

FUEL

CONTENTS

GASOLINE DIRECT INJECTION (GDI) 13A

GASOLINE DIRECT INJECTION (GDI)

CONTENTS

GENERAL	3	Fuel Pressure Test	108
Outline of Changes	3	Component Location	112
GENERAL INFORMATION	3	Oxygen Sensor Check	112
SERVICE SPECIFICATIONS	5	FUEL PUMP (HIGH PRESSURE)	114
TROUBLESHOOTING	6	INJECTOR	117
ON-VEHICLE SERVICE	108	THROTTLE BODY	121

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.
- Fuel pressure regulator (high-pressure) incorporate fuel pump (high-pressure) has been adopted.
- An oxygen sensor (rear) has been added.
- A ignition failure sensor has been added.

GENERAL INFORMATION

SELF-DIAGNOSIS FUNCTION

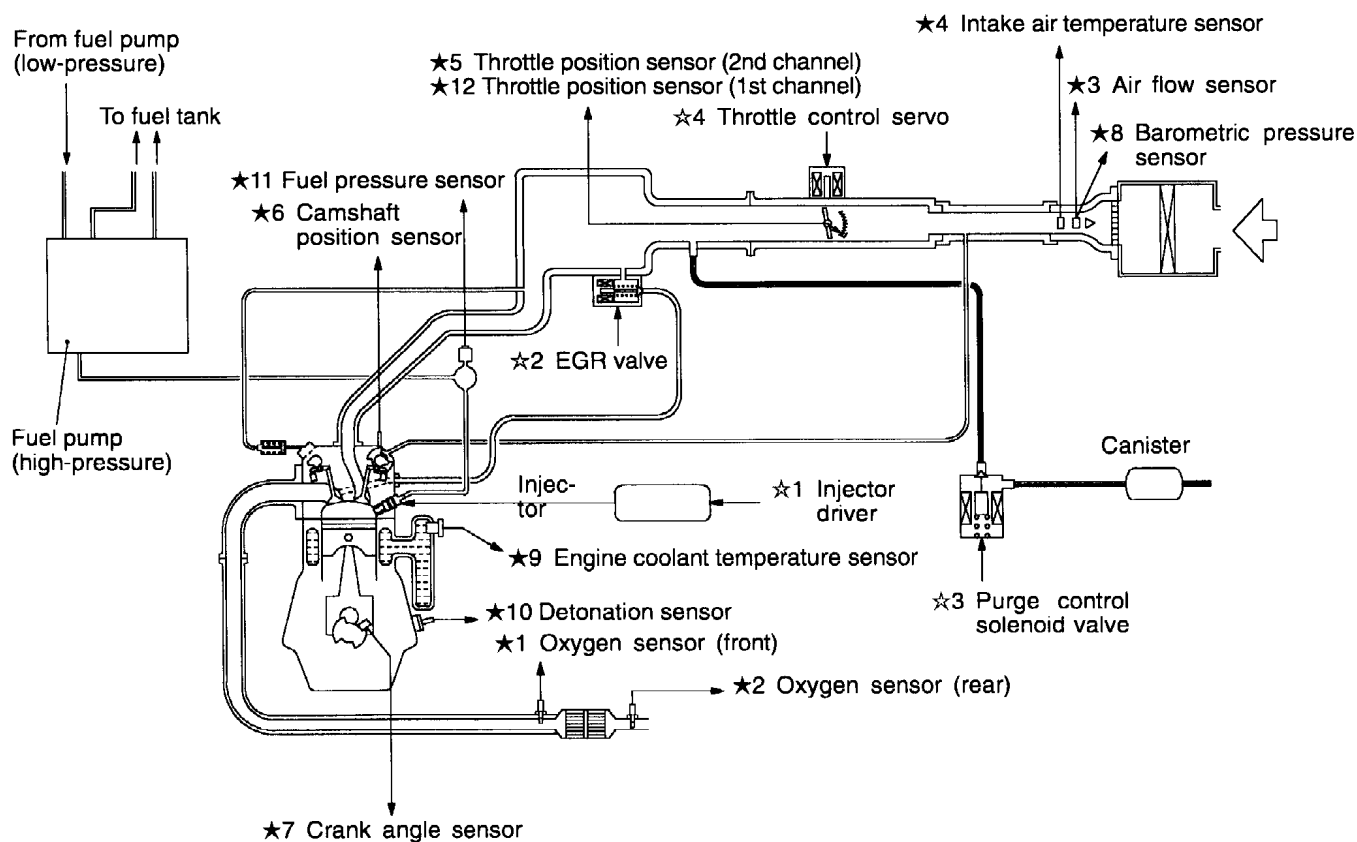
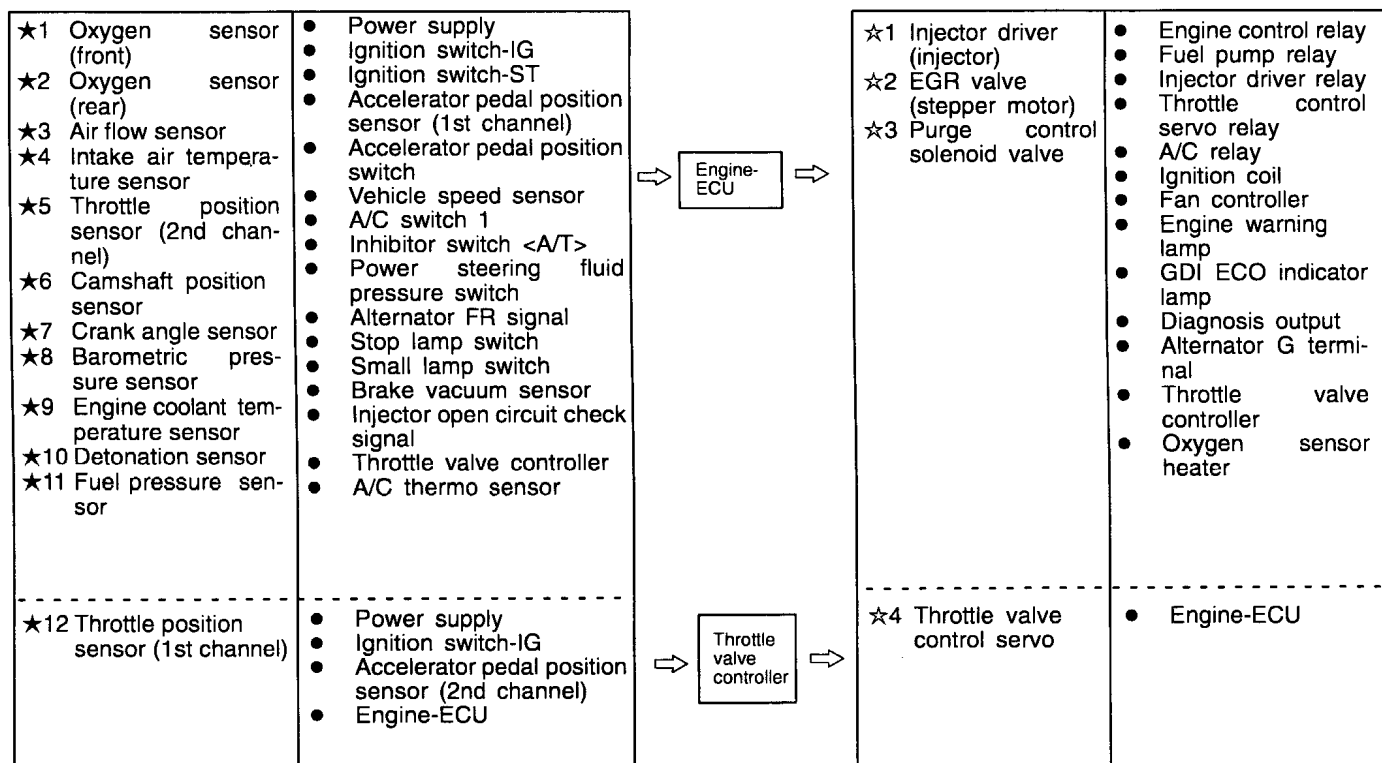
Following functions have been added.

- The engine-ECU 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 SPECIFICATION

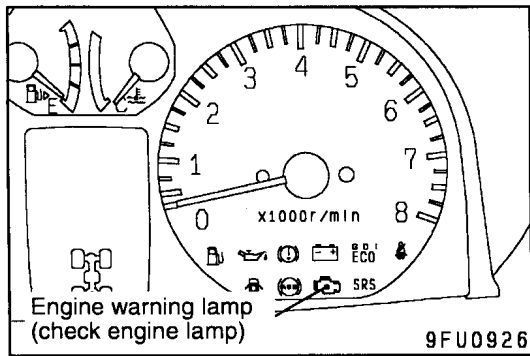
Items		Specification
Engine-ECU	Identification No.	E2T71582

GASOLINE DIRECT INJECTION SYSTEM DIAGRAM



SERVICE SPECIFICATIONS

Items		Standard value
Fuel pressure	High-pressure side MPa	4 – 6.9
	Low-pressure side kPa	Approximately 324
Oxygen sensor output voltage (during revving) V		0.6 – 1.0
Oxygen sensor heater resistance (at 20°C) Ω	Front	4.5 – 8.0
	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 GDI 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
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 (1st channel) system
P0125	Feedback system
P0130	Oxygen sensor (front) system <sensor 1>
P0135	Oxygen sensor heater (front) system <sensor 1>
P0136	Oxygen sensor (rear) system <sensor 2>
P0141	Oxygen sensor heater (rear) system <sensor 2>
P0170	Abnormal fuel system
P0190★	Abnormal fuel pressure
P0201	No. 1 injector system
P0202	No. 2 injector system
P0203	No. 3 injector system
P0204	No. 4 injector system
P0220★	Accelerator pedal position sensor (1st channel) system
P0225★	Throttle position sensor (2nd channel) system
P0300★	Ignition coil (power transistor) system
P0301	No. 1 cylinder misfire detected
P0302	No. 2 cylinder misfire detected
P0303	No. 3 cylinder misfire detected
P0304	No. 4 cylinder misfire detected

Code No.	Diagnosis item
P0335	Crank angle sensor system
P0340	Camshaft position sensor system
P0403	EGR valve system
P0420	Catalyst malfunction
P0443	Purge control solenoid valve system
P1200	Injector driver system
P1220★	Electronic-controlled throttle valve system
P1221★	Throttle valve position feedback system
P1223★	Communication line with throttle valve controller
P1224★	Throttle valve control servo motor (motor 1st phase malfunction) system
P1225★	Accelerator pedal position sensor (2nd channel) system
P1228★	Throttle valve control servo motor (motor 2nd phase malfunction) system
P1515	Brake vacuum sensor system

NOTE

1. If the engine warning lamp illuminates because of a malfunction of the engine-ECU, communication between MUT-II and the engine-ECU is impossible. In this case, the diagnosis code cannot be read.
2. After the engine-ECU 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.
As for P1220, P1221, P1223, P1224, and P1228, the engine warning lamp flashes. If malfunctions are detected at the throttle position sensor (1st channel) and the throttle position sensor (2nd channel) at the same time, or malfunctions are detected at the accelerator pedal position sensor (1st channel) and the accelerator pedal position sensor (2nd channel) at the same time, the engine warning lamp will flash.
3. After the engine warning lamp illuminates, it will be switched off under the following conditions.
 - (1) When the engine-ECU 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 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 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 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: P0420
- Oxygen sensor: P0130
- Oxygen sensor heater: P0135, P0141

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	1. Suspends lean burn operation. 2. 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.
Intake air temperature sensor	Controls as if the intake air temperature is 25°C.
Throttle position sensor (2nd channel)	1. Suspends lean burn operation. 2. Controls the throttle opening angle feedback (half as much as the opening rate in the normal condition) by using signals from the throttle position sensor (1st channel). However, this controlling system is not applied if the throttle position sensor (1st channel) and throttle position sensor (2nd channel) combination output voltage is outside 4 – 6 V. 3. Refrains from controlling the throttle opening angle feedback if the throttle position sensor (1st channel) is also defective.
Engine coolant temperature sensor	Controls as if the engine coolant temperature is 80°C. (Moreover, the control system is working until the ignition switch is turned OFF if the sensor signal returns to normal.)
Camshaft position sensor	Controls maintaining the condition before determined as failure. 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)
Vehicle speed sensor	1. Suspends lean burn operation. However, the control is cancelled as a certain time passes by with the engine speed of 1,500 r/min or more. 2. Suspends lean burn operation during the engine idling.
Barometric pressure sensor	Controls as if the barometric pressure is 101 kPa.
Detonation sensor	Fixes the ignition timing as that for standard petrol.
Injector	1. Suspends lean burn operation. 2. Suspends the exhaust gas recirculation.
Communication line with A/T-ECU	Disable ignition timing retard control (engine and transmission total control) during shift change.
Ignition coil (incorporating power transistor)	1. Suspends lean burn operation. 2. Cuts off the fuel supply to cylinders with an abnormal ignition signal.
Fuel pressure sensor	1. Controls as if the fuel pressure is 5 MPa. (In case of open/short circuit) 2. Turns the fuel pump relay off. (In case of abnormality in high pressure) 3. Suspends fuel injection. (when the low pressure is detected and the engine speed is more than 3,000 r/min)
Alternator FR terminal	Refrains from controlling to suppress the alternator output to electrical load. (Operated as a normal alternator)
Accelerator pedal position sensor (2nd channel)	1. Suspends lean burn operation. 2. Controls the throttle valve position by using signals from the accelerator pedal position sensor (1st channel). (However, the control system is not applicable if the difference from the accelerator pedal position sensor (1st channel) output voltage is 1.0 V or higher.) 3. Suspends the electronic controlled throttle valve system if accelerator pedal position sensor (1st channel) is also defective.

Malfunctioning item	Control contents during malfunction
Accelerator pedal position sensor (1st channel)	1. Suspends lean burn operation. 2. Controls the throttle valve position by using signals from the accelerator pedal position sensor (2nd channel). (However, this control is not applicable if the voltage difference between the accelerator pedal position sensor (1st channel) and accelerator pedal position sensor (2nd channel) is 1.0 V or higher.) 3. Also suspends the electronic-controlled throttle valve system when the accelerator pedal position sensor (2nd channel) is defective.
Throttle position sensor (1st channel)	1. Suspends lean burn operation. 2. Controls throttle opening angle feedback by using signals from throttle position sensor (2nd channel). (However, the controlling system is not applied when the throttle position sensor (1st channel) and throttle position sensor (2nd channel) combination output voltage is outside 4 – 6 V.) 3. Refrains from controlling the throttle opening angle feedback when throttle position sensor (2nd channel) is also defective.
Electronic-controlled throttle valve system	1. Suspends the electronic controlled throttle valve system. 2. Suspends lean burn operation. 3. Suspends the idle speed feedback control.
Throttle valve position feedback	1. Suspends the electronic controlled throttle valve system. 2. Suspends lean burn operation. 3. Suspends the engine speed feedback control.
Communication line between the throttle valve controller and the engine-ECU	1. Communication error between the throttle valve controller and the engine-ECU • Suspends lean burn operation. • Cuts the fuel supply when the engine speed reaches 3,000 r/min or more. • Suspends the cruise-control. 2. Communication error between the throttle valve controller and the engine-ECU • Suspends lean burn operation. • Cuts the fuel supply when the engine speed reaches 3,000 r/min or more. • Suspends the cruise-control. • The throttle valve controller controls the throttle valve opening angle by using signals from accelerator pedal position sensor (2nd channel).
Throttle control servo motor 1st phase malfunction	Bans lean burn operation.
Throttle control servo motor 2nd phase malfunction	1. Suspends electronic control throttle valve system. 2. Bans lean burn operation. 3. Bans engine speed feed back control.
Misfiring	If the detected misfiring causes damage to the catalyst, the misfiring cylinder will be shut down.

NOTE

If the electronic-controlled throttle valve system is suspended, the engine warning lamp will illuminate.

INSPECTION CHART FOR DIAGNOSIS CODES

Code No.	Diagnosis item	Reference page
P0100	Air flow sensor system	13A-14
P0105	Barometric pressure sensor system	13A-16
P0110	Intake air temperature sensor system	13A-18
P0115	Engine coolant temperature sensor system	13A-19
P0120★	Throttle position sensor 1 (1st channel) system	13A-22
P0125	Feedback system	13A-24
P0130	Oxygen sensor (front) system <sensor 1>	13A-25
P0135	Oxygen sensor heater (front) system <sensor 1>	13A-27
P0136	Oxygen sensor (rear) system <sensor 2>	13A-28
P0141	Oxygen sensor heater (rear) system <sensor 2>	13A-30
P0170	Abnormal fuel system	13A-31
P0190★	Abnormal fuel pressure	13A-33
P0201	No. 1 injector system	13A-34
P0202	No. 2 injector system	13A-36
P0203	No. 3 injector system	13A-37
P0204	No. 4 injector system	13A-38
P0220★	Accelerator pedal position sensor (1st channel) system	13A-40
P0225★	Throttle position sensor (2nd channel) system	13A-43
P0300★	Ignition coil (power transistor) system	13A-44
P0301	No. 1 cylinder misfire detected	13A-46
P0302	No. 2 cylinder misfire detected	13A-46
P0303	No. 3 cylinder misfire detected	13A-46
P0304	No. 4 cylinder misfire detected	13A-46
P0325	Detonation sensor system	13A-47
P0335	Crank angle sensor system	13A-47
P0340	Camshaft position sensor system	13A-59
P0403	EGR valve system	13A-50
P0420	Catalyst malfunction	13A-51
P0443	Purge control solenoid valve system	13A-52
P0500	Vehicle speed sensor system	13A-53
P1200	Injector driver system	13A-53
P1220★	Electronic-controlled throttle valve system	13A-54

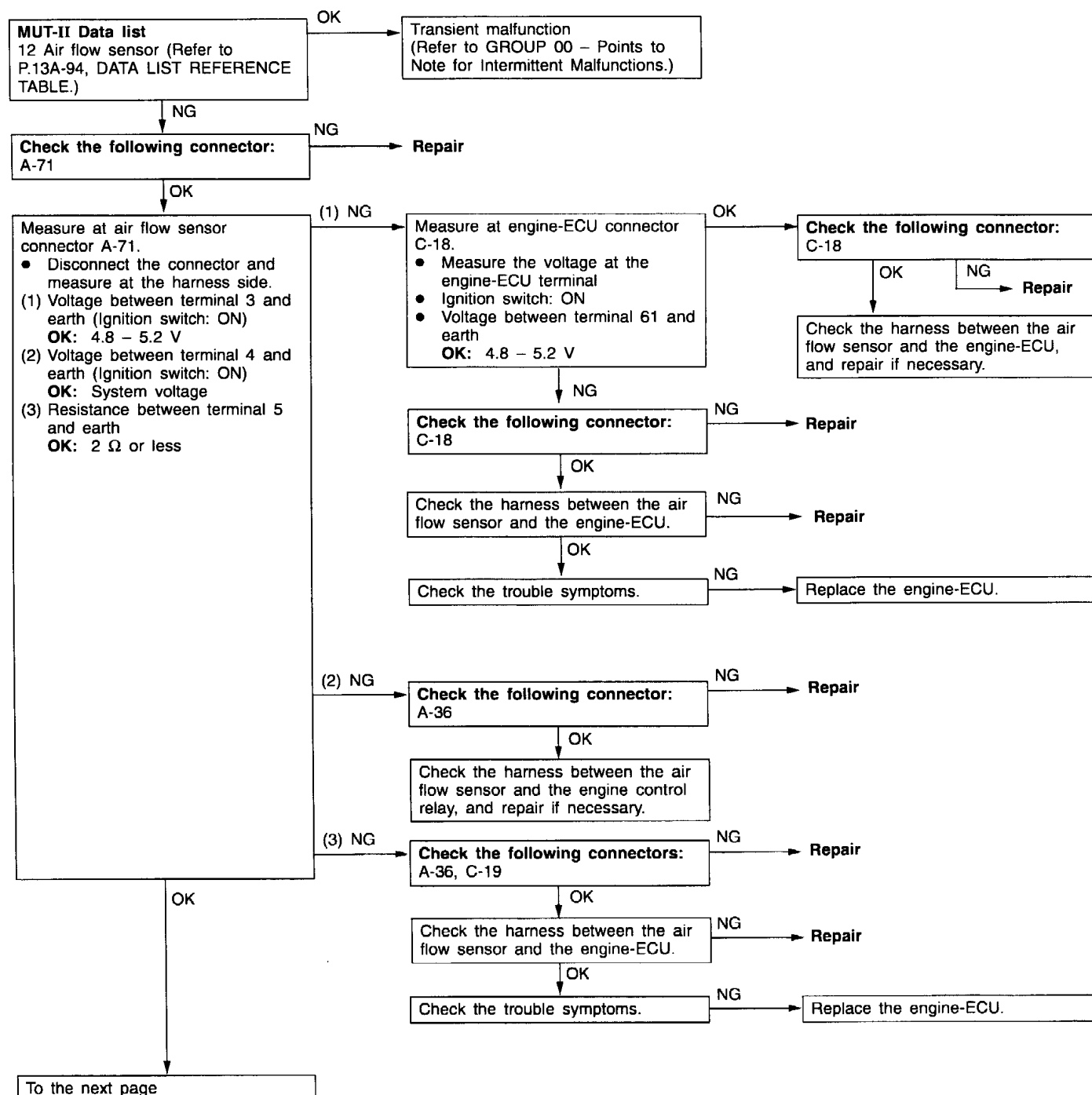
Code No.	Diagnosis item	Reference page
P1221★	Throttle valve position feedback system	13A-55
P1223★	Communication line with throttle valve controller	13A-56
P1224★	Throttle valve control servo motor (motor 1st phase malfunction) system	13A-57
P1225★	Accelerator pedal position sensor (2nd channel) system	13A-58
P1228★	Throttle valve control servo motor (motor 2nd phase malfunction) system	13A-60
P1500	Alternator FR terminal system	13A-61
P1515	Brake vacuum sensor system	13A-62
P1600	Communication wire with A/T-ECU system	13A-64
P1610	Immobilizer system	13A-64

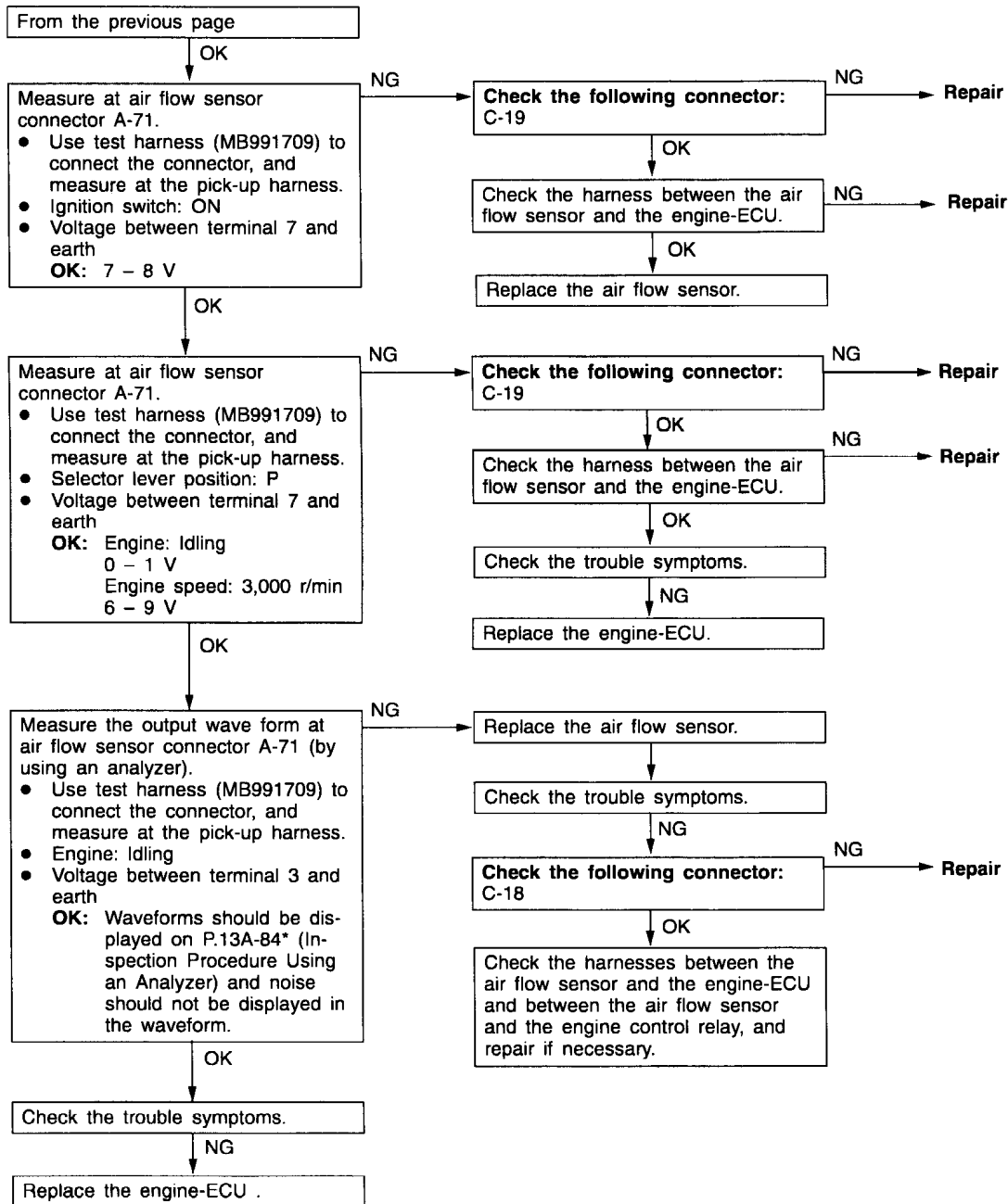
NOTE

1. Do not replace the engine-ECU until a through terminal check reveals there are no short/open circuit.
2. Check that the engine-ECU earth circuit is normal before checking for the cause of the problem.
3. After the engine-ECU 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

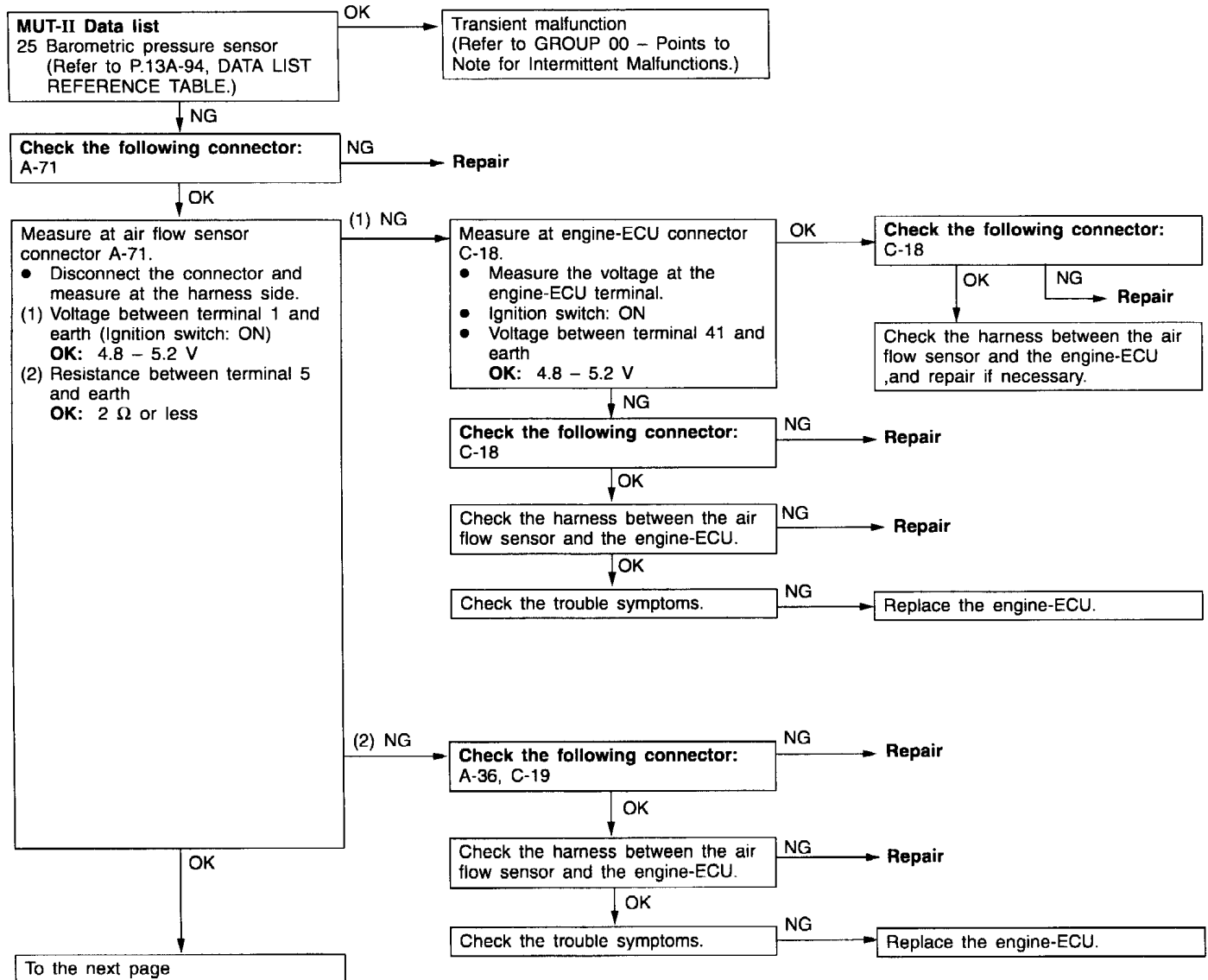


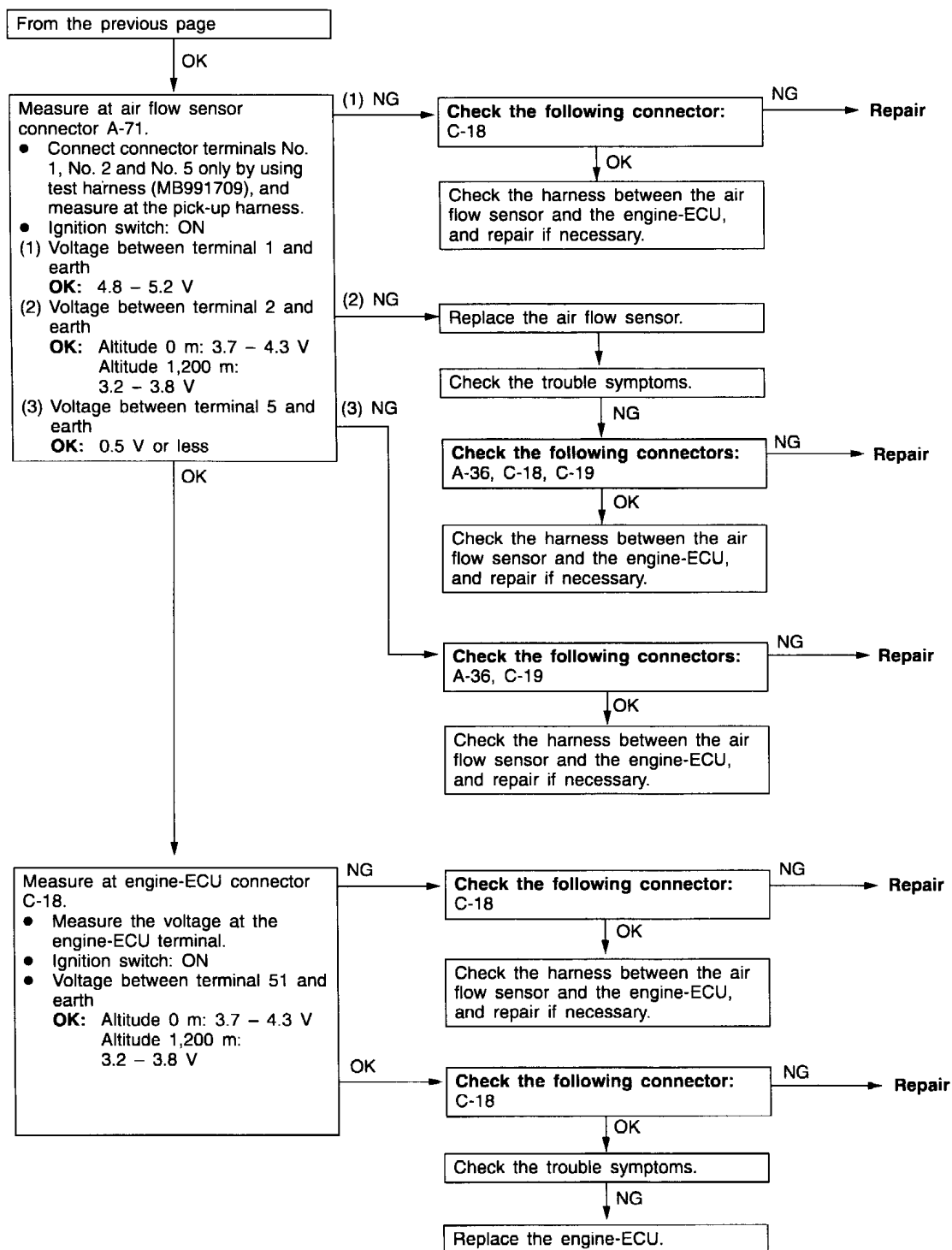


NOTE

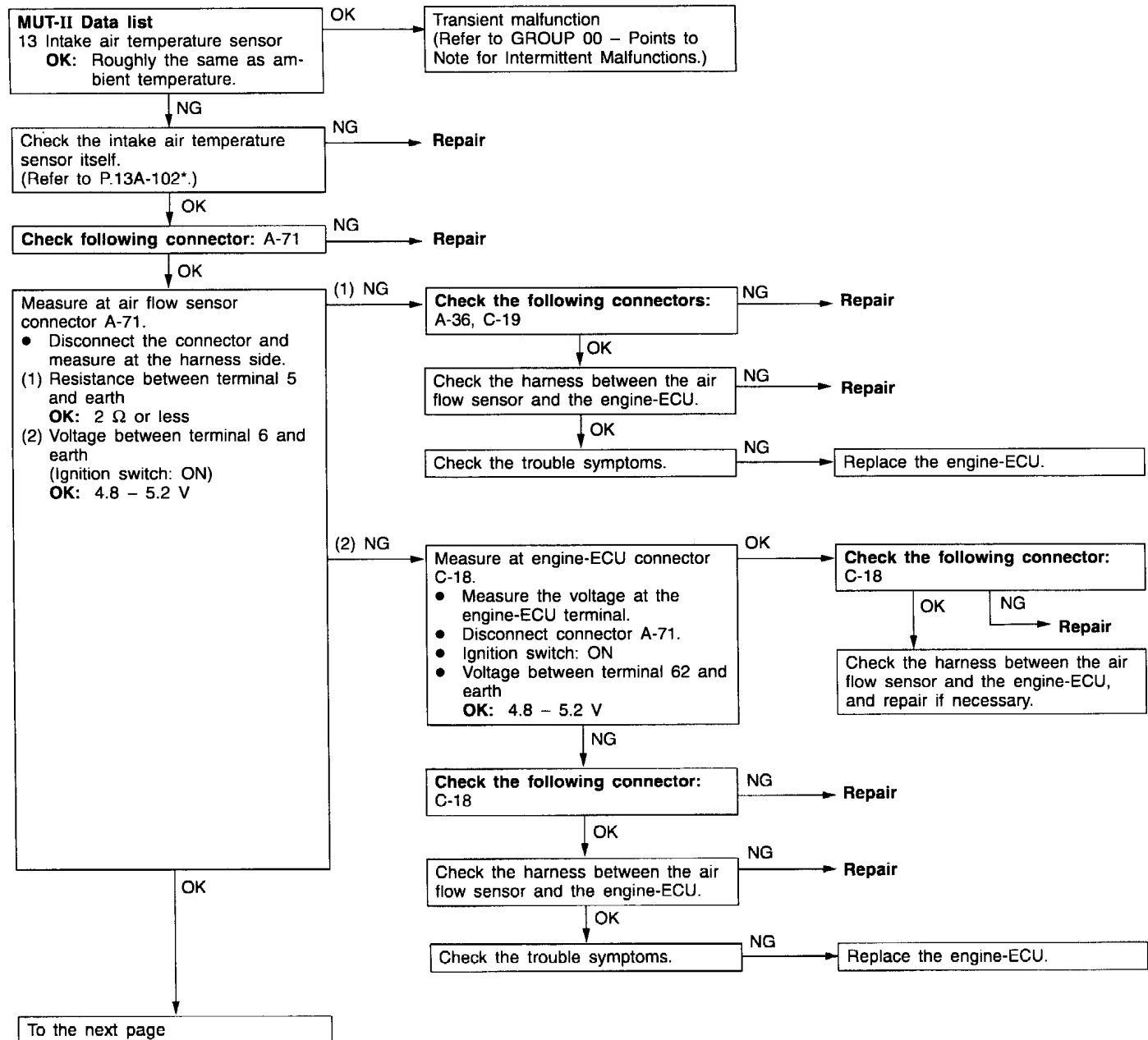
*: Refer to the '00 PAJERO PININ Workshop Manual (Pub. No. CKRE00E1).

Code No. P0105 Barometric pressure sensor system	Probable cause
Range of Check - Two seconds have passed since the ignition switch is turned ON or the engine starting process is completed. - Battery voltage: 8 V or more Set Conditions - The sensor output voltage is 4.5 V or more for four seconds (equivalent to 114 kPa of barometric pressure) or - The sensor output voltage is 0.2 V or less (equivalent to 53 kPa of barometric pressure)	- Malfunction of barometric pressure sensor - Open or short circuit in barometric pressure sensor circuit or loose connector contact - Malfunction of engine-ECU



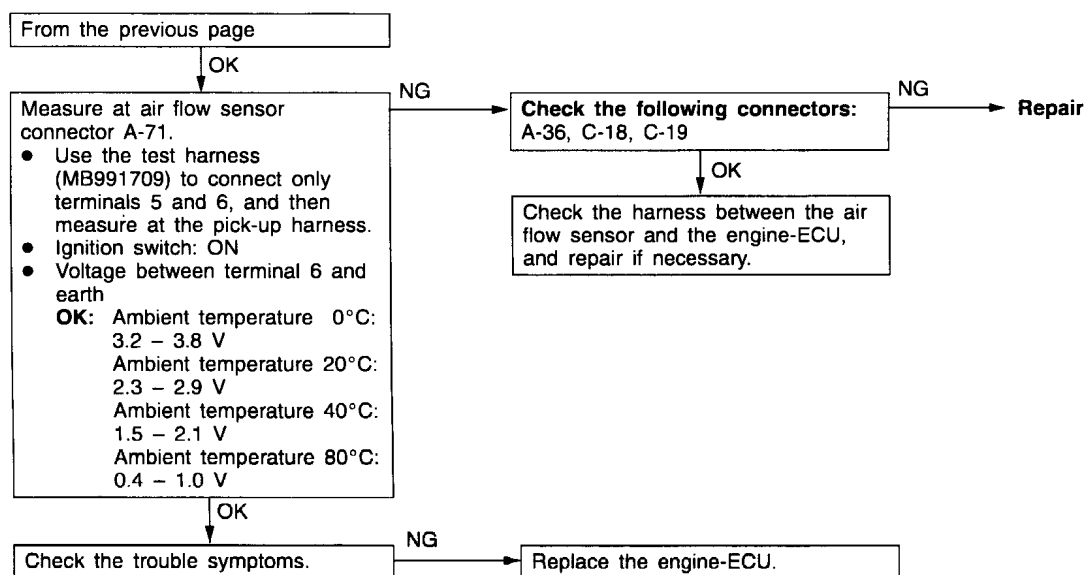


Code No. P0110 Intake air temperature sensor system	Probable cause
Range of Check - Two seconds have passed since the ignition switch is turned ON or the engine starting process is completed. Set Conditions - The sensor output voltage is 4.6 V or more for four seconds (equivalent to -45°C of intake air temperature) or - The sensor output voltage is 0.2 V or more for four seconds (equivalent to 125°C of intake air temperature)	- Malfunction of intake air temperature sensor - Open or short circuit in intake air temperature sensor or loose connector contact - Malfunction of engine-ECU

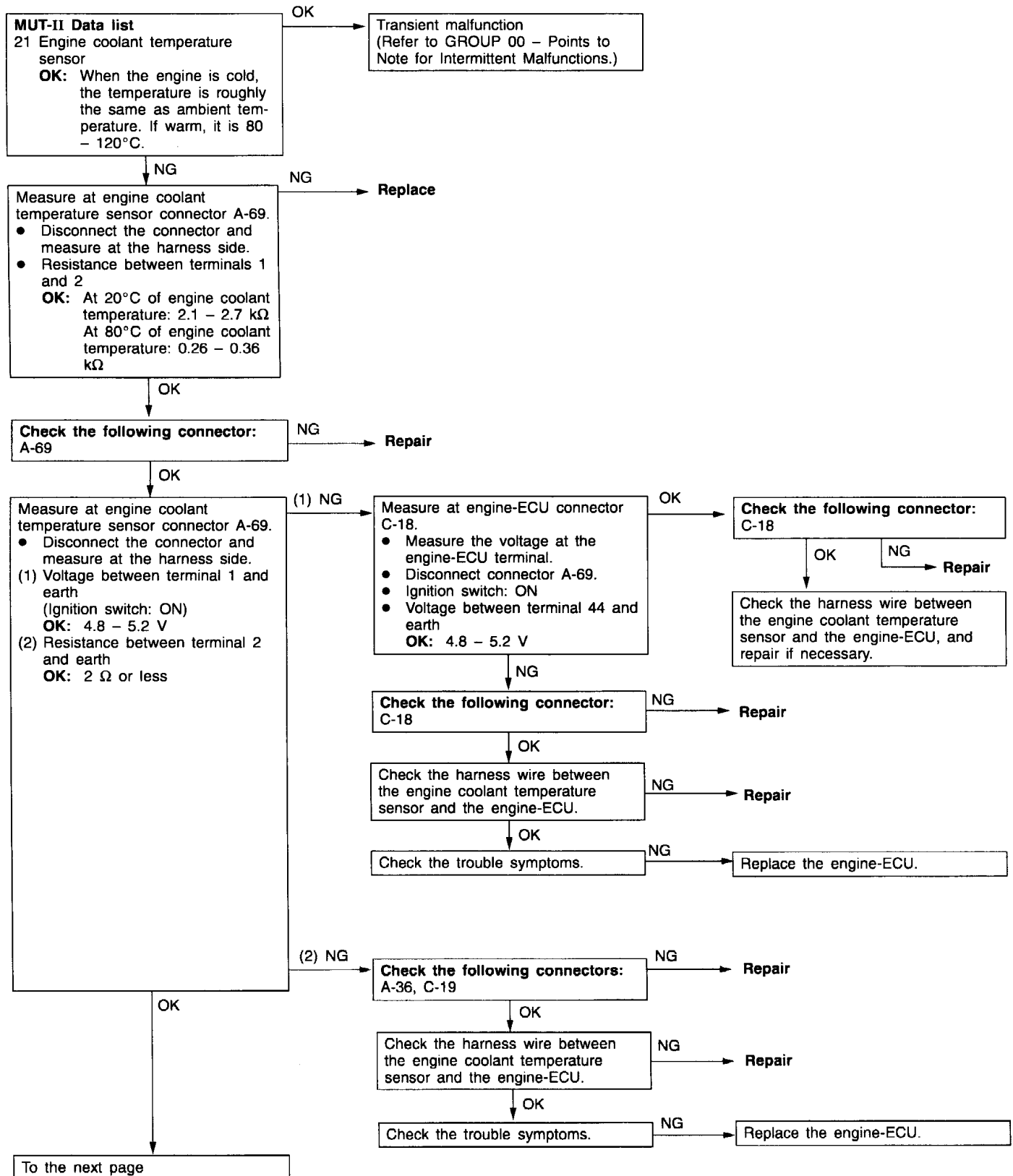


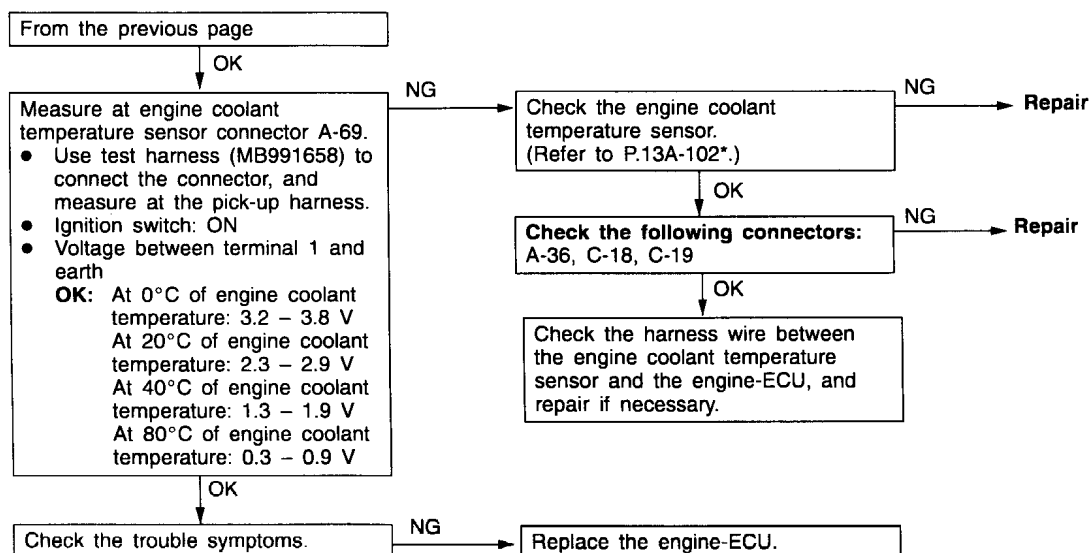
NOTE

*: Refer to the '00 PAJERO PININ Workshop Manual (Pub. No. CKRE00E1).



