FUEL

Click on the applicable bookmark to selected the required model year

MULTIPOINT FUEL INJECTION (MPI)

CONTENTS

13109000577

GENERAL INFORMATION

13100010647

The Multipoint Fuel Injection System consists of sensors which detect the engine conditions, the engine-ECU which controls the system based on signals from these sensors, and actuators which operate under the control of the engine-ECU. The engine-ECU carries out activities such as fuel injection control, idle speed control and ignition timing control. In addition, the engine-ECU is equipped with several diagnosis modes which simplify troubleshooting when a problem develops.

FUEL INJECTION CONTROL

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

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

Fuel injection is normally carried out once for each cylinder for every two rotations of the crankshaft. The firing order is 1-3-4-2. This is called sequential fuel injection. The engine-ECU provides a richer air/fuel mixture by carrying out “open-loop” control when the engine is cold or operating under high load conditions in order to maintain engine performance. In addition, when the engine is warm or operating under normal conditions, the engine-ECU controls the air/fuel mixture by using the oxygen sensor signal to carry out “closed-loop” control in order to obtain the theoretical air/fuel mixture ratio that provides the maximum cleaning performance from the three way catalyst.

IDLE AIR CONTROL

The idle speed is kept at the optimum speed by controlling the amount of air that bypasses the throttle valve in accordance with changes in idling conditions and engine load during idling. The engine-ECU drives the idle speed control (ISC) motor to keep the engine running at the pre-set idle target speed in accordance with the engine coolant temperature and air conditioner load. In addition, when the air conditioner switch is turned off and on while the engine is idling, the ISC motor operates to adjust the throttle valve bypass air amount in accordance with the engine load conditions in order to avoid fluctuations in the engine speed.

IGNITION TIMING CONTROL

The power transistor located in the ignition primary circuit turns ON and OFF to control the primary current flow to the ignition coil. This controls the ignition timing in order to provide the optimum ignition timing with respect to the engine operating conditions. The ignition timing is determined by the engine-ECU from the engine speed, intake air volume, engine coolant temperature and atmospheric pressure.

SELF-DIAGNOSIS FUNCTION

- When an abnormality is detected in one of the sensors or actuators related to emission control, the engine warning lamp (check engine lamp) illuminates as a warning to the driver.
- When an abnormality is detected in one of the sensors or actuators, a diagnosis code corresponding to the abnormality is output.
- The RAM data inside the ENGINE-ECU that is related to the sensors and actuators can be read by means of the MUT-II. In addition, the actuators can be force-driven under certain circumstances.

OTHER CONTROL FUNCTIONS

1. Fuel Pump Control
   Turns the fuel pump relay ON so that current is supplied to the fuel pump while the engine is cranking or running.
2. A/C Relay Control
   Turns the compressor clutch of the A/C ON and OFF.
3. Fan Relay Control
   The revolutions of the radiator fan and condenser fan are controlled in response to the engine coolant temperature and vehicle speed.
4. Purge Control Solenoid Valve Control
   Refer to GROUP 17.
5. EGR Control Solenoid Valve Control
   Refer to GROUP 17.

GENERAL SPECIFICATIONS

Items		Specifications
Throttle body	Throttle bore mm	46
	Throttle position sensor	Variable resistor type
	Idle speed control servo	Stepper motor type (Stepper motor type by-pass air control system with the air volume limiter)
Engine-ECU	Identification model No.	E2T71272 <Except vehicles for Germany> E2T71275 <Vehicles for Germany>
Sensors	Vacuum sensor (Manifold absolute pressure sensor)	Semiconductor type
	Intake air temperature sensor	Thermistor type
	Engine coolant temperature sensor	Thermistor type
	Oxygen sensor	Zirconia type
	Vehicle speed sensor	Magnetic resistive element type
	Crank angle sensor	Hall element type
	Detonation sensor	Piezoelectric type
	Power steering fluid pressure switch	Contact switch type
Actuators	Control relay type	Contact switch type
	Fuel pump relay type	Contact switch type
	Injector type and number	Electromagnetic type, 4
	Injector identification mark	CDH166
	EGR control solenoid valve	ON/OFF type solenoid valve
	Purge control solenoid valve	ON/OFF type solenoid valve
Fuel pressure regulator	Regulator pressure kPa	329

MULTI-POINT FUEL INJECTION SYSTEM DIAGRAM

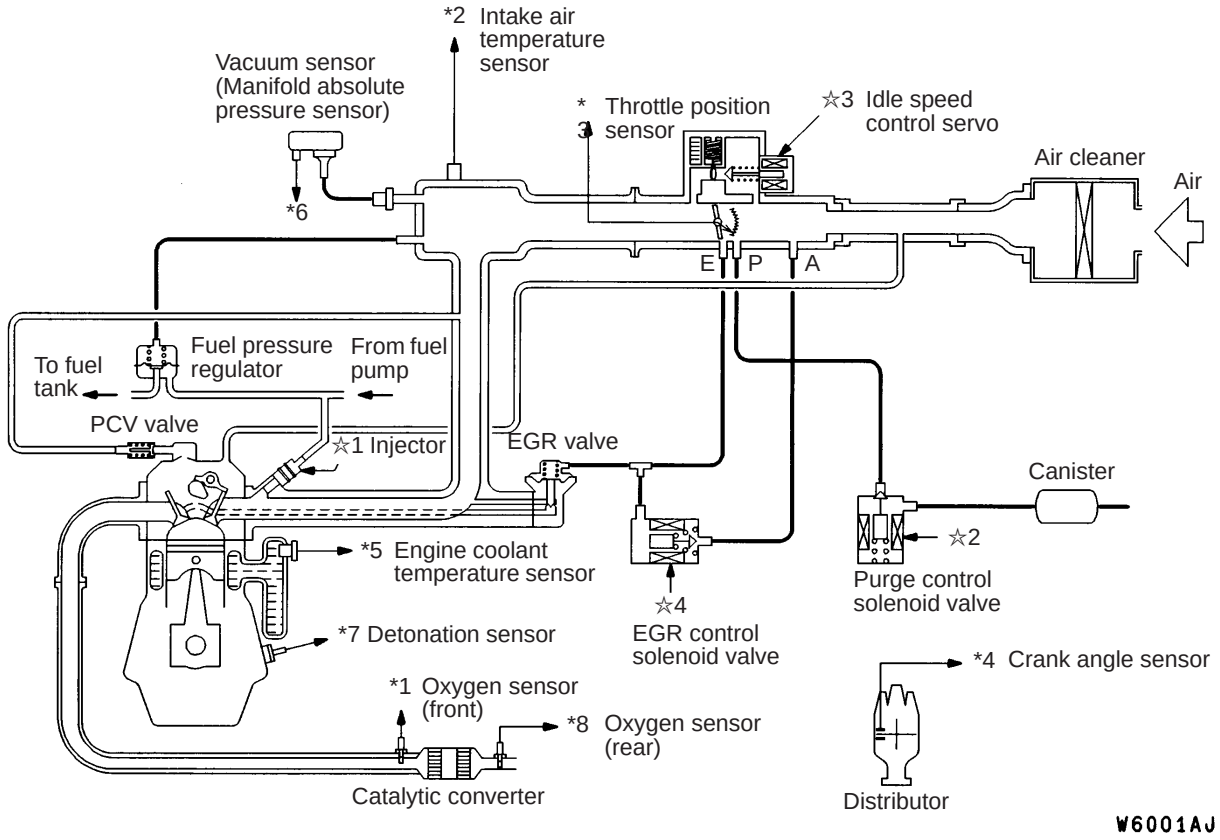
*1 Oxygen sensor (front)
*2 Intake air temperature sensor
*3 Throttle position sensor
*4 Crank angle sensor
*5 Engine coolant temperature sensor
*6 Vacuum sensor
*7 Detonation sensor
*8 Oxygen sensor (rear)

- Power supply voltage
- Vehicle speed sensor
- A/C switch
- Power steering fluid pressure switch
- Ignition switch – ST
- Ignition switch – IG

⇨ Engine-ECU ⇨

☆1 Injector
☆2 Purge control solenoid valve
☆3 Idle speed control servo
☆4 EGR control solenoid valve

- Fuel pump relay
- Control relay
- A/C power relay
- Engine warning lamp
- Diagnosis signal
- Ignition coil, power transistor
- Fan motor relay



SERVICE SPECIFICATIONS

13100030469

Items		Specifications
Basic idle speed r/min		750±50
Idle speed when A/C is ON r/min		850 at neutral position
Throttle position sensor adjusting voltage mV		530 – 740
Throttle position sensor resistance kΩ		3.5–6.5
Idle speed control servo coil resistance Ω		28–33 (at 20°C)
Intake air temperature sensor resistance kΩ	20°C	2.3–3.0
	80°C	0.30–0.42
Engine coolant temperature sensor resistance kΩ	20°C	2.1–2.7
	80°C	0.26–0.36
Oxygen sensor output voltage V		0.6–1.0
Fuel pressure kPa	Vacuum hose disconnection	324–343 at curb idle
	Vacuum hose connection	Approx. 265 at curb idle
Injector coil resistance Ω		13–16 (at 20°C)

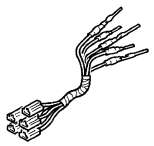
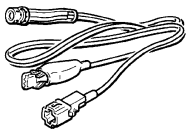
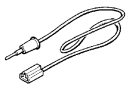
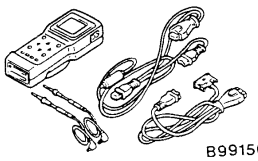
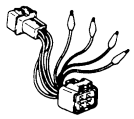
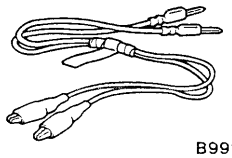
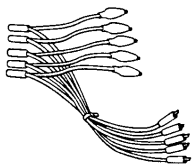
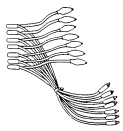
SEALANT

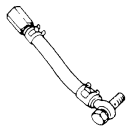
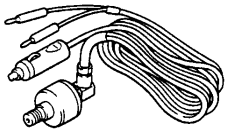
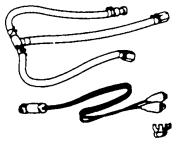
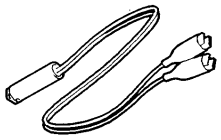
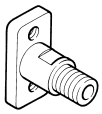
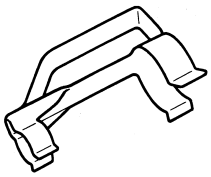
13100050038

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

SPECIAL TOOLS

13100060444

Tool	Number	Name	Use
A  B  C  D  C991223	MB991223 A: MB991219 B: MB991220 C: MB991221 D: MB991222	Harness set A: Test harness B: LED harness C: LED harness adapter D: Probe	● Fuel gauge simple inspection A: Connector pin contact pressure inspection B: Power circuit inspection C: Power circuit inspection D: Commercial tester connection
 B991502	MB991502	MUT-II sub assembly	● Reading diagnosis code ● MPI system inspection
	MB998464	Test harness (4–pin, square)	Inspection of oxygen sensor
 B991529	MB991529	Diagnosis code check harness	Reading diagnosis code
	MB991348	Test harness set	● Measurement of voltage during trouble-shooting ● Inspection using an analyzer
 MB991709	MB991709	Test harness	● Inspection of idle speed control servo ● Measurement of voltage during trouble-shooting ● Inspection using an analyzer

Tool	Number	Name	Use
	MD998709	Adaptor hose	Measurement of fuel pressure
	MD998742	Hose adaptor	
 B991637	MB991637	Fuel pressure gauge set	
	MD998706	Injector test set	Checking the spray condition of injectors
 MB991607	MB991607	Injector test harness	
 MD998741	MD998741	Injector test adaptor	
	MB991608	Clip	

TROUBLESHOOTING

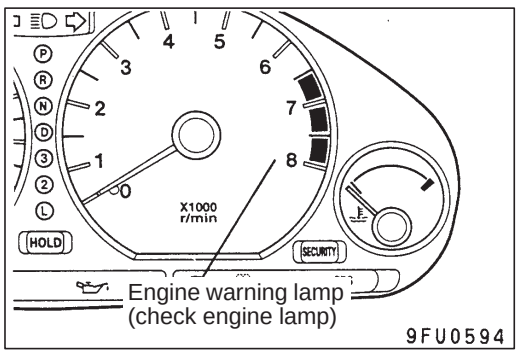
13100850409

DIAGNOSIS TROUBLESHOOTING FLOW

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

NOTE

If the engine-ECU is replaced, immobilizer-ECU and ignition key should be also replaced.



DIAGNOSIS FUNCTION

13100860594

ENGINE WARNING LAMP (CHECK ENGINE LAMP)

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

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

Engine warning lamp inspection items

Engine-ECU
Oxygen sensor
Vacuum sensor
Intake air temperature sensor
Throttle position sensor
Engine coolant temperature sensor
Crank angle sensor
Detonation sensor
Ignition timing adjustment signal
Injector
Immobilizer system

Caution
Engine warning lamp will come on even when terminal for ignition timing adjustment is short-circuited. Therefore, it is not abnormal that the lamp comes on even when terminal for ignition timing adjustment is short-circuited at the time of ignition timing adjustment.

METHOD OF READING AND ERASING DIAGNOSIS CODES

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

INSPECTION USING MUT-II DATA LIST AND ACTUATOR TESTING

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

FAIL-SAFE FUNCTION REFERENCE TABLE

13100910398

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.
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.

INSPECTION CHART FOR DIAGNOSIS CODES

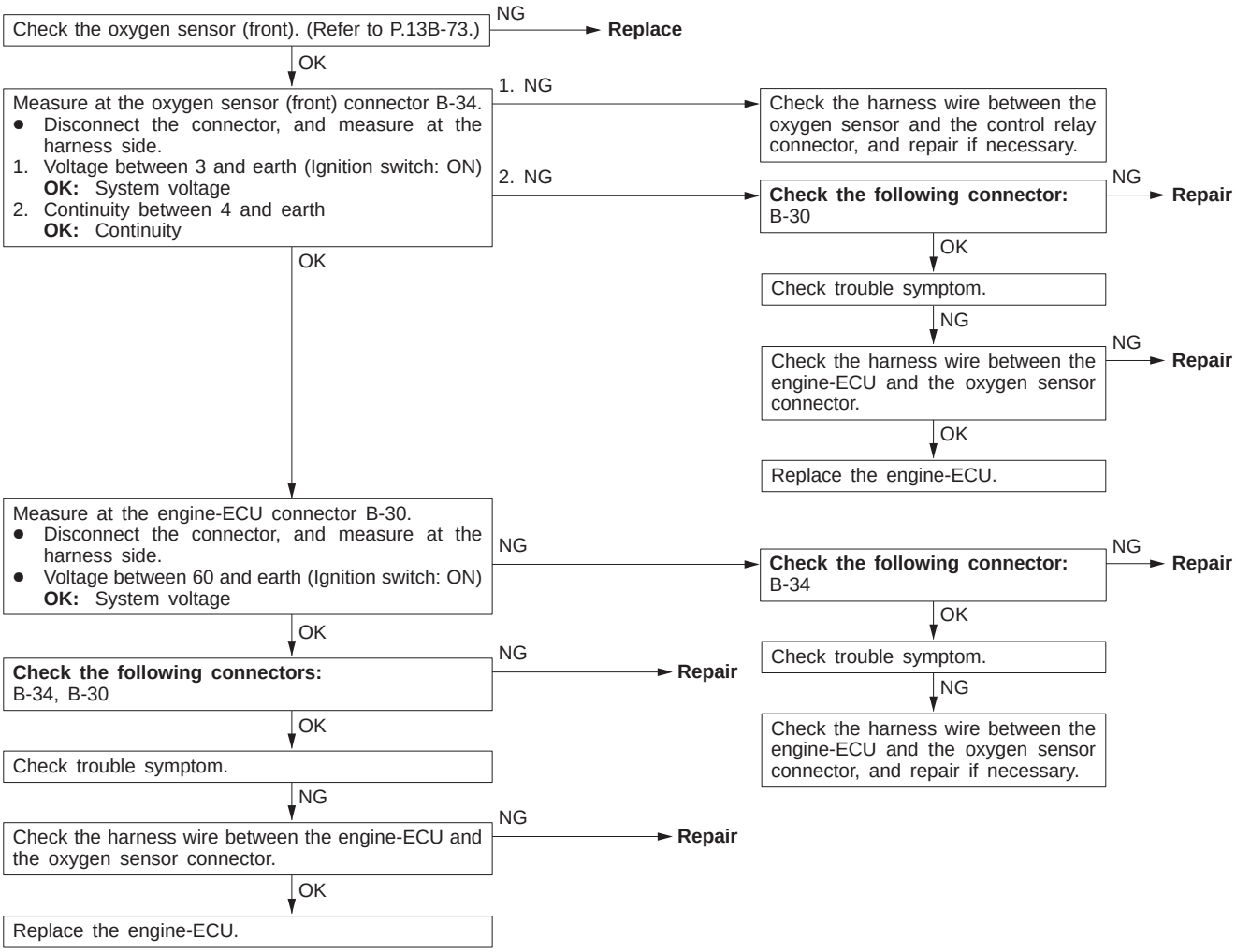
13100870672

Code No.	Diagnosis item	Reference page
11	Oxygen sensor (front) system	13B-10
13	Intake air temperature sensor system	13B-11
14	Throttle position sensor system	13B-12
21	Engine coolant temperature sensor system	13B-13
22	Crank angle sensor system	13B-14
24	Vehicle speed sensor system	13B-14
31	Detonation sensor system	13B-15
32	Vacuum sensor system	13B-16
36*	Ignition timing adjustment signal system	13B-17
41	Injector system	13B-17
54	Immobilizer system	13B-18
59	Oxygen sensor (rear) system	13B-19

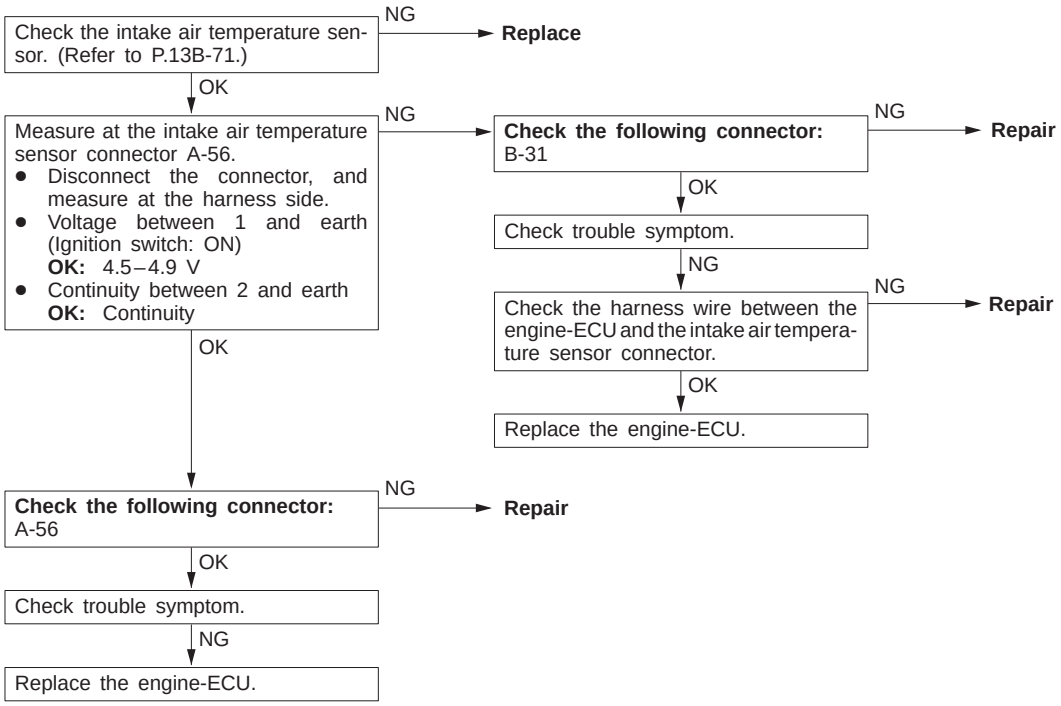
NOTE
*: Malfunction code No. 36 is not memorized.

INSPECTION PROCEDURE FOR DIAGNOSIS CODES

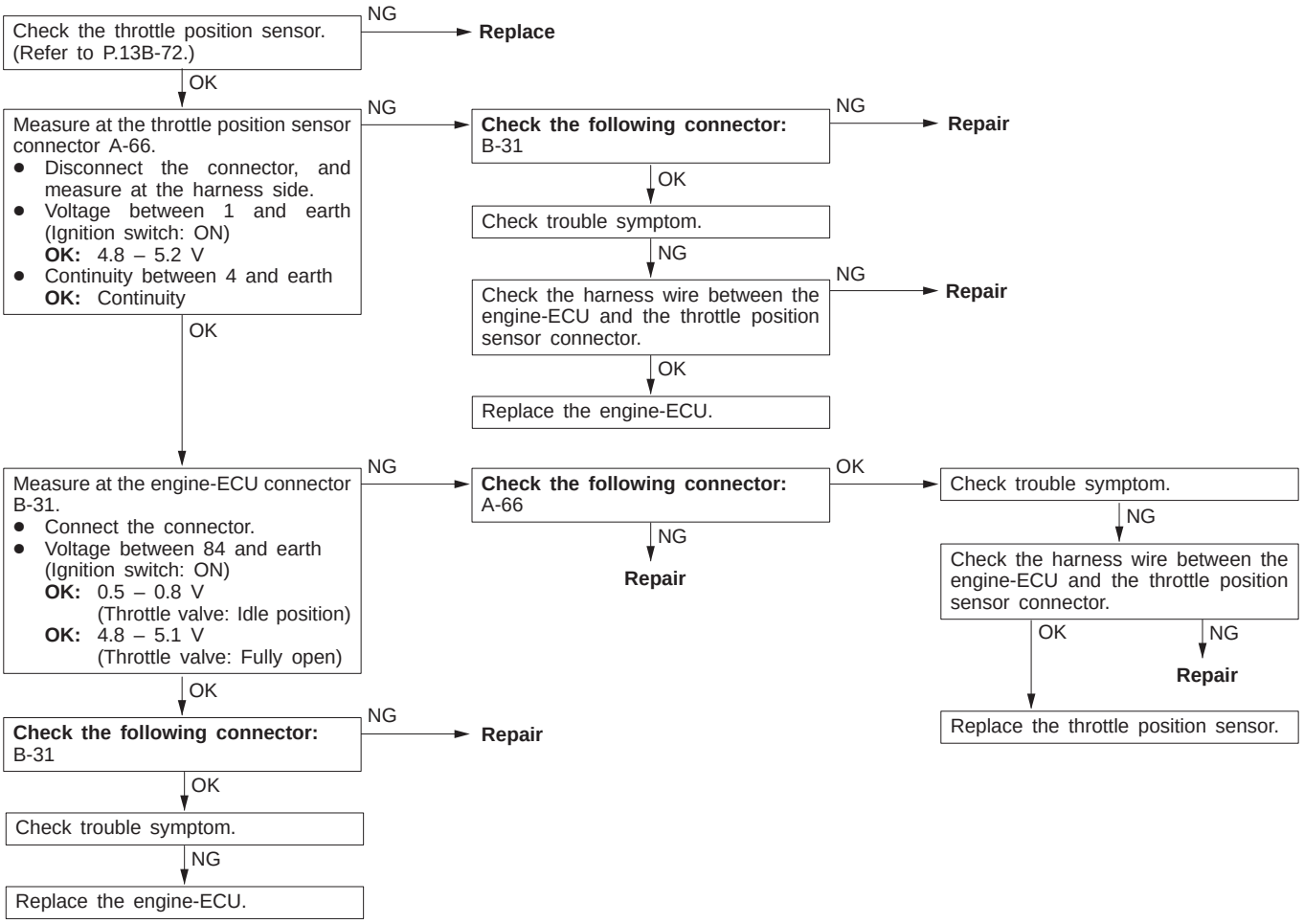
Code No. 11 Oxygen sensor (front) system	Probable cause
Range of Check ● 3 minutes have passed after engine was started. ● Engine coolant temperature is approx. 80°C or more. ● Intake air temperature is 20–50°C. ● Engine speed is approx. 2,000–3,000 r/min ● Vehicle is moving at constant speed on a flat, level road surface Set conditions ● The oxygen sensor (front) output voltage is around 0.6 V for 30 seconds (does not cross 0.6 V for 30 seconds). ● When the range of check operations given above which accompany starting of the engine are carried out four time in succession, a problem is detected after each operation.	● Malfunction of the oxygen sensor (front) ● Improper connector contact, open circuit or short-circuited harness wire ● Malfunction of the engine-ECU



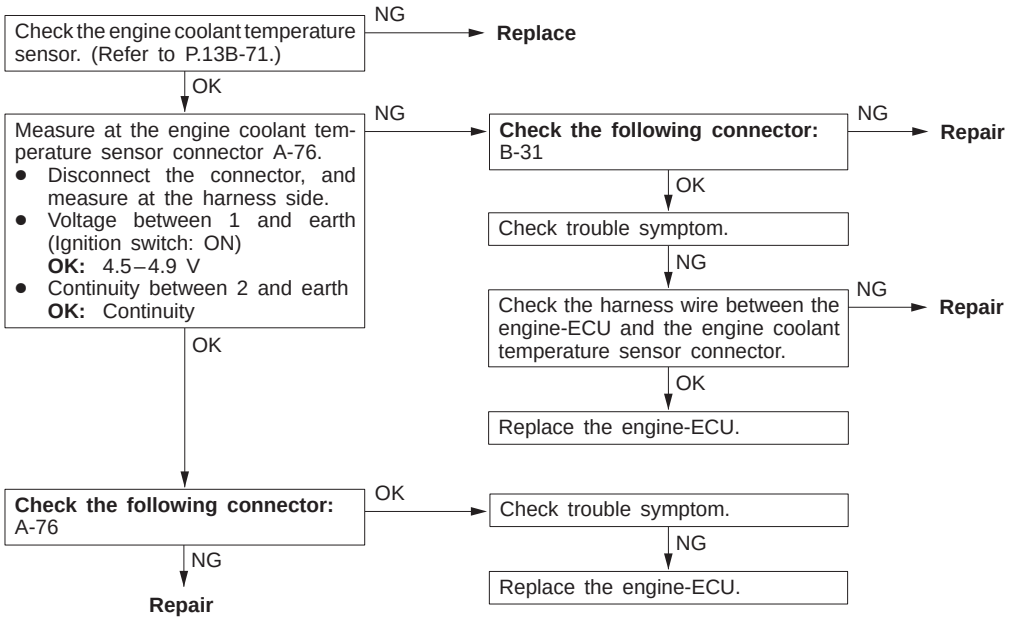
Code No. 13 Intake air temperature sensor system	Probable cause
Range of Check ● Ignition switch: ON ● Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts. Set conditions ● Sensor output voltage is 4.6 V or more (corresponding to an intake air temperature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



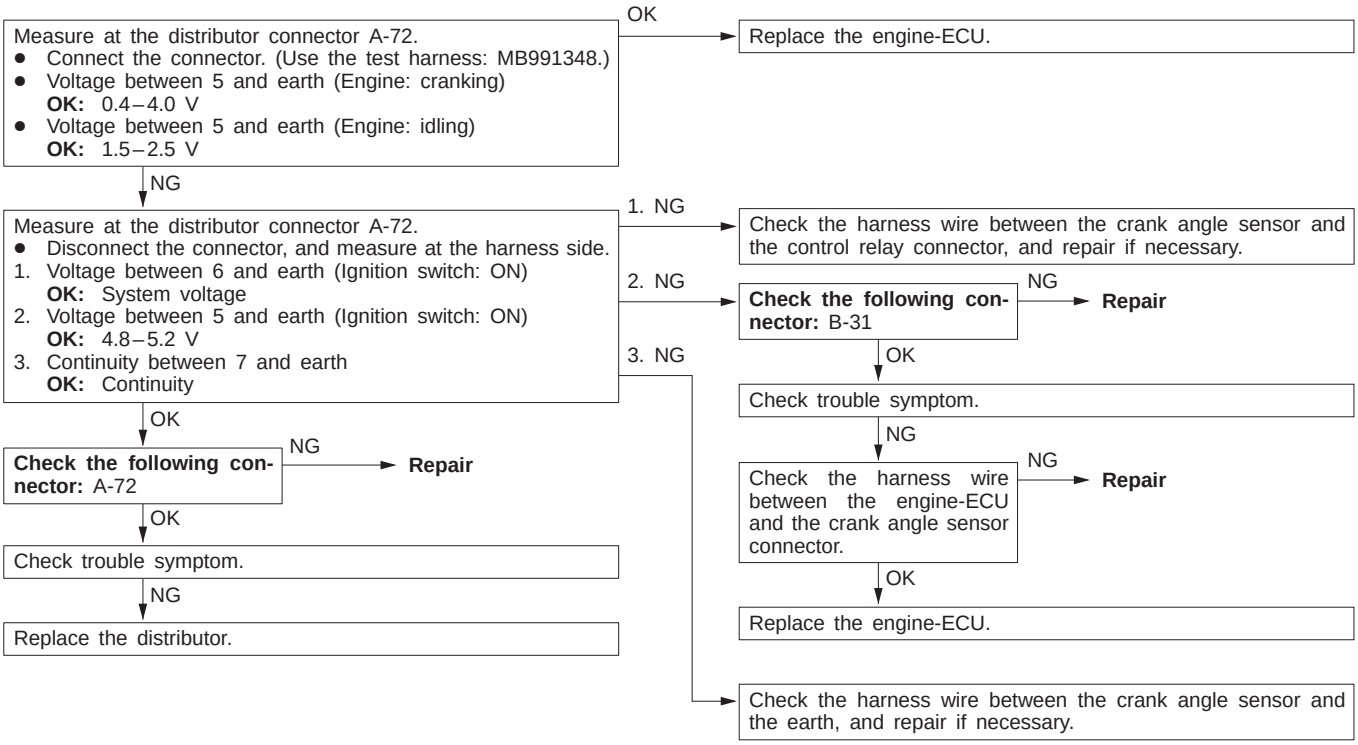
Code No.14 Throttle position sensor system	Probable cause
Range of Check ● Ignition switch: ON ● Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts. Set conditions ● Engine speed is 3,000 r/min or less, and volumetric efficiency is 30% or less, TPS output voltage is 4.6 V or more for 4 seconds. or ● Engine speed is 2,000 r/min or more, and volumetric efficiency is 60% or more, TPS output voltage is 0.8 V or less for 4 seconds.	● Malfunction of the throttle position sensor ● Improper connector contact, open circuit or short-circuited harness wire of the throttle position sensor circuit ● Malfunction of the engine-ECU



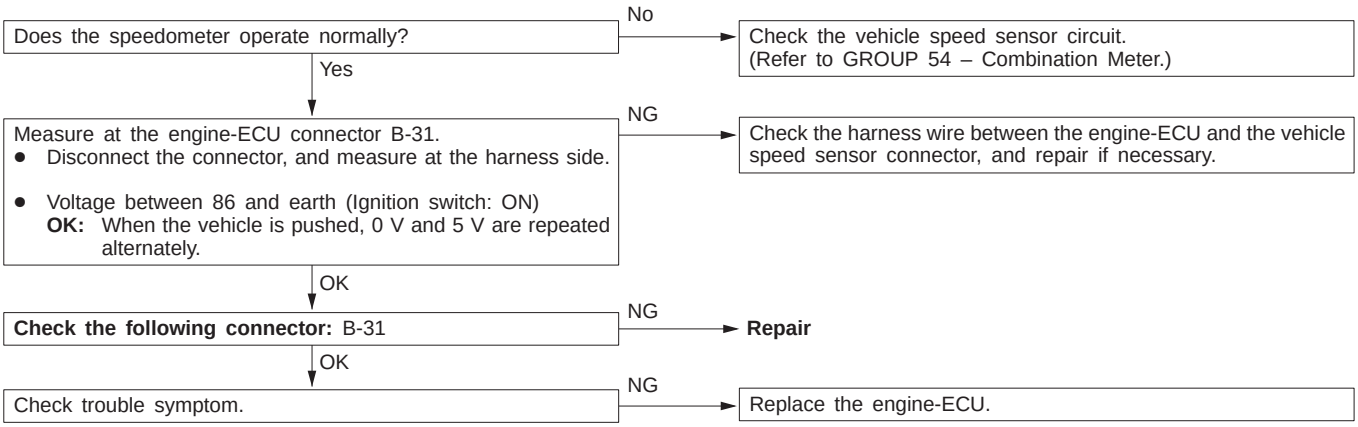
Code No. 21 Engine coolant temperature sensor system	Probable cause
Range of Check ● Ignition switch: ON ● Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts. Set conditions ● Sensor output voltage is 4.6 V or more (corresponding to an engine coolant temperature of –45°C or less) for 4 seconds. or ● Sensor output voltage is 0.1 V or less (corresponding to an engine coolant temperature of 140°C or more) for 4 seconds.	● Malfunction of the engine coolant temperature sensor ● Improper connector contact, open circuit or short-circuited harness wire of the engine coolant temperature sensor circuit ● Malfunction of the engine-ECU
Range of Check ● Ignition switch: ON ● Engine speed is approx. 50 r/min or more Set conditions ● The sensor output voltage increases from 1.6 V or less (corresponding to an engine coolant temperature of 40°C or more) to 1.6 V or more (corresponding to an engine coolant temperature of 40°C or less). ● After this, the sensor output voltage is 1.6 V or more for 5 minutes.	



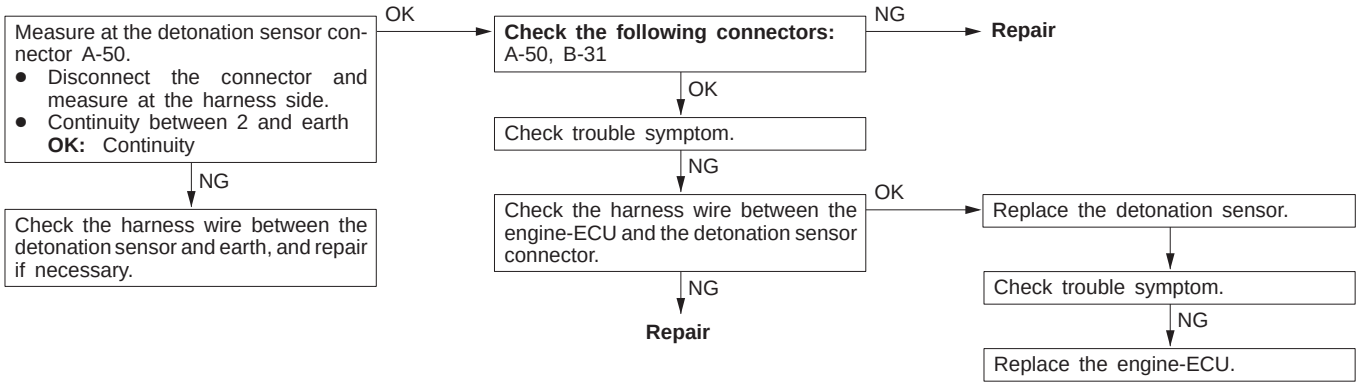
Code No. 22 Crank angle sensor system	Probable cause
Range of Check ● Engine is cranking. Set conditions ● Sensor output voltage does not change for 4 seconds (no pulse signal input.)	● Malfunction of the crank angle sensor ● Improper connector contact, open circuit or short-circuited harness wire of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



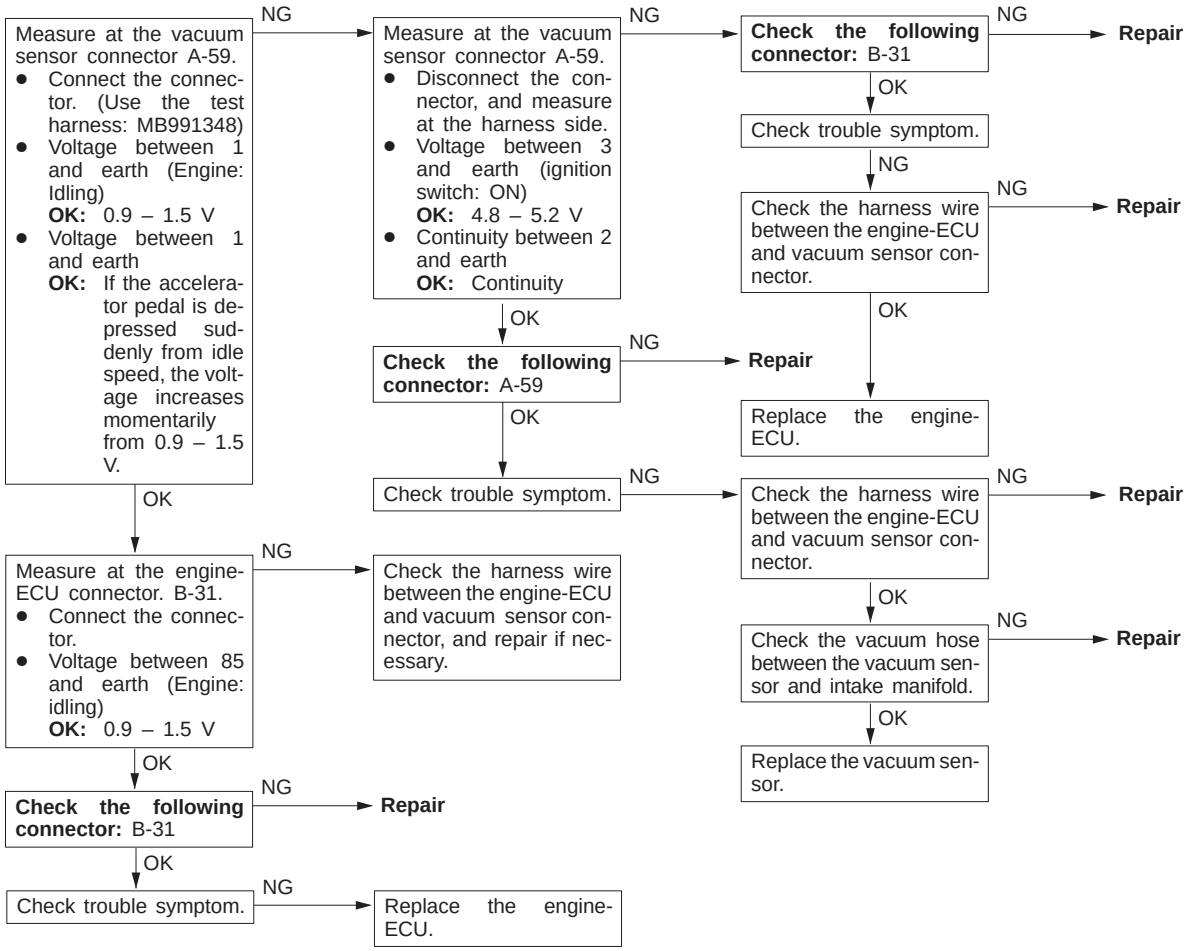
Code No. 24 Vehicles speed sensor system	Probable cause
Range of check ● Ignition switch: ON ● Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts. ● Idle position switch: OFF ● Engine speed is 3,000 r/min or more. ● Driving under high engine load conditions. Set conditions ● Sensor output voltage does not change for 4 seconds (no pulse signal input).	● Malfunction of the vehicle speed sensor ● Improper connector contact, open circuit or short-circuited harness wire of the vehicle speed sensor circuit ● Malfunction of the engine-ECU



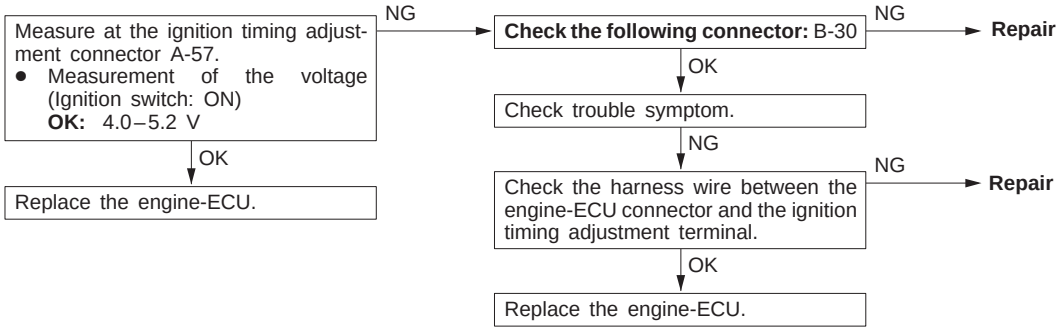
Code No. 31 Detonation sensor system	Probable cause
Range of Check ● Ignition switch: ON ● Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts. ● Engine speed is approx. 5,000 r/min or more Set conditions The change in the detonation sensor output voltage (detonation sensor peak voltage at each 1/2 revolution of the crankshaft) is less than 0.06 V for 200 times in succession.	● Malfunction of the detonation sensor ● Improper connector contact, open circuit or short-circuited harness wire of the detonation sensor circuit ● Malfunction of the engine-ECU



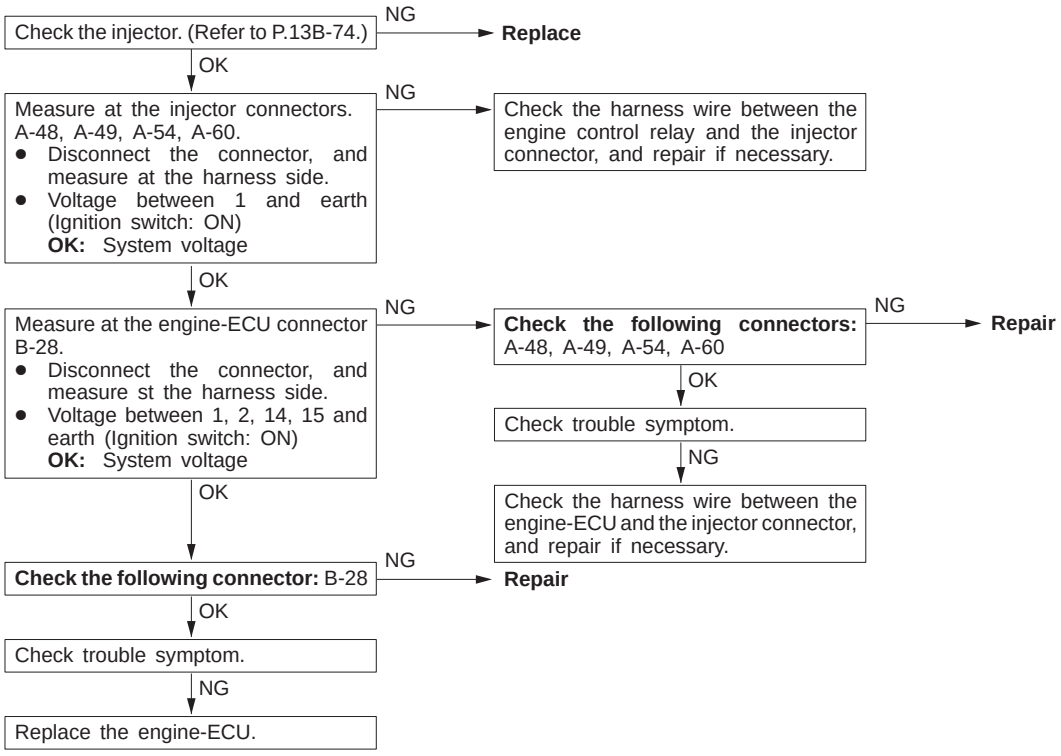
Code No.32 Vacuum sensor system	Range of Check
Range of Check ● Ignition switch: ON Set Conditions ● The output voltage of the vacuum sensor is 4.5 V or more for 4 seconds. (This corresponds to the absolute manifold pressure of 115 kPa or more.)	● Malfunction of the vacuum sensor ● Improper connector 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 4 seconds. (This corresponds to the absolute manifold pressure of 4.9 kPa or less.)	



Code No. 36 Ignition timing adjustment signal system	Probable cause
Range of Check ● Ignition switch: ON Set conditions ● The ignition timing adjusting signal wire is shorted to the earth.	● Short circuit to earth of the ignition timing adjustment signal line ● Malfunction of the engine-ECU

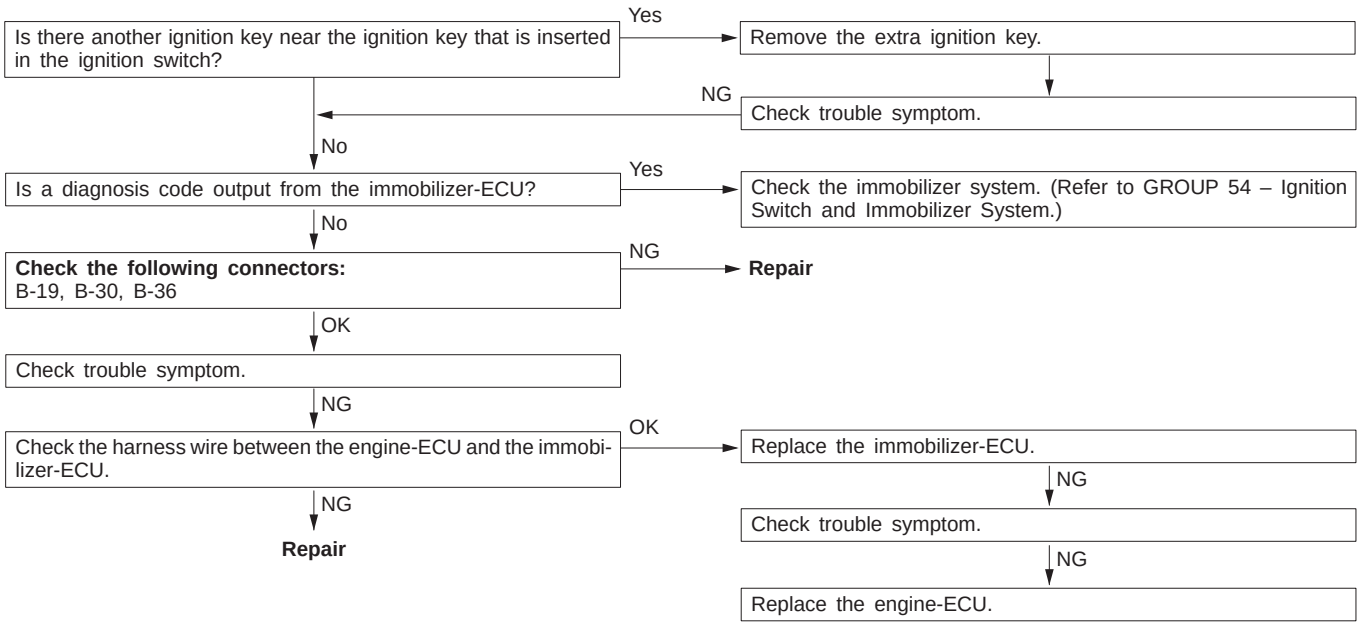


Code No. 41 Injector system	Probable cause
Range of Check ● Engine speed is approx. 50 – 1,000 r/min ● The throttle position sensor output voltage is 1.15 V or less. ● Actuator test by MUT-II is not carried out. Set conditions ● Surge voltage of injector coil is not detected for 4 seconds.	● Malfunction of the injector ● Improper connector contact, open circuit or short-circuited harness wire of the injector circuit ● Malfunction of the engine-ECU

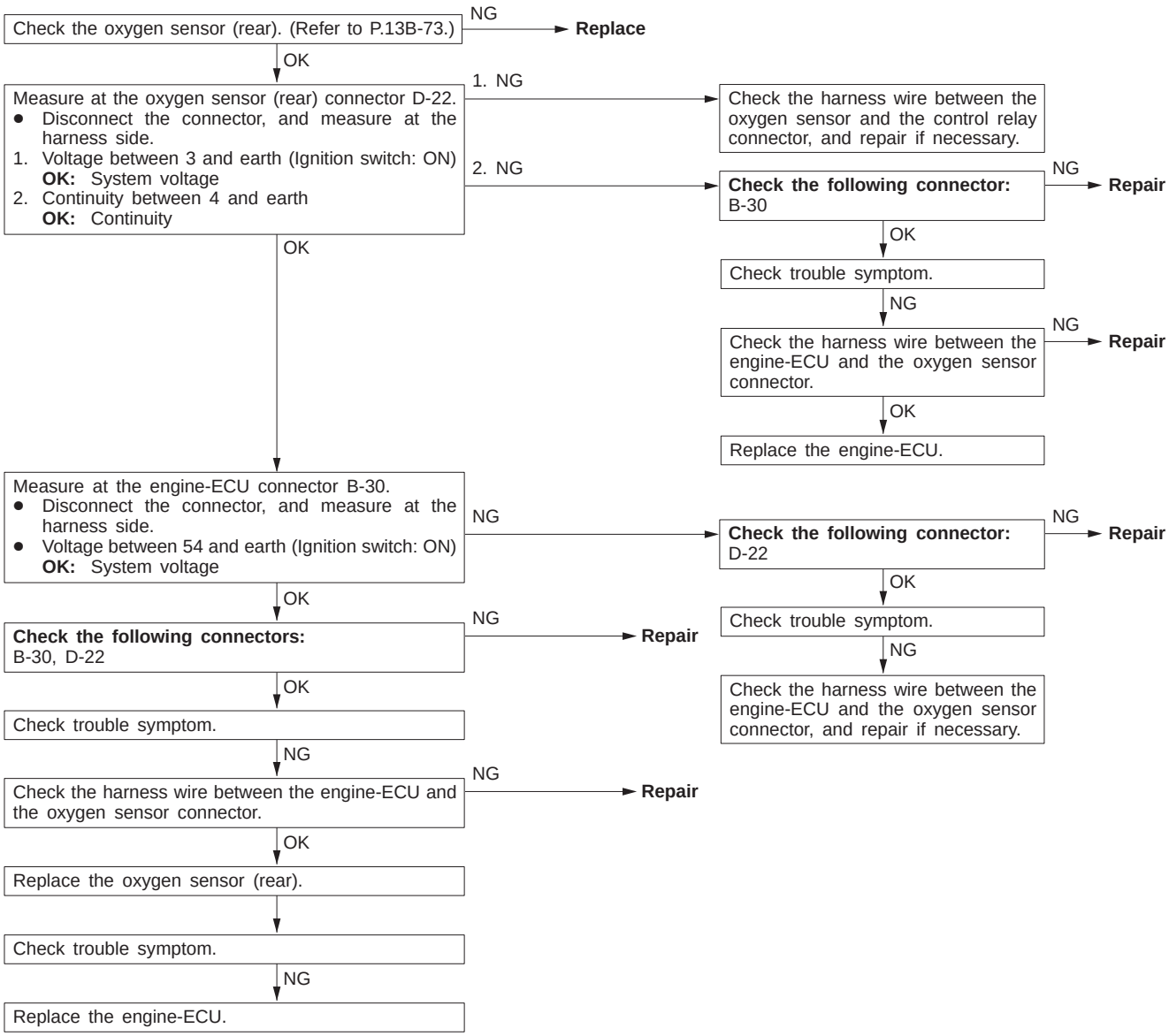


Code No.54 Immobilizer system	Probable cause
Range of Check ● Ignition switch: ON Set Conditions ● Improper communication between the engine-ECU and immobilizer-ECU	● Radio interference of ID codes ● Incorrect ID code ● Malfunction of harness or connector ● Malfunction of immobilizer-ECU ● Malfunction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

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



Code No. 59 Oxygen sensor (rear) system	Probable cause
Range of Check ● 3 minutes have passed after engine was started. ● Engine coolant temperature is approx. 80°C or more. ● Idle position switch: OFF ● The throttle position sensor output voltage is 4.1 V or more. ● Open loop control in operation ● 20 seconds have passed after deceleration finished. Set conditions ● The oxygen sensor (rear) output voltage is 0.1 V or less. ● The difference in the maximum and minimum values for the oxygen sensor (rear) output voltage is 0.08 V or less. ● The oxygen sensor (rear) output voltage is 0.5 V or more. ● The above conditions continue for a continuous period of 5 seconds.	● Malfunction of the oxygen sensor (rear) ● Improper connector contact, open circuit or short-circuited harness wire ● Malfunction of the engine-ECU



INSPECTION CHART FOR TROUBLE SYMPTOMS

13100880590

Trouble symptom		Inspection procedure No.	Reference page
Communication with MUT-II is impossible.	Communication with all systems is not possible.	1	13B-22
	Communication with engine-ECU only is not possible.	2	13B-22
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	13B-23
	The engine warning lamp remains illuminating and never goes out.	4	13B-23
Starting	No initial combustion (starting impossible)	5	13B-24
	Initial combustion but no complete combustion (starting impossible)	6	13B-25
	Long time to start (improper starting)	7	13B-26
Idling stability (Improper idling)	Unstable idling (Rough idling, hunting)	8	13B-27
	Idling speed is high. (Improper idling speed)	9	13B-29
	Idling speed is low. (Improper idling speed)	10	13B-29
Idling stability (Engine stalls)	When the engine is cold, it stalls at idling. (Die out)	11	13B-30
	When the engine becomes hot, it stalls at idling. (Die out)	12	13B-31
	The engine stalls when starting the car. (Pass out)	13	13B-33
	The engine stalls when decelerating.	14	13B-33
Driving	Hesitation, sag or stumble	15	13B-34
	The feeling of impact or vibration when accelerating	16	13B-35
	The feeling of impact or vibration when decelerating	17	13B-35
	Poor acceleration	18	13B-36
	Surge	19	13B-37
	Knocking	20	13B-38
Dieseling		21	13B-38
Too high CO and HC concentration when idling		22	13B-39
Fans (radiator fan, A/C condenser fan) are inoperative		23	13B-40

PROBLEM SYMPTOMS TABLE (FOR YOUR INFORMATION)

Items		Symptom
Starting	Won't start	The starter is used to crank the engine, but there is no combustion within the cylinders, and the engine won't start.
	Fires up and dies	There is combustion within the cylinders, but then the engine soon stalls.
	Hard starting	Engine starts after cranking a while.
Idling stability	Hunting	Engine speed doesn't remain constant; changes at idle.
	Rough idle	Usually, a judgement can be based upon the movement of the tachometer pointer, and the vibration transmitted to the steering wheel, shift lever, body, etc. This is called rough idle.
	Incorrect idle speed	The engine doesn't idle at the usual correct speed.
	Engine stall (Die out)	The engine stalls when the foot is taken from the accelerator pedal, regardless of whether the vehicles is moving or not.
	Engine stall (Pass out)	The engine stalls when the accelerator pedal is depressed or while it is being used.
Driving	Hesitation Sag	"Hesitation" is the delay in response of the vehicle speed (engine speed) that occurs when the accelerator is depressed in order to accelerate from the speed at which the vehicle is now traveling, or a temporary drop in vehicle speed (engine speed) during such acceleration. Serious hesitation is called "sag". (Refer to Fig. 1)
	Poor acceleration	Poor acceleration is inability to obtain an acceleration corresponding to the degree of throttle opening, even though acceleration is smooth, or the inability to reach maximum speed.
	Stumble	Engine speed increase is delayed when the accelerator pedal is initially depressed for acceleration. (Refer to Fig. 2)
	Shock	The feeling of a comparatively large impact or vibration when the engine is accelerated or decelerated.
	Surge	This is repeated surging ahead during constant speed travel or during variable speed travel.
	Knocking	A sharp sound like a hammer striking the cylinder walls during driving and which adversely affects driving.
Stopping	Run on ("Dieseling")	The condition in which the engine continues to run after the ignition switch is turned to OFF. Also called "Dieseling".

Fig. 1

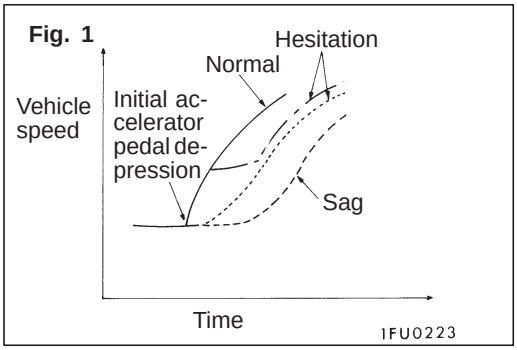
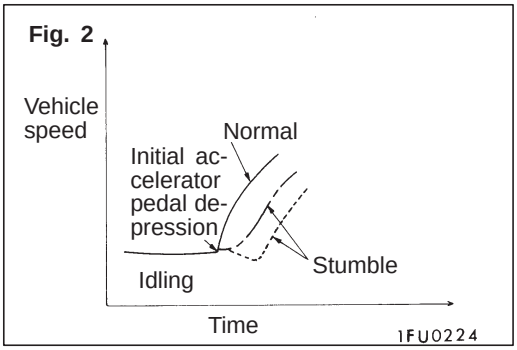


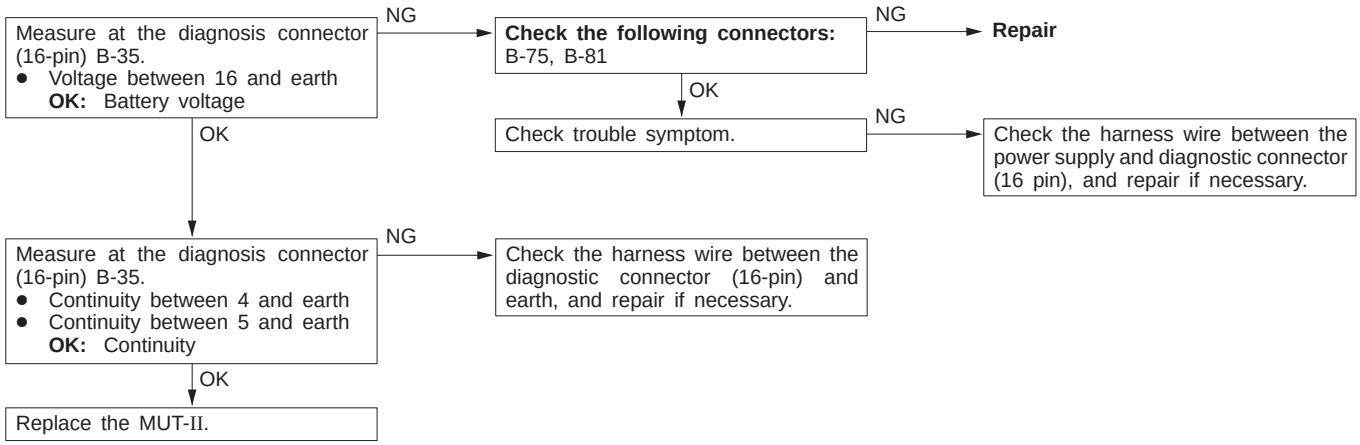
Fig. 2



INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

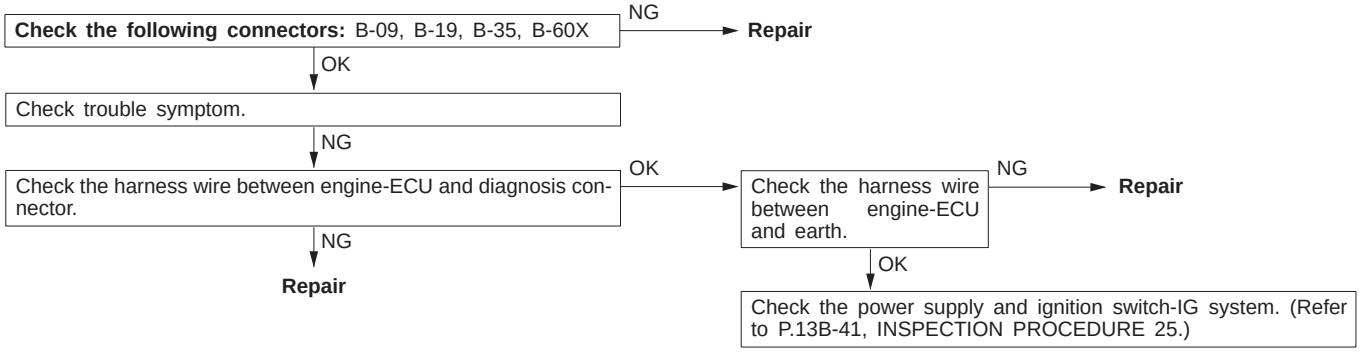
INSPECTION PROCEDURE 1

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

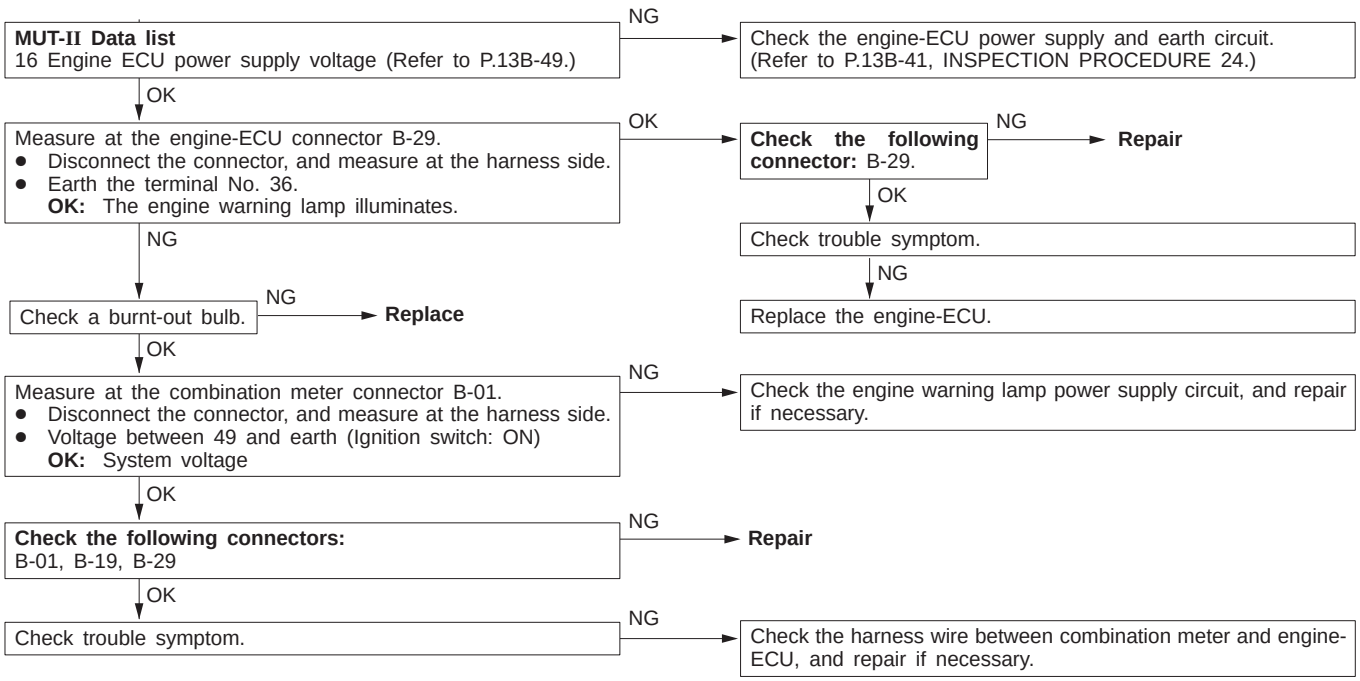
MUT-II communication with engine-ECU is impossible.	Probable cause
One of the following causes may be suspected: • No power supply to engine-ECU. • Defective earth circuit of engine-ECU. • Defective engine-ECU. • Improper communication line between engine-ECU and MUT-II	• Malfunction of engine-ECU power 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.

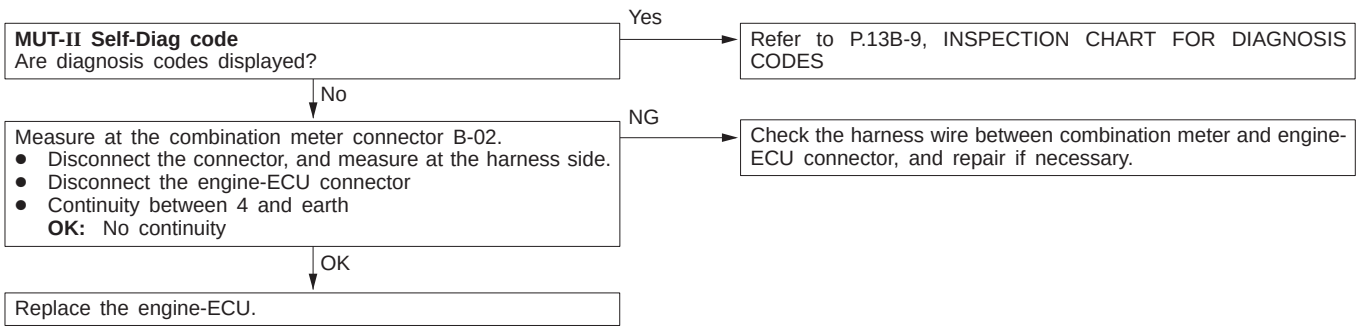
INSPECTION PROCEDURE 3

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

Check battery voltage when cranking.
OK: 8 V or higher
NG → Check the battery. (Refer to GROUP 54 – Battery.)
OK ↓

Is an immobilizer-ECU diagnosis code displayed?
Yes → Check the immobilizer. (Refer to GROUP 54 – Ignition Key and Immobilizer.)
No ↓

MUT-II Data list
16 Voltage of engine-ECU power source (Refer to P.13B-49.)
NG → Check the power supply and ignition switch-IG system. (Refer to P.13B-41, INSPECTION PROCEDURE 25.)
OK ↓

Does the camshaft rotate at the engine cranking? (When oil filler cap is removed.)
No → Check timing belt for breakage.
Yes ↓

MUT-II Self-Diag code
Are diagnosis codes displayed?
Yes → Refer to P.13B-9, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

MUT-II Data list
22 Crank angle sensor
OK: Cranking speed is displayed.
No → Check the crank angle sensor system. (Refer to P.13B-14, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 22.)
OK ↓

MUT-II Actuator test
07 Fuel pump (Refer to P.13B-52)
NG → Check the fuel pump system. (Refer to P.13B-42, INSPECTION PROCEDURE 26.)
OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13B-49.)
NG → Check the engine coolant temperature sensor system. (Refer to P.13B-13, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 21.)
OK ↓

Can any sound be heard from the injectors when cranking?
NG → Check the injector system. (Refer to P.13B-17, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 41.)
OK ↓

Does the engine tachometer display the cranking speed?
- Set the tachometer of primary voltage detection type.

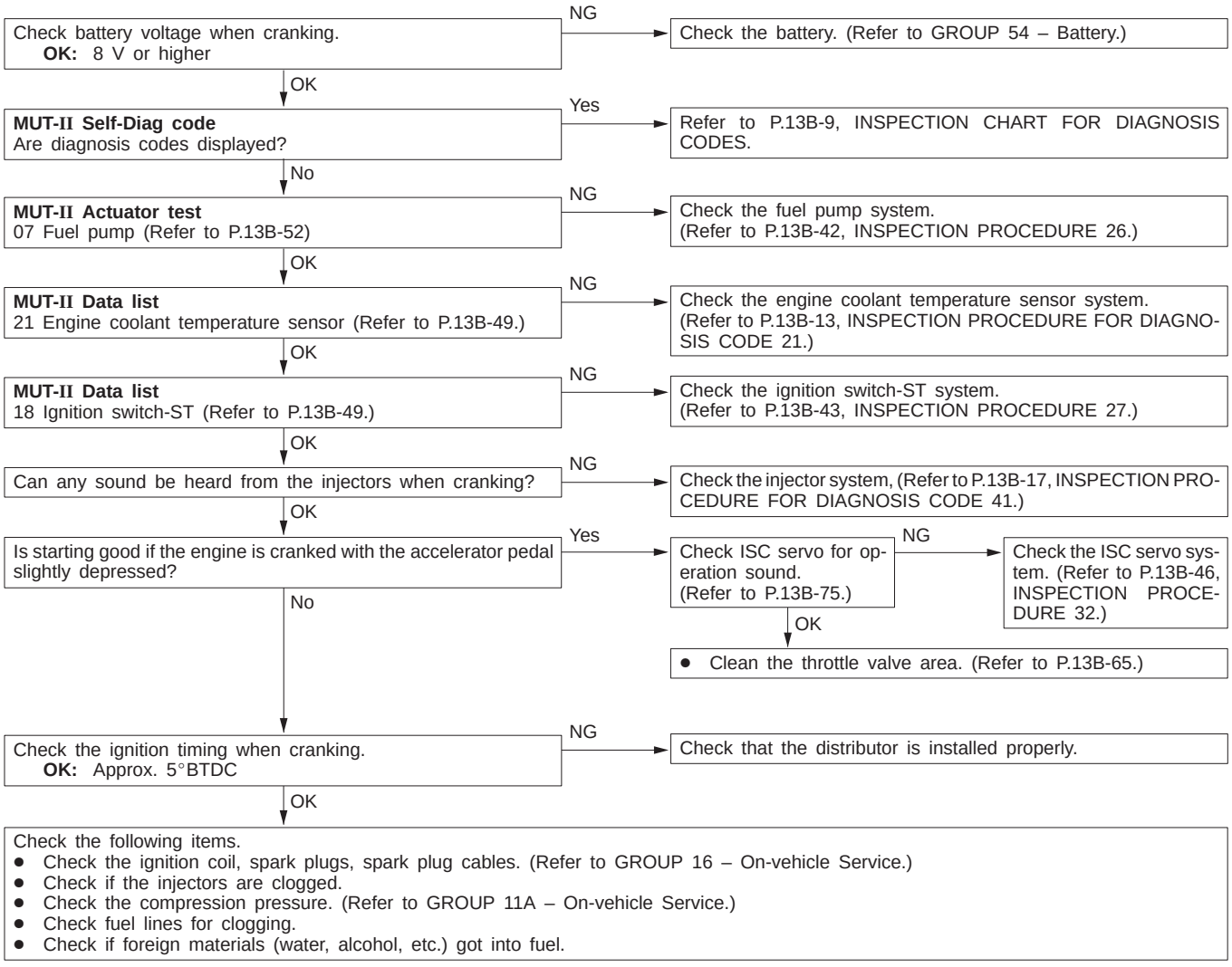
NG → Check the ignition circuit system. (Refer to P.13B-45, INSPECTION PROCEDURE 31.)
OK ↓

Check the ignition timing when cranking.
OK: Approx. 5° BTDC
NG → Check that the distributor is installed properly.
OK ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle service.)
- Check if the injectors are clogged.
- Check if foreign materials (water, alcohol, etc.) got into fuel.
- Check the compression pressure.
- Check the immobilizer system. (Refer to GROUP 54 – Ignition Key and Immobilizer.)

