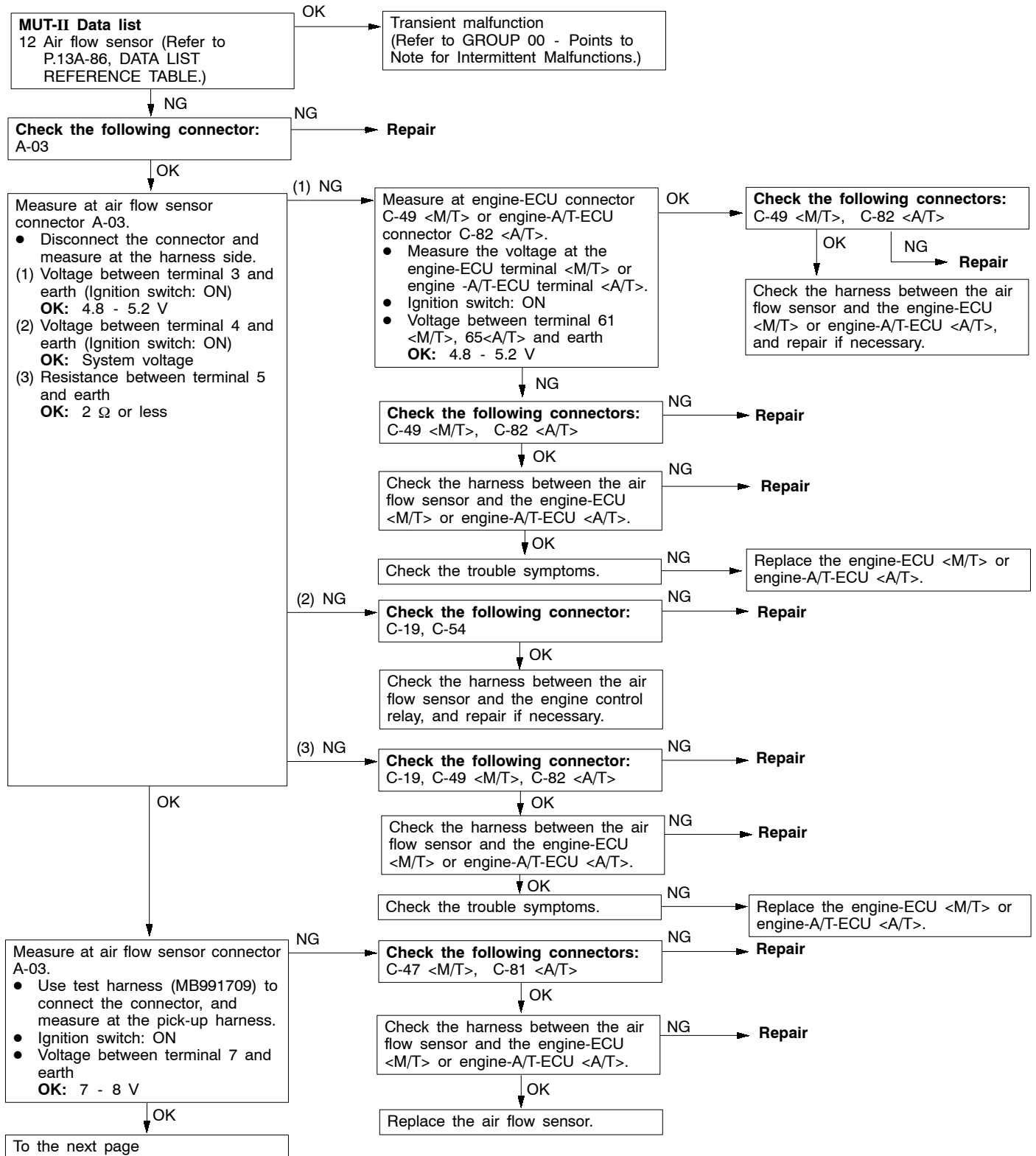
Code No.	Diagnosis item	Reference page
P0421	Catalyst malfunction (Bank 1)	13A-46
P0431	Catalyst malfunction (Bank 2)	13A-47
P0443	Purge control solenoid valve system	13A-48
P0500	Vehicle speed sensor system	13A-49
P0505	Idle speed control system	13A-49
P0510	Idle position switch system	13A-51
P0551	Power steering fluid pressure switch system	13A-52
P1610	Immobilizer system	13A-53

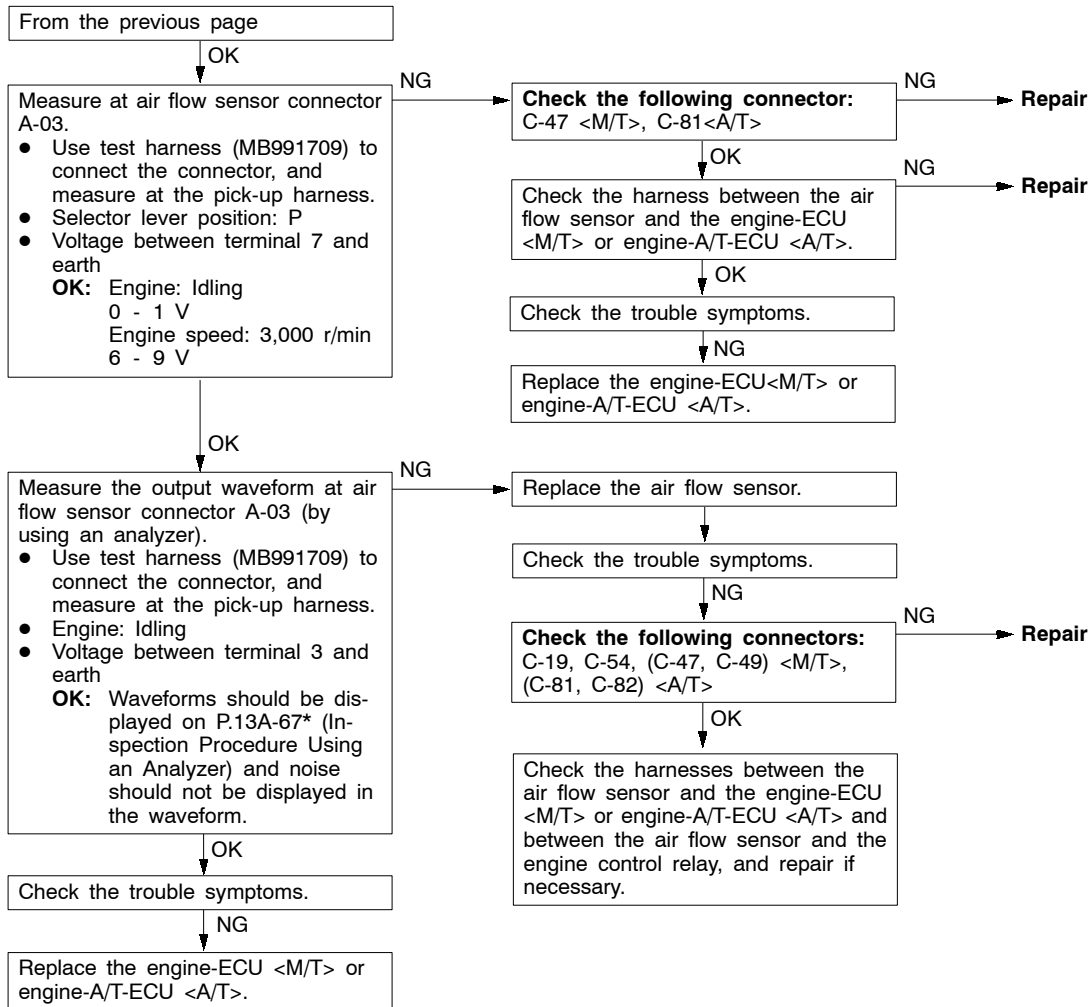
## NOTE

1. Do not replace the engine-ECU <M/T> or engine-A/T-ECU <A/T> until a through terminal check reveals there are no short/open circuit.
2. Check that the engine-ECU <M/T> or engine-A/T-ECU <A/T> earth circuit is normal before checking for the cause of the problem.
3. After the engine-ECU <M/T> or engine-A/T-ECU <A/T> has detected a malfunction, a diagnosis code is recorded the next time the engine is started and the same malfunction is re-detected. However, for items marked with a “★”, the diagnosis code is recorded on the first detection of the malfunction.
4. Sensor 1 indicates the sensor mounted at a position closest to the engine, and sensor 2 indicates the sensor mounted at the position second closest to the engine.

## INSPECTION PROCEDURE CLASSIFIED BY DIAGNOSIS CODE

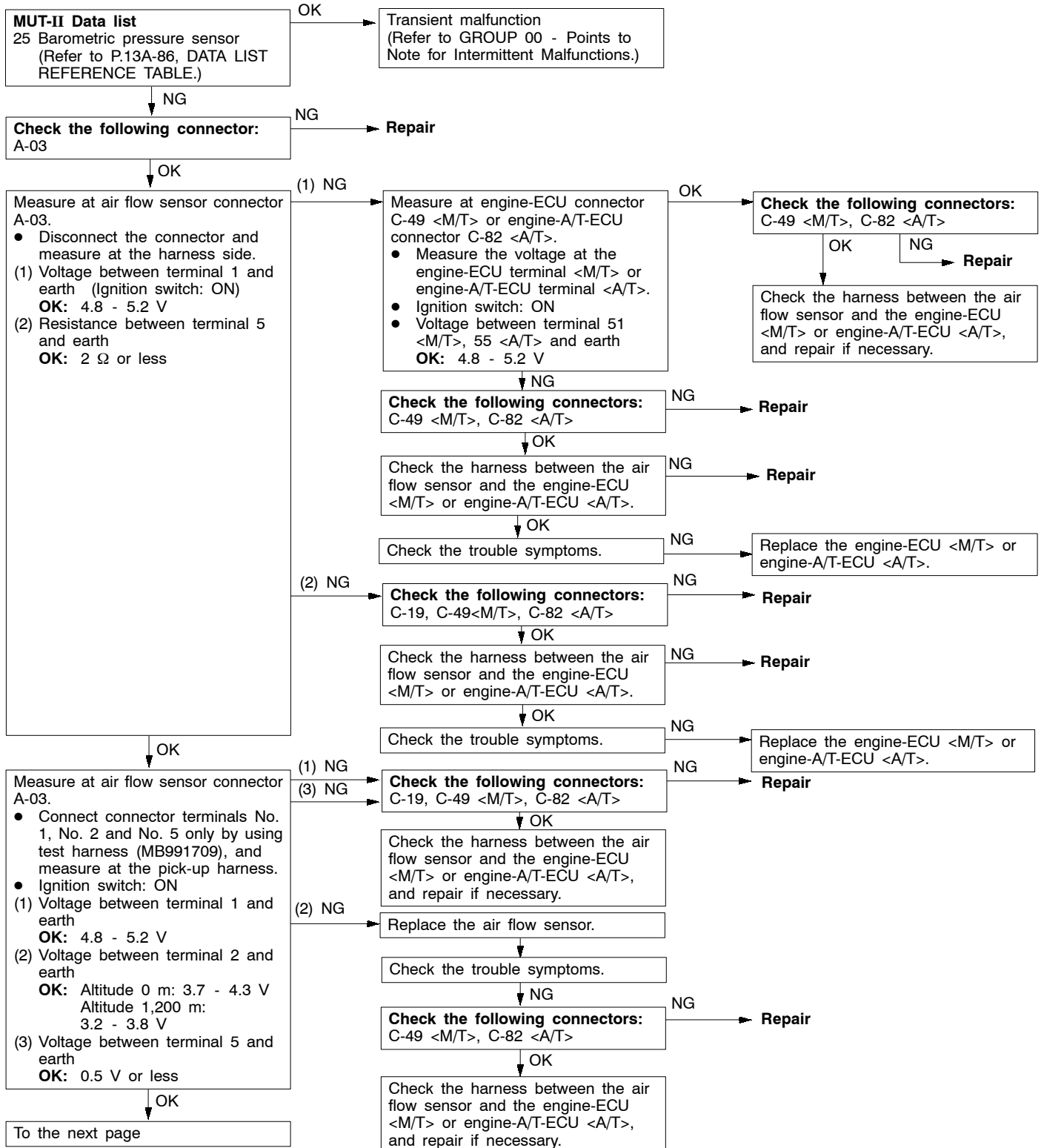
Code No. P0100 Air flow sensor system	Probable cause
Range of Check • Engine speed: 500 r/min or more Set Conditions • The sensor output frequency is 3.3 Hz or less for four seconds.	• Malfunction of air flow sensor • Open or short circuit in air flow sensor circuit or loose connector contact • Malfunction of engine-ECU <M/T> • Malfunction of engine-A/T-ECU <A/T>

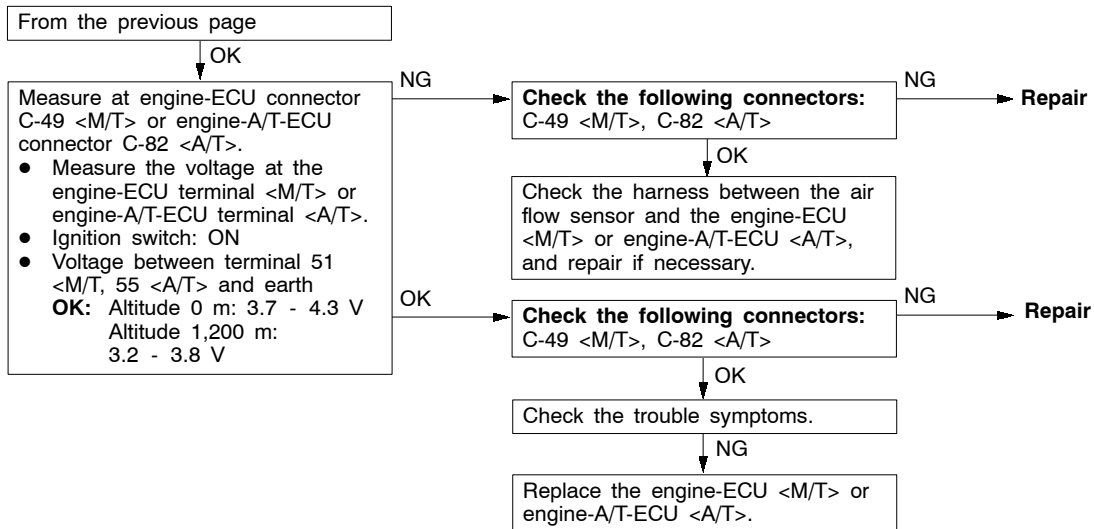


**NOTE:**

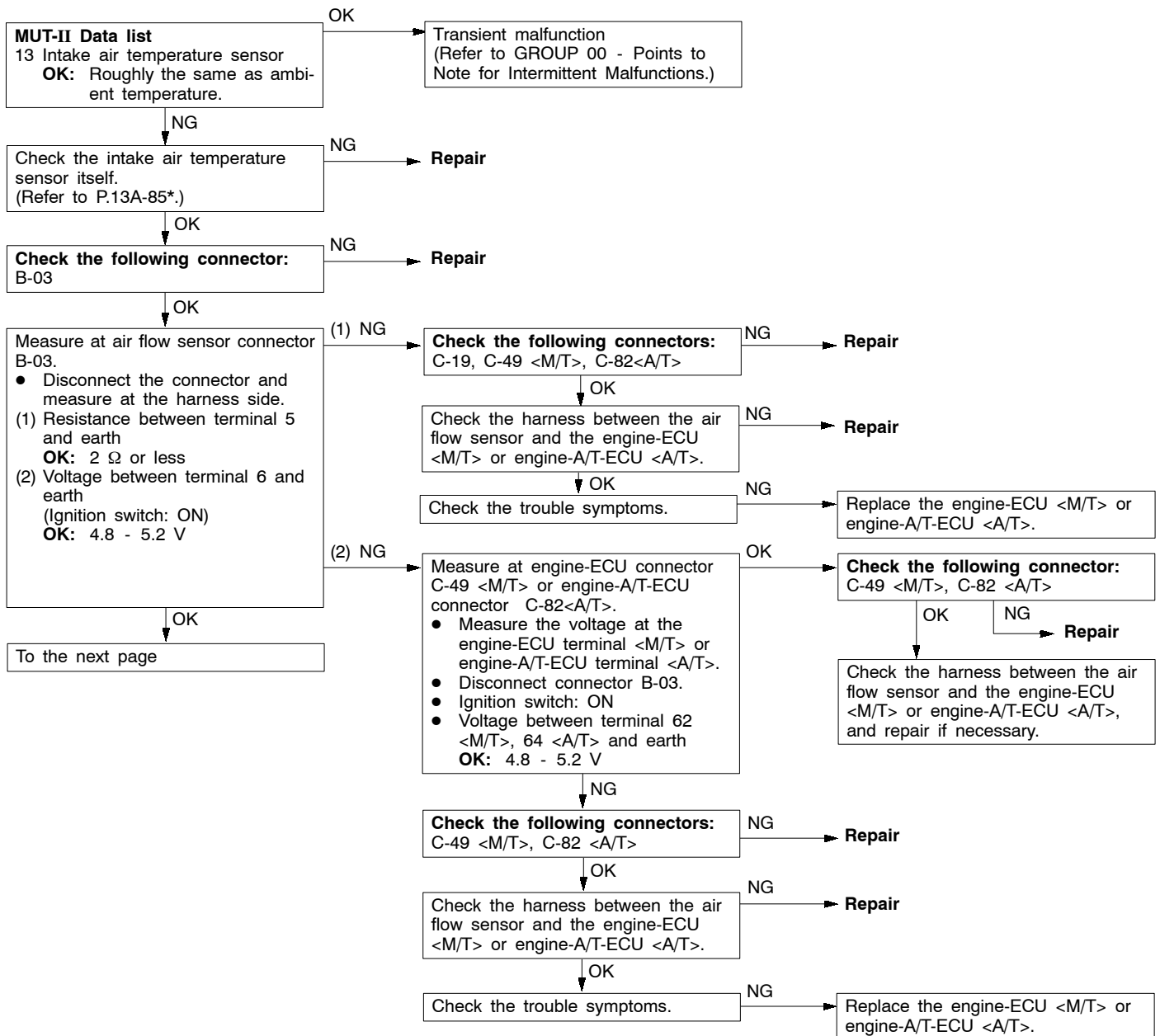
\*: Refer to the '99 PAJERO SPORT Workshop Manual (Pub. No. PWJE9812).

Code No. P0105 Barometric pressure sensor system	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>Two seconds have passed since the ignition switch is turned ON or the engine starting process is completed.</li> <li>Battery voltage: 8 V or more</li> </ul> <p>Set Conditions</p> <ul style="list-style-type: none"> <li>The sensor output voltage is 4.5 V or more for four seconds (equivalent to 114 kPa of barometric pressure)</li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>The sensor output voltage is 0.2 V or less (equivalent to 53 kPa of barometric pressure)</li> </ul>	<ul style="list-style-type: none"> <li>Malfunction of barometric pressure sensor</li> <li>Open or short circuit in barometric pressure sensor circuit or loose connector contact</li> <li>Malfunction of engine-ECU &lt;M/T&gt;</li> <li>Malfunction of engine-A/T-ECU &lt;A/T&gt;</li> </ul>



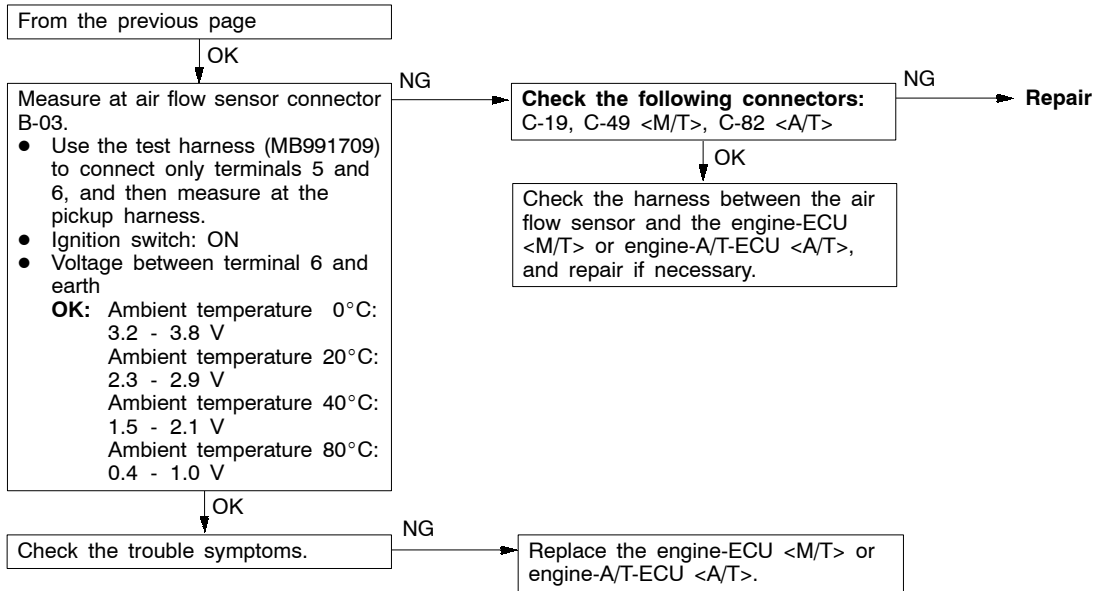


Code No. P0110 Intake air temperature sensor system	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>Two seconds have passed since the ignition switch is turned ON or the engine starting process is completed.</li> </ul> <p>Set Conditions</p> <ul style="list-style-type: none"> <li>The sensor output voltage is 4.6 V or more for four seconds (equivalent to -45°C of intake air temperature)</li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>The sensor output voltage is 0.2 V or more for four seconds (equivalent to 125°C of intake air temperature)</li> </ul>	<ul style="list-style-type: none"> <li>Malfunction of intake air temperature sensor</li> <li>Open or short circuit in intake air temperature sensor or loose connector contact</li> <li>Malfunction of engine-ECU &lt;M/T&gt;</li> <li>Malfunction of engine-A/T-ECU &lt;A/T&gt;</li> </ul>

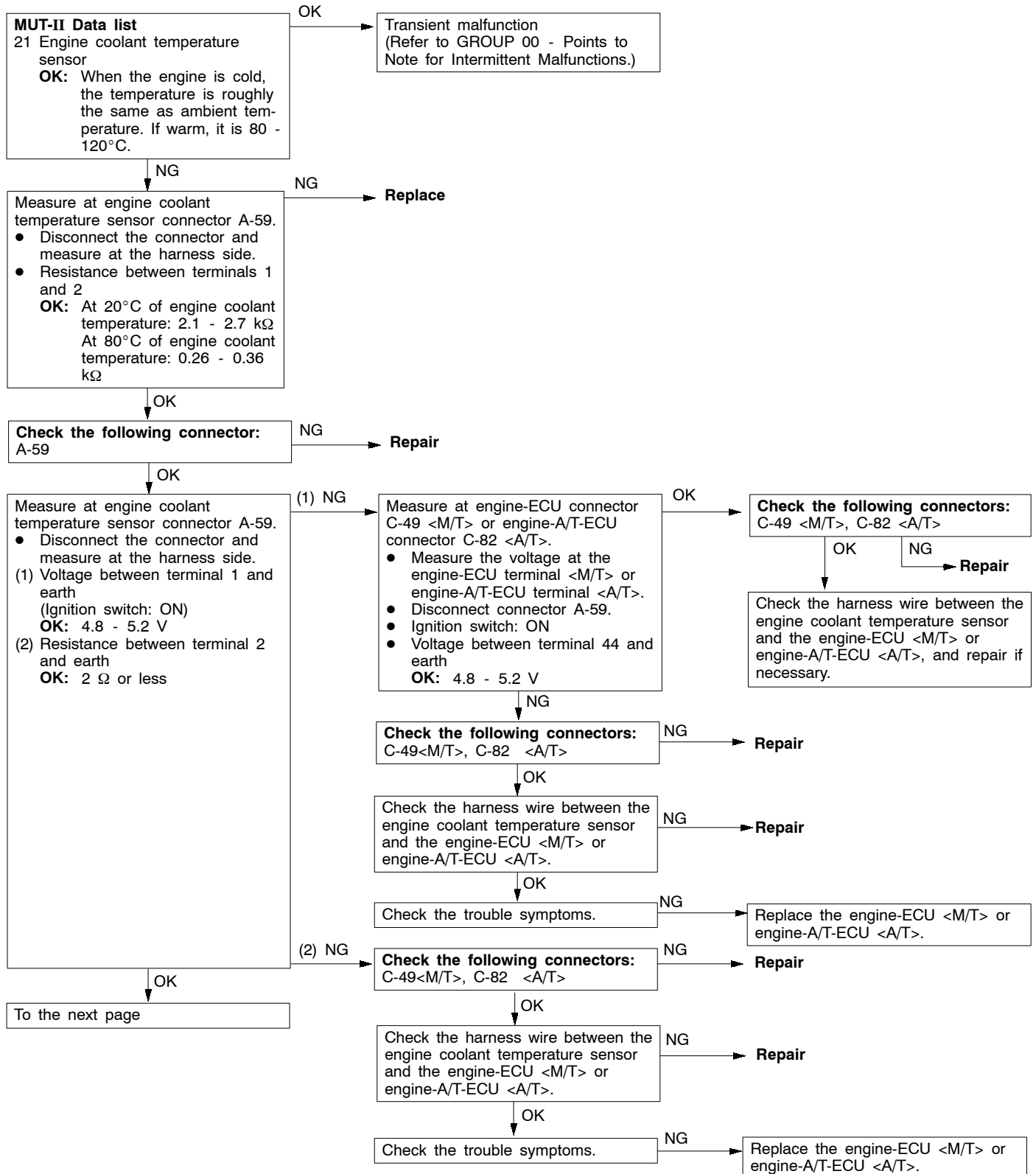


## NOTE:

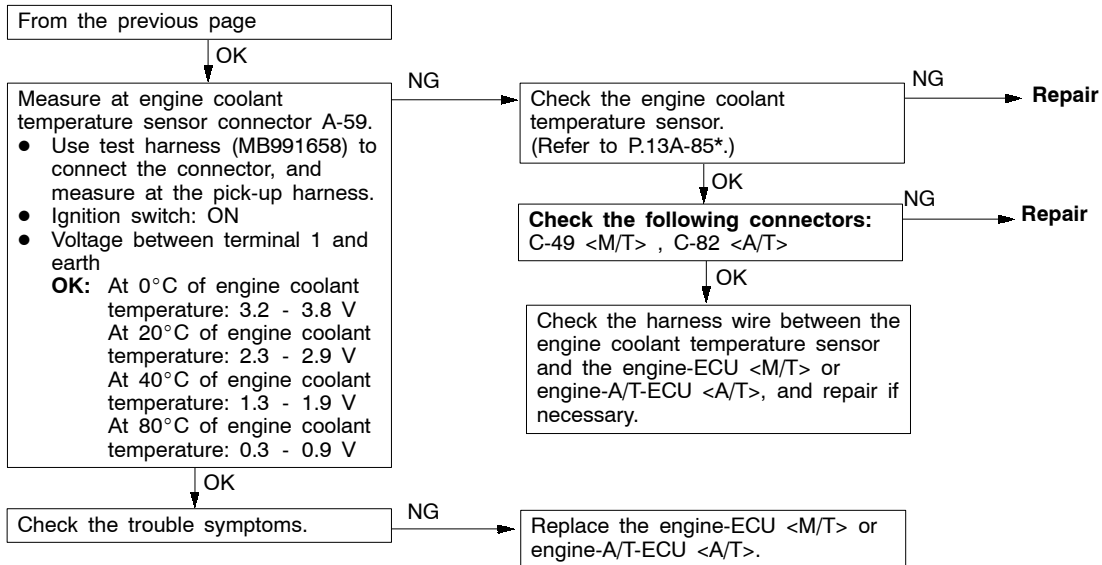
\*: Refer to the '99 PAJERO SPORT Workshop Manual (Pub. No. PWJE9812).



Code No. P0115 Engine coolant temperature sensor system	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>• Engine: Two seconds after the engine has been started</li> </ul> <p>Set Conditions</p> <ul style="list-style-type: none"> <li>• The sensor output voltage is 4.6 V or more for four seconds (equivalent to -45°C of engine coolant temperature)</li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>• The sensor output voltage is 0.1 V or less for four seconds (equivalent to 140°C of engine coolant temperature)</li> </ul> <p>Range of Check</p> <ul style="list-style-type: none"> <li>• Engine: After starting</li> </ul> <p>Set Conditions</p> <ul style="list-style-type: none"> <li>• The engine coolant temperature has reduced from over 40°C to less than 40°C, and that condition has lasted for five minutes or more.</li> </ul>	<ul style="list-style-type: none"> <li>• Malfunction of engine coolant temperature sensor</li> <li>• Open or short circuit in the engine coolant temperature sensor circuit or loose connector contact</li> <li>• Malfunction of engine-ECU &lt;M/T&gt;</li> <li>• Malfunction of engine-A/T-ECU &lt;A/T&gt;</li> </ul>



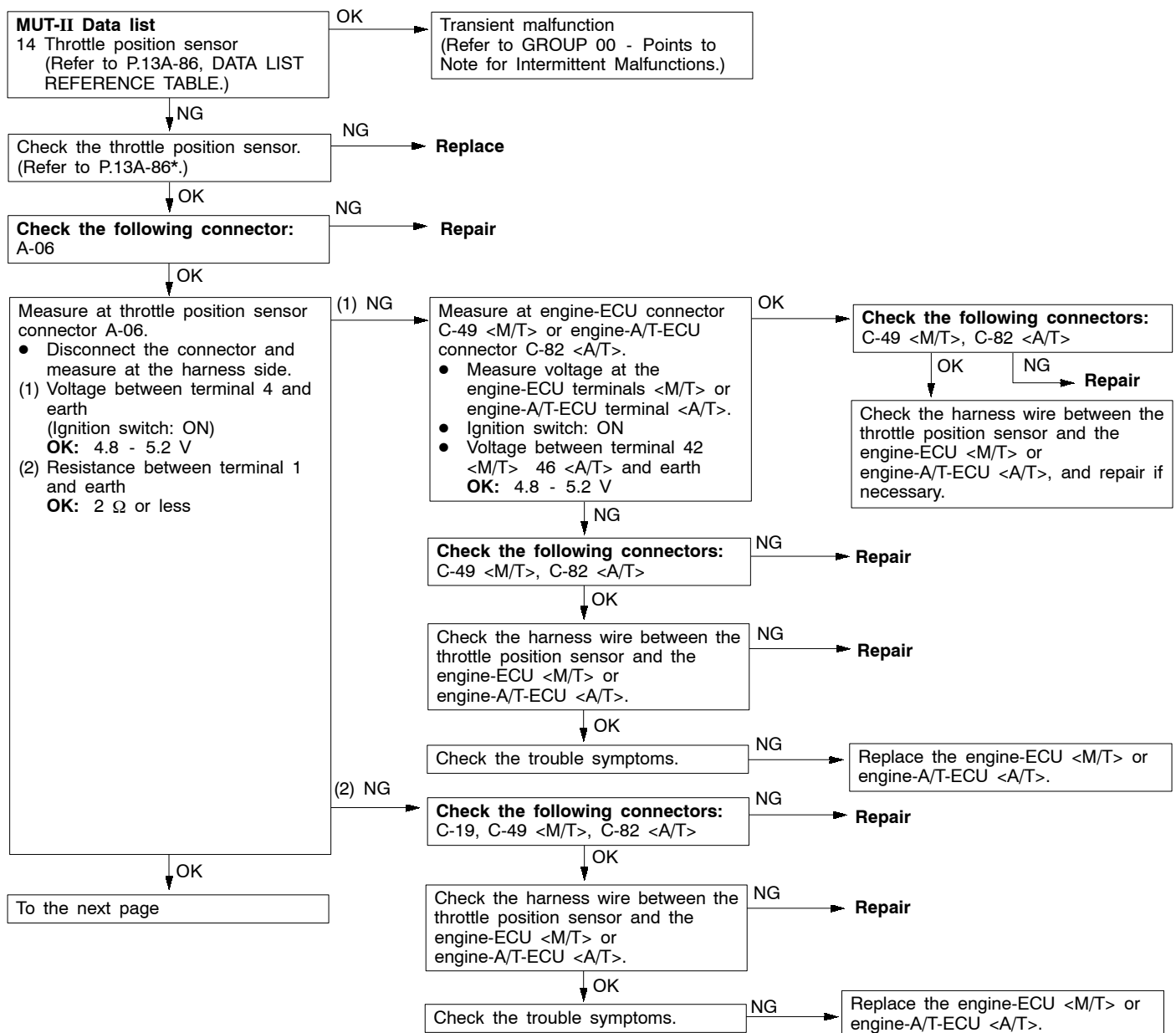


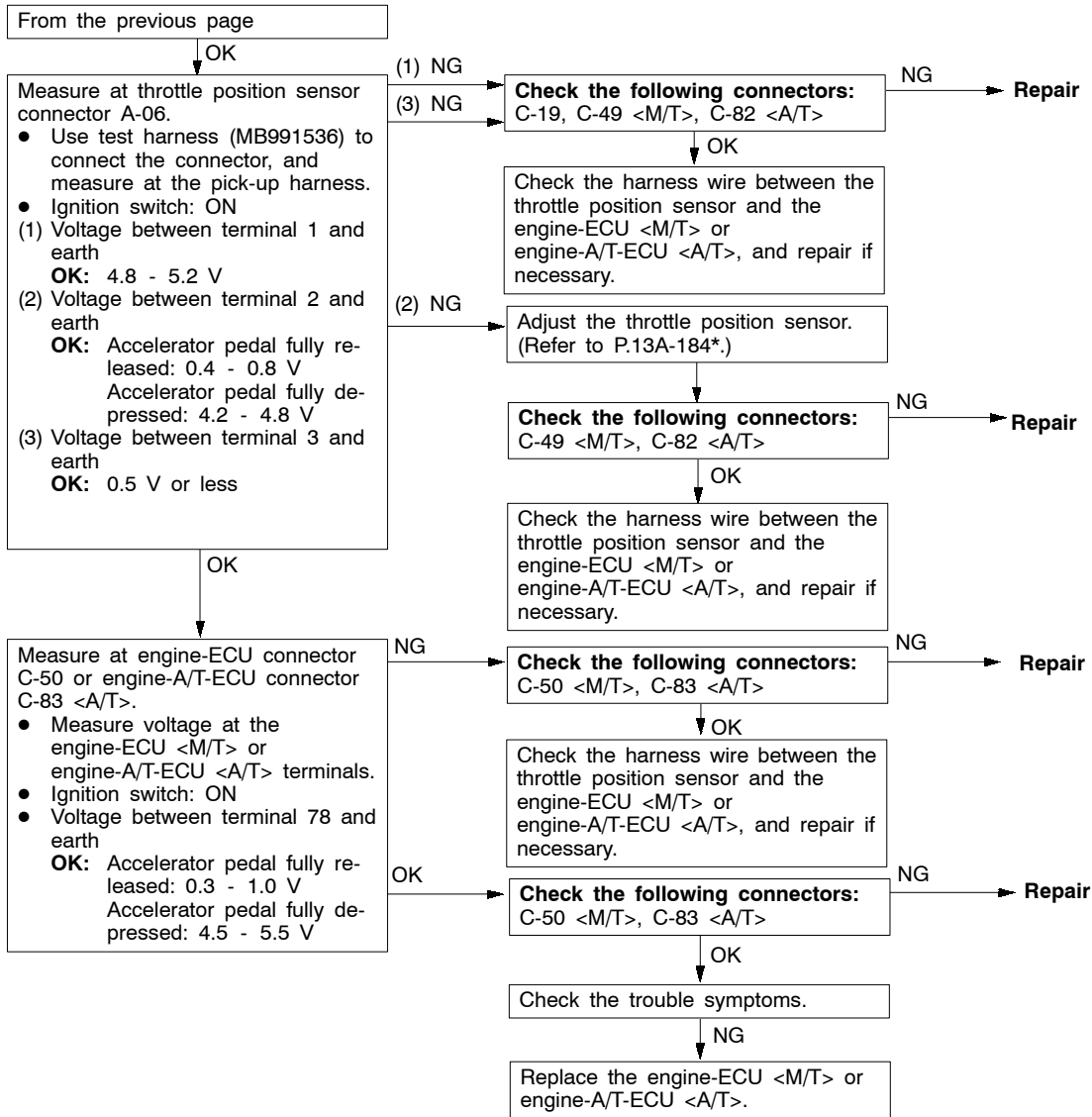


## NOTE:

\*: Refer to the '99 PAJERO SPORT Workshop Manual (Pub. No. PWJE9812).

Code No. P0120 Throttle position sensor system	Probable cause
Range of Check <ul style="list-style-type: none"> <li>Ignition switch: ON</li> <li>Excluding 2 seconds after the ignition switch is turned ON or immediately after the engine starts.</li> </ul> Set Conditions <ul style="list-style-type: none"> <li>When the idle position switch is ON, the sensor output voltage is 2 V or more for 2 seconds</li> </ul> or <ul style="list-style-type: none"> <li>The sensor output voltage is 0.2 V or less for 2 seconds</li> </ul>	<ul style="list-style-type: none"> <li>Malfunction of throttle position sensor</li> <li>Improper connector contact, open circuit or short-circuited harness wire</li> <li>Improper "ON" state of idle position switch</li> <li>Short circuit of the idle position switch signal line</li> <li>Malfunction of engine-ECU &lt;M/T&gt;</li> <li>Malfunction of engine-A/T-ECU &lt;A/T&gt;</li> </ul>
Range of Check <ul style="list-style-type: none"> <li>Two seconds or more have passed since the engine was started.</li> <li>Engine speed is lower than 3,000 r/min.</li> <li>Volumetric efficiency is lower than 30 percent.</li> </ul> Set Conditions <ul style="list-style-type: none"> <li>Throttle position sensor output voltage has continued to be 4.6 volts or higher for two seconds.</li> </ul>	
Range of Check <ul style="list-style-type: none"> <li>Two seconds or more have passed since the engine was started.</li> <li>Engine speed is lower than 2,000 r/min.</li> <li>Volumetric efficiency is lower than 60 percent.</li> </ul> Set Conditions <ul style="list-style-type: none"> <li>Throttle position sensor output voltage has continued to be 0.8 volts or higher for two seconds.</li> </ul>	

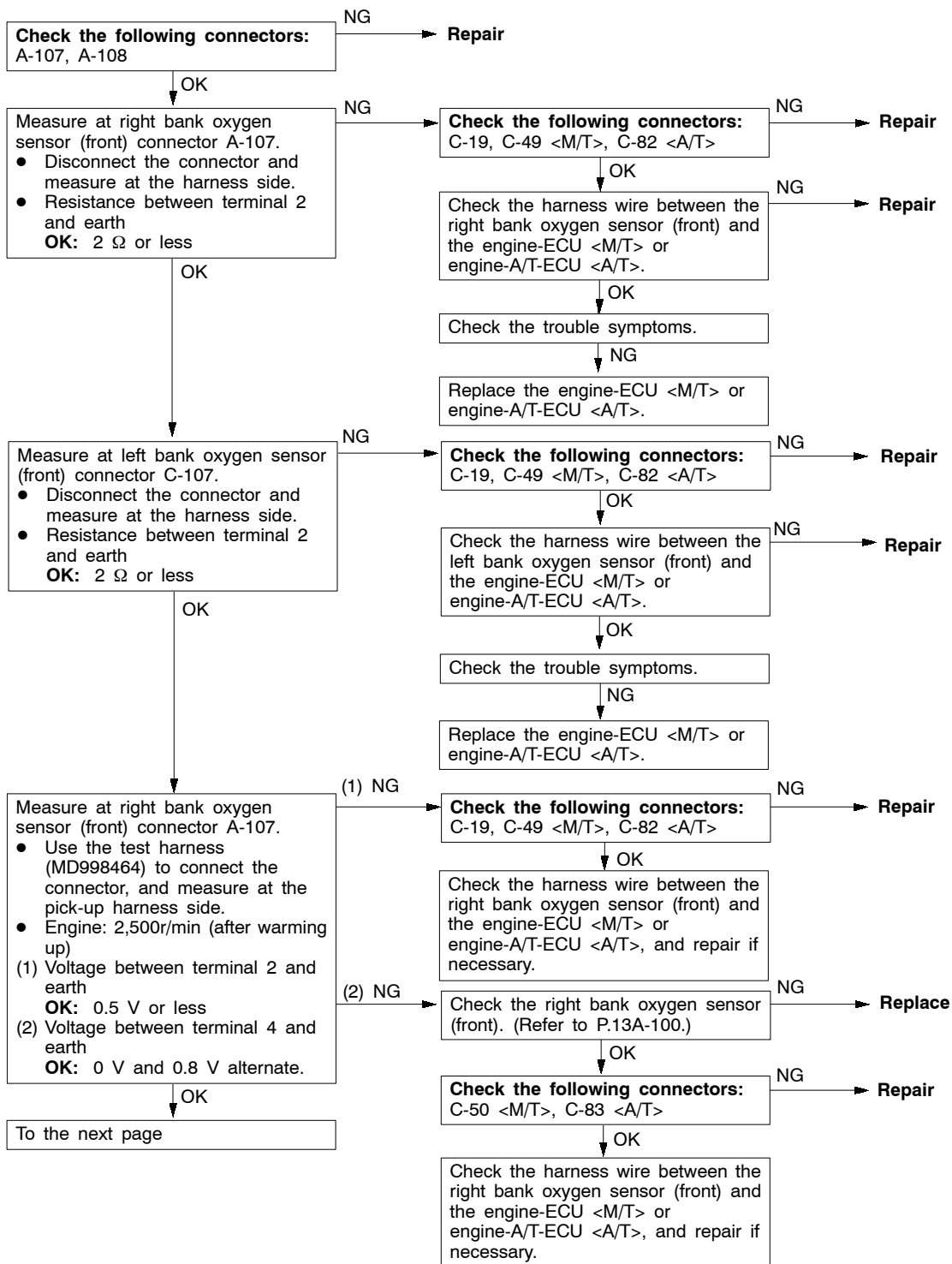


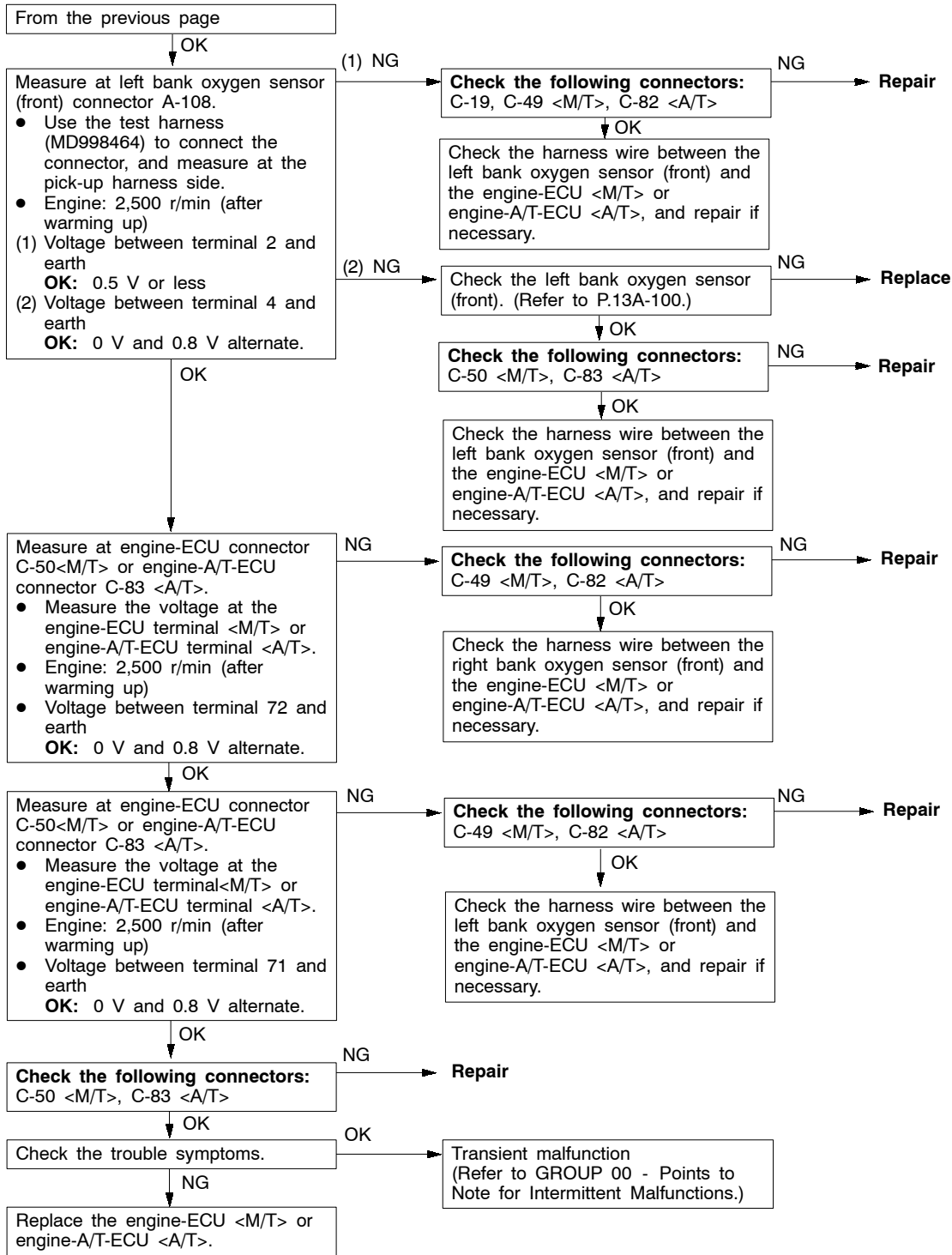


## NOTE:

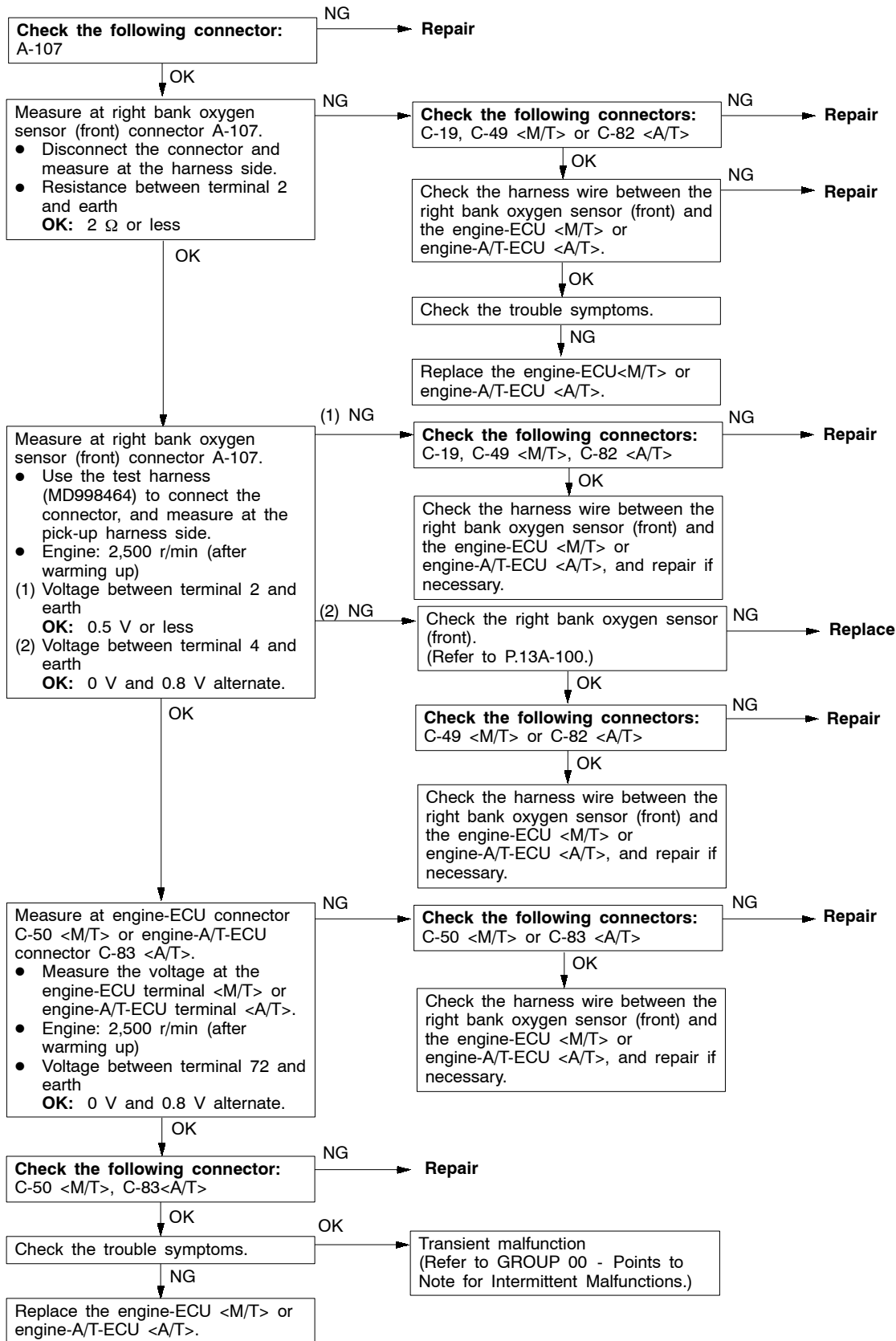
\*: Refer to the '99 PAJERO SPORT Workshop Manual (Pub. No. PWJE9812).