Code No. P0115 Engine coolant temperature sensor system	Probable cause
Range of Check • Engine: Two seconds after the engine has been started Set Conditions • The sensor output voltage is 4.6 V or more for four seconds (equivalent to -45°C of engine coolant temperature) or • The sensor output voltage is 0.1 V or less for four seconds (equivalent to 140°C of engine coolant temperature) Range of Check • Engine: After starting Set Conditions • 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.	• Malfunction of engine coolant temperature sensor • Open or short circuit in the engine coolant temperature sensor circuit or loose connector contact • Malfunction of engine-ECU





NOTE

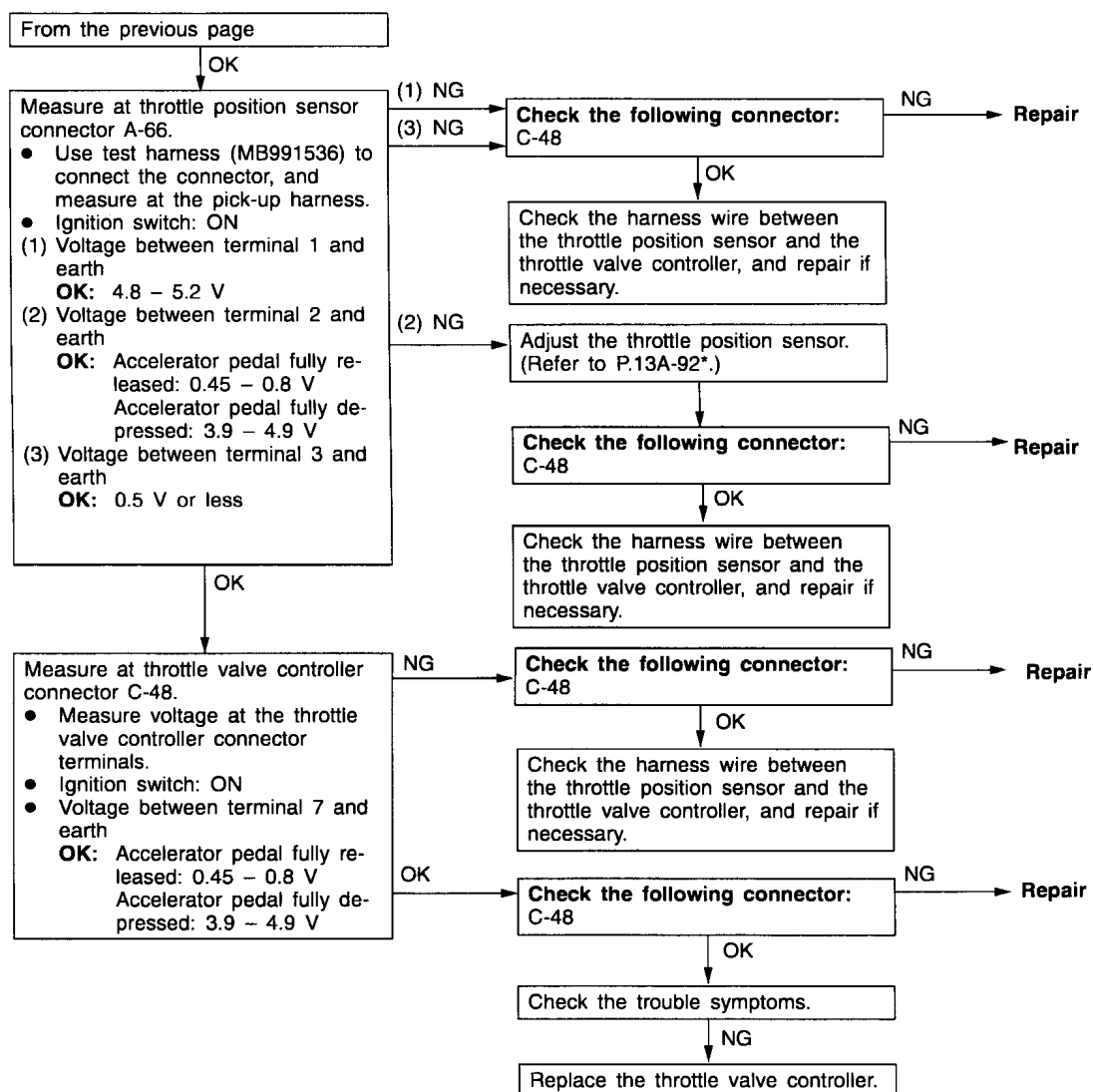
*: Refer to the '00 PAJERO PININ Workshop Manual (Pub. No. CKRE00E1).

```

graph TD
    Start([Start]) --> MUTII[MUT-II Data list  
79 Throttle position sensor (1st channel)  
(Refer to P.13A-94, DATA LIST REFERENCE TABLE.)]
    MUTII -- OK --> Tmf[Transient malfunction  
(Refer to GROUP 00 – Points to Note for Intermittent Malfunctions.)]
    MUTII -- NG --> Tps[Check the throttle position sensor.  
(Refer to P.13A-103*.)]
    Tps -- NG --> Replace[Replace]
    Tps -- OK --> A06[Check the following connector:  
A-06]
    A06 -- NG --> Repair1[Repair]
    A06 -- OK --> Measure1[Measure at throttle position sensor connector A-06.  
• Disconnect the connector and measure at the harness side.  
(1) Voltage between terminal 1 and earth  
(Ignition switch: ON)  
OK: 4.8 – 5.2 V  
(2) Resistance between terminal 3 and earth  
OK: 2 Ω or less]
    Measure1 -- (1) NG --> Measure2[Measure at throttle valve controller connector C-48.  
• Measure voltage at the throttle valve controller connector terminals.  
• Ignition switch: ON  
• Voltage between terminal 6 and earth  
OK: 4.8 – 5.2 V]
    Measure1 -- (2) NG --> C48_2[Check the following connector:  
C-48]
    Measure1 -- OK --> NextPage[To the next page]
    Measure2 -- OK --> C48_1[Check the following connector:  
C-48]
    Measure2 -- NG --> C48_2
    C48_1 -- OK --> CheckWire1[Check the harness wire between the throttle position sensor and the throttle valve controller, and repair if necessary.]
    C48_1 -- NG --> Repair2[Repair]
    C48_2 -- NG --> Repair2
    C48_2 -- OK --> CheckWire2[Check the harness wire between the throttle position sensor and the throttle valve controller.]
    CheckWire2 -- NG --> Repair2
    CheckWire2 -- OK --> CheckSym1[Check the trouble symptoms.]
    CheckSym1 -- NG --> ReplaceTV[Replace the throttle valve controller.]
    CheckSym1 -- OK --> C48_3[Check the following connector:  
C-48]
    C48_3 -- NG --> Repair2
    C48_3 -- OK --> CheckWire3[Check the harness wire between the throttle position sensor and the throttle valve controller.]
    CheckWire3 -- NG --> Repair2
    CheckWire3 -- OK --> CheckSym2[Check the trouble symptoms.]
    CheckSym2 -- NG --> ReplaceTV
    CheckSym2 -- OK --> End([End])

```

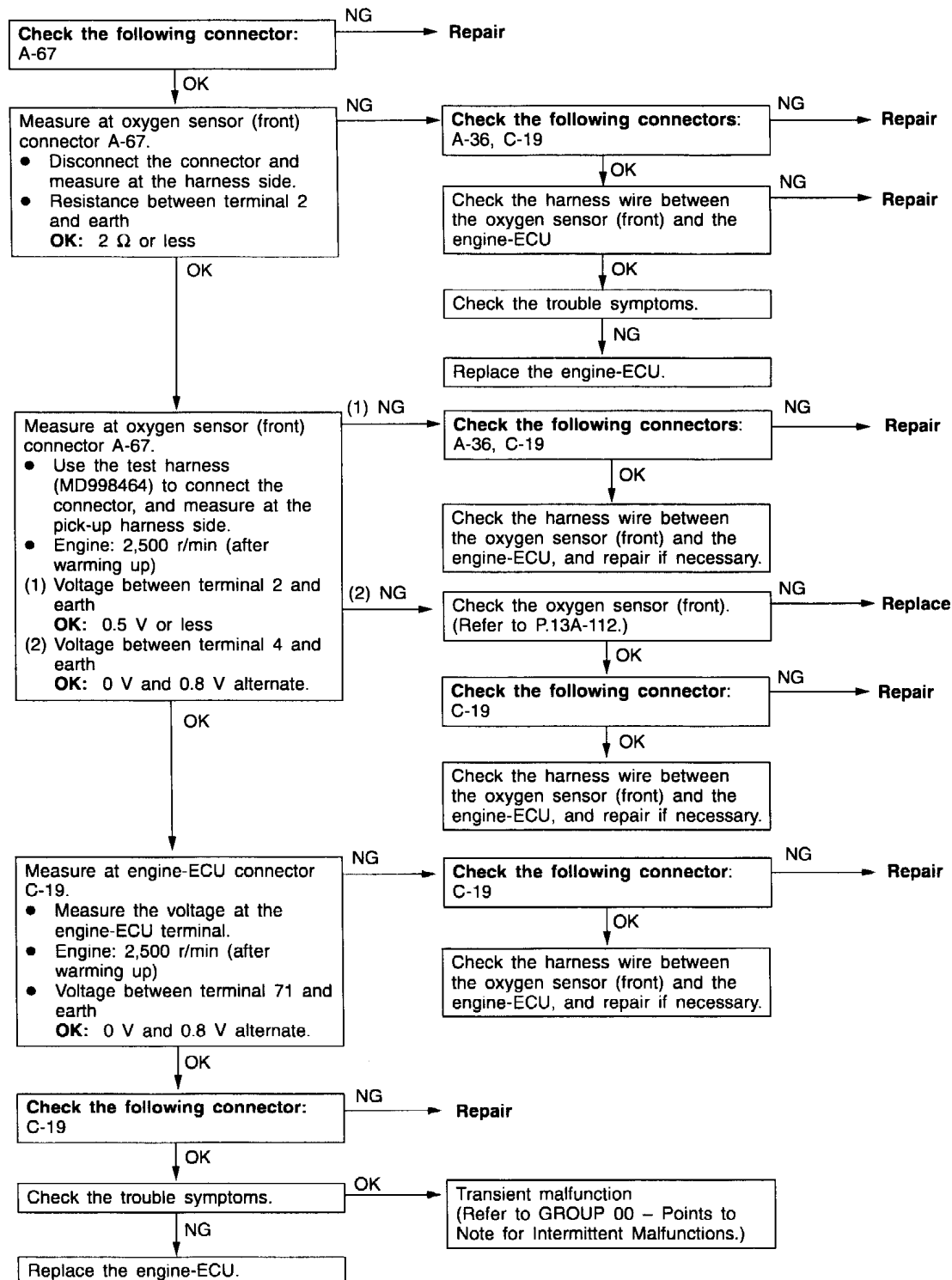
*: Refer to the '00 PAJERO PININ Workshop Manual (Pub. No. CKPE00E1)



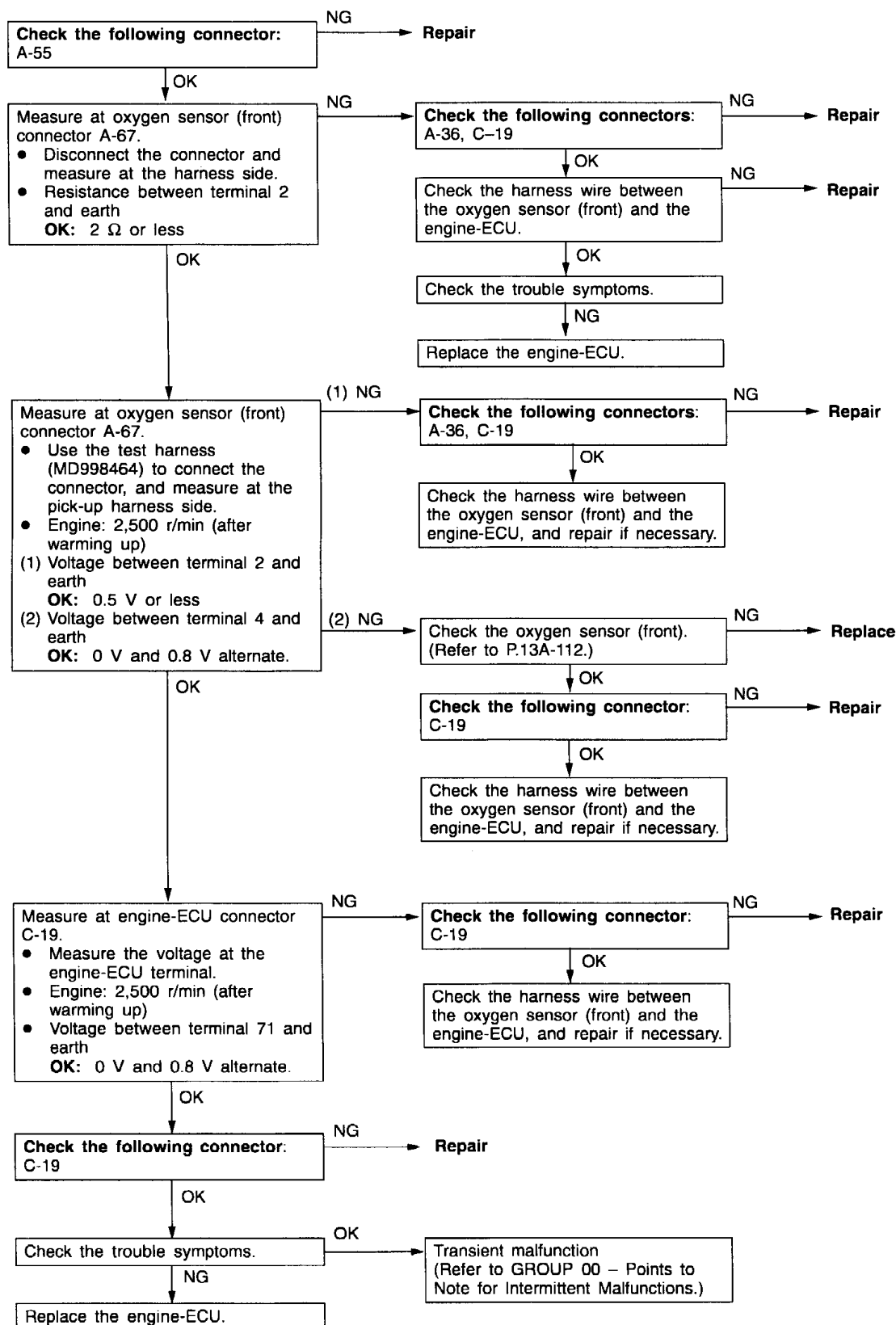
NOTE

*: Refer to the '00 PAJERO PININ Workshop Manual (Pub. No. CKRE00E1)

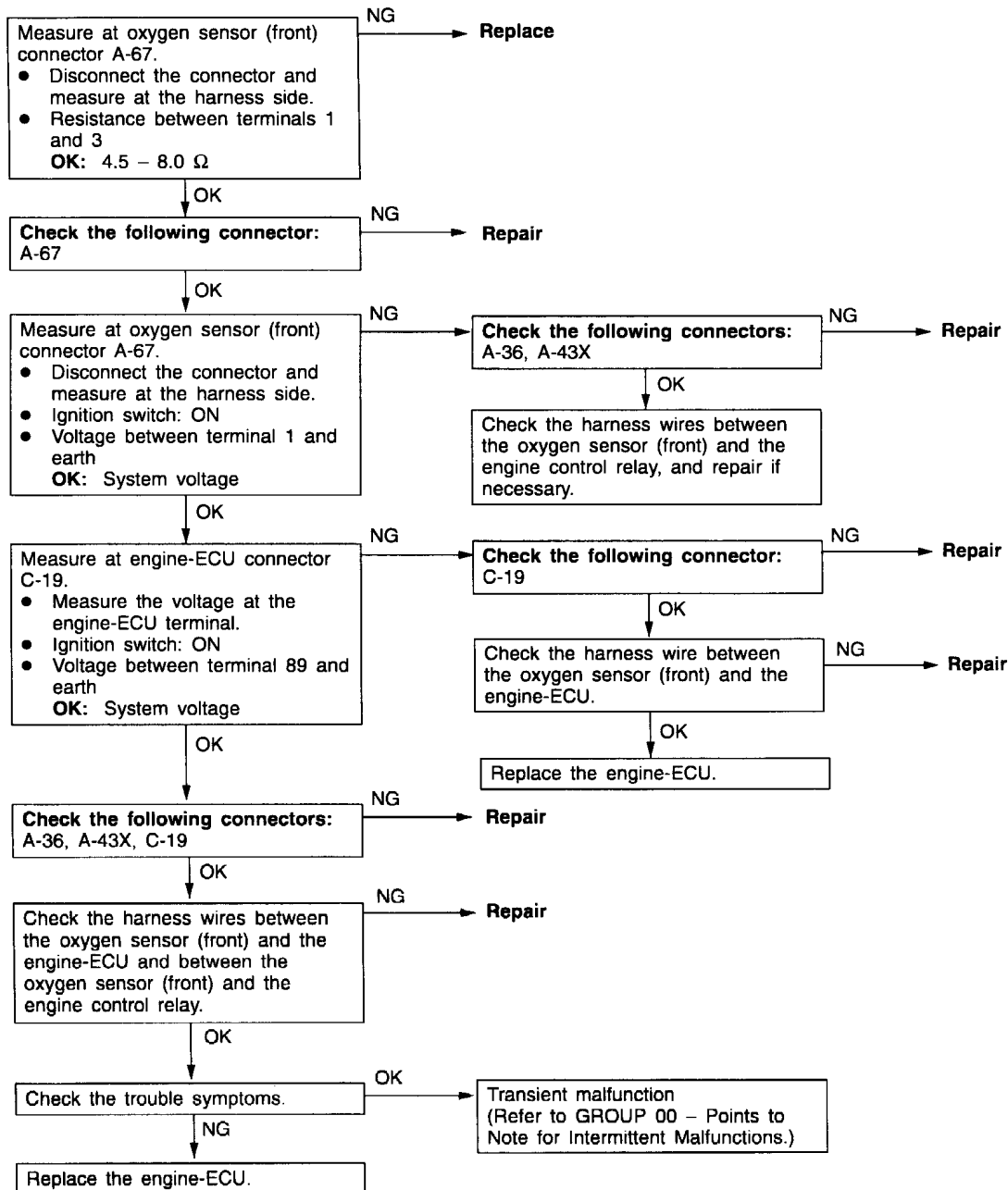
Code No. P0125 Feedback system	Probable cause
Range of Check • The engine coolant temperature is approx. 80°C or more. • During stoichiometric feedback control • The vehicle is not being decelerated. Set Conditions • Oxygen sensor (front) output voltage has been higher or lower than 0.5 V for at least thirty seconds.	• Malfunction of oxygen sensor (front) • Open or short circuit in the oxygen sensor (front) circuit or loose connector contact • Malfunction of engine-ECU



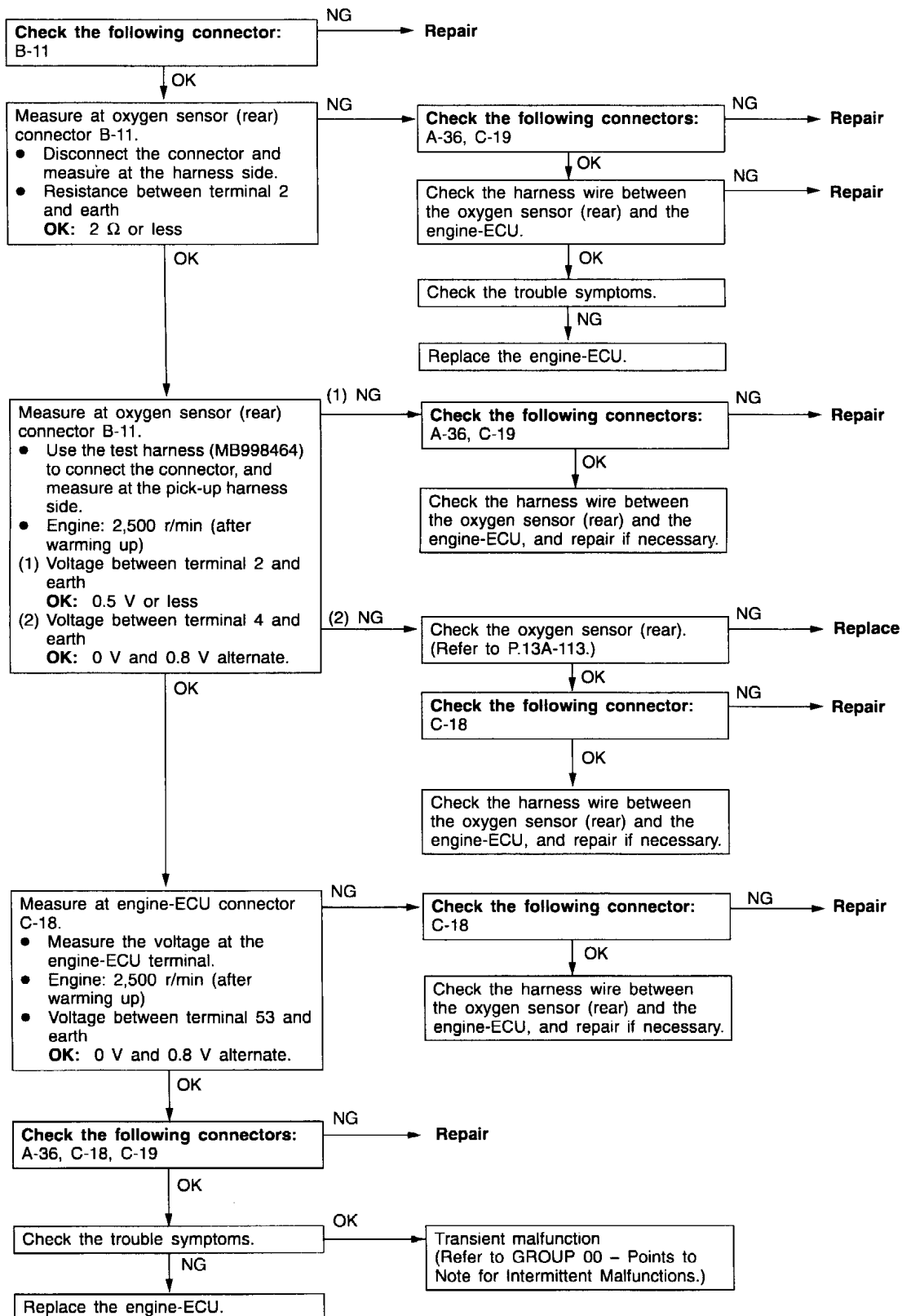
Code No. P0130 Oxygen sensor (front) system <sensor 1>	Probable cause
Range of Check • Three minutes have been passed since the engine has been started. • The engine coolant temperature is approx. 80°C or more. • Intake air temperature is 20 – 50°C • Engine speed is 1,200 r/min or more • Driving on a level surface at constant speed. Set Conditions • The oxygen sensor (front) output voltage is 4.5 V or more when the sensor output voltage is 0.2 V or less and a voltage of 5 V is applied to the oxygen sensor (front) inside the engine-ECU.	• Malfunction of oxygen sensor (front) • Open or short circuit in the oxygen sensor (front) circuit or loose connector contact • Malfunction of engine-ECU
Range of Check • Engine speed is 3,000 r/min or less • During driving • During air/fuel ratio feedback control Set Conditions • The oxygen sensor (front) output frequency is five or less per 12 seconds on average.	



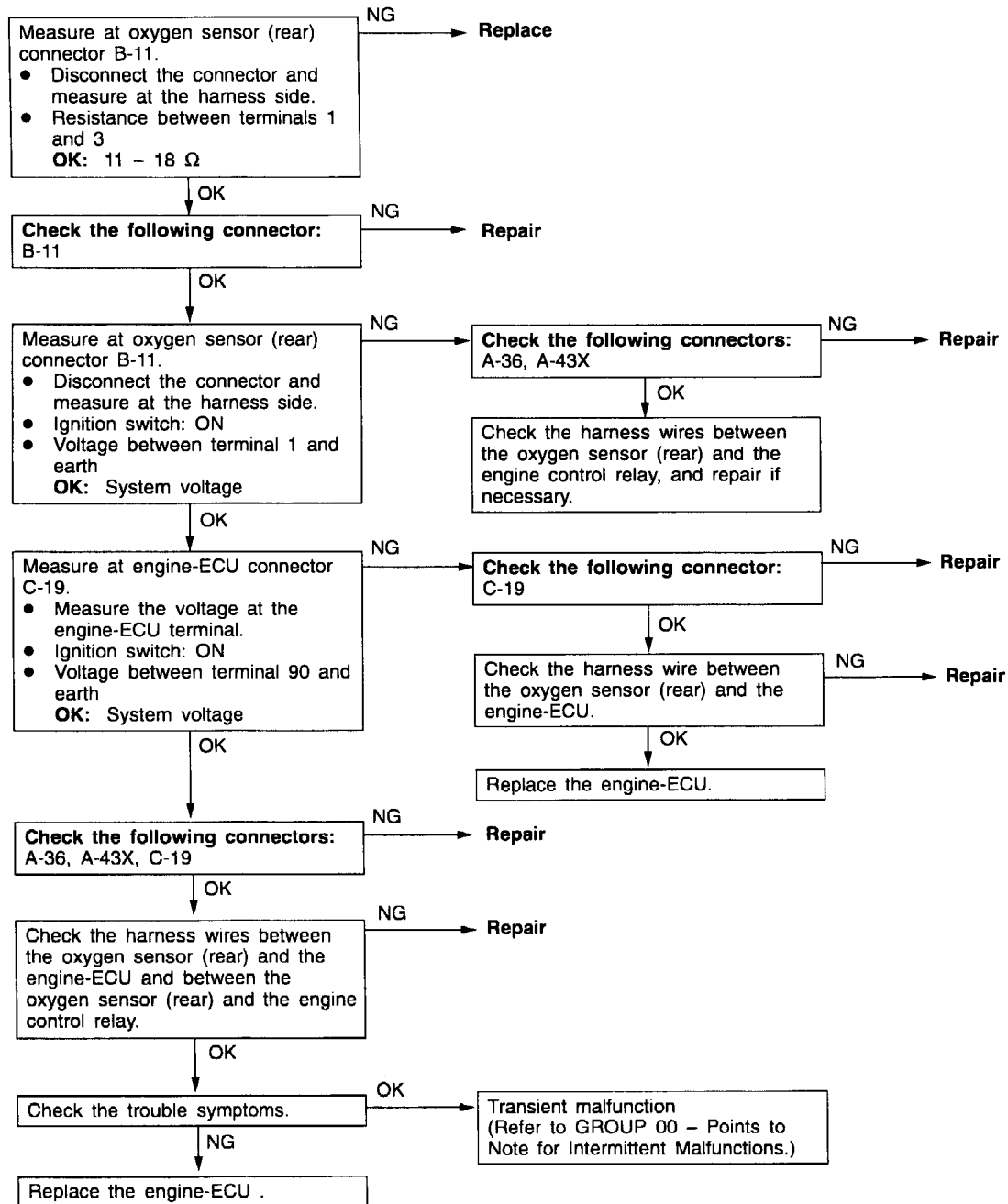
Code No. P0135 Oxygen sensor heater (front) system <sensor 1>	Probable cause
Range of Check • The engine coolant temperature is approx. 20°C or more. • The oxygen sensor heater (front) remains on. • The engine speed is 50 r/min or more. • Battery voltage is 11 – 16 V. Set Conditions • The current, which flows through the oxygen sensor heater (front), is 0.2 A or less or 3.5 A or more for six seconds.	• Malfunction of oxygen sensor heater (front) • Open or short circuit in the oxygen sensor heater (front) circuit or loose connector contact • Malfunction of engine-ECU



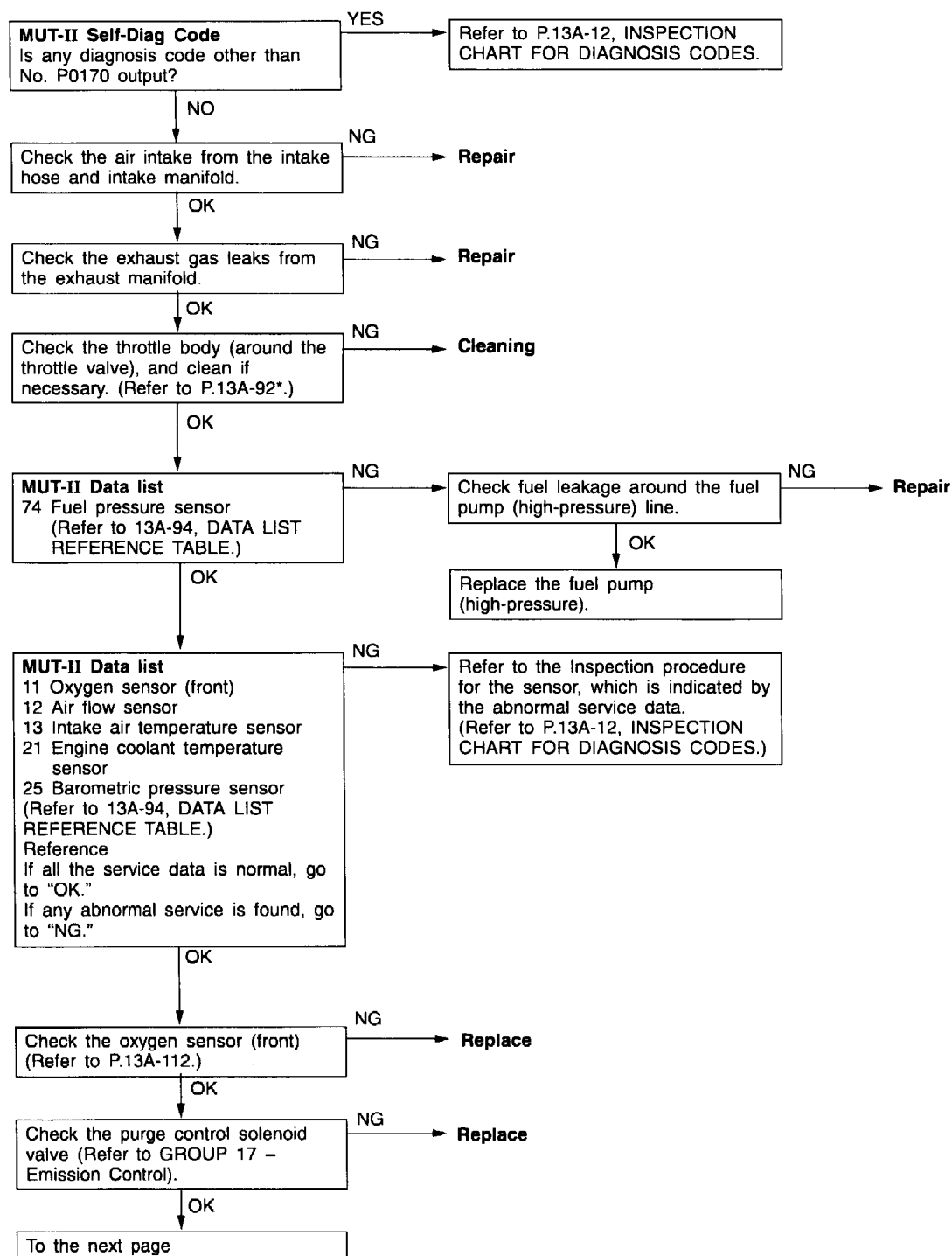
Code No. P0136 Oxygen sensor (rear) system <sensor 2>	Probable cause
Range of Check • Three minutes have been passed since the engine has been started. • The engine coolant temperature is approx. 80°C or more. • Intake air temperature is 20 – 50°C • Engine speed is 1,200 r/min or more • Driving on a level surface at constant speed. Set Conditions • The oxygen sensor (rear) output voltage is 4.5 V or more when the sensor output voltage is 0.2 V or less and a voltage of 5 V is applied to the oxygen sensor (rear) inside the engine-ECU.	• Malfunction of oxygen sensor (rear) • Open or short circuit in the oxygen sensor (rear) circuit or loose connector contact • Malfunction of engine-ECU
Range of Check • Two seconds have passed after the engine-ECU detected an open circuit. • When the oxygen sensor (front) is in good condition. Set Conditions • When the air/fuel ratio is rich, the oxygen sensor (front) output voltage is 0.5 V or more, the oxygen sensor (rear) output voltage is less than 0.1 V, and the oxygen sensor (rear) output voltage fluctuates within 0.078 V.	



Code No. P0141 Oxygen sensor heater (rear) system <sensor 2>	Probable cause
Range of Check • The engine coolant temperature is approx. 20°C or more. • The oxygen sensor heater (rear) remains on. • The engine speed is 50 r/min or more. • Battery voltage is 11 – 16 V. Set Conditions • 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.	• Malfunction of oxygen sensor heater (rear) • Open or short circuit in the oxygen sensor heater (rear) circuit or loose connector contact • Malfunction of engine-ECU

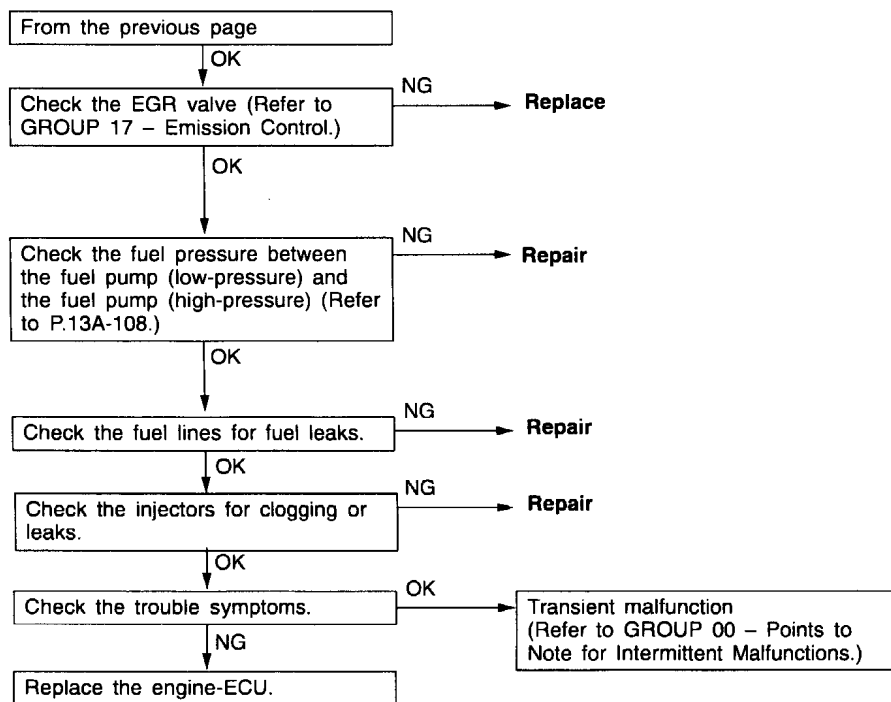


Code No. P0170 Abnormal fuel system	Probable cause
Range of Check • Engine: Being learning the air-fuel ratio Set Conditions • Ten seconds or more have been passed while the fuel injection amount compensation value is too low. or • Ten seconds or more have been passed while the fuel injection amount compensation value is too high.	• Malfunction of fuel supply system • Malfunction of oxygen sensor (front) • Malfunction of intake air temperature sensor • Malfunction of barometric pressure sensor • Malfunction of air flow sensor • Malfunction of engine-ECU

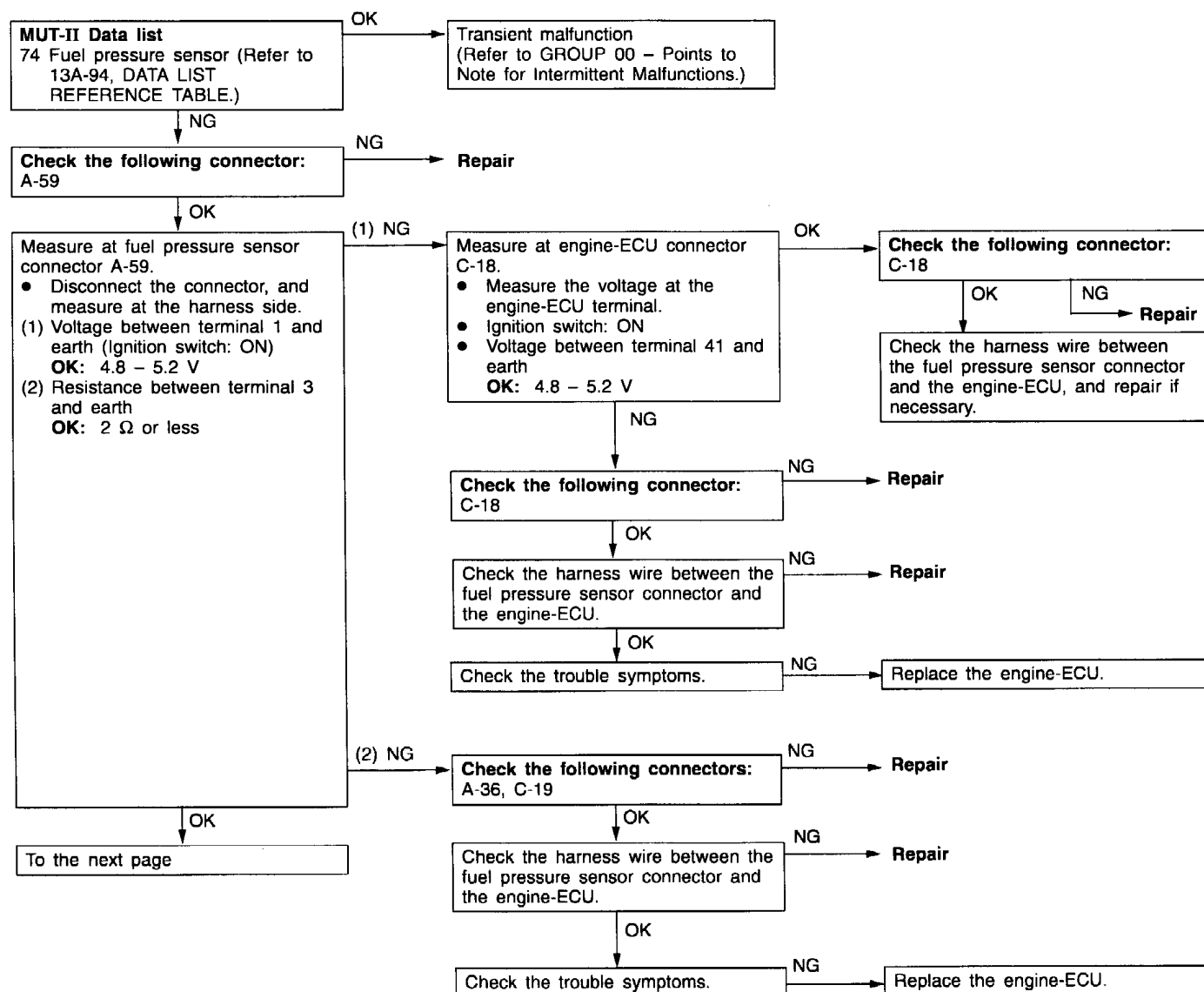


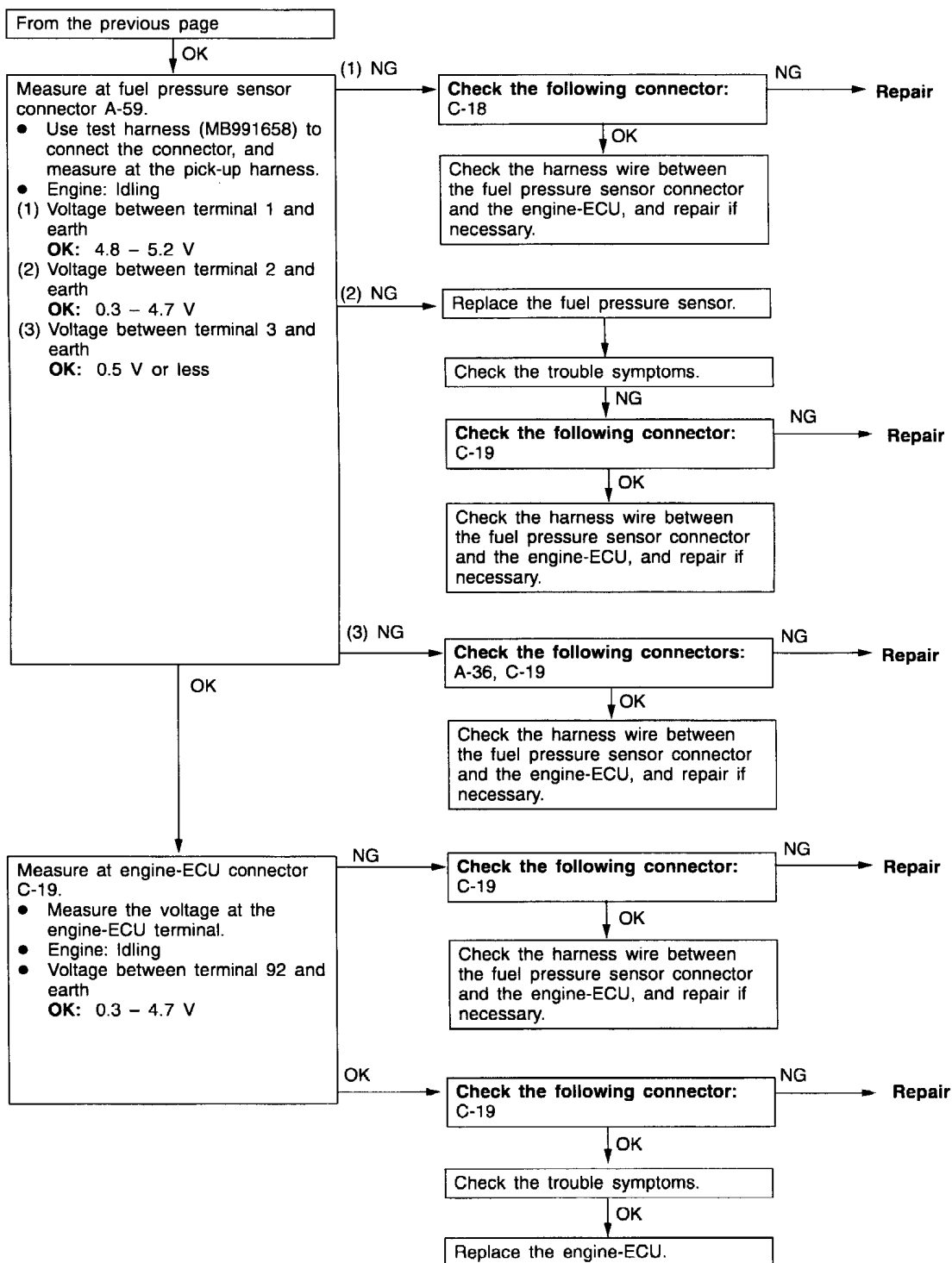
NOTE

*: Refer to the '00 PAJERO PININ Workshop Manual (Pub. No. CKRE00E1)



Code No. P0190 Abnormal fuel pressure	Probable cause
Range of Check • Ignition switch: ON Set Conditions • The sensor output voltage is 4.8 V or more, or 0.2 V or less for four seconds.	• Malfunction of fuel pressure sensor • Open or short circuit in the fuel pressure sensor circuit or loose connector contact • Malfunction of engine-ECU
Range of Check • The following conditions are detected temporarily after the engine has been started. (1) Engine speed: 1,000 r/min or more (2) Fuel pressure: 2 MPa or more • Engine running Set Conditions • The fuel pressure is 6.9 MPa or more, or 2 MPa or less for four seconds.	• Malfunction of high-pressure fuel pump • Clogging of high-pressure fuel lines
This diagnosis code will also be output when air is trapped into the high-pressure fuel lines (such as poor fuel level). In that case, the air can be evacuated by operating the engine for at least 15 seconds at 2,000 r/min. After the repair, use the MUT-II to erase the diagnosis code.	• Air trapped due to poor fuel level



**Code No. P0201 No. 1 injector system****Range of Check**

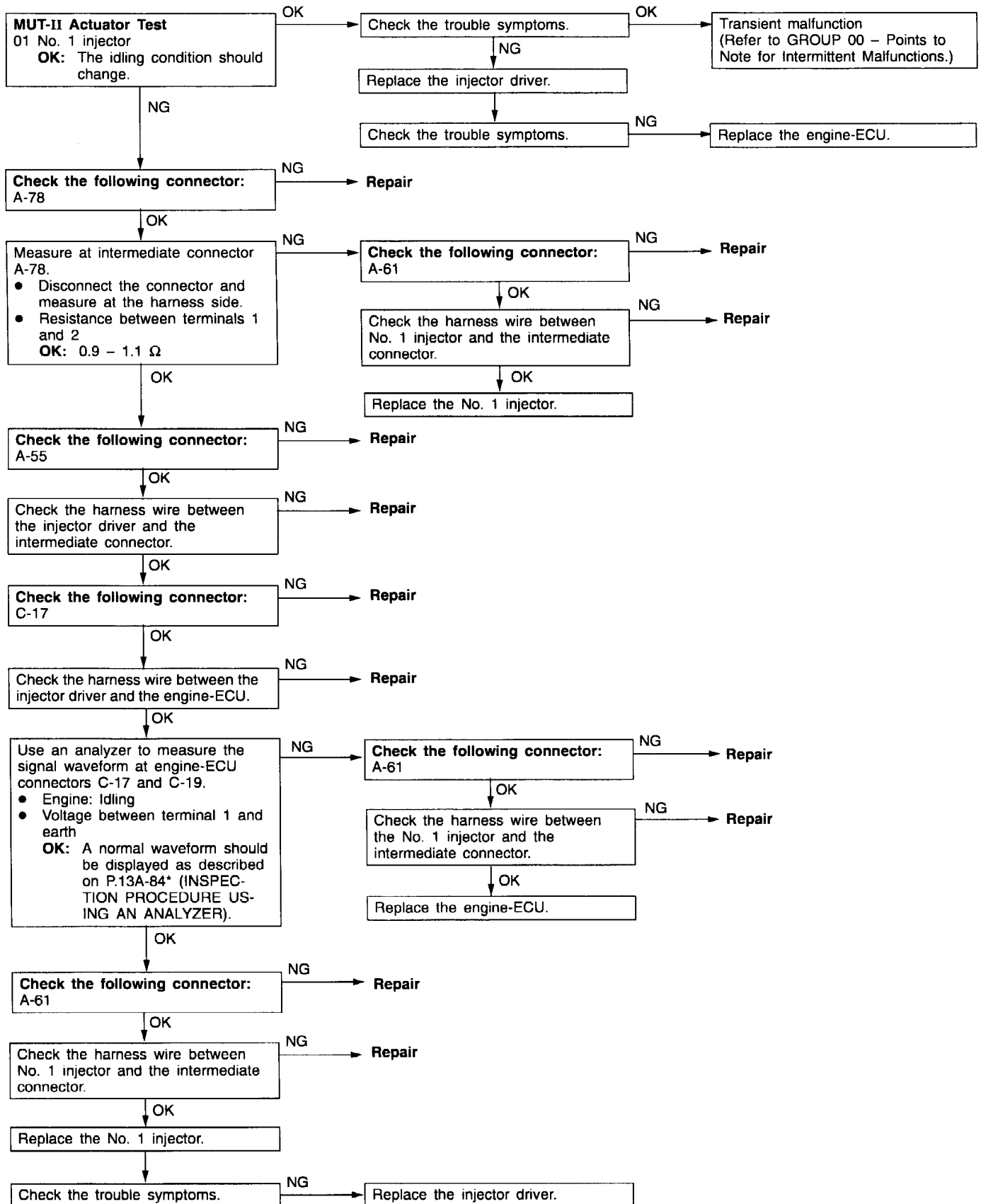
- The engine speed is 4,000 r/min or less.
- The battery voltage is 10 V or more.
- The fuel cut operation or the injector operation (by carrying out the Actuator Test) is not in progress.

Set Conditions

- The injector driver is not transmitting a injector open circuit check signal for four seconds.