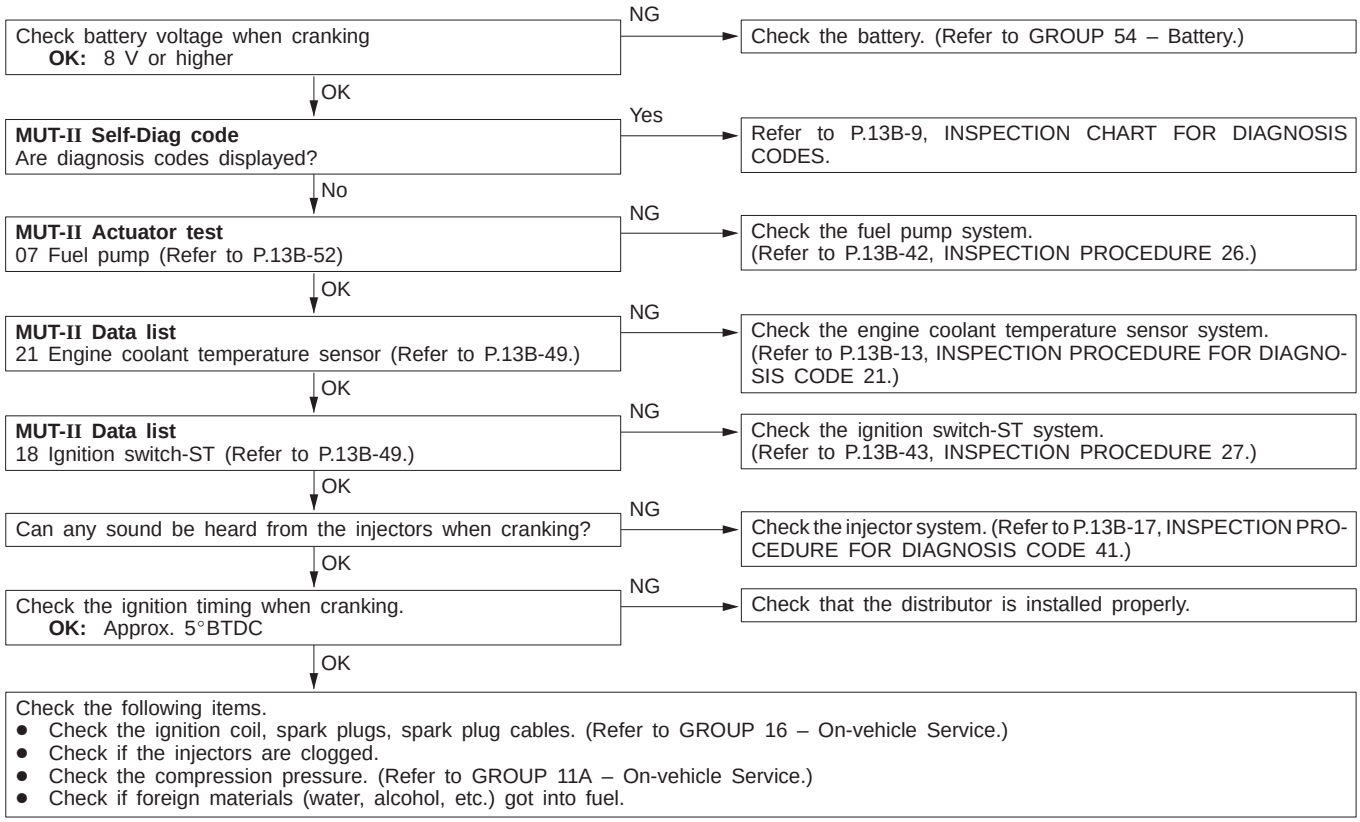
INSPECTION PROCEDURE 6

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



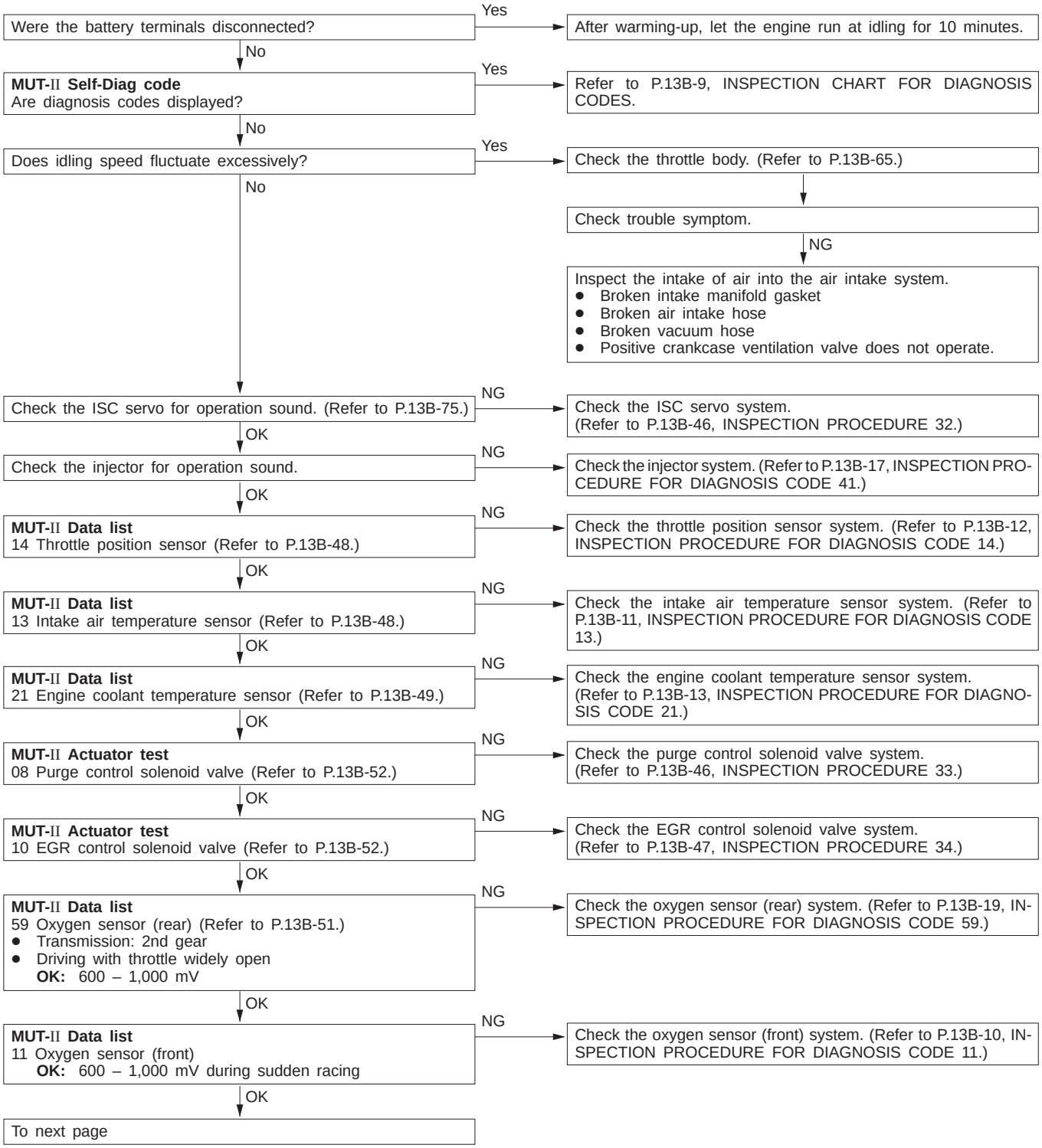
INSPECTION PROCEDURE 7

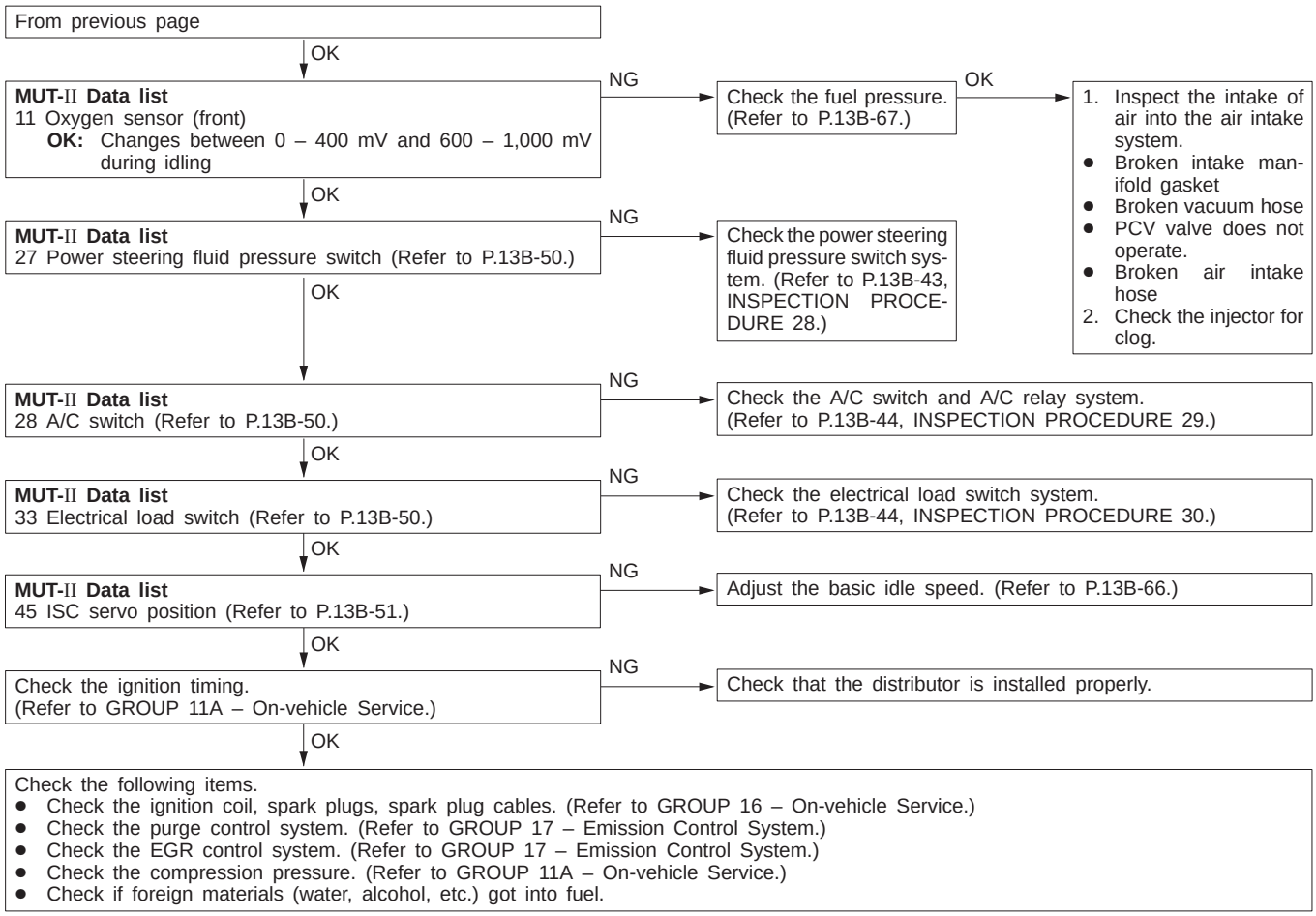
In takes too long time to start. (Incorrect starting)	Probable cause
In cases such as the above, the cause is probably that the spark is weak and ignition is difficult, the initial mixture for starting is not appropriate, or sufficient compression pressure is not being obtained.	● Malfunction of the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



INSPECTION PROCEDURE 8

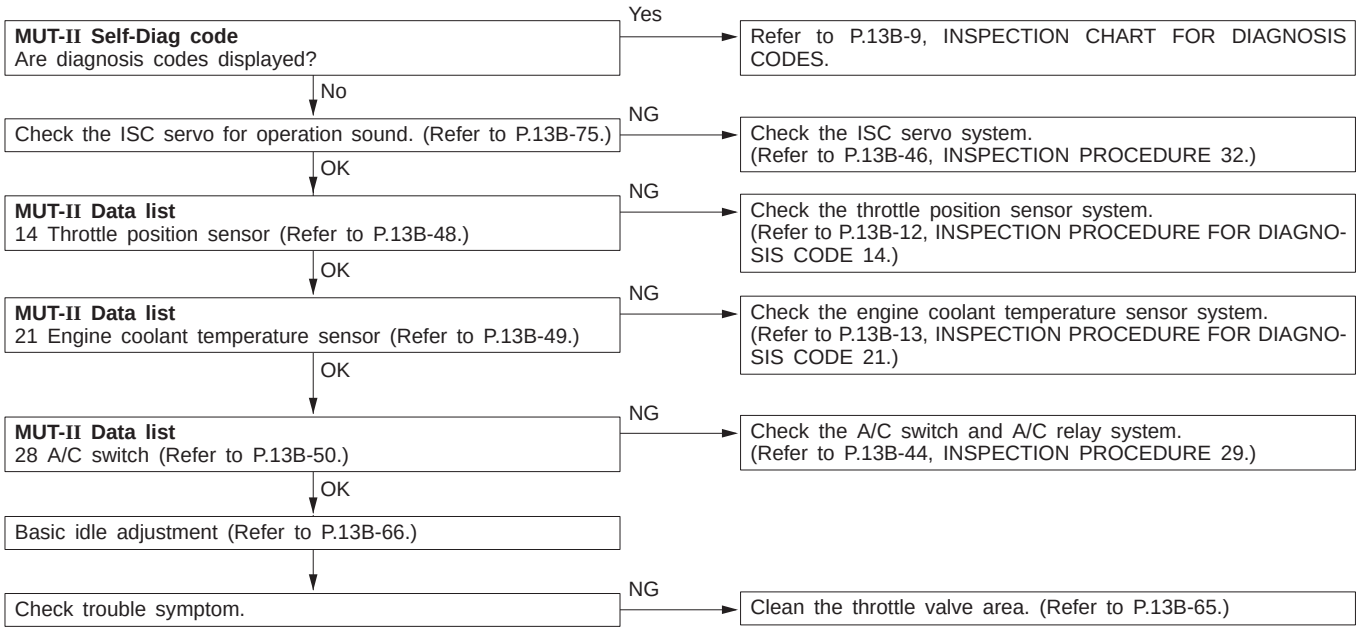
Unstable idling (Rough idling, hunting)	Probable cause
In cases as the above, the cause is probably that the ignition system, air/fuel mixture, idle speed control (ISC) or compression pressure is defective. Because the range of possible causes is broad, inspection is narrowed down to simple items.	• 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




From previous page
OK
MUT-II Data list
11 Oxygen sensor (front)
OK: Changes between 0 – 400 mV and 600 – 1,000 mV during idling
NG
Check the fuel pressure. (Refer to P.13B-67.)
OK
1. Inspect the intake of air into the air intake system.
● Broken intake manifold gasket
● Broken vacuum hose
● PCV valve does not operate.
● Broken air intake hose
2. Check the injector for clog.
OK
MUT-II Data list
27 Power steering fluid pressure switch (Refer to P.13B-50.)
NG
Check the power steering fluid pressure switch system. (Refer to P.13B-43, INSPECTION PROCEDURE 28.)
OK
MUT-II Data list
28 A/C switch (Refer to P.13B-50.)
NG
Check the A/C switch and A/C relay system. (Refer to P.13B-44, INSPECTION PROCEDURE 29.)
OK
MUT-II Data list
33 Electrical load switch (Refer to P.13B-50.)
NG
Check the electrical load switch system. (Refer to P.13B-44, INSPECTION PROCEDURE 30.)
OK
MUT-II Data list
45 ISC servo position (Refer to P.13B-51.)
NG
Adjust the basic idle speed. (Refer to P.13B-66.)
OK
Check the ignition timing. (Refer to GROUP 11A – On-vehicle Service.)
NG
Check that the distributor is installed properly.
OK
Check the following items.
● Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle Service.)
● Check the purge control system. (Refer to GROUP 17 – Emission Control System.)
● Check the EGR control system. (Refer to GROUP 17 – Emission Control System.)
● Check the compression pressure. (Refer to GROUP 11A – On-vehicle Service.)
● Check if foreign materials (water, alcohol, etc.) got into fuel.

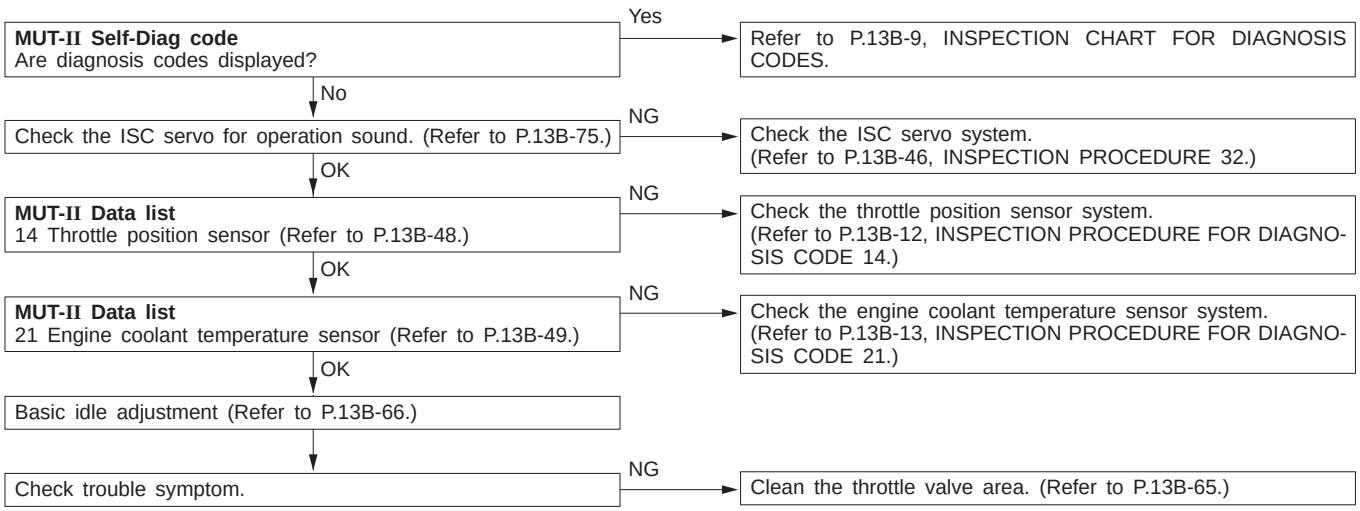
INSPECTION PROCEDURE 9

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



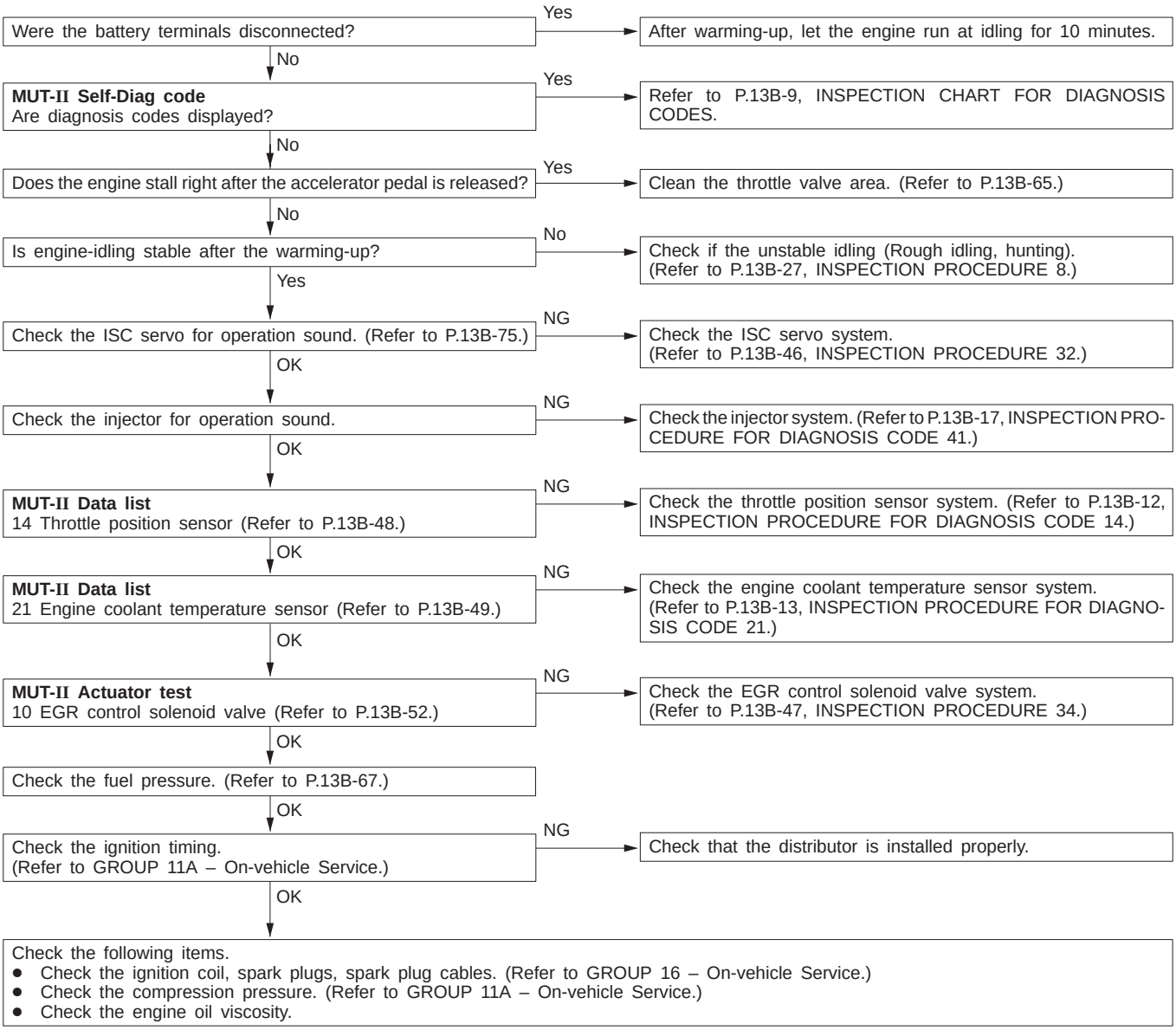
INSPECTION PROCEDURE 10

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



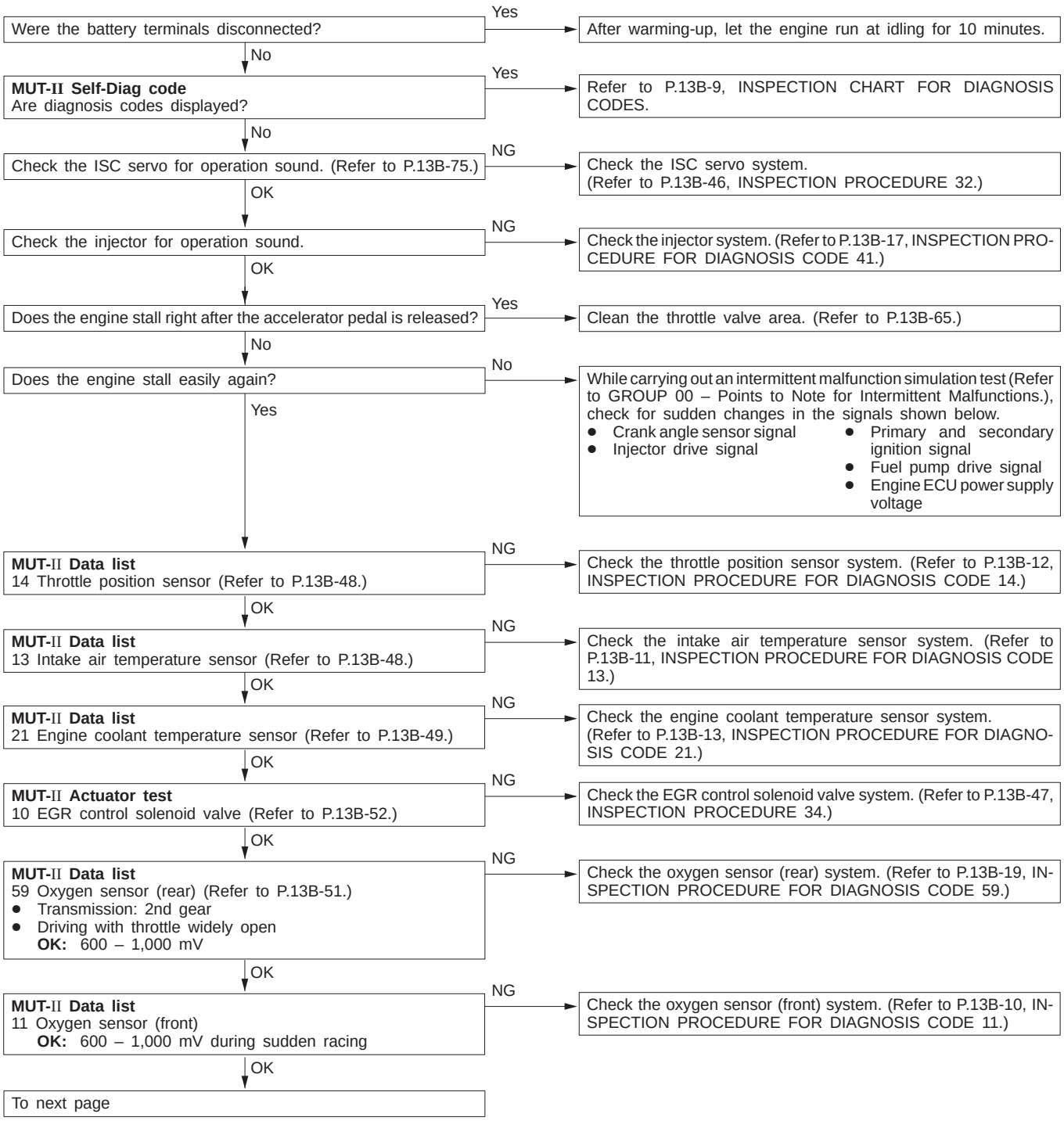
INSPECTION PROCEDURE 11

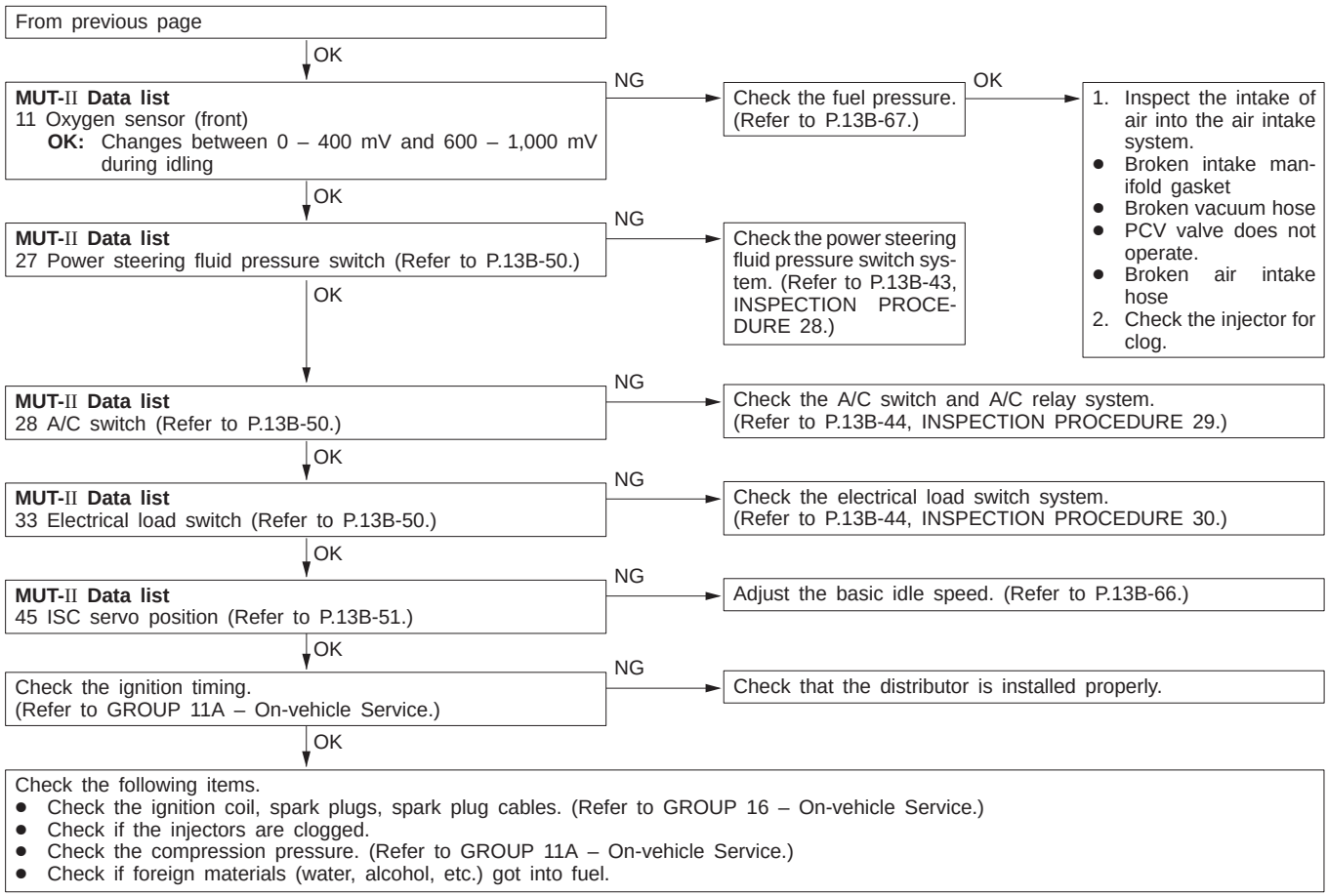
When the engine is cold, it stalls at idling. (Die out)	Probable cause
In such cases as the above, the cause is probably that the air/fuel mixture is inappropriate when the engine is cold, or that the intake air volume is insufficient.	• Malfunction of the ISC servo system • Malfunction of the throttle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



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




From previous page
OK
MUT-II Data list
11 Oxygen sensor (front)
OK: Changes between 0 – 400 mV and 600 – 1,000 mV during idling
NG
Check the fuel pressure. (Refer to P.13B-67.)
OK
1. Inspect the intake of air into the air intake system.
● Broken intake manifold gasket
● Broken vacuum hose
● PCV valve does not operate.
● Broken air intake hose
2. Check the injector for clog.
OK
MUT-II Data list
27 Power steering fluid pressure switch (Refer to P.13B-50.)
NG
Check the power steering fluid pressure switch system. (Refer to P.13B-43, INSPECTION PROCEDURE 28.)
OK
MUT-II Data list
28 A/C switch (Refer to P.13B-50.)
NG
Check the A/C switch and A/C relay system. (Refer to P.13B-44, INSPECTION PROCEDURE 29.)
OK
MUT-II Data list
33 Electrical load switch (Refer to P.13B-50.)
NG
Check the electrical load switch system. (Refer to P.13B-44, INSPECTION PROCEDURE 30.)
OK
MUT-II Data list
45 ISC servo position (Refer to P.13B-51.)
NG
Adjust the basic idle speed. (Refer to P.13B-66.)
OK
Check the ignition timing. (Refer to GROUP 11A – On-vehicle Service.)
NG
Check that the distributor is installed properly.
OK
Check the following items.
● Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle Service.)
● Check if the injectors are clogged.
● Check the compression pressure. (Refer to GROUP 11A – On-vehicle Service.)
● Check if foreign materials (water, alcohol, etc.) got into fuel.

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

MUT-II Self-Diag code
Are diagnosis codes displayed?
Yes → Refer to P.13B-9, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13B-52.)
NG → Check the EGR control solenoid valve system. (Refer to P.13B-47, INSPECTION PROCEDURE 34.)
OK ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle Service.)
- Check if air was drawn into the intake system.
  - Broken intake manifold gasket
  - Broken or disconnected vacuum hose
  - Improper operation of the PCV valve
  - Broken air intake hose

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

Were the battery terminals disconnected?
Yes → After warming-up, let the engine run at idling for 10 minutes.
No ↓

MUT-II Self-Diag code
Are diagnosis codes displayed?
Yes → Refer to P.13B-9, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

MUT-II Data list
14 Throttle position sensor (Refer to P.13B-48.)
NG → Check the throttle position sensor system. (Refer to P.13B-12, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 14.)
OK ↓

MUT-II Data list
45 ISC servo position
- Is the idle speed control (ISC) servo position drops to 0 – 2 steps when decelerating (engine r/min less than 1,000)?

Yes → Check the vehicle speed sensor system. (Refer to P.13B-14, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 24.)
No ↓

MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13B-52.)
NG → Check the EGR control solenoid valve system. (Refer to P.13B-47, INSPECTION PROCEDURE 34.)
OK ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle Service.)
- Clean the throttle valve area.

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

MUT-II Self-Diag code
Are diagnosis codes displayed?
Yes → Refer to P.13B-9, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

Check the injectors for operation sound.
NG → Check the injector system. (Refer to P.13B-17, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 41.)
OK ↓

Check the ignition timing.
(Refer to GROUP 11A – On-vehicle Service.)
NG → Check that the distributor is installed properly.
OK ↓

MUT-II Data list
13 Intake air temperature sensor (Refer to P.13B-48.)
NG → Check the intake air temperature sensor system. (Refer to P.13B-11, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 13.)
OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13B-49.)
NG → Check the engine coolant temperature sensor system. (Refer to P.13B-13, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 21.)
OK ↓

MUT-II Data list
14 Throttle position sensor (Refer to P.13B-48.)
NG → Check the throttle position sensor system. (Refer to P.13B-12, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 14.)
OK ↓

MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13B-52.)
NG → Check the EGR control solenoid valve system. (Refer to P.13B-47, INSPECTION PROCEDURE 34.)
OK ↓

MUT-II Data list
59 Oxygen sensor (rear) (Refer to P.13B-51.)
- Transmission: 2nd gear
- Driving with throttle widely open

OK: 600 – 1,000 mV
NG → Check the oxygen sensor (rear) system. (Refer to P.13B-19, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 59.)
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.13B-10, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 11.)
OK ↓

MUT-II Data list
11 Oxygen sensor (front)
OK: Changes between 0 – 400 mV and 600 – 1,000 mV during idling
NG → Check the fuel pressure. (Refer to P.13B-67.)
OK → 1. Inspect the intake of air into the air intake system.
- Broken intake manifold gasket
- Broken vacuum hose
- PCV valve does not operate.
- Broken air intake hose

2. Check the injector for clog.

OK ↓

Check the fuel pressure. (Refer to P.13B-67.)
OK ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle Service.)
- Check the EGR control system. (Refer to GROUP 17 – Emission Control System.)
- Check the compression pressure. (Refer to GROUP 11A – On-vehicle Service.)
- Check the fuel filter or fuel line for clogging.

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

MUT-II Self-Diag code
Are diagnosis codes displayed?
Yes → Refer to P.13B-9, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle Service.)
- Check for occurrence of ignition leak.

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

MUT-II Self-Diag code
Are diagnosis codes displayed?
Yes → Refer to P.13B-9, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

Check the ISC servo for operation sound. (Refer to P.13B-75.)
NG → Check the ISC servo system. (Refer to P.13B-46, INSPECTION PROCEDURE 32.)
OK ↓

MUT-II Data list
14 Throttle position sensor (Refer to P.13B-48.)
NG → Check the throttle position sensor system. (Refer to P.13B-12, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 14.)
OK ↓

Clean the throttle valve area. (Refer to P.13B-65.)

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

MUT-II Self-Diag code
Are diagnosis codes displayed?
Yes → Refer to P.13B-9, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

Check the injectors for operation sound.
NG → Check the injector system. (Refer to P.13B-17, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 41.)
OK ↓

Check the ignition timing.
(Refer to GROUP 11A – On-vehicle Service.)
NG → Check that the distributor is installed properly.
OK ↓

MUT-II Data list
13 Intake air temperature sensor (Refer to P.13B-48.)
NG → Check the intake air temperature sensor system. (Refer to P.13B-11, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 13.)
OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13B-49.)
NG → Check the engine coolant temperature sensor system. (Refer to P.13B-13, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 21.)
OK ↓

MUT-II Data list
14 Throttle position sensor (Refer to P.13B-48.)
NG → Check the throttle position sensor system. (Refer to P.13B-12, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 14.)
OK ↓

MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13B-52.)
NG → Check the EGR control solenoid valve system. (Refer to P.13B-47, INSPECTION PROCEDURE 34.)
OK ↓

MUT-II Data list
59 Oxygen sensor (rear) (Refer to P.13B-51.)
- Transmission: 2nd gear
- Driving with throttle widely open

OK: 600 – 1,000 mV
NG → Check the oxygen sensor (rear) system. (Refer to P.13B-19, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 59.)
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.13B-10, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 11.)
OK ↓

MUT-II Data list
11 Oxygen sensor (front)
OK: Changes between 0 – 400 mV and 600 – 1,000 mV during idling
NG → Check the fuel pressure. (Refer to P.13B-67.)
OK → 1. Inspect the intake of air into the air intake system.
- Broken intake manifold gasket
- Broken vacuum hose
- PCV valve does not operate.
- Broken air intake hose

2. Check the injector for clog.

OK ↓

Check the fuel pressure. (Refer to P.13B-67.)
OK ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle Service.)
- Check the compression pressure. (Refer to GROUP 11A – On-vehicle Service.)
- Check the fuel filter or fuel line for clogging.
- Broken air intake hose
- Clogged air cleaner

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

MUT-II Self-Diag code
Are diagnosis codes displayed?
Yes → Refer to P.13B-9, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

Check the injectors for operation sound.
NG → Check the injector system. (Refer to P.13B-17, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 41.)
OK ↓

Check the ignition timing.
(Refer to GROUP 11A – On-vehicle Service.)
NG → Check that the distributor is installed properly.
OK ↓

MUT-II Data list
13 Intake air temperature sensor (Refer to P.13B-48.)
NG → Check the intake air temperature sensor system. (Refer to P.13B-11, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 13.)
OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13B-49.)
NG → Check the engine coolant temperature sensor system. (Refer to P.13B-13, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 21.)
OK ↓

MUT-II Data list
14 Throttle position sensor (Refer to P.13B-48.)
NG → Check the throttle position sensor system. (Refer to P.13B-12, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 14.)
OK ↓

MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13B-52.)
NG → Check the EGR control solenoid valve system. (Refer to P.13B-47, INSPECTION PROCEDURE 34.)
OK ↓

MUT-II Data list
59 Oxygen sensor (rear) (Refer to P.13B-51.)
- Transmission: 2nd gear
- Driving with throttle widely open
  OK: 600 – 1,000 mV

NG → Check the oxygen sensor (rear) system. (Refer to P.13B-19, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 59.)
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.13B-10, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 11.)
OK ↓

MUT-II Data list
11 Oxygen sensor (front)
OK: Changes between 0 – 400 mV and 600 – 1,000 mV during idling
NG → Check the fuel pressure. (Refer to P.13B-67.)
OK → 1. Inspect the intake of air into the air intake system.
- Broken intake manifold gasket
- Broken vacuum hose
- PCV valve does not operate.
- Broken air intake hose

2. Check the injector for clog.

OK ↓

Check the fuel pressure. (Refer to P.13B-67.)
OK ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle Service.)
- Check the EGR control system. (Refer to GROUP 17 – Emission Control System.)

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

MUT-II Self-Diag code
Are diagnosis codes displayed?
→ Yes: Refer to P.13B-9, INSPECTION CHART FOR DIAGNOSIS CODES.
↓ No

Does knocking occur when driving with the detonation sensor connector disconnected? At this time, use the MUT-II to check if the timing is retarded compared to when the detonation sensor connector is disconnected.
→ No: Check the detonation sensor system. (Refer to P.13B-15, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 31.)
↓ Yes

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

INSPECTION PROCEDURE 21

Dieseling	Probable cause
Fuel leakage from injectors is suspected.	• 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

MUT-II Self-Diag code
Are diagnosis codes displayed?
Yes → Refer to P.13B-9, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

Check the ignition timing.
(Refer to GROUP 11A – On-vehicle Service.)
NG → Check that the distributor is installed properly.
OK ↓

MUT-II Data list
21 Engine coolant temperature sensor. (Refer to P.13B-49.)
NG → Check the engine coolant temperature sensor system. (Refer to P.13B-13, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 21.)
OK ↓

MUT-II Data list
13 Intake air temperature sensor (Refer to P.13B-48.)
NG → Check the intake air temperature sensor system. (Refer to P.13B-11, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 13.)
OK ↓

MUT-II Data list
59 Oxygen sensor (rear) (Refer to P.13B-51.)
- Transmission: 2nd gear
- Driving with throttle widely open
  OK: 600 – 1,000 mV

NG → Check the oxygen sensor (rear) system. (Refer to P.13B-19, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 59.)
OK ↓

MUT-II Data list
11 Oxygen sensor (front) (Refer to P.13B-48.)
OK: 600 – 1000 mV when racing suddenly
NG → Check the oxygen sensor (front) system. (Refer to P.13B-10, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 11.)
OK ↓

MUT-II Data list
11 Oxygen sensor (front) (Refer to P.13B-48.)
OK: Repeat 0 – 400 mV and 600 – 1,000 mV alternately when idling.
OK → Replace the oxygen sensor. → Check trouble symptom.
NG ↓

Check the fuel pressure. (Refer to P.13B-67.)
OK ↓

Check the following items.
- Check the injectors for operation sound.
- Check the injectors for fuel leakage.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle Service.)
- Check the compression pressure. (Refer to GROUP 11A – On-vehicle Service.)
- Check the positive crankcase ventilation system. (Refer to GROUP 17 – Emission Control System.)
- Check the purge control system. (Refer to GROUP 17 – Emission Control System.)
- Check the EGR control system. (Refer to GROUP 17 – Emission Control System.)

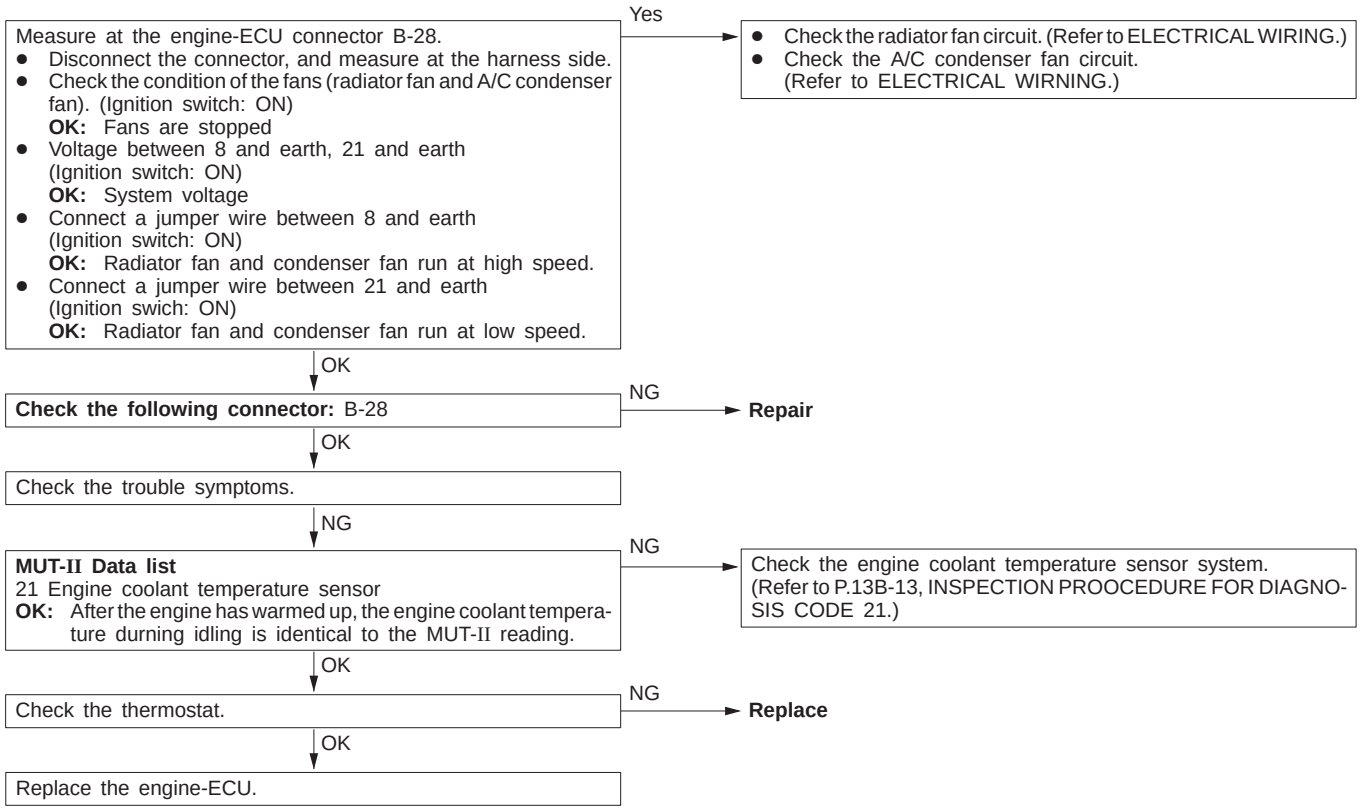
↓

Check the trouble symptom.
NG ↓

Replace the catalytic converter.

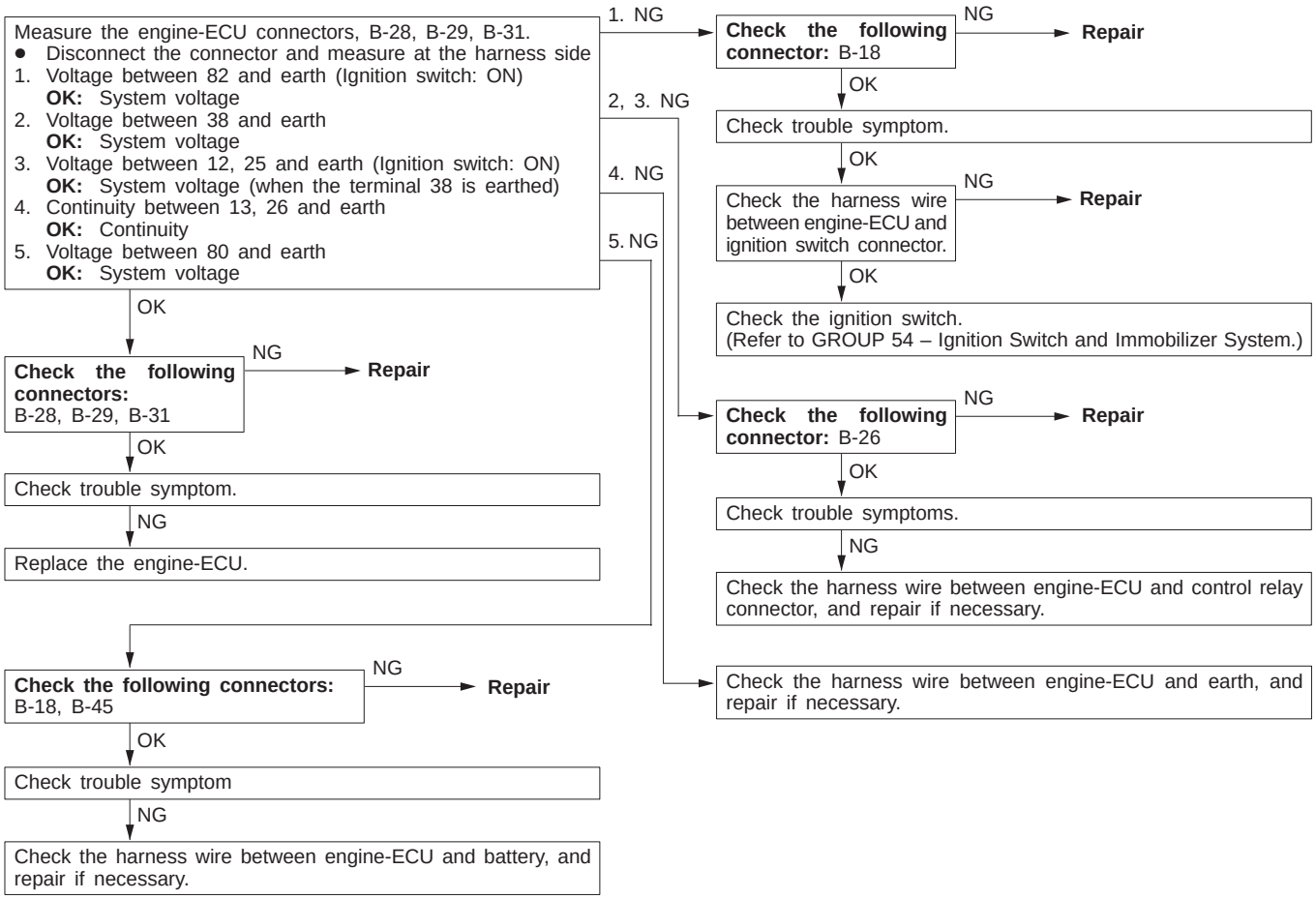
INSPECTION PROCEDURE 23

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.	• Malfundtion 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



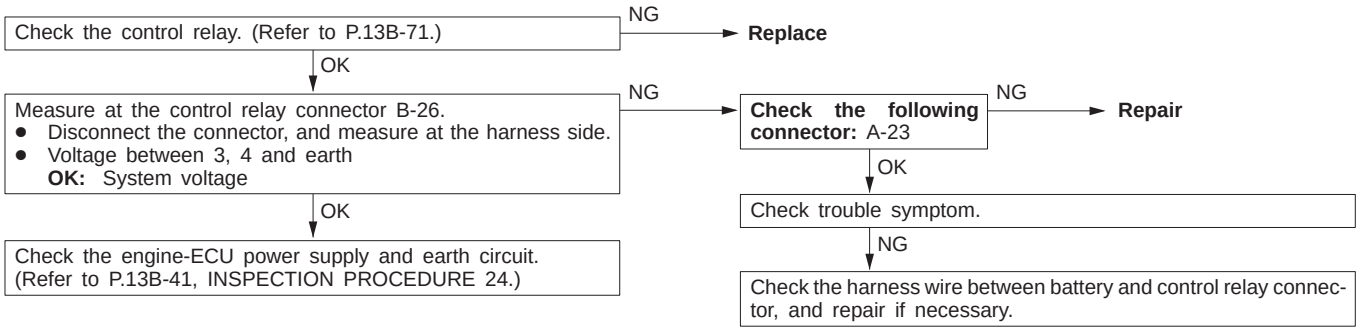
INSPECTION PROCEDURE 24

Check the engine-ECU power supply and earth circuit.



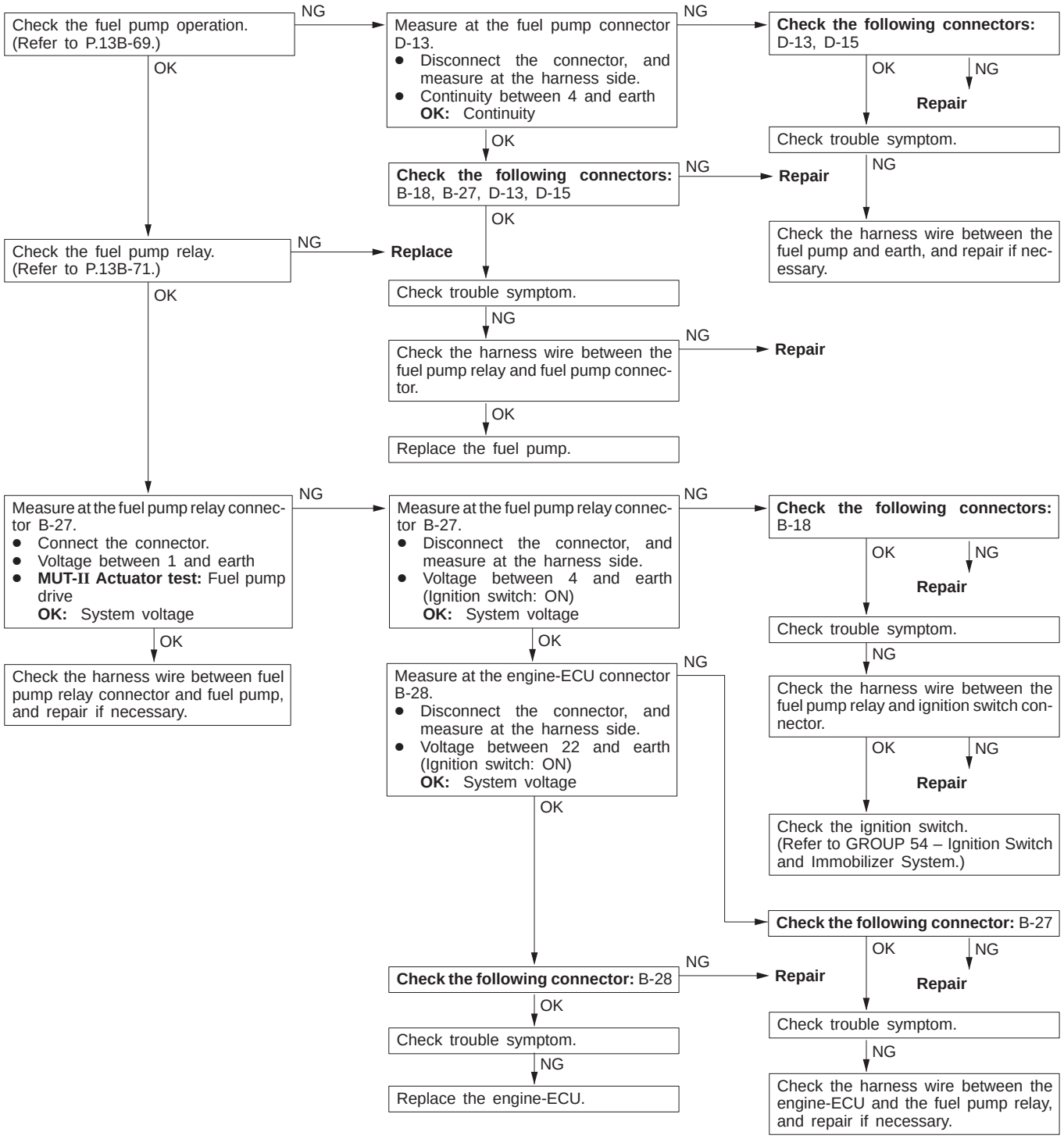
INSPECTION PROCEDURE 25

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



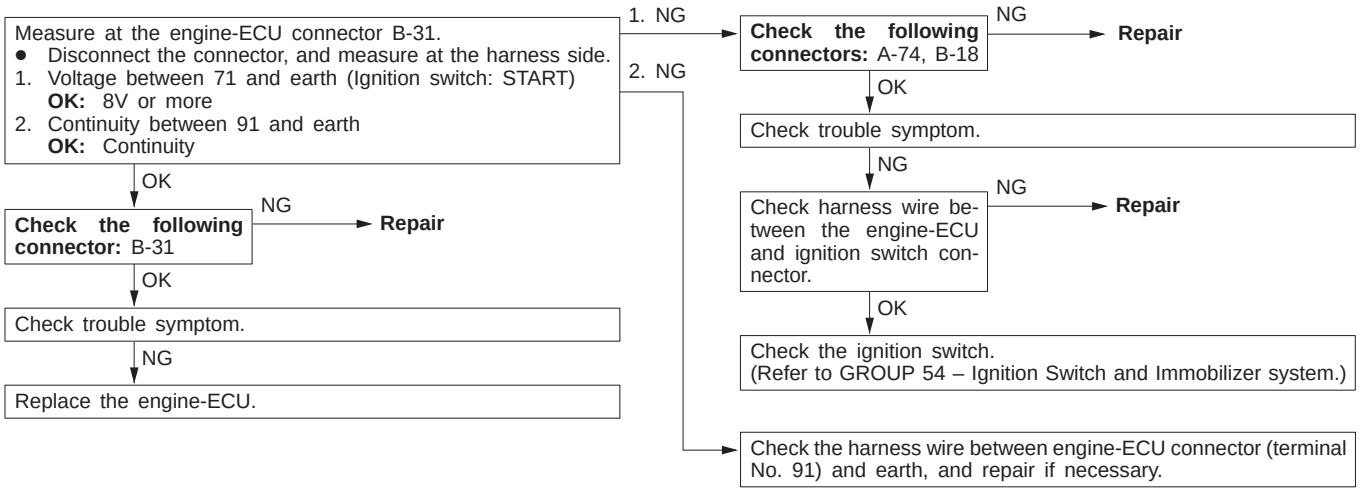
INSPECTION PROCEDURE 26

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



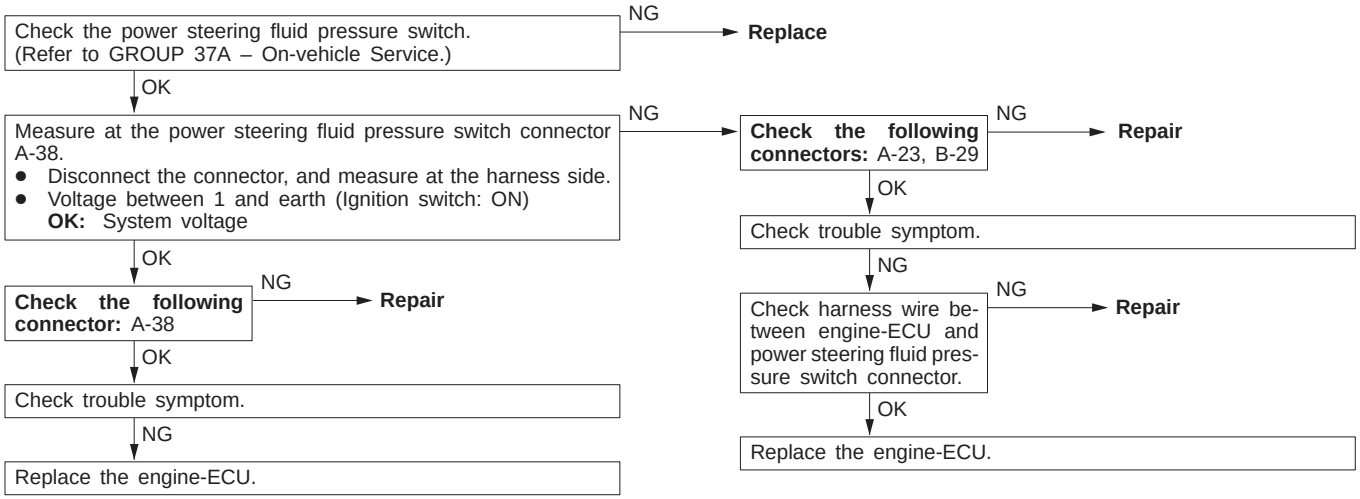
INSPECTION PROCEDURE 27

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



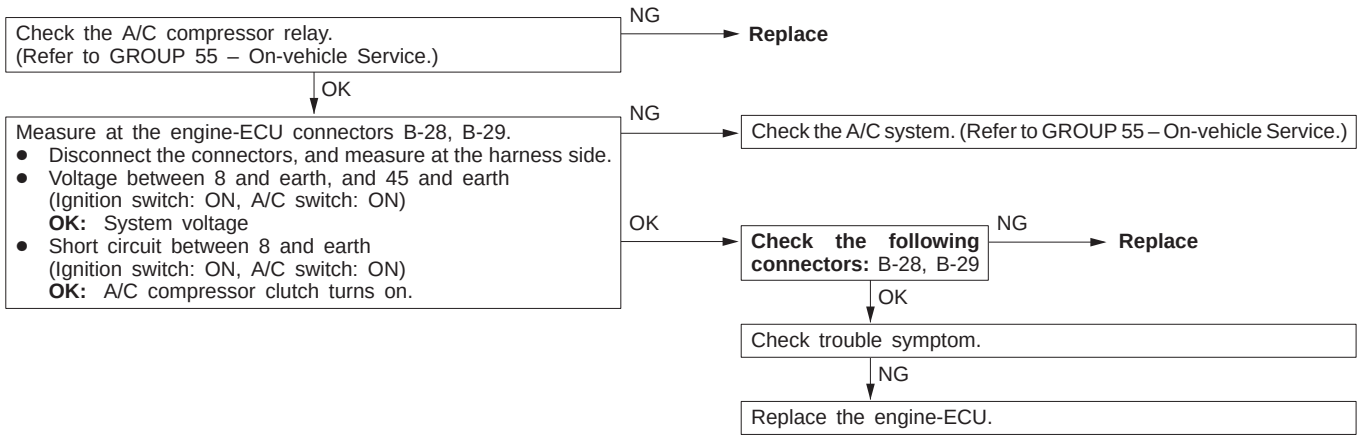
INSPECTION PROCEDURE 28

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



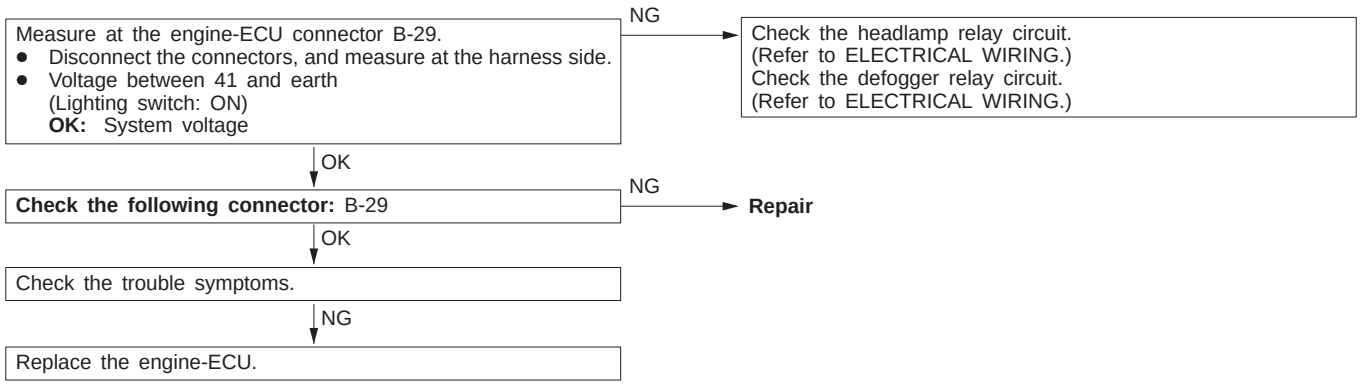
INSPECTION PROCEDURE 29

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



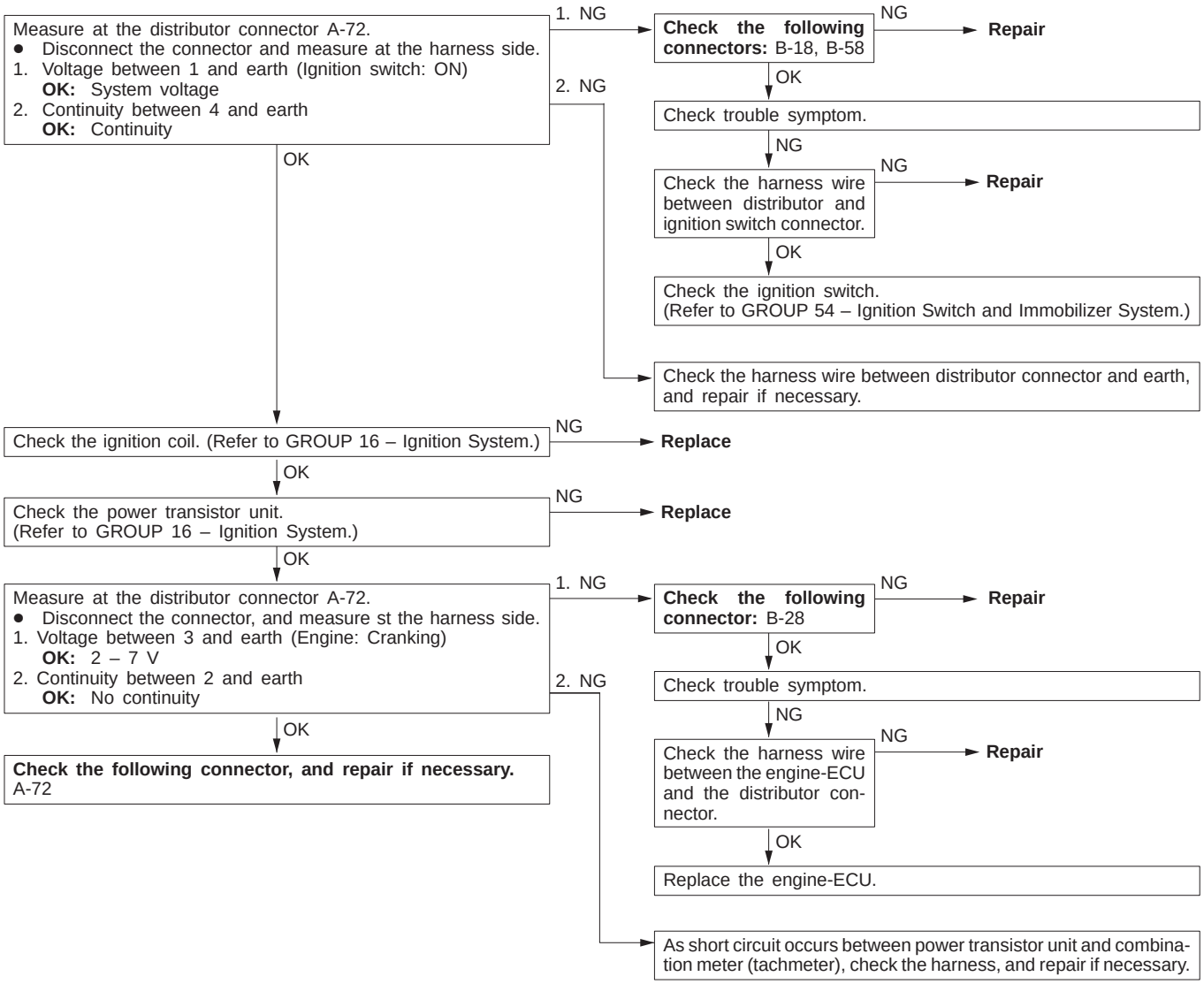
INSPECTION PROCEDURE 30

Electrical load swich	Probable cause
During idling, the ON/OFF condition of switches is equipment which have a large electical load is input to the engine-ECU. The engine-ECU controls the idle speed control servo on this input.	• Improper connector contact, open circut or short-circuited harness wire in the headlamp relay circuit • Improper connector contact, open circuit or short-circuited harness wire in the defogger relay circuit. • Malfunction of the engine-ECU



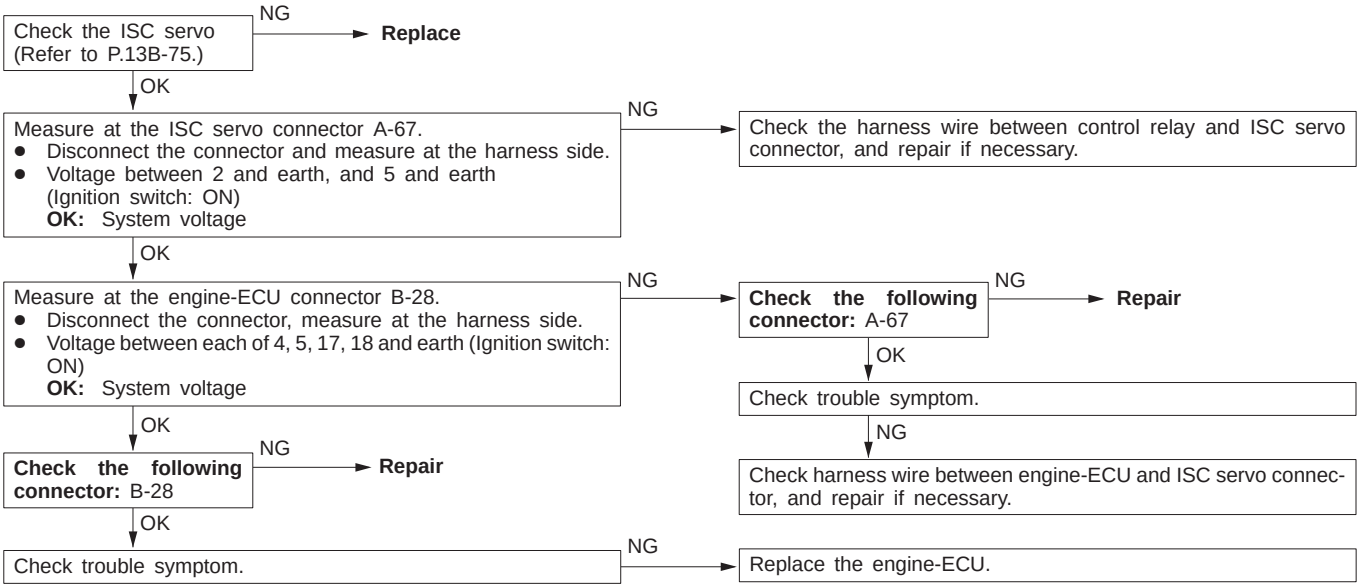
INSPECTION PROCEDURE 31

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



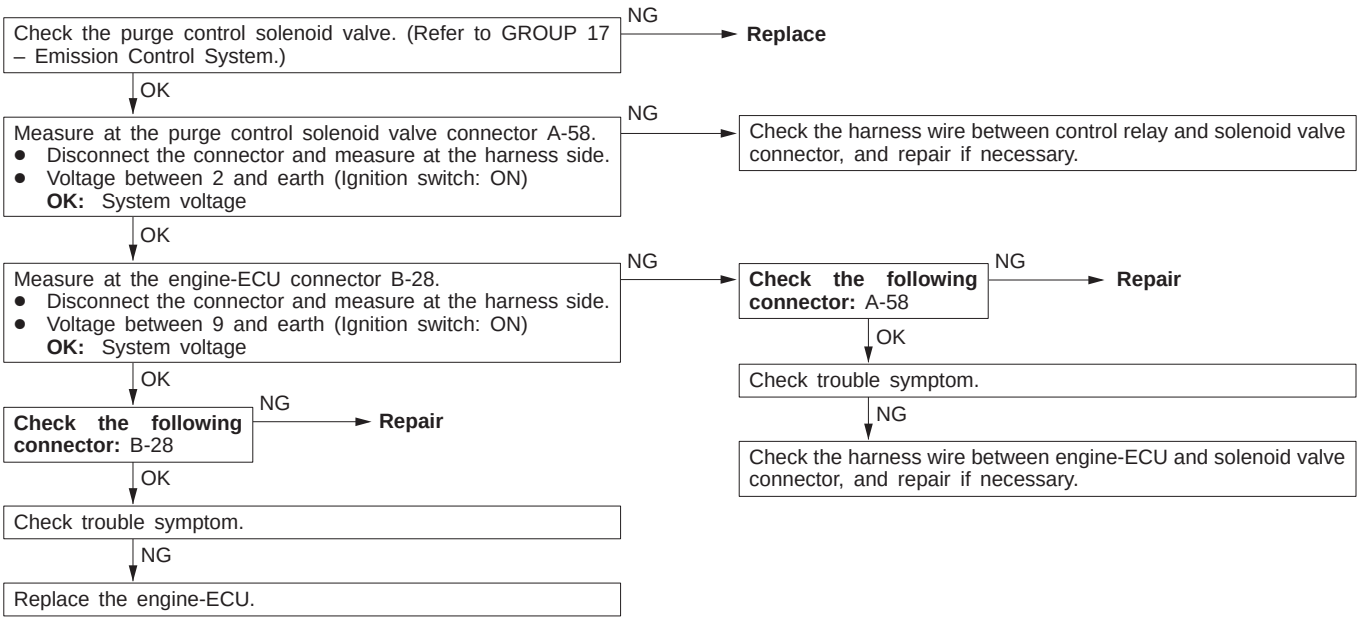
INSPECTION PROCEDURE 32

Idle speed control (ISC) servo (Stepper motor) system	Probable cause
The engine-ECU controls the intake air volume during idling by opening and closing the servo valve located in the bypass air passage.	• Malfunction of ISC servo • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the engine-ECU



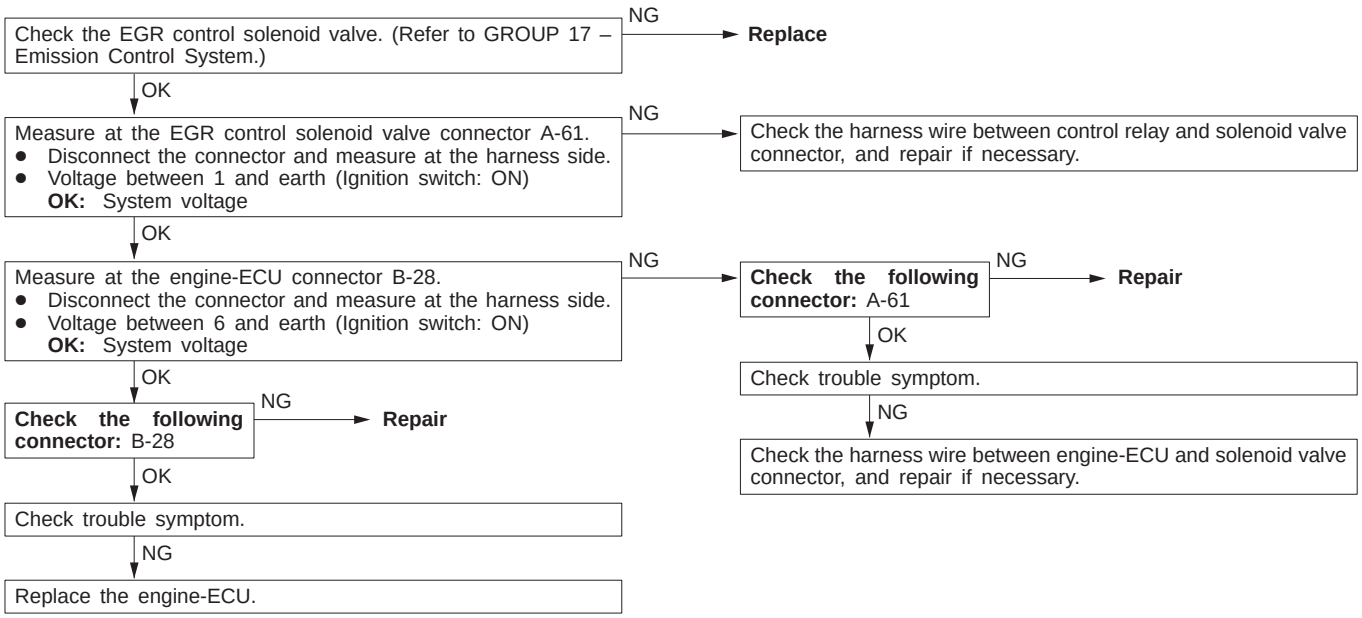
INSPECTION PROCEDURE 33

Purge control solenoid valve system	Probable cause
The purge control solenoid valve controls the purging of air from the canister located inside the intake manifold.	• Malfunction of solenoid valve • Improper connector contact, open circuit or short-circuited harness wire. • Malfunction of the engine-ECU



INSPECTION PROCEDURE 34

EGR control solenoid valve system	Probable cause
The EGR control solenoid valve is controlled by the negative pressure resulting from EGR operation leaking to port "A" of the throttle body.	• Malfunction of solenoid valve • Improper connector contact, open circuit or short-circuited harness wire. • Malfunction of the engine-ECU



DATA LIST REFERENCE TABLE

13100890500

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 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. 11	13B-10
			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. 13	13B-11
			When intake air temperature is 0°C	0°C		
			When intake air temperature is 20°C	20°C		
			When intake air temperature is 40°C	40°C		
			When intake air temperature is 80°C	80°C		
14	Throttle position sensor	Ignition switch: ON	Set to idle position	300–1,000 mV	Code No. 14	13B-12
			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	13B-41
18	Cranking signal (ignition switch-ST)	Ignition switch: ON	Engine: Stopped	OFF	Procedure No. 27	13B-43
			Engine: Cranking	ON		
21	Engine coolant temperature sensor	Ignition switch: ON or with engine running	When engine coolant temperature is –20°C	–20°C	Code No. 21	13B-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. 22	13B-14
		● 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	1,300–1,500 r/min		
			When engine coolant temperature is 40°C	1,160–1,360 r/min		
			When engine coolant temperature is 80°C	650–850 r/min		

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	13B-43
			Steering wheel turning	ON		
28	A/C switch	Engine: Idling (when A/C switch is ON, A/C compressor should be operating.)	A/C switch: OFF	OFF	Procedure No. 29	13B-44
			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 (P range for A/T) ● Ignition switch: ON	Engine: Stopped (At altitude of 0 m)	101 kPa	Code No. 32	13B-16
			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		
33	Electrical load switch	All accessories: OFF	Lighting switch only: OFF → ON	OFF → ON	Procedure No.30	13B-44
36	Ignition timing adjustment mode	Engine: Idling	Ignition timing adjustment terminal is earthed	ON	Code No. 36	13B-17
			Ignition timing adjustment terminal is disconnected from earth	OFF		
41	Injectors *2	Engine: Cranking	When engine coolant temperature is 0°C (injection is carried out for all cylinders simultaneously)	19–29 ms	–	–
			When engine coolant temperature is 20°C	39–59 ms		
			When engine coolant temperature is 80°C	8.8–13.2 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 (A/T : P range)	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	2–18 °BTDC	–	–
			2,500 r/min	25–45 °BTDC		
45	ISC (stepper) 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	13B-44
			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. 59	13B-19

ACTUATOR TEST REFERENCE TABLE

13100900579

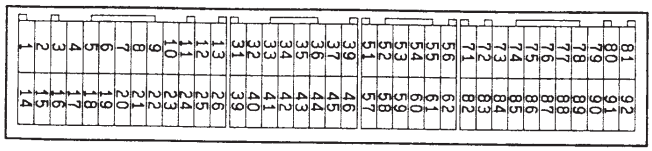
Item No.	Inspection item	Drive contents	Inspection contents		Normal condition	Inspection procedure No.	Reference page
01	Injectors	Cut fuel to No. 1 injector	Engine: After having warmed up/Engine is idling (Cut the fuel supply to each injector in turn and check cylinders which don't affect idling.)		Idling condition becomes different (becomes unstable).	Code No. 41	13B-17
02		Cut fuel to No. 2 injector					
03		Cut fuel to No. 3 injector					
04		Cut fuel to No. 4 injector					
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	13B-42
				Listen near the fuel tank for the sound of fuel pump operation.	Sound of operation is heard.		
08	Purge control solenoid valve	Solenoid valve turns from OFF to ON.	Ignition switch: ON		Sound of operation can be heard when solenoid valve is driven.	Procedure No. 33	13B-46
10	EGR control solenoid valve	Solenoid valve turns from OFF to ON.	Ignition switch: ON		Sound of operation can be heard when solenoid valve is driven.	Procedure No. 34	13B-47
20	Condenser fan	Drive the fan motors (condenser)	• Ignition switch: ON • A/C switch: ON		Fan motor runs	Procedure No. 23	13B-40
21	Radiator fan	Drive the fan motors (radiator)	• Ignition switch: ON		Fan motor runs	Procedure No. 23	13B-40

CHECK AT THE ENGINE-ECU TERMINALS

13100920506

TERMINAL VOLTAGE CHECK CHART

Engine-ECU Connector Terminal Arrangement



9FU0393

Terminal No.	Check item	Check condition (Engine condition)	Normal condition
1	No. 1 injector	While engine is idling after having warmed up, suddenly depress the accelerator pedal.	From 11–14 V, momentarily drops slightly
14	No. 2 injector		
2	No. 3 injector		
15	No. 4 injector		
4	Stepper motor coil <A1>	Engine: Soon after the warmed up engine is started	System voltage 0 V (Changes repeatedly)
17	Stepper motor coil <A2>		
5	Stepper motor coil <B1>		
18	Stepper motor coil <B2>		
6	EGR control solenoid valve	Ignition switch: ON	System Voltage
		While engine is idling, suddenly depress the accelerator pedal.	From system voltage, momentarily drops
8	A/C relay	● Engine: Idle speed ● A/C switch: OFF → ON (A/C compressor runs)	System voltage or momentarily 6 V or more → 0–3 V
9	Purge control solenoid valve	Ignition switch: ON	System voltage
		Running at 3,000r/min while engine is warming up after having been started.	0–3 V
10	Power transistor unit	Engine r/min: 3,000 r/min	0.3–3.0 V
12	Power supply	Ignition switch: ON	System voltage
25			

Terminal No.	Check item	Check condition (Engine condition)		Normal condition
20	Condenser fan motor relay	Condenser fan is not operating (Engine coolant temperature is 90°C or less)		System voltage
		Condenser fan is operating (Engine coolant temperature is 105°C or more)		0 – 3 V
21	Radiator fan motor relay	Radiator fan is not operating (Engine coolant temperature is 90°C or less)		System voltage
		Radiator fan is operating (Engine coolant temperature is 90 – 105°C)		0 – 3 V
22	Fuel pump relay	Ignition switch: ON		System voltage
		Engine: Idle speed		0–3 V
36	Engine warning lamp	Ignition switch: OFF → ON		0–3 V → 9–13 V (After several seconds have elapsed)
37	Power steering fluid pressure switch	Engine: Idling after warming up	When steering wheel is stationary	System voltage
			When steering wheel is turned	0–3 V
38	Control relay (Power supply)	Ignition switch: OFF		System voltage
		Ignition switch: ON		0–3 V
41	Electrical load switch	Engine: Idling	Turn off the lighting switch	0 – 3 V
			Turn on the lighting switch	System voltage
45	A/C switch	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
52	Ignition timing adjustment terminal	Ignition switch: ON	Earth the ignition timing adjustment terminal	0–1 V
			Remove the earth connection from the ignition timing adjustment terminal	4.0–5.5 V
54	Oxygen sensor heater (rear)	Engine: Idling after warming up		0 – 3 V
		Engine r/min: 5,000 r/min		System voltage
60	Oxygen sensor heater (front)	Engine: Idling after warming up		0–3 V
		Engine r/min: 5,000r/min		System voltage
71	Ignition switch – ST	Engine: Cranking		8V or more

Terminal No.	Check item	Check condition (Engine condition)		Normal condition
72	Intake air temperature sensor	Ignition switch: ON	When intake air temperature is 0°C	3.2–3.8 V
			When intake air temperature is 20°C	2.3–2.9 V
			When intake air temperature is 40°C	1.5–2.1 V
			When intake air temperature is 80°C	0.4–1.0 V
75	Oxygen sensor (rear)	● Transmission: 2nd gear ● Engine r/min: 3,500 r/min or more ● Driving with the throttle valve widely open		0.6 – 1.0 V
76	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	Backup power supply	Ignition switch: OFF		System voltage
81	Sensor impressed voltage	Ignition switch: ON		4.5–5.5 V
82	Ignition switch – IG	Ignition switch: ON		System voltage
83	Engine coolant temperature sensor	Ignition switch: ON	When engine coolant temperature is 0°C	3.2–3.8 V
			When engine coolant temperature is 20°C	2.3–2.9 V
			When engine coolant temperature is 40°C	1.3–1.9 V
			When engine coolant temperature is 80°C	0.3–0.9 V
84	Throttle position sensor	Ignition switch: ON	Set throttle valve to idle position	0.3–1.0 V
			Fully open throttle valve	4.5–5.5 V
85	Vacuum sensor (Manifold absolute pressure sensor)	Ignition switch: ON (when altitude is 0 m)		3.7 – 4.3 V
		Ignition switch: ON (when altitude is 1,200 m)		3.2 – 3.8 V
		Engine: Idle speed		0.9 – 1.5 V
		While engine is idling after having warmed up, suddenly depress the accelerator pedal		From 0.9 – 1.5 V, momentarily increases
86	Vehicle speed sensor	● Ignition switch: ON ● Move the vehicle slowly forward		0 5 V (Changes repeatedly)
89	Crank angle sensor	Engine: Cranking		0.4–4.0 V
		Engine: Idle speed		1.5–2.5 V

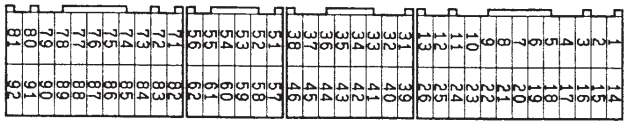
CHECK CHART FOR RESISTANCE AND CONTINUITY BETWEEN TERMINALS

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

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

   Caution
   If the terminals that should be checked are mistaken, or if connector terminals are not correctly shorted to earth, damage may be caused to the vehicle wiring, sensors, engine-ECU and/or ohmmeter.
   Be careful to prevent this!
4. If the ohmmeter shows any deviation from the standard value, check the corresponding sensor, actuator and related electrical wiring, and then repair or replace.
5. After repair or replacement, recheck with the ohmmeter to confirm that the repair or replacement has corrected the problem.