Code No. P0125 Feedback system	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>• The engine coolant temperature is approx. 80°C or more.</li> <li>• During stoichiometric feedback control</li> <li>• The vehicle is not being decelerated.</li> </ul> <p>Set Conditions</p> <ul style="list-style-type: none"> <li>• Right bank oxygen sensor (front) output voltage has been higher or lower than 0.5 V for at least thirty seconds.</li> <li>• Left bank oxygen sensor (front) output voltage has been higher or lower than 0.5 V for at least thirty seconds.</li> </ul>	<ul style="list-style-type: none"> <li>• Malfunction of oxygen sensor (front)</li> <li>• Open or short circuit in the right bank oxygen sensor (front) circuit or loose connector contact</li> <li>• Open or short circuit in the left bank oxygen sensor (front) circuit or loose connector contact</li> <li>• Malfunction of engine-ECU &lt;M/T&gt;</li> <li>• Malfunction of engine-A/T-ECU &lt;A/T&gt;</li> </ul>

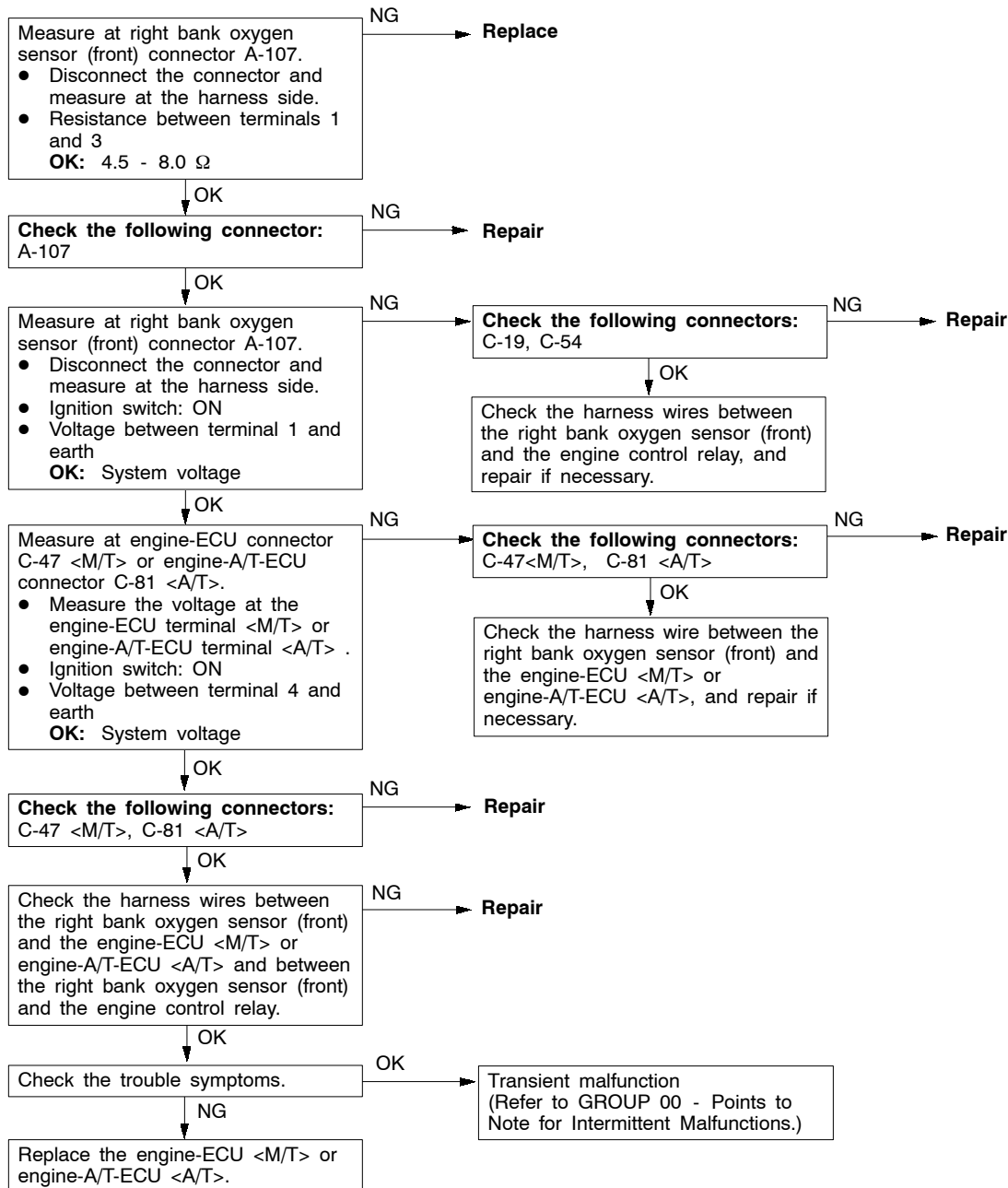




Code No. P0130 Right bank oxygen sensor (front) system <Bank 1 sensor 1>	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>● Right bank oxygen sensor (front) signal voltage has continued to be 0.2 volt or lower for three minutes or more after the starting sequence was completed.</li> <li>● Engine coolant temperature is higher than approximately 82°C.</li> <li>● Engine speed is higher than 1,200 r/min.</li> <li>● Volumetric efficiency is higher than 25 percent.</li> <li>● Monitoring time: 7 seconds</li> </ul> <p>Set Conditions</p> <ul style="list-style-type: none"> <li>● Input voltage supplied to the engine-ECU&lt;M/T&gt; or engine-A/T-ECU &lt;A/T&gt; interface circuit is higher than 4.5 volts when 5 volts is applied to the right bank oxygen sensor (front) output line via a resistor.</li> <li>● Only one monitor during one drive cycle.</li> </ul>	<ul style="list-style-type: none"> <li>● Malfunction of right bank oxygen sensor (front)</li> <li>● Open or short circuit in the right bank oxygen sensor (front) circuit or loose connector contact</li> <li>● Malfunction of engine-ECU &lt;M/T&gt;</li> <li>● Malfunction of engine-A/T-ECU &lt;A/T&gt;</li> </ul>
<p>Range of Check</p> <ul style="list-style-type: none"> <li>● Engine coolant temperature is higher than 50°C.</li> <li>● Engine speed is at between 1,250 and 3,000 r/min.</li> <li>● Volumetric efficiency is at between 25 and 60 percent.</li> <li>● Intake air temperature is higher than -10°C.</li> <li>● Under the closed loop air/fuel control.</li> <li>● Vehicle speed is 30 km/h or more.</li> <li>● Throttle valve opening angle (throttle position sensor output voltage) fluctuates within 0.117 volts every 250 milliseconds.</li> </ul> <p>Set Conditions</p> <ul style="list-style-type: none"> <li>● When the air/fuel ratio is forcibly changed (lean to rich), the right bank oxygen sensor (front) signal does not provide response within 1.1 seconds.</li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>● The right bank oxygen sensor sends "lean" and "rich" signals alternately eleven times or less for 12 seconds.</li> </ul>	

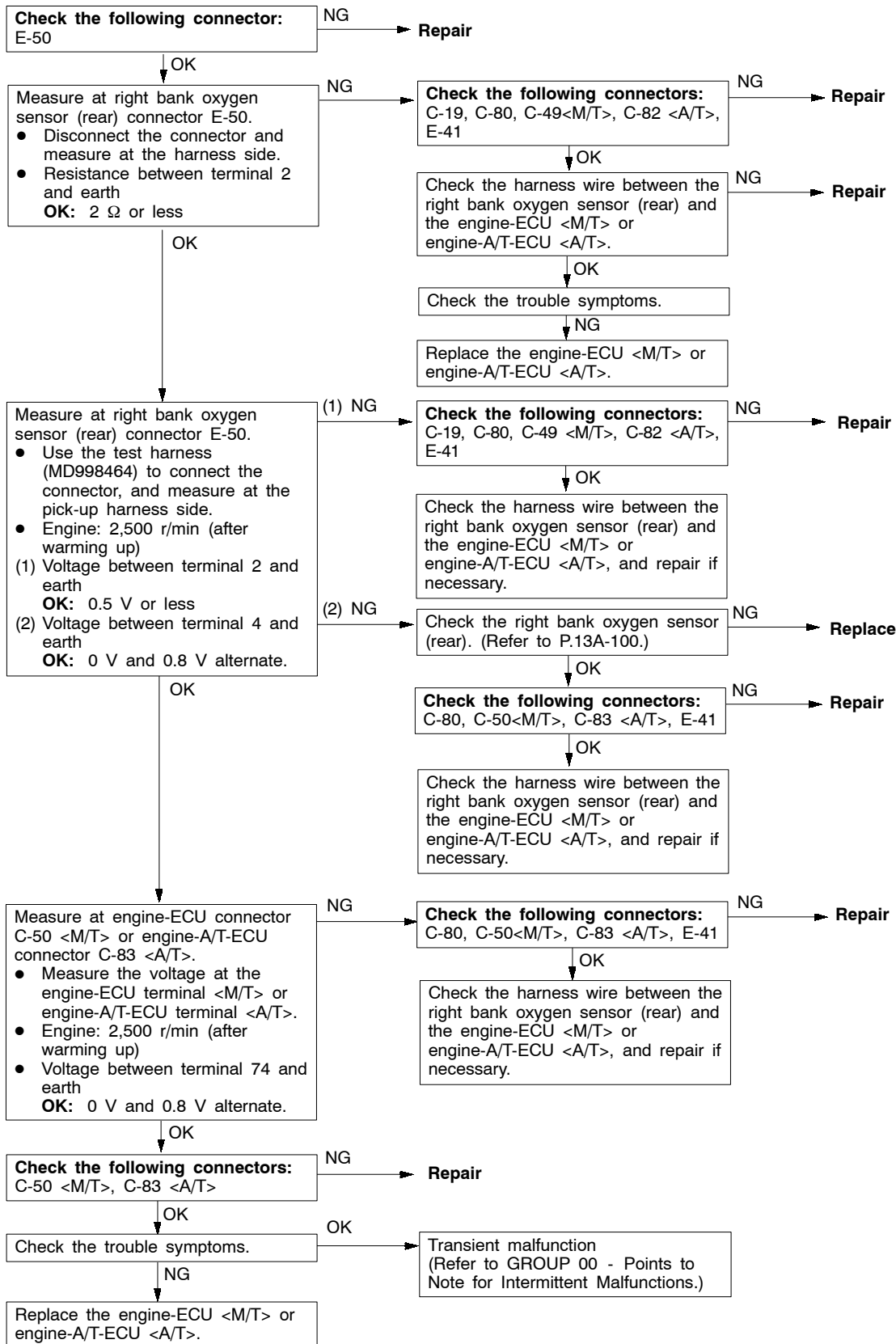


Code No. P0135 Oxygen sensor heater (front) system <Bank 1 sensor 1>	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>• The engine coolant temperature is approx. 20°C or more.</li> <li>• The right bank oxygen sensor heater (front) remains on.</li> <li>• The engine speed is 50 r/min or more.</li> <li>• Battery voltage is 11 - 16 V.</li> </ul> <p>Set Conditions</p> <ul style="list-style-type: none"> <li>• The current, which flows through the right bank oxygen sensor heater (front), is 0.2 A or less or 3.5 A or more for six seconds.</li> </ul>	<ul style="list-style-type: none"> <li>• Malfunction of the right bank oxygen sensor heater (front)</li> <li>• Open or short circuit in the right bank oxygen sensor heater (front) circuit or loose connector contact</li> <li>• Malfunction of engine-ECU &lt;M/T&gt;</li> <li>• Malfunction of engine-A/T-ECU &lt;A/T&gt;</li> </ul>

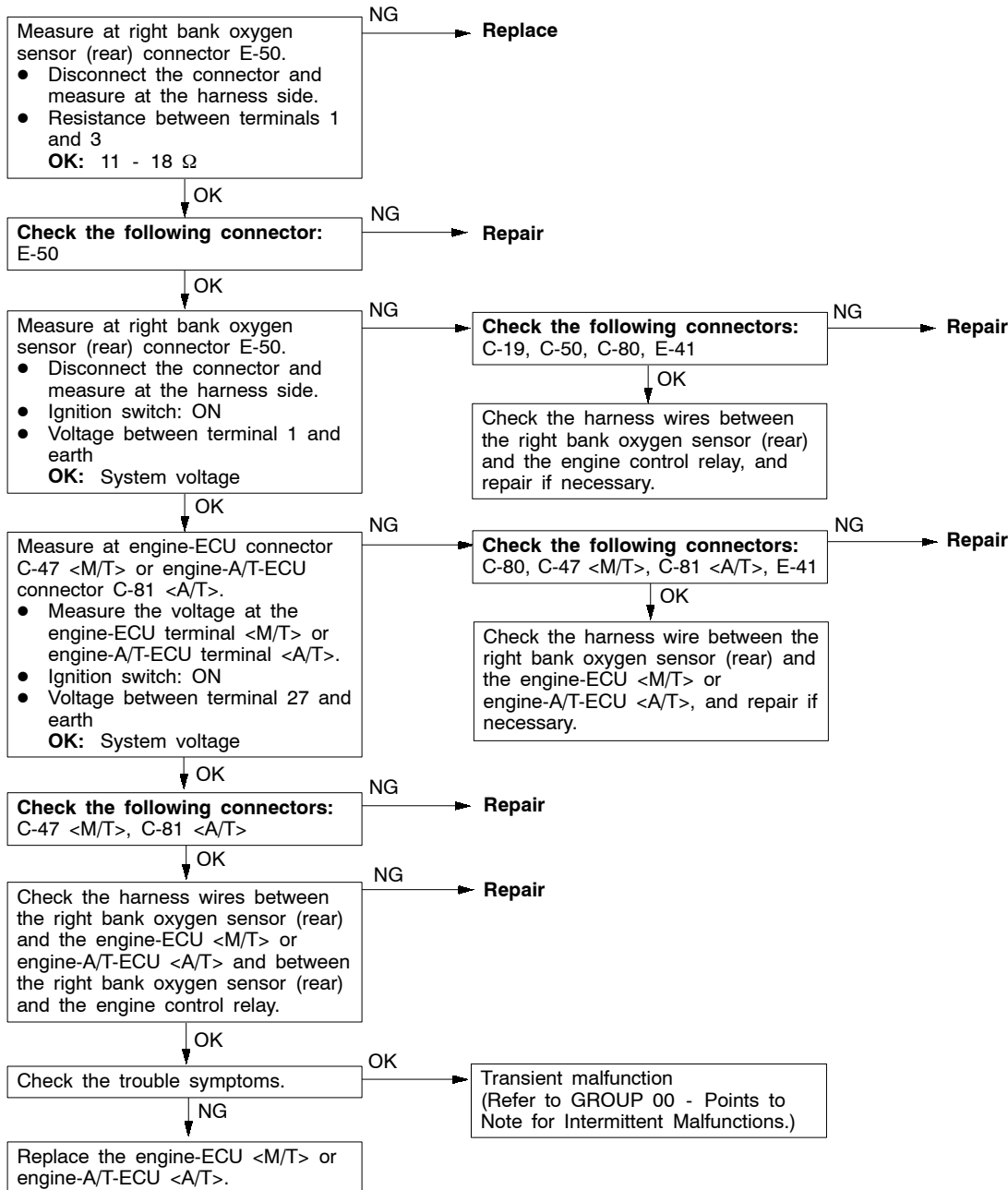




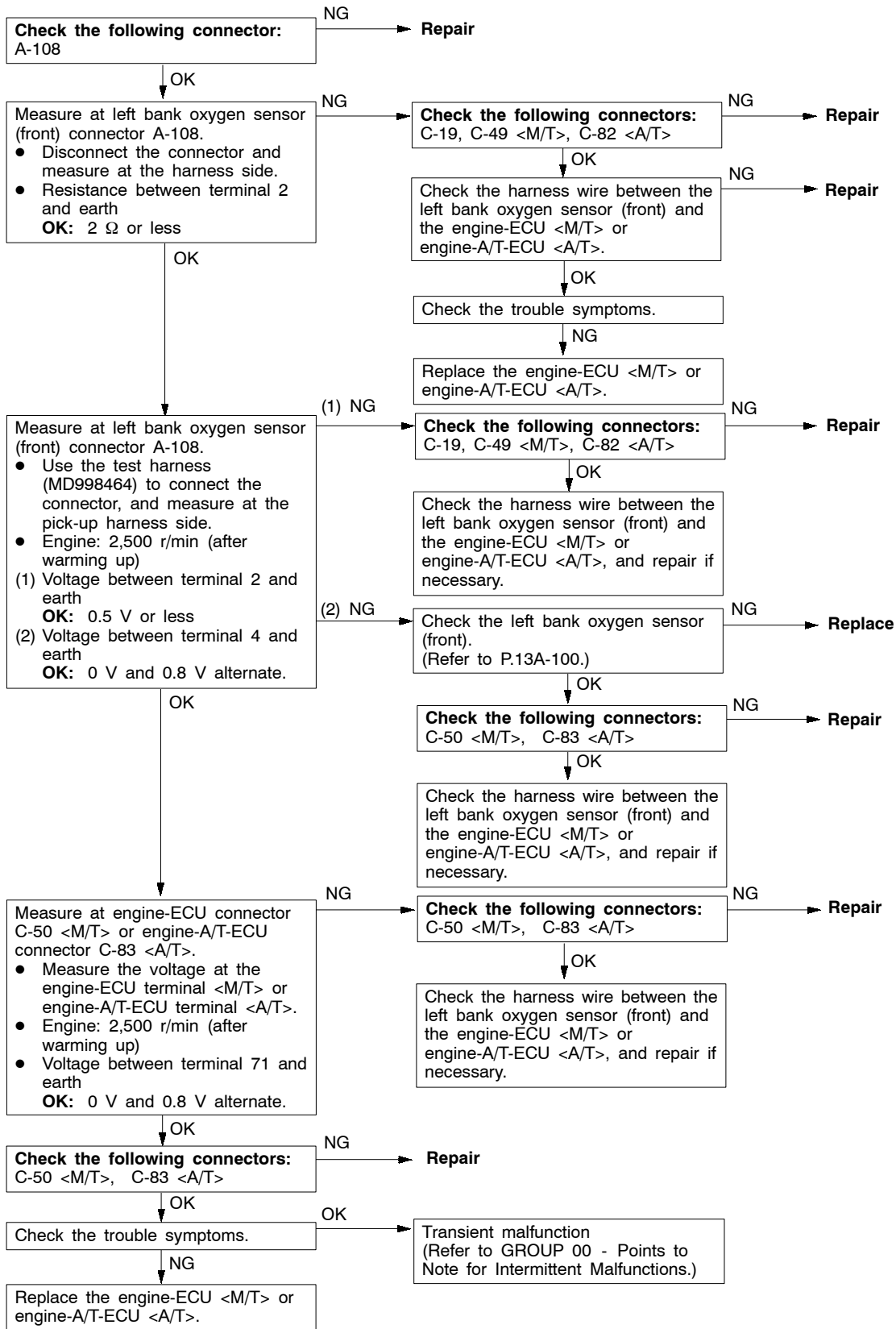
Code No. P0136 Right bank oxygen sensor (rear) system <Bank 1 sensor 2>	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>Right bank heated oxygen sensor (rear) signal voltage has continued to be 0.15 volts or lower for three minutes or more after the starting sequence was completed.</li> <li>Engine coolant temperature is higher than approximately 82°C.</li> <li>Engine speed is higher than 1,200 r/min.</li> <li>Volumetric efficiency is higher than 25 percent.</li> <li>Monitoring time: 7 seconds.</li> </ul> <p>Set Conditions</p> <ul style="list-style-type: none"> <li>Input voltage supplied to the engine-ECU &lt;M/T&gt; or engine-A/T-ECU &lt;A/T&gt; interface circuit is higher than 4.5 volts when 5 volts are applied to the right bank heated oxygen sensor (rear) output line via a resistor.</li> <li>Only one monitor during one drive cycle.</li> </ul>	<ul style="list-style-type: none"> <li>Malfunction of right bank oxygen sensor (rear)</li> <li>Open or short circuit in the right bank oxygen sensor (rear) circuit or loose connector contact</li> <li>Malfunction of engine-ECU &lt;M/T&gt;</li> <li>Malfunction of engine-A/T-ECU &lt;A/T&gt;</li> </ul>
<p>Range of Check</p> <ul style="list-style-type: none"> <li>Right bank heated oxygen sensor (rear) signal voltage remains 0.15 volts or less for at least three minutes after the engine is started.</li> <li>Engine coolant temperature is higher than approximately 82°C.</li> <li>Engine speed is higher than 1,200 r/min.</li> <li>Volumetric efficiency is higher than 25 percent.</li> <li>Volume air flow sensor output frequency is 100 Hz or more.</li> <li>At least twenty seconds have passed since fuel shut off control was canceled.</li> <li>The right bank heated oxygen sensor outputs 0.5 volts or more.</li> <li>Monitoring time: 10 seconds.</li> </ul> <p>Set Conditions</p> <ul style="list-style-type: none"> <li>Making the air/fuel ratio 15 percent for 10 seconds richer does not result in raising the right bank heated oxygen sensor (rear) output voltage beyond 0.15 volts.</li> <li>Only one monitor during one drive cycle.</li> </ul>	
<p>Range of Check</p> <ul style="list-style-type: none"> <li>Engine coolant temperature is higher than approximately 82°C.</li> <li>Barometric pressure is higher than 76 kPa.</li> <li>The right bank heated oxygen sensor (front) is active.</li> </ul> <p>Set Conditions</p> <ul style="list-style-type: none"> <li>The right bank heated oxygen sensor (rear) output voltage, before the fuel shut off is started, was 0.4 volts or more, and during the shut off, it takes one second or more for the right bank heated oxygen sensor (rear) output voltage to fall from 0.4 to 0.15 volts.</li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>The right bank heated oxygen sensor (rear) output voltage, before the fuel shut off is started, was 0.15 volts or more, and during the shut off, it takes three seconds or more for the right bank heated oxygen sensor (rear) output voltage to fall below 0.15 volts.</li> </ul>	



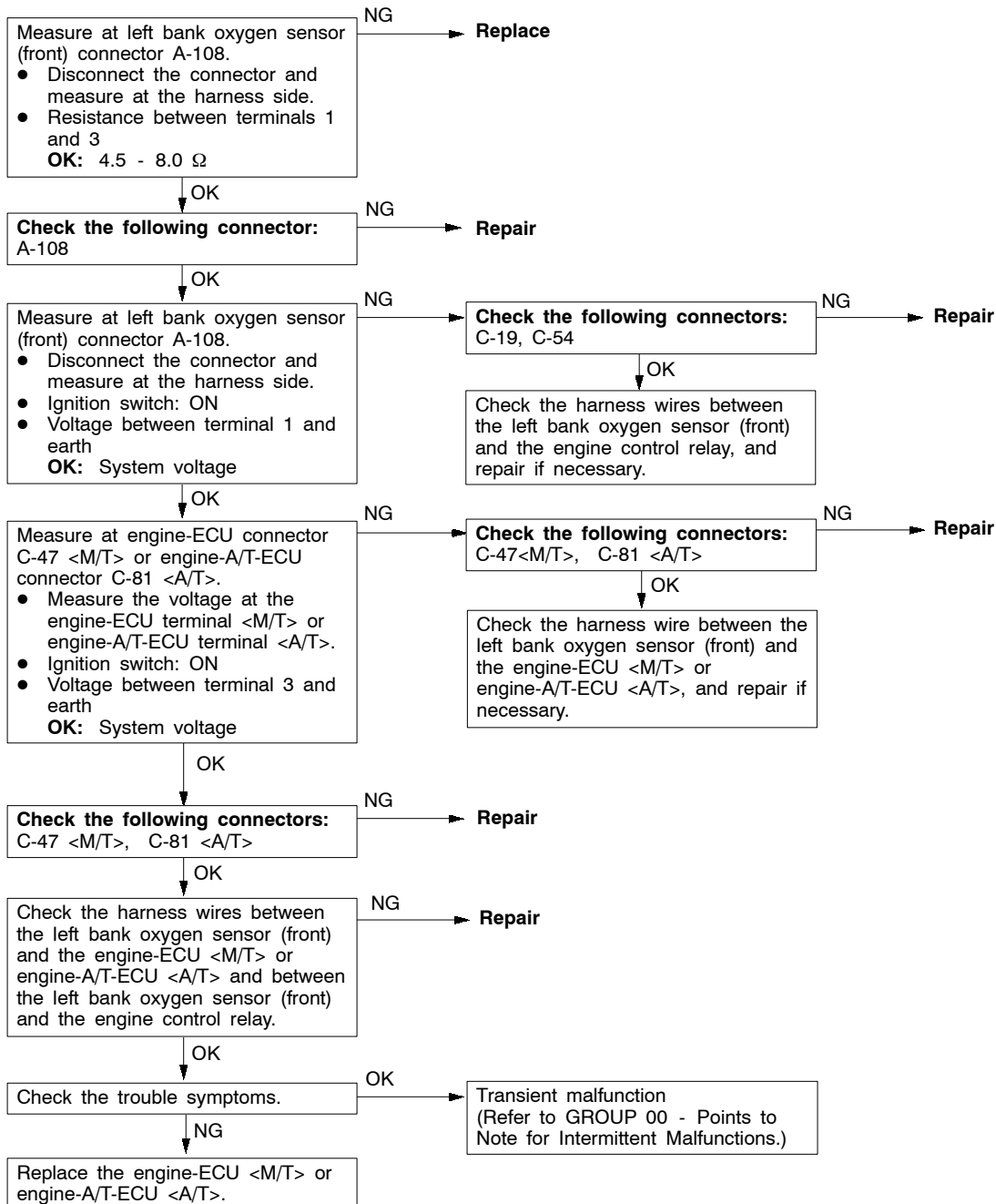
Code No. P0141 Oxygen sensor heater (rear) system <Bank 1 sensor 2>	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>• The engine coolant temperature is approx. 20°C or more.</li> <li>• The right bank oxygen sensor heater (rear) remains on.</li> <li>• The engine speed is 50 r/min or more.</li> <li>• Battery voltage is 11 - 16 V.</li> </ul> <p>Set Conditions</p> <ul style="list-style-type: none"> <li>• The current, which flows through the right bank oxygen sensor heater (rear), is 0.2 A or less or 3.5 A or more for six seconds.</li> </ul>	<ul style="list-style-type: none"> <li>• Malfunction of right bank oxygen sensor heater (rear)</li> <li>• Open or short circuit in the right bank oxygen sensor heater (rear) circuit or loose connector contact</li> <li>• Malfunction of engine-ECU &lt;M/T&gt;</li> <li>• Malfunction of engine-A/T-ECU &lt;A/T&gt;</li> </ul>



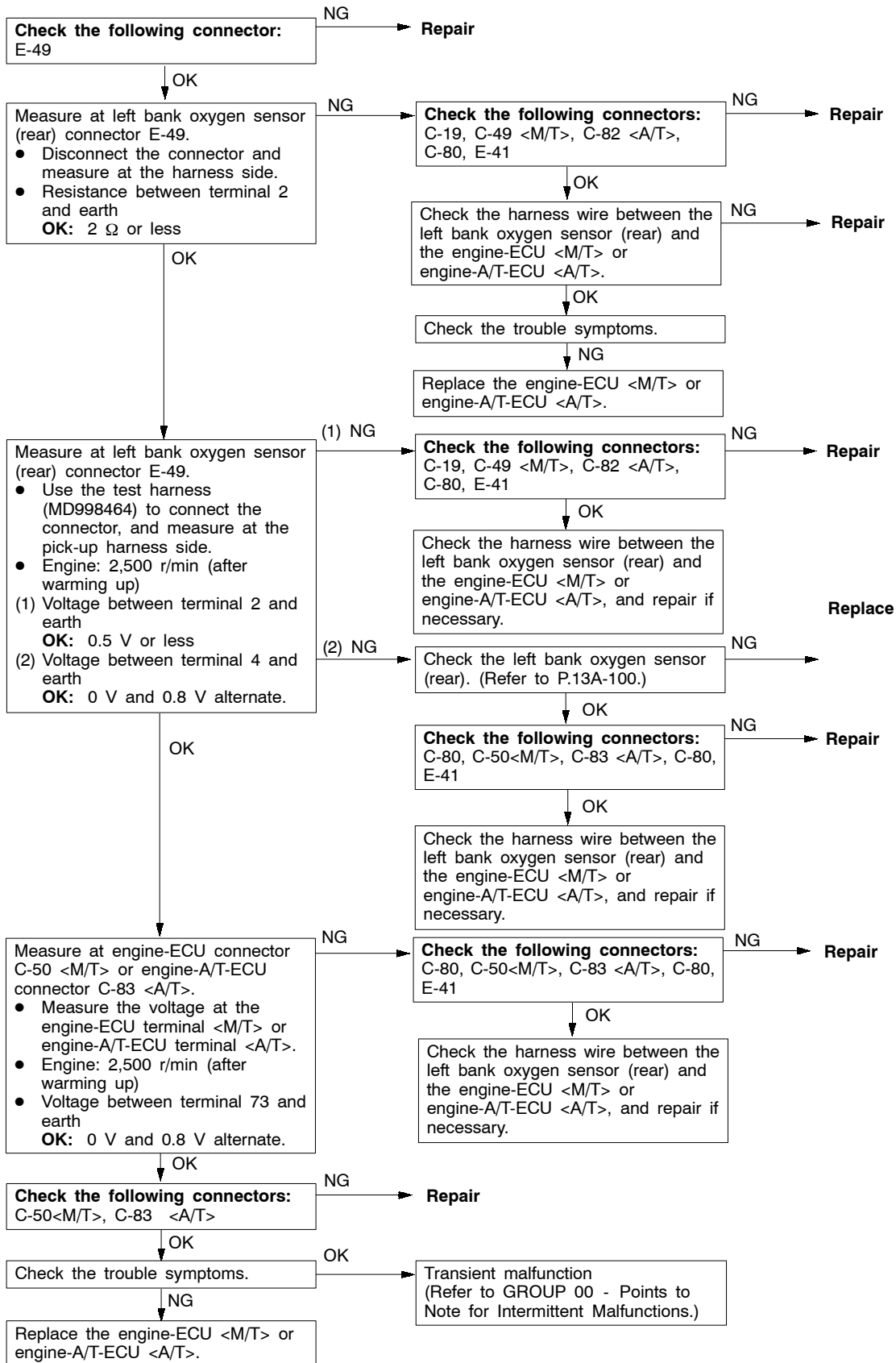
Code No. P0150 Left bank oxygen sensor (front) system <Bank 2 sensor 1>	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>Left bank heated oxygen sensor (front) signal voltage has continued to be 0.2 volt or lower for three minutes or more after engine start.</li> <li>The engine coolant temperature is higher than approximately 82°C.</li> <li>Engine speed is higher than 1,200 r/min.</li> <li>Volumetric efficiency is higher than 25 percent.</li> <li>Monitoring time: 7 seconds.</li> </ul> <p>Set Conditions</p> <ul style="list-style-type: none"> <li>Input voltage supplied to the engine-ECU &lt;M/T&gt; or engine-A/T-ECU &lt;A/T&gt; interface circuit is higher than 4.5 volts when 5 volts are applied to the left bank heated oxygen sensor (front) output line.</li> <li>Only one monitor during one drive cycle.</li> </ul>	<ul style="list-style-type: none"> <li>Malfunction of left bank oxygen sensor (front)</li> <li>Open or short circuit in the left bank oxygen sensor (front) circuit or loose connector contact</li> <li>Malfunction of engine-ECU &lt;M/T&gt;</li> <li>Malfunction of engine-A/T-ECU &lt;A/T&gt;</li> </ul>
<p>Range of Check</p> <ul style="list-style-type: none"> <li>The engine coolant temperature is higher than 50°C.</li> <li>Engine speed is at between 1,250 and 3,000 r/min.</li> <li>Volumetric efficiency is at between 25 and 60 percent.</li> <li>Intake air temperature is higher than -10°C.</li> <li>Barometric pressure is higher than 76kPa.</li> <li>Under the closed loop air/fuel control.</li> <li>Vehicle speed is 30 km/h (18.7 mph) or more.</li> <li>Throttle valve opening angle (throttle position sensor output voltage) fluctuates within 0.117 volts every 250 milliseconds.</li> </ul> <p>Set Conditions</p> <ul style="list-style-type: none"> <li>When the air/fuel ratio is forcibly changed (lean to rich), the left bank heated oxygen sensor (front) signal does not provide response within 1.1 seconds.</li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>The left bank heated oxygen sensor (front) sends "lean" "rich" signals alternately eleven times or less for 12 seconds.</li> </ul>	



Code No. P0155 Oxygen sensor heater (front) system <Bank 2 sensor 1>	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>• The engine coolant temperature is approx. 20°C or more.</li> <li>• The oxygen sensor heater (front) remains on.</li> <li>• The engine speed is 50 r/min or more.</li> <li>• Battery voltage is 11 - 16 V.</li> </ul> <p>Set Conditions</p> <ul style="list-style-type: none"> <li>• The current, which flows through the oxygen sensor heater (front), is 0.2 A or less or 3.5 A or more for six seconds.</li> </ul>	<ul style="list-style-type: none"> <li>• Malfunction of oxygen sensor heater (front)</li> <li>• Open or short circuit in the oxygen sensor heater (front) circuit or loose connector contact</li> <li>• Malfunction of engine-ECU &lt;M/T&gt;</li> <li>• Malfunction of engine-A/T-ECU &lt;A/T&gt;</li> </ul>

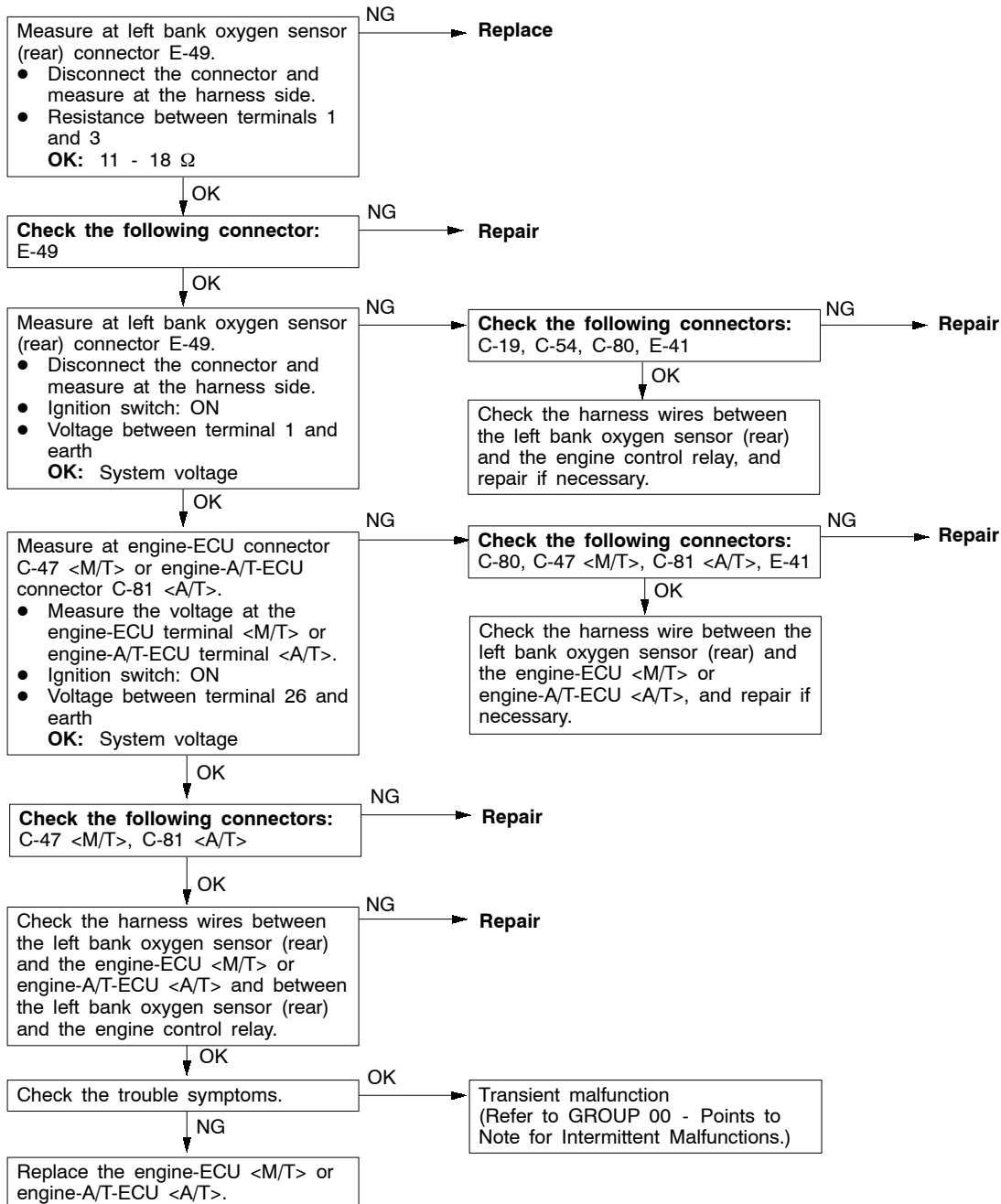


Code No. P0156 Left bank oxygen sensor (rear) system <Bank 2 sensor 2>	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>Left bank heated oxygen sensor (rear) signal voltage has continued to be 0.15 volt or lower for three minutes or more after the starting sequence was completed.</li> <li>Engine coolant temperature is higher than approximately 82°C.</li> <li>Engine speed is higher than 1,200 r/min.</li> <li>Volumetric efficiency is higher than 25 percent.</li> <li>Monitoring time: 7 seconds.</li> </ul> <p>Check Condition</p> <ul style="list-style-type: none"> <li>Input voltage supplied to the engine-ECU &lt;M/T&gt; or engine-A/T-ECU &lt;A/T&gt; interface circuit is higher than 4.5 volts when 5 volts is applied to the left bank heated oxygen sensor (rear) output line via a resistor.</li> <li>Only one monitor during one drive cycle.</li> </ul>	<ul style="list-style-type: none"> <li>Malfunction of left bank oxygen sensor (rear)</li> <li>Open or short circuit in the left bank oxygen sensor (rear) circuit or loose connector contact</li> <li>Malfunction of engine-ECU &lt;M/T&gt;</li> <li>Malfunction of engine-A/T-ECU &lt;A/T&gt;</li> </ul>
<p>Range of Check</p> <ul style="list-style-type: none"> <li>Left bank heated oxygen sensor (rear) signal voltage remains 0.15 volt or less for at least three minutes after the engine is started.</li> <li>Engine coolant temperature is higher than approximately 82°C.</li> <li>Engine speed is higher than 1,200 r/min.</li> <li>Volumetric efficiency is higher than 25 percent.</li> <li>Volume air flow sensor output frequency is 100 Hz or more.</li> <li>At least twenty seconds have passed since fuel shut off control was canceled.</li> <li>The left bank heated oxygen sensor outputs 0.5 volts or more.</li> <li>Monitoring time: 10 seconds.</li> </ul> <p>Check Condition</p> <ul style="list-style-type: none"> <li>Making the air/fuel ratio 15 percent for 0 seconds richer does not result in raising the left bank heated oxygen sensor (rear) output voltage beyond 0.15 volt.</li> <li>Only one monitor during one drive cycle.</li> </ul>	
<p>Range of Check</p> <ul style="list-style-type: none"> <li>Engine coolant temperature is higher than approximately 82°C</li> <li>Barometric pressure is higher than 76 kPa.</li> <li>The left bank heated oxygen sensor (front) is active.</li> </ul> <p>Check Condition</p> <ul style="list-style-type: none"> <li>The left bank heated oxygen sensor (rear) output voltage, before the fuel shut off is started, was 0.4 volts or more, and during the shut off, it takes one second or more for the left bank heated oxygen sensor (rear) output voltage to fall from 0.4 to 0.15 volts.</li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>The left bank heated oxygen sensor (rear) output voltage, before the fuel shut off is started, was 0.15 volts or more, and during the shut off, it takes three seconds or more for the left bank heated oxygen sensor (rear) output voltage to fall below 0.15 volts.</li> </ul>	

