

MULTIPOINT FUEL INJECTION (MPI)

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MULTIPOINT FUEL INJECTION (MPI) <4G1>

GENERAL

OUTLINE OF CHANGES

The service procedures have been established to describe revised sections due to the changed items shown below.

- On-board Diagnostics System has been adopted, diagnostic items have been expanded, and diagnostic code numbering system has been changed.
- Non-distributor two-coiled ignition system has been adopted.
- Crank angle sensor attached to the crank shaft has been adopted.
- Camshaft position sensor has been added.
- Ignition failure sensor has been added.
- Intake air temperature sensor built in the vacuum sensor (manifold absolute pressure sensor) has been adopted.
- Oxygen sensor (front, rear) has been changed.
- Ignition timing adjustment terminal has been abolished.
- Delivery pipe has been changed.

GENERAL INFORMATION

SELF-DIAGNOSIS FUNCTION

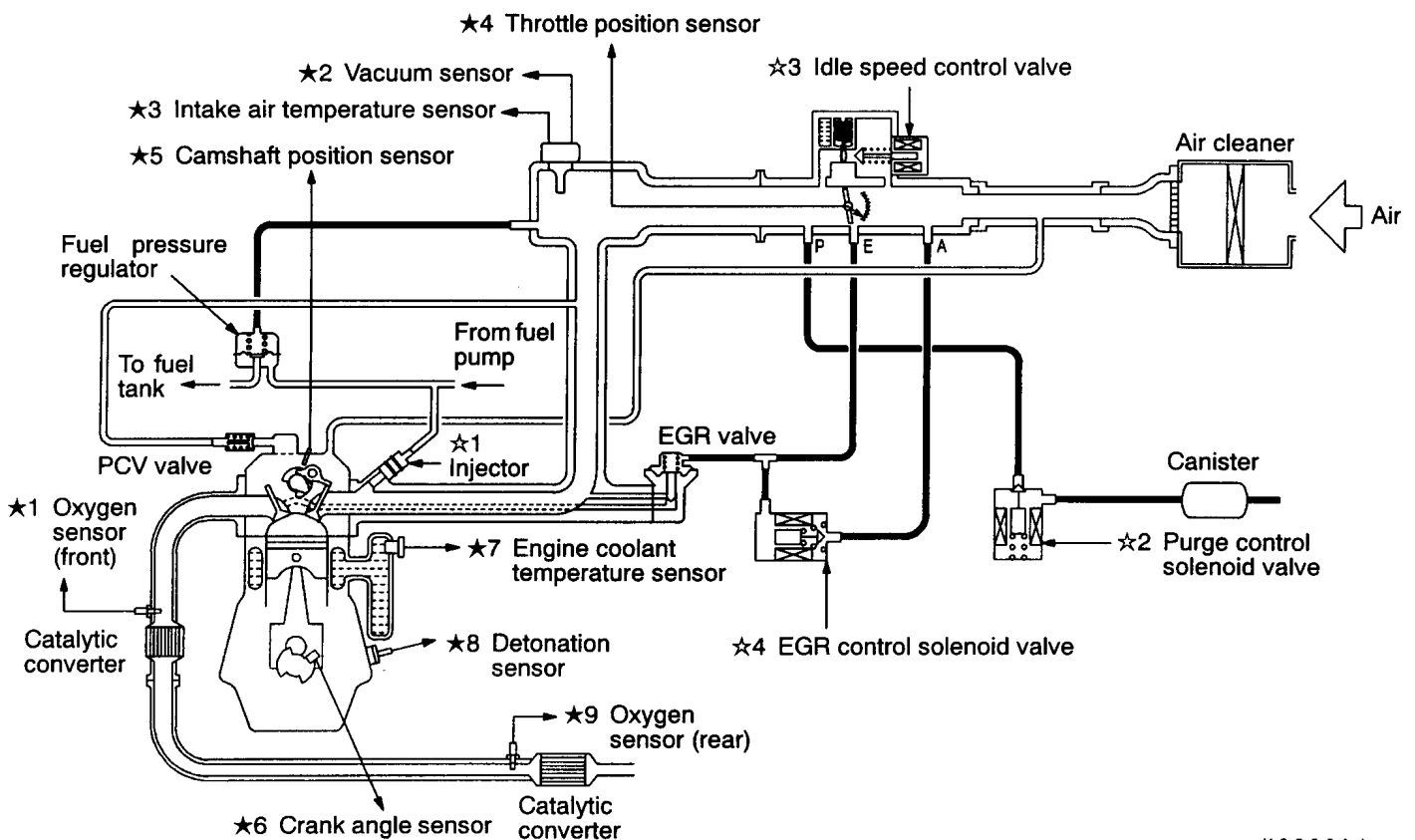
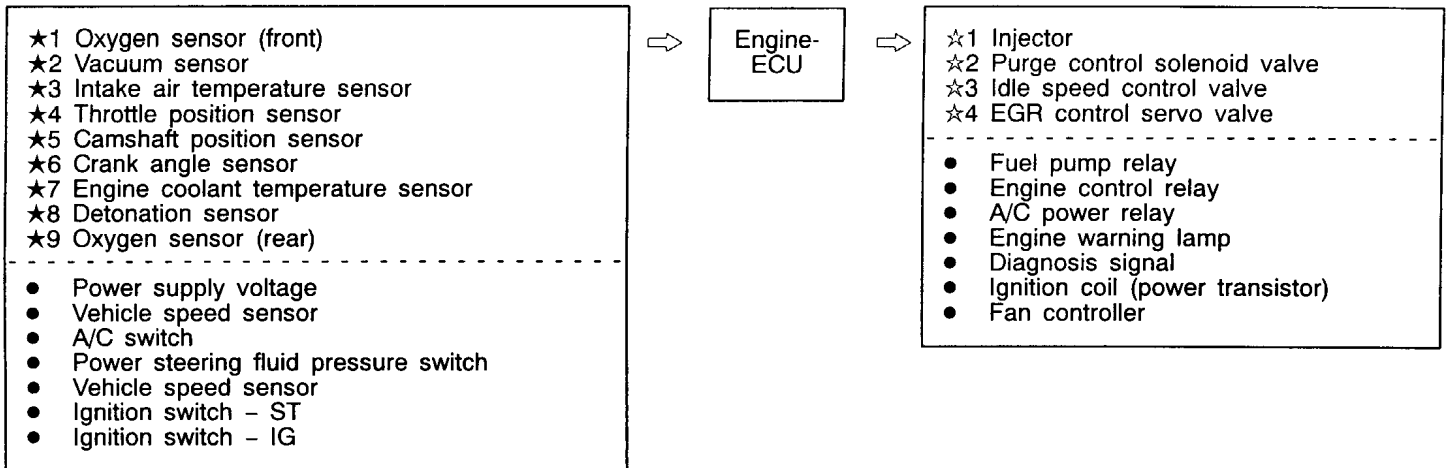
The following functions have been added.

- 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, and can then be used in simulation tests for troubleshooting.

GENERAL SPECIFICATIONS

Item		Specifications
Engine-ECU	Identification No.	E6T31372 <Vehicles with immobilizer system> E6T31373 <Vehicles without immobilizer system>

MULTI-POINT FUEL INJECTION SYSTEM DIAGRAM

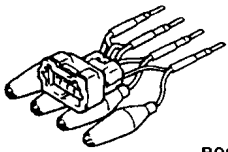
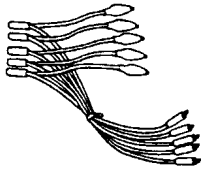
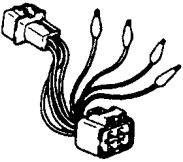


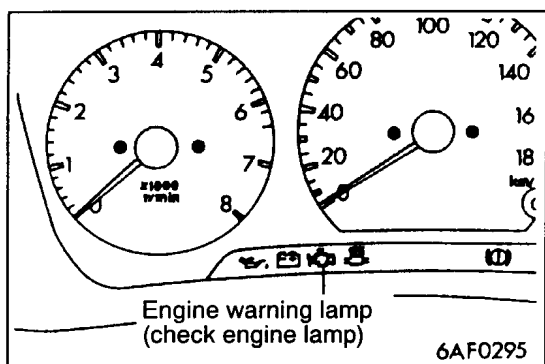
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SERVICE SPECIFICATIONS

Items		Standard value
Intake air temperature sensor resistance k Ω	20°C	2.3 – 3.0
	80°C	0.30 – 0.42
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

SPECIAL TOOLS

Tool	Number	Name	Use
 B991536	MB991536	Throttle position sensor adjustment harness	Measurement of voltage during trouble-shooting
	MB991658	Test harness set	Measurement of voltage during trouble-shooting
	MD998464	Test harness (4-pin, square)	- Measurement of voltage during trouble-shooting - Inspection of oxygen sensor (front)
	MD998478	Test harness (3-pin, triangle)	- Measurement of voltage during trouble-shooting - Inspection using an analyzer



TROUBLESHOOTING

DIAGNOSIS FUNCTION

ENGINE WARNING LAMP (CHECK ENGINE LAMP)

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

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
P0105	Vacuum sensor system
P0110	Intake air temperature sensor system
P0115	Engine coolant temperature sensor system
P0120	Throttle position sensor system
P0125	Feedback system
P0130	Oxygen sensor (front) system <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
P0201	No. 1 injector system
P0202	No. 2 injector system
P0203	No. 3 injector system
P0204	No. 4 injector system
P0300★	Random cylinder misfire detected
P0301	No. 1 cylinder misfire detected
P0302	No. 2 cylinder misfire detected
P0303	No. 3 cylinder misfire detected
P0304	No. 4 cylinder misfire detected
P0335	Crank angle sensor system
P0340	Camshaft position sensor system
P0403	EGR control solenoid valve system
P0420	Catalyst malfunction
P0443	Purge control solenoid valve system
P0505	Idle speed control 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.
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.

Displayed items of freeze frame data are shown in the following:

DISPLAYED 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 the stores its history. This history can be read out by using MUT-II. (If the ECU has judged a item before, the MUT-II displays “Complete.”)

In addition, if diagnosis codes are erased or the battery cable is disconnected, this history will also be erased (the memory will be reset).

- Catalyst: P0421
- 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
Vacuum sensor	1. Uses the throttle position sensor signal and engine speed signal (crank angle sensor signal) to take reading of the basic injector drive time and basic ignition timing from the pre-set mapping. 2. Fixes the ISC servo in the appointed position so idle control is not performed.
Intake air temperature sensor	Controls as if the intake air temperature is 45°C.
Throttle position sensor (TPS)	No increase in fuel injection amount during acceleration due to the throttle position sensor signal.
Engine coolant temperature sensor	Controls as if the engine coolant temperature is 80°C.
Camshaft position sensor	Injects fuel into the cylinders in the order 1-3-4-2 with irregular timing. (After the ignition switch is turned to ON, the No. 1 cylinder top dead centre is not detected at all.)
Detonation sensor	Switches the ignition timing from ignition timing for super petrol to ignition timing for standard petrol.
Oxygen sensor (front)	Air/fuel ratio feedback control (closed loop control) is not performed.
Oxygen sensor (rear)	Performs the feedback control (closed loop control) of the air/fuel ratio by using only the signal of the oxygen sensor (front) installed on the front of the catalytic converter.
Misfire detection	The engine-ECU stops supplying fuel to the cylinder with the highest misfiring rate if a misfiring that could damage the catalytic converter is detected.

INSPECTION CHART FOR DIAGNOSIS CODES

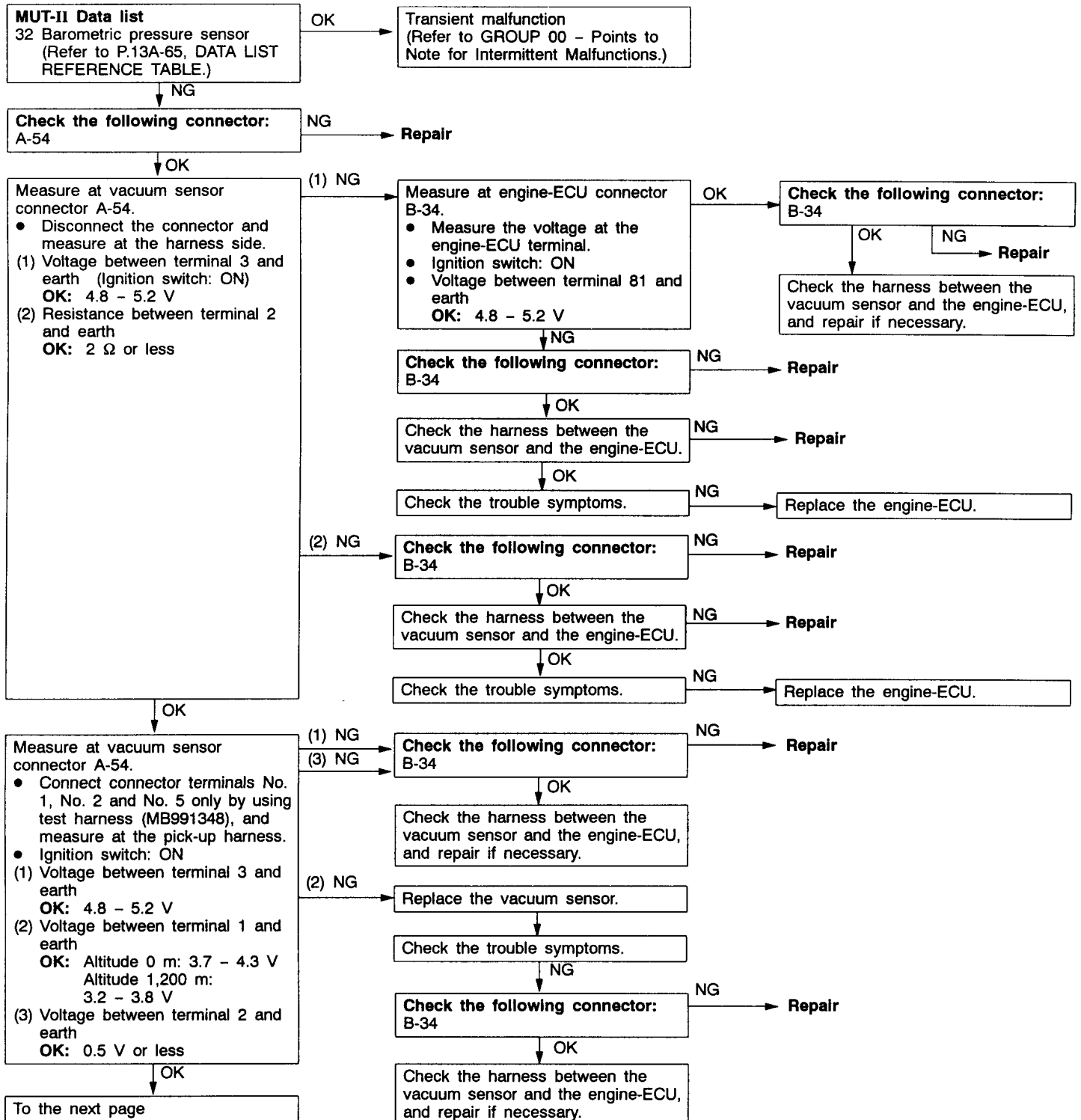
Code No.	Diagnosis item	Reference page
P0105	Vacuum sensor system	13A-10
P0110	Intake air temperature sensor system	13A-12
P0115	Engine coolant temperature sensor system	13A-13
P0120	Throttle position sensor system	13A-16
P0125	Feedback system	13A-18
P0130	Oxygen sensor (front) system <sensor 1>	13A-19
P0135	Oxygen sensor heater (front) system <sensor 1>	13A-21
P0136	Oxygen sensor (rear) system <sensor 2>	13A-22
P0141	Oxygen sensor heater (rear) system <sensor 2>	13A-24
P0170	Abnormal fuel system	13A-25
P0201	No. 1 injector system	13A-26
P0202	No. 2 injector system	13A-26
P0203	No. 3 injector system	13A-26
P0204	No. 4 injector system	13A-26
P0300★	Random cylinder misfire detected	13A-27
P0301	No. 1 cylinder misfire detected	13A-28
P0302	No. 2 cylinder misfire detected	13A-28
P0303	No. 3 cylinder misfire detected	13A-28
P0304	No. 4 cylinder misfire detected	13A-28
P0325	Detonation sensor system	13A-29
P0335	Crank angle sensor system	13A-29
P0340	Camshaft position sensor system	13A-31
P0403	EGR control solenoid valve system	13A-32
P0421	Catalyst malfunction	13A-33
P0443	Purge control solenoid valve system	13A-34
P0500	Vehicle speed sensor system	13A-35
P0505	Idle speed control system	13A-36
P1610	Immobilizer system	13A-38

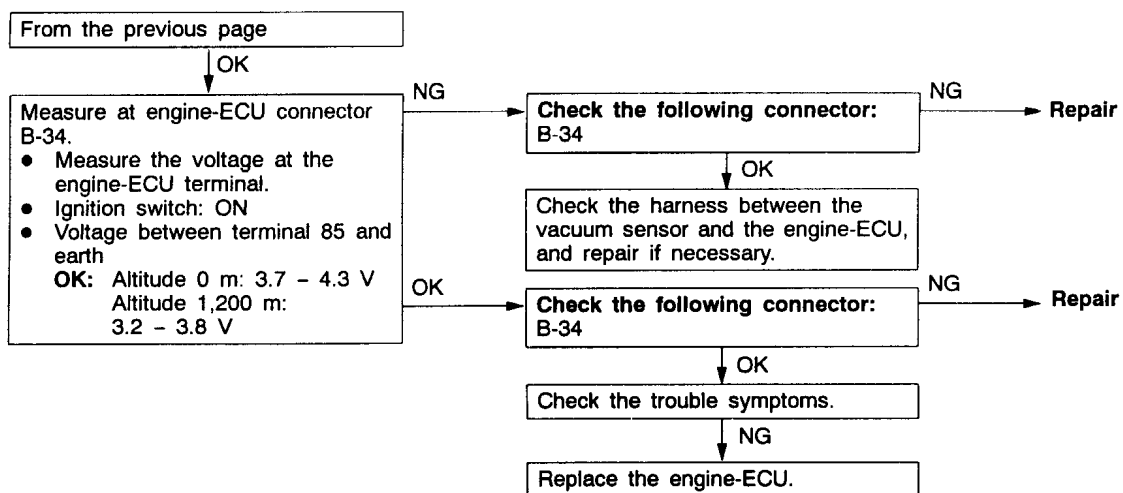
NOTE

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.

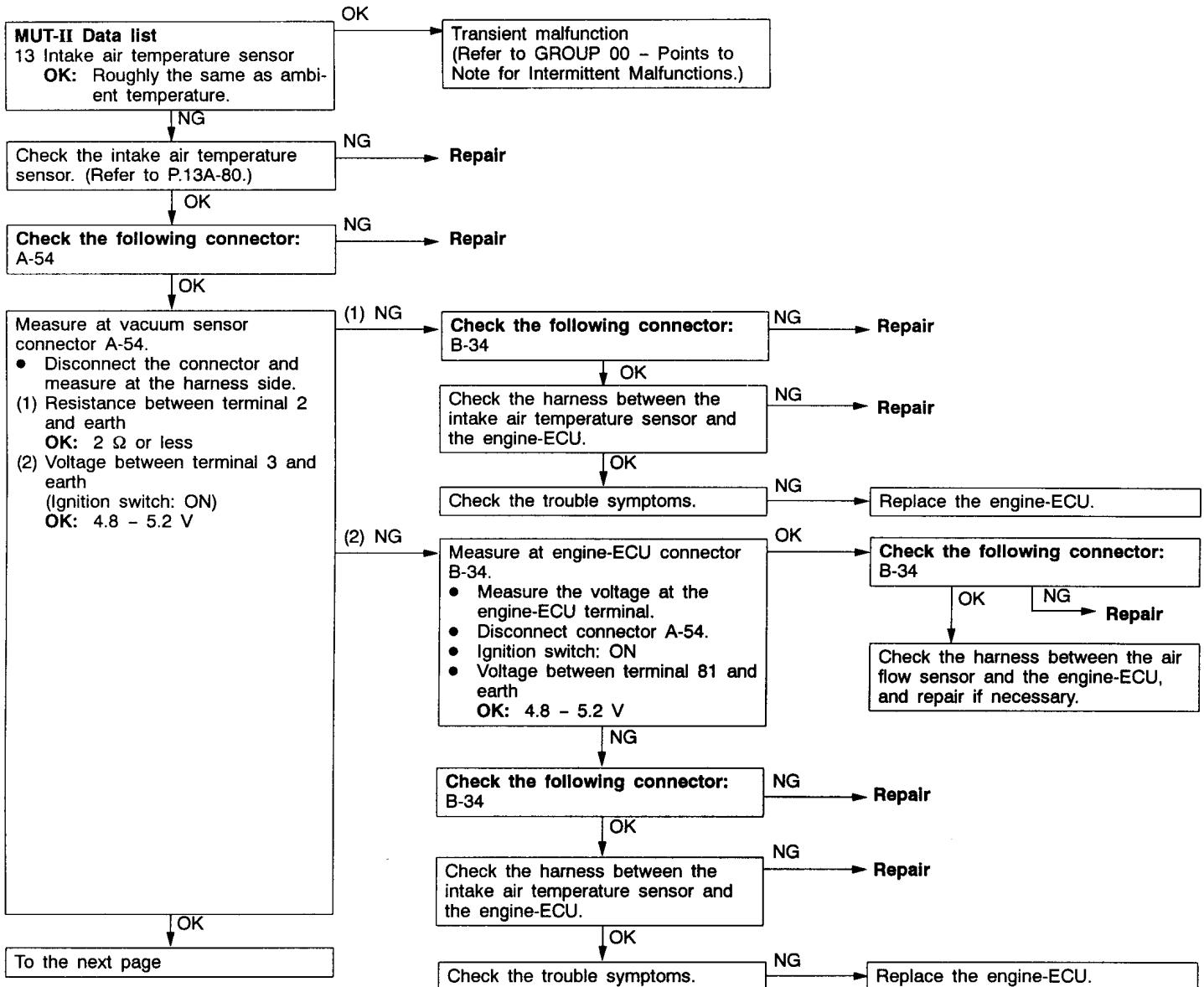
INSPECTION PROCEDURE CLASSIFIED BY DIAGNOSIS CODE

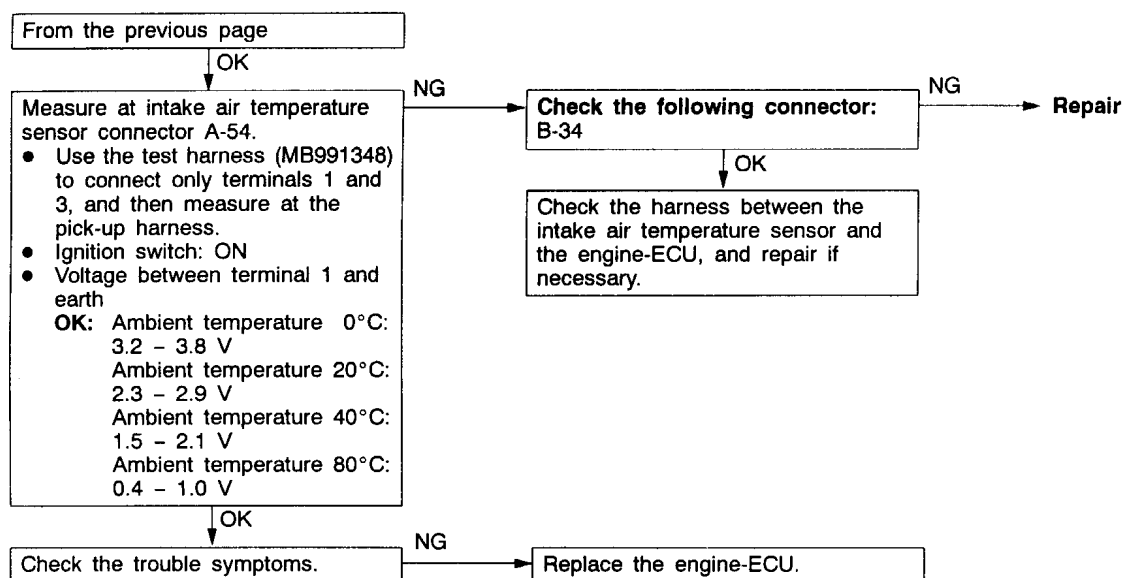
Code No. P0105 Vacuum sensor system	Range of Check
Range of Check • Ignition switch: ON Set Conditions • The output voltage of the vacuum sensor is 4.5 V or more for 2 seconds. (This corresponds to the absolute manifold pressure of 115 kPa or more.)	• Malfunction of the vacuum sensor • Improper connector contact, open circuit or short-circuited harness • Malfunction of the engine-ECU
Range of Check • The output voltage of the throttle position sensor is 1.25 V or more. or • The vehicle is stationary. Set Conditions • The output voltage of the vacuum sensor is 0.2 V or less for 2 seconds. (This corresponds to the absolute manifold pressure of 4.9 kPa or less.)	



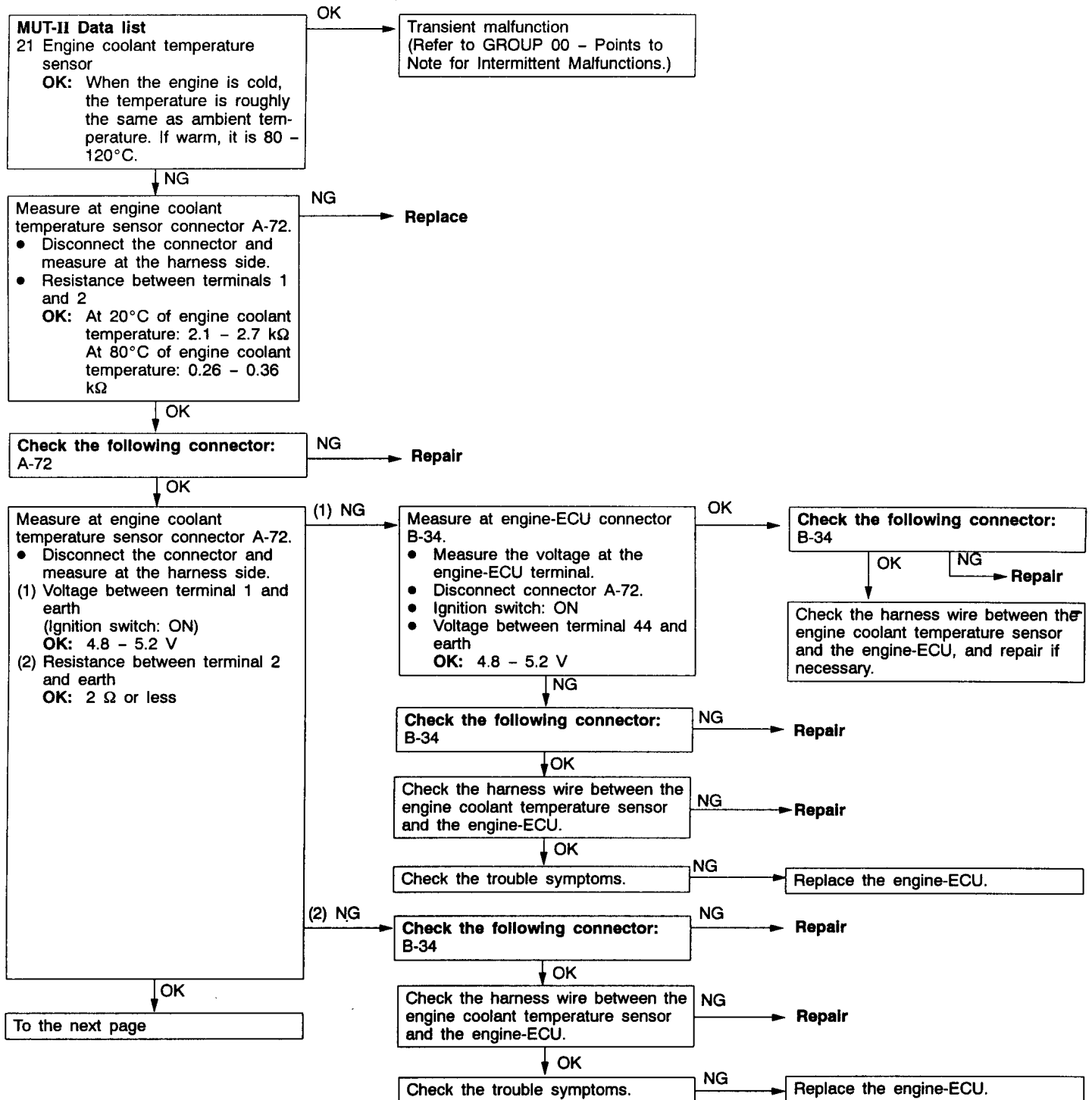


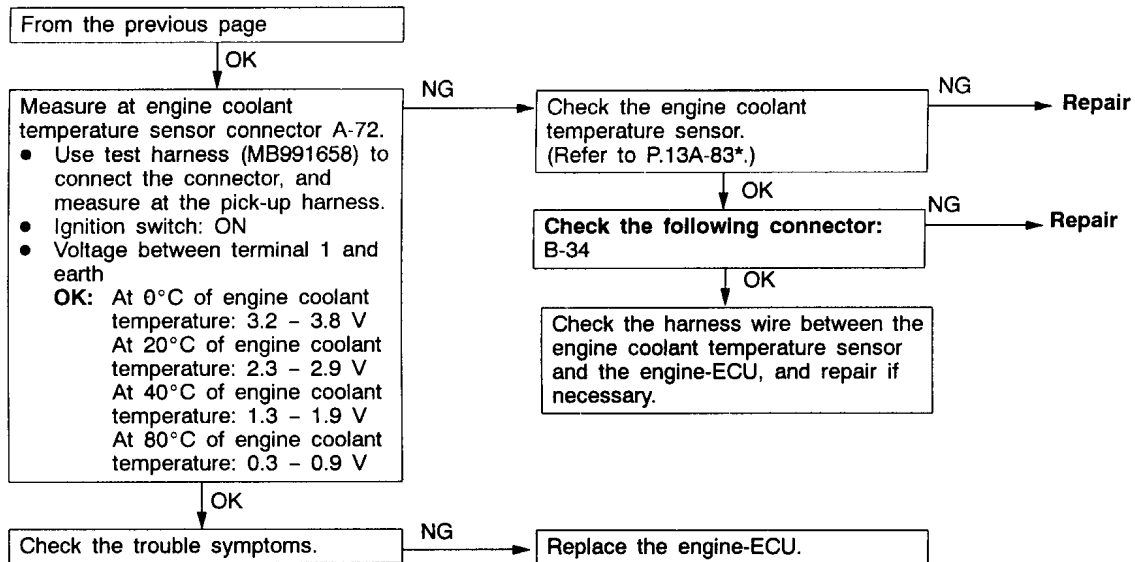
Code No. P0110 Intake air temperature sensor system	Probable cause
Range of Check • Two seconds have passed since the ignition switch is turned ON or the engine starting process is completed. Set Conditions • The sensor output voltage is 4.6 V or more for two seconds (equivalent to -45°C of intake air temperature) or • The sensor output voltage is 0.2 V or more for two 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





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 two seconds (equivalent to -45°C of engine coolant temperature) or • The sensor output voltage is 0.1 V or less for two seconds (equivalent to 140°C of engine coolant temperature)	• 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
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.	

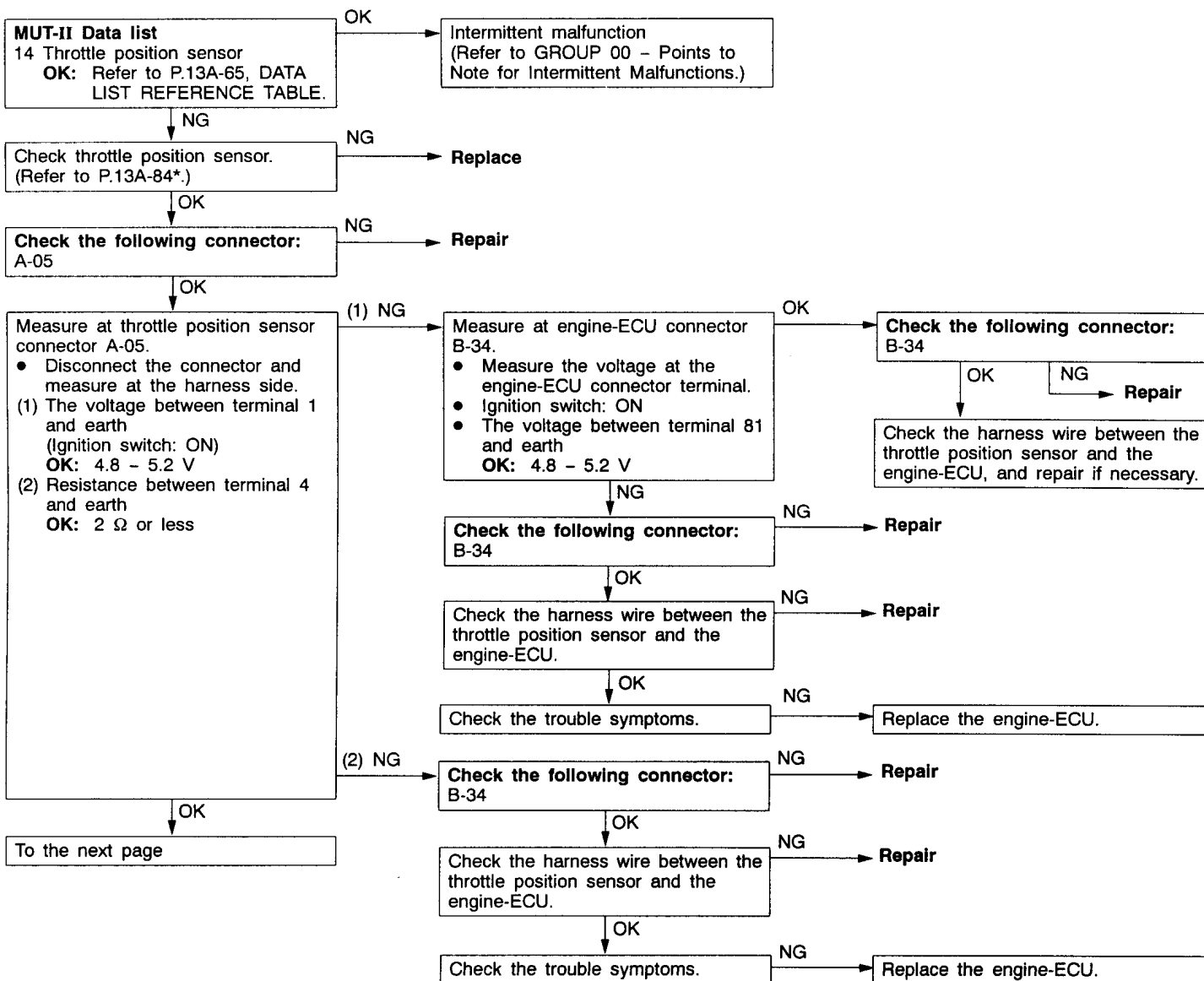




NOTE:

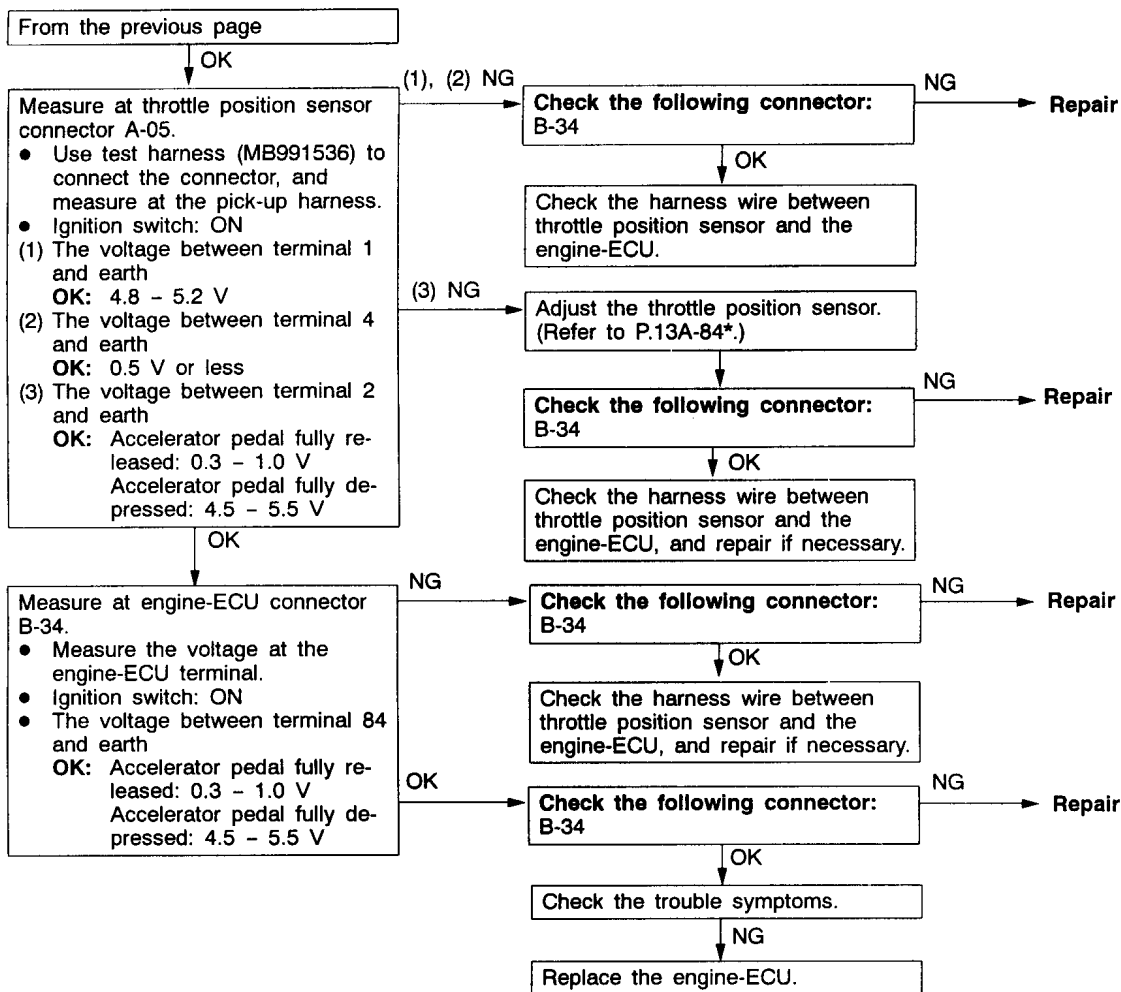
*: Refer to the '96 COLT/LANCER Workshop Manual (Pub. No. PWME9511).

Code No. 0120 Throttle position sensor system	Probable cause
Range of Check - Ignition switch: ON - Excluding 2 seconds after the ignition switch is turned to ON or immediately after the engine starts. Set Conditions - Engine speed is 1,000 r/min or less, and intake air pressure is 48 kPa or less, TPS output voltage is 4.6 V or more for 2 seconds. or - The sensor output voltage is 0.2 V or less for 2 seconds.	- Malfunction of throttle position sensor - Open or short circuit in the throttle position sensor circuit or loose connector contact - Malfunction of the engine-ECU



NOTE:

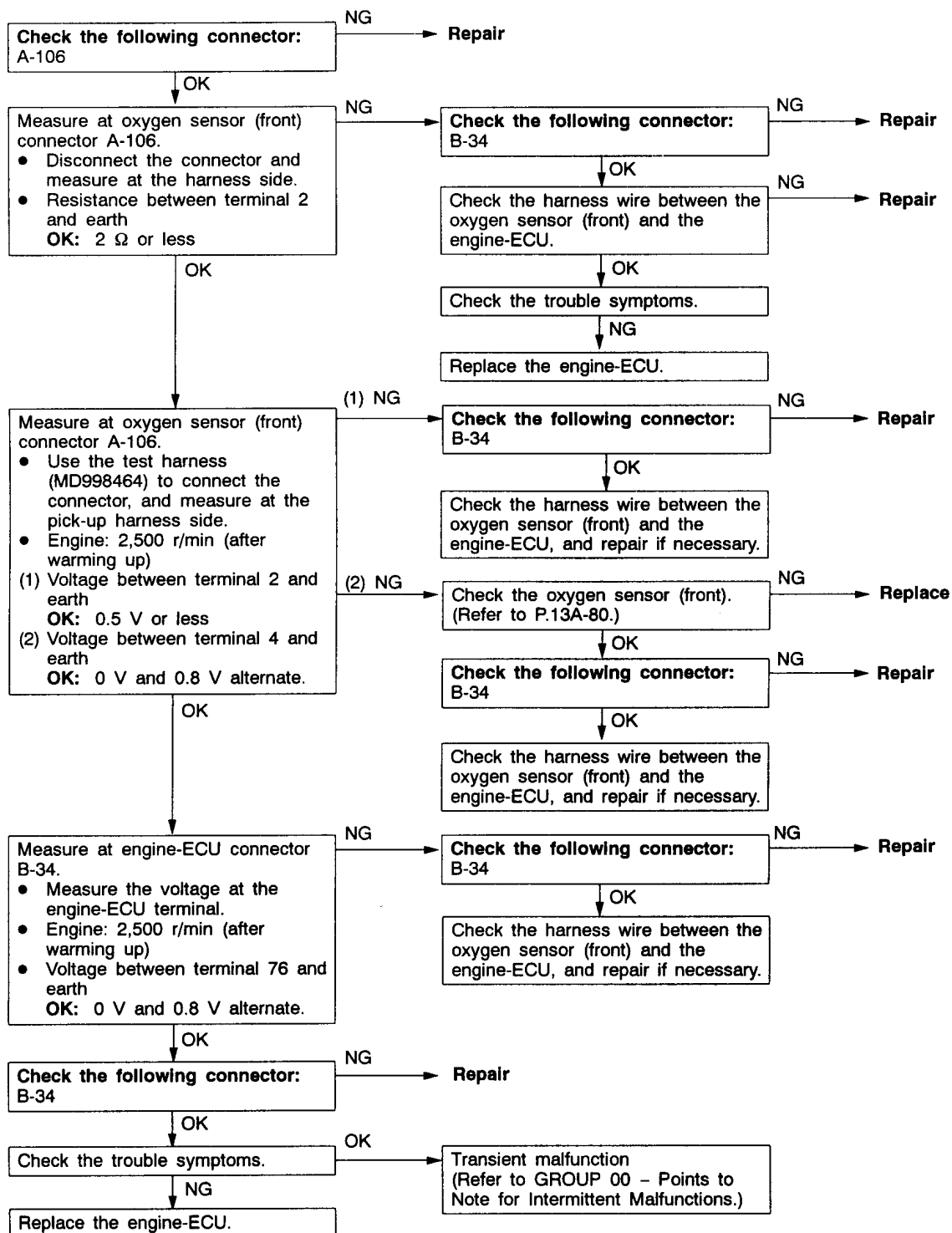
*: Refer to the '96 COLT/LANCER Workshop Manual (Pub. No. PWME9511).



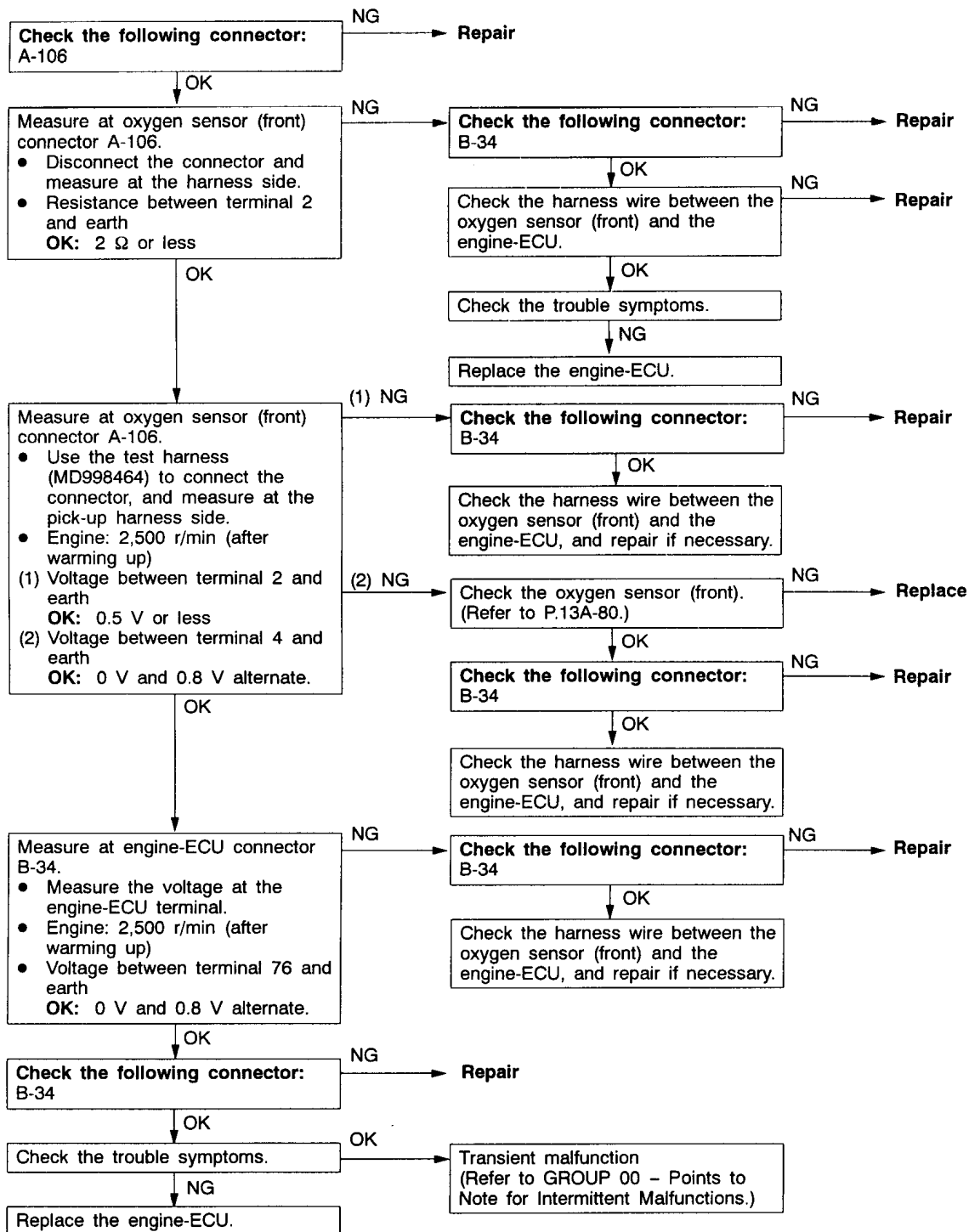
NOTE:

*: Refer to the '96 COLT/LANCER Workshop Manual (Pub. No. PWME9511).

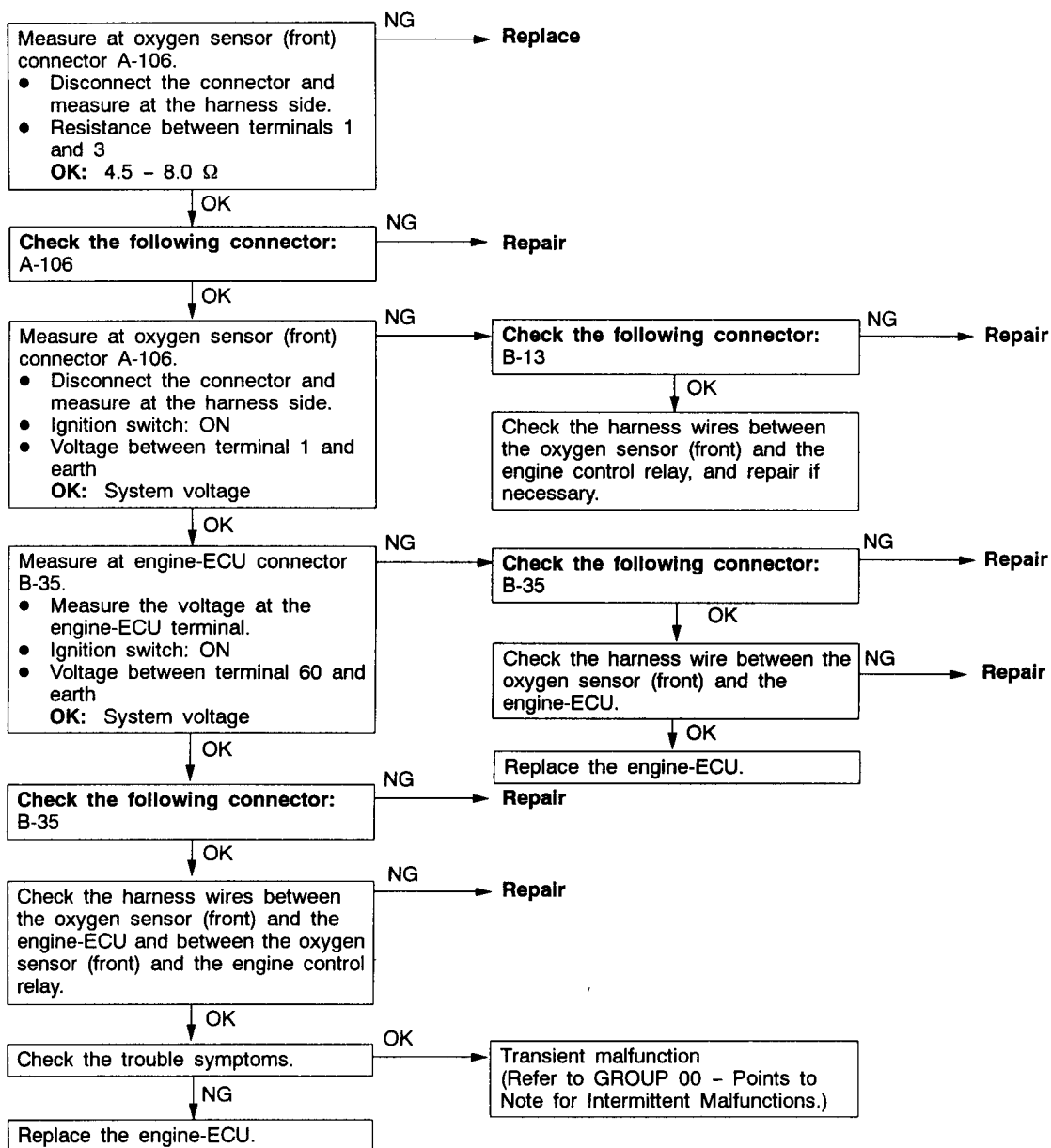
Code No. P0125 Feedback system	Probable cause
Range of Check - The engine coolant temperature is approx. 80°C or more. - During stoichiometric feedback control - The vehicle is not being decelerated. Set Conditions - Oxygen sensor (front) output voltage has been higher or lower than 0.5 V for at least 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



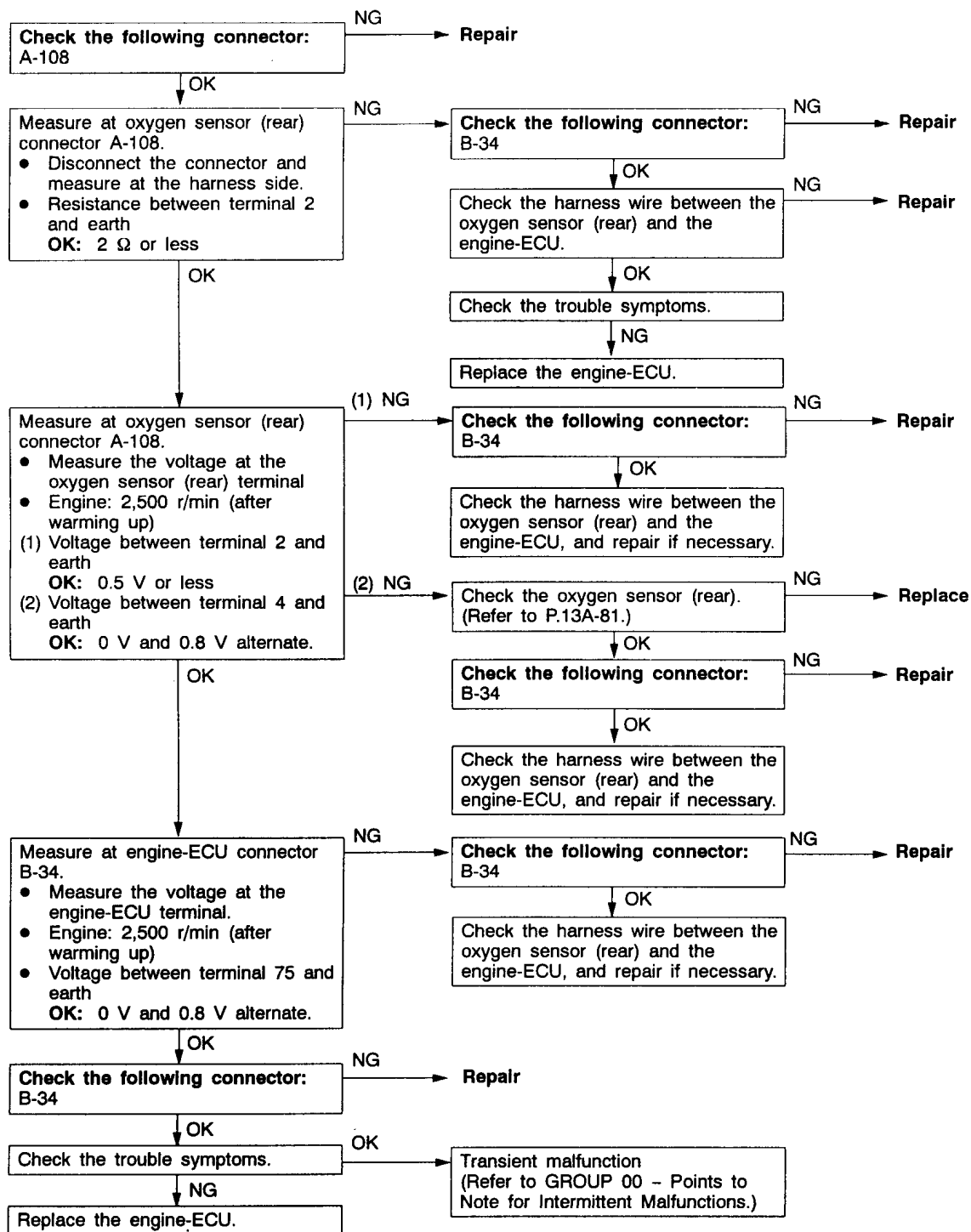
Code No. P0130 Oxygen sensor (front) system <sensor 1>	Probable cause
Range of Check • Three minutes have been passed since the engine has been started. • The engine coolant temperature is approx. 80°C or more. • Intake air temperature is 20 – 50°C • Engine speed is 1,200 r/min or more • Driving on a 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 2,800 r/min or less • During driving • During air/fuel ratio feedback control Set Conditions • The oxygen sensor (front) output frequency is six or less per 10 seconds on average.	



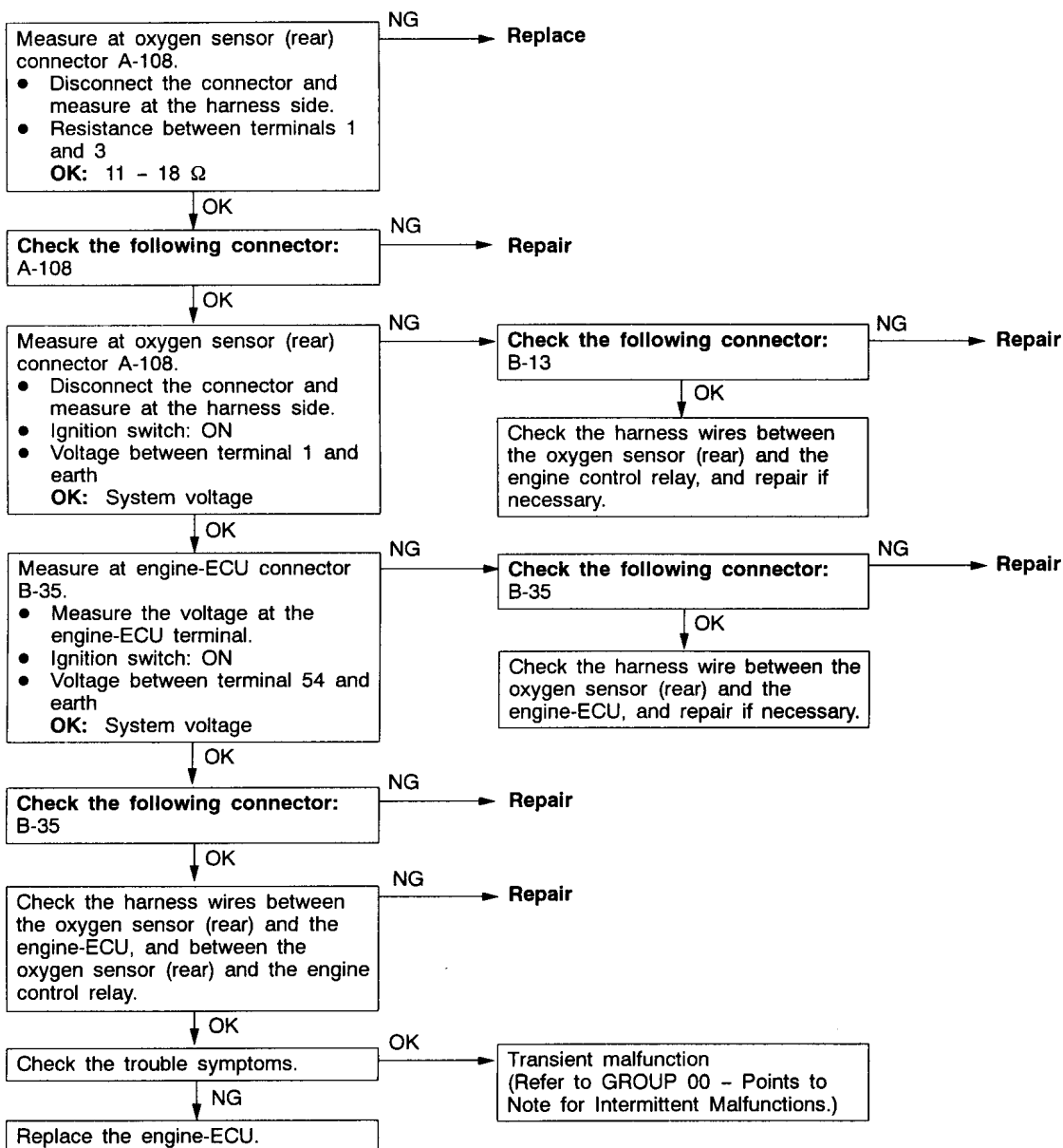
Code No. P0135 Oxygen sensor heater (front) system <sensor 1>	Probable cause
Range of Check - The engine coolant temperature is approx. 20°C or more. - The oxygen sensor heater (front) remains on. - The engine speed is 50 r/min or more. - Battery voltage is 11 – 16 V. Set Conditions - The current, which 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



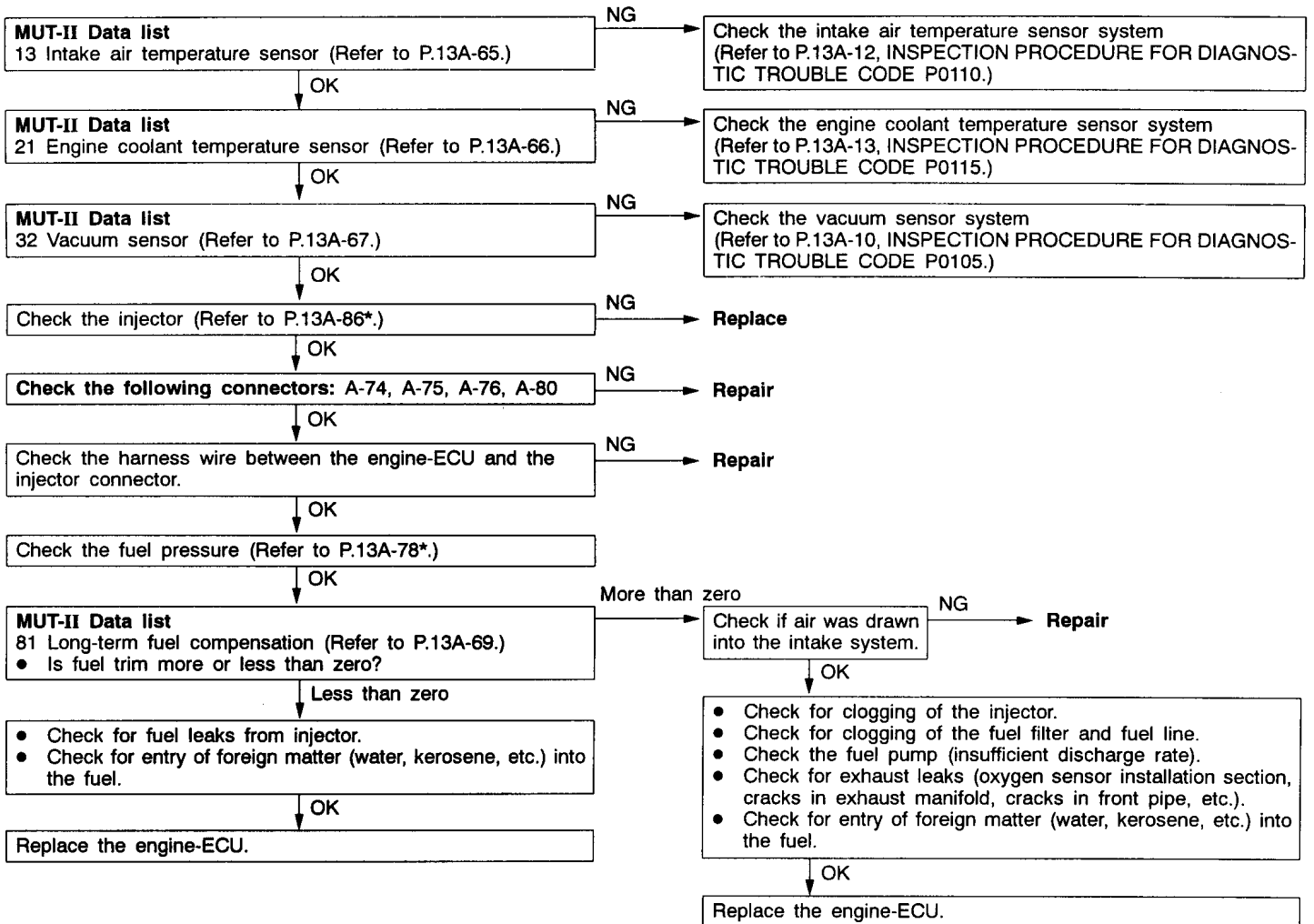
Code No. P0136 Oxygen sensor (rear) system <sensor 2>	Probable cause
Range of Check • Three minutes have been passed since the engine has been started. • The engine coolant temperature is approx. 80°C or more. • Intake air temperature is 20 – 50°C • Engine speed is 1,200 r/min or more • Driving on a 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 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



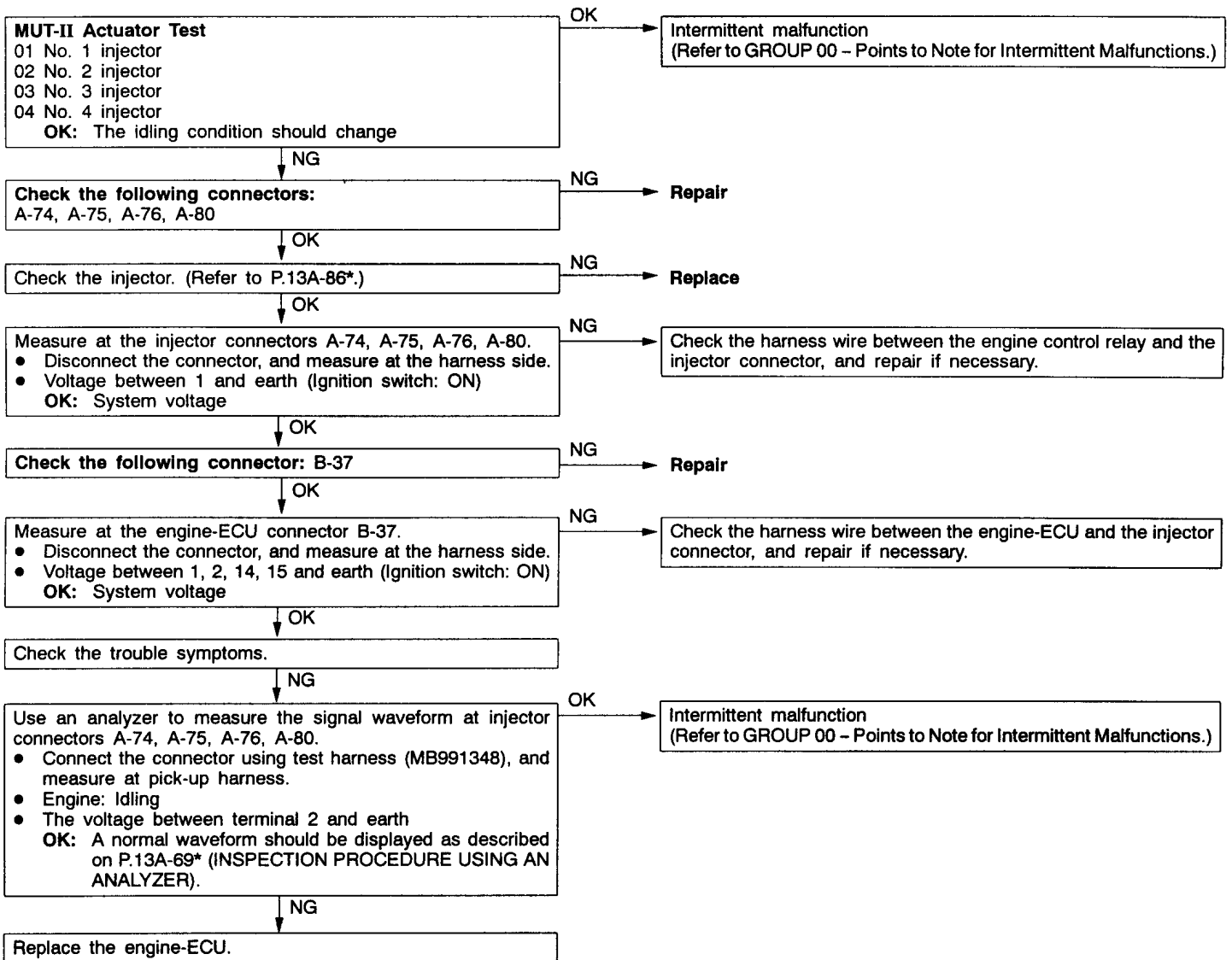
Code No. P0170 Abnormal fuel system	Probable cause
Range of Check - Engine: Being learning the air-fuel ratio Set Conditions - Two seconds or more have been passed while the fuel injection amount compensation value is too low. or - Two seconds or more have been passed while the fuel injection amount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



NOTE:

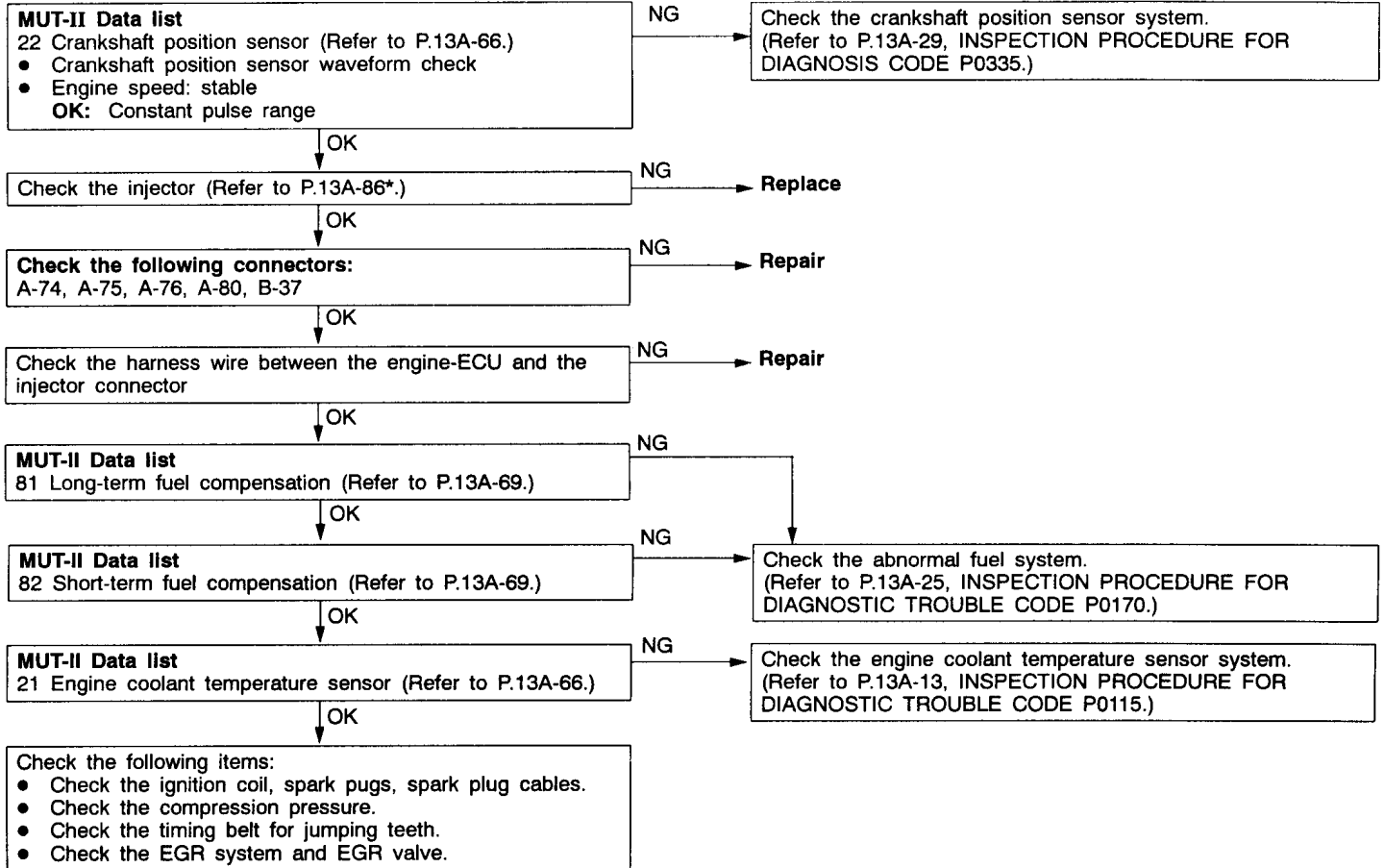
*: Refer to the '96 COLT/LANCER Workshop Manual (Pub. No. PWME9511).