Probable cause

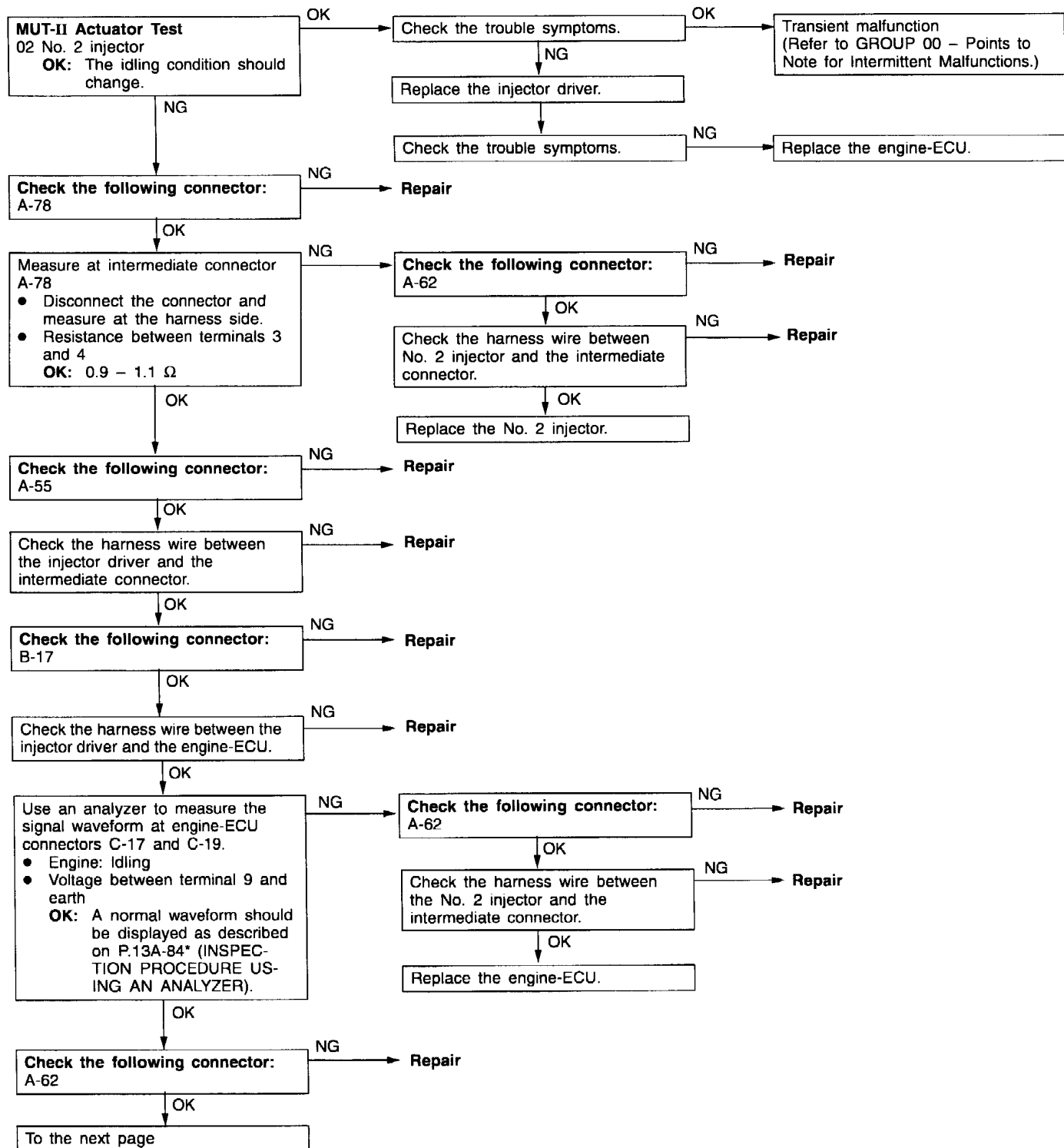
- Malfunction of No. 1 injector
- Open or short circuit in the No. 1 injector circuit or loose connector contact
- Malfunction of engine-ECU



NOTE

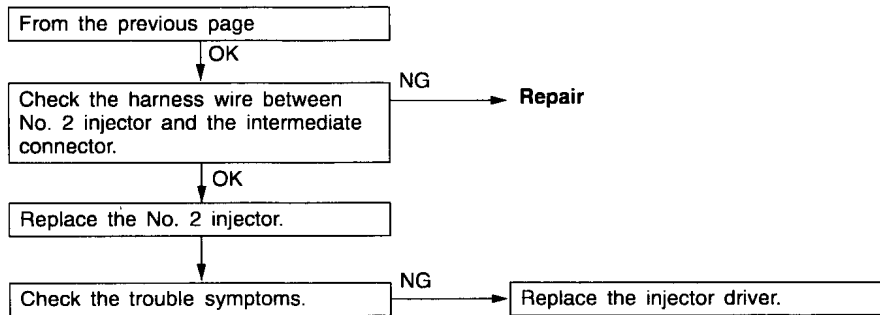
*: Refer to the '00 PAJERO PININ Workshop Manual (Pub. No. CKRE00E1)

Code No. P0202 No. 2 injector system	Probable cause
Range of Check - The engine speed is 4,000 r/min or less. - The battery voltage is 10 V or more. - The fuel cut operation or the injector operation (by carrying out the Actuator Test) is not in progress. Set Conditions - The injector driver is not transmitting a injector open circuit check signal for four seconds.	- Malfunction of No. 2 injector - Open or short circuit in the No. 2 injector circuit or loose connector contact - Malfunction of engine-ECU



NOTE

*: Refer to the '00 PAJERO PININ Workshop Manual (Pub. No. CKRE00E1)

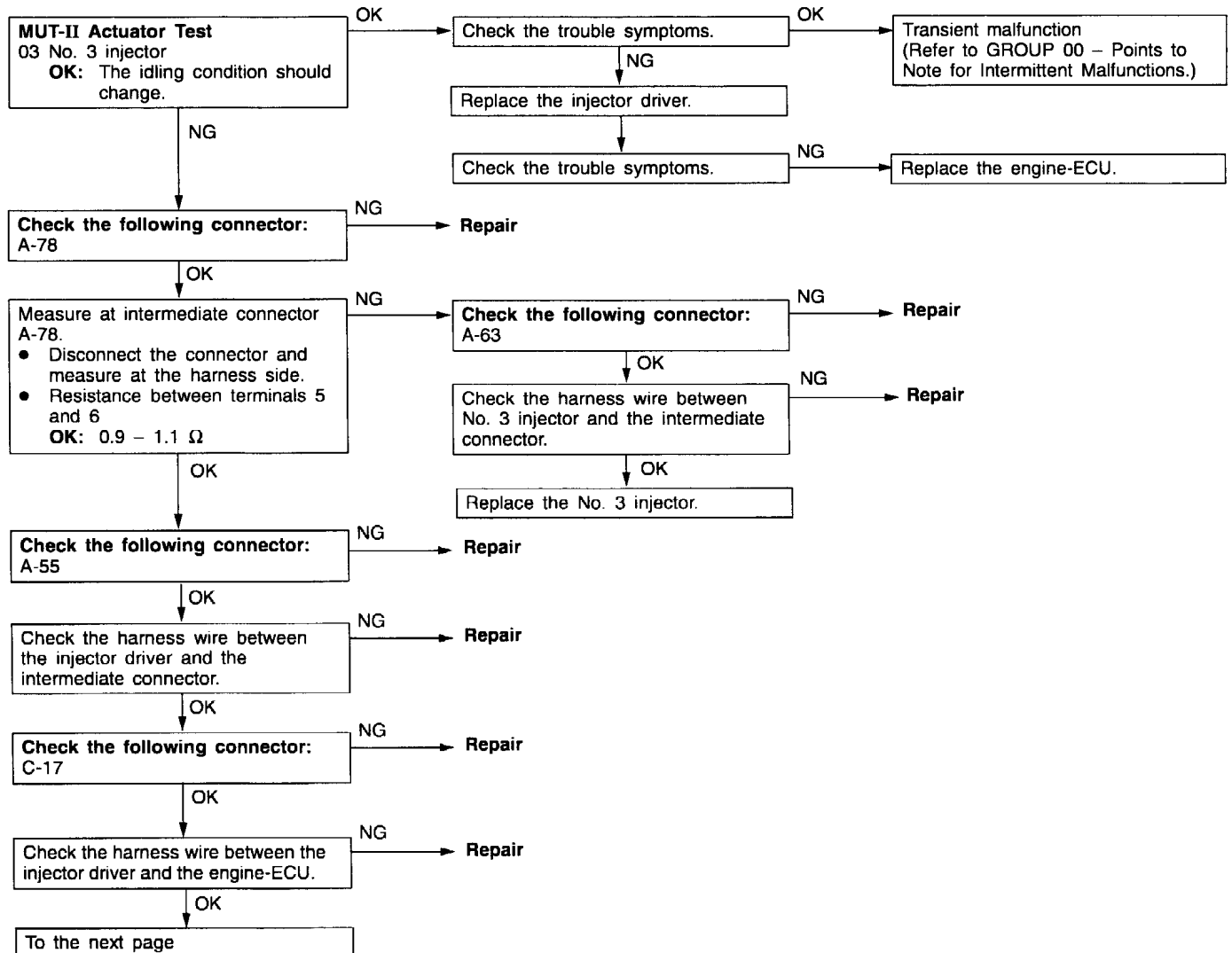
**Code No. P0203 No. 3 injector system****Probable cause****Range of Check**

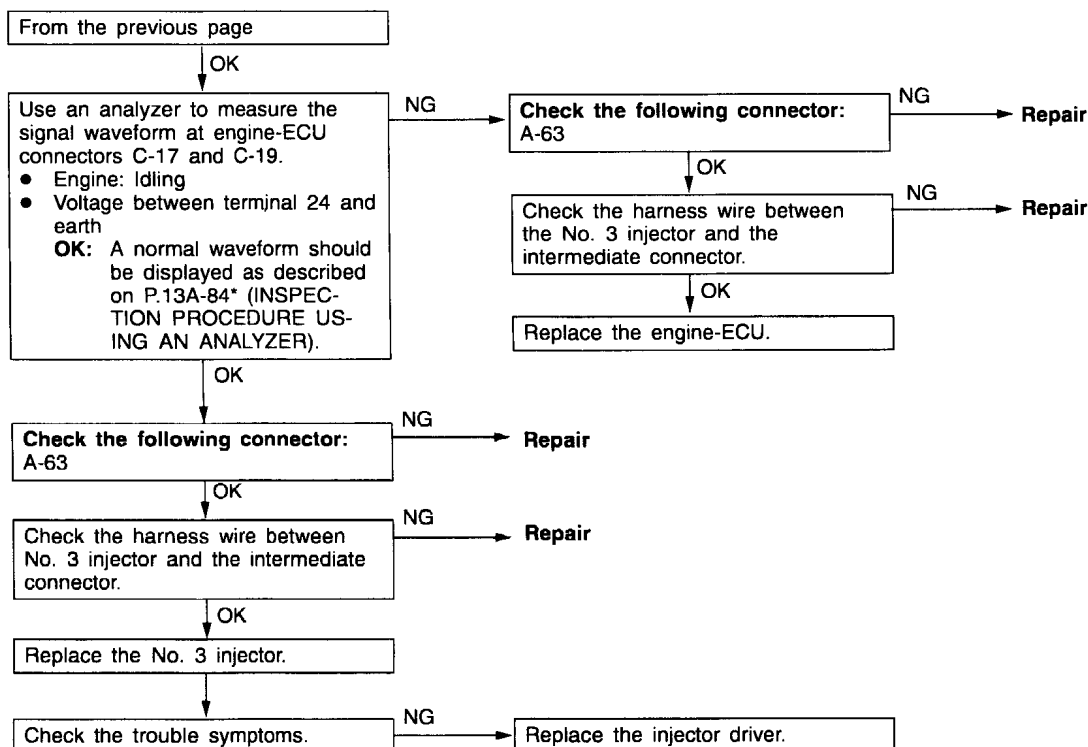
- The engine speed is 4,000 r/min or less.
- The battery voltage is 10 V or more.
- The fuel cut operation or the injector operation (by carrying out the Actuator Test) is not in progress.

Set Conditions

- The injector driver is not transmitting a injector open circuit check signal for four seconds.

- Malfunction of No. 3 injector
- Open or short circuit in the No. 3 injector circuit or loose connector contact
- Malfunction of engine-ECU

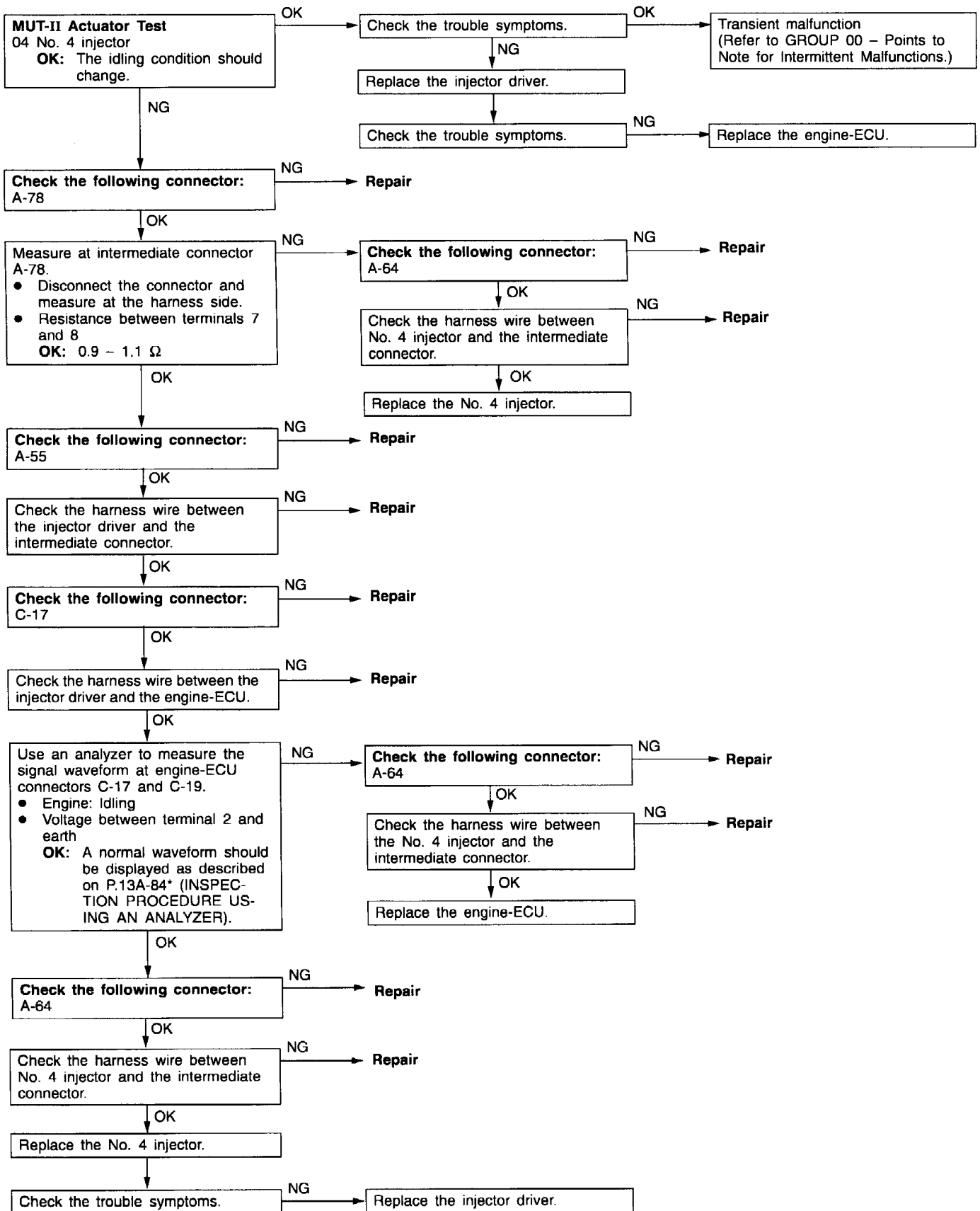




NOTE

*: Refer to the '00 PAJERO PININ Workshop Manual (Pub. No. CKRE00E1)

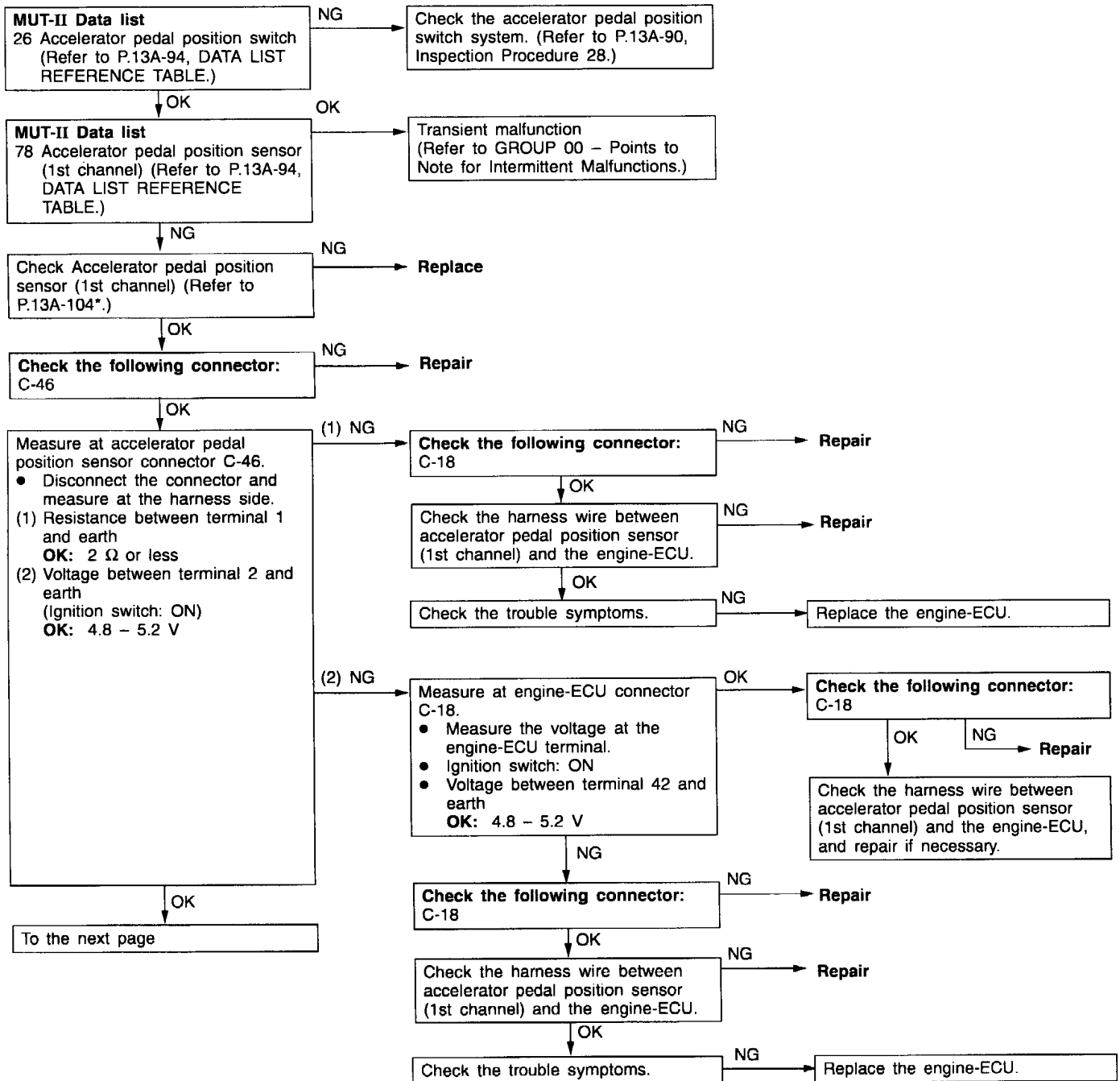
Code No. P0204 No. 4 injector system	Probable cause
Range of Check - The engine speed is 4,000 r/min or less. - The battery voltage is 10 V or more. - The fuel cut operation or the injector operation (by carrying out the Actuator Test) is not in progress. Set Conditions - The injector driver is not transmitting a injector open circuit check signal for four seconds.	- Malfunction of No. 4 injector - Open or short circuit in the No. 4 injector circuit or loose connector contact - Malfunction of engine-ECU



NOTE

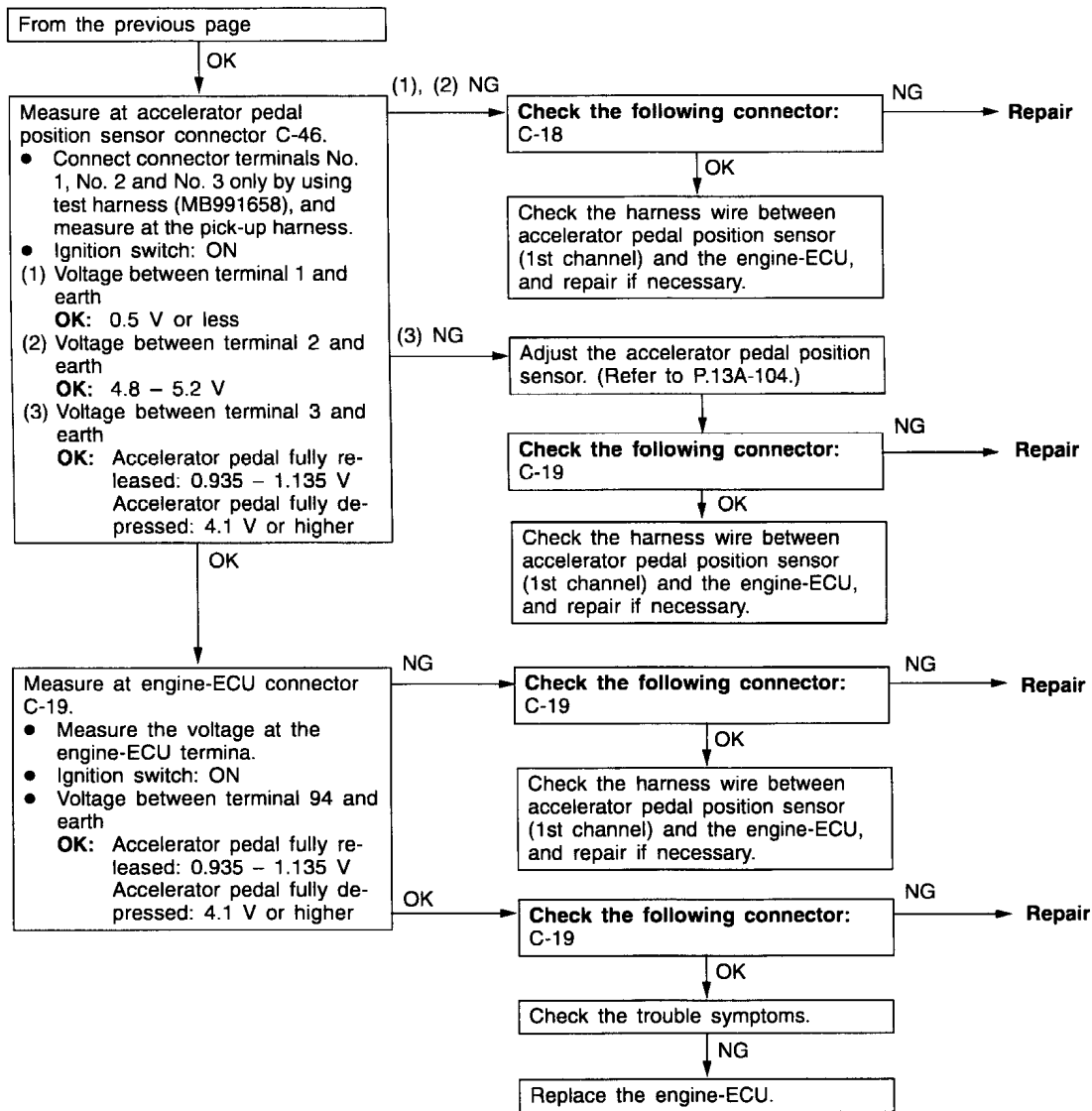
*: Refer to the '00 PAJERO PININ Workshop Manual (Pub. No. CKRE00E1)

Code No. P0220 Accelerator pedal position sensor (1st channel) system	Probable cause
Range of Check - Accelerator pedal position sensor (2nd channel) is normal. - Communication between the engine-ECU and the throttle valve controller is normal. Set Conditions - The output voltage of accelerator pedal position sensor (1st channel) is 0.2 V or less for one second. or - The output voltage of accelerator pedal position sensor (2nd channel) is 2.5 V or less, and that of accelerator pedal position sensor (1st channel) is 4.5 V or more for one second or - The difference between accelerator pedal position sensor (1st channel) and accelerator pedal position sensor (2nd channel) output voltages is 1.0 V or more (i.e. the throttle opening angle changes slightly). or - The output voltage of accelerator pedal position sensor (1st channel) is 1.875 V or more for one second when the accelerator pedal position switch is turned on.	- Malfunction of accelerator pedal position sensor (1st channel) - Open or short circuit in the accelerator pedal position sensor (1st channel) circuit or loose connector contact - Accelerator pedal position switch seized ON - Malfunction of throttle valve controller - Malfunction of engine-ECU



NOTE

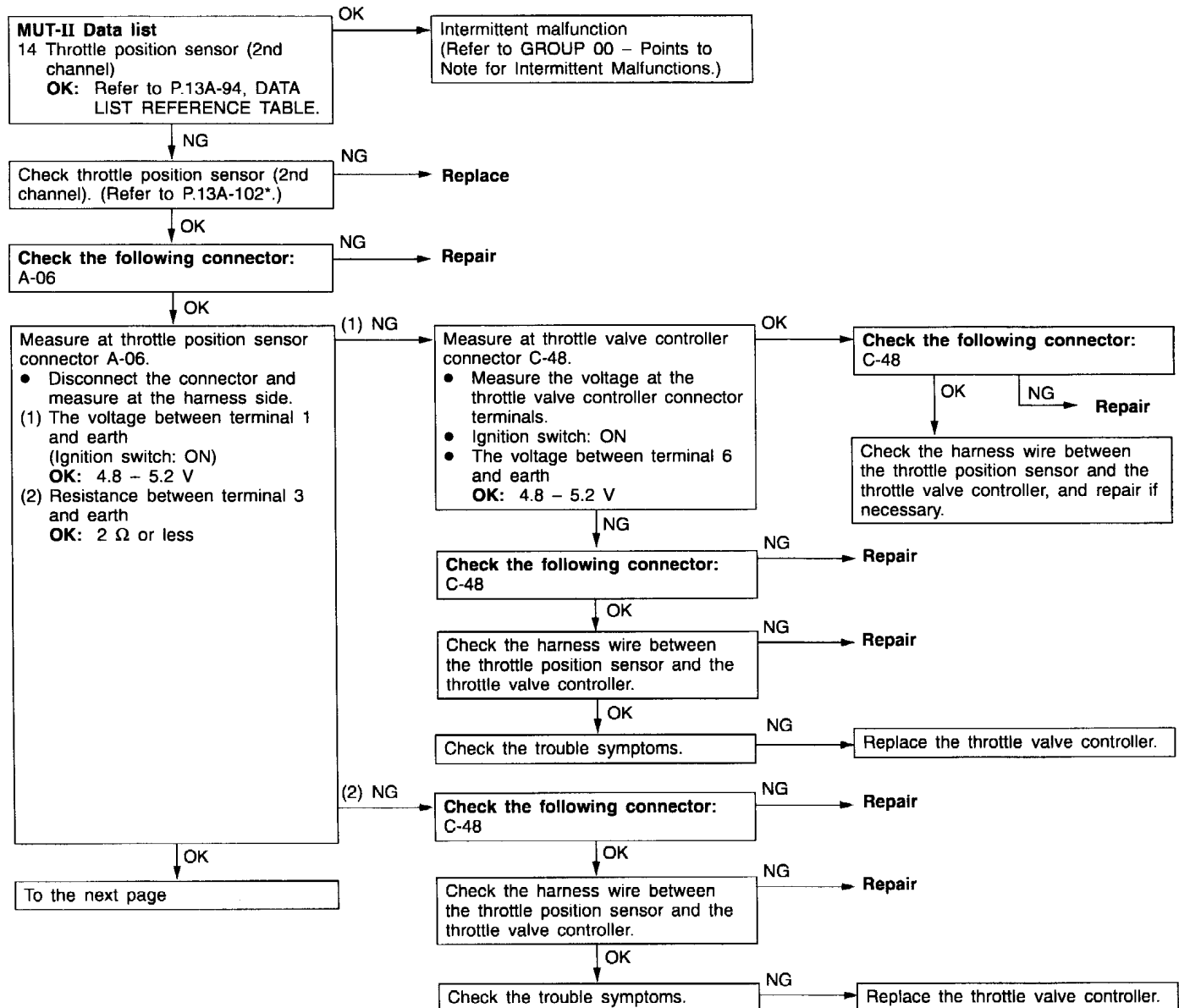
*: Refer to the '00 PAJERO PININ Workshop Manual (Pub. No. CKRE00E1)



NOTE

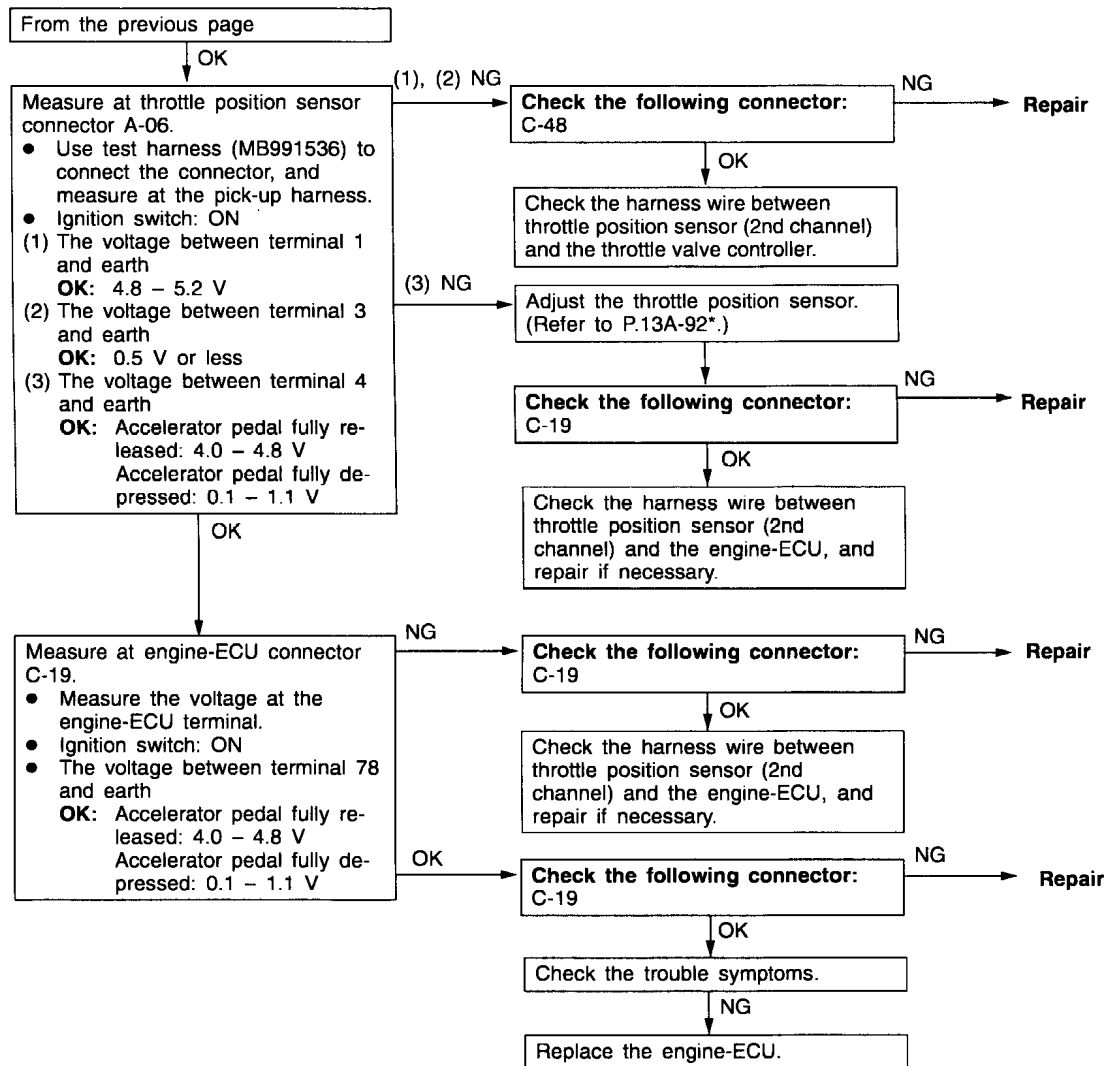
*: Refer to the '00 PAJERO PININ Workshop Manual (Pub. No. CKRE00E1)

Code No. 0225 Throttle position sensor (2nd channel) system	Probable cause
The throttle valve controller judges a malfunction, and then transmit the result to the engine-ECU Range of Check - Ignition switch: ON - The throttle position sensor (1st channel) is normal. Set Conditions - The sensor output voltage is 0.2 V or less for four seconds. or - The sensor output voltage is 4.85 V or more for four seconds, and the output voltage of the throttle position sensor (1st channel) is 1.2 V or more. or - The throttle position sensor (1st channel) and throttle position sensor (2nd channel) combination output voltage is outside 4 – 6 V.	- Malfunction of throttle position sensor (2nd channel) - Open or short circuit in the throttle position sensor (2nd channel) circuit or loose connector contact - Malfunction of the throttle valve controller - Malfunction of the engine-ECU



NOTE

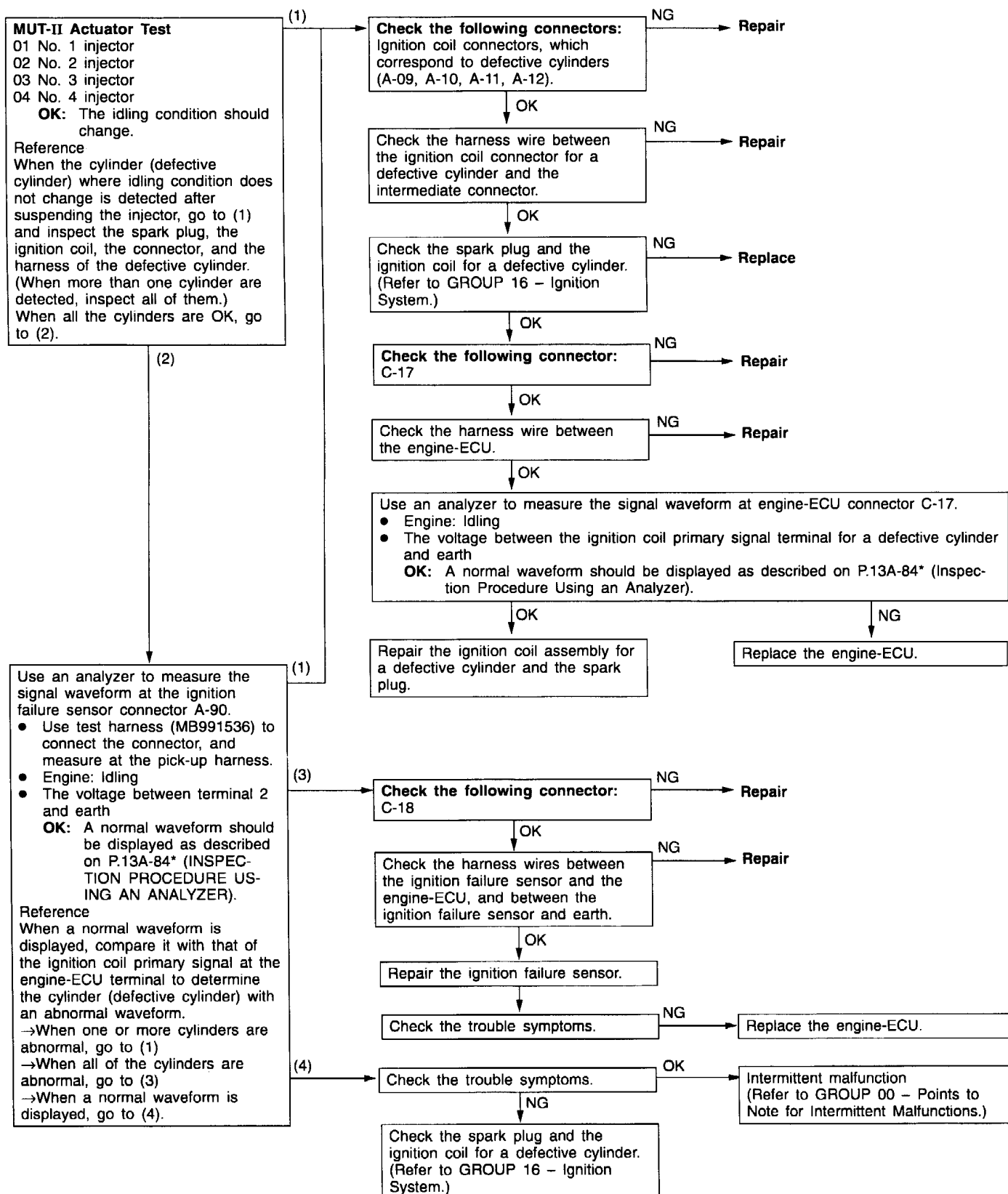
*: Refer to the '00 PAJERO PININ Workshop Manual (Pub. No. CKRE00E1)



NOTE

*: Refer to the '00 PAJERO PININ Workshop Manual (Pub. No. CKRE00E1)

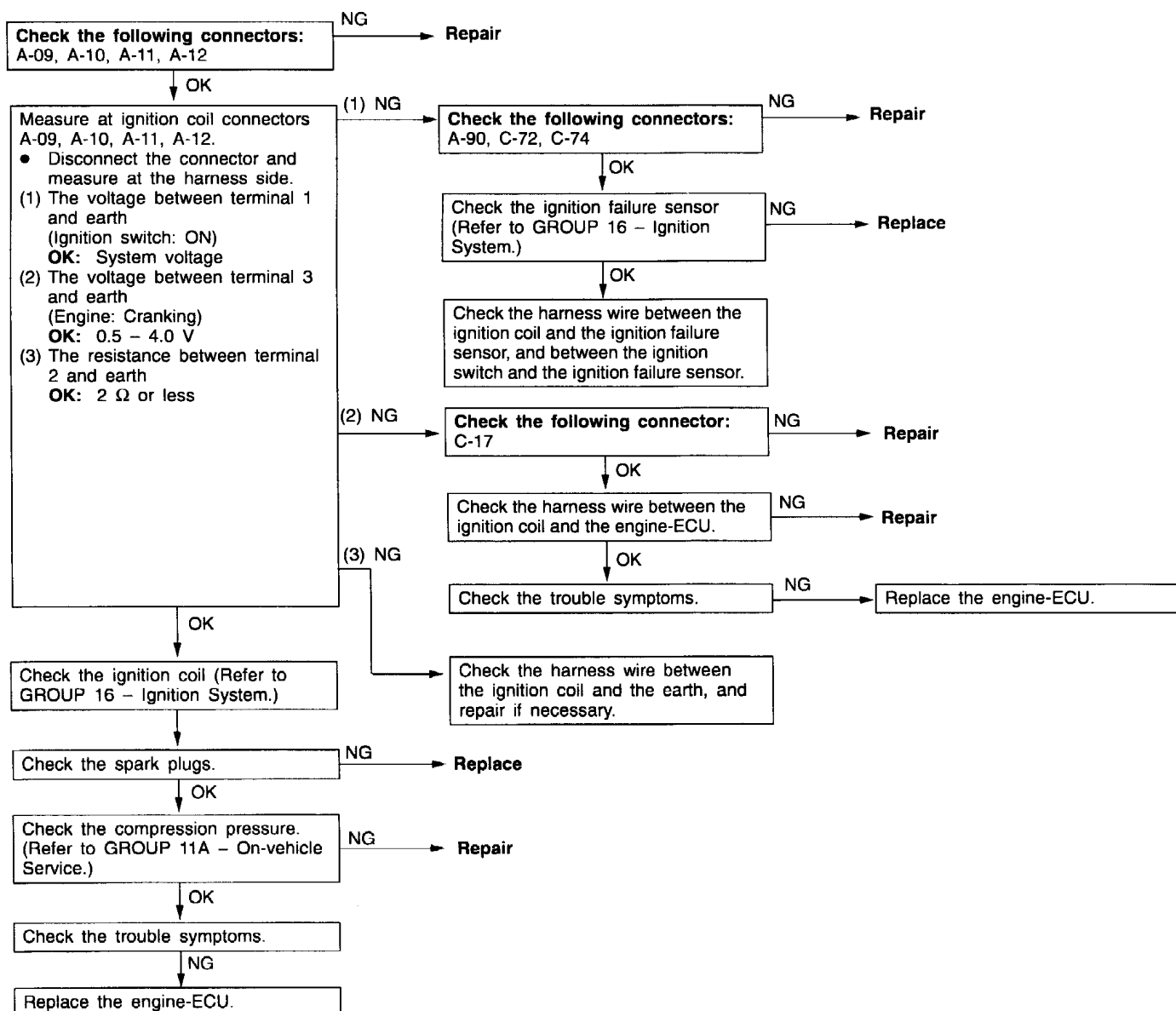
Code No. P0300 Ignition coil (power transistor) system	Probable cause
Range of Check • Engine speed is approx. 50 – 4,000 r/min. • Engine is not cranking. Set Conditions • The ignition failure sensor does not send a signal about a certain cylinder for four seconds.	• Malfunction of the ignition coil • Malfunction of the ignition failure sensor • Malfunction of spark plug • Open or short circuit in the primary ignition circuit or loose connector contact • Malfunction of engine-ECU



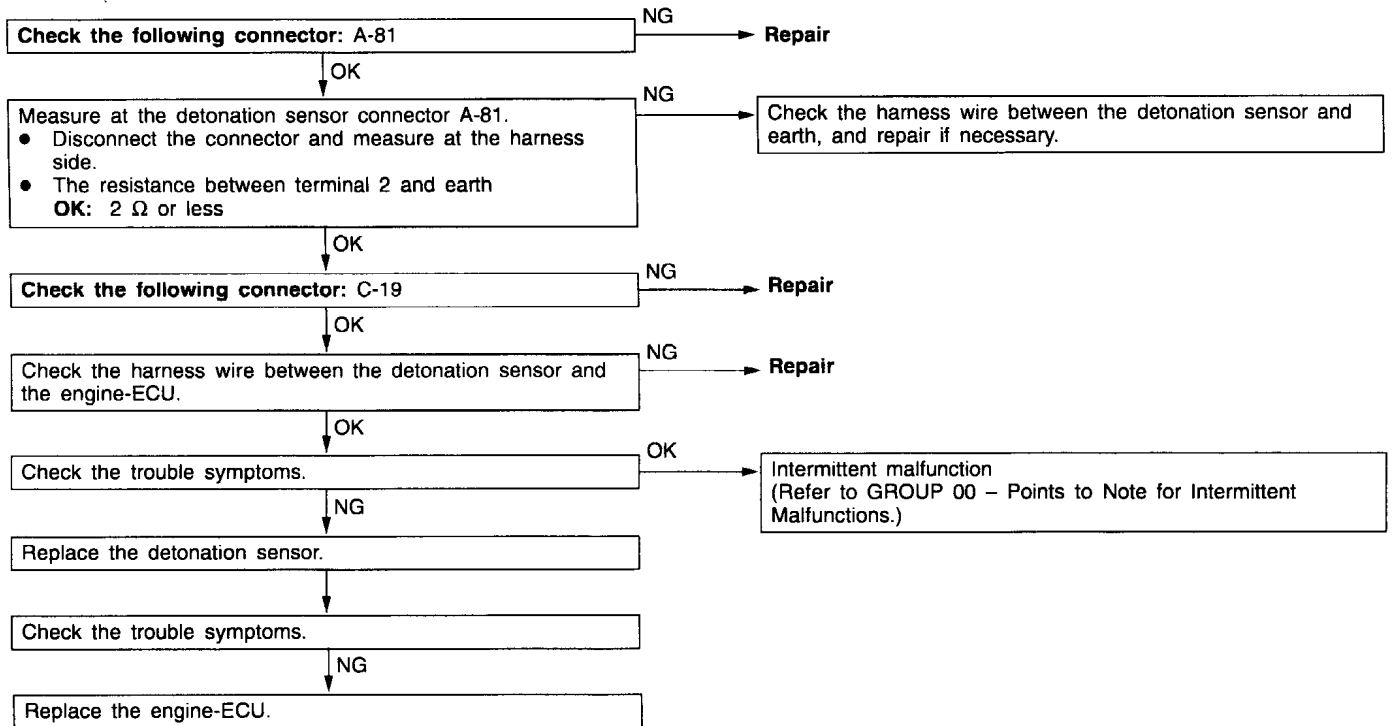
NOTE

*: Refer to the '00 PAJERO PININ Workshop Manual (Pub. No. CKRE00E1)

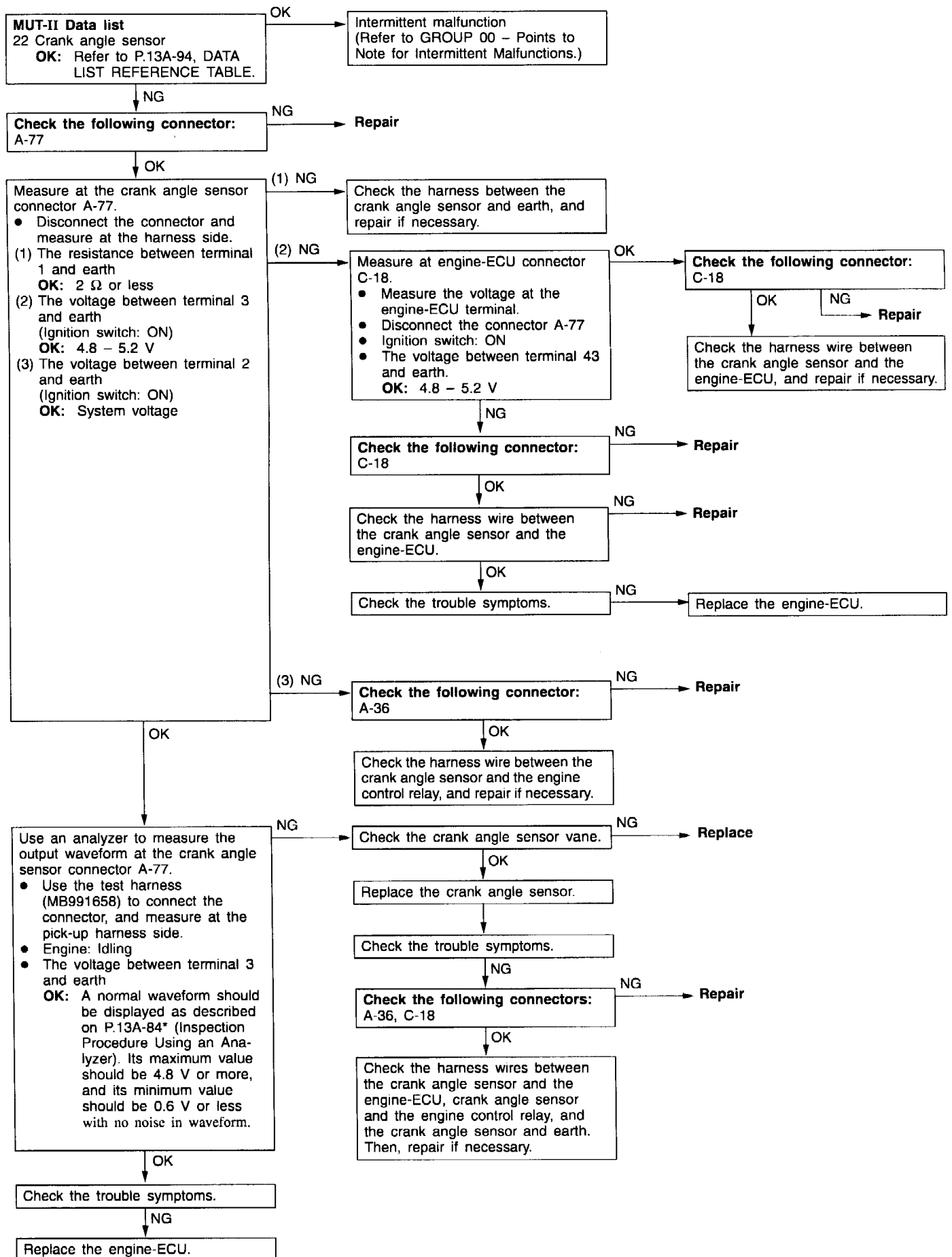
Code No. P0301 No. 1 cylinder misfire detected Code No. P0302 No. 2 cylinder misfire detected Code No. P0303 No. 3 cylinder misfire detected Code No. P0304 No. 4 cylinder misfire detected	Probable cause
Range of Check • The engine speed is 500 – 4,500 r/min. • While the engine is running except deceleration and sudden acceleration. Set Conditions • The number of misfires exceeds a predetermined number per 200 engine revolutions (Misfire has occurred in only one cylinder). or • The number of misfires exceeds a predetermined number per 100 engine revolutions (Misfire has occurred in only one cylinder).	• Malfunction of the ignition system • Abnormal compression • Malfunction of injector • Malfunction of engine-ECU