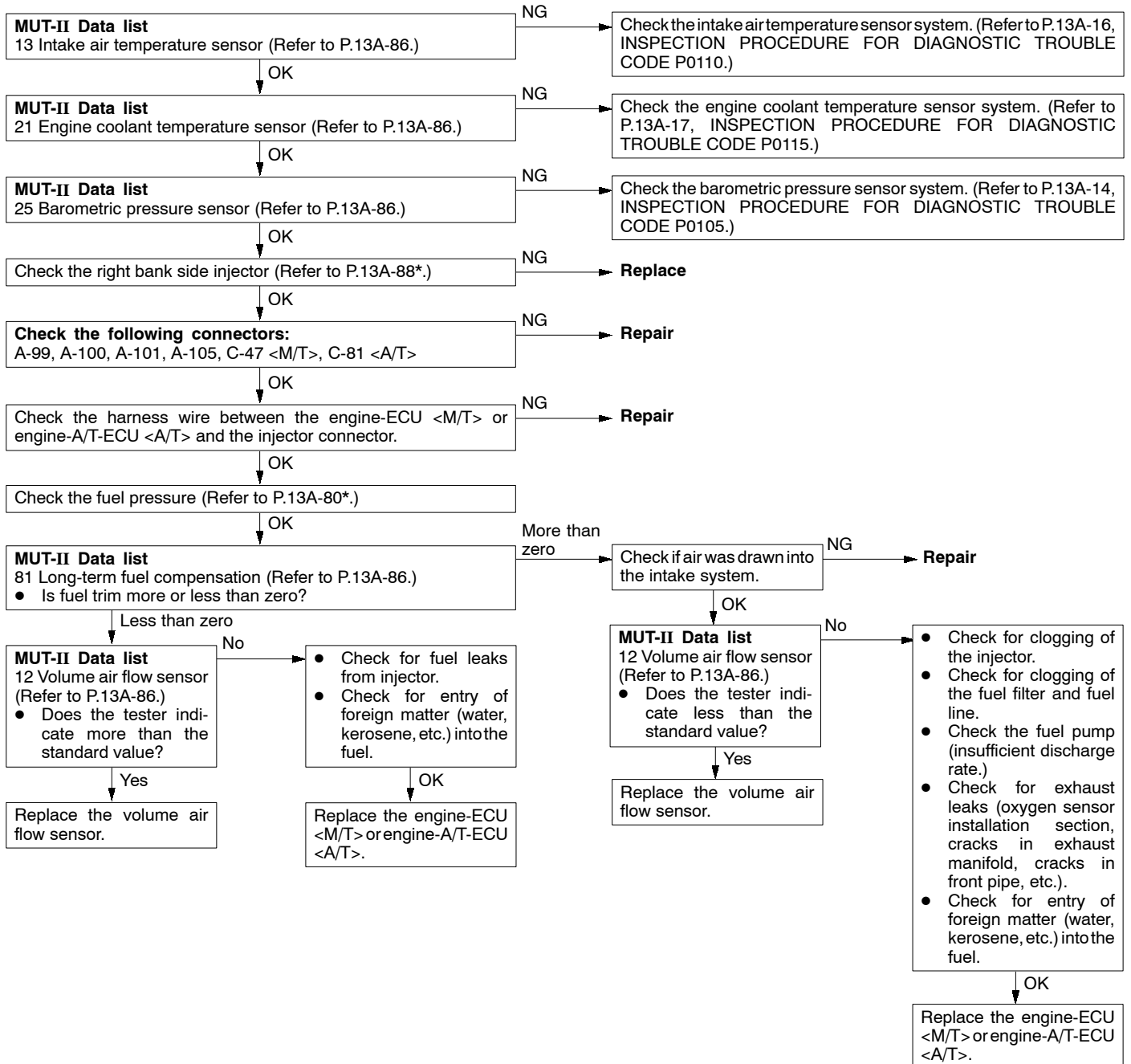




Code No. P0161 Oxygen sensor heater (rear) system <Bank 2 sensor 2>	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>• The engine coolant temperature is approx. 20°C or more.</li> <li>• The oxygen sensor heater (rear) remains on.</li> <li>• The engine speed is 50 r/min or more.</li> <li>• Battery voltage is 11 - 16 V.</li> </ul> <p>Set Conditions</p> <ul style="list-style-type: none"> <li>• The current, which flows through the oxygen sensor heater (rear), is 0.2 A or less or 3.5 A or more for six seconds.</li> </ul>	<ul style="list-style-type: none"> <li>• Malfunction of oxygen sensor heater (rear)</li> <li>• Open or short circuit in the oxygen sensor heater (rear) circuit or loose connector contact</li> <li>• Malfunction of engine-ECU &lt;M/T&gt;</li> <li>• Malfunction of engine-A/T-ECU &lt;A/T&gt;</li> </ul>



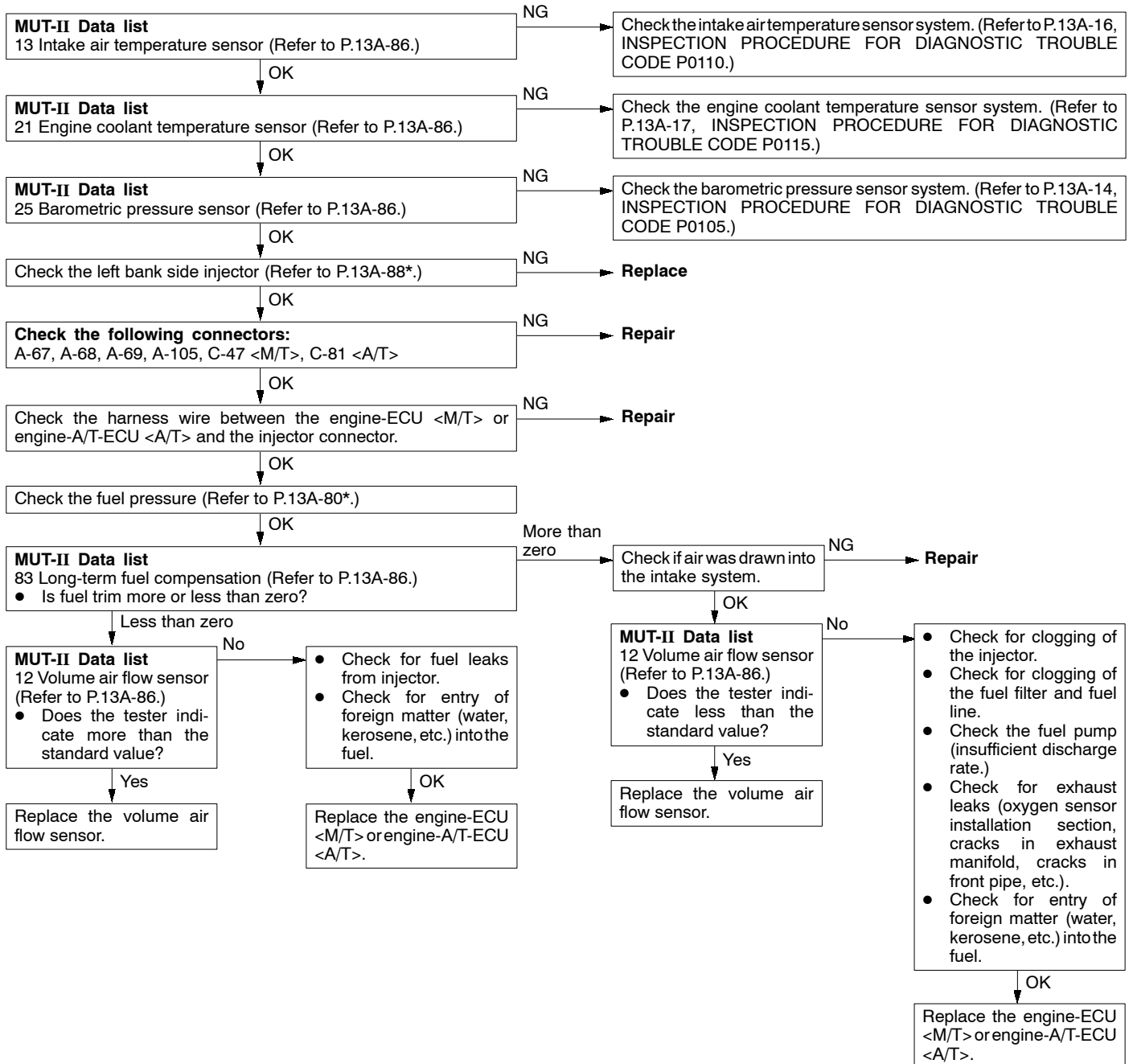
Code No. P0170 Abnormal fuel system (Bank 1)	Probable cause
Range of Check • Engine: Being learning the air-fuel ratio Set Conditions • Ten seconds or more have been passed while the fuel injection amount compensation value is too low. or • Ten seconds or more have been passed while the fuel injection amount compensation value is too high.	<ul style="list-style-type: none"> <li>• Incorrect fuel pressure</li> <li>• Malfunction of fuel supply system</li> <li>• Malfunction of right bank oxygen sensor (front)</li> <li>• Malfunction of intake air temperature sensor</li> <li>• Malfunction of barometric pressure sensor</li> <li>• Malfunction of air flow sensor</li> <li>• Malfunction of engine-ECU &lt;M/T&gt;</li> <li>• Malfunction of engine-A/T-ECU &lt;A/T&gt;</li> </ul>



## NOTE:

\*: Refer to the '99 PAJERO SPORT Workshop Manual (Pub. No. PWJE9812)

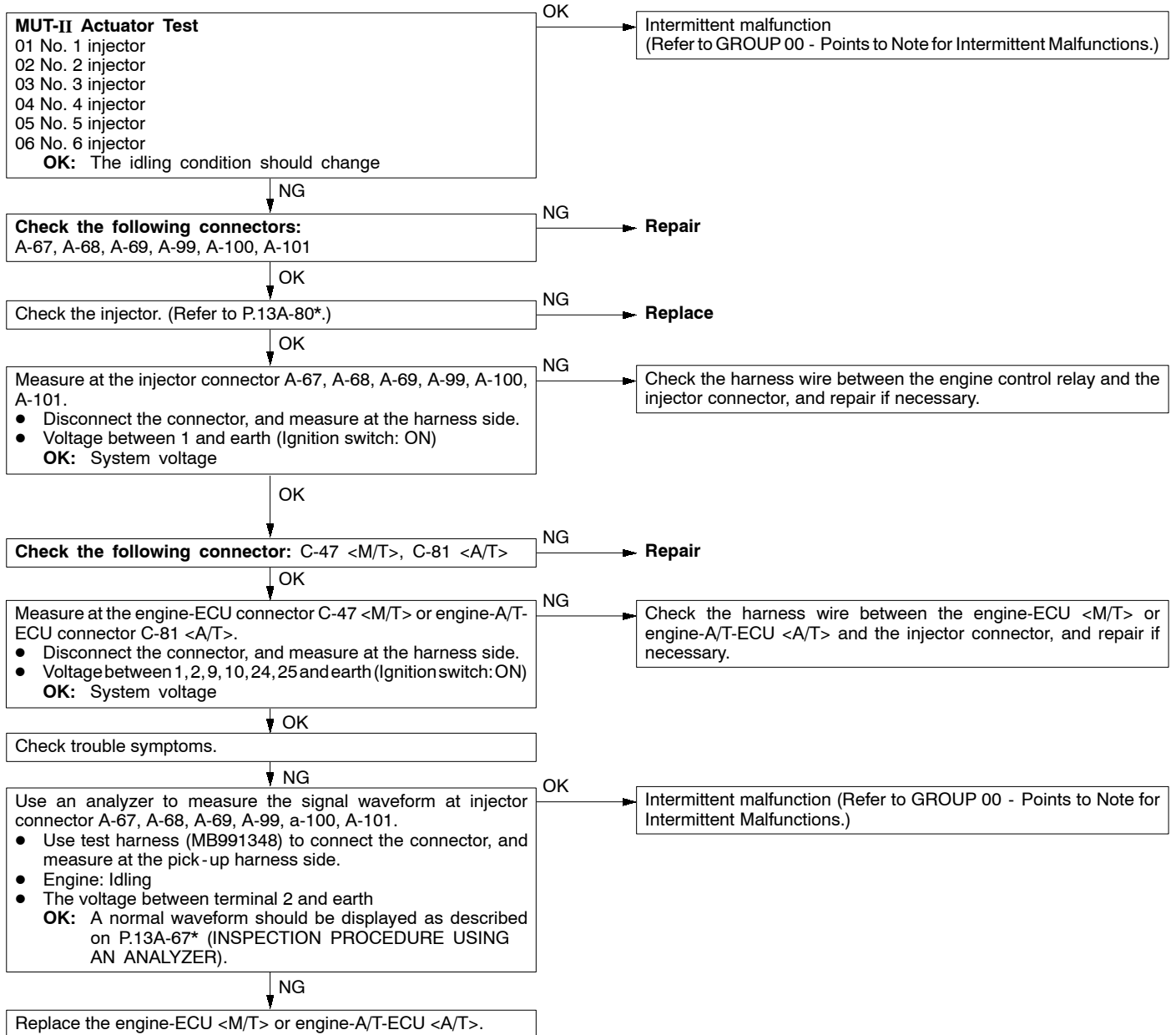
Code No. P0173 Abnormal fuel system (Bank 2)	Probable cause
Range of Check • Engine: Being learning the air-fuel ratio Set Conditions • Ten seconds or more have been passed while the fuel injection amount compensation value is too low. or • Ten seconds or more have been passed while the fuel injection amount compensation value is too high.	<ul style="list-style-type: none"> <li>• Incorrect fuel pressure</li> <li>• Malfunction of fuel supply system</li> <li>• Malfunction of left bank oxygen sensor (front)</li> <li>• Malfunction of intake air temperature sensor</li> <li>• Malfunction of barometric pressure sensor</li> <li>• Malfunction of air flow sensor</li> <li>• Malfunction of engine-ECU &lt;M/T&gt;</li> <li>• Malfunction of engine-A/T-ECU &lt;A/T&gt;</li> </ul>



## NOTE:

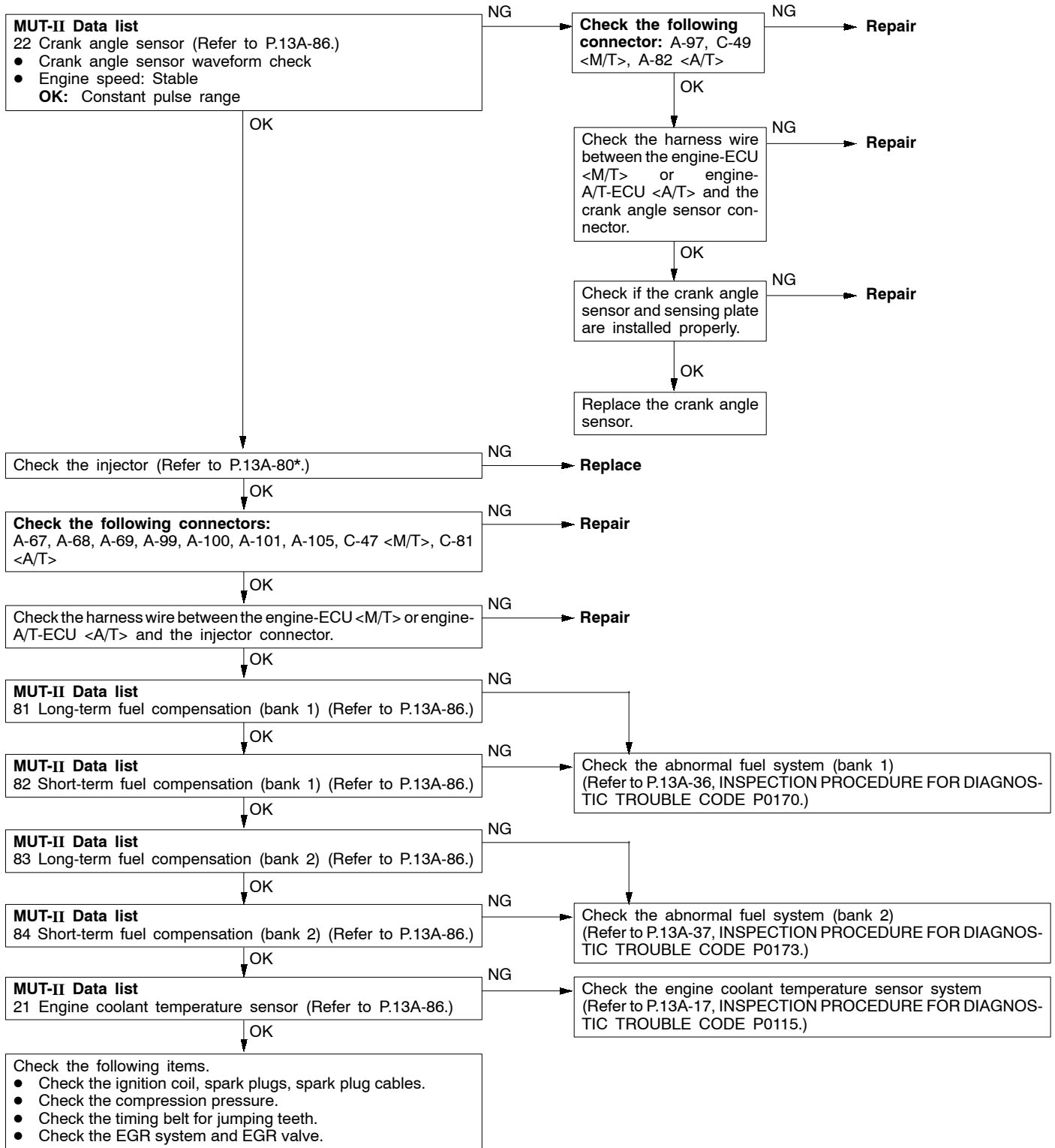
\*: Refer to the '99 PAJERO SPORT Workshop Manual (Pub. No. PWJE9812)

<b>Code No. P0201 No. 1 injector system</b> <b>Code No. P0202 No. 2 injector system</b> <b>Code No. P0203 No. 3 injector system</b> <b>Code No. P0204 No. 4 injector system</b> <b>Code No. P0205 No. 5 injector system</b> <b>Code No. P0206 No. 6 injector system</b>	<b>Probable cause</b>
Range of Check <ul style="list-style-type: none"> <li>Engine speed is approx. 50 - 1,000 r/min</li> <li>The throttle position sensor output voltage is 1.15 V or less.</li> <li>Actuator test by MUT-II is not carried out.</li> </ul> Set Conditions <ul style="list-style-type: none"> <li>Surge voltage of injector coil is not detected for 4 seconds.</li> </ul>	<ul style="list-style-type: none"> <li>Malfunction of the injector</li> <li>Improper connector contact, open circuit or short-circuited harness wire of the injector circuit</li> <li>Malfunction of engine-ECU &lt;M/T&gt;</li> <li>Malfunction of engine-A/T-ECU &lt;A/T&gt;</li> </ul>

**NOTE:**

\*: Refer to the '99 PAJERO SPORT Workshop Manual (Pub. No. PWJE9812)

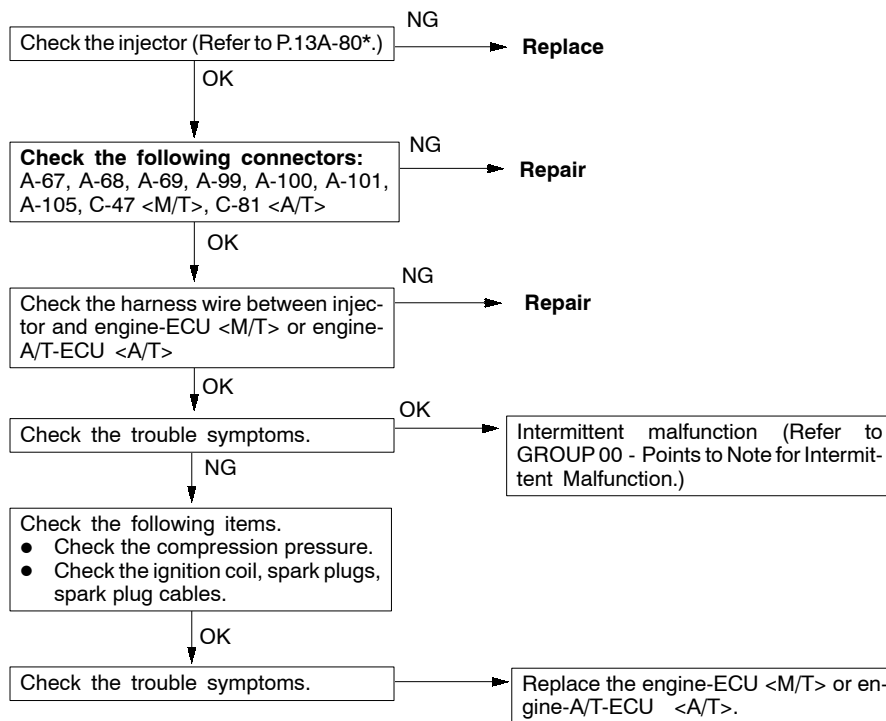
Code No. P0300 Random misfire	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>● Five seconds have passed since the engine starts</li> <li>● Engine speed is approx. 500 - 4,500 rpm</li> <li>● Intake manifold pressure is 32kPa (240 mmHg) or over</li> <li>● Engine coolant temperature is - 10°C or over</li> <li>● Intake air temperature is - 10°C or over</li> <li>● Barometric pressure is 72kPa (570 mmHg) or over</li> <li>● Volumetric efficiency is between 30 and 60%</li> <li>● Adaptive learning has been completed with the vane that generates the crankshaft position signals.</li> <li>● Shift change, deceleration, rapid acceleration and deceleration, continuous operation of air conditioner compressor (A/C: within in three seconds after changing ON ↔ OFF) at any time when the engine is in operation except for the fore-mentioned occasion</li> <li>● Throttle variance is between - 0.059V/10ms and 0.059V/10ms</li> </ul> <p>Set Conditions</p> <ul style="list-style-type: none"> <li>● Number of misfiring with the engine speed per 200 rpm reaches the specified number or over (The catalyst temperature is 950°C or over when the misfiring takes place)</li> <li>● Number of misfiring with the engine speed per 1000 rpm reaches the specified number or over (The misfiring is over 1.5 times as the limit of emission standard)</li> </ul>	<ul style="list-style-type: none"> <li>● Malfunction of the ignition system</li> <li>● Malfunction of the crank angle sensor signal</li> <li>● Malfunction of air fuel ratio control system</li> <li>● Compression malfunction</li> <li>● Timing belt for jumping teeth</li> <li>● Malfunction of EGR system and EGR valve</li> <li>● Malfunction of engine-ECU &lt;M/T&gt;</li> <li>● Malfunction of engine-A/T-ECU &lt;A/T&gt;</li> </ul>



## NOTE:

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<b>Code No. P0301 No. 1 cylinder misfire detected</b> <b>Code No. P0302 No. 2 cylinder misfire detected</b> <b>Code No. P0303 No. 3 cylinder misfire detected</b> <b>Code No. P0304 No. 4 cylinder misfire detected</b> <b>Code No. P0305 No. 5 cylinder misfire detected</b> <b>Code No. P0306 No. 6 cylinder misfire detected</b>	<b>Probable cause</b>
<p>Range of Check</p> <ul style="list-style-type: none"> <li>Five seconds have passed since the engine starts</li> <li>Engine speed is approx. 500 - 4,500 rpm</li> <li>Intake manifold pressure is 32kPa (240 mmHg) or over</li> <li>Engine coolant temperature is -10°C or over</li> <li>Intake air temperature is -10°C or over</li> <li>Barometric pressure is 72kPa (570 mmHg) or over</li> <li>Volumetric efficiency is between 30 and 60%</li> <li>Adaptive learning has been completed with the vane that generates the crankshaft position signals.</li> <li>Shift change, deceleration, rapid acceleration and deceleration, continuous operation of air conditioner compressor (A/C: within in three seconds after changing ON ↔ OFF) at any time when the engine is in operation except for the fore-mentioned occasion</li> <li>Throttle variance is between - 0.059V/10ms and 0.059V/10ms</li> </ul> <p>Set Conditions</p> <ul style="list-style-type: none"> <li>Number of misfiring with the engine speed per 200 rpm reaches the specified number or over (The catalyst temperature is 950°C or over when the misfiring takes place)</li> <li>Number of misfiring with the engine speed per 1000 rpm reaches the specified number or over (The misfiring is over 1.5 times as the limit of emission standard)</li> </ul>	<ul style="list-style-type: none"> <li>Malfunction of the ignition system</li> <li>Abnormal compression</li> <li>Malfunction of injector</li> <li>Malfunction of engine-ECU &lt;M/T&gt;</li> <li>Malfunction of engine-A/T-ECU &lt;A/T&gt;</li> </ul>

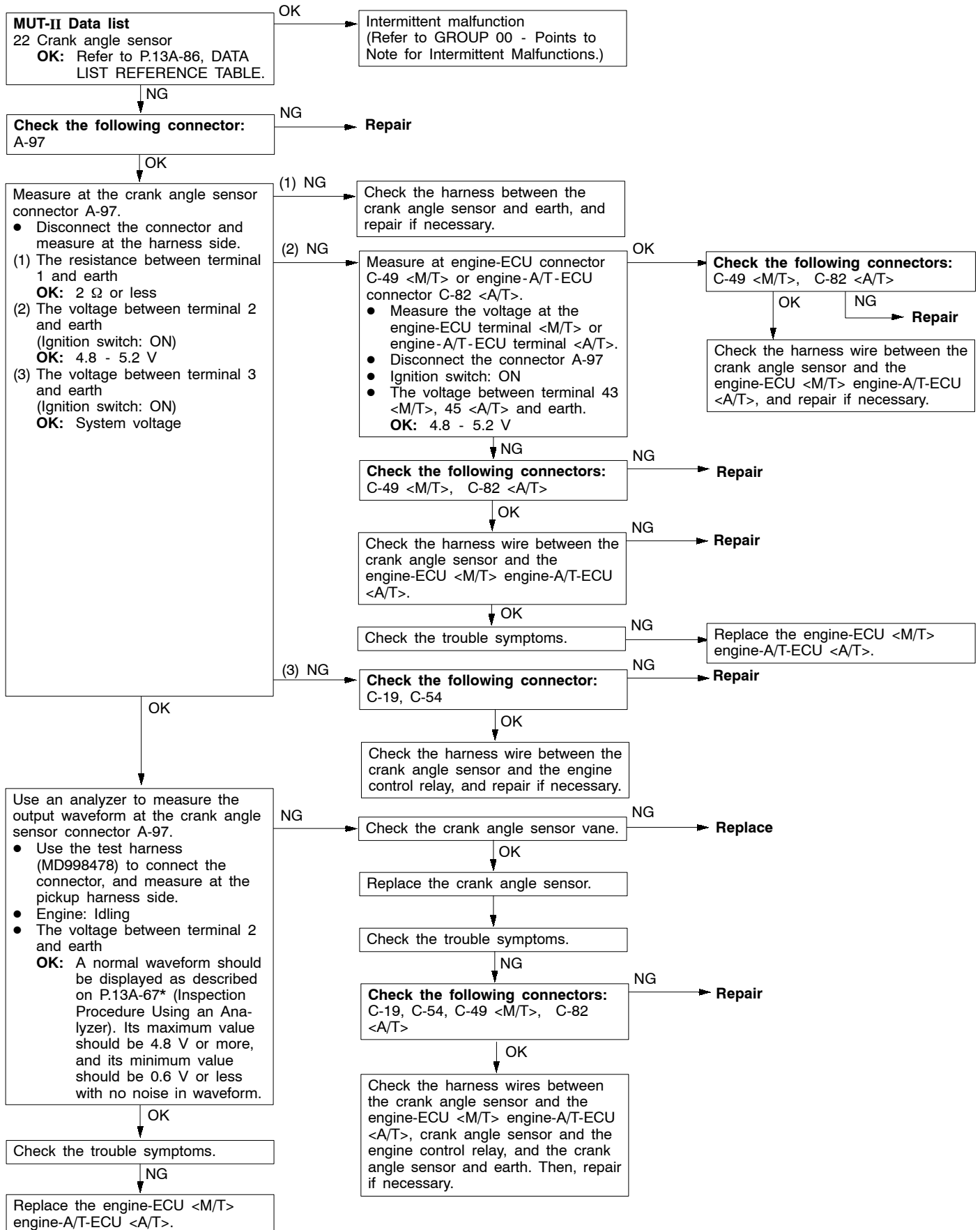


## NOTE:

\*: Refer to the '99 PAJERO SPORT Workshop Manual (Pub. No. PWJE9812)

Code No. P0335 Crank angle sensor system	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"><li>● Engine is 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 input).</li></ul>	<ul style="list-style-type: none"><li>● Malfunction of the crank angle sensor.</li><li>● Open or short circuit in the crank angle sensor circuit or loose connector contact.</li><li>● Malfunction of engine-ECU &lt;M/T&gt;</li><li>● Malfunction of engine-A/T-ECU &lt;A/T&gt;</li></ul>

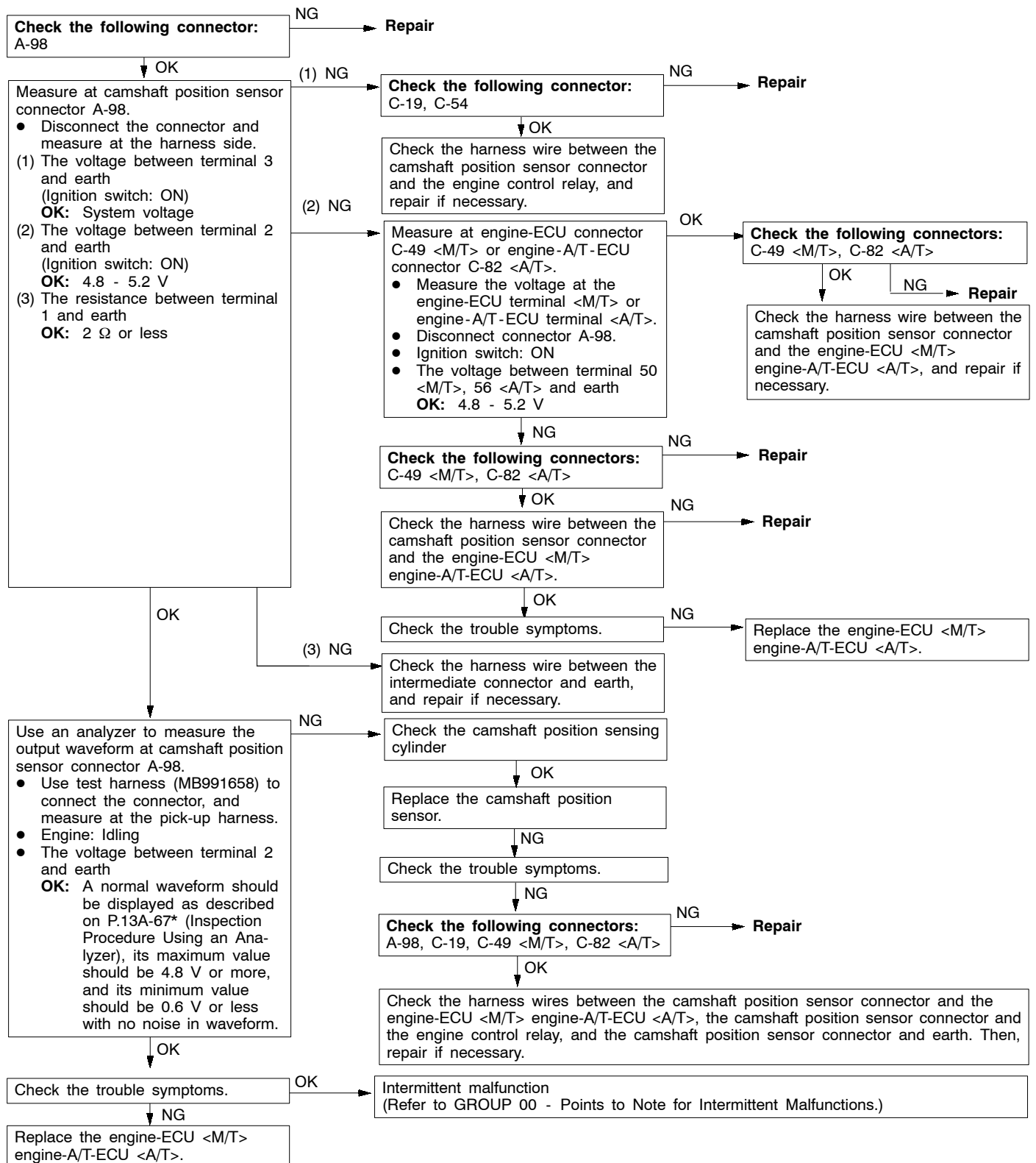




## NOTE:

\*: Refer to the '99 PAJERO SPORT Workshop Manual (Pub. No. PWJE9812)

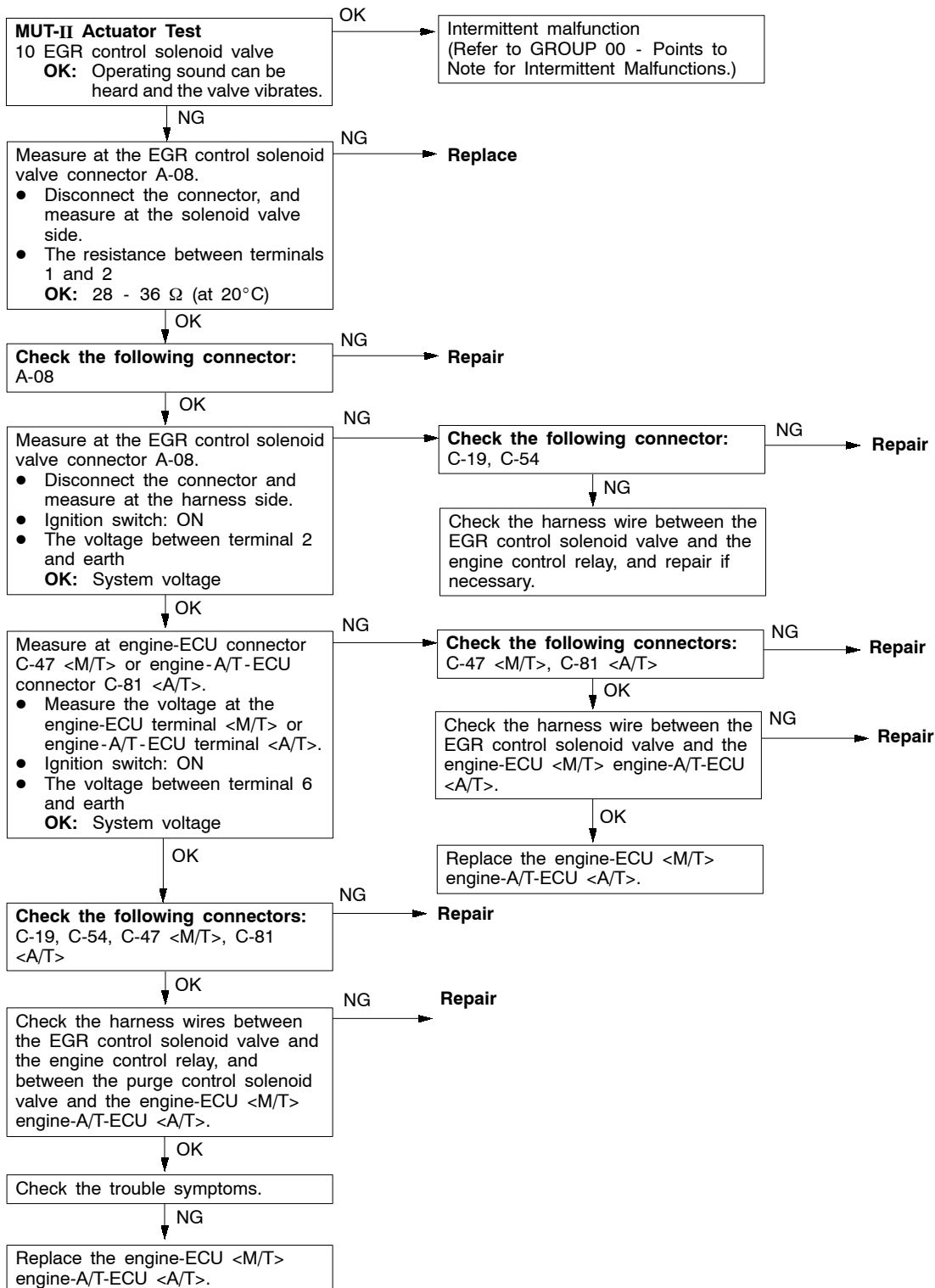
Code No. P0340 Camshaft position sensor system	Probable cause
Range of Check <ul style="list-style-type: none"> <li>After the engine was started</li> </ul> Set Conditions <ul style="list-style-type: none"> <li>The sensor output voltage does not change for 4 seconds (no pulse signal input).</li> </ul>	<ul style="list-style-type: none"> <li>Malfunction of the camshaft position sensor</li> <li>Open or short circuit in the camshaft position sensor circuit or loose connector contact.</li> <li>Malfunction of engine-ECU &lt;M/T&gt;</li> <li>Malfunction of engine-A/T-ECU &lt;A/T&gt;</li> </ul>



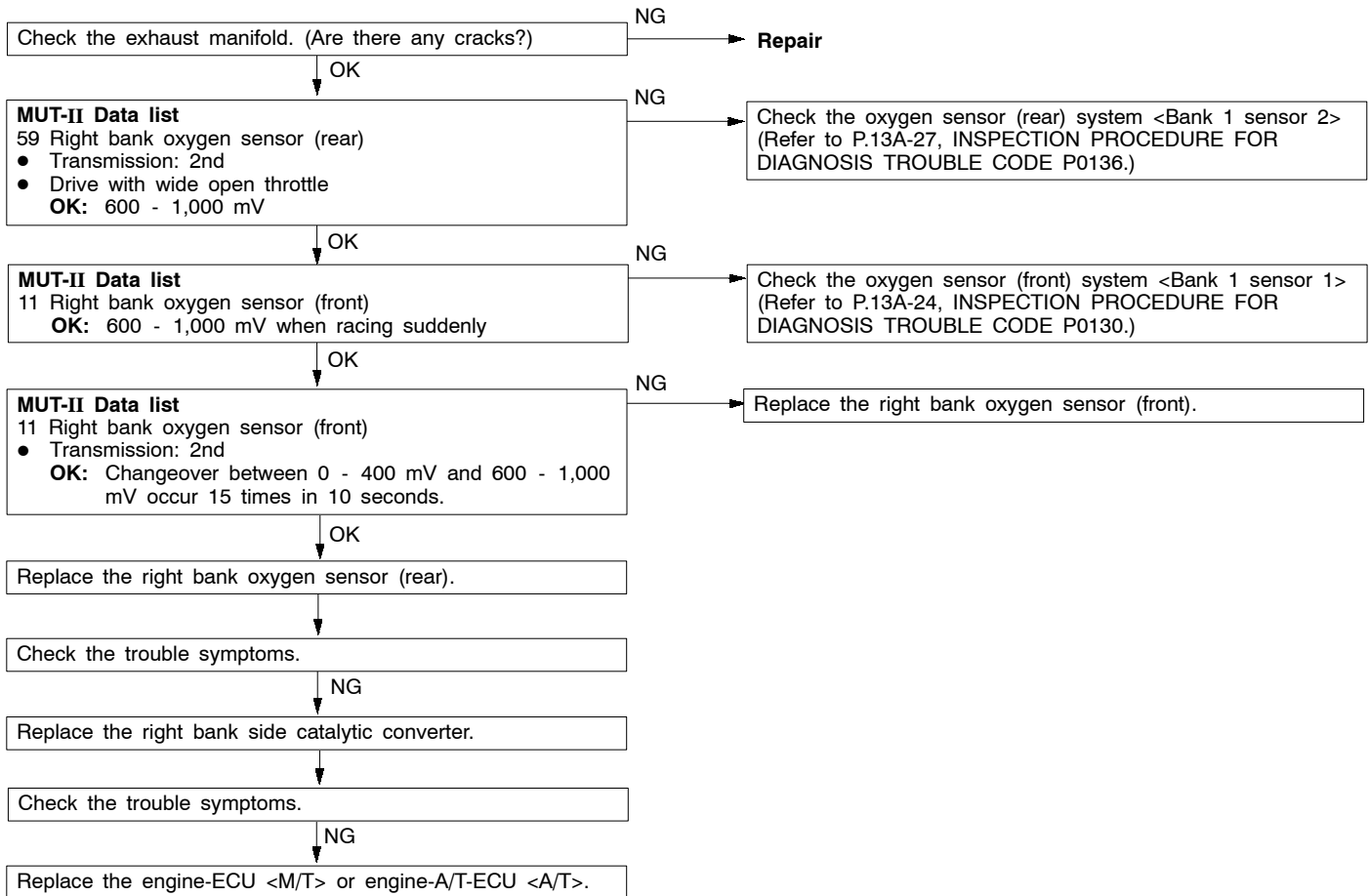
## NOTE:

\*: Refer to the '99 PAJERO SPORT Workshop Manual (Pub. No. PWJE9812)

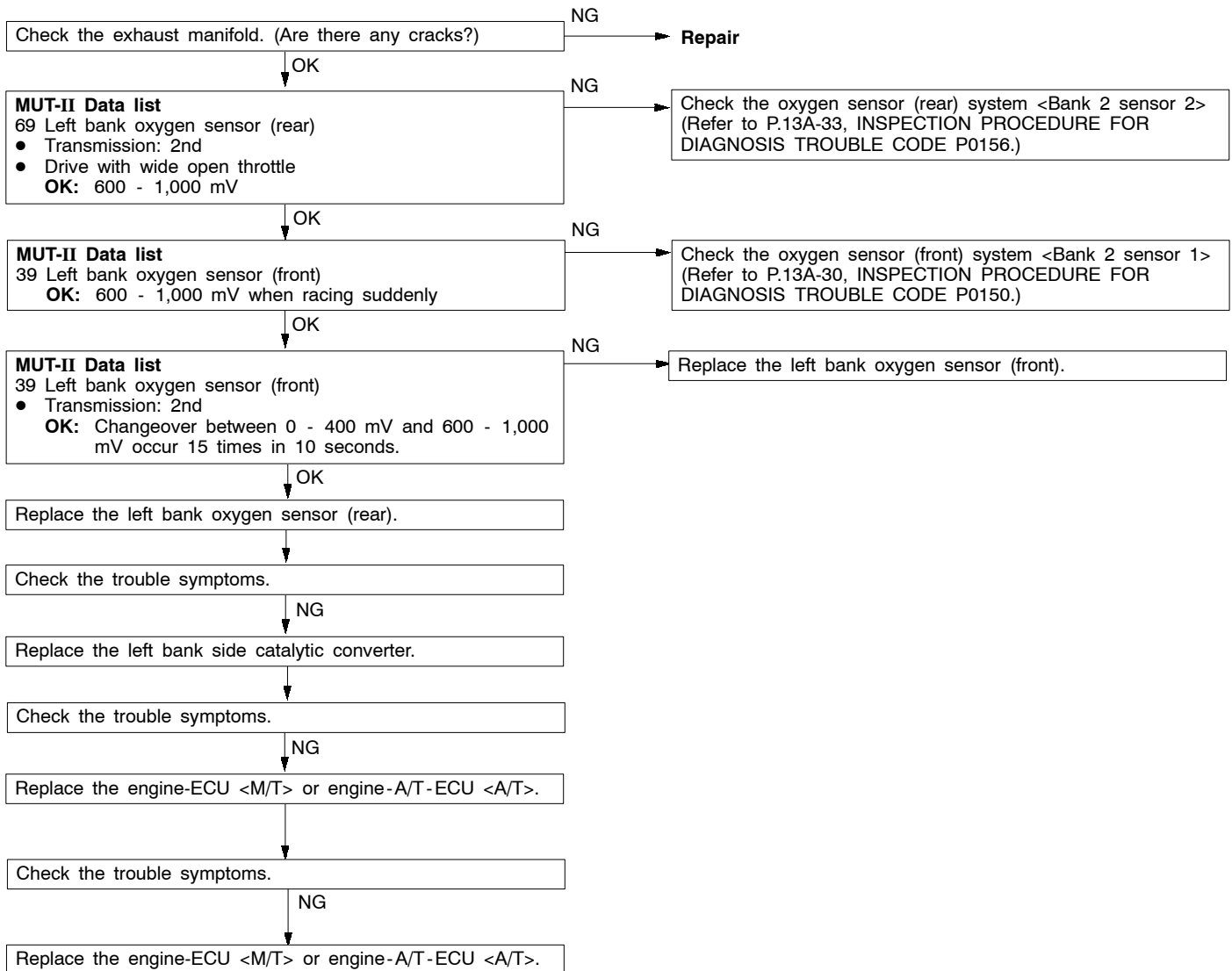
Code No. P0403 EGR control solenoid valve system	Probable cause
Range of Check • Ignition switch: ON • Battery voltage is 10 V or more. Set Conditions • The solenoid coil surge voltage (battery voltage + 2 V) is not detected when the purge control solenoid valve is turned from on to off.	• Malfunction of the EGR control solenoid valve • Open or short circuit in the EGR control solenoid valve circuit or loose connector contact • Malfunction of engine-ECU <M/T> • Malfunction of engine-A/T-ECU <A/T>



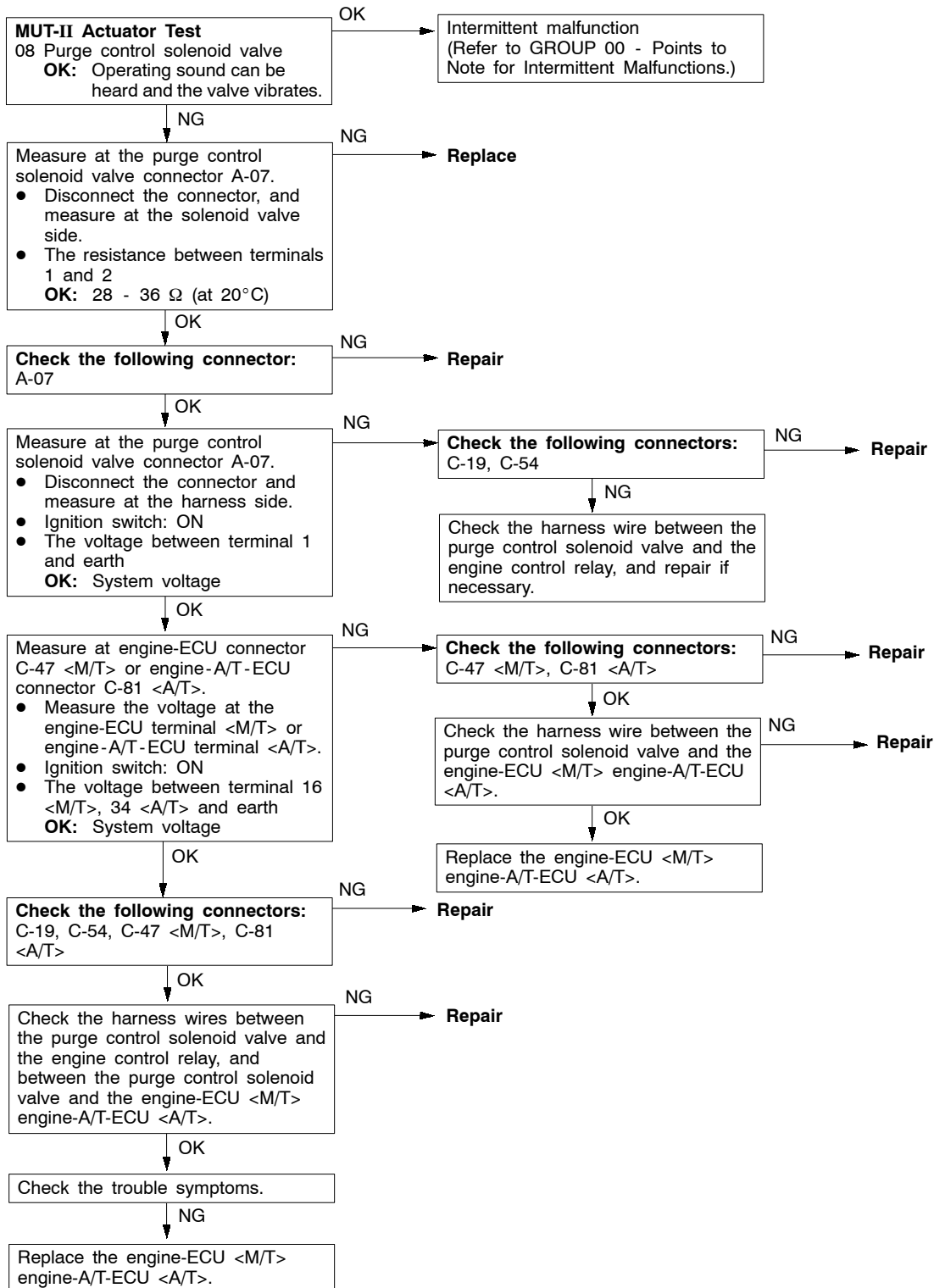
Code No. P0421 Catalyst malfunction (Bank 1)	Probable cause
Range of Check <ul style="list-style-type: none"> <li>• The engine speed is 3,000 r/min or less.</li> <li>• During driving</li> <li>• During air/fuel ratio feedback control</li> </ul> Set Conditions <ul style="list-style-type: none"> <li>• The ratio between the right bank oxygen sensor (rear) and the right bank oxygen sensor (front) output frequencies reaches 0.8 per 12 seconds on average.</li> </ul>	<ul style="list-style-type: none"> <li>• Malfunction of right bank side catalyst</li> <li>• Malfunction of the right bank oxygen sensor (front)</li> <li>• Malfunction of the right bank oxygen sensor (rear)</li> <li>• Malfunction of engine-ECU &lt;M/T&gt;</li> <li>• Malfunction of engine-A/T-ECU &lt;A/T&gt;</li> </ul>



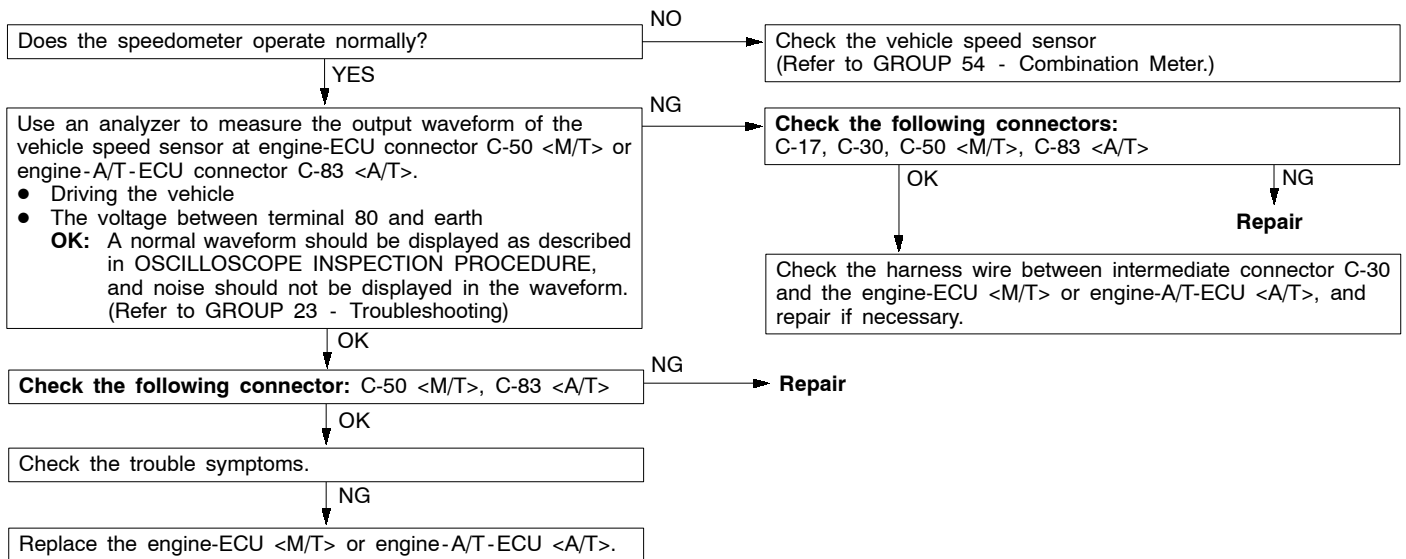
Code No. P0431 Catalyst malfunction (Bank 2)	Probable cause
Range of Check <ul style="list-style-type: none"> <li>• The engine speed is 3,000 r/min or less.</li> <li>• During driving</li> <li>• During air/fuel ratio feedback control</li> </ul> Set Conditions <ul style="list-style-type: none"> <li>• The ratio between the left bank oxygen sensor (rear) and the left bank oxygen sensor (front) output frequencies reaches 0.8 per 12 seconds on average.</li> </ul>	<ul style="list-style-type: none"> <li>• Malfunction of left bank side catalyst</li> <li>• Malfunction of the left bank oxygen sensor (front)</li> <li>• Malfunction of the left bank oxygen sensor (rear)</li> <li>• Malfunction of engine-ECU &lt;M/T&gt;</li> <li>• Malfunction of engine-A/T-ECU &lt;A/T&gt;</li> </ul>



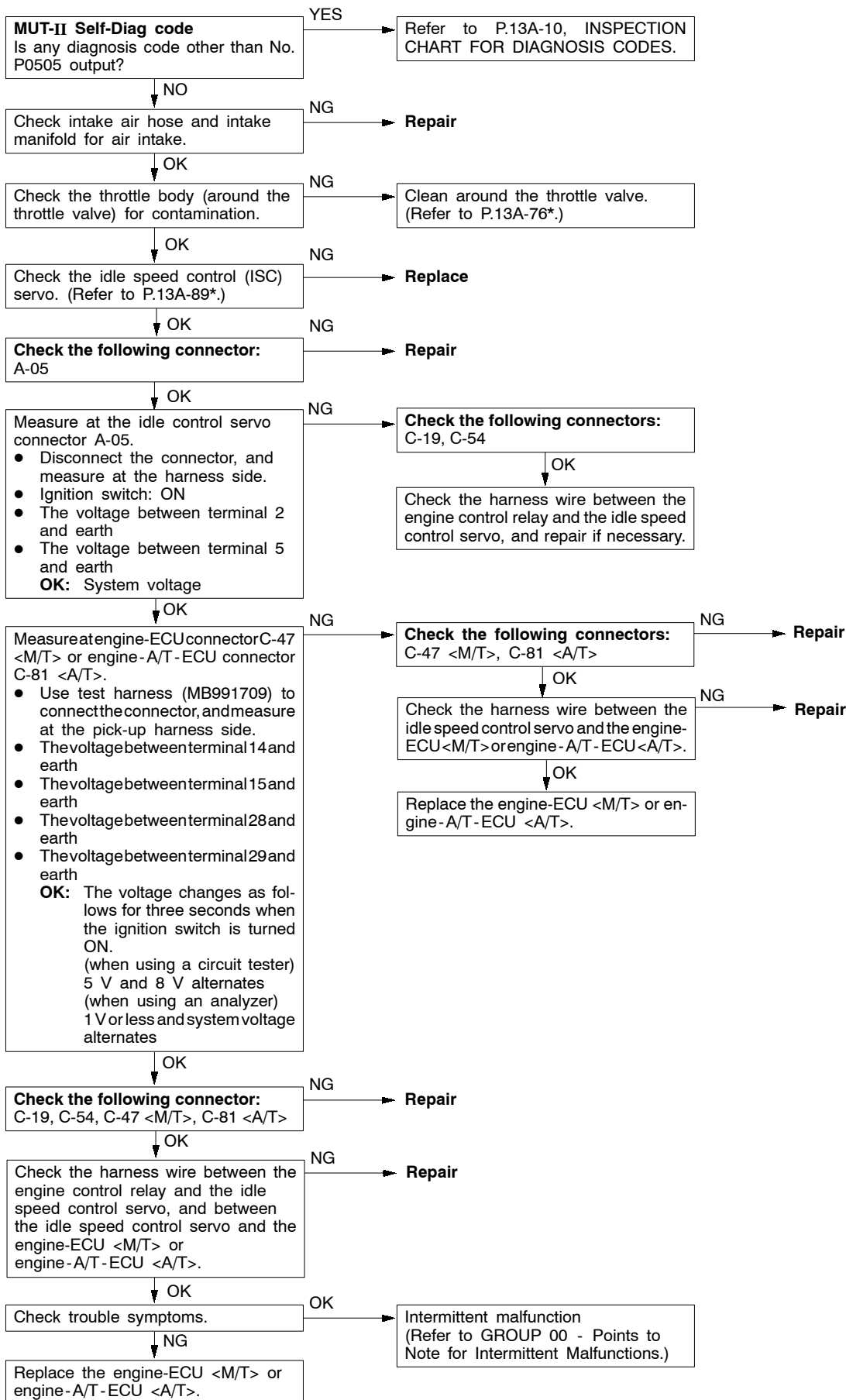
Code No. P0443 Purge control solenoid valve system	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>● Ignition switch: ON</li> <li>● Battery voltage is 10 V or more.</li> </ul> <p>Set Conditions</p> <ul style="list-style-type: none"> <li>● The solenoid coil surge voltage (battery voltage + 2 V) is not detected when the purge control solenoid valve is turned from on to off.</li> </ul>	<ul style="list-style-type: none"> <li>● Malfunction of the purge control solenoid valve</li> <li>● Open or short circuit in the purge control solenoid valve circuit or loose connector contact</li> <li>● Malfunction of engine-ECU &lt;M/T&gt;</li> <li>● Malfunction of engine-A/T-ECU &lt;A/T&gt;</li> </ul>



Code No. P0500 Vehicle speed sensor system	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>Engine: Two seconds after the engine was started</li> <li>Idle switch: OFF</li> <li>Engine speed: 2,500 r/min or more</li> <li>During high engine load</li> </ul> <p>Set Conditions</p> <ul style="list-style-type: none"> <li>The 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>Open or short circuit in the vehicle speed sensor circuit or loose connector contact</li> <li>Malfunction of the engine-ECU &lt;M/T&gt;</li> <li>Malfunction of the engine-A/T-ECU &lt;A/T&gt;</li> </ul>



Code No. P0505 Idle speed control (ISC) system	Probable cause
<p>Check Area</p> <ul style="list-style-type: none"> <li>Vehicle speed has reached 1.5 km/h at least once.</li> <li>Under the closed loop idle speed control.</li> </ul> <p>Judgment Criteria</p> <ul style="list-style-type: none"> <li>Actual idle speed has continued to be higher than the target idle speed by 300 r/min or more for 10 sec.</li> </ul> <p>Check Area</p> <ul style="list-style-type: none"> <li>Vehicle speed has reached 1.5 km/h at least once.</li> <li>During idle speed closed loop control.</li> <li>The highest temperature at the last drive is 45°C or less.</li> <li>Engine coolant temperature is approx. 80°C or more.</li> <li>Battery voltage is 10 V or more.</li> <li>Intake air temperature is -10°C (14°F) or more.</li> </ul> <p>Judgment Criteria</p> <ul style="list-style-type: none"> <li>Actual idle speed has been minimum 200 r/min higher than the target idle speed for ten seconds.</li> </ul> <p>Check Area</p> <ul style="list-style-type: none"> <li>During idle speed closed loop control.</li> <li>Engine coolant temperature is about 80°C or higher.</li> <li>Battery voltage is 10 V or higher.</li> <li>Power steering switch is off.</li> <li>Intake air pipe pressure is 53 kPa or less.</li> <li>Intake air temperature is -10°C or more.</li> </ul> <p>Judgment Criteria</p> <ul style="list-style-type: none"> <li>Actual idle speed has been minimum 100 r/min higher than the target idle speed for ten seconds.</li> </ul>	<ul style="list-style-type: none"> <li>Malfunction of idle speed control (ISC) servo</li> <li>Improper connector contact, open circuit or short-circuit harness wire</li> <li>Malfunction of the engine-ECU &lt;M/T&gt;</li> <li>Malfunction of the engine-A/T-ECU &lt;A/T&gt;</li> </ul>

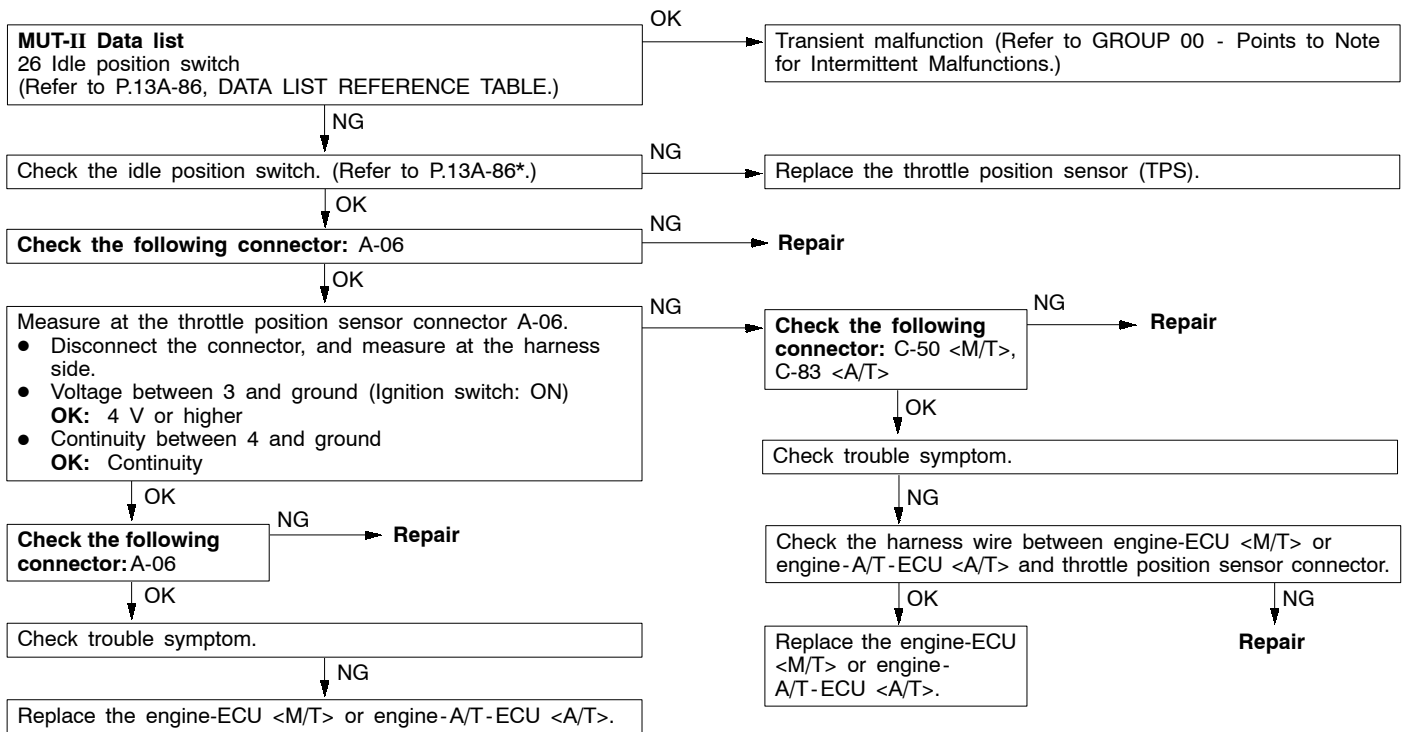


## NOTE:

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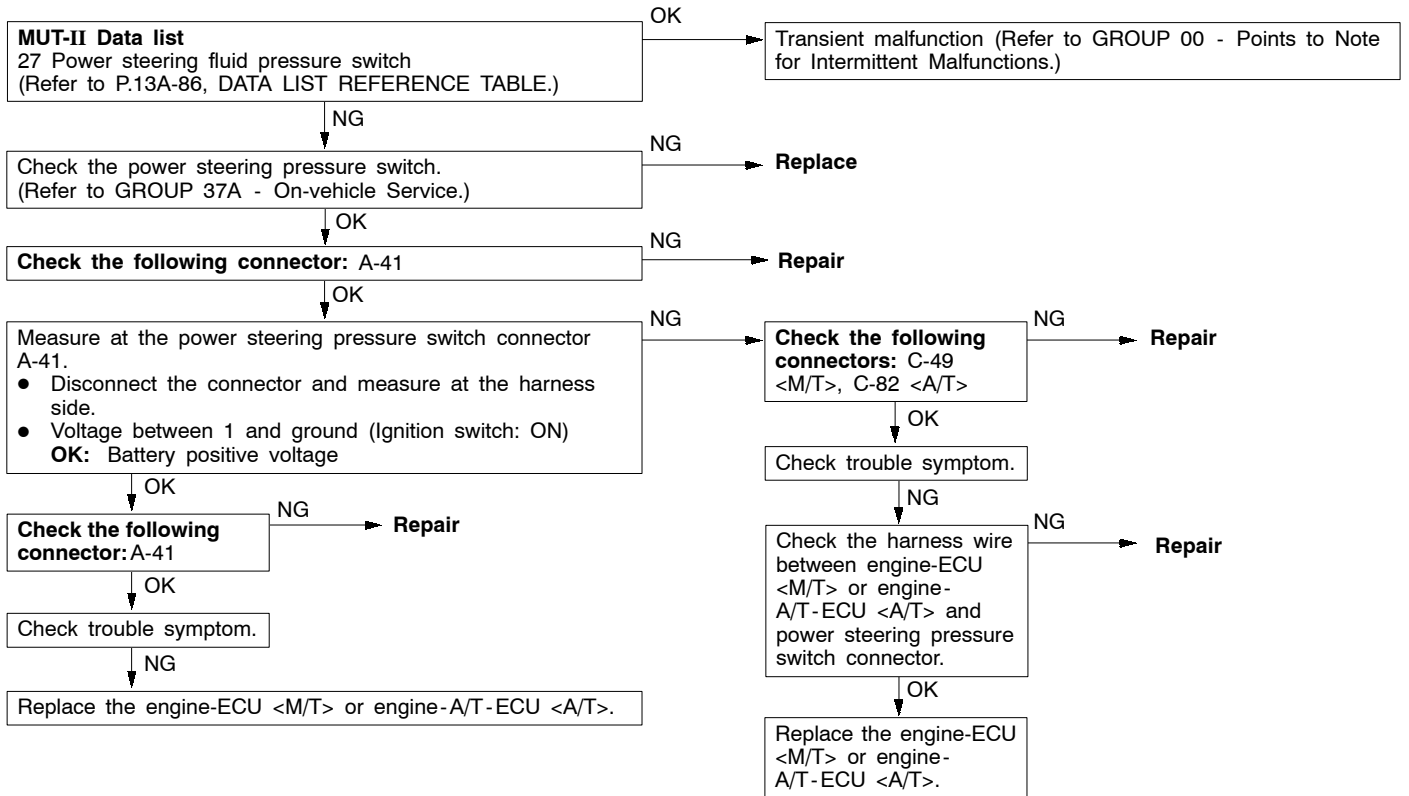
Code No. P0510 Idle Position Switch System	Probable cause
Check Area • Throttle position sensor output voltage is 2.0 V or more. Judgment Criteria • Idle position switch has been turned on. Check Area • Repeat the *1 drive and *2 stop 15 times. *1 drive: Vehicle speed is more than 30 km/h (19mph) for two seconds or more. *2 stop: Vehicle speed is more than 1.5 km/h (0.93 mph). Judgment Criteria • Idle position switch remains off.	• Malfunction of idle position switch • Open or shorted idle position switch circuit, or loose connector. • Malfunction of the engine-ECU <M/T> • Malfunction of the engine-A/T-ECU <A/T>



## NOTE:

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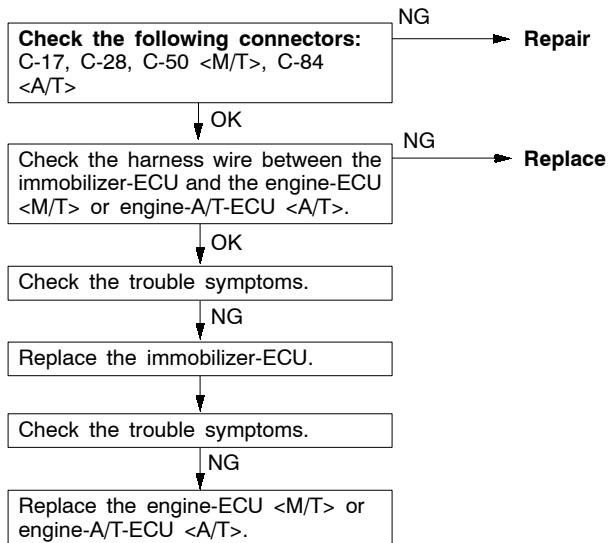
Code No. P0551 Power Steering fluid Pressure Switch System	Probable cause
<p>Check Area</p> <ul style="list-style-type: none"> <li>Intake air temperature is -10°C (14°F) or higher.</li> <li>Barometric pressure is 76 kPa (11 psi) or higher.</li> <li>Engine coolant temperature is 30°C (86°F) or more.</li> <li>Repeat *1 drive and *2 stop ten times or more.</li> </ul> <p>*1: Engine speed is 2,500 r/min or higher, volumetric efficiency is 55 % or higher and vehicle speed is 5 km/h (3.1 mph) or higher for 4 seconds or more.</p> <p>*2: Vehicle speed is 1.5 km/h (0.93 mph) or lower.</p> <p>Judgment Criteria</p> <ul style="list-style-type: none"> <li>Power steering pressure switch remains on.</li> </ul>	<ul style="list-style-type: none"> <li>Power steering fluid pressure switch failed.</li> <li>Open or shorted power steering fluid pressure switch circuit, or loose connector.</li> <li>Malfunction of the engine-ECU &lt;M/T&gt;</li> <li>Malfunction of the engine-A/T-ECU &lt;A/T&gt;</li> </ul>



Cord No. P1610 Immobilizer system	Probable cause
Range of Check • Ignition switch: ON Set Conditions • Improper communication between the engine-ECU <M/T> or engine-A/T-ECU <A/T> and the immobilizer-ECU	• Open or short circuit, or loose connector contact • Malfunction of the immobilizer-ECU • Malfunction of the engine-ECU <M/T> • Malfunction of the engine-A/T-ECU <A/T>

**NOTE**

- (1) If the registered ignition keys 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 ID code.



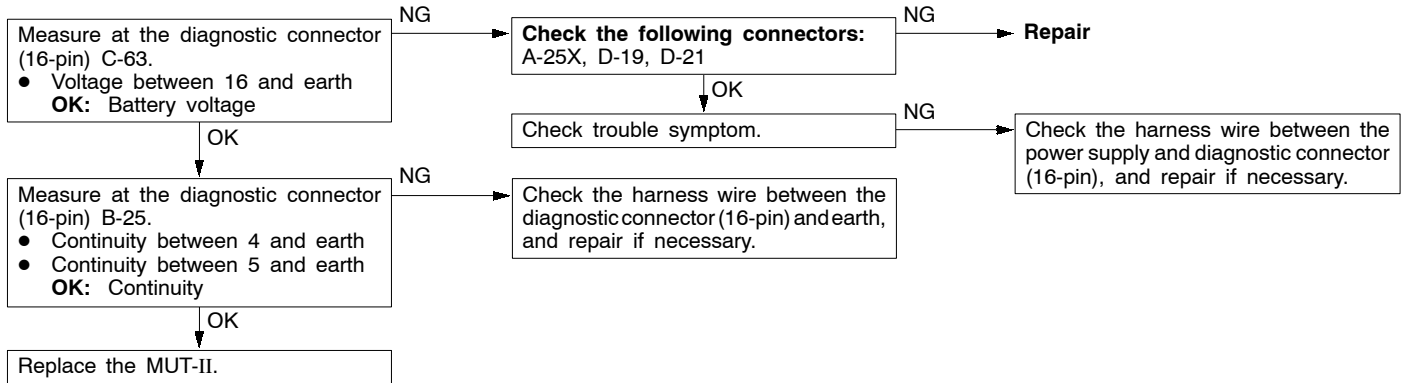
## INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom		Inspection procedure No.	Reference page
Communication with MUT-II is impossible.	Communication with all systems is not possible.	1	13A-55
	Communication with engine-ECU <M/T> or engine-A/T-ECU <A/T> only is not possible.	2	13A-55
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	13A-56
	The engine warning lamp remains illuminating and never goes out.	4	13A-56
Starting	No initial combustion (starting impossible)	5	13A-57
	Initial combustion but no complete combustion (starting impossible)	6	13A-58
	Long time to start (improper starting)	7	13A-59
Idling stability (Improper idling)	Unstable idling (Rough idling, hunting)	8	13A-60
	Idling speed is high. (Improper idling speed)	9	13A-62
	Idling speed is low. (Improper idling speed)	10	13A-63
Idling stability (Engine stalls)	When the engine is cold, it stalls at idling. (Die out)	11	13A-64
	When the engine becomes hot, it stalls at idling. (Die out)	12	13A-65
	The engine stalls when starting the car. (Pass out)	13	13A-67
	The engine stalls when decelerating.	14	13A-67
Driving	Hesitation, sag or stumble	15	13A-68
	The feeling of impact or vibration when accelerating	16	13A-70
	The feeling of impact or vibration when decelerating	17	13A-70
	Poor acceleration	18	13A-71
	Surge	19	13A-73
	Knocking	20	13A-75
Dieseling		21	13A-75
Too high CO and HC concentration when idling		22	13A-75
Idling speed is improper when A/C is operating		23	13A-77
Fans (radiator fan, A/C condenser fan) are inoperative		24	13A-78

## INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

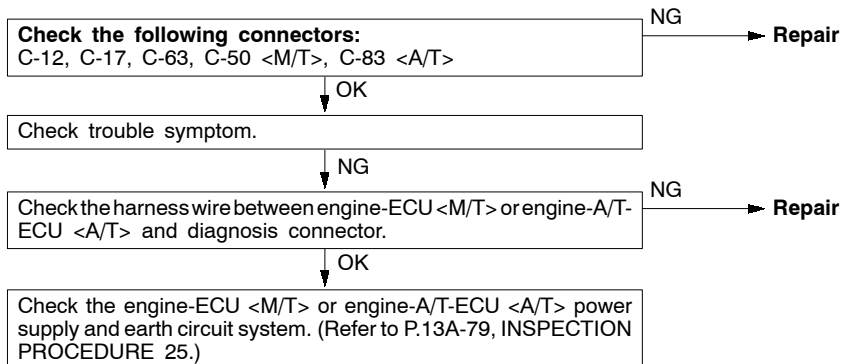
## INSPECTION PROCEDURE 1

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



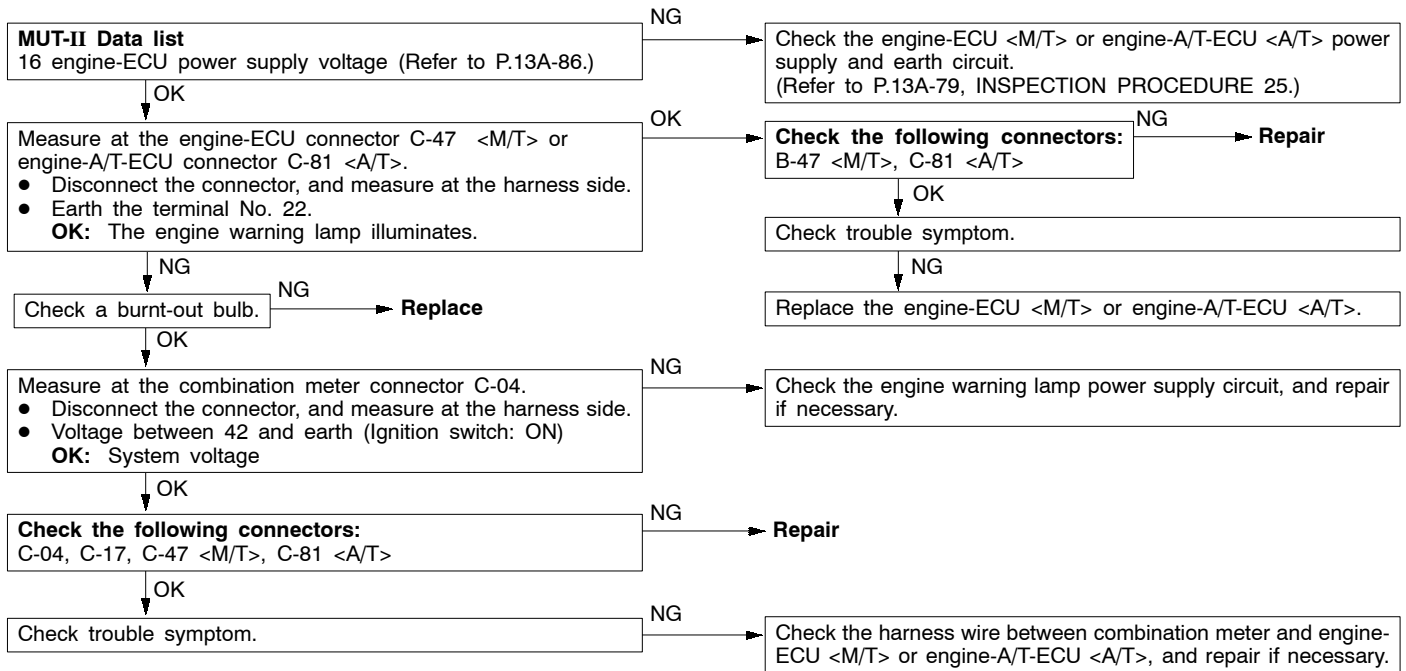
## INSPECTION PROCEDURE 2

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



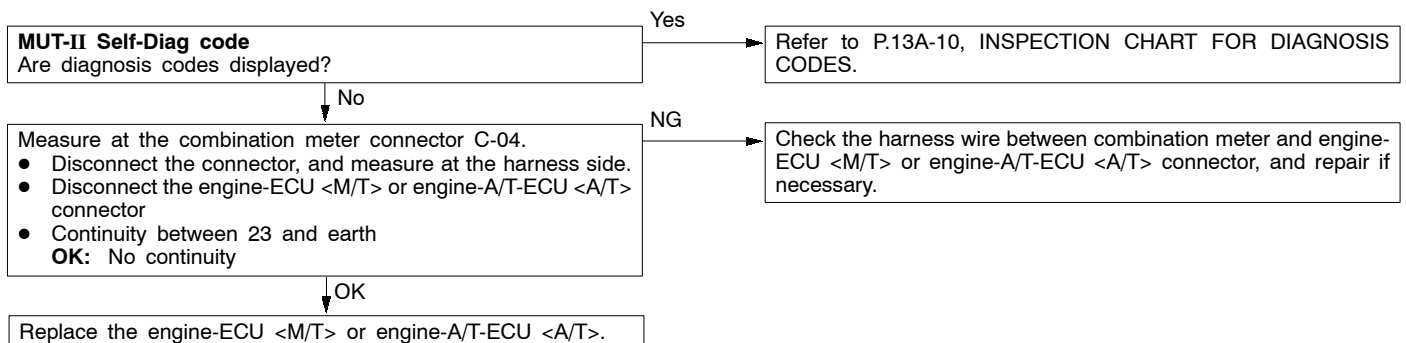
## INSPECTION PROCEDURE 3

The engine warning lamp does not illuminate right after the ignition switch is turned to the ON position.	Probable cause
Because there is a burnt-out bulb, the engine-ECU <M/T> or engine-A/T-ECU <A/T> 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.	<ul style="list-style-type: none"> <li>● Burnt-out bulb</li> <li>● Defective warning lamp circuit</li> <li>● Malfunction of the engine-ECU &lt;M/T&gt;</li> <li>● Malfunction of the engine-A/T-ECU &lt;A/T&gt;</li> </ul>