Code No. P0201 No. 1 injector system Code No. P0202 No. 2 injector system Code No. P0203 No. 3 injector system Code No. P0204 No. 4 injector system	Probable cause
Range of Check - Engine speed is approx. 50 – 1,000 r/min - The throttle position sensor output voltage is 1.15 V or less. - Actuator test by MUT-II is not carried out. Set Conditions - Surge voltage of injector coil is not detected for 2 seconds.	- Malfunction of the injector - Improper connector contact, open circuit or short-circuited harness wire of the injector circuit - Malfunction of the engine-ECU

**NOTE:**

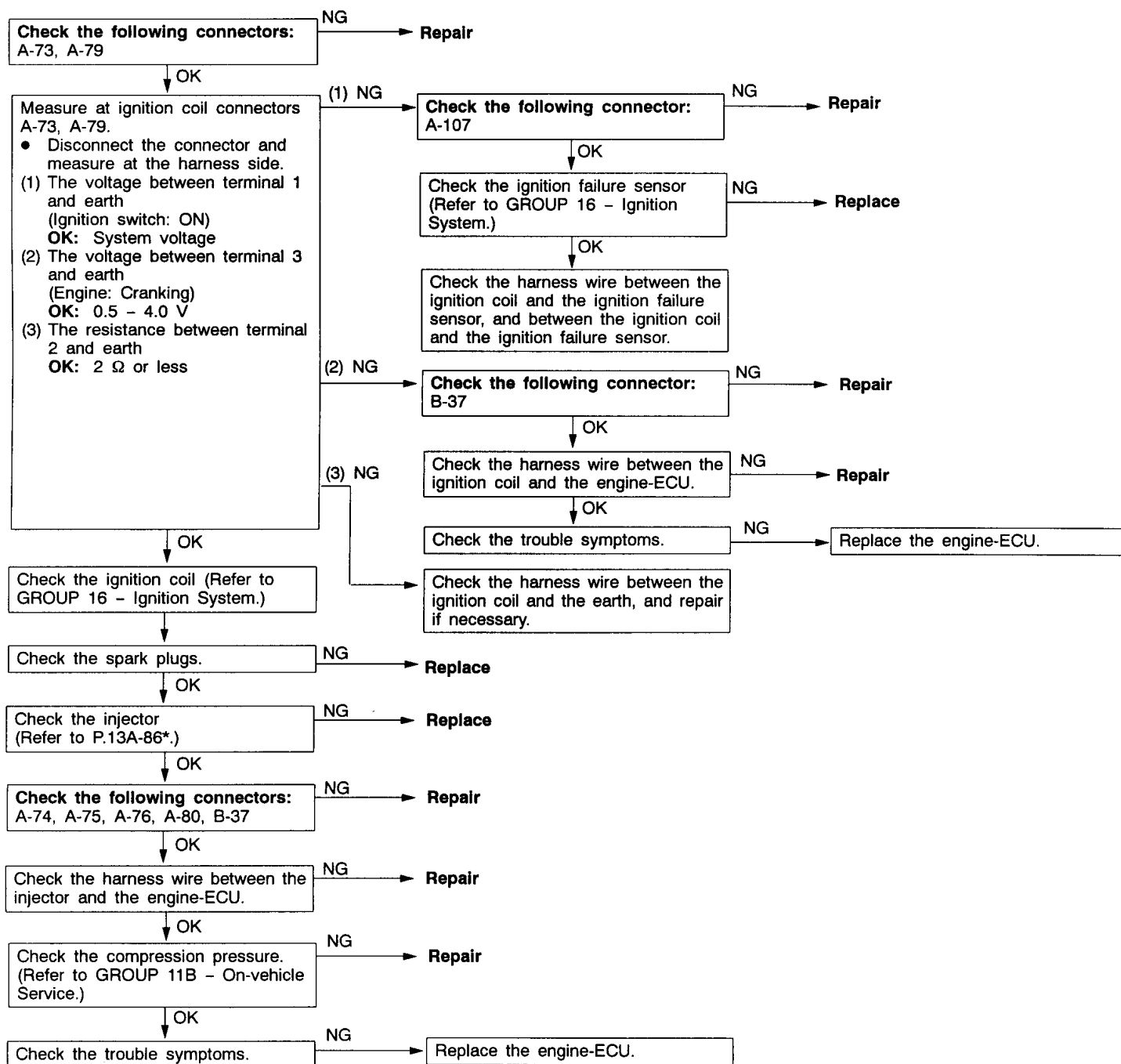
*: Refer to the '96 COLT/LANCER Workshop Manual (Pub. No. PWME9511).

Code No. P0300 Random cylinder misfire detected	Probable cause
Range of Check - Engine speed is approx. 50 - 4,500 r/min. - When the engine is running except deceleration and sudden acceleration. Set Conditions - The number of misfires exceeds a predetermined number per 200 engine revolutions. - The number of misfires exceeds a predetermined number per 1,000 engine revolutions.	- Malfunction of the ignition system - Abnormal compression - Malfunction of injector - Abnormal signal from the crank angle sensor - Malfunction of the lambda control system - Malfunction of the engine coolant temperature sensor - Missing timing belt teeth - Malfunction of the EGR valve - Malfunction of engine-ECU

**NOTE:**

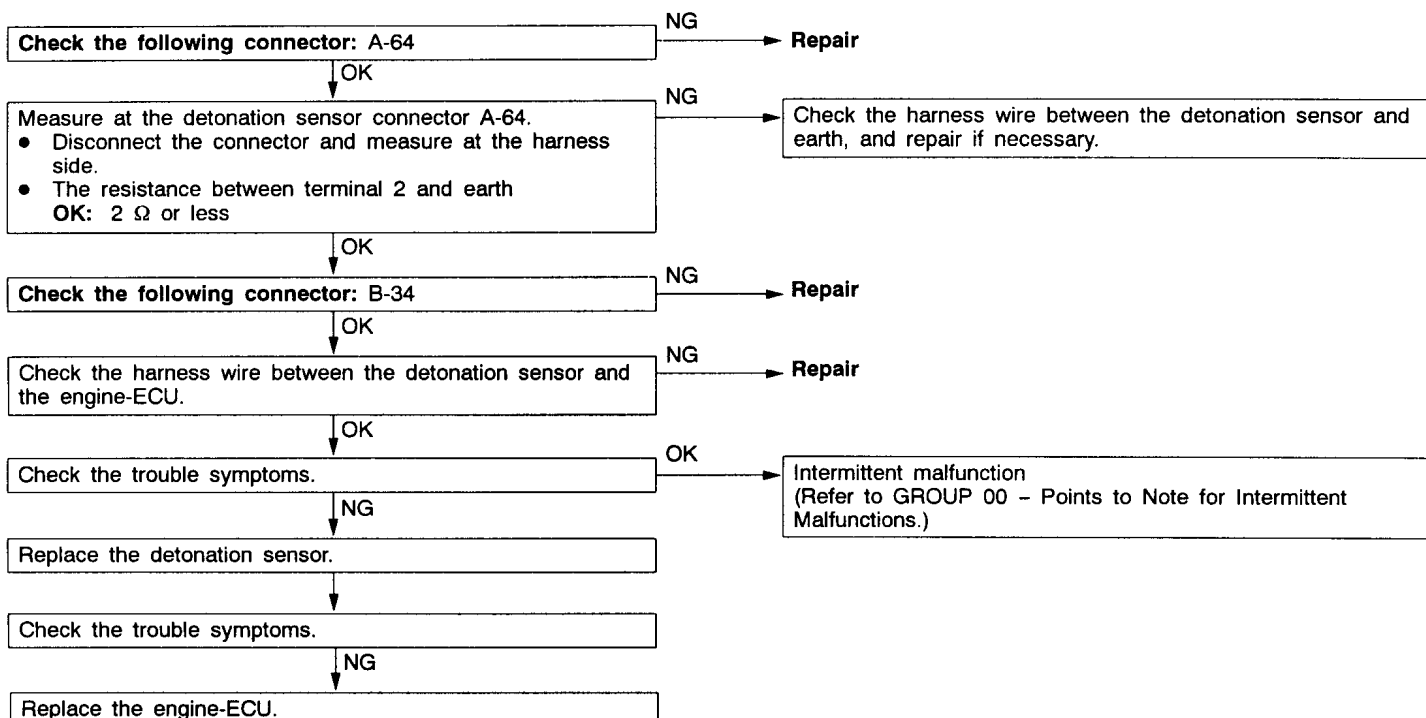
*: Refer to the '96 COLT/LANCER Workshop Manual (Pub. No. PWME9511).

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 • Malfunction of the ignition system • Abnormal compression • Malfunction of injector • Malfunction of engine-ECU
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 1,000 engine revolutions (Misfire has occurred in only one cylinder).	

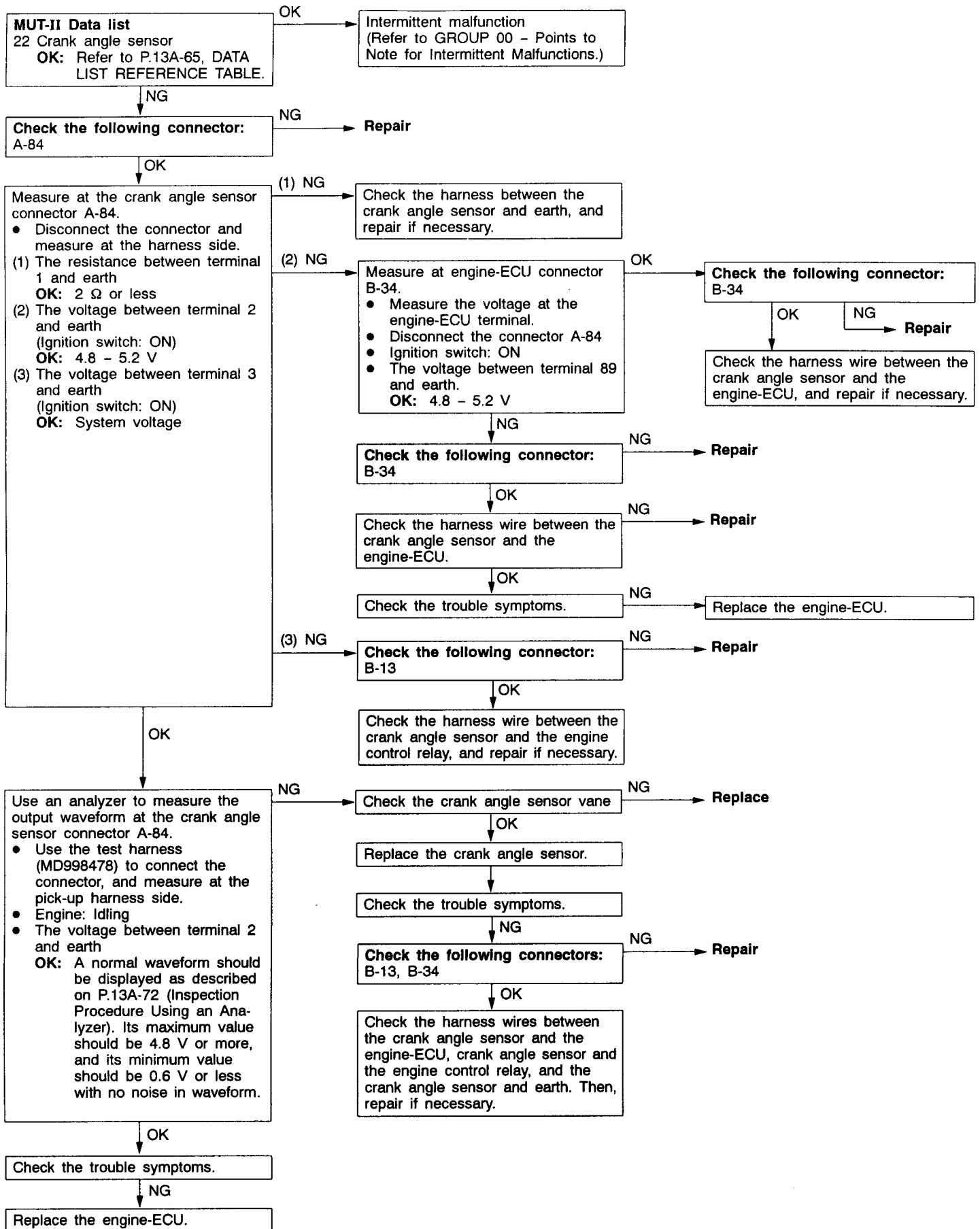
**NOTE:**

*: Refer to the '96 COLT/LANCER Workshop Manual (Pub. No. PWME9511).

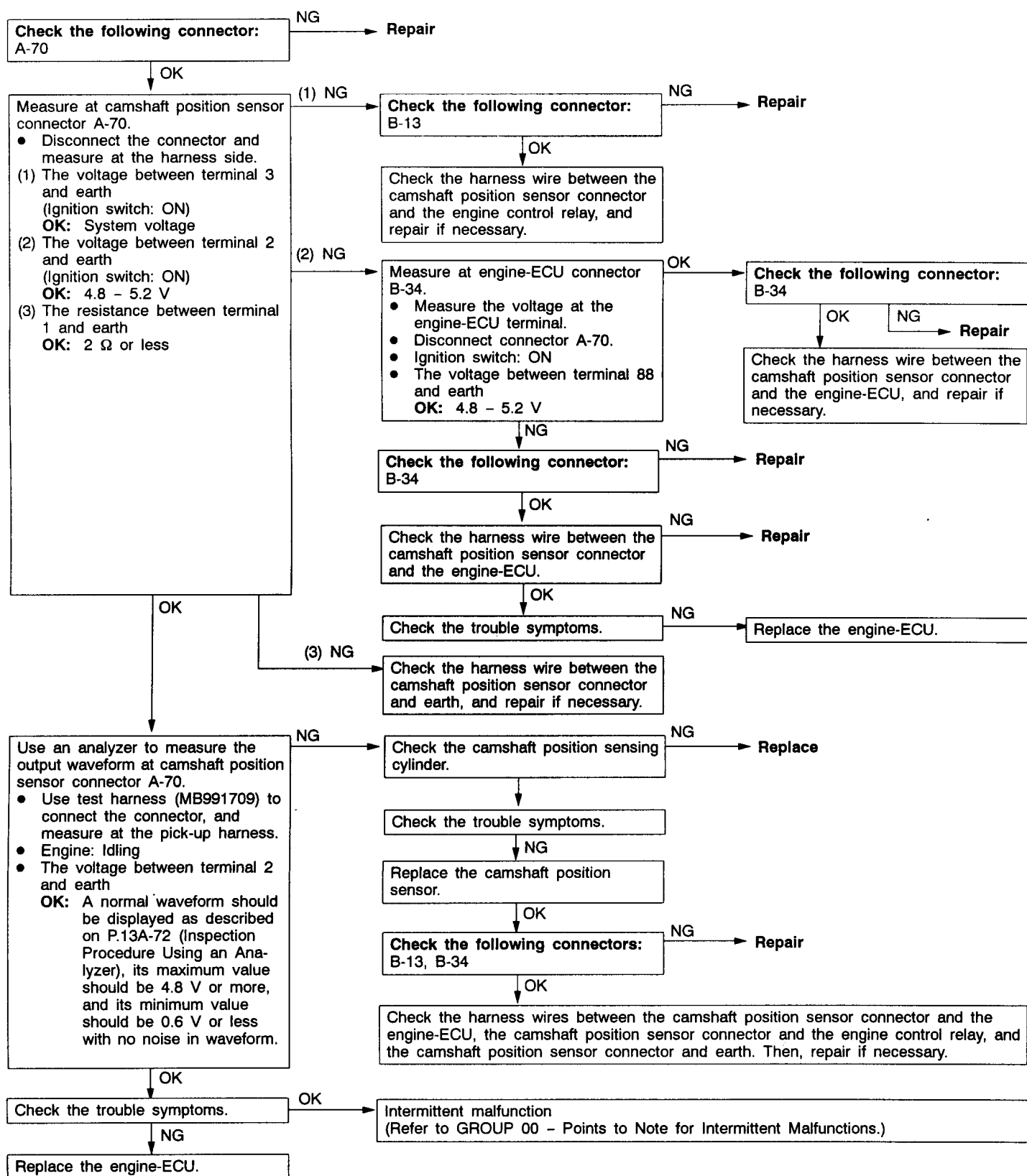
Code No. P0325 Detonation sensor system	Probable cause
Range of Check • Engine: Two seconds after the engine has been started Set Conditions • Changes in sensor output voltage (detonation sensor peak voltage per 1/2 crankshaft rotation) in 200 consecutive cycles are 0.06 V or less.	• Malfunction of the detonation sensor • Open or short circuit in the detonation sensor circuit or loose connector contact • Malfunction of engine-ECU



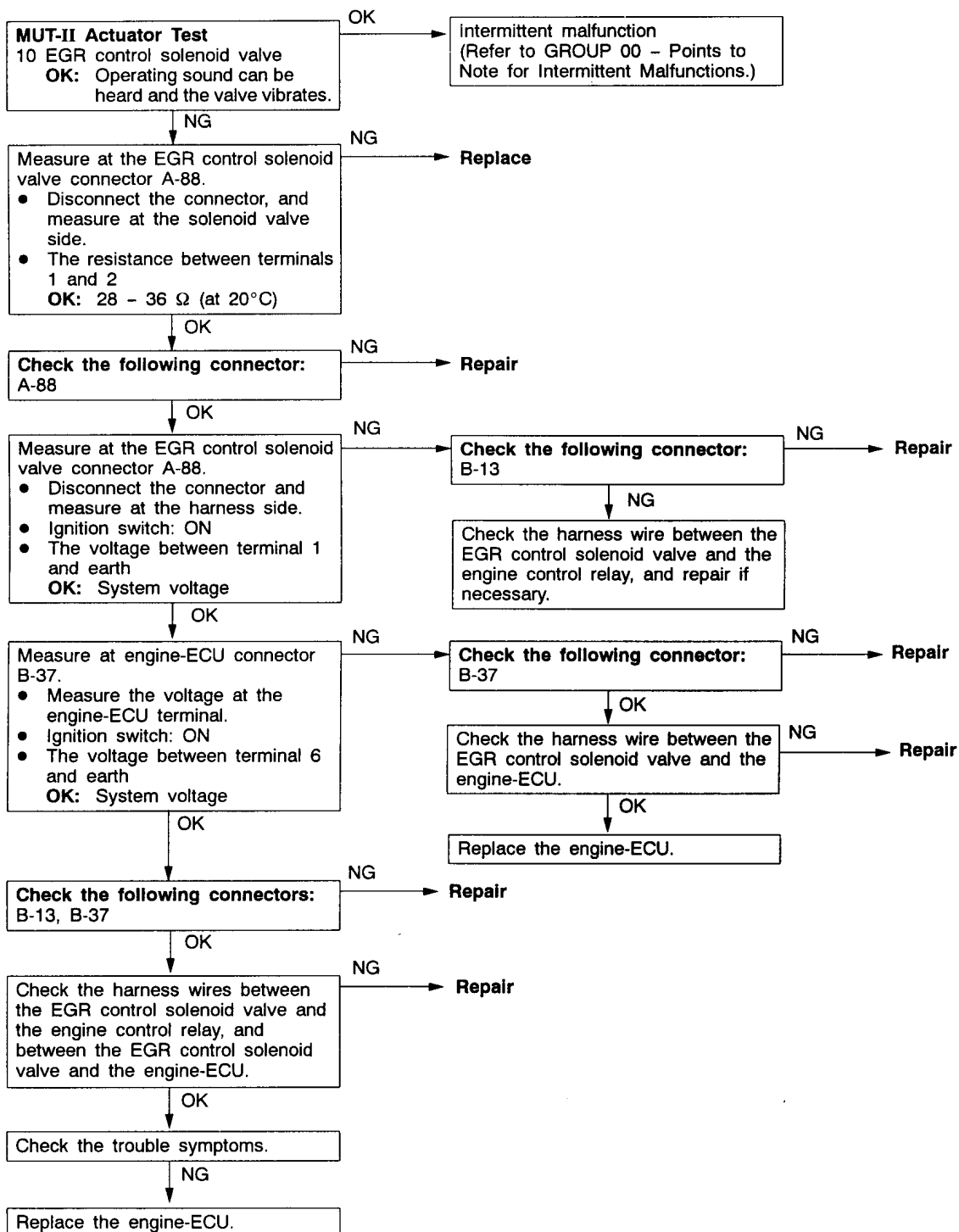
Code No. P0335 Crank angle sensor system	Probable cause
Range of Check • Engine is cranking Set Conditions • Sensor output voltage does not change for 2 seconds (no pulse signal input).	• Malfunction of the crank angle sensor. • Open or short circuit in the crank angle sensor circuit or loose connector contact. • Malfunction of engine-ECU



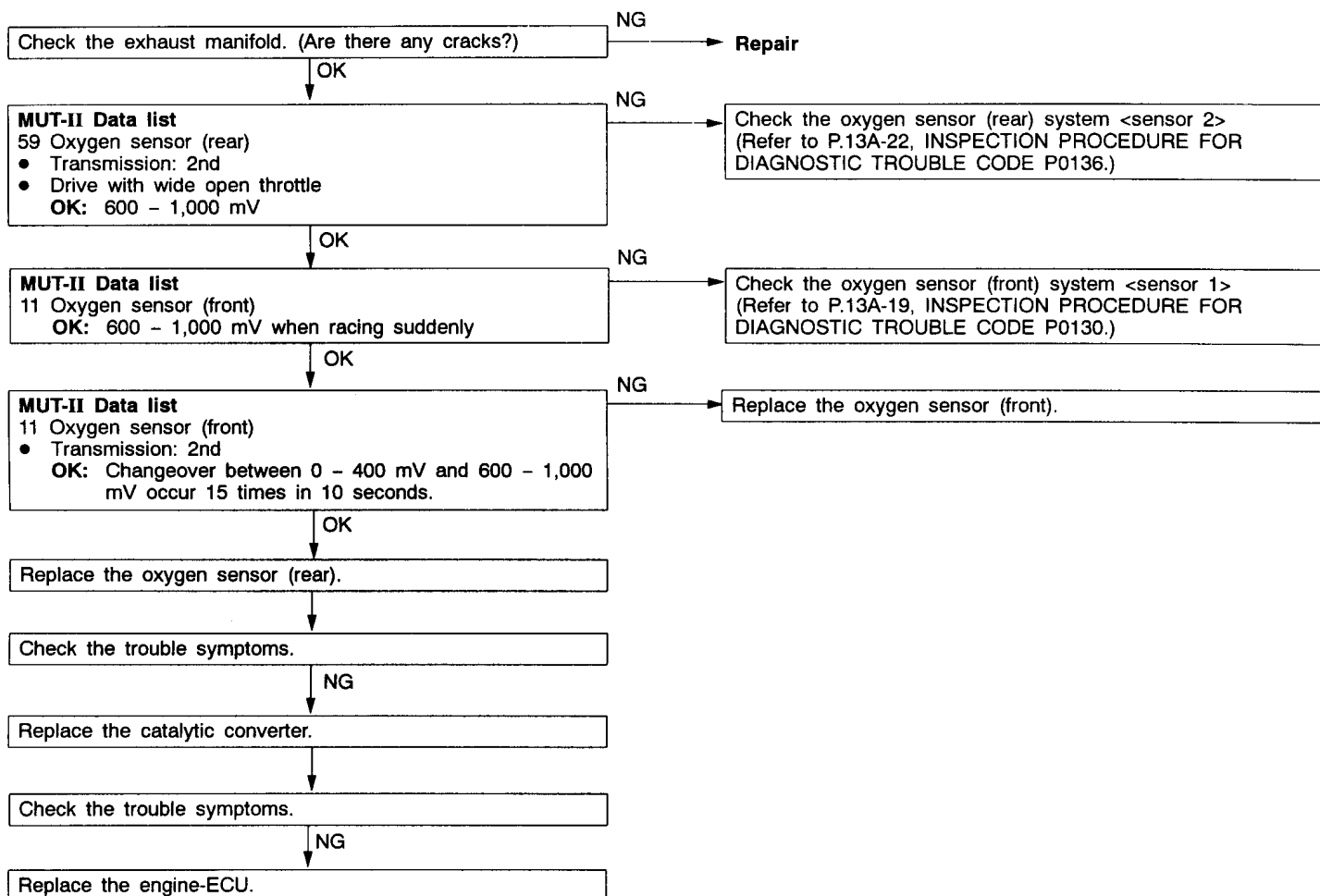
Code No. P0340 Camshaft position sensor system	Probable cause
Range of Check • After the engine was started Set Conditions • The sensor output voltage does not change for 2 seconds (no pulse signal input).	• Malfunction of the camshaft position sensor • Open or short circuit in the camshaft position sensor circuit or loose connector contact. • Malfunction of engine-ECU



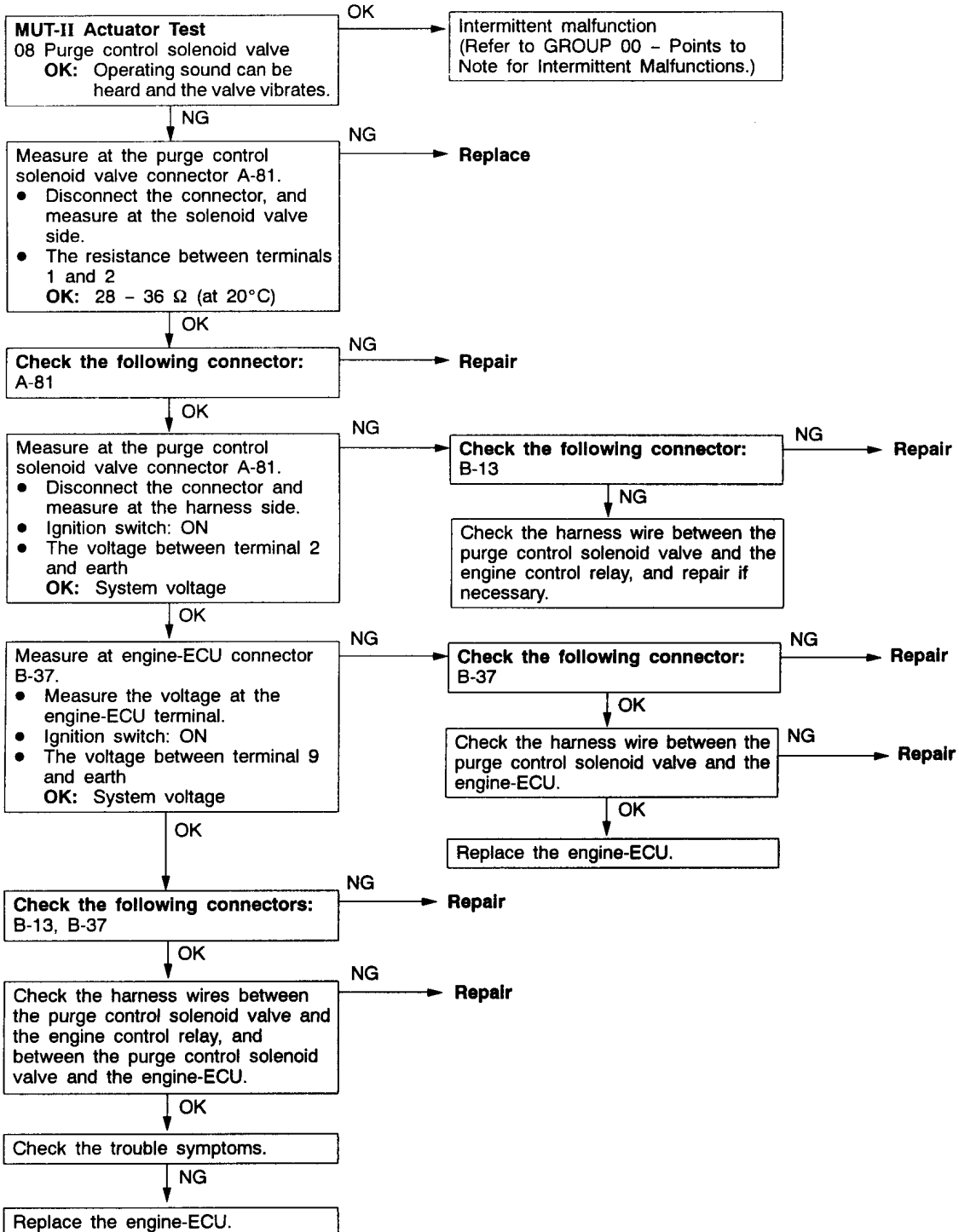
Code No. P0403 EGR control solenoid valve system	Probable cause
Range of Check • Ignition switch: ON • Battery voltage is 10 V or more. Set Conditions • The solenoid coil surge voltage (battery voltage + 2 V) is not detected when the EGR control solenoid valve is turned from on to off.	• Malfunction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



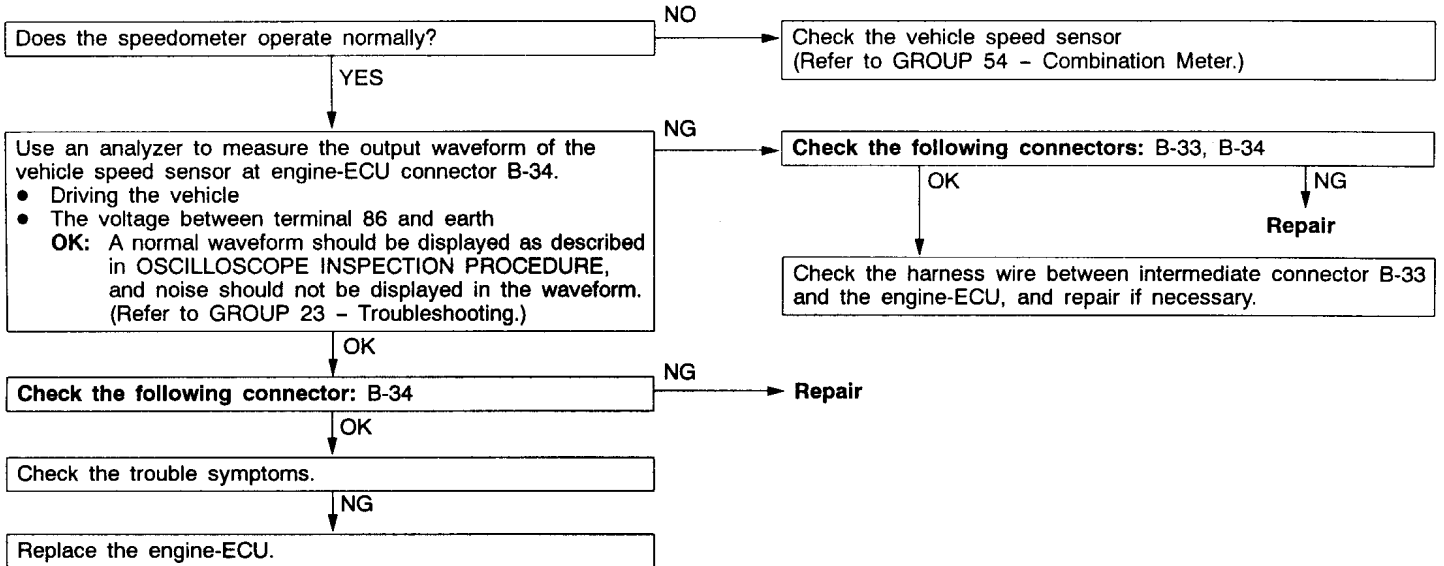
Code No. P0421 Catalyst malfunction	Probable cause
Range of Check • The engine speed is 4,000 r/min or less. • During driving • During air/fuel ratio feedback control Set Conditions • The ratio between the oxygen sensor (rear) and the oxygen sensor (front) output frequencies reaches 0.8 per 10 seconds on average.	• Malfunction of catalyst • Malfunction of the oxygen sensor (front) • Malfunction of the oxygen sensor (rear) • Malfunction of engine-ECU



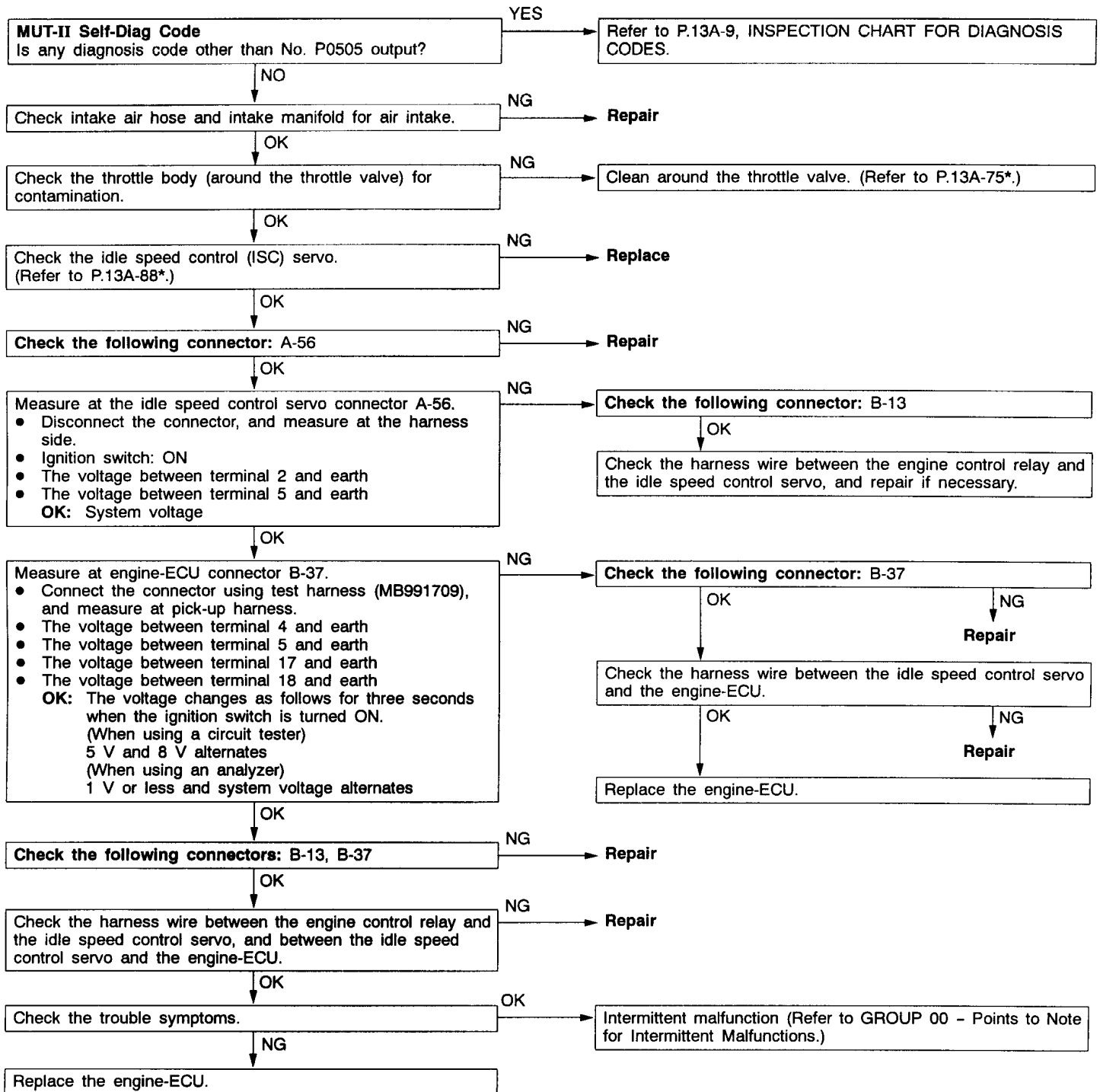
Code No. P0443 Purge control solenoid valve system	Probable cause
Range of Check • Ignition switch: ON • Battery voltage is 10 V or more. Set Conditions • The solenoid coil surge voltage (battery voltage + 2 V) is not detected when the purge control solenoid valve is turned from on to off.	• Malfunction 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 2 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. P0505 Idle speed control (ISC) system	Probable cause
Check Area - Vehicle speed has reached 1.5 km/h at least once. - Under the closed loop idle speed control. Judgment Criteria - Actual idle speed has continued to be higher than the target idle speed by 300 r/min or more for 10 sec. Check Area - Vehicle speed has reached 1.5 km/h at least once. - During idle speed closed loop control. - The highest temperature at the last drive is 45°C or less. - Engine coolant temperature is approx. 80°C or more. - Battery voltage is 10 V or more. - Intake air temperature is -10°C (14°F) or more. Judgment Criteria - Actual idle speed has been minimum 200 r/min higher than the target idle speed for ten seconds. Check Area - During idle speed closed loop control. - Engine coolant temperature is about 80°C or higher. - Battery voltage is 10 V or higher. - Power steering switch is off. - Intake air pipe pressure is 53 kPa or less. - Intake air temperature is -10°C or more. Judgment Criteria - Actual idle speed has been minimum 100 r/min higher than the target idle speed for ten seconds.	- Malfunction of idle speed control (ISC) servo - Improper connector contact, open circuit or short-circuited harness wire - Malfunction of the engine-ECU



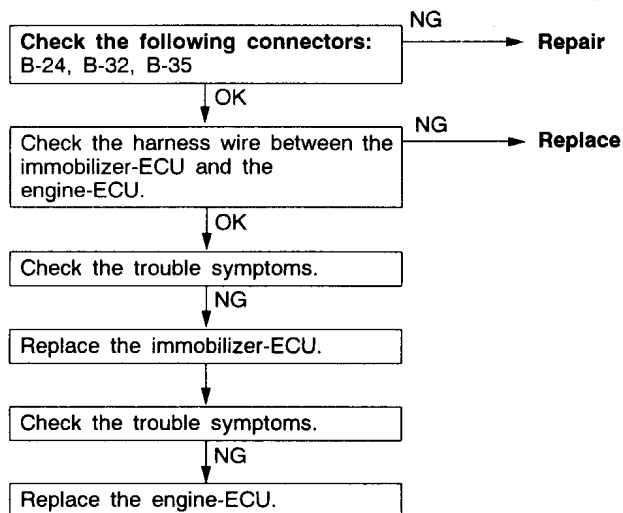
NOTE:

*: Refer to the '96 COLT/LANCER Workshop Manual (Pub. No. PWME9511).

Code 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.



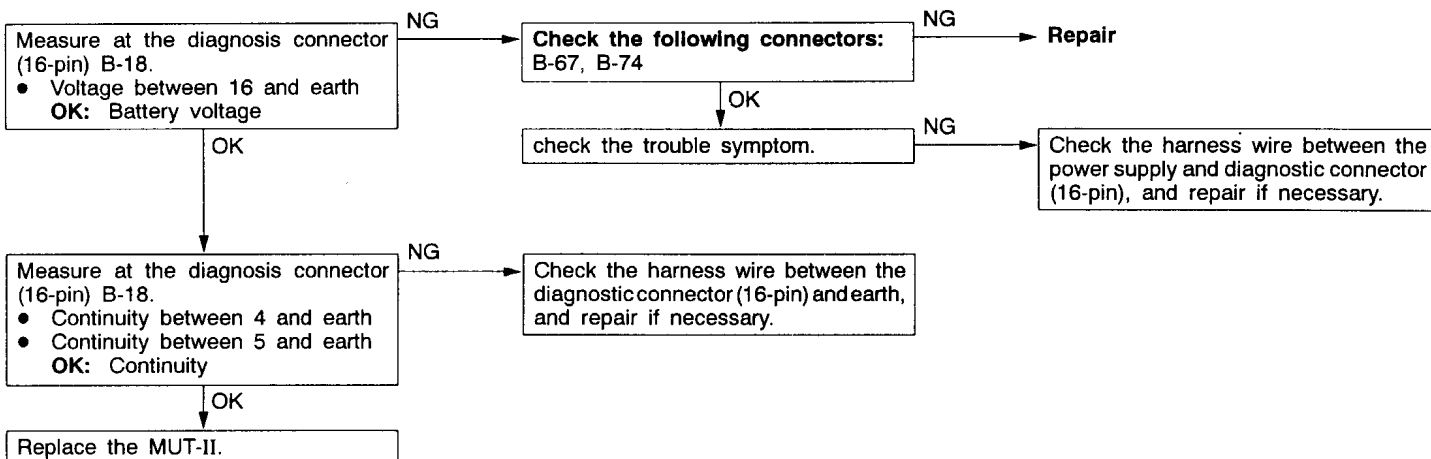
INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom		Inspection procedure No.	Reference page
Communication with MUT-II is impossible.	Communication with all systems is not possible.	1	13A-40
	Communication with engine-ECU only is not possible.	2	13A-40
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-41
	The engine warning lamp remains illuminating and never goes out.	4	13A-41
Starting	No initial combustion (starting impossible)	5	13A-42
	Initial combustion but no complete combustion (starting impossible)	6	13A-43
	Long time to start (improper starting)	7	13A-44
Idling stability (Improper idling)	Unstable idling (Rough idling, hunting)	8	13A-45
	Idling speed is high. (Improper idling speed)	9	13A-47
	Idling speed is low. (Improper idling speed)	10	13A-47
Idling stability (Engine stalls)	When the engine is cold, it stalls at idling. (Die out)	11	13A-48
	When the engine becomes hot, it stalls at idling. (Die out)	12	13A-49
	The engine stalls when starting the car. (Pass out)	13	13A-51
	The engine stalls when decelerating.	14	13A-51
Driving	Hesitation, sag or stumble	15	13A-52
	The feeling of impact or vibration when accelerating	16	13A-53
	The feeling of impact or vibration when decelerating	17	13A-53
	Poor acceleration	18	13A-54
	Surge	19	13A-55
	Knocking	20	13A-56
Dieseling		21	13A-56
Too high CO and HC concentration when idling		22	13A-57
Fans (radiator fan, A/C condenser fan) are inoperative		23	13A-58

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

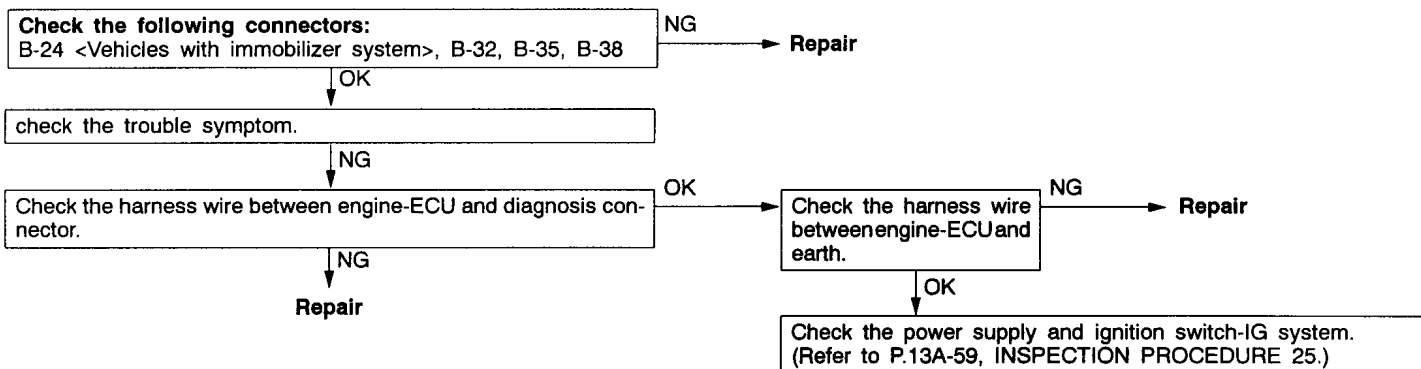
INSPECTION PROCEDURE 1

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



INSPECTION PROCEDURE 2

MUT-II communication with engine-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 engine-ECU and diagnosis connector

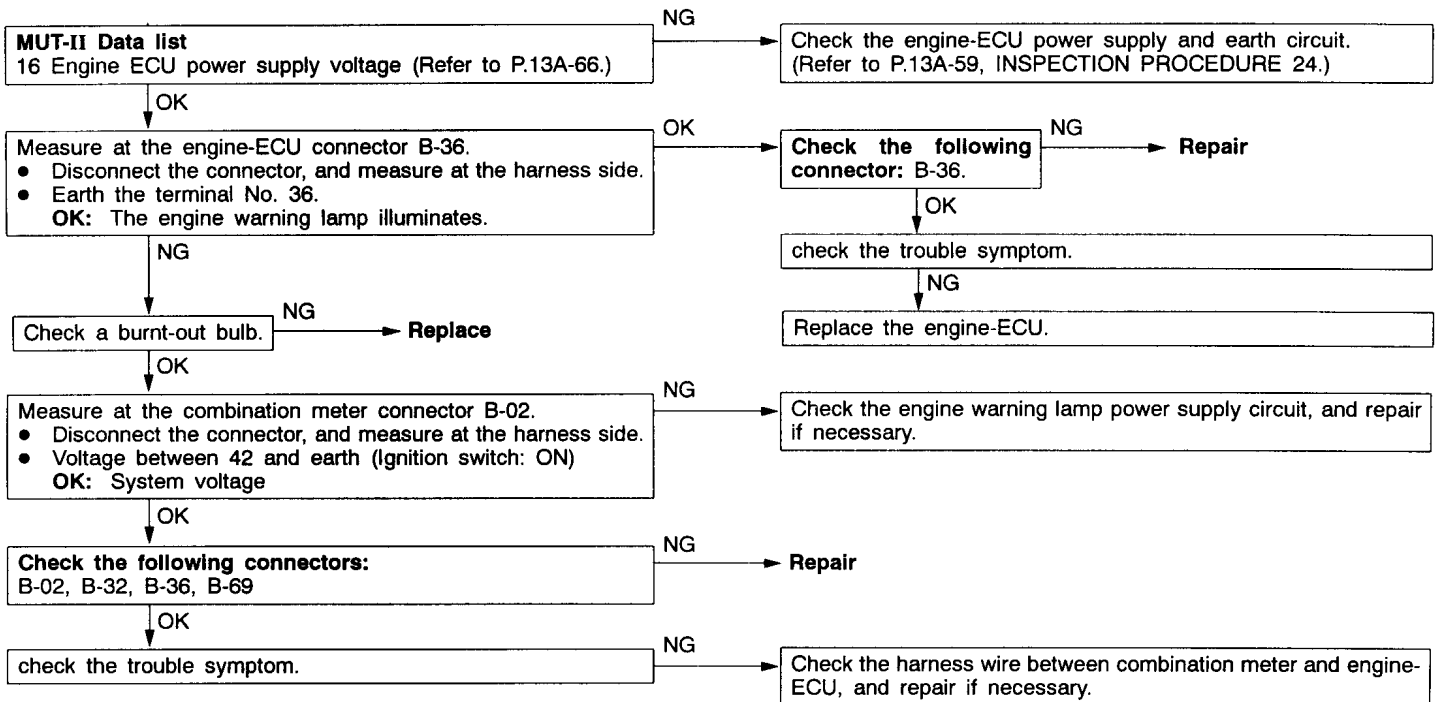


NOTE

Though the above inspection has been performed, if trouble symptom does not disappear, check the multi center display, and replace it if necessary.

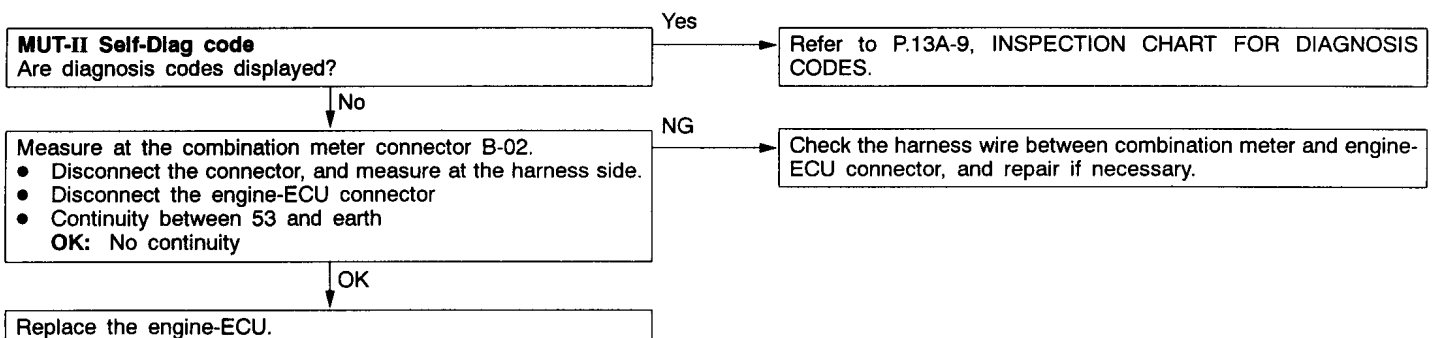
INSPECTION PROCEDURE 3

The engine warning lamp does not illuminate right after the ignition switch is turned to the ON position.	Probable cause
Because there is a burnt-out bulb, the engine-ECU causes the engine warning lamp to illuminate for five seconds immediately after the ignition switch is turned to ON. If the engine warning lamp does not illuminate immediately after the ignition switch is turned to ON, one of the malfunctions listed at right has probably occurred.	- Burnt-out bulb - Defective warning lamp circuit - Malfunction of the engine-ECU



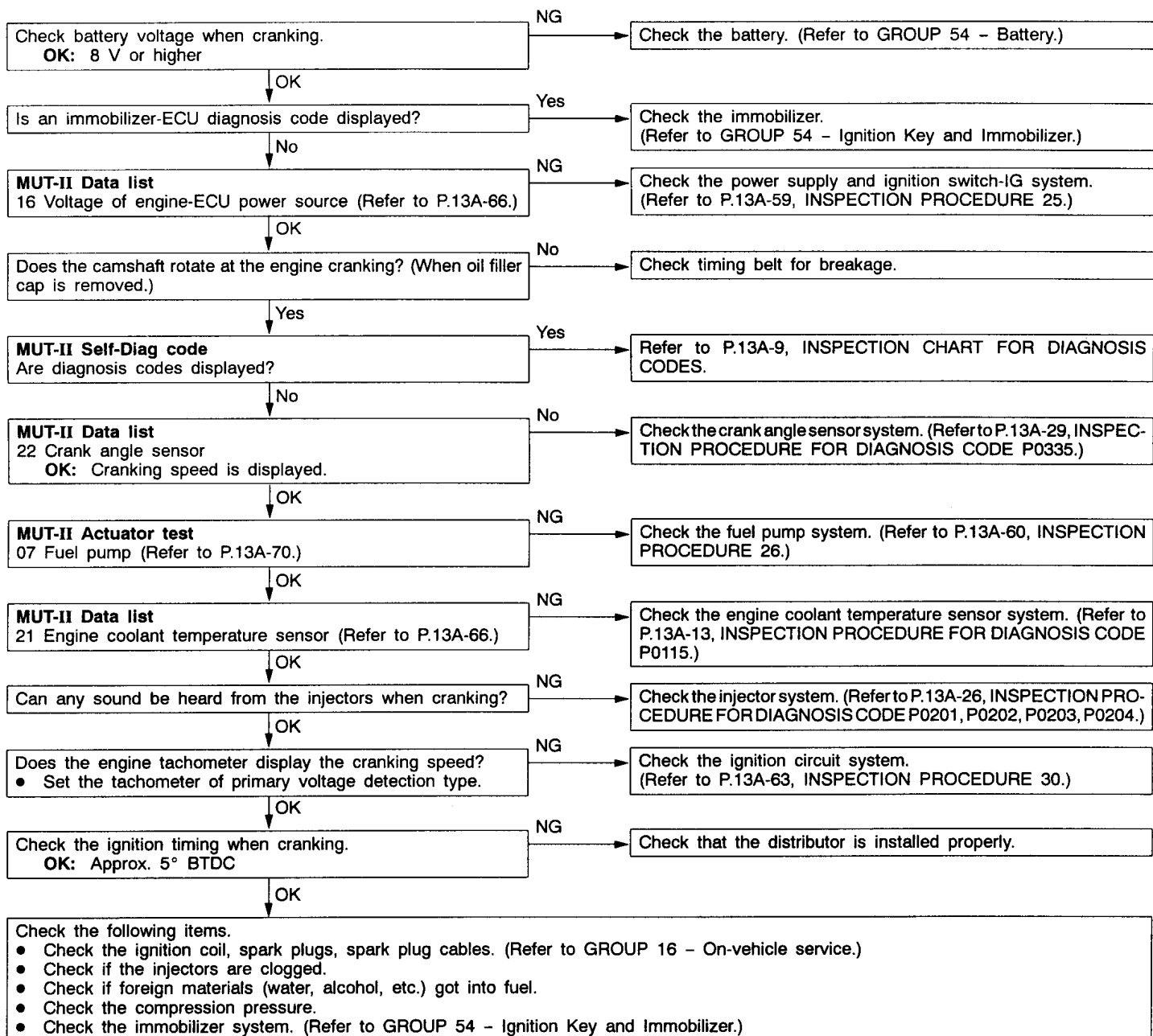
INSPECTION PROCEDURE 4

The engine warning lamp remains illuminating and never goes out.	Probable cause
In cases such as the above, the cause is probably that the engine-ECU is detecting a problem in a sensor or actuator, or that one of the malfunctions listed at right has occurred.	- Short-circuit between the engine warning lamp and engine-ECU - Malfunction of the engine-ECU



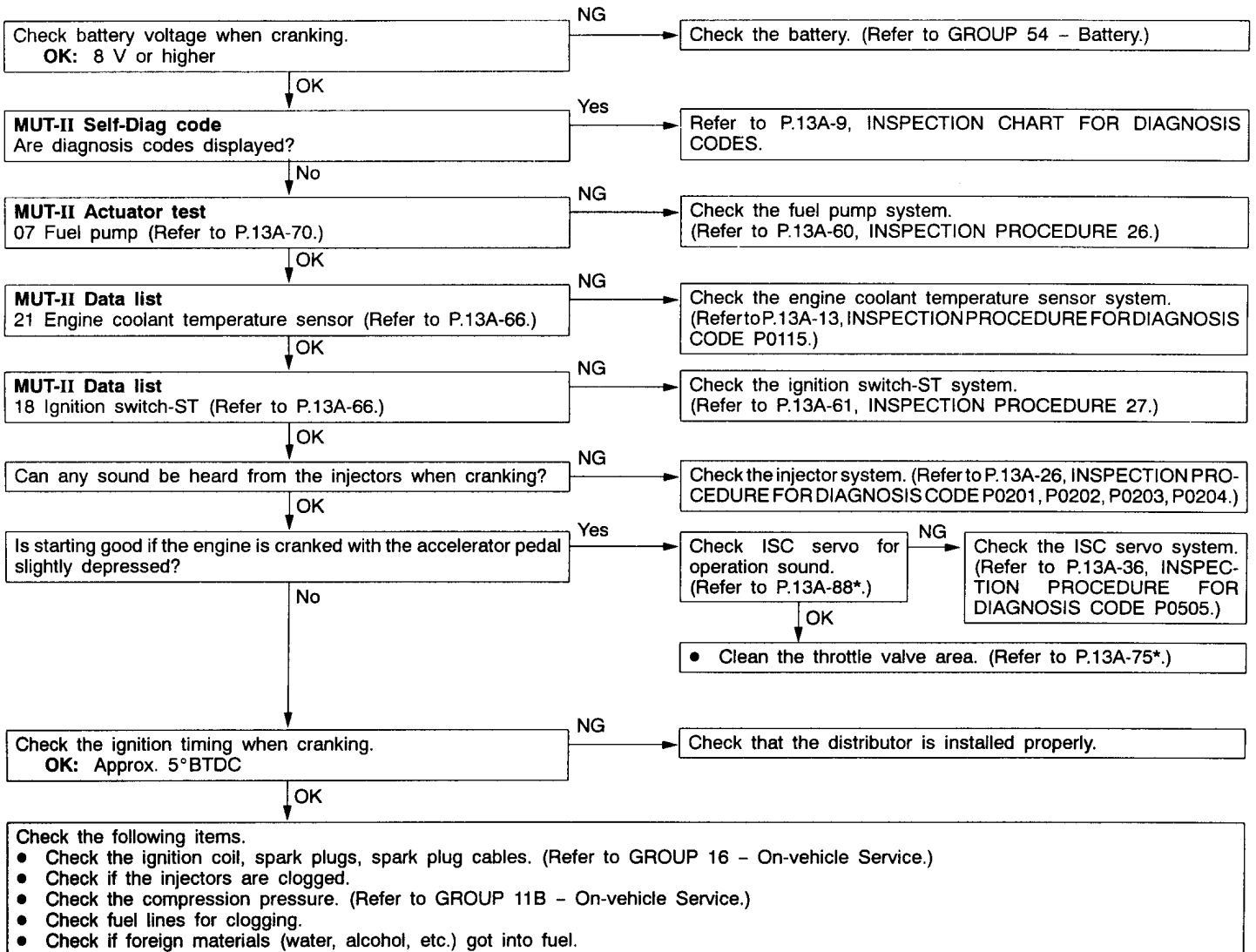
INSPECTION PROCEDURE 5

No initial combustion (starting impossible)	Probable cause
In cases such as the above, the cause is probably that a spark plug is defective, or that the supply of fuel to the combustion chamber is defective. In addition, foreign materials (water, kerosene, etc.) may be mixed with the fuel.	• Malfunction of the ignition system • Malfunction of the fuel pump system • Malfunction of the injectors • Malfunction of the engine-ECU • Malfunction of the immobilizer system • Foreign materials in fuel



INSPECTION PROCEDURE 6

Initial combustion but no complete combustion (starting impossible)	Probable cause
In such cases as the above, the cause is probably that the spark plugs are generating sparks but the sparks are weak, or the initial mixture for starting is not appropriate.	• Malfunction of the ignition system • Malfunction of the injector system • Foreign materials in fuel • Poor compression • Malfunction of the engine-ECU

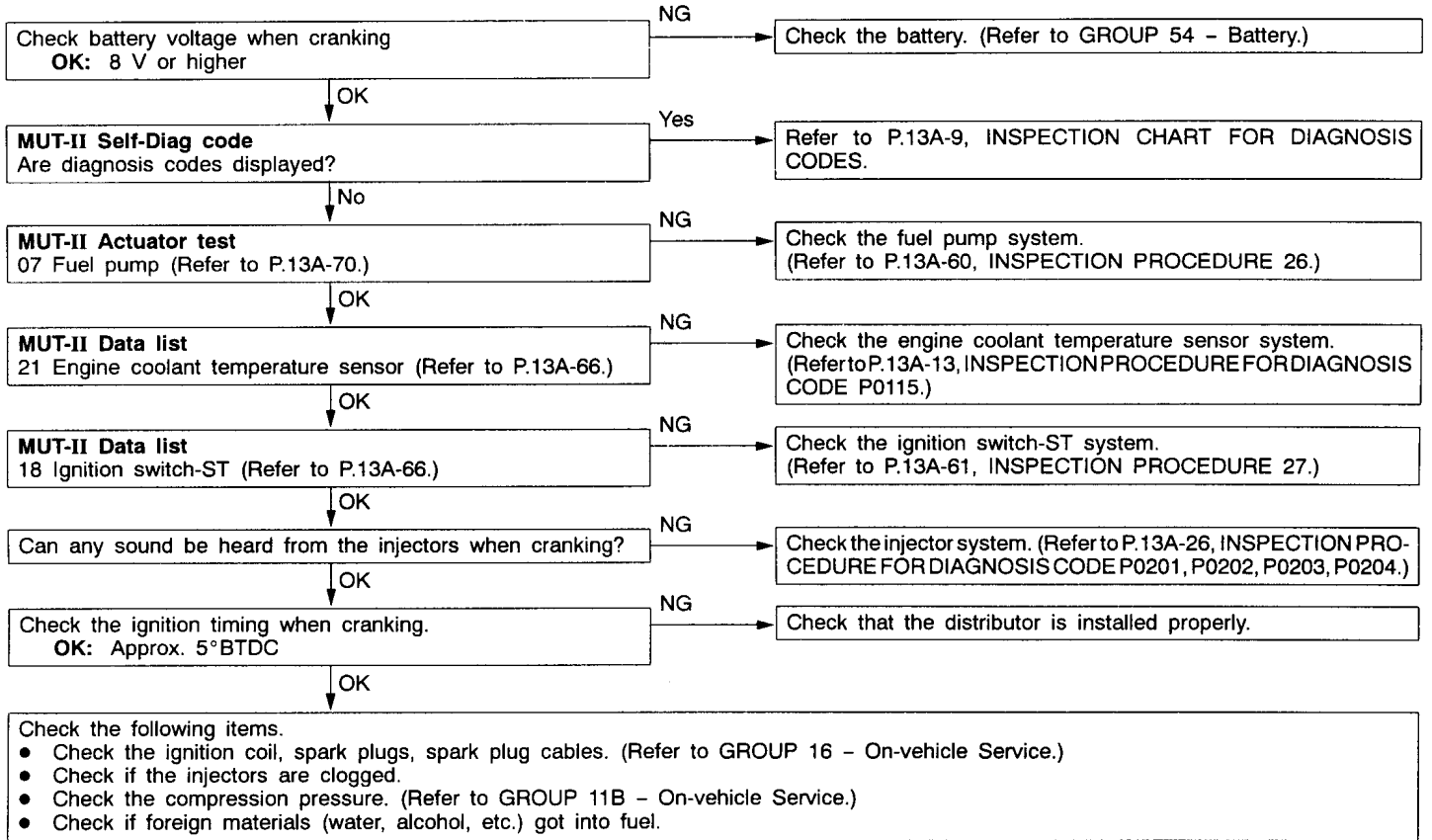


NOTE:

*: Refer to the '96 COLT/LANCER Workshop Manual (Pub. No. PWME9511).