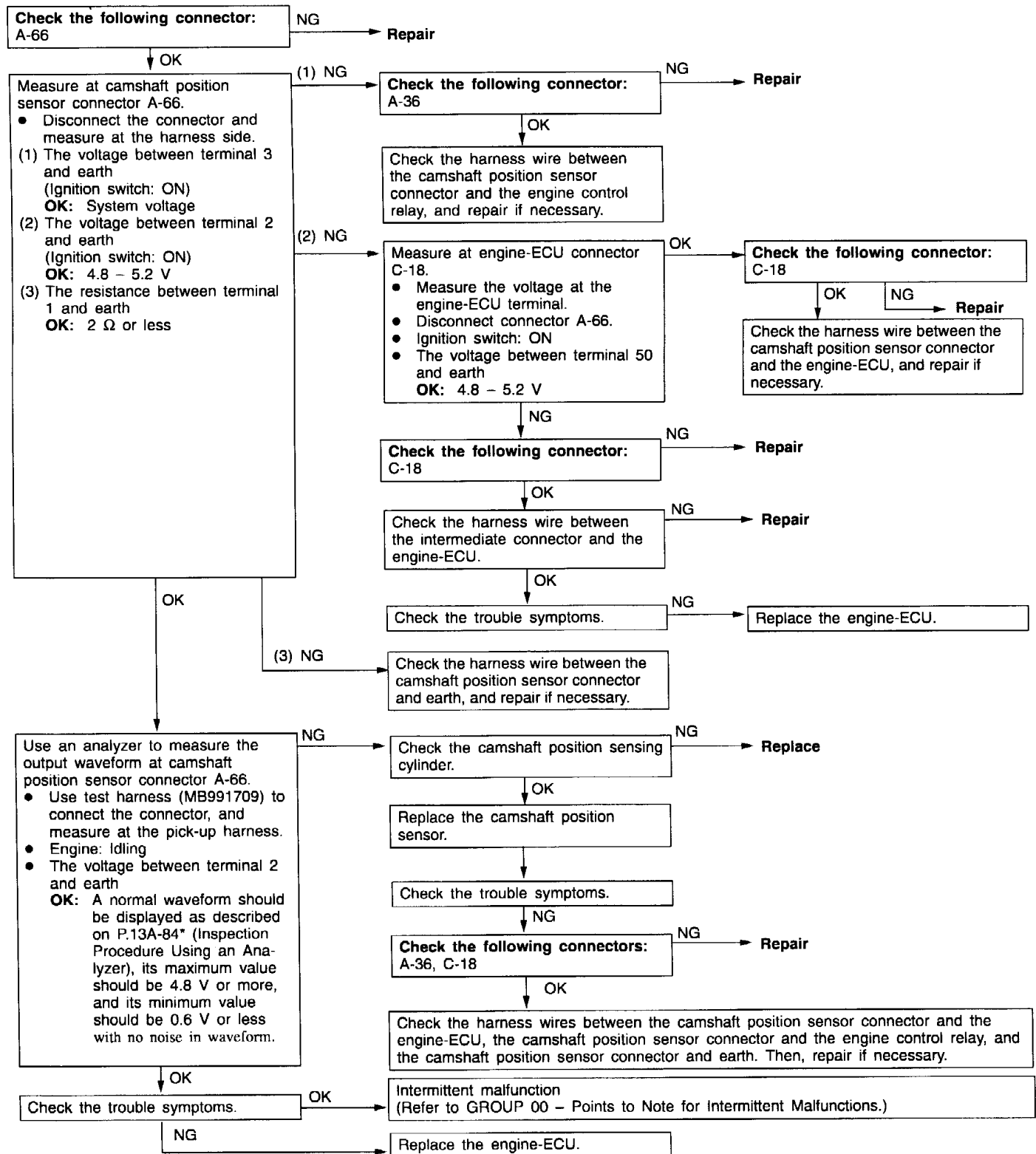
Code No. P0325 Detonation sensor system	Probable cause
Range of Check • Engine: Two seconds after the engine has been started Set Conditions • Changes in sensor output voltage (detonation sensor peak voltage per 1/3 crankshaft rotation) in 200 consecutive cycles are 0.08 V or less.	• Malfunction of the detonation sensor • Open or short circuit in the detonation sensor circuit or loose connector contact • Malfunction of engine-ECU



Code No. P0335 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. • Open or short circuit in the crank angle sensor circuit or loose connector contact. • Malfunction of engine-ECU



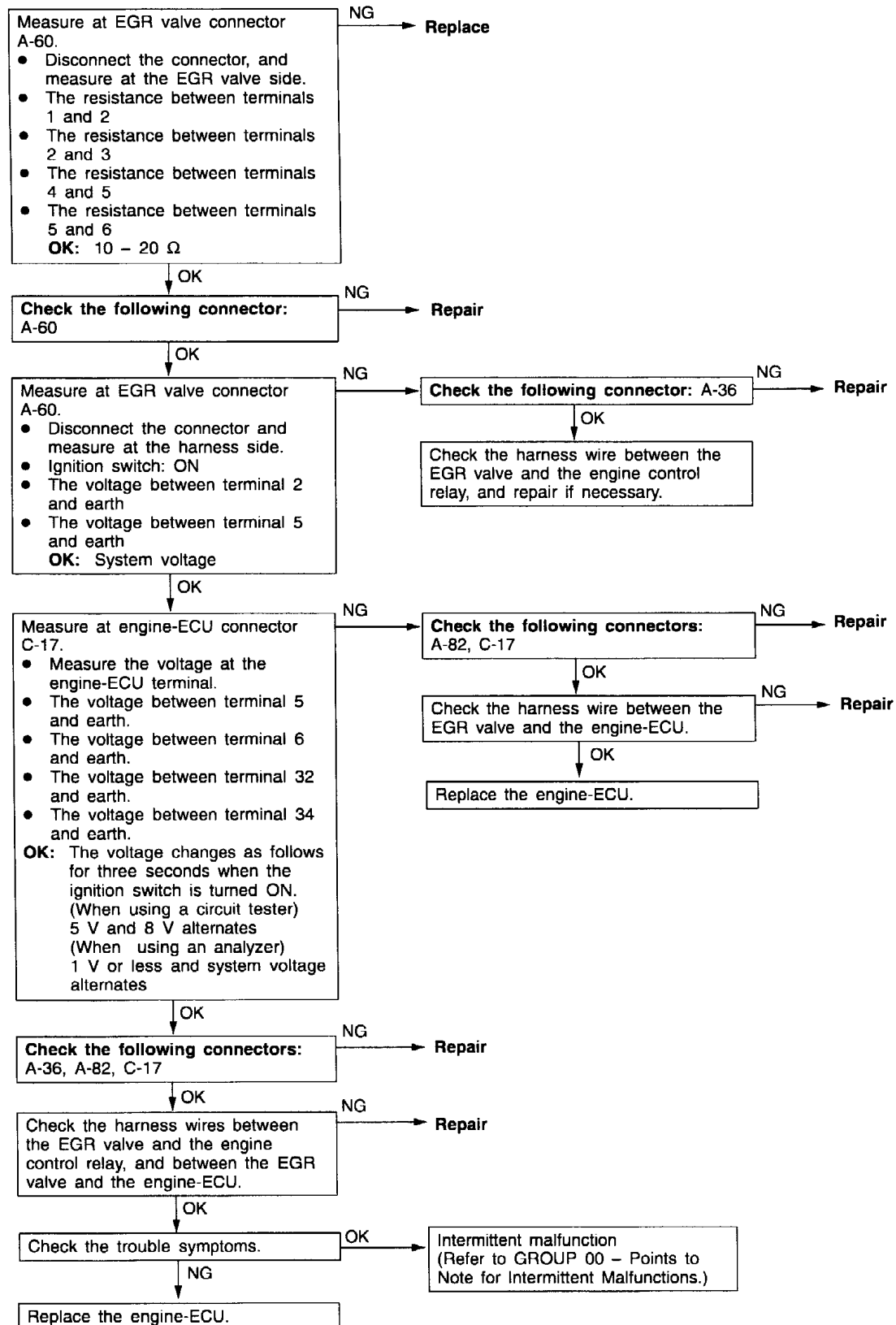
Code No. P0340 Camshaft position sensor system	Probable cause
Range of Check • After the engine was started Set Conditions • The sensor output voltage does not change for 4 seconds (no pulse signal input).	• Malfunction of the camshaft position sensor • Open or short circuit in the camshaft position sensor circuit or loose connector contact. • Malfunction of engine-ECU



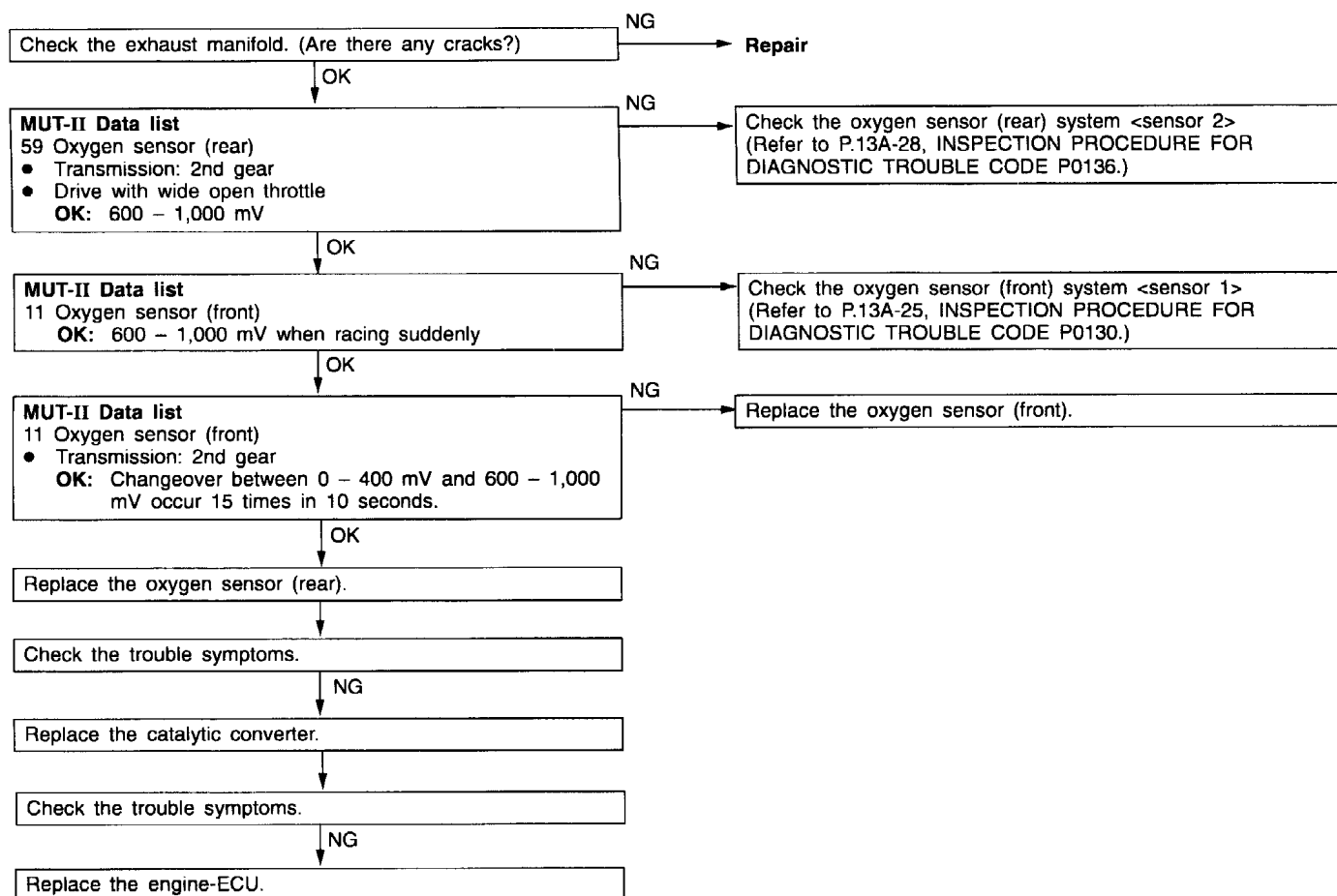
NOTE

*: Refer to the '00 PAJERO PININ Workshop Manual (Pub. No. CKRE00E1)

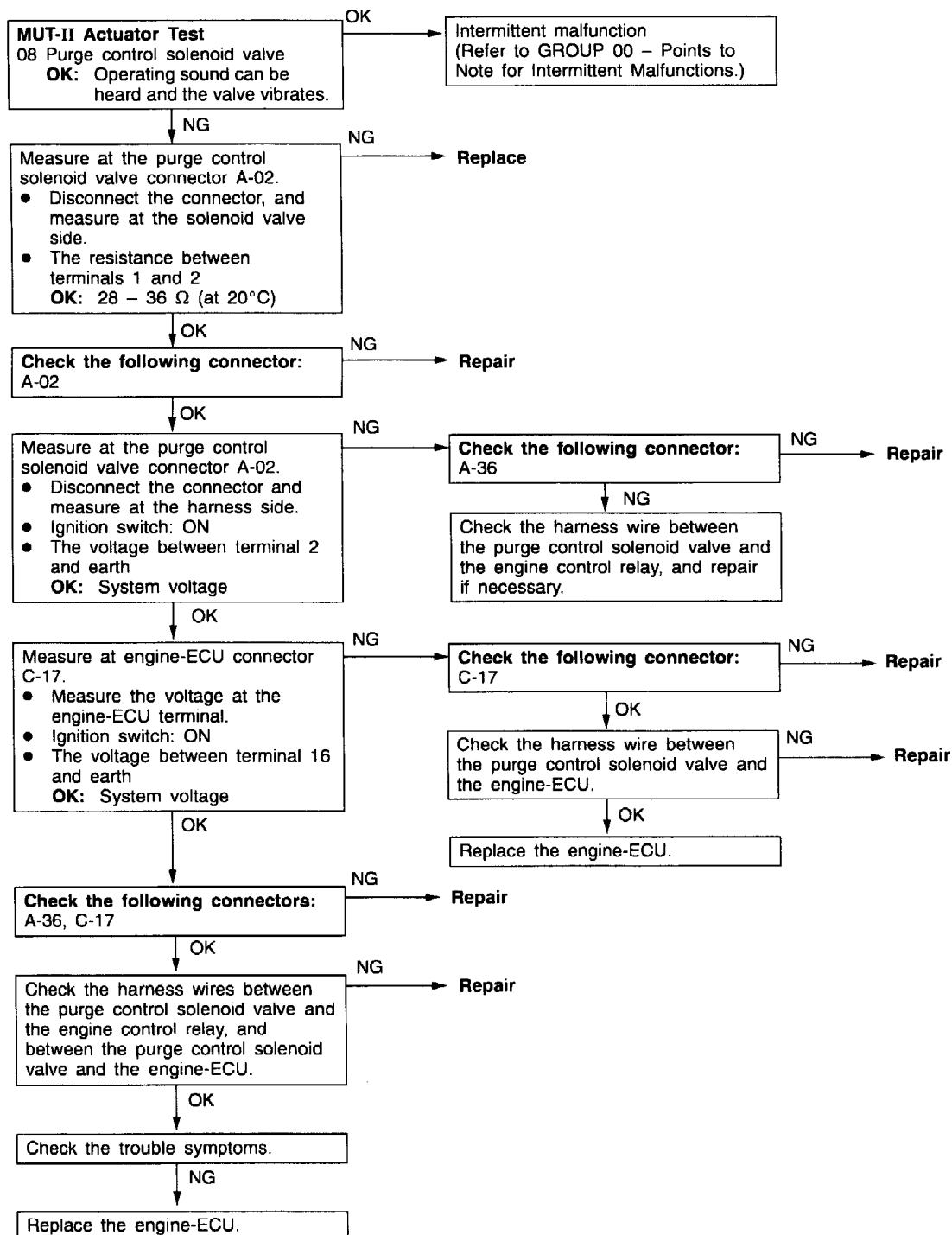
Code No. P0403 EGR valve system	Probable cause
Range of Check • Ignition switch: OFF to ON • EGR valve is in operation after the engine starting process is complete. Set Conditions • Off-surge voltage is not generated from the motor coil while the EGR valve control motor is running.	• Malfunction of the EGR valve • Open or short circuit in the EGR valve circuit or loose connector contact • Malfunction of engine-ECU



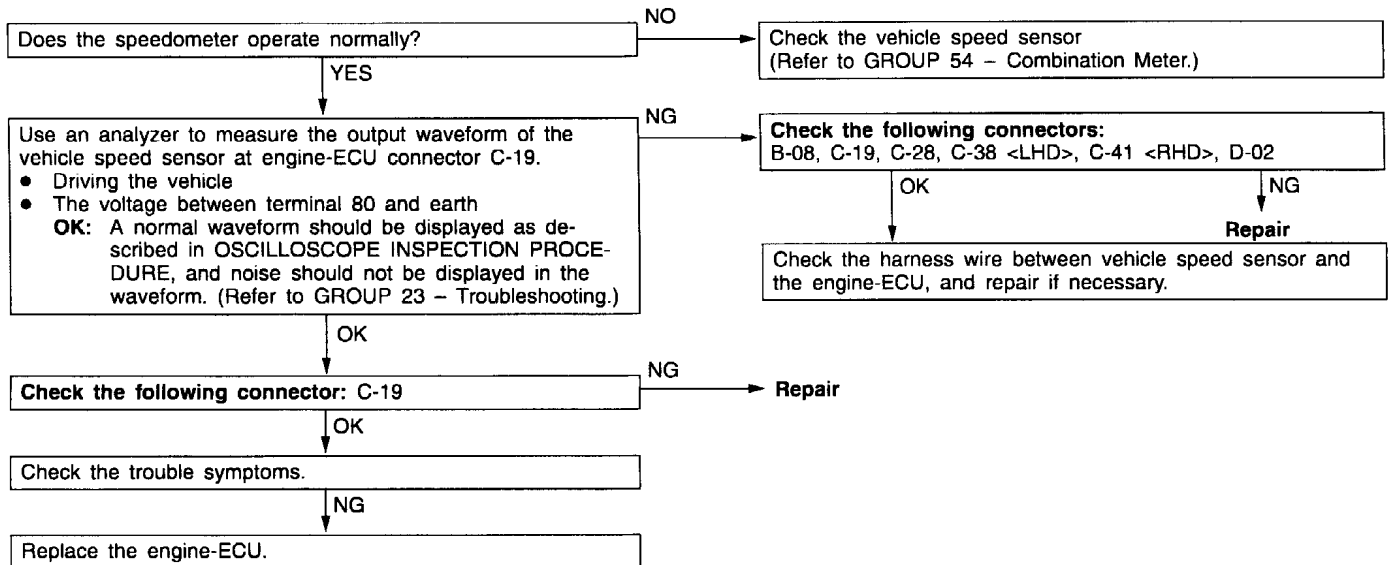
Code No. P0420 Catalyst malfunction	Probable cause
Range of Check • The engine speed is 3,000 r/min or less. • During driving • During air/fuel ratio feedback control Set Conditions • The ratio between the oxygen sensor (rear) and the oxygen sensor (front) output frequencies reaches 0.8 per 12 seconds on average.	• Malfunction of catalyst • Malfunction of the oxygen sensor (front) • Malfunction of the oxygen sensor (rear) • Malfunction of engine-ECU



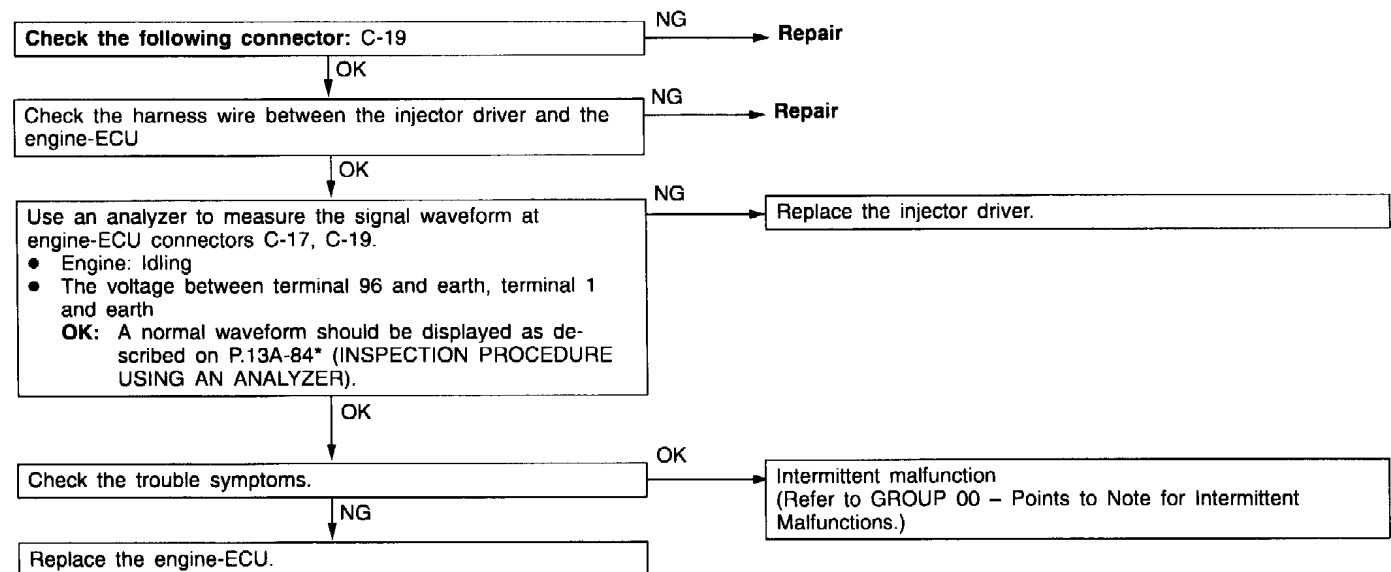
Code No. P0443 Purge control solenoid valve system	Probable cause
Range of Check - Ignition switch: ON - Battery voltage is 10 V or more. Set Conditions - The solenoid coil surge voltage (battery voltage + 2 V) is not detected when the purge control solenoid valve is turned from on to off.	- Malfunction of the purge control solenoid valve - Open or short circuit in the purge control solenoid valve circuit or loose connector contact - Malfunction of engine-ECU



Code No. P0500 Vehicle speed sensor system	Probable cause
Range of Check - Engine: Two seconds after the engine was started - Idle switch: OFF - Engine speed: 2,500 r/min or more - During high engine load Set Conditions - The sensor output voltage does not change for 4 seconds (no pulse signal input).	- Malfunction of the vehicle speed sensor - Open or short circuit in the vehicle speed sensor circuit or loose connector contact - Malfunction of engine-ECU



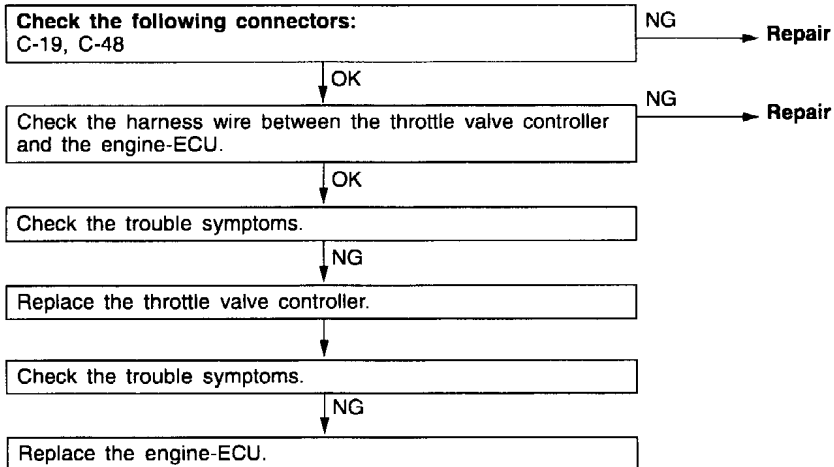
Code No. P1200 Injector driver system	Probable cause
Range of Check - Engine speed: 4,000 r/min or less - Battery voltage: 10 V or more - The fuel cut operation and the injector operation (by carrying out the Actuator test) are not in progress. - During high engine load Set Conditions - Injector open circuit check signal is not output from the injector driver.	- Malfunction of the injector driver - Open or short circuit, or loose connector contact - Malfunction of engine-ECU



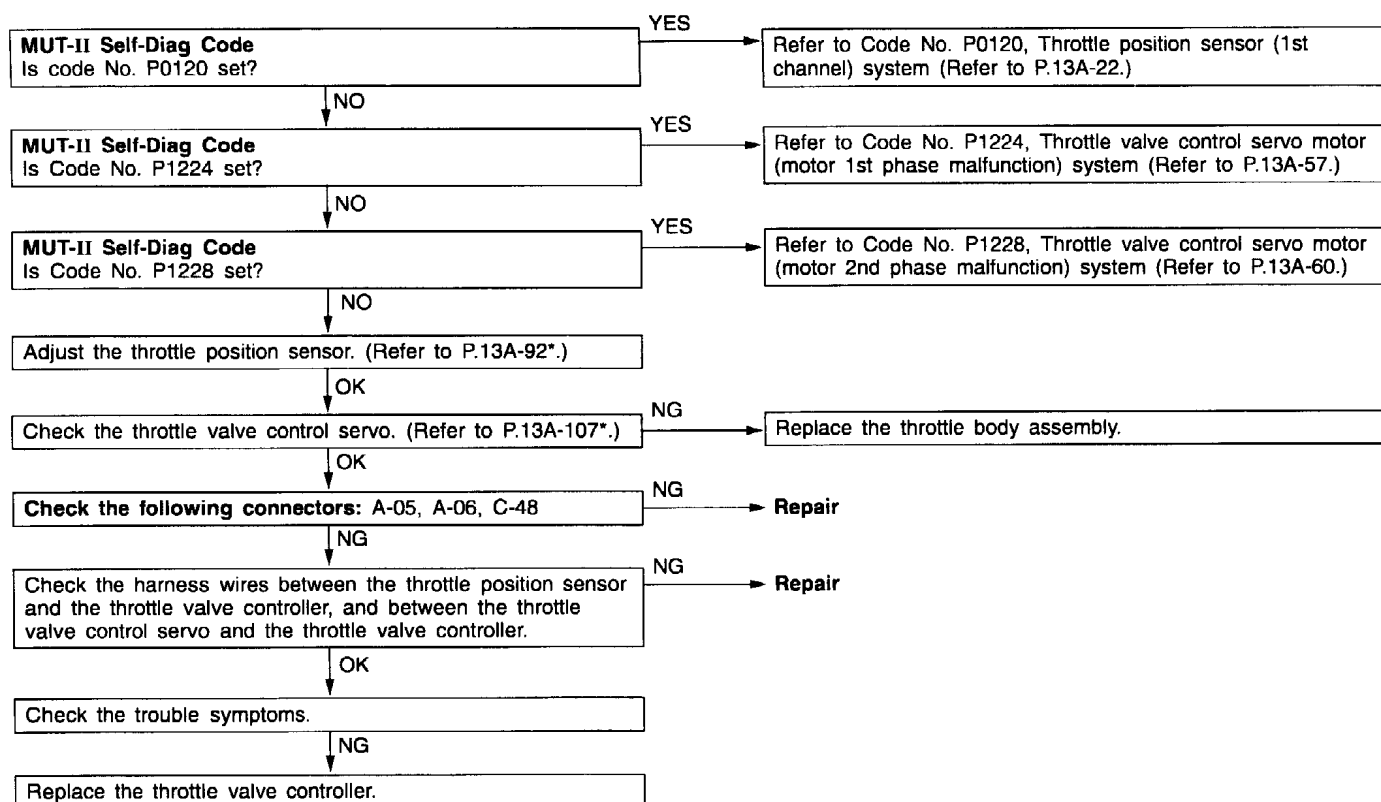
NOTE

*: Refer to the '00 PAJERO PININ Workshop Manual (Pub. No. CKRE00E1)

Code No. P1220 Electronic-controlled throttle valve system	Probable cause
Range of Check - Ignition switch: ON - Error in communication between the engine-ECU and the throttle valve controller Set Conditions - Output voltage of throttle position sensor (2nd channel) fluctuates significantly (approx. 1 V or more) from an expected value, based on that of the accelerator pedal position sensor (2nd channel). Range of Check - Ignition switch: ON - Error in communication between the throttle valve controller and the engine-ECU Set Conditions - The output voltage of the throttle position sensor (2nd channel) is significantly different (approx. 1 V) from the throttle valve opening angle (voltage), which the engine-ECU request the throttle valve controller.	- Short in communication line - Malfunction of the engine-ECU - Malfunction of the throttle valve controller



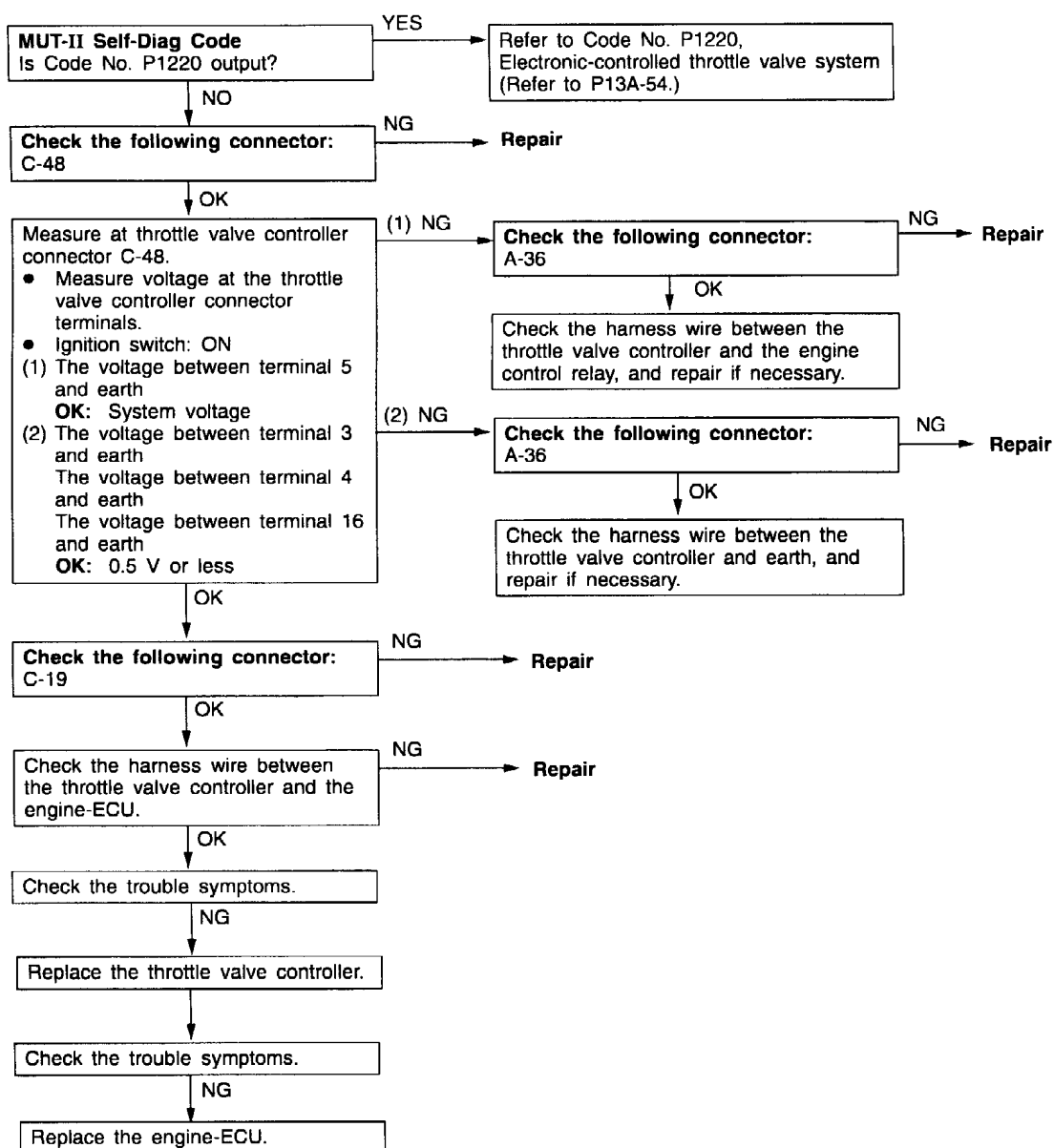
Code No. P1221 Throttle valve position feedback system	Probable cause
The throttle valve controller judges a malfunction, and then transmit the result to the engine-ECU. Range of Check - Ignition switch: ON - Battery voltage: 10 V or more Set Conditions - Failure in the motor position feedback (The engine-ECU detects that the current in the motor is excessive and the opening angle difference between the target value of throttle position sensor (1st channel) and the actual value of throttle position sensor (1st channel) is 1.0 V or more)	- Malfunction of throttle position sensor (1st channel) - Open or short circuit in the throttle position sensor (1st channel) circuit or loose connector contact - Malfunction of the throttle valve controller



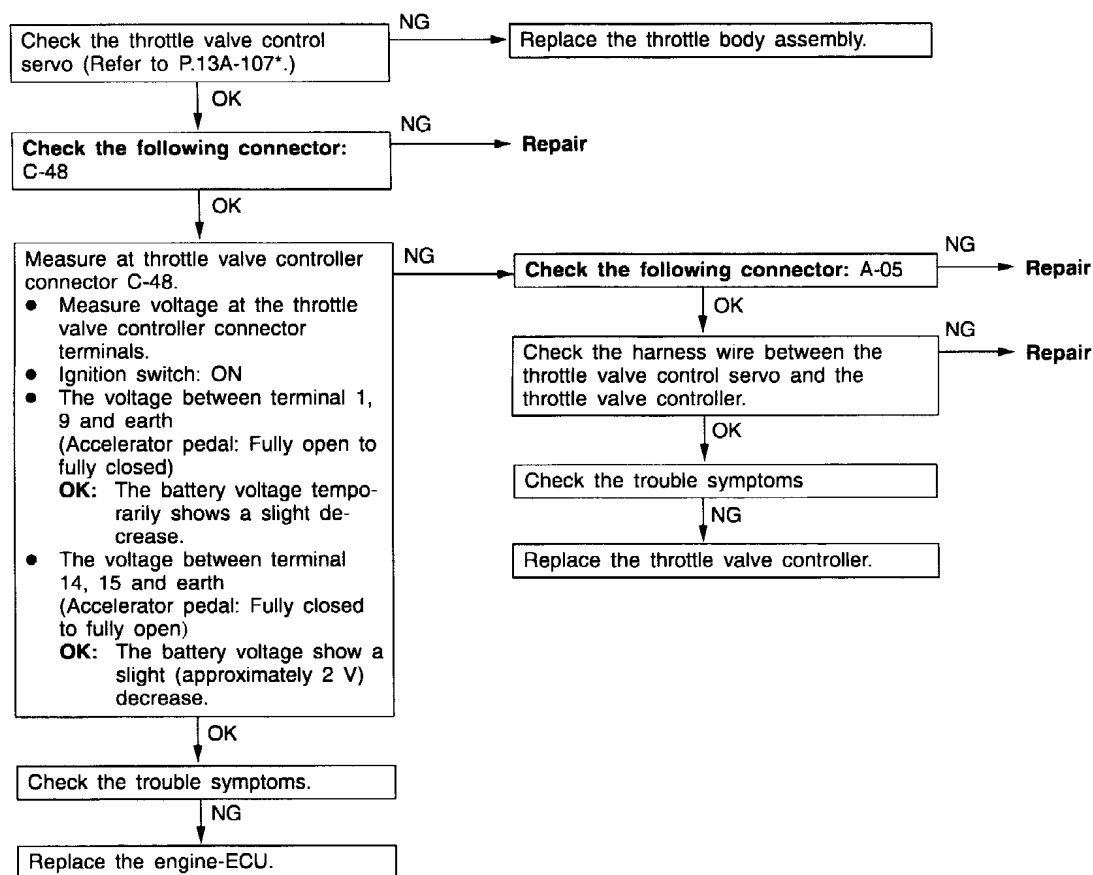
NOTE

*: Refer to the '00 PAJERO PININ Workshop Manual (Pub. No. CKRE00E1)

Code No. P1223 Communication line system with the throttle valve controller	Probable cause
Range of Check - Ignition switch: ON - Battery voltage: 8 V or more. - Engine: Not cranking Set Conditions - System detects an error in communication line between the engine-ECU and the throttle valve controller, and between the throttle valve controller and the engine-ECU.	- Short in communication line - Malfunction of engine-ECU - Malfunction of throttle valve controller

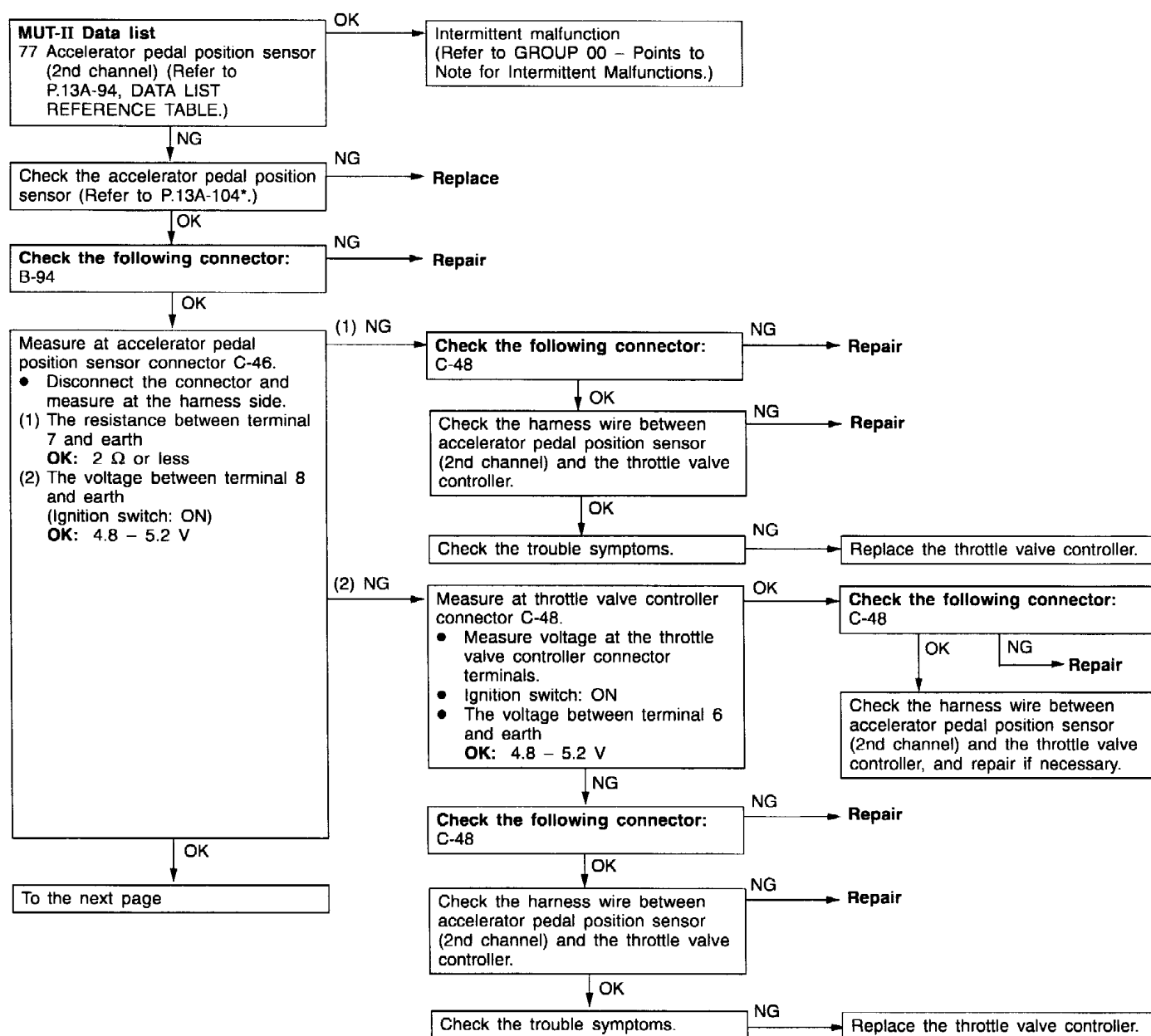


Code No. P1224 Throttle valve control servo (Motor 1st phase malfunction) system	Probable cause
Range of Check - Throttle valve control servo relay: ON - System voltage: 8 V or more. Set Conditions - Throttle valve control servo drive circuit is shorted to earth. - Other power source interferences with throttle valve control servo drive circuit. - Throttle valve control servo drive circuit is open circuit.	- Malfunction of the throttle valve control servo - Open circuit or short-circuited harness wire in throttle valve control servo system, or poor connector contact - Malfunction of the throttle valve controller

**NOTE**

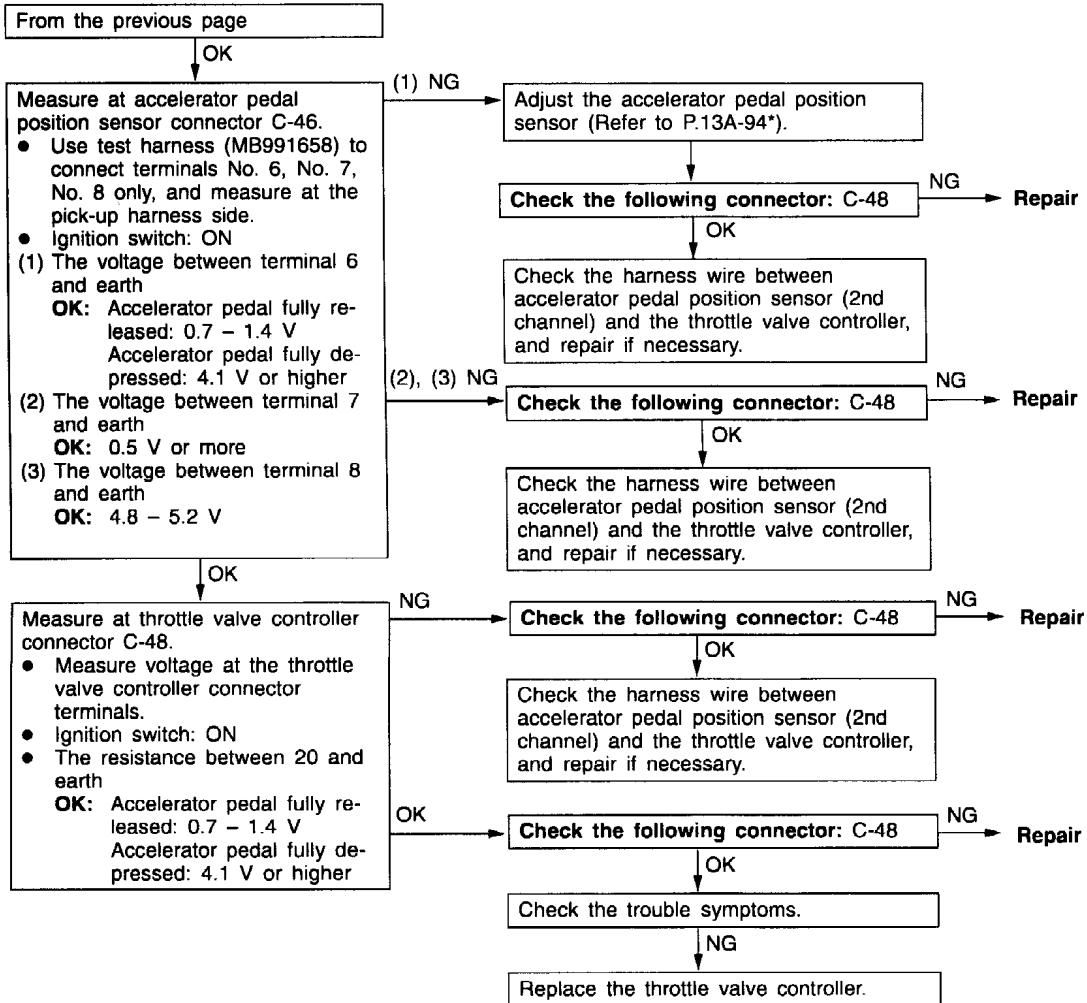
*: Refer to the '00 PAJERO PININ Workshop Manual (Pub. No. CKRE00E1)

Code No. P1225 Accelerator pedal position sensor (2nd channel) system	Probable cause
Range of Check - Accelerator pedal position sensor (2nd channel) is normal. - Communication between the engine-ECU and the throttle valve controller is normal. Set Conditions - Output voltage of the accelerator pedal position sensor (2nd channel) is 0.2 V or less for one second or - Output voltage of the accelerator pedal position sensor (1st channel) is 2.5 V or less, and output voltage of the accelerator pedal position sensor (2nd channel) is 4.5 V or more for one second. or - Difference between the accelerator pedal position sensor (1st and 2nd channels) output voltages exceeds 1.0 V (i.e. when the throttle valve opening angle changes slightly).	- Malfunction of accelerator pedal position sensor (2nd channel) - Open or short circuit in accelerator pedal position sensor (2nd channel) circuit or loose connector contact - Malfunction of the throttle valve controller - Malfunction of engine-ECU

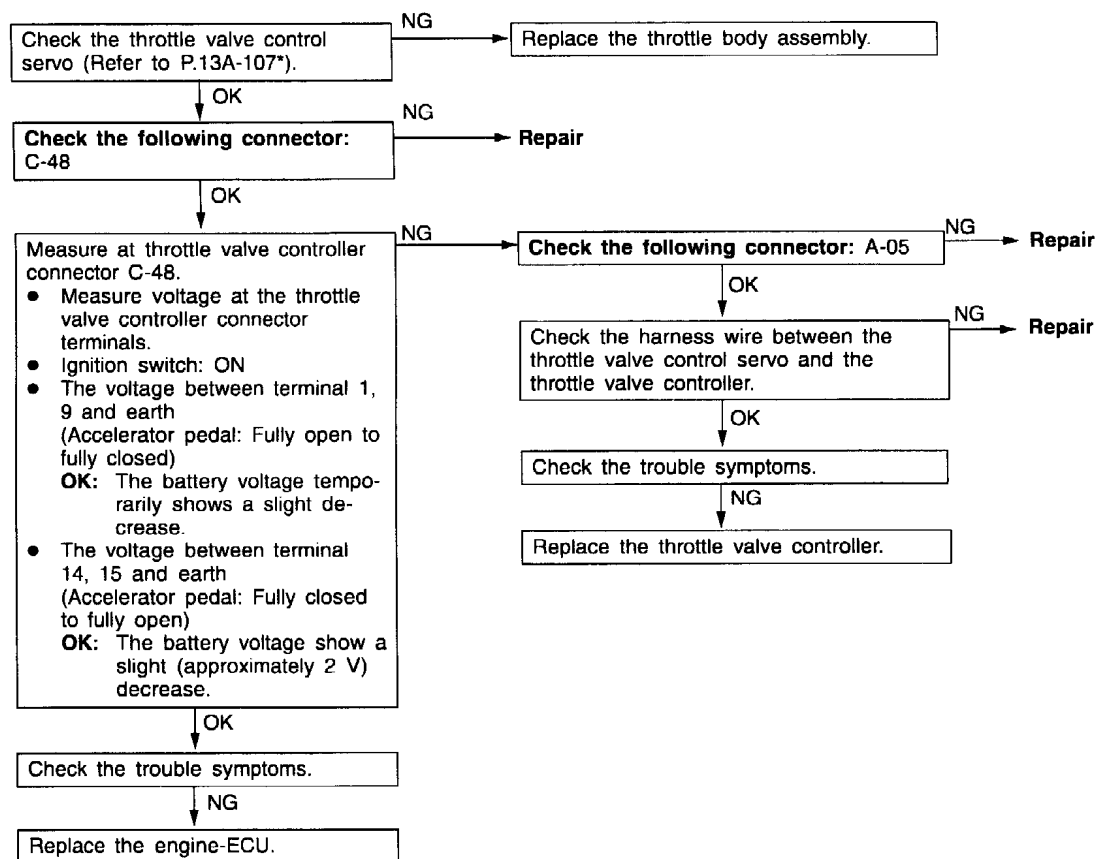


NOTE

*: Refer to the '00 PAJERO PININ Workshop Manual (Pub. No. CKRE00E1)