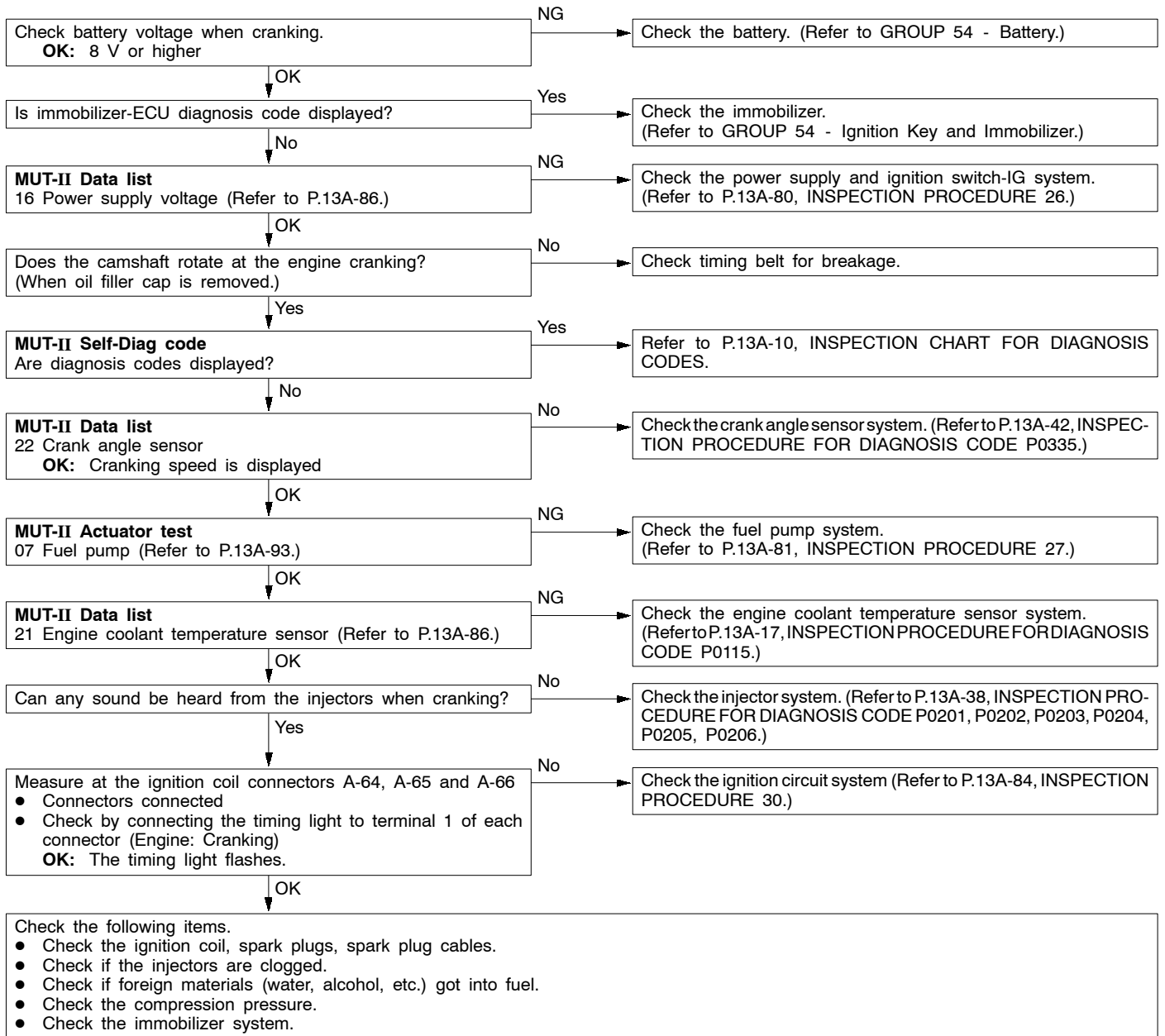
## INSPECTION PROCEDURE 4

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



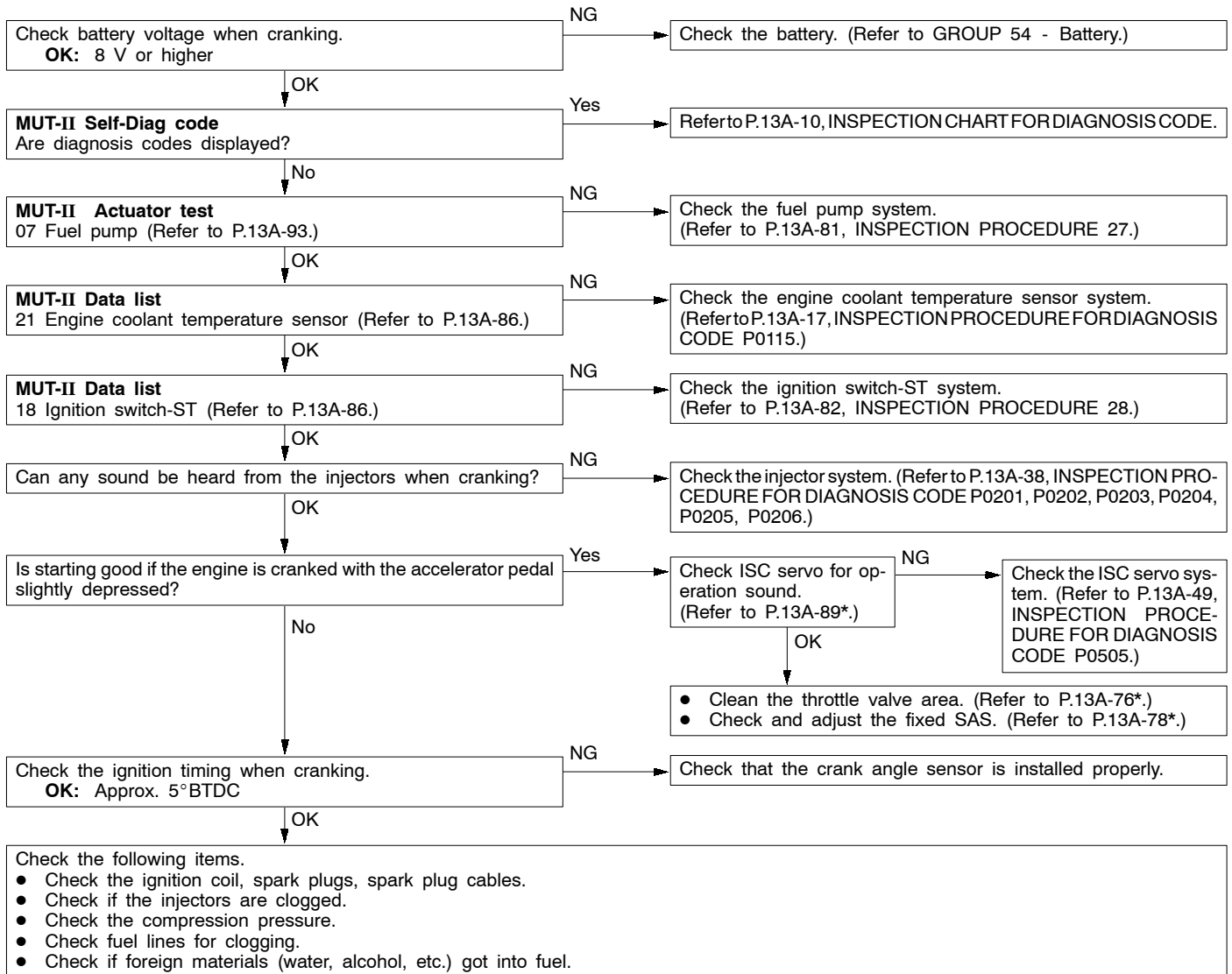
## INSPECTION PROCEDURE 5

No initial combustion (starting impossible)	Probable cause
<p>In cases such as the above, the cause is probably that a spark plug is defective, or that the supply of fuel to the combustion chamber is defective. In addition, foreign materials (water, kerosene, etc.) may be mixed with the fuel.</p>	<ul style="list-style-type: none"> <li>• Malfunction of the ignition system</li> <li>• Malfunction of the fuel pump system</li> <li>• Malfunction of the injectors</li> <li>• Malfunction of the engine-ECU &lt;M/T&gt;</li> <li>• Malfunction of the engine-A/T-ECU &lt;A/T&gt;</li> <li>• Malfunction of the immobilizer system</li> <li>• Foreign materials in fuel</li> </ul>



## INSPECTION PROCEDURE 6

Initial combustion but no complete combustion (starting impossible)	Probable cause
In such cases as the above, the cause is probably that the spark plugs are generating sparks but the sparks are weak, or the initial mixture for starting is not appropriate.	<ul style="list-style-type: none"> <li>● Malfunction of the ignition system</li> <li>● Malfunction of the injector system</li> <li>● Foreign materials in fuel</li> <li>● Poor compression</li> <li>● Malfunction of the engine-ECU &lt;M/T&gt;</li> <li>● Malfunction of the engine-A/T-ECU &lt;A/T&gt;</li> </ul>



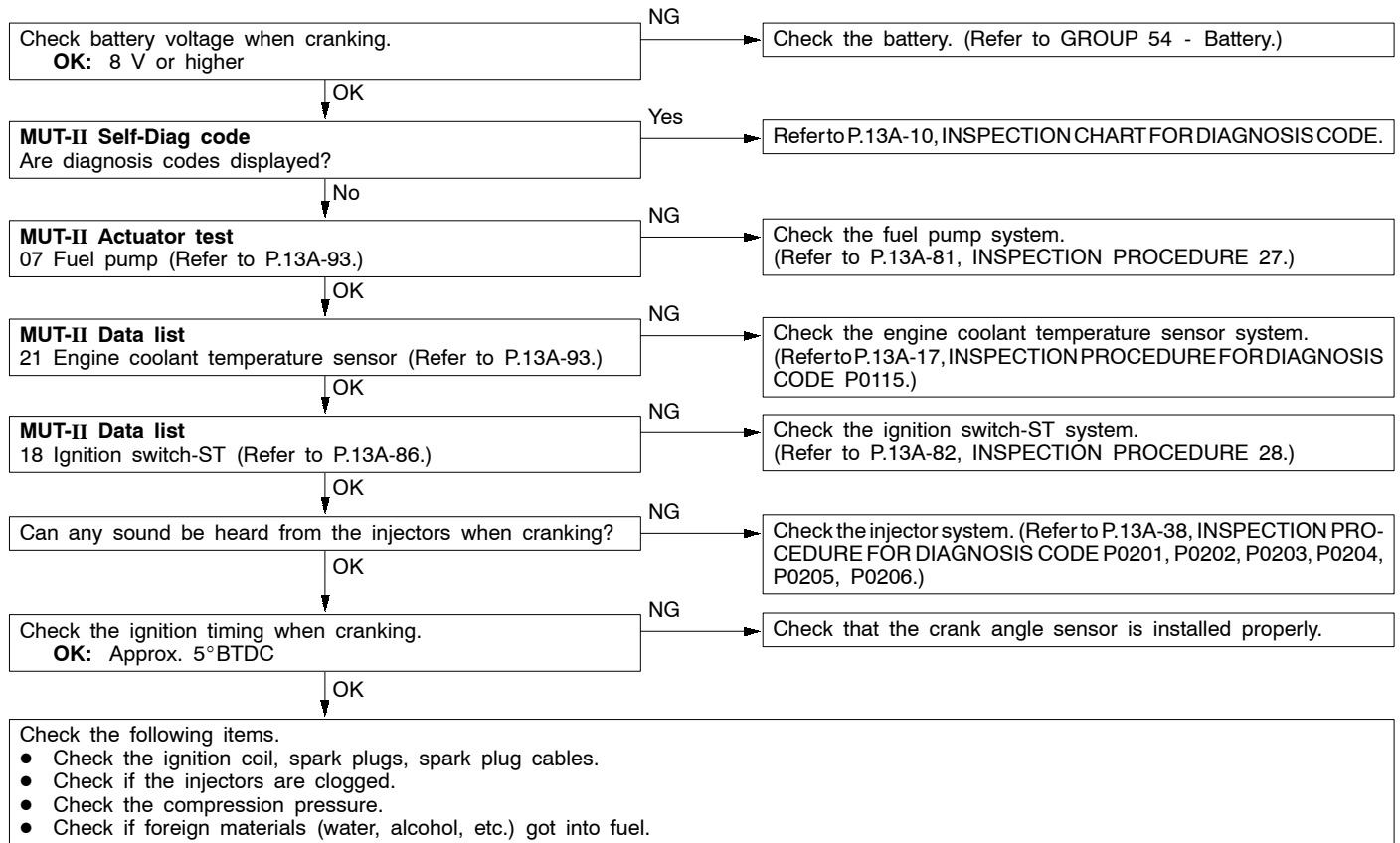
## NOTE:

\*: Refer to the '99 PAJERO SPORT Workshop Manual (Pub. No. PWJE9812)



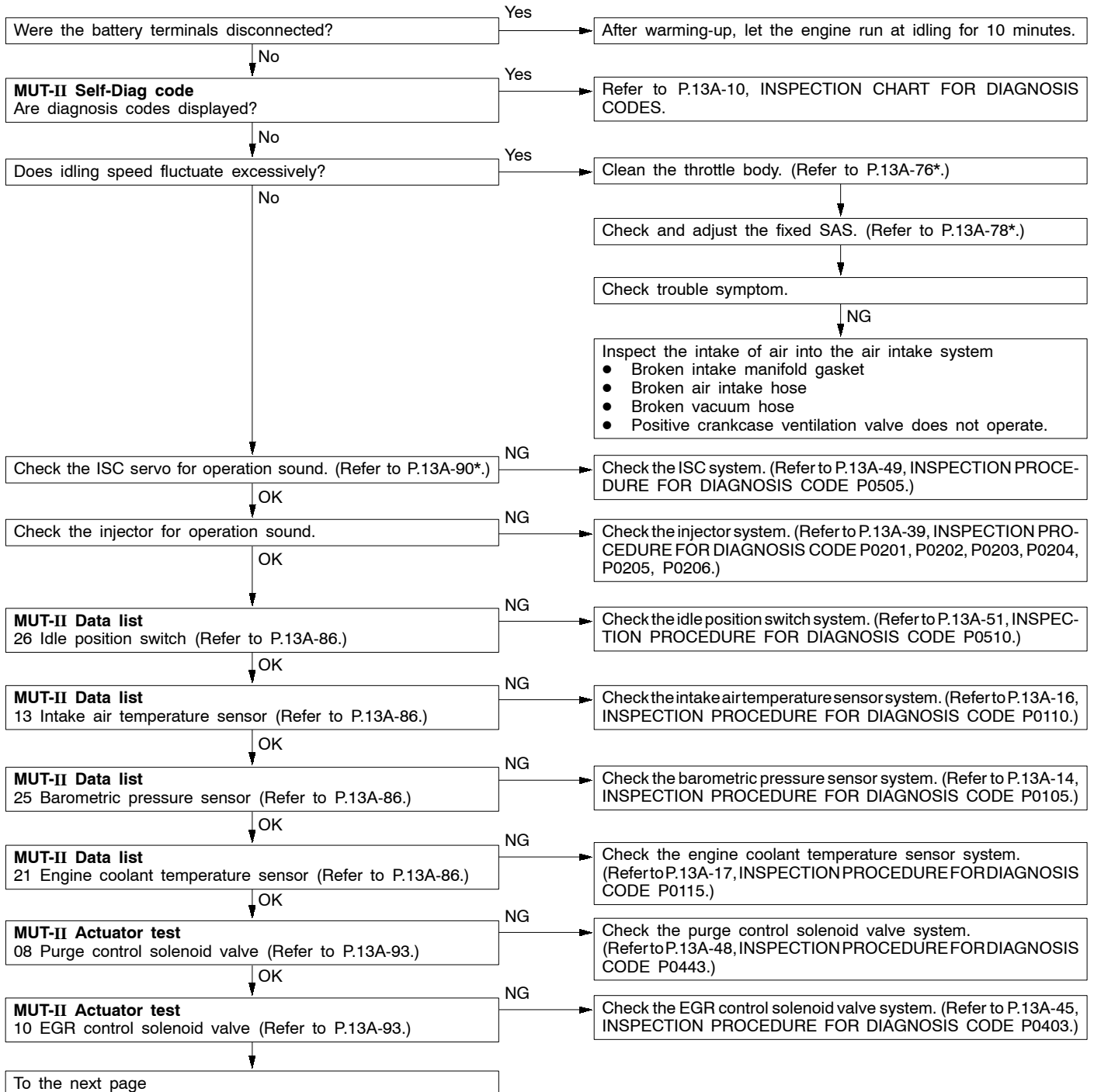
## INSPECTION PROCEDURE 7

It takes too long time to start. (Incorrect starting)	Probable cause
In cases such as the above, the cause is probably that the spark is weak and ignition is difficult, the initial mixture for starting is not appropriate, or sufficient compression pressure is not being obtained.	<ul style="list-style-type: none"> <li>• Malfunction of the ignition system</li> <li>• Malfunction of the injector system</li> <li>• Inappropriate gasoline use</li> <li>• Poor compression</li> </ul>



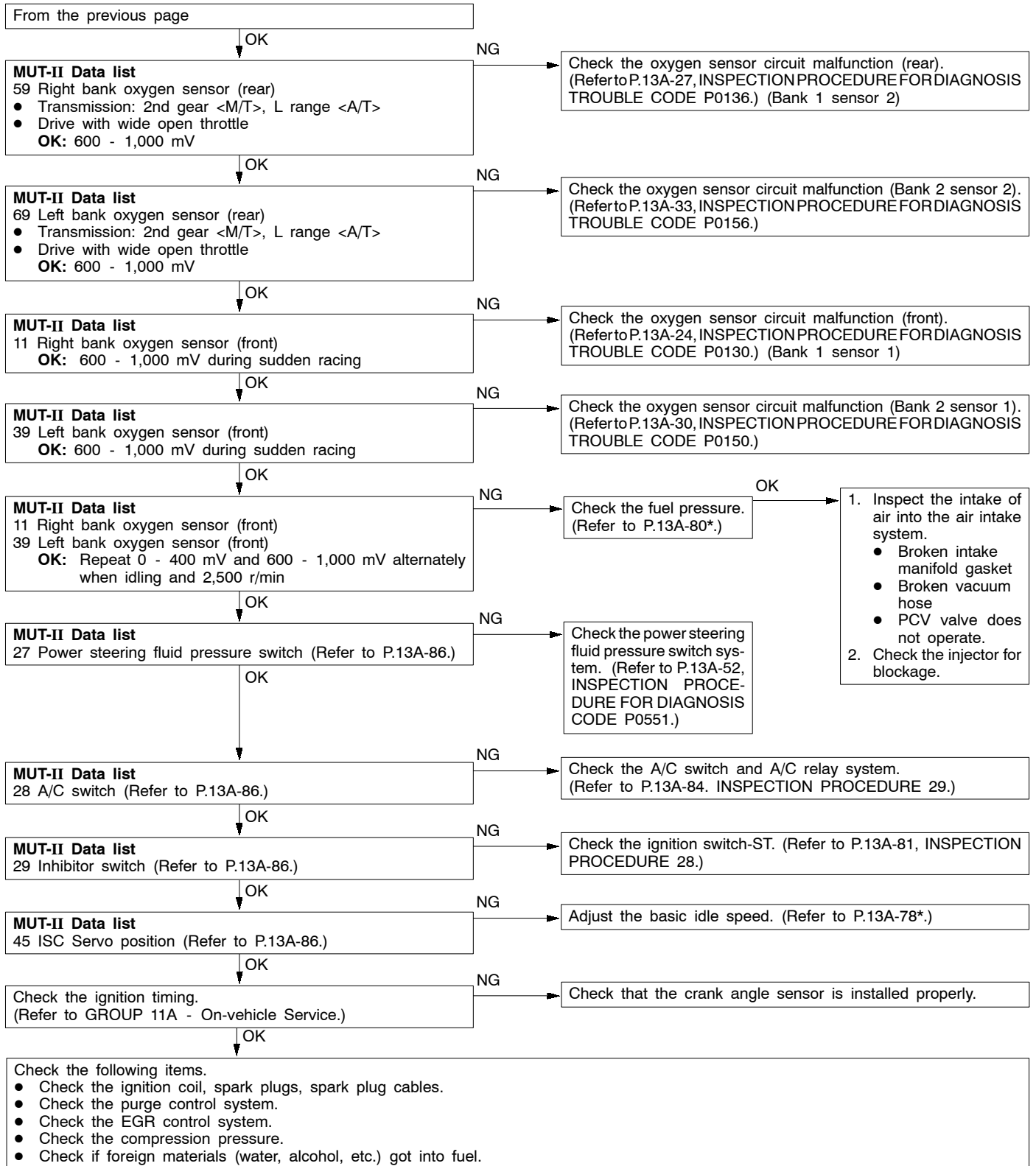
## INSPECTION PROCEDURE 8

Unstable idling (Rough idling, hunting)	Probable cause
In cases as the above, the cause is probably that the ignition system, air/fuel mixture, idle speed control (ISC) or compression pressure is defective. Because the range of possible causes is broad, inspection is narrowed down to simple items.	<ul style="list-style-type: none"> <li>• Malfunction of the ignition system</li> <li>• Malfunction of air-fuel ratio control system</li> <li>• Malfunction of the ISC system</li> <li>• Malfunction of the purge control solenoid valve system</li> <li>• Malfunction of the EGR solenoid valve system</li> <li>• Poor compression</li> <li>• Drawing air into exhaust system</li> </ul>



## NOTE:

\*: Refer to the '99 PAJERO SPORT Workshop Manual (Pub. No. PWJE9812)

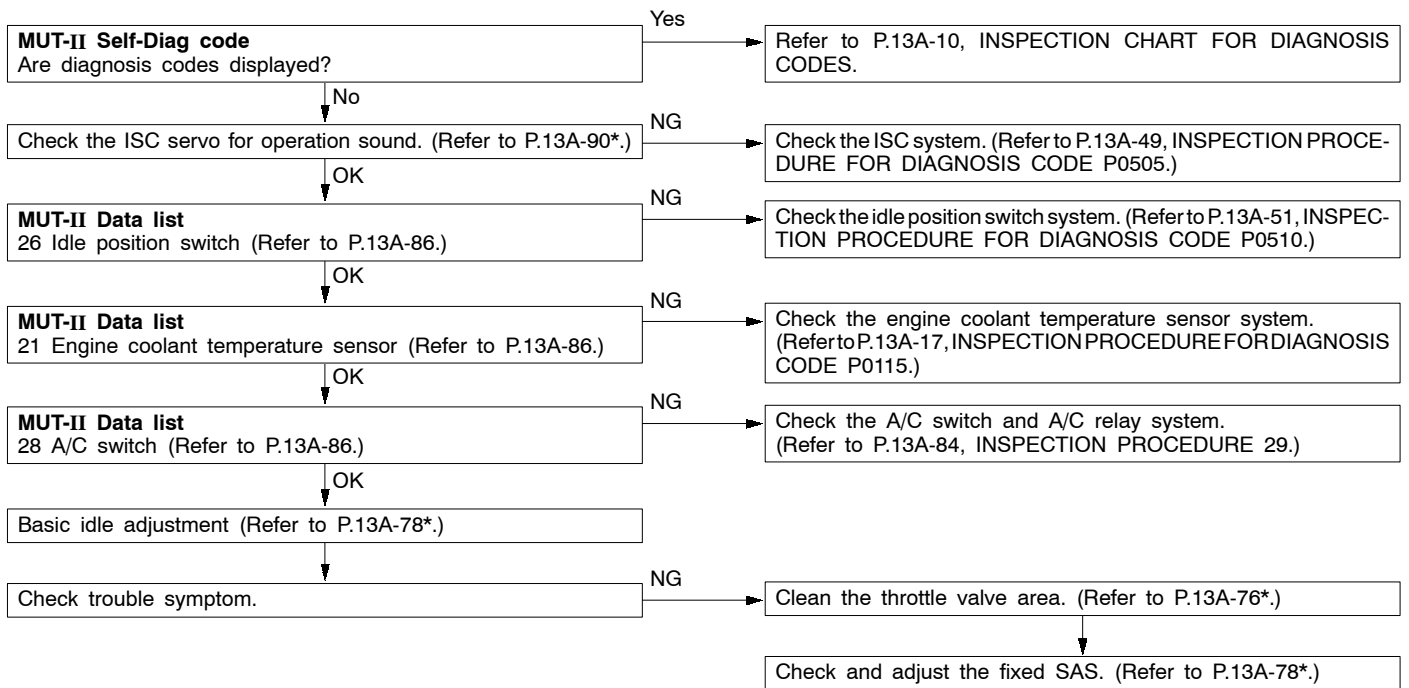


## NOTE:

\*: Refer to the '99 PAJERO SPORT Workshop Manual (Pub. No. PWJE9812)

## INSPECTION PROCEDURE 9

Idling speed is high. (Improper idling speed)	Probable cause
In such cases as the above, the cause is probably that the intake air volume during idling is too great.	<ul style="list-style-type: none"> <li>• Malfunction of the ISC servo system</li> <li>• Malfunction of the throttle body</li> </ul>

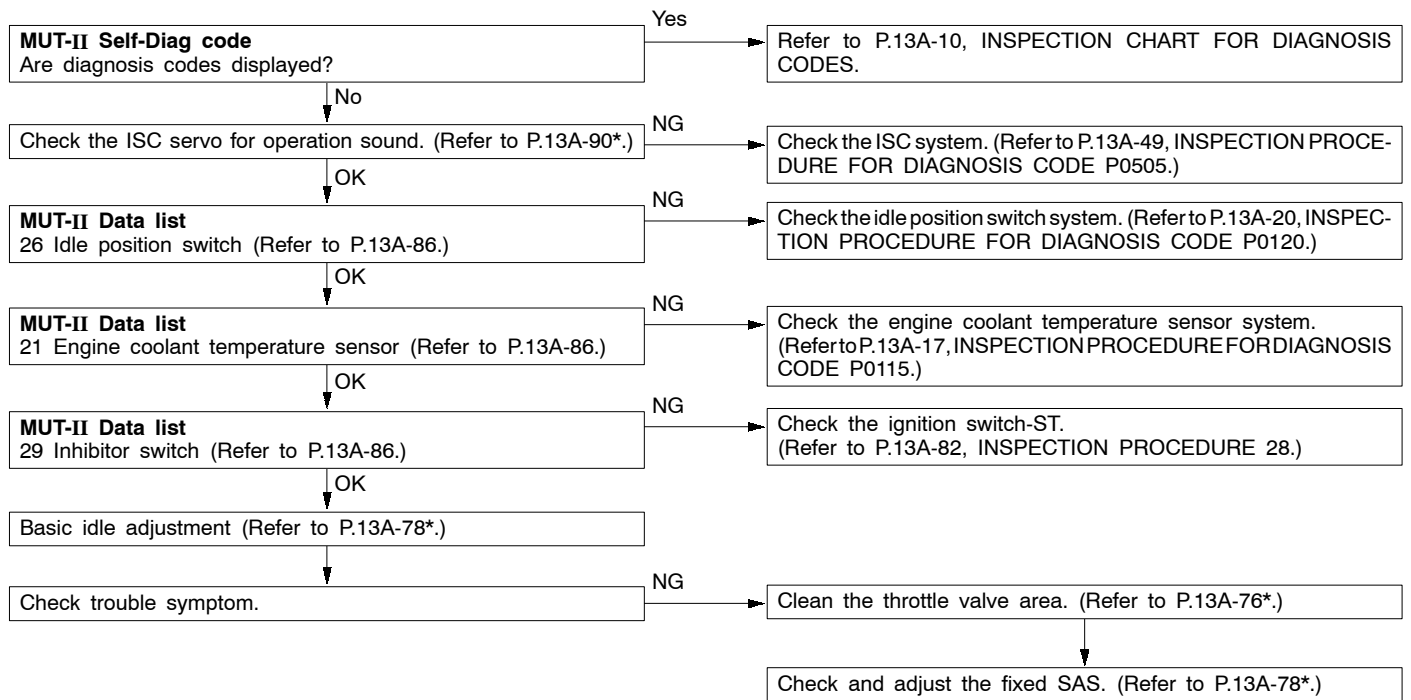


## NOTE:

\*: Refer to the '99 PAJERO SPORT Workshop Manual (Pub. No. PWJE9812)

## INSPECTION PROCEDURE 10

Idling speed is low. (Improper idling speed)	Probable cause
In cases such as the above, the cause is probably that the intake air volume during idling is too small.	<ul style="list-style-type: none"> <li>• Malfunction of the ISC servo system</li> <li>• Malfunction of the throttle body</li> </ul>

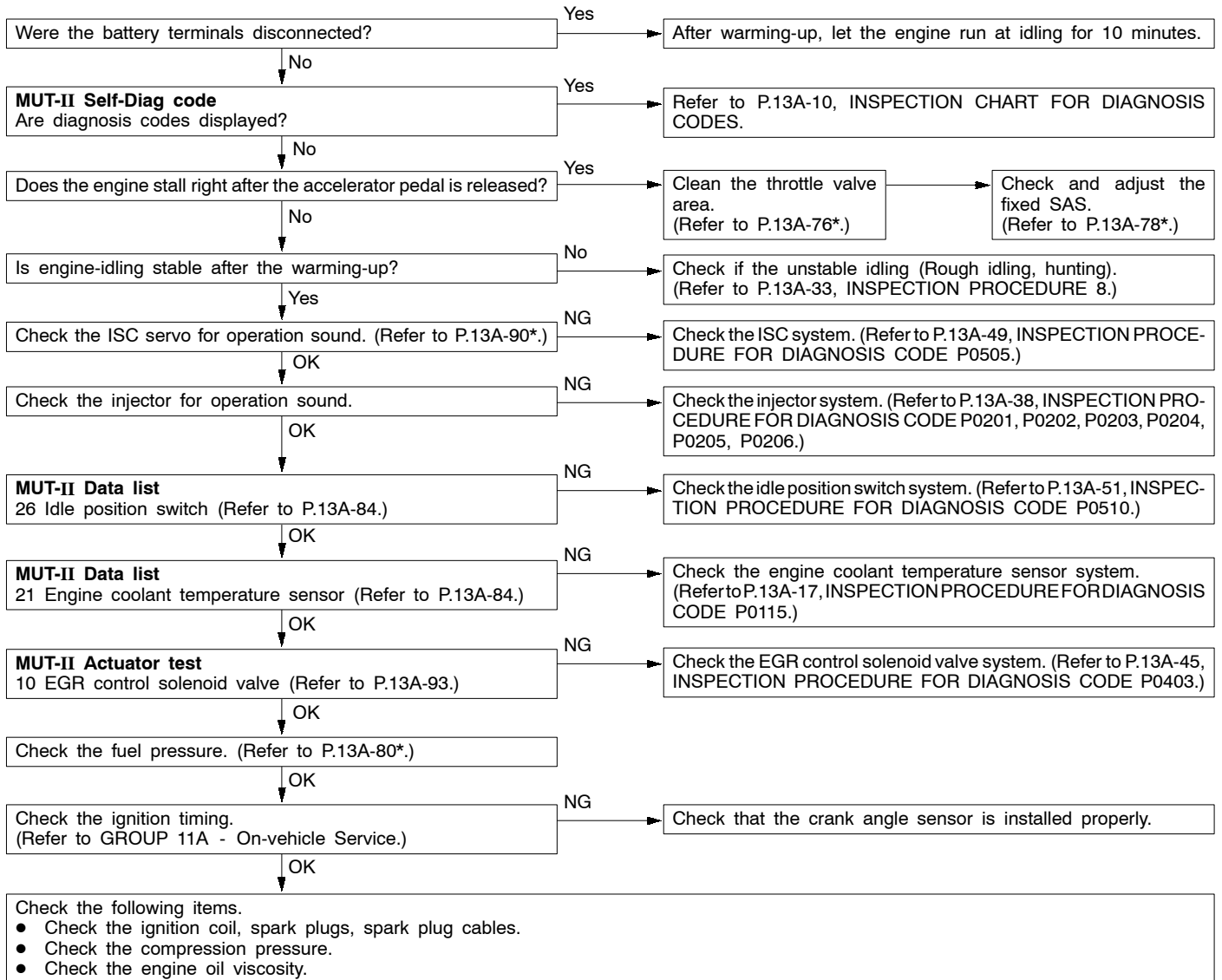


## NOTE:

\*: Refer to the '99 PAJERO SPORT Workshop Manual (Pub. No. PWJE9812)

## INSPECTION PROCEDURE 11

When the engine is cold, it stalls at idling. (Die out)	Probable cause
In such cases as the above, the cause is probably that the air/fuel mixture is inappropriate when the engine is cold, or that the intake air volume is insufficient.	<ul style="list-style-type: none"> <li>• Malfunction of the ISC servo system</li> <li>• Malfunction of the throttle body</li> <li>• Malfunction of the injector system</li> <li>• Malfunction of the ignition system</li> </ul>

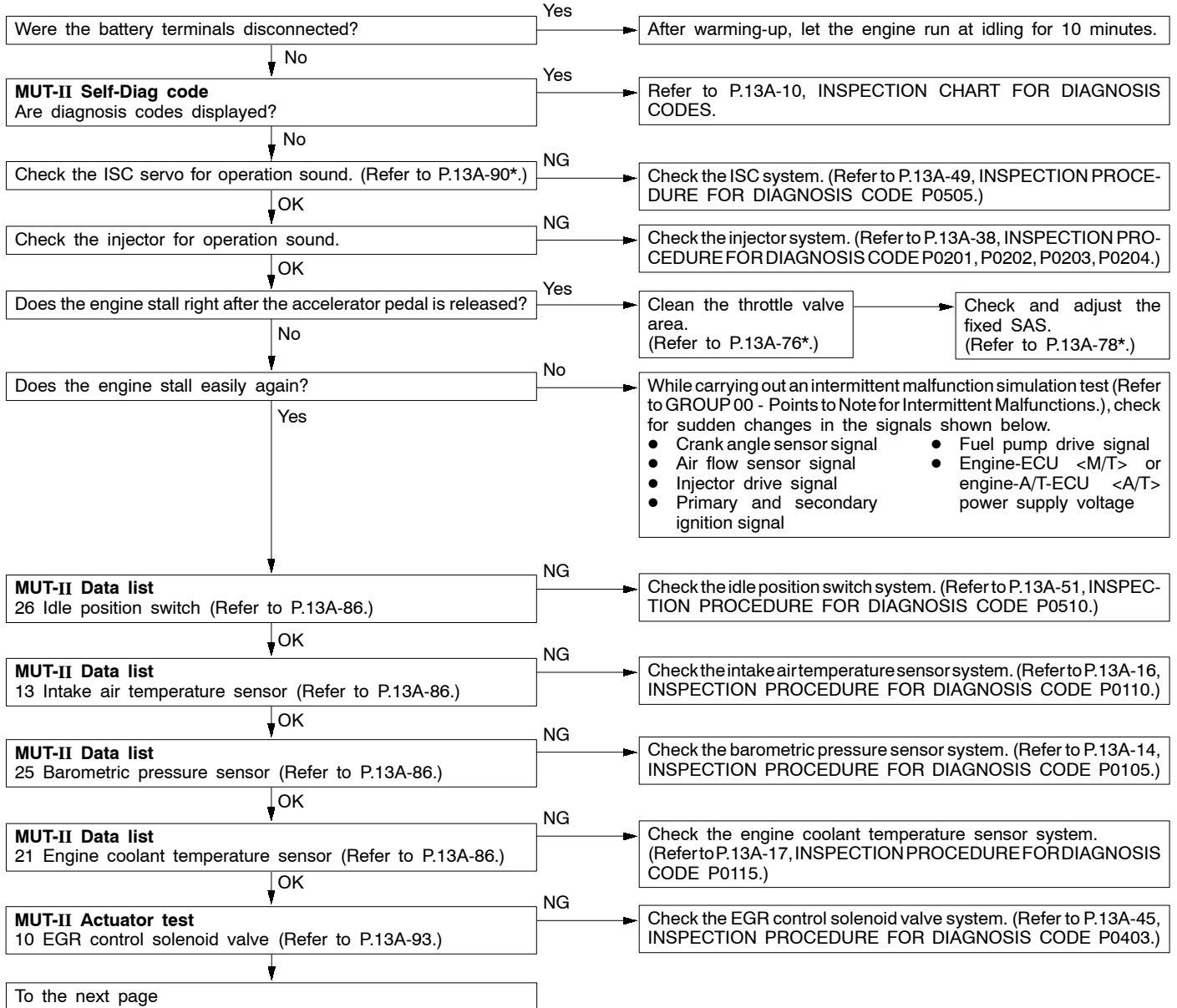


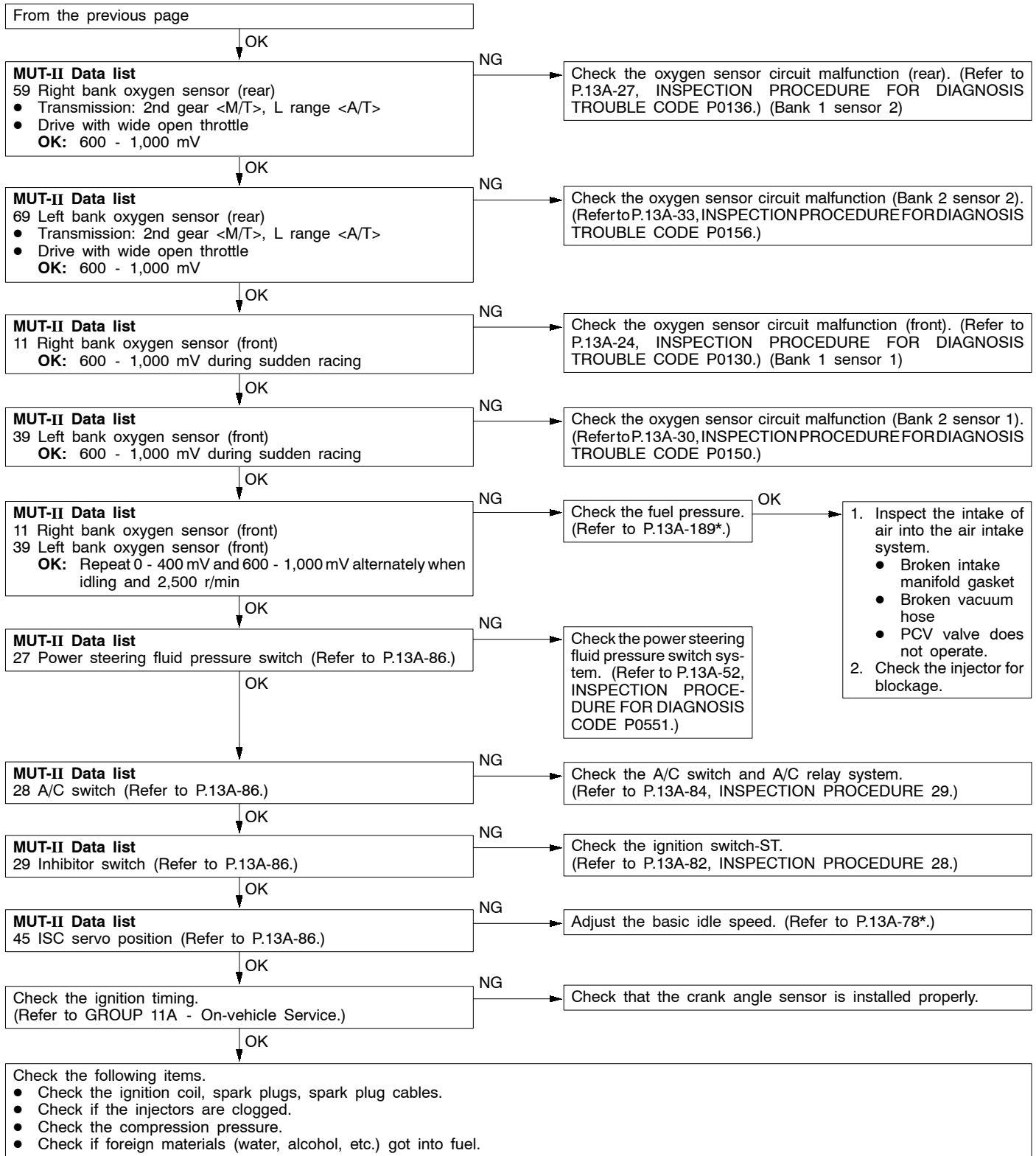
## NOTE:

\*: Refer to the '99 PAJERO SPORT Workshop Manual (Pub. No. PWJE9812)

## INSPECTION PROCEDURE 12

When the engine is hot, it stalls at idling. (Die out)	Probable cause
In such cases as the above, the cause is probably that ignition system, air/fuel mixture, idle speed control (ISC) or compression pressure is defective. In addition, if the engine suddenly stalls, the cause may also be a defective connector contact.	<ul style="list-style-type: none"> <li>• Malfunction of the ignition system</li> <li>• Malfunction of air-fuel ratio control system</li> <li>• Malfunction of the ISC system</li> <li>• Drawing air into intake system</li> <li>• Improper connector contact</li> </ul>





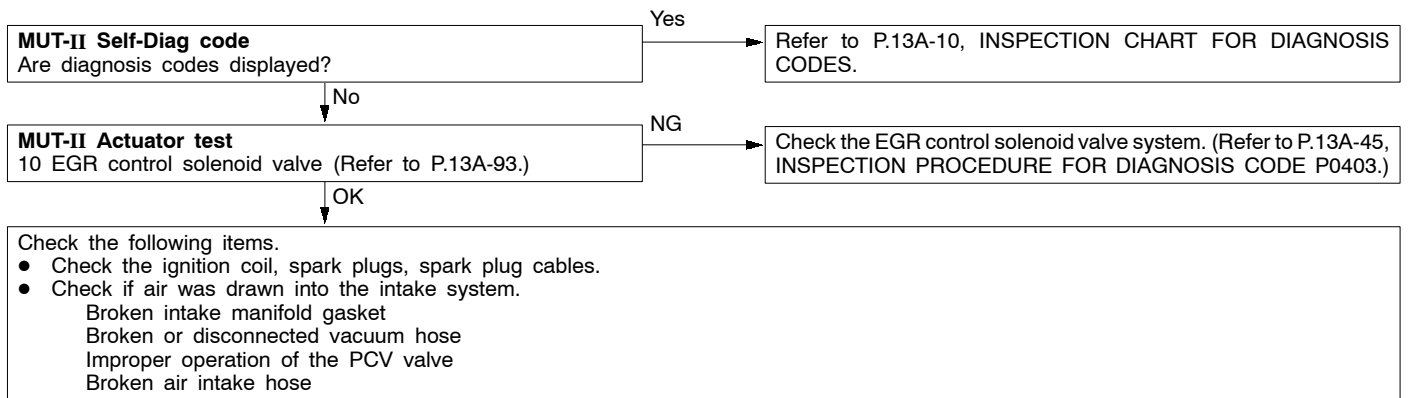
## NOTE:

\*: Refer to the '99 PAJERO SPORT Workshop Manual (Pub. No. PWJE9812)



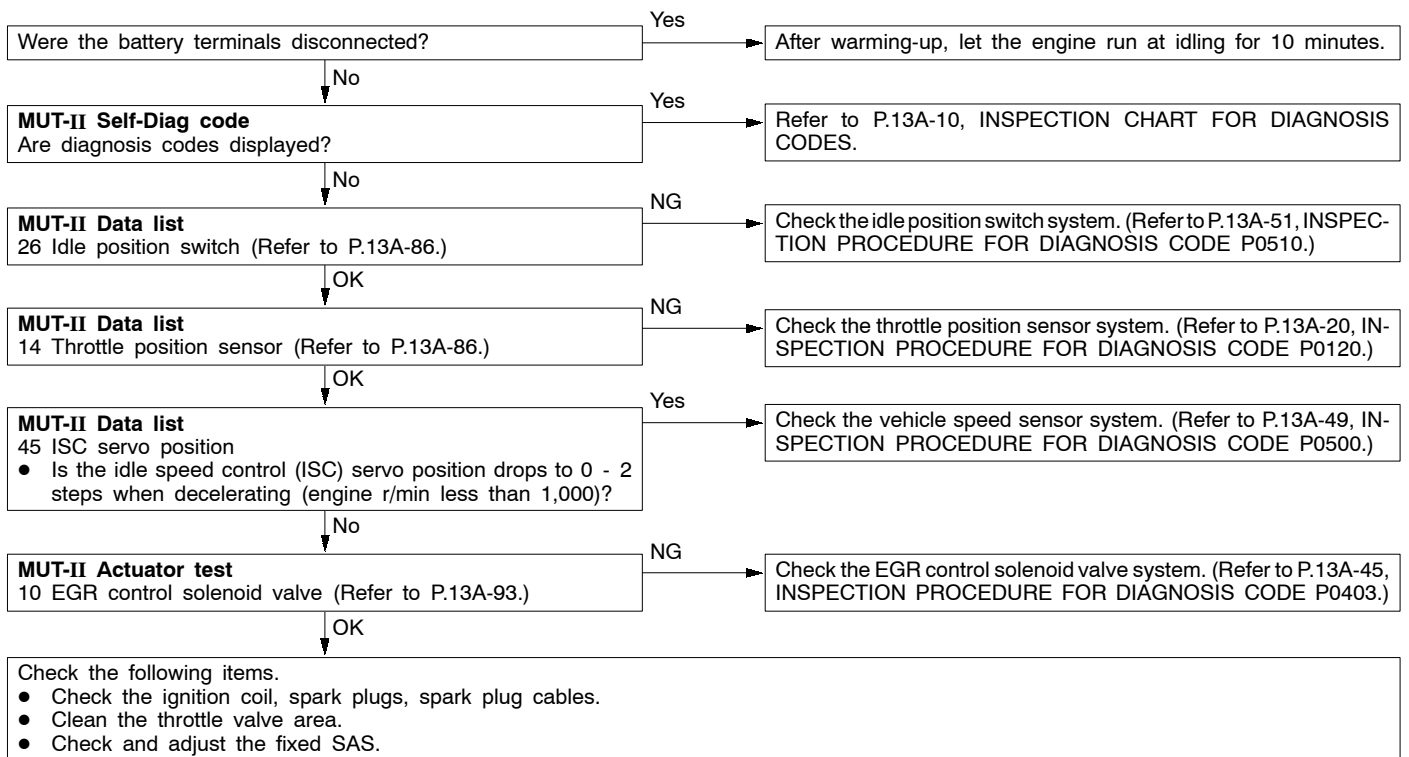
## INSPECTION PROCEDURE 13

The engine stalls when starting the car. (Pass out)	Probable cause
In cases such as the above, the cause is probably misfiring due to a weak spark, or an inappropriate air/fuel mixture when the accelerator pedal is depressed.	<ul style="list-style-type: none"> <li>• Drawing air into intake system</li> <li>• Malfunction of the ignition system</li> </ul>