INSPECTION PROCEDURE 7

In takes too long time to start. (Incorrect starting)	Probable cause
In cases such as the above, the cause is probably that the spark is weak and ignition is difficult, the initial mixture for starting is not appropriate, or sufficient compression pressure is not being obtained.	• Malfunction of the ignition system • Malfunction of the injector system • Inappropriate gasoline use • Poor compression

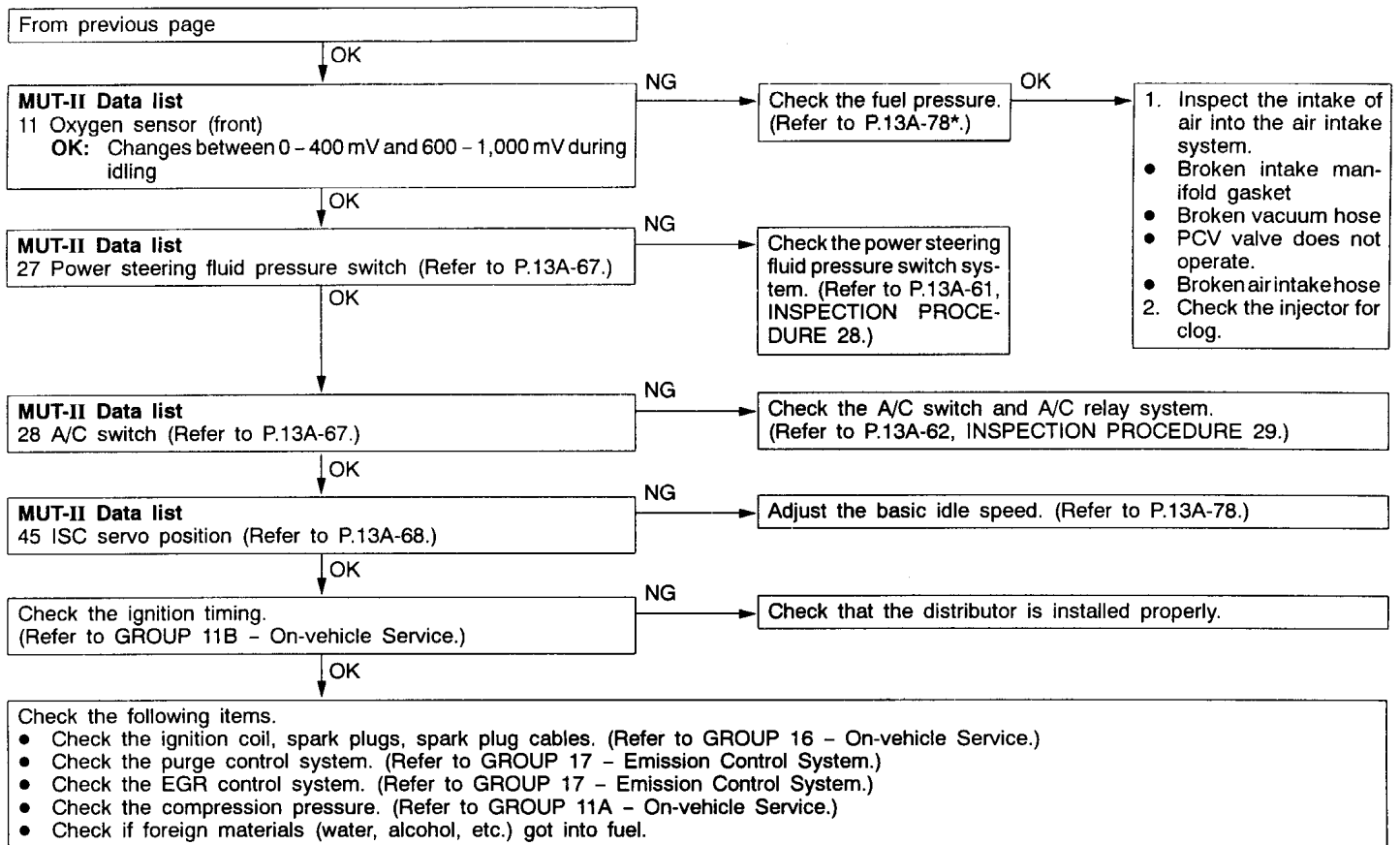


INSPECTION PROCEDURE 8

Unstable idling (Rough idling, hunting)	Probable cause
In cases as the above, the cause is probably that the ignition system, air/fuel mixture, idle speed control (ISC) or compression pressure is defective. Because the range of possible causes is broad, inspection is narrowed down to simple items.	• Malfunction of the ignition system • Malfunction of air-fuel ratio control system • Malfunction of the ISC system • Malfunction of the purge control solenoid valve system • Malfunction of the EGR solenoid valve system • Poor compression • Drawing air into exhaust system
Were the battery terminals disconnected?	Yes → After warming-up, let the engine run at idling for 10 minutes.
MUT-II Self-Diag code Are diagnosis codes displayed?	Yes → Refer to P.13A-9, INSPECTION CHART FOR DIAGNOSIS CODES.
Does idling speed fluctuate excessively?	Yes → Check the throttle body. (Refer to P.13A-75*.)
No	check the trouble symptom.
	NG Inspect the intake of air into the air intake system. • Broken intake manifold gasket • Broken air intake hose • Broken vacuum hose • Positive crankcase ventilation valve does not operate.
Check the ISC servo for operation sound. (Refer to P.13A-88*.)	NG → Check the ISC system. (Refer to P.13A-36, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0505.)
OK	
Check the injector for operation sound.	NG → Check the injector system. (Refer to P.13A-26, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0201, P0202, P0203, P0204.)
OK	
MUT-II Data list 14 Throttle position sensor (Refer to P.13A-65.)	NG → Check the throttle position sensor system. (Refer to P.13A-16, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0120.)
OK	
MUT-II Data list 13 Intake air temperature sensor (Refer to P.13A-65.)	NG → Check the intake air temperature sensor system. (Refer to P.13A-12, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0110.)
OK	
MUT-II Data list 21 Engine coolant temperature sensor (Refer to P.13A-66.)	NG → Check the engine coolant temperature sensor system. (Refer to P.13A-13, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0115.)
OK	
MUT-II Actuator test 08 Purge control solenoid valve (Refer to P.13A-70.)	NG → Check the purge control solenoid valve system. (Refer to P.13A-34, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0443.)
OK	
MUT-II Actuator test 10 EGR control solenoid valve (Refer to P.13A-70.)	NG → Check the EGR control solenoid valve system. (Refer to P.13A-32, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0403.)
OK	
MUT-II Data list 59 Oxygen sensor (rear) • Transmission: 2nd gear • Driving with throttle widely open OK: 600 - 1,000 mV	NG → Check the oxygen sensor (rear) system. (Refer to P.13A-22, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0136.)
OK	
MUT-II Data list 11 Oxygen sensor (front) OK: 600 - 1,000 mV during sudden racing	NG → Check the oxygen sensor (front) system. (Refer to P.13A-19, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0130.)
	OK → To next page

NOTE:

*: Refer to the '96 COLT/LANCER Workshop Manual (Pub. No. PWME9511).

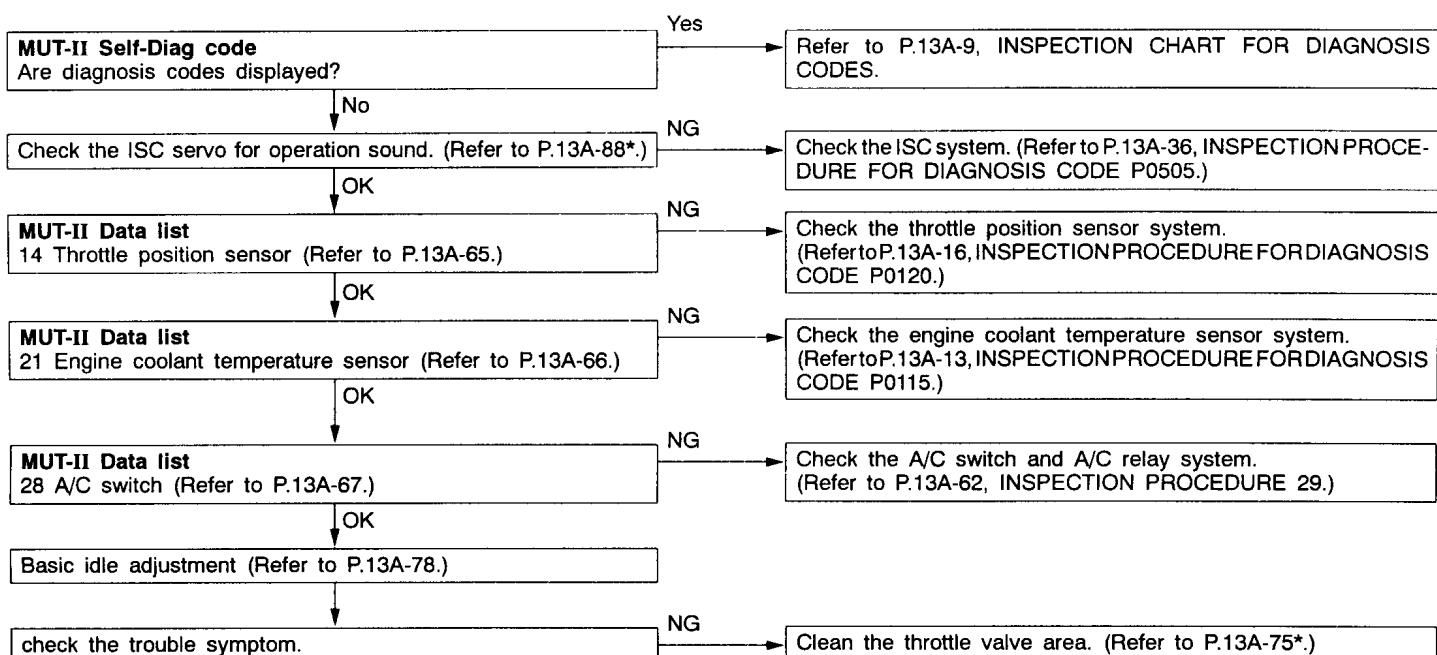


NOTE:

*: Refer to the '96 COLT/LANCER Workshop Manual (Pub. No. PWME9511).

INSPECTION PROCEDURE 9

Idling speed is high. (Improper idling speed)	Probable cause
In such cases as the above, the cause is probably that the intake air volume during idling is too great.	• Malfunction of the ISC system • Malfunction of the throttle body

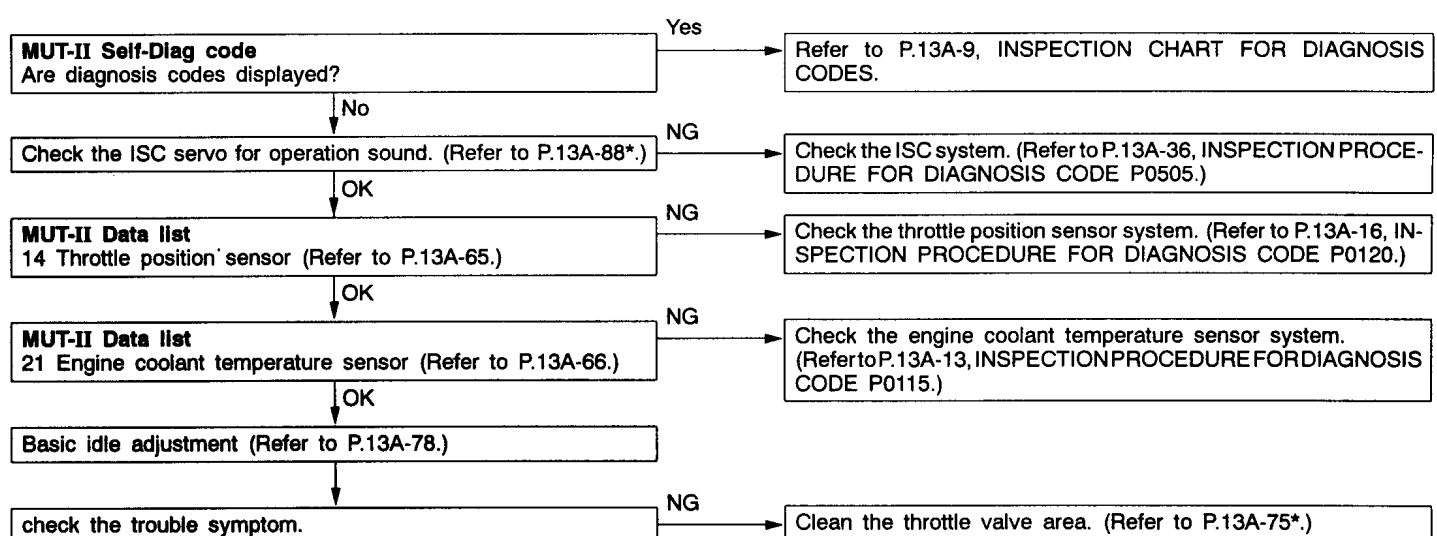


NOTE:

*: Refer to the '96 COLT/LANCER Workshop Manual (Pub. No. PWME9511).

INSPECTION PROCEDURE 10

Idling speed is low. (Improper idling speed)	Probable cause
In cases such as the above, the cause is probably that the intake air volume during idling is too small.	• Malfunction of the ISC system • Malfunction of the throttle body

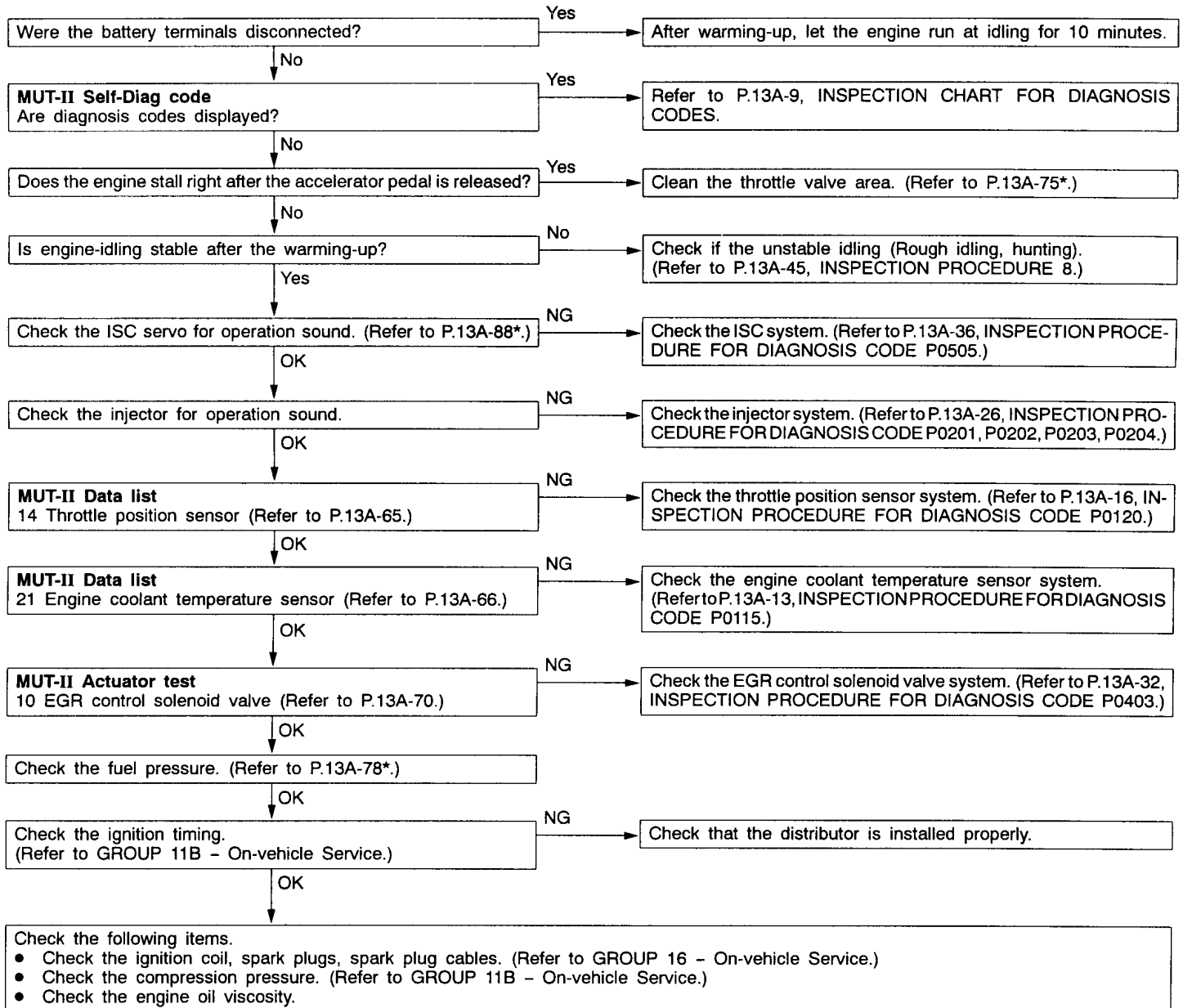


NOTE:

*: Refer to the '96 COLT/LANCER Workshop Manual (Pub. No. PWME9511).

INSPECTION PROCEDURE 11

When the engine is cold, it stalls at idling. (Die out)	Probable cause
In such cases as the above, the cause is probably that the air/fuel mixture is inappropriate when the engine is cold, or that the intake air volume is insufficient.	• Malfunction of the ISC system • Malfunction of the throttle body • Malfunction of the injector system • Malfunction of the ignition system

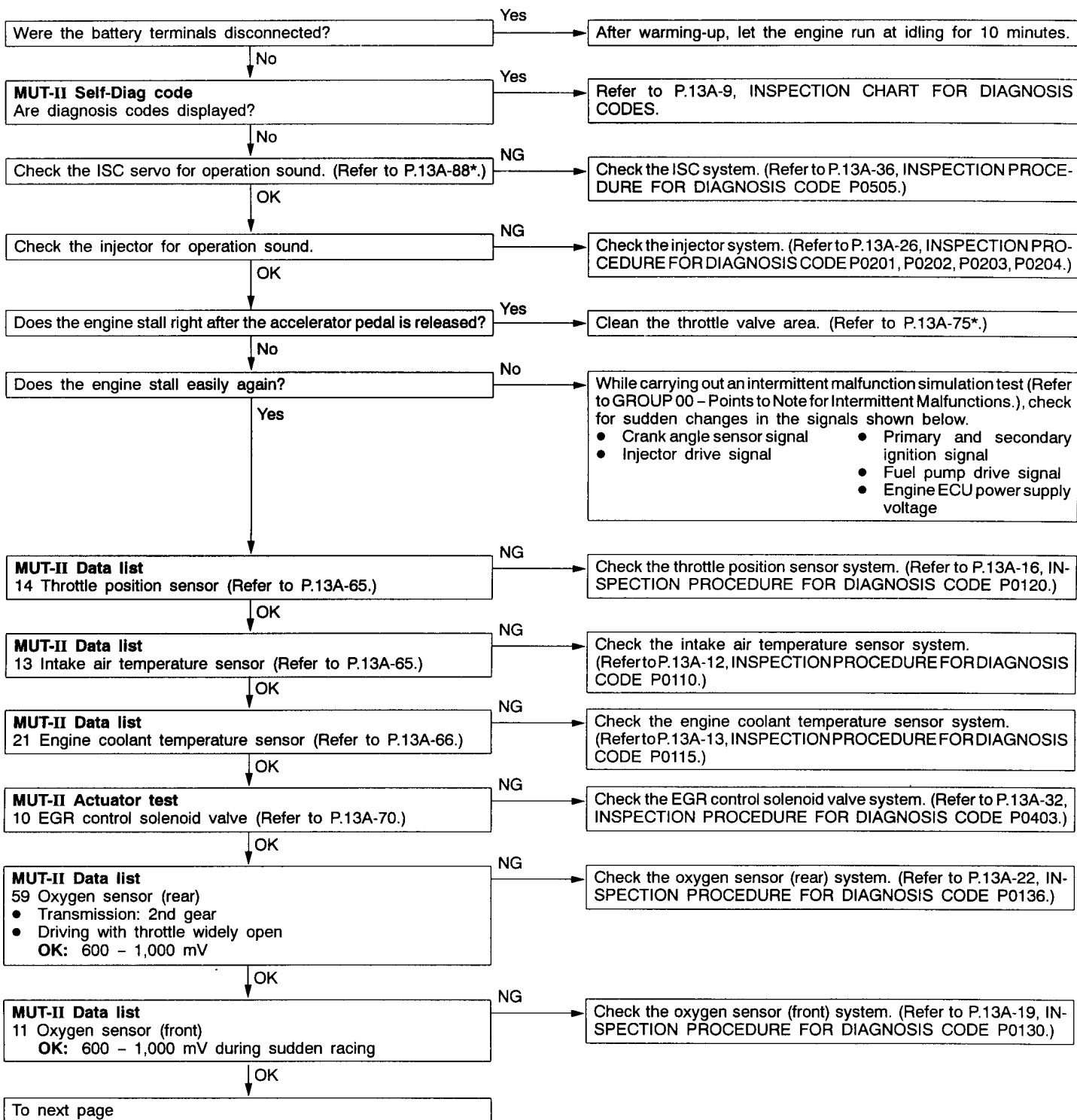


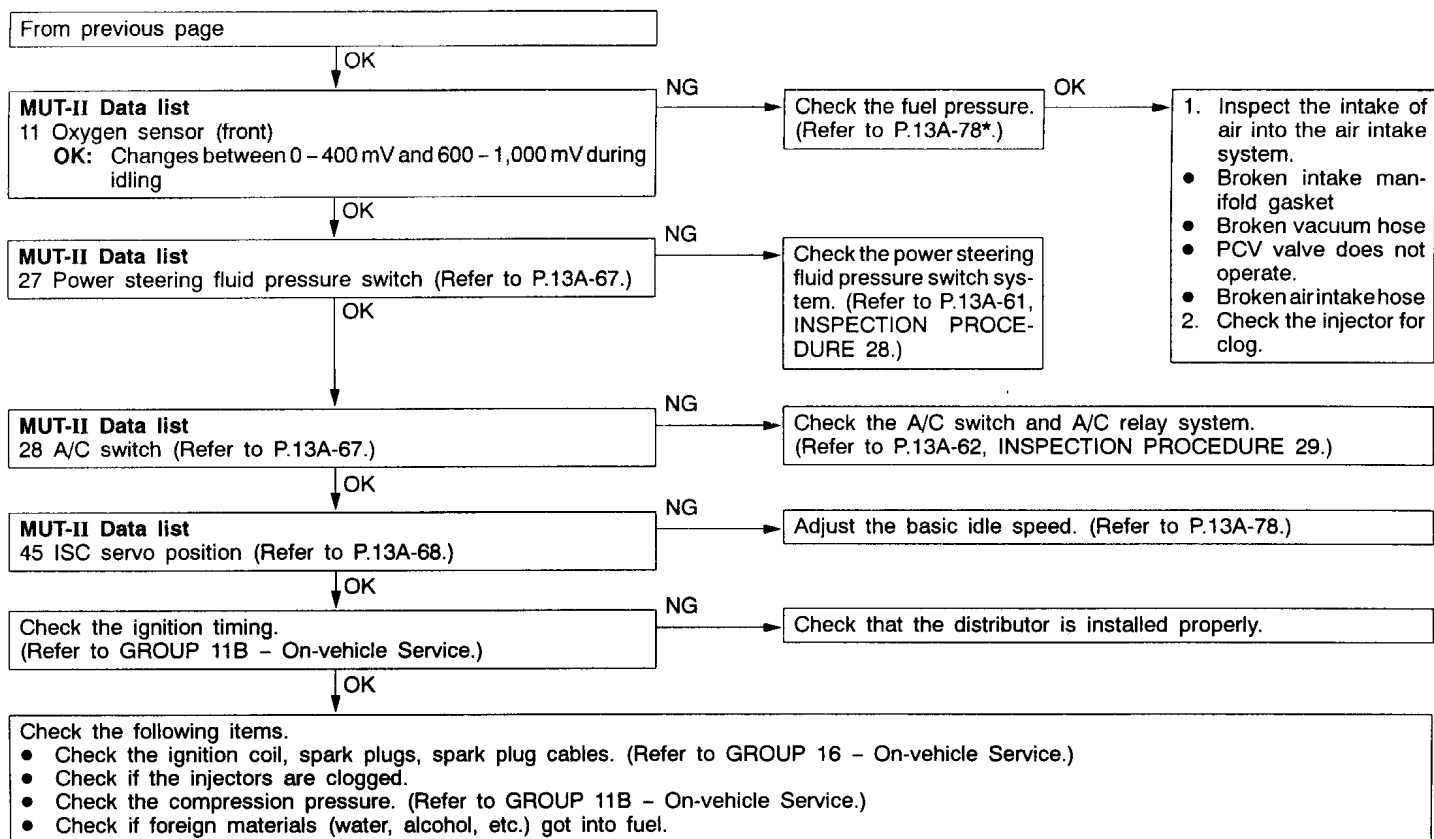
NOTE:

*: Refer to the '96 COLT/LANCER Workshop Manual (Pub. No. PWME9511).

INSPECTION PROCEDURE 12

When the engine is hot, it stalls at idling. (Die out)	Probable cause
In such cases as the above, the cause is probably that ignition system, air/fuel mixture, idle speed control (ISC) or compression pressure is defective. In addition, if the engine suddenly stalls, the cause may also be a defective connector contact.	• Malfunction of the ignition system • Malfunction of air-fuel ratio control system • Malfunction of the ISC system • Drawing air into intake system • Improper connector contact



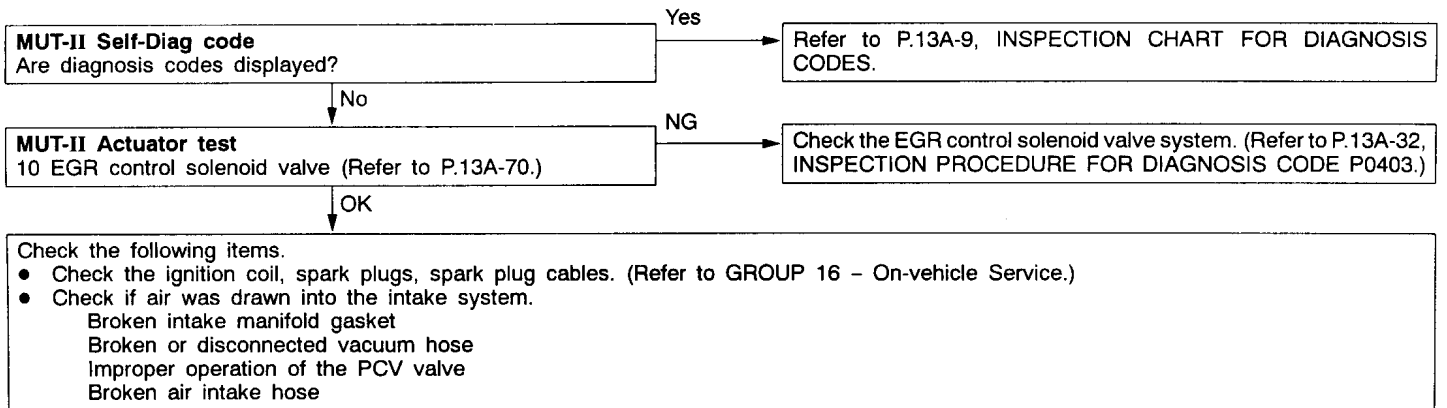


NOTE:

*: Refer to the '96 COLT/LANCER Workshop Manual (Pub. No. PWME9511).

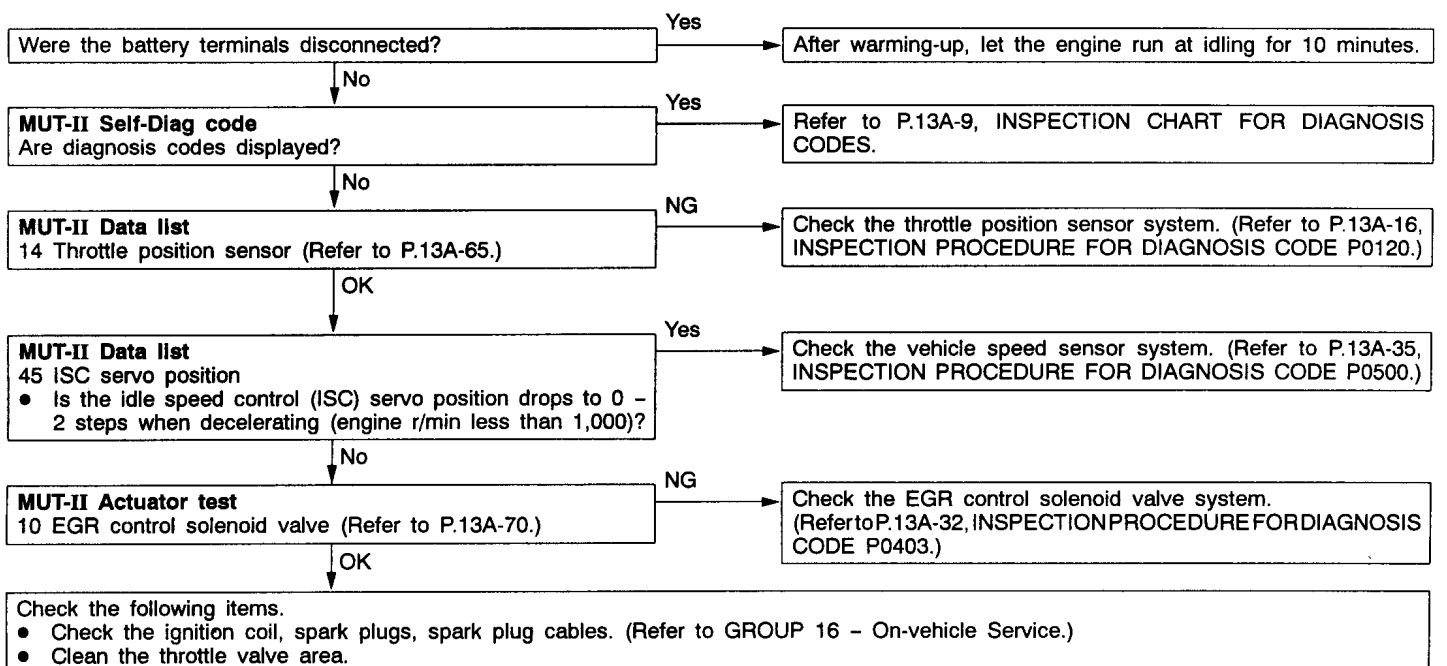
INSPECTION PROCEDURE 13

The engine stalls when starting the car. (Pass out)	Probable cause
In cases such as the above, the cause is probably misfiring due to a weak spark, or an inappropriate air/fuel mixture when the accelerator pedal is depressed.	• Drawing air into intake system • Malfunction of the ignition system



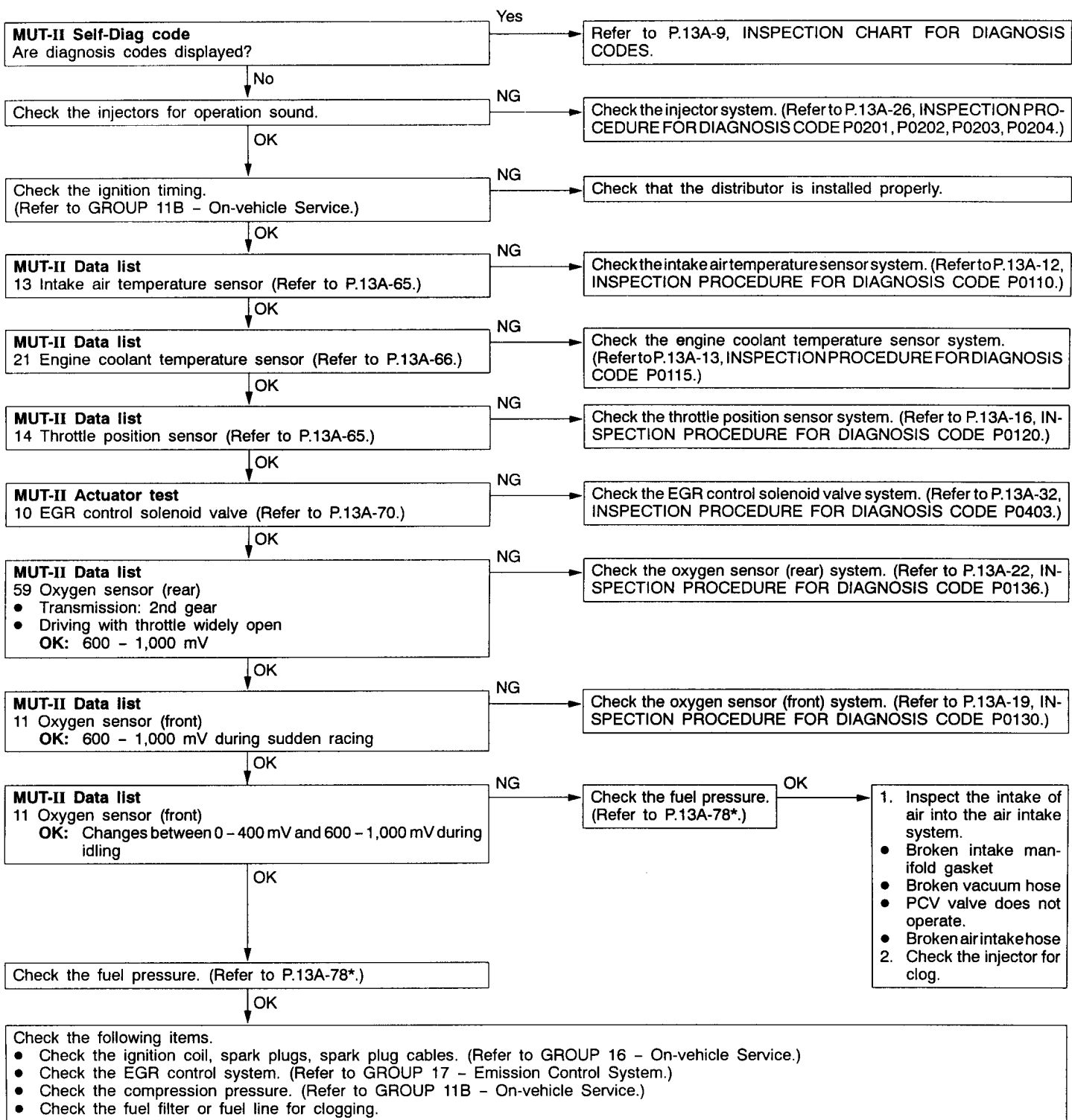
INSPECTION PROCEDURE 14

The engine stalls when decelerating.	Probable cause
In cases such as the above, the cause is probably that the intake air volume is insufficient due to a defective idle speed control (ISC) servo system.	• Malfunction of the ISC system



INSPECTION PROCEDURE 15

Hesitation, sag or stumble	Probable cause
In cases such as the above, the cause is probably that ignition system, air/fuel mixture or compression pressure is defective.	• Malfunction of the ignition system • Malfunction of air-fuel ratio control system • Malfunction of the fuel supply system • Malfunction of the EGR control solenoid valve system • Poor compression

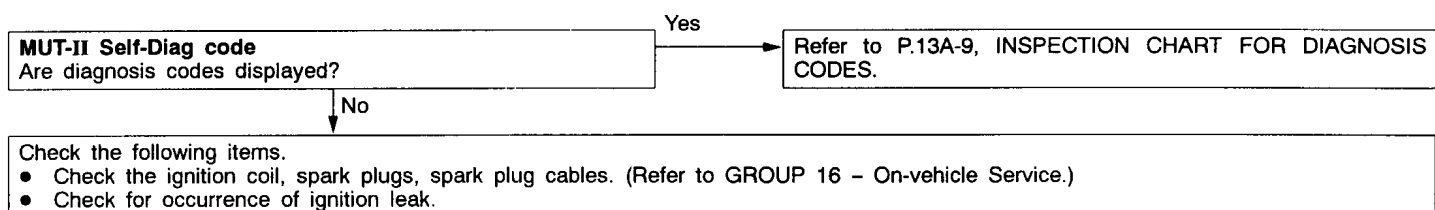


NOTE:

*: Refer to the '96 COLT/LANCER Workshop Manual (Pub. No. PWME9511).

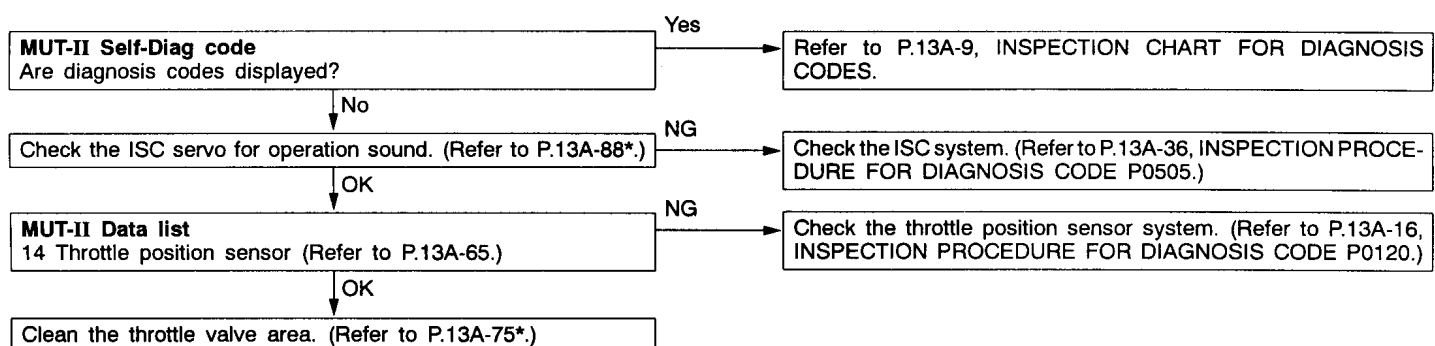
INSPECTION PROCEDURE 16

The feeling of impact or vibration when accelerating	Probable cause
In cases such as the above, the cause is probably that there is an ignition leak accompanying the increase in the spark plug demand voltage during acceleration.	Malfunction of the ignition system



INSPECTION PROCEDURE 17

The feeling of impact or vibration when decelerating.	Probable cause
Malfunction of the ISC system is suspected.	Malfunction of the ISC system

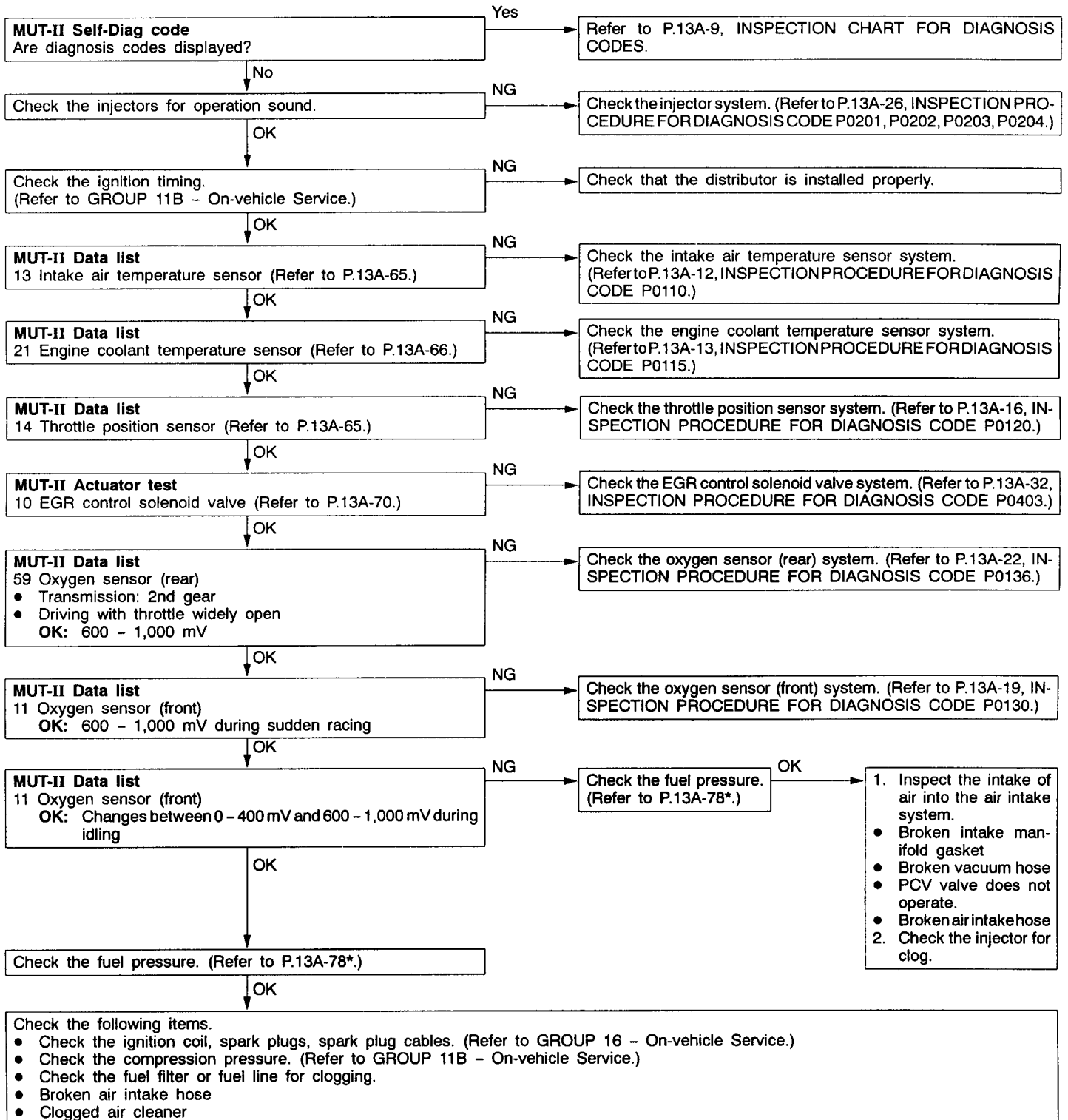


NOTE:

*: Refer to the '96 COLT/LANCER Workshop Manual (Pub. No. PWME9511).

INSPECTION PROCEDURE 18

Poor acceleration	Probable cause
Defective ignition system, abnormal air-fuel ratio, poor compression pressure, etc. are suspected.	• Malfunction of the ignition system • Malfunction of air-fuel ratio control system • Malfunction of the fuel supply system • Poor compression pressure • Clogged exhaust system

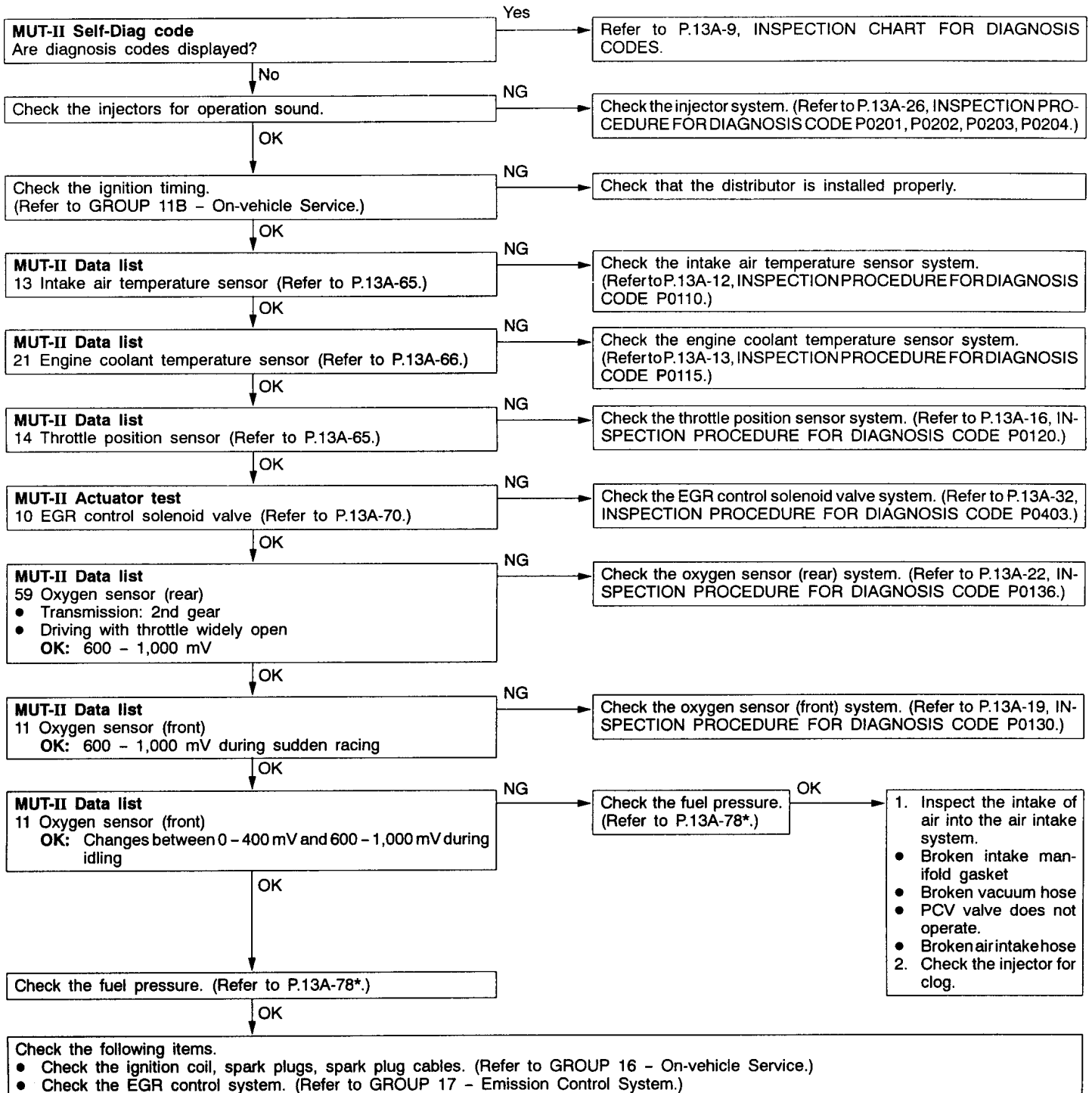


NOTE:

*: Refer to the '96 COLT/LANCER Workshop Manual (Pub. No. PWME9511).

INSPECTION PROCEDURE 19

Surge	Probable cause
Defective ignition system, abnormal air-fuel ratio, etc. are suspected.	• Malfunction of the ignition system • Malfunction of air-fuel ratio control system • Malfunction of the EGR control solenoid valve system

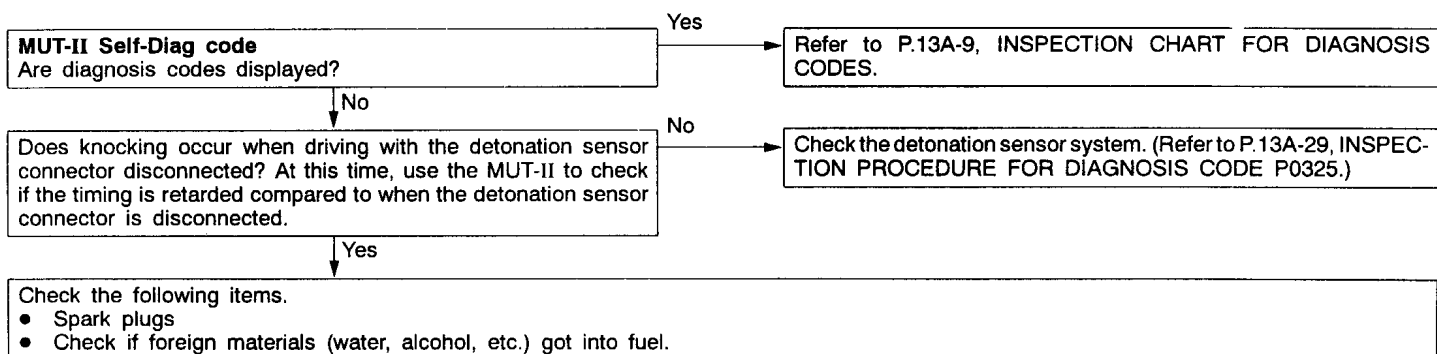


NOTE:

*: Refer to the '96 COLT/LANCER Workshop Manual (Pub. No. PWME9511).

INSPECTION PROCEDURE 20

Knocking	Probable cause
In cases as the above, the cause is probably that the detonation control is defective or the heat value of the spark plug is inappropriate.	- Defective detonation sensor - Inappropriate heat value of the spark plug



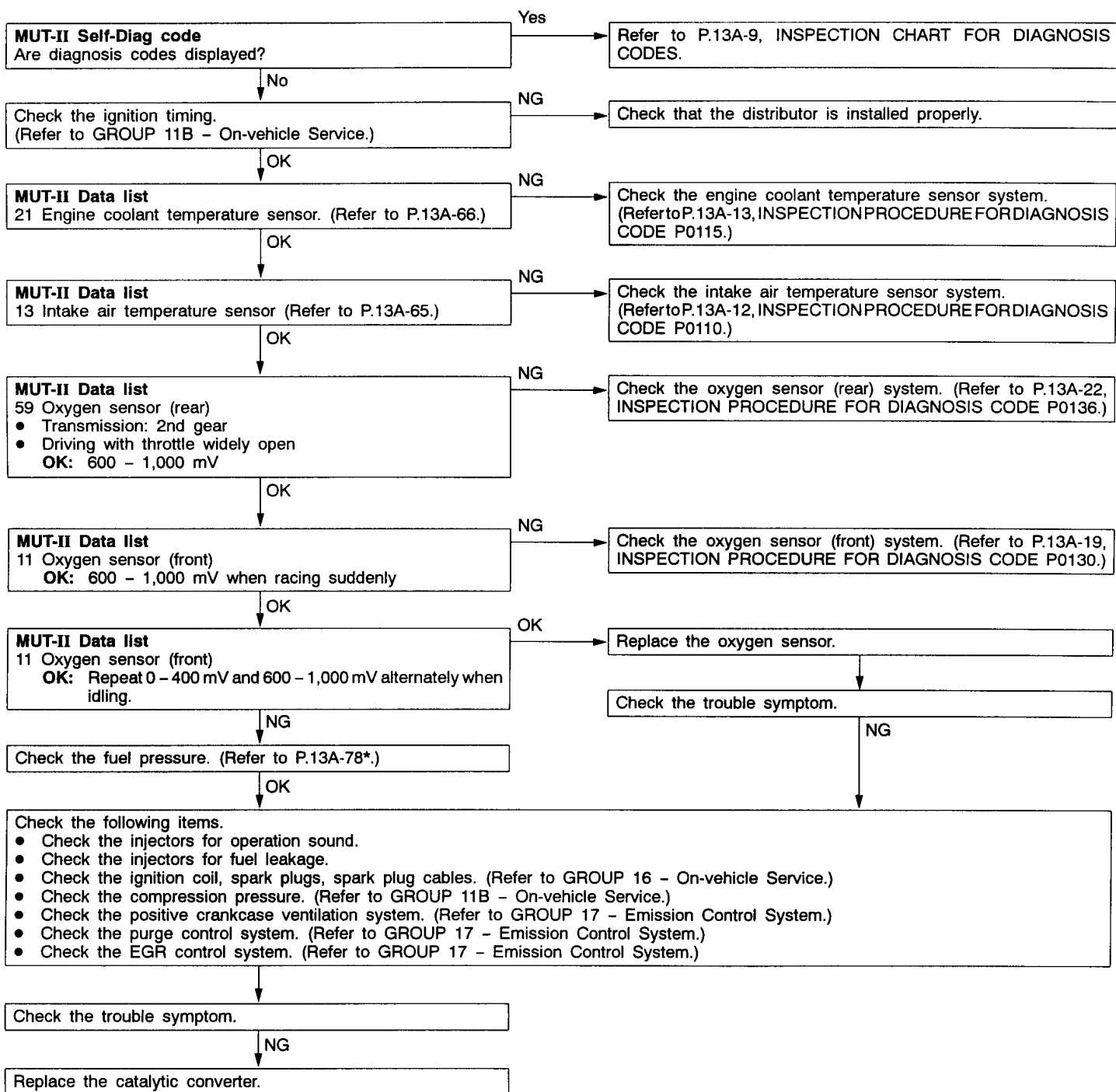
INSPECTION PROCEDURE 21

Dieseling	Probable cause
Fuel leakage from injectors is suspected.	Fuel leakage from injectors

Check the injectors for fuel leakage.

INSPECTION PROCEDURE 22

Too high CO and HC concentration when idling	Probable cause
Abnormal air-fuel ratio is suspected.	- Malfunction of the air-fuel ratio control system - Deteriorated catalyst

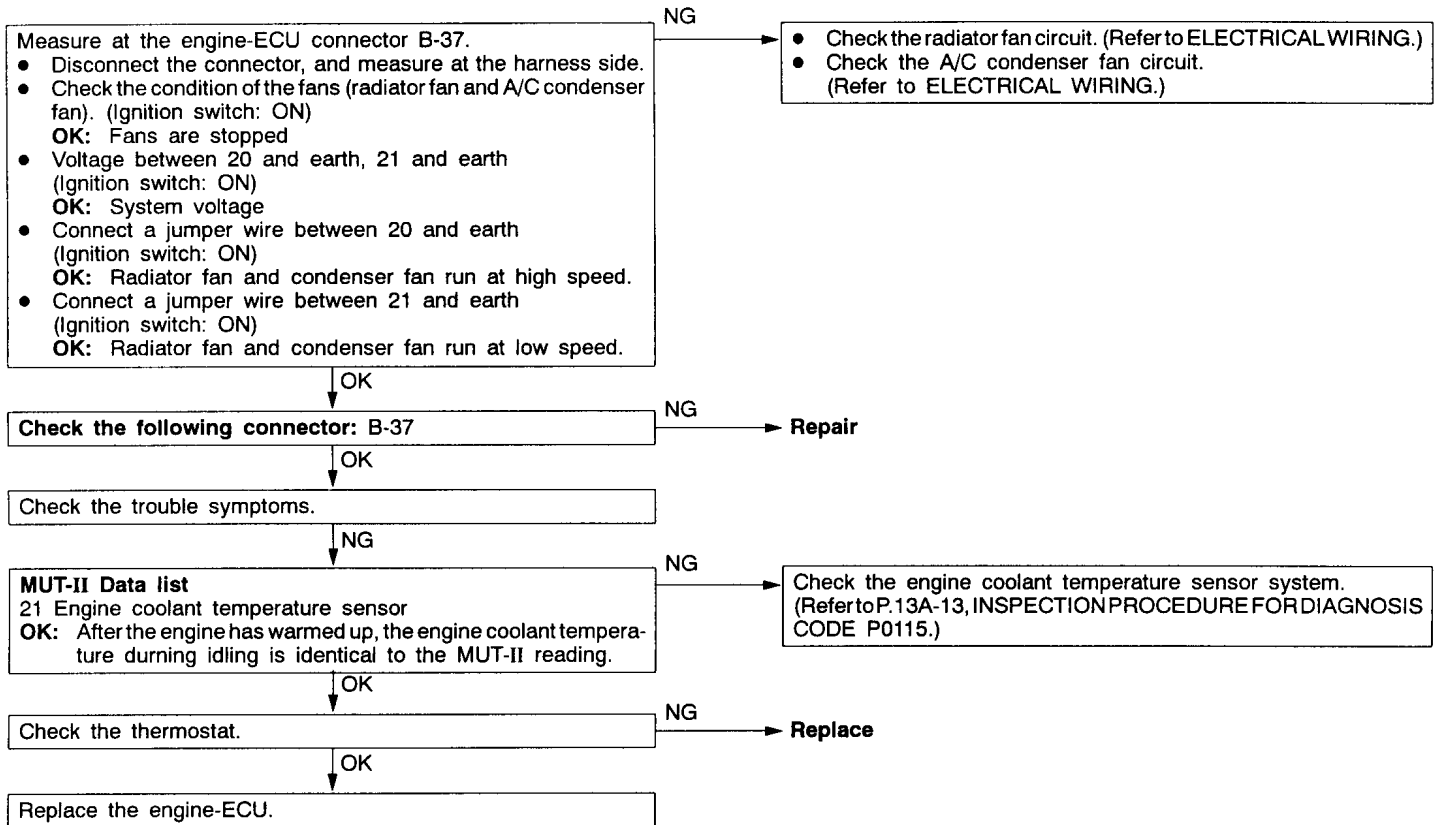


NOTE:

*: Refer to the '96 COLT/LANCER Workshop Manual (Pub. No. PWME9511).

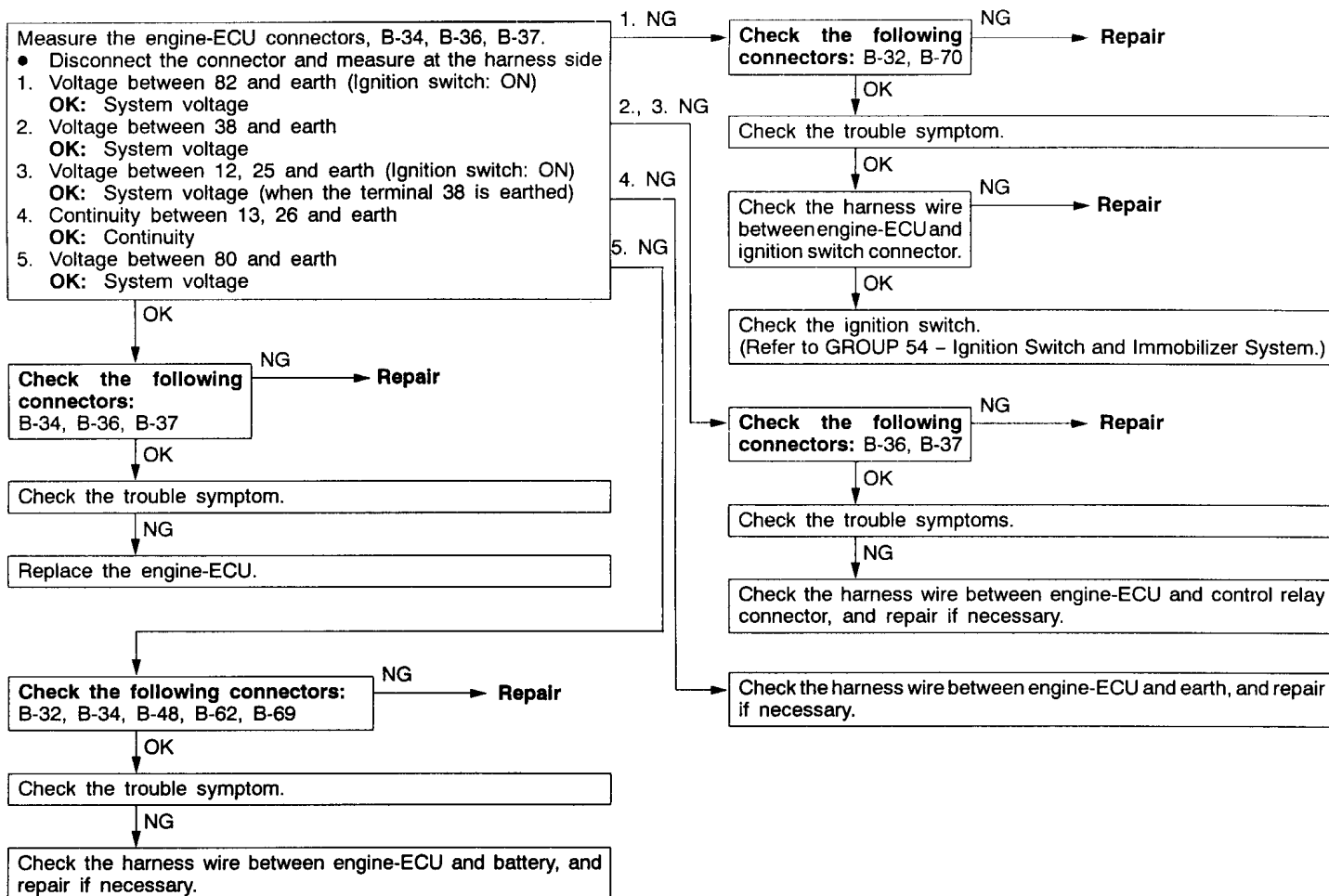
INSPECTION PROCEDURE 23

Fans (radiator fan, A/C condenser fan) are inoperative.	Probable cause
The fan motor relay is controlled by the power transistor inside the engine-ECU turning ON and OFF.	• Malfunction of the fan motor relay • Malfunction of the fan motor • Malfunction of the thermostat • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the engine-ECU



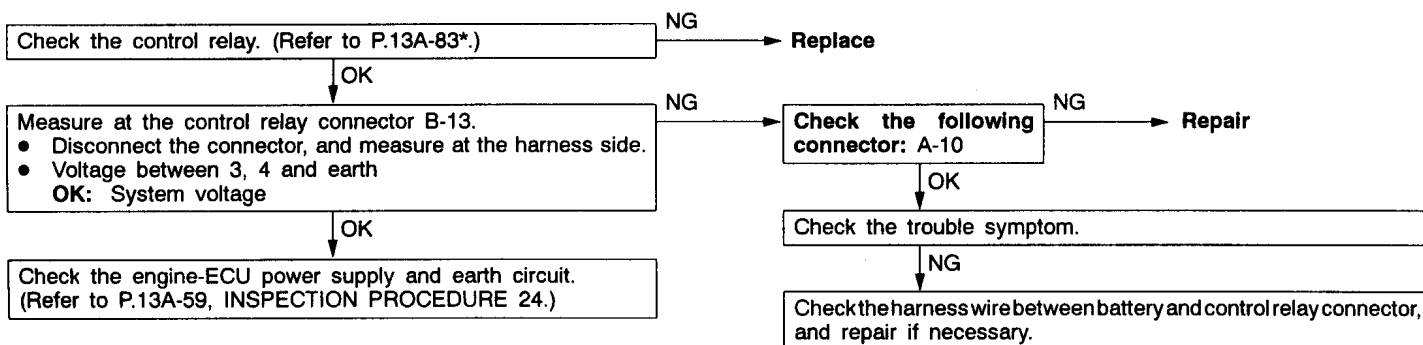
INSPECTION PROCEDURE 24

Check the engine-ECU power supply and earth circuit.