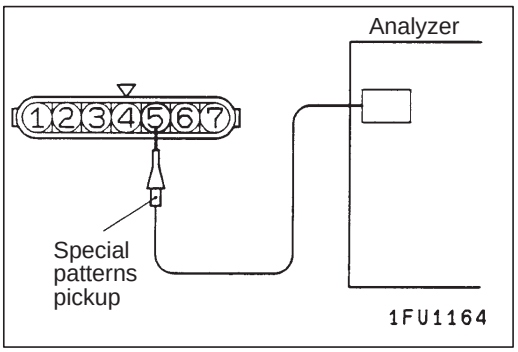
Engine-ECU Harness Side Connector Terminal Arrangement



9FU0392

Terminal No.	Inspection item	Normal condition (Check condition)
1–12	No. 1 injector	13–16 Ω (At 20°C)
14–12	No. 2 injector	
2–12	No. 3 injector	
15–12	No. 4 injector	

Terminal No.	Inspection item	Normal condition (Check condition)
4–12	Stepper motor coil (A1)	28–33 Ω (At 20°C)
17–12	Stepper motor coil (A2)	
5–12	Stepper motor coil (B1)	
18–12	Stepper motor coil (B2)	
6–12	EGR control solenoid valve	36–44 Ω (At 20°C)
9–12	Purge control solenoid valve	36–44 Ω (At 20°C)
13–Body earth	ENGINE-ECU earth	Continuity (0Ω)
26–Body earth	ENGINE-ECU earth	
54–12	Oxygen sensor heater (rear)	2.5 – 5.0 Ω (At 20°C)
60–12	Oxygen sensor heater (front)	2.5 – 5.0 Ω (At 20°C)
72–92	Intake air temperature sensor	5.3–6.7 kΩ (When intake air temperature is 0°C)
		2.3–3.0 kΩ (When intake air temperature is 20°C)
		1.0–1.5 kΩ (When intake air temperature is 40°C)
		0.30–0.42 kΩ (When intake air temperature is 80°C)
83–92	Engine coolant temperature sensor	5.1–6.5 kΩ (When coolant temperature is 0°C)
		2.1–2.7 kΩ (When coolant temperature is 20°C)
		0.9–1.3 kΩ (When coolant temperature is 40°C)
		0.26–0.36 kΩ (When coolant temperature is 80°C)



INSPECTION PROCEDURE USING AN ANALYZER

13100930363

CRANK ANGLE SENSOR

Measurement Method

1. Disconnect the distributor (crank angle sensor) connector and connect the special tool (test harness: MB991348) in between. (All terminals should be connected.)
2. Connect the analyzer special patterns pickup to distributor connector terminal 5.

Alternate Method (Test harness not available)

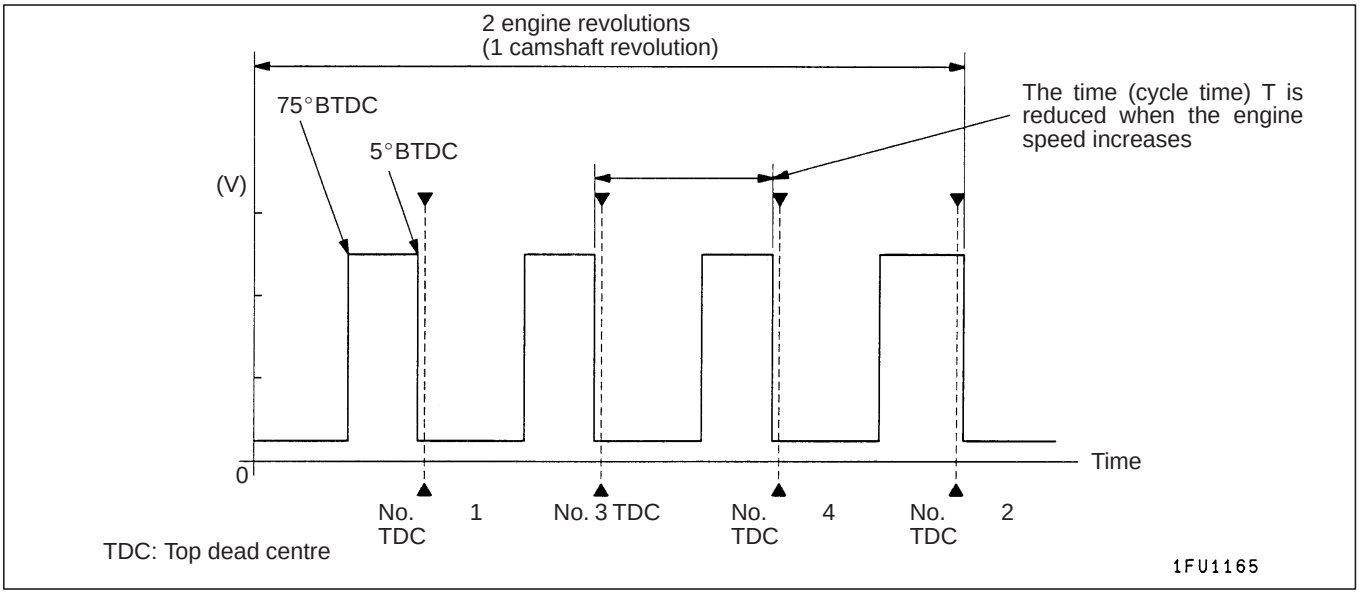
1. Connect the analyzer special patterns pickup to engine-ECU terminal 89.

Standard Wave Pattern

Observation conditions

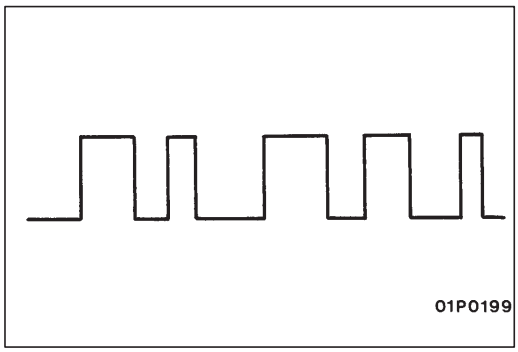
Function	Special patterns
Pattern height	Low
Pattern selector	Display
Engine r/min	Idle speed

Standard wave pattern



Wave Pattern Observation Points

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



Examples of Abnormal Wave Patterns

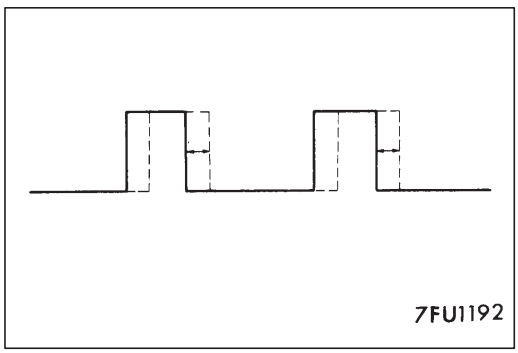
- Example 1

  Cause of problem

  Sensor interface malfunction

  Wave pattern characteristics

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



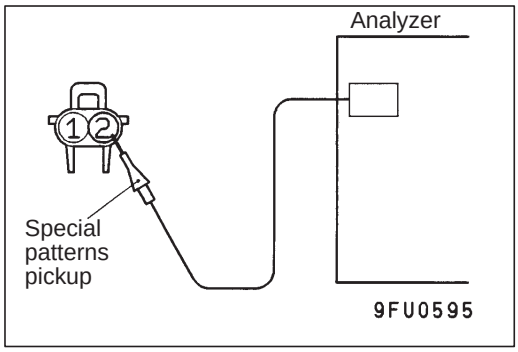
- Example 2

  Cause of problem

  Loose timing belt
  Abnormality in sensor disk

  Wave pattern characteristics

  Wave pattern is displaced to the left or right.



INJECTOR

Measurement Method

1. Disconnect the injector connector, and then connect the special tool (test harness: MB991348) in between.
   (Both the power supply side and engine-ECU side should be connected.)
2. Connect the analyzer special patterns pickup to terminal 2 of the injector connector.

Alternate Method (Test harness not available)

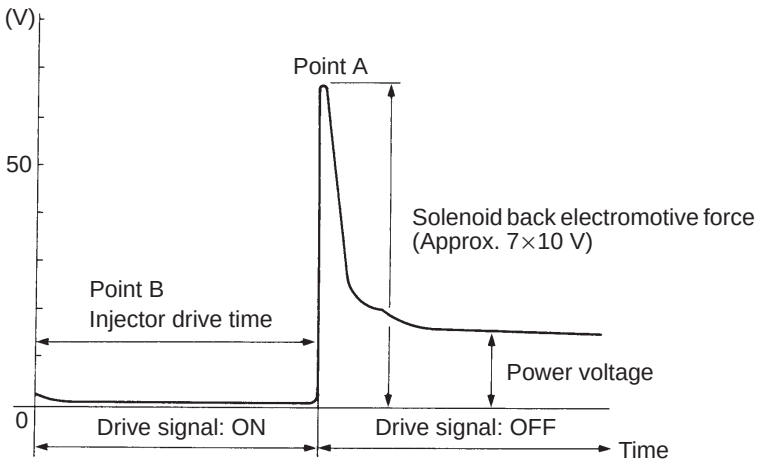
1. Connect the analyzer special patterns pickup to engine-ECU terminal 1.
   (When checking the No. 1 cylinder.)
2. Connect the analyzer special patterns pickup to engine-ECU terminal 14.
   (When checking the No. 2 cylinder.)
3. Connect the analyzer special patterns pickup to engine-ECU terminal 2.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

Standard Wave Pattern

Observation conditions

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

Standard wave pattern

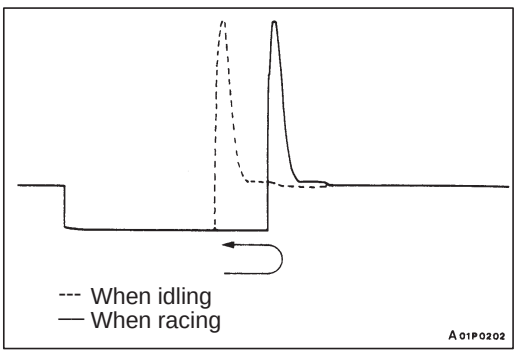


Wave Pattern Observation Points

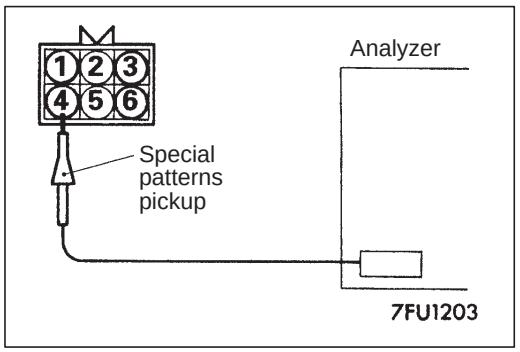
Point A: Height of solenoid back electromotive force

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

Point B: Injector drive time



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



IDLE SPEED CONTROL (ISC) SERVO (STEPPER MOTOR)

Measurement Method

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

Alternate Method (Test harness not available)

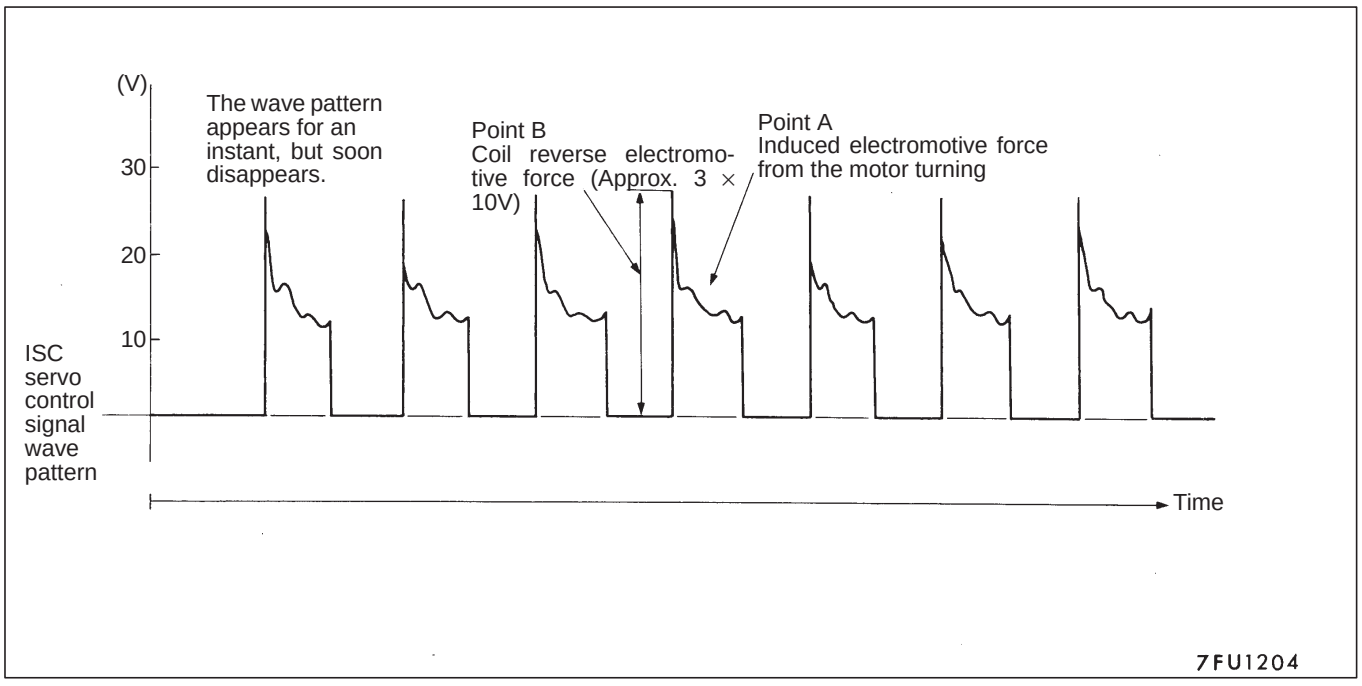
1. Connect the analyzer special patterns pickup to engine-ECU terminal 4, connection terminal 5, connection terminal 17, and connection terminal 18 respectively.

Standard Wave Pattern

Observation conditions

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

Standard wave pattern



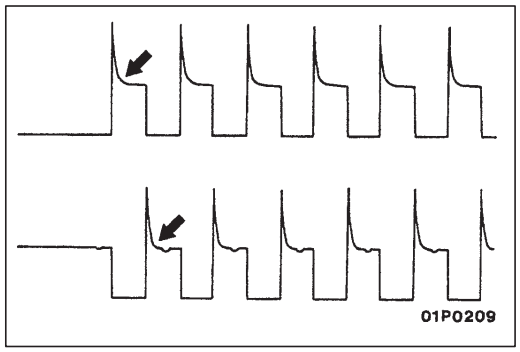
Wave Pattern Observation Points

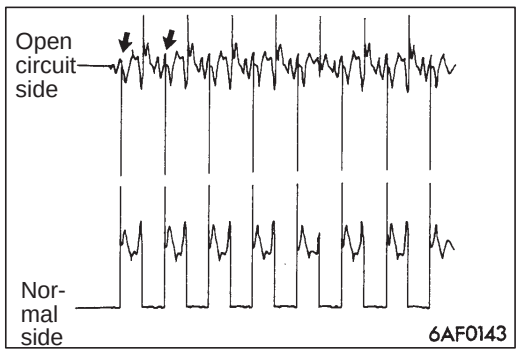
Check that the standard wave pattern appears when the ISC servo is operating.
Point A: Presence or absence of induced electromotive force from the motor turning. (Refer to the abnormal wave pattern.)

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 reverse electromotive force

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





Examples of Abnormal Wave Pattern

- Example 1

  Cause of problem

  Motor is malfunctioning. (Motor is not operating.)

  Wave pattern characteristics

  Induced electromotive force from the motor turning does not appear.

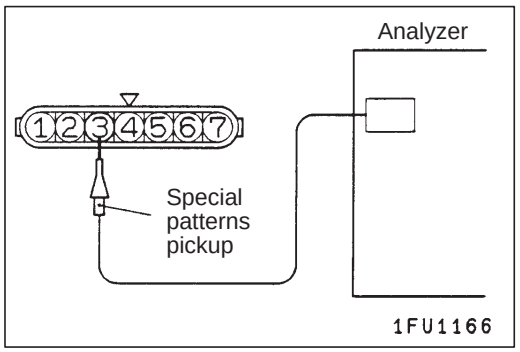
- Example 2

  Cause of problem

  Open circuit in the line between the 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

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

Measurement Method

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

Alternate Method (Test harness not available)

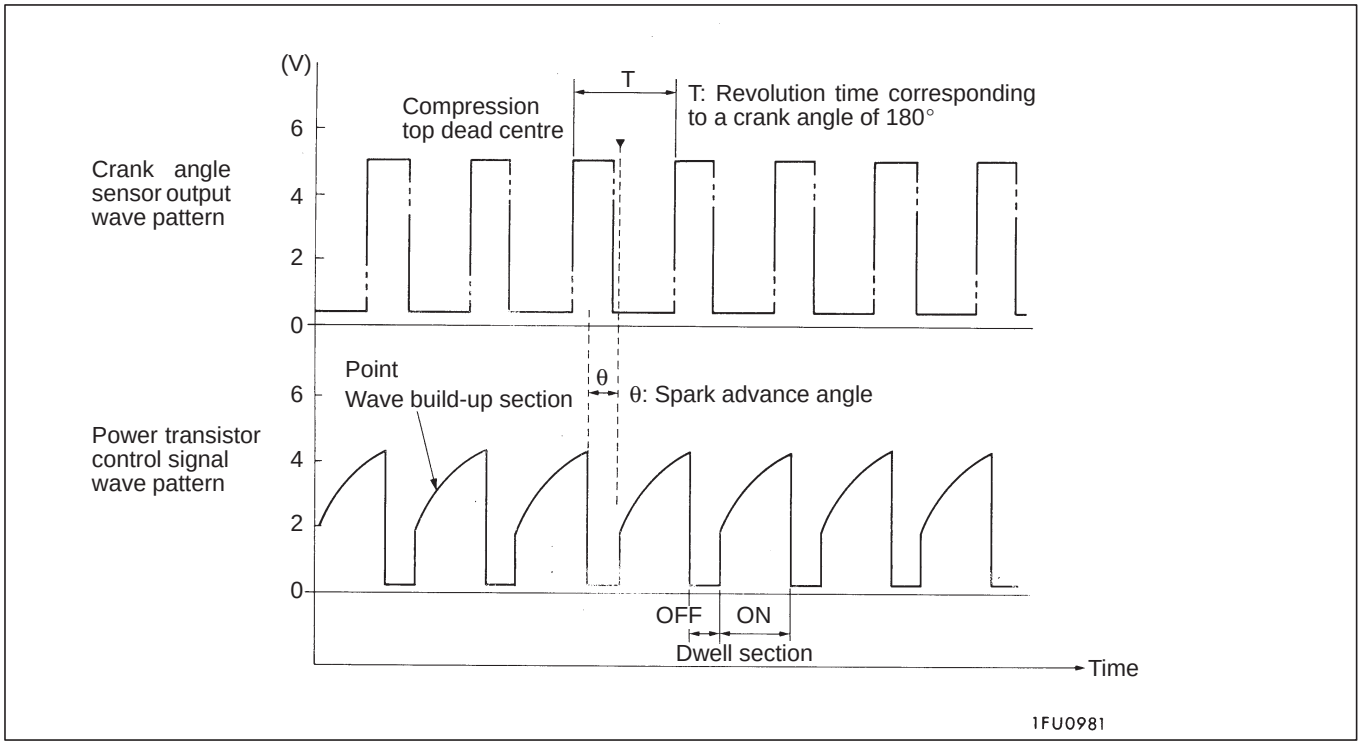
1. Connect the analyzer special patterns pickup to engine-ECU terminal 10.

Standard Wave Pattern

Observation condition

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

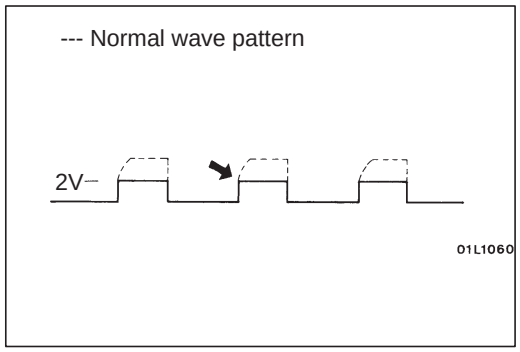
Standard wave pattern

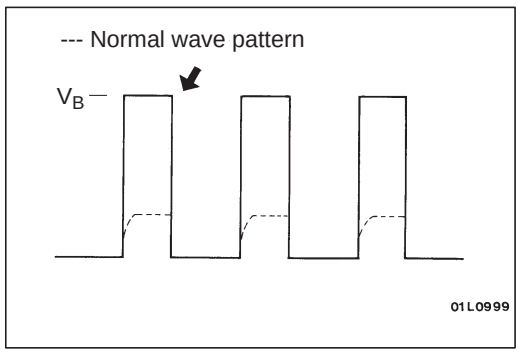


Wave Pattern Observation Points

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

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





Examples of Abnormal Wave Patterns

- Example 1

  Wave pattern during engine cranking

  Cause of problem

  Open-circuit in ignition primary circuit

  Wave pattern characteristics

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

- Example 2

  Wave pattern during engine cranking

  Cause of problem

  Malfunction in power transistor

  Wave pattern characteristics

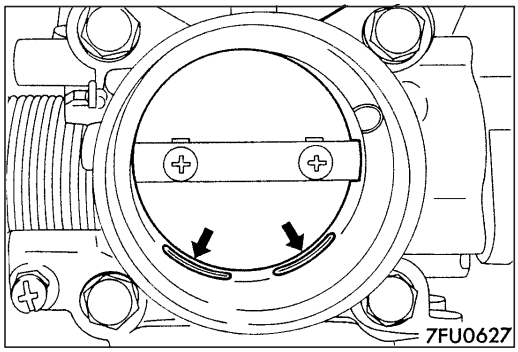
  Power voltage results when the power transistor is ON.

ON-VEHICLE SERVICE

13100100450

THROTTLE BODY (THROTTLE VALVE AREA) CLEANING

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



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

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

4. Spray cleaning solvent into the valve through the throttle body intake port and leave it for about 5 minutes.
5. Start the engine, race it several times and idle it for about 1 minute. If the idling speed becomes unstable (or if the engine stalls) due to the bypass passage being plugged, slightly open the throttle valve to keep the engine running.
6. If the throttle valve deposits are not removed, repeat steps 4 and 5.
7. Unplug the bypass passage inlet.
8. Attach the air intake hose.
9. Use the MUT-II to erase the self-diagnosis code.
10. Adjust the basic idle speed. (Refer to P.13B-66.)

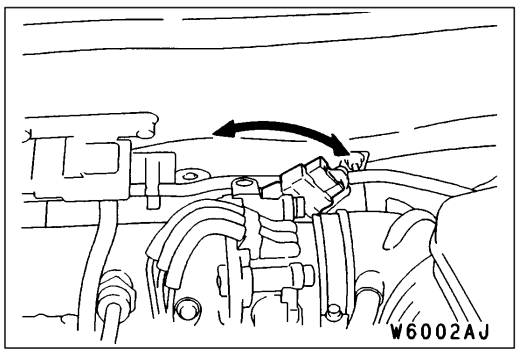
    NOTE
    If the engine hunts while idling after adjustment of the basic idle speed, disconnect the (–) cable from the battery for 10 seconds or more, and then reconnect it and run the engine at idle for about 10 minutes.

THROTTLE POSITION SENSOR ADJUSTMENT

13100110071

1. Connect the MUT-II to the diagnosis connector.
2. Turn the ignition switch to ON (but do not start the engine).
3. Check the throttle position sensor output voltage.

   Standard value: 530 – 740 mV



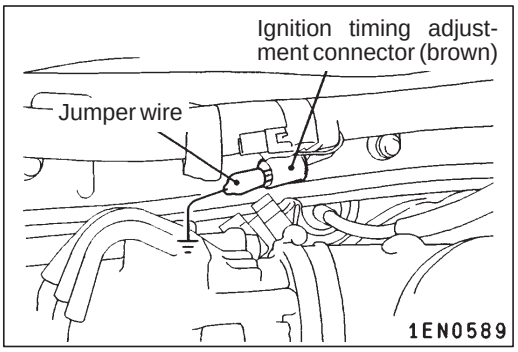
4. If the voltage is outside the standard value, adjust by loosening the throttle position sensor mounting bolts and turning the throttle position sensor body. After adjusting, tighten the bolts securely.
5. Turn the ignition switch to OFF.
6. If a diagnosis code is output while adjusting the thrittle position sensor, use the MUT-II to erase the diagnosis code.

BASIC IDLE SPEED ADJUSTMENT 13100180508

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).

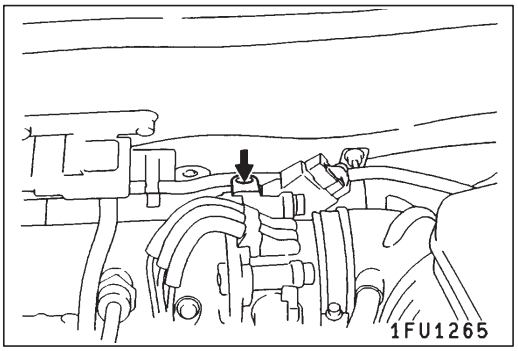
   NOTE
   When the MUT-II is connected, the diagnosis control terminal should be earthed.



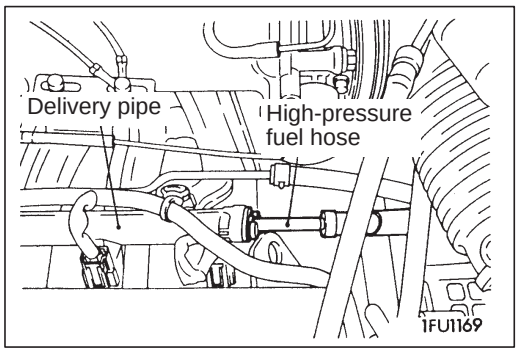
3. Remove the waterproof female connector from the ignition timing adjustment connector.
4. Use a jumper wire to earth the ignition timing adjustment terminal.
5. Start the engine and run at idle.
6. Check the idle speed.

   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. (Refer to P.13B-65.)



7. If not within the standard value range, turn the speed adjusting screw (SAS) to make the necessary adjustment.
8. Switch OFF the ignition switch.
9. Disconnect the jumper wire from the ignition timing adjustment terminal and return the connector to its original condition.
10. Disconnect the MUT-II.
11. Start the engine again and let it run at idle speed for about 10 minutes; check that the idling condition is normal.



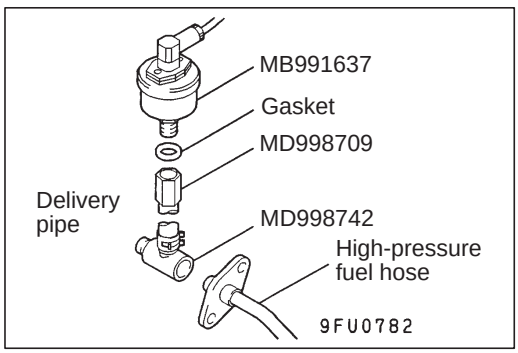
FUEL PRESSURE TEST

13100190440

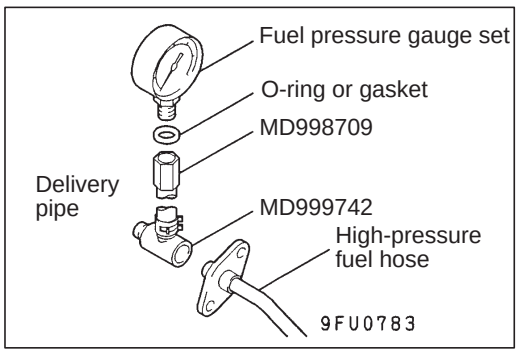
1. Release residual pressure from the fuel pipe line to prevent fuel gush out. (Refer to P.13B-69.)
2. Disconnect the high-pressure fuel hose at the delivery pipe side.

Caution

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

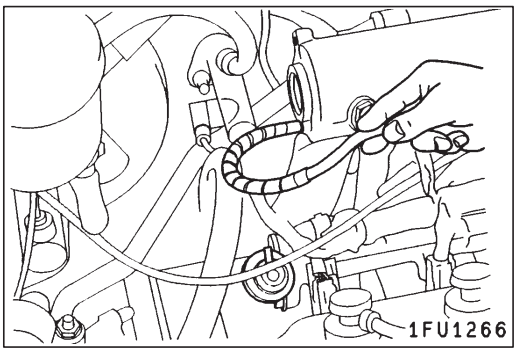


3. Remove the union joint and bolt from the special tool (adapter hose) and instead attach the special tool (hose adapter) to the adapter hose.
4. Install the special tool (for measuring the fuel pressure) that was set up in step 3.
   <When using the fuel pressure gauge set (special tool)>
   (1) Install the special tool (for measuring the fuel pressure) between the high-pressure fuel hose and the delivery pipe.
   (2) Install the fuel pressure gauge set (special tool) on the special tool (for measuring the fuel pressure) putting the gasket between them.
   (3) Connect the lead wire of the fuel pressure gauge set (special tool) to the power supply (cigarette lighter socket) and to the MUT-II.



   <When using the fuel pressure gauge>
   (1) Install the fuel pressure gauge on the special tool (for measuring the fuel pressure) putting a suitable O-ring or gasket between them.
   (2) Install the special tool which was set up in step (1) between the high-pressure fuel hose and the delivery pipe.
5. Connect the MUT-II to the diagnosis connector.
6. Turn the ignition switch to ON. (But do not start the engine.)
7. Select “Item No.07” from the MUT-II Actuator test to drive the fuel pump. Check that there are no fuel leaks from any parts.
8. Finish the actuator test or turn the ignition switch to OFF.
9. Start the engine and run at idle.
10. Measure fuel pressure while the engine is running at idle.

Standard value: Approx. 265 kPa at kerb idle



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

    Standard value:
    324 – 343 kPa at kerb idle

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

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

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

Symptom	Probable cause	Remedy
• Fuel pressure too low • Fuel pressure drops after racing • No fuel pressure in fuel return hose	Clogged fuel filter	Replace fuel filter
	Fuel leaking to return side due to poor fuel regulator valve seating or settled spring	Replace fuel pressure regulator
	Low fuel pump delivery pressure	Replace fuel pump
Fuel pressure too high	Binding valve in fuel pressure regulator	Replace fuel pressure regulator
	Clogged fuel return hose or pipe	Clean or replace hose or pipe
Same fuel pressure when vacuum hose is connected and when disconnected	Damaged vacuum hose or clogged nipple	Replace vacuum hose or clean nipple

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

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

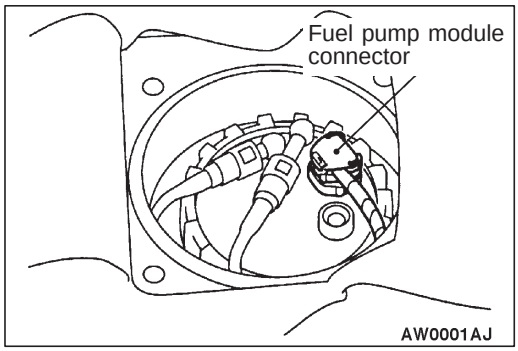
16. Release residual pressure from the fuel pipe line. (Refer to P.13B-69.)
17. Remove the fuel pressure gauge and special tool from the delivery pipe.

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

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

    Tightening torque: 5 Nm

20. Check for any fuel leaks by following the procedure in step 7.
21. Disconnect the MUT-II.

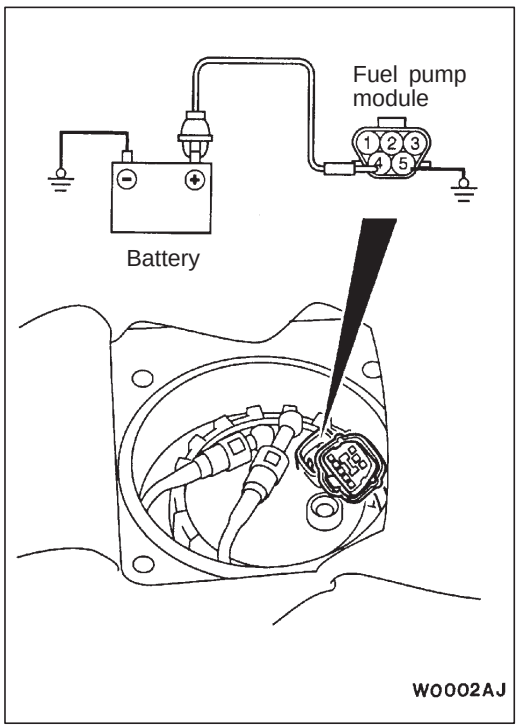


FUEL PUMP CONNECTOR DISCONNECTION (HOW TO REDUCE THE FUEL PRESSURE)

13100090320

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

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



FUEL PUMP OPERATION CHECK

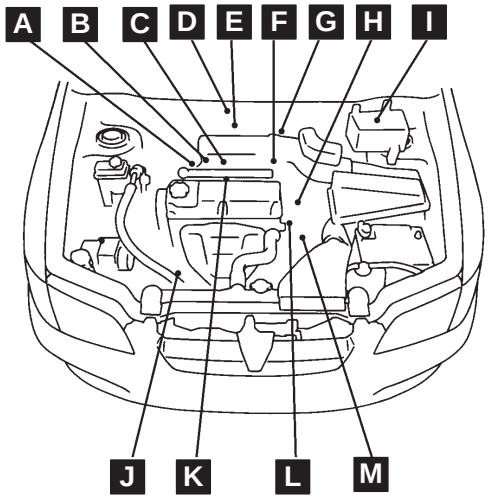
13100200303

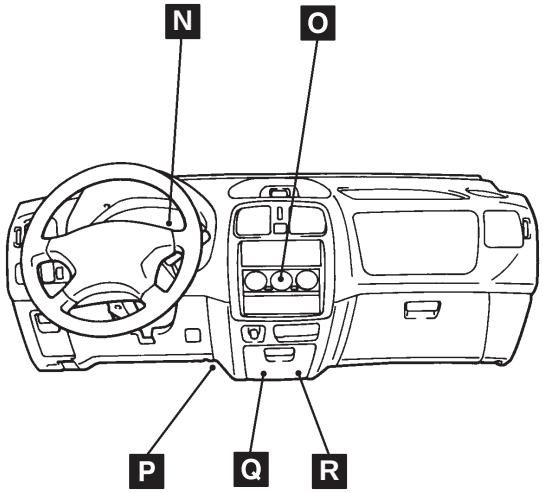
1. Check the operation of the fuel pump by using the MUT-II to force-drive the fuel pump.
2. If the fuel pump will not operate, check by using the following procedure, and if it is normal, check the drive circuit.
   (1) Turn the ignition switch to OFF.
   (2) Remove the rear seat assembly. (Refer to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

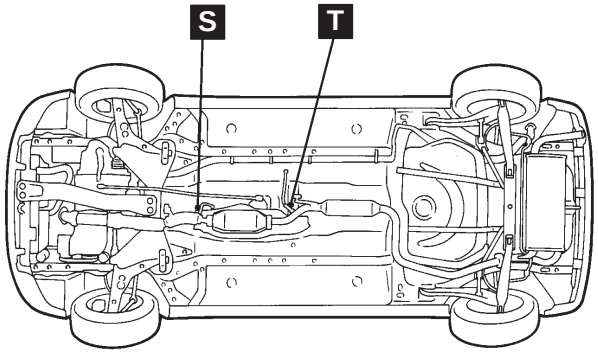
COMPONENT LOCATION

13100210566

Name	Symbol	Name	Symbol
A/C relay	I	Idle speed control servo	F
A/C switch	O	Ignition timing adjustment terminal	E
Control relay and fuel pump relay	R	Injectors	K
Detonation sensor	A	Intake air temperature sensor	B
Diagnosis connector	P	Oxygen sensor (front)	S
Distributor (with ignition coil and crank angle sensor)	H	Oxygen sensor (rear)	T
		Power steering fluid pressure switch	J
EGR control solenoid valve	C	Purge control solenoid valve	C
Engine coolant temperature sensor	L	Throttle position sensor	G
Engine-ECU	Q	Vacuum sensor	D
Engine warning lamp (check engine lamp)	N	Vehicle speed sensor	M







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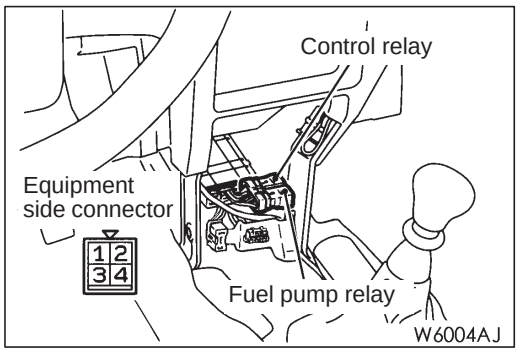
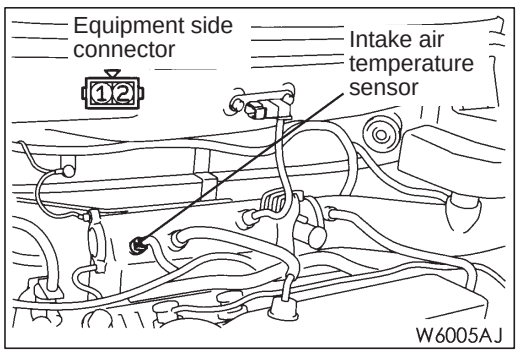


CONTROL RELAY AND FUEL PUMP RELAY CONTINUITY CHECK

13100990248

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



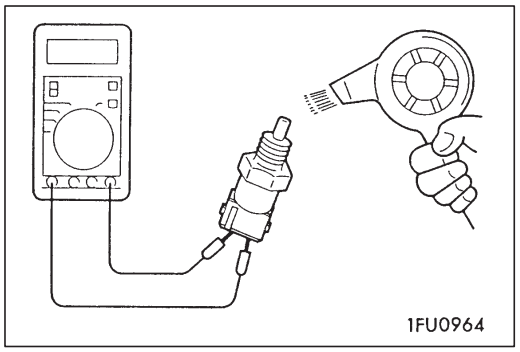
INTAKE AIR TEMPERATURE SENSOR CHECK

13100280314

1. Disconnect the intake air temperature sensor connector.
2. Measure resistance between terminals 1 and 2.

   Standard value:
   2.3 – 3.0 kΩ (at 20°C)
   0.30 – 0.42 kΩ (at 80°C)

3. Remove the intake air temperature sensor.



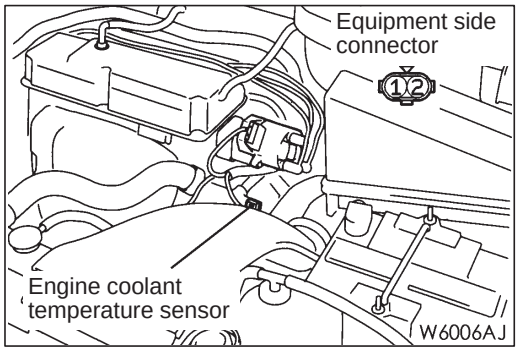
4. Measure resistance while heating the sensor using a hair drier.

   Normal condition:

Temperature (°C)	Resistance (kΩ)
Higher	Smaller

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

   Tightening torque: 12 – 15 Nm

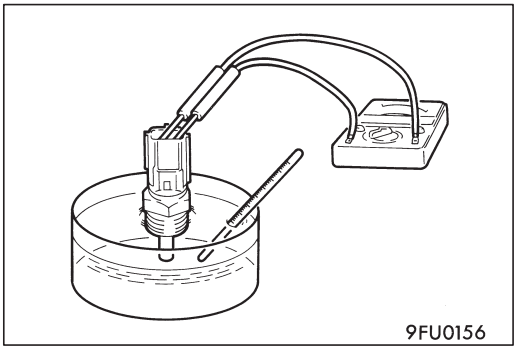


ENGINE COOLANT TEMPERATURE SENSOR CHECK

13100310303

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

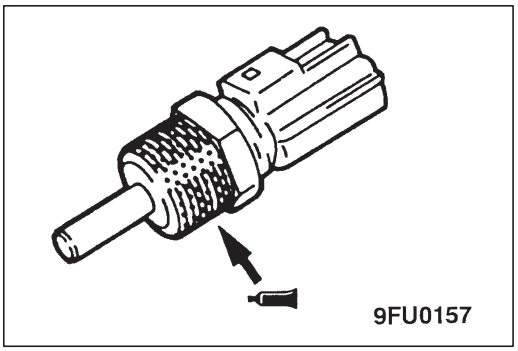
1. Remove the engine coolant temperature sensor.



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

   Standard value:
   2.1 – 2.7 kΩ (at 20°C)
   0.26 – 0.36 kΩ (at 80°C)

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

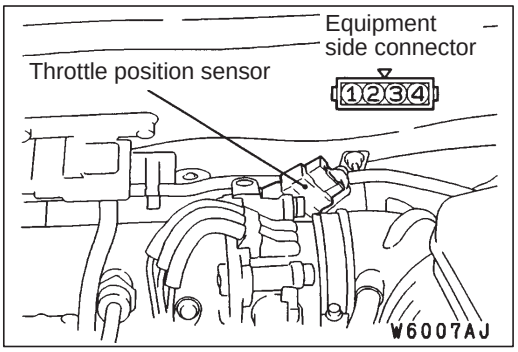


4. Apply sealant to threaded portion.

   Specified sealant:
   3M NUT Locking Part No.4171 or equivalent

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

   Tightening torque: 29 Nm



THROTTLE POSITION SENSOR CHECK 13100320412

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

   Standard value: 3.5–6.5 kΩ

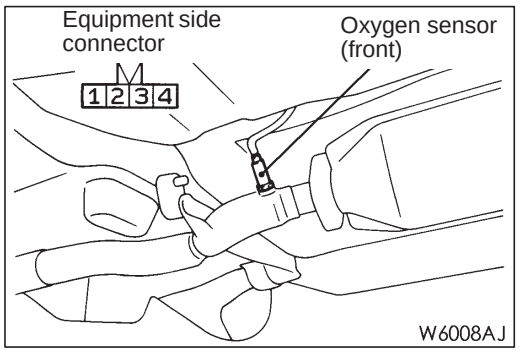
3. Measure the resistance between the throttle position sensor side connector terminal 2 and terminal 4.

   Normal condition:

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

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

   NOTE
   For the throttle position sensor adjustment procedure, refer to P.13B-65.

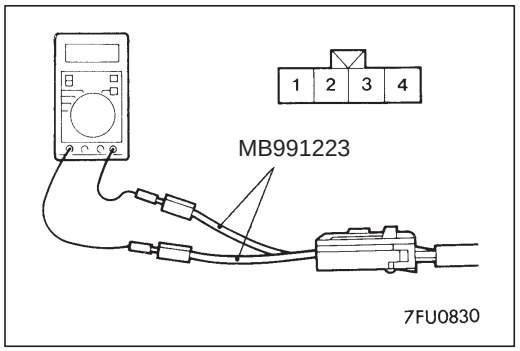


OXYGEN SENSOR CHECK

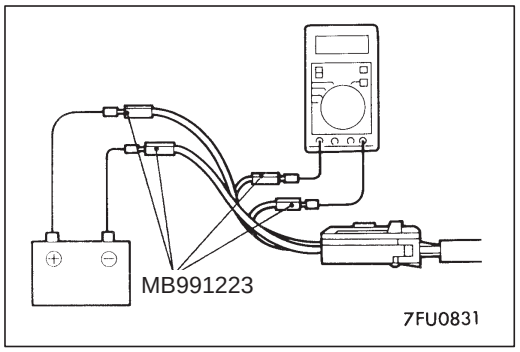
13100510222

<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 (2.5 – 5.0 Ω at 20°C) between terminal 3 and terminal 4 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 the jumper wire to connect terminal 3 of the oxygen sensor connector to the battery (+) terminal and terminal 4 to the battery (–) terminal.

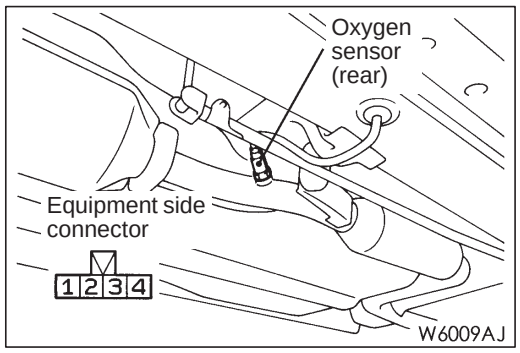
   Caution
   Be very careful when connectiong the jumper wire; incorrect connection can damage the oxygen sensor.
6. Connect a digital voltage meter between terminal 1 and terminal 2.
7. While repeatedly racing the engine, measure the oxygen sensor output voltage.

   Standard value:

Engine	Oxygen sensor output voltage	Remarks
When racing the engine	0.6 – 1.0 V	If you mark 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.

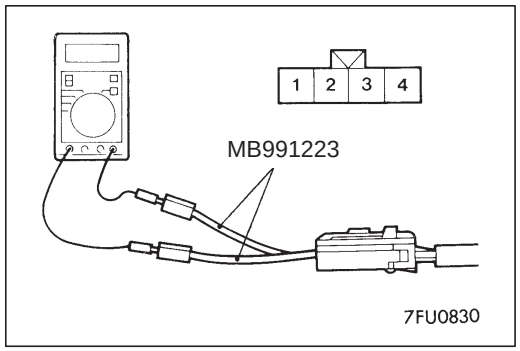
   NOTE
   For removal and installation of the oxygen sensor, refer to GROUP 15 – Exhaust Pipe and Main Muffler.

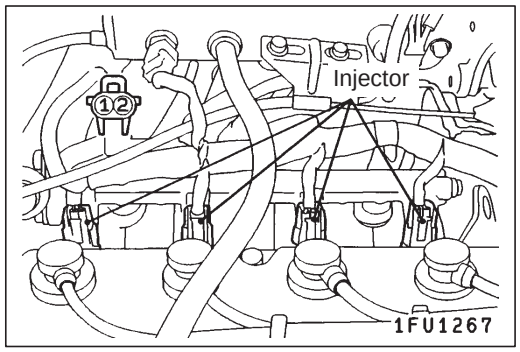


<Oxygen sensor (rear)>

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 (2.5 – 5.0 Ω at 20°C) between terminal 3 and terminal 4 on the oxygen sensor connector.
3. If there is no continuity, replace the oxugen 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 CHECK

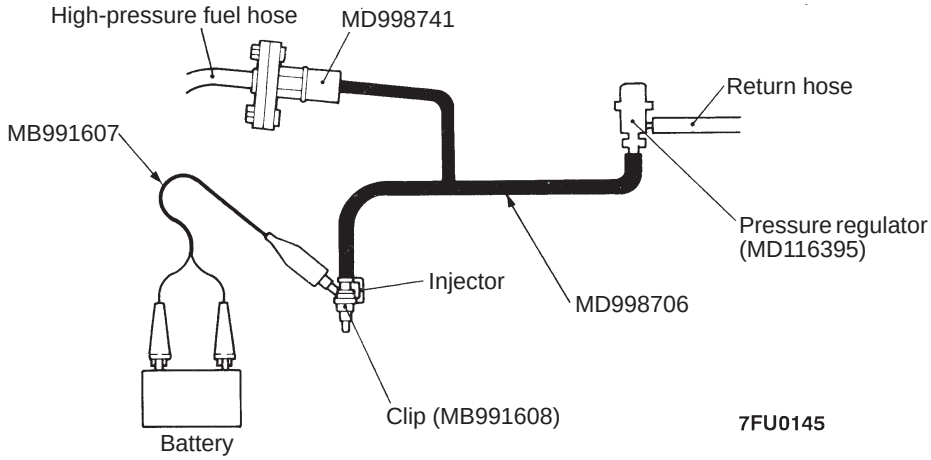
13100520409

Measurement of Resistance between Terminals

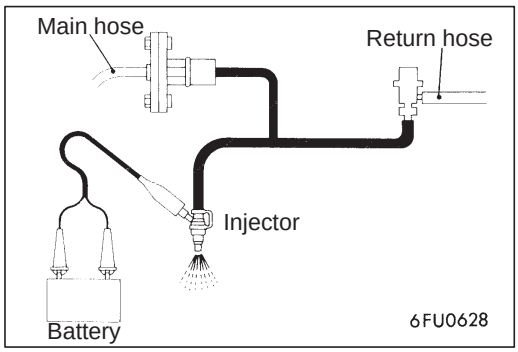
1. Remove the injector connector.
2. Measure the resistance btween terminals.
   Standaed value: 13 – 16 Ω (at 20°C)
3. Install the injector connector.

Checking the Injection Condition

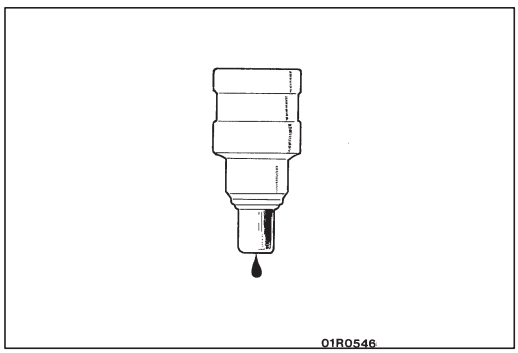
1. Following the steps below, bleed out the residual pressure within the fuel pipe line to prevent flow of the fuel. (Refer to P.13B-69.)
2. Remove the injector.
3. Arrange the special tool (injector test set), adaptor, fuel pressure regulator and clips as shown in the illustration below.



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



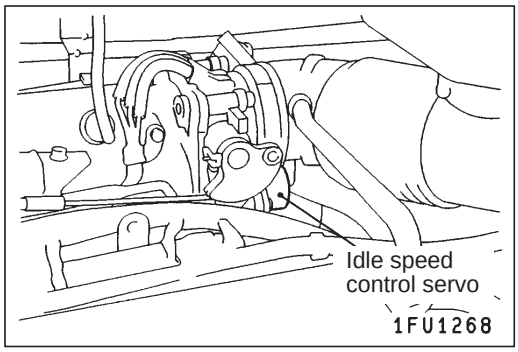
7. Activate the injector and check the atomized spray condition of the fuel.
   The condition can be considered satisfactory unless it is extremely poor.



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

   Standard value: 1 drop or less per minute

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



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

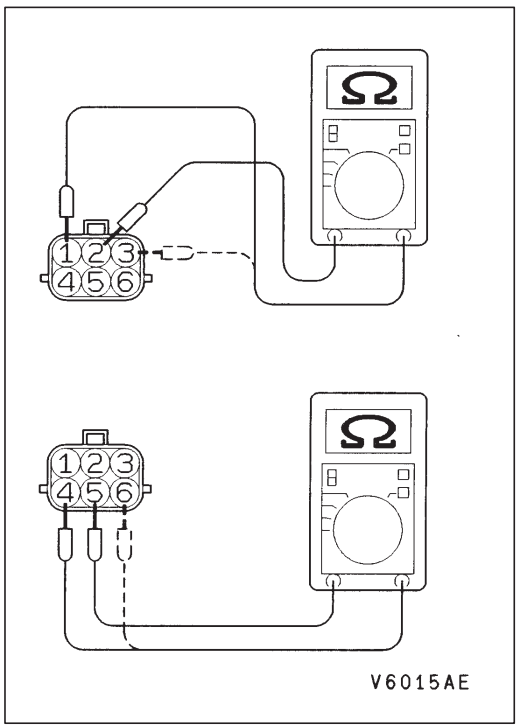
13100540344

Checking the Operation Sound

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

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

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



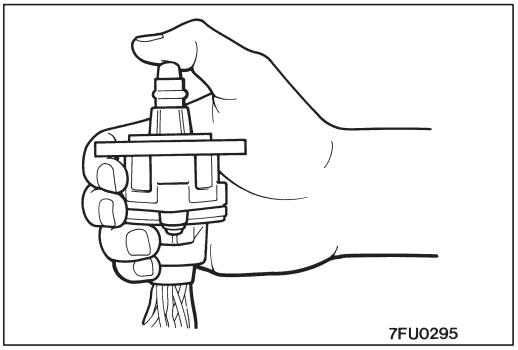
Checking the Coil Resistance

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

   Standard value: 28–33 Ω (at 20°C)

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

   Standard value: 28–33 Ω (at 20°C)



Operation Check

1. Remove the throttle body.
2. Remove the idle speed control servo.

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

PURGE CONTROL SOLENOID VALVE CHECK

13100560357

Refer to GROUP 17 – Emission Control System.

EGR CONTROL SOLENOID VALVE CHECK

13100570268

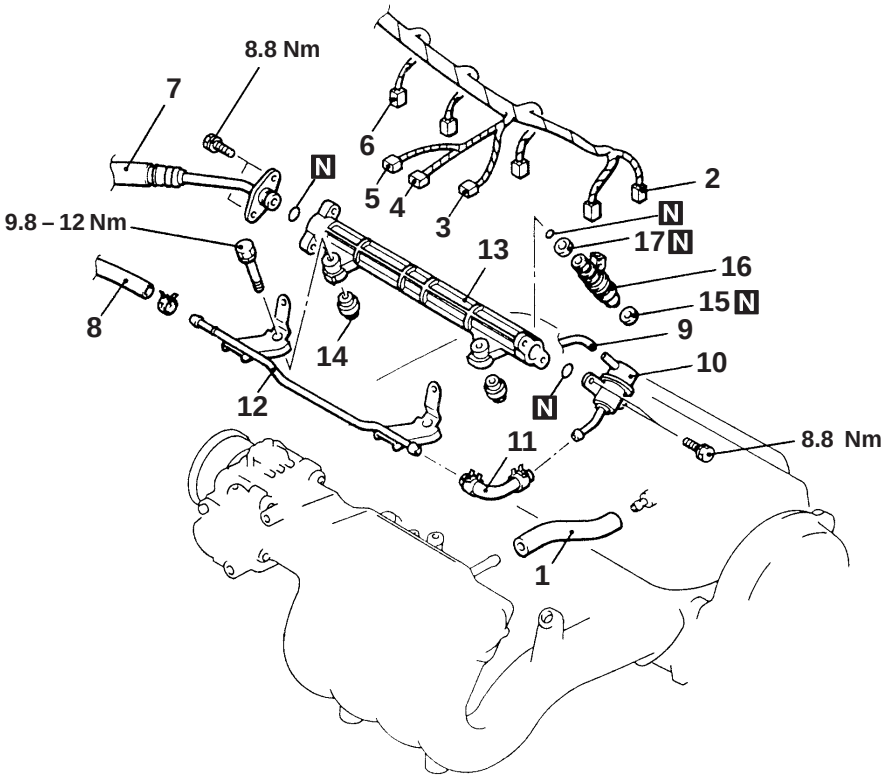
Refer to GROUP 17 – Emission Control System.

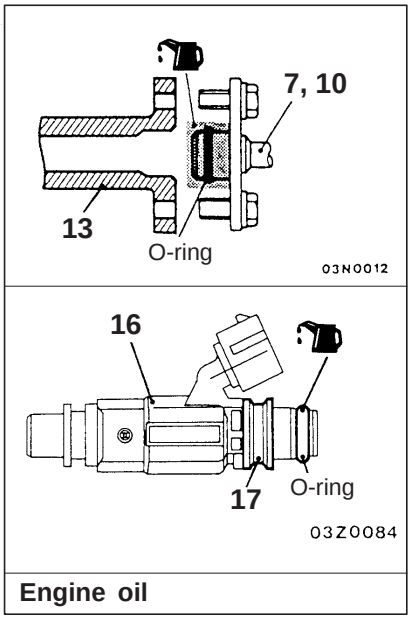
INJECTOR

13100710462

REMOVAL AND INSTALLATION

Pre-removal Operation
- Fuel Discharge Prevention (Refer to P.13B-69.)





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Removal steps

1. PCV hose
2. Detonation sensor connector
3. Intake air temperature sensor connector
4. Purge control solenoid valve connector
5. EGR solenoid valve connector
6. Injector connector
▶A◀ 7. High-pressure fuel hose connection
8. Fuel return hose connection
9. Vacuum hose connection
▶A◀ 10. Fuel pressure regulator
11. Fuel hose
12. Fuel return pipe
◀A▶ 13. Delivery pipe
14. Insulator
15. Insulator
◀A▶ ▶A◀ 16. Injector
17. Grommet

REMOVAL SERVICE POINT

◀A▶ DELIVERY PIPE/INJECTOR 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◀ INJECTOR/FUEL PRESSURE REGULATOR/HIGH-PRESSURE FUEL HOSE 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 and fuel pressure regulator to the specified torque.

   Tightening torque:
   8.8 Nm (Fuel pressure regulator)

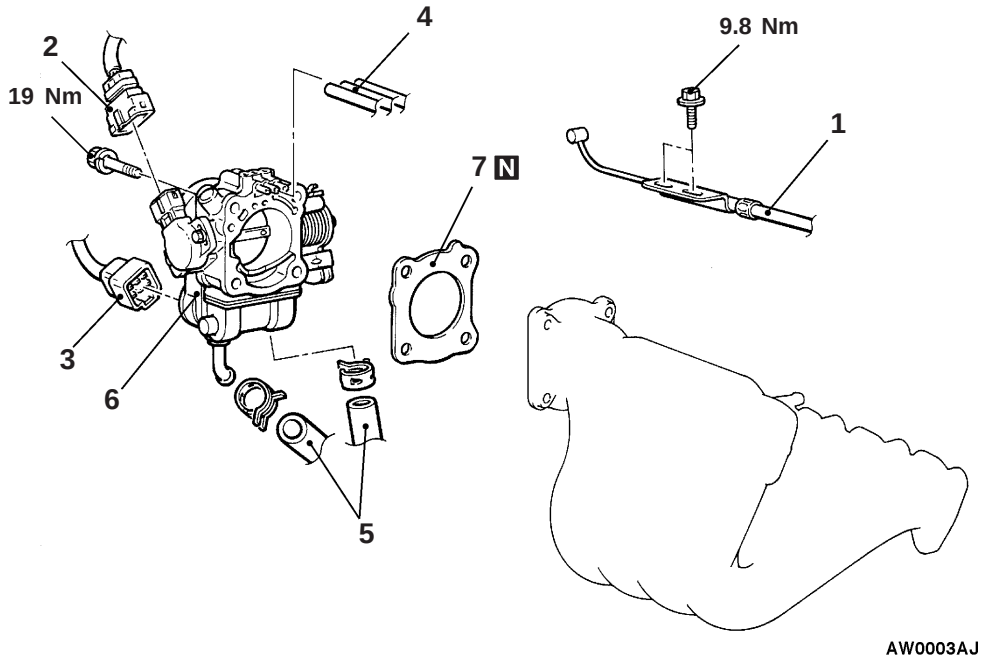
THROTTLE BODY

13100770439

REMOVAL AND INSTALLATION

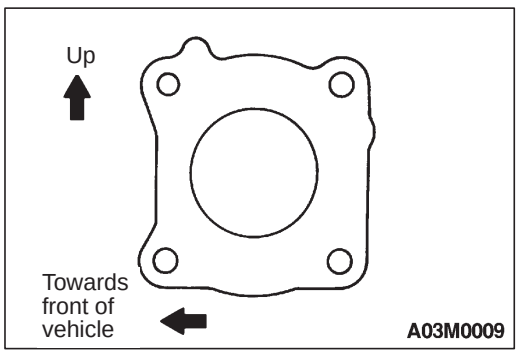
Pre-removal Operation
- Engine Coolant Draining (Refer to GROUP 14 – On-vehicle Service.)
- Air Cleaner Removal

Post-installation Operation
- Air Cleaner Installation
- Engine Coolant Supplying (Refer to GROUP 14 – On-vehicle Service.)
- Accelerator Cable Adjustment (Refer to GROUP 17 – On-vehicle Service.)



Removal steps

1. Accelerator cable connection
2. Throttle position sensor connector
3. Idle speed control servo connector
4. Vacuum hose connection
5. Water hose connection
6. Throttle body
▶A◀ 7. Throttle body gasket



INSTALLATION SERVICE POINT

▶A◀ THROTTLE BODY GASKET INSTALLATION

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

DISASSEMBLY AND REASSEMBLY

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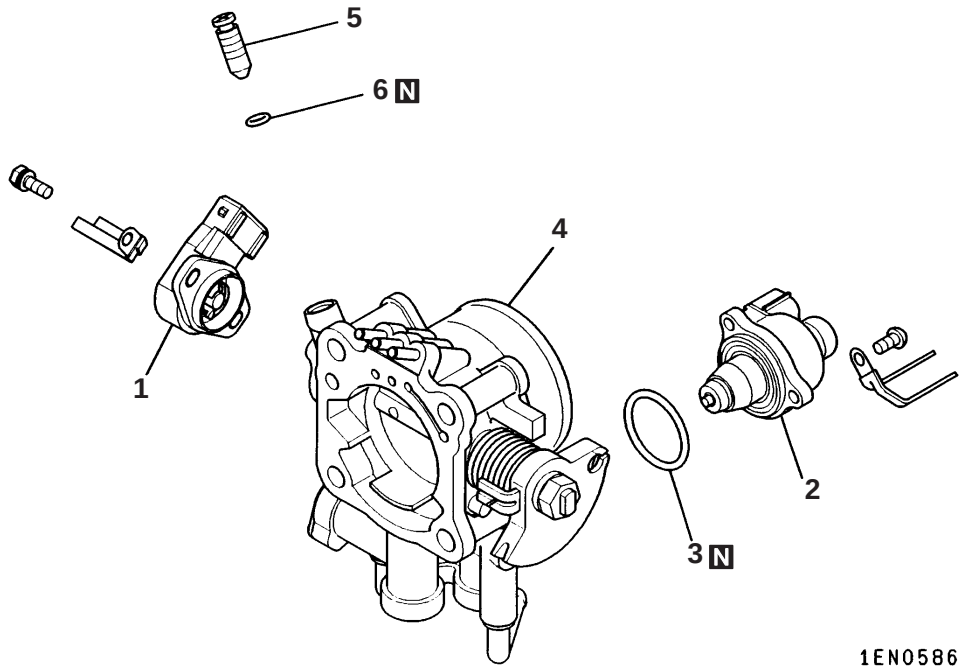


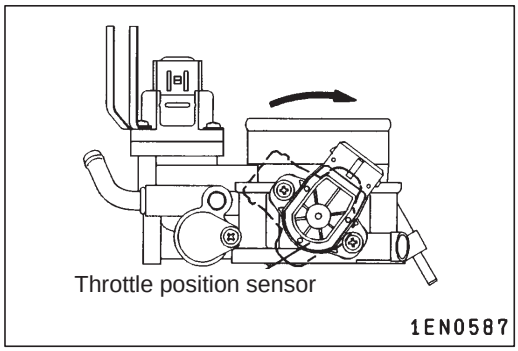
Disassembly steps

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

CLEANING THROTTLE BODY PARTS

1. Clean all throttle body parts.
   Do not use solvent to clean the following parts:
   - Throttle position sensor
   - Accelerator pedal position sensor
   - Idle speed control servo assembly

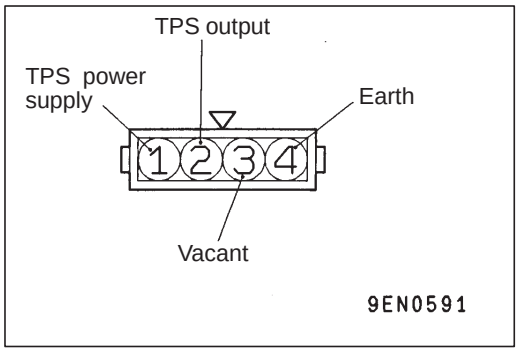
   If these parts are immersed in solvent, their insulation will deteriorate.
   Wipe them with cloth only.
2. Check if the vacuum port or passage is clogged. Use compressed air to clean the vacuum passage.