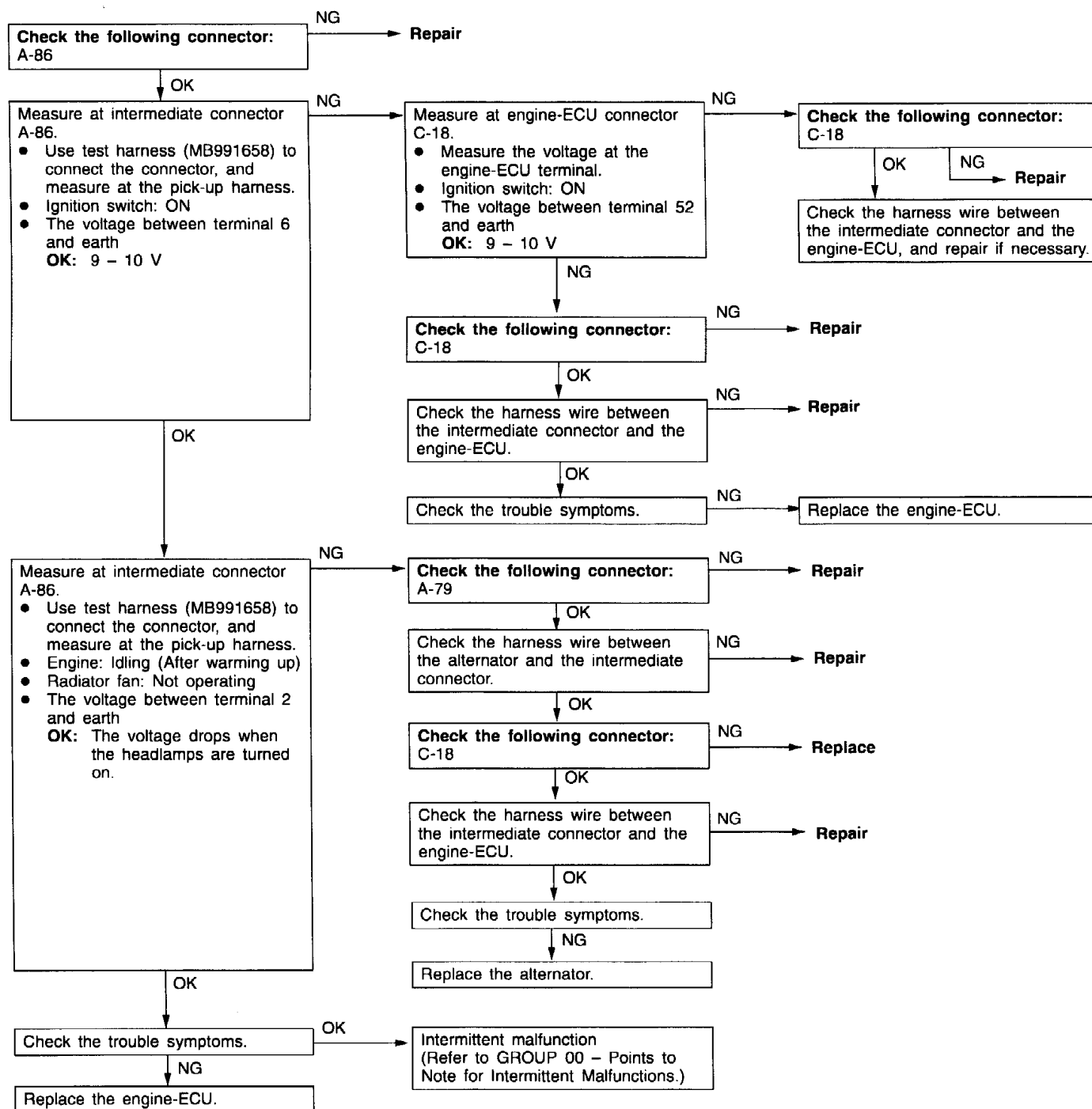
Code No. P1228 Throttle valve control servo (Motor 2nd phase malfunction) system	Probable cause
Range of Check - Throttle valve control servo relay: ON - System voltage: 8 V or more Set Conditions - Throttle valve control servo drive circuit is shorted to earth. - Other power source interferes with throttle valve control servo drive circuit. - Throttle valve control servo drive circuit is open-circuit.	- Malfunction of the throttle valve control servo - Open circuit or short-circuited harness wire in throttle valve control servo system, or poor connector contact - Malfunction of the throttle valve controller



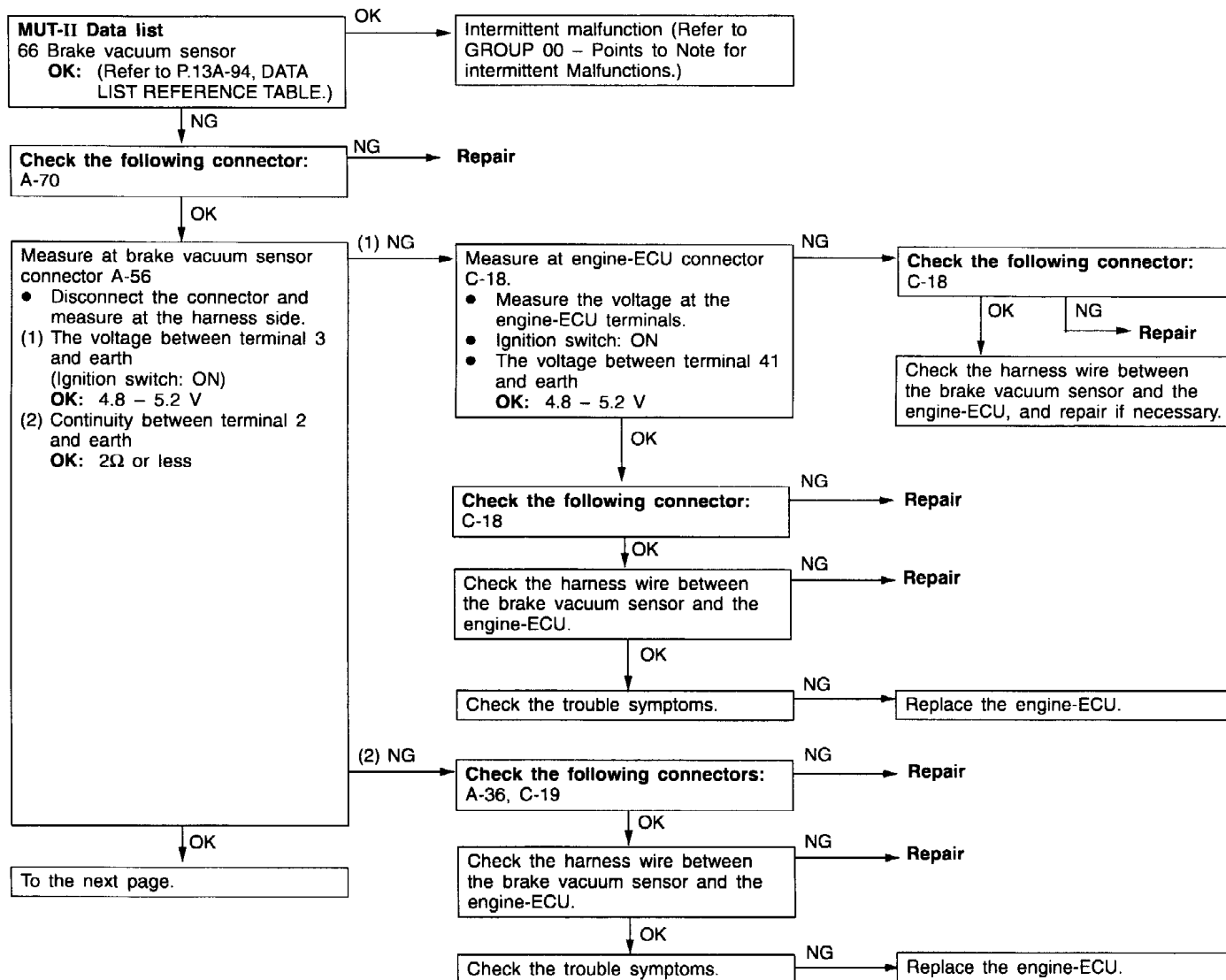
NOTE

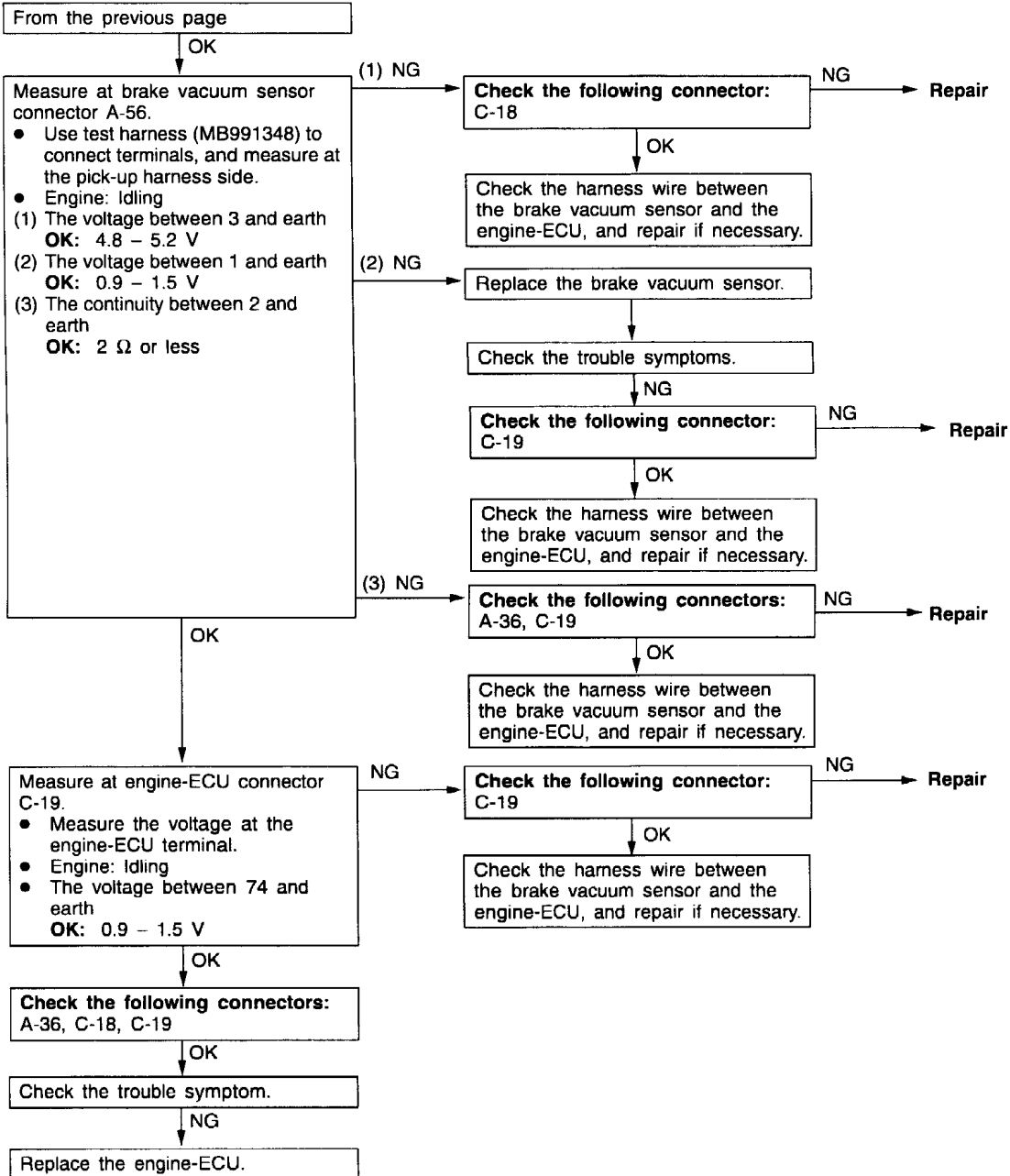
*: Refer to the '00 PAJERO PININ Workshop Manual (Pub. No. CKRE00E1)

Code No. P1500 Alternator FR terminal system	Probable cause
Range of Check • Engine speed: 50 r/min or more Set Conditions • Input voltage from the alternator FR terminal is system voltage for 20 seconds.	• Open circuit in alternator FR terminal circuit • Malfunction of engine-ECU

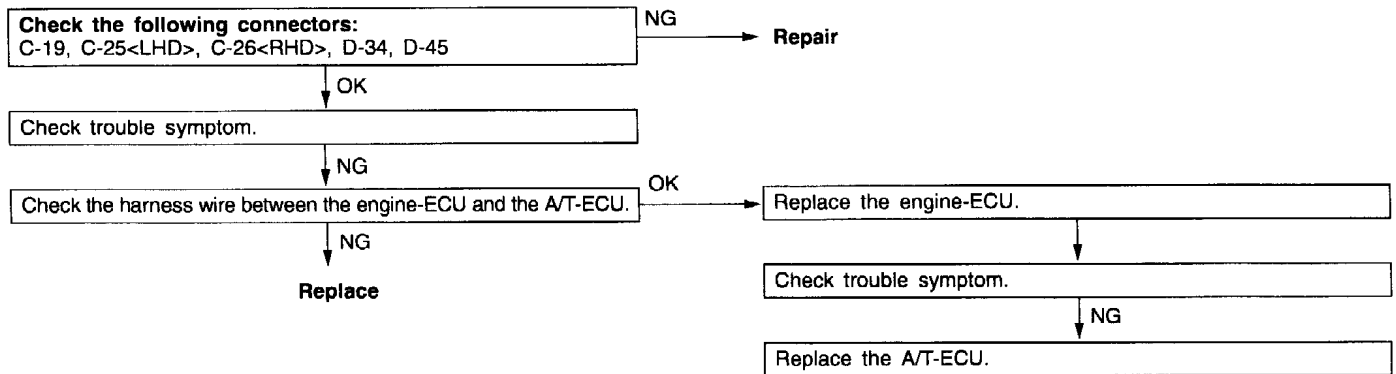


Code No. P1515 Brake vacuum sensor system	Probable cause
Range of Check • Ignition switch: ON Set Conditions • Sensor output voltage is 4.8 V or more. or • Sensor output voltage is 0.2 V or less.	• Malfunction of the brake vacuum sensor • Improper connector contact, open circuit or short-circuited harness wire of the brake vacuum sensor • Malfunction of the engine-ECU





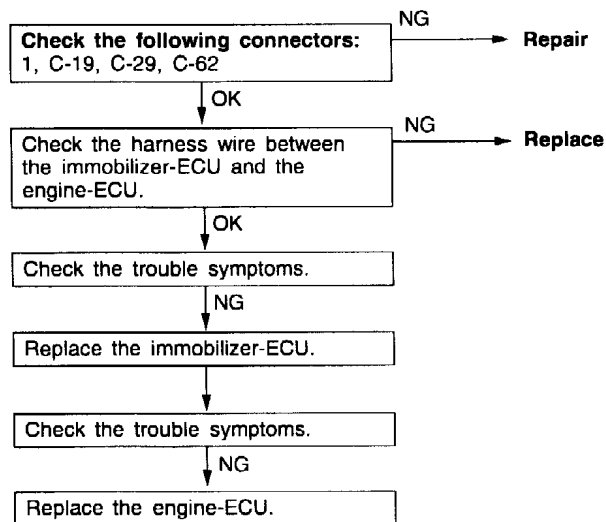
Cord No. P1600 Communication wire with A/T-ECU system	Probable cause
Range of Check - After 60 seconds have passed since the engine have started Set Conditions - Torque reduction request signal from A/T-ECU is input continuously for 1.5 seconds or more.	- Short circuit in ECU communication circuit - Malfunction of the engine-ECU - Malfunction of the A/T-ECU



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

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.



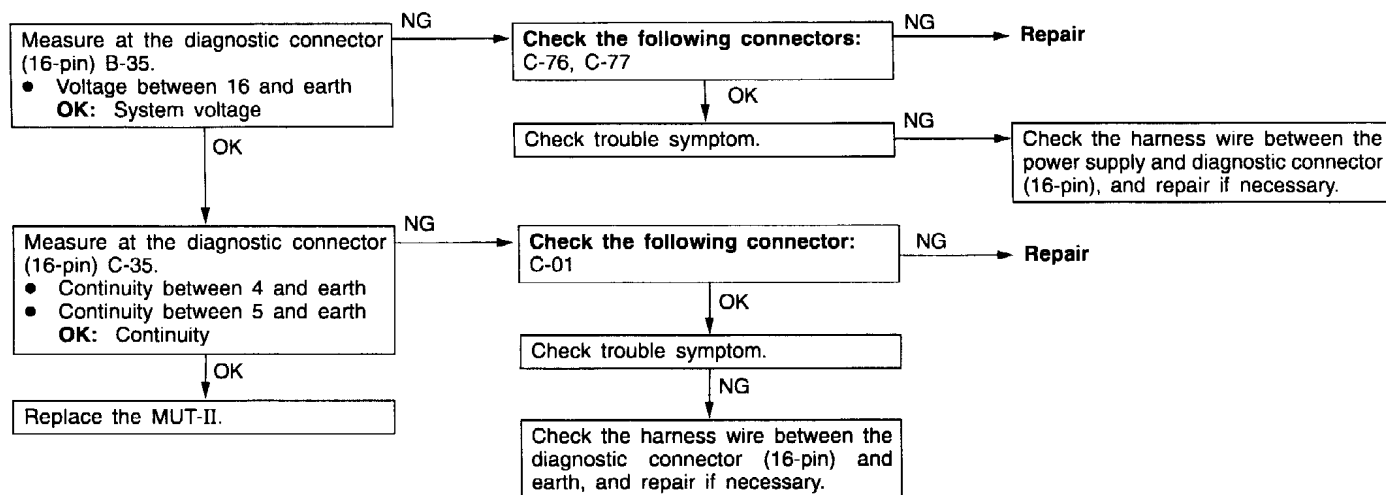
INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom		Inspection procedure No.	Reference page
Communication with MUT-II is impossible.	Communication with all systems is not possible.	1	13A-66
	Communication with engine-ECU only is not possible.	2	13A-66
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-67
	The engine warning lamp remains illuminating and never goes out.	4	13A-67
Starting	No initial combustion (starting impossible)	5	13A-78
	Initial combustion but no complete combustion (starting impossible)	6	13A-70
	Long time to start (improper starting)		
Idling stability (Improper idling)	Unstable idling (Rough idling, hunting)	7	13A-71
	Idling speed is high. (Improper idling speed)	8	13A-73
	Idling speed is low. (Improper idling speed)		
Idling stability (Engine stalls)	When the engine is cold, it stalls at idling. (Die out)	9	13A-74
	When the engine is hot, it stalls at idling. (Die out)	10	13A-75
	The engine stalls when starting the car. (Pass out)	11	13A-77
	The engine stalls when decelerating.	12	13A-78
Driving	Hesitation, sag or stumble	13	13A-79
	Poor acceleration		
	Surge		
	The feeling of impact or vibration when accelerating	14	13A-80
	The feeling of impact or vibration when decelerating	15	13A-81
	Knocking	16	13A-81
Dieseling		17	13A-81
Too high CO and HC concentration when idling		18	13A-82
Low alternator output voltage (approx. 12.3 V)		19	13A-83
Fans (radiator fan, A/C condenser fan) are inoperative		20	13A-84
GDI ECO indicator lamp system	GDI ECO indicator lamp does not illuminate.	21	13A-85
	GDI ECO indicator lamp remains illuminated and does not go off.	22	13A-85

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

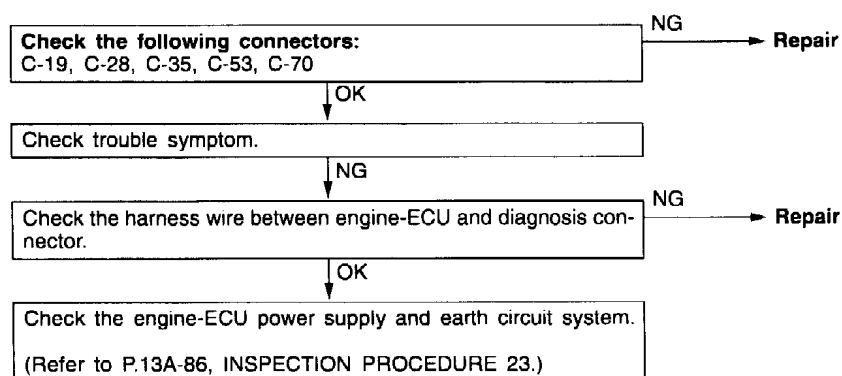
INSPECTION PROCEDURE 1

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.	• Malfunction of the connector • Malfunction of the harness wire • Malfunction of MUT-II



INSPECTION PROCEDURE 2

MUT-II communication with engine-ECU (engine-A/T-ECU) is impossible.	Probable cause
One of the following causes may be suspected. • No power supply to engine-ECU • Defective earth circuit of engine-ECU • Defective engine-ECU • Improper communication line between engine-ECU and MUT-II	• Malfunction of engine-ECU power supply circuit • Malfunction of engine-ECU • Open circuit between the engine-ECU and diagnosis connector



NOTE

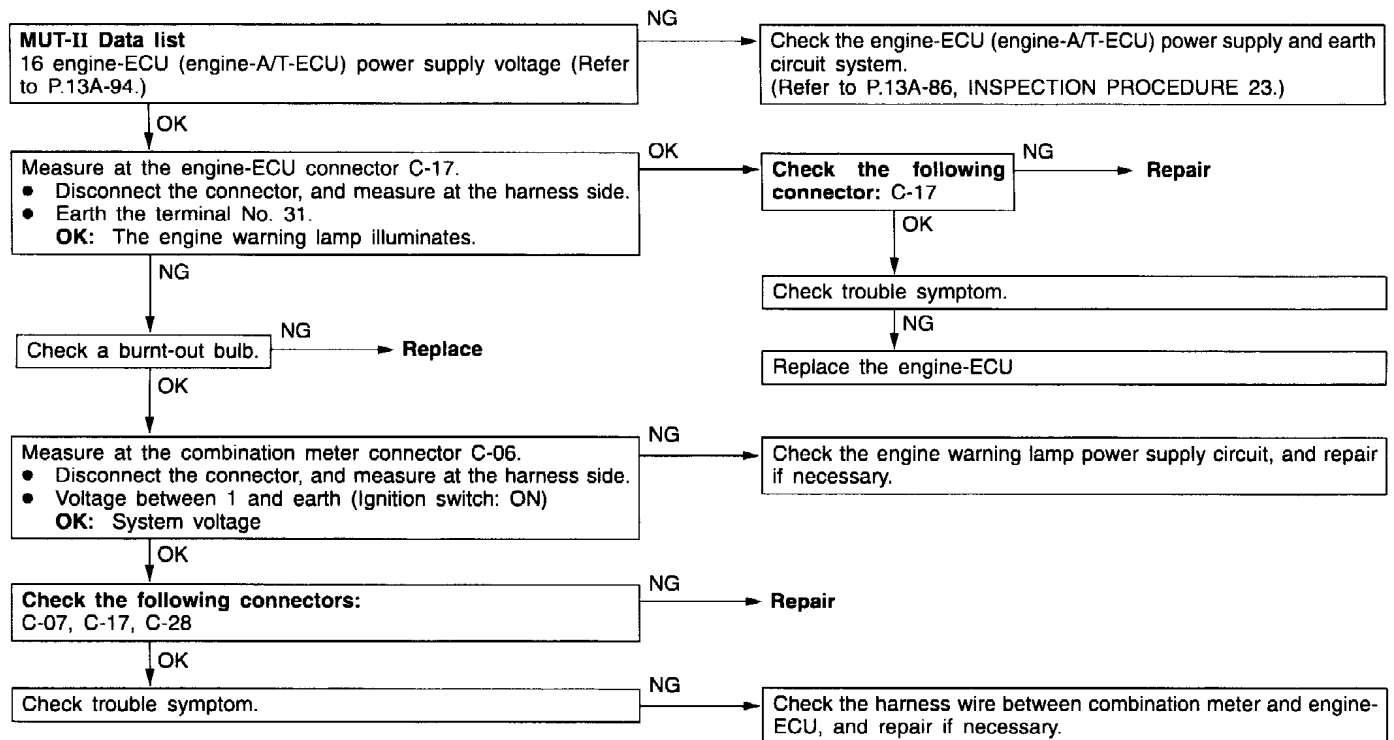
On vehicles with multi center display, if a malfunction cannot be resolved after the procedure above, check the multi center display and replace if necessary. (Refer to GROUP 54 – Multi Center display.)

INSPECTION PROCEDURE 3

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

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.

- Burnt-out bulb
- Defective warning lamp circuit
- Malfunction of the engine-ECU <M/T>
- Malfunction of the engine-A/T-ECU <A/T>

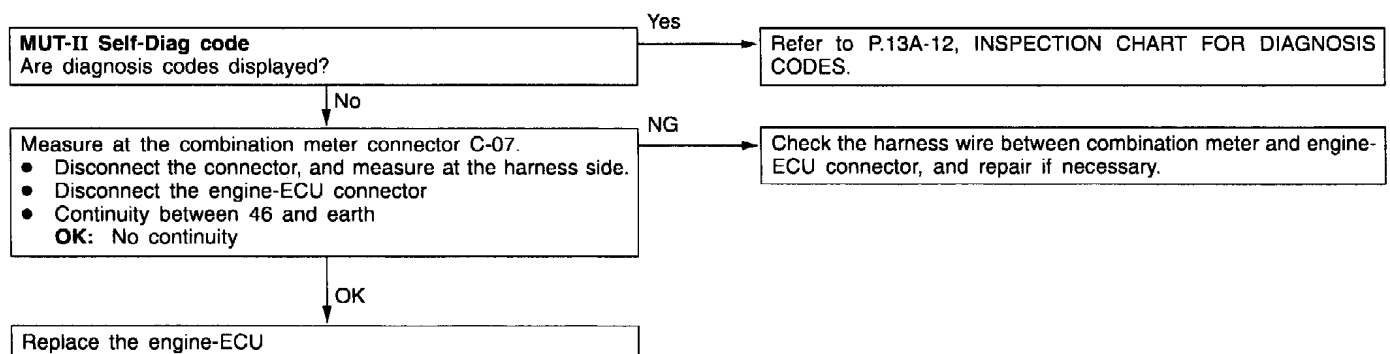


INSPECTION PROCEDURE 4

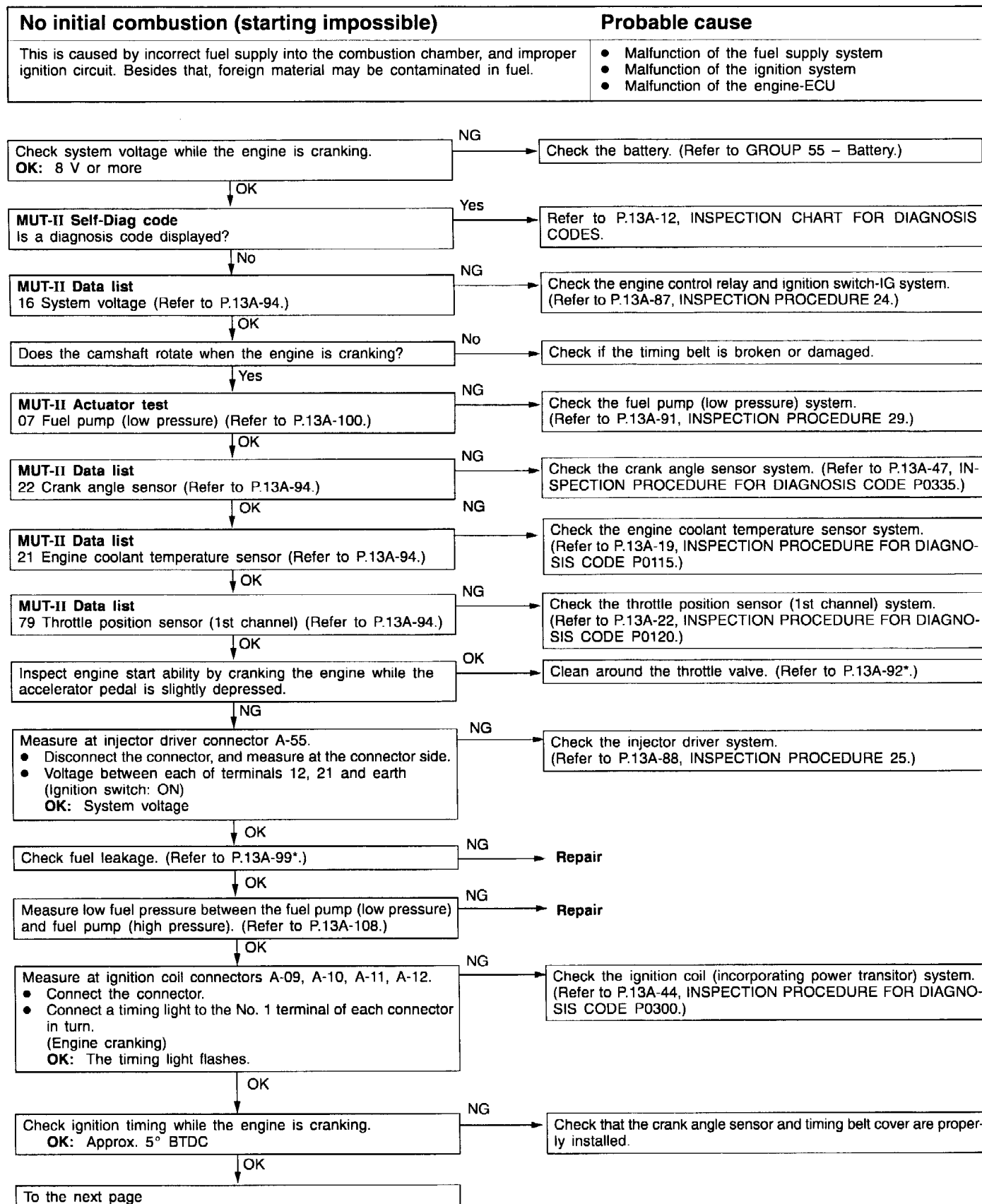
The engine warning lamp remains illuminating and never goes out.**Probable cause**

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.

- Short-circuit between the engine warning lamp and engine-ECU
- Malfunction of the engine-ECU

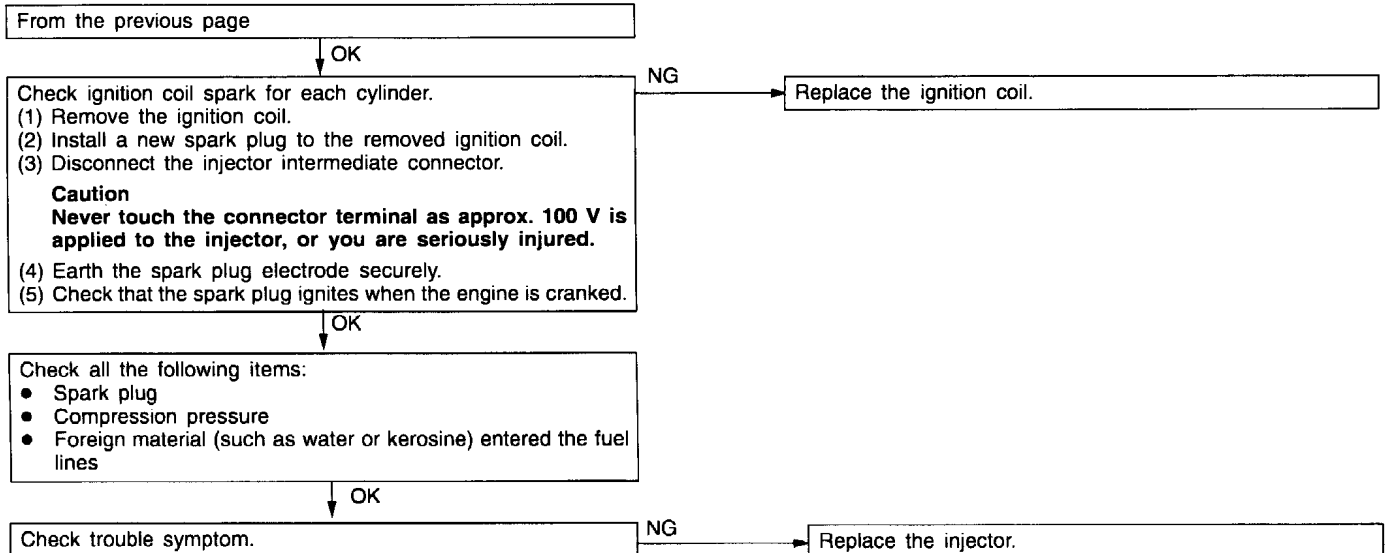


INSPECTION PROCEDURE 5



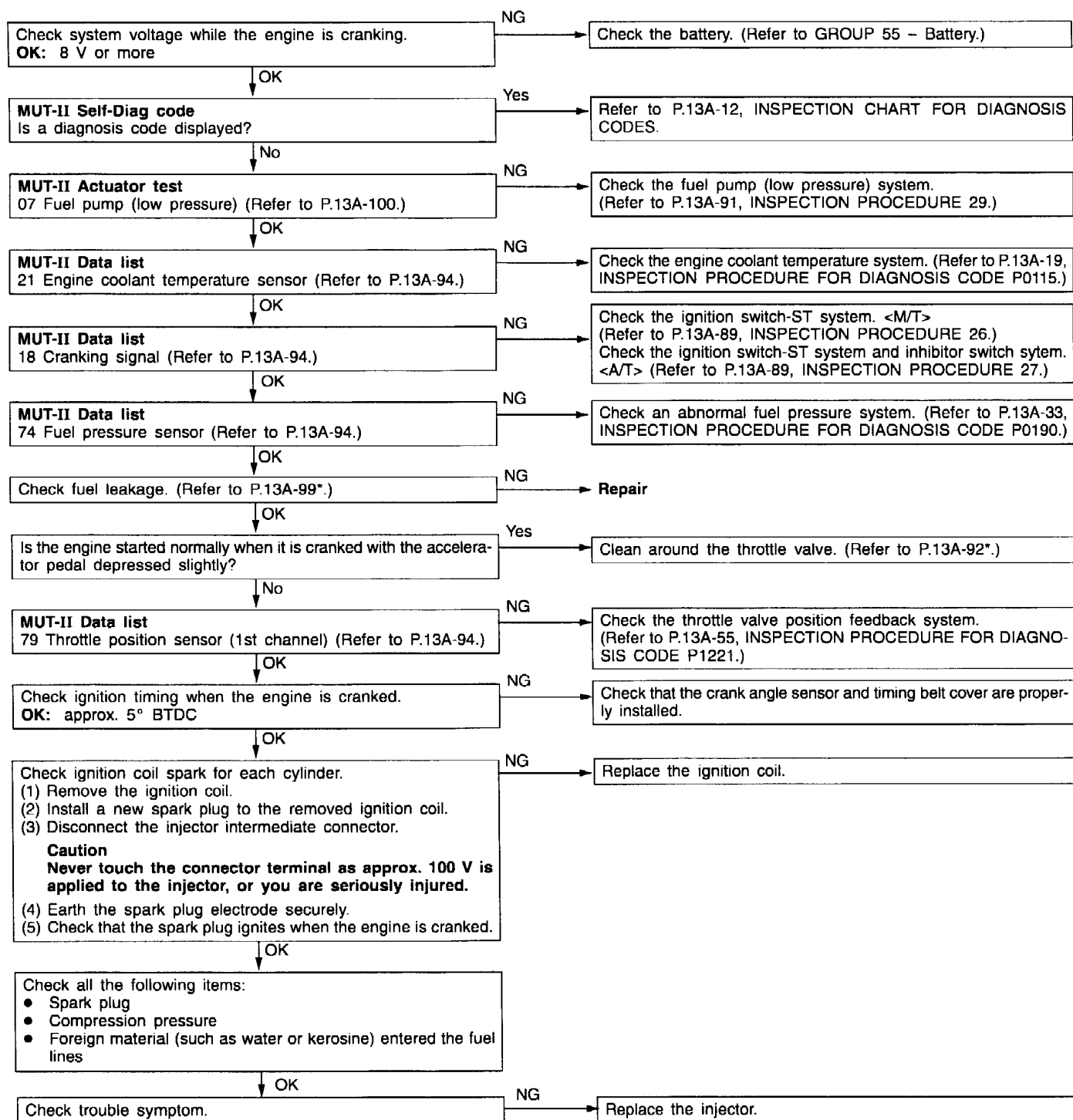
NOTE

*: Refer to the '00 PAJERO PININ Workshop Manual (Pub. No. CKRE00E1)



INSPECTION PROCEDURE 6

Initial combustion takes place, but does not complete (start impossible), too long time to start (poor start)	Probable cause
This may be caused by improper spark plug ignition (poor spark), improper mixture during engine cranking, improper fuel pressure.	• Malfunction of the fuel supply system • Malfunction of the fuel pressure sensor • Malfunction of the ignition system • Malfunction of the electronic-controlled throttle valve system • Malfunction of the engine-ECU <M/T> • Malfunction of the engine-A/T-ECU <A/T>

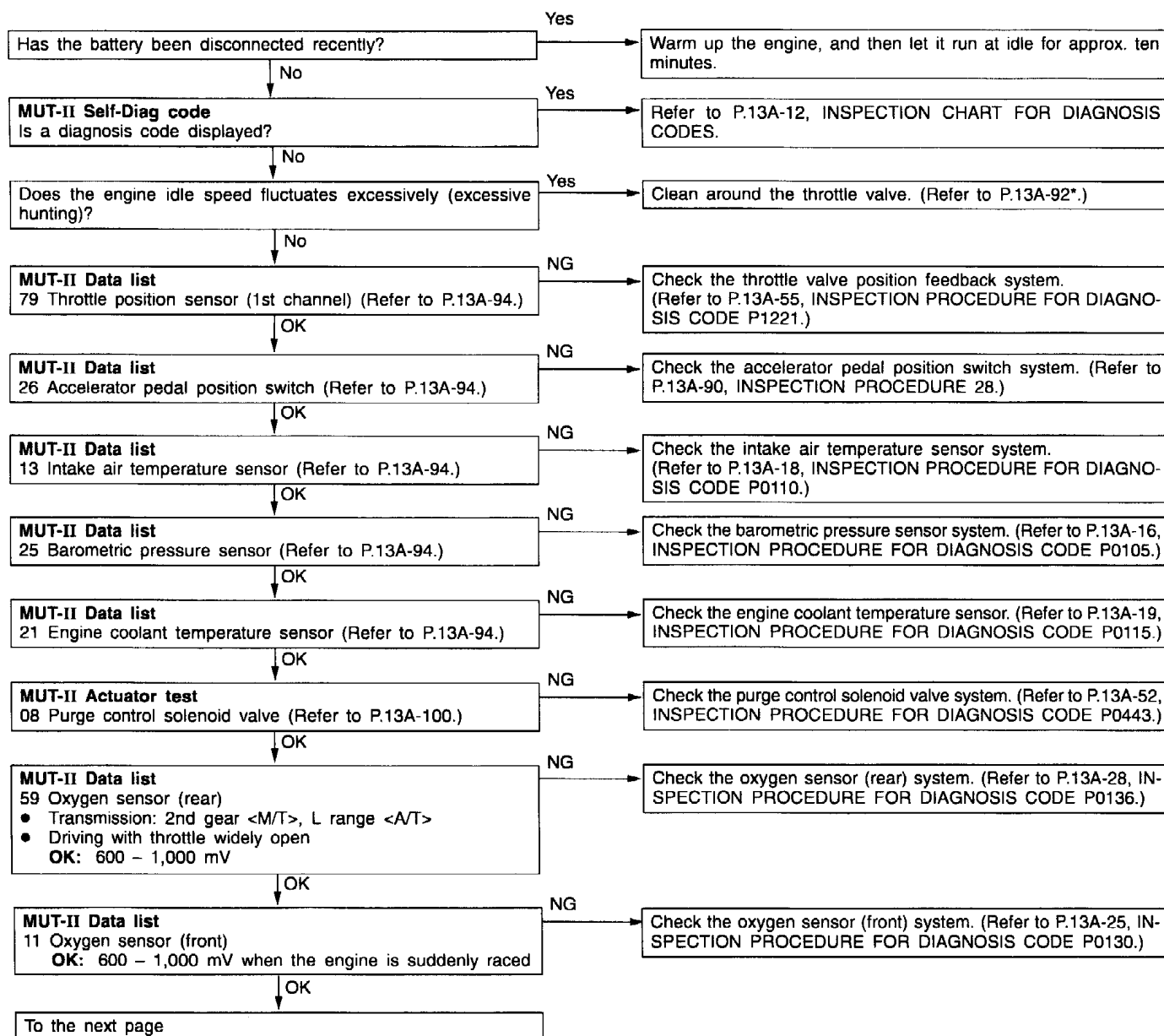


NOTE

*: Refer to the '00 PAJERO PININ Workshop Manual (Pub. No. CKRE00E1)

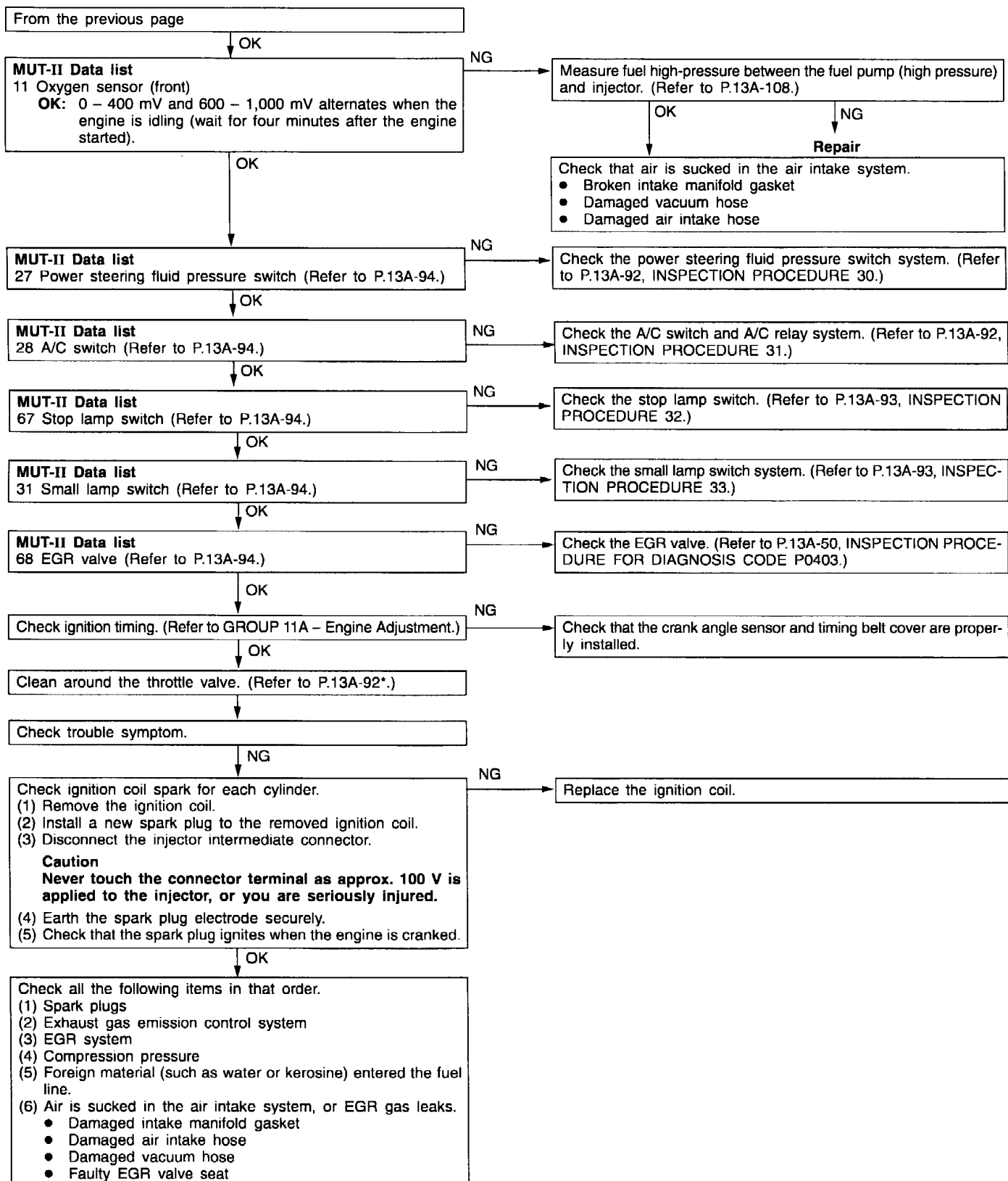
INSPECTION PROCEDURE 7

Unstable idling (rough idle, hunting)	Probable cause
This malfunction is probably caused by a faulty ignition system, improper air/fuel ratio, a faulty electronic-controlled throttle valve system, improper compression pressure, etc. As many causes can be suspected, diagnose from easier items.	• Malfunction of the ignition system • Malfunction of the air/fuel ratio control system • Malfunction of the electronic-control throttle valve system • Improper compression pressure • Air sucking into the air intake system



NOTE

*: Refer to the '00 PAJERO PININ Workshop Manual (Pub. No. CKRE00E1)

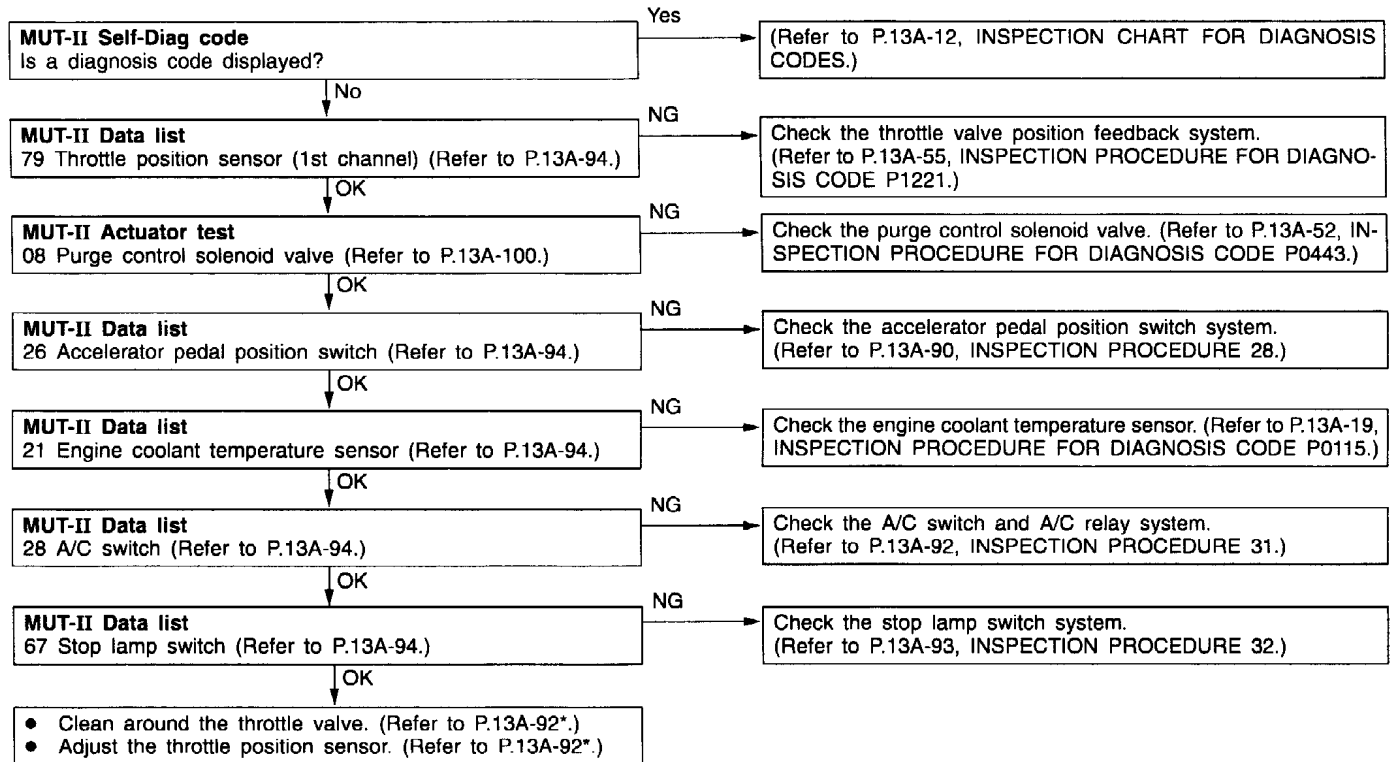


NOTE

*: Refer to the '00 PAJERO PININ Workshop Manual (Pub. No. CKRE00E1)

INSPECTION PROCEDURE 8

Idle speed is high or low (Improper idling)	Probable cause
The cause is probably that the intake air amount during idling is too great or too small.	- Malfunction of the electronic-controlled throttle valve system - Malfunction of the throttle body