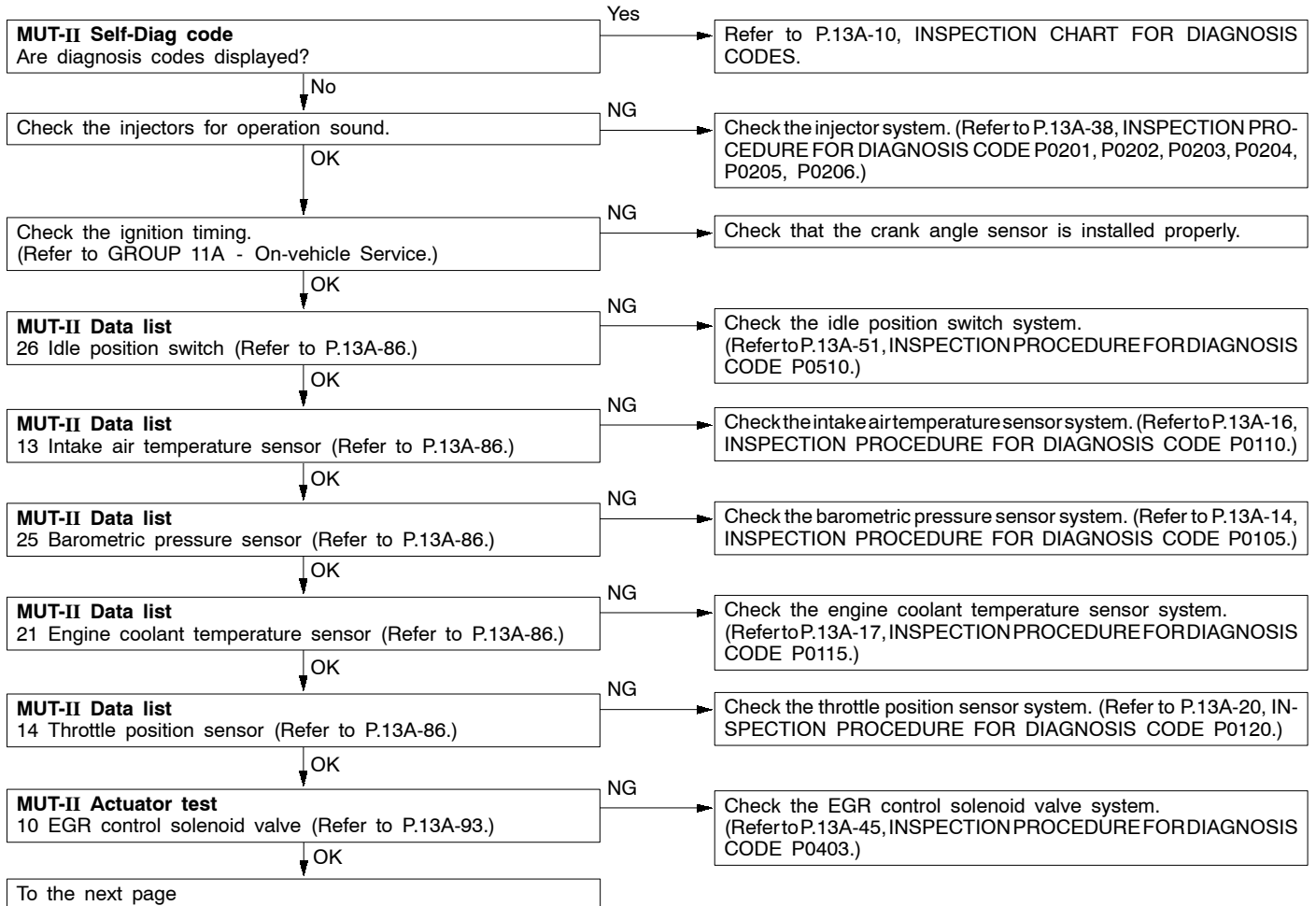
## INSPECTION PROCEDURE 14

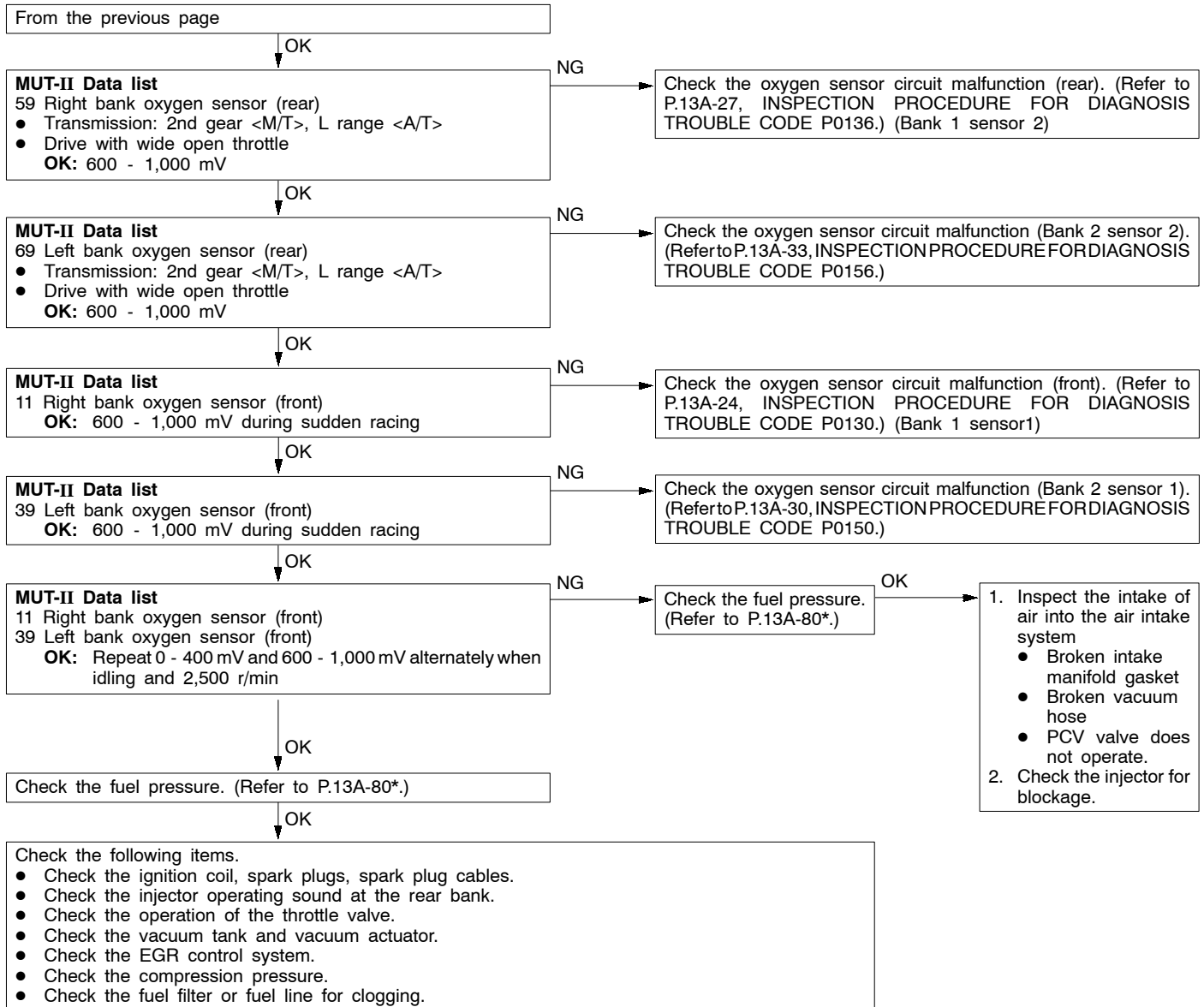
The engine stalls when decelerating.	Probable cause
In cases such as the above, the cause is probably that the intake air volume is insufficient due to a defective idle speed control (ISC) servo system.	<ul style="list-style-type: none"> <li>• Malfunction of the ISC system</li> </ul>



## INSPECTION PROCEDURE 15

Hesitation, sag or stumble	Probable cause
In cases such as the above, the cause is probably that ignition system, air/fuel mixture or compression pressure is defective.	<ul style="list-style-type: none"> <li>• Malfunction of the ignition system</li> <li>• Malfunction of air-fuel ratio control system</li> <li>• Malfunction of the fuel supply system</li> <li>• Malfunction of the EGR control solenoid valve system</li> <li>• Poor compression</li> </ul>



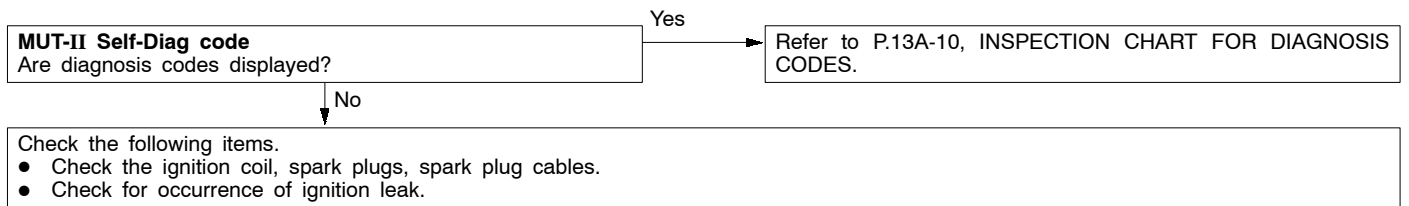


## NOTE:

\*: Refer to the '99 PAJERO SPORT Workshop Manual (Pub. No. PWJE9812)

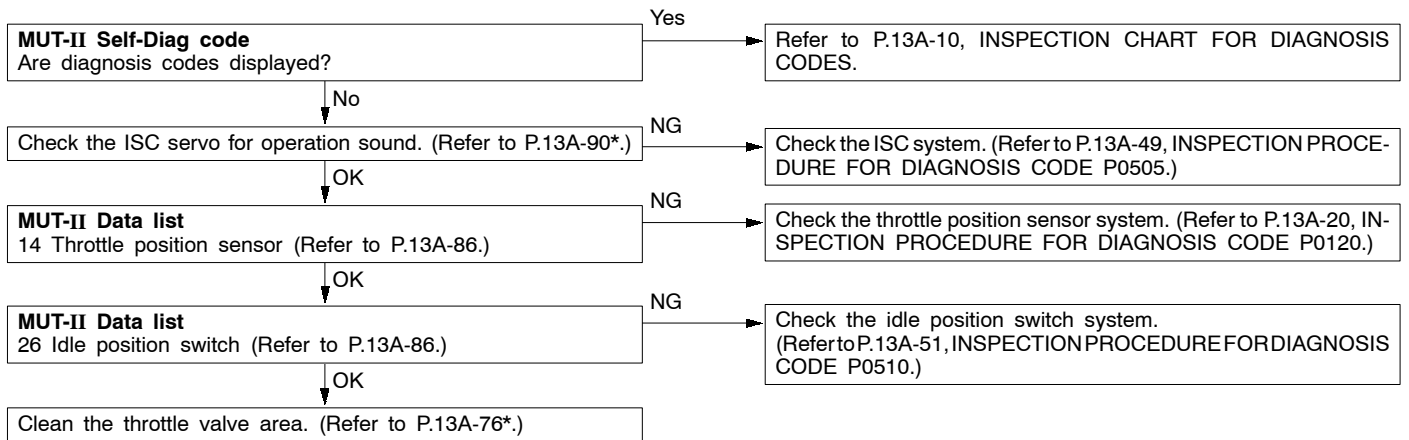
## INSPECTION PROCEDURE 16

The feeling of impact or vibration when accelerating	Probable cause
In cases such as the above, the cause is probably that there is an ignition leak accompanying the increase in the spark plug demand voltage during acceleration.	<ul style="list-style-type: none"> <li>Malfunction of the ignition system</li> </ul>



## INSPECTION PROCEDURE 17

The feeling of impact or vibration when decelerating.	Probable cause
Malfunction of the ISC system is suspected.	<ul style="list-style-type: none"> <li>Malfunction of the ISC system</li> </ul>

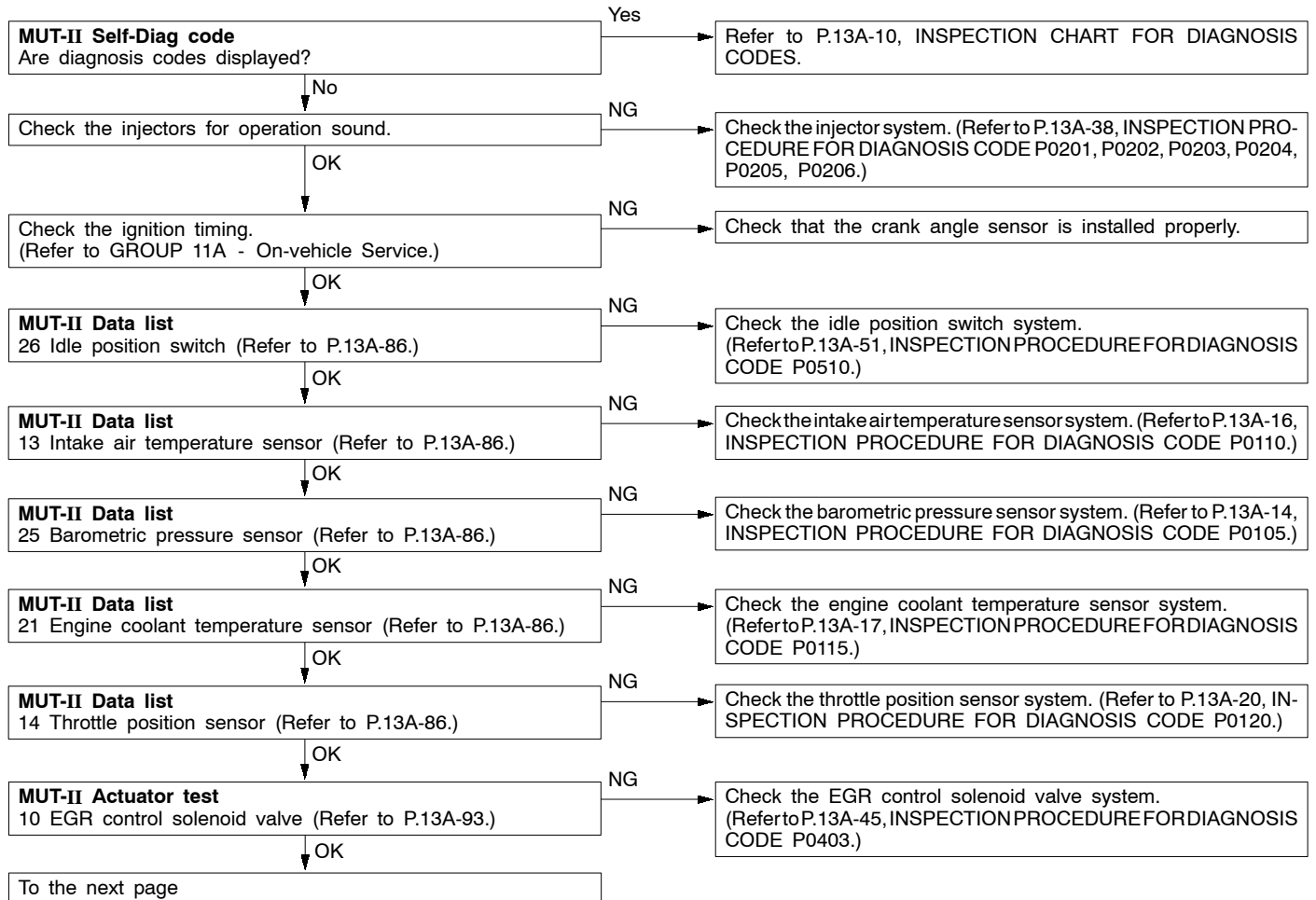


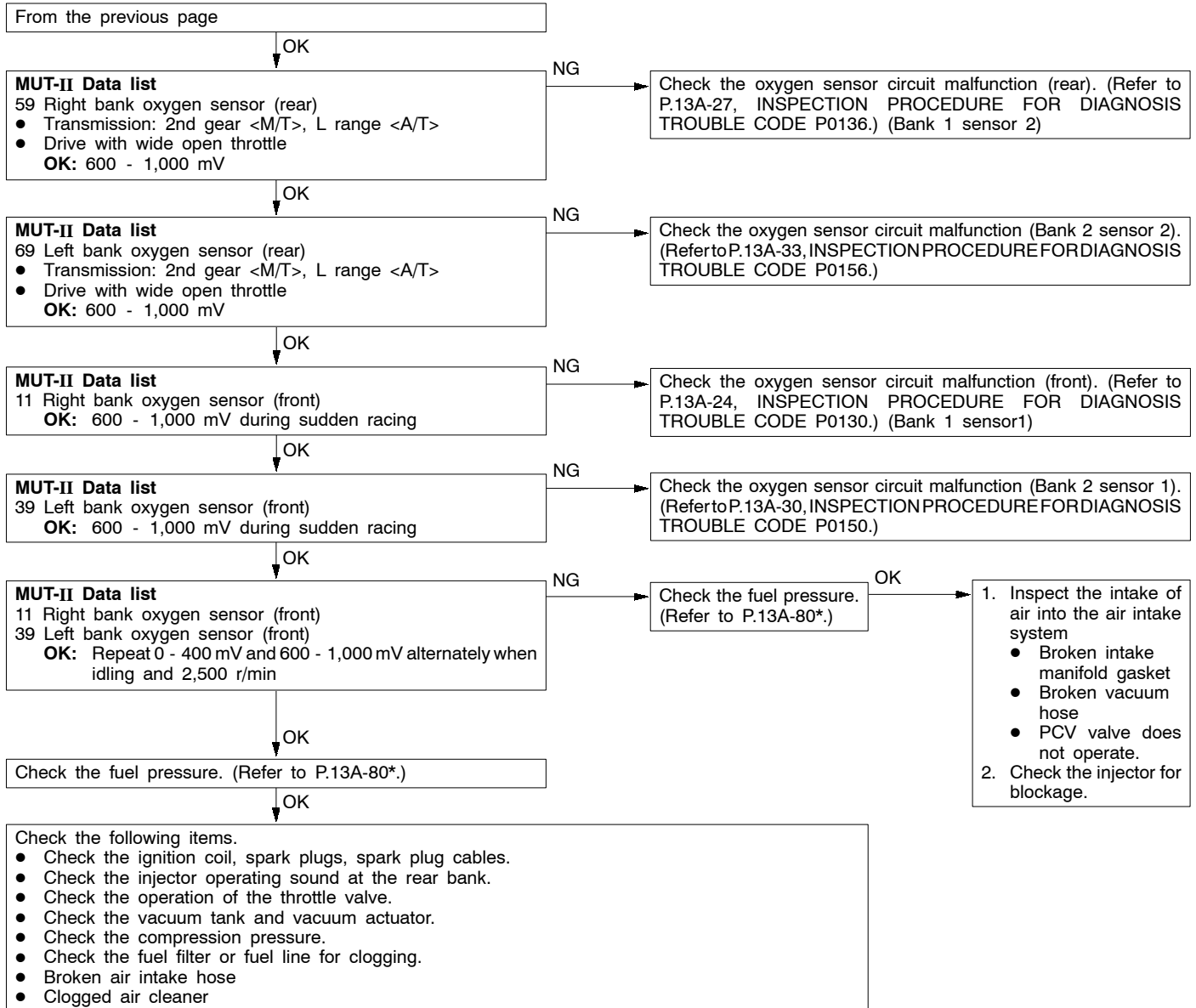
## NOTE:

\*: Refer to the '99 PAJERO SPORT Workshop Manual (Pub. No. PWJE9812)

## INSPECTION PROCEDURE 18

Poor acceleration	Probable cause
Defective ignition system, abnormal air-fuel ratio, poor compression pressure, etc. are suspected.	<ul style="list-style-type: none"> <li>• Malfunction of the ignition system</li> <li>• Malfunction of air-fuel ratio control system</li> <li>• Malfunction of the fuel supply system</li> <li>• Poor compression pressure</li> <li>• Clogged exhaust system</li> </ul>



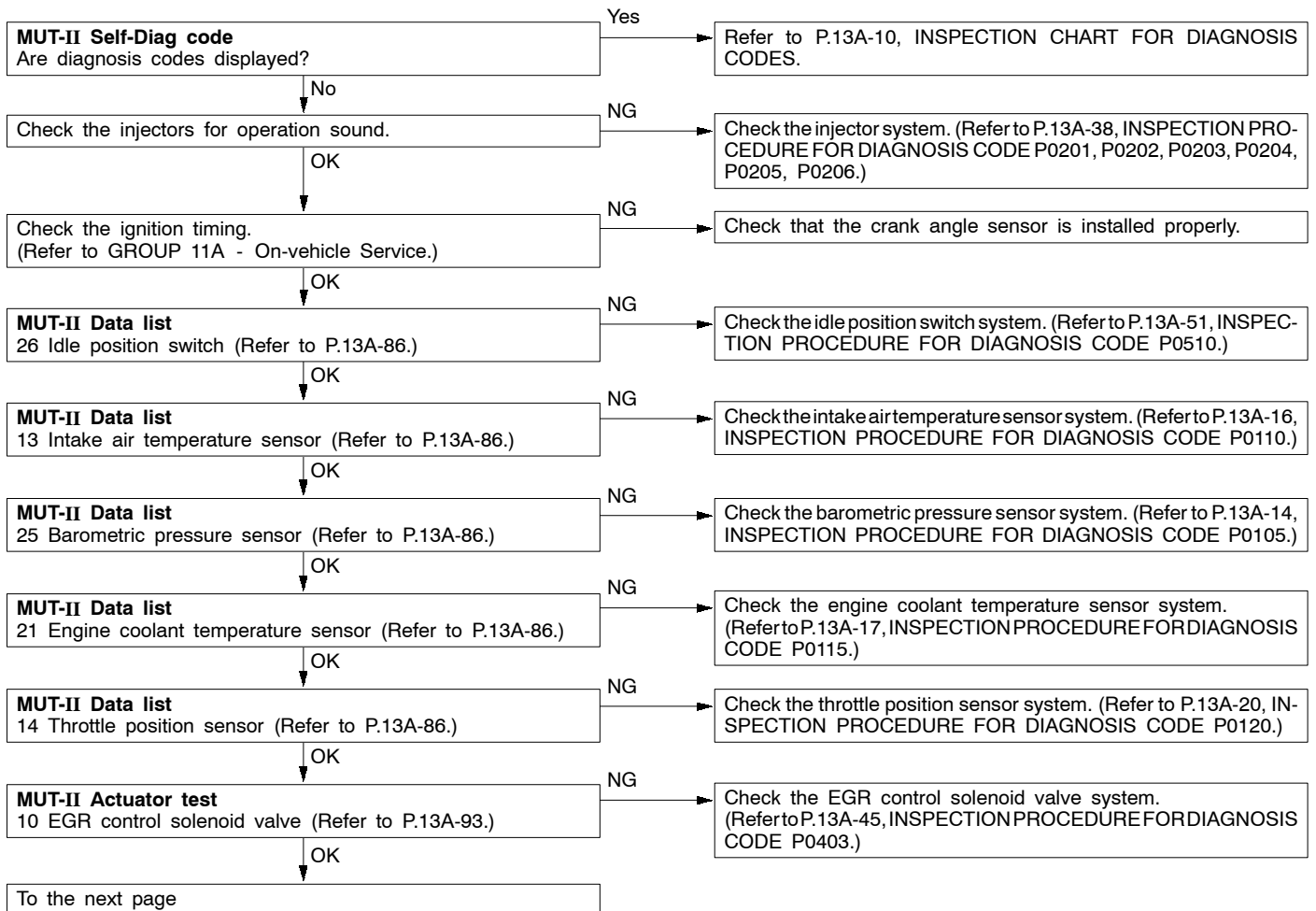


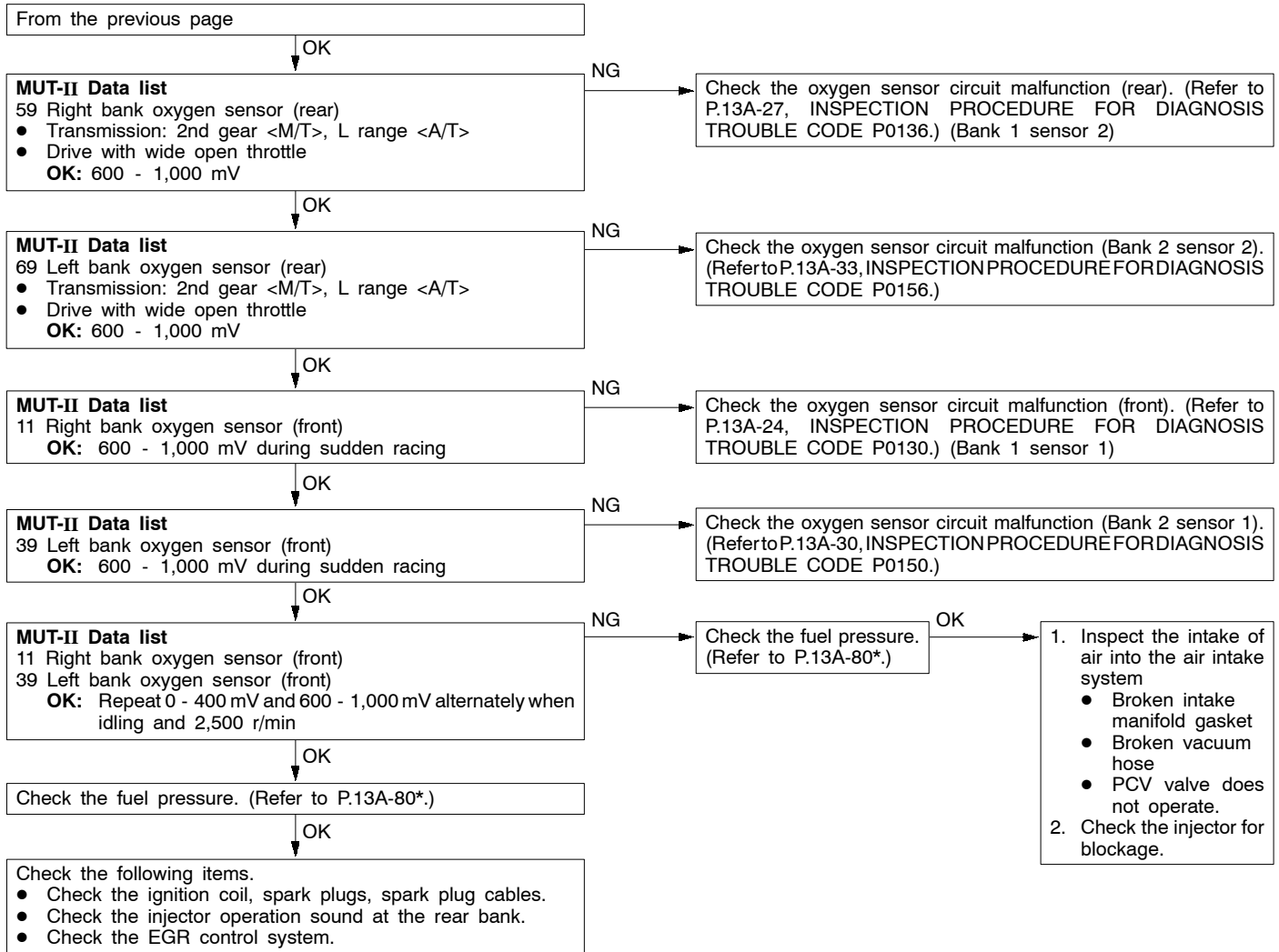
## NOTE:

\*: Refer to the '99 PAJERO SPORT Workshop Manual (Pub. No. PWJE9812)

## INSPECTION PROCEDURE 19

Surge	Probable cause
Defective ignition system, abnormal air-fuel ratio, etc. are suspected.	<ul style="list-style-type: none"> <li>• Malfunction of the ignition system</li> <li>• Malfunction of air-fuel ratio control system</li> <li>• Malfunction of the EGR control solenoid valve system</li> </ul>





## NOTE:

\*: Refer to the '99 PAJERO SPORT Workshop Manual (Pub. No. PWJE9812)



## INSPECTION PROCEDURE 20

Knocking	Probable cause
In cases as the above, the cause is probably that the heat value of the spark plug is inappropriate.	<ul style="list-style-type: none"> <li>Inappropriate heat value of the spark plug</li> </ul>

Check the following items.

- Spark plugs
- Check if foreign materials (water, alcohol, etc.) got into fuel.

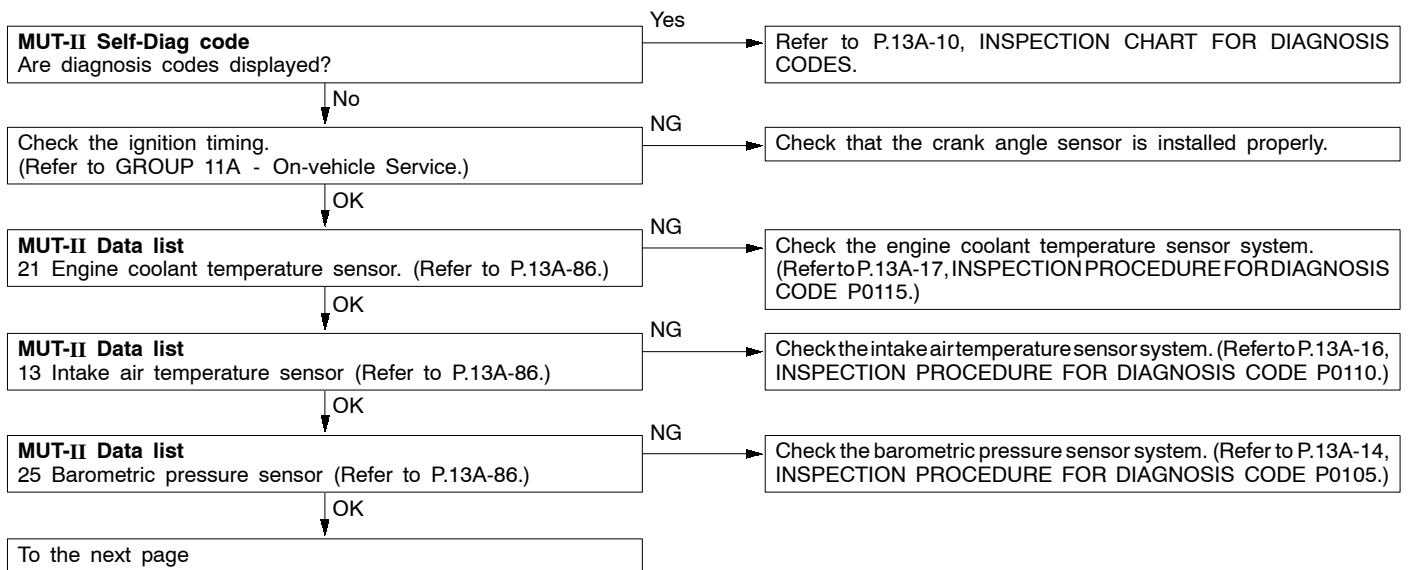
## INSPECTION PROCEDURE 21

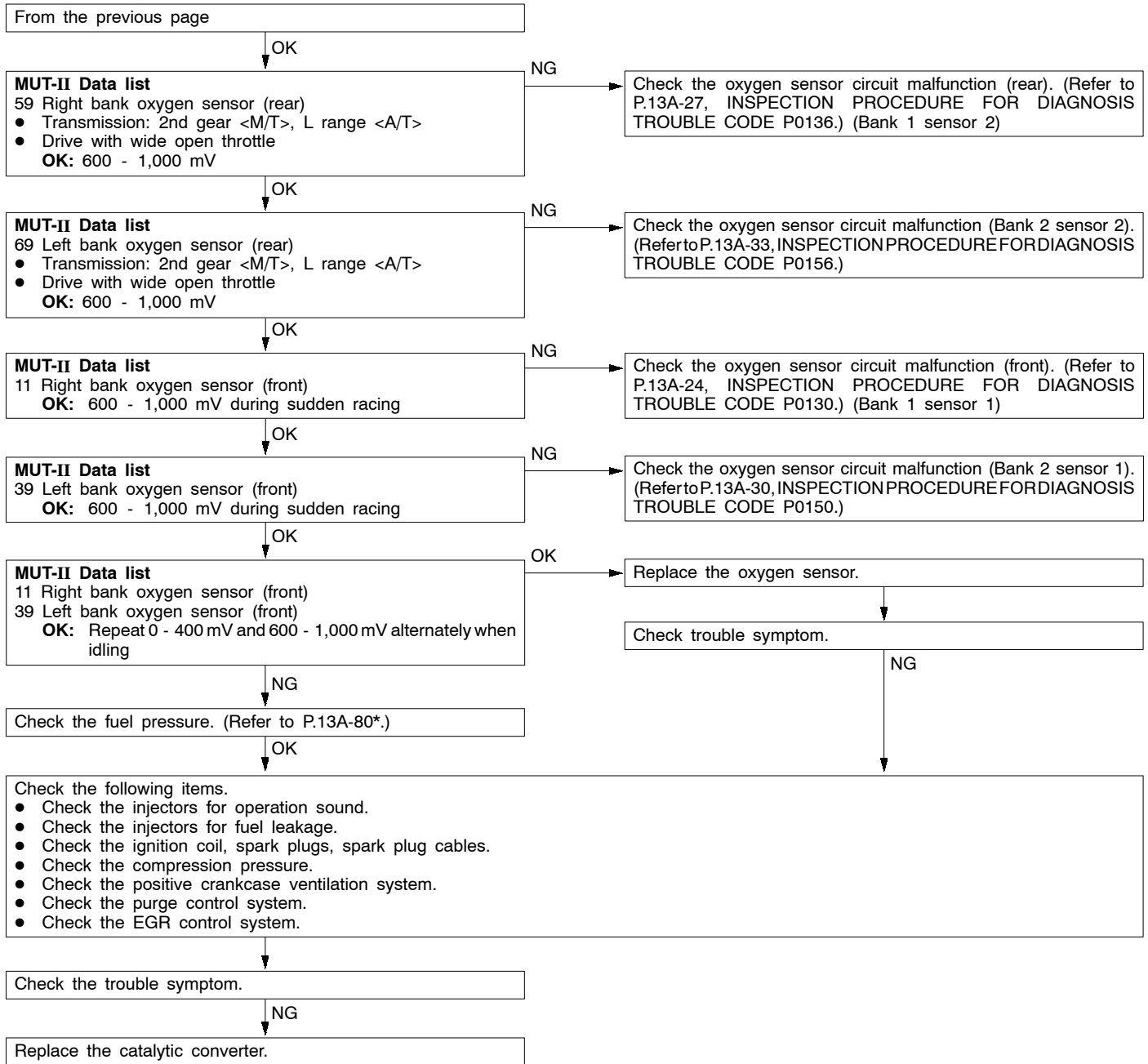
Dieseling	Probable cause
Fuel leakage from injectors is suspected.	<ul style="list-style-type: none"> <li>Fuel leakage from injectors</li> </ul>

Check the injectors for fuel leakage.

## INSPECTION PROCEDURE 22

Too high CO and HC concentration when idling	Probable cause
Abnormal air-fuel ratio is suspected.	<ul style="list-style-type: none"> <li>Malfunction of the air-fuel ratio control system</li> <li>Deteriorated catalyst</li> </ul>



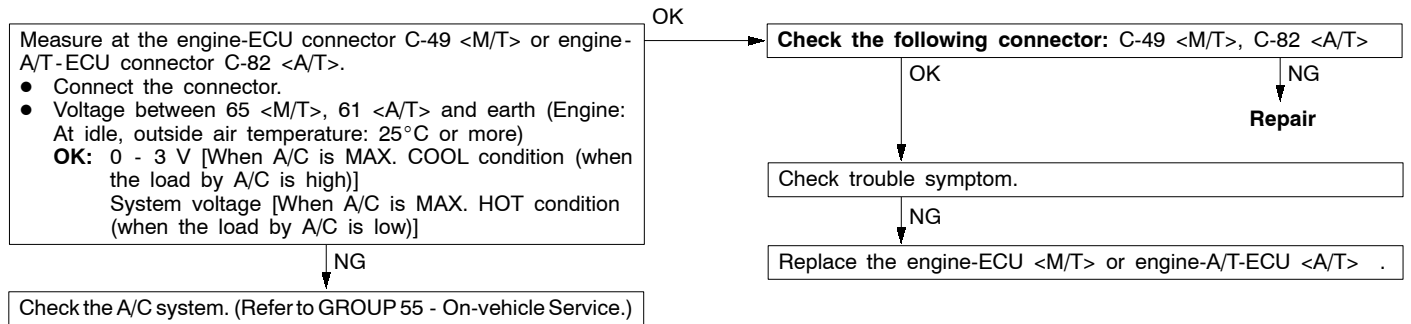


## NOTE:

\*: Refer to the '99 PAJERO SPORT Workshop Manual (Pub. No. PWJE9812)

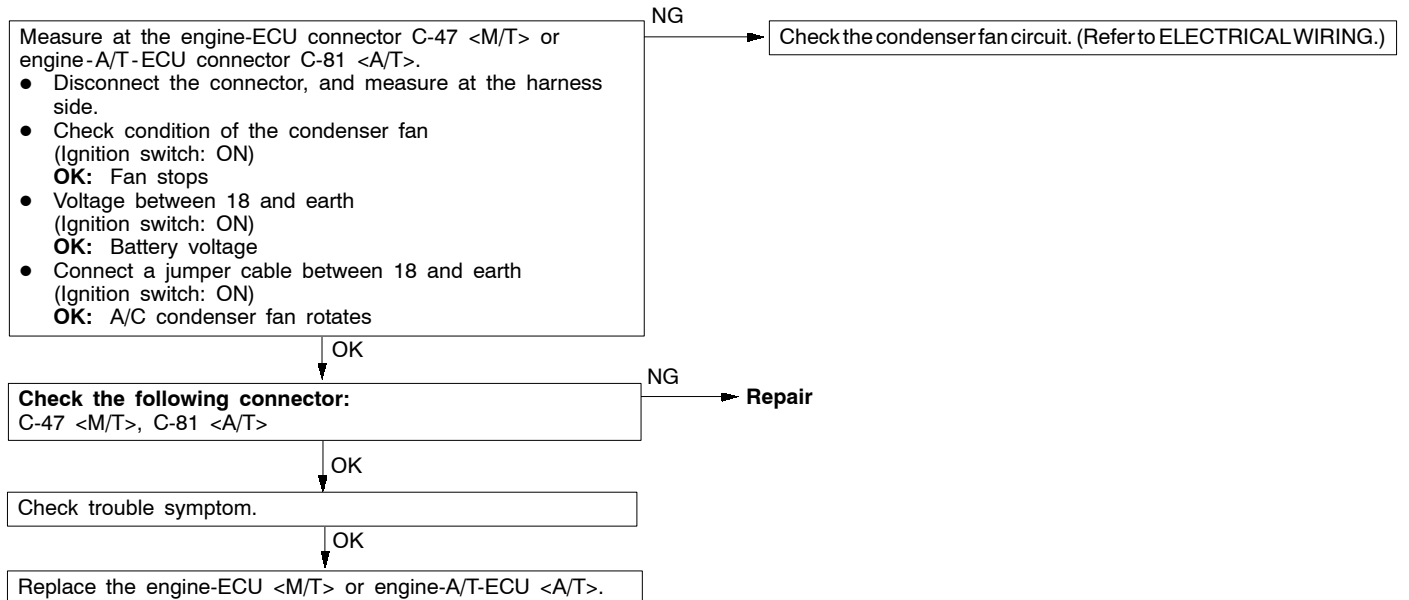
## INSPECTION PROCEDURE 23

Idling speed is improper when A/C is operating	Probable cause
<p>If the engine-ECU &lt;M/T&gt; or engine-A/T-ECU &lt;A/T&gt; 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 &lt;M/T&gt; or engine-A/T-ECU &lt;A/T&gt; .</p> <p>Based on this voltage signal, the engine-ECU &lt;M/T&gt; or engine-A/T-ECU &lt;A/T&gt; 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 &lt;M/T&gt; or engine-A/T-ECU &lt;A/T&gt;</li> </ul>



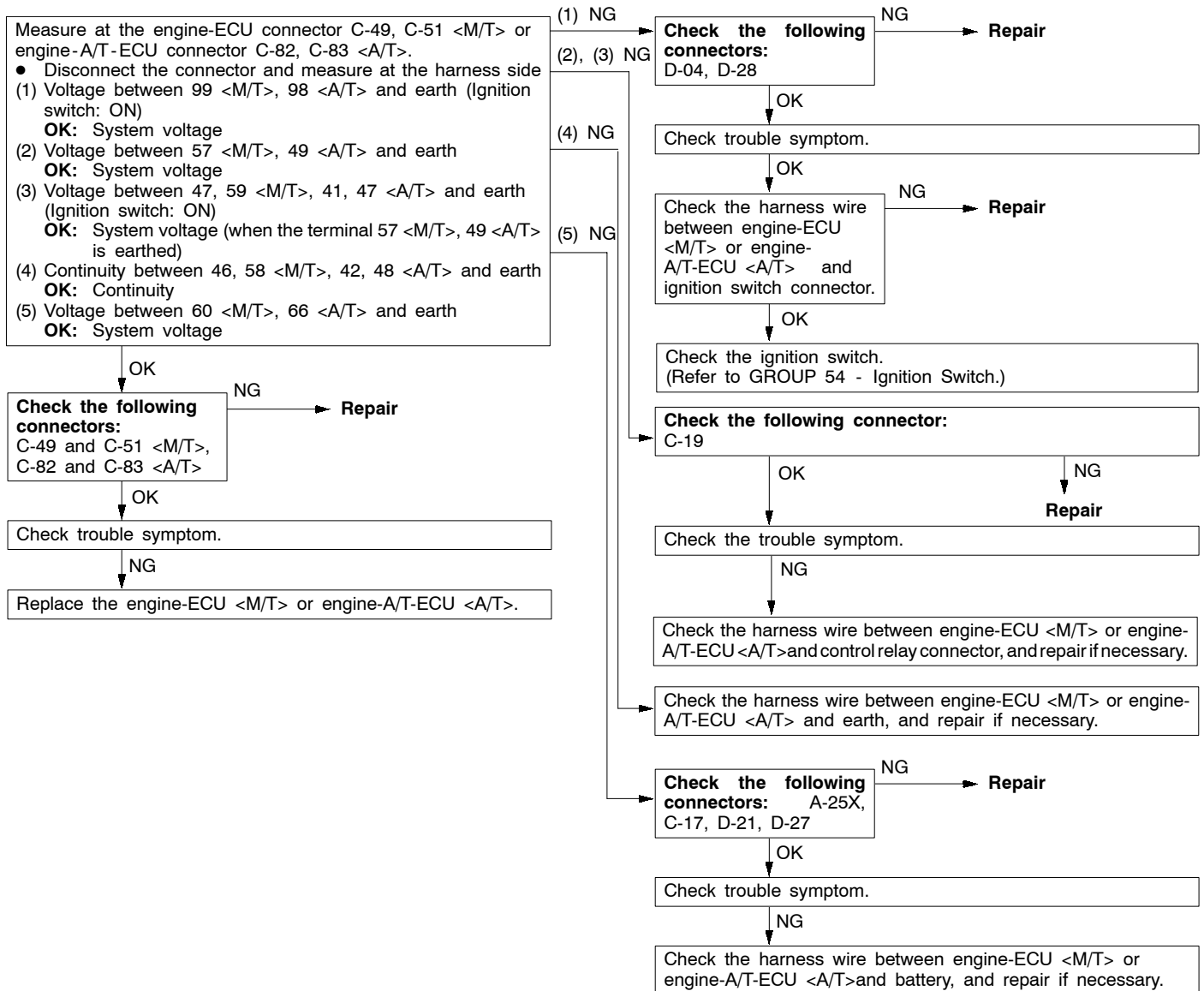
## INSPECTION PROCEDURE 24

A/C condenser fan is inoperative	Probable cause
<p>The fan motor relay is controlled by turning on and off the power transistor in the engine-ECU &lt;M/T&gt; or engine-A/T-ECU &lt;A/T&gt;.</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 fan controller</li> <li>● Improper connector contact, open circuit or short-circuited harness wire</li> <li>● Malfunction of the engine-ECU &lt;M/T&gt;</li> <li>● Malfunction of the engine-A/T-ECU &lt;A/T&gt;</li> </ul>