REASSEMBLY SERVICE POINT

▶A◀ THROTTLE POSITION SENSOR (TPS) INSTALLATION

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



NOTES

MULTIPOINT FUEL INJECTION (MPI)

CONTENTS

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.

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, are can then be used in simulation tests for troubleshooting.

GENERAL SPECIFICATIONS

Item		Specifications
Engine-ECU	Identification No.	E2T71279

MULTI-POINT FUEL INJECTION SYSTEM DIAGRAM

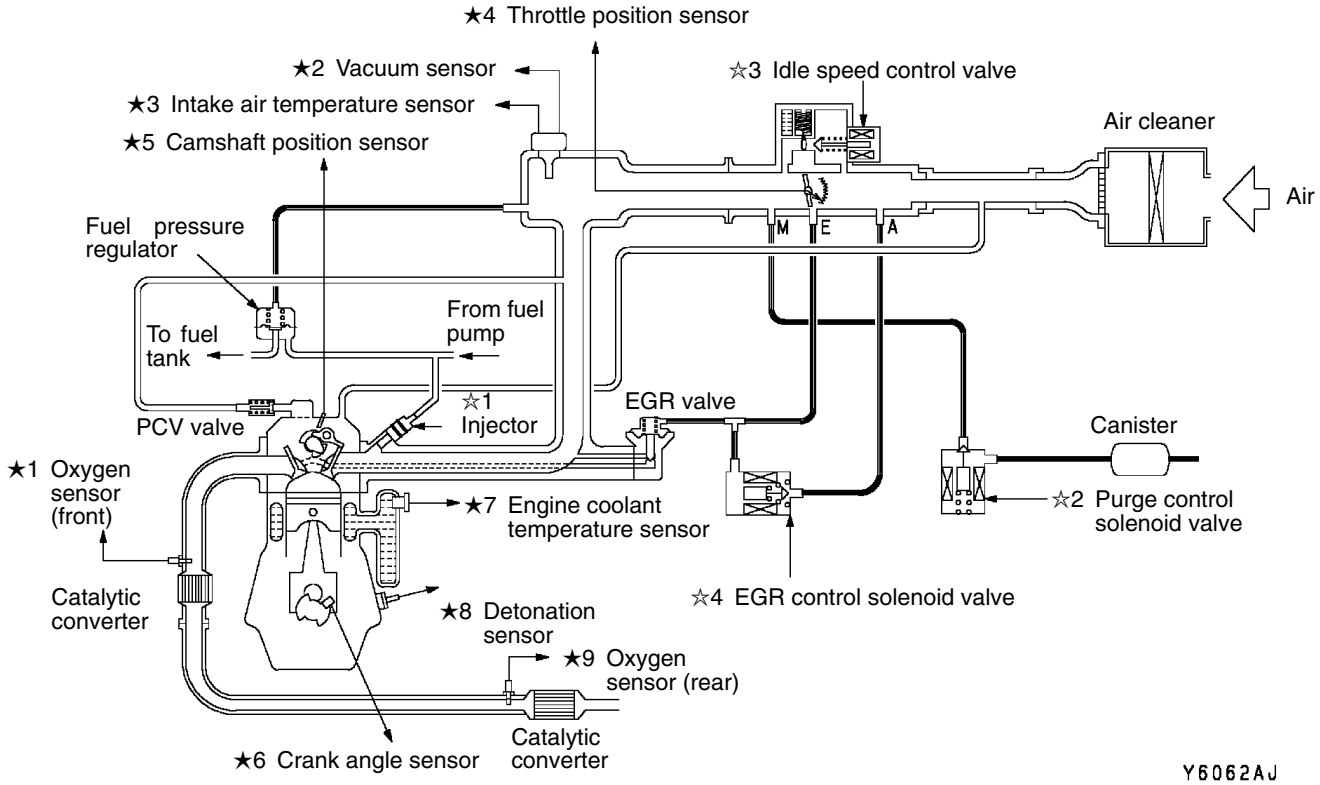
★1 Oxygen sensor (front)
★2 Vacuum sensor
★3 Intake air temperature sensor
★4 Throttle position sensor
★5 Camshaft position sensor
★6 Crank angle sensor
★7 Engine coolant temperature sensor
★8 Detonation sensor
★9 Oxygen sensor (rear)

- Power supply voltage
- Vehicle speed sensor
- A/C switch
- Power steering fluid pressure switch
- Vehicle speed sensor
- Ignition switch – ST
- Ignition switch – IG

⇨ Engine-ECU ⇨

☆1 Injector
☆2 Purge control solenoid valve
☆3 Idle speed control valve
☆4 EGR control servo valve

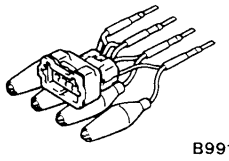
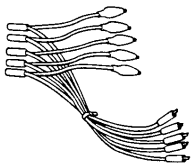
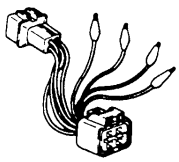
- Fuel pump relay
- Engine control relay
- A/C power relay
- Engine warning lamp
- Diagnosis signal
- Ignition coil (power transistor)
- Fan controller

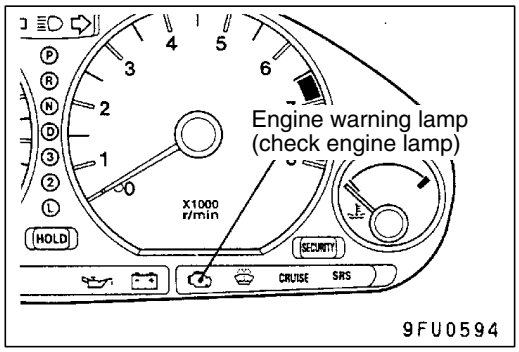


SERVICE SPECIFICATIONS

Items		Standard value
Intake air temperature sensor resistance kΩ	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.

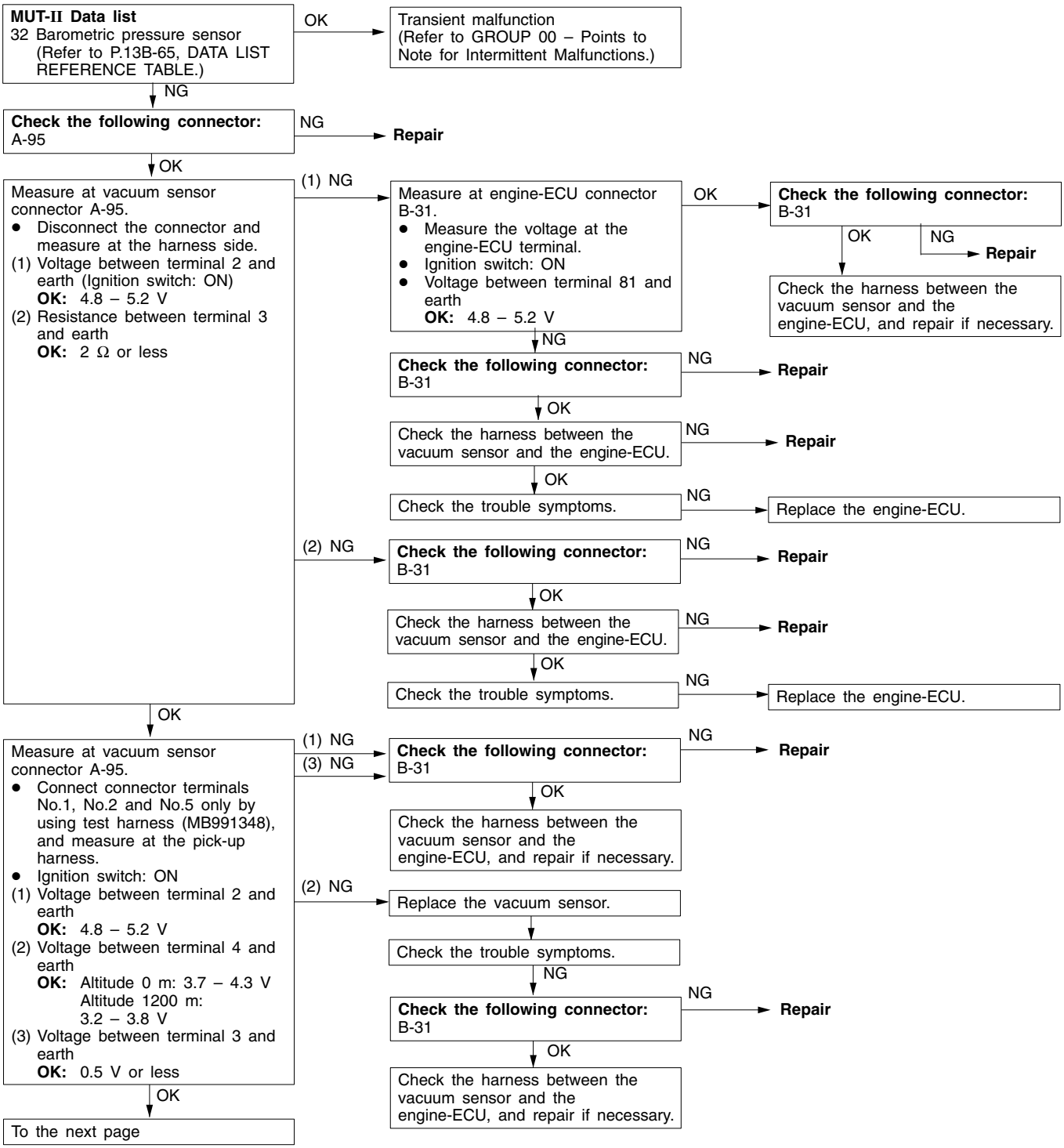
INSPECTION CHART FOR DIAGNOSIS CODES

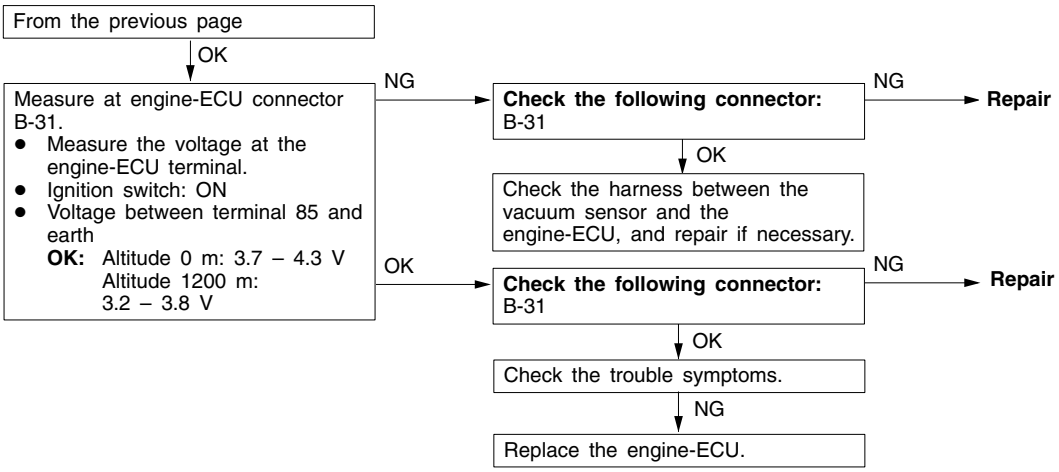
Code No.	Diagnosis item	Reference page
P0105	Vacuum sensor system	13B-10
P0110	Intake air temperature sensor system	13B-12
P0115	Engine coolant temperature sensor system	13B-13
P0120	Throttle position sensor system	13B-16
P0125	Feedback system	13B-18
P0130	Oxygen sensor (front) system <sensor 1>	13B-19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

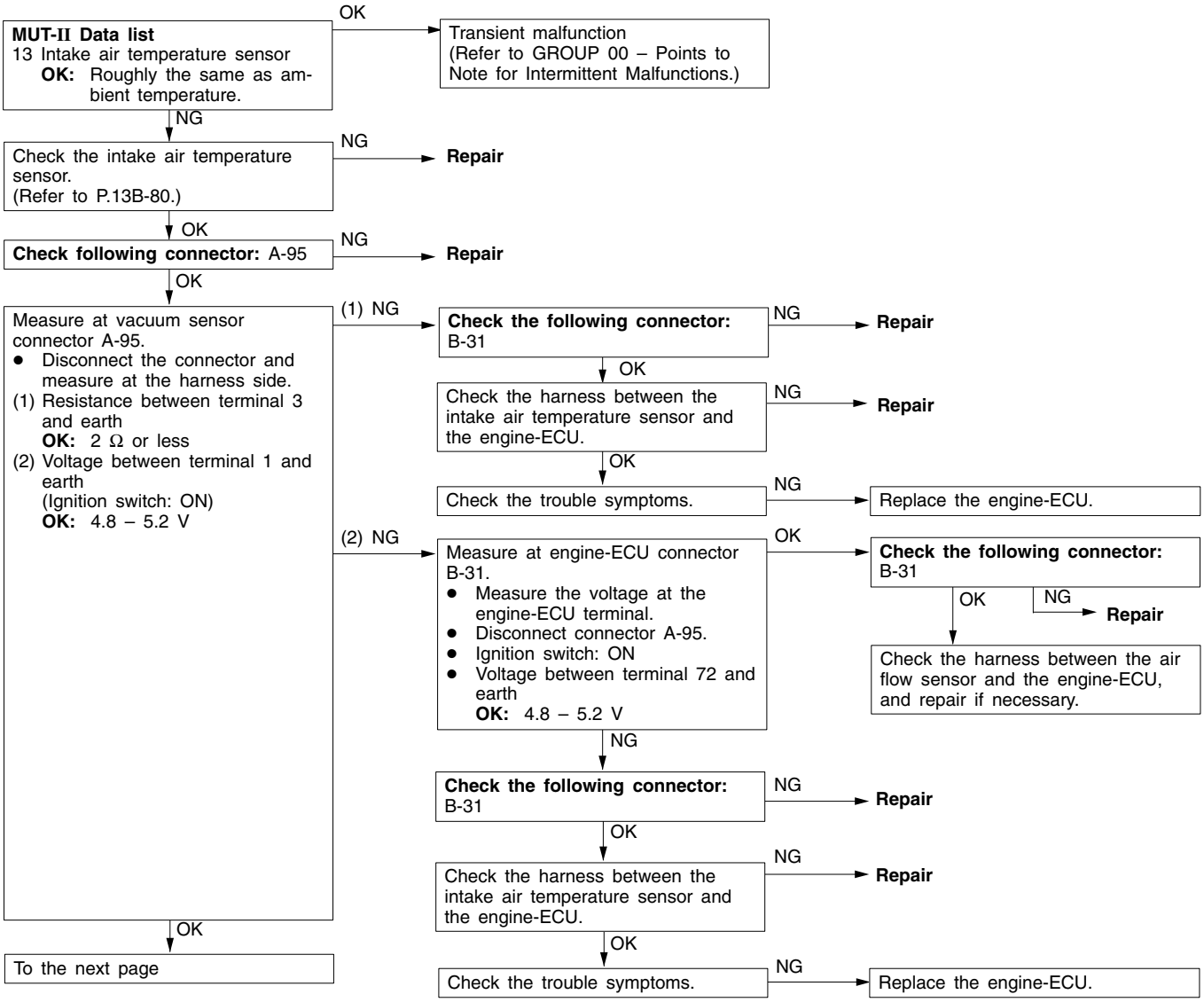
INSPECTION PROCEDURE CLASSIFIED BY DIAGNOSIS CODE

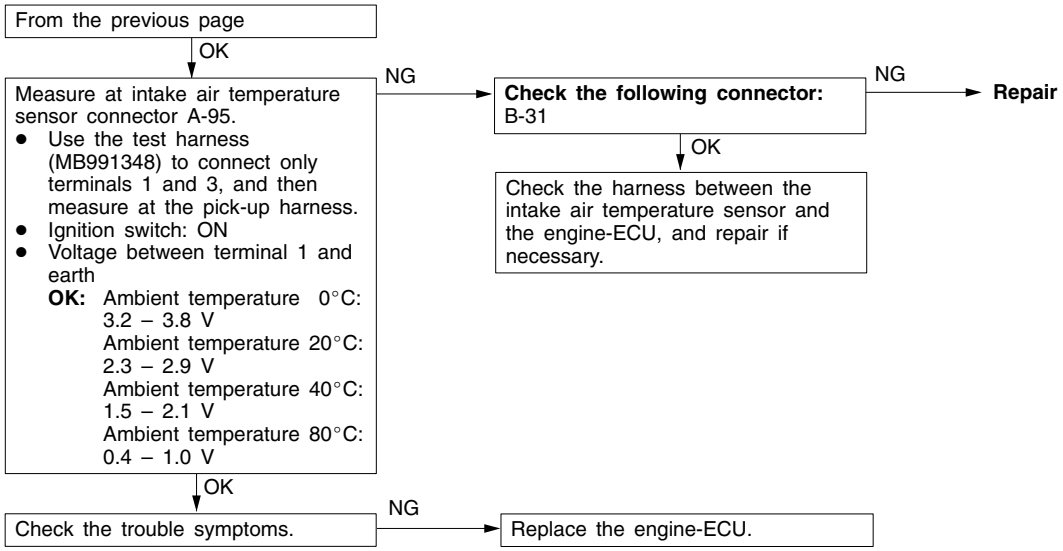
Code No. P0105 Vacuum sensor system	Range of Check
Range of Check ● Ignition switch: ON Set Conditions ● The output voltage of the vacuum sensor is 4.5 V or more for 2 seconds. (This corresponds to the absolute manifold pressure of 115 kPa or more.)	● Malfunction of the vacuum sensor ● Improper connector 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.)	



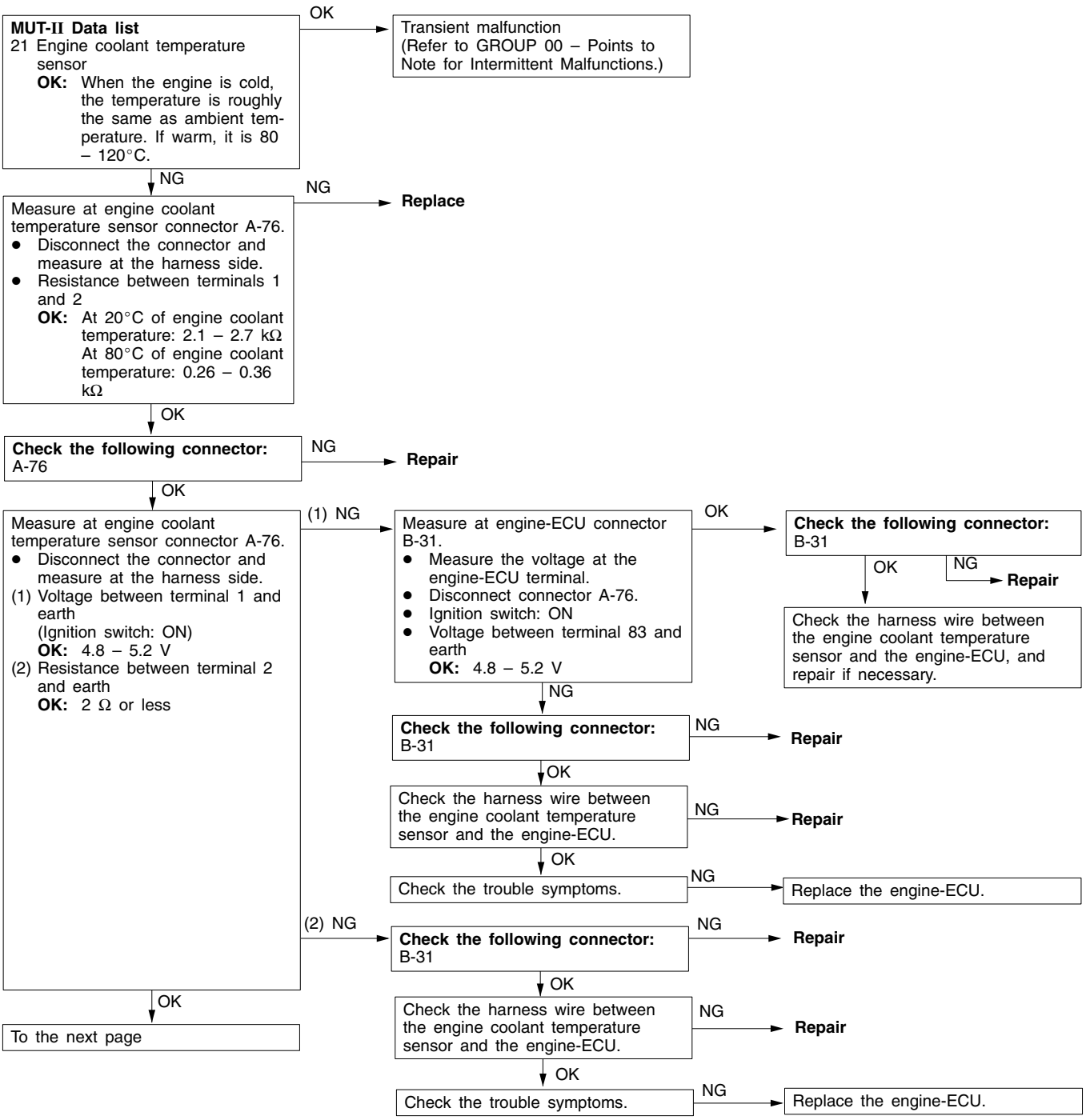

From the previous page
OK
Measure at engine-ECU connector B-31.
● Measure the voltage at the engine-ECU terminal.
● Ignition switch: ON
● Voltage between terminal 85 and earth
OK: Altitude 0 m: 3.7 – 4.3 V
Altitude 1200 m: 3.2 – 3.8 V
NG
Check the following connector: B-31
NG
Repair
OK
Check the harness between the vacuum sensor and the engine-ECU, and repair if necessary.
OK
Check the following connector: B-31
NG
Repair
OK
Check the trouble symptoms.
NG
Replace the engine-ECU.

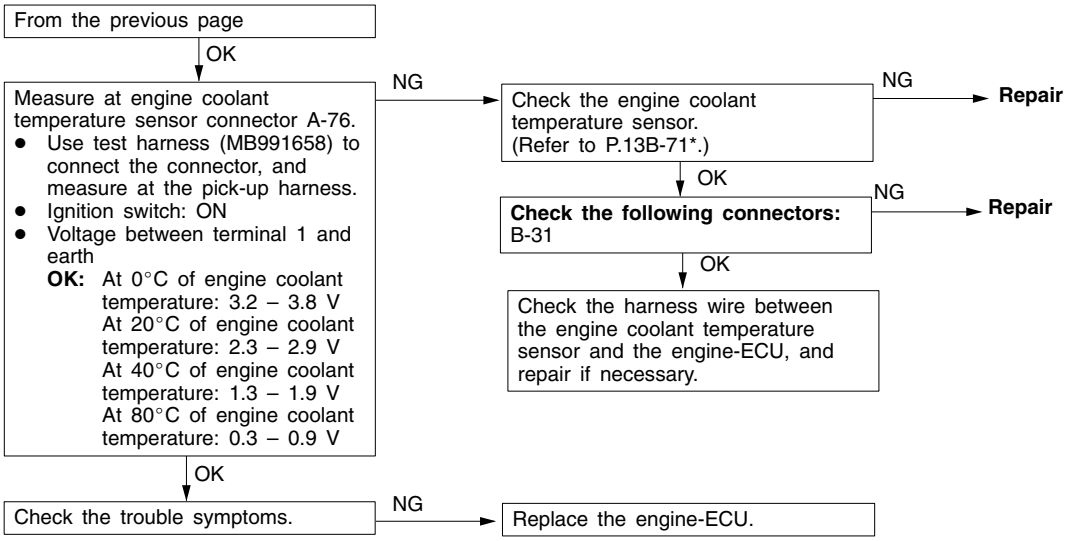
Code No. P0110 Intake air temperature sensor system	Probable cause
Range of Check ● Two seconds have passed since the ignition switch is turned ON or the engine starting process is completed. Set Conditions ● The sensor output voltage is 4.6 V or more for two seconds (equivalent to –45°C of intake air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





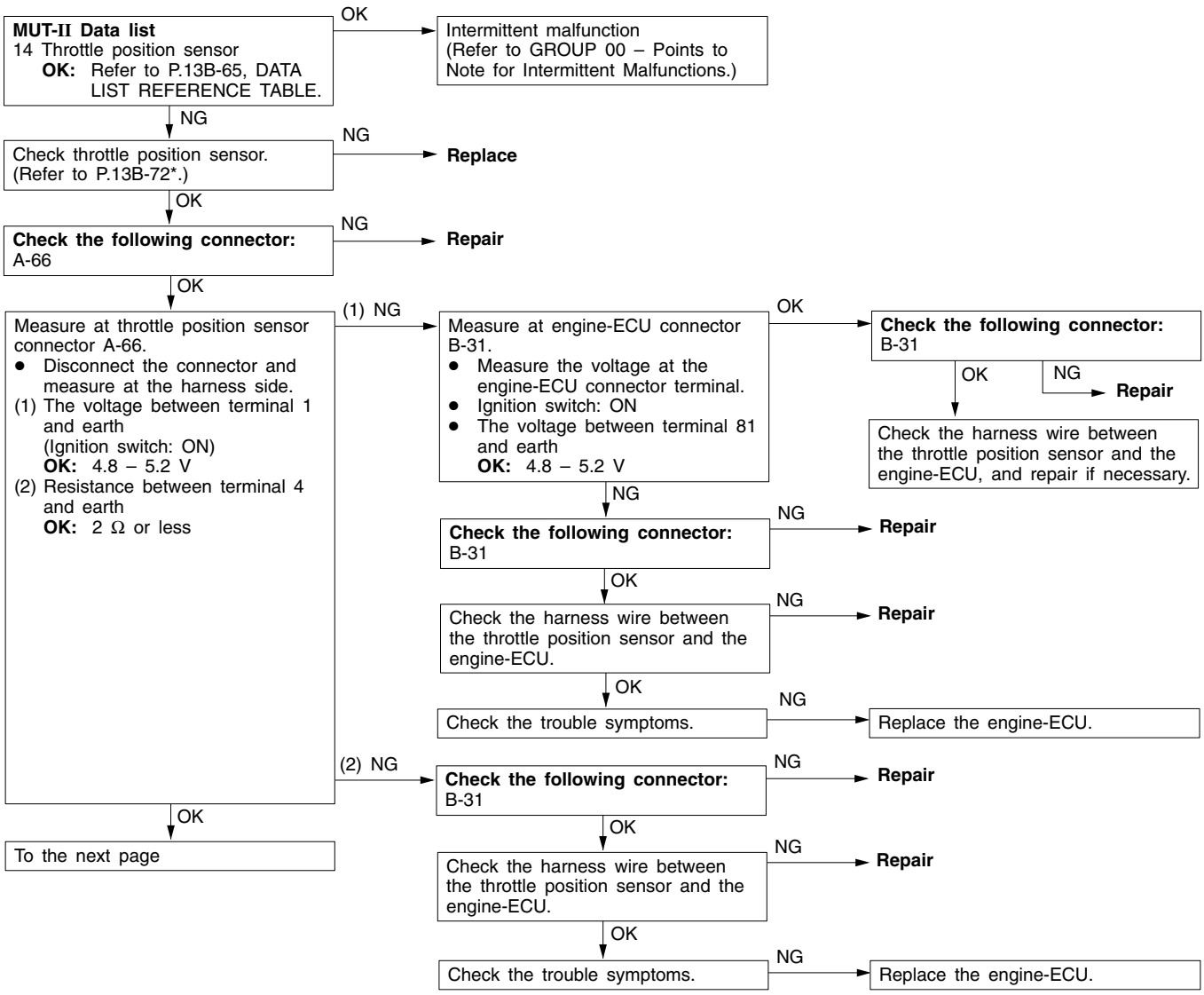
Code No. P0115 Engine coolant temperature sensor system	Probable cause
Range of Check ● Engine: Two seconds after the engine has been started Set Conditions ● The sensor output voltage is 4.6 V or more for two seconds (equivalent to –45°C of engine coolant temperature) or ● The sensor output voltage 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.	


MUT-II Data list
21 Engine coolant temperature sensor
OK: When the engine is cold, the temperature is roughly the same as ambient temperature. If warm, it is 80 – 120°C.
OK
Transient malfunction (Refer to GROUP 00 – Points to Note for Intermittent Malfunctions.)
NG
Measure at engine coolant temperature sensor connector A-76.
• Disconnect the connector and measure at the harness side.
• Resistance between terminals 1 and 2
OK: At 20°C of engine coolant temperature: 2.1 – 2.7 kΩ
At 80°C of engine coolant temperature: 0.26 – 0.36 kΩ
NG
Replace
OK
Check the following connector: A-76
NG
Repair
OK
Measure at engine coolant temperature sensor connector A-76.
• Disconnect the connector and measure at the harness side.
(1) Voltage between terminal 1 and earth
(Ignition switch: ON)
OK: 4.8 – 5.2 V
(2) Resistance between terminal 2 and earth
OK: 2 Ω or less
(1) NG
Measure at engine-ECU connector B-31.
• Measure the voltage at the engine-ECU terminal.
• Disconnect connector A-76.
• Ignition switch: ON
• Voltage between terminal 83 and earth
OK: 4.8 – 5.2 V
OK
Check the following connector: B-31
OK
NG
Repair
Check the harness wire between the engine coolant temperature sensor and the engine-ECU, and repair if necessary.
NG
Check the following connector: B-31
NG
Repair
OK
Check the harness wire between the engine coolant temperature sensor and the engine-ECU.
NG
Repair
OK
Check the trouble symptoms.
NG
Replace the engine-ECU.
(2) NG
Check the following connector: B-31
NG
Repair
OK
Check the harness wire between the engine coolant temperature sensor and the engine-ECU.
NG
Repair
OK
Check the trouble symptoms.
NG
Replace the engine-ECU.
OK
To the next page

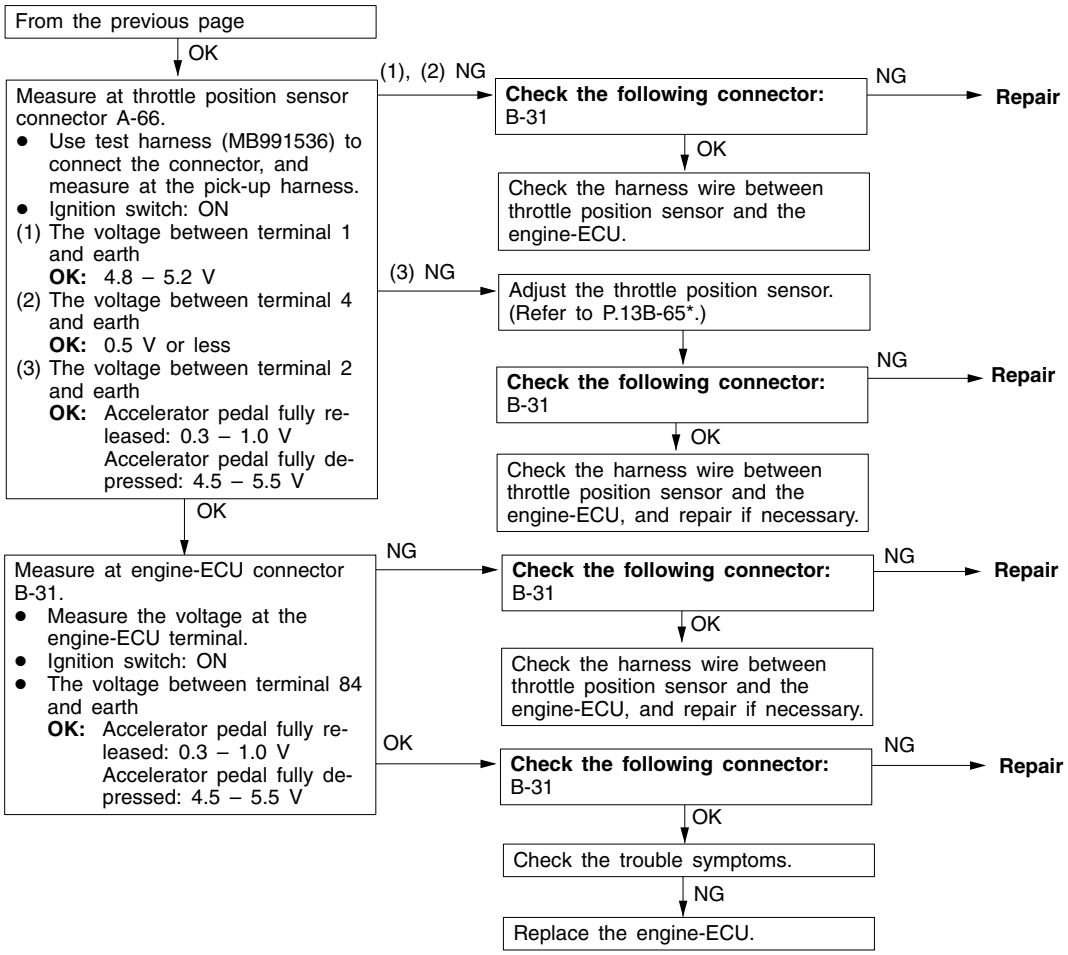


NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

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 48kPa 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

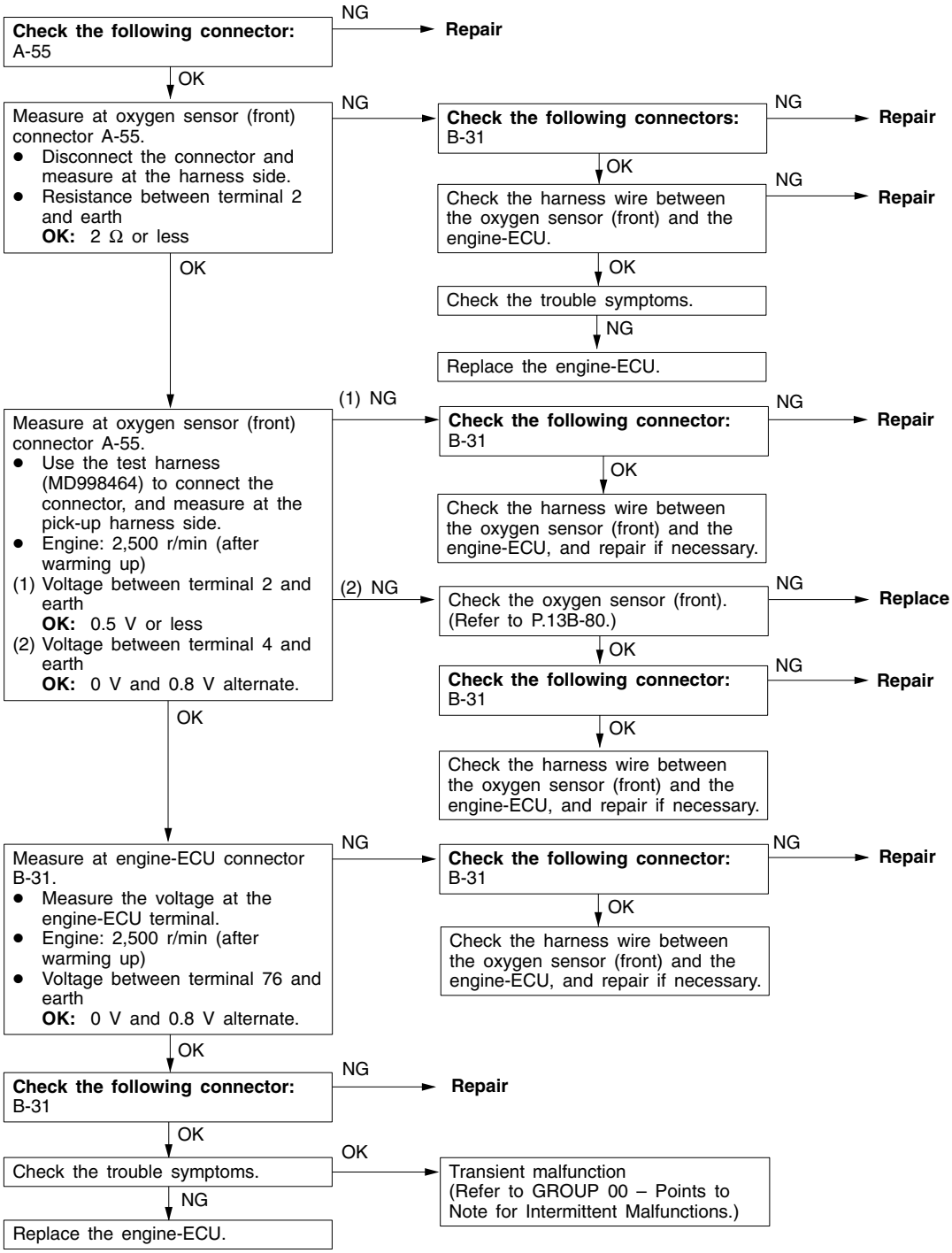


NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

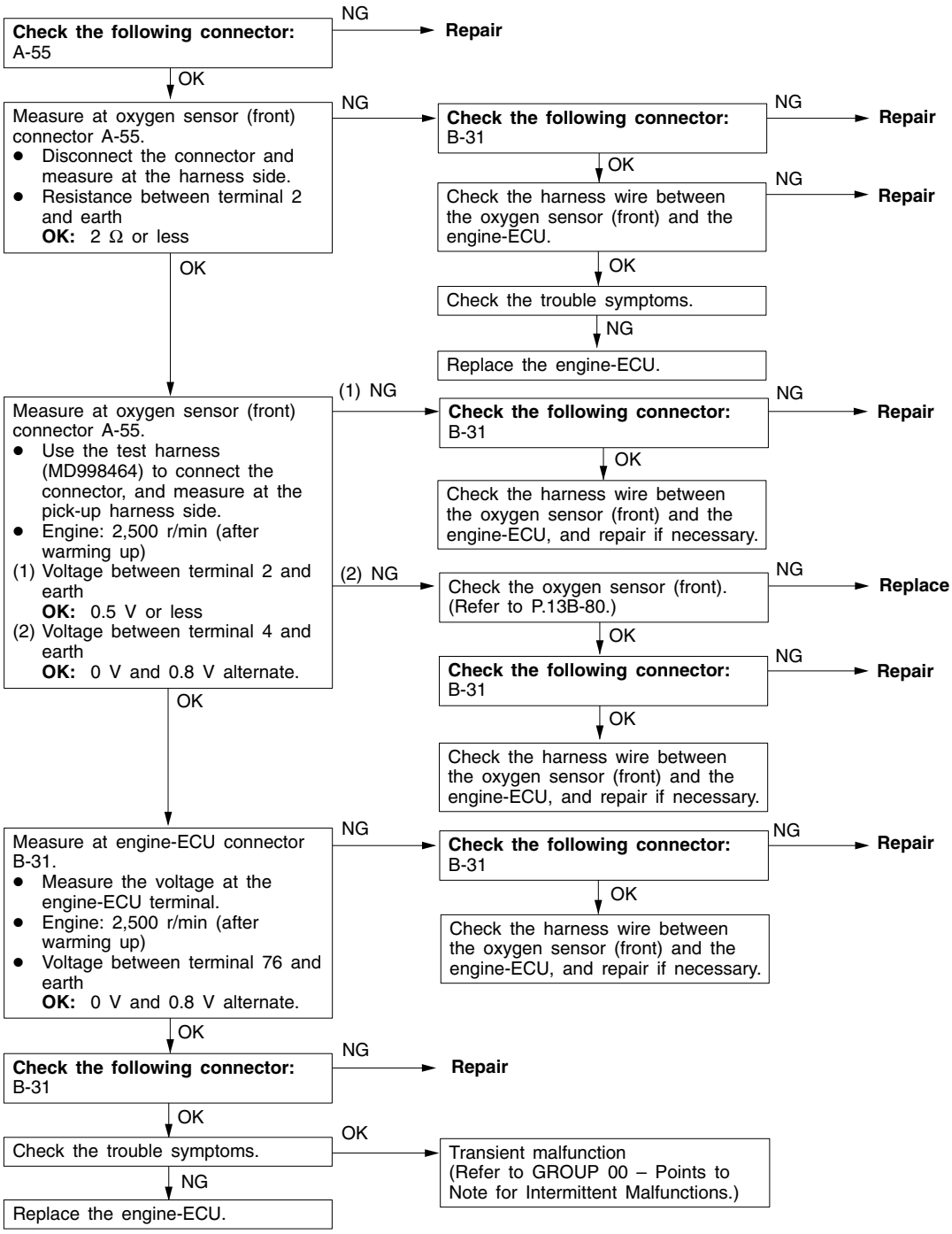


NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

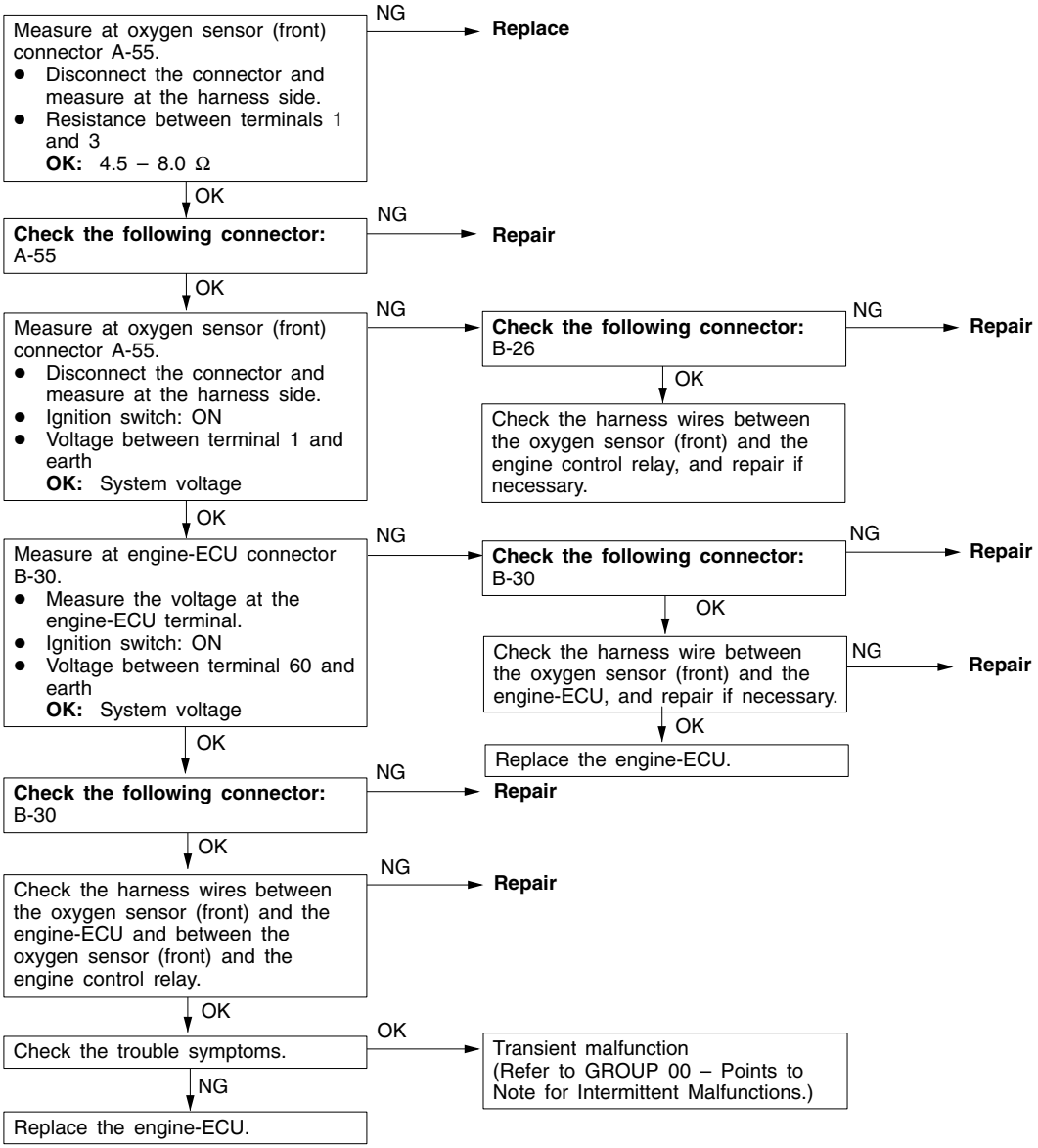
Code No. P0125 Feedback system	Probable cause
Range of Check • The engine coolant temperature is approx. 80°C or more. • During stoichiometric feedback control • The vehicle is not being decelerated. Set Conditions • Oxygen sensor (front) output voltage has been higher or lower than 0.5 V for at least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



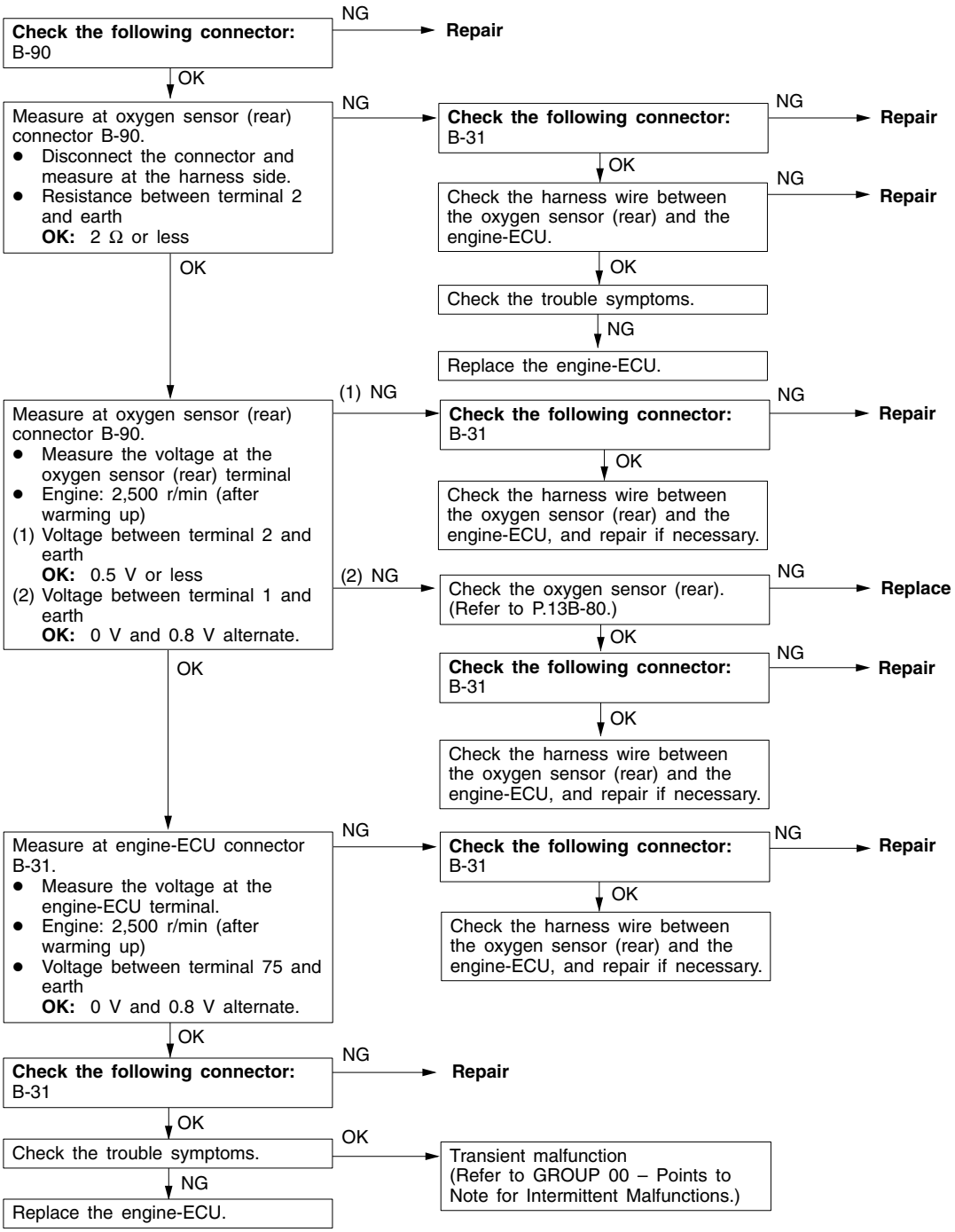
Code No. P0130 Oxygen sensor (front) system <sensor 1>	Probable cause
Range of Check ● Three minutes have been passed since the engine has been started. ● The engine coolant temperature is approx. 80°C or more. ● Intake air temperature is 20 – 50°C ● Engine speed is 1,200 r/min or more ● Driving on a 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.	


Check the following connector: A-55
NG
Repair
OK
Measure at oxygen sensor (front) connector A-55.
• Disconnect the connector and measure at the harness side.
• Resistance between terminal 2 and earth
OK: 2 Ω or less
NG
Check the following connector: B-31
NG
Repair
OK
Check the harness wire between the oxygen sensor (front) and the engine-ECU.
NG
Repair
OK
Check the trouble symptoms.
NG
Replace the engine-ECU.
OK
Measure at oxygen sensor (front) connector A-55.
• Use the test harness (MD998464) to connect the connector, and measure at the pick-up harness side.
• Engine: 2,500 r/min (after warming up)
(1) Voltage between terminal 2 and earth
OK: 0.5 V or less
(2) Voltage between terminal 4 and earth
OK: 0 V and 0.8 V alternate.
(1) NG
Check the following connector: B-31
NG
Repair
OK
Check the harness wire between the oxygen sensor (front) and the engine-ECU, and repair if necessary.
(2) NG
Check the oxygen sensor (front). (Refer to P.13B-80.)
NG
Replace
OK
Check the following connector: B-31
NG
Repair
OK
Check the harness wire between the oxygen sensor (front) and the engine-ECU, and repair if necessary.
OK
Measure at engine-ECU connector B-31.
• Measure the voltage at the engine-ECU terminal.
• Engine: 2,500 r/min (after warming up)
• Voltage between terminal 76 and earth
OK: 0 V and 0.8 V alternate.
NG
Check the following connector: B-31
NG
Repair
OK
Check the harness wire between the oxygen sensor (front) and the engine-ECU, and repair if necessary.
OK
Check the following connector: B-31
NG
Repair
OK
Check the trouble symptoms.
OK
Transient malfunction (Refer to GROUP 00 – Points to Note for Intermittent Malfunctions.)
NG
Replace the engine-ECU.

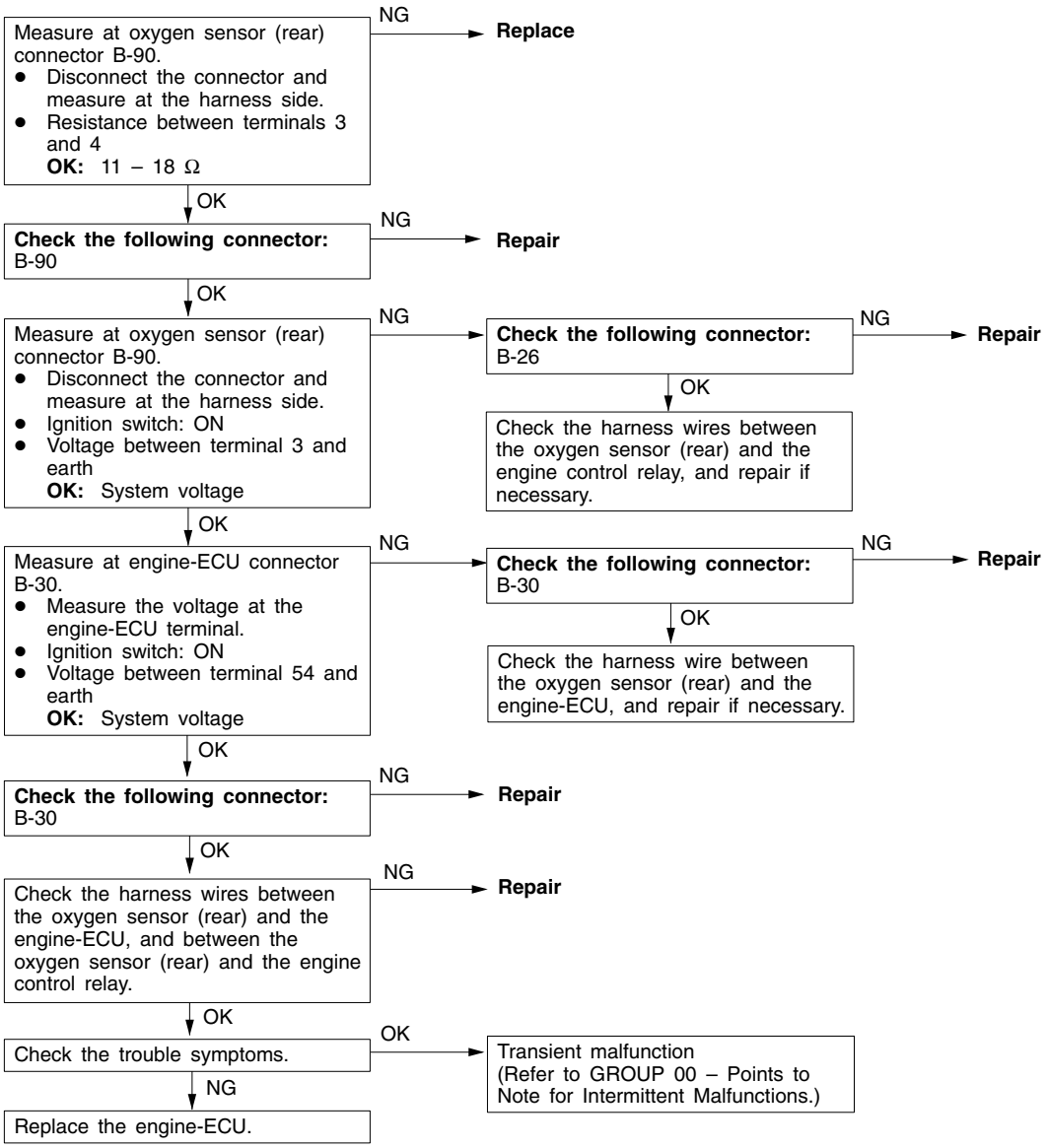
Code No. P0135 Oxygen sensor heater (front) system <sensor 1>	Probable cause
Range of Check • The engine coolant temperature is approx. 20°C or more. • The oxygen sensor heater (front) remains on. • The engine speed is 50 r/min or more. • Battery voltage is 11 – 16 V. Set Conditions • The current, which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



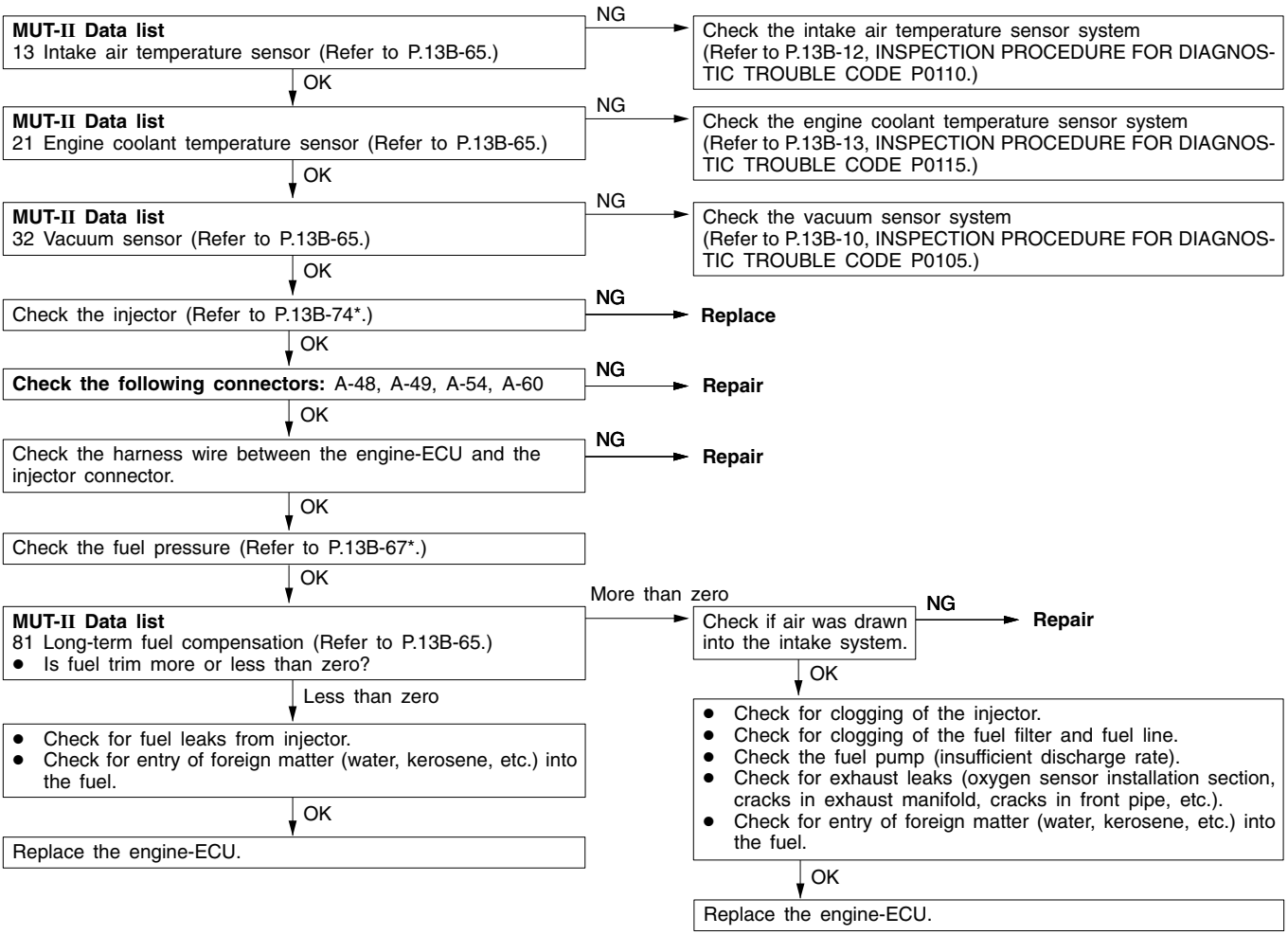
Code No. P0136 Oxygen sensor (rear) system <sensor 2>	Probable cause
Range of Check ● Three minutes have been passed since the engine has been started. ● The engine coolant temperature is approx. 80°C or more. ● Intake air temperature is 20 – 50°C ● Engine speed is 1,200 r/min or more ● Driving on a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


Check the following connector: B-90
NG
Repair
OK
Measure at oxygen sensor (rear) connector B-90.
• Disconnect the connector and measure at the harness side.
• Resistance between terminal 2 and earth
OK: 2 Ω or less
NG
Check the following connector: B-31
NG
Repair
OK
Check the harness wire between the oxygen sensor (rear) and the engine-ECU.
NG
Repair
OK
Check the trouble symptoms.
NG
Replace the engine-ECU.
OK
Measure at oxygen sensor (rear) connector B-90.
• Measure the voltage at the oxygen sensor (rear) terminal
• Engine: 2,500 r/min (after warming up)
(1) Voltage between terminal 2 and earth
OK: 0.5 V or less
(2) Voltage between terminal 1 and earth
OK: 0 V and 0.8 V alternate.
(1) NG
Check the following connector: B-31
NG
Repair
OK
Check the harness wire between the oxygen sensor (rear) and the engine-ECU, and repair if necessary.
(2) NG
Check the oxygen sensor (rear). (Refer to P.13B-80.)
NG
Replace
OK
Check the following connector: B-31
NG
Repair
OK
Check the harness wire between the oxygen sensor (rear) and the engine-ECU, and repair if necessary.
OK
Measure at engine-ECU connector B-31.
• Measure the voltage at the engine-ECU terminal.
• Engine: 2,500 r/min (after warming up)
• Voltage between terminal 75 and earth
OK: 0 V and 0.8 V alternate.
NG
Check the following connector: B-31
NG
Repair
OK
Check the harness wire between the oxygen sensor (rear) and the engine-ECU, and repair if necessary.
OK
Check the following connector: B-31
NG
Repair
OK
Check the trouble symptoms.
OK
Transient malfunction (Refer to GROUP 00 – Points to Note for Intermittent Malfunctions.)
NG
Replace the engine-ECU.

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

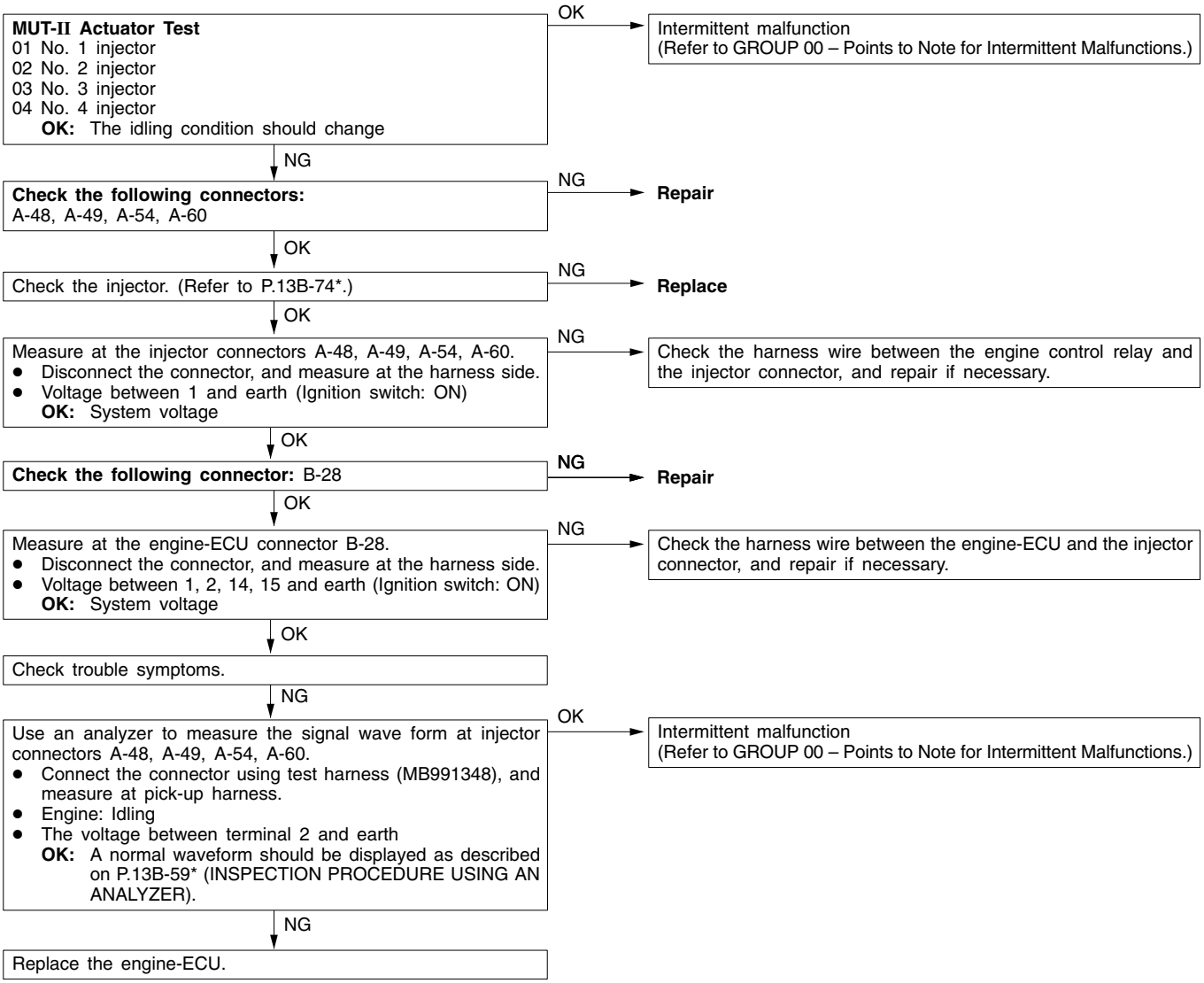


Code No. P0170 Abnormal fuel system	Probable cause
Range of Check • Engine: Being learning the air-fuel ratio Set Conditions • Two seconds or more have been passed while the fuel injection amount compensation value is too low. or • Two seconds or more have been passed while the fuel injection amount 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



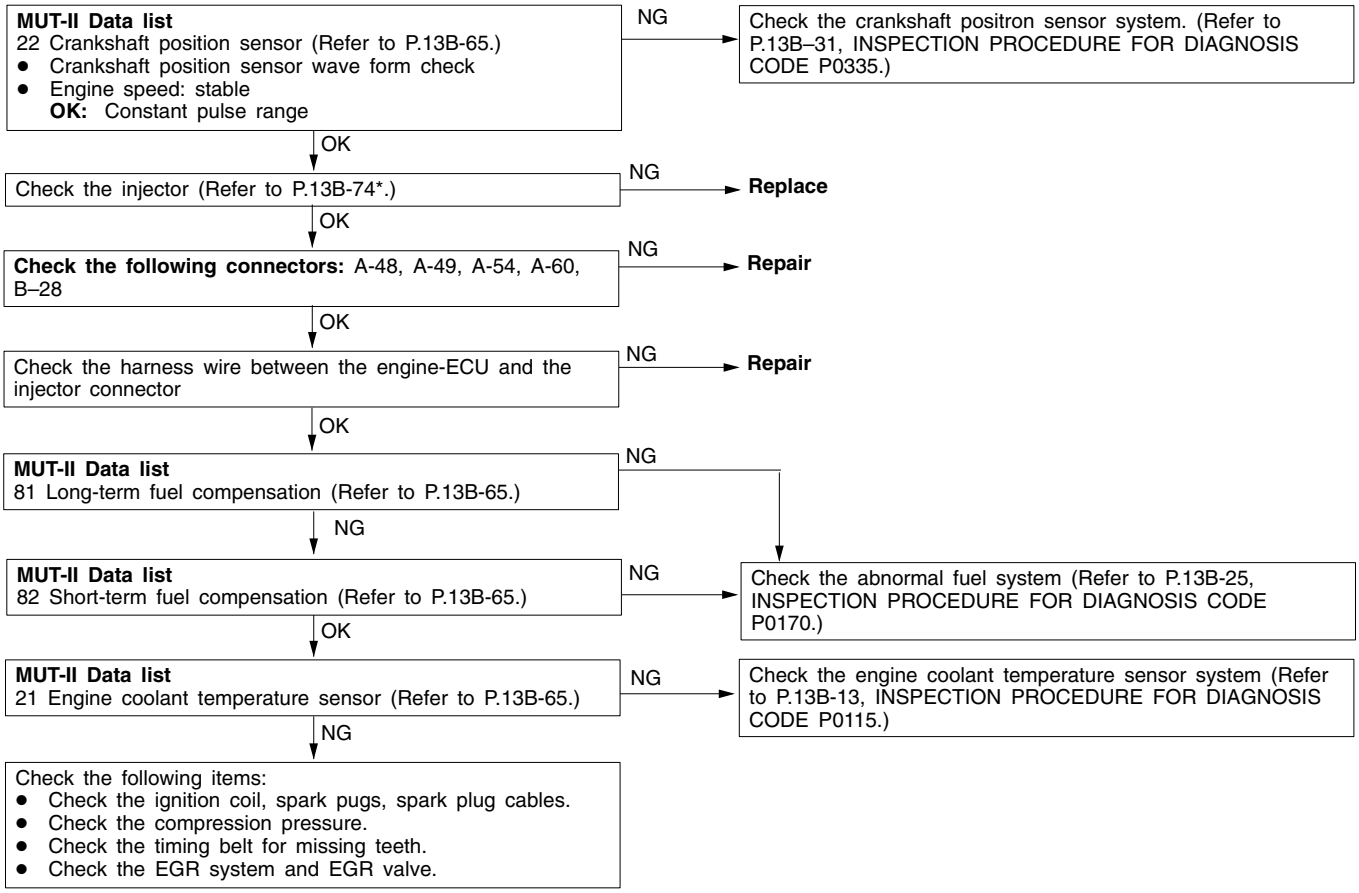
NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

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



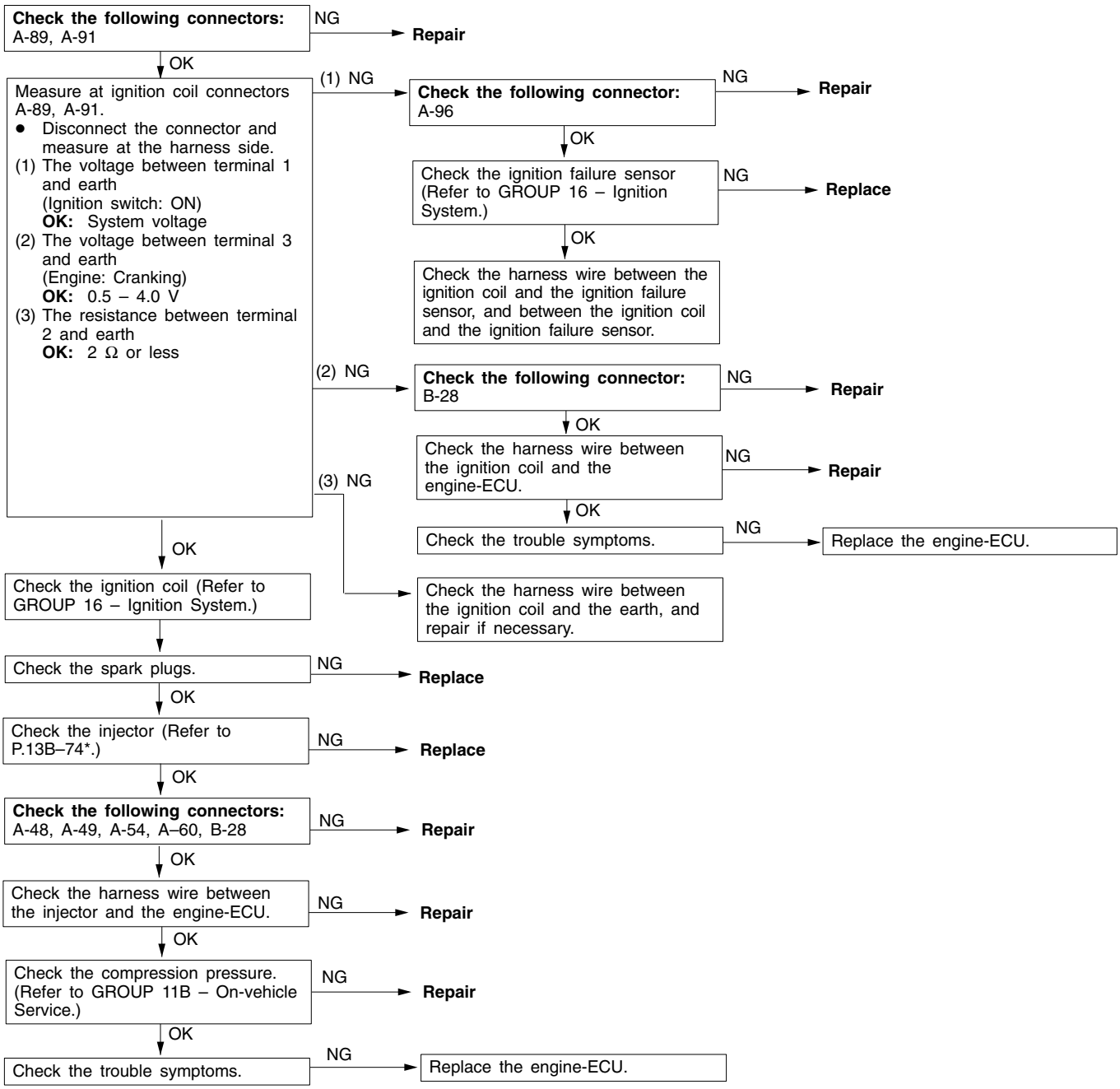
NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

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 misfire exceeds a predetermined number per 200 engine revolutions. ● The number of misfire 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