INSPECTION PROCEDURE 25

Power supply system and ignition switch-IG system	Probable cause
When an ignition switch ON signal is input to the engine-ECU, the engine-ECU turns the control relay ON. This causes battery voltage to be supplied to the engine-ECU, injectors and air flow sensor.	- Malfunction of the ignition switch - Malfunction of the control relay - Improper connector contact, open circuit or short-circuited harness wire - Disconnected engine-ECU earth wire - Malfunction of the engine-ECU

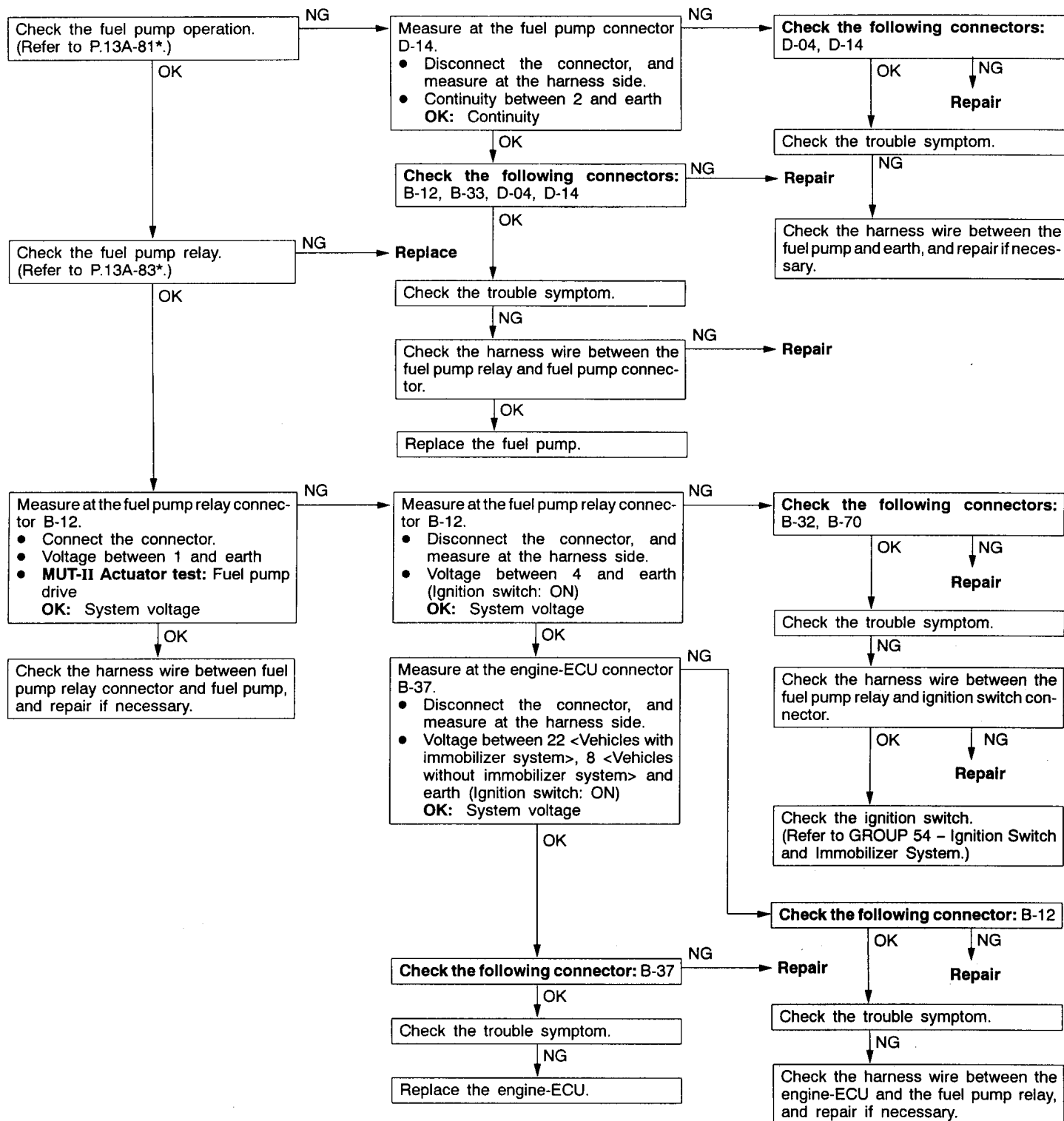


NOTE:

*: Refer to the '96 COLT/LANCER Workshop Manual (Pub. No. PWME9511).

INSPECTION PROCEDURE 26

Fuel pump system	Probable cause
The engine-ECU turns the fuel pump relay ON when the engine is cranking or running, and this supplies power to drive the fuel pump.	• Malfunction of the fuel pump relay • Malfunction of the fuel pump • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the engine-ECU

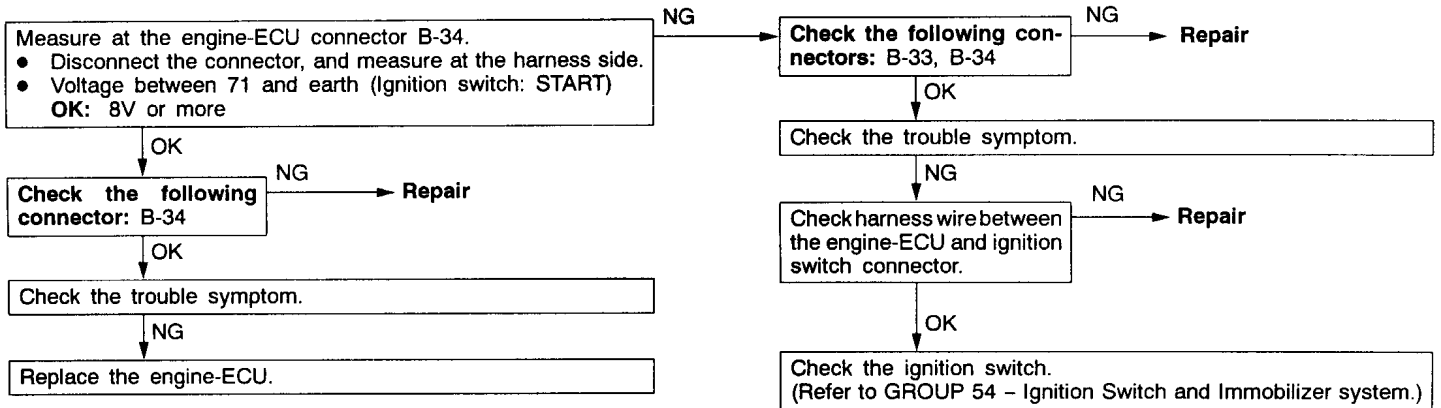


NOTE:

*: Refer to the '96 COLT/LANCER Workshop Manual (Pub. No. PWME9511).

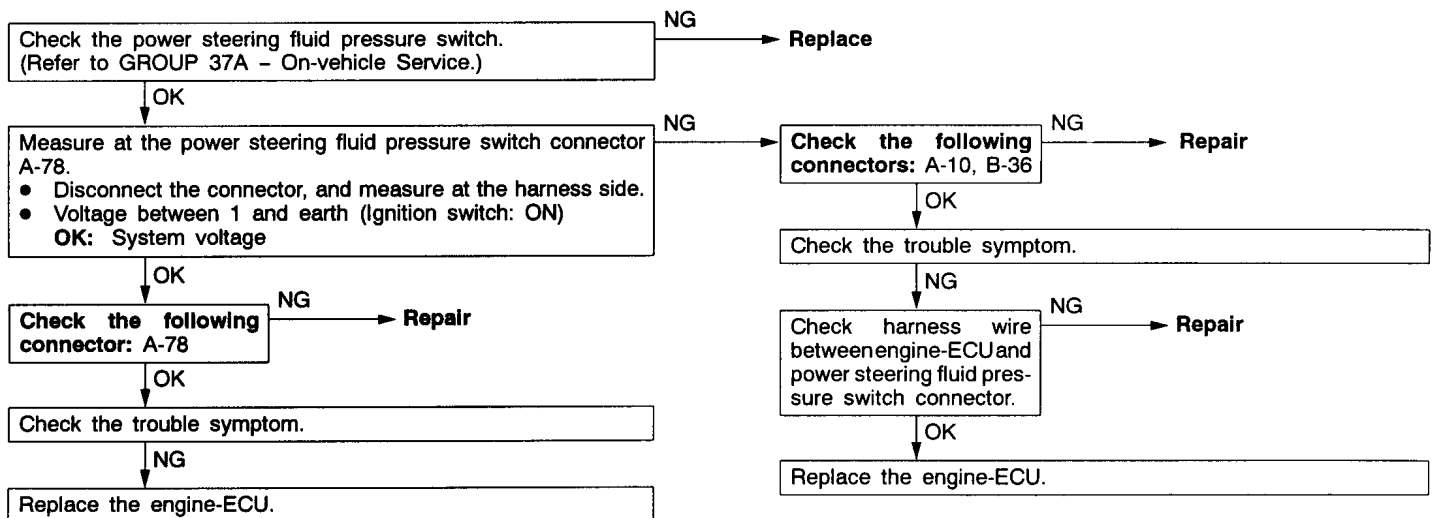
INSPECTION PROCEDURE 27

Ignition switch-ST system	Probable cause
The ignition switch-ST inputs a HIGH signal to the engine-ECU while the engine is cranking. The engine-ECU controls fuel injection, etc. during starting based on this input.	• Malfunction of ignition switch • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the engine-ECU



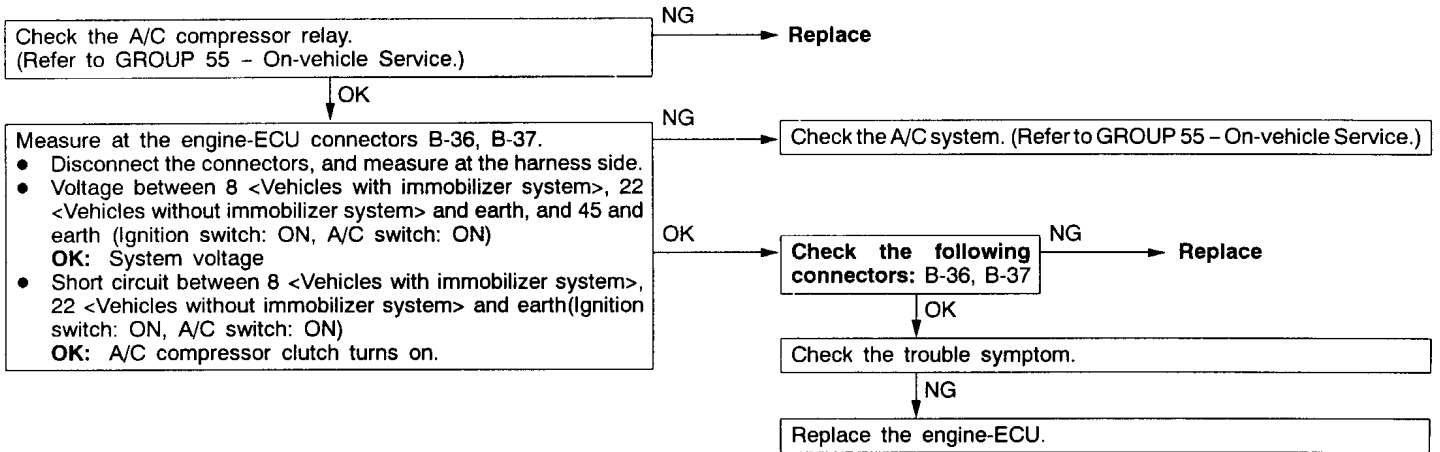
INSPECTION PROCEDURE 28

Power steering fluid pressure switch system	Probable cause
The presence or absence of power steering load is input to the engine-ECU. The engine-ECU controls the idle speed control (ISC) servo based on this input.	• Malfunction of power steering fluid pressure switch • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the engine-ECU



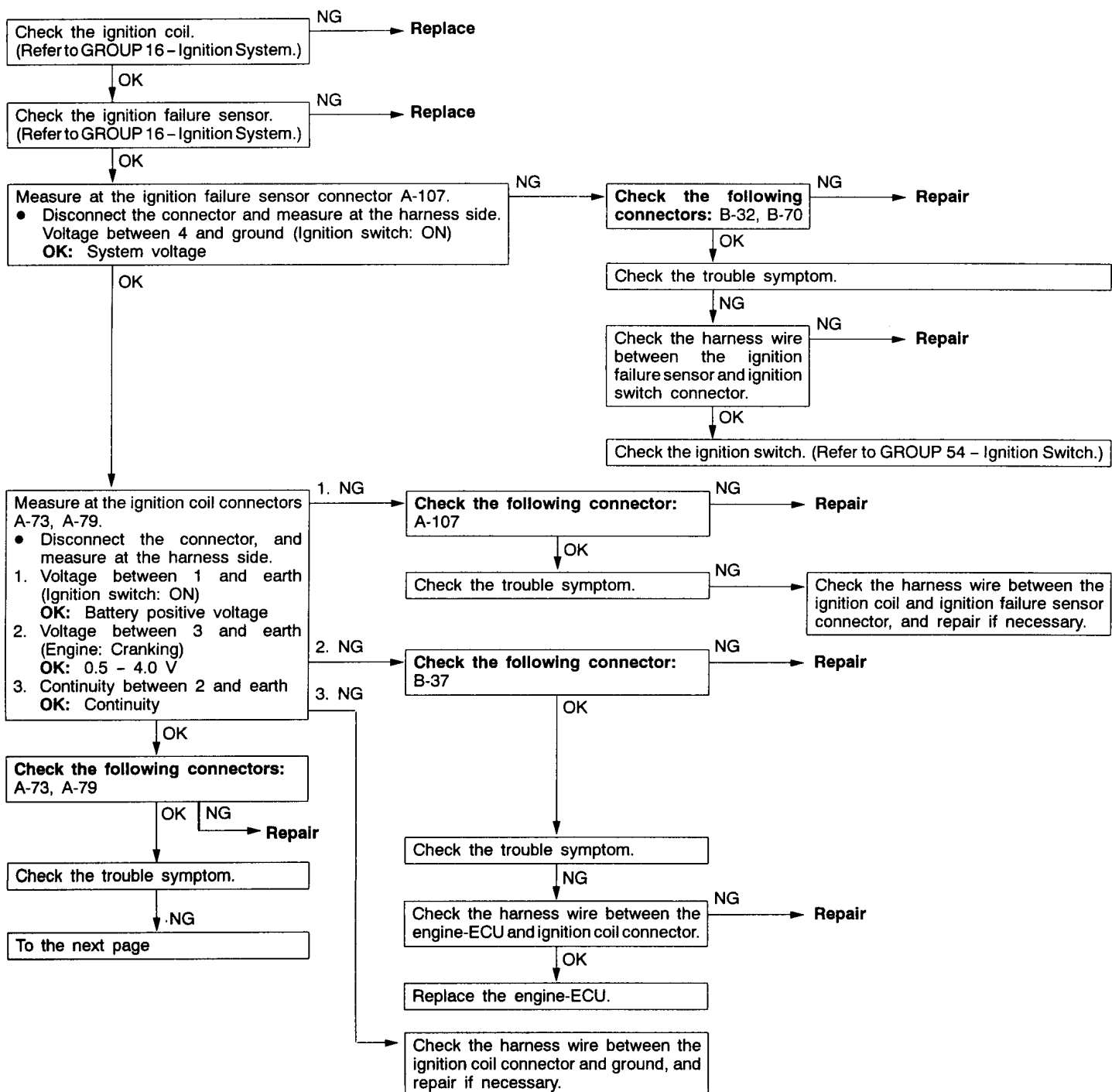
INSPECTION PROCEDURE 29

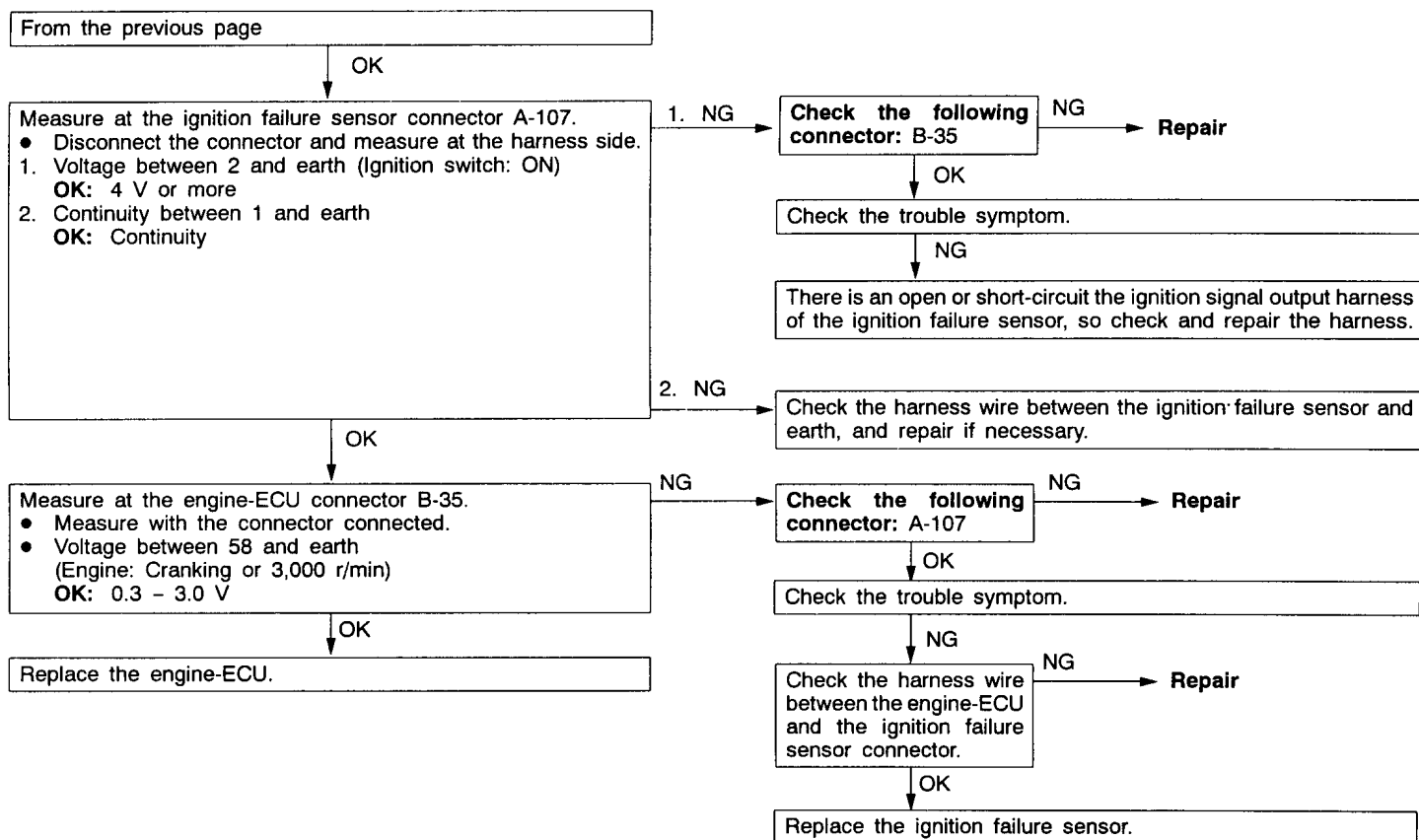
A/C switch and A/C relay system	Probable cause
When an A/C ON signal is input to the engine-ECU, the engine-ECU carries out control of the idle speed control (ISC) servo, and also operates the A/C compressor magnetic clutch.	• Malfunction of A/C control system • Malfunction of A/C switch • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the engine-ECU



INSPECTION PROCEDURE 30

Ignition circuit system	Probable cause
The engine-ECU interrupts the ignition coil primary current by turning the power transistor inside the engine-ECU ON and OFF.	- Malfunction of ignition coil - Malfunction of ignition failure sensor - Improper connector contact, open circuit or short-circuited harness wire - Malfunction of the engine-ECU





DATA LIST REFERENCE TABLE

NOTE

- *1: In a new vehicle [driven approximately 500 km or less], the air intake plenum pressure is sometimes 10 % higher than the standard pressure.
- *2: The injector drive time represents the time when the cranking speed is at 250 r/min or below when the power supply voltage is 11 V.
- *3: In a new vehicle [driven approximately 500 km or less], the injector drive time is sometimes 10 % longer than the standard time.
- *4: In a new vehicle [driven approximately 500 km or less], the step of the stepper motor is sometimes 30 steps greater than the standard value.

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
11	Oxygen sensor (front)	Engine: After having warmed up Air/fuel mixture is made leaner when decelerating, and is made richer when racing.	When at 4,000 r/min, engine is suddenly decelerated	200 mV or less	Code No. P0130	13A-19
			When engine is suddenly raced	600 – 1,000 mV		
		Engine: After having warmed up The oxygen sensor signal is used to check the air/fuel mixture ratio, and control condition is also checked by the ECU.	Engine is idling	400 mV or less (Changes) 600 – 1,000 mV		
			2,500 r/min			
13	Intake air temperature sensor	Ignition switch: ON or with engine running	When intake air temperature is -20°C	-20°C	Code No. P0110	13A-12
			When intake air temperature is 0°C	0°C		
			When intake air temperature is 20°C	20°C		
			When intake air temperature is 40°C	40°C		
			When intake air temperature is 80°C	80°C		
14	Throttle position sensor	Ignition switch: ON	Set to idle position	300 – 1,000 mV	Code No. P0120	13A-16
			Gradually open	Increases in proportion to throttle opening angle		
			Open fully	4,500 – 5,500 mV		

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
16	Power supply voltage	Ignition switch: ON		System voltage	Procedure No. 25	13A-59
18	Cranking signal (ignition switch-ST)	Ignition switch: ON	Engine: Stopped	OFF	Procedure No. 27	13A-61
			Engine: Cranking	ON		
21	Engine coolant temperature sensor	Ignition switch: ON or with engine running	When engine coolant temperature is -20°C	-20°C	Code No. P0115	13A-13
			When engine coolant temperature is 0°C	0°C		
			When engine coolant temperature is 20°C	20°C		
			When engine coolant temperature is 40°C	40°C		
			When engine coolant temperature is 80°C	80°C		
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-29
		- Engine: Idling - Idle position switch: ON	When engine coolant temperature is -20°C	1,475 – 1,675 r/min		
			When engine coolant temperature is 0°C	1,345 – 1,545 r/min		
			When engine coolant temperature is 20°C	1,200 – 1,400 r/min		
			When engine coolant temperature is 40°C	1,025 – 1,225 r/min		
			When engine coolant temperature is 80°C	650 – 850 r/min		
24	Vehicle speed sensor	Drive at 40 km/h		Approximately 40 km/h	Code No. P0500	13A-35

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
27	Power steering fluid pressure switch	Engine: Idling	Steering wheel stationary	OFF	Procedure No. 28	13A-61
			Steering wheel turning	ON		
28	A/C switch	Engine: Idling (when A/C switch is ON, A/C compressor should be operating.)	A/C switch: OFF	OFF	Procedure No. 29	13A-62
			A/C switch: ON	ON		
32	Vacuum sensor*1	- Engine coolant temperature: 80 – 95°C - Lamps, electric cooling fan and all accessories: OFF - Transmission: Neutral - Ignition switch: ON	Engine: Stopped (At altitude of 0 m)	101 kPa	Code No. P0105	13A-10
			Engine: Stopped (At altitude of 600 m)	95 kPa		
			Engine: Stopped (At altitude of 1,200 m)	88 kPa		
			Engine: Stopped (At altitude of 1,800 m)	81 kPa		
			Engine: Idling	24.3 – 37.7 kPa		
			When engine is suddenly raced	Increases		
41	Injectors*2	Engine: Cranking	When engine coolant temperature is 0°C (injection is carried out for all cylinders simultaneously)	13 – 23 ms	–	–
			When engine coolant temperature is 20°C	26 – 46 ms		
			When engine coolant temperature is 80°C	8 – 12 ms		

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
41	Injectors*3	- Engine coolant temperature: 80 – 95°C - Lamps, electric cooling fan and all accessories: OFF - Transmission: Neutral	Engine is idling	1.7 – 2.9 ms	–	–
			2,500 r/min	1.4 – 2.6 ms		
			When engine is suddenly raced	Increases		
44	Ignition coils and power transistors	- Engine: After having warmed up - Timing lamp is set. (The timing lamp is set in order to check actual ignition timing.)	Engine is idling	0 – 20 °BTDC	–	–
			2,500 r/min	19 – 39 °BTDC		
45	ISC (stepper) motor position*4	- Engine coolant temperature: 80 – 95°C - Lamps, electric cooling fan and all accessories: OFF - Transmission: Neutral - Engine: Idling - When A/C switch is ON, A/C compressor should be operating	A/C switch: OFF	2 – 25 STEP	–	–
			A/C switch: OFF → ON	Increases by 10 – 70 steps		
49	A/C relay	Engine: After having warmed up/Engine is idling	A/C switch: OFF	OFF (Compressor clutch is not operating)	Procedure No. 29	13A-62
			A/C switch: ON	ON (Compressor clutch is operating)		
59	Oxygen sensor (rear)	- Transmission: 2nd gear - Drive with throttle widely open	3,500 r/min	600 – 1,000 mV	Code No. P0136	13A-22

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
81	Long-term fuel compensation	Engine: Warm, 2,500 r/min without any load (during closed loop)		-12.5 – 12.5 %	Code No. P0170	13A-25
82	Short-term fuel compensation	Engine: Warm, 2,500 r/min without any load (during closed loop)		-17 – 17 %	Code No. P0170	13A-25
87	Calculation load value	Engine: Warm	Engine: Idling	20 – 33 %	–	–
			2,500 r/min	20 – 33 %		
88	Fuel control condition	Engine: Warm	2,500 r/min	Closed loop	Code No. P0125	13A-18
			When engine is suddenly raced	Open loop – drive condition		
A1	Oxygen sensor (front)	Engine: After having warmed up Air/fuel mixture is made leaner when decelerating, and is made richer when racing.	When at 4,000 r/min, engine is suddenly decelerated	0.2 V or less	Code No. P0130	13A-19
			When engine is sudden racing	0.6 – 1.0 V		
		Engine: After having warmed up The oxygen sensor signal is used to check the air/fuel mixture ratio, and control condition is also checked by the engine-ECU.	Engine is idling	0.4 V or less (Changes)		
			2,500 r/min	0.6 – 1.0 V		
A2	Oxygen sensor (rear)	- Transmission: 2nd gear - Drive with throttle widely open	3,500 r/min	0.6 – 1.0 V	Code No. P0136	13A-22
8A	Throttle position sensor (Throttle opening angle)	Ignition switch: ON	Set to idle position	6 – 20 %	Code No. P0120	13A-16
			Gradually open	Increase in proportion to throttle opening angle		
			Open fully	80 – 100 %		

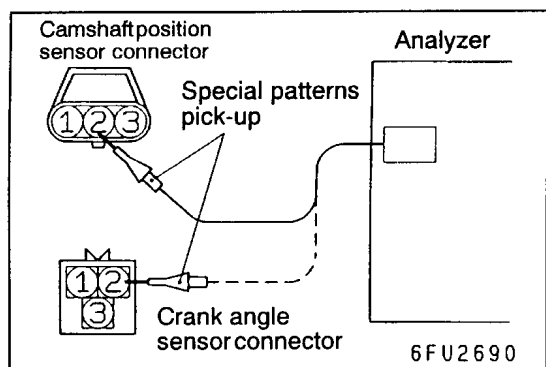
ACTUATOR TEST REFERENCE TABLE

Item No.	Inspection item	Drive contents	Inspection contents		Normal condition	Inspection procedure No.	Reference page
01	Injectors	Cut fuel to No. 1 injector	Engine: After having warmed up/Engine is idling (Cut the fuel supply to each injector in turn and check cylinders which don't affect idling.)		Idling condition becomes different (becomes unstable).	Code No. P0201	13A-26
02		Cut fuel to No. 2 injector				Code No. P0202	
03		Cut fuel to No. 3 injector				Code No. P0203	
04		Cut fuel to No. 4 injector				Code No. P0204	
07	Fuel pump	Fuel pump operates and fuel is recirculated.	- Engine: Cranking - Fuel pump: Forced driving Inspect according to both the above conditions.	Pinch the return hose with fingers to feel the pulse of the fuel being recirculated.	Pulse is felt.	Procedure No. 26	13A-60
				Listen near the fuel tank for the sound of fuel pump operation.	Sound of operation is heard.		
08	Purge control solenoid valve	Solenoid valve turns from OFF to ON.	Ignition switch: ON		Sound of operation can be heard when solenoid valve is driven.	Code No. P0443	13A-34
10	EGR control solenoid valve	Solenoid valve turns from OFF to ON.	Ignition switch: ON		Sound of operation can be heard when solenoid valve is driven.	Code No. P0403	13A-32
20	Condenser fan	Drive the fan motors (condenser)	- Ignition switch: ON - A/C switch: ON		Fan motor runs	Procedure No. 23	13A-58
21	Radiator fan	Drive the fan motors (radiator)	Ignition switch: ON		Fan motor runs	Procedure No. 23	13A-58

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

The following items have been added. The ignition timing adjustment terminal (terminal No. 52) and inhibitor switch-A/T (terminal No. 91) has been discontinued.

Terminal No.	Check item	Check condition	Normal condition
10	Ignition coil – No. 1, No. 4 (Ignition power transistor)	Engine r/min: 3,000 r/min	0.3 – 3.0 V
20	Fan motor relay (HI)	Radiator fan is not operating (Engine coolant temperature is 90°C or less)	System voltage
		Radiator fan is not operating (Engine coolant temperature is 105°C or more)	0 – 3 V
21	Fan motor relay (LO)	Radiator fan and condenser fan are not operating (Engine coolant temperature is 90°C or less)	System voltage
		Radiator fan and condenser fan are not operating (Engine coolant temperature is 90 – 105°C or less)	0 – 3 V
23	Ignition coil – No. 2, No. 3 (Ignition power transistor)	Engine r/min: 3,000 r/min	0.3 – 3.0 V
58	Engine ignition signal	Engine r/min: 3,000 r/min	0.3 – 3.0 V
88	Camshaft position sensor	Engine: Cranking	0.4 – 3.0 V
		Engine: Idling	0.5 – 2.0 V



INSPECTION PROCEDURE USING AN ANALYZER

CAMSHAFT POSITION SENSOR AND CRANK ANGLE SENSOR

Measurement Method

1. Disconnect the camshaft position sensor connector and connect the special tool (test harness: MB991709) in between. (All terminals should be connected.)
2. Connect the analyzer special patterns pickup to camshaft position sensor terminal 2.
3. Disconnect the crank angle sensor connector and connect the special tool (test harness: MD998478) in between.
4. Connect the analyzer special patterns pickup to crank angle sensor terminal 2.

Alternate Method (Test harness not available)

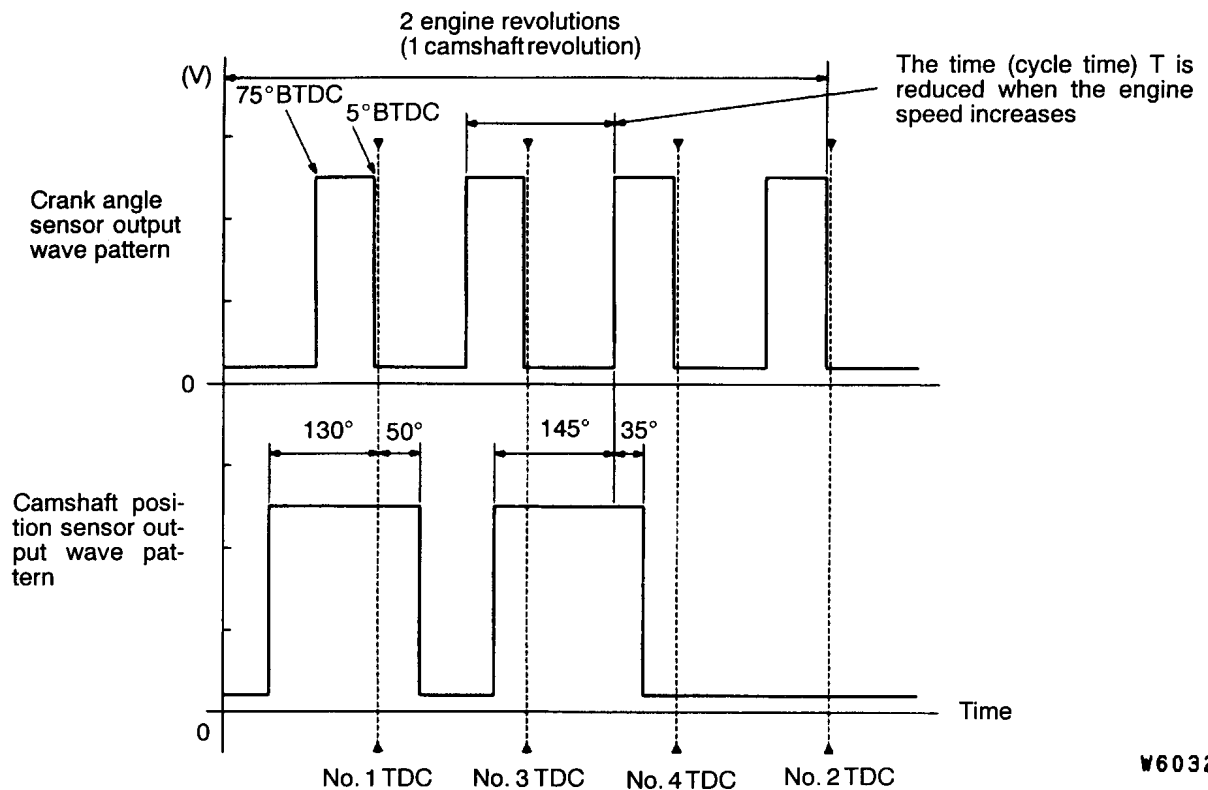
1. Connect the analyzer special patterns pickup to engine-ECU terminal 88. (When checking the camshaft position sensor signal wave pattern.)
2. Connect the analyzer special patterns pickup to engine-ECU terminal 89. (When checking the crank angle sensor signal wave pattern.)

Standard Wave Pattern

Observation conditions

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

Standard wave pattern

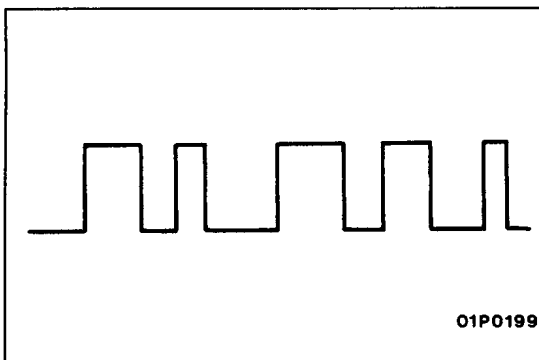


TDC: Top dead centre

W6032AJ

Wave Pattern Observation Points

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



Examples of Abnormal Wave Patterns

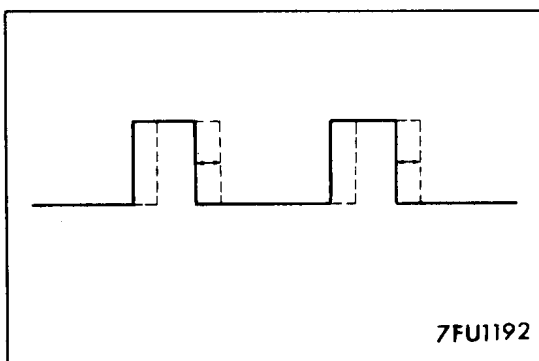
- Example 1

Cause of problem

Sensor interface malfunction

Wave pattern characteristics

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



- Example 2

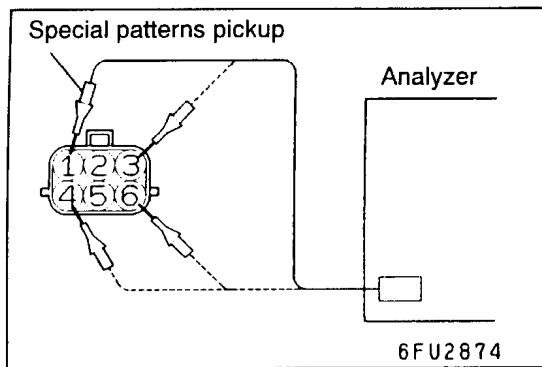
Cause of problem

Loose timing belt

Abnormality in sensor disk

Wave pattern characteristics

Wave pattern is displaced to the left or right.



IDLE SPEED CONTROL (ISC) SERVO (STEPPER MOTOR)

Measurement Method

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

Alternate Method (Test harness not available)

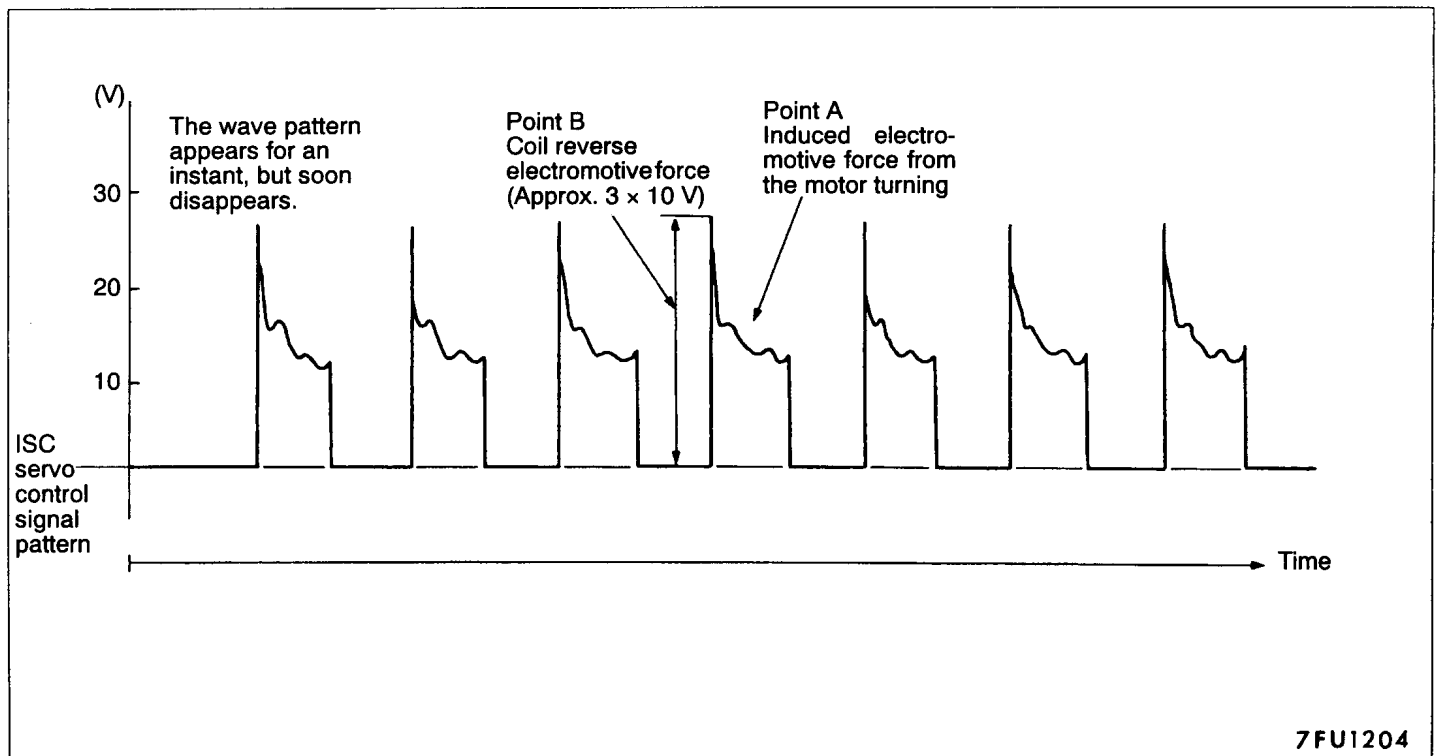
1. Connect the analyzer special patterns pickup to engine-ECU terminal 4, connection terminal 5, connection terminal 17, and connection terminal 18 respectively.

Standard Wave Pattern

Observation conditions

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

Standard wave pattern



Wave Pattern Observation Points

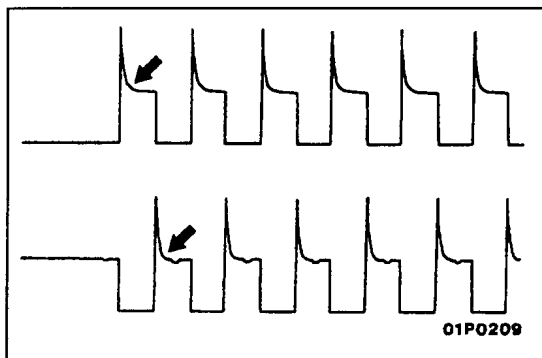
Check that the standard wave pattern appears when the ISC servo is operating.

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

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

Point B: Height of coil electromotive force

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

**Examples of Abnormal Wave Pattern**

- Example 1

Cause of problem

Motor is malfunctioning. (Motor is not operating.)

Wave pattern characteristics

Induced electromotive force from the motor turning does not appear.

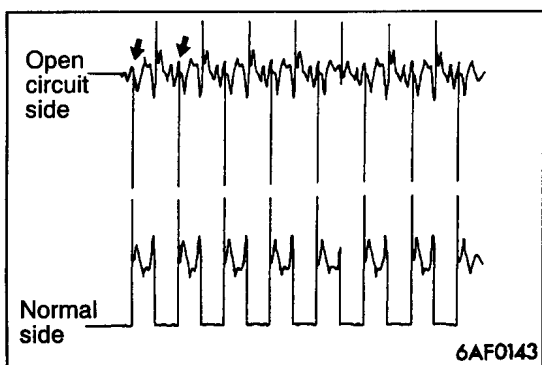
- Example 2

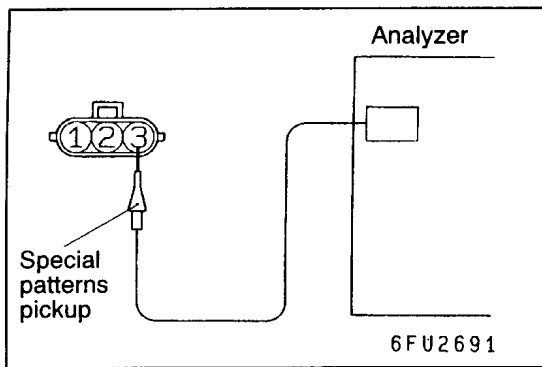
Cause of problem

Open circuit in the line between the ISC servo and the engine-ECU.

Wave pattern characteristics

Current is not supplied to the motor coil on the open circuit side. (Voltage does not drop to 0 V.) Furthermore, the induced electromotive force waveform at the normal side is slightly different from the normal waveform.





IGNITION COIL AND POWER TRANSISTOR

Power transistor control signal

Measurement Method

1. Disconnect the ignition coil connector, and connect the special tool (test harness: MB991348) in between. (All terminals should be connected.)
2. Connect the analyzer special patterns pickup to terminal 3 of each ignition coil connector in turn.

Alternate Method (Test harness not available)

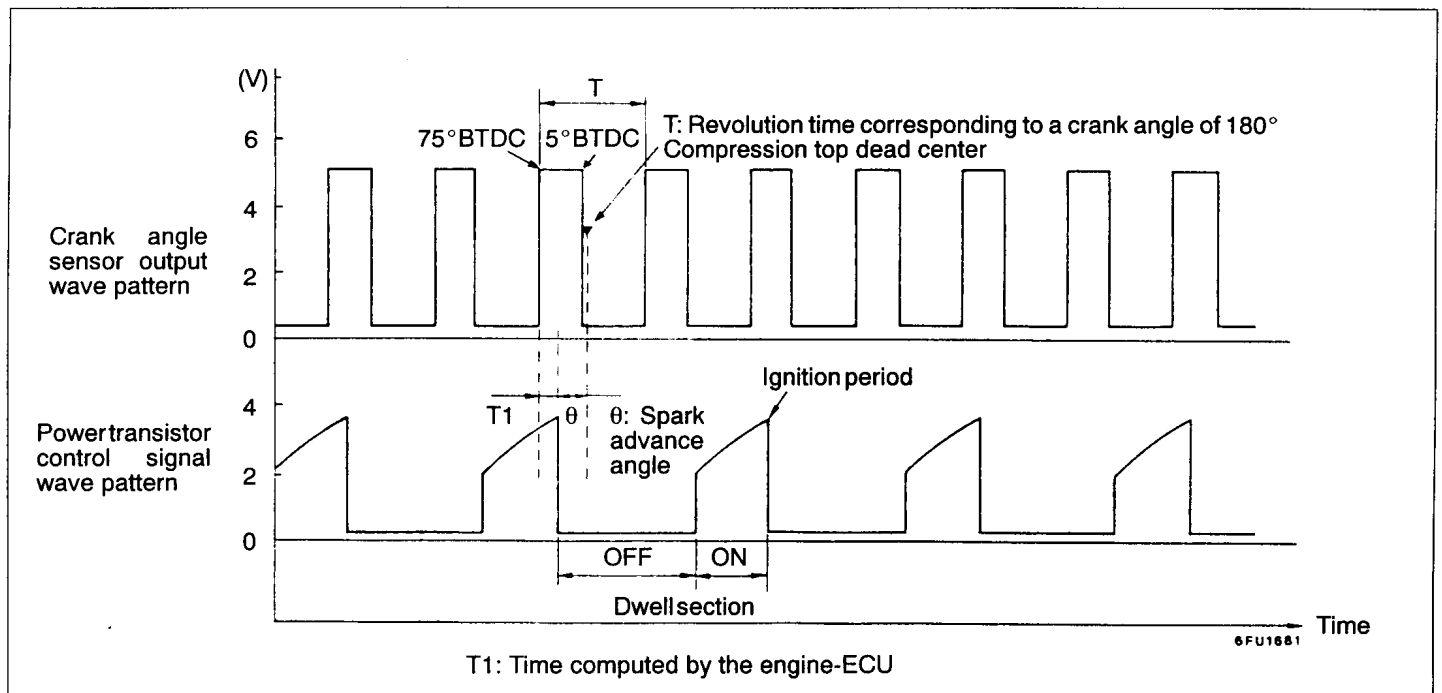
1. Connect the analyzer special patterns pickup to engine-ECU terminal 10 (No. 1 - No. 4), terminal 23 (No. 2 - No. 3) respectively.

Standard Wave Pattern

Observation condition

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

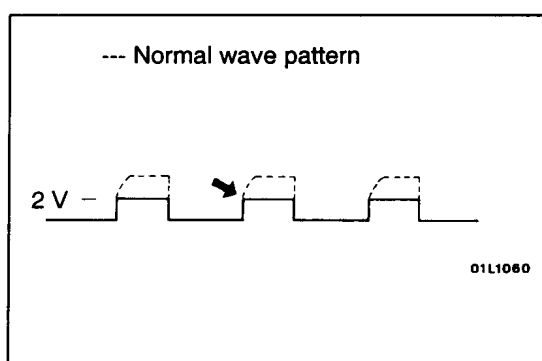
Standard wave pattern



Wave Pattern Observation Points

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

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

**Examples of Abnormal Wave Pattern**

- Example 1

Wave pattern during engine cranking

Cause of problem

Open-circuit in ignition primary circuit

Wave pattern characteristics

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

- Example 2

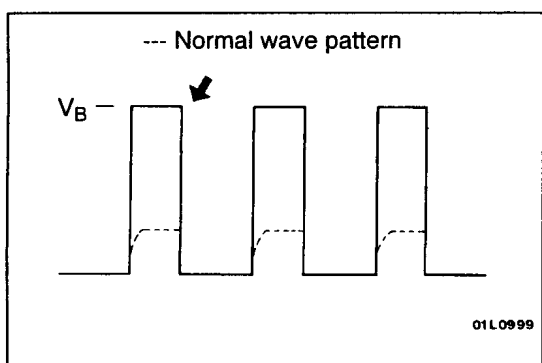
Wave pattern during engine cranking

Cause of problem

Malfunction in power transistor

Wave pattern characteristics

Power voltage results when the power transistor is ON.



ON-VEHICLE SERVICE

BASIC IDLE SPEED ADJUSTMENT

NOTE

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

1. Before inspection and adjustment, set the vehicle to the pre-inspection condition.
2. Connect the MUT-II to the diagnosis connector (16-pin).

NOTE

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

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

NOTE

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

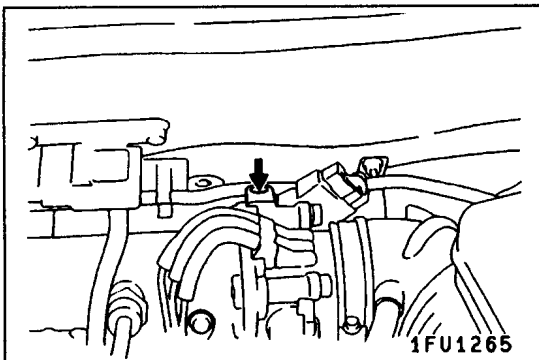
5. Check the idle speed.

Standard value: 750 ± 50 r/min

NOTE

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

6. If not within the standard value range, turn the speed adjusting screw (SAS) to make the necessary adjustment.
7. Press the MUT-II clear key, and release the ISC servo from the Actuator test mode.



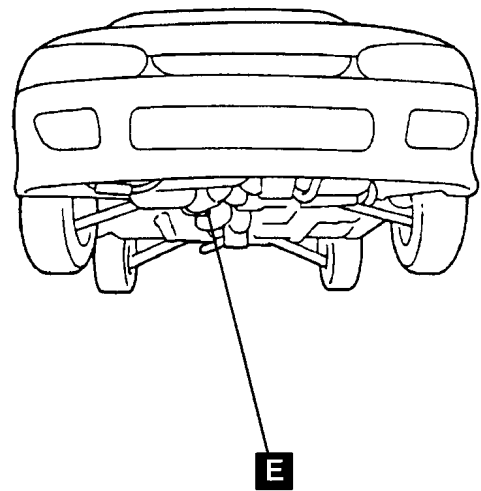
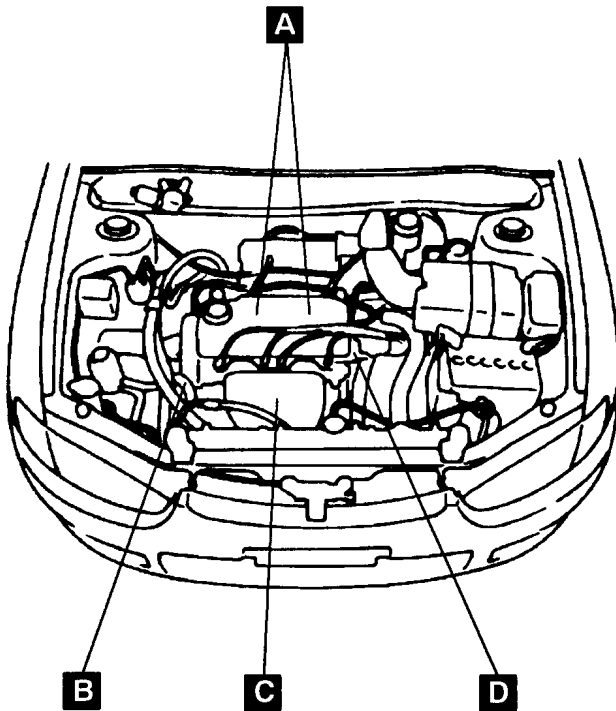
NOTE

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

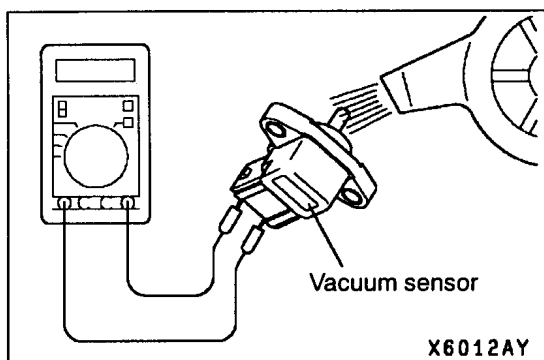
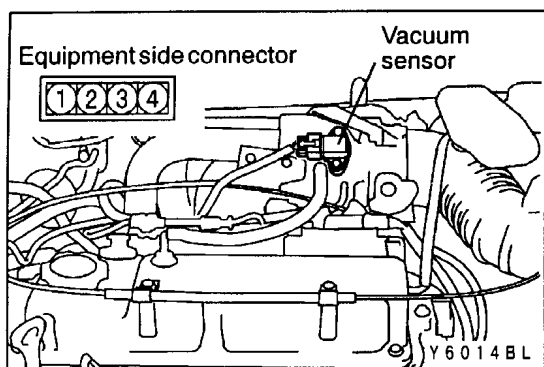
8. Switch OFF the ignition switch.
9. Disconnect the MUT-II.
10. Start the engine again and let it run at idle speed for about 10 minutes; check that the idling condition is normal.

COMPONENT LOCATION

Name	Symbol	Name	Symbol
Camshaft position sensor	D	Ignition failure sensor	D
Crank angle sensor	B	Oxygen sensor (front)	C
Ignition coil	A	Oxygen sensor (rear)	E



Y6013BL



INTAKE AIR TEMPERATURE SENSOR CHECK

1. Disconnect the vacuum sensor connector.
2. Measure resistance between terminals 1 and 3.

Standard value:

2.3 – 3.0 k Ω (at 20°C)

0.30 – 0.42 k Ω (at 80°C)

3. Remove the vacuum sensor.

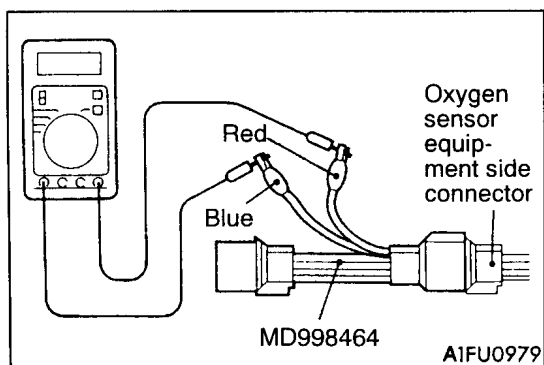
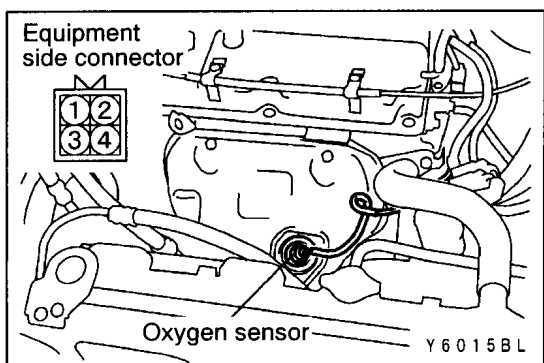
4. Measure resistance while heating the sensor using a hair drier.

Normal condition:

Temperature (°C)	Resistance (k Ω)
Higher	Smaller

5. If the value deviates from the standard value or the resistance remains unchanged, replace the vacuum sensor.
6. Install the vacuum sensor and tighten it to the specified torque.

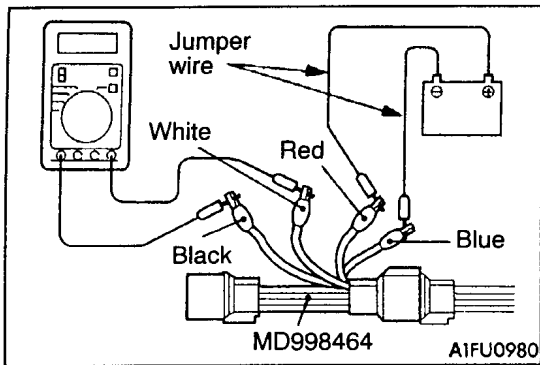
Tightening torque: 4 – 6 N·m



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 Ω at 20°C) between terminal 1 (red clip of special tool) and terminal 3 (blue clip of special tool) on the oxygen sensor connector.
3. If there is no continuity, replace the oxygen sensor.
4. Warm up the engine until engine coolant is 80°C or higher.



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

Caution

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

6. Connect a digital voltage meter between terminal 2 (black clip) and terminal 4 (white clip).

7. While repeatedly racing the engine, measure the oxygen sensor output voltage.

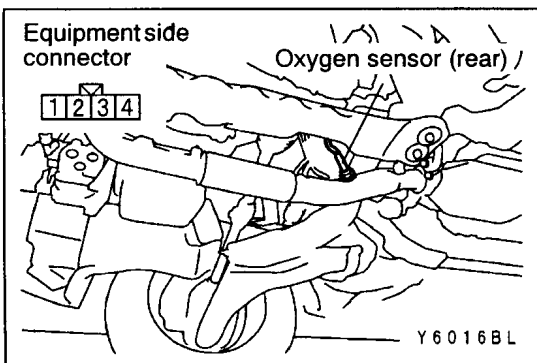
Standard value:

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

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

NOTE

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

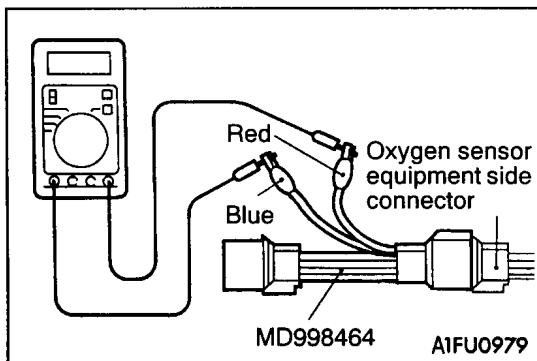


<Oxygen sensor (rear)>

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 and terminal 3 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.

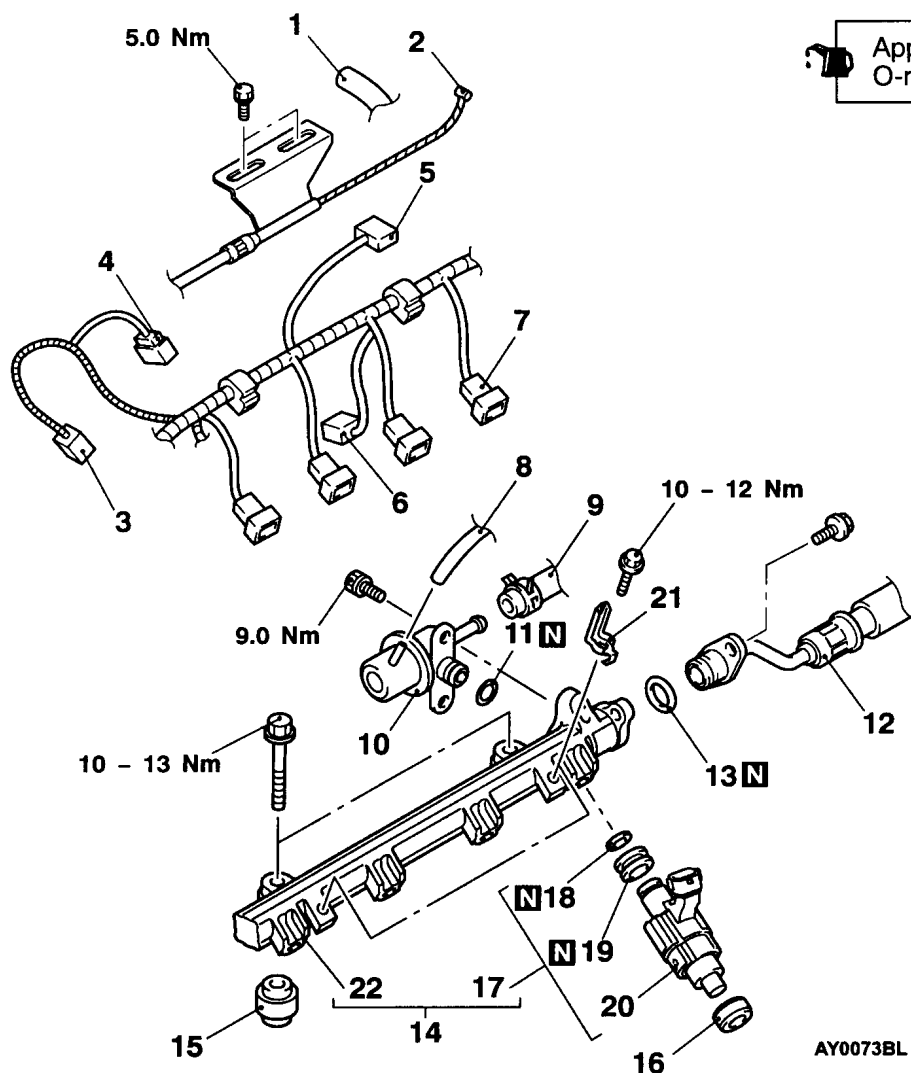


INJECTOR

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

- Prevention of Fuel Discharge <before removal only>
- Fuel Leak Check <after installation only>
- Accelerator Cable Adjustment



Apply engine oil to all O-rings during installation.

Removal steps

- | | | | |
|-----|-----------------------------------|-----|---|
| ▶A◀ | 1. PCV hose connection | ▶A◀ | 12. High-pressure fuel hose connection |
| ▶A◀ | 2. Accelerator cable connection | ▶A◀ | 13. O-ring |
| ▶A◀ | 3. Oxygen sensor (rear) connector | ▶A◀ | 14. Delivery pipe and injector assembly |
| ▶A◀ | 4. Detonation sensor connector | ▶A◀ | 15. Insulator |
| ▶A◀ | 5. Vacuum sensor connector | ▶A◀ | 16. Insulator |
| ▶A◀ | 6. EGR solenoid valve connector | ▶A◀ | 17. Injector assembly |
| ▶A◀ | 7. Injector connector | ▶A◀ | 18. O-ring |
| ▶A◀ | 8. Vacuum hose connection | ▶A◀ | 19. Grommet |
| ▶A◀ | 9. Fuel return hose connection | ▶A◀ | 20. Injector |
| ▶A◀ | 10. Fuel pressure regulator | ▶A◀ | 21. Harness bracket |
| ▶A◀ | 11. O-ring | ▶A◀ | 22. Delivery pipe |

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REMOVAL SERVICE POINT**◀A▶ DELIVERY PIPE AND INJECTOR ASSEMBLY
REMOVAL**

Remove the delivery pipe (with the injectors attached to it).

Caution

Care must be taken, when removing the delivery pipe, not to drop the injector.

INSTALLATION SERVICE POINT**▶A◀ O-RING/INJECTOR ASSEMBLY/HIGH-PRESSURE
FUEL HOSE/FUEL PRESSURE REGULATOR
INSTALLATION**

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

Caution

Be sure not to let engine oil enter the delivery pipe.