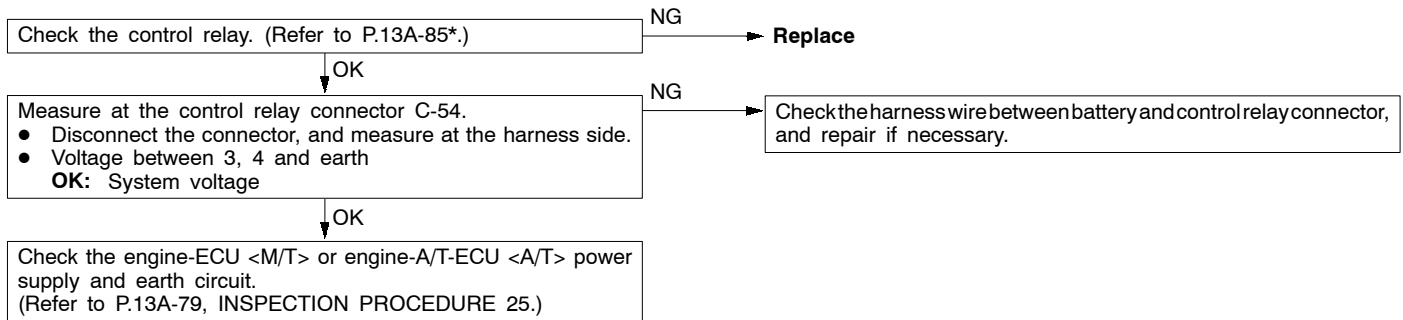
## INSPECTION PROCEDURE 25

engine-ECU <M/T> or engine-A/T-ECU <A/T> power supply and earth circuit system	Probable cause
<p>The engine-ECU &lt;M/T&gt; or engine-A/T-ECU &lt;A/T&gt; may be defective, or that one of the malfunctions listed at right has occurred.</p>	<ul style="list-style-type: none"> <li>Improper connector contact, open circuit or short-circuited harness wire in the engine-ECU &lt;M/T&gt; or engine-A/T-ECU &lt;A/T&gt; power supply circuit.</li> <li>Open circuit or short-circuited harness wire in the engine-ECU &lt;M/T&gt; or engine-A/T-ECU &lt;A/T&gt; earth circuit</li> <li>Malfunction of the engine-ECU &lt;M/T&gt; or engine-A/T-ECU &lt;A/T&gt;</li> </ul>



## INSPECTION PROCEDURE 26

Power supply system and ignition switch-IG system	Probable cause
When an ignition switch ON signal is input to the engine-ECU <M/T> or engine-A/T-ECU <A/T>, the engine-ECU <M/T> or engine-A/T-ECU <A/T> turns the control relay ON. This causes battery voltage to be supplied to the engine-ECU <M/T> or engine-A/T-ECU <A/T>, injectors and air flow sensor.	<ul style="list-style-type: none"> <li>● Malfunction of the ignition switch</li> <li>● Malfunction of the control relay</li> <li>● Improper connector contact, open circuit or short-circuited harness wire</li> <li>● Disconnected engine-ECU &lt;M/T&gt; or engine-A/T-ECU &lt;A/T&gt; earth wire</li> <li>● Malfunction of the engine-ECU &lt;M/T&gt; or engine-A/T-ECU &lt;A/T&gt;</li> </ul>

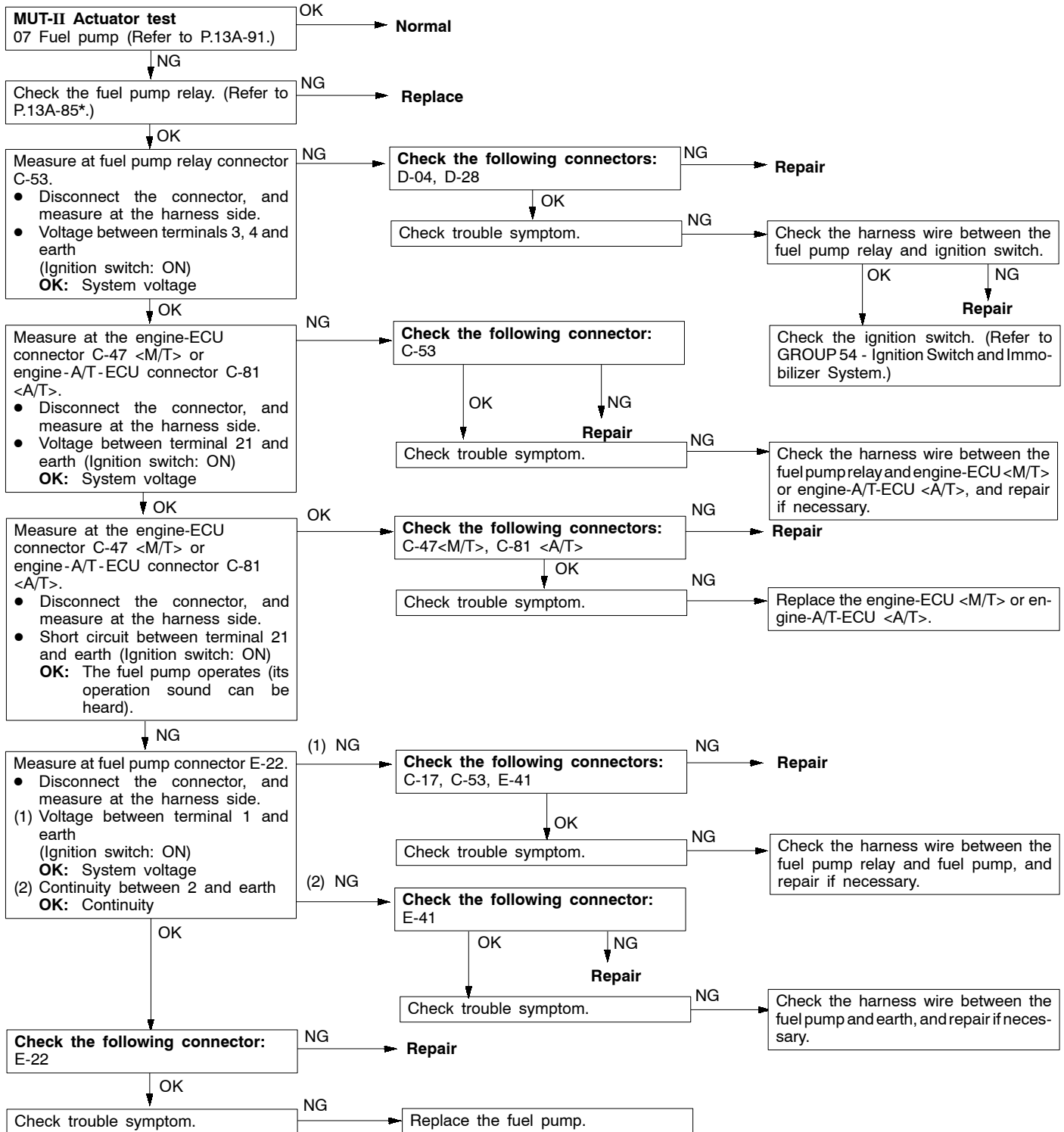


## NOTE:

\*: Refer to the '99 PAJERO SPORT Workshop Manual (Pub. No. PWJE9812)

## INSPECTION PROCEDURE 27

Fuel pump system	Probable cause
The engine-ECU <M/T> or engine-A/T-ECU <A/T> turns the control relay ON when the engine is cranking or running, and this supplies power to drive the fuel pump.	<ul style="list-style-type: none"> <li>• Malfunction of the fuel pump relay</li> <li>• Malfunction of the fuel pump</li> <li>• Improper connector contact, open circuit or short-circuited harness wire</li> <li>• Malfunction of the engine-ECU &lt;M/T&gt;</li> <li>• Malfunction of the engine-A/T-ECU &lt;A/T&gt;</li> </ul>



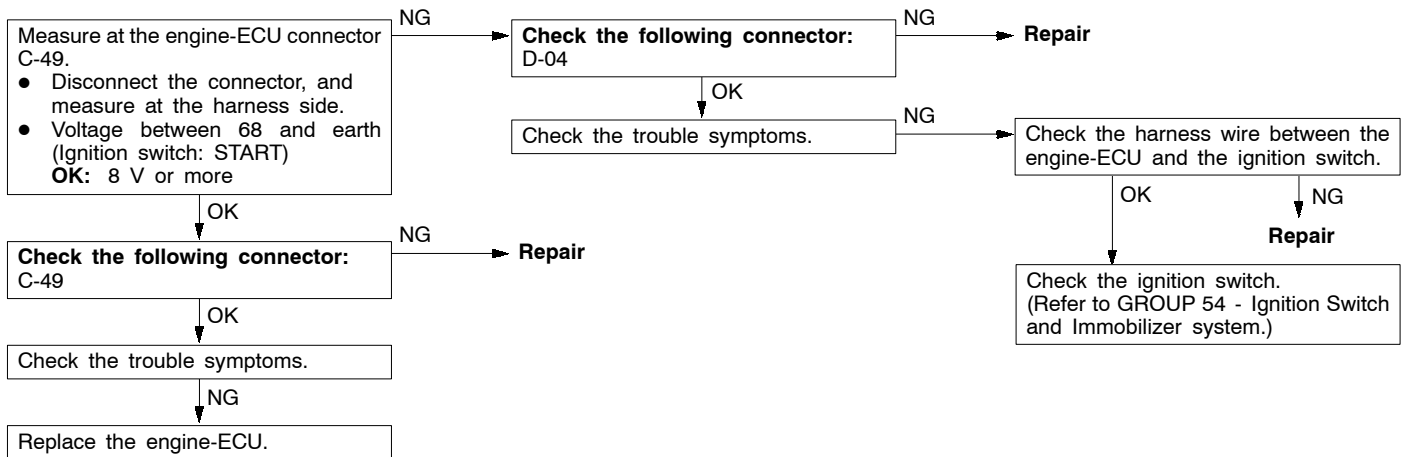
## NOTE:

\*: Refer to the '99 PAJERO SPORT Workshop Manual (Pub. No. PWJE9812)

## INSPECTION PROCEDURE 28

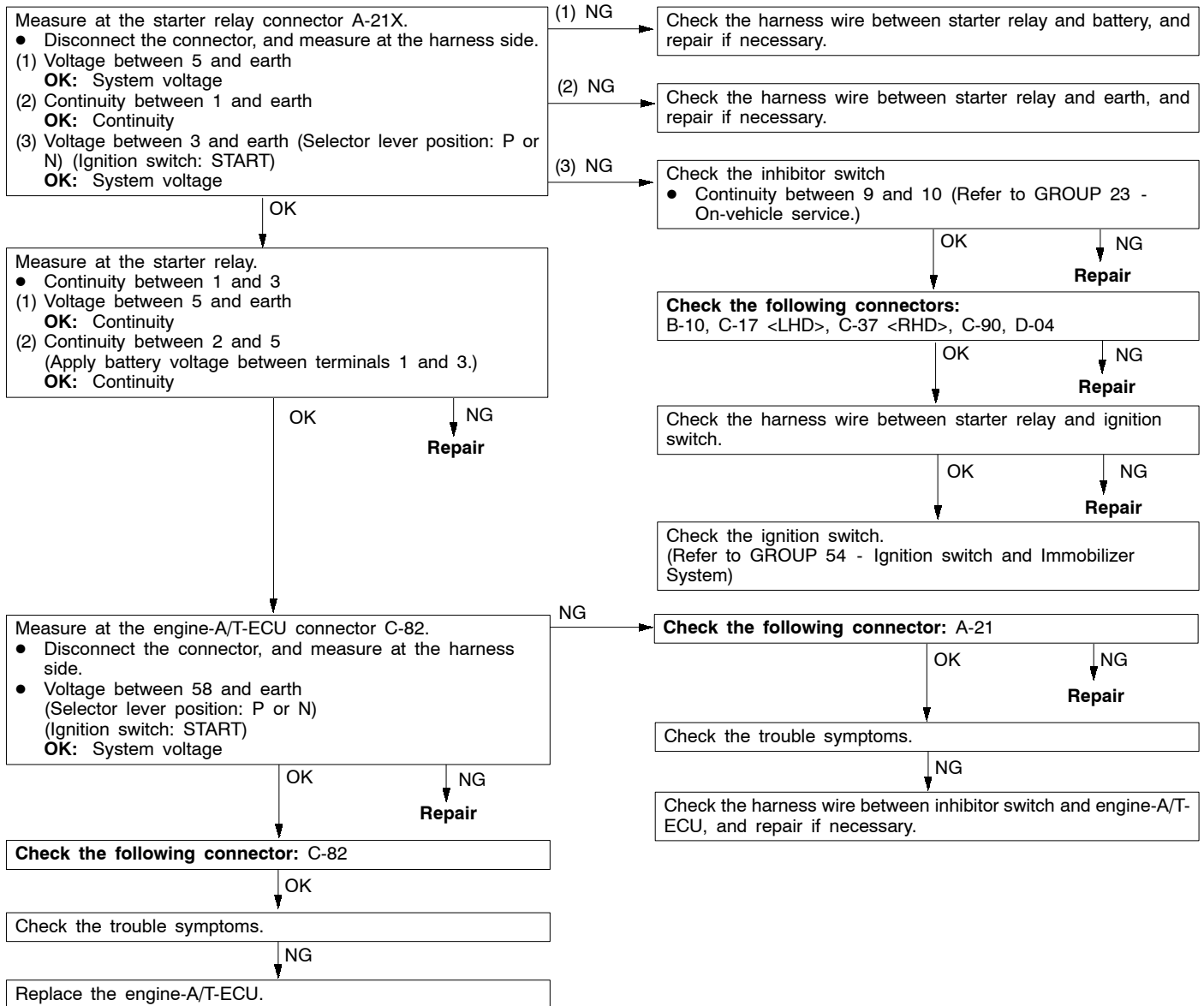
Ignition switch-ST system	Probable cause
<p>The ignition switch-ST outputs a HIGH signal to the engine-ECU &lt;M/T&gt; or engine-A/T-ECU &lt;A/T&gt; while the engine is cranking.</p> <p>The engine-ECU &lt;M/T&gt; or engine-A/T-ECU &lt;A/T&gt; uses this signal to carry out functions such as fuel injection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

## &lt;M/T&gt;



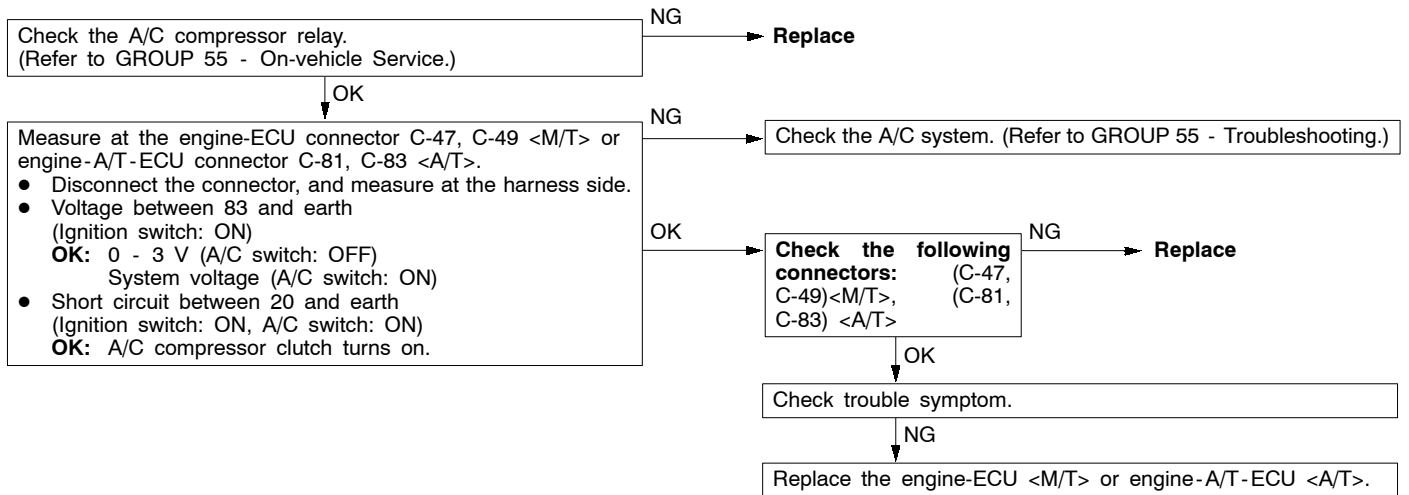


## &lt;A/T&gt;



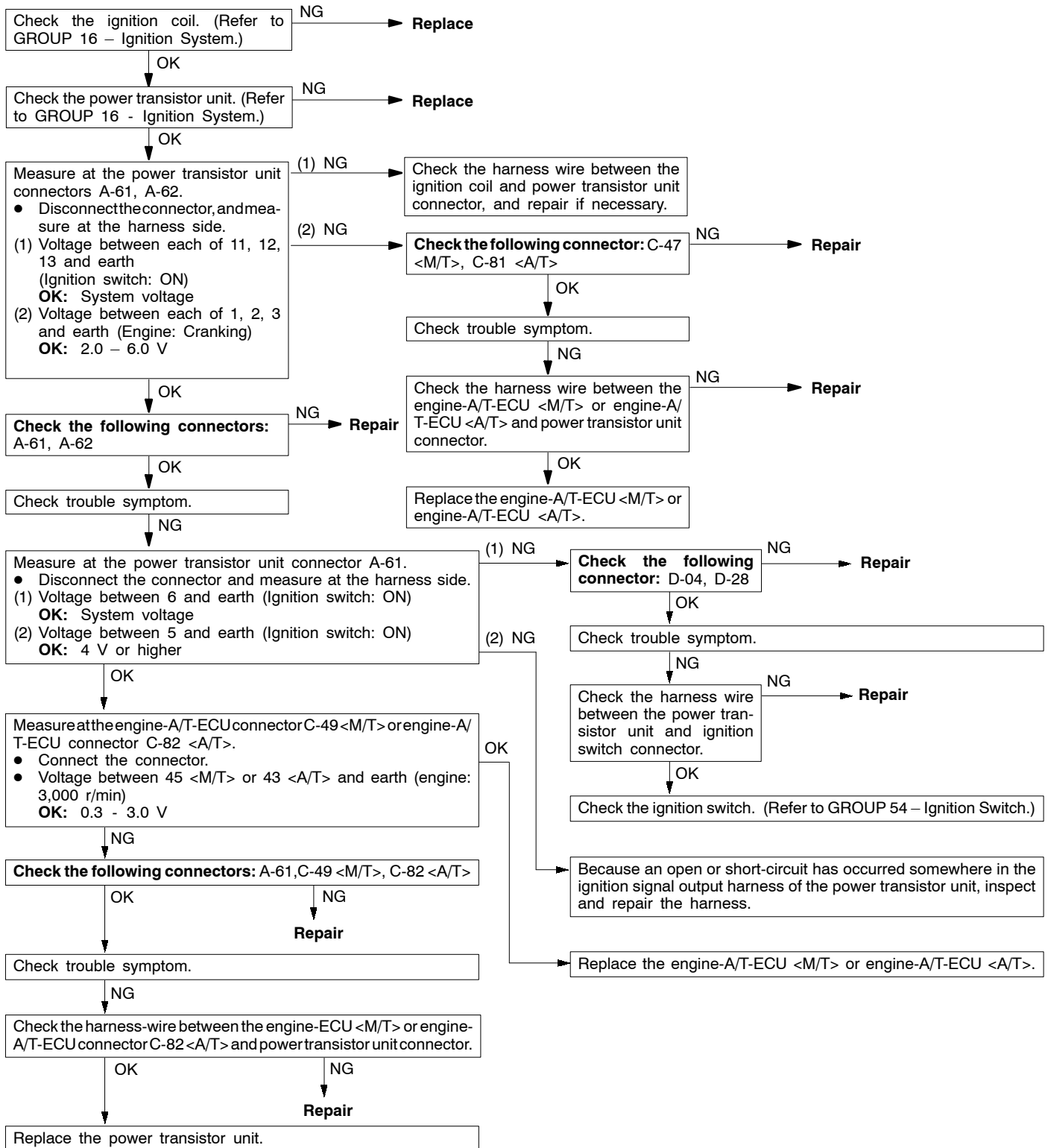
## INSPECTION PROCEDURE 29

A/C switch and A/C relay system	Probable cause
When an A/C ON signal is input to the engine-ECU <M/T> or engine-A/T-ECU <A/T>, the engine-ECU <M/T> or engine-A/T-ECU <A/T> carries out control of the idle speed control (ISC) servo, and also operates the A/C compressor magnetic clutch.	<ul style="list-style-type: none"> <li>● Malfunction of A/C control system</li> <li>● Malfunction of A/C switch</li> <li>● Improper connector contact, open circuit or short-circuited harness wire</li> <li>● Malfunction of the engine-ECU &lt;M/T&gt;</li> <li>● Malfunction of the engine-A/T-ECU &lt;A/T&gt;</li> </ul>



## INSPECTION PROCEDURE 30

Ignition circuit system	Probable cause
<ul style="list-style-type: none"> <li>● The battery positive voltage is applied on the ignition coil by the ignition switch -IG.</li> <li>● When the engine-ECU &lt;M/T&gt; or engine-A/T-ECU &lt;A/T&gt; turns the power transistor in the engine-ECU &lt;M/T&gt; or engine-A/T-ECU &lt;A/T&gt; "OFF," battery positive voltage is applied on the ignition power transistor (terminals 1, 2 and 3), and the ignition power transistor turns "on."</li> <li>● When the ignition power transistor turns on, the ignition coil's primary circuit is grounded by the ignition power transistor terminal 2. Then the primary current flows to the ignition coil.</li> </ul>	<ul style="list-style-type: none"> <li>● Malfunction of ignition switch</li> <li>● Malfunction of ignition power transistor</li> <li>● Improper connector contact, open circuit or short-circuited harness wire</li> <li>● Malfunction of the engine-ECU &lt;M/T&gt;</li> <li>● Malfunction of the engine-A/T-ECU &lt;A/T&gt;</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. In a new vehicle [driven approximately 500 km or less], the air flow sensor output frequency is sometimes 10 % higher than the standard frequency.
- \*2. The idle position switch normally turns off when the voltage of the throttle position sensor is 50 - 100 mV higher than the voltage at the idle position. If the throttle position switch turns back on after the throttle position sensor voltage has risen by 100 mV and the throttle valve has opened, the idle position switch and the throttle position sensor need to be adjusted.
- \*3. The injector drive time represents the time when the cranking speed is at 250 r/min or below when the power supply voltage is 11 V.
- \*4. In a new vehicle [driven approximately 500 km or less], the injector drive time is sometimes 10 % longer than the standard time.
- \*5. In a new vehicle [driven approximately 500 km or less], the step of the stepper motor is sometimes 30 steps greater than the standard value.

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
11	Right bank oxygen sensor (front)	Engine: After having warmed up Air/fuel mixture is made leaner when decelerating, and is made richer when racing.	When at 4,000 r/min, engine is suddenly decelerated	200 mV or less	Code No. P0130	13A-24
			When engine is suddenly raced	600 - 1,000 mV		
		Engine: After having warmed up The oxygen sensor signal is used to check the air/fuel mixture ratio, and control condition is also checked by the ECU.	Engine is idling	400 mV or less (Changes) 600 - 1,000 mV		
			2,500 r/min			
12	Air flow sensor*1	<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	25 - 61 Hz (3.7 - 7.6 g/s)	Code No. P0100	13A-12
			2,500 r/min	74 - 114 Hz (11.9 - 17.9 g/s)		
			Engine is raced	Frequency increases in response to racing		

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
13	Intake air temperature sensor	Ignition switch: ON or with engine running	When intake air temperature is -20°C	-20°C	Code No. P0110	13A-16
			When intake air temperature is 0°C	0°C		
			When intake air temperature is 20°C	20°C		
			When intake air temperature is 40°C	40°C		
			When intake air temperature is 80°C	80°C		
14	Throttle position sensor	Ignition switch: ON	Set to idle position	300 - 1,000 mV	Code No. P0120	13A-20
			Gradually open	Increases in proportion to throttle opening angle		
			Open fully	4,500 - 5,500 mV		
16	Power supply voltage	Ignition switch: ON		System voltage	Procedure No. 25	13A-79
18	Cranking signal (ignition switch-ST)	Ignition switch: ON	Engine: Stopped	OFF	Procedure No. 28	13A-82
			Engine: Cranking	ON		
21	Engine coolant temperature sensor	Ignition switch: ON or with engine running	When engine coolant temperature is -20°C	-20°C	Code No. P0115	13A-17
			When engine coolant temperature is 0°C	0°C		
			When engine coolant temperature is 20°C	20°C		
			When engine coolant temperature is 40°C	40°C		
			When engine coolant temperature is 80°C	80°C		

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
22	Crank angle sensor	<ul style="list-style-type: none"> <li>Engine: Cranking</li> <li>Tachometer: Connected</li> </ul>	Compare the engine speed readings on the tachometer and the MUT-II.	Accord	Code No. P0335	13A-41
		<ul style="list-style-type: none"> <li>Engine: Idling</li> <li>Idle position switch: ON</li> </ul>	When engine coolant temperature is -20°C	1,275 - 1,475 rpm		
			When engine coolant temperature is 0°C	1,225 - 1,425 rpm		
			When engine coolant temperature is 20°C	1,100 - 1,300 rpm		
			When engine coolant temperature is 40°C	950 - 1,150 rpm		
			When engine coolant temperature is 80°C	600 - 800 rpm		
24	Vehicle speed sensor	Drive at 40 km/h		Approximately 40 km/h	Code No. P0500	13A-49
25	Barometric pressure sensor	Ignition switch: ON	At altitude of 0 m	101 kPa	Code No. P0105	13A-14
			At altitude of 600 m	95 kPa		
			At altitude of 1,200 m	88 kPa		
			At altitude of 1,800 m	81 kPa		
26	Idle position switch	Ignition switch: ON Check by operating accelerator pedal repeatedly	Throttle valve: Set to idle position	ON	Code No. P0510	13A-51
			Throttle valve: Slightly open	OFF*2		
27	Power steering fluid pressure switch	Engine: Idling	Steering wheel stationary	OFF	Code No. P0551	13A-52
			Steering wheel turning	ON		
28	A/C switch	Engine: Idling (when A/C switch is ON, A/C compressor should be operating.)	A/C switch: OFF	OFF	Procedure No. 29	13A-84
			A/C switch: ON	ON		
29	Inhibitor switch <A/T>	Ignition switch: ON	P or N	P or N	Procedure No. 28	13A-82
			D, 2, L or R	D, 2, L or R		

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
34	Air flow sensor reset signal	Engine: After having warmed up	Engine is idling	ON	Code No. P0100	13A-12
			2,000 r/min	OFF		
37	Volumetric efficiency	<ul style="list-style-type: none"> <li>Engine coolant temperature: 80 - 95°C</li> <li>Lights, power cooling fan and all accessories: OFF</li> <li>Transmission: Neutral (A/T: P range)</li> </ul>	Engine is idling	15 - 35 %	-	-
			2,000 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.	Code No. P0335	13A-42
39	Left bank oxygen sensor (front)	Engine: After having warmed up Air/fuel mixture is made leaner when decelerating, and is made richer when racing.	When at 4,000 r/min, engine is suddenly decelerated	200 mV or less	Code No. P0150	13A-30
			When engine is suddenly raced	600 - 1,000 mV		
		Engine: After having warmed up The oxygen sensor signal is used to check the air/fuel mixture ratio, and control condition is also checked by the ECU.	Engine is idling	400 mV or less (Changes) 600 - 1,000 mV		
			2,500 r/min			

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
41	Injectors* <sup>3</sup> (bank 2)	Engine: Cranking	When engine coolant temperature is 0°C (injection is carried out for all cylinders simultaneously)	13.8 - 20.6 ms	-	-
			When engine coolant temperature is 20°C	34 - 51 ms		
			When engine coolant temperature is 80°C	8.8 - 13.2 ms		
	Injectors* <sup>4</sup> (bank 2)	<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	2.6 - 3.8 ms		
			2,500 r/min	2.3 - 3.5 ms		
			When engine is suddenly raced	Increases		
44	Ignition coils and power transistors	<ul style="list-style-type: none"> <li>Engine: After having warmed up</li> <li>Timing lamp is set. (The timing lamp is set in order to check actual ignition timing.)</li> </ul>	Engine is idling	7 - 23° BTDC	-	-
			2,500 r/min	27 - 47° BTDC		
45	ISC (stepper) motor position* <sup>5</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> <li>Idle position switch: ON</li> <li>Engine: Idling</li> <li>When A/C switch is ON, A/C compressor should be operating</li> </ul>	A/C switch: OFF	2 - 25 STEP	-	-
			A/C switch: OFF → ON	Increases by 10 - 70 steps		
			<ul style="list-style-type: none"> <li>A/C switch: OFF</li> <li>Select lever: N range → D range</li> </ul>	Increases by 5 - 50 steps		



Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
47	Injectors* <sup>3</sup> (bank 1)	Engine: Cranking	When engine coolant temperature is 0°C (injection is carried out for all cylinders simultaneously)	13.8 - 20.6 ms	-	-
			When engine coolant temperature is 20°C	34 - 51 ms		
			When engine coolant temperature is 80°C	8.8 - 13.2 ms		
	Injectors* <sup>4</sup> (bank 2)	<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	2.6 - 3.8 ms		
			2,500 r/min	2.3 - 3.5 ms		
			When engine is suddenly raced	Increases		
49	A/C relay	Engine: After having warmed up/Engine is idling	A/C switch: OFF	OFF (Compressor clutch is not operating)	Procedure No. 29	13A-84
			A/C switch: ON	ON (Compressor clutch is operating)		
59	Right bank oxygen sensor (rear)	<ul style="list-style-type: none"> <li>Transmission: 2nd gear &lt;M/T&gt;, L range &lt;A/T&gt;</li> <li>Drive with throttle widely open</li> </ul>	3,500 r/min	600 - 1,000 mV	Code No. P0136	13A-27
69	Left bank oxygen sensor (rear)	<ul style="list-style-type: none"> <li>Transmission: 2nd gear &lt;M/T&gt;, L range &lt;A/T&gt;</li> <li>Drive with throttle widely open</li> </ul>	3,500 r/min	600 - 1,000 mV	Code No. P0156	13A-33
81	Long-term fuel compensation (bank 1)	Engine: Warm, 2,500 r/min without any load (during closed loop)		-12.5 - 12.5 %	Code No. P0170	13A-36
82	Short-term fuel compensation (bank 1)	Engine: Warm, 2,500 r/min without any load (during closed loop)		-30 - 25 %	Code No. P0170	13A-36
83	Long-term fuel compensation (bank 2)	Engine: Warm, 2,500 r/min without any load (during closed loop)		-12.5 - 12.5 %	Code No. P0173	13A-37

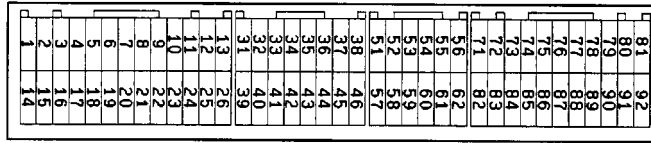
Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
84	Short-term fuel compensation (bank 2)	Engine: Warm, 2,500 r/min without any load (during closed loop)		-30 - 25 %	Code No. P0173	13A-37
87	Calculation load value	Engine: Warm	Engine: Idling	15 - 35 %	-	-
			2,500 r/min	15 - 35 %		
88	Fuel control condition (bank 1)	Engine: Warm	2,500 r/min	Closed loop	Code No. P0125	13A-21
			When engine is suddenly raced	Open loop - drive condition		
89	Fuel control condition (bank 2)	Engine: Warm	2,500 r/min	Closed loop	Code No. P0125	13A-21
			When engine is suddenly raced	Open loop - drive condition		
A1	Oxygen sensor (Bank 1, sensor 1)	Engine: After warm-up	Idling	0 V	Code No. P0130	13A-24
			Sudden racing	0.6 - 1.0 V		
			2,500 r/min	0.4 V or less and 0.6 - 1.0 V alternates		
A2	Oxygen sensor (Bank 1, sensor 2)	<ul style="list-style-type: none"> <li>Transmission: 2nd gear &lt;M/T&gt;, L range &lt;A/T&gt;</li> <li>Drive with throttle widely open</li> </ul>	3,500 r/min	0.6 - 1.0 V	Code No. P0136	13A-27
A3	Oxygen sensor (Bank 2, sensor 1)	Engine: After warm-up	Idling	0 V	Code No. P0130	13A-24
			Sudden racing	0.6 - 1.0 V		
			2,500 r/min	0.4 V or less and 0.6 - 1.0 V alternates		
A4	Oxygen sensor (Bank 2, sensor 2)	<ul style="list-style-type: none"> <li>Transmission: 2nd gear &lt;M/T&gt;, L range &lt;A/T&gt;</li> <li>Drive with throttle widely open</li> </ul>	3,500 r/min	0.6 - 1.0 V	Code No. P0136	13A-27
8A	Throttle position sensor (throttle valve opening angle)	<ul style="list-style-type: none"> <li>Engine coolant temperature: 80 - 95°C</li> <li>Ignition switch: ON (Engine: Stopped)</li> </ul>	Release the accelerator pedal	6 - 20 %	Code No. P0120	13A-20
			Depress the accelerator pedal gradually	Increase in response to pedal depression stroke		
			Depress the accelerator pedal fully	80 - 100 %		

## 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. P0201, P0202, P0203, P0204, P0205, P0206	13A-38
02		Cut fuel to No. 2 injector					
03		Cut fuel to No. 3 injector					
04		Cut fuel to No. 4 injector					
05		Cut fuel to No. 5 injector					
06		Cut fuel to No. 6 injector					
07	Fuel pump	Fuel pump operates and fuel is recirculated.	<ul style="list-style-type: none"> <li>Engine: Cranking</li> <li>Fuel pump: Forced driving</li> </ul> Inspect according to both the above conditions.	Pinch the return hose with fingers to feel the pulse of the fuel being recirculated.	Pulse is felt.	Procedure No. 27	13A-81
				Listen near the fuel tank for the sound of fuel pump operation.	Sound of operation is heard.		
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.	Code No. P0443	13A-48
10	EGR control solenoid valve	Solenoid valve turns from OFF to ON.	Ignition switch: ON		Sound of operation can be heard when solenoid valve is driven.	Code No. P0403	13A-45
17	Basic ignition timing	Set to ignition timing adjustment mode	Engine: Idling Timing light is set		5° BTDC	-	-
21	Fan controller	Drive the fan motor	<ul style="list-style-type: none"> <li>Ignition switch: ON</li> </ul>		Radiator fan and condenser fan rotate at high speed	Procedure No. 24	13A-78

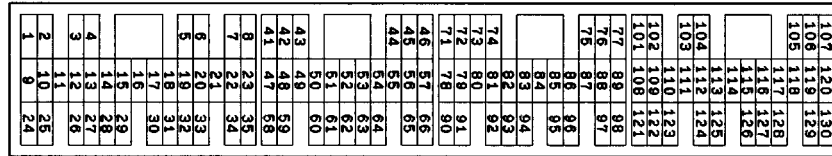
**CHECK AT THE ENGINE-ECU TERMINALS****TERMINAL VOLTAGE CHECK CHART****Engine-ECU <M/T> or Engine-A/T-ECU <A/T> Connector Terminal Arrangement**

&lt;M/T&gt;



9FU0393

&lt;A/T&gt;



7FU1763

Terminal No. <M/T>	Terminal No. <A/T>	Check item	Check condition (Engine condition)	Normal condition
1	1	No. 1 injector	While engine is idling after having warmed up, suddenly depress the accelerator pedal.	From 11 - 14 V, momentarily drops slightly
9	9	No. 2 injector		
24	24	No. 3 injector		
2	2	No. 4 injector		
10	10	No. 5 injector		
25	25	No. 6 injector		
14	14	Stepper motor coil <A>	Engine: Soon after the warmed up engine is started	10 - 15 V ↔ 0 - 6 V (Changes repeatedly)
28	28	Stepper motor coil <B>		
15	15	Stepper motor coil <C>		
29	29	Stepper motor coil <D>		
6	6	EGR control solenoid valve	Ignition switch: ON	System Voltage
			While engine is idling, suddenly depress the accelerator pedal.	From system voltage, momentarily drops
11	11	Ignition coil 1	Engine r/min: 3,000 r/min	0.3 - 3.0 V
12	12	Ignition coil 2		
13	13	Ignition coil 3		
47	41	Power supply	Ignition switch: ON	System voltage
59	47			

Terminal No. <M/T>	Terminal No. <A/T>	Check item	Check condition (Engine condition)		Normal condition
19	19	Air flow sensor reset signal	Engine: Idle speed		0 - 1 V
			Engine r/min: 3,000 r/min		6 - 9 V
18	18	Fan motor relay	When the condenser fan is not operating		System voltage
			When the condenser fan is operating		0 - 3 V
20	21	A/C relay	<ul style="list-style-type: none"> <li>Engine: Idle speed</li> <li>A/C switch: OFF → ON (A/C compressor is operating)</li> </ul>		System voltage or momentarily 6 V or more → 0 - 3 V
21	20	Fuel pump relay	Ignition switch: ON		System voltage
			Engine: Idle speed		0 - 3 V
16	34	Purge control solenoid valve	Ignition switch: ON		System voltage
			Running at 3,000 r/min while engine is warming up after having been started.		0 - 3 V
22	22	Engine warning lamp	Ignition switch: OFF → ON		0 - 3 V → 9 - 13 V (After several seconds have elapsed)
54	52	Power steering fluid pressure switch	Engine: Idling after warming up	When steering wheel is stationary	System voltage
				When steering wheel is turned	0 - 3 V
57	49	Control relay (Power supply)	Ignition switch: OFF		System voltage
			Ignition switch: ON		0 - 3 V
83	83	A/C switch 1	Engine: Idle speed	Turn the A/C switch OFF	0 - 3 V
				Turn the A/C switch ON (A/C compressor is operating)	System voltage
65	61	A/C switch 2	<ul style="list-style-type: none"> <li>Engine: Idling</li> <li>Outside air temperature: 25°C or more</li> </ul>	When A/C is MAX. COOL condition (when the load by A/C is high)	0 - 3 V
				When A/C is MAX. HOT condition (When the load by A/C is low)	System voltage

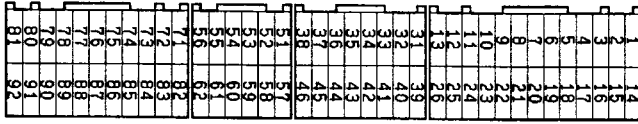
Terminal No. <M/T>	Terminal No. <A/T>	Check item	Check condition (Engine condition)		Normal condition
68	58	Ignition switch - ST	Engine: Cranking		8 V or more
62	64	Intake air temperature sensor	Ignition switch: ON	When intake air temperature is 0°C	3.2 - 3.8 V
				When intake air temperature is 20°C	2.3 - 2.9 V
				When intake air temperature is 40°C	1.5 - 2.1 V
				When intake air temperature is 80°C	0.4 - 1.0 V
71	71	Left bank oxygen sensor (front)	Engine: Running at 2,500 r/min after warmed up (Check using a digital type voltmeter)		0 ↔ 0.8 V (Changes repeatedly)
73	73	Left bank oxygen sensor (rear)	<ul style="list-style-type: none"> <li>• Transmission: 2nd gear &lt;M/T&gt;, L range &lt;A/T&gt;</li> <li>• Engine speed: 3,500 r/min or more</li> <li>• Driving with the throttle valve widely open</li> </ul>		0.6 - 1.0 V
72	72	Right bank oxygen sensor (front)	Engine: Running at 2,500 r/min after warmed up (Check using a digital type voltmeter)		0 ↔ 0.8 V (Changes repeatedly)
74	74	Right bank oxygen sensor (rear)	<ul style="list-style-type: none"> <li>• Transmission: 2nd gear &lt;M/T&gt;, L range &lt;A/T&gt;</li> <li>• Engine speed: 3,500 r/min or more</li> <li>• Driving with the throttle valve widely open</li> </ul>		0.6 - 1.0 V
3	3	Left bank oxygen sensor heater (front)	Engine: Idling		0 - 3 V
			Engine: 3,500 r/min		System voltage
26	26	Left bank oxygen sensor heater (rear)	Engine: Idling		0 - 3 V
			Engine: 3,500 r/min		System voltage
4	4	Right bank oxygen sensor heater (front)	Engine: Idling		0 - 3 V
			Engine: 3,500 r/min		System voltage
27	27	Right bank oxygen sensor heater (rear)	Engine: Idling		0 - 3 V
			Engine: 3,500 r/min		System voltage
60	66	Backup power supply	Ignition switch: OFF		System voltage
42	46	Sensor impressed voltage	Ignition switch: ON		4.5 - 5.5 V
99	98	Ignition switch-IG	Ignition switch: ON		System voltage