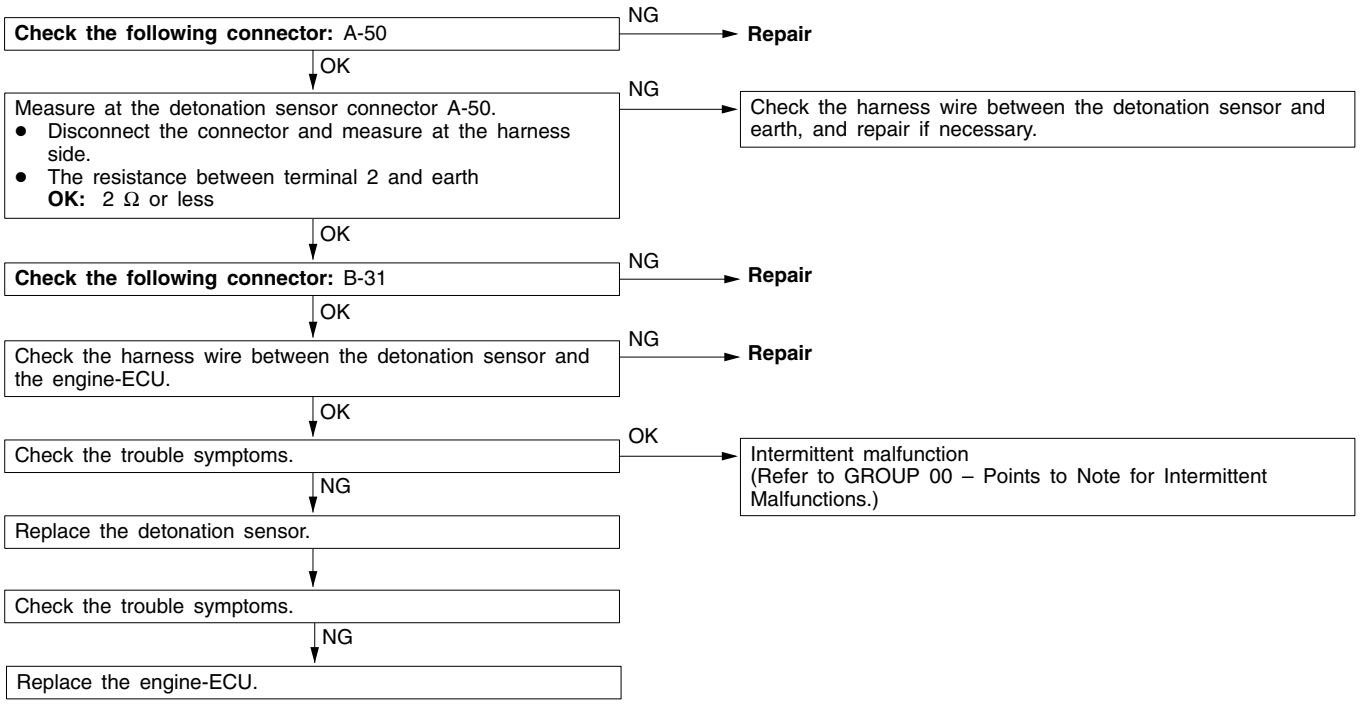
NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

Code No. P0301 No. 1 cylinder misfire detected Code No. P0302 No. 2 cylinder misfire detected Code No. P0303 No. 3 cylinder misfire detected Code No. P0304 No. 4 cylinder misfire detected	Probable cause
Range of Check • The engine speed is 500 – 4,500 r/min. • While the engine is running except deceleration and sudden acceleration. Set Conditions • The number of misfires exceeds a predetermined number per 200 engine revolutions (Misfire has occurred in only one cylinder). or • The number of misfires exceeds a predetermined number per 1,000 engine revolutions (Misfire has occurred in only one cylinder).	• Malfunction of the ignition system • Abnormal compression • Malfunction of injector • Malfunction of engine-ECU

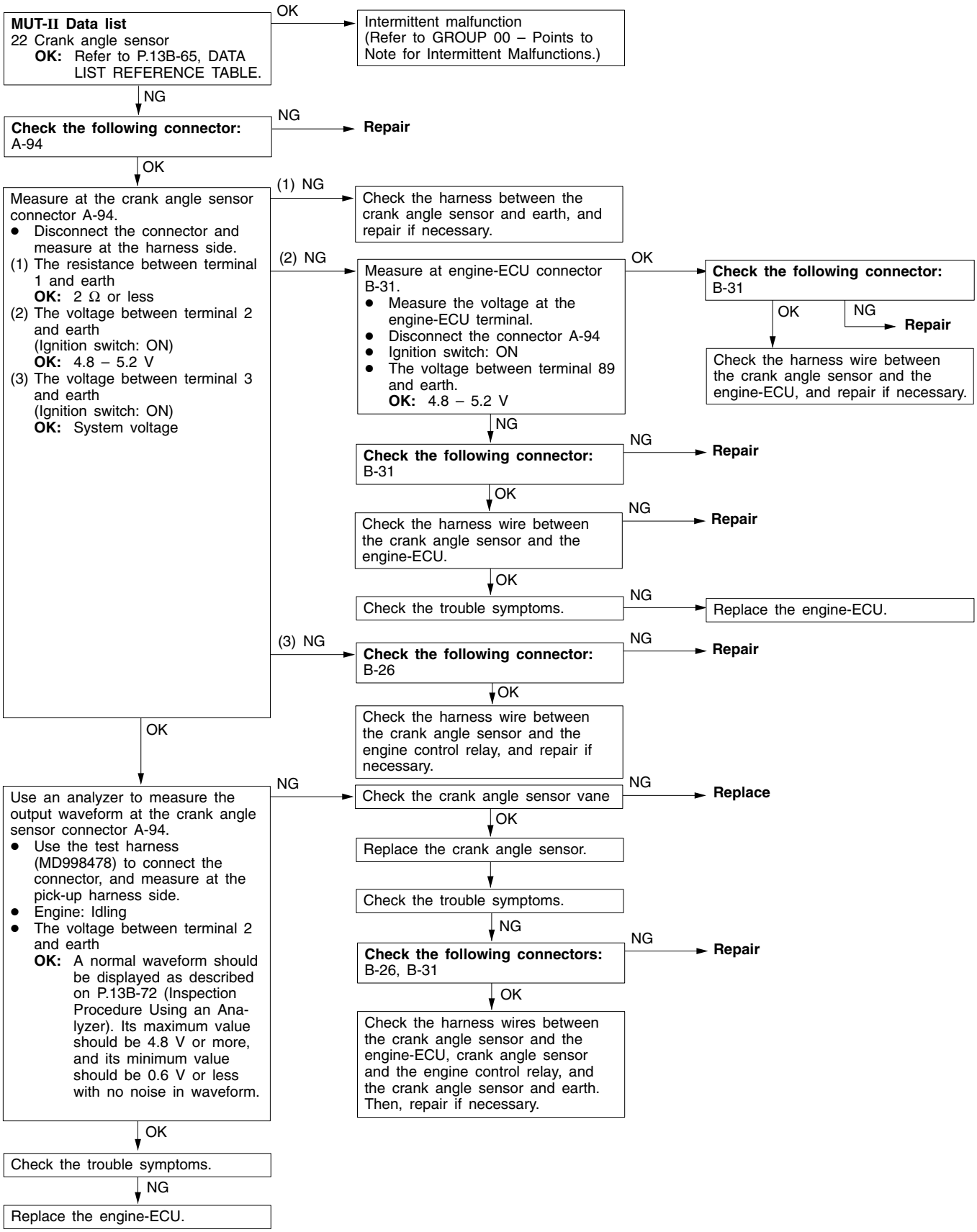


NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

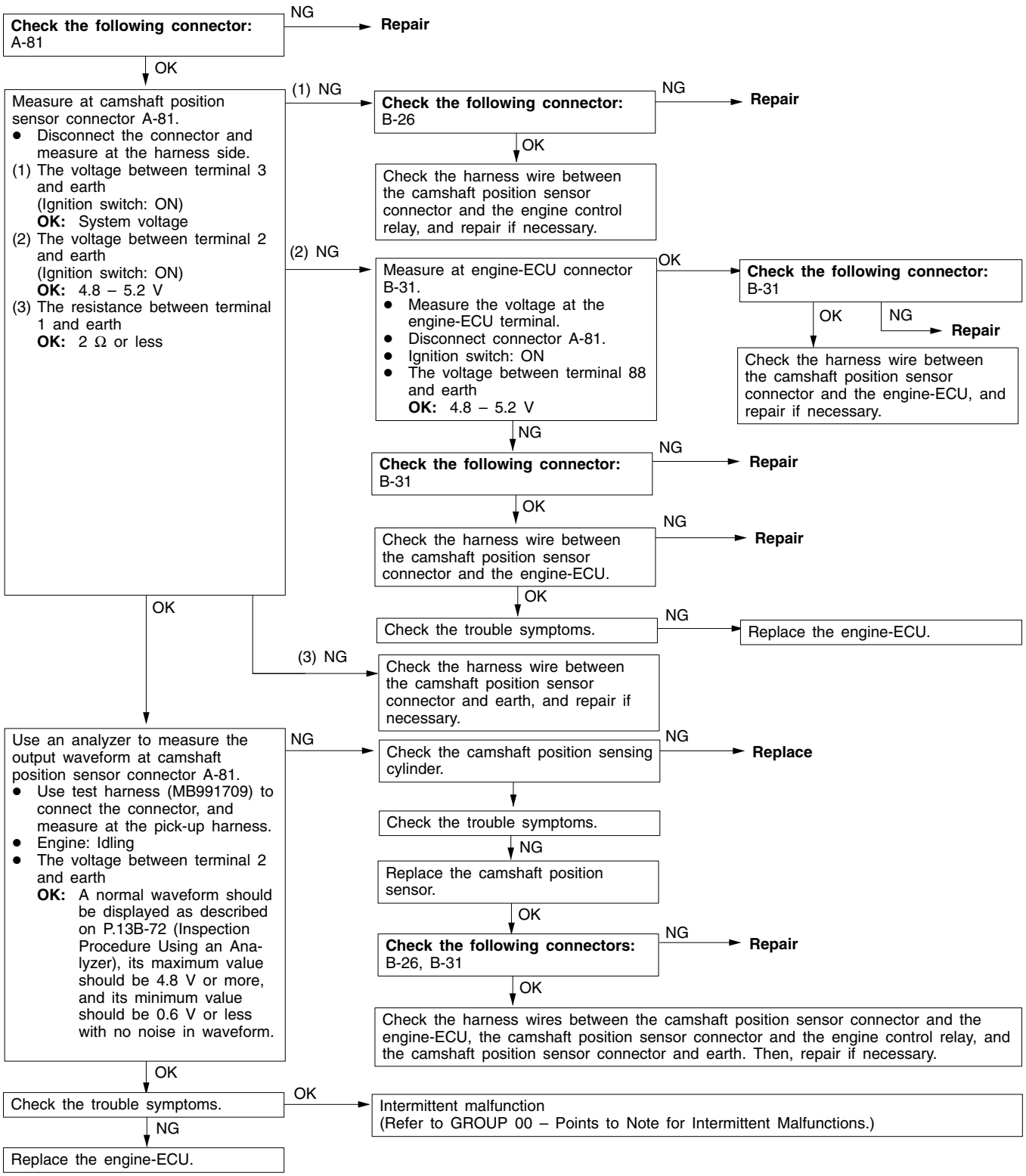
Code No. P0325 Detonation sensor system	Probable cause
Range of Check ● Engine: Two seconds after the engine has been started Set Conditions ● Changes in sensor output voltage (detonation sensor peak voltage per 1/2 crankshaft rotation) in 200 consecutive cycles are 0.06 V or less.	● Malfunction of the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



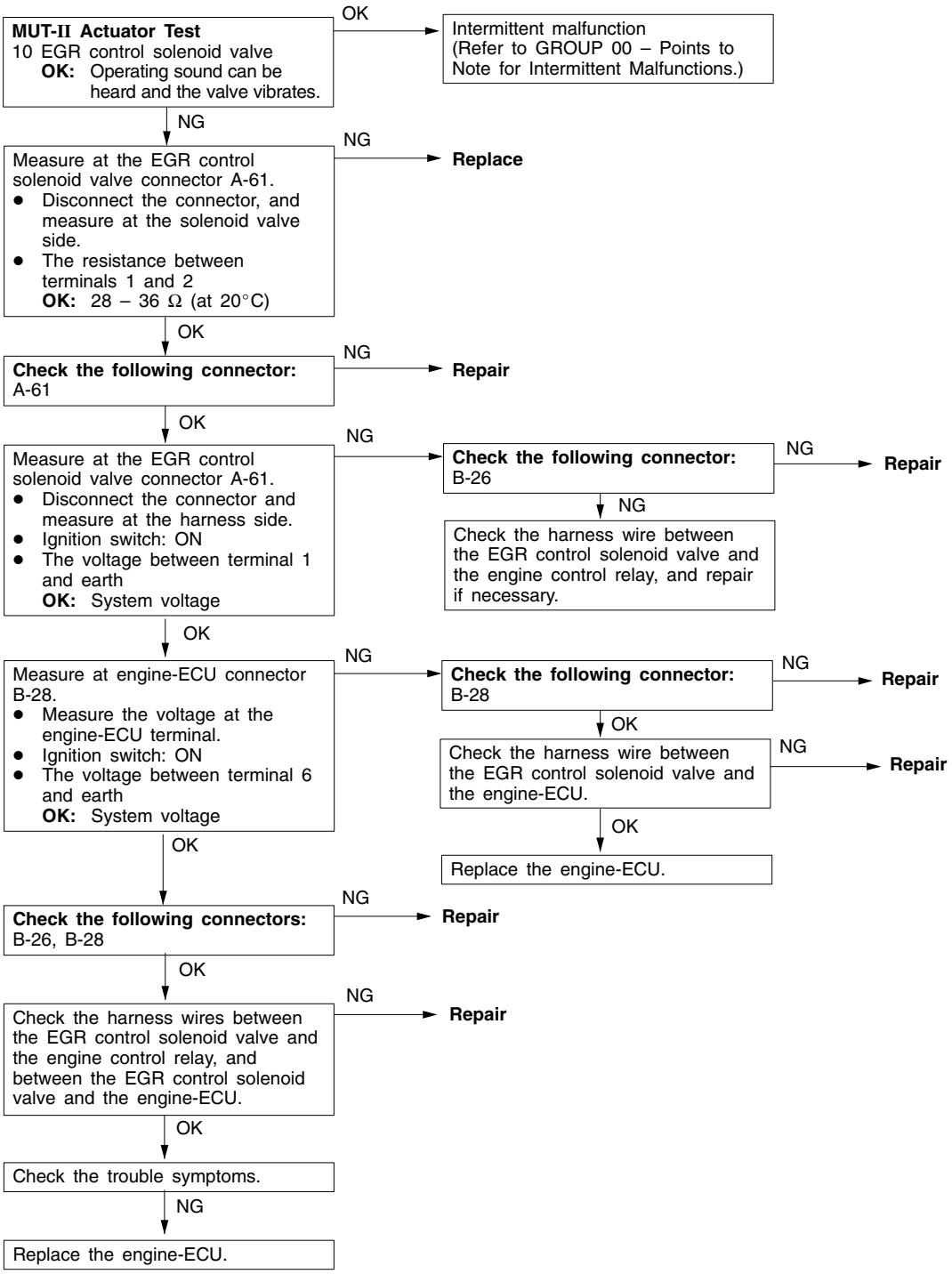
Code No. P0335 Crank angle sensor system	Probable cause
Range of Check ● Engine is cranking Set Conditions ● Sensor output voltage does not change for 2 seconds (no pulse signal input).	● Malfunction of the crank angle sensor. ● Open or short circuit in the crank angle sensor circuit or loose connector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


MUT-II Data list
22 Crank angle sensor
OK: Refer to P.13B-65, DATA LIST REFERENCE TABLE.
OK
Intermittent malfunction (Refer to GROUP 00 – Points to Note for Intermittent Malfunctions.)
NG
Check the following connector: A-94
NG
Repair
OK
Measure at the crank angle sensor connector A-94.
• Disconnect the connector and measure at the harness side.
(1) The resistance between terminal 1 and earth
OK: 2 Ω or less
(2) The voltage between terminal 2 and earth
(Ignition switch: ON)
OK: 4.8 – 5.2 V
(3) The voltage between terminal 3 and earth
(Ignition switch: ON)
OK: System voltage
(1) NG
Check the harness between the crank angle sensor and earth, and repair if necessary.
(2) NG
Measure at engine-ECU connector B-31.
• Measure the voltage at the engine-ECU terminal.
• Disconnect the connector A-94
• Ignition switch: ON
• The voltage between terminal 89 and earth.
OK: 4.8 – 5.2 V
OK
Check the following connector: B-31
OK
NG
Repair
Check the harness wire between the crank angle sensor and the engine-ECU, and repair if necessary.
NG
Check the following connector: B-31
NG
Repair
OK
Check the harness wire between the crank angle sensor and the engine-ECU.
NG
Repair
OK
Check the trouble symptoms.
NG
Replace the engine-ECU.
(3) NG
Check the following connector: B-26
NG
Repair
OK
Check the harness wire between the crank angle sensor and the engine control relay, and repair if necessary.
OK
Use an analyzer to measure the output waveform at the crank angle sensor connector A-94.
• Use the test harness (MD998478) to connect the connector, and measure at the pick-up harness side.
• Engine: Idling
• The voltage between terminal 2 and earth
OK: A normal waveform should be displayed as described on P.13B-72 (Inspection Procedure Using an Analyzer). Its maximum value should be 4.8 V or more, and its minimum value should be 0.6 V or less with no noise in waveform.
NG
Check the crank angle sensor vane
NG
Replace
OK
Replace the crank angle sensor.
Check the trouble symptoms.
NG
Check the following connectors: B-26, B-31
NG
Repair
OK
Check the harness wires between the crank angle sensor and the engine-ECU, crank angle sensor and the engine control relay, and the crank angle sensor and earth. Then, repair if necessary.
OK
Check the trouble symptoms.
NG
Replace the engine-ECU.

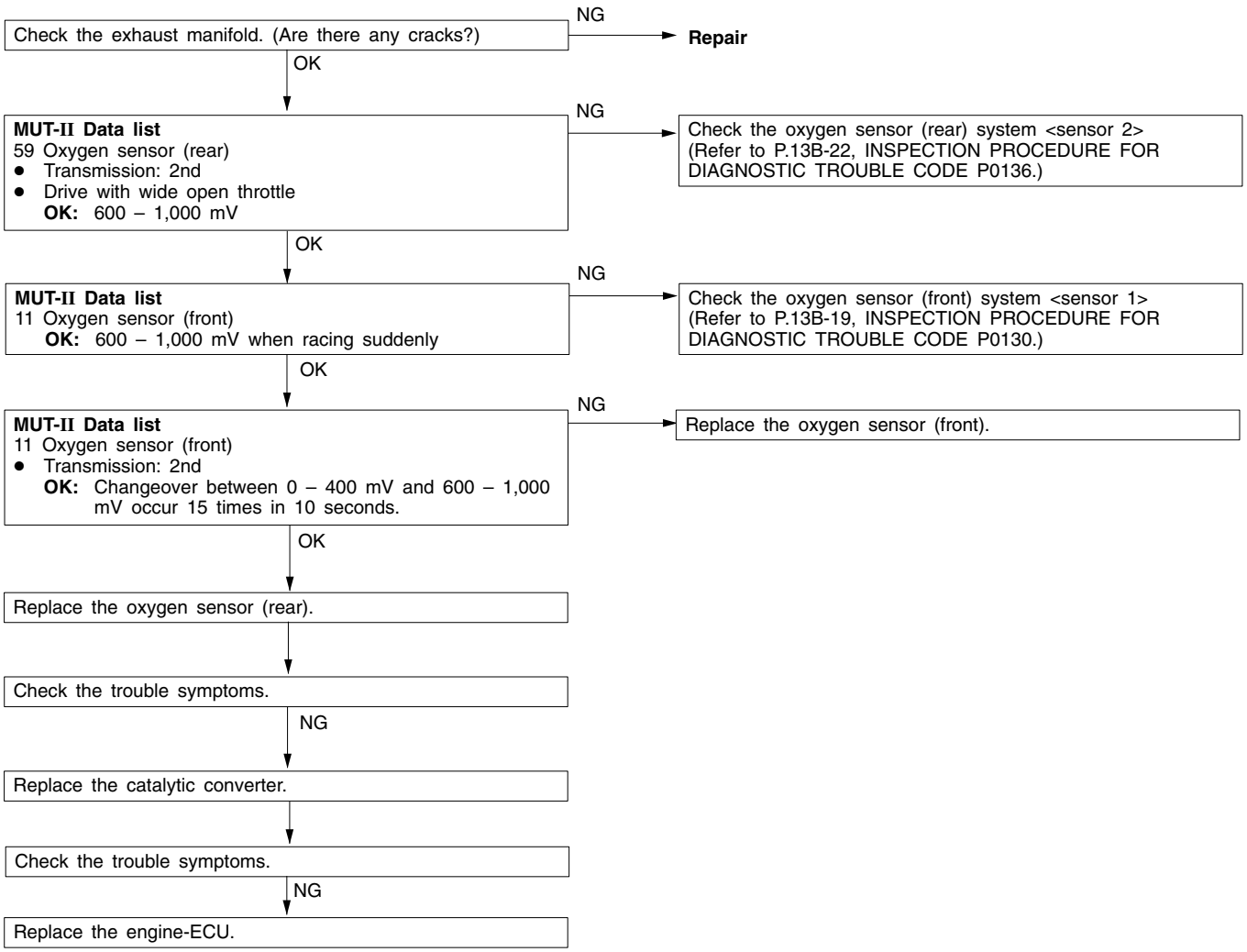
Code No. P0340 Camshaft position sensor system	Probable cause
Range of Check ● After the engine was started Set Conditions ● The sensor output voltage does not change for 2 seconds (no pulse signal input).	● Malfunction of the camshaft position sensor ● Open or short circuit in the camshaft position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



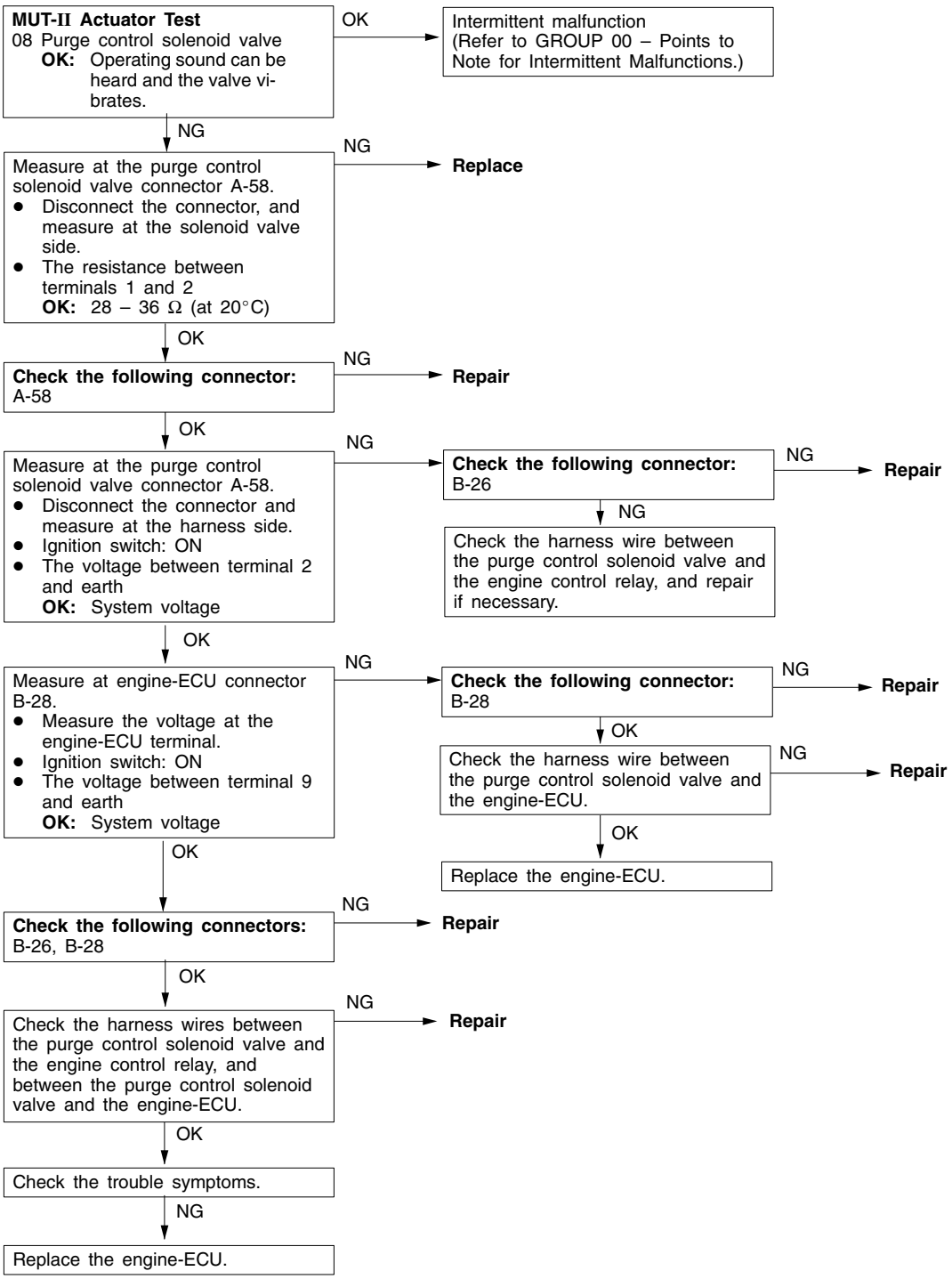
Code No. P0403 EGR control solenoid valve system	Probable cause
Range of Check • Ignition switch: ON • Battery voltage is 10 V or more. Set Conditions • The solenoid coil surge voltage (battery voltage + 2 V) is not detected when the EGR control solenoid valve is turned from on to off.	• Malfunction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



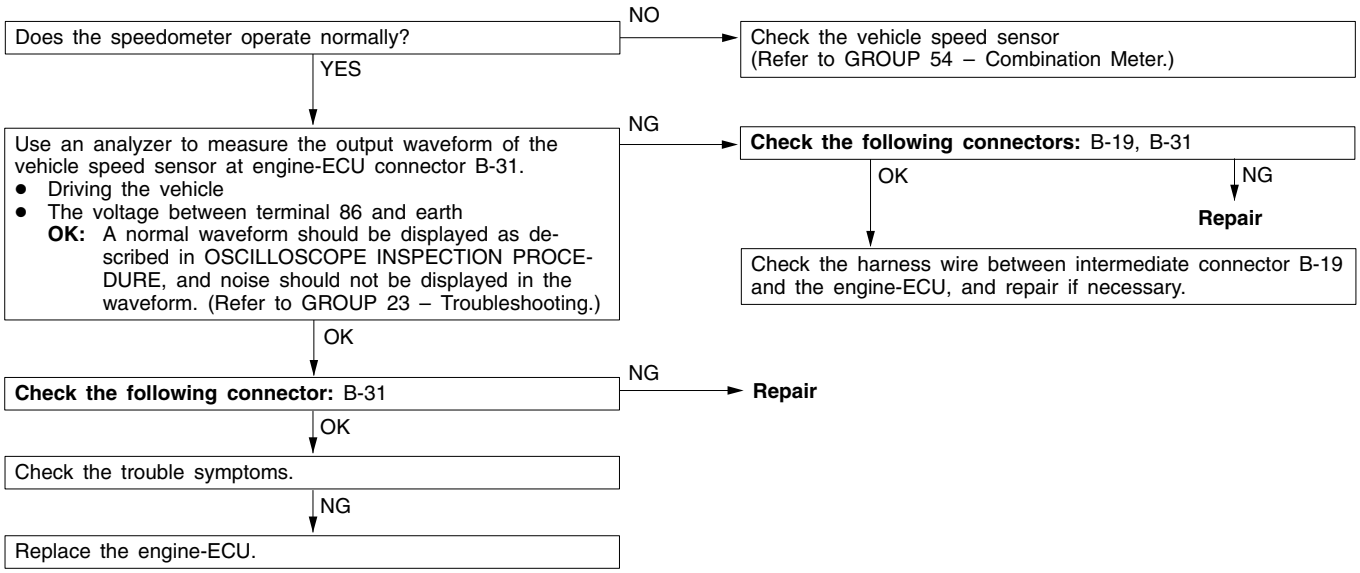
Code No. P0421 Catalyst malfunction	Probable cause
Range of Check • The engine speed is 4,000 r/min or less. • During driving • During air/fuel ratio feedback control Set Conditions • The ratio between the oxygen sensor (rear) and the oxygen sensor (front) output frequencies reaches 0.8 per 10 seconds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



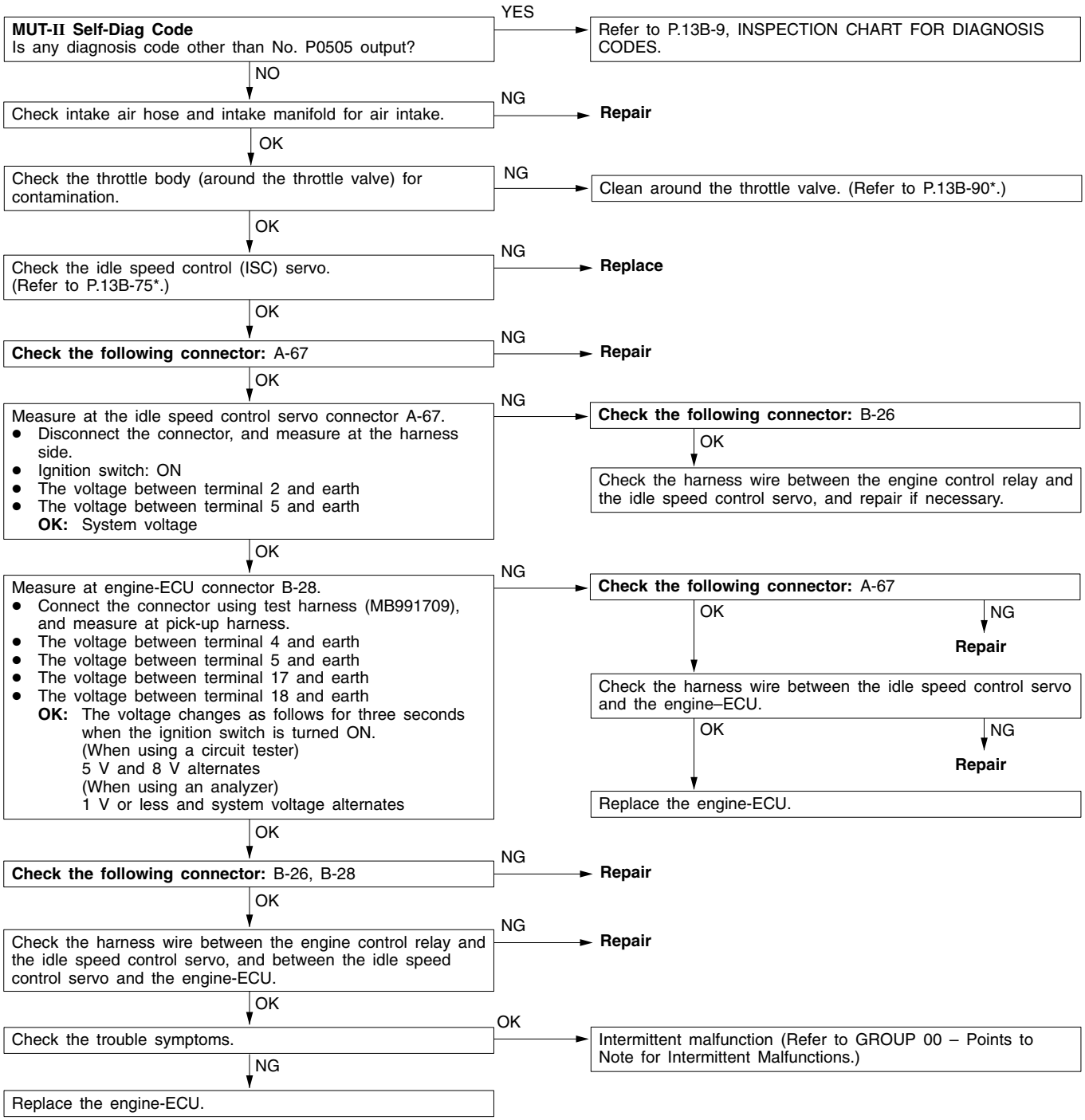
Code No. P0443 Purge control solenoid valve system	Probable cause
Range of Check ● Ignition switch: ON ● Battery voltage is 10 V or more. Set Conditions ● The solenoid coil surge voltage (battery voltage + 2 V) is not detected when the purge control solenoid valve is turned from on to off.	● Malfunction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



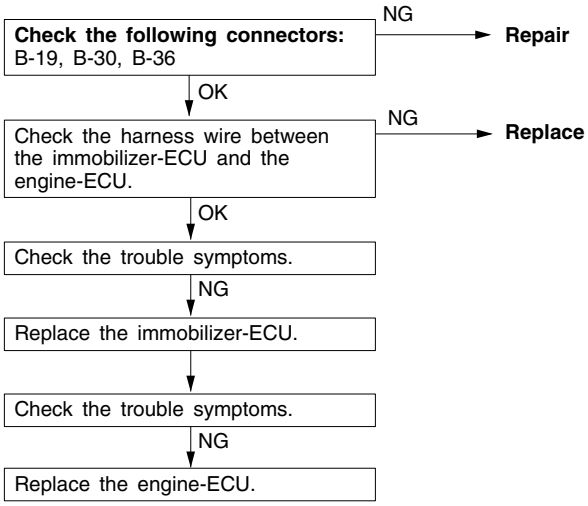
Code No. P0505 Idle speed control (ISC) system	Probable cause
Check Area ● Vehicle speed has reached 1.5 km/h at least once. ● Under the closed loop idle speed control. Judgment Criteria ● Actual idle speed has continued to be higher than the target idle speed by 300 r/min or more for 10 sec. Check Area ● 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 '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

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

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



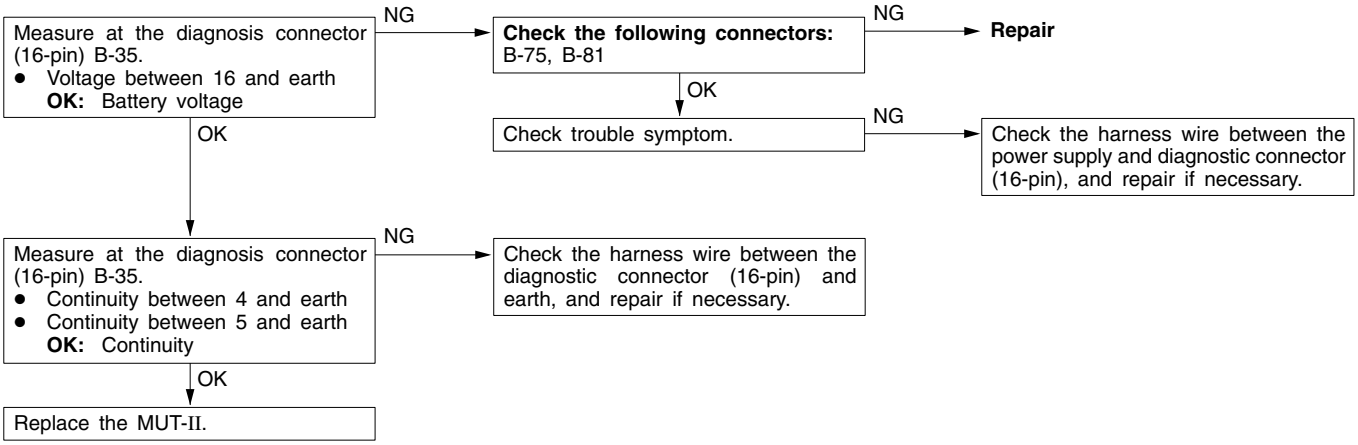
INSPECTION CHART FOR TROUBLE SYMPTOMS

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

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

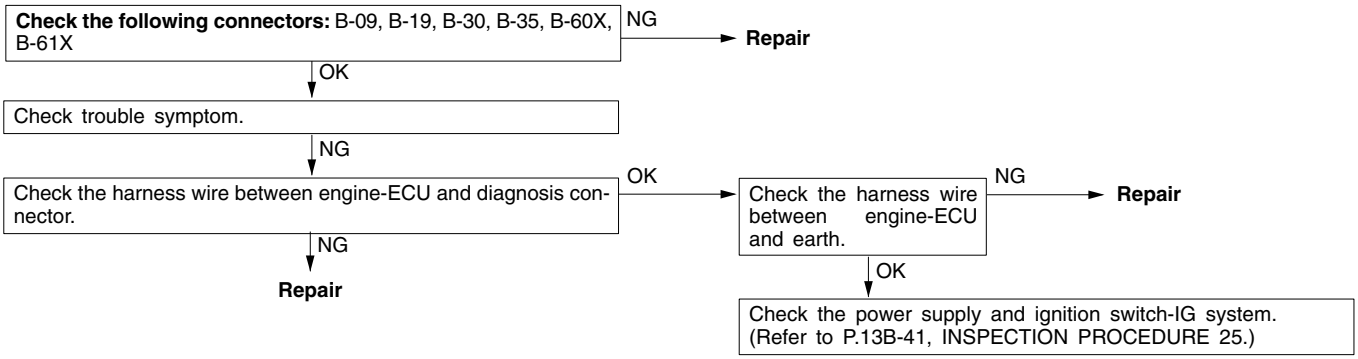
INSPECTION PROCEDURE 1

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

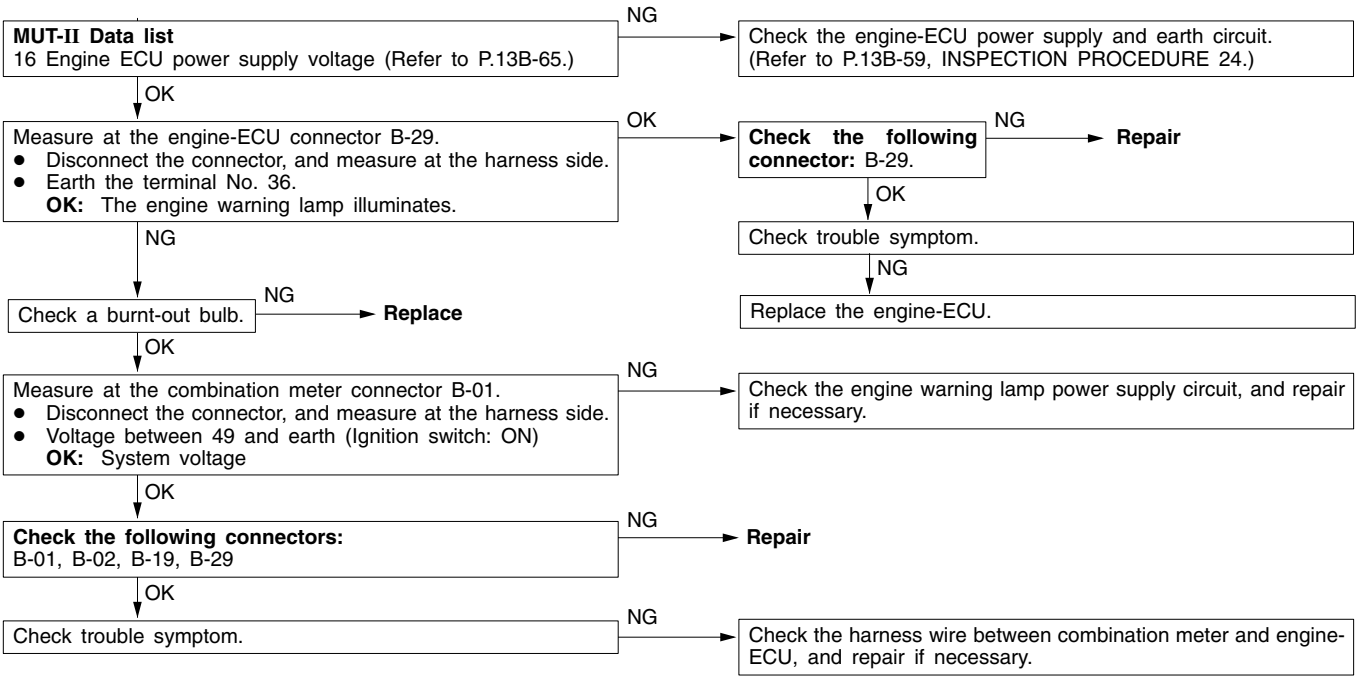
MUT-II communication with engine-ECU is impossible.	Probable cause
One of the following causes may be suspected: • No power supply to engine-ECU. • Defective earth circuit of engine-ECU. • Defective engine-ECU. • Improper communication line between engine-ECU and MUT-II	• Malfunction of engine-ECU power 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.

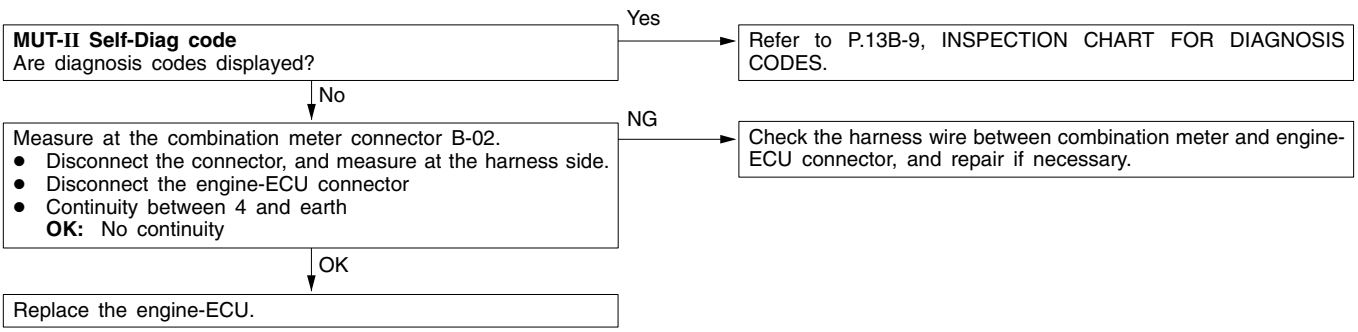
INSPECTION PROCEDURE 3

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

Check battery voltage when cranking.
OK: 8 V or higher
NG → Check the battery. (Refer to GROUP 54 – Battery.)
OK ↓

Is an immobilizer-ECU diagnosis code displayed?
Yes → Check the immobilizer. (Refer to GROUP 54 – Ignition Key and Immobilizer.)
No ↓

MUT-II Data list
16 Voltage of engine-ECU power source (Refer to P.13B-65.)
NG → Check the power supply and ignition switch-IG system. (Refer to P.13B-59, INSPECTION PROCEDURE 25.)
OK ↓

Does the camshaft rotate at the engine cranking? (When oil filler cap is removed.)
No → Check timing belt for breakage.
Yes ↓

MUT-II Self-Diag code
Are diagnosis codes displayed?
Yes → Refer to P.13B-9, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

MUT-II Data list
22 Crank angle sensor
OK: Cranking speed is displayed.
No → Check the crank angle sensor system. (Refer to P.13B-25, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0335.)
OK ↓

MUT-II Actuator test
07 Fuel pump (Refer to P.13B-70.)
NG → Check the fuel pump system. (Refer to P.13B-60, INSPECTION PROCEDURE 26.)
OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13B-65.)
NG → Check the engine coolant temperature sensor system. (Refer to P.13B-13, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0115.)
OK ↓

Can any sound be heard from the injectors when cranking?
NG → Check the injector system. (Refer to P.13B-26, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0201, P0202, P0203, P0204.)
OK ↓

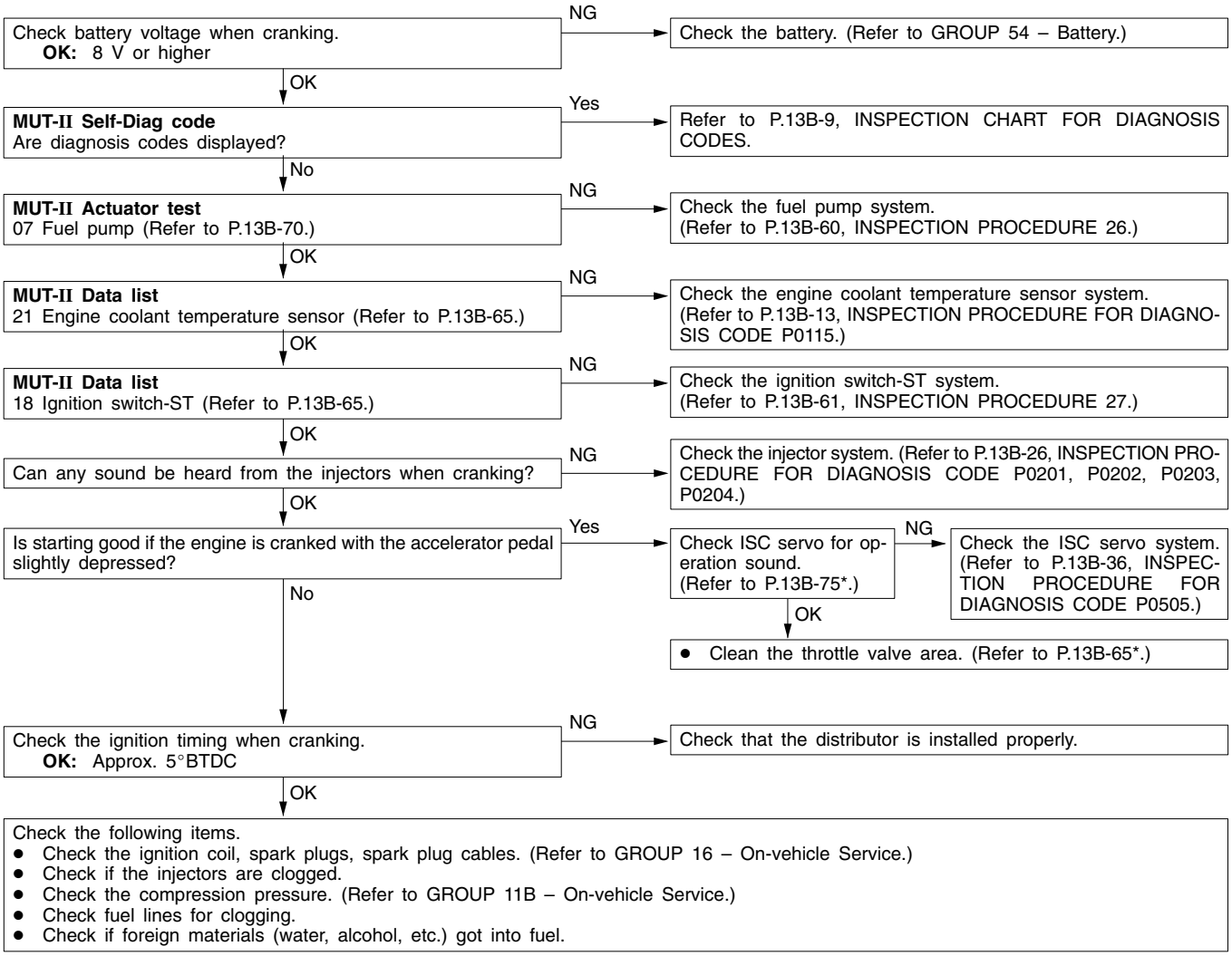
Does the engine tachometer display the cranking speed?
• Set the tachometer of primary voltage detection type.
NG → Check the ignition circuit system. (Refer to P.13B-63, INSPECTION PROCEDURE 31.)
OK ↓

Check the ignition timing when cranking.
OK: Approx. 5° BTDC
NG → Check that the distributor is installed properly.
OK ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle service.)
- Check if the injectors are clogged.
- Check if foreign materials (water, alcohol, etc.) got into fuel.
- Check the compression pressure.
- Check the immobilizer system. (Refer to GROUP 54 – Ignition Key and Immobilizer.)

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 '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

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

Check battery voltage when cranking
OK: 8 V or higher
NG → Check the battery. (Refer to GROUP 54 – Battery.)
OK ↓

MUT-II Self-Diag code
Are diagnosis codes displayed?
Yes → Refer to P.13B-9, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

MUT-II Actuator test
07 Fuel pump (Refer to P.13B-70.)
NG → Check the fuel pump system. (Refer to P.13B-60, INSPECTION PROCEDURE 26.)
OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13B-65.)
NG → Check the engine coolant temperature sensor system. (Refer to P.13B-13, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0115.)
OK ↓

MUT-II Data list
18 Ignition switch-ST (Refer to P.13B-65.)
NG → Check the ignition switch-ST system. (Refer to P.13B-61, INSPECTION PROCEDURE 27.)
OK ↓

Can any sound be heard from the injectors when cranking?
NG → Check the injector system. (Refer to P.13B-26, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0201, P0202, P0203, P0204.)
OK ↓

Check the ignition timing when cranking.
OK: Approx. 5°BTDC
NG → Check that the distributor is installed properly.
OK ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle Service.)
- Check if the injectors are clogged.
- Check the compression pressure. (Refer to GROUP 11B – On-vehicle Service.)
- Check if foreign materials (water, alcohol, etc.) got into fuel.

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.
- No ↓

MUT-II Self-Diag code
Are diagnosis codes displayed?
- Yes → Refer to P.13B-9, INSPECTION CHART FOR DIAGNOSIS CODES.
- No ↓

Does idling speed fluctuate excessively?
- Yes → Check the throttle body. (Refer to P.13B-65*.)
  - Check trouble symptom.
    - NG → Inspect the intake of air into the air intake system.
      - Broken intake manifold gasket
      - Broken air intake hose
      - Broken vacuum hose
      - Positive crankcase ventilation valve does not operate.
- No ↓

Check the ISC servo for operation sound. (Refer to P.13B-75*.)
- NG → Check the ISC system. (Refer to P.13B-36, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0505.)
- OK ↓

Check the injector for operation sound.
- NG → Check the injector system. (Refer to P.13B-26, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0201, P0202, P0203, P0204.)
- OK ↓

MUT-II Data list
14 Throttle position sensor (Refer to P.13B-65.)
- NG → Check the throttle position sensor system. (Refer to P.13B-16, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0120.)
- OK ↓

MUT-II Data list
13 Intake air temperature sensor (Refer to P.13B-65.)
- NG → Check the intake air temperature sensor system. (Refer to P.13B-12, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0110.)
- OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13B-65.)
- NG → Check the engine coolant temperature sensor system. (Refer to P.13B-13, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0115.)
- OK ↓

MUT-II Actuator test
08 Purge control solenoid valve (Refer to P.13B-70.)
- NG → Check the purge control solenoid valve system. (Refer to P.13B-34, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0443.)
- OK ↓

MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13B-70.)
- NG → Check the EGR control solenoid valve system. (Refer to P.13B-32, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0403.)
- OK ↓

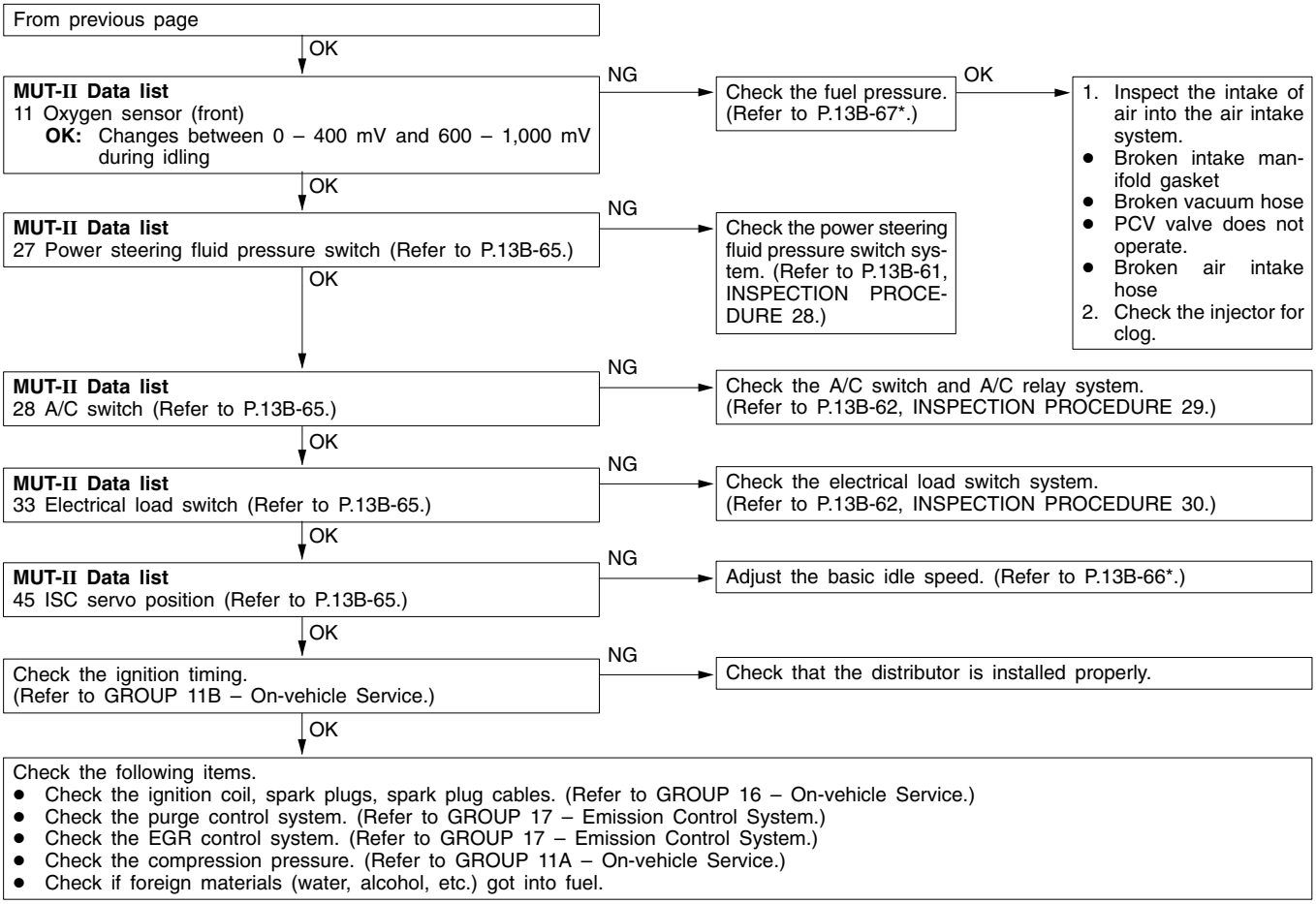
MUT-II Data list
59 Oxygen sensor (rear)
- Transmission: 2nd gear
- Driving with throttle widely open

OK: 600 – 1,000 mV
- NG → Check the oxygen sensor (rear) system. (Refer to P.13B-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.13B-19, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0130.)
- OK → To next page

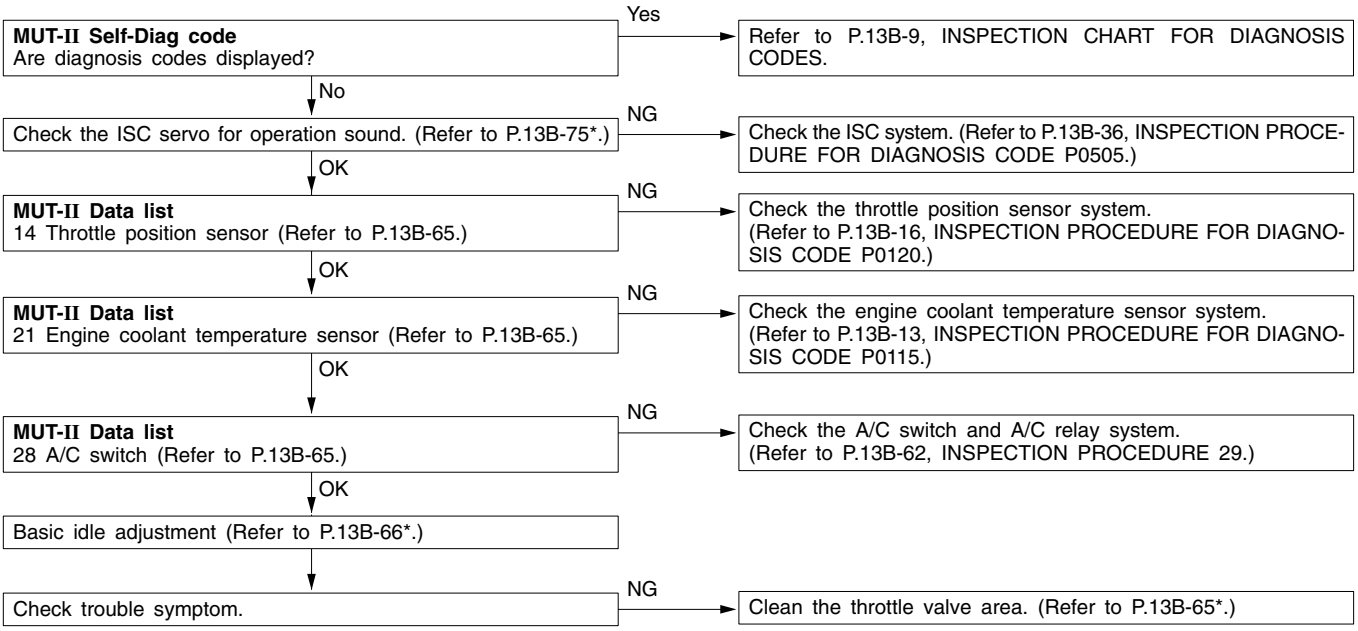
NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)



NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

INSPECTION PROCEDURE 9

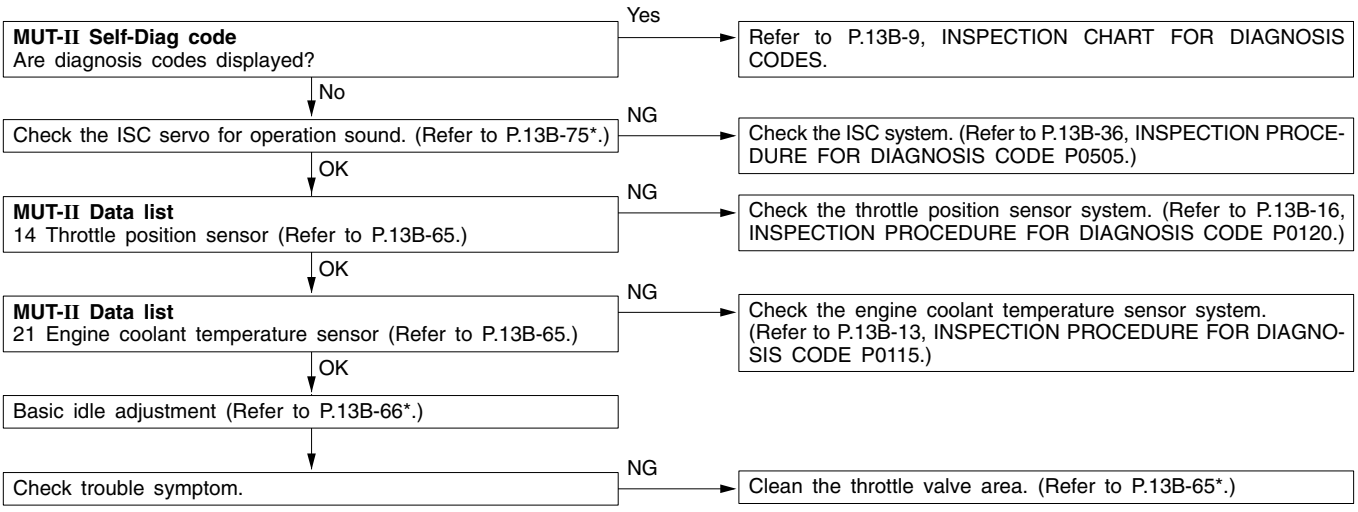
Idling speed is high. (Improper idling speed)	Probable cause
In such cases as the above, the cause is probably that the intake air volume during idling is too great.	• Malfunction of the ISC system • Malfunction of the throttle body



NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

INSPECTION PROCEDURE 10

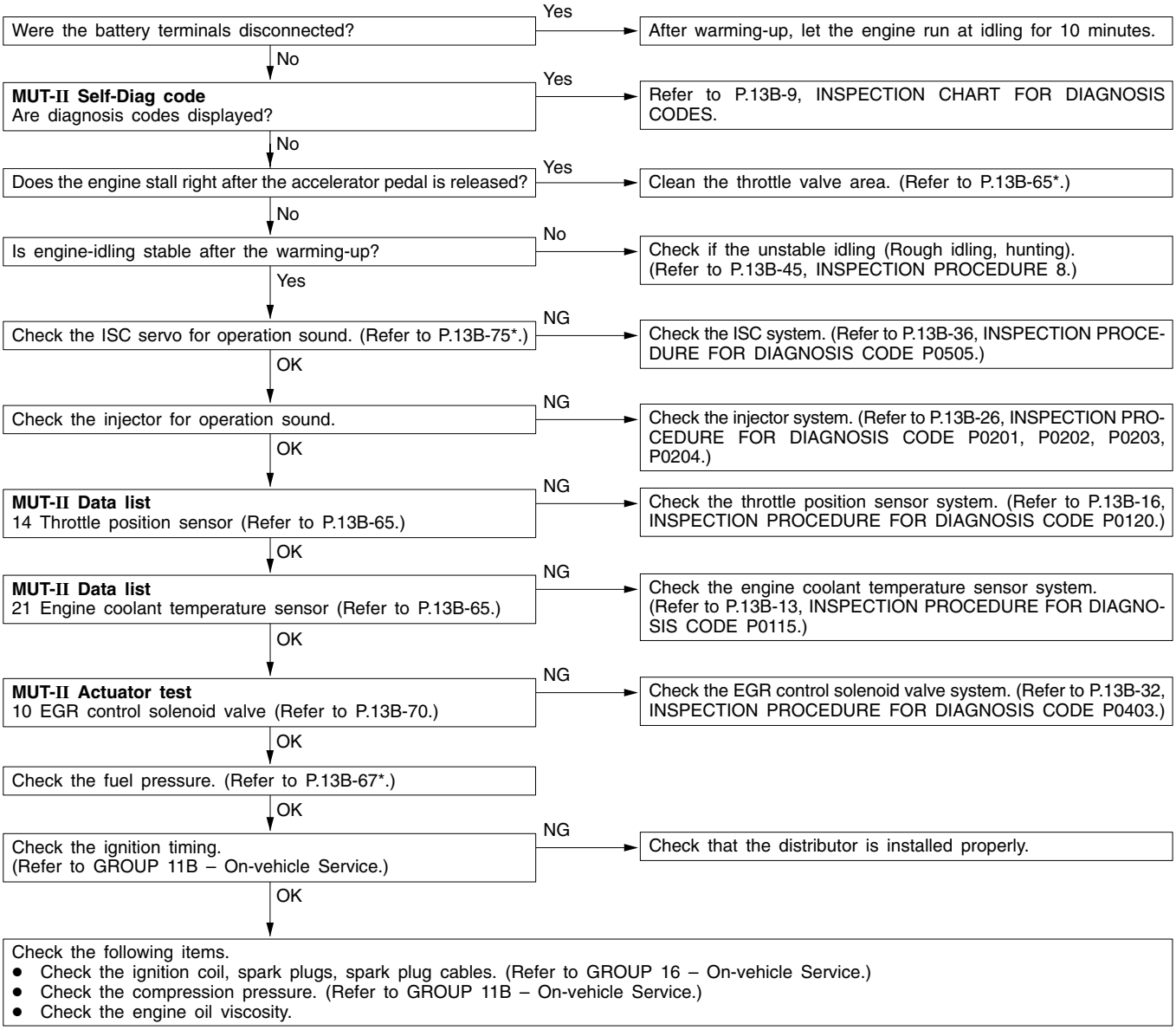
Idling speed is low. (Improper idling speed)	Probable cause
In cases such as the above, the cause is probably that the intake air volume during idling is too small.	• Malfunction of the ISC system • Malfunction of the throttle body



NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

INSPECTION PROCEDURE 11

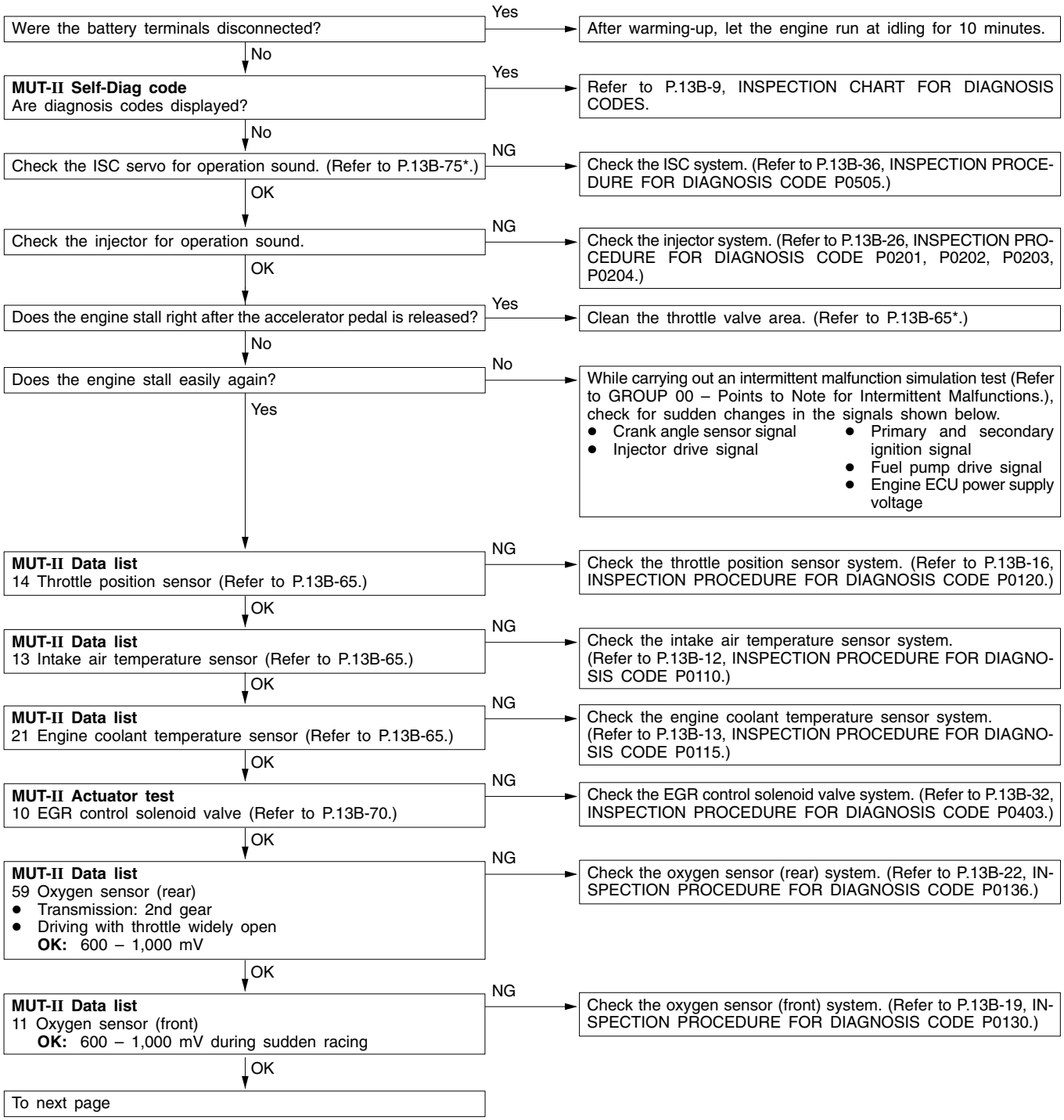
When the engine is cold, it stalls at idling. (Die out)	Probable cause
In such cases as the above, the cause is probably that the air/fuel mixture is inappropriate when the engine is cold, or that the intake air volume is insufficient.	• Malfunction of the ISC system • Malfunction of the throttle body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

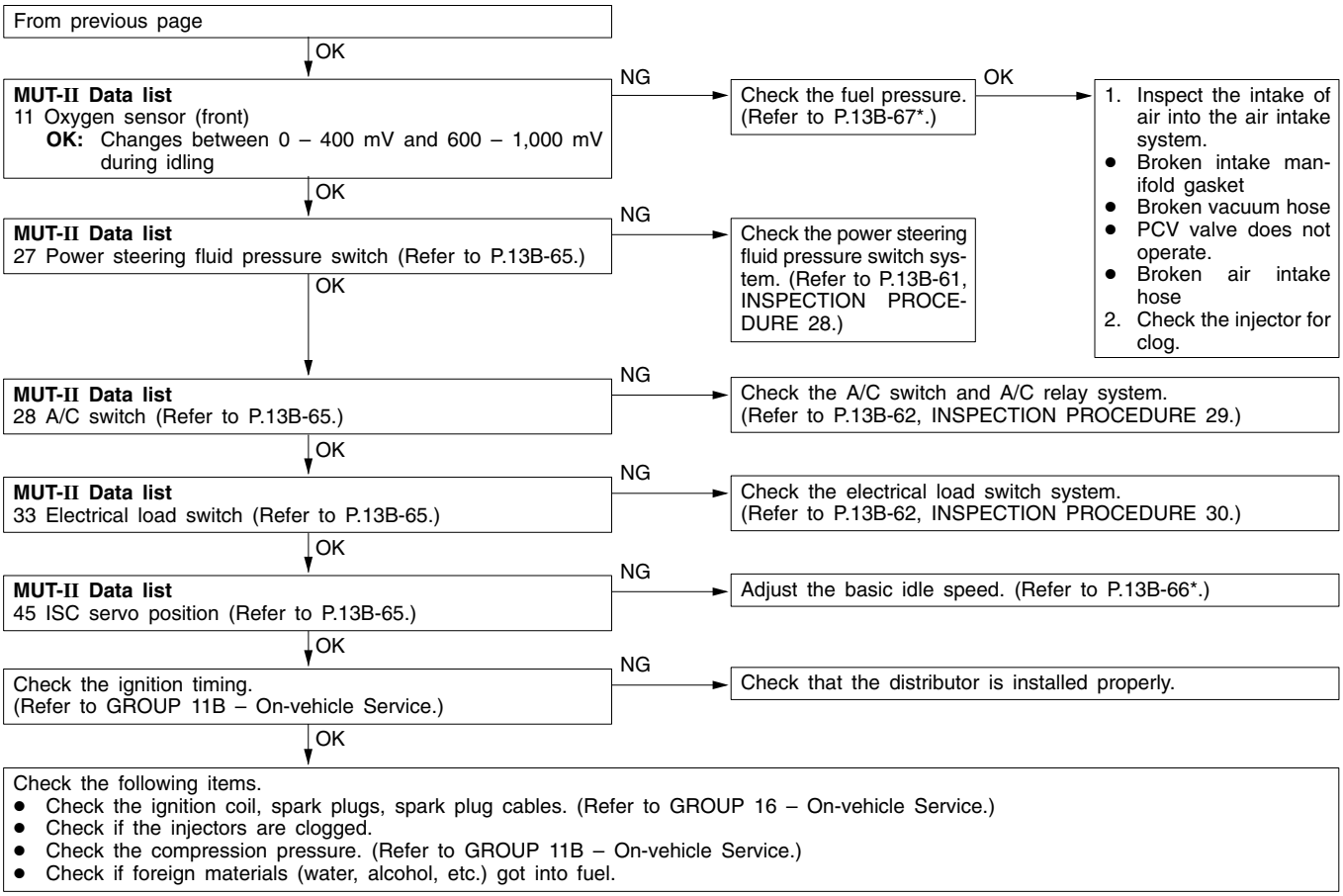


NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

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 '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

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

MUT-II Self-Diag code
Are diagnosis codes displayed?
Yes → Refer to P.13B-9, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13B-70.)
NG → Check the EGR control solenoid valve system. (Refer to P.13B-32, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0403.)
OK ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle Service.)
- Check if air was drawn into the intake system.
  - Broken intake manifold gasket
  - Broken or disconnected vacuum hose
  - Improper operation of the PCV valve
  - Broken air intake hose

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

Were the battery terminals disconnected?
Yes → After warming-up, let the engine run at idling for 10 minutes.
No ↓

MUT-II Self-Diag code
Are diagnosis codes displayed?
Yes → Refer to P.13B-9, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

MUT-II Data list
14 Throttle position sensor (Refer to P.13B-65.)
NG → Check the throttle position sensor system. (Refer to P.13B-16, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0120.)
OK ↓

MUT-II Data list
45 ISC servo position
- Is the idle speed control (ISC) servo position drops to 0–2 steps when decelerating (engine r/min less than 1,000)?

Yes → Check the vehicle speed sensor system. (Refer to P.13B-35, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0500.)
No ↓

MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13B-70.)
NG → Check the EGR control solenoid valve system. (Refer to P.13B-32, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0403.)
OK ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle Service.)
- Clean the throttle valve area.