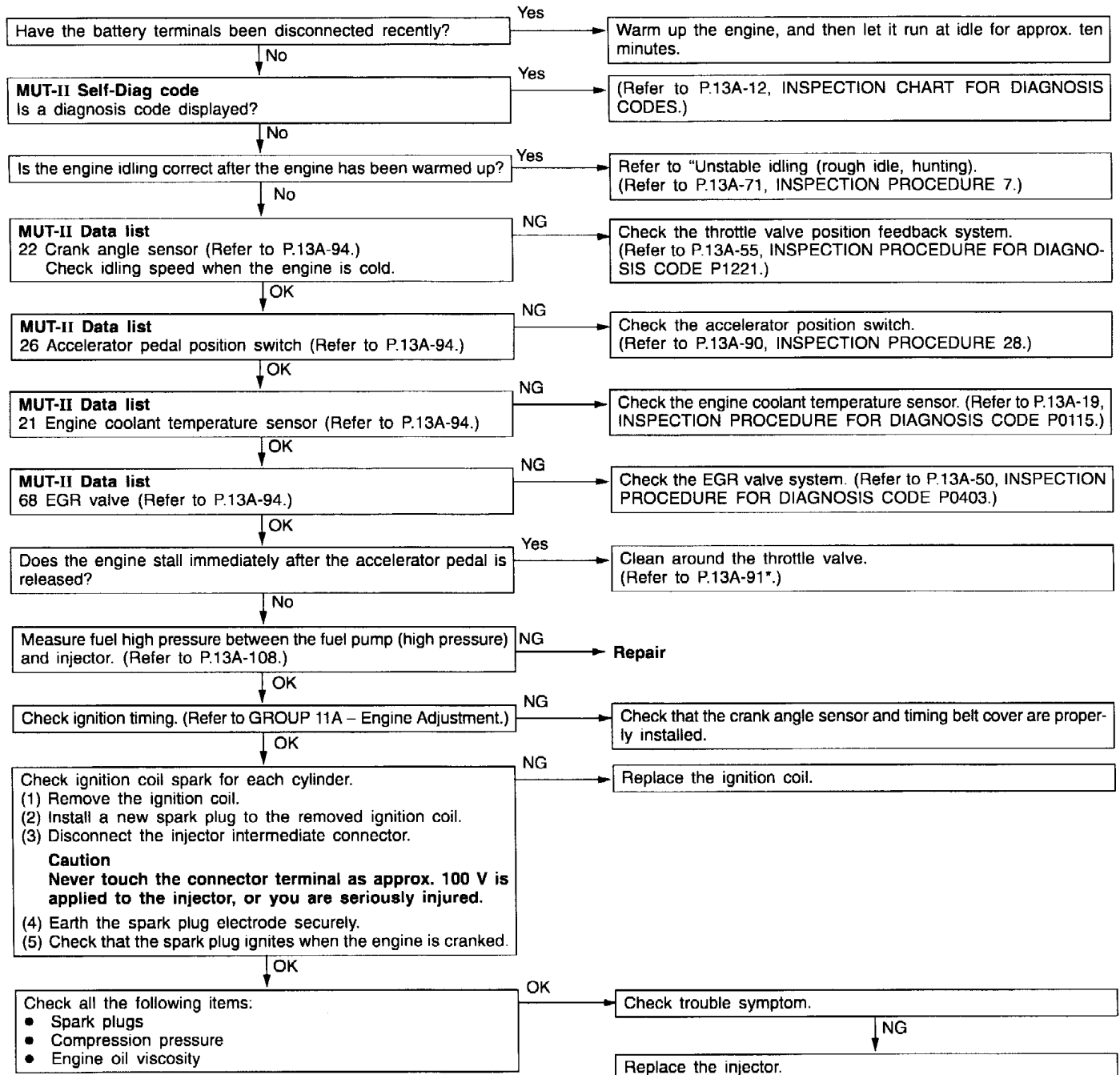


NOTE

*: Refer to the '00 PAJERO PININ Workshop Manual (Pub. No. CKRE00E1)

INSPECTION PROCEDURE 9

When the engine is cold, it stalls at idling. (Die out)	Probable cause
The cause is probably an incorrect air/fuel ratio or poor intake air amount when the engine is cold.	- Malfunction of the electronic-control throttle valve system - Malfunction of the throttle body

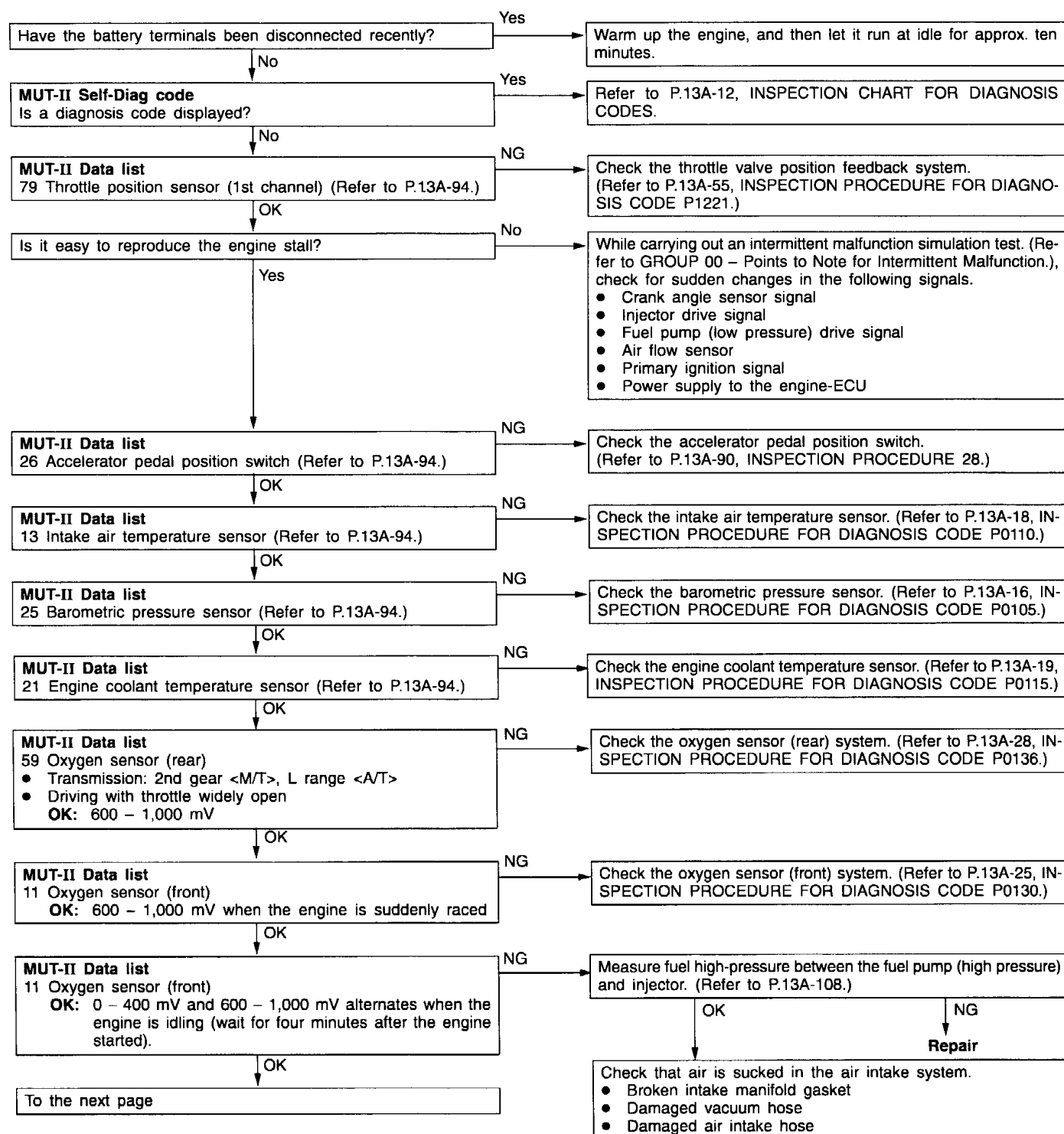


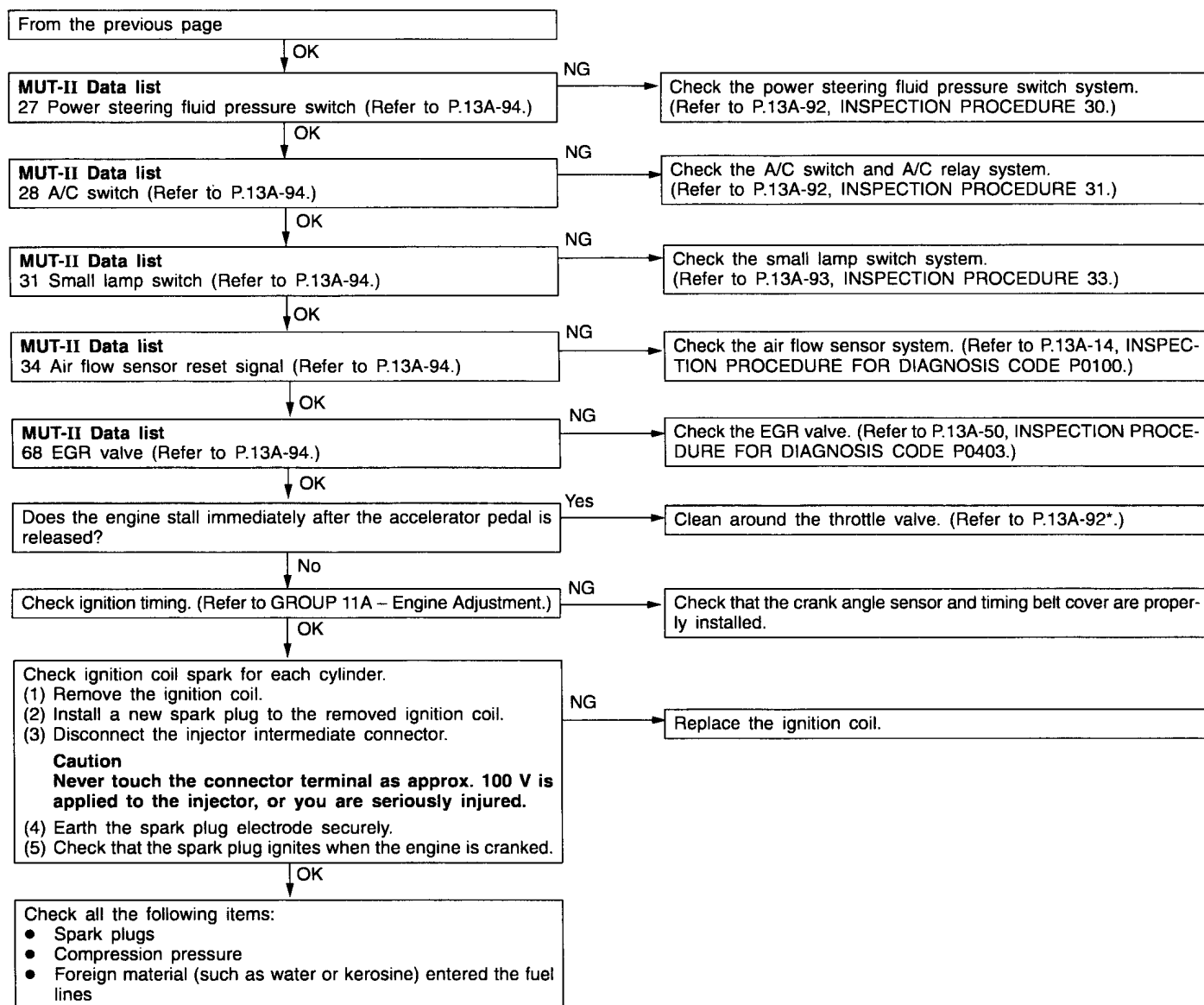
NOTE

*: Refer to the '00 PAJERO PININ Workshop Manual (Pub. No. CKRE00E1)

INSPECTION PROCEDURE 10

When the engine is hot, it stalls at idling. (Die out)	Probable cause
The cause is probably an improper air/fuel ratio, faulty electronic-controlled throttle valve system, compression pressure. In addition, if the engine stalls suddenly, another possible cause might be a poor connector contact.	● Malfunction of the ignition system ● Malfunction of air/fuel ratio control system ● Malfunction of electronic-controlled throttle valve system ● Malfunction of the throttle body ● Poor connector contact ● Improper compression pressure ● Air stuck in the air intake system



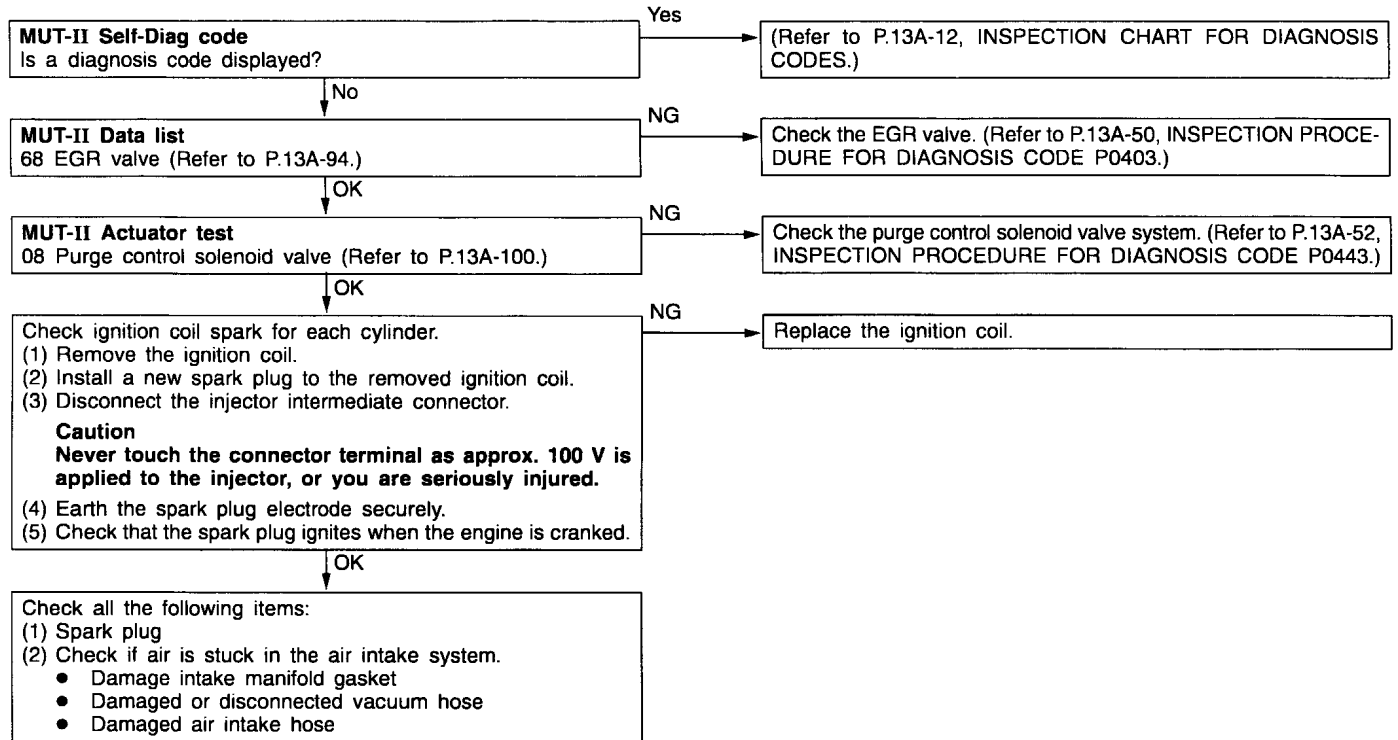


NOTE

*: Refer to the '00 PAJERO PININ Workshop Manual (Pub. No. CKRE00E1)

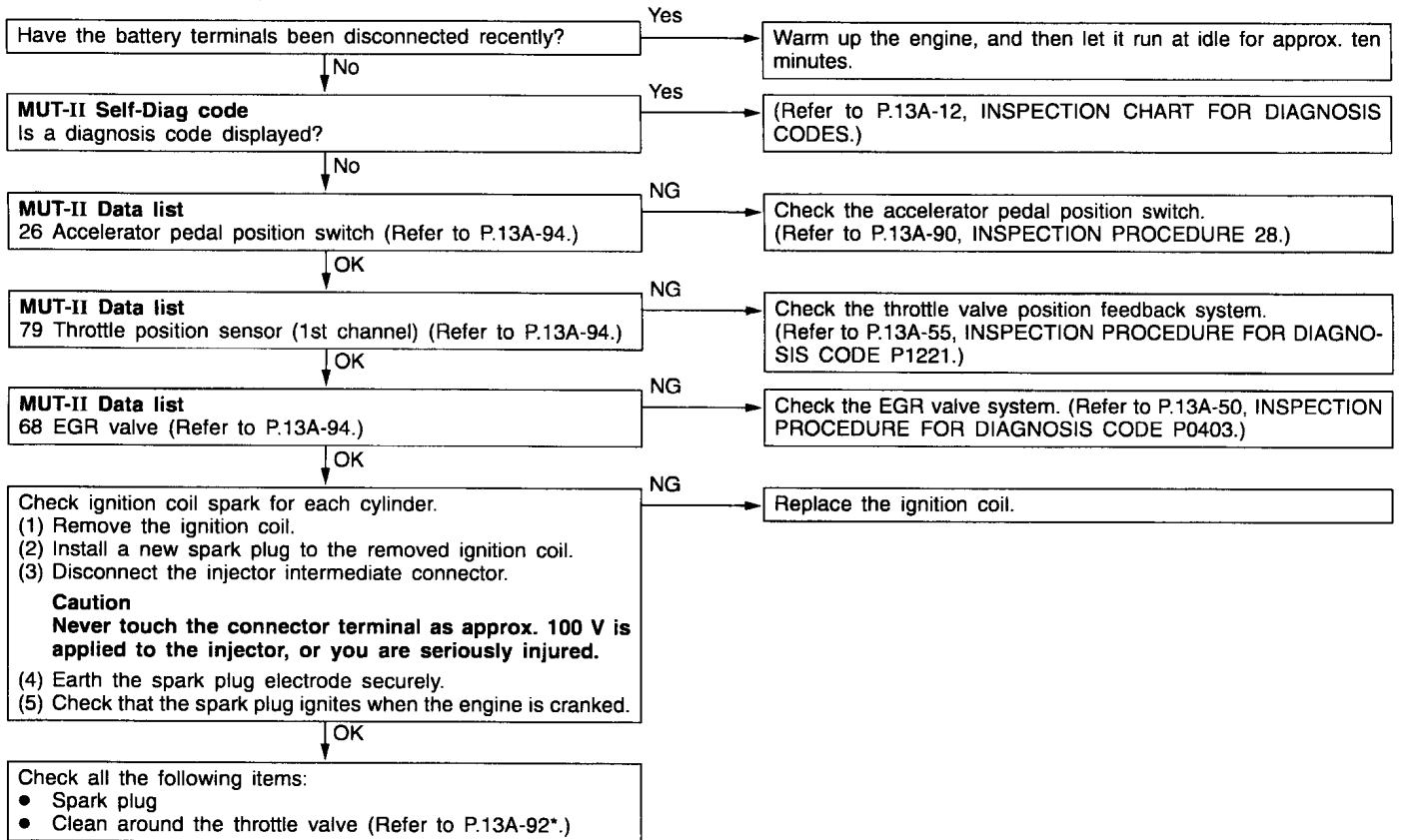
INSPECTION PROCEDURE 11

The engine stalls when starting the car. (Pass out)	Probable cause
The cause is probably poor ignition due to a malfunctioning spark plug (weak spark), or an incorrect air/fuel ratio when the accelerator is depressed.	● Malfunction of the ignition system ● Malfunction of the EGR valve ● Air stuck in the air intake system



INSPECTION PROCEDURE 12

The engine stalls when decelerating.	Probable cause
The cause is probably an improper air/fuel ratio due to a faulty EGR system, or poor intake air volume due to a faulty electronic-controlled throttle valve system.	- Malfunction of the electronic-controlled throttle valve system - Malfunction of the EGR valve



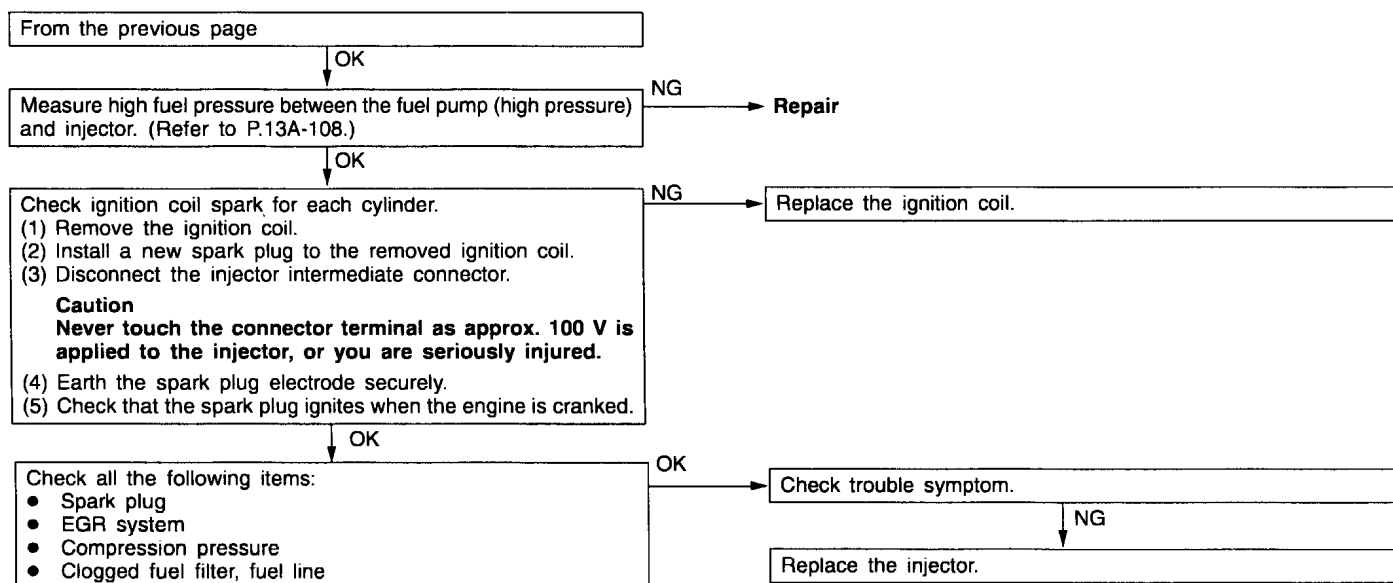
NOTE

*: Refer to the '00 PAJERO PININ Workshop Manual (Pub. No. CKRE00E1)

INSPECTION PROCEDURE 13

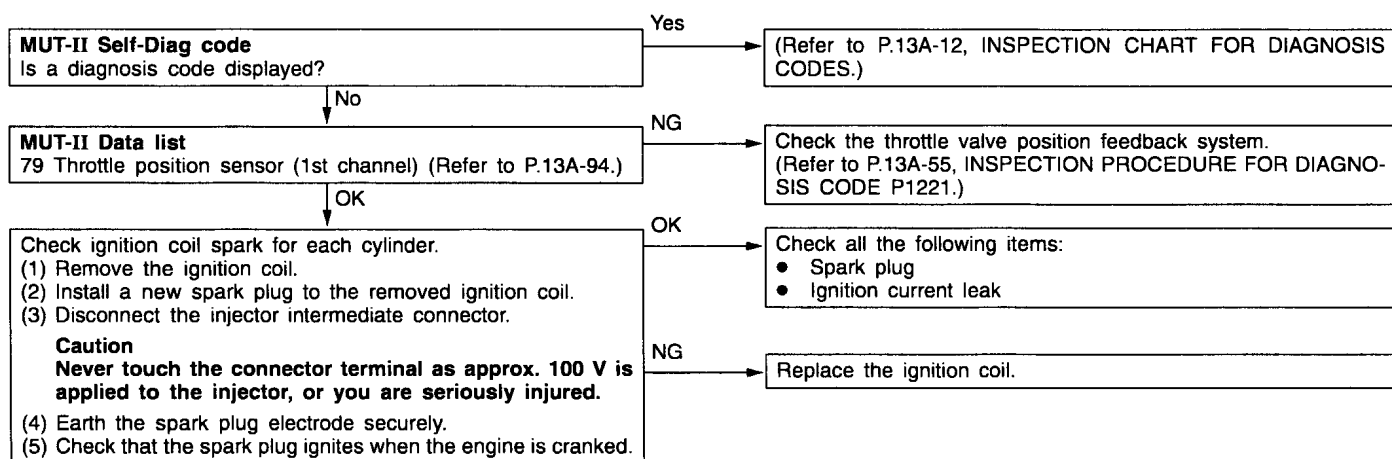
Hesitation, sag, stumble, poor acceleration or surge	Probable cause
The cause is probably a malfunction of the ignition system, electronic-controlled throttle valve system, compression pressure, etc.	• Malfunction of the ignition system • Malfunction of the air/fuel ratio control system • Malfunction of the electronic-controlled throttle valve system • Improper compression pressure • Air stuck in the air intake system

MUT-II Self-Diag code Is a diagnosis code displayed?	Yes	(Refer to P.13A-12, INSPECTION CHART FOR DIAGNOSIS CODES.)
No	NG	Check that the crank angle sensor and timing belt cover are properly installed.
Check ignition timing. (Refer to GROUP 11A – Engine Adjustment.)	OK	
MUT-II Data list 26 Accelerator pedal position switch (Refer to P.13A-94.)	NG	Check the accelerator pedal position switch. (Refer to P.13A-90, INSPECTION PROCEDURE 28.)
OK		
MUT-II Data list 13 Intake air temperature sensor (Refer to P.13A-94.)	NG	Check the intake air temperature sensor. (Refer to P.13A-18, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0110.)
OK		
MUT-II Data list 25 Barometric pressure sensor (Refer to P.13A-94.)	NG	Check the barometric pressure sensor. (Refer to P.13A-16, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0105.)
OK		
MUT-II Data list 21 Engine coolant temperature sensor (Refer to P.13A-94.)	NG	Check the engine coolant temperature sensor. (Refer to P.13A-19, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0115.)
OK		
MUT-II Data list 79 Throttle position sensor (1st channel) (Refer to P.13A-94.)	NG	Check the throttle valve position feedback system. (Refer to P.13A-55, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P1221.)
OK		
MUT-II Data list 59 Oxygen sensor (rear) • Transmission: 2nd gear <M/T>, L range <A/T> • Driving with throttle widely open OK: 600 – 1,000 mV	NG	Check the oxygen sensor (rear) system. (Refer to P.13A-28, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0136.)
OK		
MUT-II Data list 11 Oxygen sensor (front) OK: 600 – 1,000 mV when the engine is suddenly raced	NG	Check the oxygen sensor (front) system. (Refer to P.13A-25, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0130.)
OK		
MUT-II Data list 11 Oxygen sensor (front) OK: 0 – 400 mV and 600 – 1,000 mV alternates when the engine is idling (wait for four minutes after the engine started).	NG	Measure fuel high-pressure between the fuel pump (high pressure) and injector. (Refer to P.13A-108.)
OK		
		Check that air is sucked in the air intake system. • Broken intake manifold gasket • Damaged vacuum hose • Damaged air intake hose
MUT-II Data list 68 EGR valve (Refer to P.13A-94.)	NG	Check the EGR valve. (Refer to P.13A-50, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0403.)
OK		
MUT-II Actuator test 08 Purge control solenoid valve (Refer to P.13A-100.)	NG	Check the purge control solenoid valve. (Refer to P.13A-52, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0443.)
OK		
To the next page		



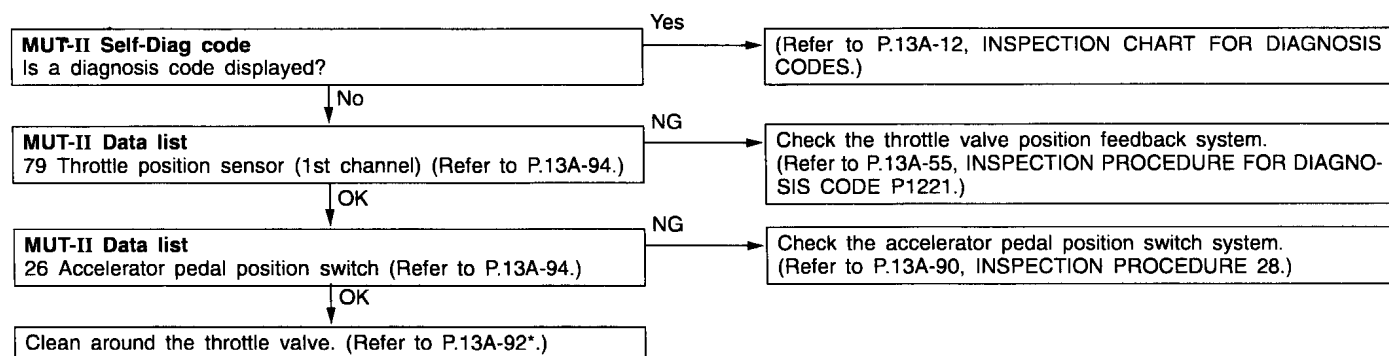
INSPECTION PROCEDURE 14

The feeling of impact when accelerating	Probable cause
The cause is probably an ignition leak being generated in line with an increase in the spark plug request voltage during acceleration.	Malfunction of the ignition system



INSPECTION PROCEDURE 15

The feeling of impact when decelerating	Probable cause
The cause is probably insufficient intake air due to a faulty electronic-controlled throttle valve system.	Malfunction of the electronic-controlled throttle valve system

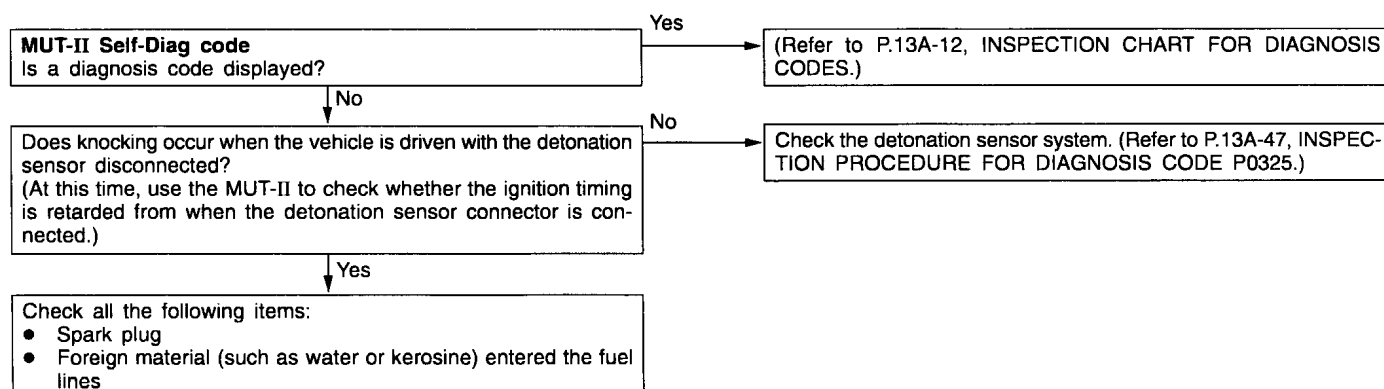


NOTE

*: Refer to the '00 PAJERO PININ Workshop Manual (Pub. No. CKRE00E1)

INSPECTION PROCEDURE 16

Knocking	Probable cause
The cause is probably incorrect detonation control or improper heat range of the spark plugs.	- Malfunction of the detonation sensor - Improper heat range of the spark plugs



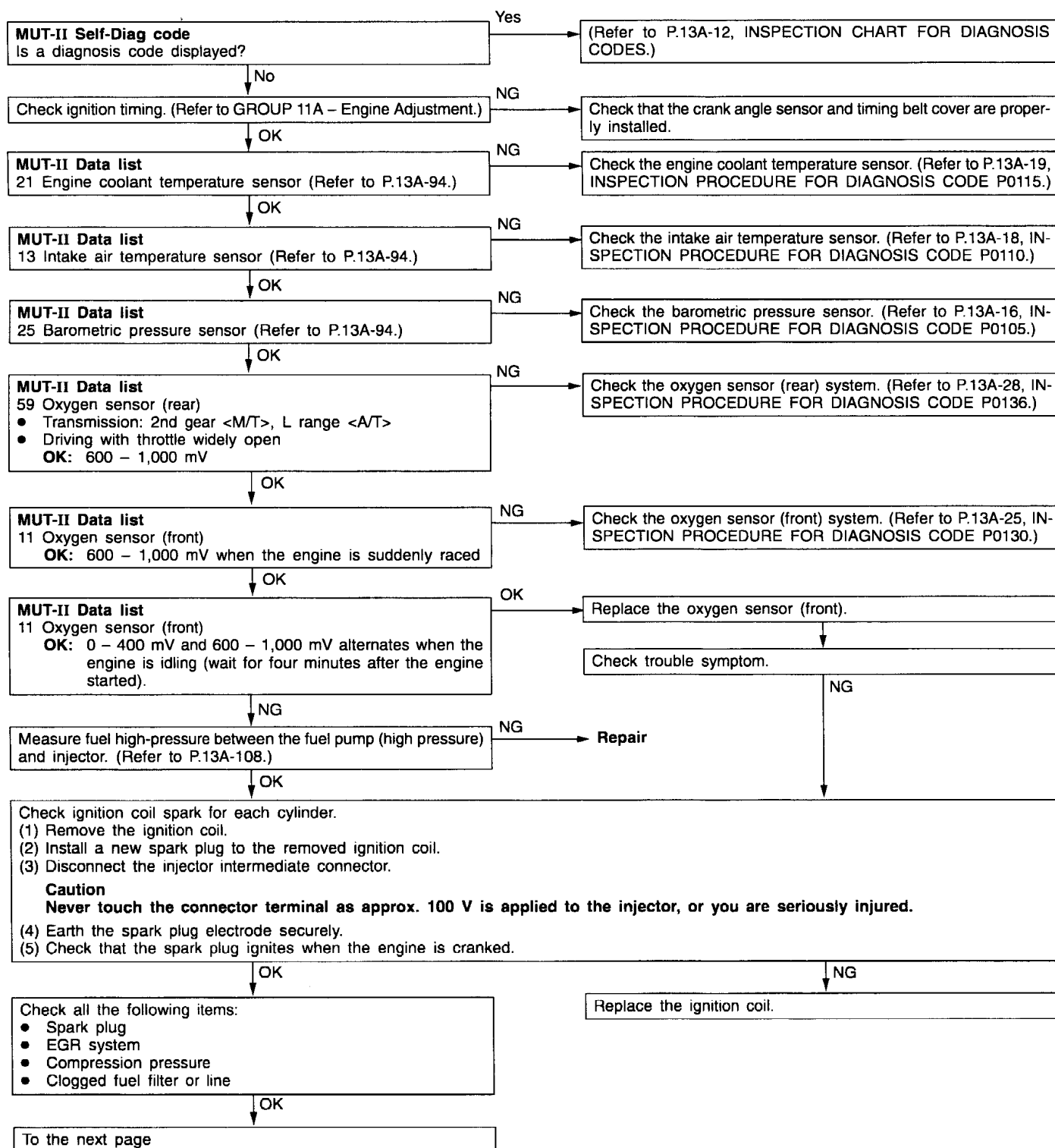
INSPECTION PROCEDURE 17

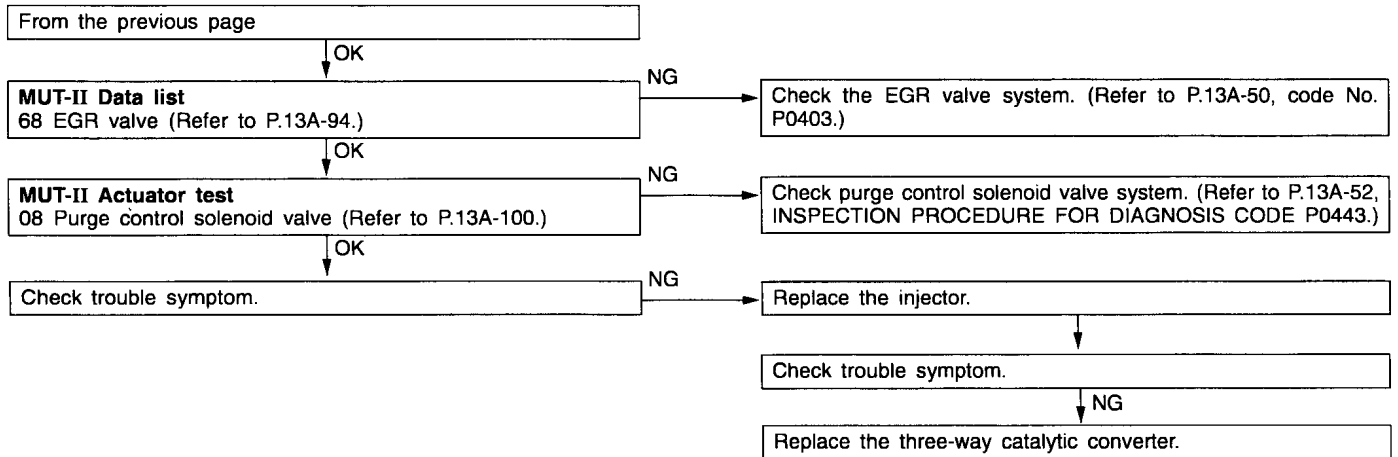
Run-on (dieseling)	Probable cause
The cause is probably fuel leak from injector(s)	Malfunction of the injector

Replace the injector.

INSPECTION PROCEDURE 18

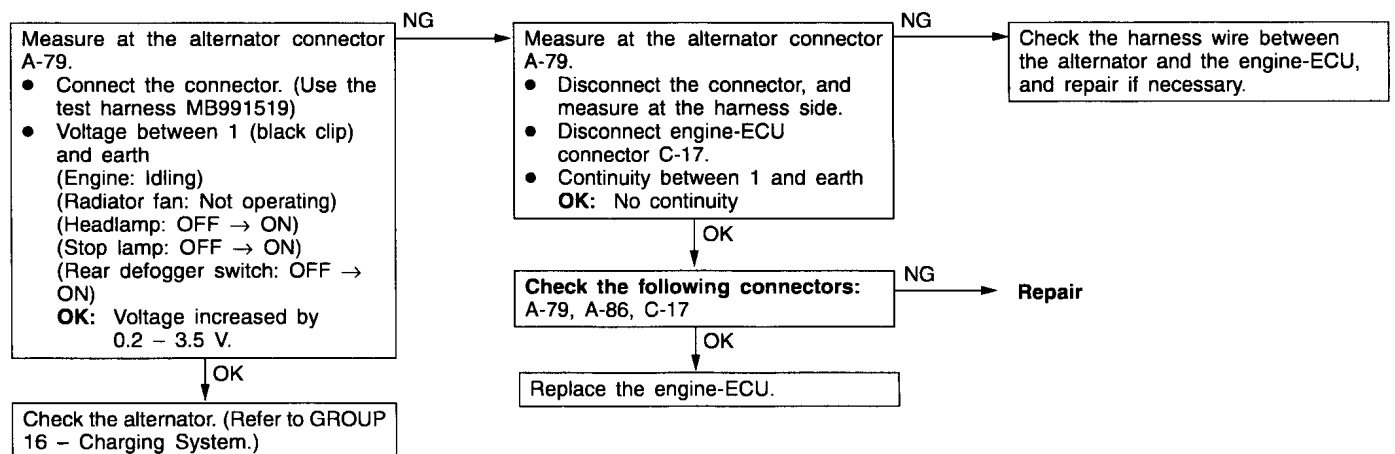
Too high CO and HC concentration when idling	Probable cause
The cause is probably an incorrect air/fuel ratio	• Malfunction of air/fuel ratio control system • Deterioration of the catalyst





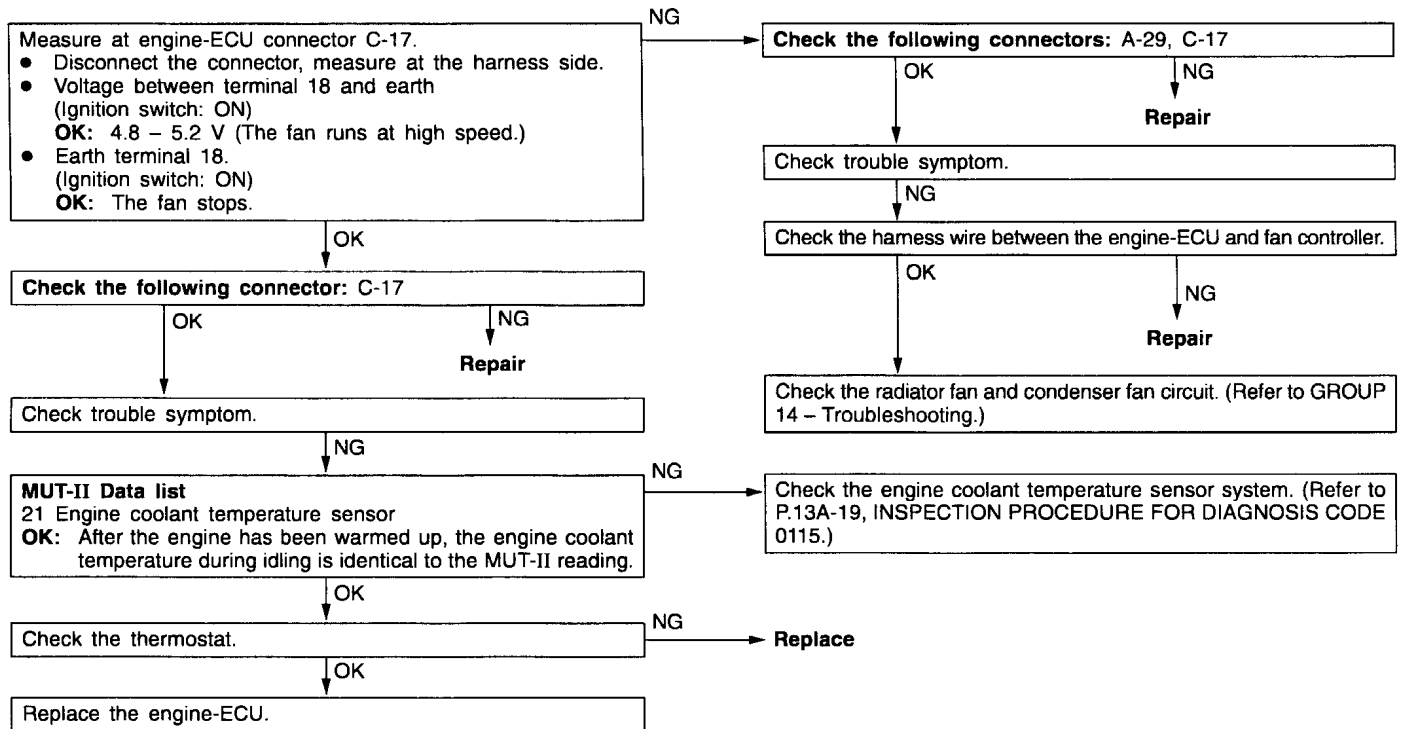
INSPECTION PROCEDURE 19

Low alternator output voltage (approx. 12.3 V)	Probable cause
The cause is probably a malfunction of the alternator or one of the problems listed at right.	- Malfunction of the charging system - Open circuit between the alternator G terminal and the engine-ECU - Malfunction of the engine-ECU



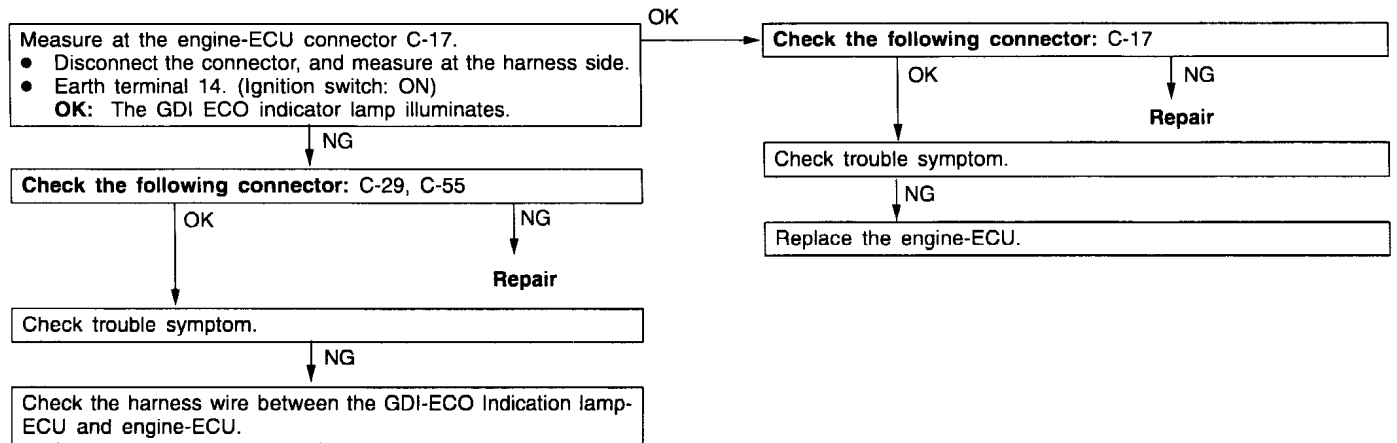
INSPECTION PROCEDURE 20

Fans (radiator fan, A/C condenser fan) are inoperative.	Probable cause
The engine-ECU sends a duty signal to the fan controller according to engine coolant temperature, vehicle speed, or A/C switch load. The fan controller controls radiator fan and condenser fan speeds, based on this signal. (The closer the terminal voltage comes to 5 V, the higher the fan speed becomes.)	• Malfunction of the fan motor relay • Malfunction of the fan motor • Malfunction of the fan controller • Open or short circuit, or poor connector contact • Malfunction of the engine-ECU



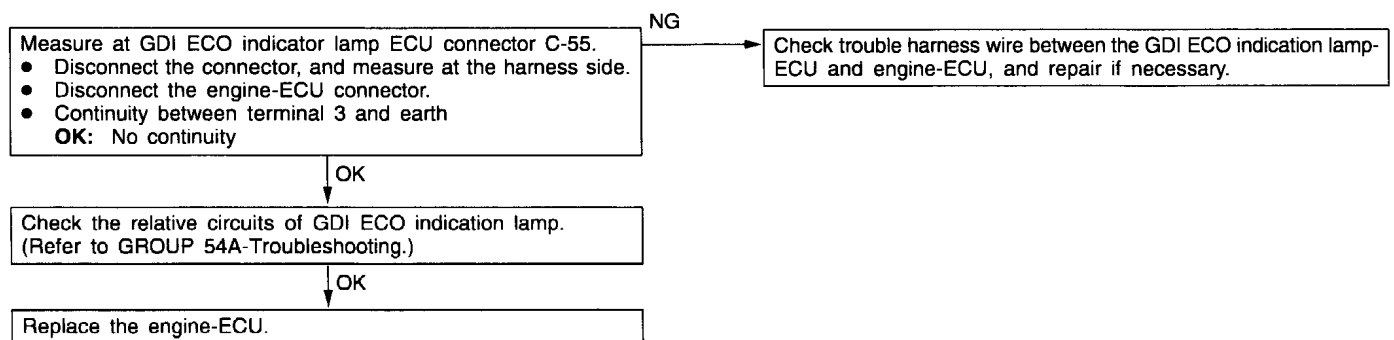
INSPECTION PROCEDURE 21

GDI ECO indicator lamp does not illuminate.	Probable cause
If the GDI ECO indicator lamp does not illuminate after turning switch, the causes listed in the right column are suspected.	• Burned-out GDI ECO indicator lamp bulb • Open circuit or short-circuited harness wire in the GDI ECO indicator lamp circuit • Malfunction of the engine-ECU • Malfunction of the GDI ECO indicator lamp ECU