2. While turning the injector, high-pressure fuel hose and fuel pressure regulator to the right and left, install the delivery pipe, while being careful not to damage the O-ring. After installing, check that the hose turns smoothly.
3. If it does not turn smoothly, the O-ring may be trapped, remove the injector, high-pressure fuel hose or fuel pressure regulator and then re-insert it into the delivery pipe and check once again.
4. Tighten the high-pressure fuel hose to the standard torque, and tighten the fuel pressure regulator to the specified torque.

Tightening torque: 9.0 Nm (Fuel pressure regulator)

MULTIPOINT FUEL INJECTION (MPI) <4G9>

GENERAL

OUTLINE OF CHANGES

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

- On-board Diagnostics System has been adopted to expand the diagnostic items and to change diagnosis code numbering system.
- The engine-ECU has been changed. <Vehicles with M/T>
- An engine-A/T-ECU has been adopted. <Vehicles with A/T>
- An ignition failure sensor has been adopted.

GENERAL INFORMATION

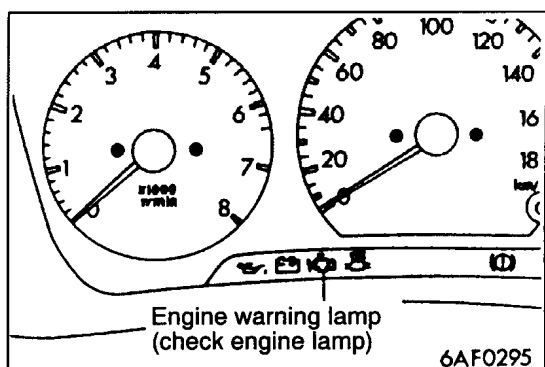
SELF-DIAGNOSIS FUNCTION

Following functions have been added.

- This 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, and can then be used in simulation tests for troubleshooting.

GENERAL SPECIFICATIONS

Items		Specifications
Engine-ECU <M/T>	Identification model No.	E6T31972 <Vehicles with immobilizer system> E6T31973 <Vehicles without immobilizer system>
Engine-A/T-ECU <A/T>	Identification model No.	E6T32072 <Vehicles with immobilizer system> E6T32073 <Vehicles without immobilizer system>



TROUBLESHOOTING

DIAGNOSIS FUNCTION

ENGINE WARNING LAMP (CHECK ENGINE LAMP)

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

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

Engine warning lamp inspection items

Code No.	Diagnosis item
–	Engine-ECU <M/T> or engine-A/T-ECU <A/T>
P0100	Air flow sensor system
P0105	Barometric pressure sensor system
P0110	Intake air temperature sensor system
P0115	Engine coolant temperature sensor system
P0120★	Throttle position sensor system
P0125	Feedback system
P0130	Oxygen sensor (front) system <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
P0201	No. 1 injector system
P0202	No. 2 injector system
P0203	No. 3 injector system
P0204	No. 4 injector 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
P0335	Crank angle sensor system
P0340	Camshaft position sensor system

Code No.	Diagnosis item
P0403	EGR valve system
P0420	Catalyst malfunction
P0443	Purge control solenoid valve system
P0505	Idle speed control system
P0551	Power steering fluid pressure switch system

NOTE

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

METHOD OF READING AND ERASING DIAGNOSIS CODES

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

DIAGNOSIS USING DIAGNOSIS 2 MODE

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

NOTE

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

5. Erase the diagnosis codes.

INSPECTION USING MUT-II DATA LIST AND ACTUATOR TESTING

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

FREEZE FRAME DATA

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

The display items of freeze frame data are shown below.

Display item list

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

NOTE

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

READINESS TEST STATUS

The engine-ECU <M/T> or engine-A/T-ECU <A/T> monitors the following main diagnosis items, judges if these items are in good condition or not, and stores its history. This history can be read out by using MUT-II. (If the ECU has judged a item before, the MUT-II displays "Complete.")

In addition, if diagnosis codes are erased or the battery cable is disconnected, this history will also be erased (the memory will be reset).

- Catalyst: 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. 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. 2. Fixes the ISC servo in the appointed position so idle control is not performed.
Intake air temperature sensor	Controls as if the intake air temperature is 25°C.
Throttle position sensor (TPS)	No increase in fuel injection amount during acceleration due to the throttle position sensor signal.
Engine coolant temperature sensor	Controls as if the engine coolant temperature is 80°C.
Camshaft position sensor	Injects fuel to all cylinders simultaneously. (However, after the ignition switch is turned to ON, the No. 1 cylinder top dead centre is not detected at all.)
Barometric pressure sensor	Controls as if the barometric pressure is 101 kPa.
Detonation sensor	Switches the ignition timing from ignition timing for super petrol to ignition timing for standard petrol.
Ignition coil, power transistor	Cuts off the fuel supply to cylinders with an abnormal ignition.
Oxygen sensor (front)	Air/fuel ratio feedback control (closed loop control) is not performed.
Oxygen sensor (rear)	Performs the feedback control (closed loop control) of the air/fuel ratio by using only the signal of the oxygen sensor (front) installed on the front of the catalytic converter.
Alternator FR terminal	Does not control the output of the alternator according to an electrical load. (works as a normal alternator)
Misfiring	If the detected misfiring causes damage to the catalyst, the misfiring cylinder will be shut down.

INSPECTION CHART FOR DIAGNOSIS CODES

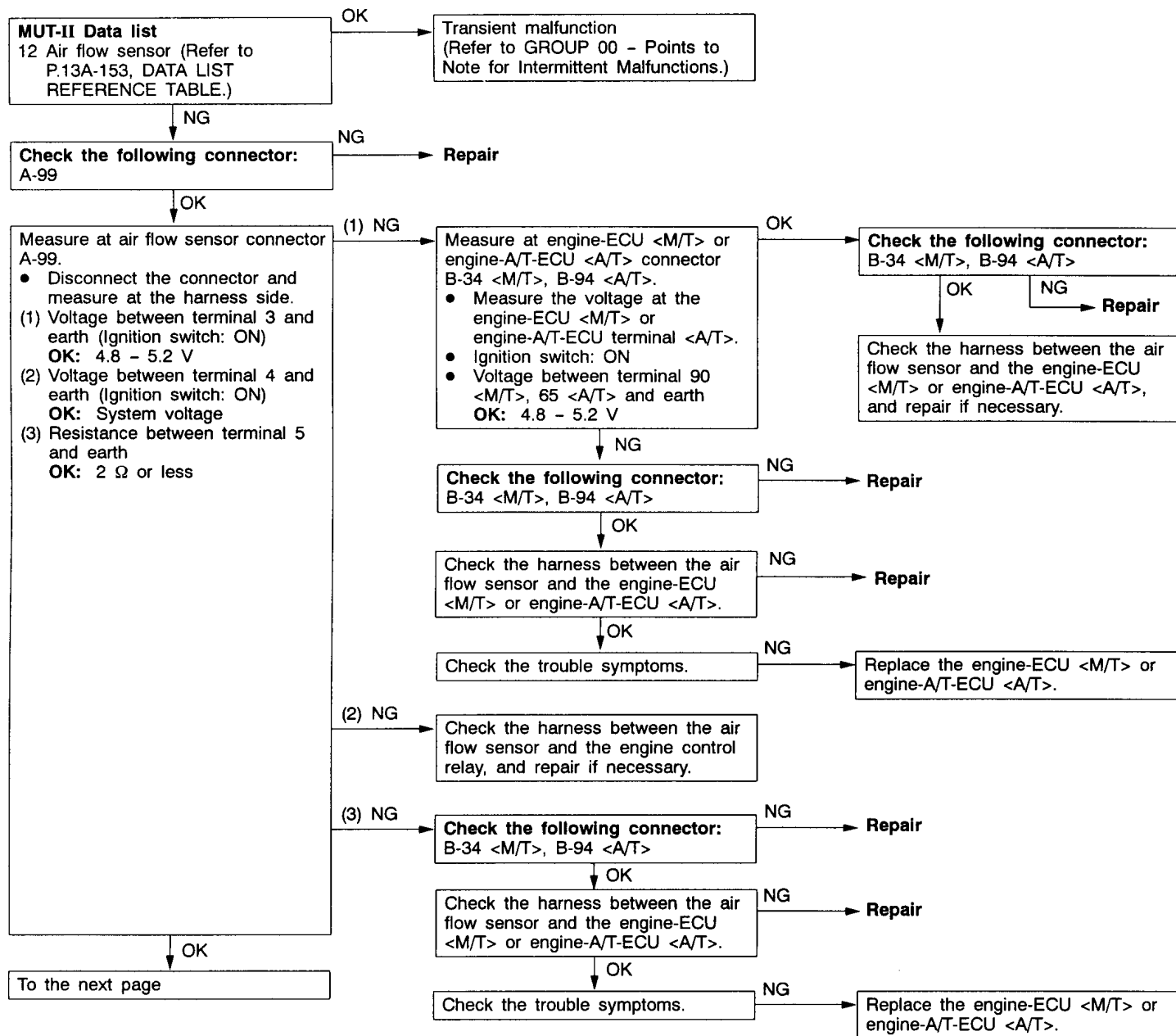
Code No.	Diagnosis item	Reference page
P0100	Air flow sensor system	13A-92
P0105	Barometric pressure sensor system	13A-94
P0110	Intake air temperature sensor system	13A-96
P0115	Engine coolant temperature sensor system	13A-98
P0120	Throttle position sensor 1 system	13A-100
P0125	Feedback system	13A-101
P0130	Oxygen sensor (front) system <sensor 1>	13A-103
P0135	Oxygen sensor heater (front) system <sensor 1>	13A-105
P0136	Oxygen sensor (rear) system <sensor 2>	13A-106
P0141	Oxygen sensor heater (rear) system <sensor 2>	13A-108
P0170	Abnormal fuel system	13A-109
P0201	No. 1 injector system	13A-110
P0202	No. 2 injector system	13A-110
P0203	No. 3 injector system	13A-110
P0204	No. 4 injector system	13A-110
P0300★	Ignition coil (power transistor) system	13A-111
P0301	No. 1 cylinder misfire detected	13A-112
P0302	No. 2 cylinder misfire detected	13A-112
P0303	No. 3 cylinder misfire detected	13A-112
P0304	No. 4 cylinder misfire detected	13A-112
P0325	Detonation sensor system	13A-113
P0335	Crank angle sensor system	13A-113
P0340	Camshaft position sensor system	13A-115
P0403	EGR valve system	13A-117
P0420	Catalyst malfunction	13A-118
P0443	Purge control solenoid valve system	13A-119
P0500	Vehicle speed sensor system	13A-120
P0505	Idle speed control system	13A-120
P0551	Power steering fluid pressure switch system	13A-123
P1610	Immobilizer system	13A-124

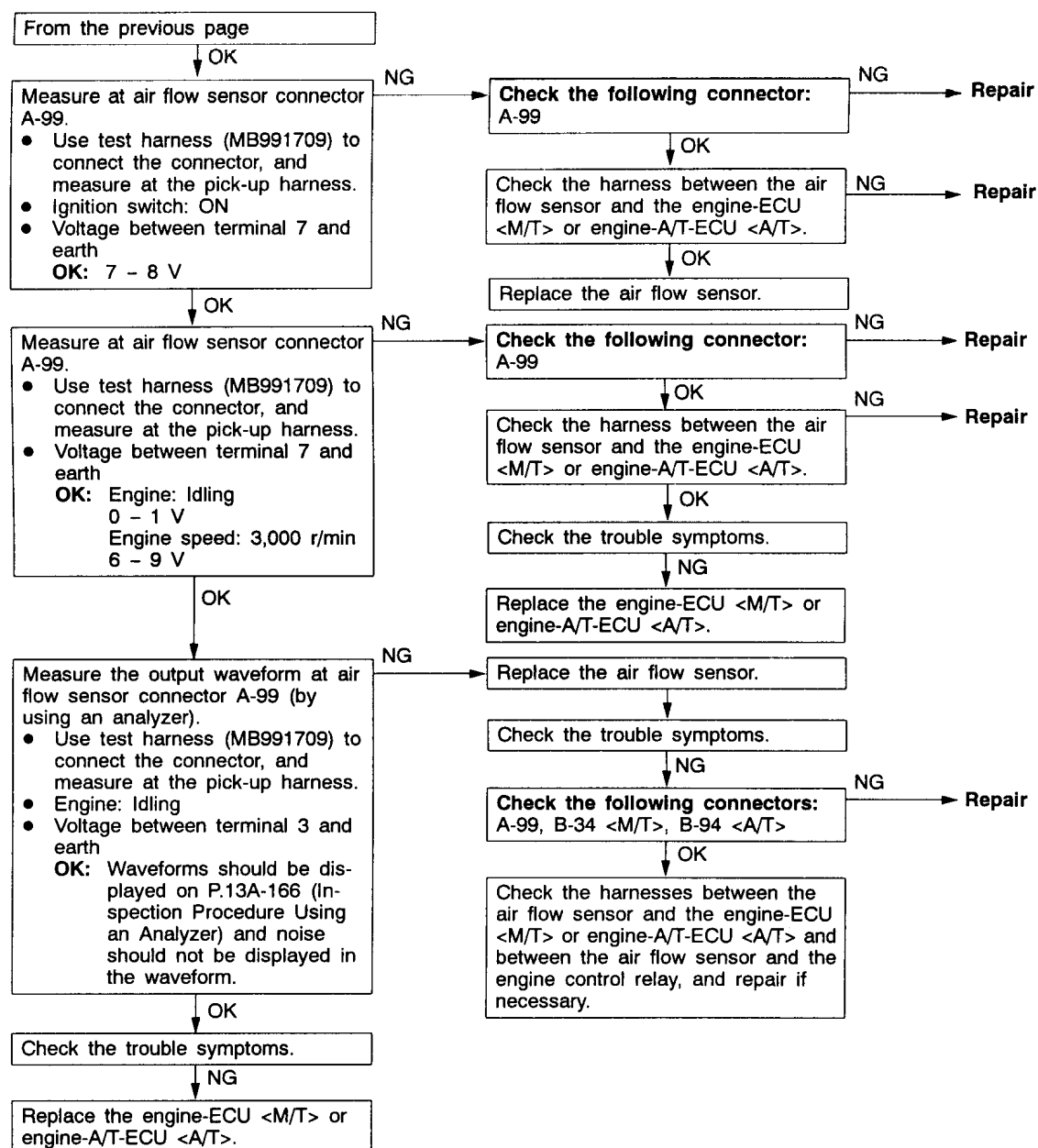
NOTE

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

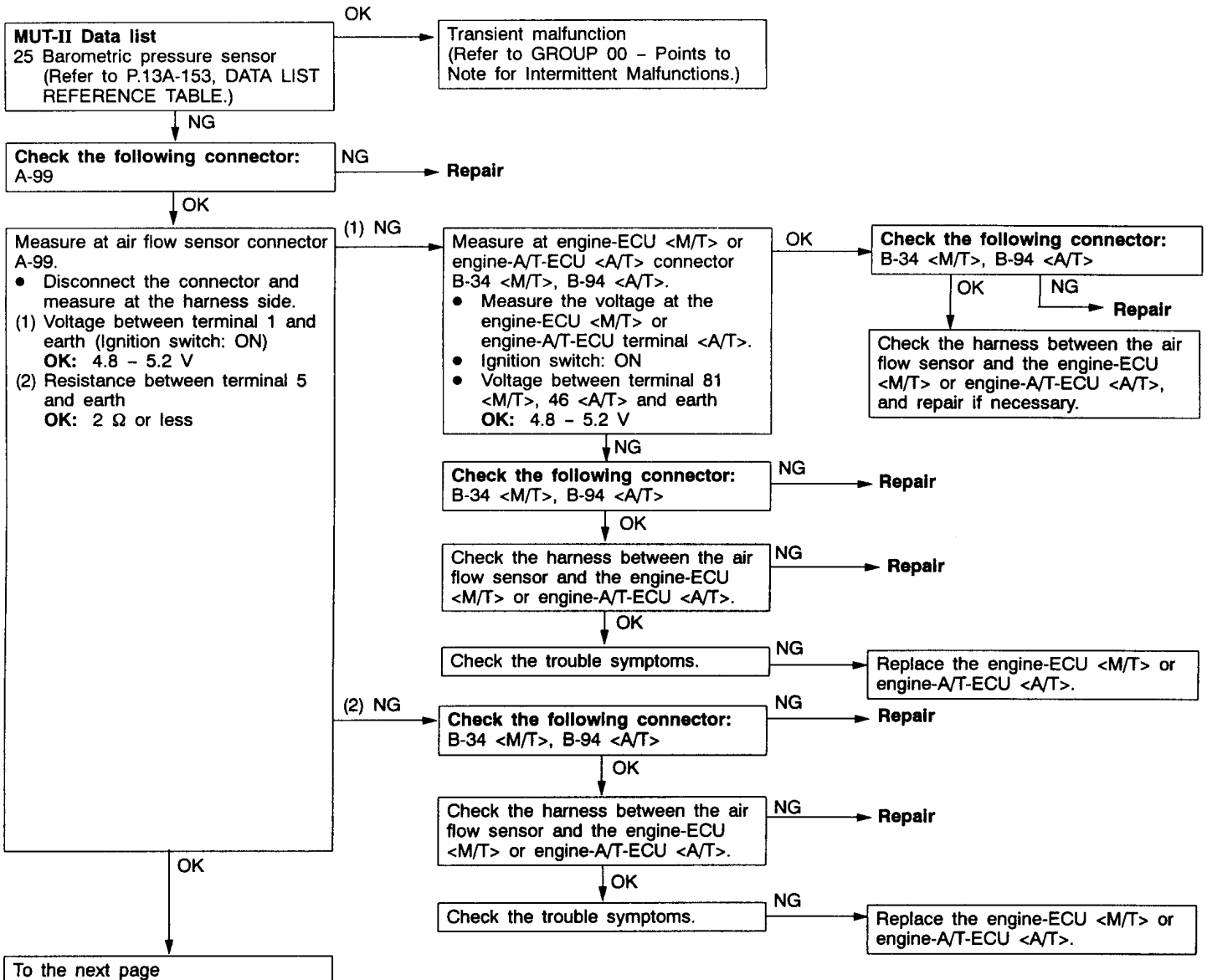
INSPECTION PROCEDURE CLASSIFIED BY DIAGNOSIS CODE

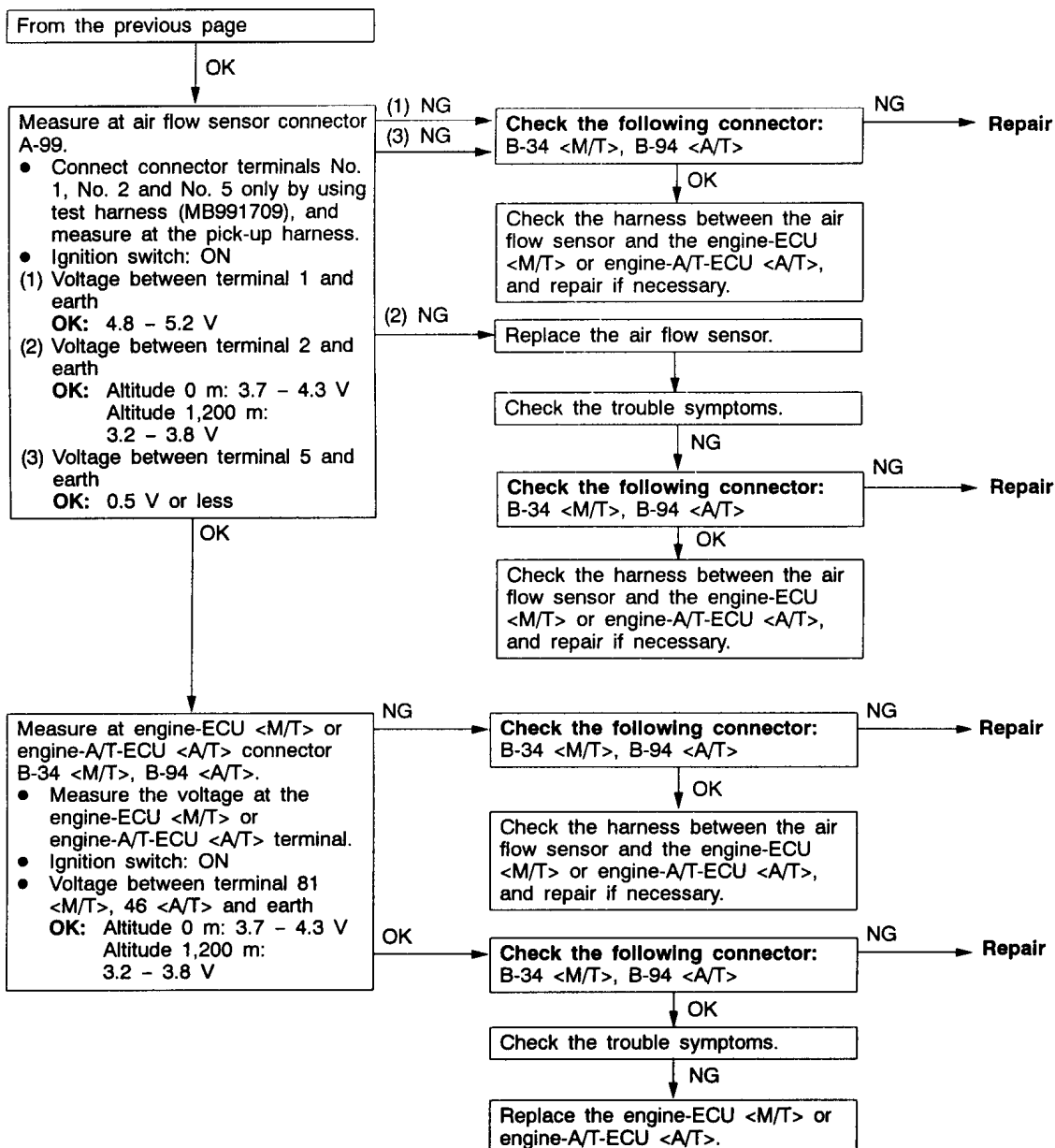
Code No. P0100 Air flow sensor system	Probable cause
Range of Check • Engine speed: 500 r/min or more Set Conditions • The sensor output frequency is 3.3 Hz or less for four seconds.	• Malfunction of air flow sensor • Open or short circuit in air flow sensor circuit or loose connector contact • Malfunction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



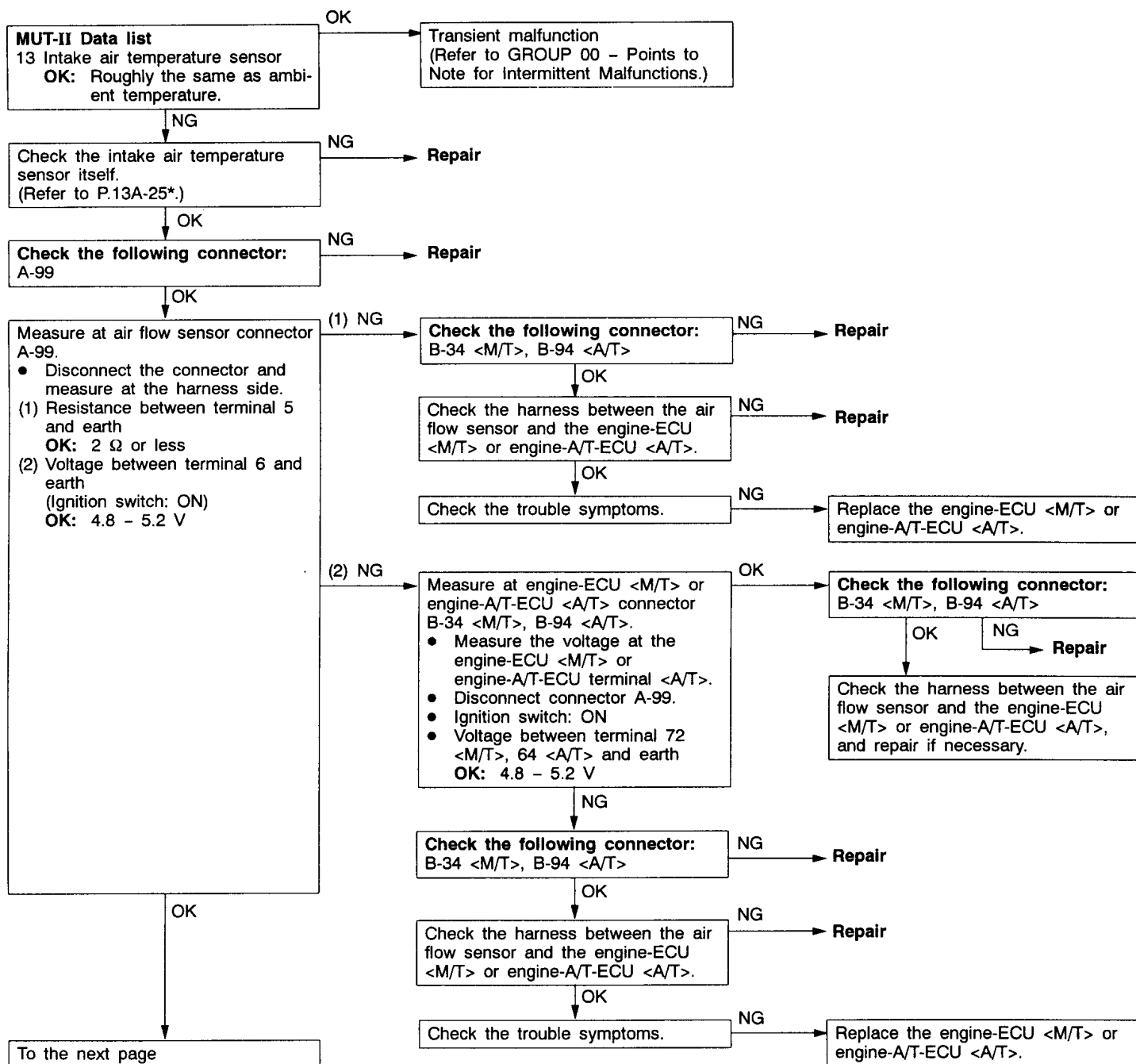


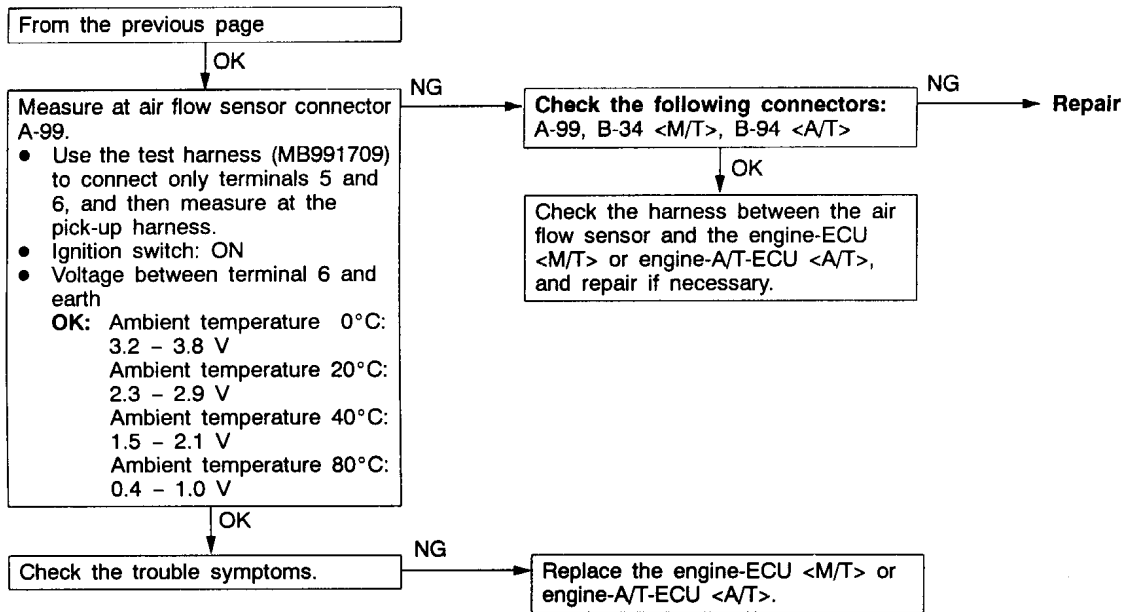
Code No. P0105 Barometric pressure sensor system	Probable cause
Range of Check - Two seconds have passed since the ignition switch is turned ON or the engine starting process is completed. - Battery voltage: 8 V or more Set Conditions - The sensor output voltage is 4.5 V or more for four seconds (equivalent 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 <M/T> - Malfunction of engine-A/T-ECU <A/T>





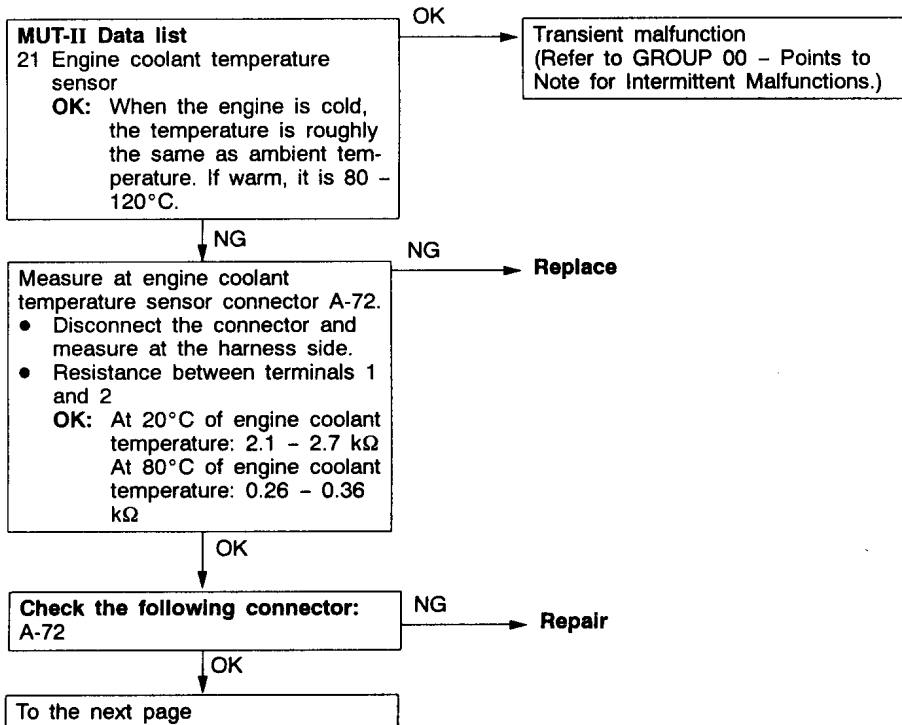
Code No. P0110 Intake air temperature sensor system	Probable cause
Range of Check - Two seconds have passed since the ignition switch is turned ON or the engine starting process is completed. Set Conditions - The sensor output voltage is 4.6 V or more for four seconds (equivalent to -45°C of intake air 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 <M/T> - Malfunction of engine-A/T-ECU <A/T>

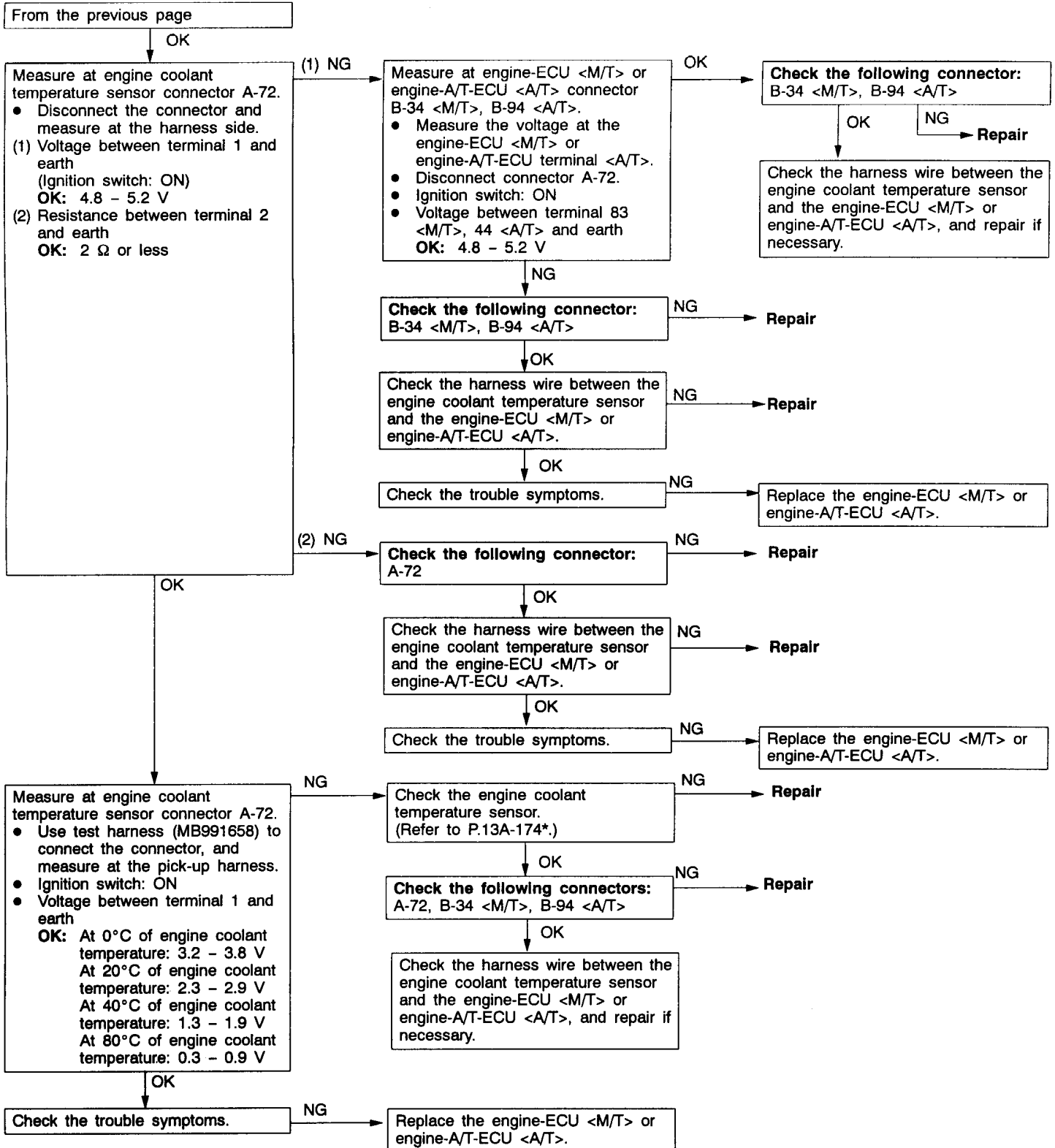


**NOTE:**

*: Refer to the 2000 COLT/LANCER Workshop Manual (Pub. No. PWME9911-B).

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 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)	• 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 <M/T> • Malfunction of engine-A/T-ECU <A/T>
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.	

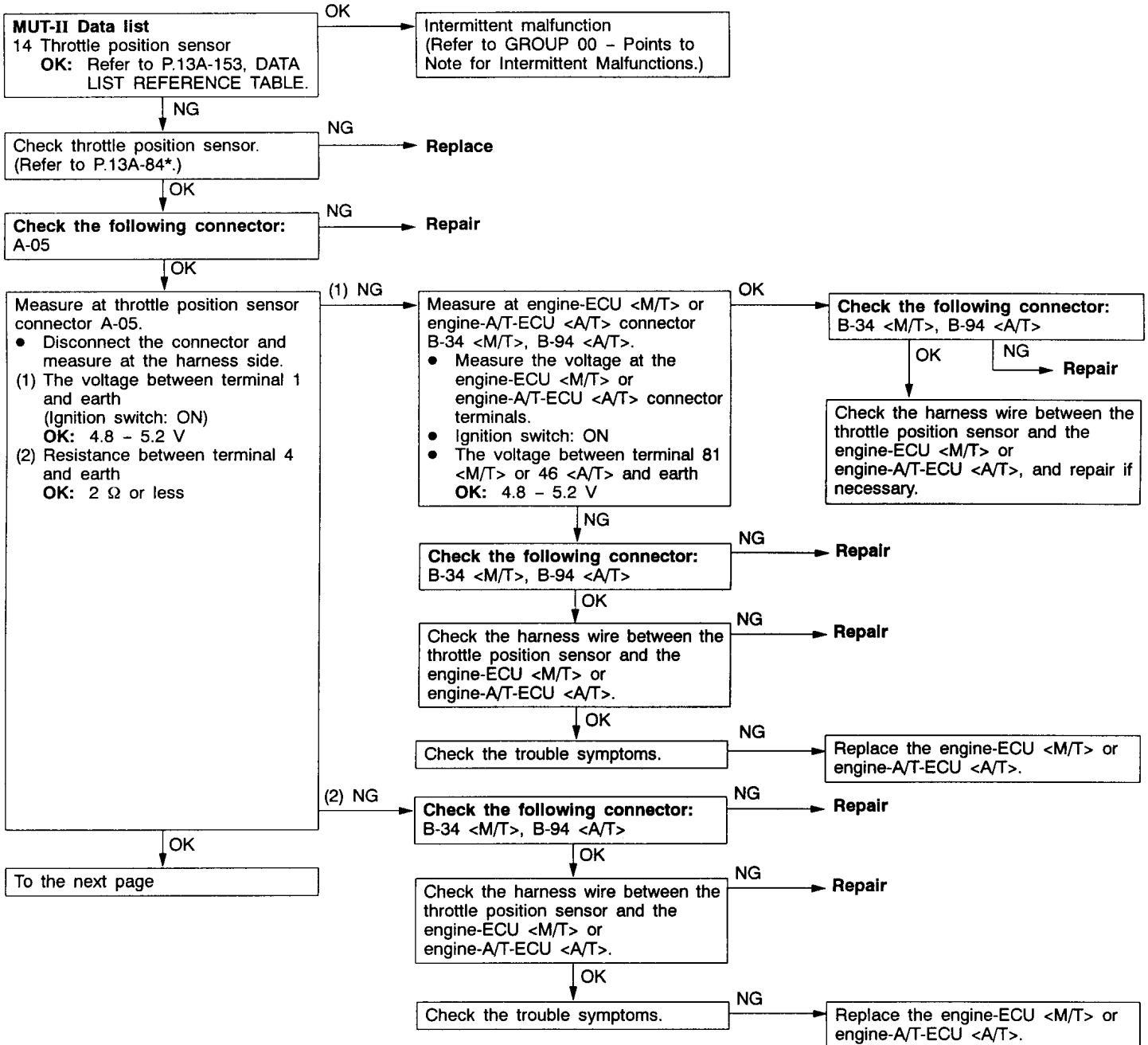




NOTE:

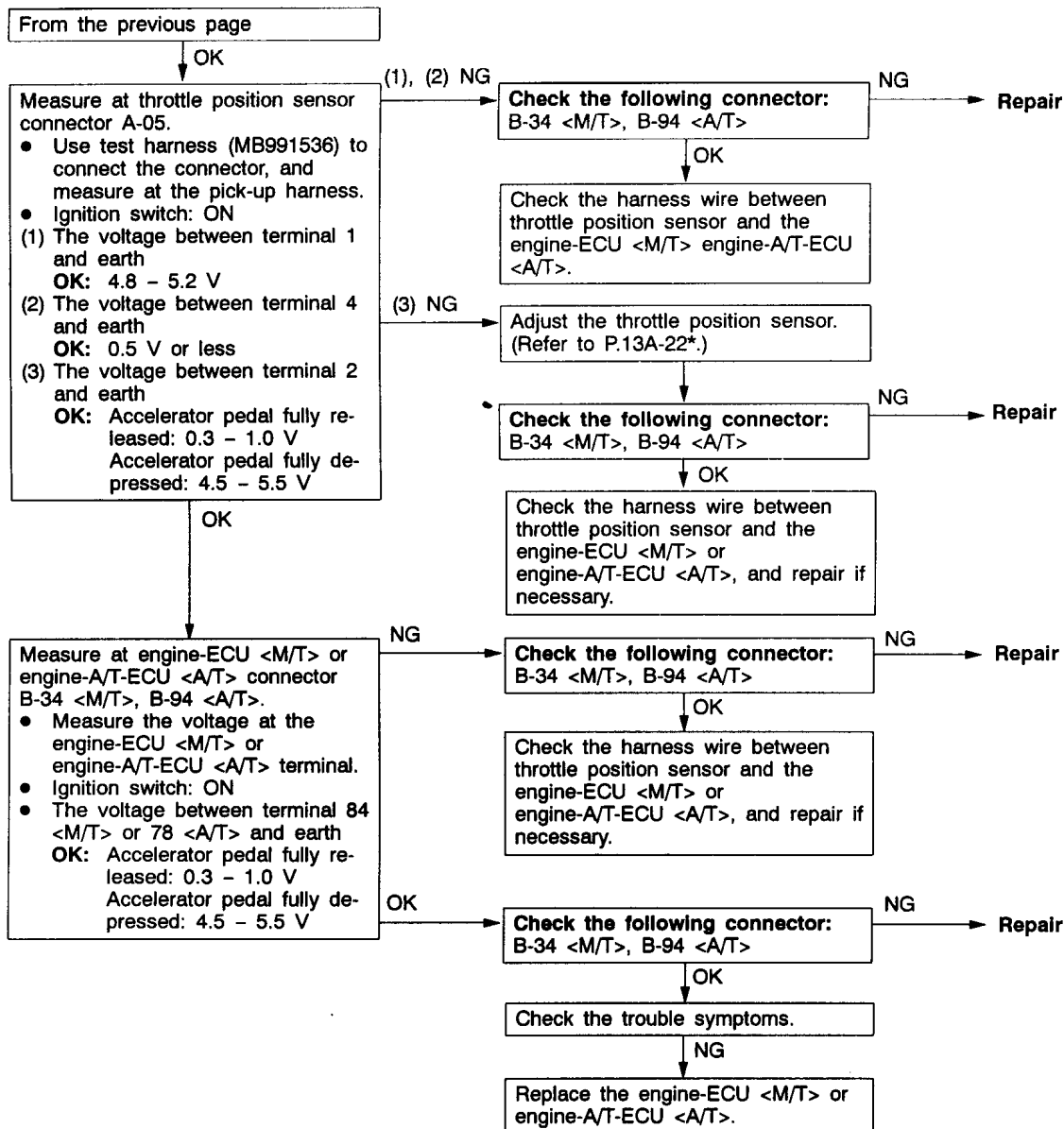
*: Refer to the '96 COLT/LANCER Workshop Manual (Pub. No. PWME9511).

Code No. 0120 Throttle position sensor system	Probable cause
Range of Check - Ignition switch: ON - The throttle position sensor 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 and combination output voltage is outside 4 – 6 V.	- Malfunction of throttle position sensor - Open or short circuit in the throttle position sensor circuit or loose connector contact - Malfunction of the engine-ECU <M/T> - Malfunction of the engine-A/T-ECU <A/T>



NOTE

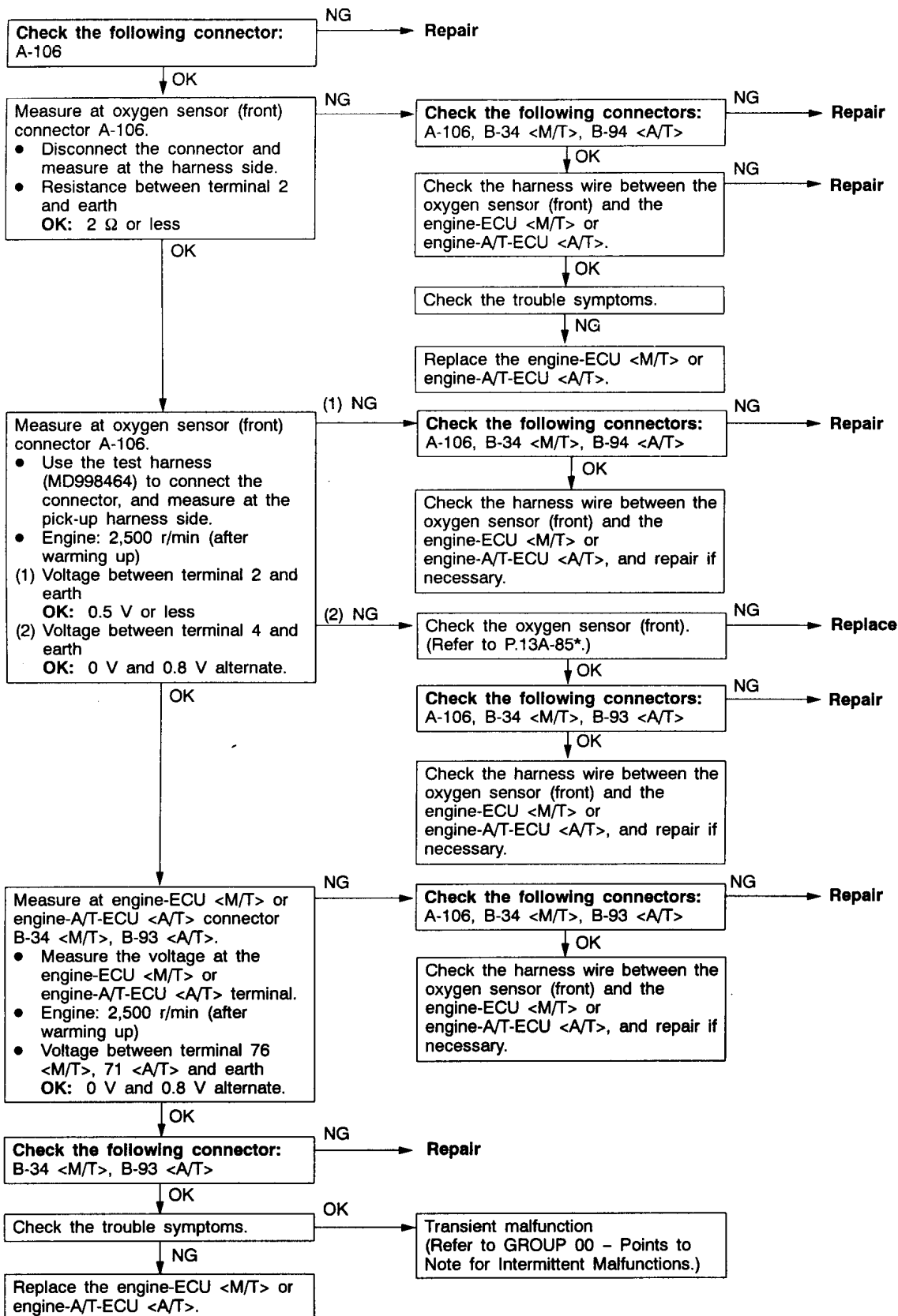
*: Refer to the '96 COLT/LANCER Workshop Manual (Pub. No. PWME9511).



NOTE

*: Refer to the 2000 COLT/LANCER Workshop Manual (Pub. No. PWME9511-B).

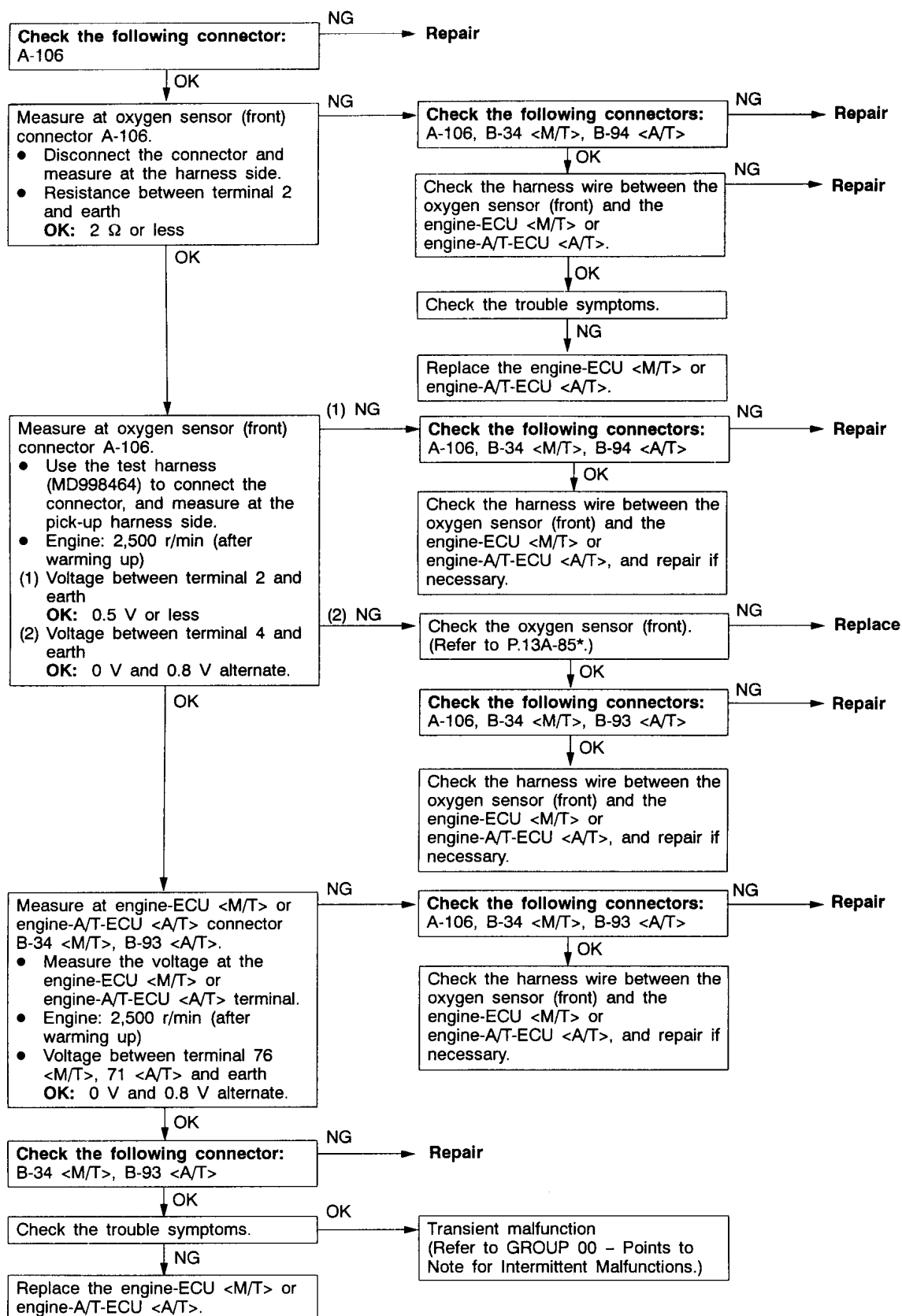
Code No. P0125 Feedback system	Probable cause
Range of Check • The engine coolant temperature is approx. 80°C or more. • During stoichiometric feedback control • The vehicle is not being decelerated. Set Conditions • Oxygen sensor (front) output voltage has been higher or lower than 0.5 V for at least 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 <M/T> • Malfunction of engine-A/T-ECU <A/T>



NOTE

*: Refer to the '96 COLT/LANCER Workshop Manual (Pub. No. PWME9511).

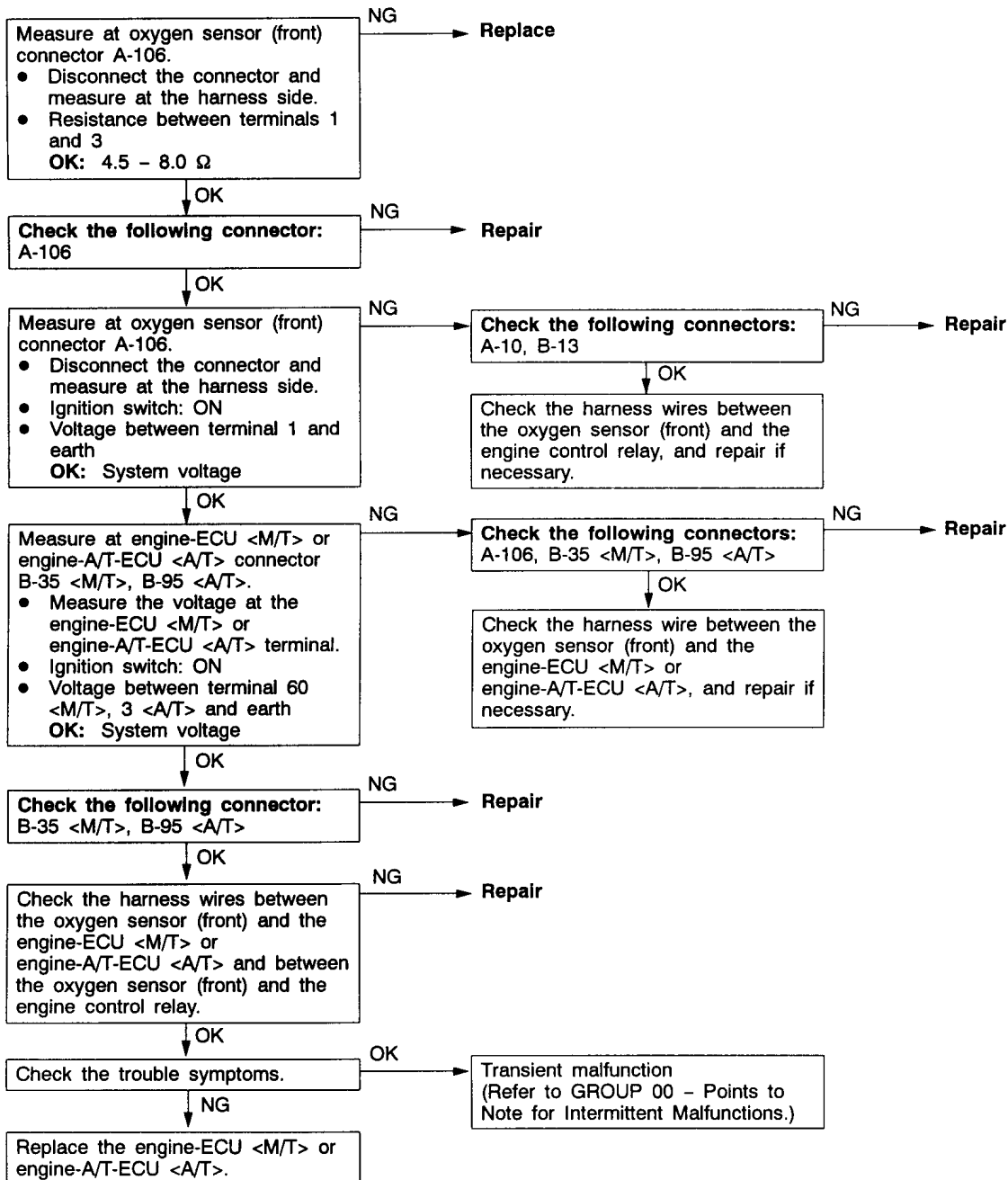
Code No. P0130 Oxygen sensor (front) system <sensor 1>	Probable cause
Range of Check • Three minutes have been passed since the engine has been started. • The engine coolant temperature is approx. 80°C or more. • Engine speed is 1,200 r/min or more • Driving on a level surface at constant speed. Set 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 <M/T> or engine-A/T-ECU <A/T>. 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.	• Malfunction of oxygen sensor (front) • Open or short circuit in the oxygen sensor (front) circuit or loose connector contact • Malfunction of engine-ECU <M/T> • Malfunction of engine-A/T-ECU <A/T>



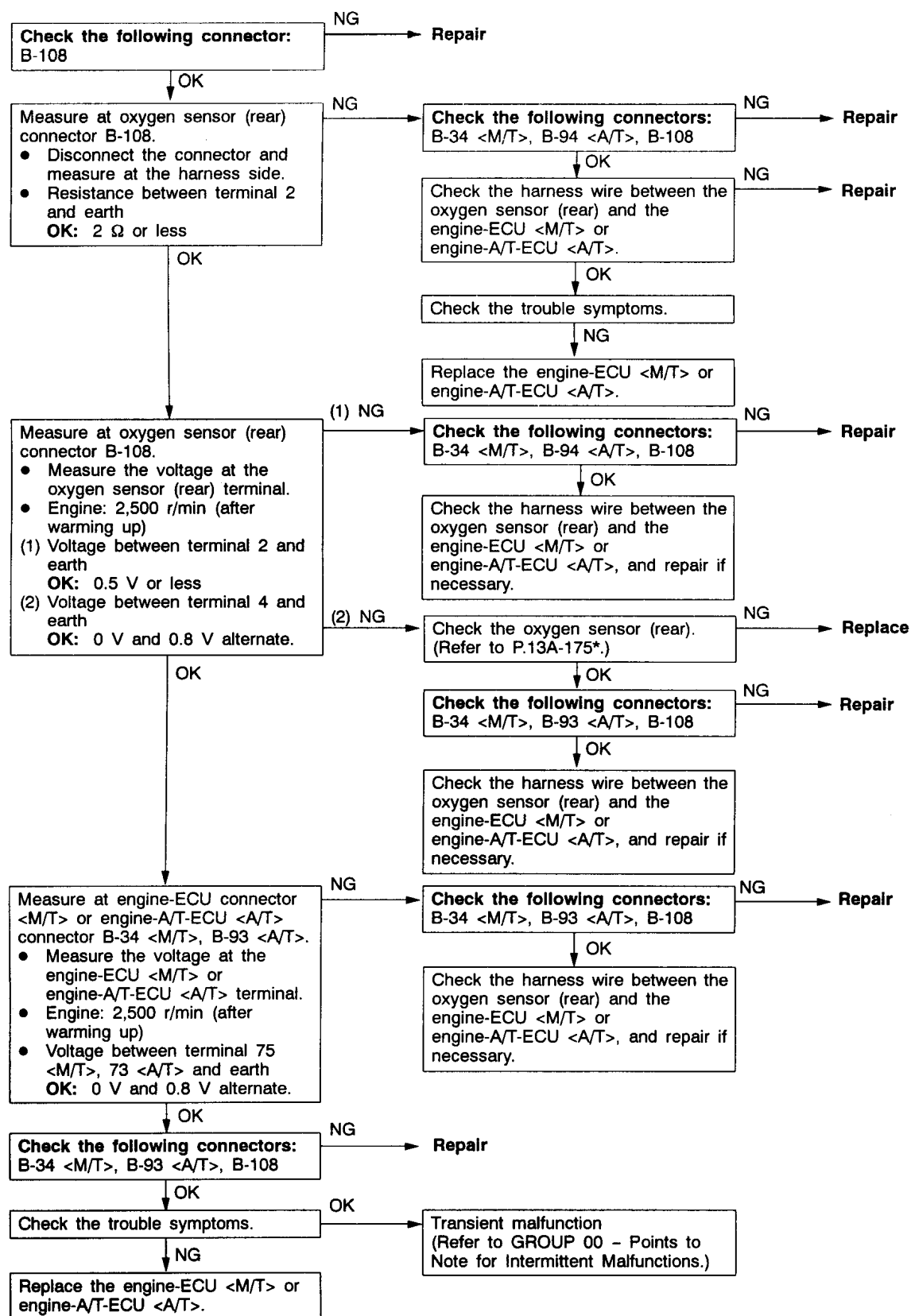
NOTE

*: Refer to the '96 COLT/LANCER Workshop Manual (Pub. No. PWME9511).

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 <M/T> - Malfunction of engine-A/T-ECU <A/T>

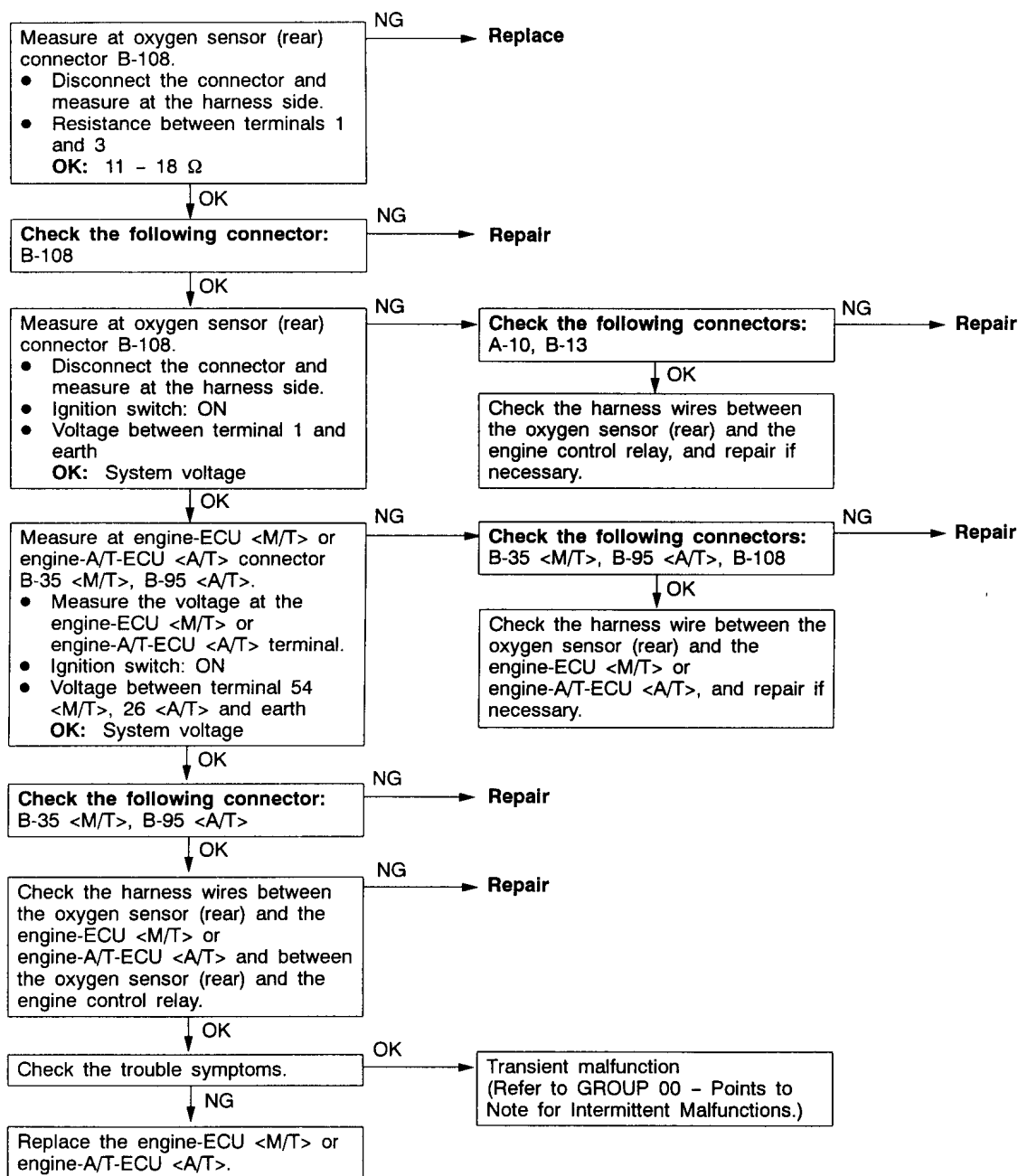


Code No. P0136 Oxygen sensor (rear) system <sensor 2>	Probable cause
Range of Check - Three minutes have been passed since the engine has been started. - The engine coolant temperature is approx. 80°C or more. - Intake air temperature is 20 – 50°C - Engine speed is 1,200 r/min or more - Driving on a 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 <M/T> or engine-A/T-ECU <A/T>. Range of Check - Two seconds have passed after the engine-ECU <M/T> or engine-A/T-ECU <A/T> 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.	- Malfunction of oxygen sensor (rear) - Open or short circuit in the oxygen sensor (rear) circuit or loose connector contact - Malfunction of engine-ECU <M/T> - Malfunction of engine-A/T-ECU <A/T>

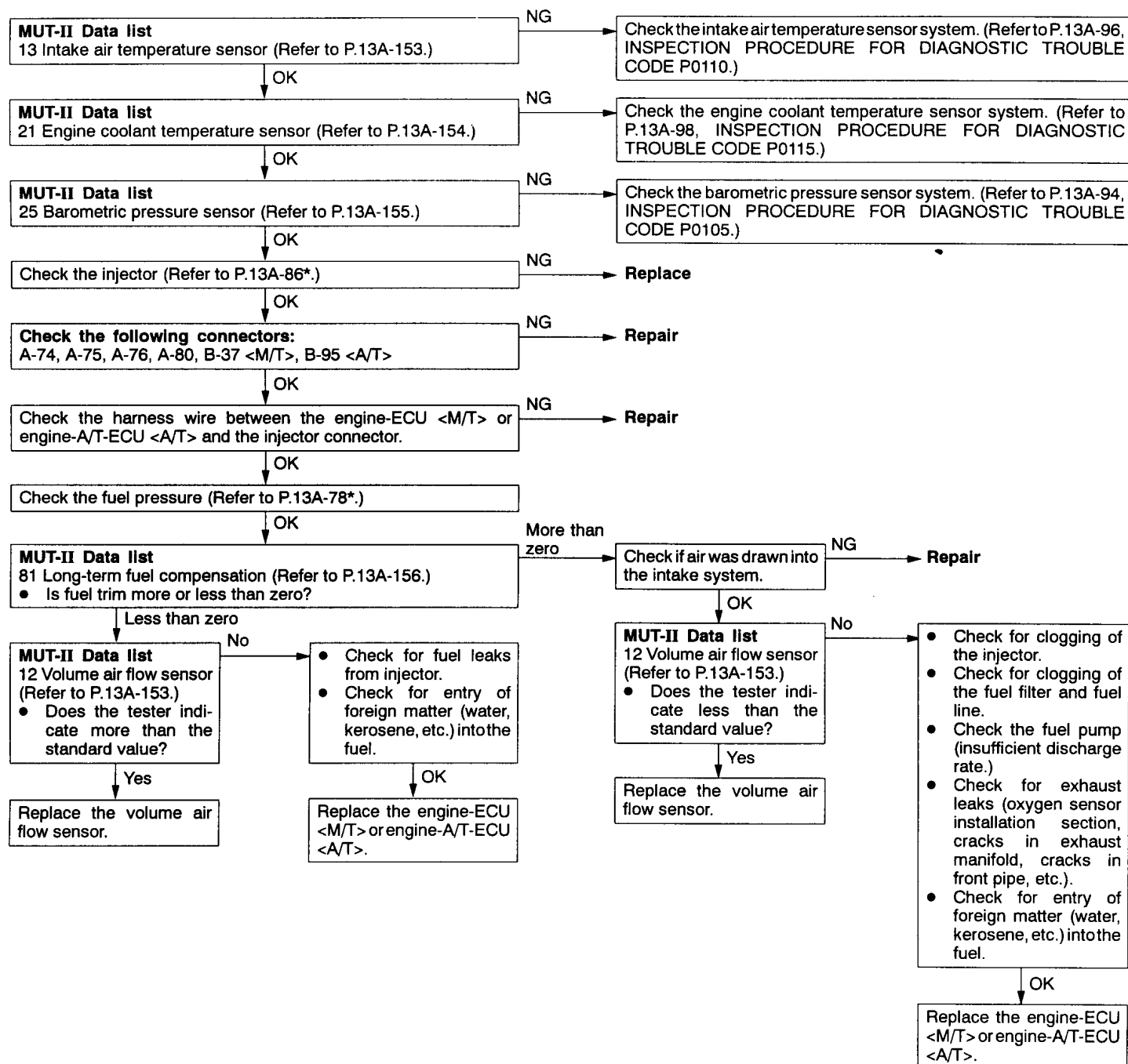
**NOTE**

*: Refer to the '96 COLT/LANCER Workshop Manual (Pub. No. PWME9511).