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

MUT-II Self-Diag code
Are diagnosis codes displayed?
Yes → Refer to P.13B-9, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

Check the injectors for operation sound.
NG → Check the injector system. (Refer to P.13B-26, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0201, P0202, P0203, P0204.)
OK ↓

Check the ignition timing.
(Refer to GROUP 11B – On-vehicle Service.)
NG → Check that the distributor is installed properly.
OK ↓

MUT-II Data list
13 Intake air temperature sensor (Refer to P.13B-65.)
NG → Check the intake air temperature sensor system. (Refer to P.13B-12, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0110.)
OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13B-65.)
NG → Check the engine coolant temperature sensor system. (Refer to P.13B-13, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0115.)
OK ↓

MUT-II Data list
14 Throttle position sensor (Refer to P.13B-65.)
NG → Check the throttle position sensor system. (Refer to P.13B-16, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0120.)
OK ↓

MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13B-70.)
NG → Check the EGR control solenoid valve system. (Refer to P.13B-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.13B-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.13B-19, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0130.)
OK ↓

MUT-II Data list
11 Oxygen sensor (front)
OK: Changes between 0 – 400 mV and 600 – 1,000 mV during idling
NG → Check the fuel pressure. (Refer to P.13B-67*.)
OK → 1. Inspect the intake of air into the air intake system.
- Broken intake manifold gasket
- Broken vacuum hose
- PCV valve does not operate.
- Broken air intake hose

2. Check the injector for clog.

OK ↓

Check the fuel pressure. (Refer to P.13B-67*.)
OK ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle Service.)
- Check the EGR control system. (Refer to GROUP 17 – Emission Control System.)
- Check the compression pressure. (Refer to GROUP 11B – On-vehicle Service.)
- Check the fuel filter or fuel line for clogging.

NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

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

MUT-II Self-Diag code
Are diagnosis codes displayed?
Yes → Refer to P.13B-9, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle Service.)
- Check for occurrence of ignition leak.

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

MUT-II Self-Diag code
Are diagnosis codes displayed?
Yes → Refer to P.13B-9, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

Check the ISC servo for operation sound. (Refer to P.13B-75*.)
NG → Check the ISC system. (Refer to P.13B-36, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0505.)
OK ↓

MUT-II Data list
14 Throttle position sensor (Refer to P.13B-65.)
NG → Check the throttle position sensor system. (Refer to P.13B-16, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0120.)
OK ↓

Clean the throttle valve area. (Refer to P.13B-65*.)

NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

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

MUT-II Self-Diag code
Are diagnosis codes displayed?
Yes → Refer to P.13B-9, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

Check the injectors for operation sound.
NG → Check the injector system. (Refer to P.13B-26, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0201, P0202, P0203, P0204.)
OK ↓

Check the ignition timing.
(Refer to GROUP 11B – On-vehicle Service.)
NG → Check that the distributor is installed properly.
OK ↓

MUT-II Data list
13 Intake air temperature sensor (Refer to P.13B-65.)
NG → Check the intake air temperature sensor system. (Refer to P.13B-12, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0110.)
OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13B-65.)
NG → Check the engine coolant temperature sensor system. (Refer to P.13B-13, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0115.)
OK ↓

MUT-II Data list
14 Throttle position sensor (Refer to P.13B-65.)
NG → Check the throttle position sensor system. (Refer to P.13B-16, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0120.)
OK ↓

MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13B-70.)
NG → Check the EGR control solenoid valve system. (Refer to P.13B-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.13B-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.13B-19, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0130.)
OK ↓

MUT-II Data list
11 Oxygen sensor (front)
OK: Changes between 0 – 400 mV and 600 – 1,000 mV during idling
NG → Check the fuel pressure. (Refer to P.13B-67*.)
OK → 1. Inspect the intake of air into the air intake system.
- Broken intake manifold gasket
- Broken vacuum hose
- PCV valve does not operate.
- Broken air intake hose

2. Check the injector for clog.

OK ↓

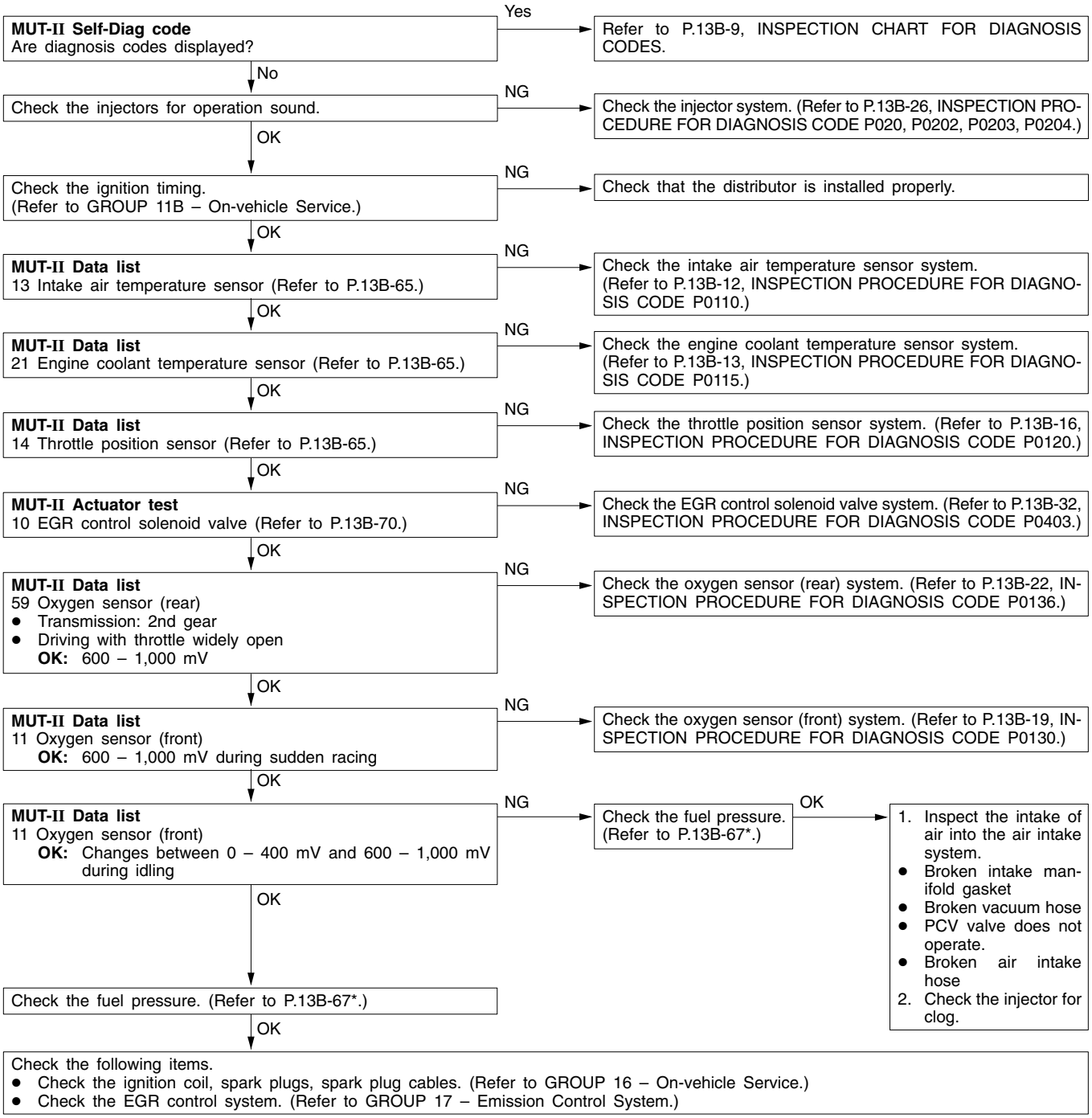
Check the fuel pressure. (Refer to P.13B-67*.)
OK ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle Service.)
- Check the compression pressure. (Refer to GROUP 11B – On-vehicle Service.)
- Check the fuel filter or fuel line for clogging.
- Broken air intake hose
- Clogged air cleaner

NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

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 '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

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

MUT-II Self-Diag code
Are diagnosis codes displayed?
Yes → Refer to P.13B-9, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

Does knocking occur when driving with the detonation sensor connector disconnected? At this time, use the MUT-II to check if the timing is retarded compared to when the detonation sensor connector is disconnected.
No → Check the detonation sensor system. (Refer to P.13B-29, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0325.)
Yes ↓

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

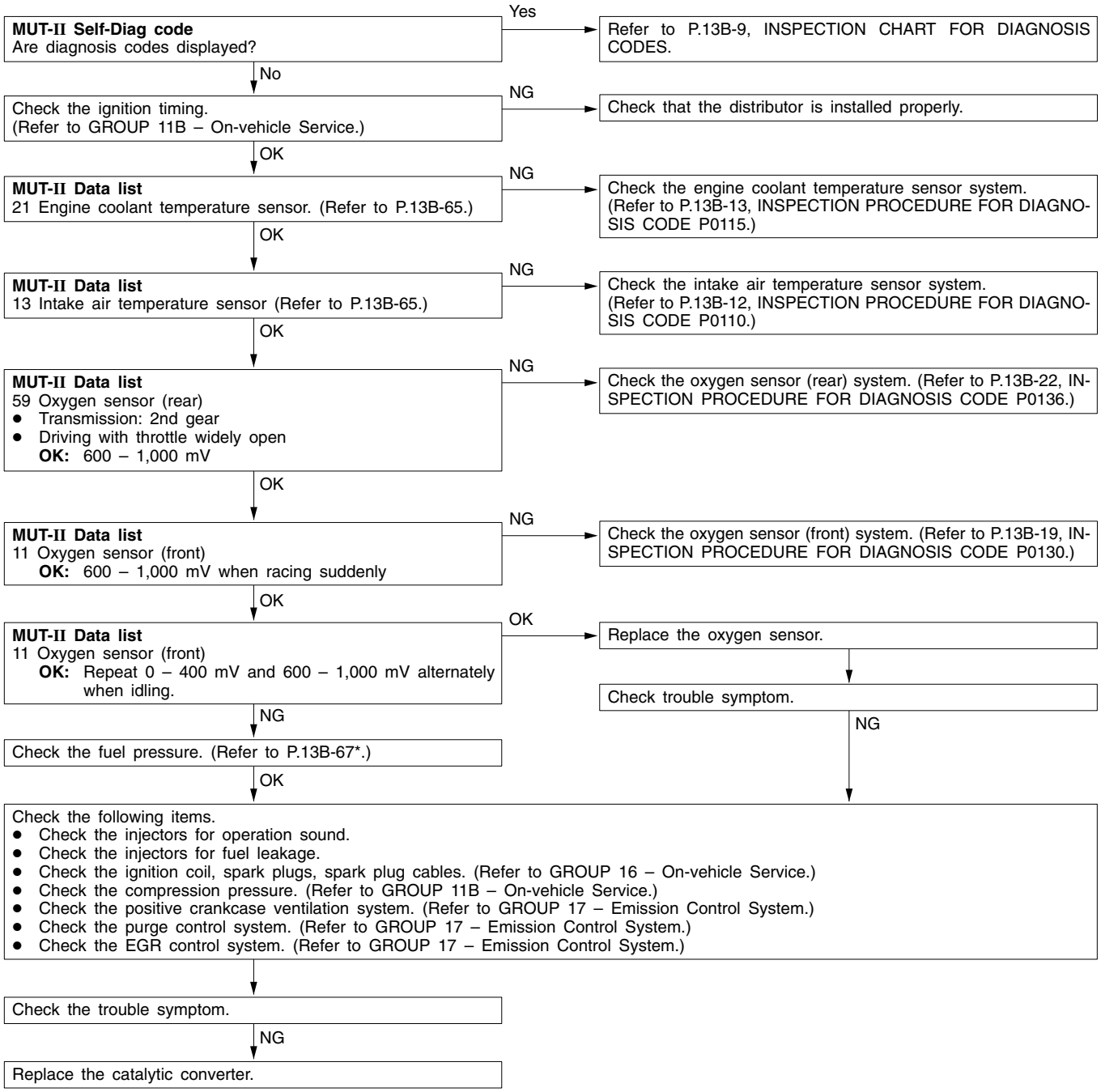
INSPECTION PROCEDURE 21

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

Check the injectors for fuel leakage.

INSPECTION PROCEDURE 22

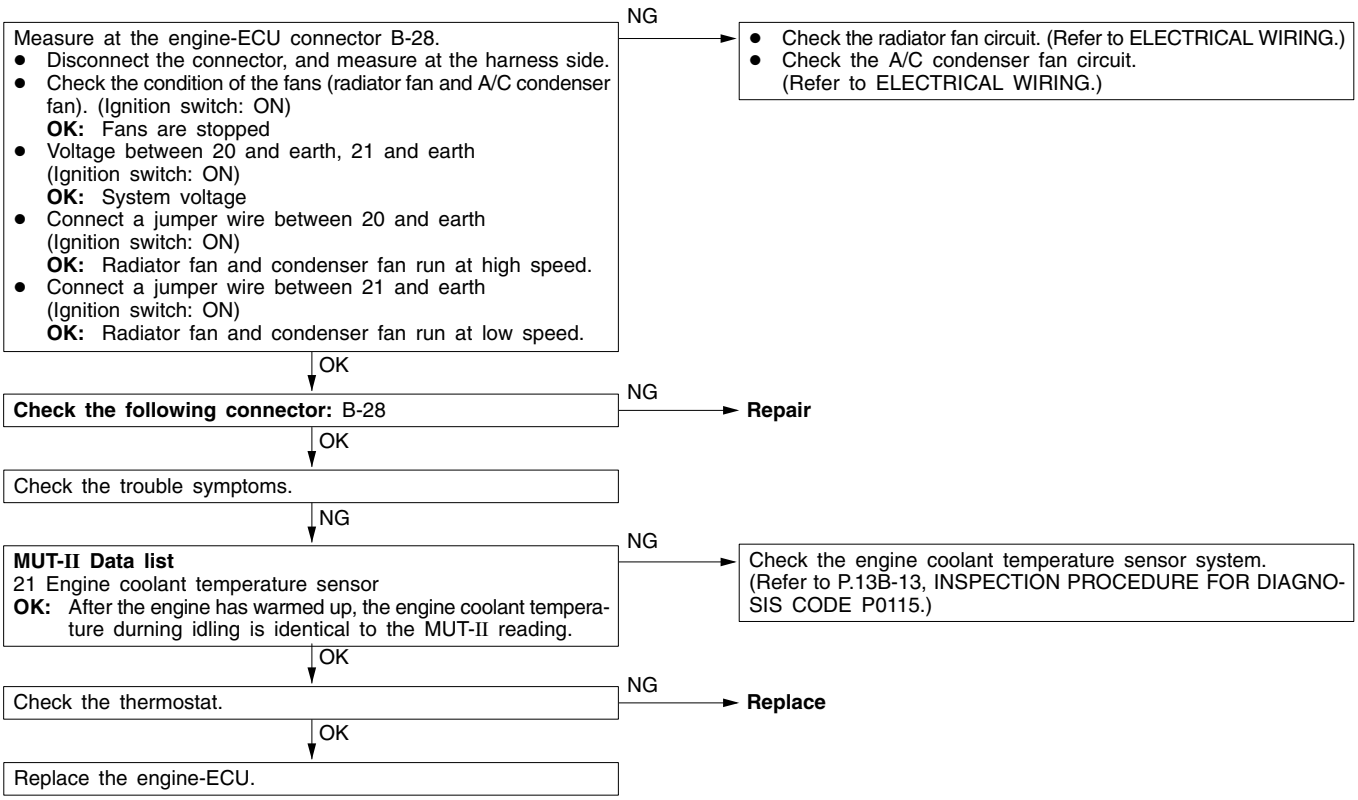
Too high CO and HC concentration when idling	Probable cause
Abnormal air-fuel ratio is suspected.	• Malfunction of the air-fuel ratio control system • Deteriorated catalyst



NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

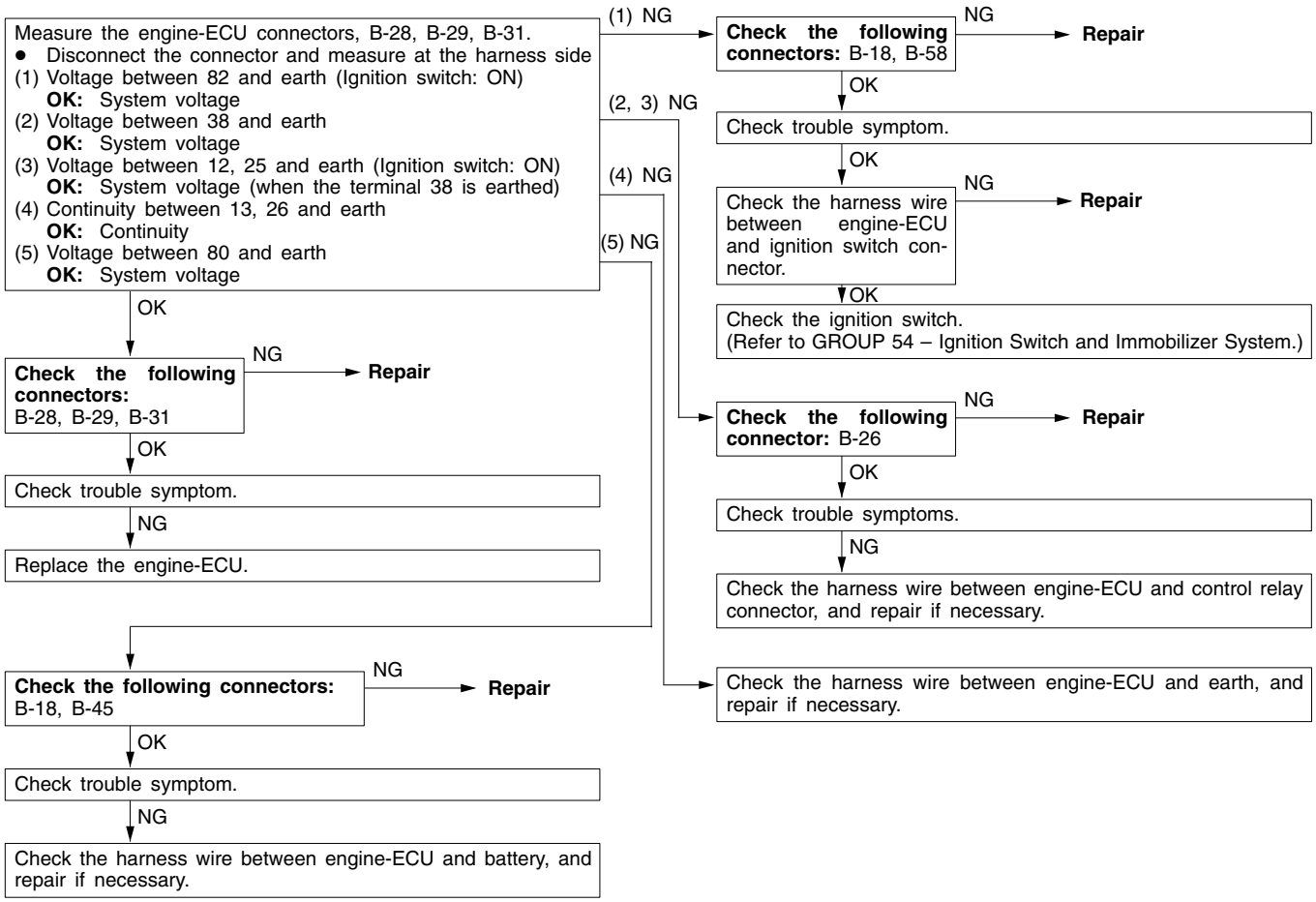
INSPECTION PROCEDURE 23

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



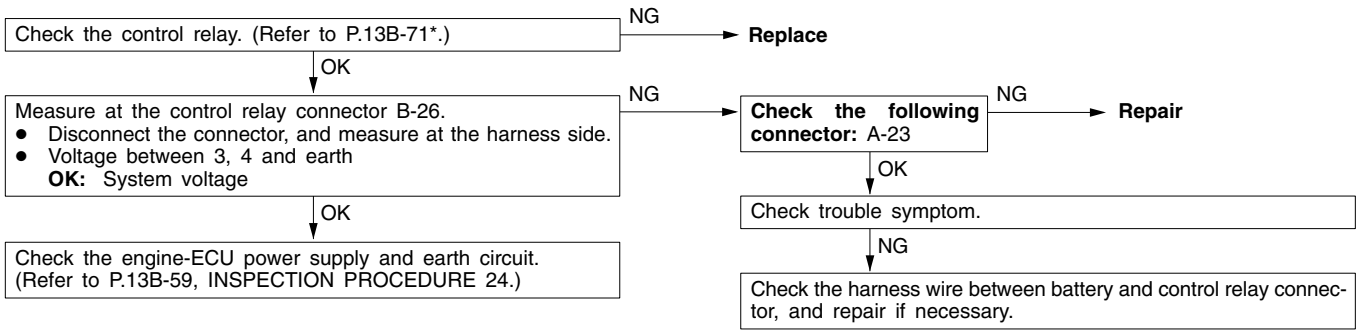
INSPECTION PROCEDURE 24

Check the engine-ECU power supply and earth circuit.



INSPECTION PROCEDURE 25

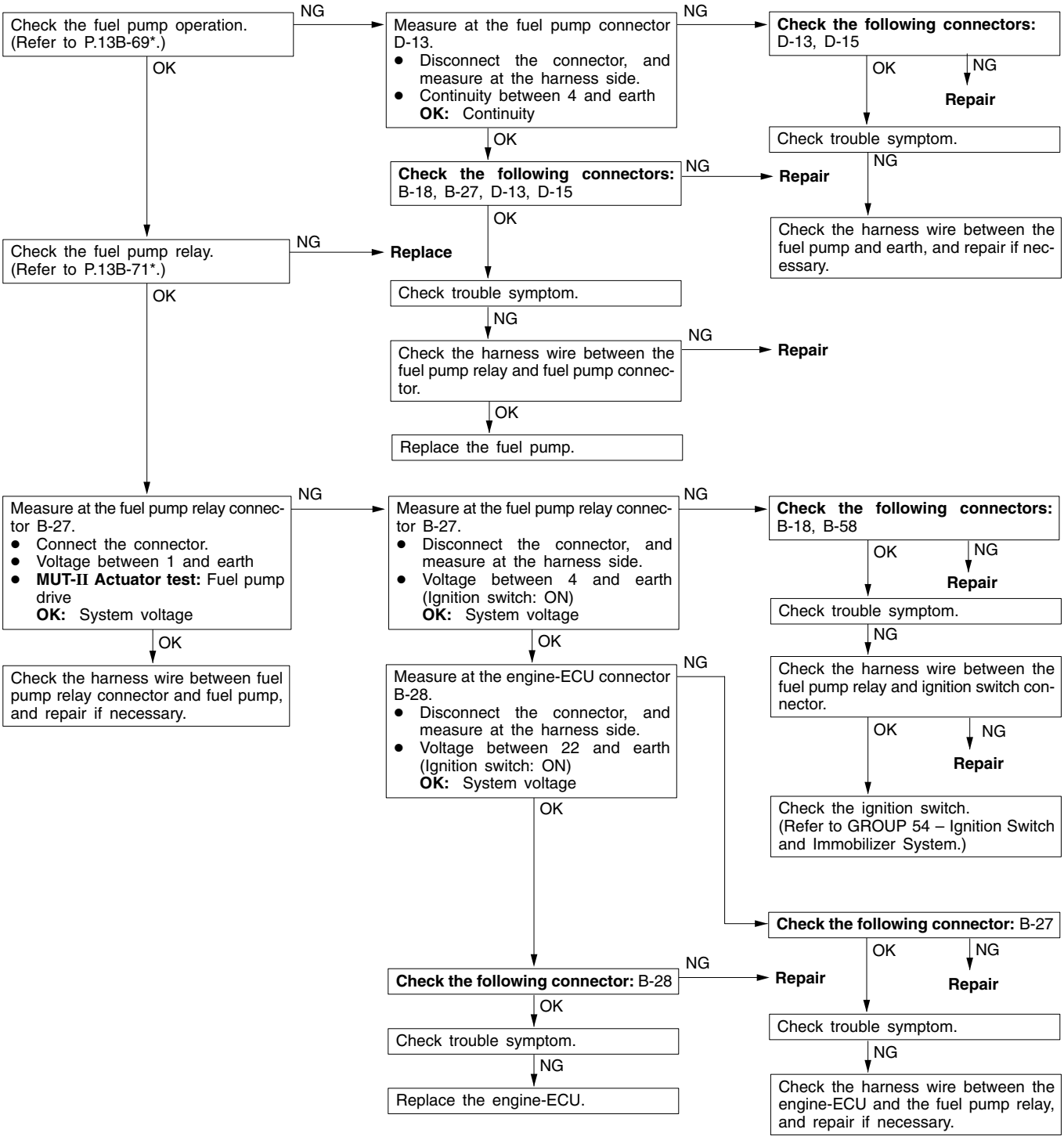
Power supply system and ignition switch-IG system	Probable cause
When an ignition switch ON signal is input to the engine-ECU, the engine-ECU turns the control relay ON. This causes battery voltage to be supplied to the engine-ECU, injectors and air flow sensor.	● Malfunction of the ignition switch ● 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 '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

INSPECTION PROCEDURE 26

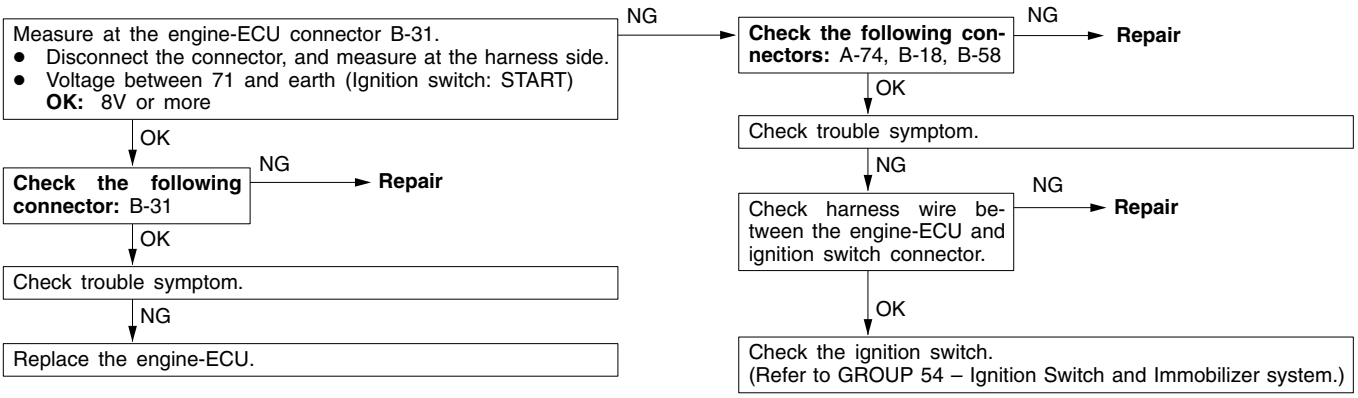
Fuel pump system	Probable cause
The engine-ECU turns the fuel pump relay ON when the engine is cranking or running, and this supplies power to drive the fuel pump.	• Malfunction of the fuel pump relay • Malfunction of the fuel pump • Improper connector contact, open circuit or short-circuited harness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



NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

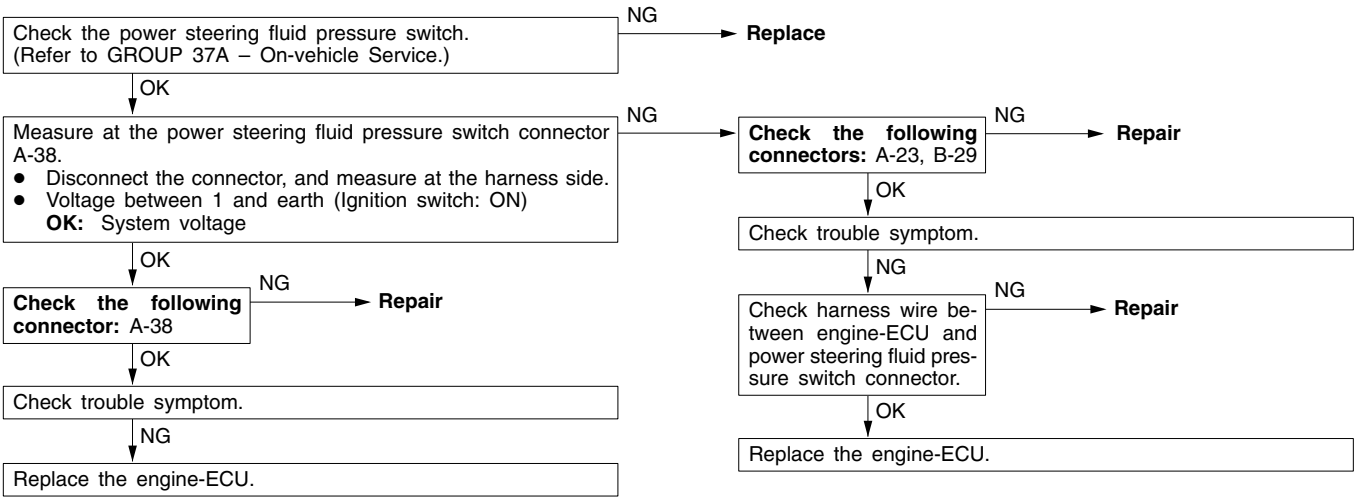
INSPECTION PROCEDURE 27

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



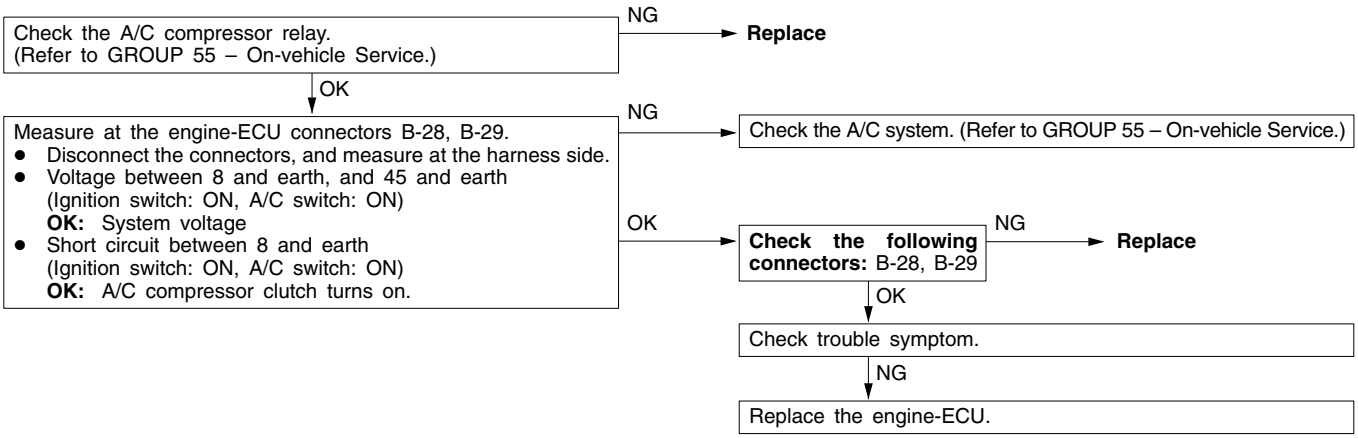
INSPECTION PROCEDURE 28

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



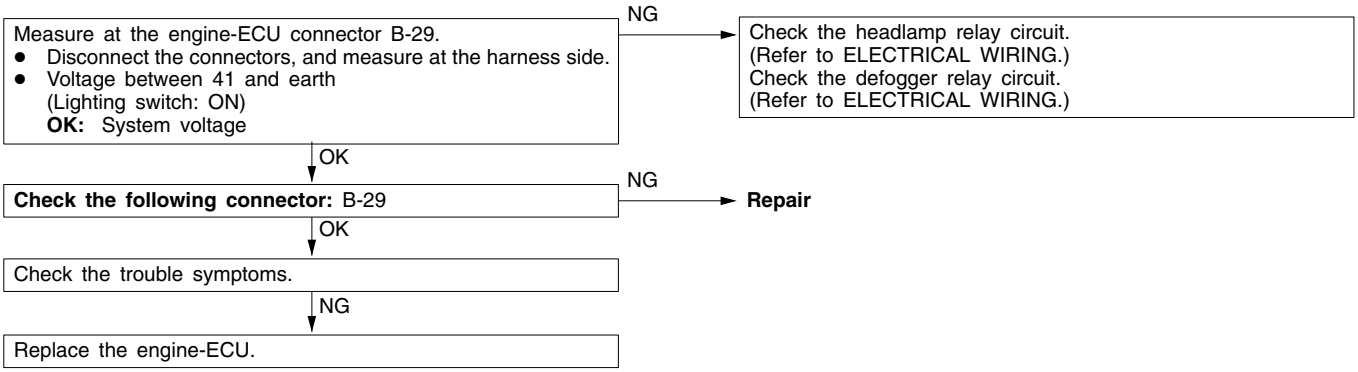
INSPECTION PROCEDURE 29

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



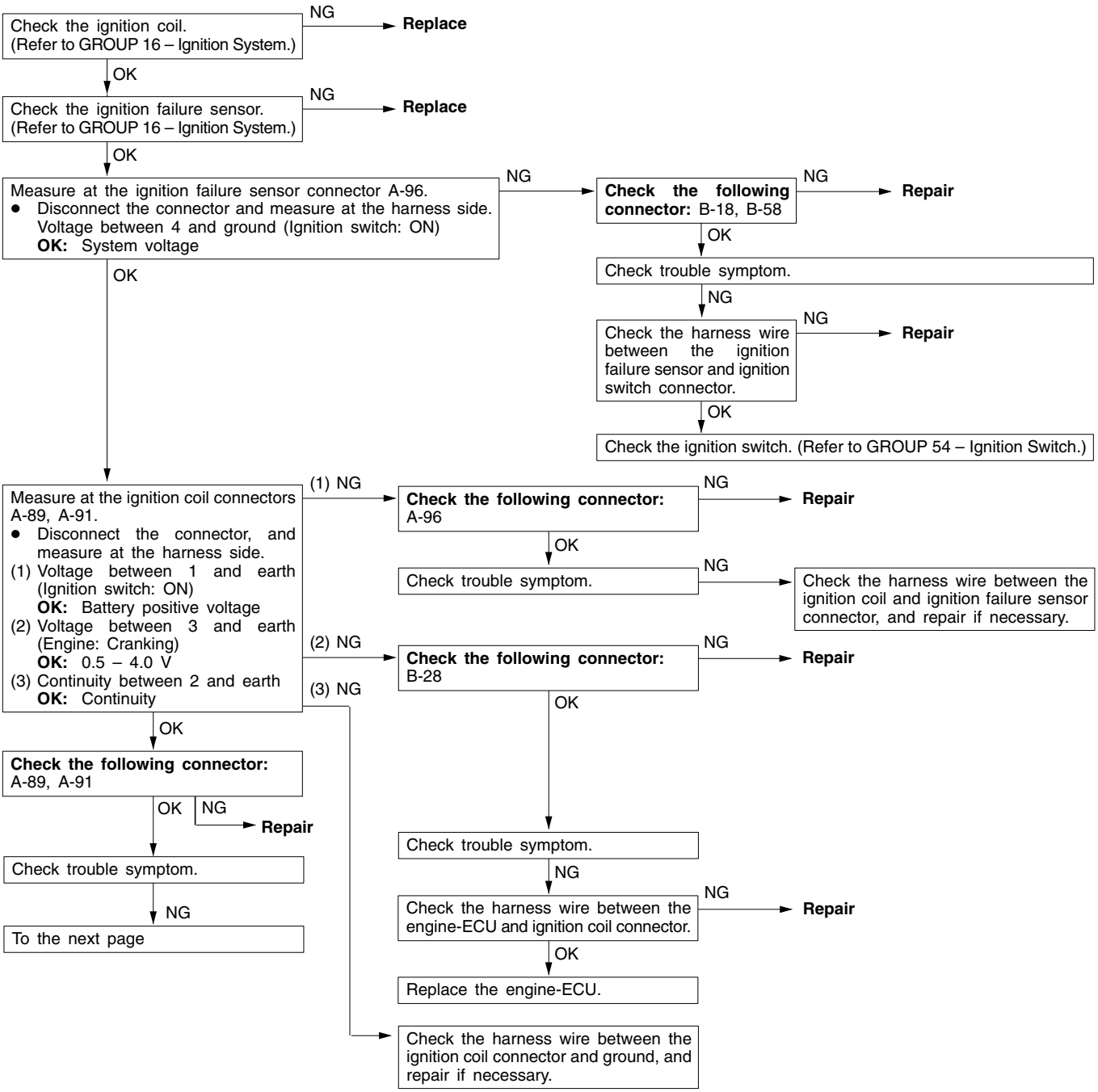
INSPECTION PROCEDURE 30

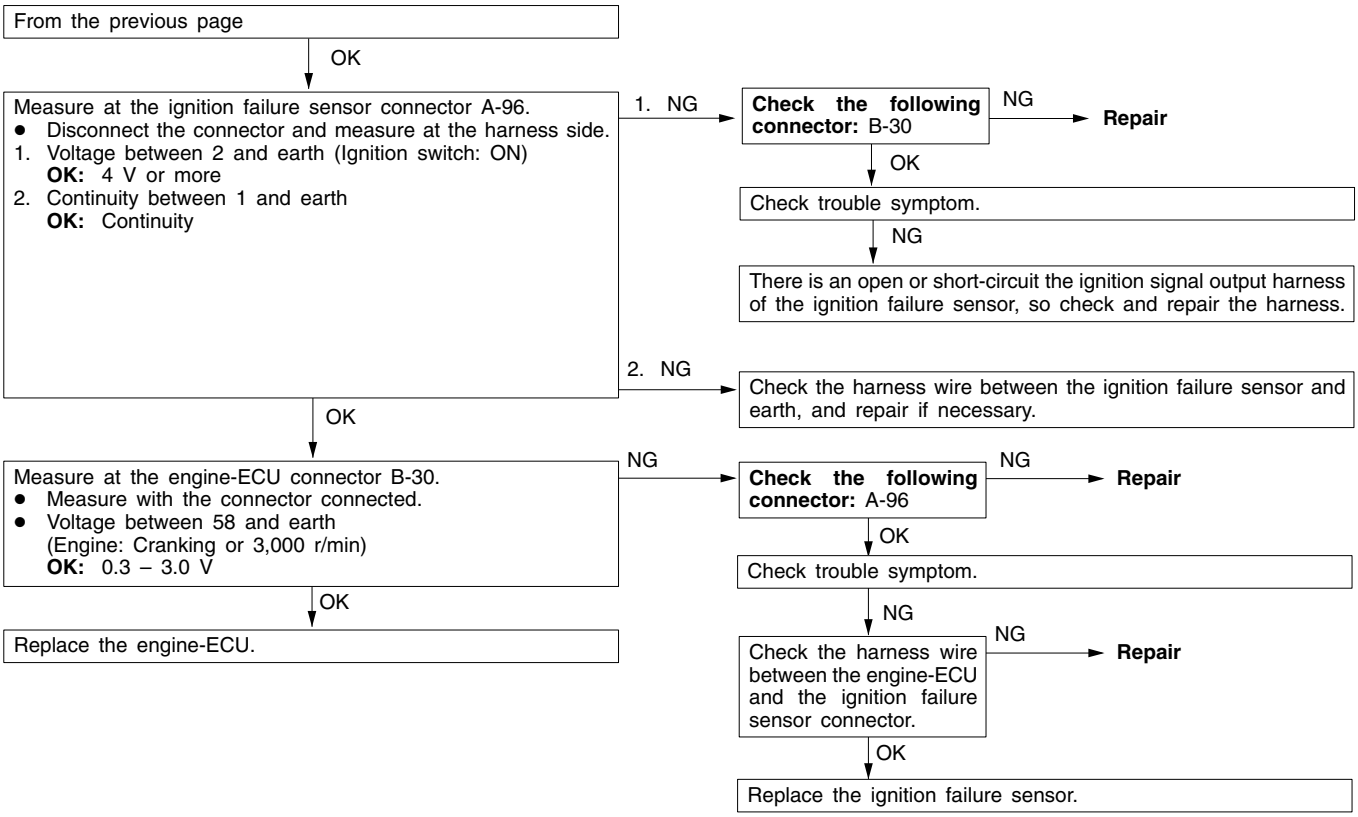
Electrical load switch	Probable cause
During idling, the ON/OFF condition of switches is equipment which have a large electrical load is input to the engine-ECU. The engine-ECU controls the idle speed control servo on this input.	• Improper connector contact, open circuit or short-circuited harness wire in the headlamp relay circuit • Improper connector contact, open circuit or short-circuited harness wire in the defogger relay circuit. • Malfunction of the engine-ECU



INSPECTION PROCEDURE 31

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




From the previous page
OK
Measure at the ignition failure sensor connector A-96.
● Disconnect the connector and measure at the harness side.
1. Voltage between 2 and earth (Ignition switch: ON)
OK: 4 V or more
2. Continuity between 1 and earth
OK: Continuity
1. NG
Check the following connector: B-30
NG
Repair
OK
Check trouble symptom.
NG
There is an open or short-circuit the ignition signal output harness of the ignition failure sensor, so check and repair the harness.
2. NG
Check the harness wire between the ignition failure sensor and earth, and repair if necessary.
OK
Measure at the engine-ECU connector B-30.
● Measure with the connector connected.
● Voltage between 58 and earth
(Engine: Cranking or 3,000 r/min)
OK: 0.3 – 3.0 V
NG
Check the following connector: A-96
NG
Repair
OK
Check trouble symptom.
NG
Check the harness wire between the engine-ECU and the ignition failure sensor connector.
NG
Repair
OK
Replace the ignition failure sensor.
OK
Replace 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	13B-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	13B-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	13B-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	13B-59
18	Cranking signal (ignition switch-ST)	Ignition switch: ON	Engine: Stopped	OFF	Procedure No. 27	13B-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	13B-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	13B-25
		• 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	1,160 – 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	13B-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	13B-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	13B-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	13B-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		
33	Electrical load switch	All accessories: OFF	Lighting switch only: OFF → ON	OFF → ON	Procedure No. 30	13B-62
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	13B-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	13B-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	13B-25
82	Short-term fuel compensation	Engine: Warm, 2,500 r/min without any load (during closed loop)		–17 – 17 %	Code No. P0170	13B-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	13B-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	13B-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) 0.6 – 1.0 V		
			2,500 r/min			
A2	Oxygen sensor (rear)	• Transmission: 2nd gear • Drive with throttle widely open	3,500 r/min	0.6 – 1.0 V	Code No. P0136	13B-22
8A	Throttle position sensor (Throttle opening angle)	• Ignition switch: ON	Set to idle position	6 – 20 %	Code No. P0120	13B-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	13B-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	13B-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	13B-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	13B-32
20	Condenser fan	Drive the fan motors (condenser)	• Ignition switch: ON • A/C switch: ON		Fan motor runs	Procedure No. 23	13B-23
21	Radiator fan	Drive the fan motors (radiator)	• Ignition switch: ON		Fan motor runs	Procedure No. 23	13B-23

CHECK AT THE ENGINE-ECU TERMINALS

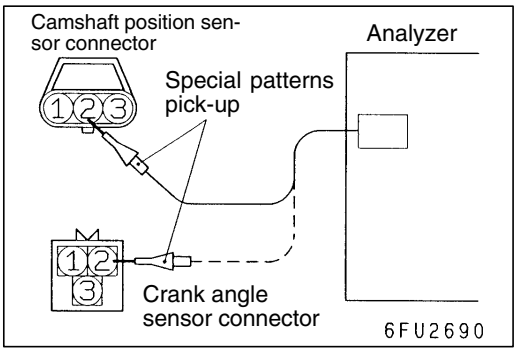
TERMINAL VOLTAGE CHECK CHART

The following items have been added. The ignition timing adjustment terminal (terminal No. 52) 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
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

CHECK CHART FOR RESISTANCE AND CONTINUITY BETWEEN TERMINALS

Terminal No.	Check item	Normal condition (check condition)
54 – 12	Oxygen sensor heater (rear)	4.5 – 8.0 Ω (at 20°C)
60 – 12	Oxygen sensor heater (front)	11 – 18 Ω (at 20°C)



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)

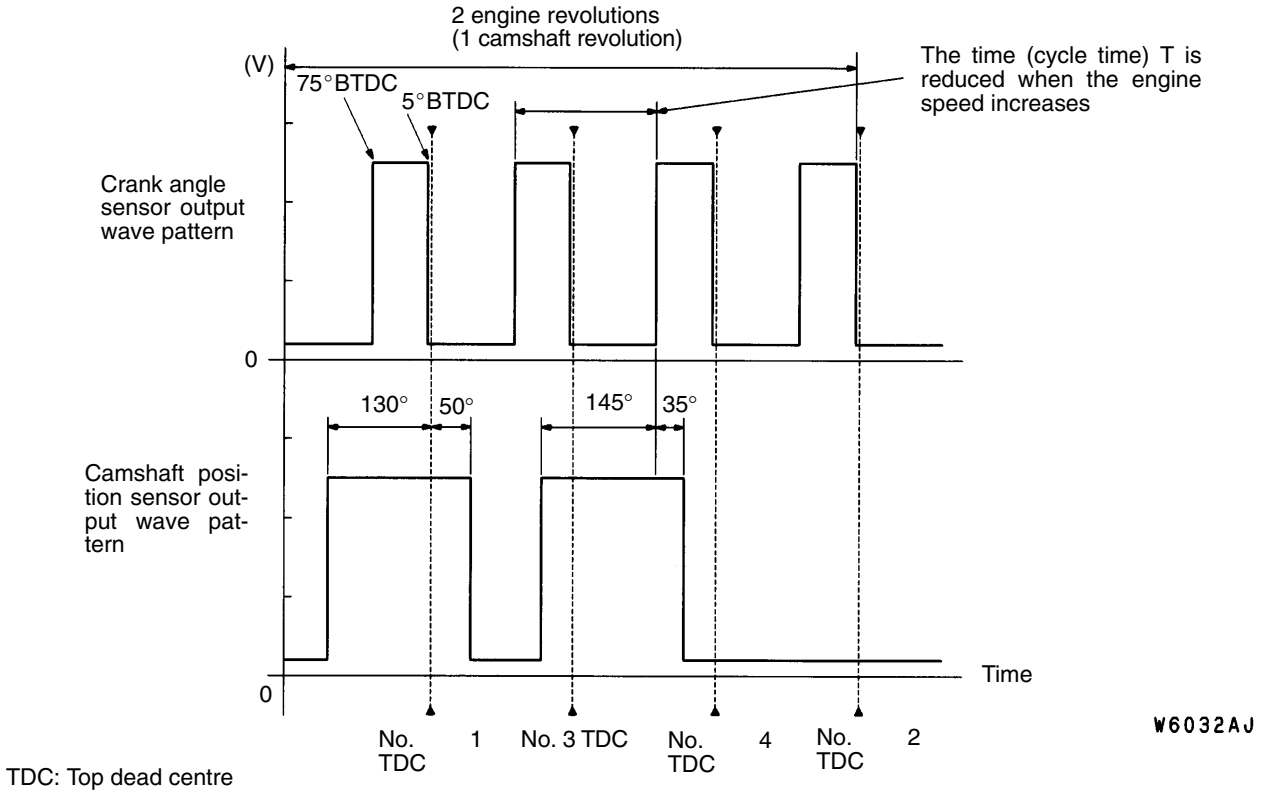
1. Connect the analyzer special patterns pickup to engine-ECU terminal 88. (When checking the camshaft position sensor signal wave pattern.)
2. Connect the analyzer special patterns pickup to engine-ECU terminal 89. (When checking the crank angle sensor signal wave pattern.)

Standard Wave Pattern

Observation conditions

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

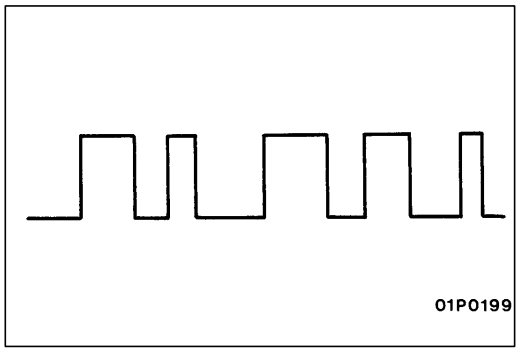
Standard wave pattern



TDC: Top dead centre

Wave Pattern Observation Points

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



Examples of Abnormal Wave Patterns

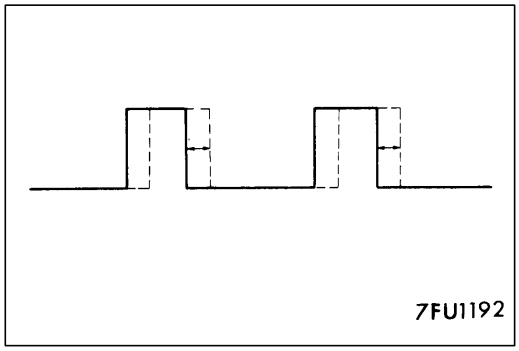
- Example 1

  Cause of problem

  Sensor interface malfunction

  Wave pattern characteristics

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



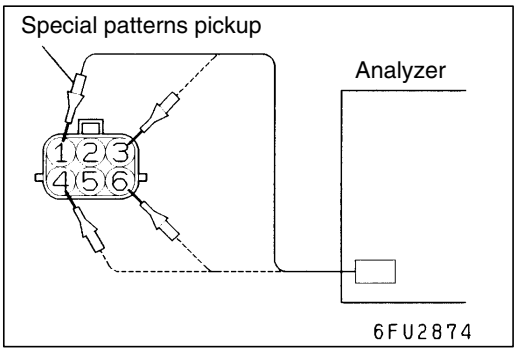
- Example 2

  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)

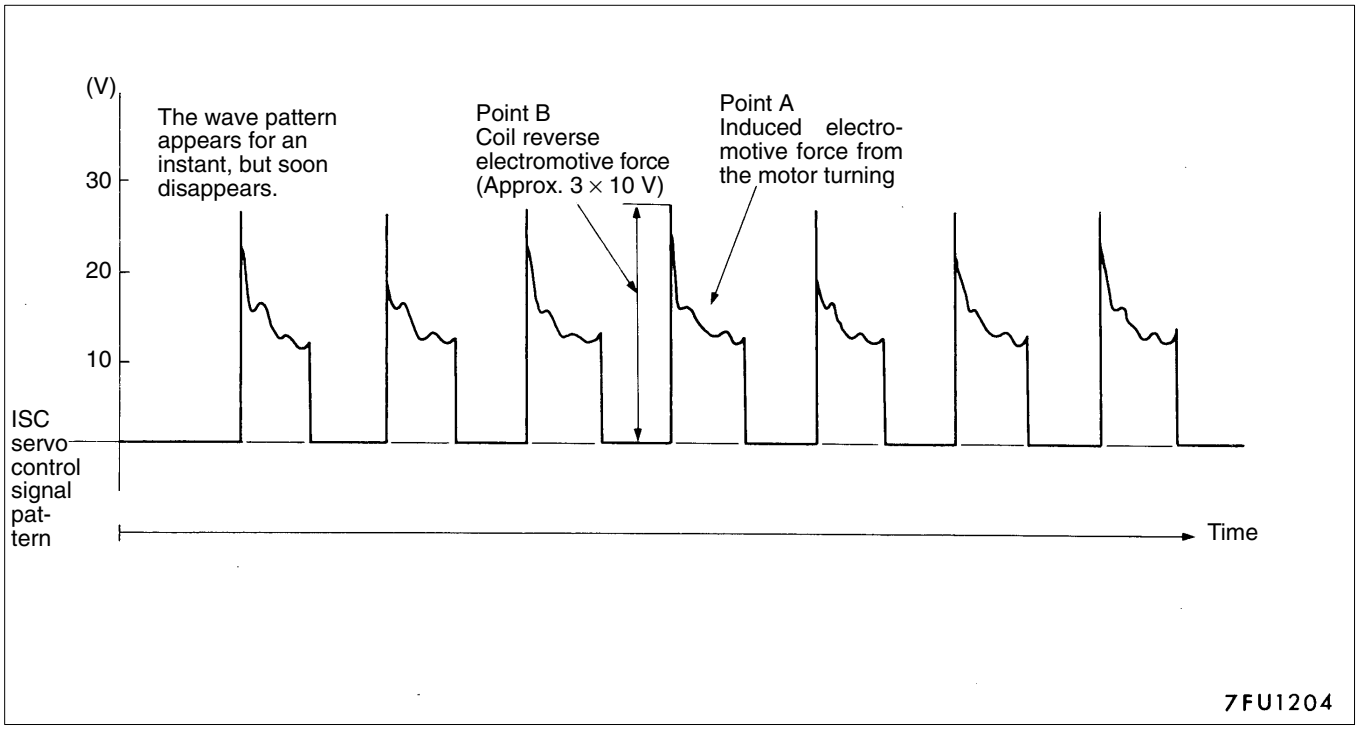
1. Connect the analyzer special patterns pickup to engine-ECU terminal 4, connection terminal 5, connection terminal 17, and connection terminal 18 respectively.

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



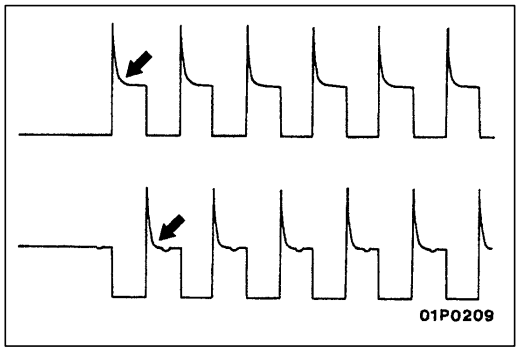
Wave Pattern Observation Points

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

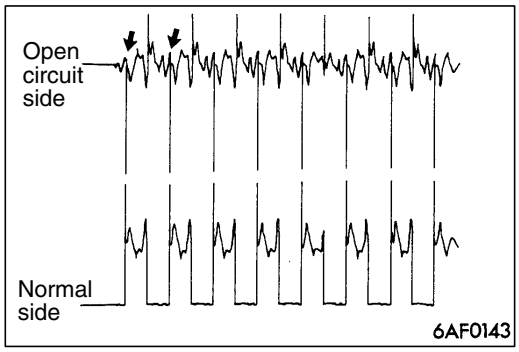
- Example 1

  Cause of problem

  Motor is malfunctioning. (Motor is not operating.)

  Wave pattern characteristics

  Induced electromotive force from the motor turning does not appear.



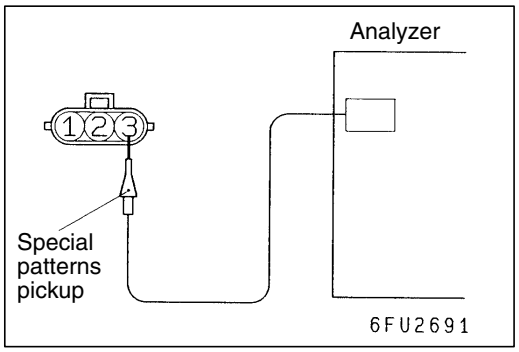
- Example 2

  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)

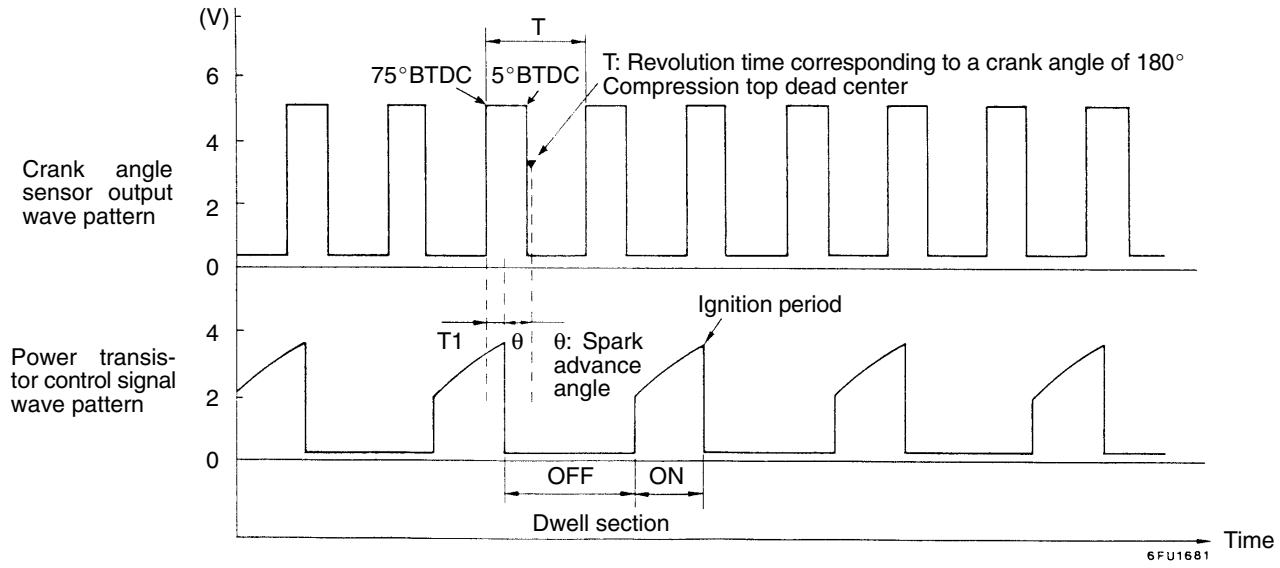
1. Connect the analyzer special patterns pickup to engine-ECU terminal 10 (No. 1 – No. 4), terminal 23 (No. 2 – No. 3) respectively.

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

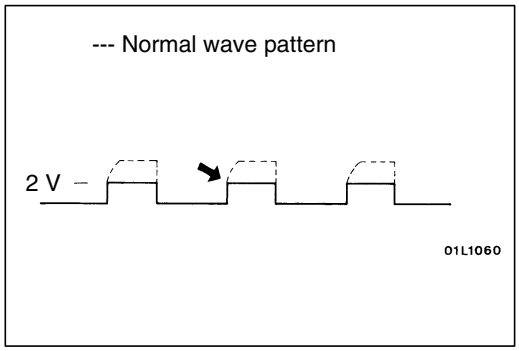


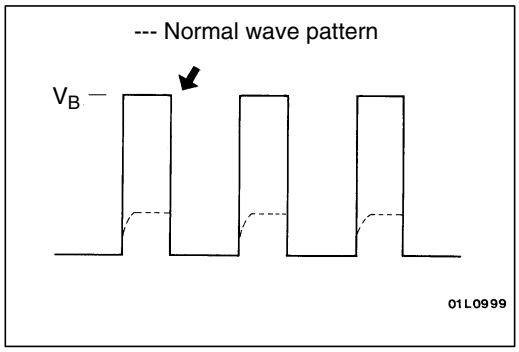
T1: Time computed by the engine-ECU

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
2V 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.

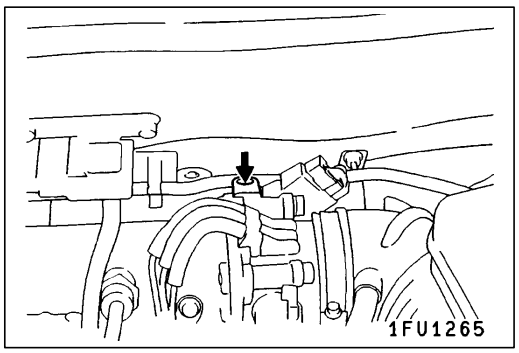
3. Start the engine and run at idle.
4. Select the item No. 30 of the MUT-II Actuator test.

   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.



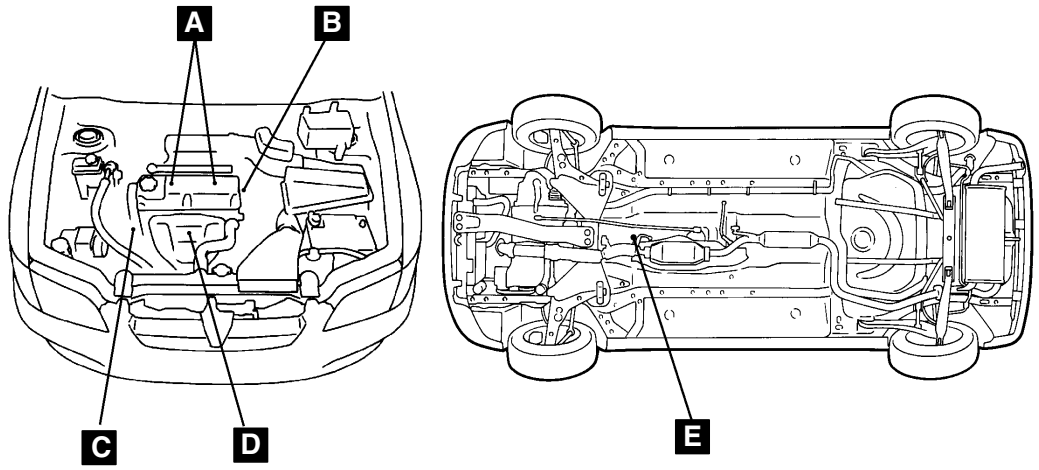
6. If not within the standard value range, turn the speed adjusting screw (SAS) to make the necessary adjustment.
7. Press the MUT-II clear key, and release the ISC servo from the Actuator test mode.

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



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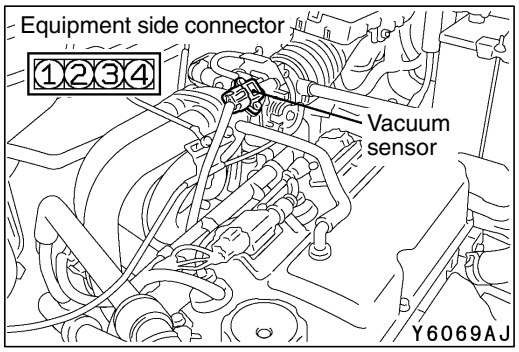
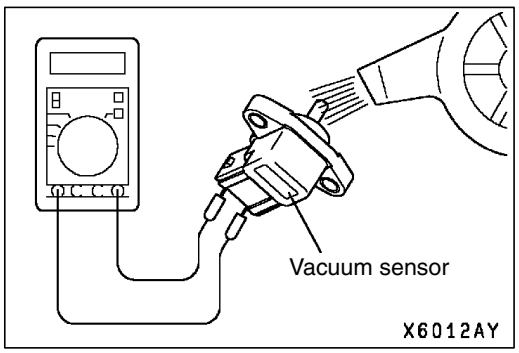


INTAKE AIR TEMPERATURE SENSOR CHECK

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

   Standard value:
   2.3 – 3.0 kΩ (at 20°C)
   0.30 – 0.42 kΩ (at 80°C)

3. Remove the vacuum sensor.



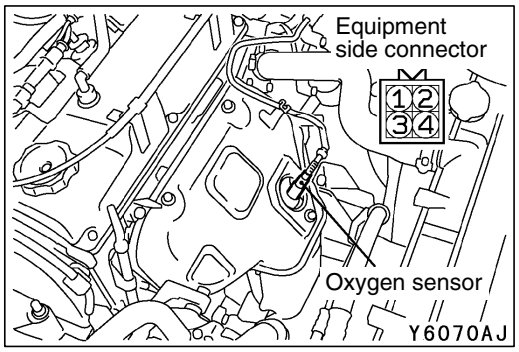
4. Measure resistance while heating the sensor using a hair drier.

   Normal condition:

Temperature (°C)	Resistance (kΩ)
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.

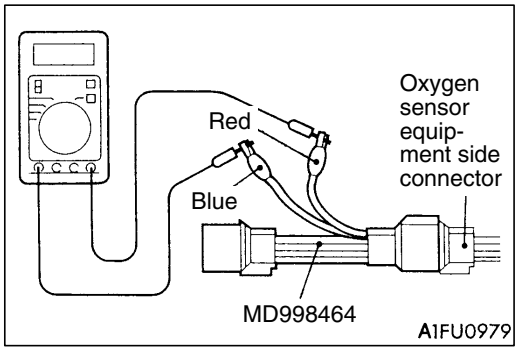
   Tightening torque: 13 – 15 Nm



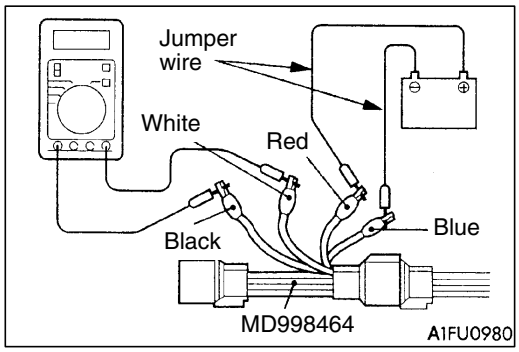
OXYGEN SENSOR CHECK

<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).

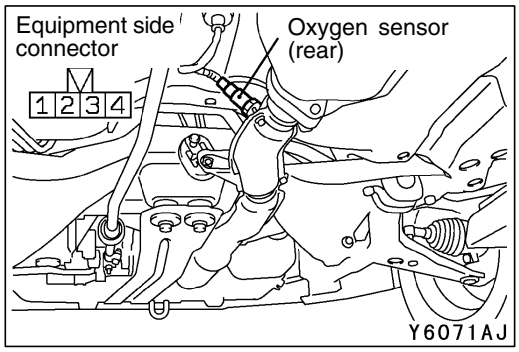
7. While repeatedly racing the engine, measure the oxygen sensor output voltage.

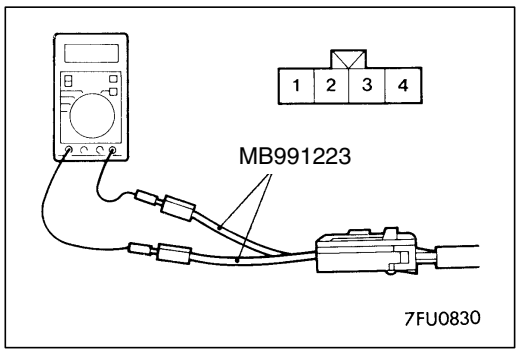
   Standard value:

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)>

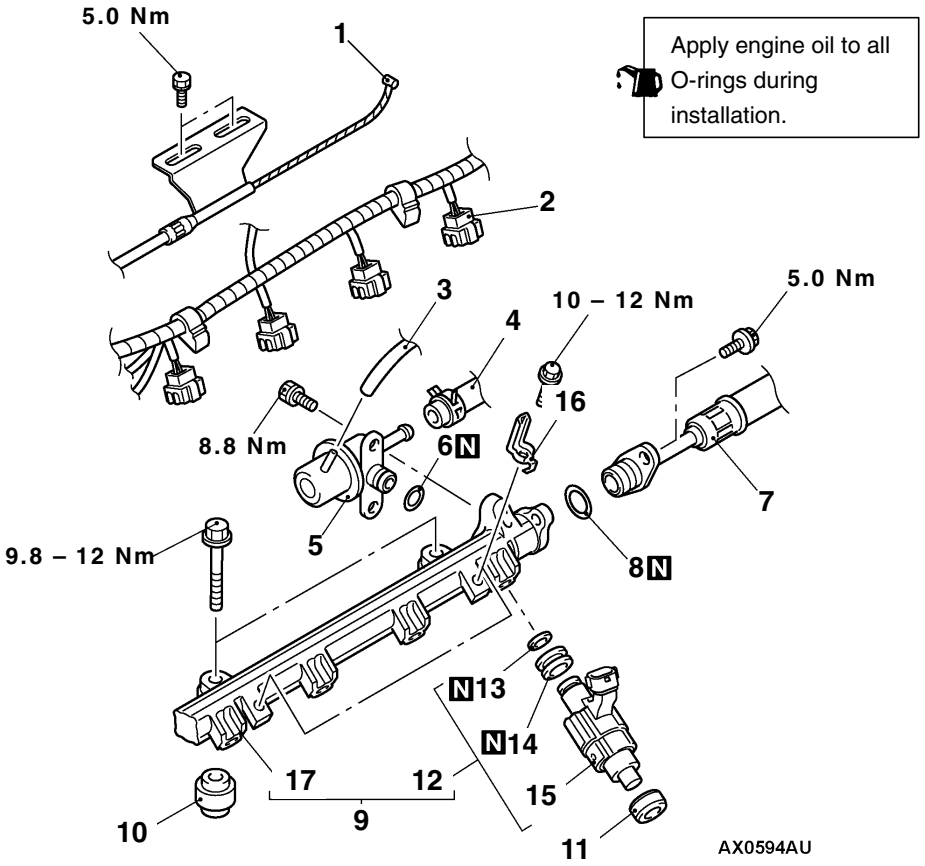
1. Disconnect the oxygen sensor connector and connect the special tool (test harness set) to the connector on the oxygen sensor side.
2. Make sure that there is continuity (11 – 18 Ω at 20°C) between terminal 3 and terminal 4 on the oxygen sensor connector.
3. If there is no continuity, replace the oxygen sensor.

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

FUEL 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



Removal steps

1. Accelerator cable connection
2. Fuel injector connector
3. Vacuum hose connection
4. Fuel return hose connection
▶A◀ 5. Fuel pressure regulator
▶A◀ 6. O-ring
▶A◀ 7. High-pressure fuel hose connection
▶A◀ 8. O-ring
◀A▶ 9. Delivery pipe and fuel injector assembly
▶A◀ 10. Insulator
11. Insulator
▶A◀ 12. Fuel injector assembly
▶A◀ 13. O-ring
14. Grommet
15. Fuel injector
16. Harness bracket
17. Delivery pipe

REMOVAL SERVICE POINT

◀A▶ DELIVERY PIPE AND FUEL 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/FUEL 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.

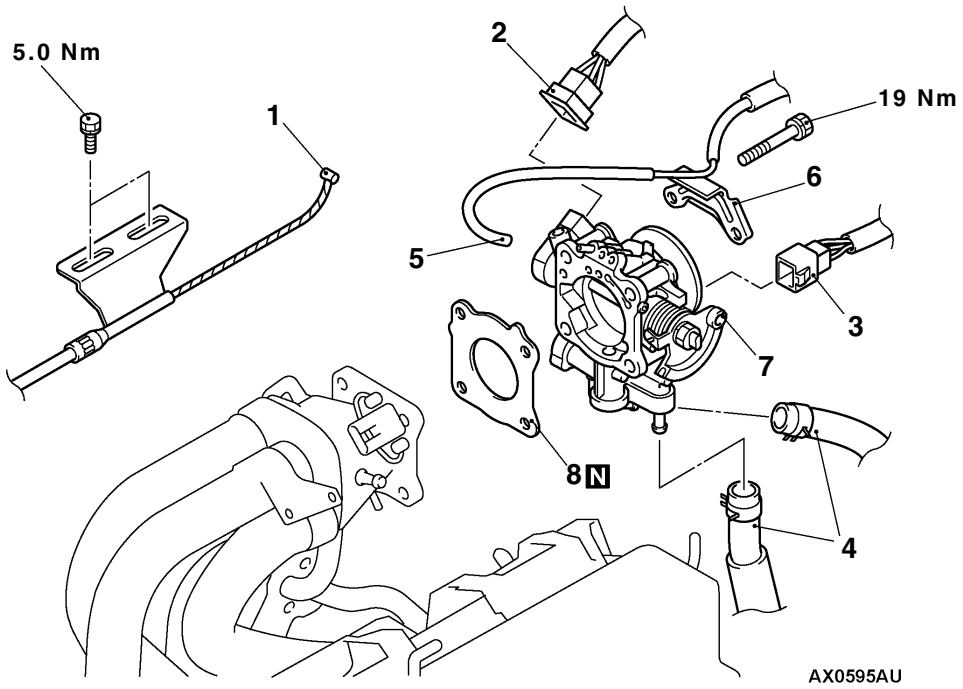
2. While turning the injector, high-pressure fuel hose and fuel pressure regulator to the right and left, install the delivery pipe, while being careful not to damage the O-ring. After installing, check that the hose turns smoothly.
3. If it does not turn smoothly, the O-ring may be trapped, remove the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

   Tightening torque:
   5.0 Nm (High-pressure fuel hose)
   8.8 Nm (Fuel pressure regulator)

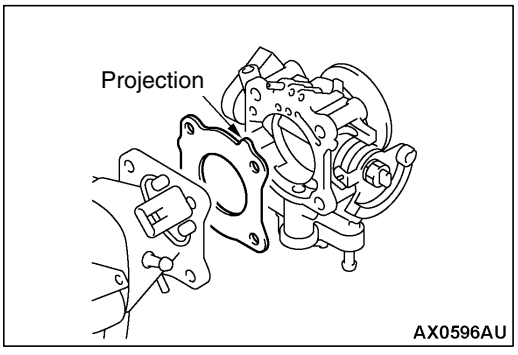
THROTTLE BODY

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Engine Coolant Draining
- Air Intake Hose Removal and Installation
- Accelerator Cable Adjustment <after installation>



Removal steps
1. Accelerator cable connection
2. Throttle position sensor connector
3. Idle speed control servo connector
4. Water hose connection
5. Vacuum hose connection
6. Vacuum pipe and hose assembly
7. Throttle body
▶A◀ 8. Throttle body gasket



INSTALLATION SERVICE POINT

▶A◀ THROTTLE BODY GASKET INSTALLATION

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

MULTIPOINT FUEL INJECTION (MPI)

CONTENTS

GENERAL

OUTLINE OF CHANGES

The 2002 MY 4G1 engine has been changed in the following manner from the previous model.
Maintenance procedures, differing from the previous procedures, have been set for these changes.