Terminal No. <M/T>	Terminal No. <A/T>	Check item	Check condition (Engine condition)		Normal condition
44	44	Engine coolant temperature sensor	Ignition switch: ON	When engine coolant temperature is 0°C	3.2 - 3.8 V
				When engine coolant temperature is 20°C	2.3 - 2.9 V
				When engine coolant temperature is 40°C	1.3 - 1.9 V
				When engine coolant temperature is 80°C	0.3 - 0.9 V
78	78	Throttle position sensor	Ignition switch: ON	Set throttle valve to idle position	0.3 - 1.0 V
				Fully open throttle valve	4.5 - 5.5 V
51	55	Barometric pressure sensor	Ignition switch: ON	When altitude is 0 m	3.7 - 4.3 V
				When altitude is 1,200 m	3.2 - 3.8 V
80	80	Vehicle speed sensor	<ul style="list-style-type: none"><li>Ignition switch: ON</li><li>Move the vehicle slowly forward</li></ul>		0 ↔ 5 V (Changes repeatedly)
79	79	Idle position switch	Ignition switch: ON	Set throttle valve to idle position	0 - 1 V
				Slightly open throttle valve	4 V or more
50	50	Top dead centre sensor	Engine: Cranking		0.4 - 3.0 V
			Engine: Idle speed		0.5 - 2.0 V
43	45	Crank angle sensor	Engine: Cranking		0.4 - 4.0 V
			Engine: Idle speed		1.5 - 2.5 V
61	65	Air flow sensor	Engine: Idle speed		2.2 - 3.2 V
			Engine r/min: 2,500 r/min		
-	59	Inhibitor switch <A/T>	Ignition switch: ON	Set selector lever to P or N	0 - 3 V
				Set selector lever to Other than P or N	8 - 14 V

## CHECK CHART FOR RESISTANCE AND CONTINUITY BETWEEN TERMINALS

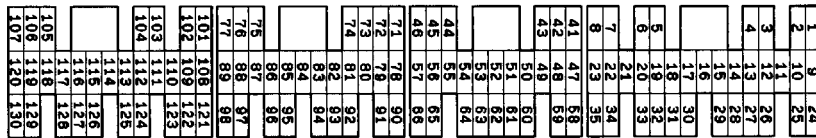
## Engine-ECU &lt;M/T&gt; or Engine-A/T-ECU &lt;A/T&gt; Harness Side Connector Terminal Arrangement

## &lt;M/T&gt;



9FU0392

## &lt;A/T&gt;



7FU1764

Terminal <M/T>	No.	Terminal <A/T>	No.	Inspection item	Normal condition (Check condition)
1 - 47		1 - 41		No. 1 injector	13 - 16 $\Omega$ (At 20°C)
9 - 47		9 - 41		No. 2 injector	
24 - 47		24 - 41		No. 3 injector	
2 - 47		2 - 41		No. 4 injector	
10 - 47		10 - 41		No. 5 injector	
25 - 47		25 - 41		No. 6 injector	
14 - 47		14 - 41		Stepper motor coil (A)	28 - 33 $\Omega$ (At 20°C)
28 - 47		28 - 41		Stepper motor coil (B)	
15 - 47		15 - 41		Stepper motor coil (C)	
29 - 47		29 - 41		Stepper motor coil (D)	
6 - 47		6 - 41		EGR control solenoid valve	29 - 35 $\Omega$ (At 20°C)
16 - 47		34 - 41		Purge control solenoid valve	30 - 34 $\Omega$ (At 20°C)
46 - Body earth		42 - Body earth		Engine-ECU <M/T> or engine-A/T-ECU <A/T> earth	Continuity (0 $\Omega$ )
58 - Body earth		48 - Body earth		Engine-ECU <M/T> or engine-A/T-ECU <A/T> earth	
3 - 47		3 - 41		Left bank oxygen sensor heater control (front)	4.5 - 8.0 $\Omega$ (At 20°C)
26 - 47		26 - 41		Left bank oxygen sensor heater control (rear)	11 - 18 $\Omega$ (At 20°C)

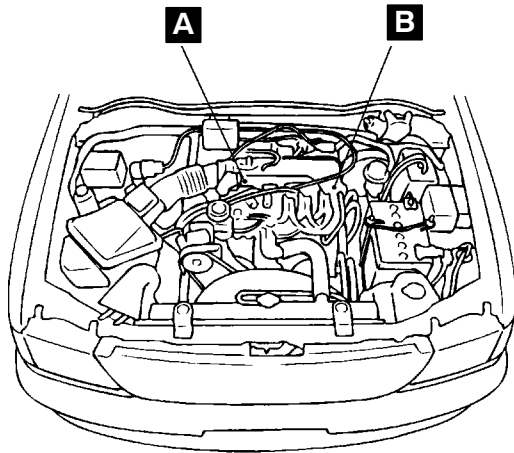


Terminal <M/T>	No.	Terminal <A/T>	No.	Inspection item	Normal condition (Check condition)
4 - 47		4 - 47		Right bank oxygen sensor heater (front)	4.5 - 8.0 $\Omega$ (At 20°C)
27 - 47		27 - 47		Right bank oxygen sensor heater (rear)	11 - 18 $\Omega$ (At 20°C)
62 - 49		64 - 57		Intake air temperature sensor	5.3 - 6.7 k $\Omega$ (When intake air temperature is 0°C)
					2.3 - 3.0 k $\Omega$ (When intake air temperature is 20°C)
					1.0 - 1.5 k $\Omega$ (When intake air temperature is 40°C)
					0.30 - 0.42 k $\Omega$ (When intake air temperature is 80°C)
44 - 49		44 - 57		Engine coolant temperature sensor	5.1 - 6.5 k $\Omega$ (When coolant temperature is 0°C)
					2.1 - 2.7 k $\Omega$ (When coolant temperature is 20°C)
					0.9 - 1.3 k $\Omega$ (When coolant temperature is 40°C)
					0.26 - 0.36 k $\Omega$ (When coolant temperature is 80°C)
79 - 49		79 - 57		Idle position switch	Continuity (when throttle valve is at idle position)
					No continuity (when throttle valve is slightly open)
67 - Body earth		59 - Body earth		Inhibitor switch <A/T>	Continuity (when select lever is at P or N)
					No continuity (when select lever is at D, 2, L or R)

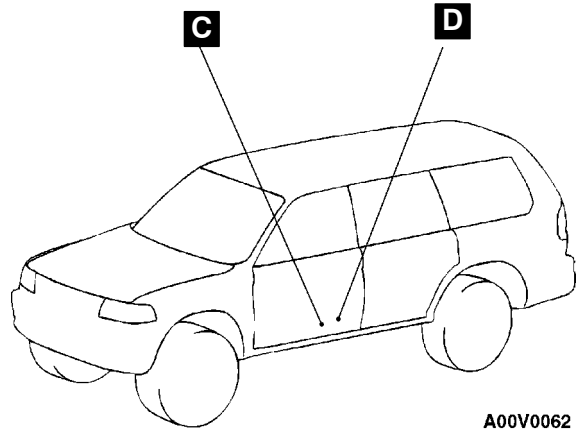
## ON-VEHICLE SERVICE

## COMPONENT LOCATION

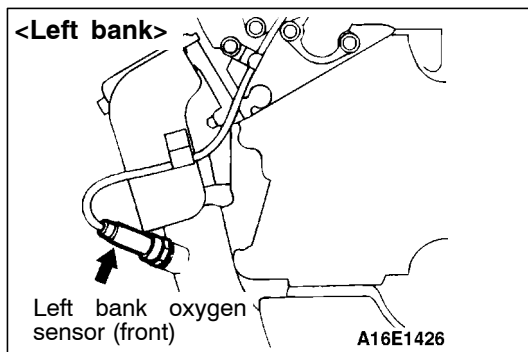
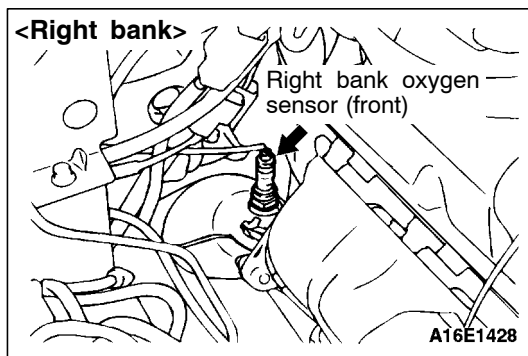
Name	Symbol	Name	Symbol
Left bank oxygen sensor (front)	B	Right bank oxygen sensor (front)	A
Left bank oxygen sensor (rear)	D	Right bank oxygen sensor (rear)	C



AT0111AA



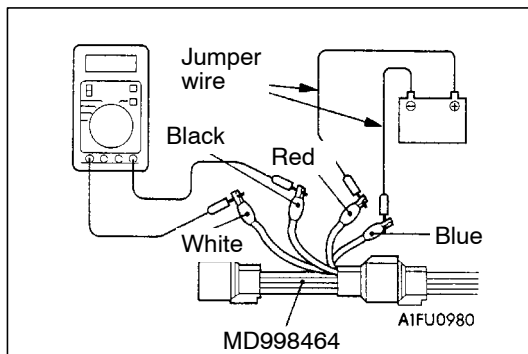
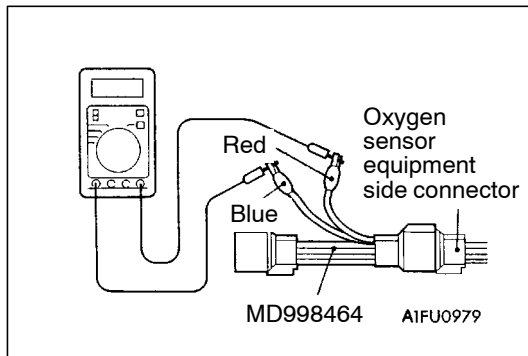
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## OXYGEN SENSOR CHECK

## &lt;Left bank oxygen sensor (front) and right bank oxygen sensor (front)&gt;

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  $\Omega$  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:

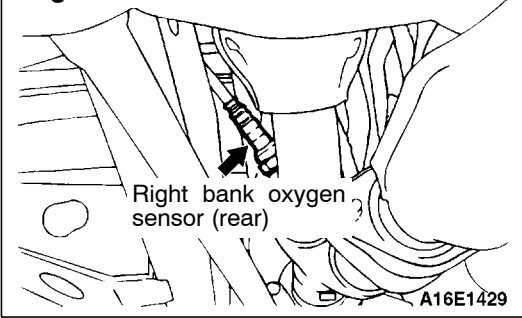
Engine	Oxygen sensor output voltage	Remarks
When racing the engine	0.6 - 1.0 V	If you make the air/fuel ratio rich by racing the engine repeatedly, a normal oxygen sensor will output a voltage of 0.6 - 1.0 V.

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

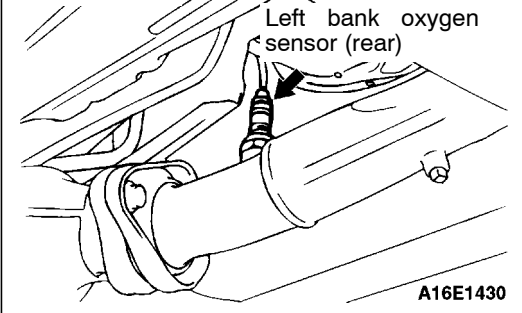
#### NOTE

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

## &lt;Right bank&gt;



## &lt;Left bank&gt;

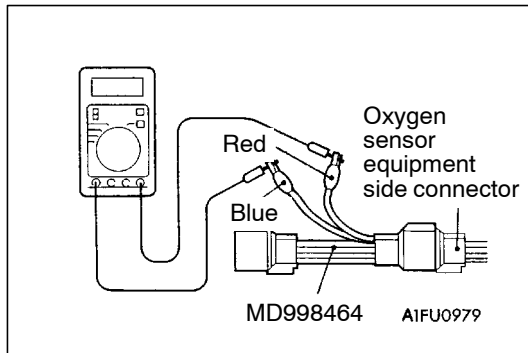


## &lt;Left bank oxygen sensor (rear) and Right bank oxygen sensor (rear)&gt;

1. Disconnect the oxygen sensor connector and connect the special tool (test harness set) to the connector on the oxygen sensor side.
2. Make sure that there is continuity ( $11 - 18 \Omega$  at  $20^\circ\text{C}$ ) 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.

## NOTE

- (1) If the MUT-II does not display the standard value although no abnormality is found by the above mentioned continuity test and harness check, replace the oxygen sensor (rear).
- (2) For removal and installation of the oxygen sensor, refer to GROUP 15 - Exhaust Pipe and Main Muffler.



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# Service Bulletins


Click on the applicable bookmark to select the Service Bulletin.

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# SERVICE BULLETIN

QUALITY INFORMATION ANALYSIS  
OVERSEAS SERVICE DEPT. MITSUBISHI MOTORS CORPORATION

<b>SERVICE BULLETIN</b>		No.: MSB-00E13-001	
		Date: 2001-06-03	<b>&lt;Model&gt;</b> (EC)GALANT(EA0) (EC)SPACE STAR (EC) SPACE RUNNER/SPACE WAGON(N80, N90) (EC)PAJERO SPORT (K80W,K90W) (EC)PAJERO/ MONTERO (V60, V70) (EC)CARISMA (EC)PAJERO PININ (H60,H70)
<b>Subject:</b> AVAILABILITY OF DRIVE CYCLE PATTERNS FOR 2001 MODEL CARS		<b>&lt;M/Y&gt;</b> 01-10	
<b>Group:</b> FUEL	<b>Draft No.:</b> 00AL602317		
<b>INFORMATION</b>	INTERNATIONAL CAR ADMINISTRATION OFFICE	 T.MASAKI-MANAGER TECHNICAL SERVICE PLANNING	

## 1. Description:

On the 2001 model cars equipped with the on-board diagnostics system, the drive cycle patterns have been made available.

Performing the running test of the car using these drive cycle patterns makes it possible to monitor all the diagnosis codes that are required for operation of the car in order to determine if the applicable system is operating properly or not.

## 2. Applicable Manuals:

Manual	Pub. No.	Language	Page(s)
2001 GALANT Workshop Manual Supplement	PWDE9611-B	(English)	4G64-GDI:13I-8
	PWDS9612-B	(Spanish)	4G63-MPI:13A-7
	PWDF9613-B	(French)	6A13-MPI:13A-97
	PWDG9614-B	(German)	
	PWDD9615-B	(Dutch)	
	PWDW9616-B	(Swedish)	
2001 SPACE RUNNER/ SPACE WAGON Workshop Manual Supplement	PWDE9803-C	(English)	4G64-GDI:13A-9
	PWDS9804-C	(Spanish)	4G63-MPI:13D-12
	PWDF9805-C	(French)	
	PWDG9806-C	(German)	
	PWDD9807-C	(Dutch)	
	PWDW9808-C	(Swedish)	
2001 CARISMA Workshop Manual Supplement	PWDE9502-E	(English)	4G93-GDI:13J-8
	PWDS9503-E	(Spanish)	4G92-MPI:13A-7
	PWDF9504-E	(French)	
	PWDG9505-E	(German)	
	PWDD9506-E	(Dutch)	
	PWDW9507-E	(Swedish)	
2001 SPACE STAR Workshop Manual Supplement	CMXE99E1-A	(English)	4G93-GDI:13A-9 4G13-MPI:13B-7
2001 COLT Workshop Manual Supplement	PWME9511-C	(English)	4G13-MPI:13A-7
	PWMS9512-C	(Spanish)	4G93-MPI:13A-88
	PWMF9513-C	(French)	
	PWMG9514-C	(German)	
	PWMD9515-C	(Dutch)	
	PWMW9516-C	(Swedish)	
2001 PAJERO Workshop Manual VOL1	PWJE0001(1/2)	(English)	6G74-GDI:13A-12
2001 MONTERO Workshop Manual VOL1	PWJS0002(1/2)	(Spanish)	
2001 PAJERO/MONTERO Workshop Manual CD-ROM	PWJT0008R	(English)	
		(Spanish)	
		(French)	
		(German)	
2001 PAJERO SPORT Workshop Manual Supplement	PWJE9812-B	(English)	6G72-MPI:13A-8
	PWJS9813-B	(Spanish)	
	PWJF9814-B	(French)	
	PWJG9815-B	(German)	
2001 PAJERO PININ Workshop Manual Supplement	CKRE99E1-A	(English)	4G93-GDI: 13A-9

2001 GALANT Workshop Manual Supplement 4G63, 6A13  
2001 SPACE RUNNER/SPACE WAGON Workshop Manual Supplement 4G63  
2001 CARISMA Workshop Manual Supplement 4G92  
2001 SPACE STAR Workshop Manual Supplement 4G13  
2001 COLT Workshop Manual Supplement 4G13, 4G93  
2001 PAJERO SPORT Workshop Manual Supplement 6G72

## **GDI - Troubleshooting**

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### **DRIVE CYCLE**

Performing the running test of the car using the following five drive cycle patterns makes it possible to monitor all the diagnosis codes that are required for operation of the car in order to determine if the applicable system is operating properly or not.

In other words, doing such a drive allows to regenerate any kind of trouble which involves illuminating the Engine Warning Lamp (Check Engine Lamp) and to verify the repair procedure has eliminated the trouble [the Engine Warning Lamp (Check Engine Lamp) is no longer illuminated].

#### **Caution**

**Two technicians should always be in the vehicle when carrying out a test drive.**

#### **NOTE**

Check that the diagnosis code is not output before traveling in the Drive cycle pattern. Erase the diagnosis code if it has been output.

### **DRIVE CYCLE PATTERN LIST**

PROCEDURE	MONITOR ITEM	DIAGNOSIS CODE (DTC)
1	Catalytic converter monitor	P0420 <sup>*1</sup> , P0421 <sup>*2</sup> , P0431 <sup>*3</sup> ,
2	Heated oxygen sensor <front> monitor	P0130
3	Other monitor	P0136, P0201, P0202, P0203, P0204, P0205 <sup>*3</sup> , P0300, P0301, P0302, P0303, P0304, P0305 <sup>*3</sup> , P0306 <sup>*3</sup> , P0325 <sup>*4</sup>

#### **NOTE**

\*1: 4G63

\*2: 4G13, 4G92, 4G93, 6A13, 6G72

\*3: 6A13, 6G72

\*4: 4G13, 4G63, 4G92, 4G93, 6A13



## GDI - Troubleshooting

### PROCEDURE 1

<b>CATALYTIC CONVERTER MONITOR</b>	
Diagnosis code No.	P0420, P0421, P0431
Drive cycle pattern	<p>One trip monitor [from start to ignition switch to "LOCK" (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 16 minutes or more.</p> <p style="text-align: right;">Y6001BY</p>
Inspection conditions	<ul style="list-style-type: none"> <li>Atmospheric temperature : -10 °C or more</li> <li>Condition of A/T : Selector lever D range, overdrive switch "ON" position</li> </ul>
Test procedure	<ol style="list-style-type: none"> <li>Engine : start</li> <li>Accelerate until the vehicle speed is 90 km/h or more.</li> <li>Travel for 6 minutes or more while keeping the vehicle speed is 90 km/h or more.</li> <li>Decelerate until the vehicle speed is 80 km/h or less.</li> <li>While traveling at 55 – 80 km/h for 10 minutes or more, fully close the throttle at least once in 2 minutes and decelerate for 10 seconds or more.             <ul style="list-style-type: none"> <li>Do not repeat deceleration too often.</li> <li>Vehicle speed may go below 55 km/h after the deceleration.</li> <li>Stopping and braking during this operation are permitted. (If stopped or drive at 55 km/h or less for more than 5 minutes the monitoring may be stopped. In this case please restart monitoring from the beginning.)</li> </ul> </li> <li>After completing the above deceleration, bring the vehicle speed back to 55 – 80 km/h and keep it in the range until starting the deceleration again.             <ul style="list-style-type: none"> <li>Repeat the above deceleration at least 5 times.</li> </ul> </li> <li>Return the vehicle to the shop, the turn the ignition switch "LOCK" (OFF) position.</li> </ol>

## GDI - Troubleshooting

### PROCEDURE 2

OXYGEN SENSOR <FRONT> MONITOR	
Diagnosis code No.	P0130
Drive cycle pattern	<p>One trip monitor [from start to ignition switch to "LOCK" (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 16 minutes or more.</p> <p style="text-align: right;">Y6002BY</p>
Inspection conditions	<ul style="list-style-type: none"> <li>• Engine coolant temperature : After engine warm up.</li> <li>• Atmospheric temperature : -10 °C or more</li> <li>• Condition of A/T :Selector lever D range, overdrive switch "ON" position</li> </ul>
Test procedure	<ol style="list-style-type: none"> <li>1. Engine : start</li> <li>2. Accelerate until the vehicle speed is 55 – 80 km/h.</li> <li>3. While keeping the accelerator pedal opening degree constant, keep the vehicle speed at 55 –80 km/h and travel for 16 minutes or more.             <ul style="list-style-type: none"> <li>• Stopping and braking during this operation are permitted.</li> </ul> </li> <li>4. Return the vehicle to the shop, then turn the ignition switch "LOCK" (OFF) position.</li> </ol>

## GDI - Troubleshooting

### PROCEDURE 3

OTHER MONITOR	
Diagnosis code No.	P0136, P0201, P0202, P0203, P0204, P0205, P0206, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0325, P0500, P0551
Drive cycle pattern	<p>One trip monitor [from start to ignition switch to "LOCK" (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 21 minutes or more.</p> <p style="text-align: right;">Y6003BY</p>
Inspection conditions	<ul style="list-style-type: none"> <li>• Engine coolant temperature : After engine warm up.</li> <li>• Atmospheric temperature : -10 °C or more</li> <li>• Condition of A/T :Selector lever D range, overdrive switch "ON" position</li> </ul>
Test procedure	<ol style="list-style-type: none"> <li>1. Engine : start</li> <li>2. Accelerate until the vehicle speed is 55 km/h.</li> <li>3. While keeping the accelerator pedal opening degree constant, keep the vehicle speed at 55 km/h or more and travel for 16 minutes or more.</li> <li>4. Return the vehicle to the shop</li> <li>5. After stopping the vehicle, continue idling for 5 minutes, and then turn the ignition switch to "LOCK" (OFF) position.</li> </ol>

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# MULTIPOINT FUEL INJECTION (MPI)

## CONTENTS

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## GENERAL

### OUTLINE OF CHANGES

Due to the changes shown below, some new service procedures have been added.

- The engine-ECU <M/T> or engine-A/T-ECU <A/T> has been changed.
- The idle position switch has been discontinued.

## GENERAL INFORMATION

### GENERAL SPECIFICATIONS

Items		Specifications
Engine-ECU	Identification model No.	E6T32677 <M/T>
Engine-A/T-ECU	Identification model No.	E6T32594 <A/T>

## TROUBLESHOOTING

### DIAGNOSIS FUNCTION

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

Diagnosis code P1603 has been added.

#### Engine warning lamp inspection items

Code No.	Diagnosis item
P1603	Battery back-up line malfunction

## INSPECTION CHART FOR DIAGNOSIS CODES

- The range of check and the set condition of the following diagnosis codes have been changed. The inspection procedures are the same as before.  
P0135, P0141, P0155, P0161, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0500, P0551
- Diagnosis code P1603 has been added.

Code No.	Diagnosis item	Reference page
P0135	Oxygen sensor heater (front) system <Bank 1 sensor 1>	13A-3
P0141	Oxygen sensor heater (rear) system <Bank 1 sensor 2>	13A-3
P0155	Oxygen sensor heater (front) system <Bank 2 sensor 1>	13A-3
P0161	Oxygen sensor heater (rear) system <Bank 2 sensor 2>	13A-4
P0300	Random misfire detected	13A-4
P0301	No. 1 cylinder misfire detected	13A-4
P0302	No. 2 cylinder misfire detected	
P0303	No. 3 cylinder misfire detected	
P0304	No. 4 cylinder misfire detected	
P0305	No. 5 cylinder misfire detected	
P0306	No. 6 cylinder misfire detected	13A-4
P0500	Vehicle speed sensor system	
P0551	Power steering fluid pressure switch system	13A-5
P1603	Battery backup line malfunction	13A-5

## INSPECTION PROCEDURE FOR DIAGNOSIS CODE

Code No. P0135 Oxygen sensor heater (front) system <Bank 1 sensor 1>	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>60 seconds have elapsed from the start of the previous monitoring.</li> <li>Engine coolant temperature is more than 20 °C.</li> <li>While the right bank heated oxygen sensor heater (front) is on.</li> <li>Battery voltage is 11 - 16 V.</li> </ul> <p>Set Conditions</p> <p>Heater current of the right bank oxygen sensor heater (front) has continued to be less than 0.16 A or more than 7.5 A for 4 seconds.</p>	<ul style="list-style-type: none"> <li>Malfunction of the right bank oxygen sensor heater (front)</li> <li>Open or short circuit in the right bank oxygen sensor heater (front) circuit or loose connector contact</li> <li>Malfunction of the engine-ECU &lt;M/T&gt;</li> <li>Malfunction of the engine-A/T-ECU &lt;A/T&gt;</li> </ul>

Code No. P0141 Oxygen sensor heater (rear) system <Bank 1 sensor 2>	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>60 seconds have elapsed from the start of the previous monitoring.</li> <li>Engine coolant temperature is more than 20 °C.</li> <li>While the right bank heated oxygen sensor heater (rear) is on.</li> <li>Battery voltage is 11 - 16 V.</li> </ul> <p>Set Conditions</p> <p>Heater current of the right bank oxygen sensor heater (rear) has continued to be less than 0.16 A or more than 5.0 A for 4 seconds.</p>	<ul style="list-style-type: none"> <li>Malfunction of the right bank oxygen sensor heater (rear)</li> <li>Open or short circuit in the right bank oxygen sensor heater (rear) circuit or loose connector contact</li> <li>Malfunction of the engine-ECU &lt;M/T&gt;</li> <li>Malfunction of the engine-A/T-ECU &lt;A/T&gt;</li> </ul>

Code No. P0155 Oxygen sensor heater (front) system <Bank 2 sensor 1>	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>60 seconds have elapsed from the start of the previous monitoring.</li> <li>Engine coolant temperature is more than 20 °C.</li> <li>While the left bank heated oxygen sensor heater (front) is on.</li> <li>Battery voltage is 11 - 16 V.</li> </ul> <p>Set Conditions</p> <p>Heater current of the left bank oxygen sensor heater (front) has continued to be less than 0.16 A or more than 7.5 A for 4 seconds.</p>	<ul style="list-style-type: none"> <li>Malfunction of the left bank oxygen sensor heater (front)</li> <li>Open or short circuit in the left bank oxygen sensor heater (front) circuit or loose connector contact</li> <li>Malfunction of the engine-ECU &lt;M/T&gt;</li> <li>Malfunction of the engine-A/T-ECU &lt;A/T&gt;</li> </ul>

Code No. P0161 Oxygen sensor heater (rear) system <Bank 2 sensor 2>	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>60 seconds have elapsed from the start of the previous monitoring.</li> <li>Engine coolant temperature is more than 20 °C.</li> <li>While the left bank heated oxygen sensor heater (rear) is on.</li> <li>Battery voltage is 11 - 16 V.</li> </ul> <p>Set Conditions</p> <p>Heater current of the left bank oxygen sensor heater (rear) has continued to be less than 0.16 A or more than 5.0 A for 4 seconds.</p>	<ul style="list-style-type: none"> <li>Malfunction of the left bank oxygen sensor heater (rear)</li> <li>Open or short circuit in the left bank oxygen sensor heater (rear) circuit or loose connector contact</li> <li>Malfunction of the engine-ECU &lt;M/T&gt;</li> <li>Malfunction of the engine-A/T-ECU &lt;A/T&gt;</li> </ul>

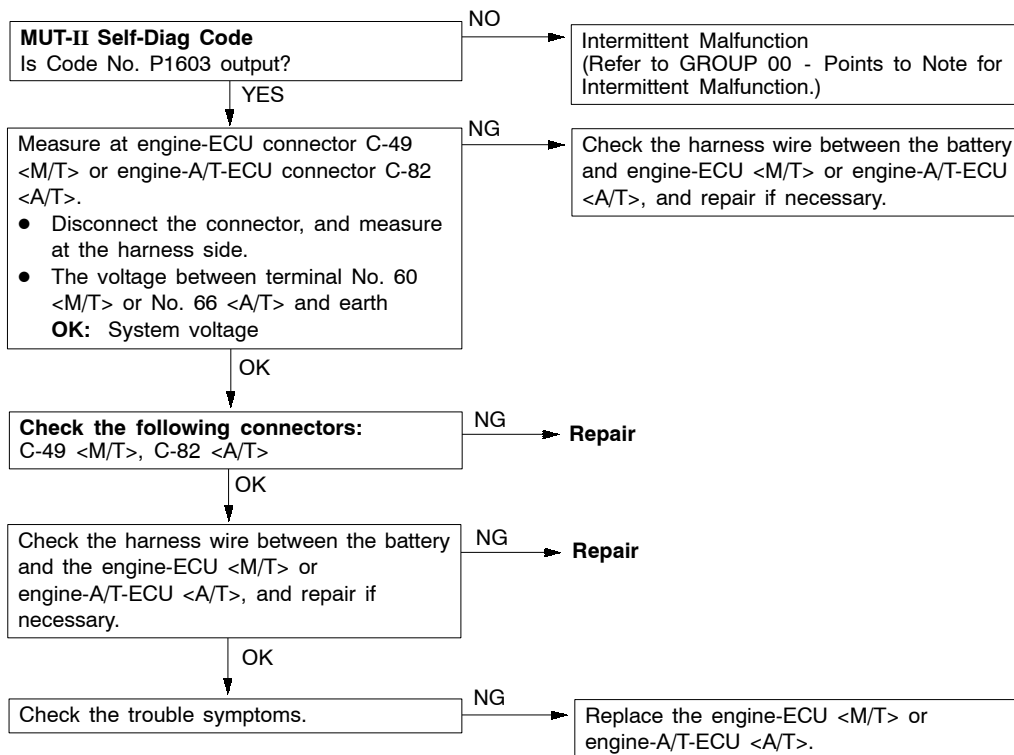
Code No. P0300 Random misfire detected	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>Engine speed is 440 - 6,000 r/min.</li> <li>Engine coolant temperature is -10 °C or over.</li> <li>Intake air temperature is -10 °C or over.</li> <li>Barometric pressure is 76 kPa or over.</li> <li>Adaptive learning has been completed with the vane that generates the crankshaft position signals.</li> <li>While the engine is running, excluding gear shifting, deceleration, sudden acceleration/deceleration and A/C compressor switching.</li> <li>Throttle variance is between -0.059 V/10 ms and 0.059 V/10 ms.</li> </ul> <p>Set Conditions (Change in the angular acceleration of the crankshaft is used for misfire detection.)</p> <ul style="list-style-type: none"> <li>Misfire has occurred more frequently than allowed during the last 200 revolutions (when the catalyst temperature is higher than 950 °C).</li> <li>Misfire has occurred in 20 or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).</li> </ul>	<ul style="list-style-type: none"> <li>Malfunction of the ignition system</li> <li>Malfunction of the crank angle sensor signal</li> <li>Malfunction of air/fuel ratio control system</li> <li>Abnormal compression</li> <li>Timing belt for jumping teeth</li> <li>Malfunction of EGR system and EGR valve</li> <li>Malfunction of the engine-ECU &lt;M/T&gt;</li> <li>Malfunction of the engine-A/T-ECU &lt;A/T&gt;</li> </ul>

Code No. P0301 No. 1 cylinder misfire detected Code No. P0302 No. 2 cylinder misfire detected Code No. P0303 No. 3 cylinder misfire detected Code No. P0304 No. 4 cylinder misfire detected Code No. P0305 No. 5 cylinder misfire detected Code No. P0306 No. 6 cylinder misfire detected	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>5 seconds or more have passed after the engine was started.</li> <li>Engine speed is 440 - 6,000 r/min.</li> <li>Engine coolant temperature is -10 °C or over.</li> <li>Intake air temperature is -10 °C or over.</li> <li>Barometric pressure is 76 kPa or over.</li> <li>Adaptive learning has been completed with the vane that generates the crankshaft position signals.</li> <li>While the engine is running, excluding gear shifting, deceleration, sudden acceleration/deceleration and A/C compressor switching.</li> <li>Throttle variance is between -0.059 V/10 ms and 0.059 V/10 ms.</li> </ul> <p>Set Conditions (Change in the angular acceleration of the crankshaft is used for misfire detection.)</p> <ul style="list-style-type: none"> <li>Misfire has occurred more frequently than allowed during the last 200 revolutions (when the catalyst temperature is higher than 950 °C).</li> <li>Misfire has occurred in 20 or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).</li> </ul>	<ul style="list-style-type: none"> <li>Malfunction of the ignition system</li> <li>Malfunction of the crank angle sensor signal</li> <li>Malfunction of air/fuel ratio control system</li> <li>Abnormal compression</li> <li>Malfunction of injector</li> <li>Malfunction of the engine-ECU &lt;M/T&gt;</li> <li>Malfunction of the engine-A/T-ECU &lt;A/T&gt;</li> </ul>

Code No. P0500 Vehicle speed sensor system	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>2 seconds after the engine was started.</li> <li>Engine speed is 2,100 - 4,000 r/min.</li> <li>Volumetric efficiency is 40 - 70 %.</li> </ul> <p>Set Conditions</p> <ul style="list-style-type: none"> <li>Vehicle speed sensor output voltage does not change for 2 seconds (no pulse signal input).</li> </ul>	<ul style="list-style-type: none"> <li>Malfunction of the vehicle speed sensor</li> <li>Open or short circuit in the vehicle speed sensor circuit or loose connector contact</li> <li>Malfunction of the engine-ECU &lt;M/T&gt;</li> <li>Malfunction of the engine-A/T-ECU &lt;A/T&gt;</li> </ul>

Code No. P0551 Power steering fluid pressure switch system	Probable cause
Range of Check <ul style="list-style-type: none"> <li>Engine coolant temperature is 30 °C or more.</li> <li>Drive for 4 seconds or more with the vehicle speed is 50 km/h or more. Stop the vehicle (vehicle speed is 1.5 km/h or less). Repeat 10 times or more.</li> </ul> Set Conditions <ul style="list-style-type: none"> <li>Power steering fluid pressure switch continues to be on.</li> </ul>	<ul style="list-style-type: none"> <li>Power steering fluid pressure switch failed</li> <li>Open or short circuit in the power steering fluid pressure switch circuit or loose connector contact</li> <li>Malfunction of the engine-ECU &lt;M/T&gt;</li> <li>Malfunction of the engine-A/T-ECU &lt;A/T&gt;</li> </ul>

Code No. P1603 Battery backup line malfunction	Probable cause
Range of Check <ul style="list-style-type: none"> <li>Starting sequence was completed.</li> <li>The battery voltage is 10V or more.</li> </ul> Set Conditions <ul style="list-style-type: none"> <li>Battery back-up line voltage is less than 2V.</li> </ul>	<ul style="list-style-type: none"> <li>Open or short circuit in the battery back-up line or loose connector contact</li> <li>Malfunction of the engine-ECU &lt;M/T&gt;</li> <li>Malfunction of the engine-A/T-ECU &lt;A/T&gt;</li> </ul> NOTE: If the engine is started with the ignition off current draw or storage connector disconnected, the engine-ECU <M/T> or the engine-A/T-ECU <A/T> judges that the battery backup line is broken, and then illuminate the engine warning lamp and stores a diagnosis code.

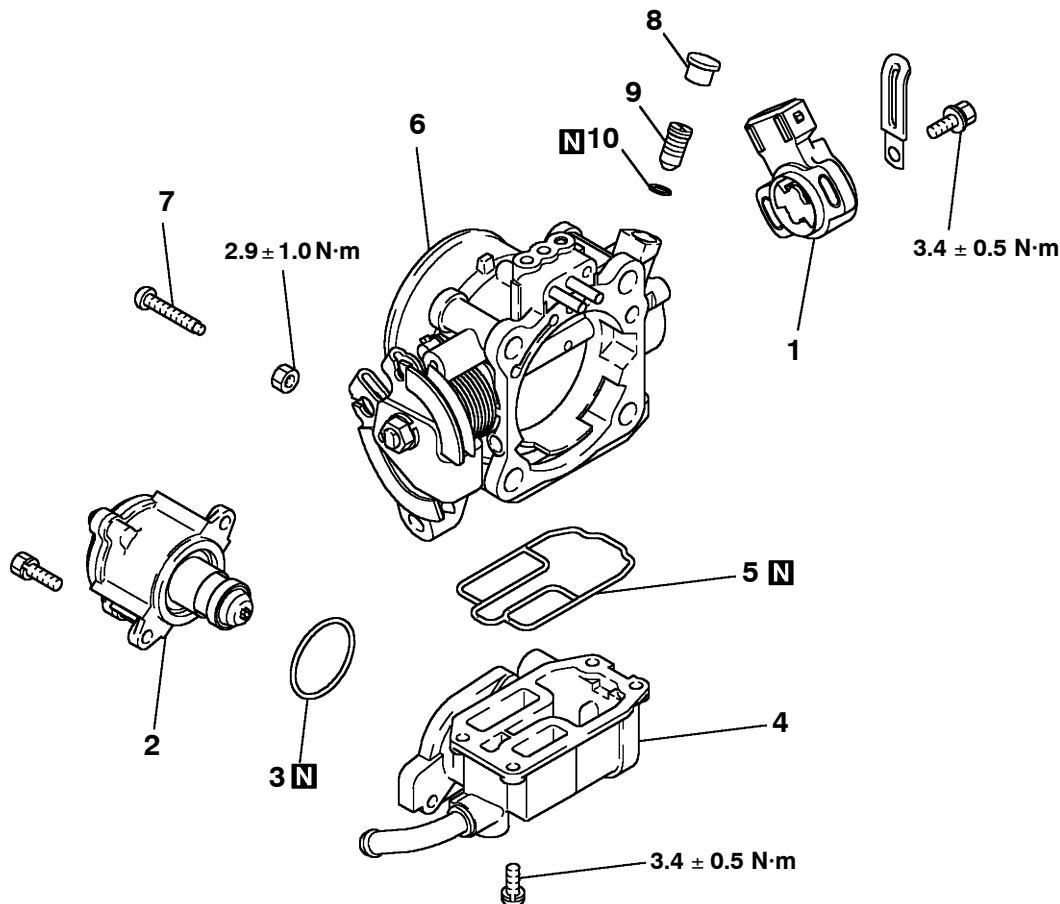




# THROTTLE BODY

## DISASSEMBLY AND REASSEMBLY

<VEHICLES WITHOUT AUTO-CRUISE CONTROL SYSTEM>



7EN1602

### Disassembly steps

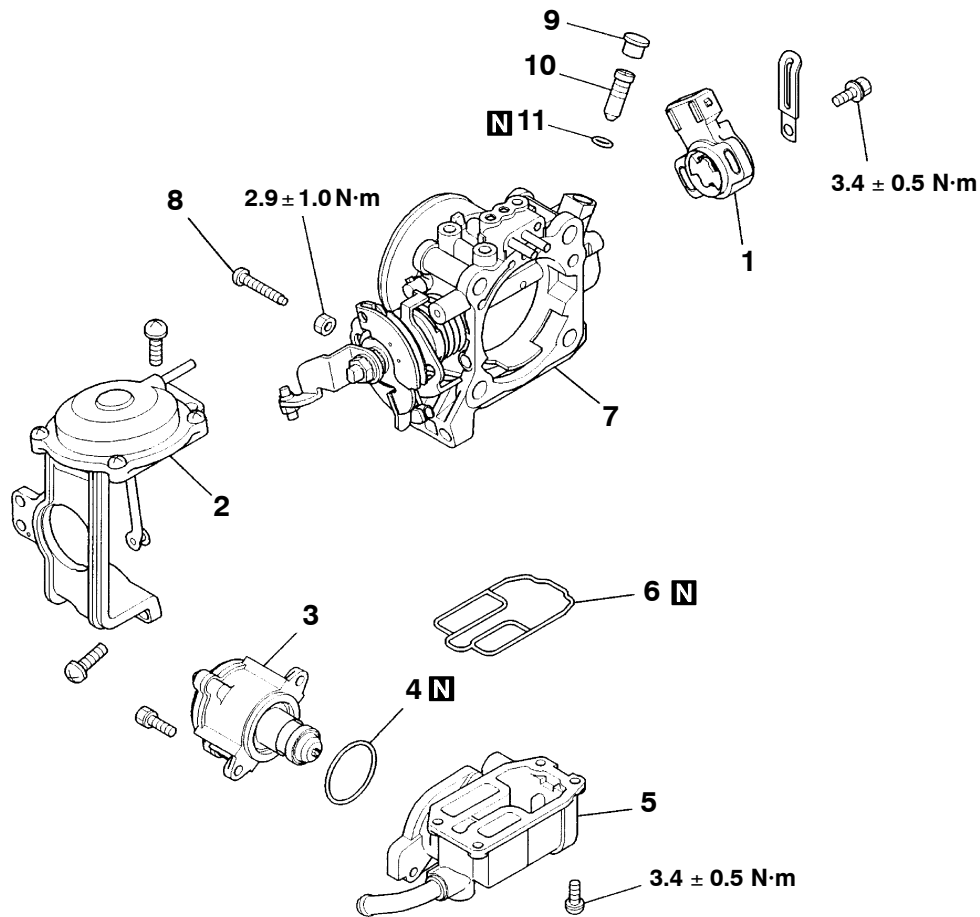


1. Throttle position sensor
2. Idle speed control servo (Stepper motor)
3. O-ring
4. Fast idle air valve
5. O-ring
6. Throttle body
7. Fixed SAS
8. Cap
9. Speed adjusting screw
10. O-ring

### NOTE

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

## &lt;VEHICLES WITH AUTO-CRUISE CONTROL SYSTEM&gt;



7EN1438

**Disassembly steps**

1. Throttle position sensor
2. Lever assembly
3. Idle speed control servo (Stepper motor)
4. O-ring
5. Fast idle air valve
6. O-ring
7. Throttle body
8. Fixed SAS
9. Cap
10. Speed adjusting screw
11. O-ring

**NOTE**

1. The fixed SAS is correctly adjusted at the factory and should not be removed.
2. If the fixed SAS should happen to have been removed, carry out fixed SAS adjustment.
3. 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.

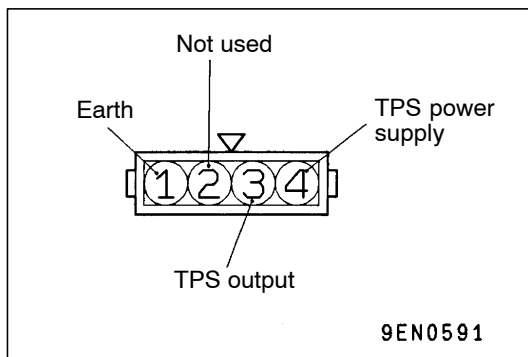
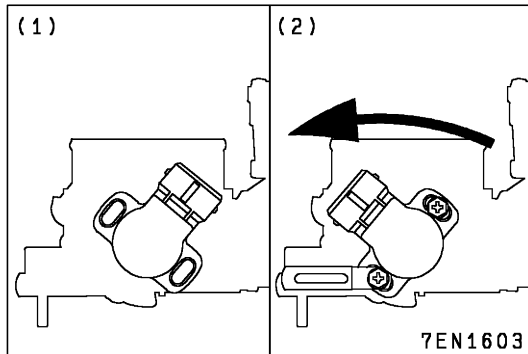
Do not use solvent to clean the following parts:

- Throttle position sensor
- Accelerator pedal position sensor
- Idle speed control body 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

### ▶◀ THROTTLE POSITION SENSOR (TPS) INSTALLATION

1. Install the TPS to the throttle body so that it faces as shown in figure (1).
2. Twist the TPS to the direction shown in figure (2), and then tighten it with screws.
3. Connect a multimeter between terminal (4) (TPS power supply) and terminal (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.
4. If there is an abnormality, replace the TPS.