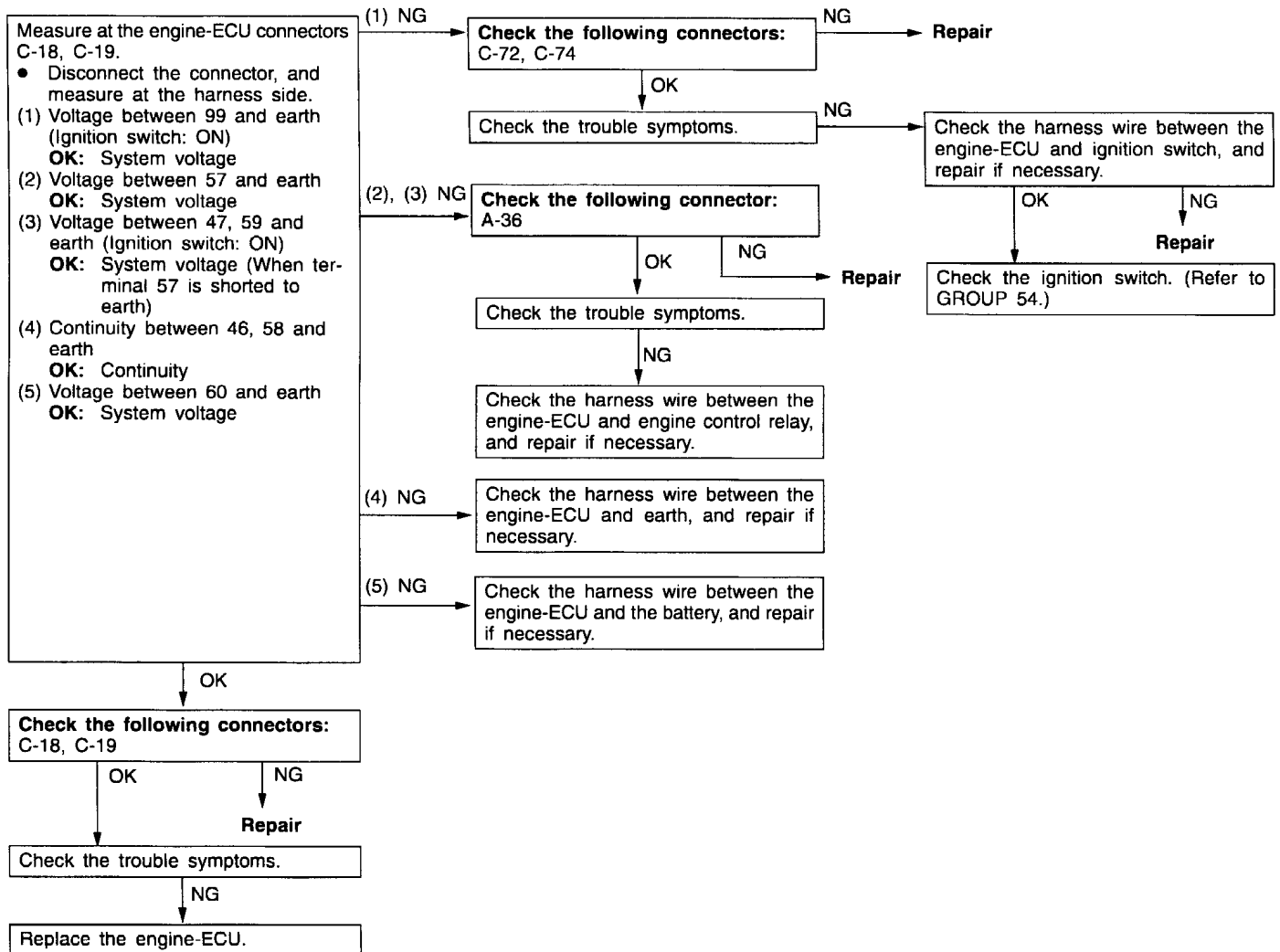
INSPECTION PROCEDURE 22

GDI ECO indicator lamp remains illuminated and does not go off.	Probable cause
If the GDI ECO indicator lamp does not go off during high load operation, the causes listed in the right column are suspected.	• Short circuit between the GDI ECO indicator lamp and engine-ECU • Malfunction of the engine-ECU • Malfunction of the GDI ECO indicator lamp ECU



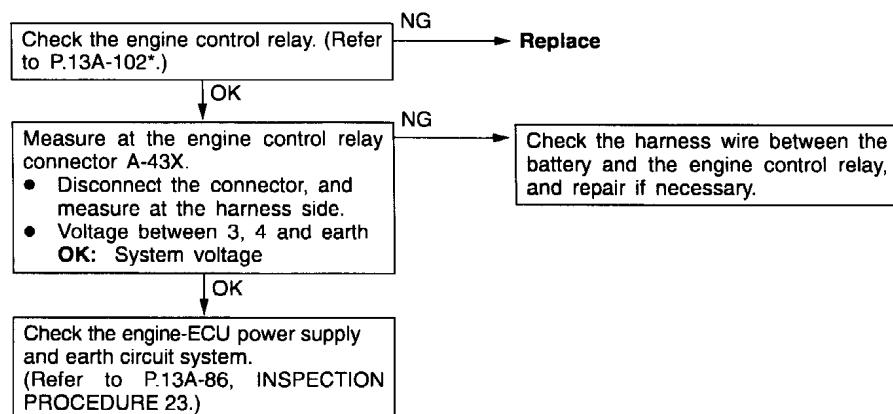
INSPECTION PROCEDURE 23

Engine-ECU power supply and earth circuit system	Probable cause
The cause is probably a malfunction of the engine-ECU or one of the problems listed at right.	• Open circuit or short-circuited harness wire in the engine-ECU power supply circuit • Open circuit or short-circuited harness wire in the engine-ECU earth circuit • Malfunction of the engine-ECU



INSPECTION PROCEDURE 24

Engine control relay and ignition switch-IG system	Probable cause
When the ignition switch ON signal is input to the engine-ECU, the engine-ECU turns on the engine control relay. This causes system voltage to be supplied to the engine-ECU and to the sensors and actuators.	• Malfunction of the ignition switch • Malfunction of the engine control relay • Open circuit or short-circuited harness wire of the engine control relay circuit • Malfunction of the engine-ECU

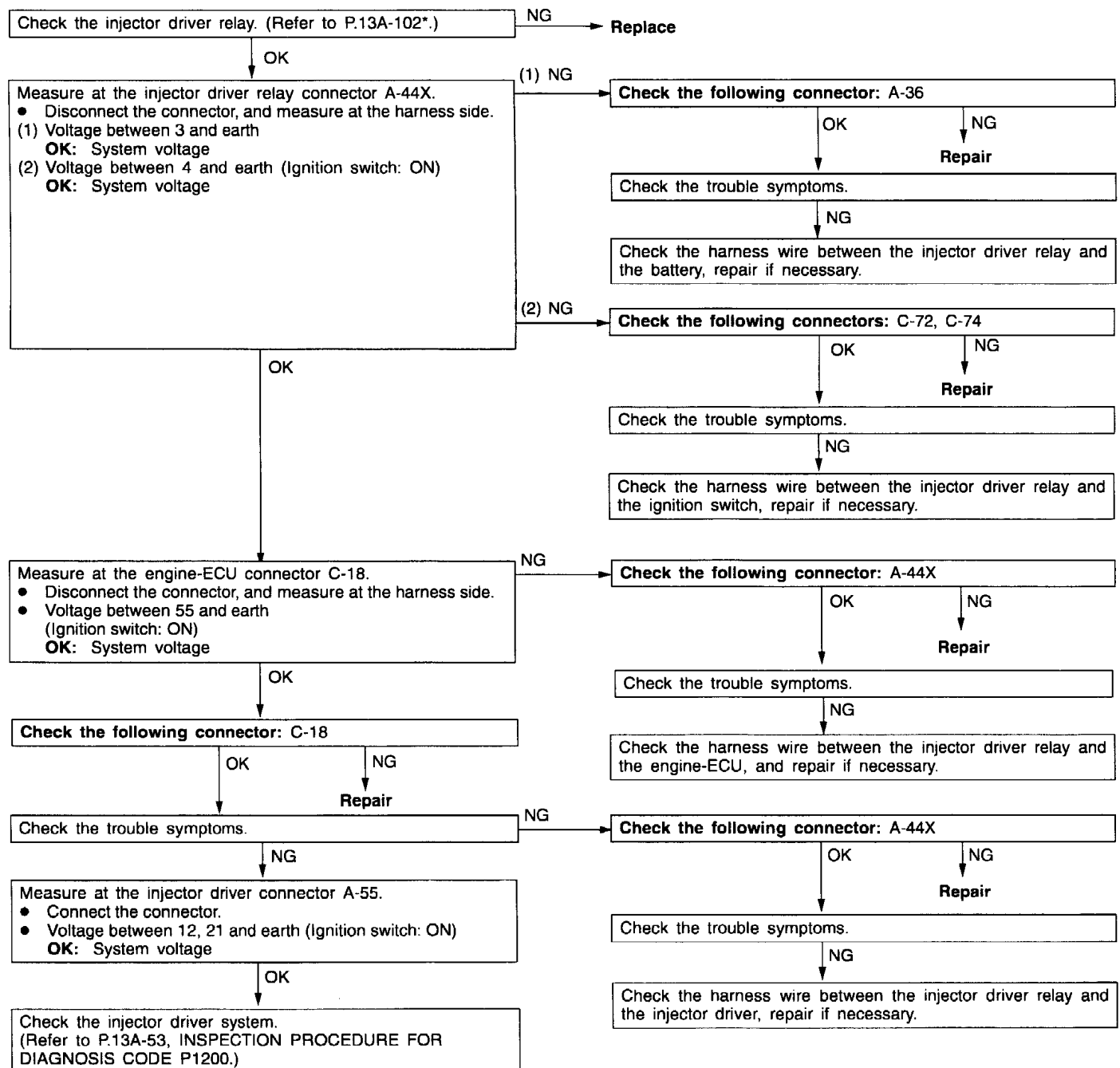


NOTE

*: Refer to the '00 PAJERO PININ Workshop Manual (Pub. No. CKRE00E1)

INSPECTION PROCEDURE 25

Injector driver relay system	Probable cause
When the ignition switch ON signal is input to the engine-ECU, engine-ECU turns on the injector driver relay. This causes system voltage to be supplied to the injector driver.	- Malfunction of the injector driver relay - Improper connector contact, open circuit or short-circuited harness wire - Malfunction of the engine-ECU

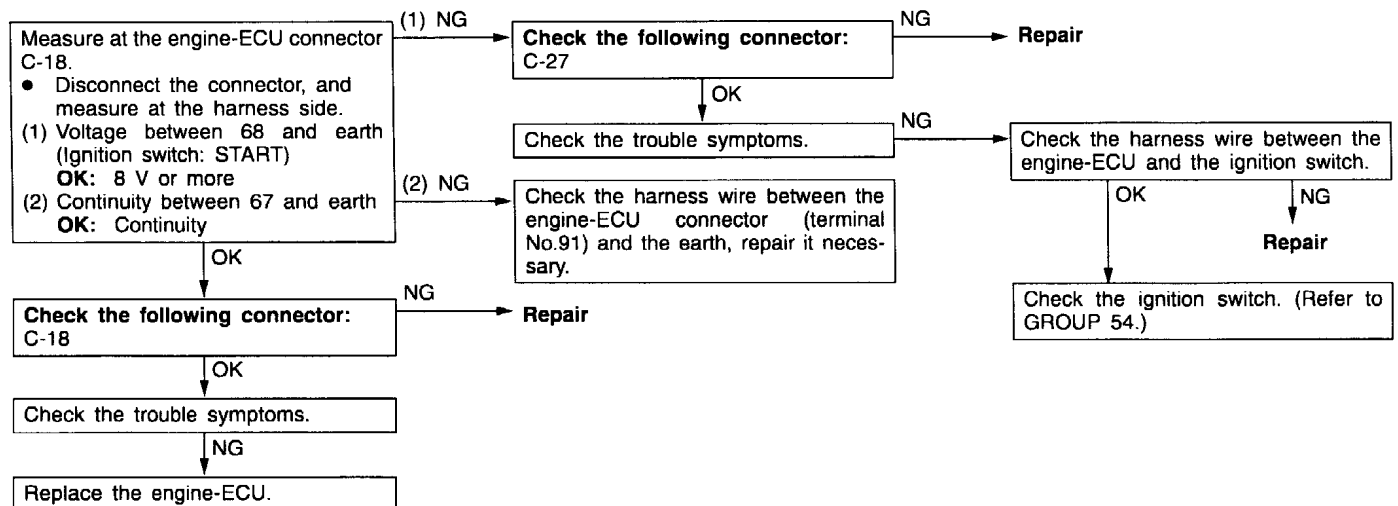


NOTE

*: Refer to the '00 PAJERO PININ Workshop Manual (Pub. No. CKRE99E1)

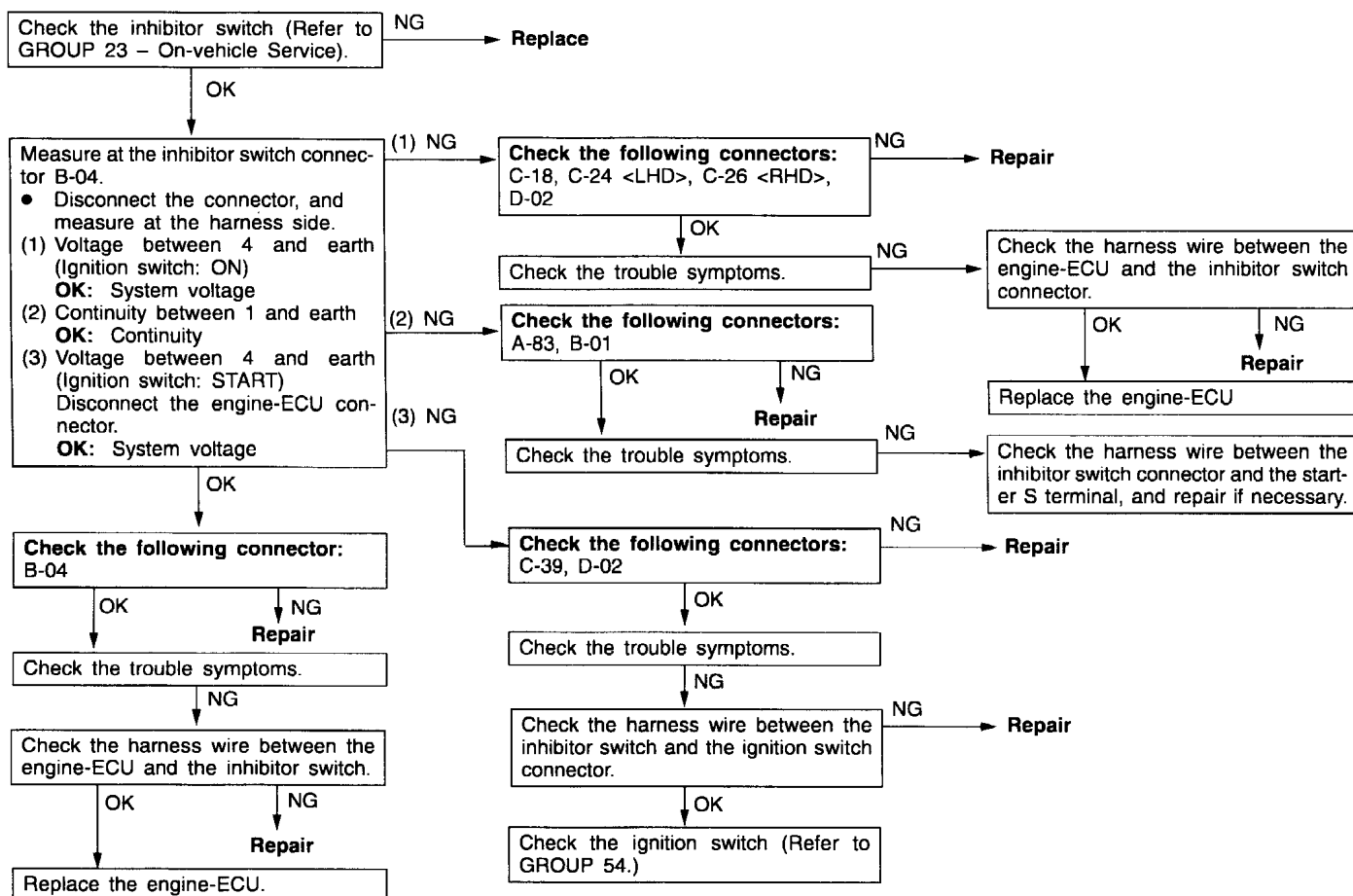
INSPECTION PROCEDURE 26

Ignition switch-ST system <M/T>	Probable cause
The ignition switch-ST outputs a HIGH signal to the engine-ECU while the engine is cranking. The engine-ECU uses this signal to carry out functions such as fuel injection control during starting.	● Malfunction of the ignition switch ● Open circuit or short-circuited harness wire of the ignition switch circuit ● Malfunction of the engine-ECU



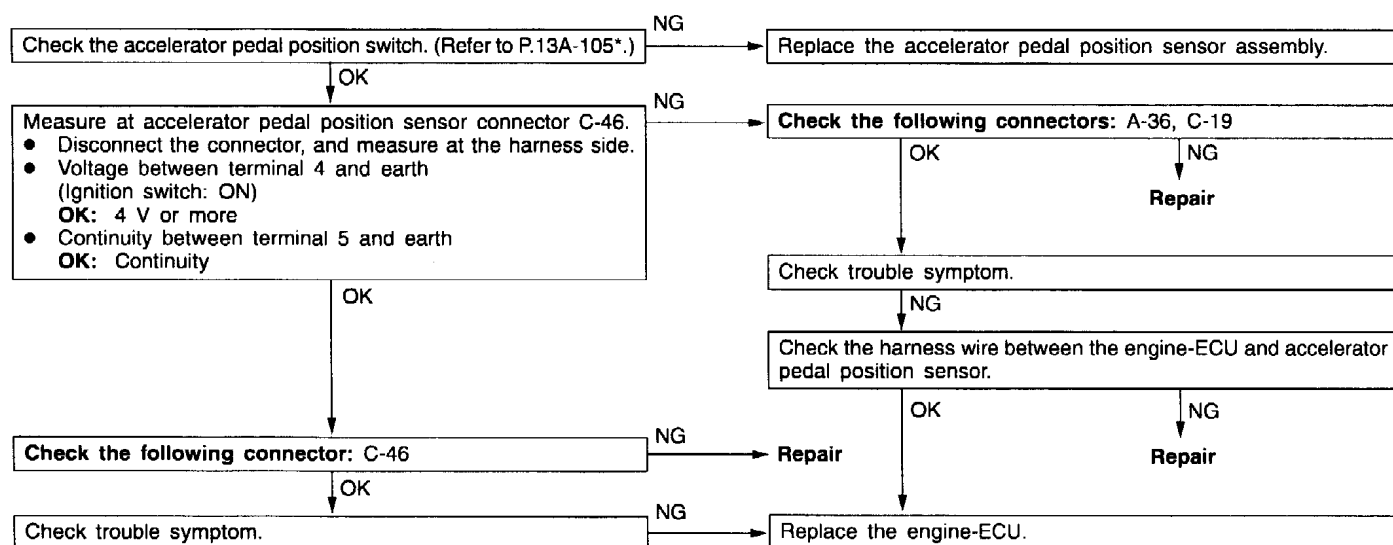
INSPECTION PROCEDURE 27

Ignition switch-ST and inhibitor switch system <A/T>	Probable cause
The ignition switch-ST outputs a HIGH signal to the engine-ECU while the engine is cranking, and the engine-ECU uses this signal to carry out functions such as fuel injection control during starting. The inhibitor switch inputs the position of the selector lever to the engine-ECU. The engine-ECU uses this signal to carry out idle speed control.	● Malfunction of the ignition switch ● Malfunction of the inhibitor switch ● Open circuit or short-circuited harness wire between ignition switch and inhibitor switch ● Malfunction of the engine-ECU



INSPECTION PROCEDURE 28

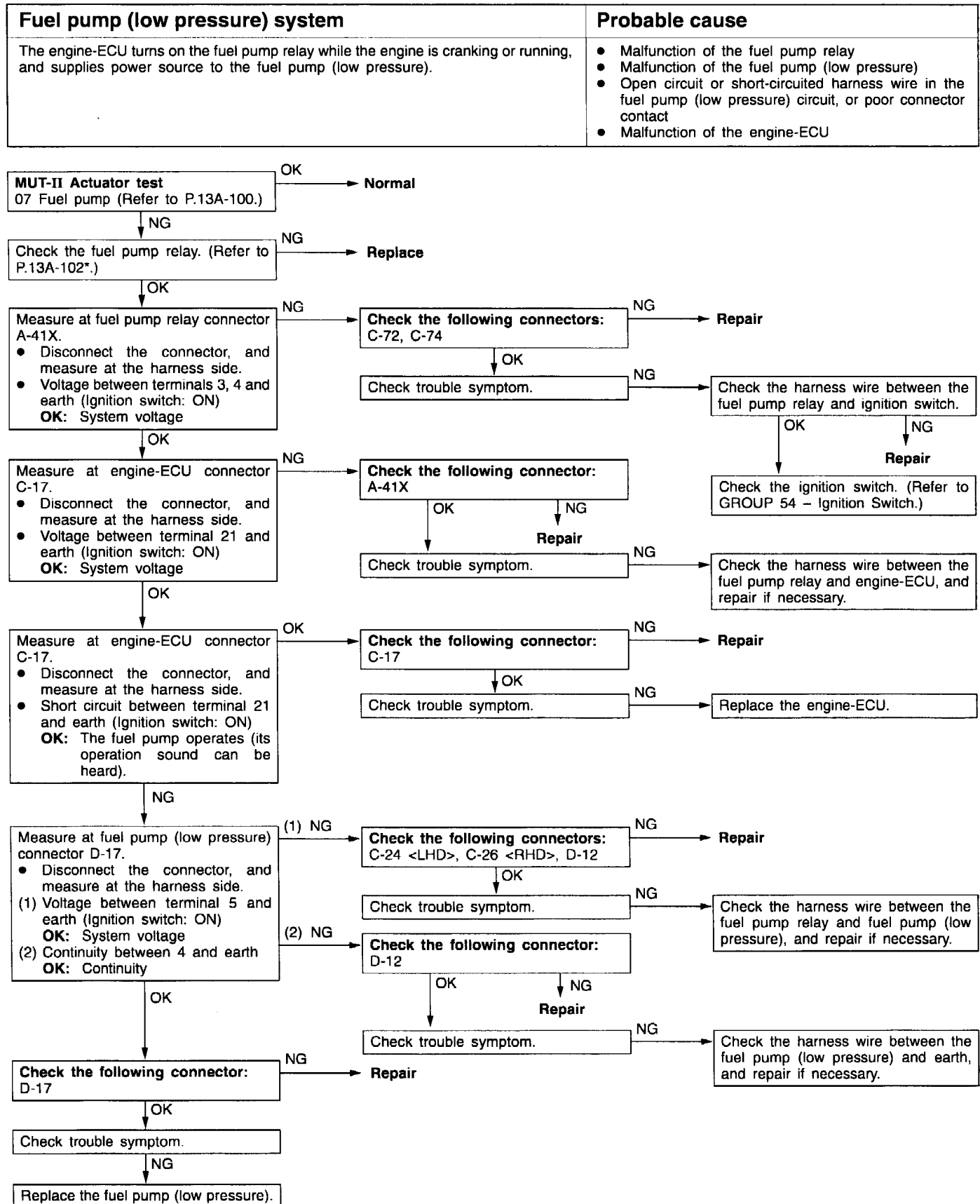
Accelerator pedal position switch system	Probable cause
The accelerator pedal position switch detects that the accelerator pedal is fully closed, and sends a signal to the engine-ECU. The engine-ECU controls idle speed, based on this signal.	- Maladjustment of the accelerator cable - Maladjustment of the accelerator pedal position switch - Open circuit or short-circuited harness wire in the accelerator pedal position switch system, or poor connector contact - Malfunction of the engine-ECU



NOTE

*: Refer to the '00 PAJERO PININ Workshop Manual (Pub. No. CKRE99E1)

INSPECTION PROCEDURE 29

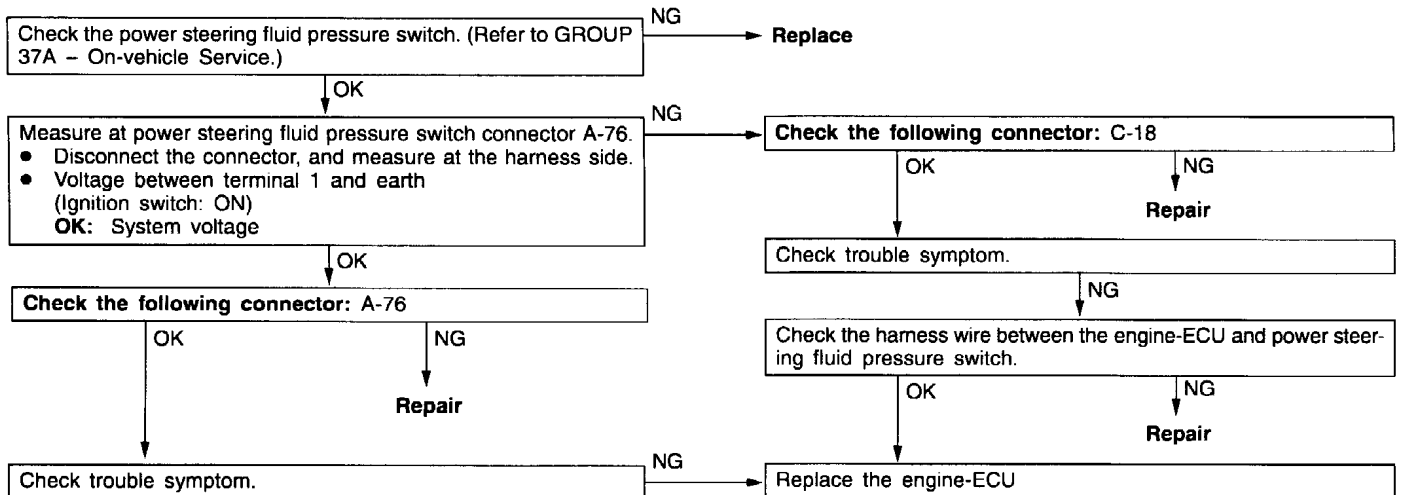


NOTE

*: Refer to the '00 PAJERO PININ Workshop Manual (Pub. No. CKRE00E1)

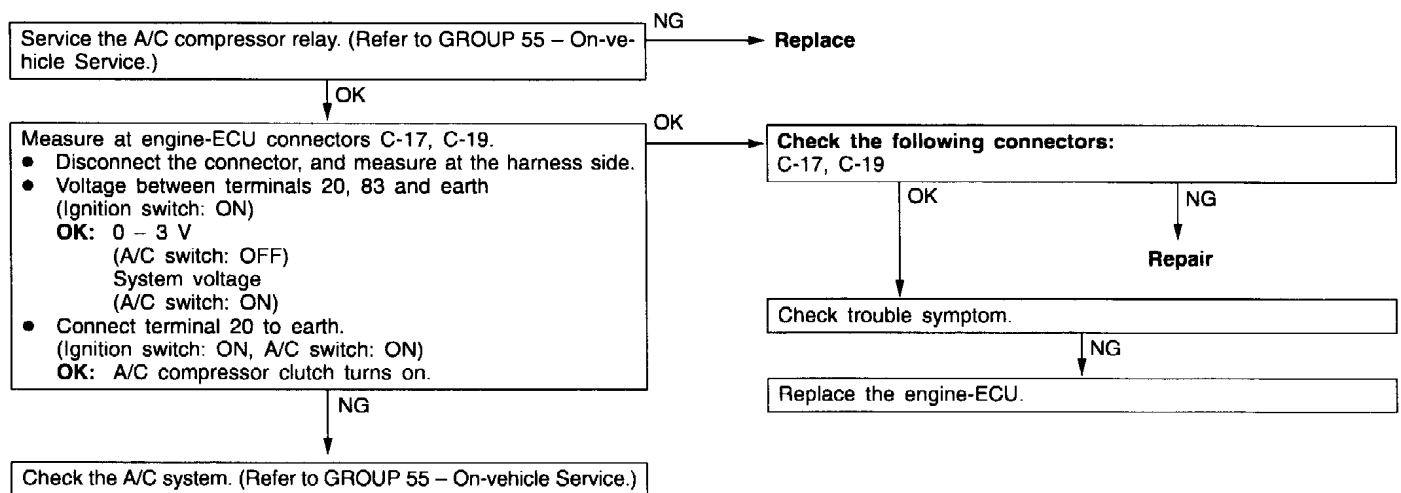
INSPECTION PROCEDURE 30

Power steering fluid pressure switch system	Probable cause
The power steering fluid pressure switch sends a signal to the engine-ECU according to power steering load. Based on this signal, the engine-ECU controls the throttle control servo so that idle speed increases when the power steering is in operation.	• Malfunction of the power steering fluid pressure switch • Open circuit or short-circuited harness wire in the power steering fluid pressure switch circuit, or poor connector contact • Malfunction of the engine-ECU



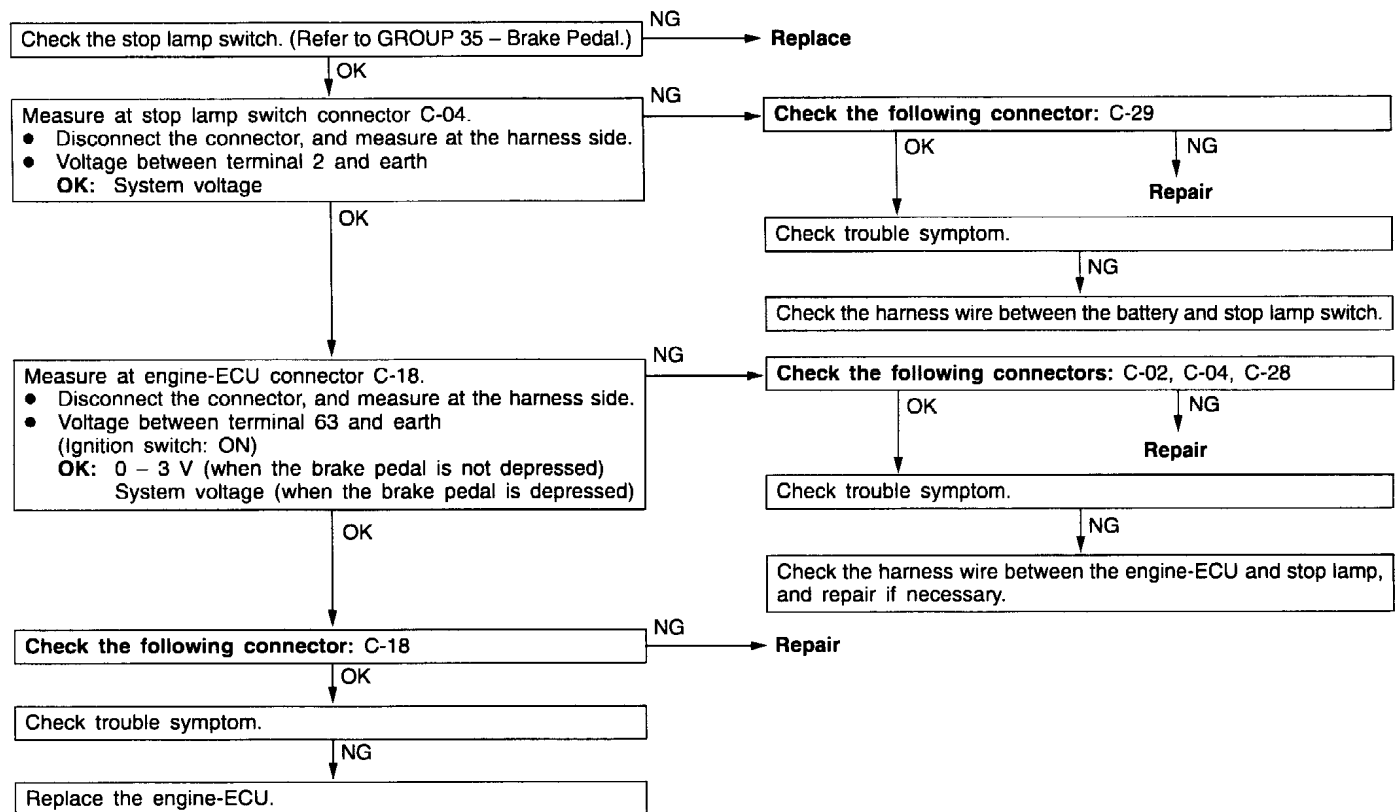
INSPECTION PROCEDURE 31

A/C switch and A/C relay system	Probable cause
If the engine-ECU receives a 'A/C on' signal, it operates the throttle control servo and A/C compressor magnetic clutch so that idle speed increases.	• Malfunction of the A/C control system • Malfunction of the A/C switch • Open circuit or short-circuited harness wire in the A/C switch circuit, or poor connector contact • Malfunction of the engine-ECU



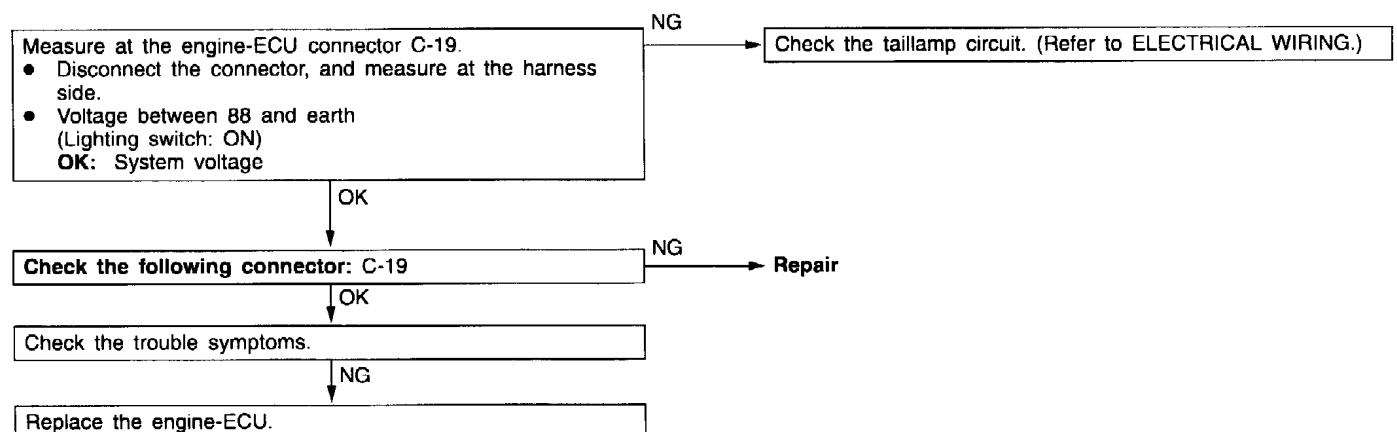
INSPECTION PROCEDURE 32

Stop lamp switch system	Probable cause
The engine-ECU determines whether the brake pedal is depressed or not, by means of the stop lamp switch input signal.	- Malfunction of the stop lamp switch - Open circuit or short-circuited harness wire in the stop lamp circuit, or poor connector contact - Malfunction of the engine-ECU



INSPECTION PROCEDURE 33

Small lamp switch system	Probable cause
The engine-ECU determines whether the small lamp switch is on or off. According to that information, the engine-ECU controls alternator output current when the vehicle is started.	- Improper connector contact, open circuit or short-circuited harness wire in the taillamp circuit - Malfunction of the engine-ECU



DATA LIST REFERENCE TABLE

Caution

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

NOTE

*1: Within four minutes after starting the engine

*2: In a new vehicle [driven approximately 500 km or less], the injector drive time is sometimes 10 % longer than the standard time.

*3: The accelerator pedal position switch normally turns off when the voltage of the accelerator pedal position sensor (1st channel) is 200 – 600 mV higher than the voltage at the idle position. If the accelerator pedal position switch turns back on after the accelerator pedal position sensor voltage has risen by 100 mV and the throttle valve has opened, the accelerator pedal position switch and the accelerator pedal position sensor (1st channel) need to be adjusted.

Item No.	Check items	Requirements	Normal condition	Inspection procedure No.	Reference page
11	Oxygen sensor (front)	Engine: warm-up After	Idling	0 mV*1	Code No. P0130 13A-25
			Sudden racing	600 – 1,000 mV	
			2,500 r/min	400 mV or less and 600 – 1,000 mV alternates.	
12	Air flow sensor	- Engine coolant temperature: 80 – 95°C - Lamps, electric cooling fan and all accessories: OFF - Transmission: Neutral (A/T: P range)	Idling	24 – 50 Hz	Code No. P0100 13A-14
			2,500 r/min	70 – 90 Hz	
			Racing	Frequency increases in response to racing.	
13	Intake air temperature sensor	Ignition switch: ON	Intake air temperature: –20°C	–20°C	Code No. P0110 13A-18
			Intake air temperature: 0°C	0°C	
			Intake air temperature: 20°C	20°C	
			Intake air temperature: 40°C	40°C	
			Intake air temperature: 80°C	80°C	

Item No.	Check items	Requirements		Normal condition	Inspection procedure No.	Reference page
14	Throttle position sensor (2nd channel)	- Engine coolant temperature: 80 – 95°C - Ignition switch: ON (Engine stopped)	Release the accelerator pedal.	4,000 – 4,800	Code No. P0225	13A-43
			Depress the accelerator pedal gradually.	Voltage decreases in response to the pedal depression.		
			Depress the accelerator pedal fully.	100 – 1,100 mV		
16	Power supply voltage	Ignition switch: ON		System voltage	Procedure No. 23	13A-86
18	Cranking signal (Ignition switch – ST)	Transmission: Neutral (A/T: P range)	Engine: Stopped	OFF	Procedure No.26 <M/T>	13A-89 <M/T> 13A-89 <A/T>
			Engine: Cranking	ON	Procedure No.27 <A/T>	
21	Engine coolant temperature sensor	Ignition switch: ON	Engine coolant temperature: –20°C	–20°C	Code No. P0115	13A-19
			Engine coolant temperature: 0°C	0°C		
			Engine coolant temperature: 20°C	20°C		
			Engine coolant temperature: 40°C	40°C		
			Engine coolant temperature: 80°C	80°C		
22	Crank angle sensor	- Engine: Cranking - Tachometer: Connected	Compare the engine speed readings on the tachometer and the MUT-II.	Accord	Code No. P0335	13A-47
		- Engine: Idling - Accelerator pedal position switch: ON	Engine coolant temperature: –20°C	1,200 – 1,400 r/min		
			Engine coolant temperature: 0°C	1,100 – 1,300 r/min		
			Engine coolant temperature: 20°C	1,000 – 1,200 r/min		
			Engine coolant temperature: 40°C	850 – 1,050 r/min		
			Engine coolant temperature: 80°C	550 – 750 r/min*1		
24	Vehicle speed sensor	Drive at 40 km/h		Approximately 40 km/h	Code No. P0500	13A-53

Item No.	Check items	Requirements		Normal condition	Inspection procedure No.	Reference page
25	Barometric pressure sensor	Ignition switch: ON	Altitude: 0 m	101 kPa	Code No. P0105	13A-16
			Altitude: 600 m	95 kPa		
			Altitude: 1,200 m	88 kPa		
			Altitude: 1,800 m	81 kPa		
26	Accelerator pedal position switch	Ignition switch: ON (Depress and release the accelerator pedal several times)	Release the accelerator pedal.	ON	Procedure No. 28	13A-90
			Depress the accelerator pedal slightly.	OFF		
27	Power steering fluid pressure switch	Engine: Idling	Steering wheel stationary	OFF	Procedure No. 30	13A-92
			Steering wheel turning	ON		
28	A/C switch	Engine: Idling (The A/C compressor is running when the A/C switch is on.)	A/C switch: OFF	OFF	Procedure No. 31	13A-92
			A/C switch: ON	ON		
29	Inhibitor switch <A/T>	Ignition switch: ON	Selector lever: P or N	P, N	Procedure No. 27	13A-89
			Selector lever: D, 2, L or R	D, 2, L, R		
31	Small lamp switch	Engine: Idling	Lighting switch: OFF	OFF	Procedure No. 33	13A-93
			Lighting switch: ON	ON		
34	Air flow sensor reset signal	Engine: After having warmed up	Engine is idling	ON	Code No. P0100	13A-14
			3,000 r/min	OFF		
37	Volumetric efficiency	- Engine coolant temperature: 80 – 95°C - Lamps, electric cooling fan and all accessories: OFF - Transmission: Neutral (A/T: P range)	Engine is idling	30 – 50 %	—	—
			2,500 r/min	10 – 30 %		
			Engine is suddenly raced	Volumetric efficiency increases in response to racing		
38	Crank angle sensor	- Engine: Cranking [reading is possible at 2,000 r/min or less] - Tachometer: Connected	Engine speeds displayed on the MUT-II and tachometer are identical.		—	—

Item No.	Check items	Requirements	Normal condition	Inspection procedure No.	Reference page
41	Injector drive time*2	- Engine coolant temperature: 80 – 95°C - Lamps, electric cooling fan and all accessories: OFF - Transmission: Neutral (A/T: P range)	Idling	0.35 – 0.55 ms*1	–
			2,500 r/min	0.4 – 0.6 ms	
			Sudden racing	Increases	
44	Ignition advance	- Engine: After warm-up - Set a timing light.	Idling	8 – 24° BTDC*1	Code No. P0300
			2,500 r/min	15 – 35° BTDC	
49	A/C relay	Engine: After warm-up, idling	A/C switch: OFF	OFF (compressor clutch is not operating)	Procedure No. 31
			A/C switch: ON	ON (compressor clutch is operating)	
59	Oxygen sensor (rear)	- Transmission: 2nd gear (A/T: L range) - Drive with throttle widely open	3,500 r/min	600 – 1,000 mV	Code No. P0136
66	Brake vacuum sensor	- Engine coolant temperature: 80 – 95°C - Lamps, electric cooling fan and all accessories: OFF - Transmission: Neutral (A/T: P range)	Stop the engine from idling speed, and then depress the brake pedal several times with the ignition switch on.	Displayed pressure increases.	Code No. P1515
67	Stop lamp switch	Ignition switch: ON	Brake pedal: Depressed	OFF	Procedure No. 32
			Brake pedal: Released	ON	
68	EGR valve	- Engine coolant temperature: 80 – 95°C - Lamps, electric cooling fan and all accessories: OFF - Transmission: Neutral (A/T: P range)	Idling	2 – 17 STEP	Code No. P0403
			2,500 r/min	0 – 9 STEP	

Item No.	Check items	Requirements		Normal condition	Inspection procedure No.	Reference page
74	Fuel pressure sensor	- Engine coolant temperature: 80 – 95°C - Lamps, electric cooling fan and all accessories: OFF - Transmission: Neutral (A/T: P range)	Engine: Idling	4 – 6.9 MPa	Code No. P0190	13A-33
77	Accelerator pedal position sensor (2nd channel)*3	Ignition switch: ON	Release the accelerator pedal.	700 – 1,400 mV	Code No. P1225	13A-58
			Depress the accelerator pedal gradually.	Increases in response to the pedal depression stroke.		
			Depress the accelerator pedal fully.	4,100 mV or more		
78	Accelerator pedal position sensor (1st channel)*3	Ignition switch: ON	Release the accelerator pedal.	985 – 1,135 mV	Code No. P0220	13A-40
			Depress the accelerator pedal gradually.	Increases in response to pedal depression stroke.		
			Depress the accelerator pedal fully.	4,100 mV or more		
79	Throttle position sensor (1st channel)	- Engine coolant temperature: 80 – 95°C - Ignition switch: ON (Engine stopped)	Release the accelerator pedal.	450 – 800 mV	Code No. P0120	13A-22
			Depress the accelerator pedal gradually.	Increases in response to pedal depression stroke.		
			Depress the accelerator pedal fully.	3,900 – 4,900 mV		
		Engine: After warm-up, idling	No load	450 – 1,000 mV		
			A/C switch: OFF → ON	Increases by 100 – 600 mV.		
			Selector lever: N → D range	Increases by 0 – 200 mV.		
81	Long-term fuel compensation	Engine: Warm, 2,500 r/min without any load (during closed loop)		–10 – 10 %	Code No. P0170	13A-31
82	Short-term fuel compensation	Engine: Warm, 2,500 r/min without any load (during closed loop)		–25 – 25 %	Code No. P0170	13A-31

Item No.	Check items	Requirements		Normal condition	Inspection procedure No.	Reference page
85	Fuel pressure sensor	- Engine coolant temperature: 80 – 95°C - Lamps, electric cooling fan and all accessories: OFF - Transmission: Neutral (A/T: P range)	Engine: Idling	4,000 – 6,900 kPa	Code No.P0190	13A-33
87	Calculation load value	Engine: Warm	Engine: Idling	15 – 35 %	–	–
			2,500 r/min	15 – 35 %		
88	Fuel control condition	Engine: Warm	2,500 r/min	Closed loop	Code No. P0125	13A-24
			When engine is suddenly raced	Open loop – drive condition		
99	Fuel injection mode	Engine: After warm up	Idling (after four minutes or more have passed since engine start)	Lean compression	–	–
			2,500 r/min	Stoichiometric metric feedback		
			Sudden racing after idle position	Open loop		
A1	Oxygen sensor (front)	Engine: After warm-up	Idling	0 V	Code No. P0130	13A-25
			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 (rear)	- Transmission: 2nd gear <M/T>, L range <A/T> - Drive with throttle widely open	3,500 r/min	0.6 – 1.0 V	Code No. P0136	13A-28
8A	Throttle position sensor (1st channel) (Throttle valve opening angle)	- Engine coolant temperature: 80 – 95°C - Ignition switch: ON (Engine: stopped)	Release the accelerator pedal.	8 – 16 %	Code No. P0120	13A-22
			Depress the accelerator pedal gradually.	Increase in response to pedal depression stroke.		
			Depress the accelerator pedal fully.	80 – 100 %		
		Engine: After warm-up, idling	No load	8 – 18 %		
		A/C switch: OFF → ON	Rises by 2 – 10 %			

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	13A-34
02		Cut fuel to No. 2 injector			Code No. P0202	13A-36
03		Cut fuel to No. 3 injector			Code No. P0203	13A-37
04		Cut fuel to No. 4 injector			Code No. P0204	13A-38
07	Fuel pump (low pressure)	Fuel pump operates and fuel is recirculated.	Ignition switch: ON	Sound of operation is heard.	Procedure No. 29	13A-91
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-52
17	Basic ignition timing	Set the engine-ECU to ignition timing adjustment mode	Idling after engine warm up	5° BTDC	—	—
21	Fan controller	Drive the fan motor	Ignition switch: ON	The fan motor operates	Procedure No. 20	13A-84
34	Electronic-controlled throttle valve system	Stop the throttle control servo.	Ignition switch: ON	Throttle valve is opened slightly.	Code No. P1220	13A-54

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

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	-----

7FU2119

Terminal No.	Check item	Check requirements (engine condition)		Normal condition
1	No. 1 injector	Engine: Warm up, and then depress the accelerator pedal suddenly from the idle speed.		Decreases slightly for short time from 9 – 13 V
9	No. 2 injector			
24	No. 3 injector			
2	No. 4 injector			
3	No. 1 ignition coil	Engine: 3,000 r/min		0.3 – 3.0 V
13	No. 2 ignition coil			
12	No. 3 ignition coil			
4	No. 4 ignition coil			
5	EGR valve (D)	Ignition switch: Immediately after turning ON		5 – 8 V (fluctuates for approx. three seconds)
6	EGR valve (C)			
32	EGR valve (B)			
34	EGR valve (A)			
8	Alternator G terminal	- Engine: Warm up, and then idling - Radiator fan: Not operating - Headlamp: OFF → ON - Stop lamp: OFF → ON - Rear defogger switch: OFF → ON		Voltage increases by 0.2 – 3.5 V
14	GDI ECO indication lamp	Ignition switch: OFF → ON		0 – 3 V (System voltage after five seconds)
		Engine: When the accelerator pedal is suddenly depressed while the engine is idling		System voltage
16	Purge control solenoid valve	- Engine coolant temperature: 80 – 95°C - Ignition switch: ON	Engine: Stopped	System voltage
			Engine: Start the engine, and then increase engine speed up to 3,500 r/min.	Voltage decreases

Terminal No.	Check item	Check requirements (engine condition)		Normal condition
18	Fan controller	Radiator and condenser fans are not operating.		0 – 0.3 V
		Radiator and condenser fans are operating.		0.7 V or more
20	A/C relay	- Engine: Idling - A/C switch: OFF → ON (Compressor is operating)		System voltage, or changes from momentarily 6 V or more to 0 → 3 V
21	Fuel pump relay	Ignition switch: ON	Engine: Stopped	System voltage
			Engine: Idling	0 – 3 V
31	Engine warning lamp	Ignition switch: OFF → ON		0 – 3 V → System voltage (after several seconds)
41	Sensor power supply	Ignition switch: ON		4.5 – 5.5 V
42	Power supply to accelerator pedal position sensor (1st channel)	Ignition switch: ON		4.5 – 5.5 V
43	Crank angle sensor	Engine: Cranking		0.4 – 4.0 V
		Engine: Idling		1.5 – 2.5 V
44	Engine coolant temperature sensor	Ignition switch: ON	Engine coolant temperature: 0°C	3.2 – 3.5 V
			Engine coolant temperature: 20°C	2.3 – 2.9 V
			Engine coolant temperature: 40°C	1.5 – 2.1 V
			Engine coolant temperature: 80°C	0.4 – 1.0 V
45	Engine ignition signal	Engine: 3,000 r/min		0.3 – 3.0 V
47	Power supply	Ignition switch: ON		System voltage
59				
50	Camshaft position sensor	Engine: Cranking		0.4 – 3.0 V
		Engine: Idling		0.5 – 2.0 V
51	Barometric pressure sensor	Ignition switch: ON	Altitude: 0 m	3.7 – 4.3 V
			Altitude: 1,200 m	3.2 – 3.8 V
52	Alternator FR terminal	- Engine: Warm up, and then idling - Radiator fan: Not operating - Headlamp: OFF → ON - Stop lamp: OFF → ON - Rear defogger: OFF → ON		Voltage decreases

Terminal No.	Check item	Check requirements (engine condition)		Normal condition
53	Oxygen sensor (rear)	• Transmission: 2nd gear • Engine speed: 3,500 r/min or more • Driving with the throttle valve widely open		0.6 – 1.0 V
54	Power steering fluid pressure switch	Engine: Warm up, and then idling	Steering wheel stationary	System voltage
			Steering wheel turning	0 – 3 V
55	Injector driver relay	Ignition switch: OFF		0 – 0.1 V
		Ignition switch: ON		0.5 – 1.0 V
56	Throttle valve control servo relay	Ignition switch: OFF		0 – 0.3 V
		Ignition switch: ON		0.5 – 1.0 V
57	Engine control relay	Ignition switch: OFF		0 – 3 V
		Ignition switch: ON		System voltage
60	Back-up power source	Ignition switch: OFF		System voltage
61	Air flow sensor	Engine: Idling		2.2 – 3.2 V
		Engine: 2,500 r/min		
62	Intake air temperature sensor	Ignition switch: ON	Intake air temperature: 0°C	3.2 – 3.8 V
			Intake air temperature: 20°C	2.3 – 2.9 V
			Intake air temperature: 40°C	1.5 – 2.1 V
			Intake air temperature: 80°C	0.4 – 1.0 V
63	Stop lamp switch	Depress the brake pedal.		System voltage
		Release the brake pedal.		0 – 3 V
68	Ignition switch-ST	Engine: Cranking		8 V or more
71	Oxygen sensor (front)	Engine: Warm up, and then hold the engine speed at 2,500 r/min (Use a digital voltmeter).		0 ↔ 0.8 V alternates.
74	Brake vacuum sensor	Engine: Stop the engine from idle speed, turn the ignition switch ON, and then depress the brake pedal several times.		Voltage increases
76	Air flow sensor reset signal	Engine: Idling		0 – 1 V
		Engine: 3,000 r/min		6 – 9 V

Terminal No.	Check item	Check requirements (engine condition)		Normal condition
78	Throttle position sensor (2nd channel)	Ignition switch: ON	Release the accelerator pedal.	4.0 – 4.8 V
			Depress the accelerator pedal fully.	0.1 – 1.1 V
79	Accelerator pedal position switch	Ignition switch: ON	Release the accelerator pedal.	0 – 1 V
			Depress the accelerator pedal fully.	4 V or more
80	Vehicle speed sensor	- Ignition switch: ON - Move the vehicle forward.		0 ↔ system voltage alternates.
83	A/C switch	Engine: Idling	A/C switch: OFF	0 – 3 V
			A/C switch: ON (Compressor is operating)	System voltage
88	Small lamp switch	Lighting switch: OFF		0 – 3 V
		Lighting switch: ON (Taillamp: ON)		System voltage
89	Oxygen sensor heater (front)	Engine: Idling		0 – 3 V
		Engine: 3,500 r/min		System voltage
90	Oxygen sensor heater (rear)	Engine: Idling		0 – 3 V
		Engine: 3,500 r/min		System voltage
92	Fuel pressure sensor	Engine: Idling		0.3 – 4.7 V
94	Accelerator pedal position sensor (1st channel)	Ignition switch: ON	Release the accelerator pedal.	0.935 – 1.135 V*1
			Depress the accelerator pedal fully.	4.1 V or more*2
96	Injector open circuit check signal	Engine: Increase engine speed from idle speed to 4,000 r/min.		Decreases slightly (approx. 0.7 V) from 4.5 V – 5.0 V.
97	A/C thermo sensor	- Temperature at sensing portion: Approx 25°C - Ignition switch: ON		2.0 – 2.9 V
99	Ignition switch-IG	Ignition switch: ON		System voltage

NOTE

Check if the difference in output between *1 and *2 is 4 V or more.