- The 4G18 engine has been added.
- The automatic transmission vehicle has been added.
- The engine-A/T-ECU has been adopted for the automatic transmission vehicle.
- The connection on the earthing side of the crank angle sensor and camshaft position sensor has been changed. (Dedicated earth terminals have been set for the engine-ECU and engine-A/T-ECU.)
- The open circuit detection function has been added for the battery back-up line. (The diagnosis code No. is P1603. Note that the freeze frame data will not be stored when this diagnosis code is saved.)
- The vehicle speed sensor has been abolished from the automatic transmission vehicle. The signal from the automatic transmission output shaft speed sensor is used to detect the vehicle speed.

GENERAL INFORMATION

GENERAL SPECIFICATIONS

Item		Specifications
Throttle body	Throttle bore mm	50 <4G18>
Engine-ECU <M/T>	Identification No.	E2T71281 <4G13> E2T71280 <4G18>
Engine-A/T-ECU <A/T>	Identification No.	E6T24771 <4G18>

TROUBLESHOOTING

DIAGNOSIS FUNCTION

ENGINE WARNING LAMP (CHECK ENGINE LAMP)

Engine warning lamp inspection items

The following items have been added.

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

NOTE:
When code No. P1603 is set once, the engine warning lamp (CHECK ENGINE lamp) will illuminate.

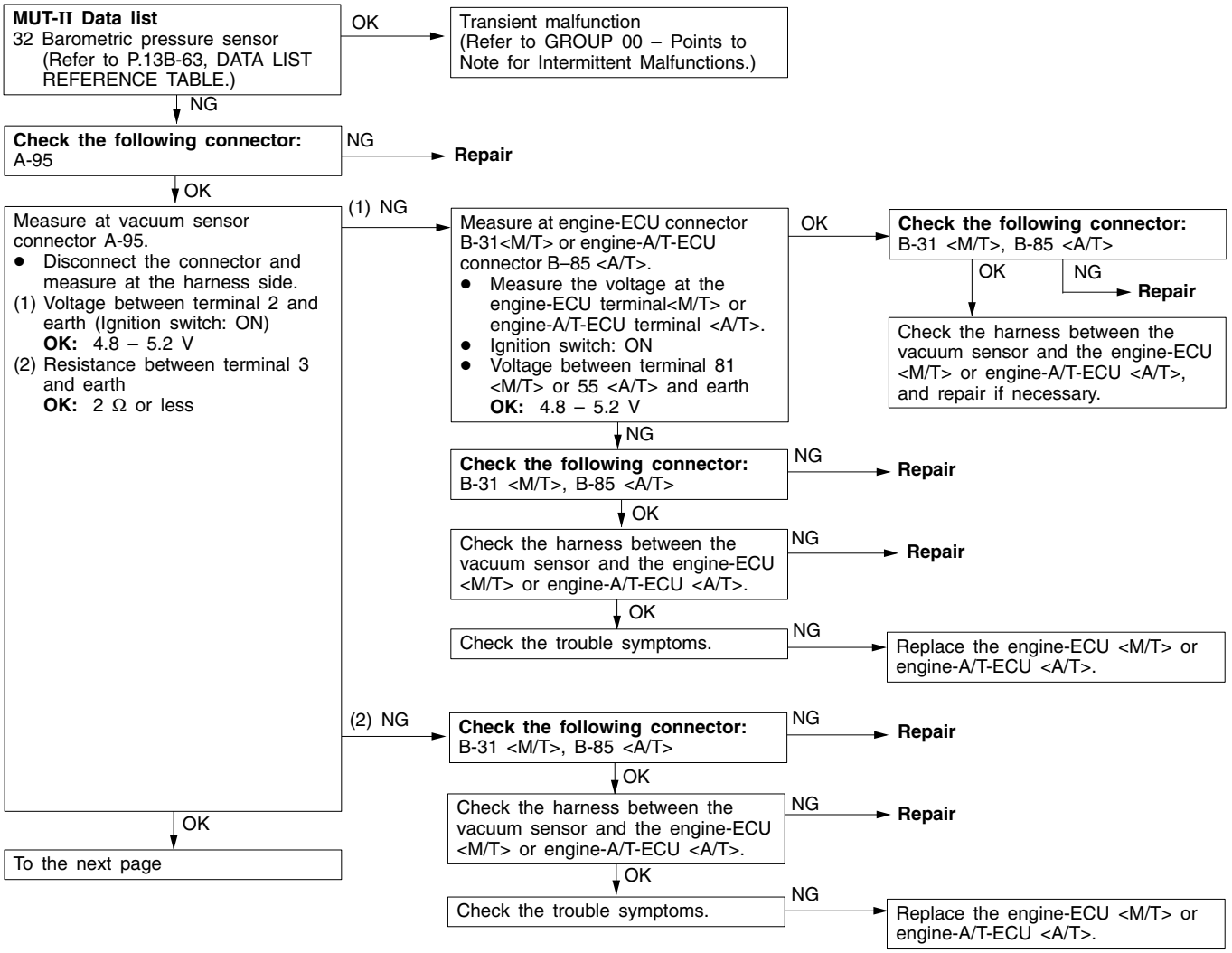
INSPECTION CHART FOR DIAGNOSIS CODES

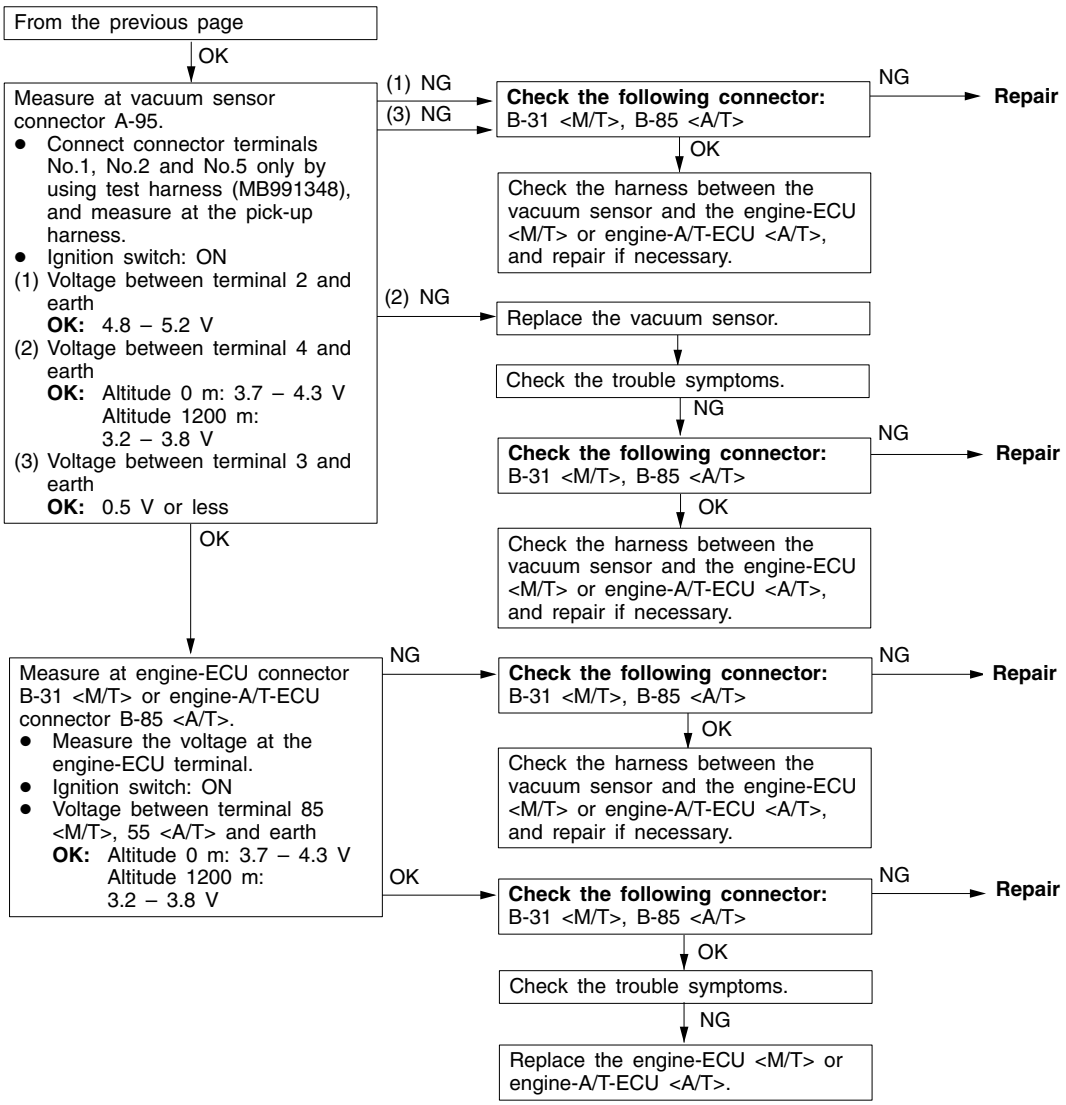
Code No.	Diagnosis item	Reference page
P0105	Vacuum sensor system	13B-4
P0110	Intake air temperature sensor system	13B-6
P0115	Engine coolant temperature sensor system	13B-7
P0120	Throttle position sensor system	13B-10
P0125	Feedback system	13B-12
P0130	Oxygen sensor (front) system <sensor 1>	13B-13
P0135	Oxygen sensor heater (front) system <sensor 1>	13B-15
P0136	Oxygen sensor (rear) system <sensor 2>	13B-16
P0141	Oxygen sensor heater (rear) system <sensor 2>	13B-18
P0170	Abnormal fuel system	13B-19
P0201	No. 1 injector system	13B-20
P0202	No. 2 injector system	13B-20
P0203	No. 3 injector system	13B-20
P0204	No. 4 injector system	13B-20
P0300★	Random cylinder misfire detected	13B-21
P0301	No. 1 cylinder misfire detected	13B-22
P0302	No. 2 cylinder misfire detected	13B-22
P0303	No. 3 cylinder misfire detected	13B-22
P0304	No. 4 cylinder misfire detected	13B-22
P0325	Detonation sensor system	13B-23
P0335	Crank angle sensor system	13B-23
P0340	Camshaft position sensor system	13B-25
P0403	EGR control solenoid valve system	13B-27
P0421	Catalyst malfunction	13B-28
P0443	Purge control solenoid valve system	13B-29
P0500	Vehicle speed sensor system	13B-30
P0505	Idle speed control system	13B-31
P1603	Battery back-up line system	13B-33
P1610	Immobilizer system	13B-34

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.

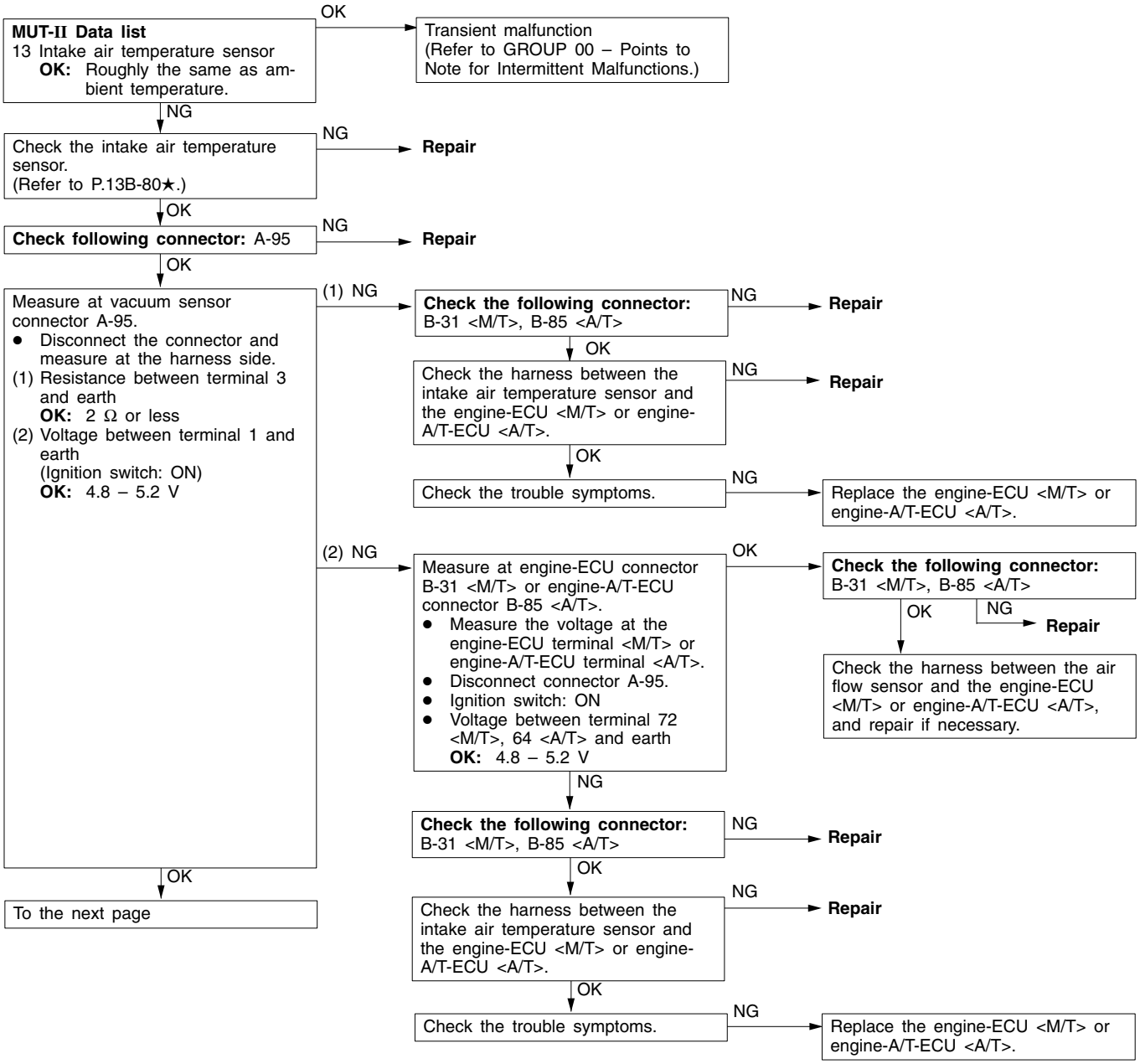
INSPECTION PROCEDURE CLASSIFIED BY DIAGNOSIS CODE

Code No. P0105 Vacuum sensor system	Probable cause
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 <M/T> ● Malfunction of the engine-A/T-ECU <A/T>
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.)	

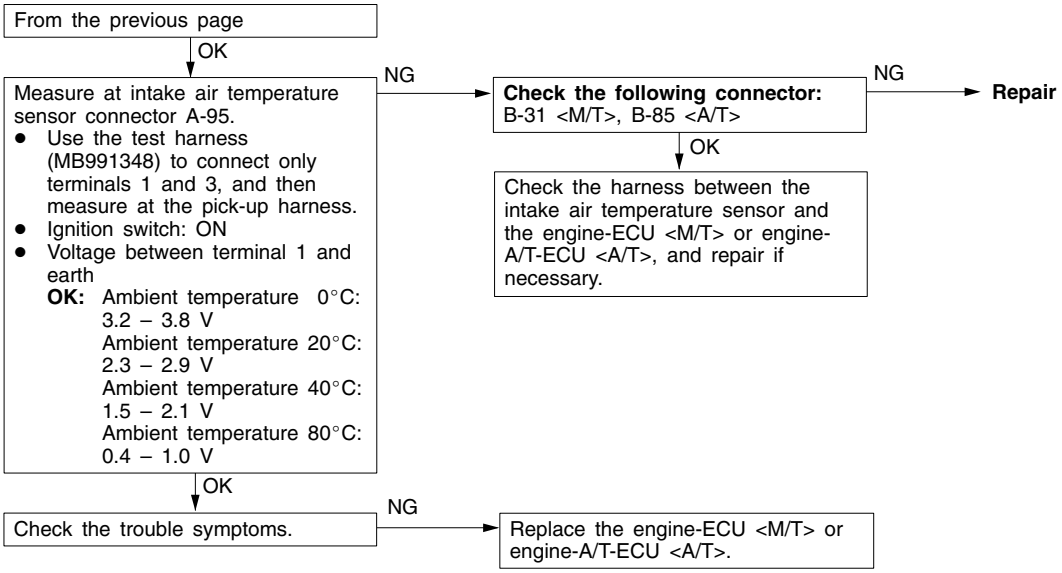



From the previous page
OK
Measure at vacuum sensor connector A-95.
● Connect connector terminals No.1, No.2 and No.5 only by using test harness (MB991348), and measure at the pick-up harness.
● Ignition switch: ON
(1) Voltage between terminal 2 and earth
OK: 4.8 – 5.2 V
(2) Voltage between terminal 4 and earth
OK: Altitude 0 m: 3.7 – 4.3 V
Altitude 1200 m: 3.2 – 3.8 V
(3) Voltage between terminal 3 and earth
OK: 0.5 V or less
(1) NG
(3) NG
Check the following connector: B-31 <M/T>, B-85 <A/T>
NG
Repair
OK
Check the harness between the vacuum sensor and the engine-ECU <M/T> or engine-A/T-ECU <A/T>, and repair if necessary.
(2) NG
Replace the vacuum sensor.
Check the trouble symptoms.
NG
Check the following connector: B-31 <M/T>, B-85 <A/T>
NG
Repair
OK
Check the harness between the vacuum sensor and the engine-ECU <M/T> or engine-A/T-ECU <A/T>, and repair if necessary.
OK
Measure at engine-ECU connector B-31 <M/T> or engine-A/T-ECU connector B-85 <A/T>.
● Measure the voltage at the engine-ECU terminal.
● Ignition switch: ON
● Voltage between terminal 85 <M/T>, 55 <A/T> and earth
OK: Altitude 0 m: 3.7 – 4.3 V
Altitude 1200 m: 3.2 – 3.8 V
NG
Check the following connector: B-31 <M/T>, B-85 <A/T>
NG
Repair
OK
Check the harness between the vacuum sensor and the engine-ECU <M/T> or engine-A/T-ECU <A/T>, and repair if necessary.
OK
Check the following connector: B-31 <M/T>, B-85 <A/T>
NG
Repair
OK
Check the trouble symptoms.
NG
Replace the engine-ECU <M/T> or engine-A/T-ECU <A/T>.

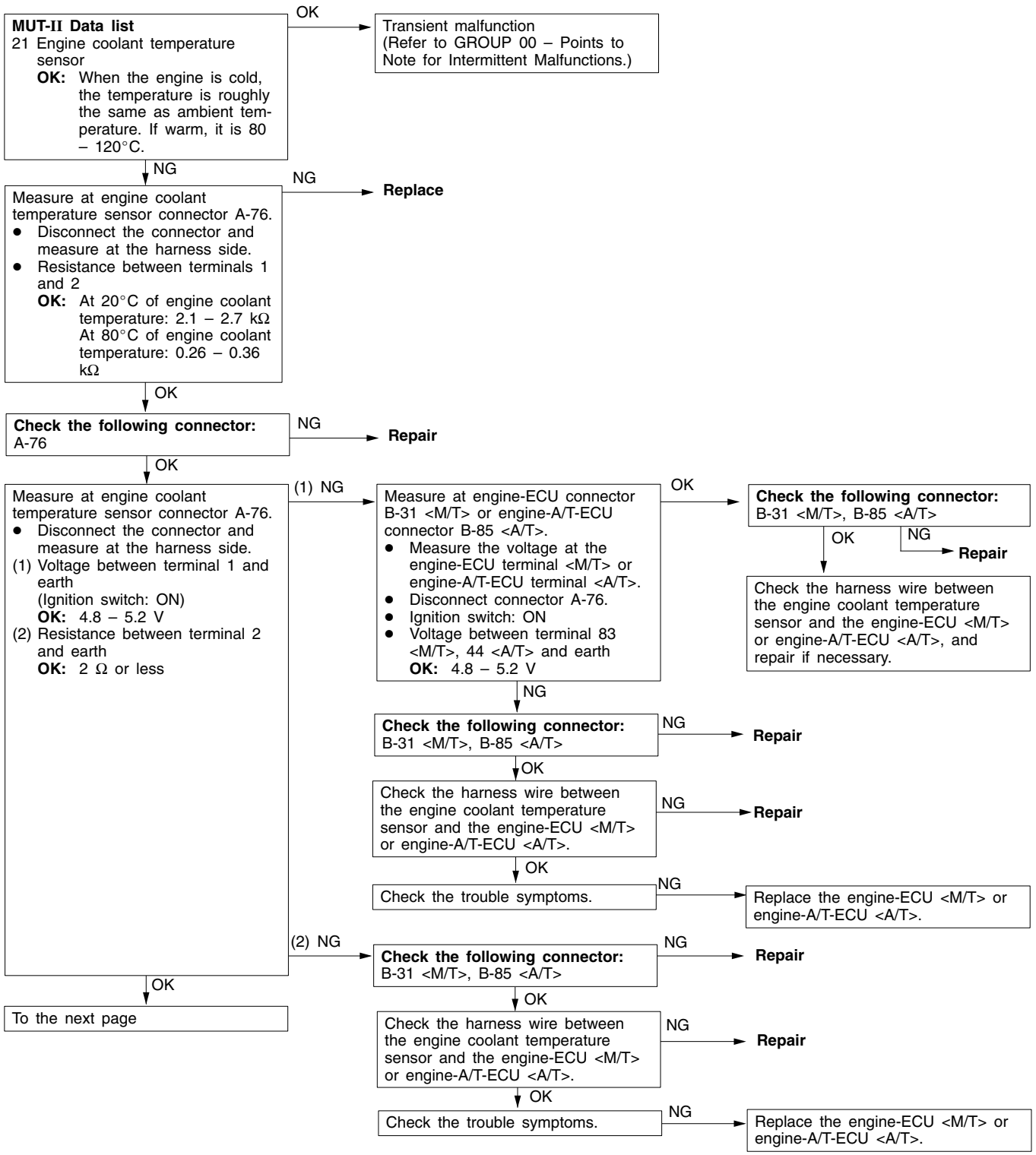
Code No. P0110 Intake air temperature sensor system	Probable cause
Range of Check ● Two seconds have passed since the ignition switch is turned ON or the engine starting process is completed. Set Conditions ● The sensor output voltage is 4.6 V or more for two seconds (equivalent to –45°C of intake air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

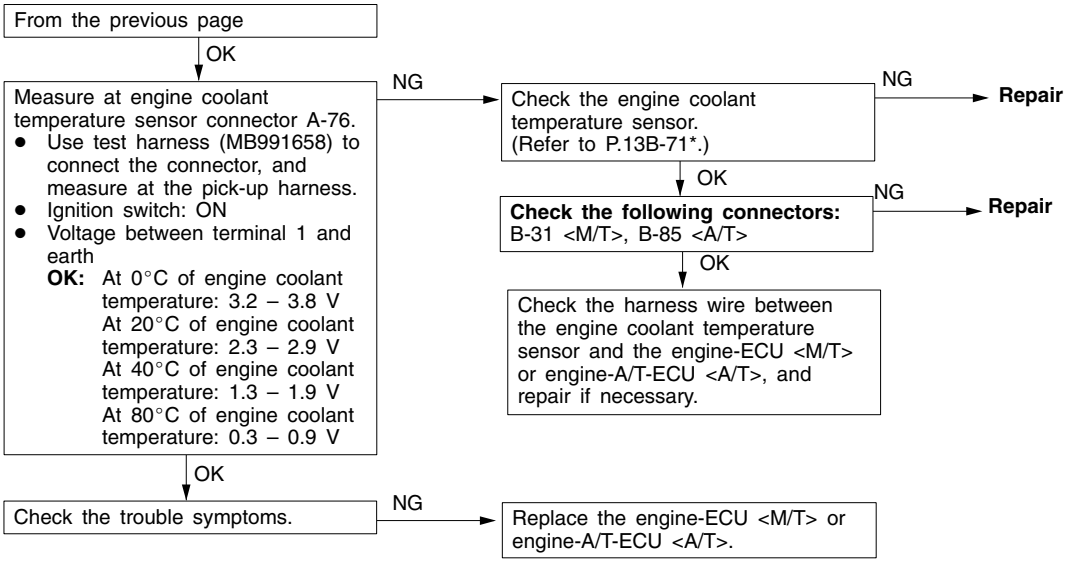


NOTE:
★: Refer to the 2001 SPACE STAR Workshop Manual (Pub. No. CMXE99E1-A)



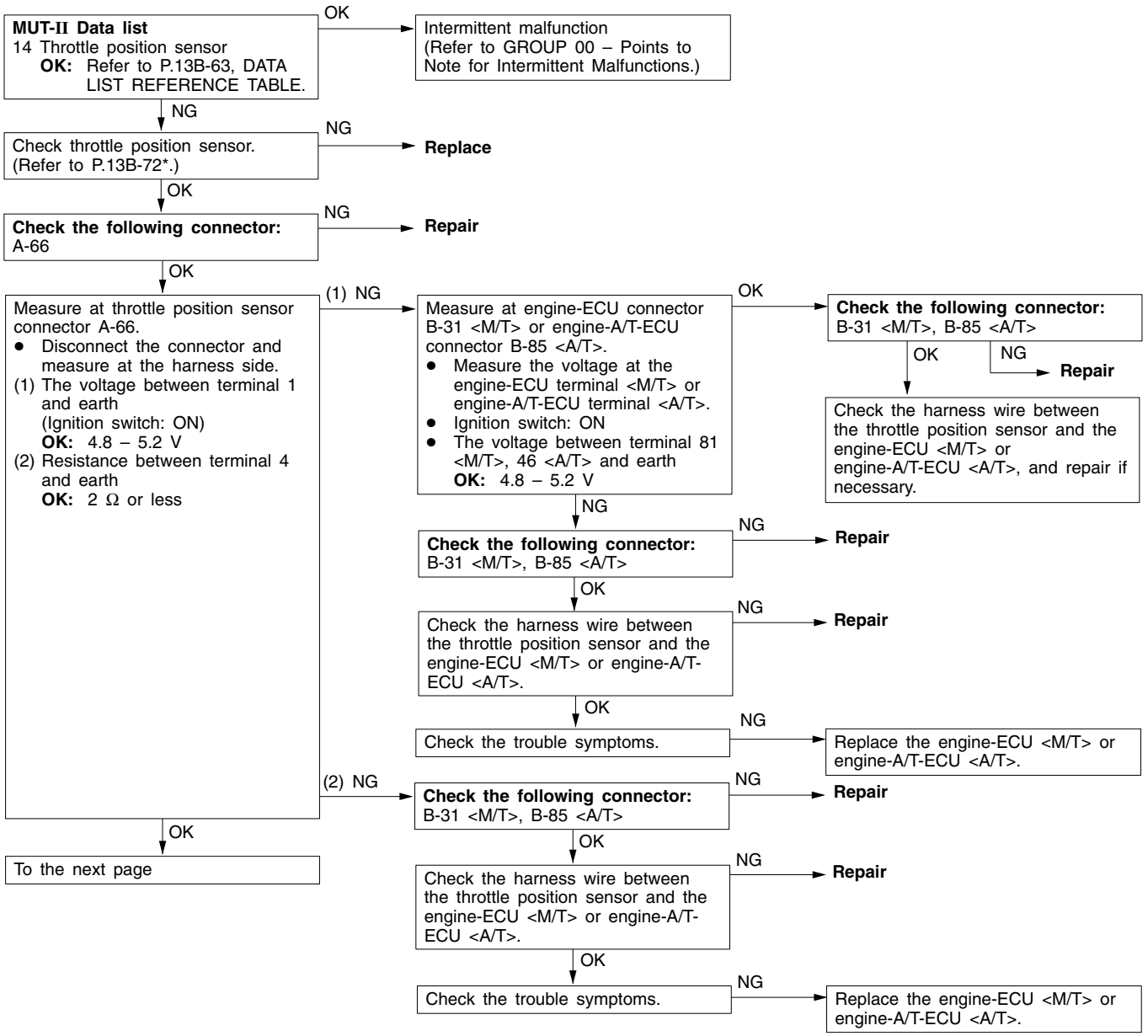
Code No. P0115 Engine coolant temperature sensor system	Probable cause
Range of Check ● Engine: Two seconds after the engine has been started Set Conditions ● The sensor output voltage is 4.6 V or more for two seconds (equivalent to –45°C of engine coolant temperature) or ● The sensor output voltage 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 <M/T> ● Malfunction of the 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.	


MUT-II Data list
21 Engine coolant temperature sensor
OK: When the engine is cold, the temperature is roughly the same as ambient temperature. If warm, it is 80 – 120°C.
OK
Transient malfunction (Refer to GROUP 00 – Points to Note for Intermittent Malfunctions.)
NG
Measure at engine coolant temperature sensor connector A-76.
• Disconnect the connector and measure at the harness side.
• Resistance between terminals 1 and 2
OK: At 20°C of engine coolant temperature: 2.1 – 2.7 kΩ
At 80°C of engine coolant temperature: 0.26 – 0.36 kΩ
NG
Replace
OK
Check the following connector: A-76
NG
Repair
OK
Measure at engine coolant temperature sensor connector A-76.
• Disconnect the connector and measure at the harness side.
(1) Voltage between terminal 1 and earth
(Ignition switch: ON)
OK: 4.8 – 5.2 V
(2) Resistance between terminal 2 and earth
OK: 2 Ω or less
(1) NG
Measure at engine-ECU connector B-31 <M/T> or engine-A/T-ECU connector B-85 <A/T>.
• Measure the voltage at the engine-ECU terminal <M/T> or engine-A/T-ECU terminal <A/T>.
• Disconnect connector A-76.
• Ignition switch: ON
• Voltage between terminal 83 <M/T>, 44 <A/T> and earth
OK: 4.8 – 5.2 V
OK
Check the following connector: B-31 <M/T>, B-85 <A/T>
OK
NG
Repair
Check the harness wire between the engine coolant temperature sensor and the engine-ECU <M/T> or engine-A/T-ECU <A/T>, and repair if necessary.
NG
Check the following connector: B-31 <M/T>, B-85 <A/T>
NG
Repair
OK
Check the harness wire between the engine coolant temperature sensor and the engine-ECU <M/T> or engine-A/T-ECU <A/T>.
NG
Repair
OK
Check the trouble symptoms.
NG
Replace the engine-ECU <M/T> or engine-A/T-ECU <A/T>.
(2) NG
Check the following connector: B-31 <M/T>, B-85 <A/T>
NG
Repair
OK
Check the harness wire between the engine coolant temperature sensor and the engine-ECU <M/T> or engine-A/T-ECU <A/T>.
NG
Repair
OK
Check the trouble symptoms.
NG
Replace the engine-ECU <M/T> or engine-A/T-ECU <A/T>.
OK
To the next page

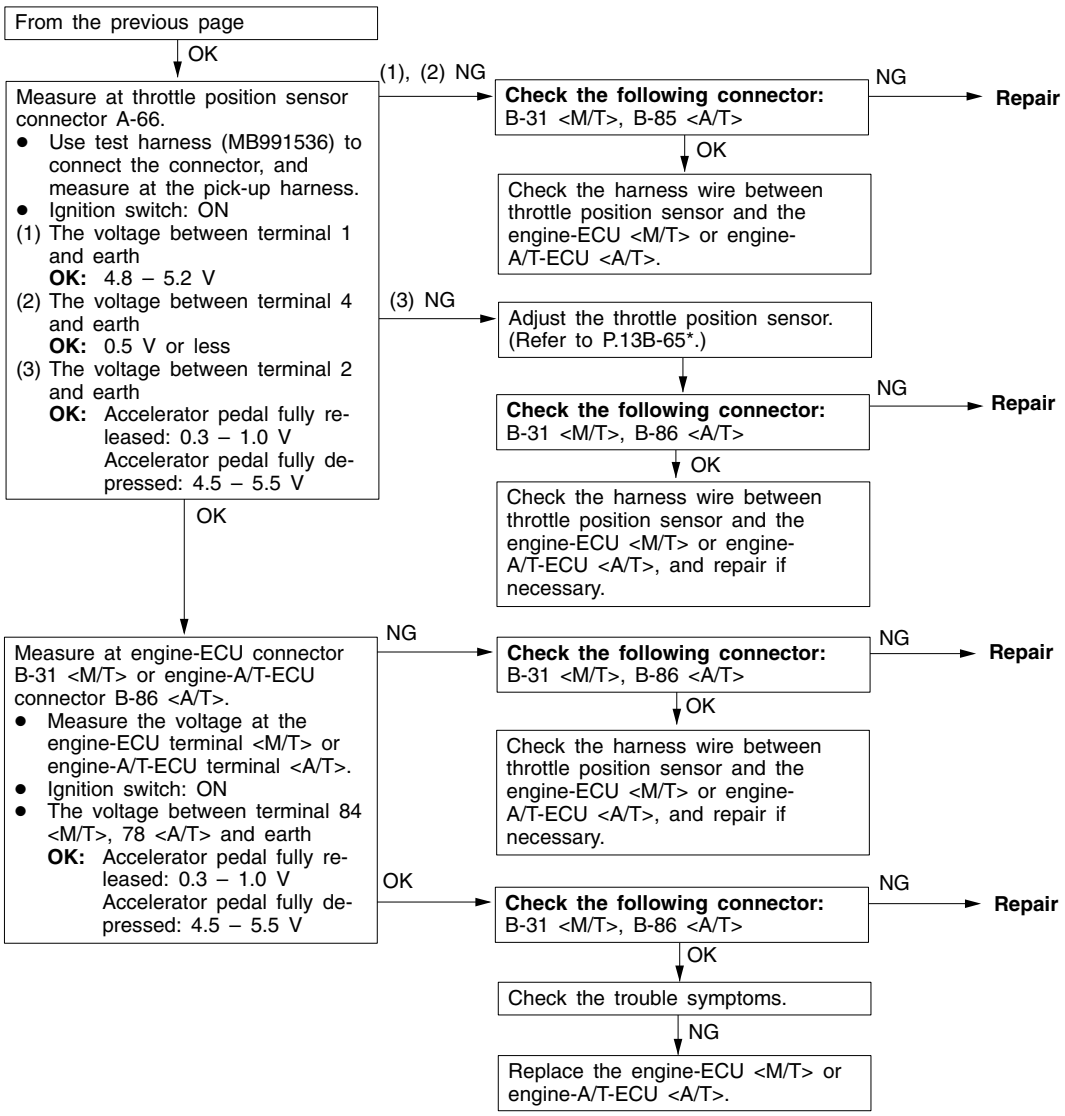


NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

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 48kPa 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 <M/T> • Malfunction of the engine-A/T-ECU <A/T>

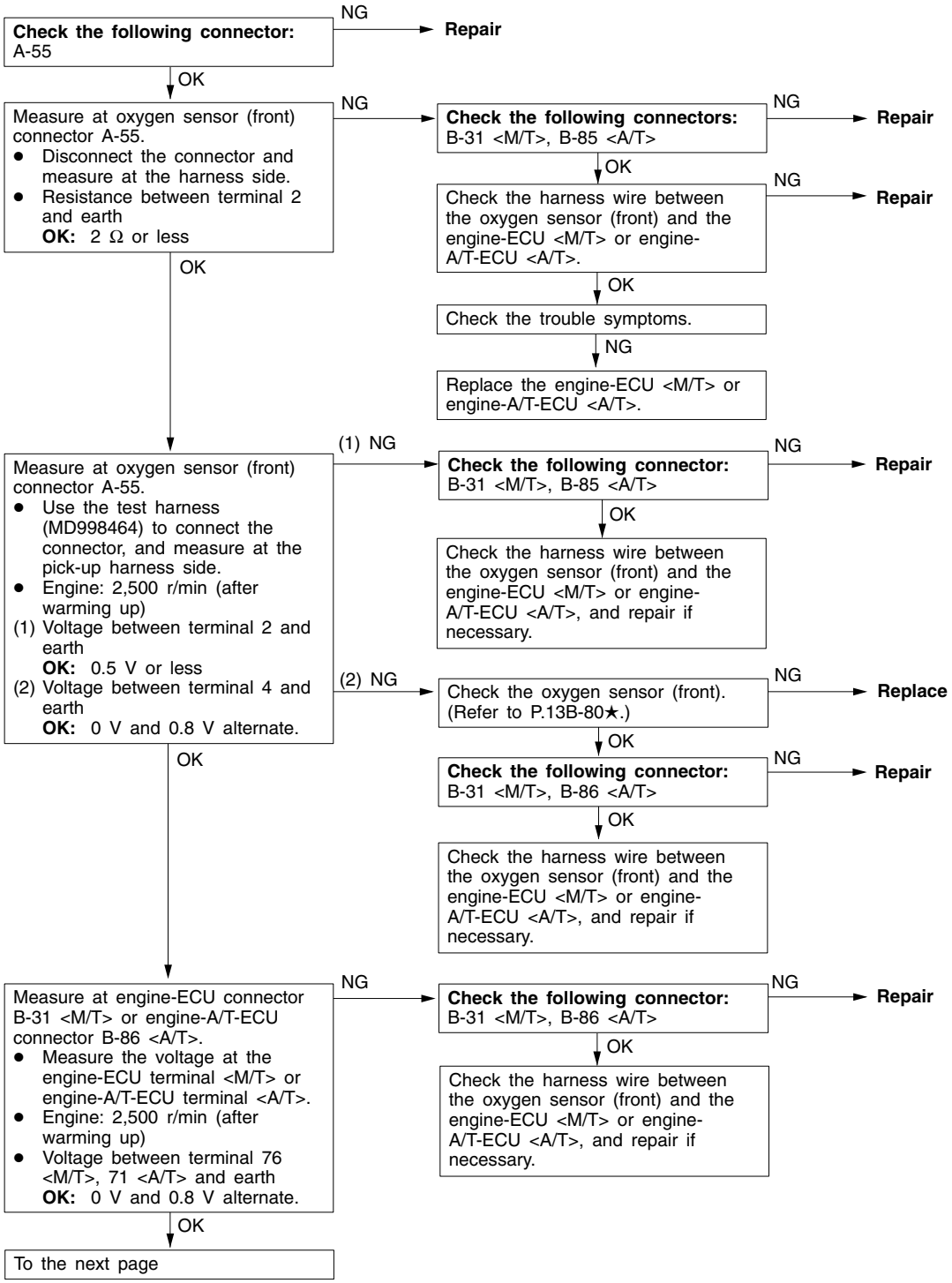


NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

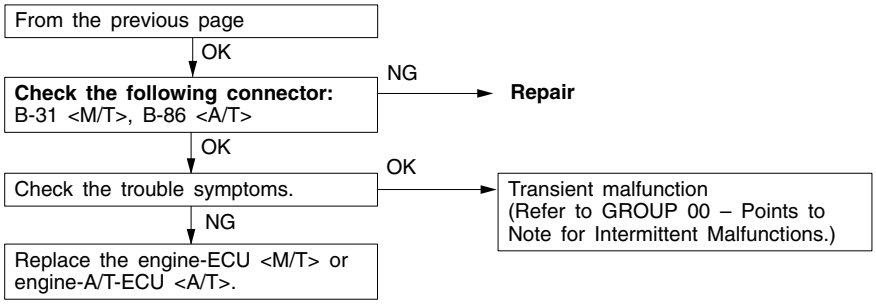


NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

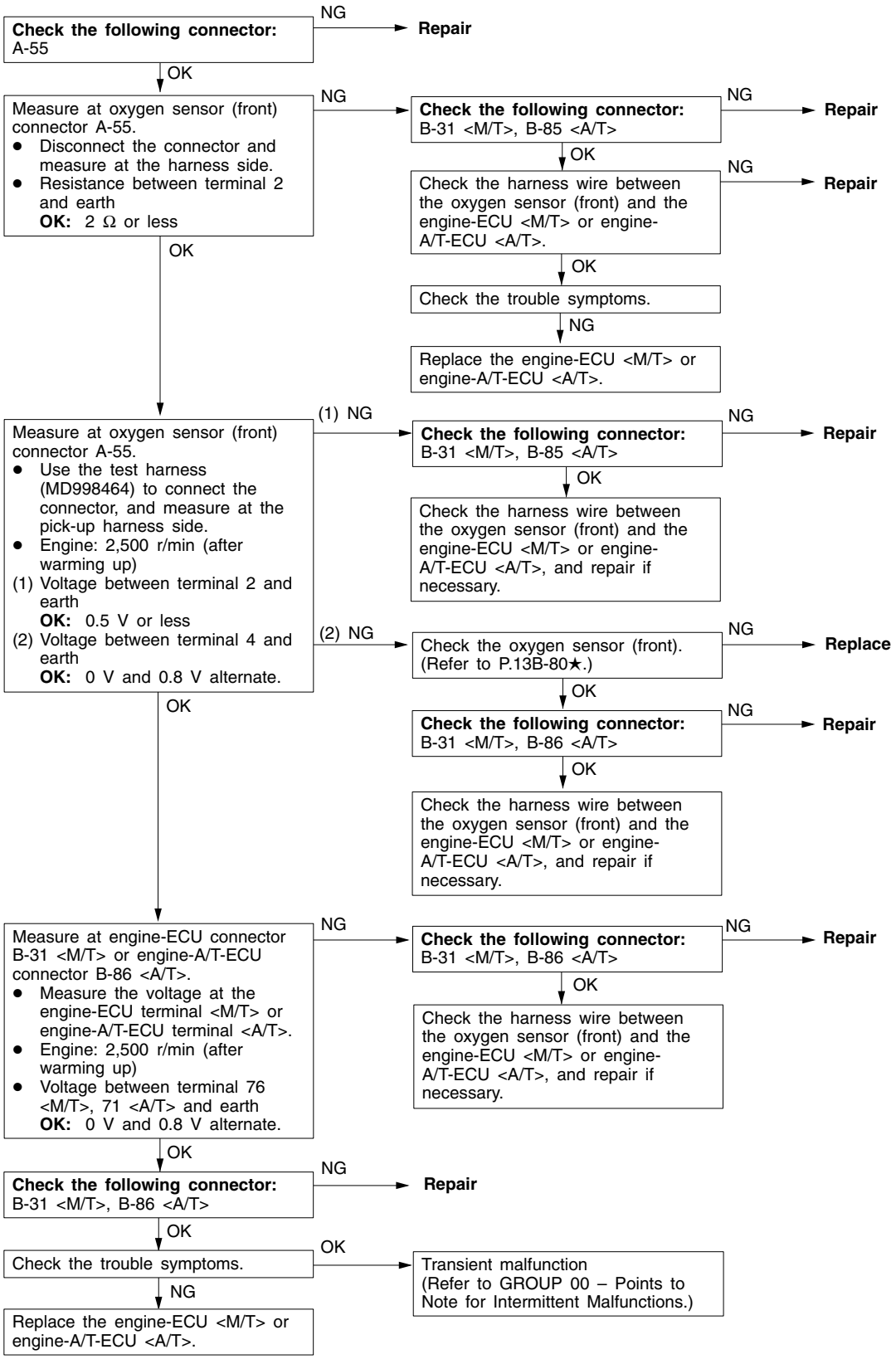
Code No. P0125 Feedback system	Probable cause
Range of Check ● The engine coolant temperature is approx. 80°C or more. ● During stoichiometric feedback control ● The vehicle is not being decelerated. Set Conditions ● Oxygen sensor (front) output voltage has been higher or lower than 0.5 V for at least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



NOTE:
★: Refer to the 2001 SPACE STAR Workshop Manual (Pub. No. CMXE99E1-A)

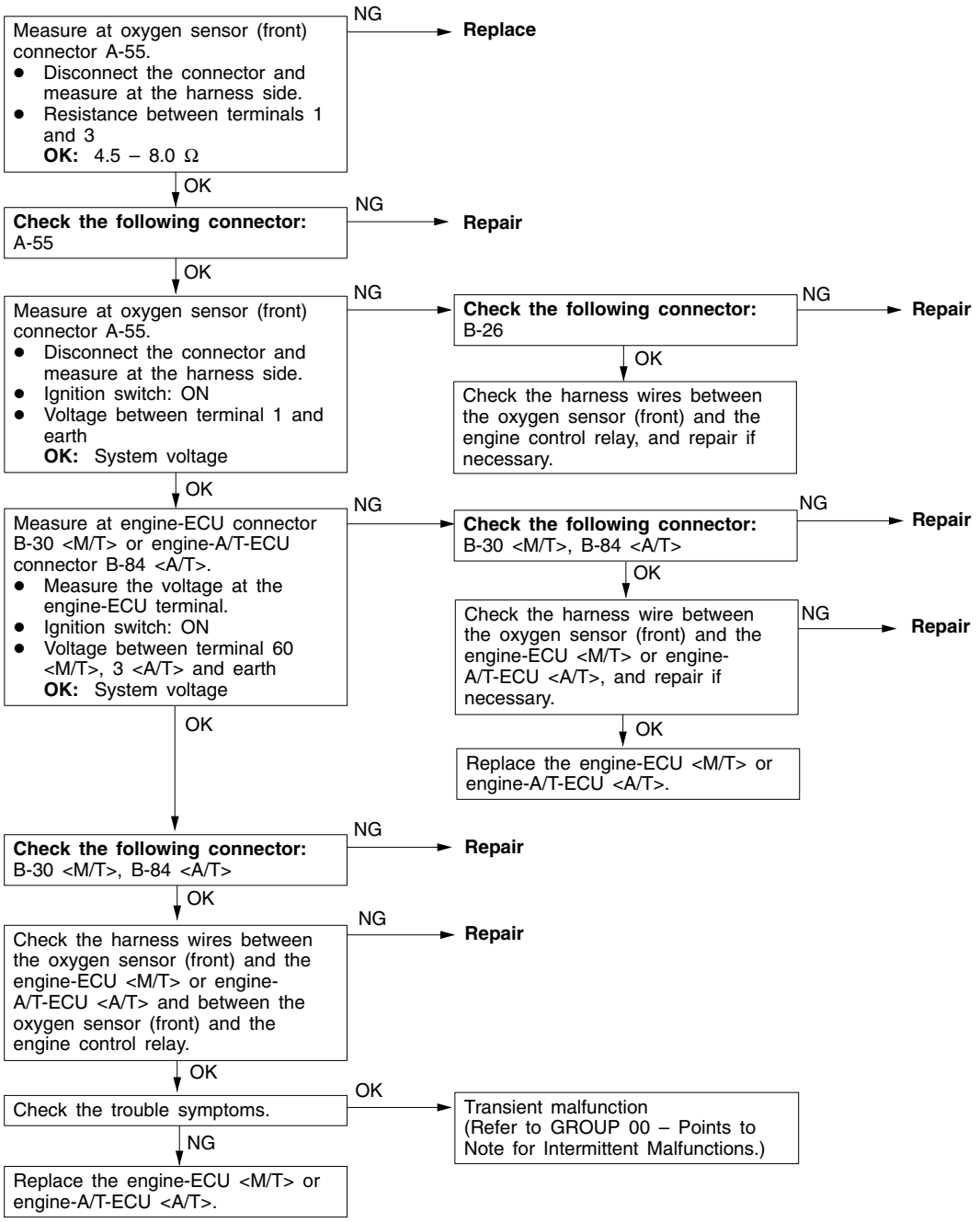


Code No. P0130 Oxygen sensor (front) system <sensor 1>	Probable cause
Range of Check ● Three minutes have been passed since the engine has been started. ● The engine coolant temperature is approx. 80°C or more. ● Intake air temperature is 20 – 50°C ● Engine speed is 1,200 r/min or more ● Driving on a 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 <M/T> ● Malfunction of the engine-A/T-ECU <A/T>
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.	

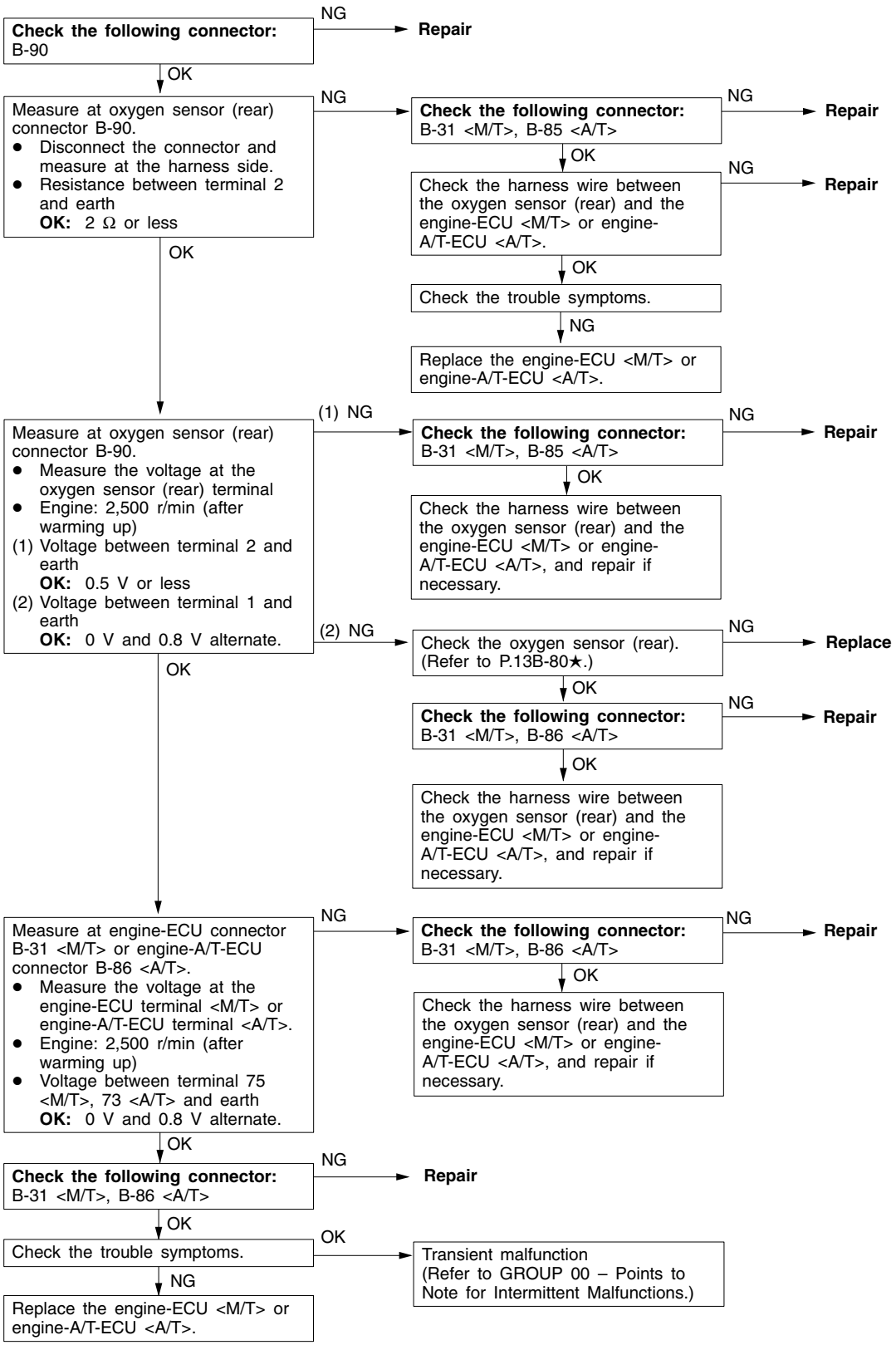


NOTE:
★: Refer to the 2001 SPACE STAR Workshop Manual (Pub. No. CMXE99E1-A)

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

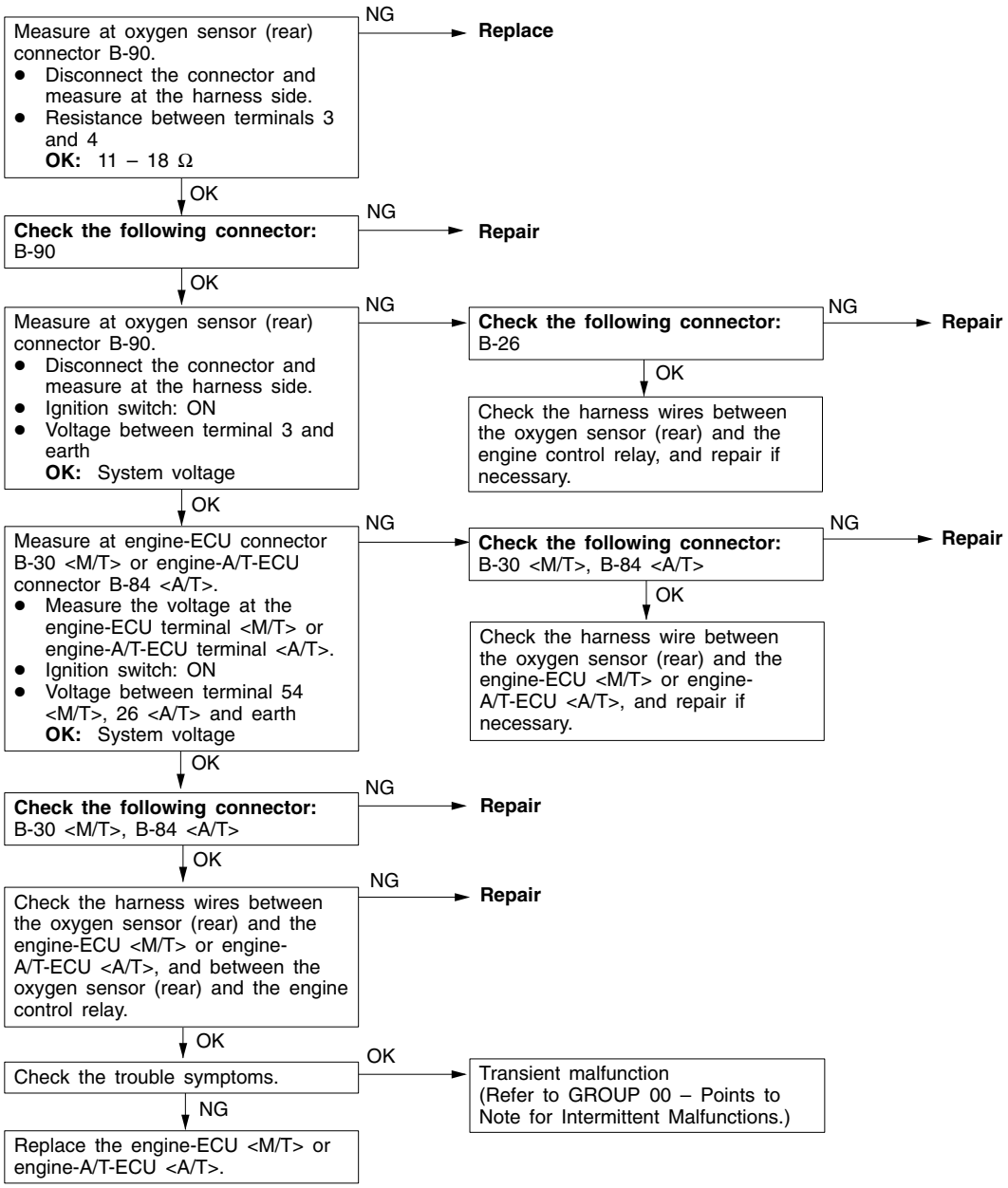


Code No. P0136 Oxygen sensor (rear) system <sensor 2>	Probable cause
Range of Check ● Three minutes have been passed since the engine has been started. ● The engine coolant temperature is approx. 80°C or more. ● Intake air temperature is 20 – 50°C ● Engine speed is 1,200 r/min or more ● Driving on a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

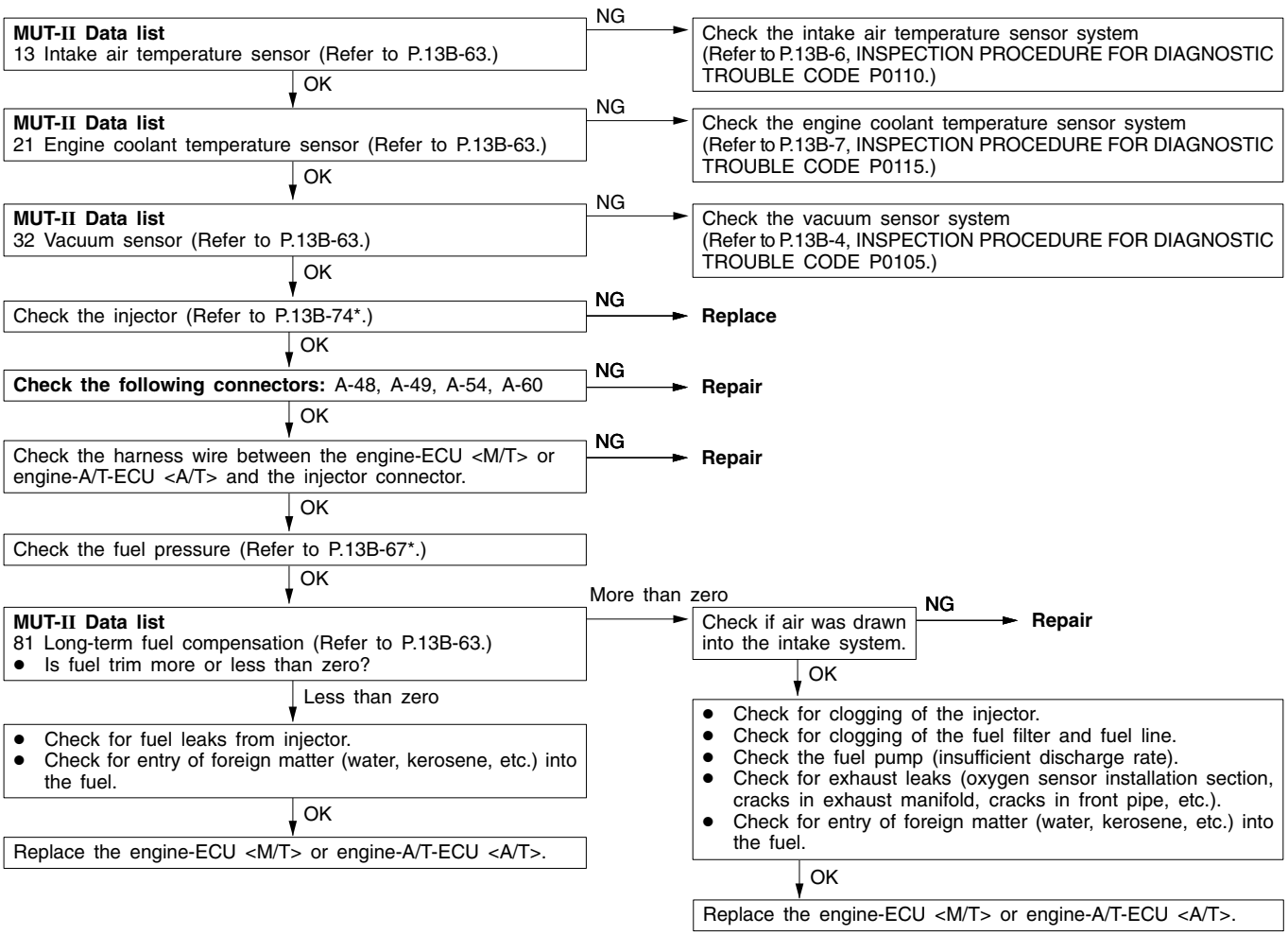


NOTE:
★: Refer to the 2001 SPACE STAR Workshop Manual (Pub. No. CMXE99E1-A)

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

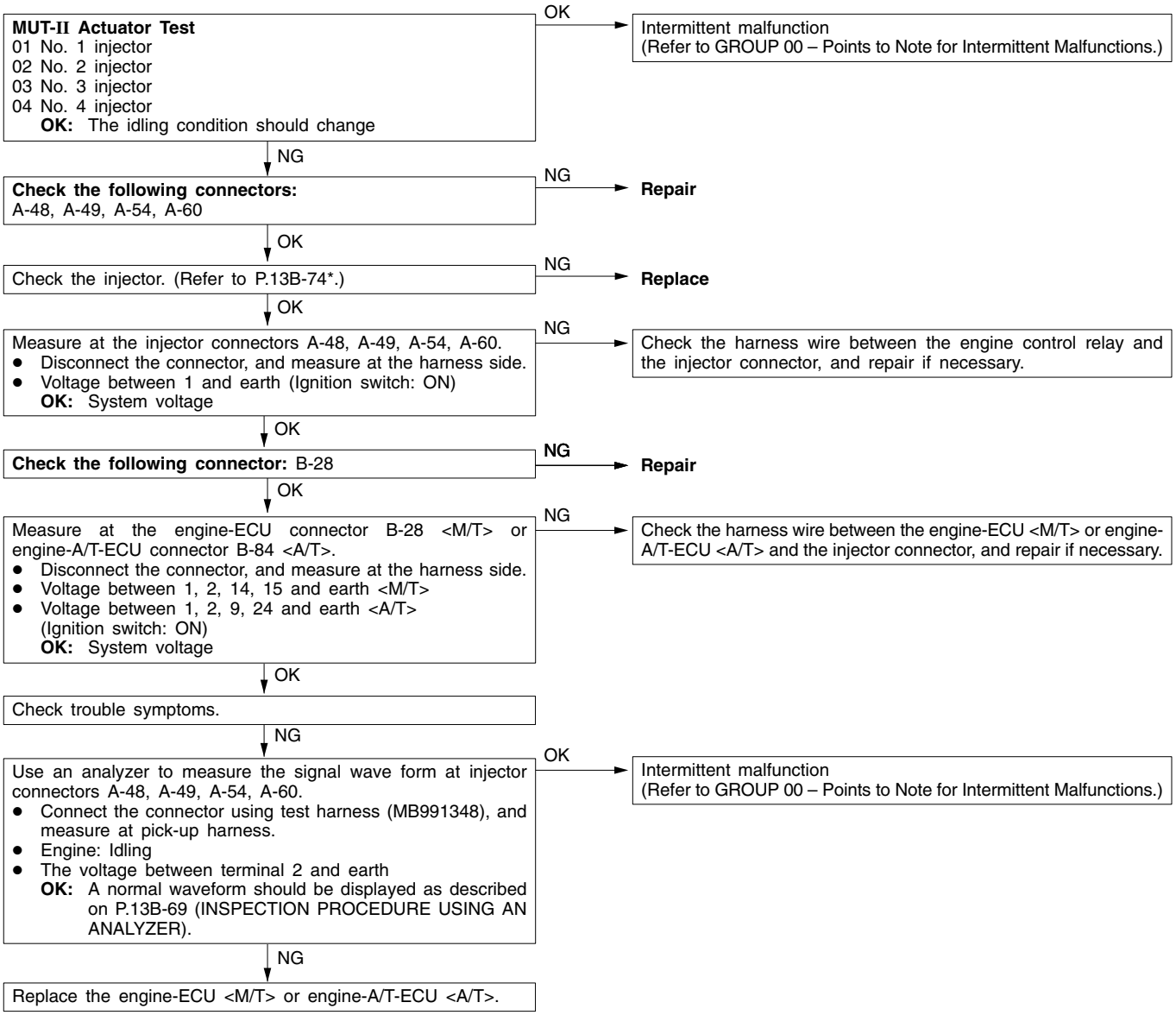


Code No. P0170 Abnormal fuel system	Probable cause
Range of Check ● Engine: Being learning the air-fuel ratio Set Conditions ● Two seconds or more have been passed while the fuel injection amount compensation value is too low. or ● Two seconds or more have been passed while the fuel injection amount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



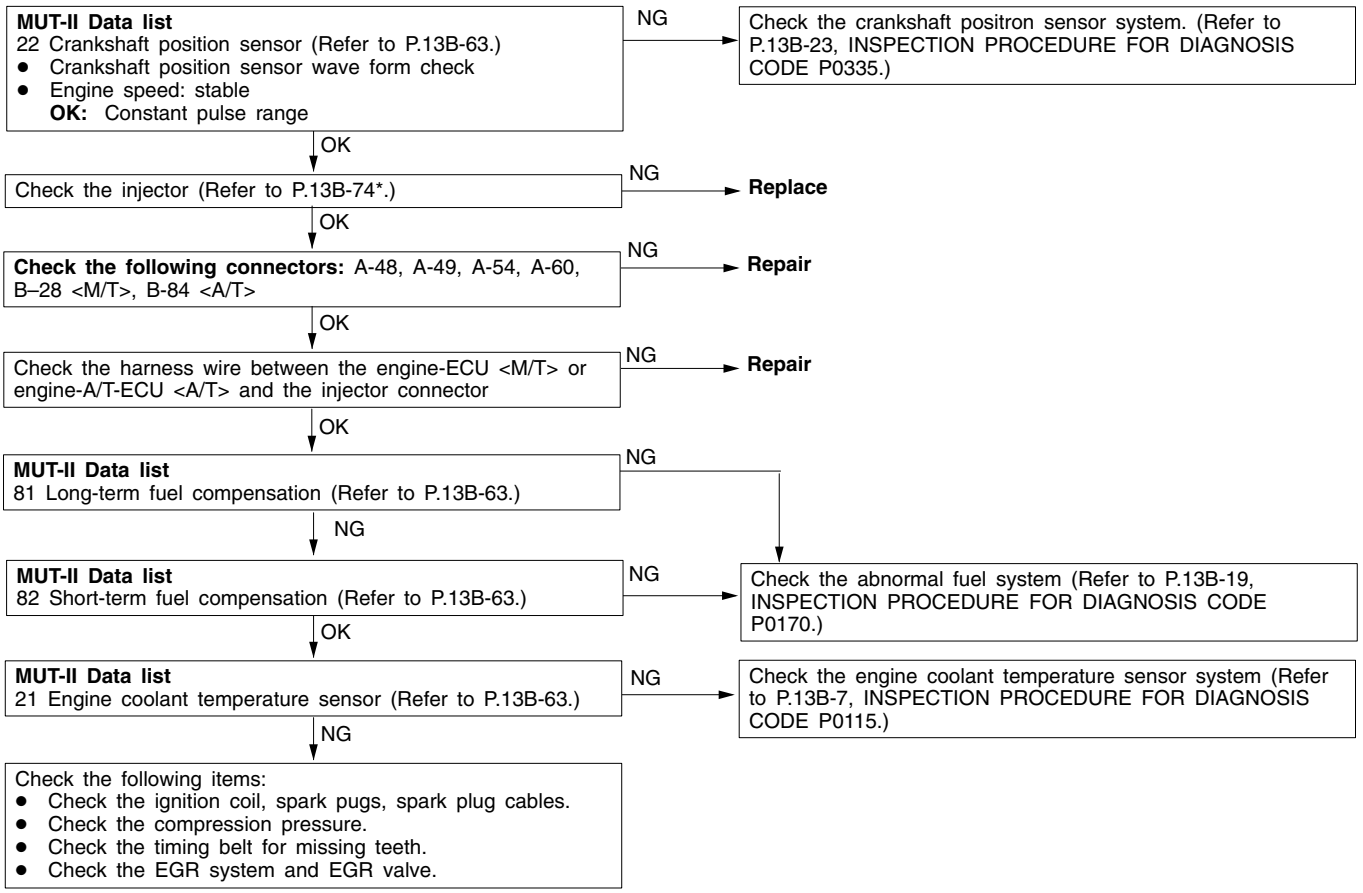
NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

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



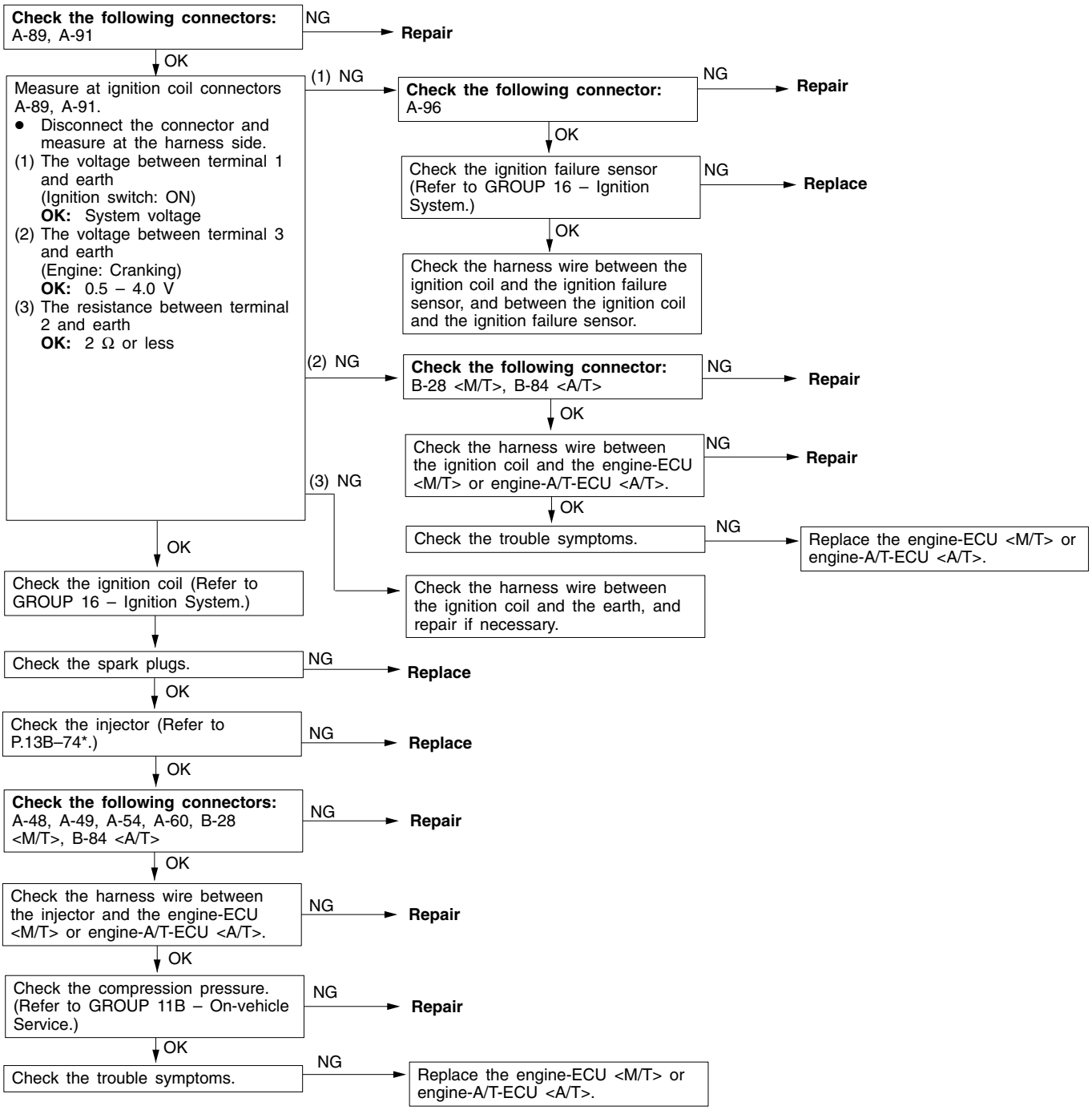
NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

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 misfire exceeds a predetermined number per 200 engine revolutions. ● The number of misfire 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 <M/T> ● Malfunction of the engine-A/T-ECU <A/T>



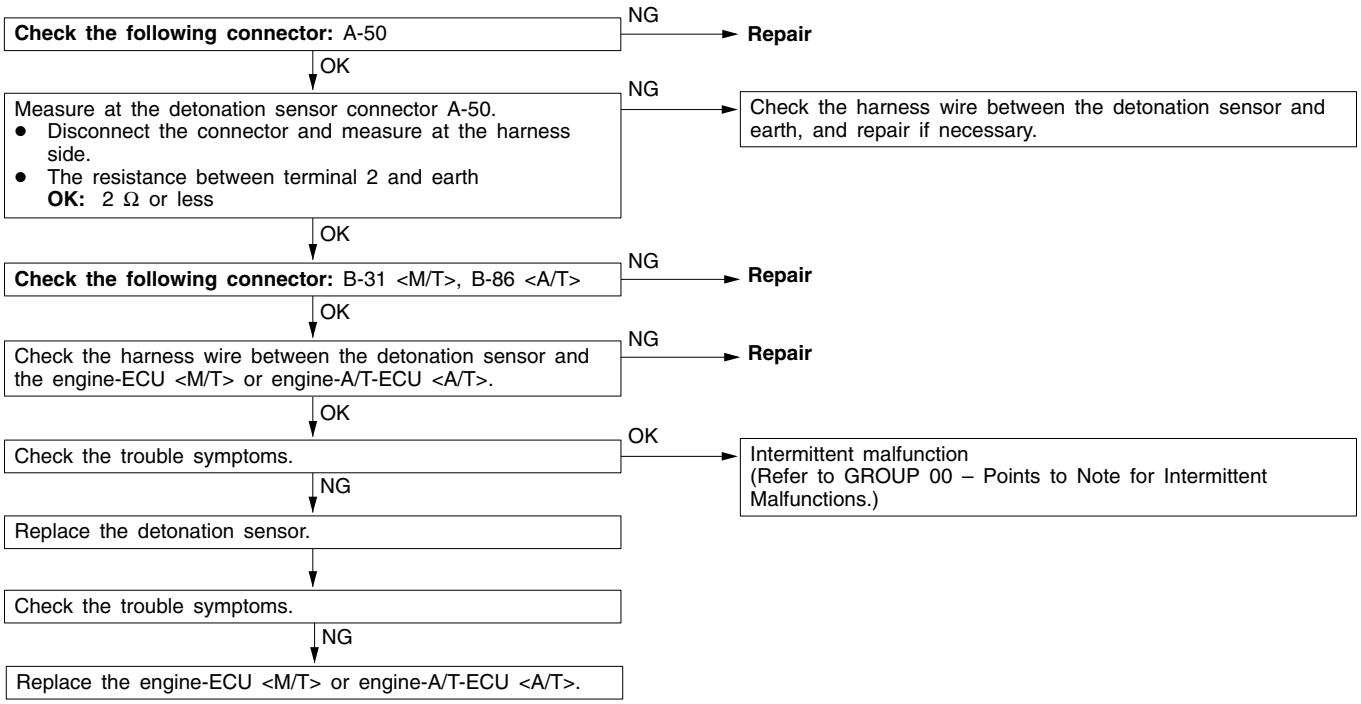
NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