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 <M/T> - Malfunction of engine-A/T-ECU <A/T>



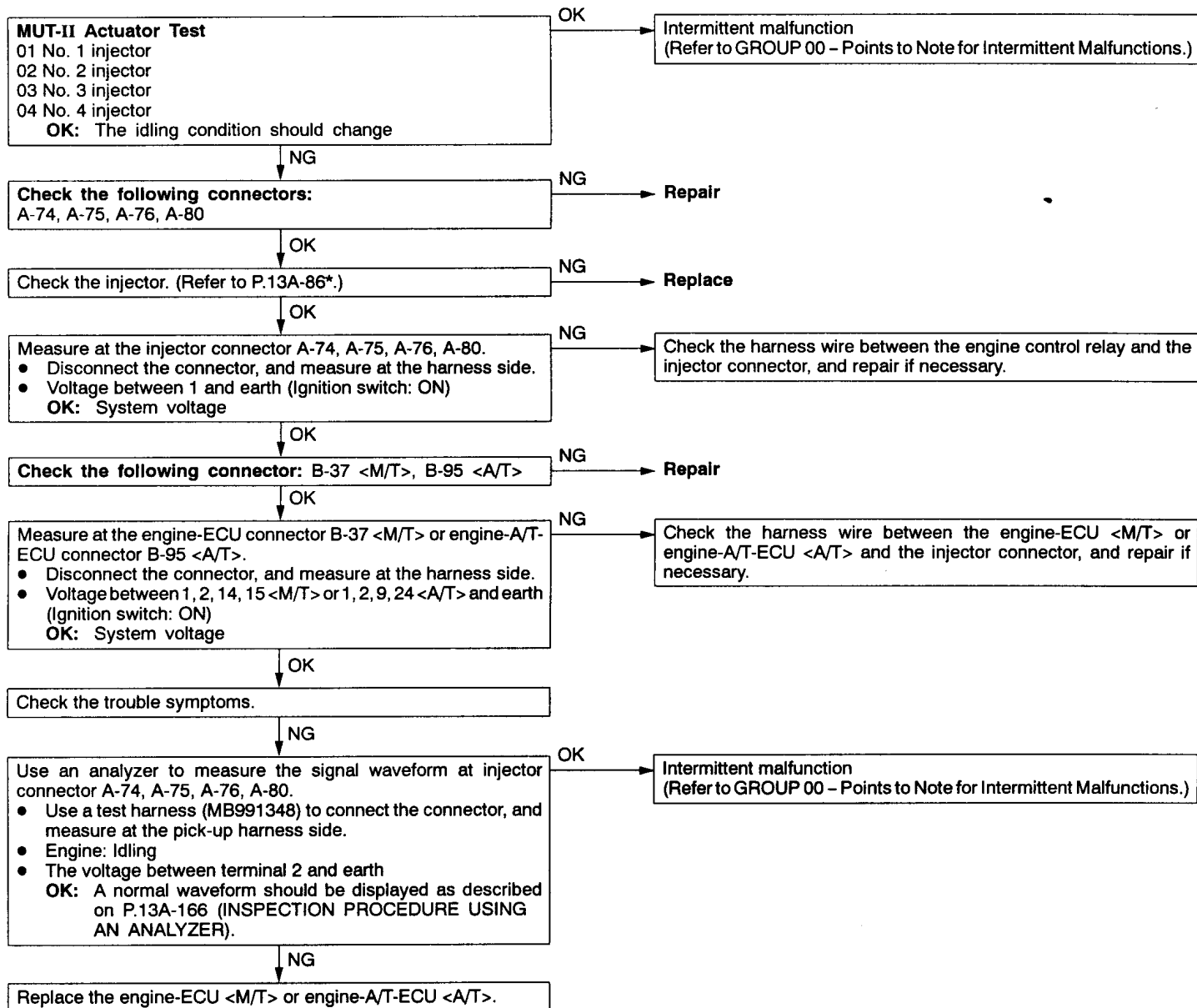
Code No. P0170 Abnormal fuel system	Probable cause
Range of Check • Engine: Being learning the air-fuel ratio Set Conditions • Ten seconds or more have been passed while the fuel injection amount compensation value is too low. or • Ten seconds or more have been passed while the fuel injection amount compensation value is too high.	• Incorrect fuel pressure • 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 <M/T> • Malfunction of engine-A/T-ECU <A/T>



NOTE

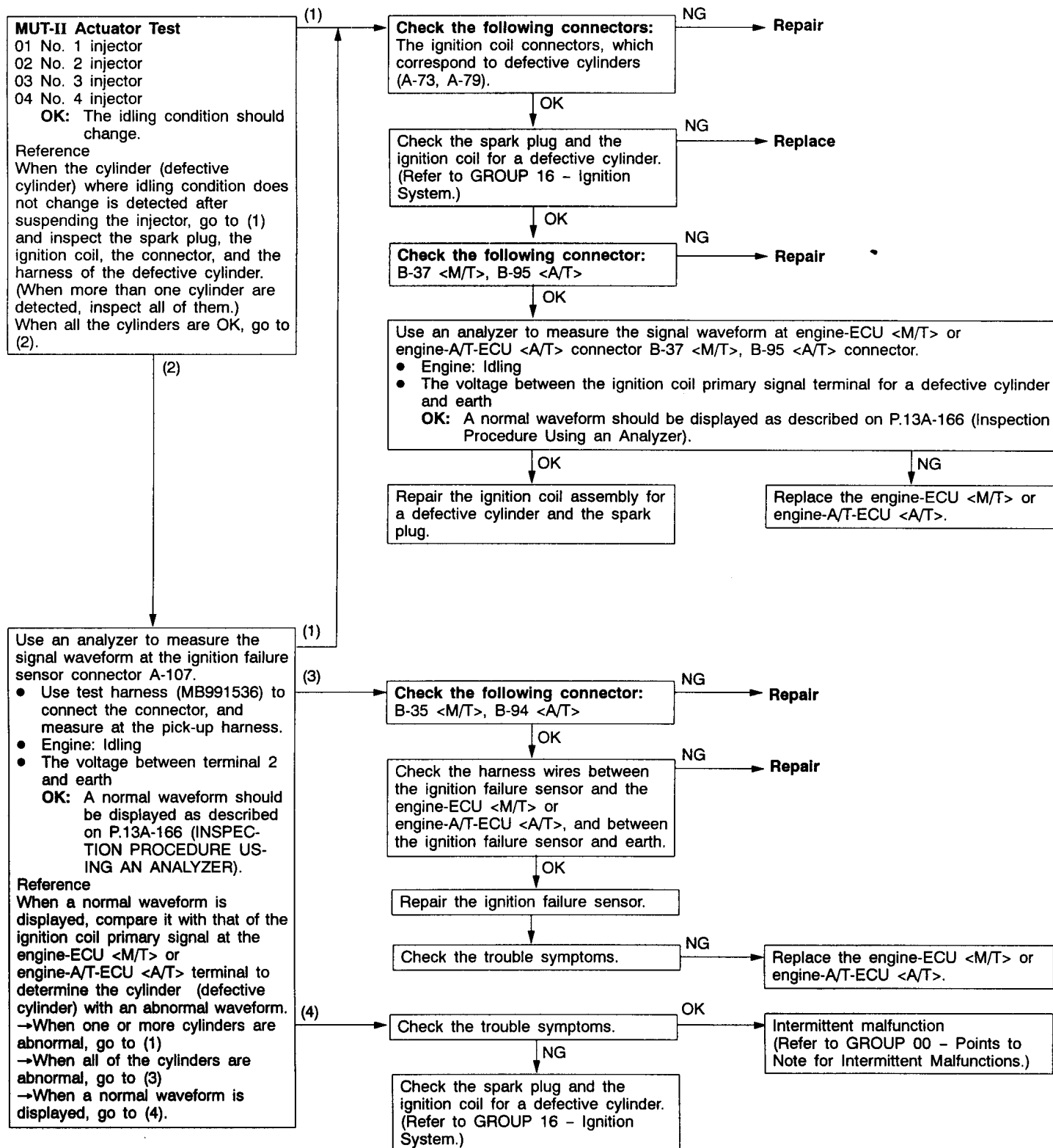
*: Refer to the '96 COLT/LANCER Workshop Manual (Pub. No. PWME9511).

Code No. P0201 No. 1 injector system Code No. P0202 No. 2 injector system Code No. P0203 No. 3 injector system Code No. P0204 No. 4 injector system	Probable cause
Range of Check - Engine speed is approx. 50 – 1,000 r/min - The throttle position sensor output voltage is 1.15 V or less. - Actuator test by MUT-II is not carried out. Set Conditions - Surge voltage of injector coil is not detected for 4 seconds.	- Malfunction of the injector - Improper connector contact, open circuit or short-circuited harness wire of the injector circuit - Malfunction of engine-ECU <M/T> - Malfunction of engine-A/T-ECU <A/T>

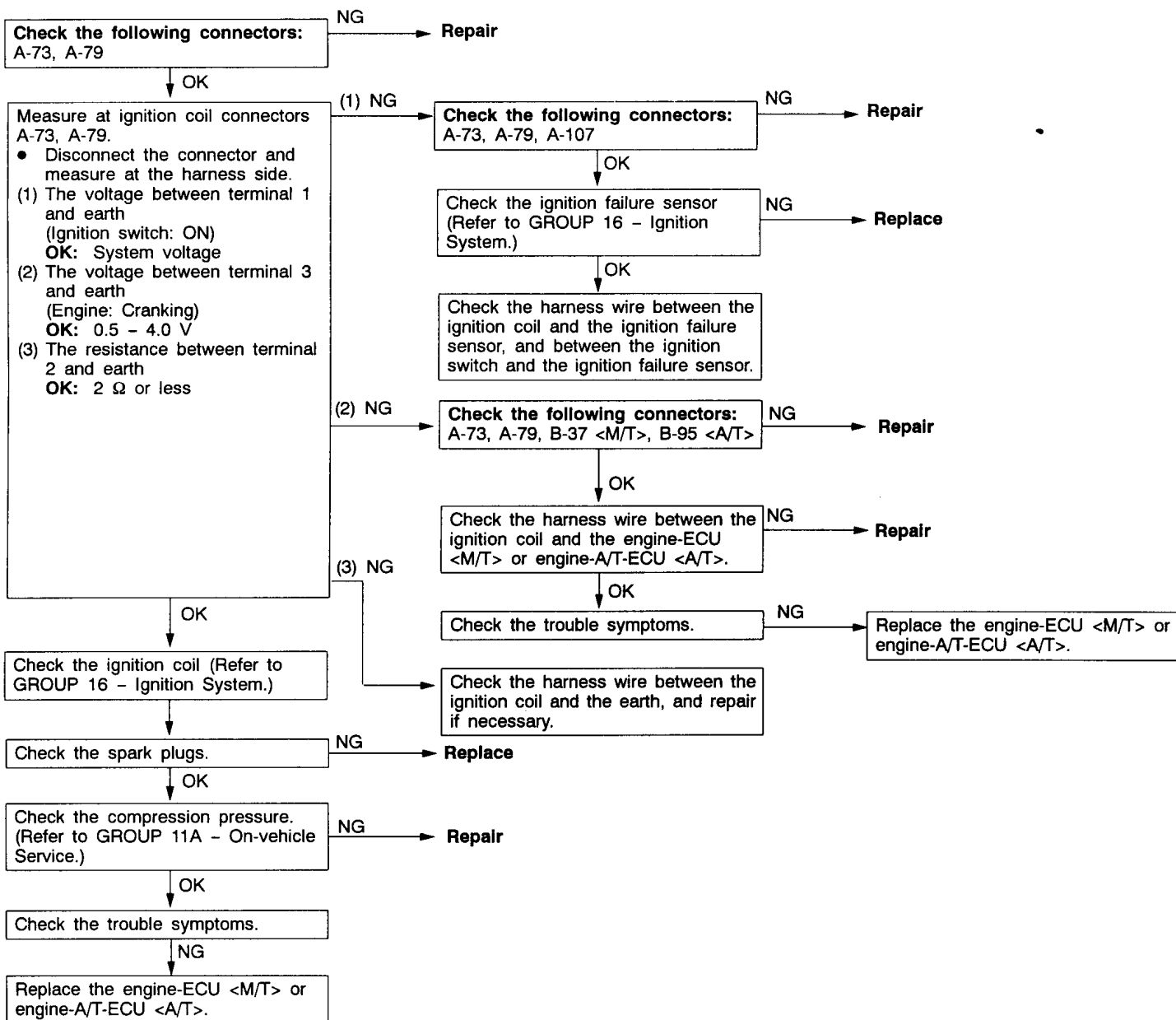
**NOTE**

*: Refer to the '96 COLT/LANCER Workshop Manual (Pub. No. PWME9511).

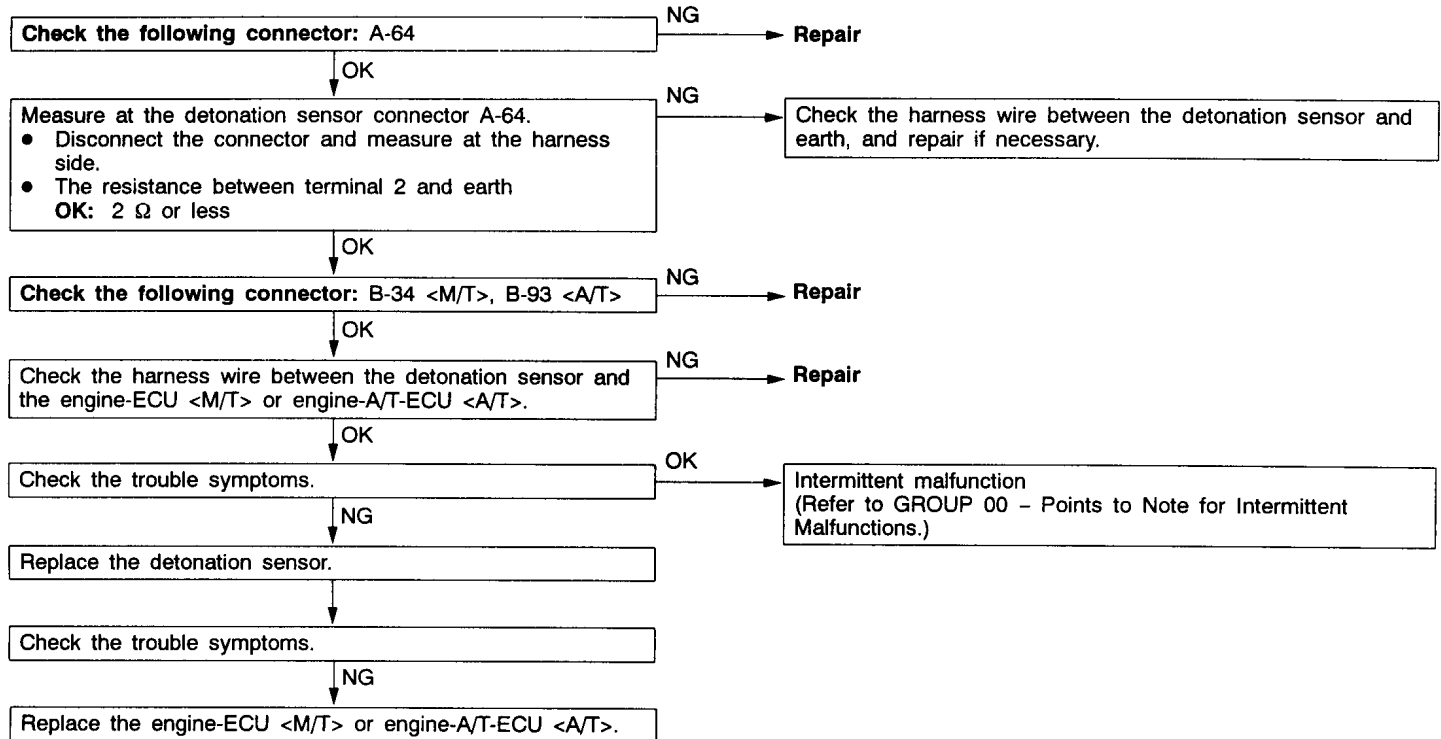
Code No. P0300 Ignition coil (power transistor) system	Probable cause
Range of Check • Engine speed is approx. 50 – 4,000 r/min. • Engine is not cranking. Set Conditions • The ignition failure sensor does not send a signal about a certain cylinder for four seconds.	• Malfunction of the ignition coil • 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 <M/T> • Malfunction of engine-A/T-ECU <A/T>



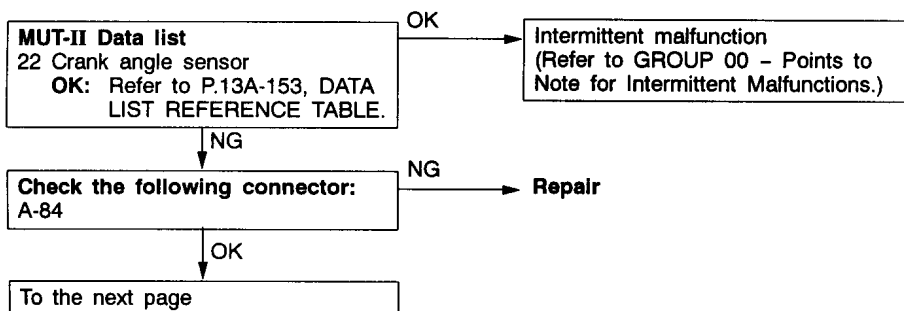
Code No. P0301 No. 1 cylinder misfire detected Code No. P0302 No. 2 cylinder misfire detected Code No. P0303 No. 3 cylinder misfire detected Code No. P0304 No. 4 cylinder misfire detected	Probable cause • Malfunction of the ignition system • Abnormal compression • Malfunction of injector • Malfunction of engine-ECU <M/T> • Malfunction of engine-A/T-ECU <A/T>
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).	

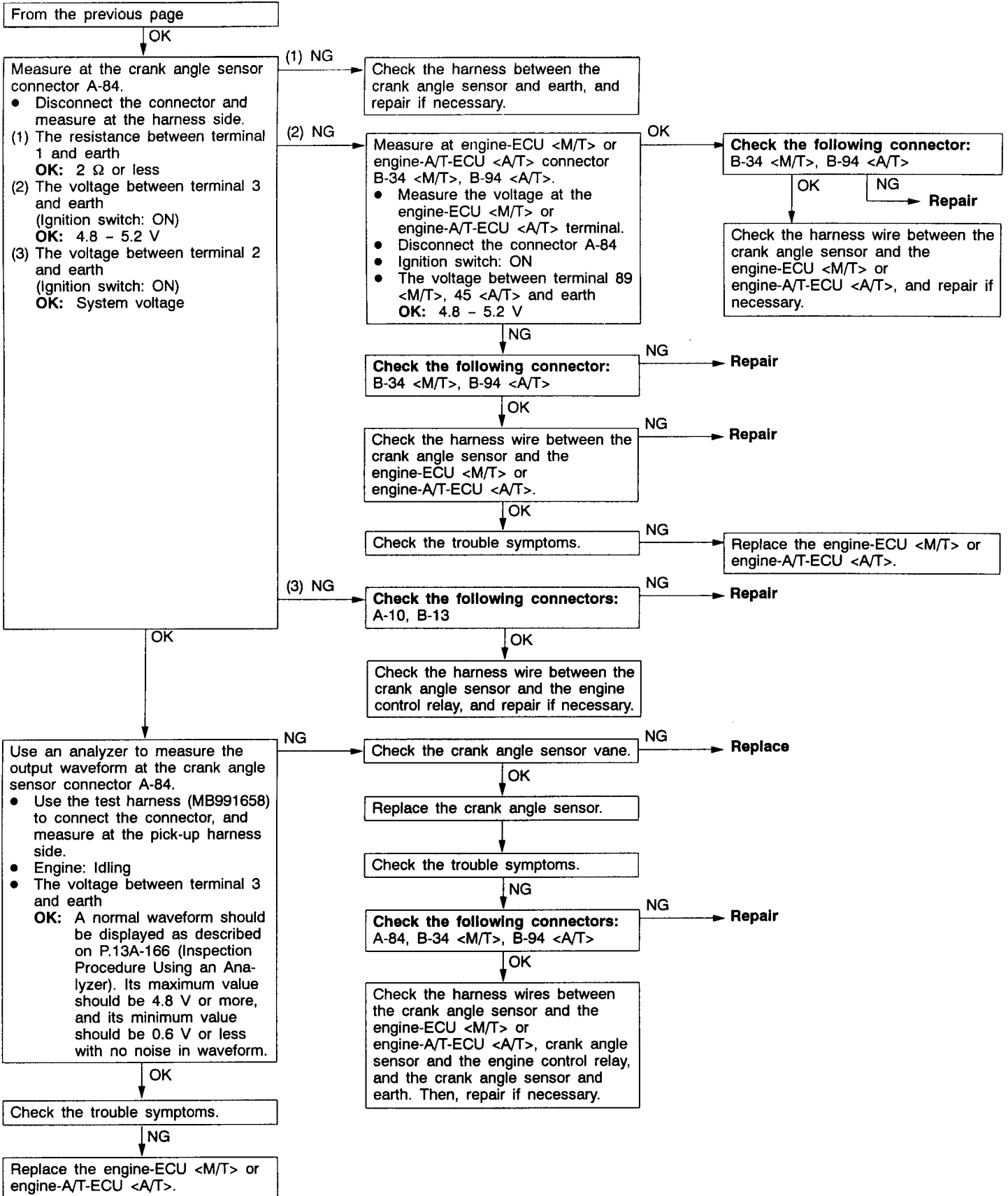


Code No. P0325 Detonation sensor system	Probable cause
Range of Check • Engine: Two seconds after the engine has been started Set Conditions • Changes in sensor output voltage (detonation sensor peak voltage per 1/2 crankshaft rotation) in 200 consecutive cycles are 0.08 V or less.	• Malfunction of the detonation sensor • Open or short circuit in the detonation sensor circuit or loose connector contact • Malfunction of engine-ECU <M/T> • Malfunction of engine-A/T-ECU <A/T>

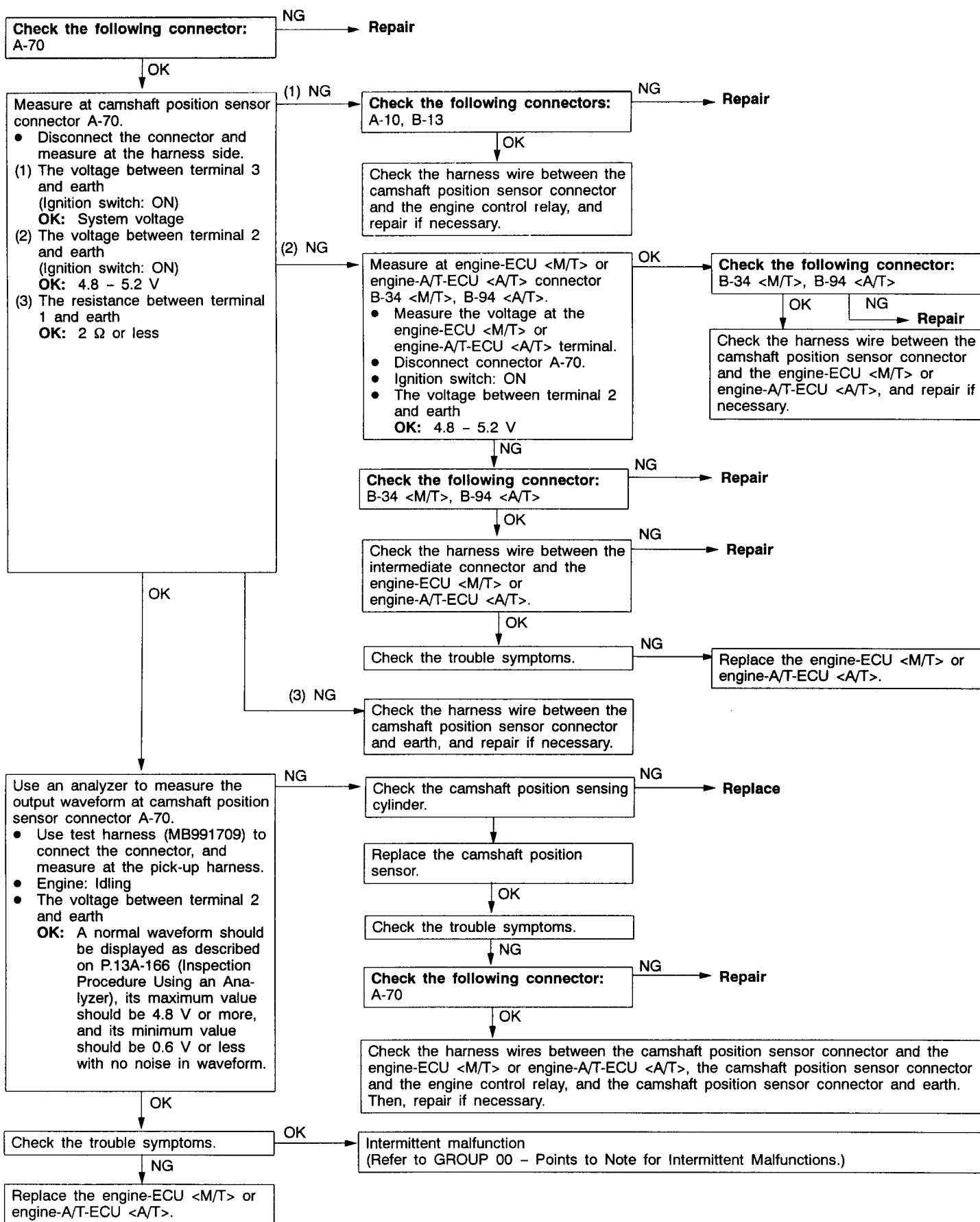


Code No. P0335 Crank angle sensor system	Probable cause
Range of Check • Engine is cranking Set Conditions • Sensor output voltage does not change for 4 seconds (no pulse signal input).	• Malfunction of the crank angle sensor. • Open or short circuit in the crank angle sensor circuit or loose connector contact. • Malfunction of engine-ECU <M/T> • Malfunction of engine-A/T-ECU <A/T>

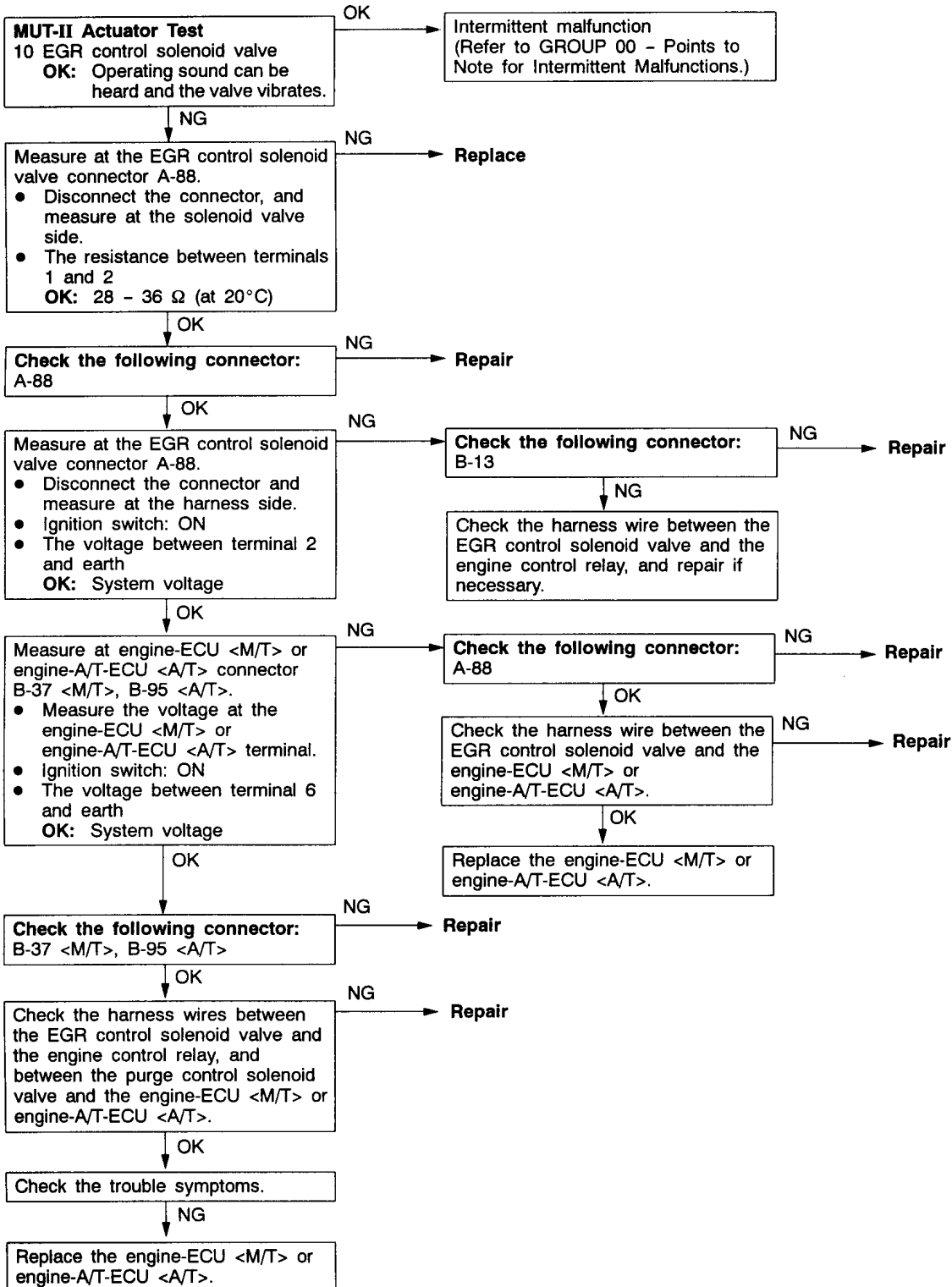




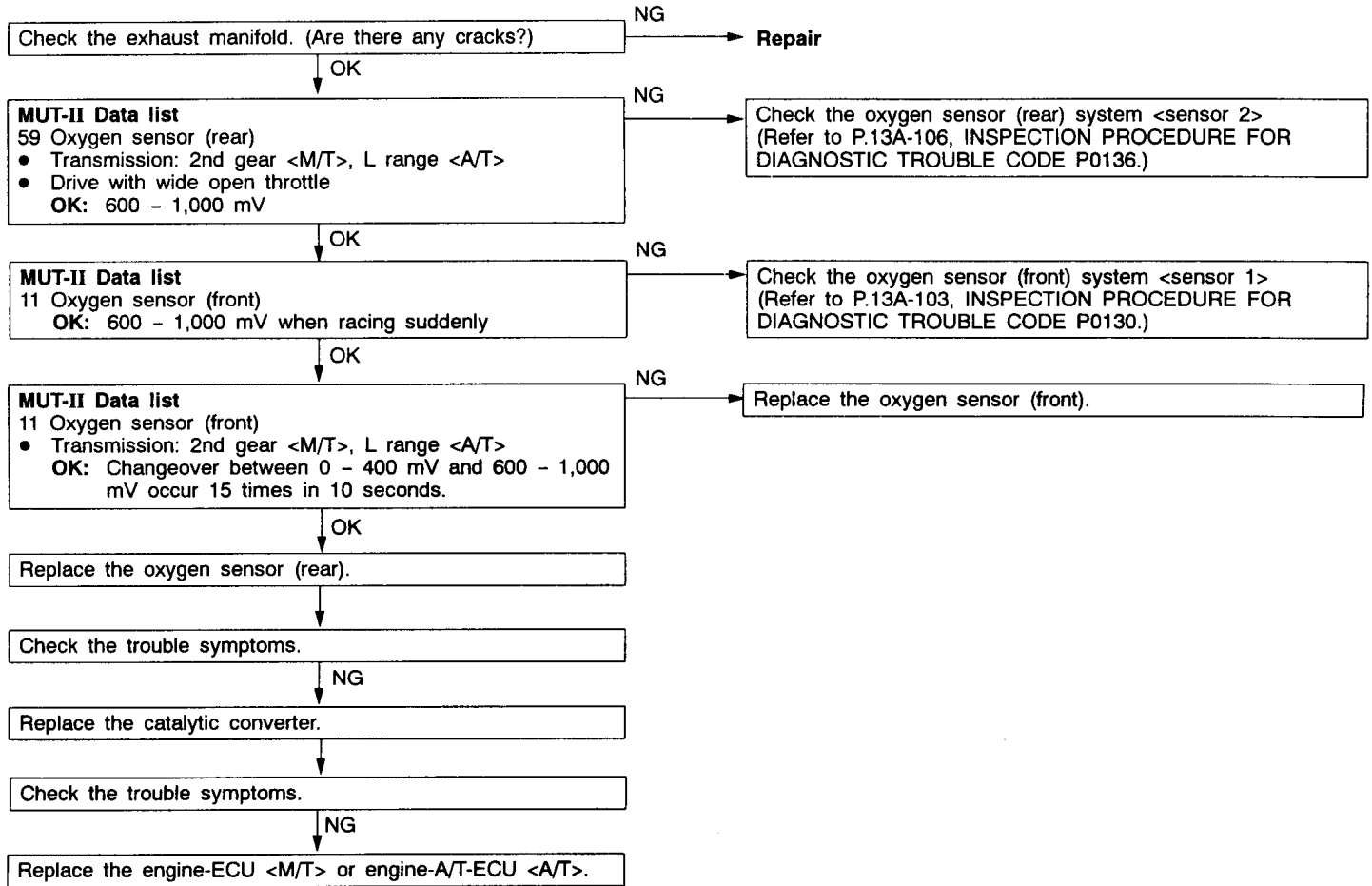
Code No. P0340 Camshaft position sensor system	Probable cause
Range of Check • After the engine was started Set Conditions • The sensor output voltage does not change for 4 seconds (no pulse signal input).	• Malfunction of the camshaft position sensor • Open or short circuit in the camshaft position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



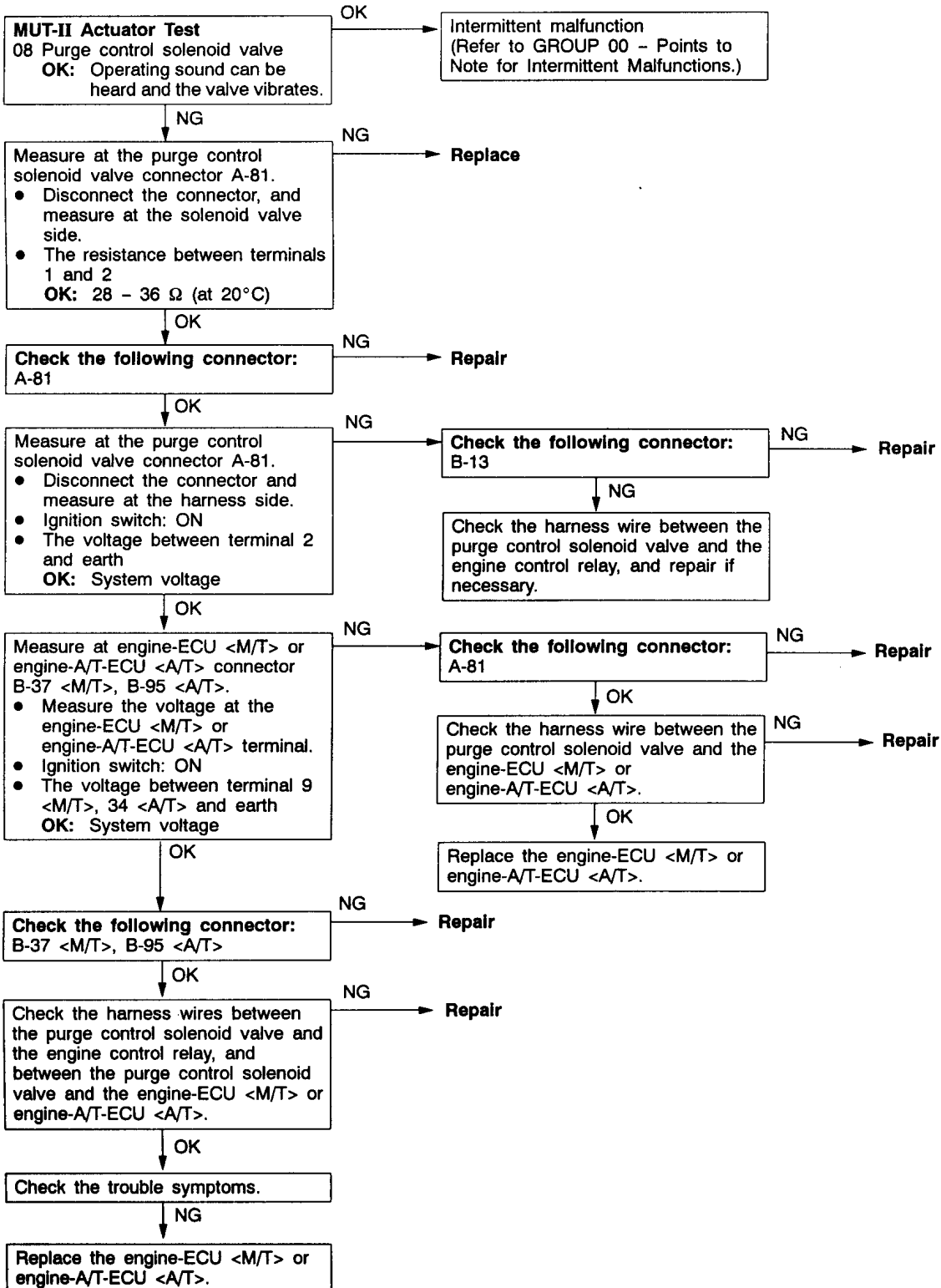
Code No. P0403 EGR control solenoid valve system	Probable cause
Range of Check • Ignition switch: ON • Battery voltage is 10 V or more. Set Conditions • The solenoid coil surge voltage (battery voltage + 2 V) is not detected when the purge control solenoid valve is turned from on to off.	• Malfunction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



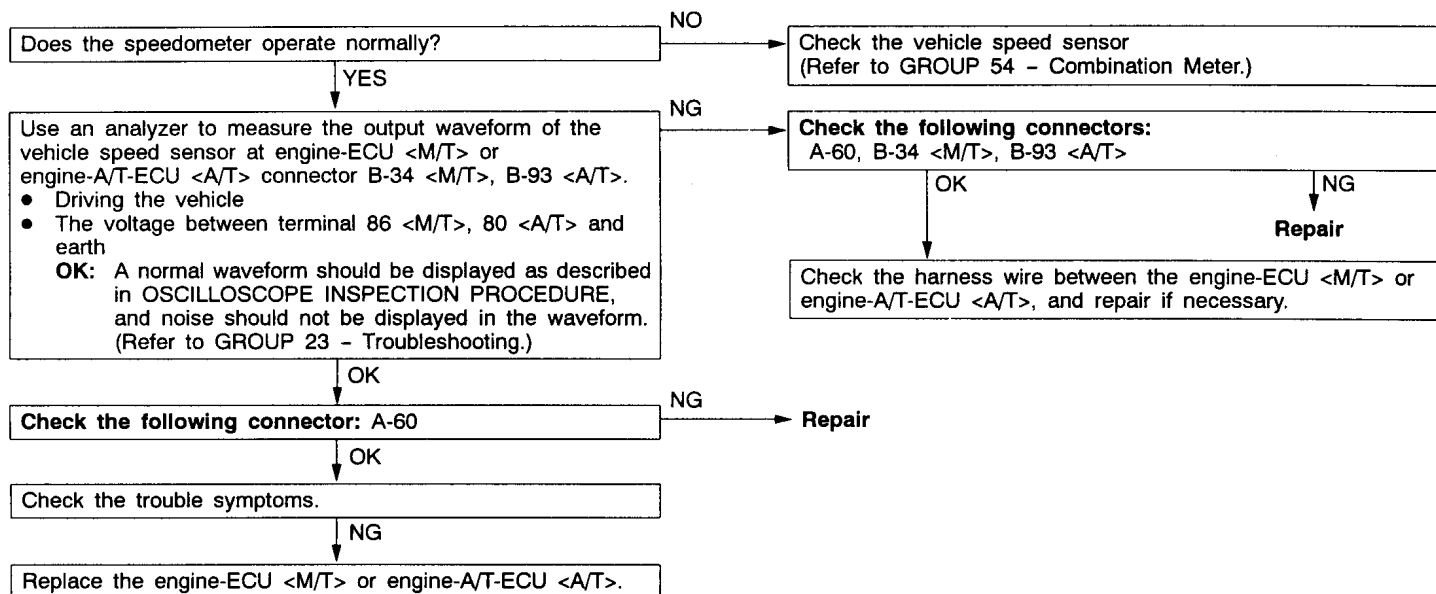
Code No. P0420 Catalyst malfunction	Probable cause
Range of Check • The engine speed is 3,000 r/min or less. • During driving • During air/fuel ratio feedback control Set Conditions • The ratio between the oxygen sensor (rear) and the oxygen sensor (front) output frequencies reaches 0.8 per 12 seconds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



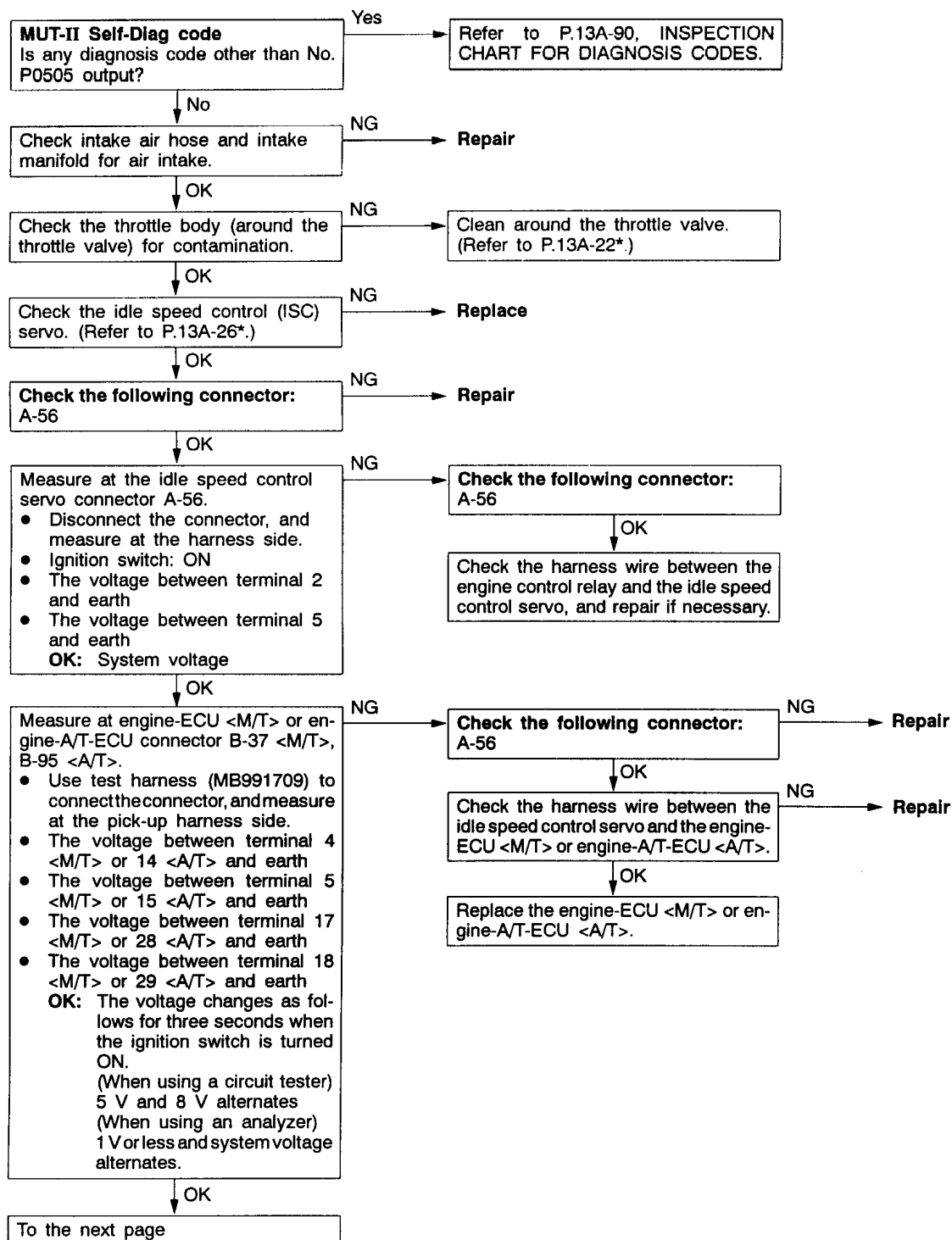
Code No. P0443 Purge control solenoid valve system	Probable cause
Range of Check - Ignition switch: ON - Battery voltage is 10 V or more. Set Conditions - The solenoid coil surge voltage (battery voltage + 2 V) is not detected when the purge control solenoid valve is turned from on to off.	- Malfunction 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 <M/T> - Malfunction of engine-A/T-ECU <A/T>

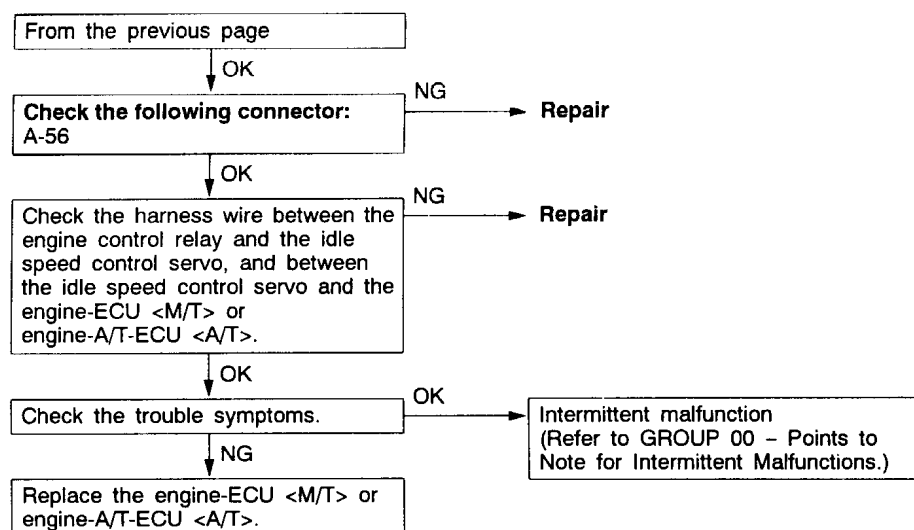


Code No. P0500 Vehicle speed sensor system	Probable cause
Range of Check - Engine: Two seconds after the engine was started - Idle switch: OFF - Engine speed: 2,500 r/min or more - During high engine load Set Conditions - The sensor output voltage does not change for 4 seconds (no pulse signal input).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



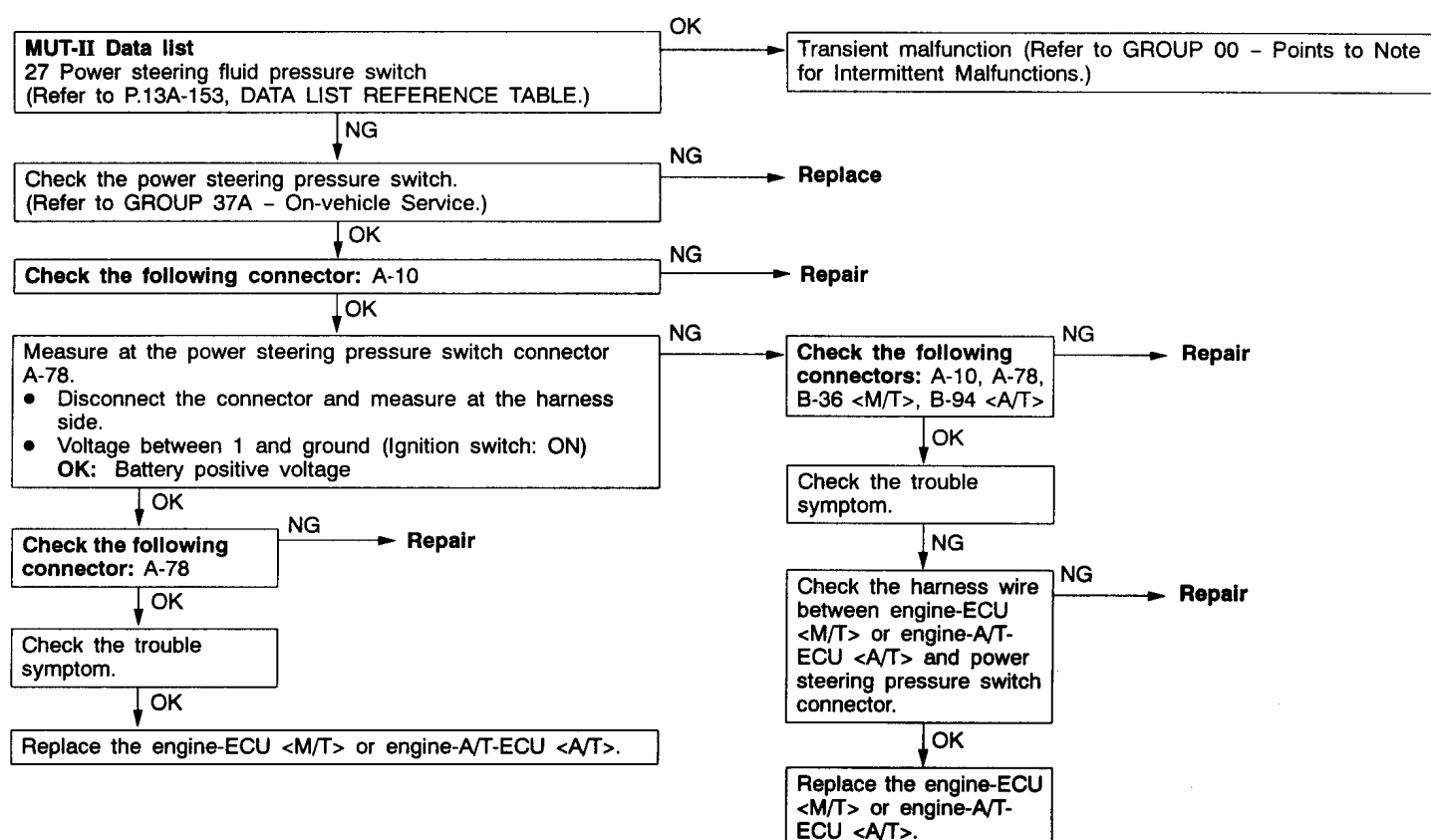
Code No. P0505 Idle speed control (ISC) system	Probable cause
Check Area - Vehicle speed has reached 1.5 km/h at least once. - Under the closed loop idle speed control. Judgment Criteria - Actual idle speed has continued to be higher than the target idle speed by 300 r/min or more for 10 sec. Check Area - Vehicle speed has reached 1.5 km/h at least once. - During idle speed closed loop control. - The highest temperature at the last drive is 45°C or less. - Engine coolant temperature is approx. 80°C or more. - Battery voltage is 10 V or more. - Intake air temperature is -10°C or more. Judgment Criteria - Actual idle speed has been minimum 200 r/min higher than the target idle speed for ten seconds. Check Area - During idle speed closed loop control. - Engine coolant temperature is about 80°C or higher. - Battery voltage is 10 V or higher. - Power steering switch is off. - Intake air pip pressure is 53 kPa or less. - Intake air temperature is -10°C or more. Judgment Criteria - Actual idle speed has been minimum 100 r/min higher than the target idle speed for ten seconds.	- Malfunction of idle speed control (ISC) servo - Improper connector contact, open circuit or short-circuit harness wire - Malfunction of engine-ECU <M/T> - Malfunction of engine-A/T-ECU <A/T>



**NOTE**

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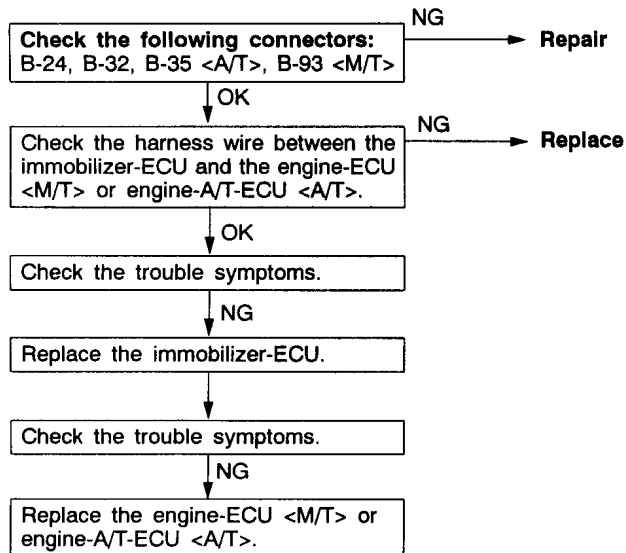
Code No. P0551 Power Steering fluid Pressure Switch System	Probable cause
Check Area - Intake air temperature is -10°C or higher. - Barometric pressure is 76 kPa or higher. - Engine coolant temperature is 30°C or more. - Repeat *1 drive and *2 stop ten times or more. *1: Engine speed is 2,500 r/min or higher, volumetric efficiency is 55 % or higher and vehicle speed is 5 km/h or higher for 4 seconds or more. *2: Vehicle speed is 1.5 km/h or lower. Judgment Criteria - Power steering pressure switch remains on.	- Power steering fluid pressure switch failed. - Open or shorted power steering fluid pressure switch circuit or loose connector - Malfunction of engine-ECU <M/T> - Malfunction of engine-A/T-ECU <A/T>



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

NOTE

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



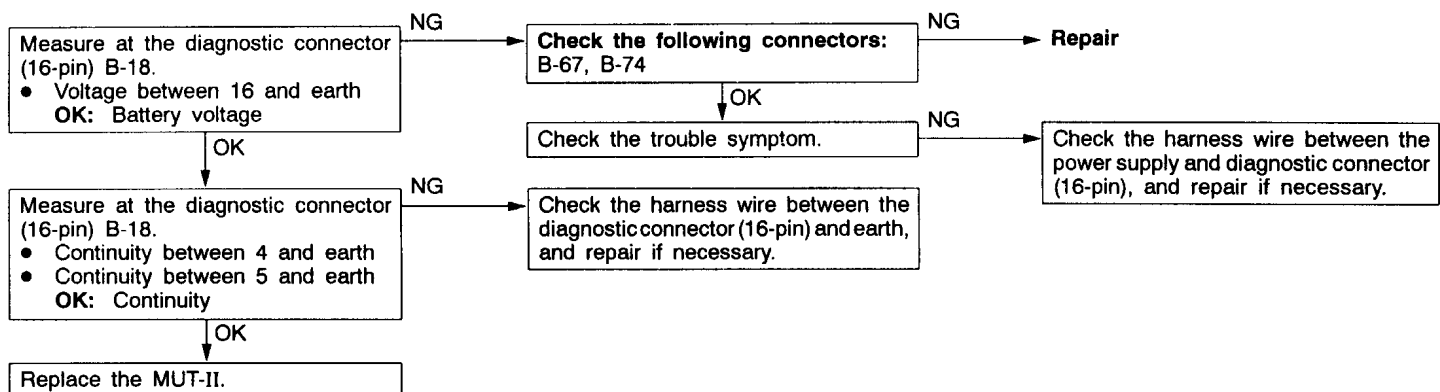
INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom		Inspection procedure No.	Reference page
Communication with MUT-II is impossible.	Communication with all systems is not possible.	1	13A-126
	Communication with engine-ECU <M/T> or engine-A/T-ECU <A/T> only is not possible.	2	13A-126
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-127
	The engine warning lamp remains illuminating and never goes out.	4	13A-127
Starting	No initial combustion (starting impossible)	5	13A-128
	Initial combustion but no complete combustion (starting impossible)	6	13A-129
	Long time to start (improper starting)	7	13A-130
Idling stability (Improper idling)	Unstable idling (Rough idling, hunting)	8	13A-131
	Idling speed is high. (Improper idling speed)	9	13A-133
	Idling speed is low. (Improper idling speed)	10	13A-133
Idling stability (Engine stalls)	When the engine is cold, it stalls at idling. (Die out)	11	13A-134
	When the engine becomes hot, it stalls at idling. (Die out)	12	13A-135
	The engine stalls when starting the car. (Pass out)	13	13A-137
	The engine stalls when decelerating.	14	13A-137
Driving	Hesitation, sag or stumble	15	13A-138
	The feeling of impact or vibration when accelerating	16	13A-139
	The feeling of impact or vibration when decelerating	17	13A-139
	Poor acceleration	18	13A-140
	Surge	19	13A-142
	Knocking	20	13A-143
Dieseling		21	13A-143
Too high CO and HC concentration when idling		22	13A-144
Idling speed is improper when A/C is operating		23	13A-145
Fans (radiator fan, A/C condensor fan) are inoperative		24	13A-146