**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

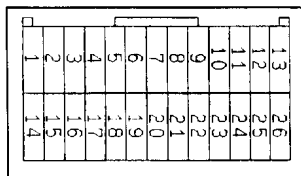
If the terminals that should be checked are mistaken, or if connector terminals are not correctly shorted to earth, damage may be caused to the vehicle wiring, sensors, engine-ECU and/or ohmmeter.

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.

1	9	24
2	10	25
3	11	
4	12	26
5	13	27
6	14	28
7	15	29
8	16	
9	17	30
10	18	31
11	19	32
12	20	33
13	21	
14	22	34
15	23	35
16	24	
17	25	36
18	26	37
19	27	38
20	28	39
21	29	40
22	30	
23	31	41
24	32	42
25	33	43
26	34	44
27	35	
28	36	45
29	37	46
30	38	47
31	39	
32	40	48
33	41	49
34	42	50
35	43	
36	44	51
37	45	52
38	46	53
39	47	54
40	48	55
41	49	56
42	50	57
43	51	58
44	52	59
45	53	60
46	54	
47	55	61
48	56	62
49	57	63
50	58	64
51	59	
52	60	65
53	61	66
54	62	67
55	63	68
56	64	
57	65	69
58	66	70
59	67	71
60	68	72
61	69	73
62	70	74
63	71	
64	72	75
65	73	76
66	74	77
67	75	
68	76	78
69	77	79
70	78	80
71	79	81
72	80	82
73	81	83
74	82	84
75	83	85
76	84	86
77	85	87
78	86	88
79	87	89
80	88	90
81	89	91
82	90	92
83	91	93
84	92	94
85	93	95
86	94	96
87	95	97
88	96	98
89	97	99
90	98	100

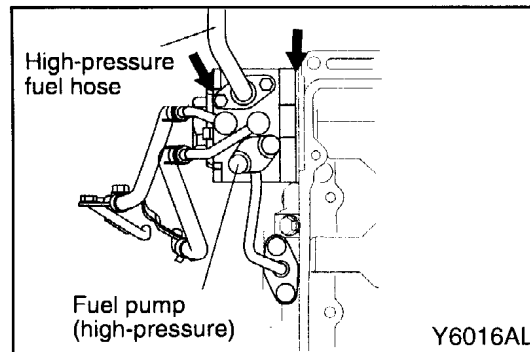
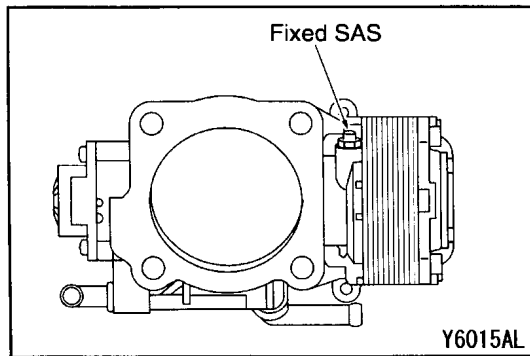
Terminal No.	Check item	Standard value, normal condition (check requirements)
5 – 47	EGR valve (D)	15 – 20 Ω (at 20°C)
6 – 47	EGR valve (C)	
32 – 47	EGR valve (B)	
34 – 47	EGR valve (A)	
16 – 47	Purge control solenoid valve	30 – 34 Ω (at 20°C)
44 – 72	Engine coolant temperature sensor	5.1 – 6.5 k Ω (when engine coolant temperature is 0°C)
		2.1 – 2.7 k Ω (when engine coolant temperature is 20°C)
		0.9 – 1.3 k Ω (when engine coolant temperature is 40°C)
		0.26 – 0.36 k Ω (when engine coolant temperature is 80°C)
46 – Body earth	Earth	Continuity (0 Ω)
58 – Body earth		
62 – 72	Intake air temperature sensor	5.3 – 6.7 k Ω (when intake air temperature is 0°C)
		2.3 – 3.0 k Ω (when intake air temperature is 20°C)
		1.0 – 1.5 k Ω (when intake air temperature is 40°C)
		0.30 – 0.42 k Ω (when intake air temperature is 80°C)
79 – 49	Accelerator pedal position switch	Continuity (when the accelerator pedal is released)
		No continuity (when the accelerator pedal is slightly depressed)
89 – 47	Oxygen sensor heater control (front)	4.5 – 8.0 Ω (at 20°C)
90 – 47	Oxygen sensor heater (rear)	11 – 18 Ω (at 20°C)

CHECK AT THE THROTTLE VALVE CONTROLLER TERMINALS**TERMINAL VOLTAGE CHECK CHART****Throttle Valve Controller Terminal Arrangement**

7FU2121

Terminal No.	Check items	Requirements		Normal value
1	Throttle valve control servo (A+)	● Ignition switch: ON ● Accelerator pedal: Fully opened → fully closed		Decreases slightly from system voltage.
9	Throttle valve control servo (B+)			
14	Throttle valve control servo (A−)	● Ignition switch: ON ● Accelerator pedal: Fully closed → fully opened		Decreases slightly (approx. 2 V) from system voltage.
15	Throttle valve control servo (B−)			
2	Power supply to throttle valve control servo	Ignition switch: ON		System voltage
19				
5	Power supply	Ignition switch: ON		System voltage
6	Sensor voltage	Ignition switch: ON		4.5 – 5.5 V
7	Throttle position sensor (1st channel)	Ignition switch: ON	Release the accelerator pedal.	0.45 – 0.8 V
			Depress the accelerator pedal fully.	3.9 – 4.9 V
20	Accelerator pedal position sensor (2nd channel)	Ignition switch: ON	Release the accelerator pedal.	0.7 – 1.4 V* ¹
			Depress the accelerator pedal fully.	4.1 V or more* ¹

NOTE:Check that the voltage difference between *¹ and *² is 4 V or more.



ON-VEHICLE SERVICE

Caution

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

FUEL PRESSURE TEST

MEASUREMENT OF FUEL LOW PRESSURE BETWEEN FUEL PUMP (LOW PRESSURE) AND FUEL PUMP (HIGH PRESSURE)

1. Release residual pressure from the fuel pipe line to prevent fuel gush out.

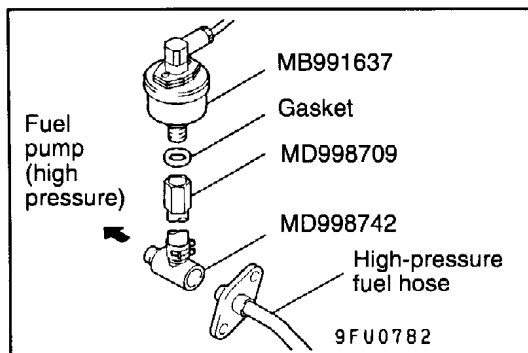
NOTE

Refer to the '00 PAJERO PININ Workshop Manual (Pub. No. CKRE00E1) GROUP 13A – On-vehicle Service.

2. Disconnect the high-pressure fuel hose at the fuel pump (high pressure) side.

Caution

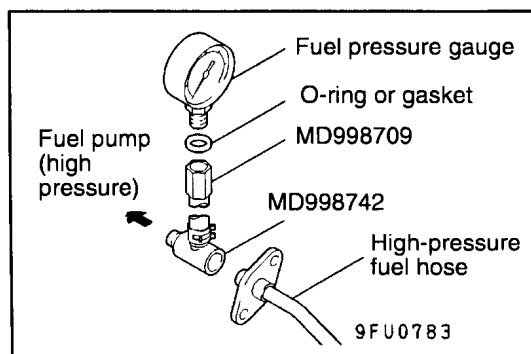
Cover the hose connection with rags to prevent splash of fuel that could be caused by some residual pressure in the fuel pipe line.



3. Remove the union joint and bolt from the special tool (adapter hose) and instead attach the special tool (hose adapter) to the adapter hose.
4. Install the special tool (for measuring the fuel pressure) that was set up in step 3.

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

- (1) Install the special tool (for measuring the fuel pressure) between the high-pressure fuel hose and the fuel pump (high pressure).
- (2) Install the fuel pressure gauge set (special tool) on the special tool (for measuring the fuel pressure) putting the gasket between them.
- (3) Connect the lead wire of the fuel pressure gauge set (special tool) to the power supply (cigarette lighter socket) and to the MUT-II.



<When using the fuel pressure gauge>

- (1) Install the fuel pressure gauge on the special tool (for measuring the fuel pressure) putting a suitable O-ring or gasket between them.
- (2) Install the special tool which was set up in step (1) between the high-pressure fuel hose and the fuel pump (high pressure).

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

Caution

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

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 (low pressure) at the fuel tank side. 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: approximately 324 kPa

11. Check to see that fuel pressure at idle does not drop even after the engine has been raced several times.
12. If fuel pressure is out of the standard value, troubleshoot and repair according to the table below.

Symptom	Probable cause	Remedy
• Fuel pressure too low • Fuel pressure drops after racing	Clogged fuel filter	Replace fuel filter
	Fuel leaking to return side due to poor fuel pressure regulator (low pressure) valve seating or settled spring	Replace fuel pressure regulator (low pressure)
	Low fuel pump (low pressure) delivery pressure	Replace the fuel pump (low pressure)
Fuel pressure too high	Binding valve in fuel pressure regulator (low pressure)	Replace fuel pressure regulator (low pressure)
	Clogged fuel return hose or pipe	Clean or replace hose or pipe

13. 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 fuel pressure regulator (low pressure) valve seat	Replace fuel pressure regulator (low pressure)
Fuel pressure drops sharply immediately after engine is stopped	Check valve in fuel pump (low pressure) is held open	Replace the fuel pump (low pressure)

14. Release residual pressure from the fuel pipe line.

NOTE

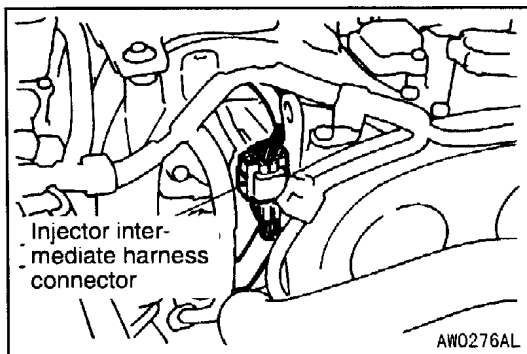
Refer to the '00 PAJERO PININ Workshop Manual (Pub. No. CKRE00E1) GROUP 13A – On-vehicle Service.

15. Remove the fuel pressure gauge and special tools from the fuel pump (high pressure).

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.

16. Replace the O-ring at the end of the high-pressure fuel hose with a new one. Furthermore, apply engine oil to the new O-ring before replacement.
17. Fit the high-pressure fuel hose to the fuel pump (high pressure) and tighten the mounting bolt to specified torque.
18. Check for any fuel leaks by following the procedure in step 7.
19. Disconnect the MUT-II.



MEASUREMENT OF FUEL HIGH PRESSURE BETWEEN FUEL PUMP (HIGH PRESSURE) AND INJECTORS

NOTE

Measurement of the fuel pressure between the fuel pump (high pressure) and the injectors should be carried out after checking that the fuel pressure between the fuel pump (low pressure) and the fuel pump (high pressure) is normal.

1. Connect the MUT-II to the diagnosis connector.
2. Disconnect the injector intermediate harness connector.
3. Turn the ignition switch to ON.
4. Select "Item No. 74" from the MUT-II Data list.
5. Crank the engine continuously for 2 seconds or more, and visually check that there are no fuel leaks from any parts.

Caution

If any fuel leaks appear, stop cranking immediately and repair the source of the leak.

6. Check if the fuel pressure is more than 1 MPa immediately after 20 seconds have passed since cranking was finished.
7. If the fuel pressure is lower than 1 MPa, it means that there is likely to be a leak in the high-pressure fuel system, so this system should be checked.

8. Turn the ignition switch to OFF.
9. Connect the injector intermediate harness connector.
10. Start the engine and run at idle.
11. Measure fuel pressure while the engine is running at idle.

Standard value: 4 – 6.9 MPa

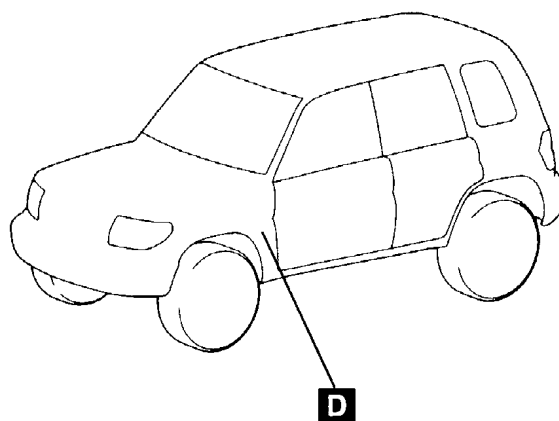
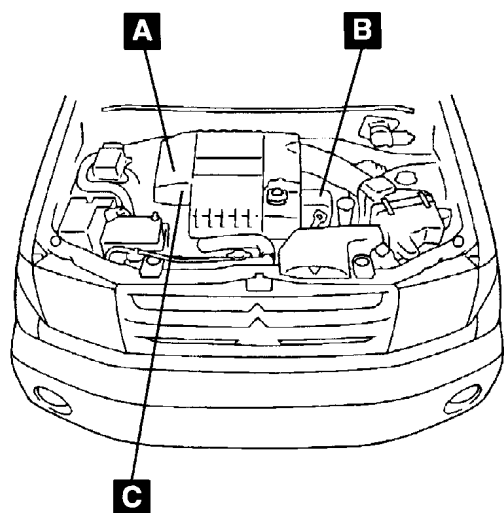
12. Check to see that fuel pressure at idle does not drop even after the engine has been raced several times.
13. If fuel pressure is out of the standard value, troubleshoot and repair according to the table below.

Symptom	Probable cause	Remedy
● Fuel pressure too low ● Fuel pressure drops after racing	Fuel leaking to return side due to poor fuel pressure regulator valve seating or settled spring in the fuel pump (high pressure).	Replace the fuel pump (high pressure)
	Low fuel pump (high pressure) delivery pressure	Replace the fuel pump (high pressure)
Fuel pressure too high	Clogged fuel pressure regulator valve in the fuel pump (high pressure)	Replace the fuel pump (high pressure)
	Clogged fuel return hose or pipe	Clean or replace hose or pipe

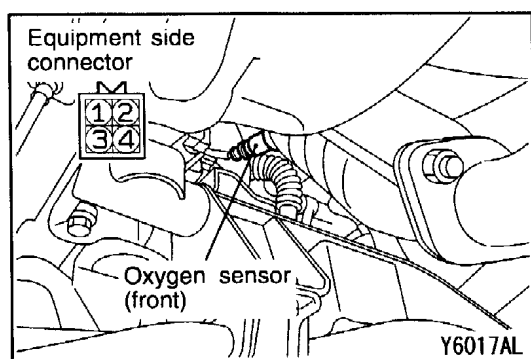
14. Stop the engine and turn the ignition switch to OFF.
15. Disconnect the MUT-II.

COMPONENT LOCATION

Name	Symbol	Name	Symbol
Fuel pressure sensor	C	Oxygen sensor (front)	B
Ignition failure sensor	A	Oxygen sensor (rear)	D



Y6030AL

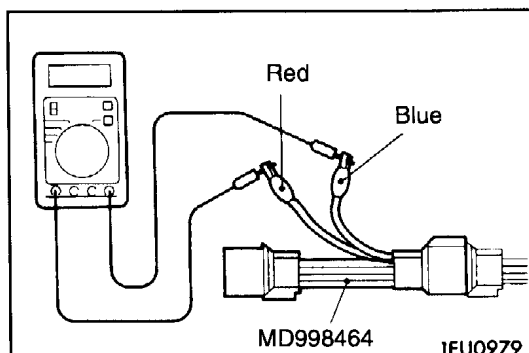


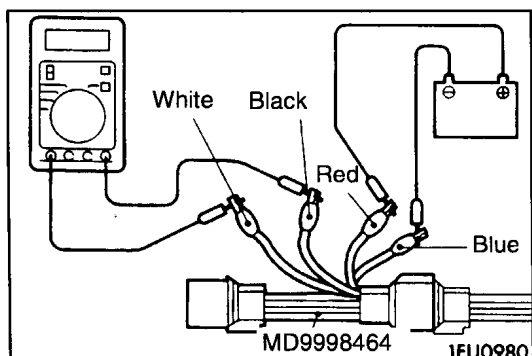
Y6017AL

OXYGEN SENSOR CHECK

<Oxygen sensor (front)>

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.

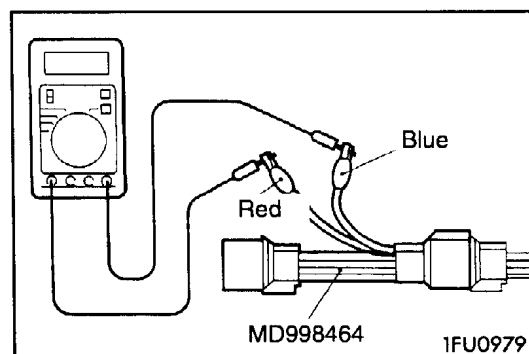
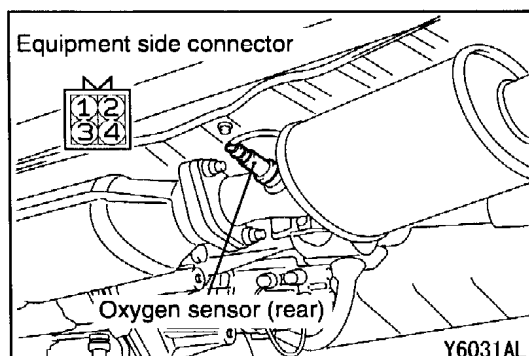
Standard value:

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.



<Oxygen sensor (rear)>

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 Ω at 20°C) between terminal 1 (red clip of special tool) and terminal 3 (blue clip of special tool) on the oxygen sensor connector.
3. If there is no continuity, replace the oxygen sensor.

NOTE

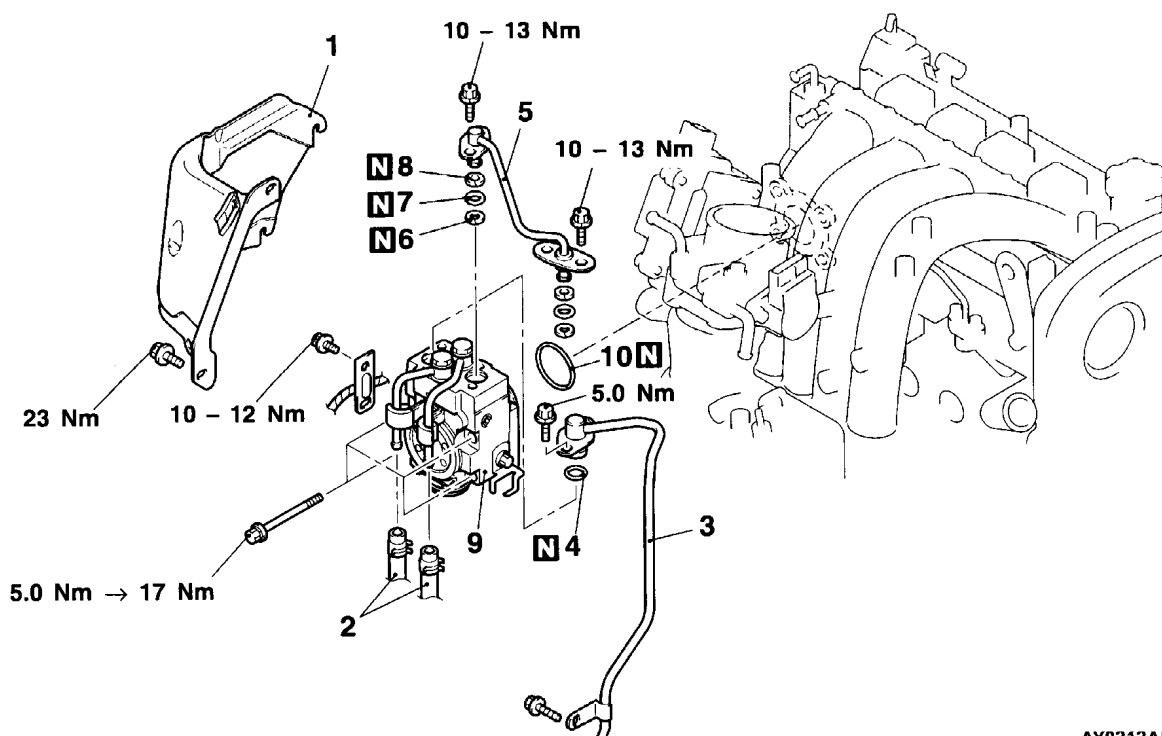
- (1) If the MUT-II does not display the standard value although no abnormality is found by the above mentioned continuity test and harness check, replace the oxygen sensor (rear).
- (2) For removal and installation of the oxygen sensor, refer to GROUP 15 – Exhaust Pipe and Main Muffler.

FUEL PUMP (HIGH PRESSURE)**REMOVAL AND INSTALLATION****Pre-removal and Post-installation Operation**

- Engine Cover Removal and Installation (Refer to GROUP 11A – Camshaft and Camshaft Oil Seal.)
- Prevention of Fuel Discharge <before removal only>
- Fuel Leak Check <after installation only>
- High-pressure Fuel Line Air Bleeding <after installation only> (P.13A-116.)
- Resonance Tank Removal and Installation



Apply engine oil to all O-rings during installation.



AY0212AL

Removal steps

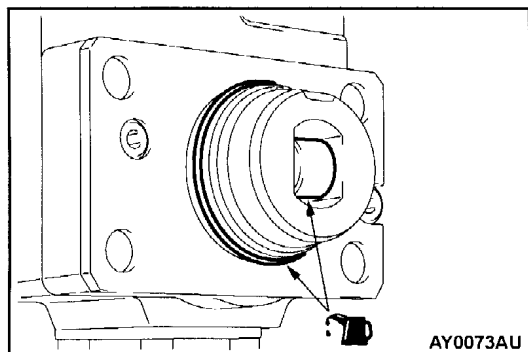
1. Fuel pump protector
2. Fuel return hose connection
3. Fuel pressure hose connection
4. O-ring
5. Fuel pipe



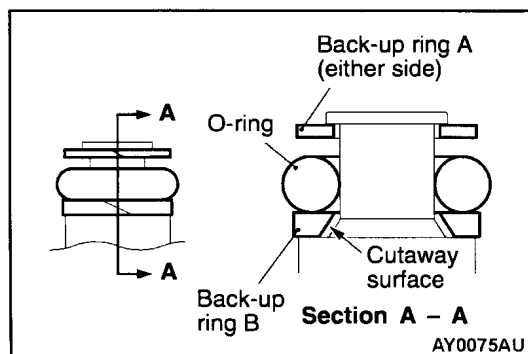
6. Back-up ring A
7. O-ring
8. Back-up ring B
9. Fuel pump (high-pressure)
10. O-ring

REMOVAL SERVICE POINT**◀A▶ FUEL PUMP PROTECTOR REMOVAL**

Jack up the transmission, and create sufficient clearance between the engine and the front deck. Then remove the fuel pump protector.

**INSTALLATION SERVICE POINTS****▶A◀ FUEL PUMP (HIGH-PRESSURE) INSTALLATION**

1. Apply clean engine oil to the O-ring and the roller of the fuel pump (high-pressure).
2. Insert the fuel pump (high-pressure) into the cylinder head mounting hole squarely, and finger-tighten the mounting bolts. The mounting bolts should be tightened securely at step ▶B◀.

**▶B◀ BACK-UP RING B/O-RING/BACK-UP RING A/FUEL PIPE INSTALLATION**

1. Install the back-up rings and the O-ring as shown in the illustration.

Caution

(1) Install the back-up ring B facing its cutaway surface toward the opposite side of the O-ring as shown in the illustration.

(2) Confirm the outer diameter of the back-up ring A. Take care not to install the back-up ring for the fuel pressure sensor by mistake. (Outer diameter of the back-up ring A: 14.8 mm)

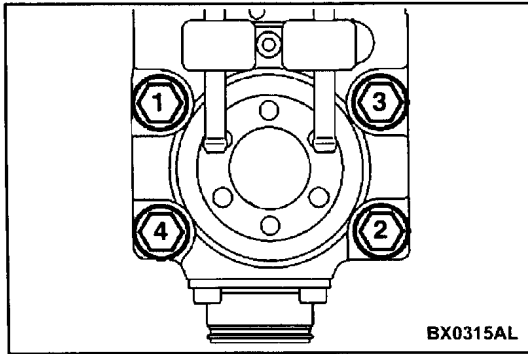
2. Apply a small amount of fresh engine oil to the O-ring.

Caution

Take care not to let any of the engine oil get inside the fuel pump (high-pressure) or the delivery pipe assembly.

3. Install the fuel pipe into the fuel pump (high pressure) and the delivery pipe ports squarely. Insert the pipe securely, being careful not to twisting it, and then tighten the mounting bolts to the specified torque.

Tightening torque: 10 – 13 Nm



4. Tighten the fuel pump (high-pressure) mounting bolts to 5.0 Nm in the order shown.
5. Tighten the mounting bolts to 17 Nm in the sequence shown as second stage. The final tightening torques should not vary more than 2.0 Nm.

►C◄ O-RING/FUEL PRESSURE HOSE INSTALLATION

1. Apply a small amount of fresh engine oil to the O-ring.

Caution

Take care not to let any of the engine oil get inside the fuel pump (high pressure).

2. While being careful not to damage the O-ring, turn the fuel pressure hose to the left and right and connect it to the fuel pump (high pressure). After connecting, check that the hose turns smoothly.
3. If the hose does not turn smoothly, the cause may be that the O-ring is getting caught. Disconnect the hose, check the O-ring for damage and re-connect the hose to the fuel pump (high pressure) and then re-check.
4. Tighten the fuel pressure hose mounting bolts to the specified torque.

Tightening torque: 5.0 Nm

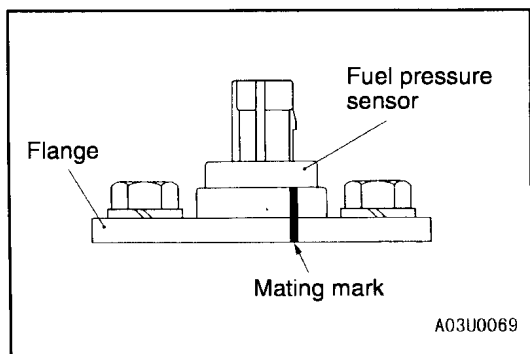
AIR-BLEEDING HIGH-PRESSURE FUEL LINE

1. Run the engine at 2000 r/min for at least 15 seconds in order to bleed air from the high-pressure fuel line.

NOTE

If air is trapped in the high-pressure fuel line due to the removal of fuel pipe, diagnosis code No. P.0190 will be set as abnormal fuel pressure.

2. Finally confirm diagnosis code by using the MUT-II. If diagnosis code, which indicates defective fuel pressure sensor system, has been set, erase the code.



REMOVAL SERVICE POINT

◀A▶ FLANGE REMOVAL

If the fuel pressure sensor is reused, make mating marks on the sensor and the flange before removal.

NOTE

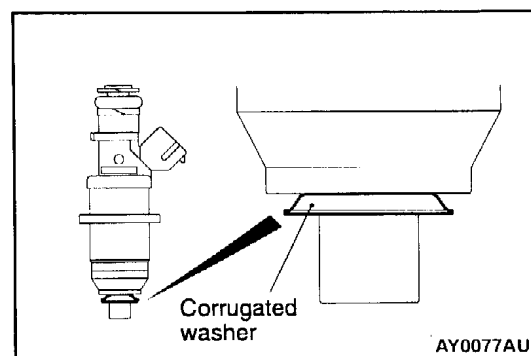
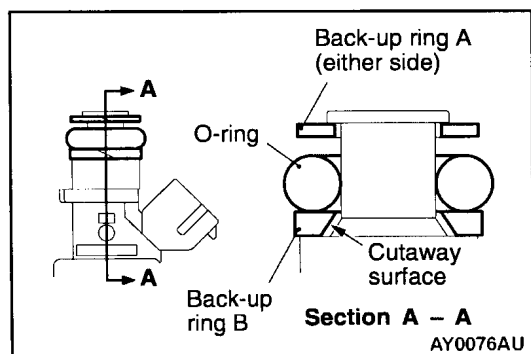
The sealing performance and the installation rigidity of the fuel pressure sensor can be secured by deforming the flange when the sensor is installed. Therefore, the flange must be reinstalled on the same side and phase as it is removed. In addition, if the fuel pressure sensor is replaced, it should be always replaced together with the flange.

◀B▶ DELIVERY PIPE ASSEMBLY/INJECTOR ASSEMBLY REMOVAL

Remove the delivery pipe assembly with the injector assembly still attached.

Caution

Be careful not to drop the injector assembly when removing the delivery pipe assembly.



INSTALLATION SERVICE POINTS

▶A◀ BACK-UP RING B/O-RING/BACK-UP RING A /CORRUGATED WASHER INSTALLATION

1. Install the back-up rings and the O-ring as shown in the illustration.

Caution

(1) Install the back-up ring B facing its cutaway surface toward the opposite side of the O-ring as shown in the illustration.

(2) Confirm the outer diameter of the back-up ring A. Take care not to install the back-up ring for the fuel pressure sensor by mistake. (Outer diameter of the back-up ring A: 14.8 mm)

2. Apply petroleum jelly to the corrugated washer to prevent it from falling off, and install it in the direction shown.

Caution

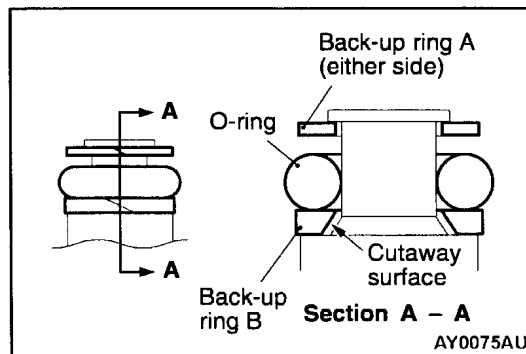
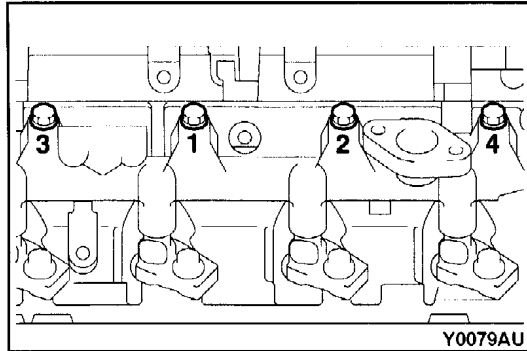
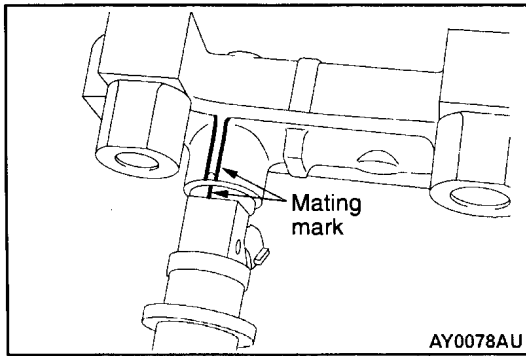
The corrugated washer should always be replaced with a new part. If the corrugated washer is reused, fuel or gas leak may occur.

▶B◀ FUEL INJECTOR ASSEMBLY/INJECTOR GASKET/INSULATOR/DELIVERY PIPE ASSEMBLY/INJECTOR HOLDER/INJECTOR WASHER INSTALLATION

1. Apply a small amount of fresh engine oil to the O-ring.

Caution

Take care not to let any of the engine oil get inside the delivery pipe assembly.



2. Insert the injector assembly into the mounting hole on the delivery pipe squarely. Then check that the fuel injector turns smoothly.
3. If the injector does not turn smoothly, the cause may be that the O-ring is getting caught. Remove the fuel injector, check the O-ring for damage and re-connect the injector to the delivery pipe assembly and then re-check.
4. Align the injector assembly mating mark with the delivery pipe mating mark.
5. Install the injector gasket and the insulator to the cylinder head.
6. Assemble the delivery pipe and injector assembly to the cylinder head, then finger-tighten the mounting bolts.
7. Assemble the injector holder and the injector washer, then tighten the mounting bolts to the specified torque.

Tightening torque: 20 – 25 Nm

8. Tighten the delivery pipe and injector assembly mounting bolts to the specified torque in the order shown.

Tightening torque: 10 – 13 Nm

►C◄ BACK-UP RING B/O-RING/BACK-UP RING A/FUEL PIPE INSTALLATION

1. Install the back-up rings and the O-ring as shown in the illustration.

Caution

(1) Install the back-up ring B facing its cutaway surface toward the opposite side of the O-ring as shown in the illustration.

(2) Confirm the outer diameter of the back-up ring A. Take care not to install the back-up ring for the fuel pressure sensor by mistake. (Outer diameter of the back-up ring A: 14.8 mm)

2. Apply a small amount of fresh engine oil to the O-ring.

Caution

Take care not to let any of the engine oil get inside the fuel pump (high-pressure) or the delivery pipe assembly.

3. Install the fuel pipe into the fuel pump (high pressure) and the delivery pipe ports squarely. Insert the pipe securely, being careful not to twisting it, and then tighten the mounting bolts to the specified torque.

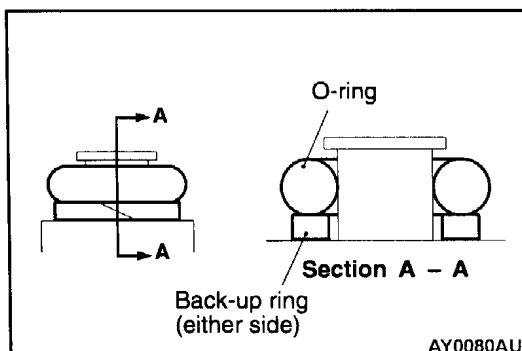
Tightening torque: 10 – 13 Nm

►D◄ BACK-UP RING/O-RING INSTALLATION

Assemble the back-up ring and the O-ring as shown.

Caution

Be careful not to confuse this back-up ring with back-up ring A for the injector or the fuel pipe. (Back-up ring outer diameter: 15.1 mm)

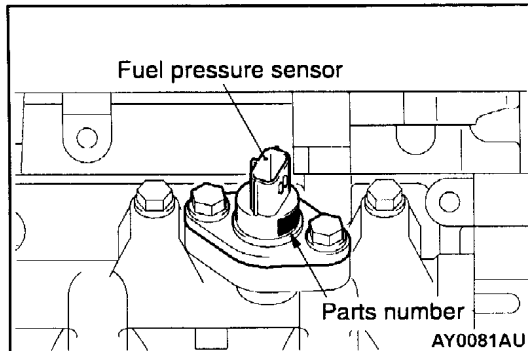


**►E◄ FUEL PRESSURE SENSOR/FLANGE
INSTALLATION**

1. Apply a small amount of fresh engine oil to the O-ring.

Caution

Be careful not to allow the engine oil to enter the delivery pipe.



2. Make the part number on the fuel pressure sensor face as shown.
If the fuel pressure sensor is reused, align the mating marks to install it to the delivery pipe.

Caution

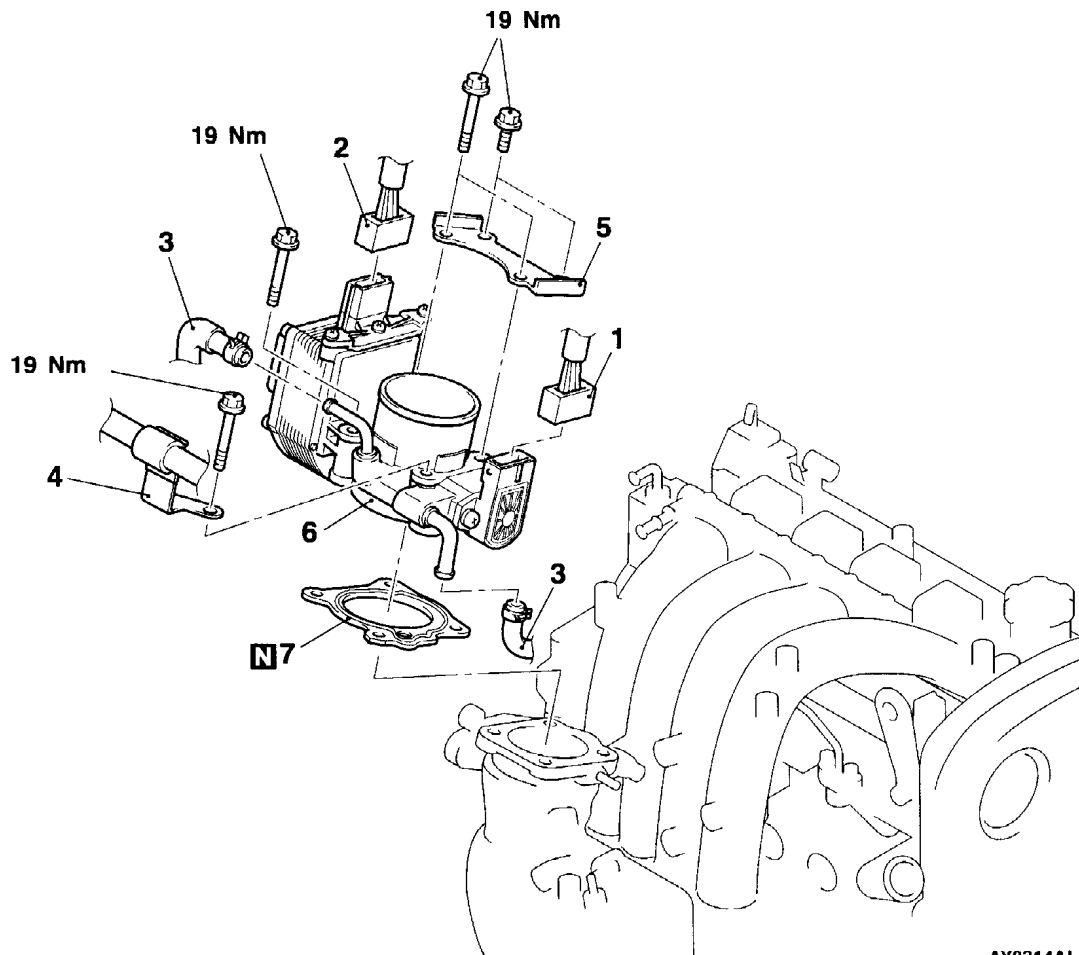
If the fuel pressure sensor is replaced, always replace it together with the flange.

THROTTLE BODY

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

- Engine Coolant Draining and Supplying
- Resonance Tank Removal and Installation



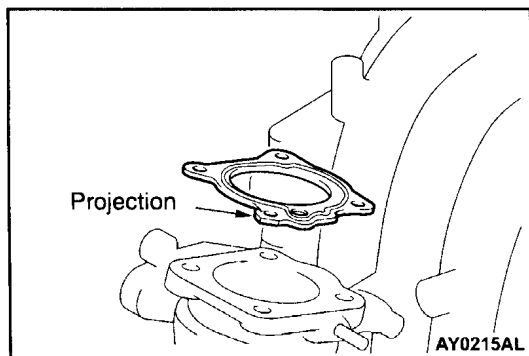
AY0214AL

Removal steps

1. Throttle position sensor connector
2. Throttle control servo connector
3. Water hose connection
4. Brake booster vacuum hose connection



5. Throttle body stay
6. Throttle body assembly
7. Throttle body gasket

**INSTALLATION SERVICE POINTS****►A◄ THROTTLE BODY GASKET INSTALLATION**

Install the throttle body gasket with its projection facing as shown in the illustration.

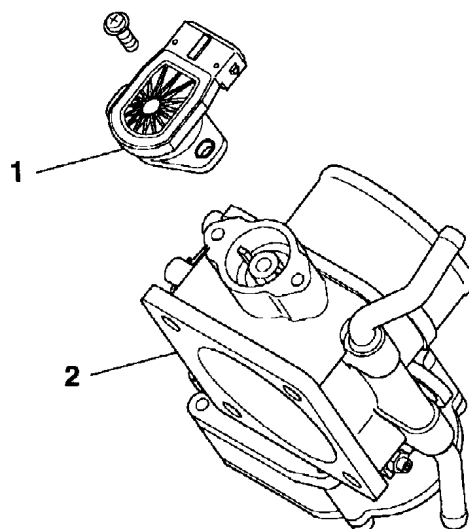
►B◄ THROTTLE BODY ASSEMBLY INSTALLATION

If the throttle body assembly is replaced, initialize the electronic-controlled throttle valve system.

Initialization

Turn on the ignition switch, and turn it to LOCK (OFF) position within one second. Then leave it for at least ten seconds with the ignition switch in LOCK (OFF) position.

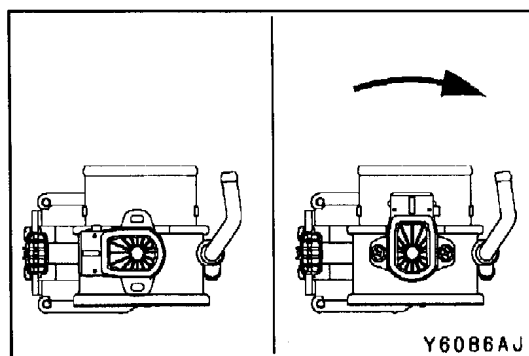
DISASSEMBLY AND REASSEMBLY



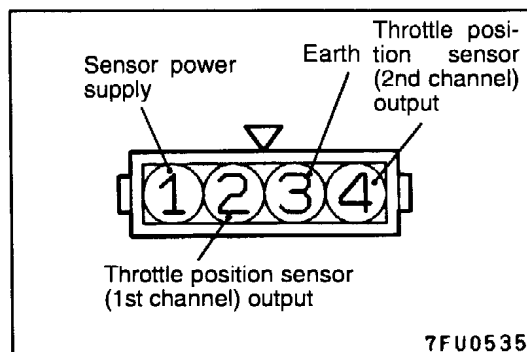
Y6085AJ

Disassembly steps

- A◄
1. Throttle position sensor
 2. Throttle body



Y6086AJ



7FU0535

REASSEMBLY SERVICE POINT

►A◄ THROTTLE POSITION SENSOR INSTALLATION

1. Position the throttle position sensor on the throttle body along the dotted line as shown in the illustration.
2. Rotate the throttle position sensor anticlockwise as shown in the illustration, and then tighten the screws.
3. Measure resistance value between terminal Nos. 1 (sensor power supply) and 2 (throttle position sensor 1st-channel output) as well as 1 (sensor power supply) and 4 (throttle position sensor 2nd-channel output).

Normal condition

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

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

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