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

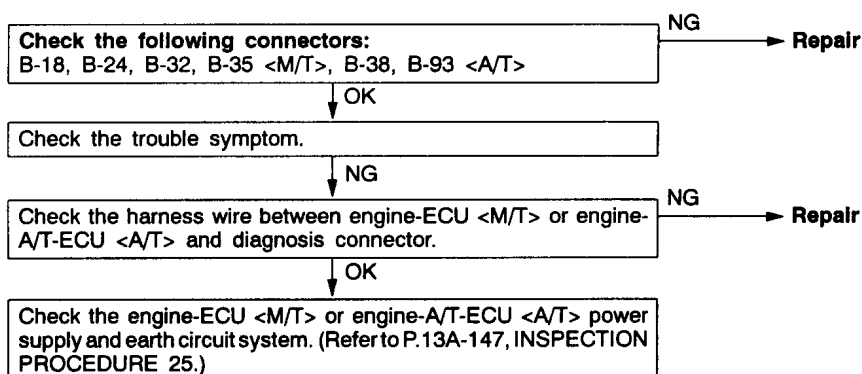
INSPECTION PROCEDURE 1

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



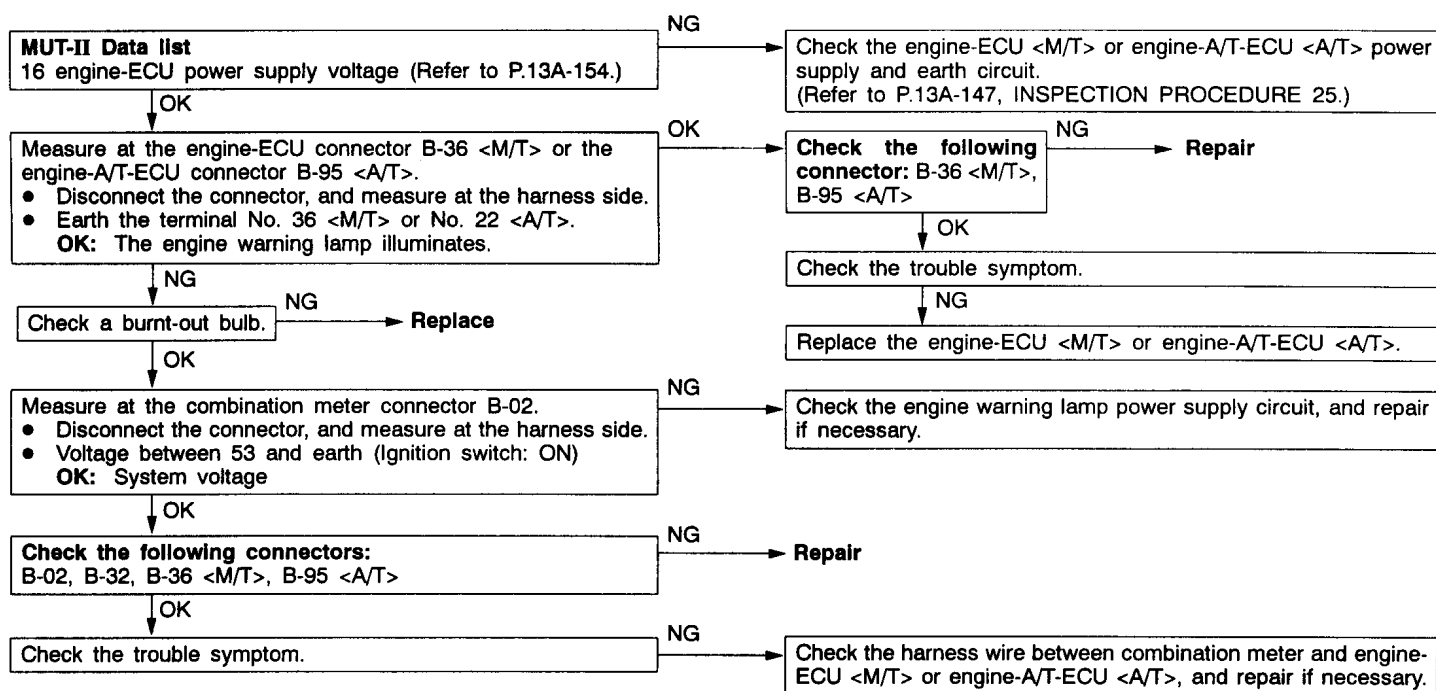
INSPECTION PROCEDURE 2

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



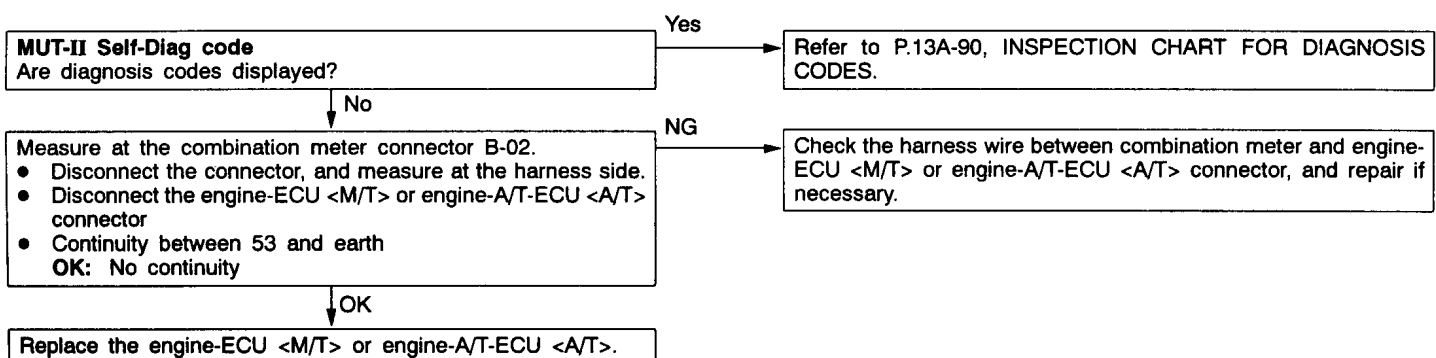
INSPECTION PROCEDURE 3

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> or engine-A/T-ECU <A/T>



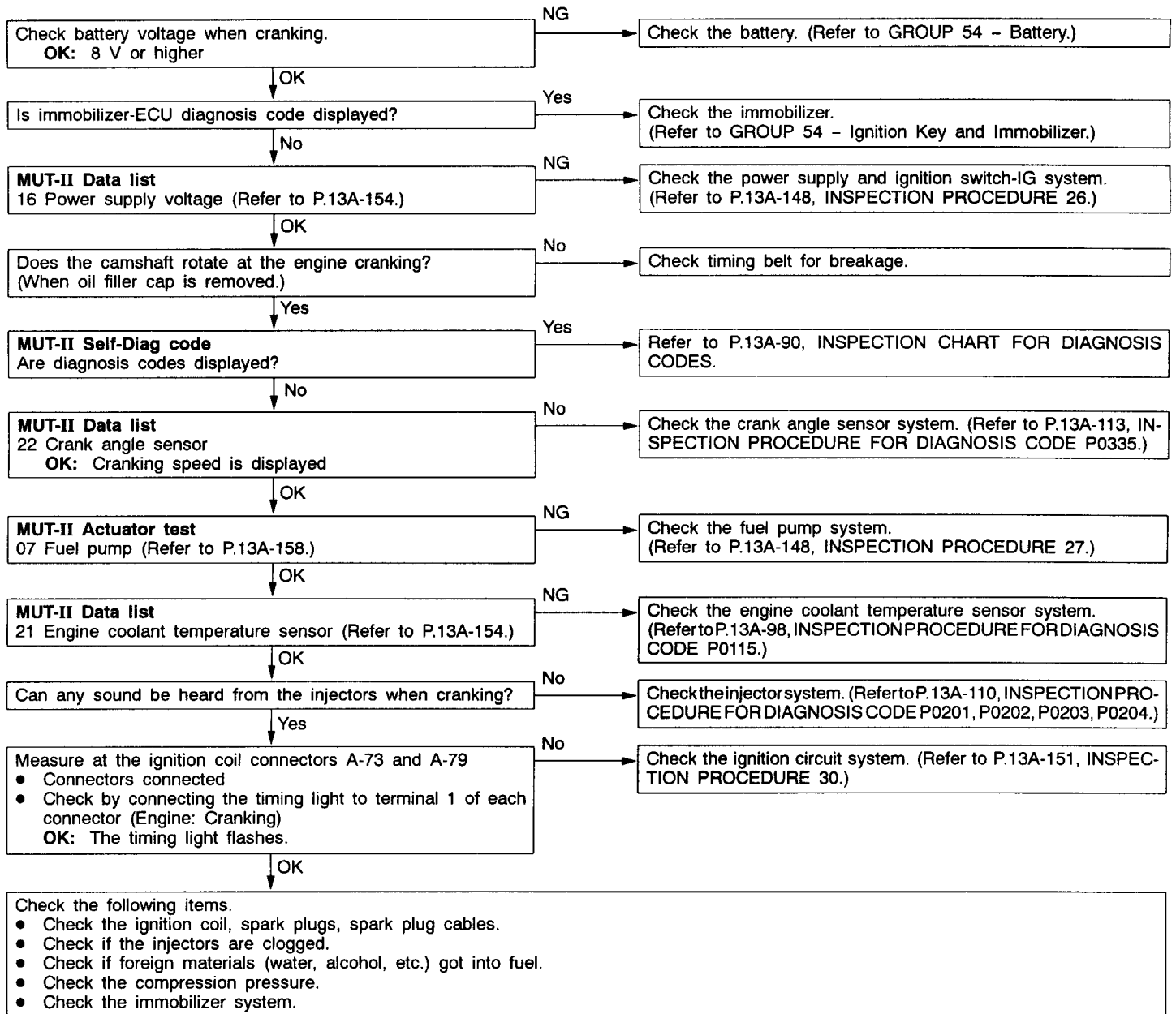
INSPECTION PROCEDURE 4

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 <M/T> or engine-A/T-ECU <A/T> is detecting a problem in a sensor or actuator, or that one of the malfunctions listed at right has occurred.	- Short-circuit between the engine warning lamp and engine-ECU <M/T> or engine-A/T-ECU <A/T> - Malfunction of the engine-ECU <M/T> or engine-A/T-ECU <A/T>



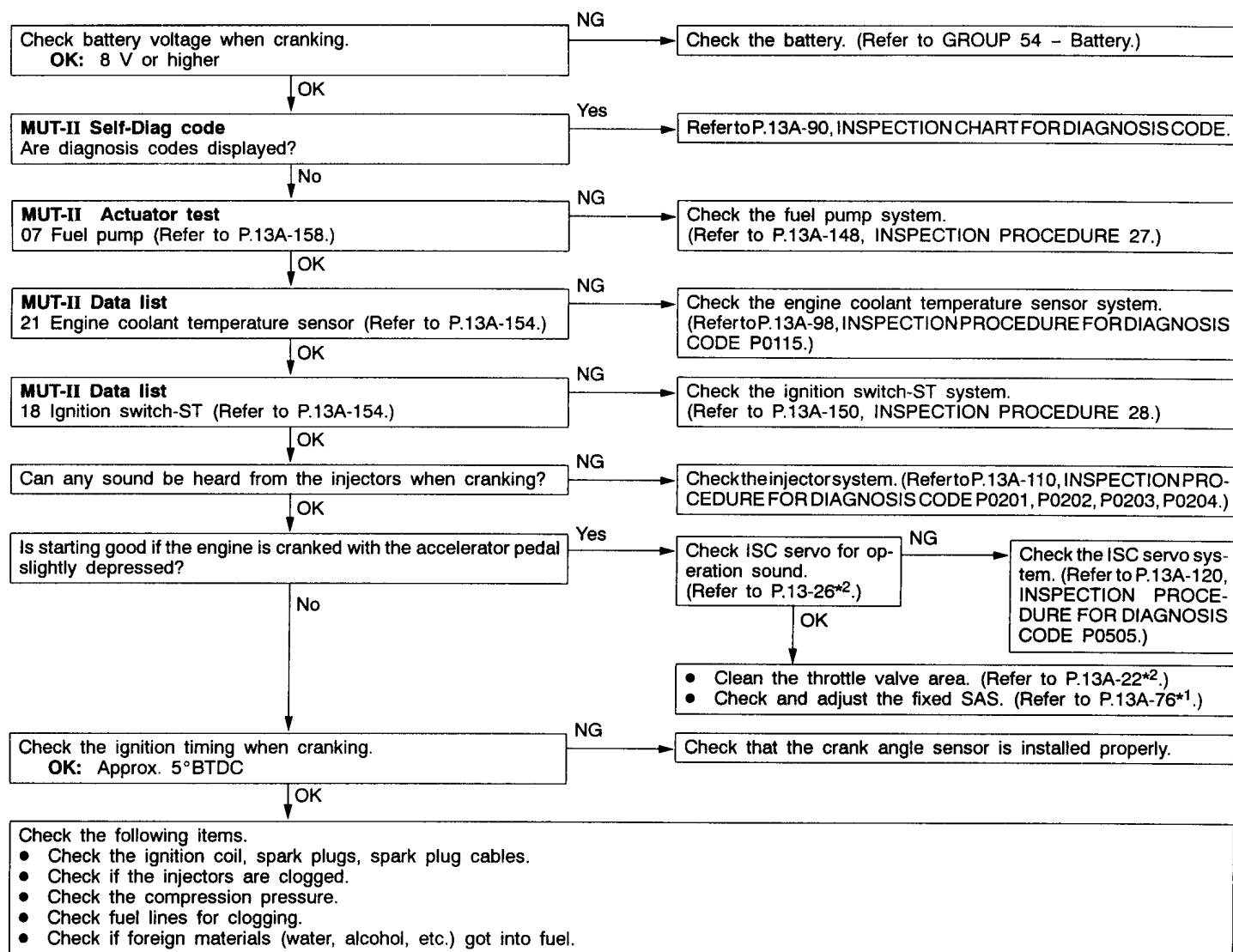
INSPECTION PROCEDURE 5

No initial combustion (starting impossible)	Probable cause
In cases such as the above, the cause is probably that a spark plug is defective, or that the supply of fuel to the combustion chamber is defective. In addition, foreign materials (water, kerosene, etc.) may be mixed with the fuel.	• Malfunction of the ignition system • Malfunction of the fuel pump system • Malfunction of the injectors • Malfunction of the engine-ECU <M/T> or engine-A/T-ECU <A/T> • Malfunction of the immobilizer system • Foreign materials in fuel



INSPECTION PROCEDURE 6

Initial combustion but no complete combustion (starting impossible)	Probable cause
In such cases as the above, the cause is probably that the spark plugs are generating sparks but the sparks are weak, or the initial mixture for starting is not appropriate.	• Malfunction of the ignition system • Malfunction of the injector system • Foreign materials in fuel • Poor compression • Malfunction of the engine-ECU <M/T> or engine-A/T-ECU <A/T>



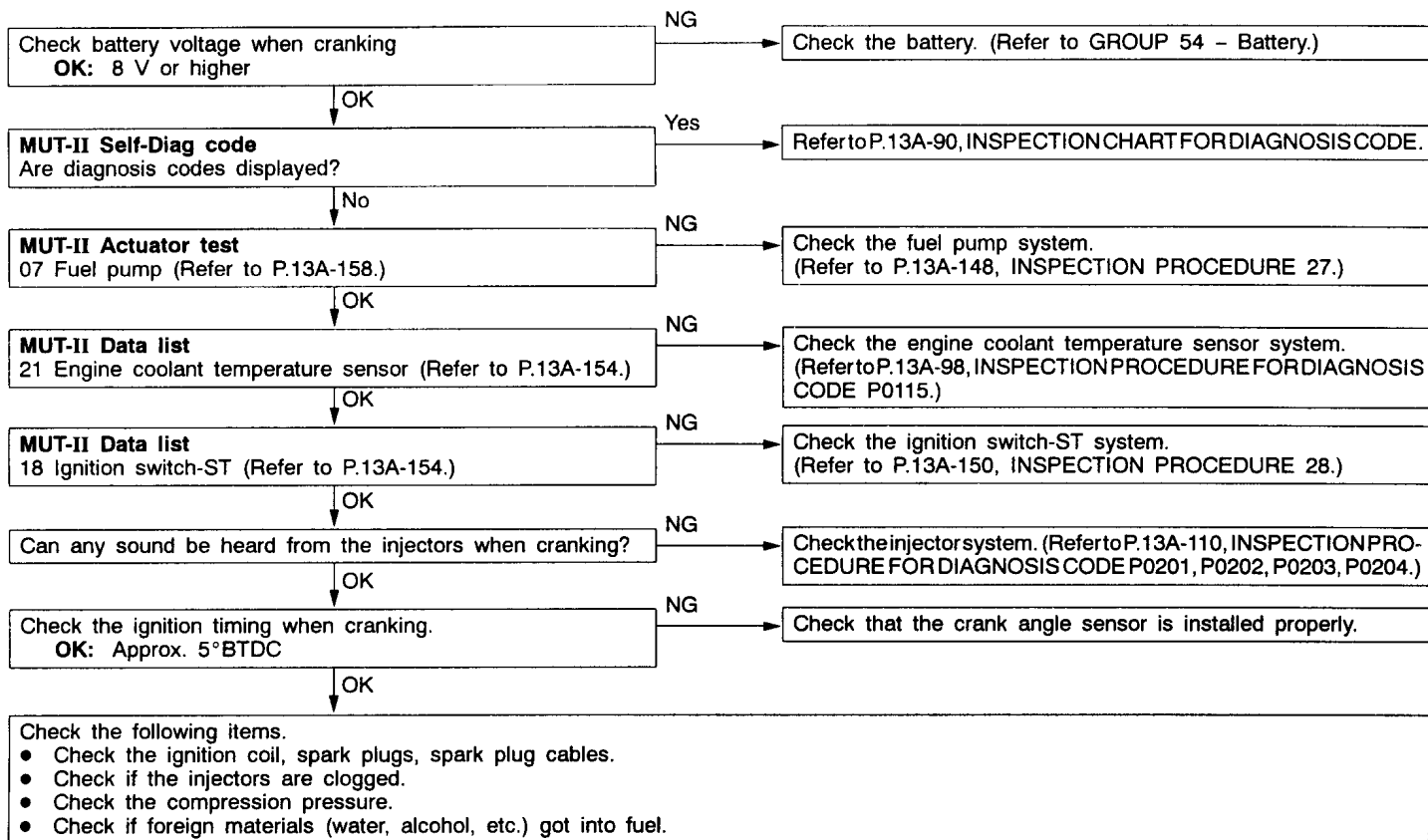
NOTE

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*2: Refer to the 2000 COLT/LANCER Workshop Manual (Pub. No. PWME9511-B).

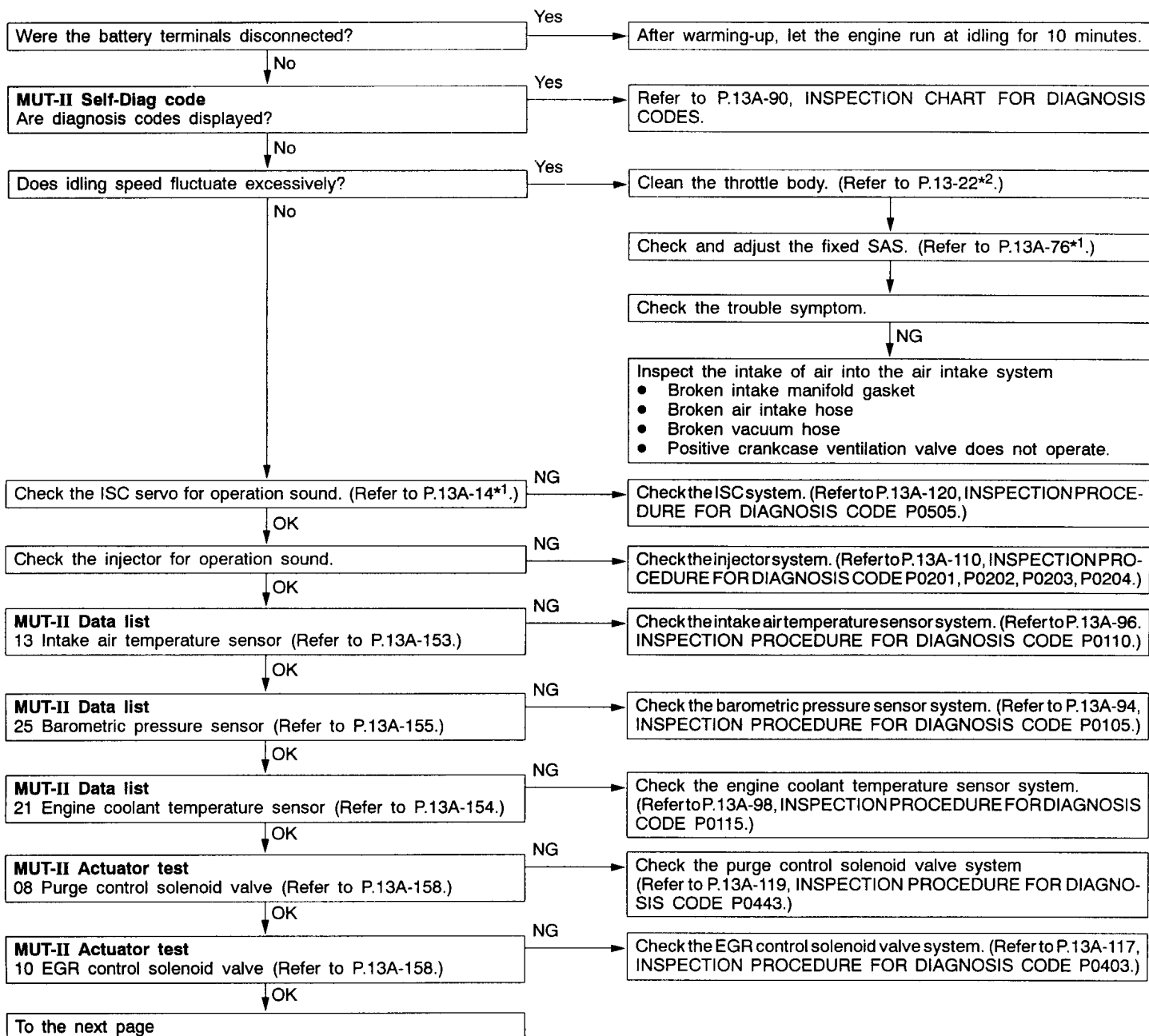
INSPECTION PROCEDURE 7

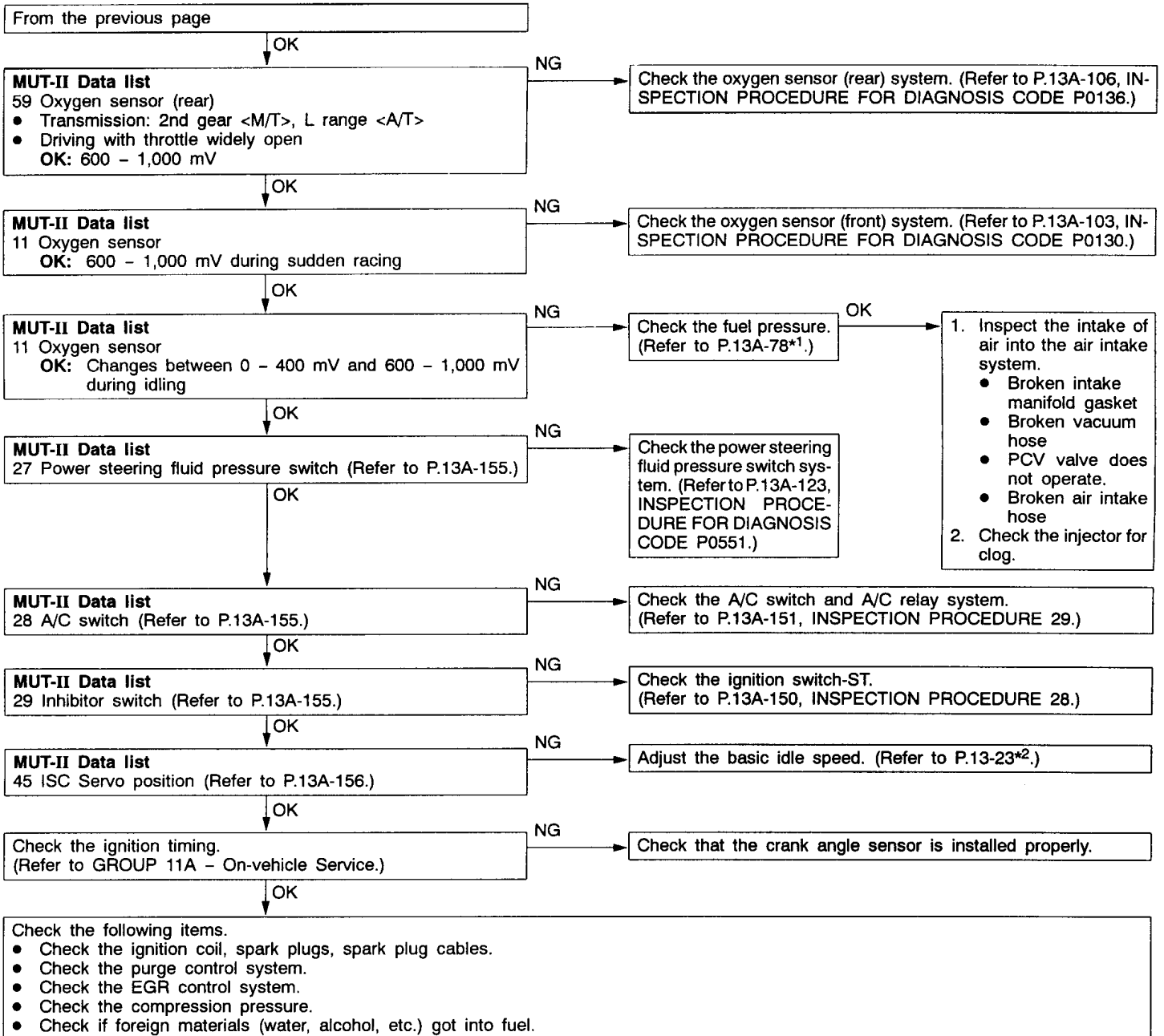
It takes too long time to start. (Incorrect starting)	Probable cause
In cases such as the above, the cause is probably that the spark is weak and ignition is difficult, the initial mixture for starting is not appropriate, or sufficient compression pressure is not being obtained.	• Malfunction of the ignition system • Malfunction of the injector system • Inappropriate gasoline use • Poor compression



INSPECTION PROCEDURE 8

Unstable Idling (Rough idling, hunting)	Probable cause
In cases as the above, the cause is probably that the ignition system, air/fuel mixture, idle speed control (ISC) or compression pressure is defective. Because the range of possible causes is broad, inspection is narrowed down to simple items.	• Malfunction of the ignition system • Malfunction of air-fuel ratio control system • Malfunction of the ISC system • Malfunction of the purge control solenoid valve system • Malfunction of the EGR solenoid valve system • Poor compression • Drawing air into exhaust system





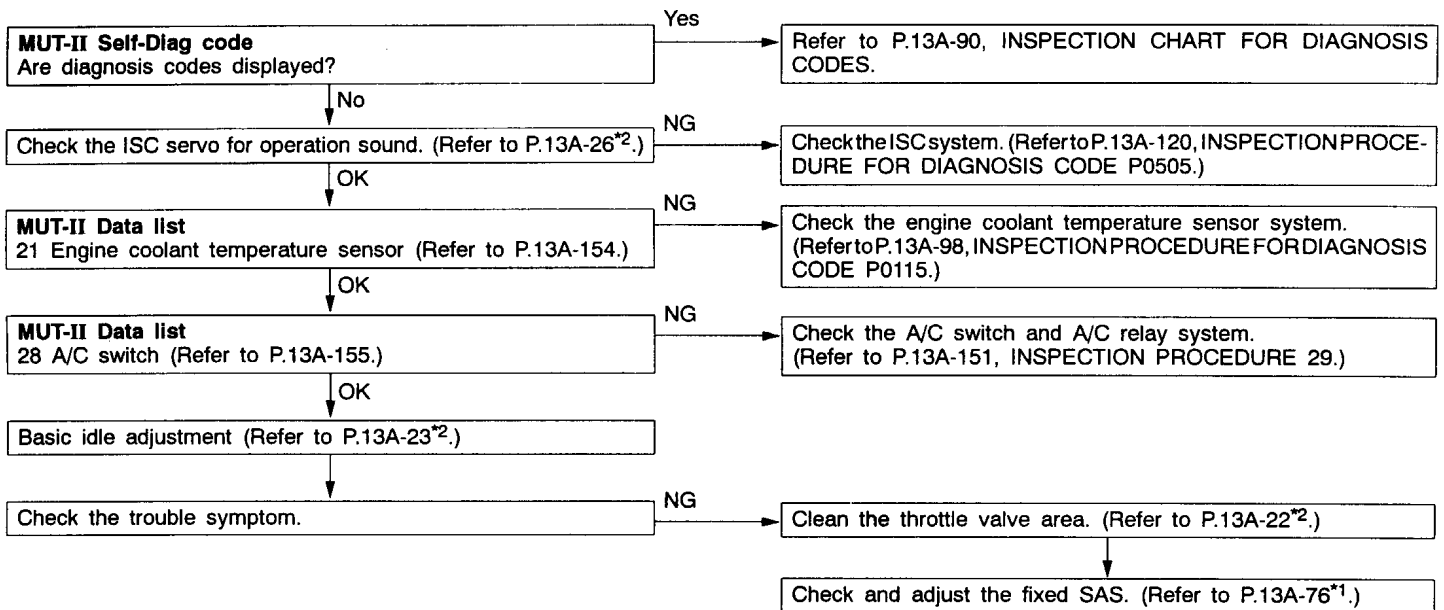
NOTE

*1: Refer to the '96 COLT/LANCER Workshop Manual (Pub. No. PWME9511).

*2: Refer to the 2000 COLT/LANCER Workshop Manual (Pub. No. PWME9511-B).

INSPECTION PROCEDURE 9

Idling speed is high. (Improper idling speed)	Probable cause
In such cases as the above, the cause is probably that the intake air volume during idling is too great.	• Malfunction of the ISC servo system • Malfunction of the throttle body



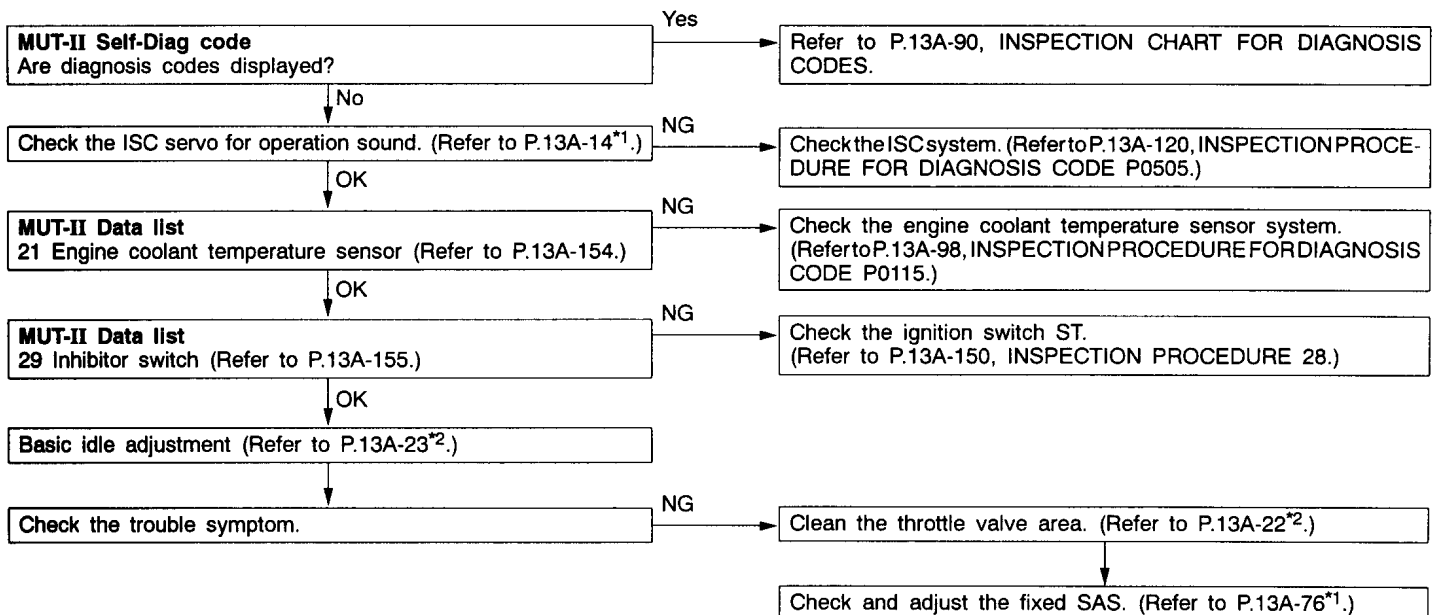
NOTE:

*1: Refer to the '96 COLT/LANCER Workshop Manual (Pub. No. PWME9511).

*2: Refer to the 2000 COLT/LANCER Workshop Manual (Pub. No. PWME9511-B).

INSPECTION PROCEDURE 10

Idling speed is low. (Improper idling speed)	Probable cause
In cases such as the above, the cause is probably that the intake air volume during idling is too small.	• Malfunction of the ISC servo system • Malfunction of the throttle body



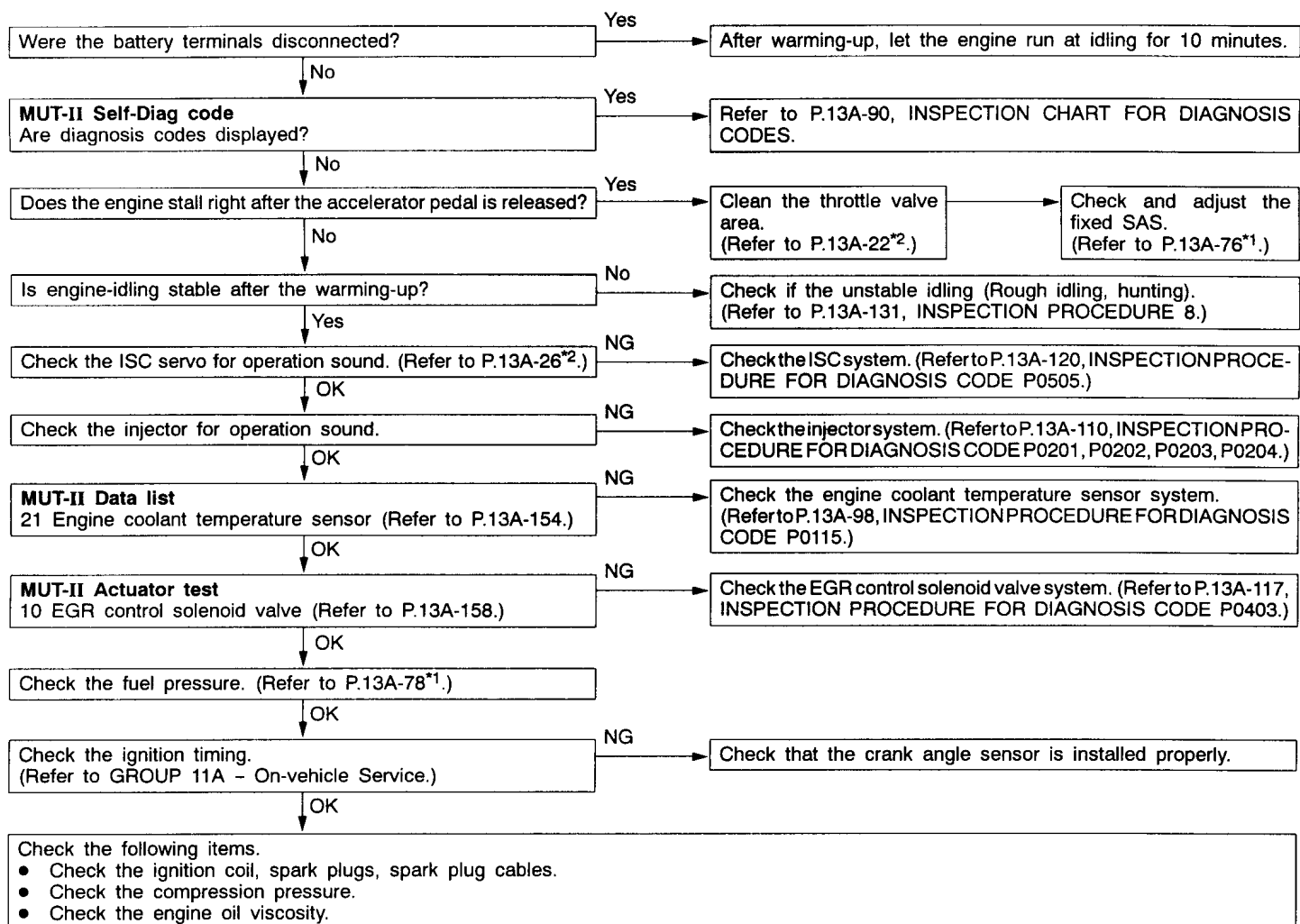
NOTE:

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*2: Refer to the 2000 COLT/LANCER Workshop Manual (Pub. No. PWME9511-B).

INSPECTION PROCEDURE 11

When the engine is cold, it stalls at idling. (Die out)	Probable cause
In such cases as the above, the cause is probably that the air/fuel mixture is inappropriate when the engine is cold, or that the intake air volume is insufficient.	• Malfunction of the ISC servo system • Malfunction of the throttle body • Malfunction of the injector system • Malfunction of the ignition system



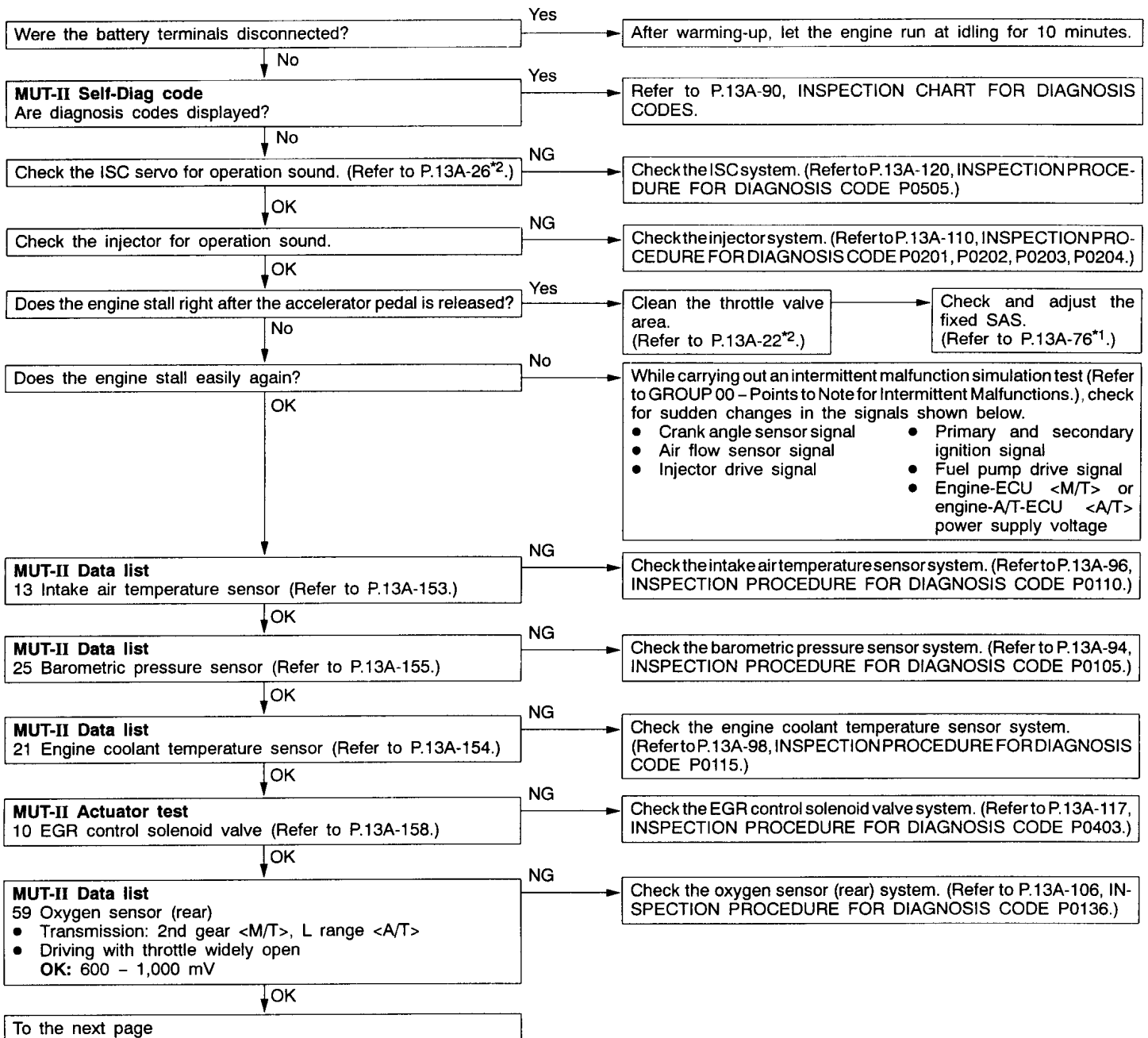
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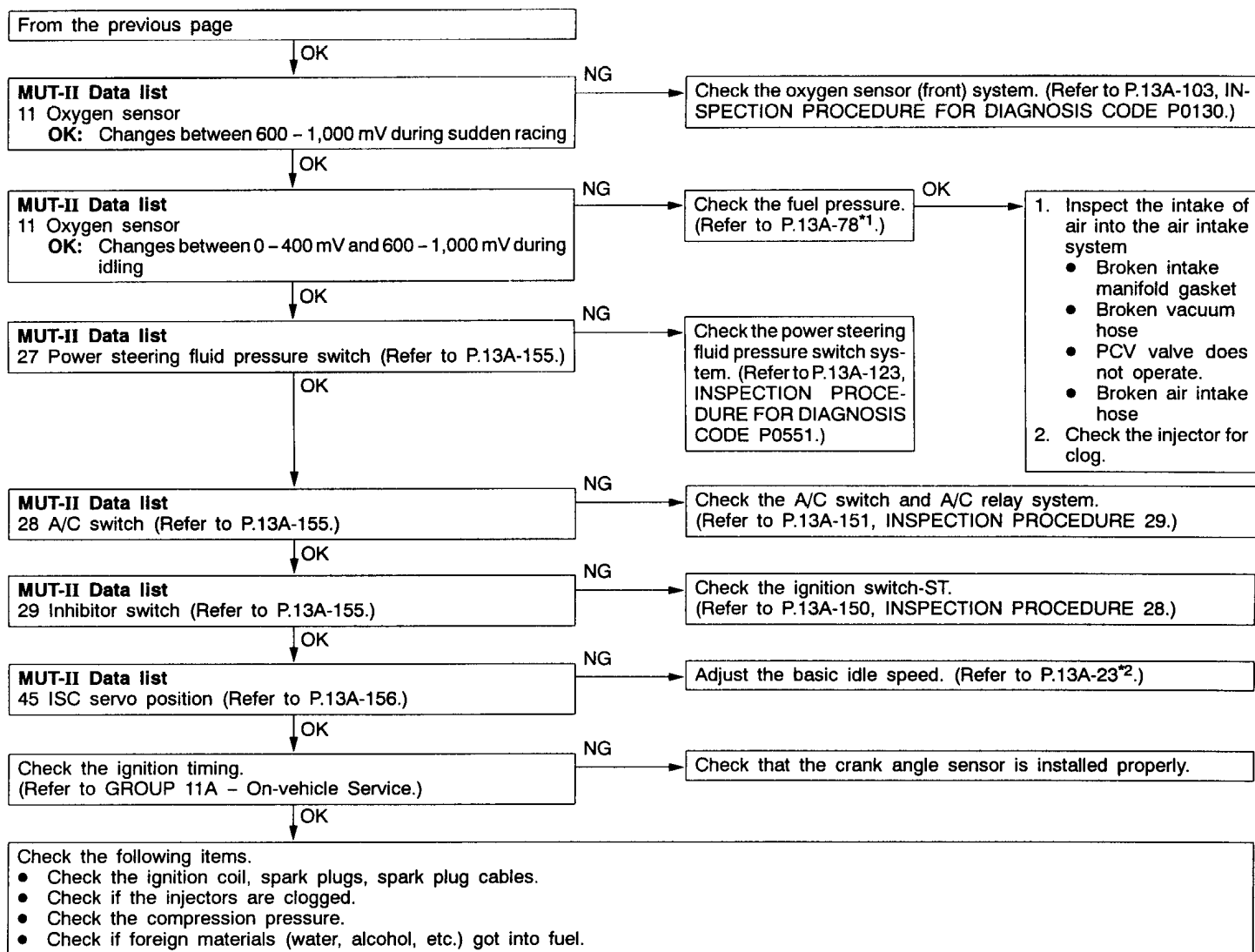
*1: Refer to the '96 COLT/LANCER Workshop Manual (Pub. No. PWME9511).

*2: Refer to the 2000 COLT/LANCER Workshop Manual (Pub. No. PWME9511-B).

INSPECTION PROCEDURE 12

When the engine is hot, it stalls at idling. (Die out)	Probable cause
In such cases as the above, the cause is probably that ignition system, air/fuel mixture, idle speed control (ISC) or compression pressure is defective. In addition, if the engine suddenly stalls, the cause may also be a defective connector contact.	• Malfunction of the ignition system • Malfunction of air-fuel ratio control system • Malfunction of the ISC system • Drawing air into intake system • Improper connector contact





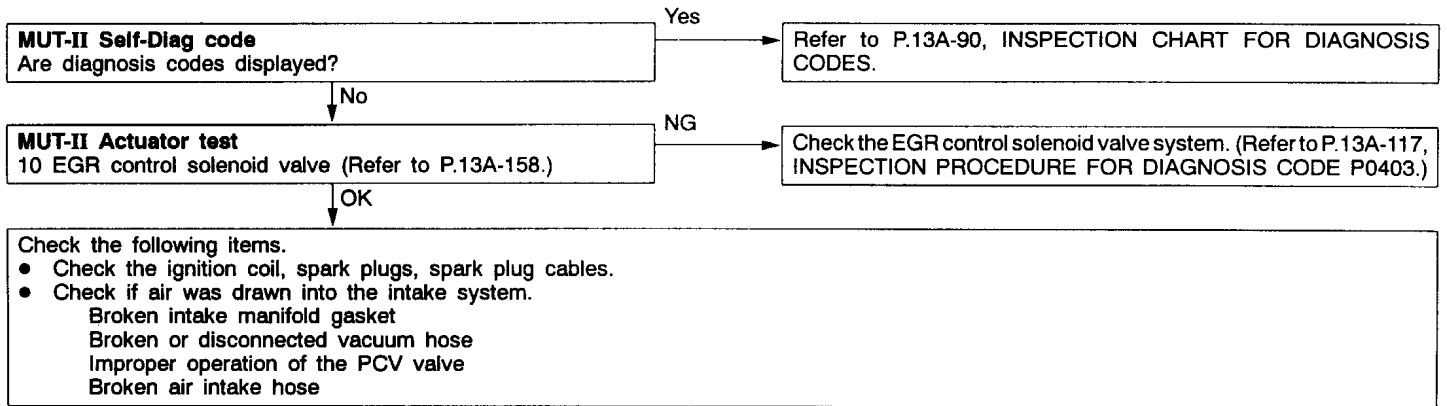
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*2: Refer to the 2000 COLT/LANCER Workshop Manual (Pub. No. PWME9511-B).

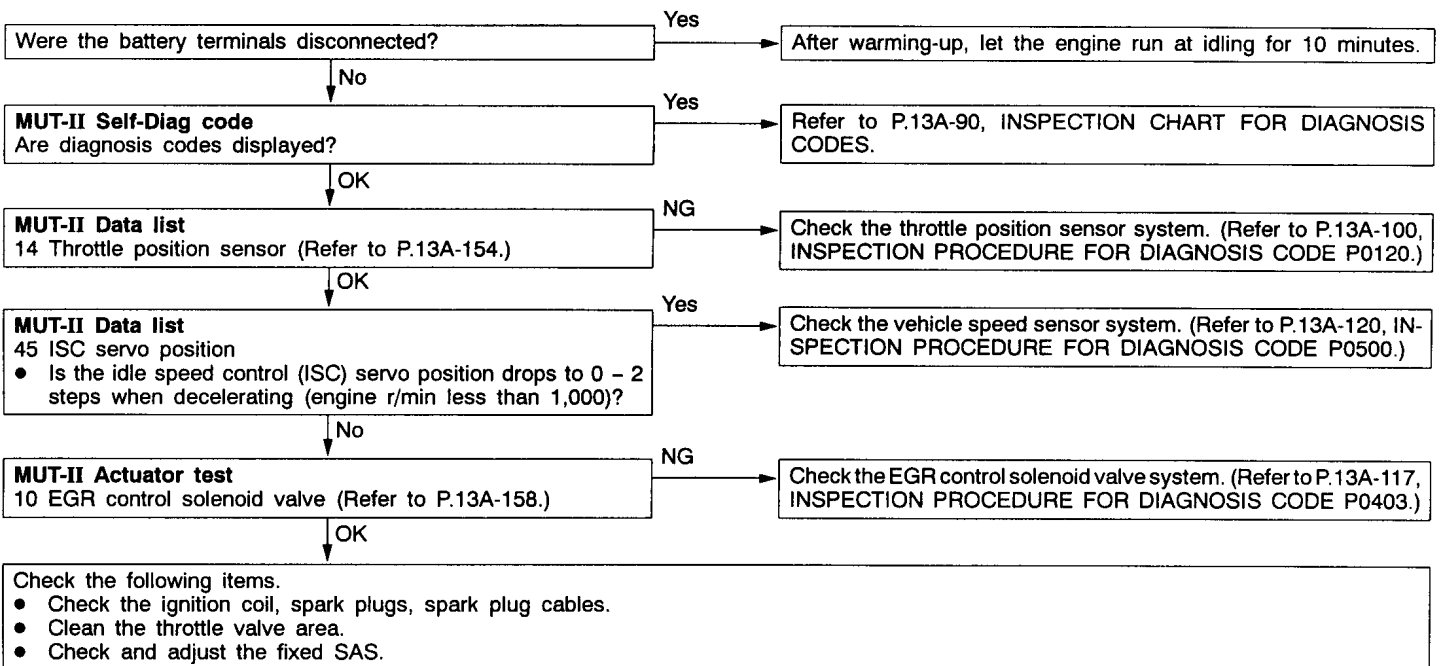
INSPECTION PROCEDURE 13

The engine stalls when starting the car. (Pass out)	Probable cause
In cases such as the above, the cause is probably misfiring due to a weak spark, or an inappropriate air/fuel mixture when the accelerator pedal is depressed.	• Drawing air into intake system • Malfunction of the ignition system



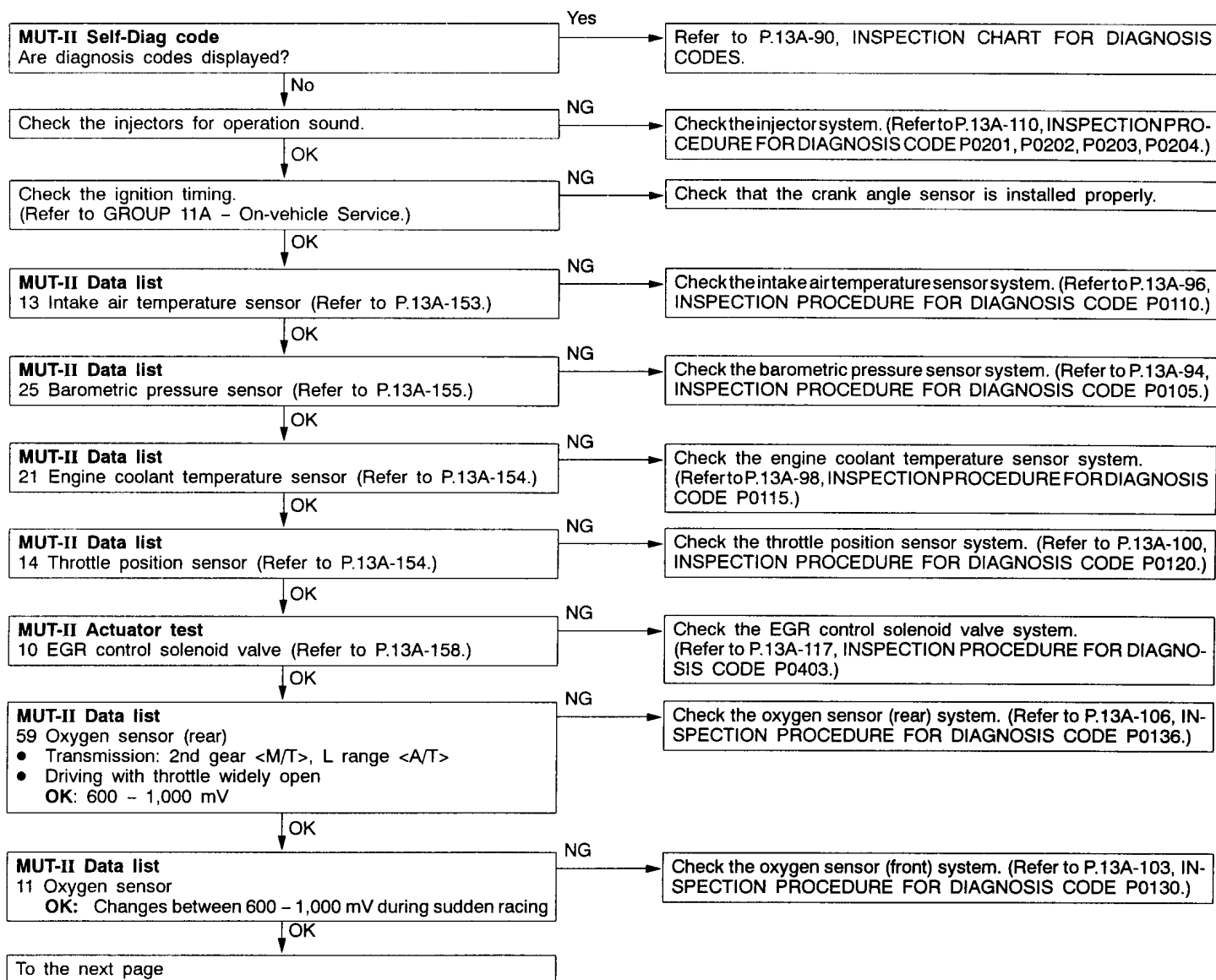
INSPECTION PROCEDURE 14

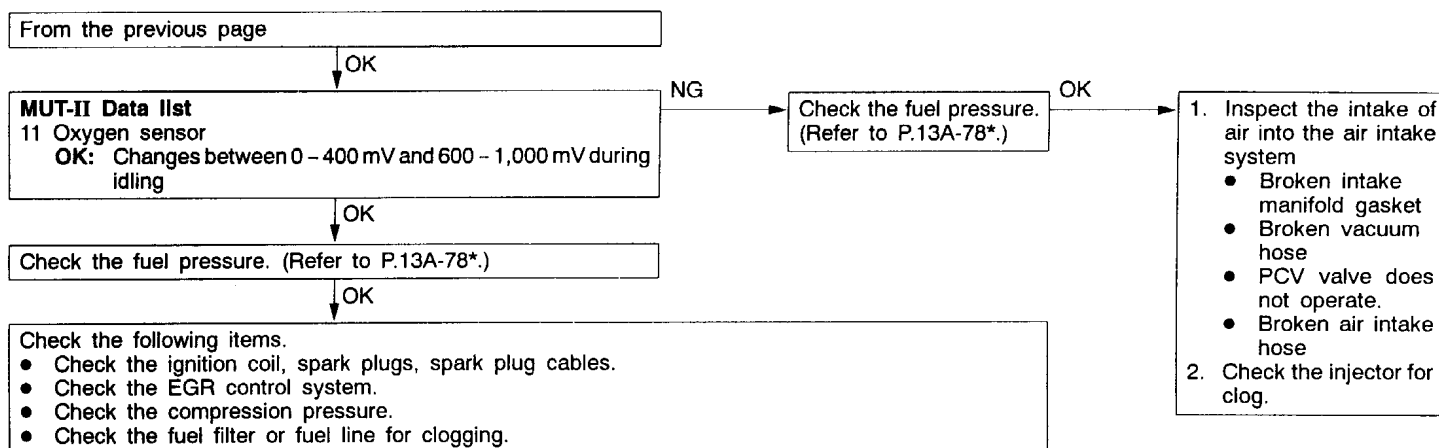
The engine stalls when decelerating.	Probable cause
In cases such as the above, the cause is probably that the intake air volume is insufficient due to a defective idle speed control (ISC) servo system.	• Malfunction of the ISC system



INSPECTION PROCEDURE 15

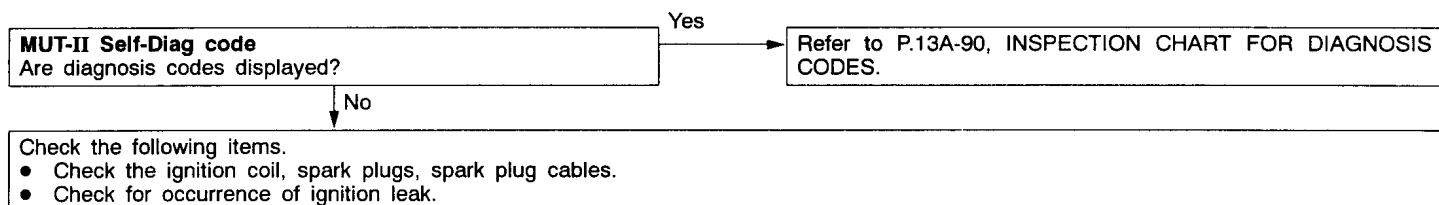
Hesitation, sag or stumble	Probable cause
In cases such as the above, the cause is probably that ignition system, air/fuel mixture or compression pressure is defective.	• Malfunction of the ignition system • Malfunction of air-fuel ratio control system • Malfunction of the fuel supply system • Malfunction of the EGR control solenoid valve system • Poor compression





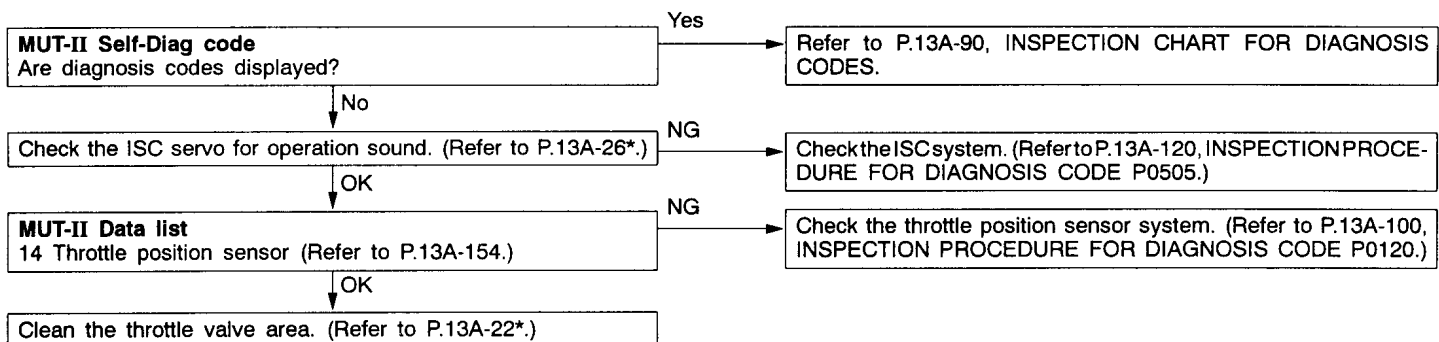
INSPECTION PROCEDURE 16

The feeling of impact or vibration when accelerating	Probable cause
In cases such as the above, the cause is probably that there is an ignition leak accompanying the increase in the spark plug demand voltage during acceleration.	• Malfunction of the ignition system



INSPECTION PROCEDURE 17

The feeling of impact or vibration when decelerating.	Probable cause
Malfunction of the ISC system is suspected.	• Malfunction of the ISC system

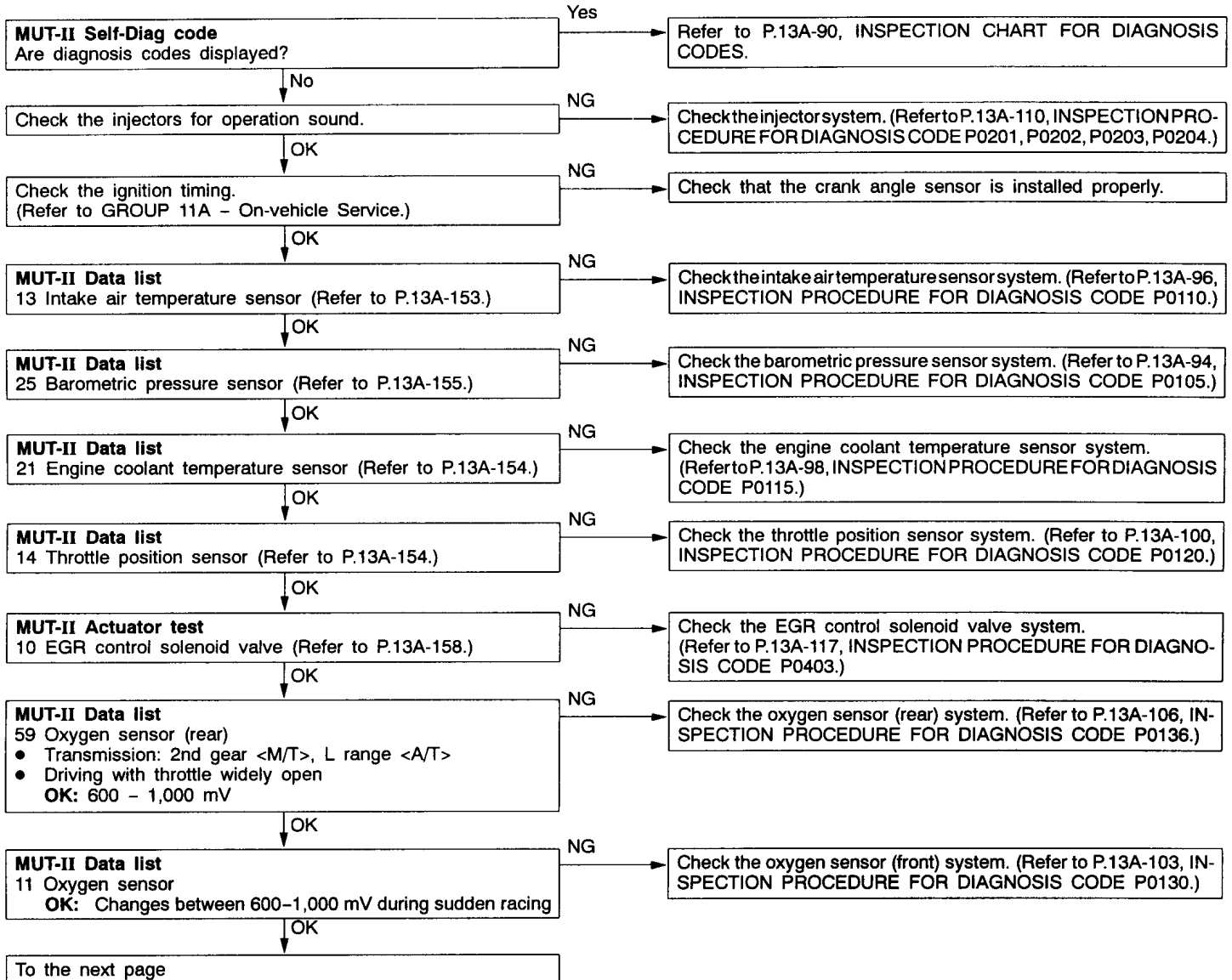


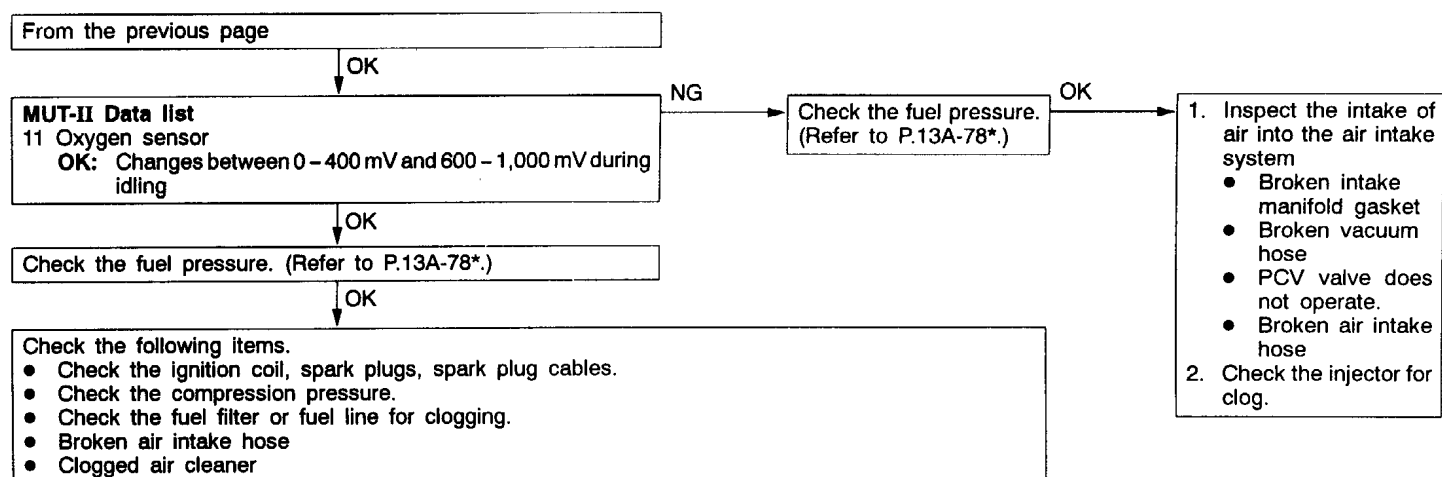
NOTE:

*: Refer to the 2000 COLT/LANCER Workshop Manual (Pub. No. PWME9511-B).

INSPECTION PROCEDURE 18

Poor acceleration	Probable cause
Defective ignition system, abnormal air-fuel ratio, poor compression pressure, etc. are suspected.	• Malfunction of the ignition system • Malfunction of air-fuel ratio control system • Malfunction of the fuel supply system • Poor compression pressure • Clogged exhaust system

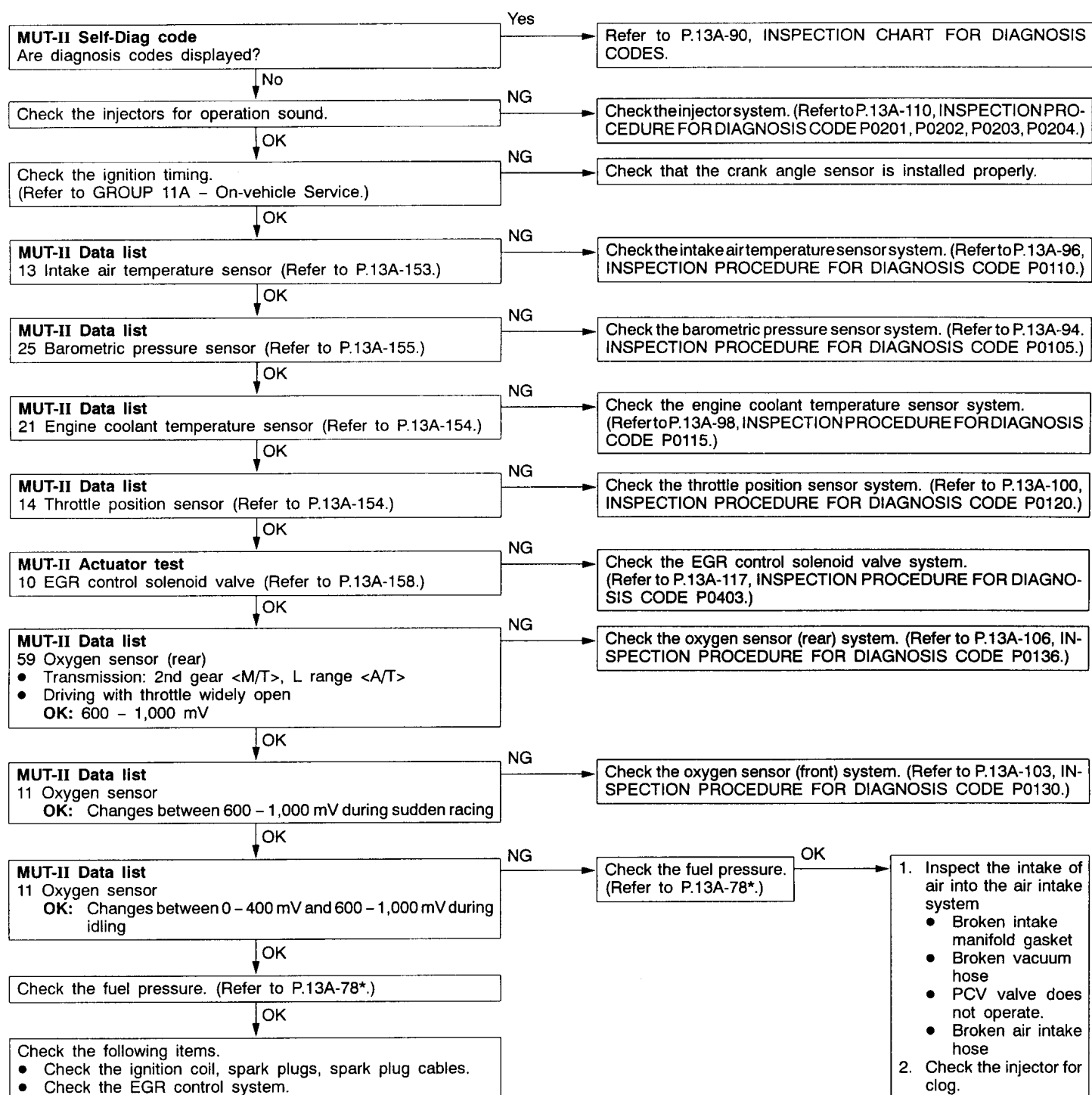


**NOTE:**

*: Refer to the '96 COLT/LANCER Workshop Manual (Pub. No. PWME9511).

INSPECTION PROCEDURE 19

Surge	Probable cause
Defective ignition system, abnormal air-fuel ratio, etc. are suspected.	• Malfunction of the ignition system • Malfunction of air-fuel ratio control system • Malfunction of the EGR control solenoid valve system

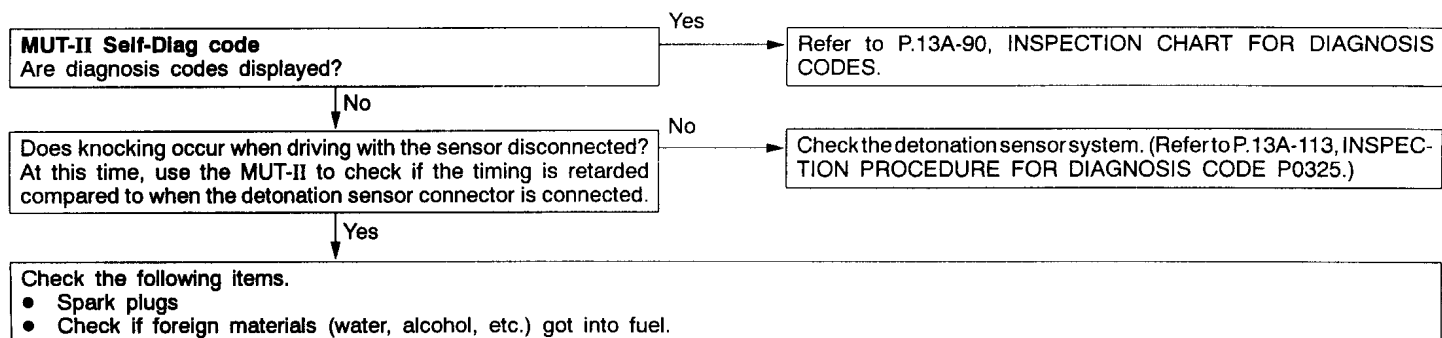


NOTE:

*: Refer to the '96 COLT/LANCER Workshop Manual (Pub. No. PWME9511).

INSPECTION PROCEDURE 20

Knocking	Probable cause
In cases as the above, the cause is probably that the detonation control is defective or the heat value of the spark plug is inappropriate.	• Defective detonation sensor • Inappropriate heat value of the spark plug



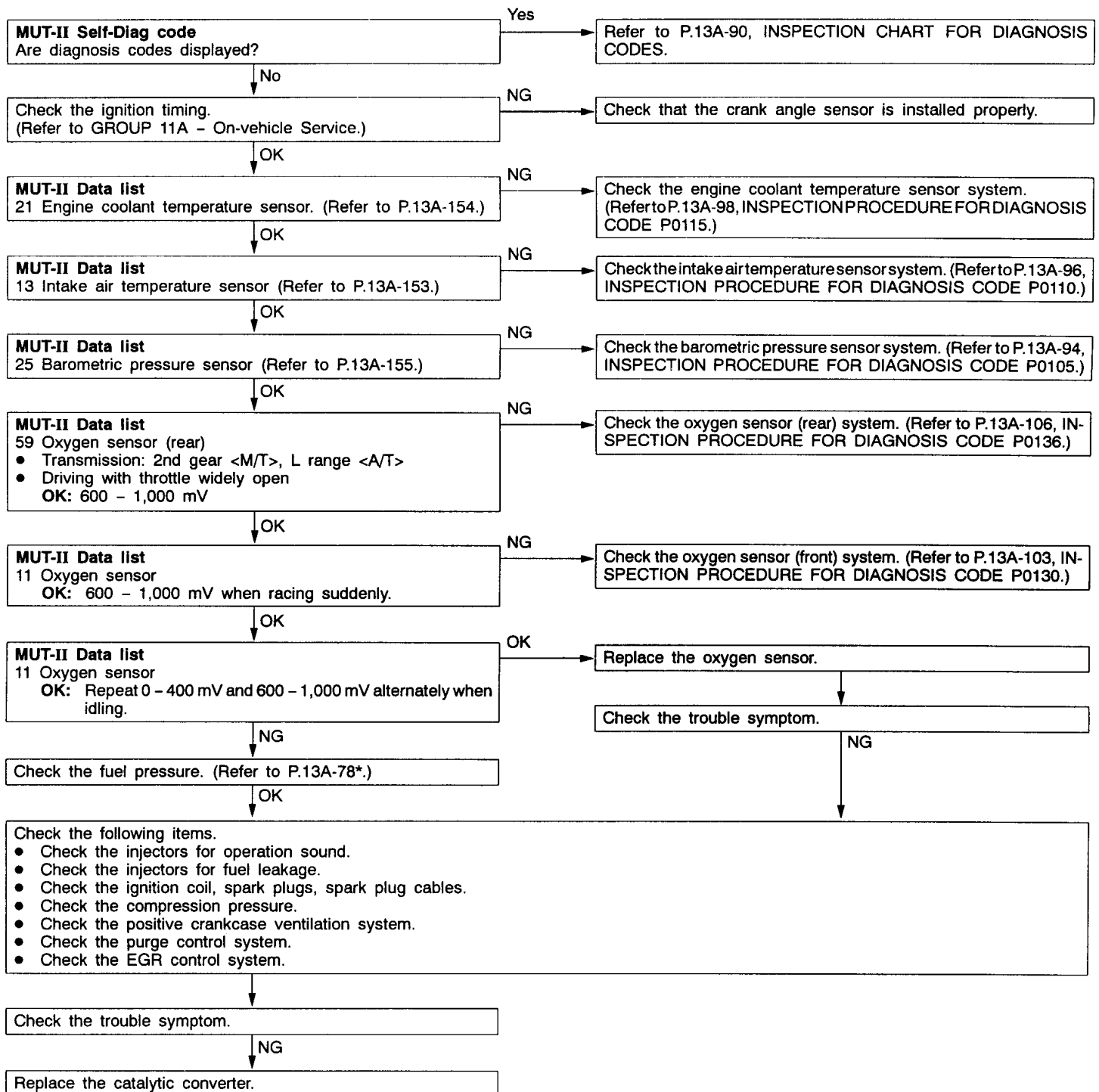
INSPECTION PROCEDURE 21

Dieseling	Probable cause
Fuel leakage from injectors is suspected.	• Fuel leakage from injectors

Check the injectors for fuel leakage.

INSPECTION PROCEDURE 22

Too high CO and HC concentration when idling	Probable cause
Abnormal air-fuel ratio is suspected.	- Malfunction of the air-fuel ratio control system - Deteriorated catalyst

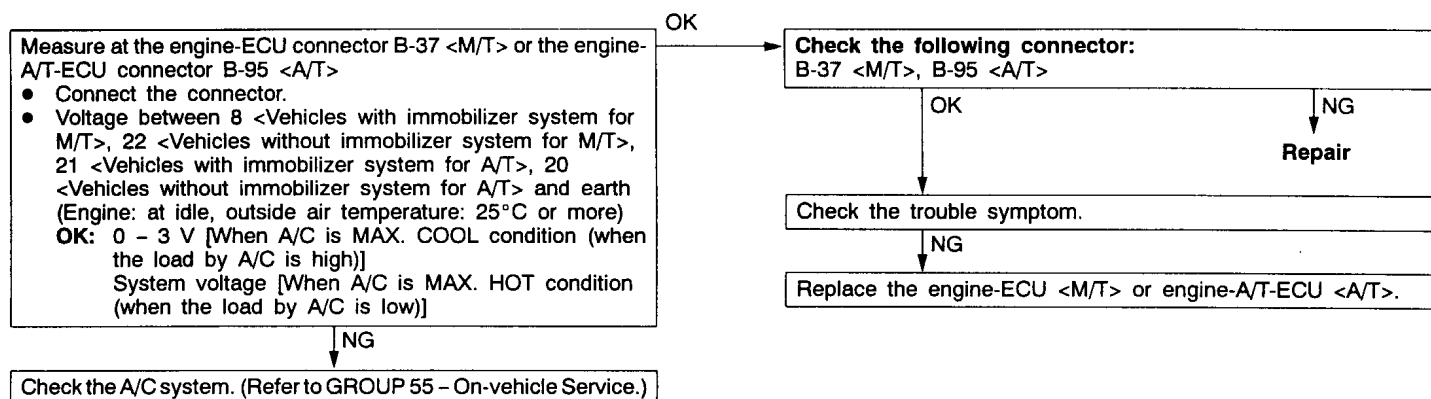


NOTE:

*: Refer to the '96 COLT/LANCER Workshop Manual (Pub. No. PWME9511).

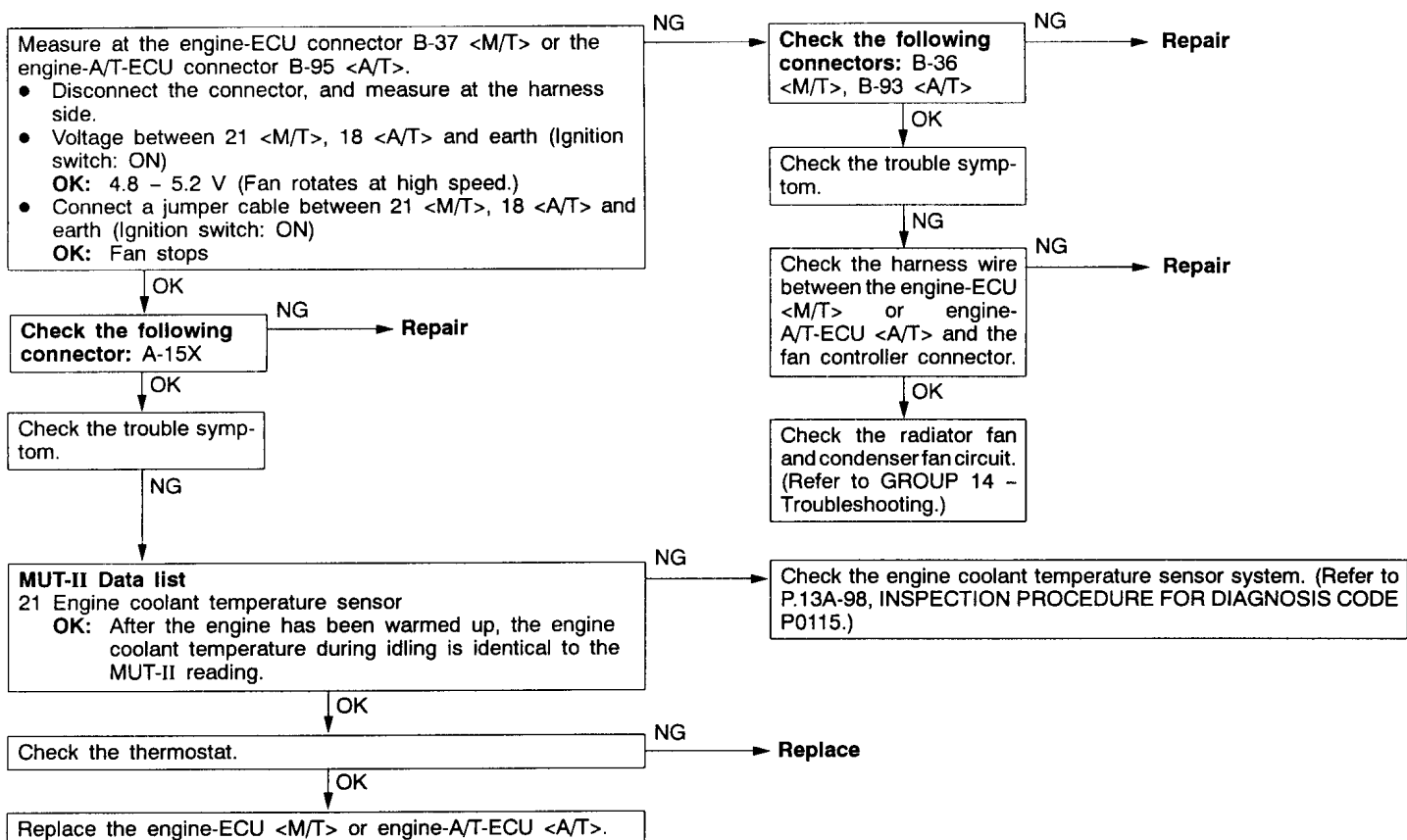
INSPECTION PROCEDURE 23

Idling speed is improper when A/C is operating	Probable cause
If the engine-ECU <M/T> or engine-A/T-ECU <A/T> detects that the air conditioner is on, it activates the idle speed control (ISC) servo to control idle-up operation. The A/C-ECU judges if the load caused by air conditioner operation is high or low, and converts it to voltage signal (high or low voltage) and inputs the signal to the engine-ECU <M/T> or engine-A/T-ECU <A/T>. Based on this voltage signal, the engine-ECU <M/T> or engine-A/T-ECU <A/T> controls the idle-up speed (for high or low load).	• Malfunction of the A/C control system • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the engine-ECU <M/T> or engine-A/T-ECU <A/T>



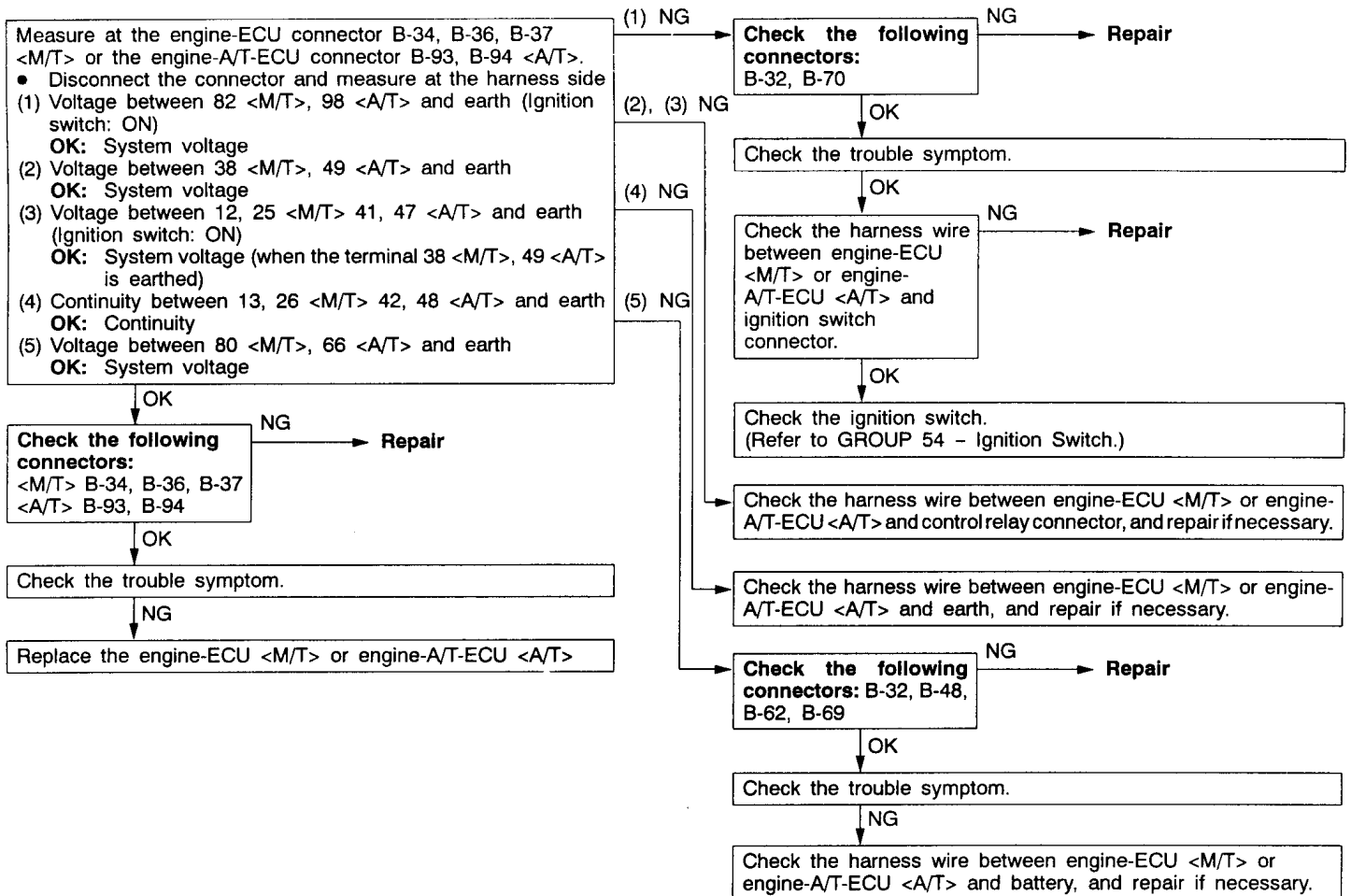
INSPECTION PROCEDURE 24

Fans (radiator fan, A/C condenser fan) are inoperative	Probable cause
The engine-ECU <M/T> or engine-A/T-ECU <A/T> outputs a duty signal to the fan controller depending on the engine coolant temperature, vehicle speed, and air conditioner switch condition. Based on this signal, the fan controller controls the radiator fan and condenser fan speeds (The more the average voltage at the terminal approaches 5 V, the higher the fan speed become.)	• Malfunction of the fan motor relay • Malfunction of the fan motor • Malfunction of the fan controller • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the engine-ECU <M/T> or engine-A/T-ECU <A/T>



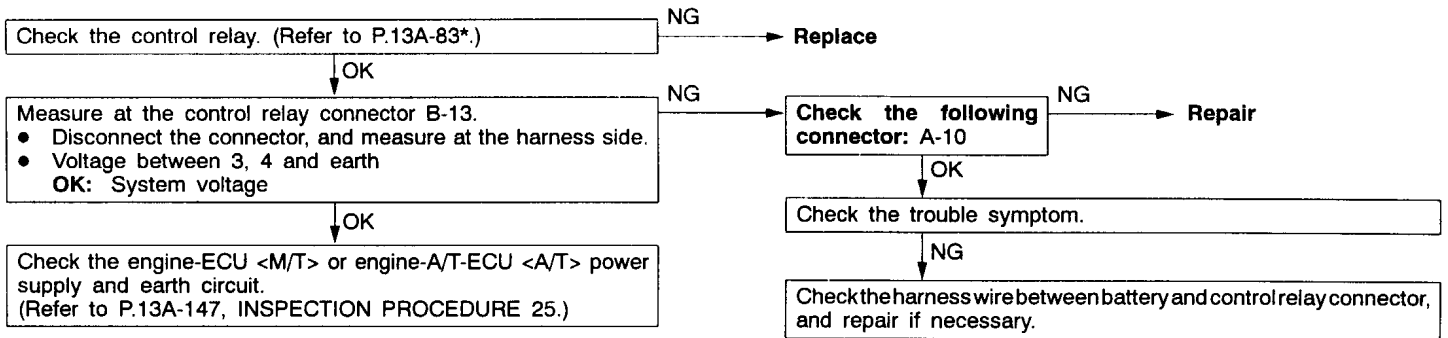
INSPECTION PROCEDURE 25

Engine-ECU <M/T> or Engine-A/T-ECU <A/T> power supply and earth circuit system	Probable cause
The engine-ECU <M/T> or engine-A/T-ECU <A/T> may be defective, or that one of the malfunctions listed at right has occurred.	- Improper connector contact, open circuit or short-circuited harness wire in the engine-ECU <M/T> or engine-A/T-ECU <A/T> power supply circuit. - Open circuit or short-circuited harness wire in the engine-ECU <M/T> or engine-A/T-ECU <A/T> earth circuit - Malfunction of the engine-ECU <M/T> or engine-A/T-ECU <A/T>



INSPECTION PROCEDURE 26

Power supply system and ignition switch-IG system	Probable cause
When an ignition switch ON signal is input to the engine-ECU <M/T> or engine-A/T-ECU <A/T>, the engine-ECU <M/T> or engine-A/T-ECU <A/T> turns the control relay ON. This causes battery voltage to be supplied to the engine-ECU <M/T> or engine-A/T-ECU <A/T>, injectors and air flow sensor.	• Malfunction of the ignition switch • Malfunction of the control relay • Improper connector contact, open circuit or short-circuited harness wire • Disconnected engine-ECU <M/T> or engine-A/T-ECU <A/T> earth wire • Malfunction of the engine-ECU <M/T> or engine-A/T-ECU <A/T>

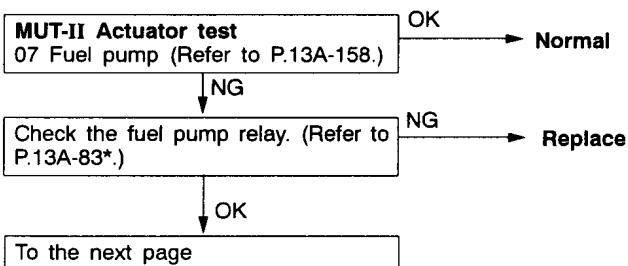


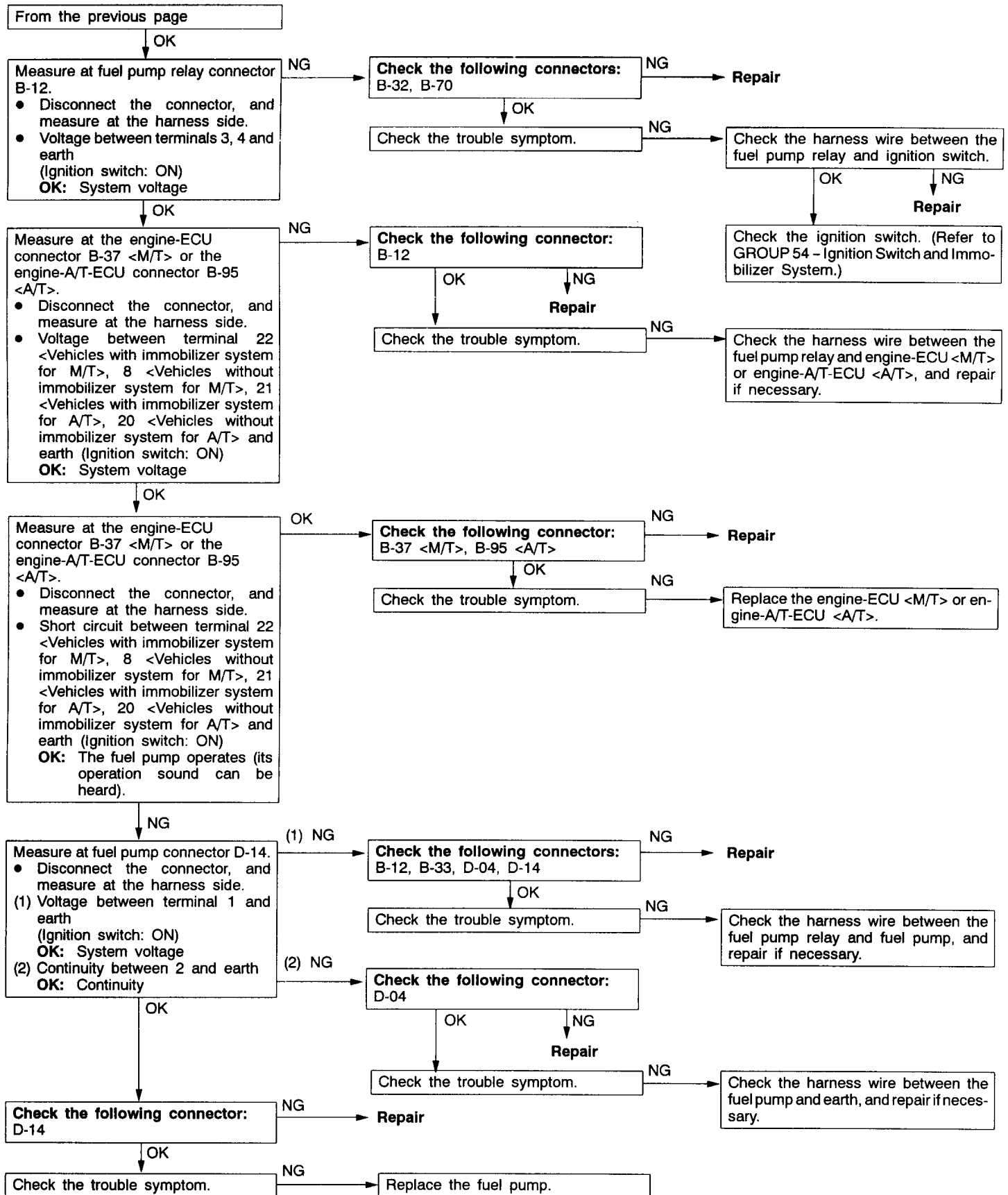
NOTE:

*: Refer to the '96 COLT/LANCER Workshop Manual (Pub. No. PWME9511).

INSPECTION PROCEDURE 27

Fuel pump system	Probable cause
The engine-ECU <M/T> or engine-A/T-ECU <A/T> turns the control relay ON when the engine is cranking or running, and this supplies power to drive the fuel pump.	• Malfunction of the fuel pump relay • Malfunction of the fuel pump • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the engine-ECU <M/T> or engine-A/T-ECU <A/T>





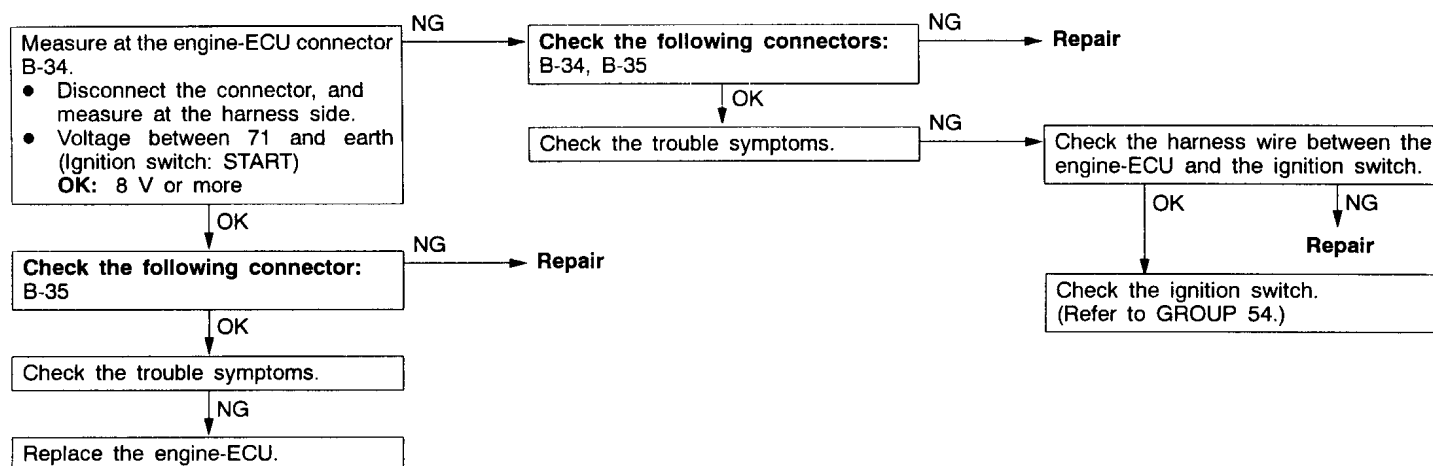
NOTE:

*: Refer to the '96 COLT/LANCER Workshop Manual (Pub. No. PWME9511).

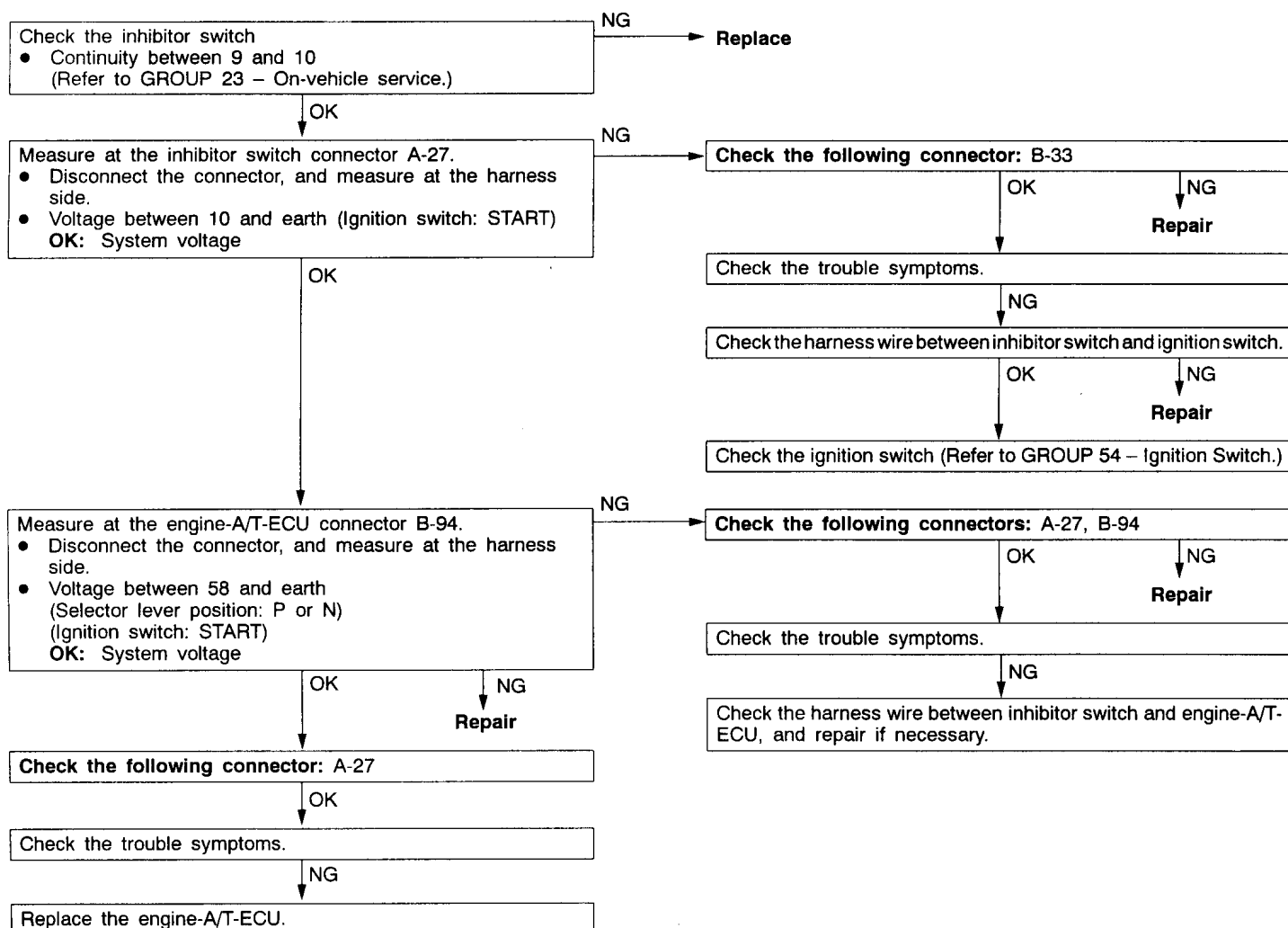
INSPECTION PROCEDURE 28

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

<M/T>

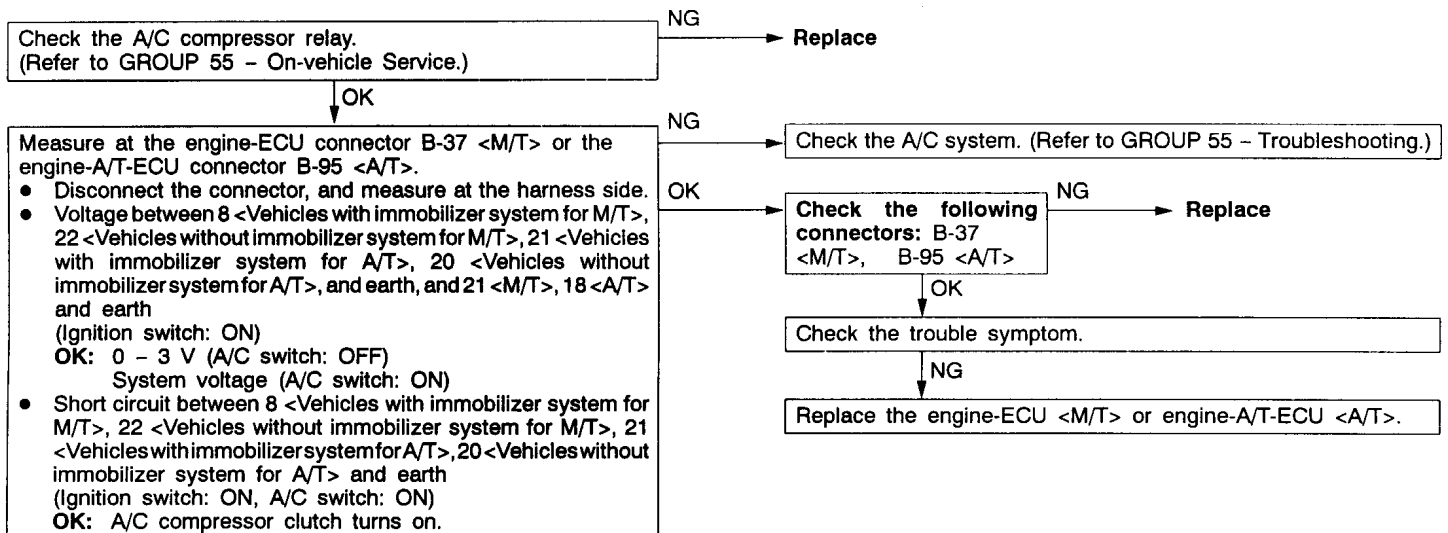


<A/T>



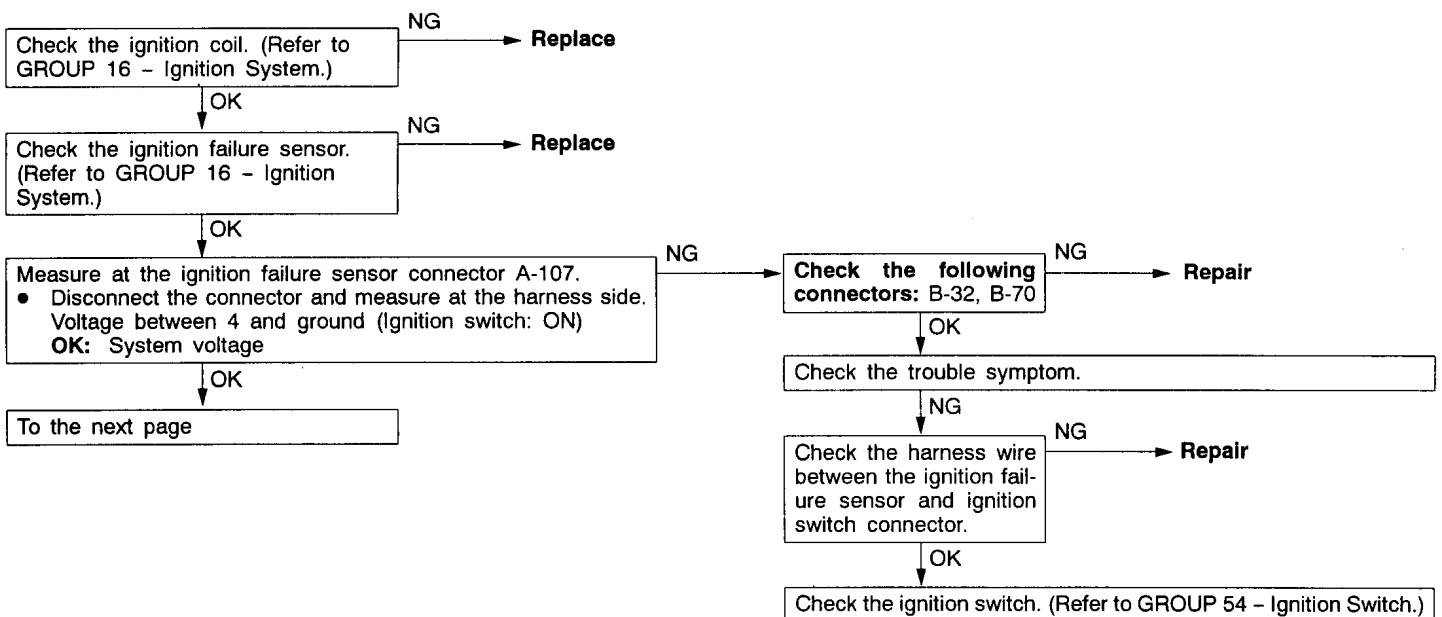
INSPECTION PROCEDURE 29

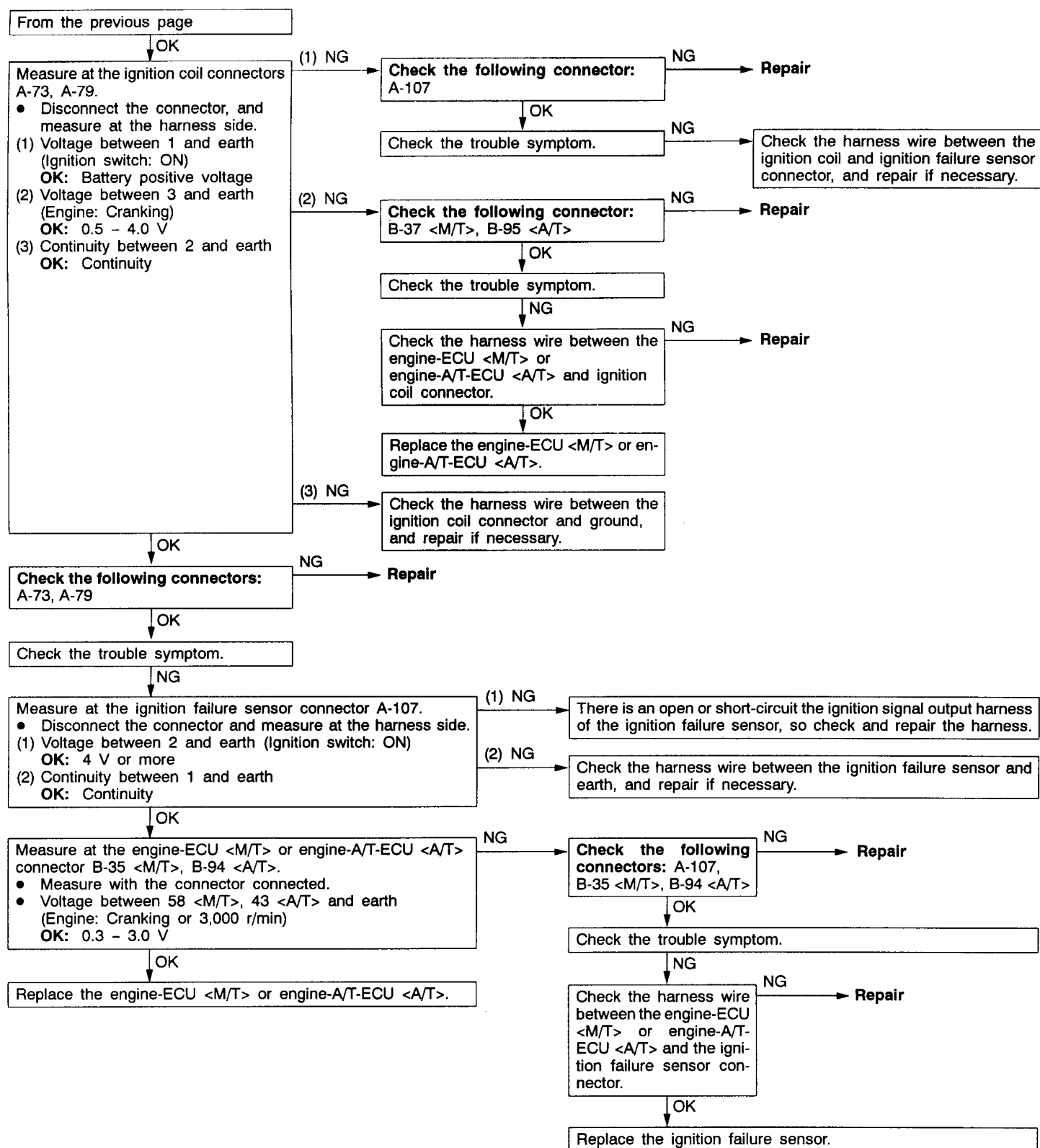
A/C switch and A/C relay system	Probable cause
When an A/C ON signal is input to the engine-ECU <M/T> or engine-A/T-ECU <A/T>, the engine-ECU <M/T> or engine-A/T-ECU <A/T> carries out control of the idle speed control (ISC) servo, and also operates the A/C compressor magnetic clutch.	- Malfunction of A/C control system - Malfunction of A/C switch - Improper connector contact, open circuit or short-circuited harness wire - Malfunction of the engine-ECU <M/T> or engine-A/T-ECU <A/T>



INSPECTION PROCEDURE 30

Ignition circuit system	Probable cause
The engine-ECU <M/T> or engine-A/T-ECU <A/T> interrupts the ignition coil primary current by turning the power transistor inside the engine-ECU <M/T> or engine-A/T-ECU <A/T> ON and OFF.	- Malfunction of ignition coil. - Malfunction of ignition failure sensor. - Improper connector contact, open circuit or short-circuited harness wire - Malfunction of the engine-ECU <M/T> or engine-A/T-ECU <A/T>





DATA LIST REFERENCE TABLE

Caution

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

NOTE

- *1. In a new vehicle [driven approximately 500 km or less], the air flow sensor output frequency is sometimes 10 % higher than the standard frequency.
- *2. The injector drive time represents the time when the cranking speed is at 250 r/min or below when the power supply voltage is 11 V.
- *3. In a new vehicle [driven approximately 500 km or less], the injector drive time is sometimes 10 % longer than the standard time.
- *4. In a new vehicle [driven approximately 500 km or less], the step of the stepper motor is sometimes 30 steps greater than the standard value.

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
11	Oxygen sensor (front)	Engine: After having warmed up Air/fuel mixture is made leaner when decelerating, and is made richer when racing.	When at 4,000 r/min, engine is suddenly decelerated	200 mV or less	Code No. P0130	13A-103
			When engine is suddenly raced	600 – 1,000 mV		
		Engine: After having warmed up The oxygen sensor signal is used to check the air/fuel mixture ratio, and control condition is also checked by the ECU.	Engine is idling	400 mV or less (Changes) 600 – 1,000 mV		
			2,500 r/min			
12	Air flow sensor*1	- Engine coolant temperature: 80 – 95°C - Lamps, electric cooling fan and all accessories: OFF - Transmission: Neutral (A/T: P range)	Engine is idling	17 – 43 Hz	–	–
			2,500 r/min	70 – 110 Hz		
			Engine is raced	Frequency increases in response to racing		
13	Intake air temperature sensor	Ignition switch: ON or with engine running	When intake air temperature is –20°C	–20°C	Code No. P0110	13A-96
			When intake air temperature is 0°C	0°C		
			When intake air temperature is 20°C	20°C		
			When intake air temperature is 40°C	40°C		
			When intake air temperature is 80°C	80°C		

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
14	Throttle position sensor	Ignition switch: ON	Set to idle position	300 – 1,000 mV	Code No. P0120	13A-100
			Gradually open	Increases in proportion to throttle opening angle		
			Open fully	4,500 – 5,500 mV		
16	Power supply voltage	Ignition switch: ON		System voltage	Procedure No. 25	13A-147
18	Cranking signal (ignition switch-ST)	Ignition switch: ON	Engine: Stopped	OFF	Procedure No. 28	13A-150
			Engine: Cranking	ON		
21	Engine coolant temperature sensor	Ignition switch: ON or with engine running	When engine coolant temperature is -20°C	-20°C	Code No. P0115	13A-98
			When engine coolant temperature is 0°C	0°C		
			When engine coolant temperature is 20°C	20°C		
			When engine coolant temperature is 40°C	40°C		
			When engine coolant temperature is 80°C	80°C		
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-113
		- Engine: Idling - Idle position switch: ON	When engine coolant temperature is -20°C	1,275 – 1,475 rpm		
			When engine coolant temperature is 0°C	1,225 – 1,425 rpm		
			When engine coolant temperature is 20°C	1,100 – 1,300 rpm		
			When engine coolant temperature is 40°C	950 – 1,150 rpm		
			When engine coolant temperature is 80°C	650 – 850 rpm		

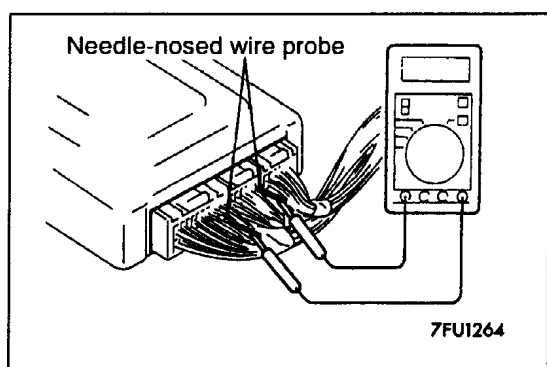
Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
24	Vehicle speed sensor	Drive at 40 km/h		Approximately 40 km/h	Code No. P0500	13A-120
25	Barometric pressure sensor	Ignition switch: ON	At altitude of 0 m	101 kPa	Code No. P0105	13A-94
			At altitude of 600 m	95 kPa		
			At altitude of 1,200 m	88 kPa		
			At altitude of 1,800 m	81 kPa		
27	Power steering fluid pressure switch	Engine: Idling	Steering wheel stationary	OFF	Code No. P0551	13A-123
			Steering wheel turning	ON		
28	A/C switch	Engine: Idling (when A/C switch is ON, A/C compressor should be operating.)	A/C switch: OFF	OFF	Procedure No. 29	13A-151
			A/C switch: ON	ON		
29	Inhibitor switch <A/T>	Ignition switch: ON	P or N	P or N	Procedure No. 28	13A-150
			D, 2, L or R	D, 2, L or R		
41	Injectors*2	Engine: Cranking	When engine coolant temperature is 0°C (injection is carried out for all cylinders simultaneously)	12 – 19 ms	–	–
			When engine coolant temperature is 20°C	26 – 40 ms		
			When engine coolant temperature is 80°C	6.0 – 9.1 ms		
	Injectors*3	- Engine coolant temperature: 80 – 95°C - Lamps, electric cooling fan and all accessories: OFF - Transmission: Neutral (A/T: P range)	Engine is idling	1.6 – 2.8 ms		
			2,500 r/min	1.4 – 2.6 ms		
			When engine is suddenly raced	Increases		
44	Ignition coils and power transistors	- Engine: After having warmed up - Timing lamp is set. (The timing lamp is set in order to check actual ignition timing.)	Engine is idling	2 – 18° BTDC	Code No. P0300	–
			2,500 r/min	18 – 38° BTDC		

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
45	ISC (step-per) motor position*4	- Engine coolant temperature: 80 – 95°C - Lamps, electric cooling fan and all accessories: OFF - Transmission: Neutral (A/T: P range) - Idle position switch: ON - Engine: Idling - When A/C switch is ON, A/C compressor should be operating	A/C switch: OFF	2 – 25 STEP	–	–
			A/C switch: OFF → ON	Increases by 10 – 70 steps		
			- A/C switch: OFF - Select lever: N range → D range	Increases by 5 – 50 steps		
49	A/C relay	Engine: After having warmed up/Engine is idling	A/C switch: OFF	OFF (Compressor clutch is not operating)	Procedure No. 29	13A-151
			A/C switch: ON	ON (Compressor clutch is operating)		
59	Oxygen sensor (rear)	- Transmission: 2nd gear <M/T>, L range <A/T> - Drive with throttle widely open	3,500 r/min	600 – 1,000 mV	Code No. P0136	13A-106
81	Long-term fuel compensation	Engine: Warm, 2,500 r/min without any load (during closed loop)		–12.5 – 12.5 %	Code No. P0170	13A-109
82	Short-term fuel compensation	Engine: Warm, 2,500 r/min without any load (during closed loop)		–30 – 25 %	Code No. P0170	13A-109
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-101
			When engine is suddenly raced	Open loop – drive condition		
A1	Oxygen sensor (sensor 1)	Engine: After warm-up	Idling	0 V	Code No. P0130	13A-103
			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 (sensor 2)	- 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-106

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
8A	Throttle position sensor (Throttle valve opening angle)	- Engine coolant temperature: 80 – 95°C - Ignition switch: ON (Engine: Stopped)	Release the accelerator pedal.	6 – 20 %	Code No. P0120	13A-100
			Depress the accelerator pedal gradually	Increase in response to pedal depression stroke.		
			Depress the accelerator pedal fully.	80 – 100 %		

ACTUATOR TEST REFERENCE TABLE

Item No.	Inspection item	Drive contents	Inspection contents		Normal condition	Inspection procedure No.	Reference page
01	Injectors	Cut fuel to No. 1 injector	Engine: After having warmed up/Engine is idling (Cut the fuel supply to each injector in turn and check cylinders which don't affect idling.)		Idling condition becomes different (becomes unstable).	Code No. P0201	13A-110
02		Cut fuel to No. 2 injector				Code No. P0202	13A-110
03		Cut fuel to No. 3 injector				Code No. P0203	13A-110
04		Cut fuel to No. 4 injector				Code No. P0204	13A-110
07	Fuel pump	Fuel pump operates and fuel is recirculated.	- Engine: Cranking - Fuel pump: Forced driving Inspect according to both the above conditions.	Pinch the return hose with fingers to feel the pulse of the fuel being recirculated.	Pulse is felt.	Procedure No. 27	13A-148
				Listen near the fuel tank for the sound of fuel pump operation.	Sound of operation is heard.		
08	Purge control solenoid valve	Solenoid valve turns from OFF to ON.	Ignition switch: ON		Sound of operation can be heard when solenoid valve is driven.	Code No. P0443	13A-119
10	EGR control solenoid valve	Solenoid valve turns from OFF to ON.	Ignition switch: ON		Sound of operation can be heard when solenoid valve is driven.	Code No. P0403	13A-117
17	Basic ignition timing	Set to ignition timing adjustment mode	Engine: Idling Timing light is set		5° BTDC	–	–
21	Fan controller	Drive the fan motor	Ignition switch: ON		Radiator fan and condenser fan operate at high speed	Procedure No. 24	13A-146



CHECK AT THE ENGINE-ECU TERMINALS

TERMINAL VOLTAGE CHECK CHART

1. Connect a needle-nosed wire probe (test harness: MB991223 or paper clip) to a voltmeter probe.
2. Insert the needle-nosed wire probe into each of the engine-ECU <M/T> or engine-A/T-ECU <A/T> connector terminals from the wire side, and measure the voltage while referring to the check chart.

NOTE

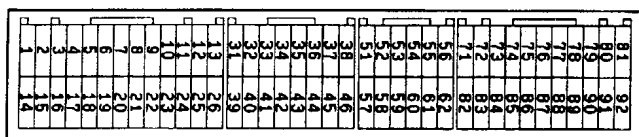
- (1) Make the voltage measurement with the engine-ECU <M/T> or engine-A/T-ECU <A/T> connectors connected.
- (2) You may find it convenient to pull out the engine-ECU <M/T> or engine-A/T-ECU <A/T> to make it easier to reach the connector terminals.
- (3) The checks can be carried out off the order given in the chart.

Caution

Short-circuiting the positive (+) probe between a connector terminal and earth could damage the vehicle wiring, the sensor, engine-ECU <M/T> or engine-A/T-ECU <A/T> or all of them. Be careful to prevent this!

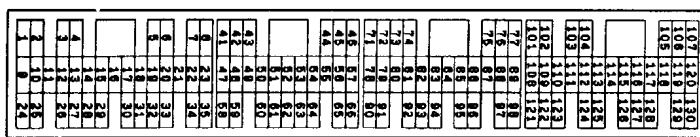
3. If voltmeter shows any division from standard value, check the corresponding sensor, actuator and related electrical wiring, then repair or replace.
4. After repair or replacement, recheck with the voltmeter to confirm that the repair has corrected the problem.

Engine-ECU <M/T> Connector Terminal Arrangement



9FU0393

Engine-A/T-ECU <A/T> Connector Terminal Arrangement



7FU1763

NOTE:

*: Vehicles with immobilizer system.

Terminal No. <M/T>	Terminal No. <A/T>	Check item	Check condition (Engine condition)	Normal condition
1	1	No. 1 injector	While engine is idling after having warmed up, suddenly depress the accelerator pedal.	From 11 – 14 V, momentarily drops slightly
14	9	No. 2 injector		
2	24	No. 3 injector		
15	2	No. 4 injector		
4	14	Stepper motor coil <A>	Engine: Soon after the warmed up engine is started	System voltage ↔ 0 V (Changes repeatedly)
17	28	Stepper motor coil 		
5	15	Stepper motor coil <C>		
18	29	Stepper motor coil <D>		
6	6	EGR control solenoid valve	Ignition switch: ON	System Voltage
			While engine is idling, suddenly depress the accelerator pedal.	From system voltage, momentarily drops
8* or 22	20* or 21	A/C relay	- Engine: Idle speed - A/C switch: OFF → ON (A/C compressor is operating)	System voltage or momentarily 6 V or more → 0 – 3 V
9	34	Purge control solenoid valve	Ignition switch: ON	System voltage
			Running at 3,000 r/min while engine is warming up after having been started.	0 – 3 V
10	11	Ignition coil – No. 1, No. 4 (power transistor)	Engine r/min: 3,000 r/min	0.3 – 3.0 V
23	12	Ignition coil – No. 2, No. 3 (power transistor)		

Terminal No. <M/T>	Terminal No. <A/T>	Check item	Check condition (Engine condition)		Normal condition
12	41	Power supply	Ignition switch: ON		System voltage
25	47				
19	19	Air flow sensor reset signal	Engine: Idle speed		0 – 1 V
			Engine r/min: 3,000 r/min		6 – 9 V
20	17	Fan motor relay (HI)	Radiator fan is not operating (Engine coolant temperature is 90°C or less)		System voltage
			Radiator fan is not operating (Engine coolant temperature is 105°C or less)		0 – 3 V
21	18	Fan motor relay (LO)	Radiator fan and condenser fan are not operating (Engine coolant temperature is 90°C or less)		System voltage
			Radiator fan and condenser fan are not operating (Engine coolant temperature is 90 – 105°C or less)		0 – 3 V
8 or 22*	20 or 21*	Fuel pump relay	Ignition switch: ON		System voltage
			Engine: Idle speed		0 – 3 V
33	8	Alternator G terminal	- Engine: Warm, idle (radiator fan: OFF) - Headlamp: OFF to ON - Rear defogger switch: OFF to ON - Brake lamp: ON		Voltage rises by 0.2 – 3.5 V.
41	54	Alternator FR terminal	- Engine: Warm, idle (radiator fan: OFF) - Headlamp: OFF to ON - Rear defogger switch: OFF to ON - Brake lamp: ON		Voltage drops by 0.2 – 3.5 V.
36	22	Engine warning lamp	Ignition switch: "LOCK" (OFF) position → ON		0 – 3 V → 9 – 13 V (After several seconds have elapsed)
37	52	Power steering fluid pressure switch	Engine: Idling after warming up	When steering wheel is stationary	System voltage
				When steering wheel is turned	0 – 3 V
38	49	Control relay (Power supply)	Ignition switch: "LOCK" (OFF) position		System voltage
			Ignition switch: ON		0 – 3 V
45	83	A/C switch 1	Engine: Idle speed	Turn the A/C switch OFF	0 – 3 V
				Turn the A/C switch ON (A/C compressor is operating)	System voltage
58	43	Tachometer signal	Engine r/min: 3,000 r/min		0.3 – 3.0 V

Terminal No. <M/T>	Terminal No. <A/T>	Check item	Check condition (Engine condition)		Normal condition
60	3	Oxygen sensor (front) heater	Engine: Idling after warming up		0 – 3 V
			Engine r/min: 5,000 r/min		System voltage
54	26	Oxygen sensor (rear) heater	Engine: Idling after warming-up		0 – 3 V
			Engine r/min: 5,000 r/min		System voltage
71	58	Ignition switch – ST	Engine: Cranking		8 V or more
72	64	Intake air temperature sensor	Ignition switch: ON	When intake air temperature is 0°C	3.2 – 3.8 V
				When intake air temperature is 20°C	2.3 – 2.9 V
				When intake air temperature is 40°C	1.5 – 2.1 V
				When intake air temperature is 80°C	0.4 – 1.0 V
75	73	Oxygen sensor (rear)	• Transmission: 2nd gear <M/T>, L range <A/T> • Engine r/min: 3,500 r/min or more • Driving with the throttle valve widely open		0.6 – 1.0 V
76	71	Oxygen sensor (front)	Engine: Running at 2,500 r/min after warmed up (Check using a digital type voltmeter)		0 ↔ 0.8 V (Changes repeatedly)
80	66	Backup power supply	Ignition switch: "LOCK" (OFF) position		System voltage
81	46	Sensor impressed voltage	Ignition switch: ON		4.5 – 5.5 V
82	98	Ignition switch – IG	Ignition switch: ON		System voltage
83	44	Engine coolant temperature sensor	Ignition switch: ON	When engine coolant temperature is 0°C	3.2 – 3.8 V
				When engine coolant temperature is 20°C	2.3 – 2.9 V
				When engine coolant temperature is 40°C	1.3 – 1.9 V
				When engine coolant temperature is 80°C	0.3 – 0.9 V

Terminal No. <M/T>	Terminal No. <A/T>	Check item	Check condition (Engine condition)		Normal condition
84	78	Throttle position sensor	Ignition switch: ON	Set throttle valve to idle position	0.3 – 1.0 V
				Fully open throttle valve	4.5 – 5.5 V
85	55	Barometric pressure sensor	Ignition switch: ON	When altitude is 0 m	3.7 – 4.3 V
				When altitude is 1,200 m	3.2 – 3.8 V
86	80	Vehicle speed sensor	- Ignition switch: ON - Move the vehicle slowly forward		0 ↔ 5 V (Changes repeatedly)
88	56	Camshaft position sensor	Engine: Cranking		0.4 – 3.0 V
			Engine: Idle speed		0.5 – 2.0 V
89	45	Crank angle sensor	Engine: Cranking		0.4 – 4.0 V
			Engine: Idle speed		1.5 – 2.5 V
90	65	Air flow sensor	Engine: Idle speed		2.2 – 3.2 V
			Engine r/min: 2,500 r/min		

CHECK CHART FOR RESISTANCE AND CONTINUITY BETWEEN TERMINALS

1. Turn the ignition switch to “LOCK” (OFF) position.
2. Disconnect the engine-ECU <M/T> or engine-A/T-ECU <A/T> connector.
3. Measure the resistance and check for continuity between the terminals of the engine-ECU <M/T> or engine-A/T-ECU <A/T> harness-side connector while referring to the check chart.

NOTE

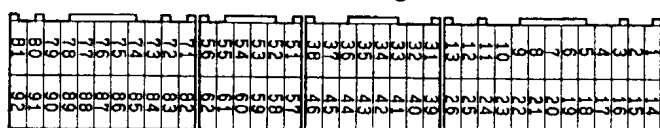
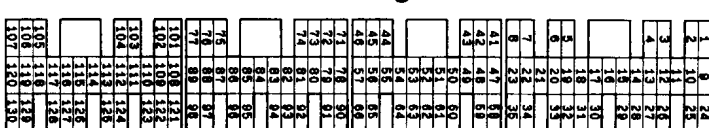
- (1) When measuring resistance and checking continuity, a harness for checking contact pin pressure should be used instead of inserting a test probe.
- (2) Checking need not be carried out in the order given in the chart.

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 <M/T> or engine-A/T-ECU <A/T> and/or ohmmeter.

Be careful to prevent this!

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

**Engine-ECU <M/T> Harness Side
Connector Terminal Arrangement**

**Engine-A/T-ECU <A/T> Harness Side
Connector Terminal Arrangement**


7FU1764

9FU0392

Terminal No.<M/T>	Terminal No. <A/T>	Inspection item	Normal condition (Check condition)
1 – 12	1 – 41	No. 1 injector	13 – 16 Ω (At 20°C)
14 – 12	9 – 41	No. 2 injector	
2 – 12	24 – 41	No. 3 injector	
15 – 12	2 – 41	No. 4 injector	
4 – 12	14 – 41	Stepper motor coil (A)	28 – 33 Ω (At 20°C)
17 – 12	28 – 41	Stepper motor coil (B)	
5 – 12	15 – 41	Stepper motor coil (C)	
18 – 12	29 – 41	Stepper motor coil (D)	
6 – 12	6 – 41	EGR control solenoid valve	29 – 35 Ω (At 20°C)
9 – 12	34 – 41	Purge control solenoid valve	29 – 35 Ω (At 20°C)
13 – Body earth	42 – Body earth	Engine-ECU <M/T> or engine-A/T-ECU <A/T> earth	Continuity (0 Ω)
26 – Body earth	48 – Body earth	Engine-ECU <M/T> or engine-A/T-ECU <A/T> earth	
60 – 12	3 – 41	Oxygen sensor (front) heater	4.5 – 8.0 Ω (At 20°C)
54 – 12	26 – 41	Oxygen sensor (rear) heater	11 – 18 Ω (At 20°C)

Terminal No.<M/T>	Terminal No. <A/T>	Inspection item	Normal condition (Check condition)
72 – 92	64 – 57	Intake air temperature sensor	5.3 – 6.7 kΩ (When intake air temperature is 0°C)
			2.3 – 3.0 kΩ (When intake air temperature is 20°C)
			1.0 – 1.5 kΩ (When intake air temperature is 40°C)
			0.30 – 0.42 kΩ (When intake air temperature is 80°C)
83 – 92	44 – 57	Engine coolant temperature sensor	5.1 – 6.5 kΩ (When coolant temperature is 0°C)
			2.1 – 2.7 kΩ (When coolant temperature is 20°C)
			0.9 – 1.3 kΩ (When coolant temperature is 40°C)
			0.26 – 0.36 kΩ (When coolant temperature is 80°C)

INSPECTION PROCEDURE USING AN ANALYZER

On A/T models, the engine-A/T-ECU (combination ECU) has been introduced. Due to this, only the inspection procedures at the engine-A/T-ECU terminals are described below (On M/T models, the inspection procedures at the engine-ECU terminals are not changed).

AIR FLOW SENSOR

Alternate method (Test harness not available)

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

CAMSHAFT POSITION SENSOR AND CRANK ANGLE SENSOR

Alternate method (Test harness not available)

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

INJECTOR

Alternate method (Test harness not available)

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

IDLE SPEED CONTROL SERVO (STEPPER MOTOR)

Alternate method (Test harness not available)

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

IGNITION COIL AND POWER TRANSISTOR

Alternate method (Test harness not available)

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