Code No. P0301 No. 1 cylinder misfire detected Code No. P0302 No. 2 cylinder misfire detected Code No. P0303 No. 3 cylinder misfire detected Code No. P0304 No. 4 cylinder misfire detected	Probable cause
Range of Check • The engine speed is 500 – 4,500 r/min. • While the engine is running except deceleration and sudden acceleration. Set Conditions • The number of misfires exceeds a predetermined number per 200 engine revolutions (Misfire has occurred in only one cylinder). or • The number of misfires exceeds a predetermined number per 1,000 engine revolutions (Misfire has occurred in only one cylinder).	• Malfunction of the ignition system • Abnormal compression • Malfunction of injector • Malfunction of engine-ECU <M/T> • Malfunction of the engine-A/T-ECU <A/T>

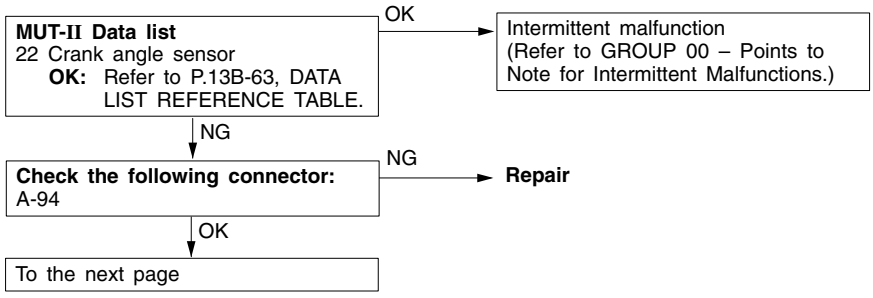


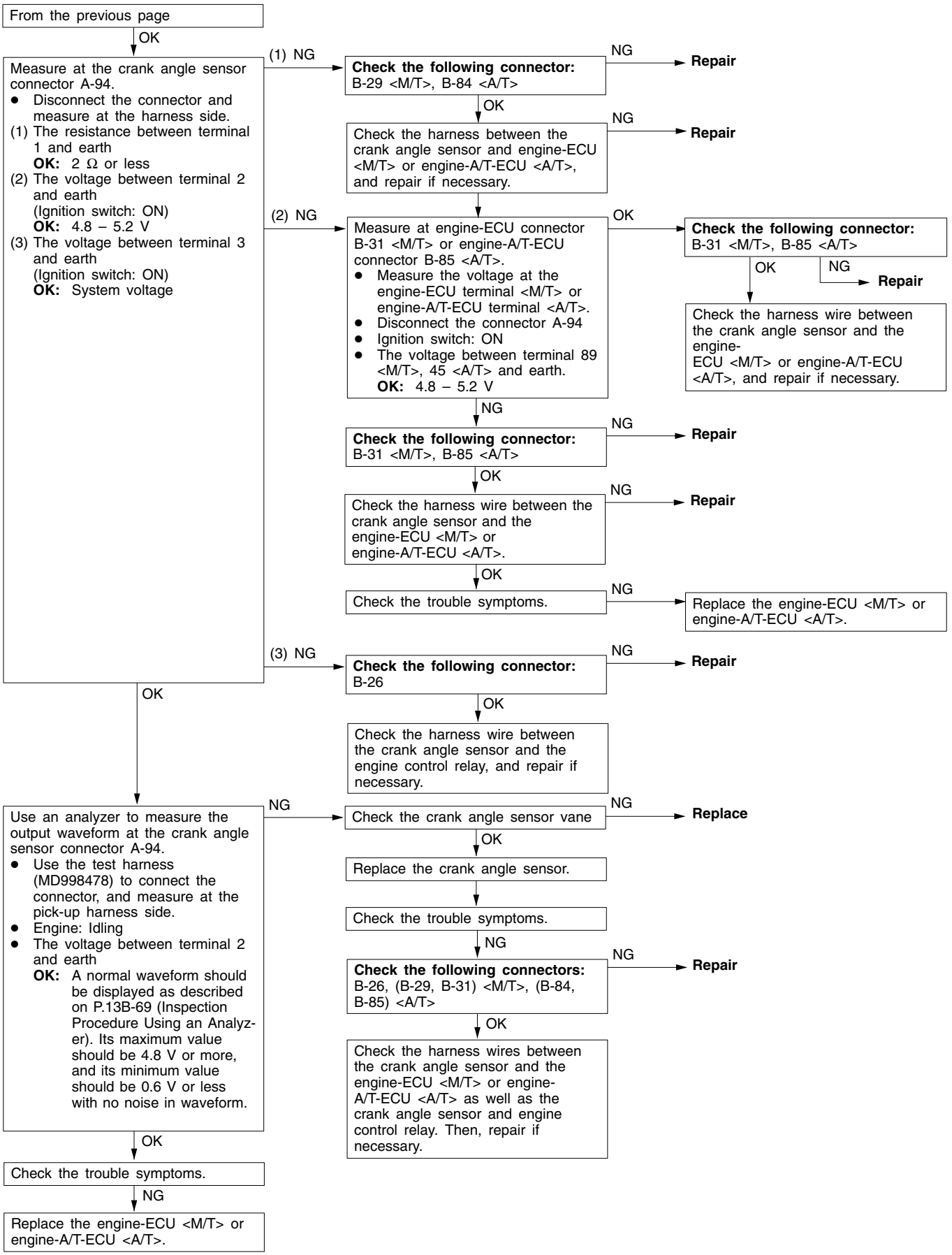
NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

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

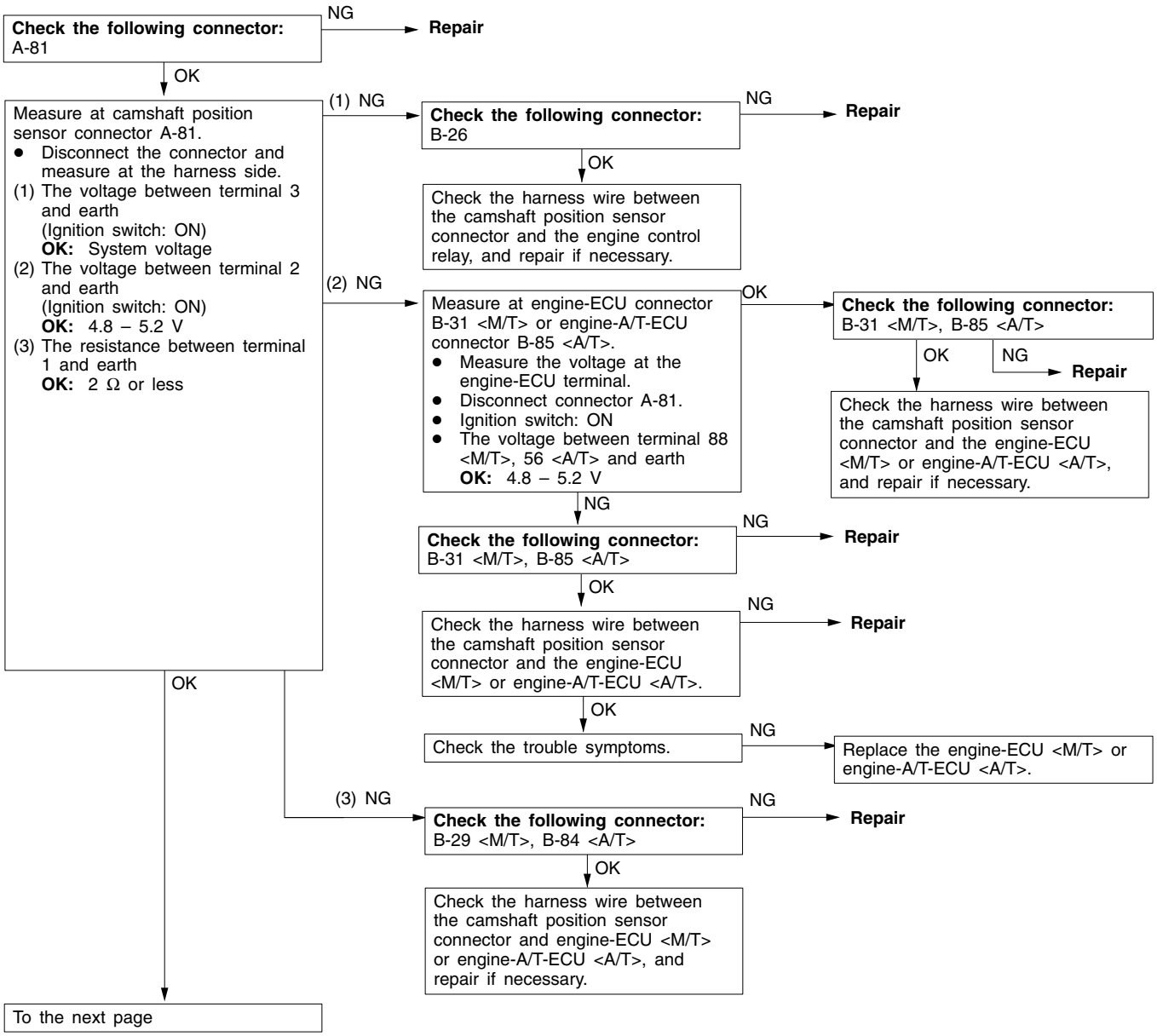


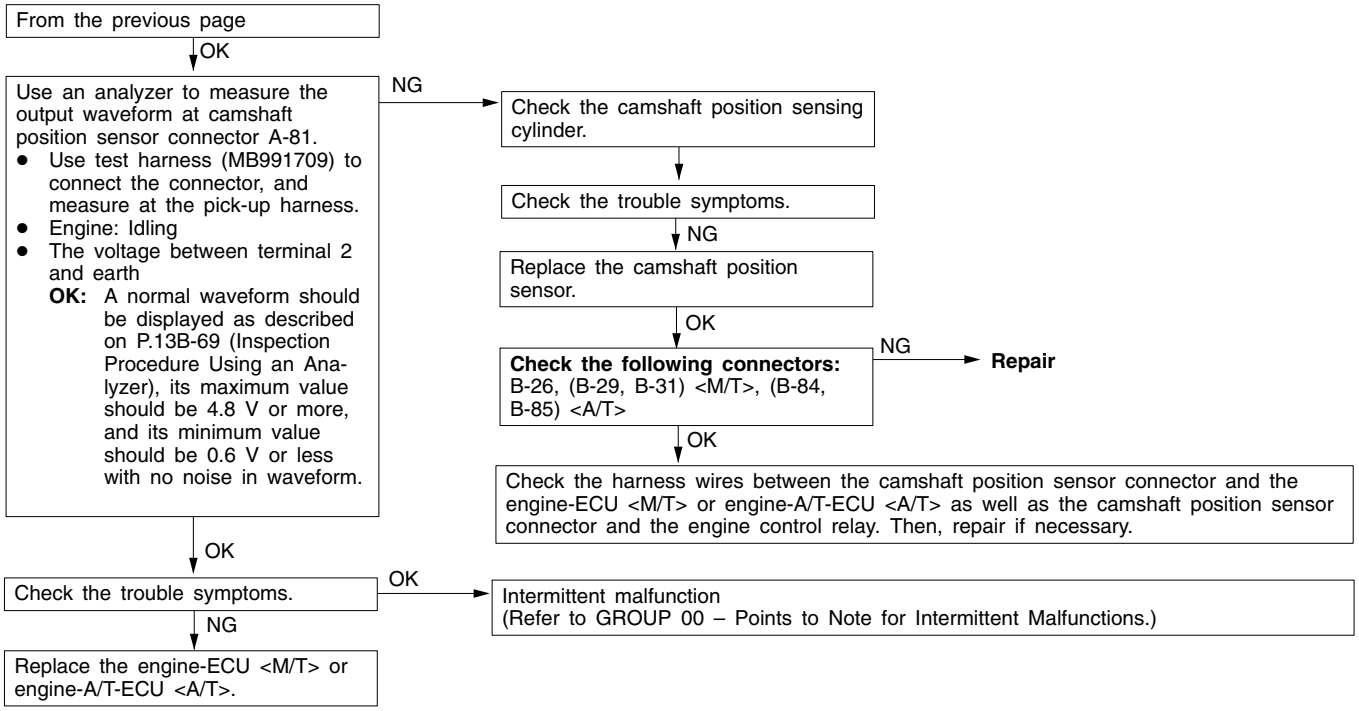
Code No. P0335 Crank angle sensor system	Probable cause
Range of Check ● Engine is cranking Set Conditions ● Sensor output voltage does not change for 2 seconds (no pulse signal input).	● Malfunction of the crank angle sensor. ● Open or short circuit in the crank angle sensor circuit or loose connector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




From the previous page
OK
Measure at the crank angle sensor connector A-94.
● Disconnect the connector and measure at the harness side.
(1) The resistance between terminal 1 and earth
OK: 2 Ω or less
(2) The voltage between terminal 2 and earth
(Ignition switch: ON)
OK: 4.8 – 5.2 V
(3) The voltage between terminal 3 and earth
(Ignition switch: ON)
OK: System voltage
(1) NG
Check the following connector: B-29 <M/T>, B-84 <A/T>
NG
Repair
OK
Check the harness between the crank angle sensor and engine-ECU <M/T> or engine-A/T-ECU <A/T>, and repair if necessary.
NG
Repair
(2) NG
Measure at engine-ECU connector B-31 <M/T> or engine-A/T-ECU connector B-85 <A/T>.
● Measure the voltage at the engine-ECU terminal <M/T> or engine-A/T-ECU terminal <A/T>.
● Disconnect the connector A-94
● Ignition switch: ON
● The voltage between terminal 89 <M/T>, 45 <A/T> and earth.
OK: 4.8 – 5.2 V
OK
Check the following connector: B-31 <M/T>, B-85 <A/T>
OK
NG
Repair
Check the harness wire between the crank angle sensor and the engine-ECU <M/T> or engine-A/T-ECU <A/T>, and repair if necessary.
NG
Check the following connector: B-31 <M/T>, B-85 <A/T>
NG
Repair
OK
Check the harness wire between the crank angle sensor and the engine-ECU <M/T> or engine-A/T-ECU <A/T>.
NG
Repair
OK
Check the trouble symptoms.
NG
Replace the engine-ECU <M/T> or engine-A/T-ECU <A/T>.
(3) NG
Check the following connector: B-26
NG
Repair
OK
Check the harness wire between the crank angle sensor and the engine control relay, and repair if necessary.
OK
Use an analyzer to measure the output waveform at the crank angle sensor connector A-94.
● Use the test harness (MD998478) to connect the connector, and measure at the pick-up harness side.
● Engine: Idling
● The voltage between terminal 2 and earth
OK: A normal waveform should be displayed as described on P.13B-69 (Inspection Procedure Using an Analyzer). Its maximum value should be 4.8 V or more, and its minimum value should be 0.6 V or less with no noise in waveform.
NG
Check the crank angle sensor vane
NG
Replace
OK
Replace the crank angle sensor.
Check the trouble symptoms.
NG
Check the following connectors: B-26, (B-29, B-31) <M/T>, (B-84, B-85) <A/T>
NG
Repair
OK
Check the harness wires between the crank angle sensor and the engine-ECU <M/T> or engine-A/T-ECU <A/T> as well as the crank angle sensor and engine control relay. Then, repair if necessary.
OK
Check the trouble symptoms.
NG
Replace the engine-ECU <M/T> or 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 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 <M/T> ● Malfunction of the engine-A/T-ECU <A/T>

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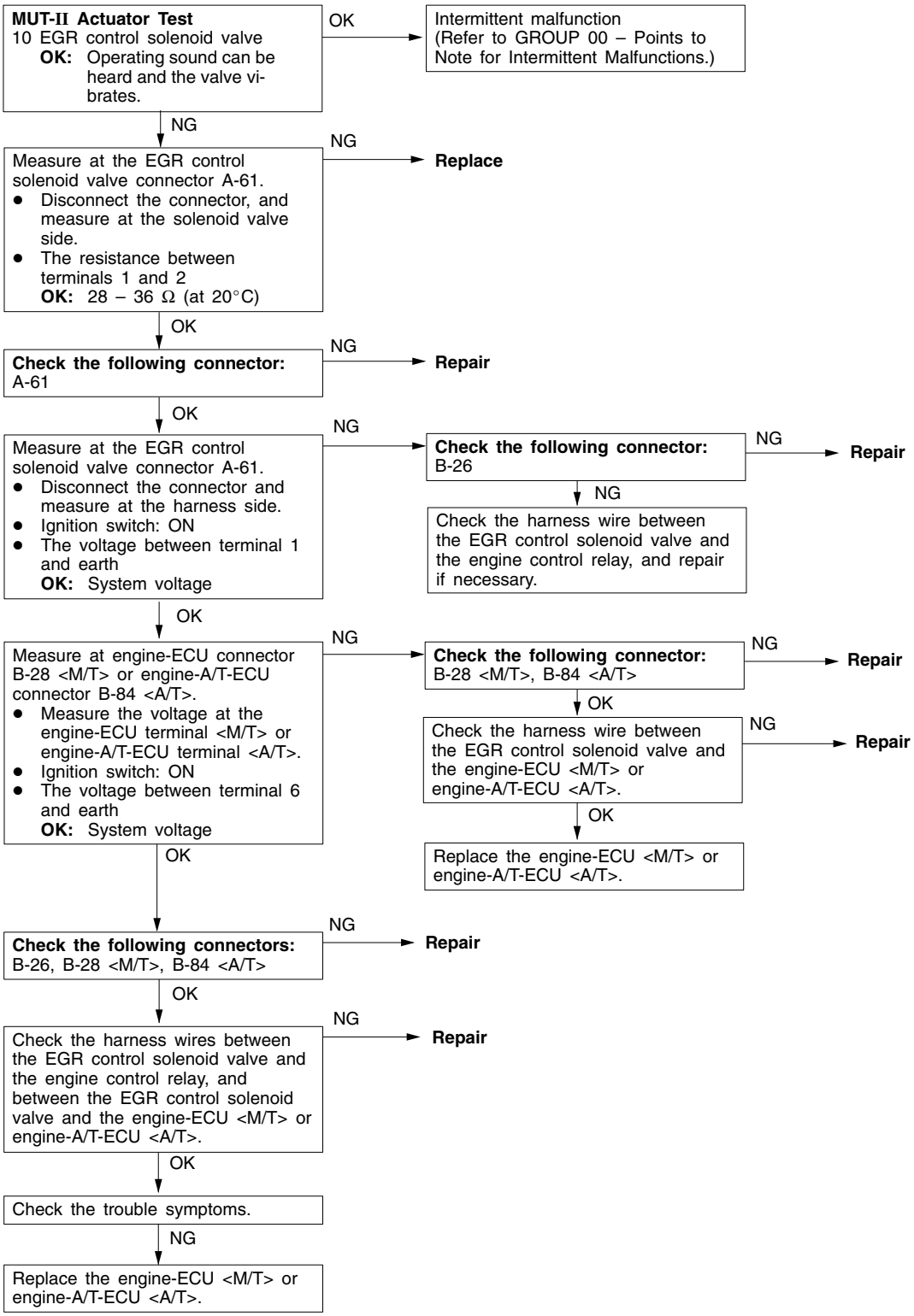
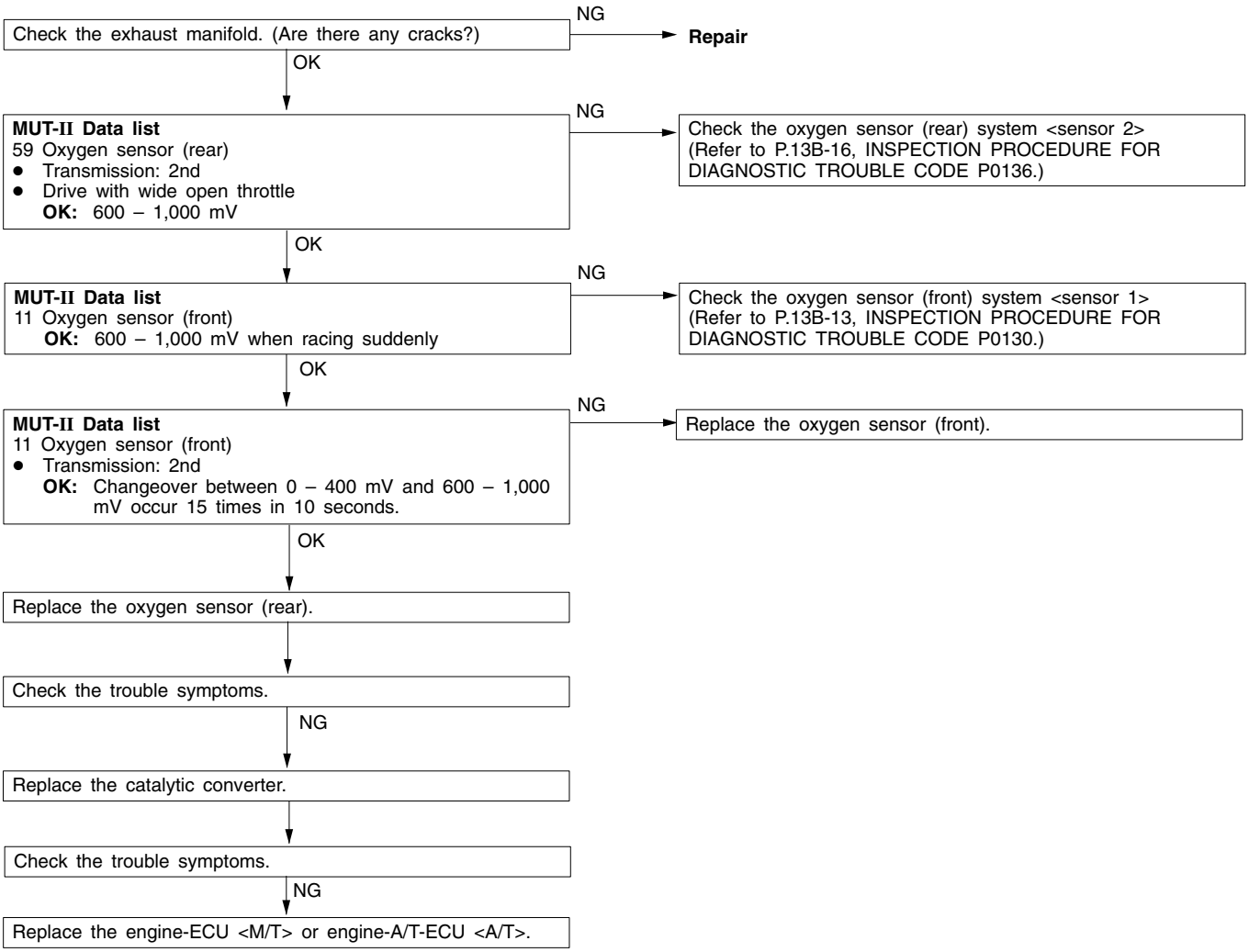
OK
Use an analyzer to measure the output waveform at camshaft position sensor connector A-81.
● Use test harness (MB991709) to connect the connector, and measure at the pick-up harness.
● Engine: Idling
● The voltage between terminal 2 and earth
OK: A normal waveform should be displayed as described on P.13B-69 (Inspection Procedure Using an Analyzer), its maximum value should be 4.8 V or more, and its minimum value should be 0.6 V or less with no noise in waveform.
NG
Check the camshaft position sensing cylinder.
Check the trouble symptoms.
NG
Replace the camshaft position sensor.
OK
Check the following connectors: B-26, (B-29, B-31) <M/T>, (B-84, B-85) <A/T>
NG
Repair
OK
Check the harness wires between the camshaft position sensor connector and the engine-ECU <M/T> or engine-A/T-ECU <A/T> as well as the camshaft position sensor connector and the engine control relay. Then, repair if necessary.
OK
Check the trouble symptoms.
OK
Intermittent malfunction
(Refer to GROUP 00 – Points to Note for Intermittent Malfunctions.)
NG
Replace the engine-ECU <M/T> or engine-A/T-ECU <A/T>.

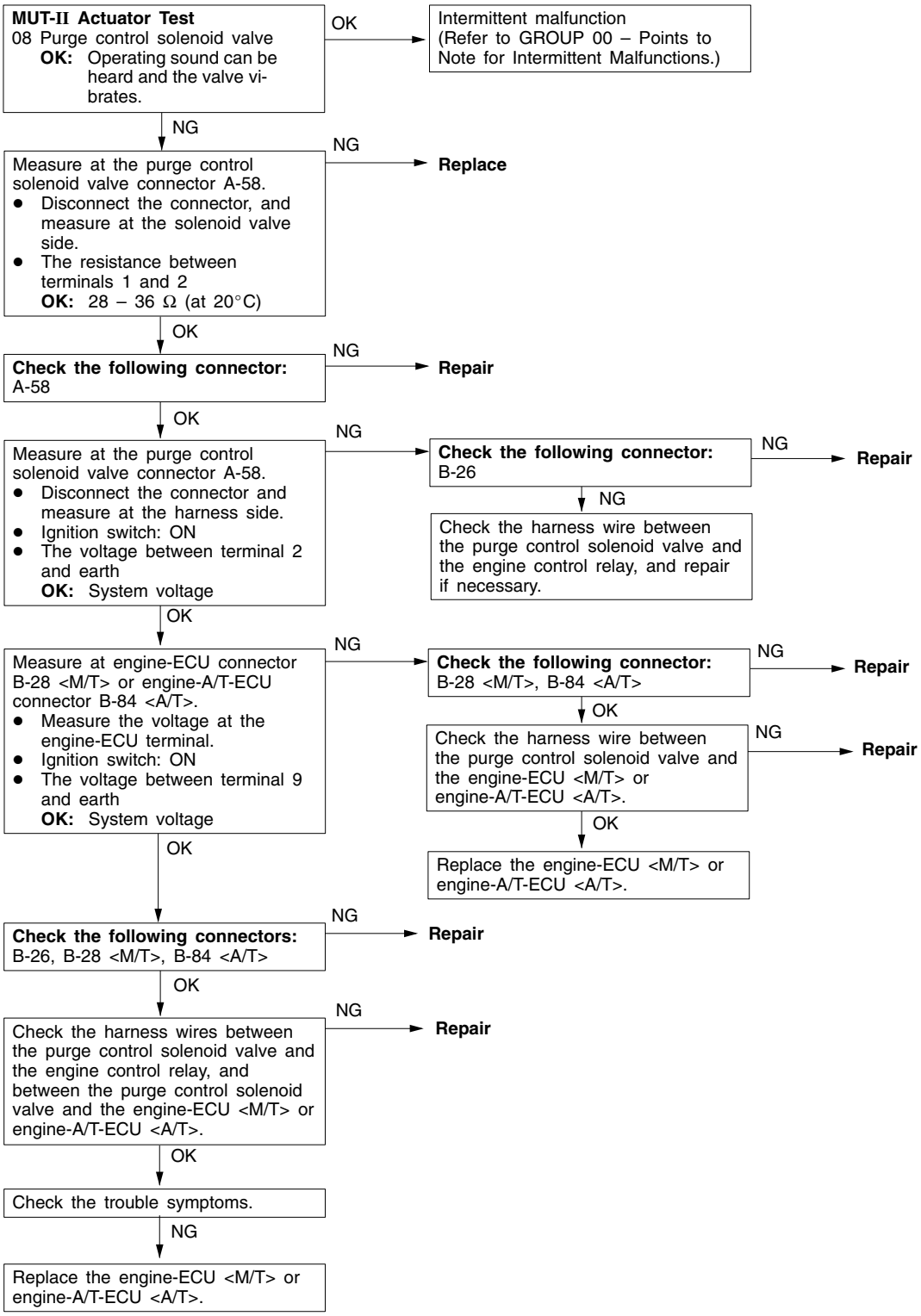
Code No. P0403 EGR control solenoid valve system	Probable cause
Range of Check • Ignition switch: ON • Battery voltage is 10 V or more. Set Conditions • The solenoid coil surge voltage (battery voltage + 2 V) is not detected when the EGR control solenoid valve is turned from on to off.	• Malfunction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



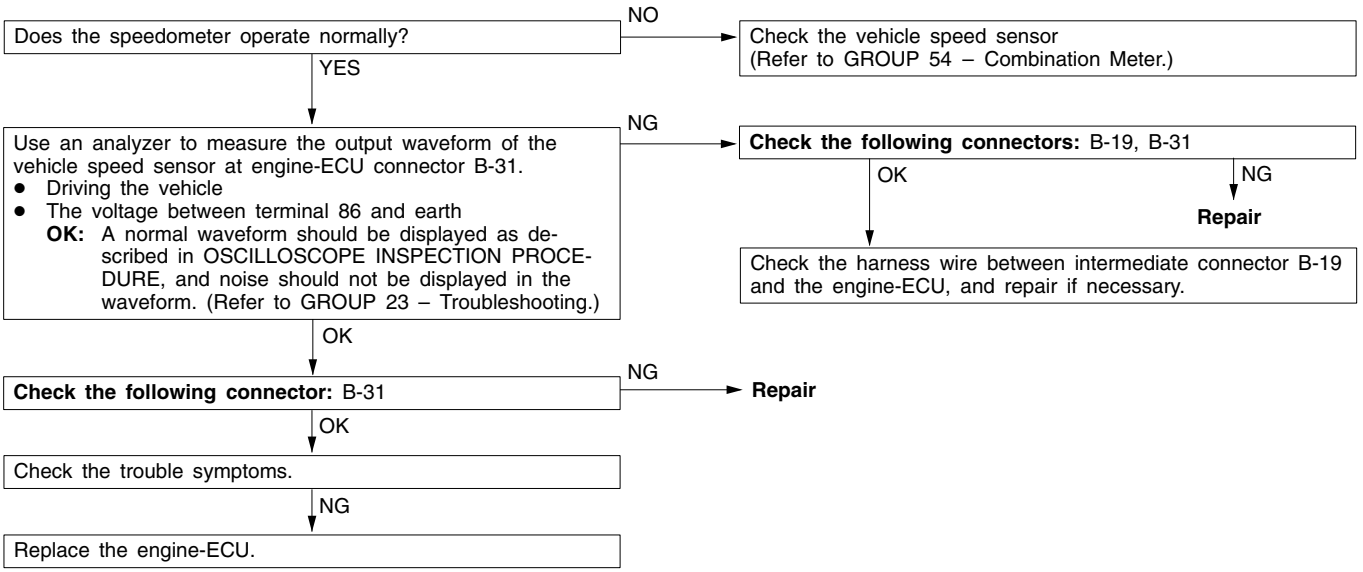
Code No. P0421 Catalyst malfunction	Probable cause
Range of Check ● The engine speed is 4,000 r/min or less. ● During driving ● During air/fuel ratio feedback control Set Conditions ● The ratio between the oxygen sensor (rear) and the oxygen sensor (front) output frequencies reaches 0.8 per 10 seconds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



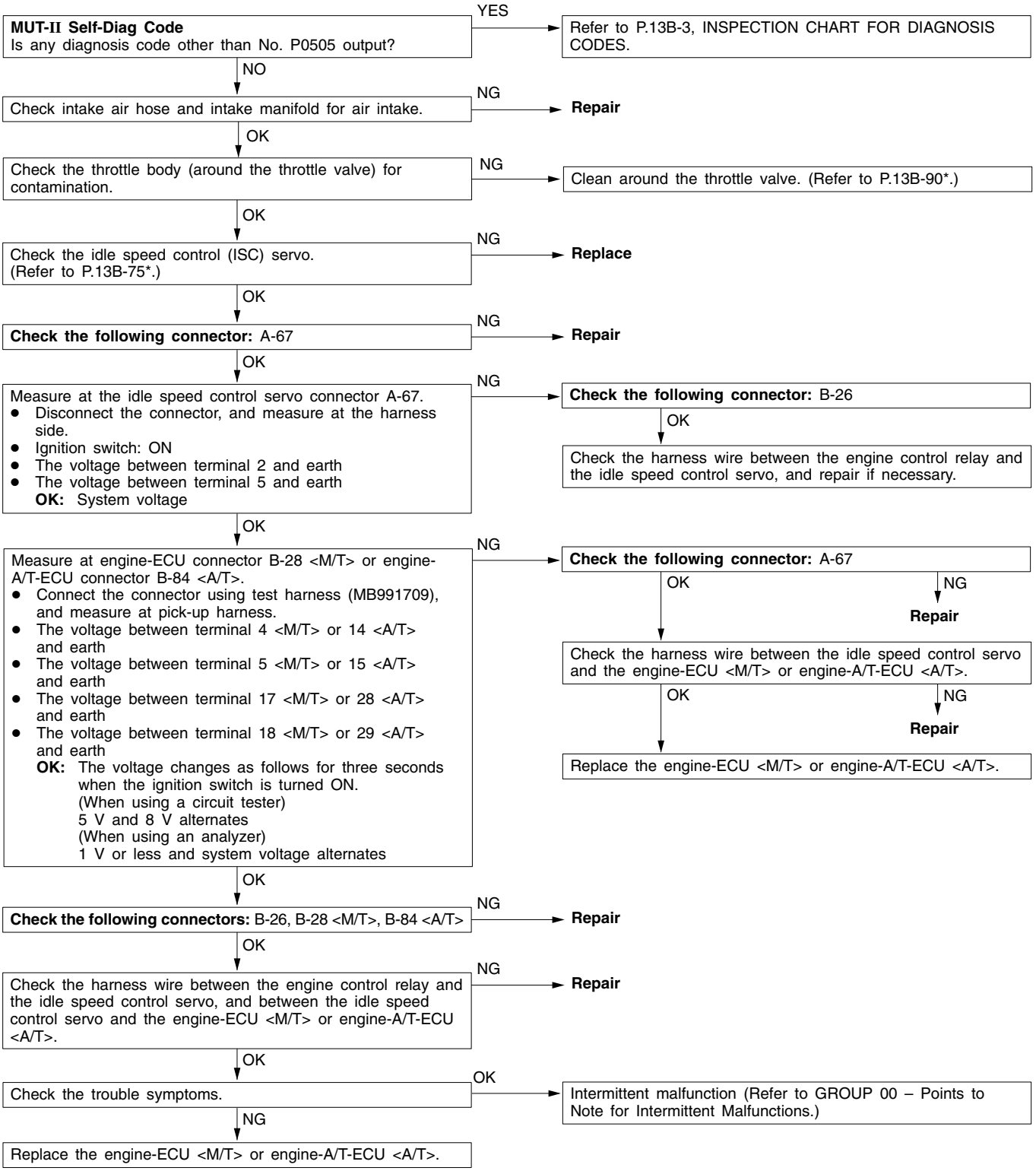
Code No. P0443 Purge control solenoid valve system	Probable cause
Range of Check • Ignition switch: ON • Battery voltage is 10 V or more. Set Conditions • The solenoid coil surge voltage (battery voltage + 2 V) is not detected when the purge control solenoid valve is turned from on to off.	• Malfunction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



Code No. P0500 Vehicle speed sensor system <M/T>	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

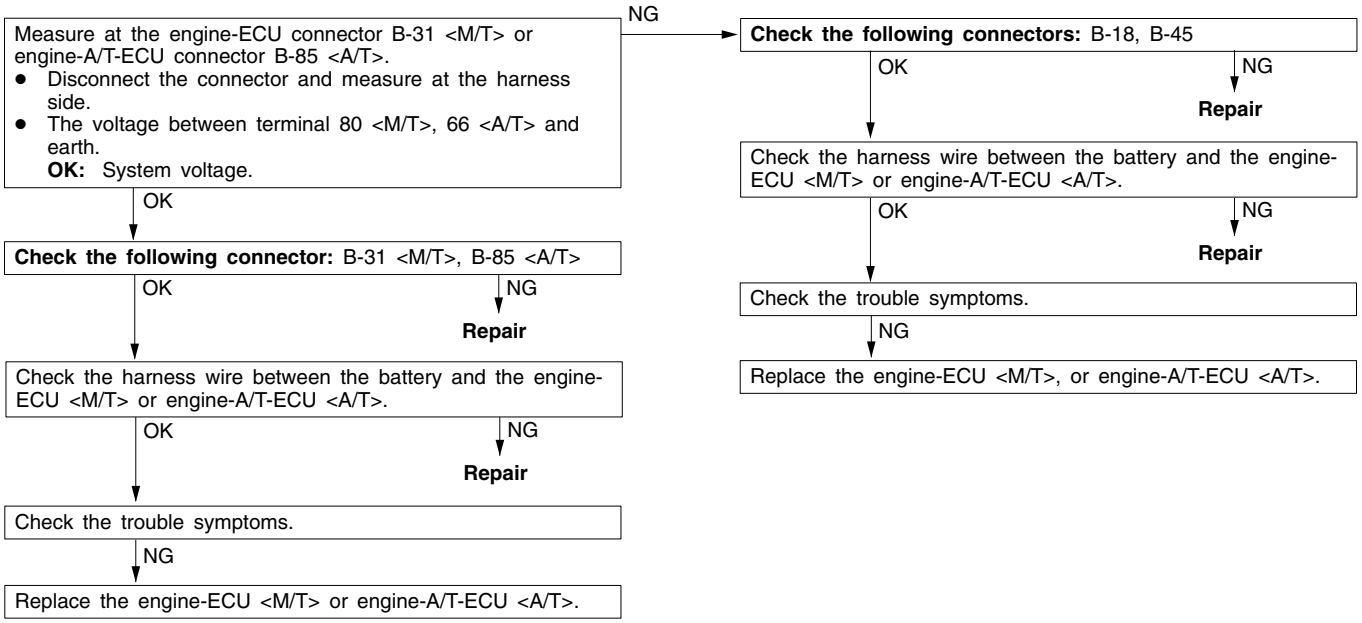


Code No. P0505 Idle speed control (ISC) system	Probable cause
Check Area ● Vehicle speed has reached 1.5 km/h at least once. ● Under the closed loop idle speed control. Judgment Criteria ● Actual idle speed has continued to be higher than the target idle speed by 300 r/min or more for 10 sec. Check Area ● 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 <M/T> ● Malfunction of the engine-A/T-ECU <A/T>



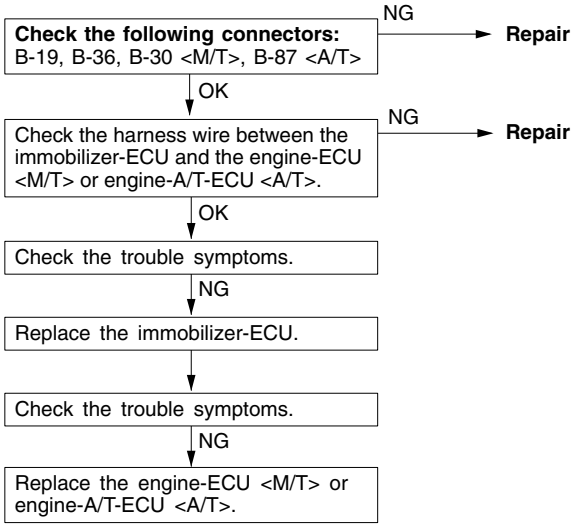
NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

Code No. P1603 Battery back-up line system	Probable cause
Range of Check • Ignition switch: ON Set Conditions • An open circuit was detected in the battery back-up line.	• Open or short circuit in the battery back-up line or loose connector contact • Malfunction of the engine-ECU <M/T> • Malfunction of the 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.



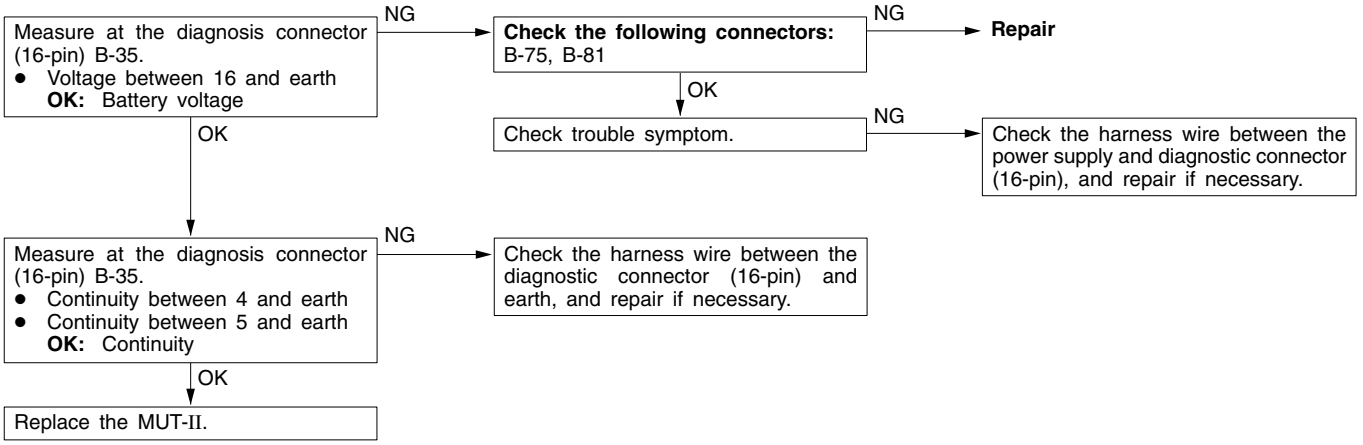
INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom		Inspection procedure No.	Reference page
Communication with MUT-II is impossible.	Communication with all systems is not possible.	1	13B-36
	Communication with engine-ECU only is not possible.	2	13B-36
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	13B-37
	The engine warning lamp remains illuminating and never goes out.	4	13B-37
Starting	No initial combustion (starting impossible)	5	13B-38
	Initial combustion but no complete combustion (starting impossible)	6	13B-39
	Long time to start (improper starting)	7	13B-40
Idling stability (Improper idling)	Unstable idling (Rough idling, hunting)	8	13B-41
	Idling speed is high. (Improper idling speed)	9	13B-43
	Idling speed is low. (Improper idling speed)	10	13B-43
Idling stability (Engine stalls)	When the engine is cold, it stalls at idling. (Die out)	11	13B-44
	When the engine becomes hot, it stalls at idling. (Die out)	12	13B-45
	The engine stalls when starting the car. (Pass out)	13	13B-47
	The engine stalls when decelerating.	14	13B-47
Driving	Hesitation, sag or stumble	15	13B-48
	The feeling of impact or vibration when accelerating	16	13B-49
	The feeling of impact or vibration when decelerating	17	13B-49
	Poor acceleration	18	13B-50
	Surge	19	13B-51
	Knocking	20	13B-52
Dieseling		21	13B-52
Too high CO and HC concentration when idling		22	13B-53
Fans (radiator fan, A/C condenser fan) are inoperative		23	13B-54

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

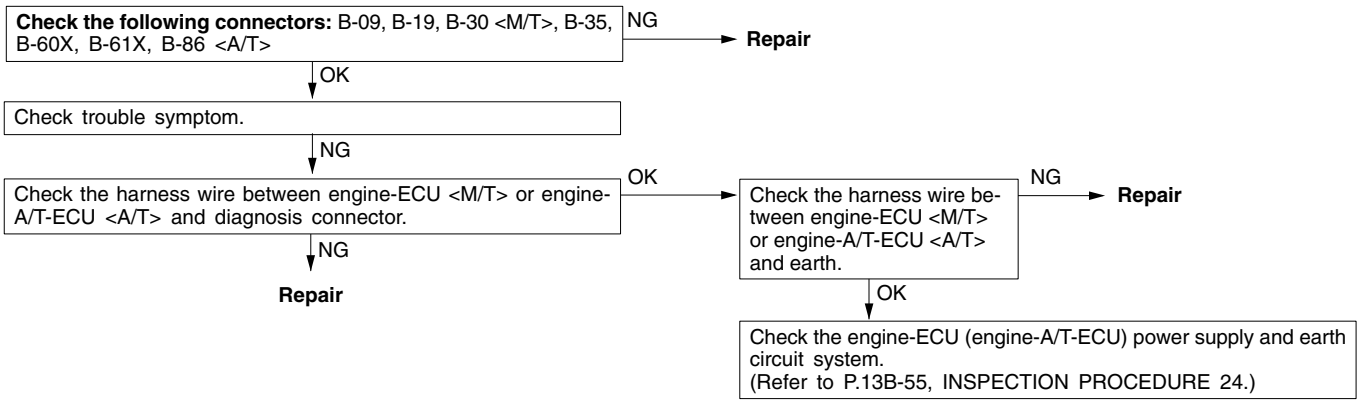
INSPECTION PROCEDURE 1

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

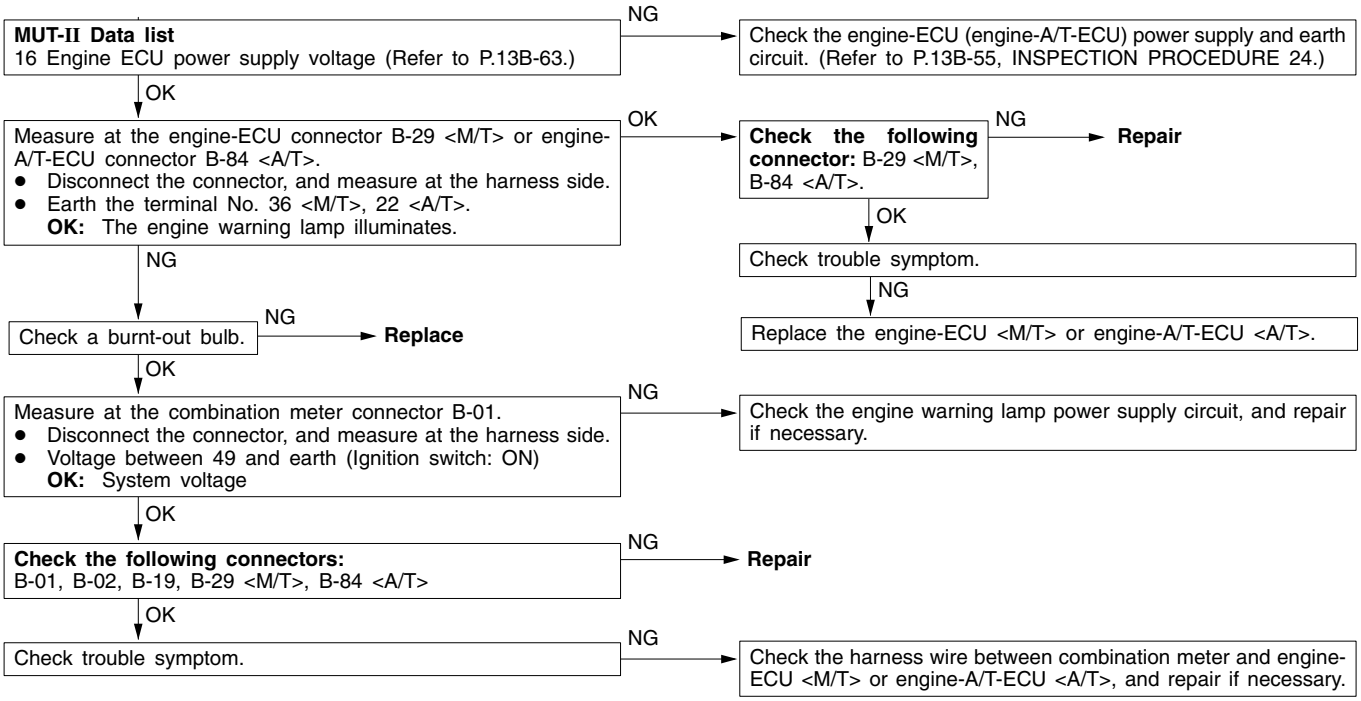
MUT-II communication with engine-ECU is impossible.	Probable cause
One of the following causes may be suspected: • No power supply to engine-ECU <M/T> or engine-A/T-ECU <A/T>. • Defective earth circuit of engine-ECU <M/T> or engine-A/T-ECU <A/T>. • Defective engine-ECU <M/T> or engine-A/T-ECU <A/T>. • 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 engine-ECU <M/T> or engine-A/T-ECU <A/T> 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.

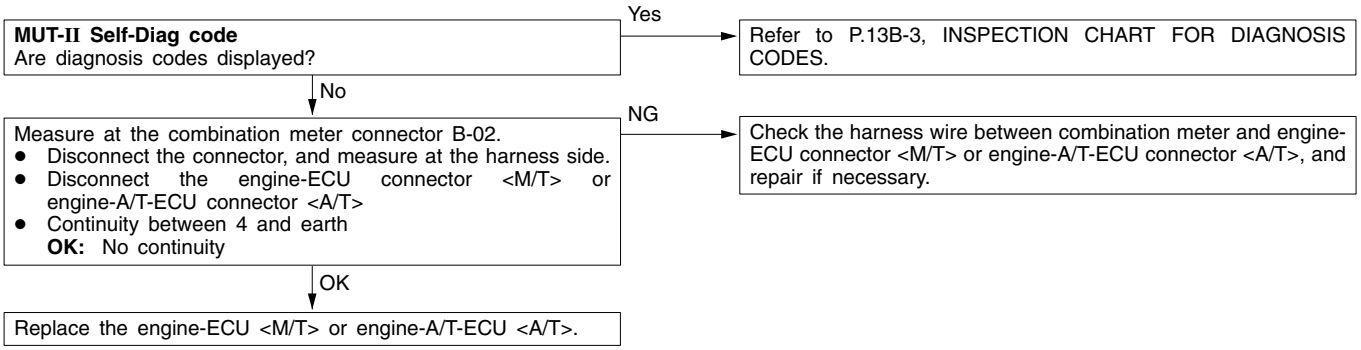
INSPECTION PROCEDURE 3

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 <M/T> or engine-A/T-ECU <A/T> causes the engine warning lamp to illuminate for five seconds immediately after the ignition switch is turned to ON. If the engine warning lamp does not illuminate immediately after the ignition switch is turned to ON, one of the malfunctions listed at right has probably occurred.	• Burnt-out bulb • Defective warning lamp circuit • Malfunction of the engine-ECU <M/T> • Malfunction of the engine-A/T-ECU <A/T>



INSPECTION PROCEDURE 4

The engine warning lamp remains illuminating and never goes out.	Probable cause
In cases such as the above, the cause is probably that the engine-ECU <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 • Malfunction of the engine-ECU <M/T> • Malfunction of the 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> • Malfunction of the engine-A/T-ECU <A/T> • Malfunction of the immobilizer system • Foreign materials in fuel

Check battery voltage when cranking.
OK: 8 V or higher
NG → Check the battery. (Refer to GROUP 54 – Battery.)
OK ↓

Is an immobilizer-ECU diagnosis code displayed?
Yes → Check the immobilizer. (Refer to GROUP 54 – Ignition Key and Immobilizer.)
No ↓

MUT-II Data list
16 Voltage of engine-ECU power source (Refer to P.13B-63.)
NG → Check the engine-ECU (engine-A/T-ECU) power supply and earth circuit system. (Refer to P.13B-55, INSPECTION PROCEDURE 24.)
OK ↓

Does the camshaft rotate at the engine cranking? (When oil filler cap is removed.)
No → Check timing belt for breakage.
Yes ↓

MUT-II Self-Diag code
Are diagnosis codes displayed?
Yes → Refer to P.13B-3, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

MUT-II Data list
22 Crank angle sensor
OK: Cranking speed is displayed.
No → Check the crank angle sensor system. (Refer to P.13B-23, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0335.)
OK ↓

MUT-II Actuator test
07 Fuel pump (Refer to P.13B-68.)
NG → Check the fuel pump system. (Refer to P.13B-57, INSPECTION PROCEDURE 26.)
OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13B-63.)
NG → Check the engine coolant temperature sensor system. (Refer to P.13B-7, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0115.)
OK ↓

Can any sound be heard from the injectors when cranking?
NG → Check the injector system. (Refer to P.13B-20, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0201, P0202, P0203, P0204.)
OK ↓

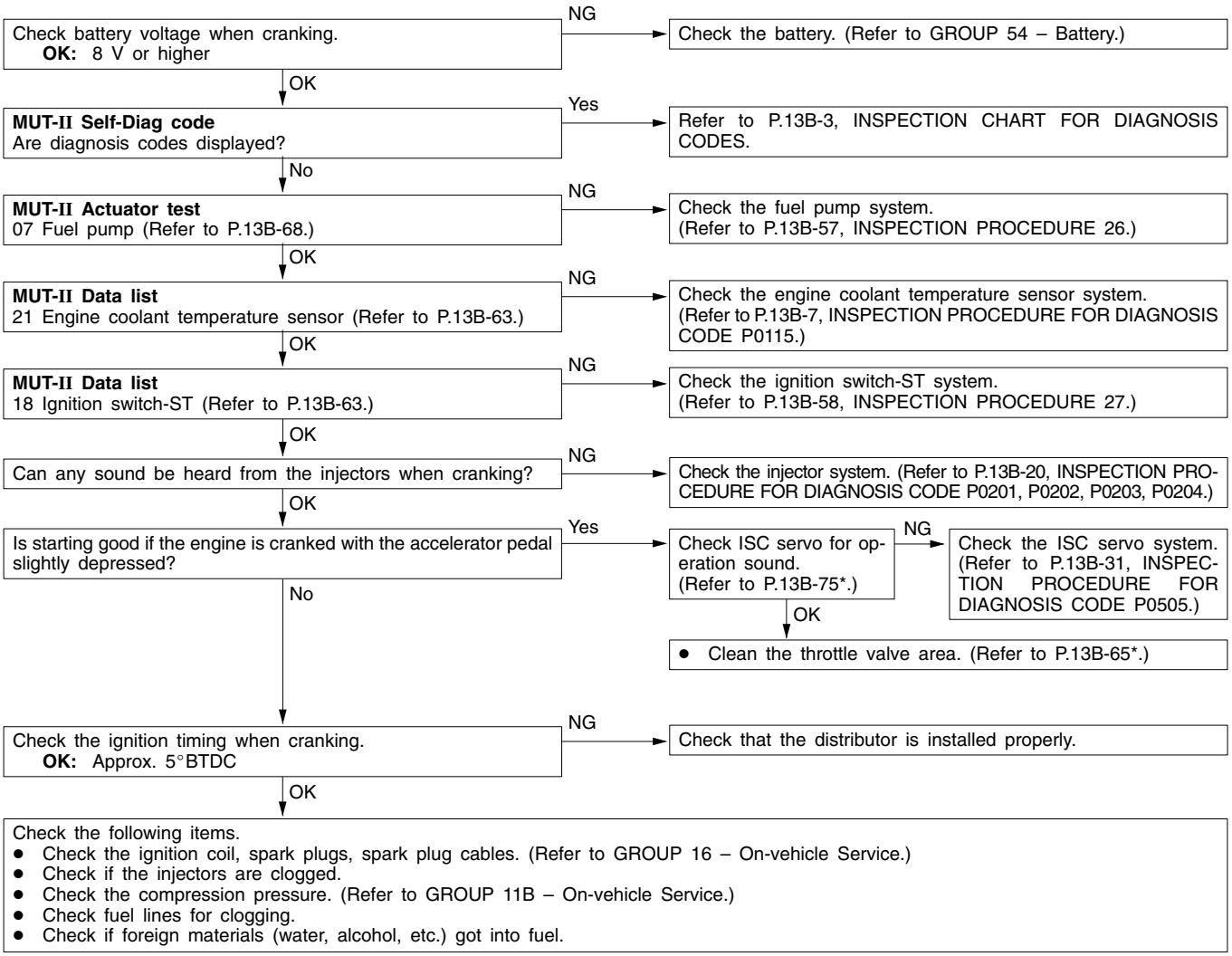
Does the engine tachometer display the cranking speed?
• Set the tachometer of primary voltage detection type.
NG → Check the ignition circuit system. (Refer to P.13B-61, INSPECTION PROCEDURE 31.)
OK ↓

Check the ignition timing when cranking.
OK: Approx. 5° BTDC
NG → Check that the distributor is installed properly.
OK ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle service.)
- Check if the injectors are clogged.
- Check if foreign materials (water, alcohol, etc.) got into fuel.
- Check the compression pressure.
- Check the immobilizer system. (Refer to GROUP 54 – Ignition Key and Immobilizer.)

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> • Malfunction of the engine-A/T-ECU <A/T>



NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

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

Check battery voltage when cranking
OK: 8 V or higher
NG → Check the battery. (Refer to GROUP 54 – Battery.)
OK ↓

MUT-II Self-Diag code
Are diagnosis codes displayed?
Yes → Refer to P.13B-3, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

MUT-II Actuator test
07 Fuel pump (Refer to P.13B-68.)
NG → Check the fuel pump system. (Refer to P.13B-57, INSPECTION PROCEDURE 26.)
OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13B-63.)
NG → Check the engine coolant temperature sensor system. (Refer to P.13B-7, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0115.)
OK ↓

MUT-II Data list
18 Ignition switch-ST (Refer to P.13B-63.)
NG → Check the ignition switch-ST system. (Refer to P.13B-58, INSPECTION PROCEDURE 27.)
OK ↓

Can any sound be heard from the injectors when cranking?
NG → Check the injector system. (Refer to P.13B-20, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0201, P0202, P0203, P0204.)
OK ↓

Check the ignition timing when cranking.
OK: Approx. 5°BTDC
NG → Check that the distributor is installed properly.
OK ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle Service.)
- Check if the injectors are clogged.
- Check the compression pressure. (Refer to GROUP 11B – On-vehicle Service.)
- Check if foreign materials (water, alcohol, etc.) got into fuel.

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.

No ↓

MUT-II Self-Diag code
Are diagnosis codes displayed? — Yes → Refer to P.13B-3, INSPECTION CHART FOR DIAGNOSIS CODES.

No ↓

Does idling speed fluctuate excessively? — Yes → Check the throttle body. (Refer to P.13B-65*.) ↓ Check trouble symptom. ↓ NG → Inspect the intake of air into the air intake system.
- Broken intake manifold gasket
- Broken air intake hose
- Broken vacuum hose
- Positive crankcase ventilation valve does not operate.

No ↓

Check the ISC servo for operation sound. (Refer to P.13B-75*.) — NG → Check the ISC system. (Refer to P.13B-31, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0505.)

OK ↓

Check the injector for operation sound. — NG → Check the injector system. (Refer to P.13B-20, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0201, P0202, P0203, P0204.)

OK ↓

MUT-II Data list
14 Throttle position sensor (Refer to P.13B-63.) — NG → Check the throttle position sensor system. (Refer to P.13B-16, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0120.)

OK ↓

MUT-II Data list
13 Intake air temperature sensor (Refer to P.13B-63.) — NG → Check the intake air temperature sensor system. (Refer to P.13B-6, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0110.)

OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13B-63.) — NG → Check the engine coolant temperature sensor system. (Refer to P.13B-7, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0115.)

OK ↓

MUT-II Actuator test
08 Purge control solenoid valve (Refer to P.13B-68.) — NG → Check the purge control solenoid valve system. (Refer to P.13B-29, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0443.)

OK ↓

MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13B-68.) — NG → Check the EGR control solenoid valve system. (Refer to P.13B-27, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0403.)

OK ↓

MUT-II Data list
59 Oxygen sensor (rear)
- Transmission: 2nd gear
- Driving with throttle widely open

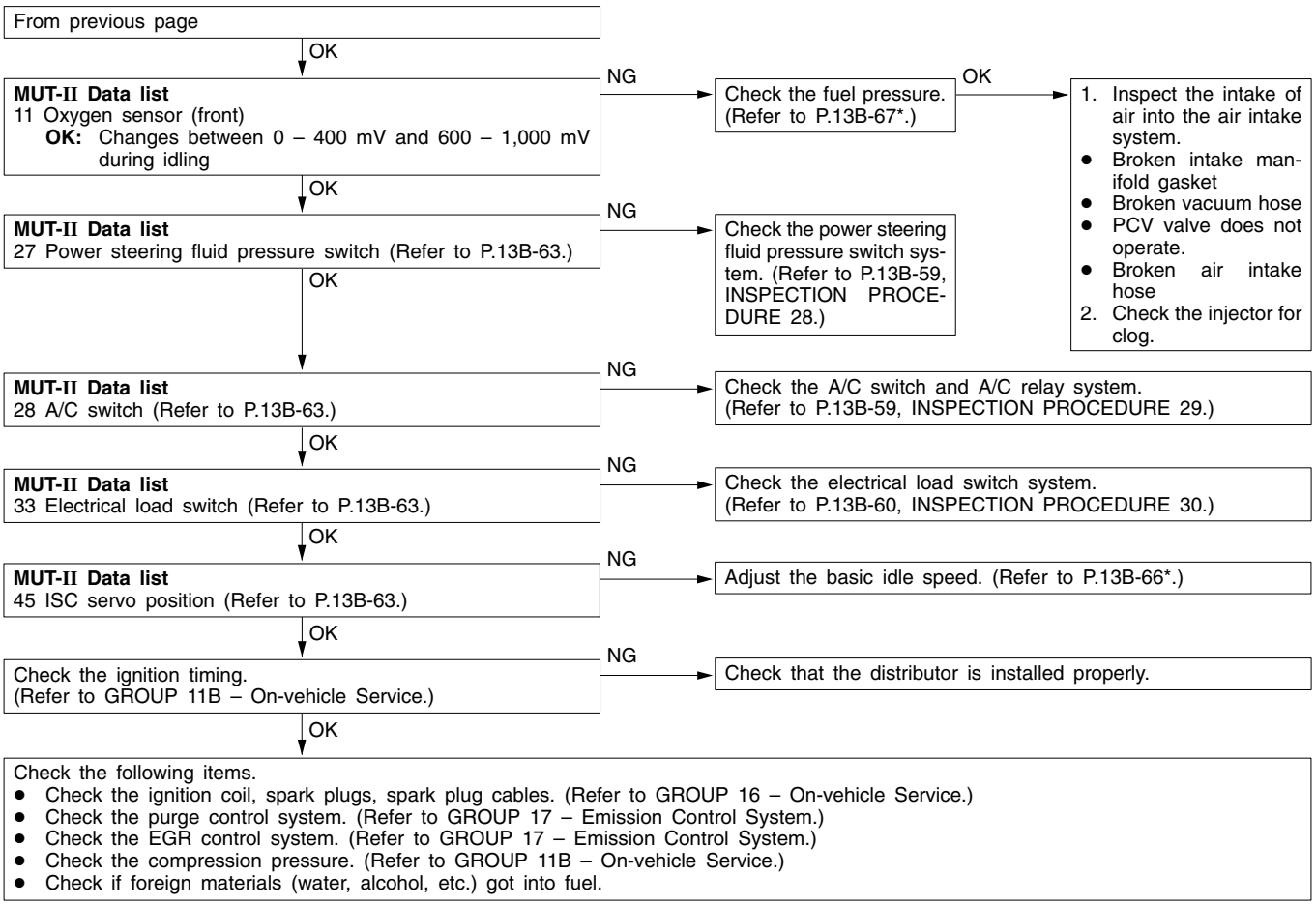
OK: 600 – 1,000 mV — NG → Check the oxygen sensor (rear) system. (Refer to P.13B-16, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0136.)

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.13B-13, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0130.)

OK → To next page

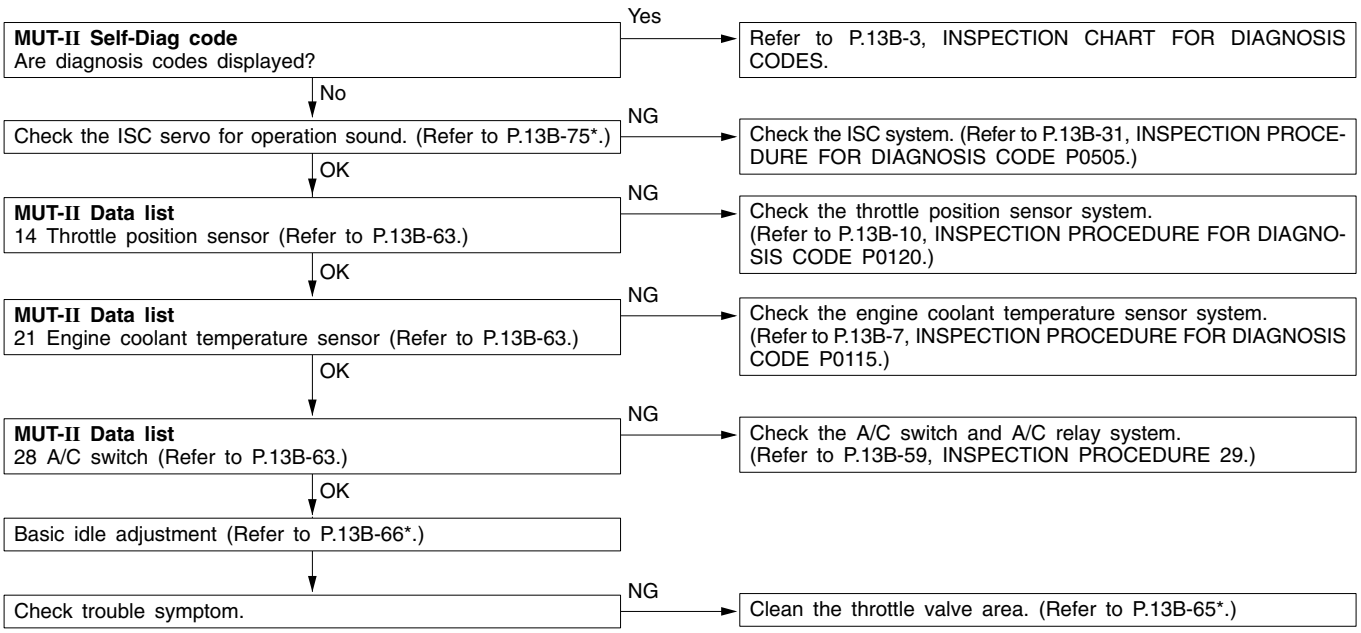
NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)



NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

INSPECTION PROCEDURE 9

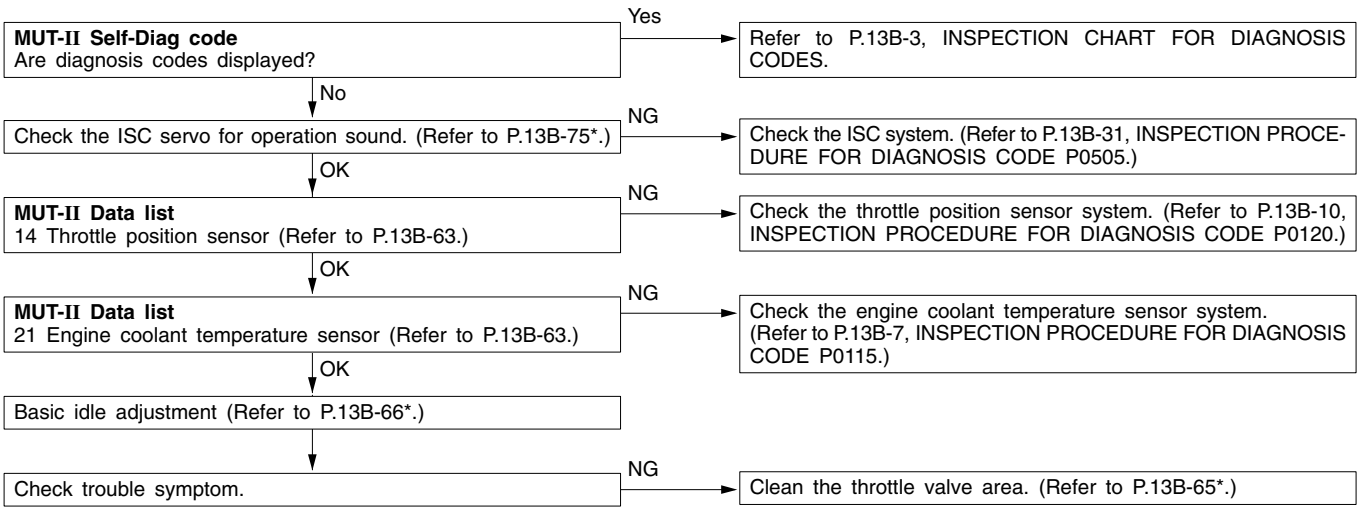
Idling speed is high. (Improper idling speed)	Probable cause
In such cases as the above, the cause is probably that the intake air volume during idling is too great.	• Malfunction of the ISC system • Malfunction of the throttle body



NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

INSPECTION PROCEDURE 10

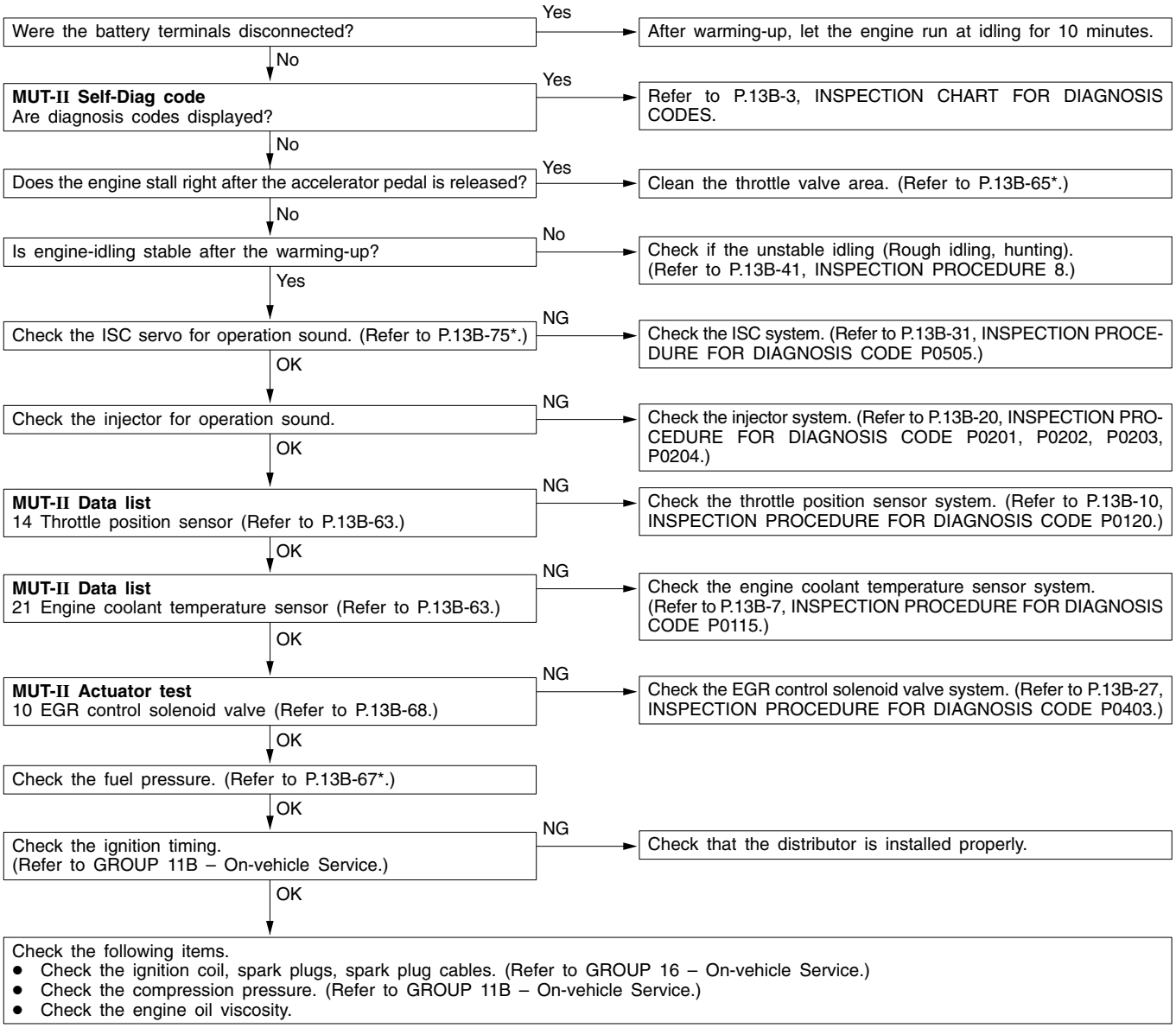
Idling speed is low. (Improper idling speed)	Probable cause
In cases such as the above, the cause is probably that the intake air volume during idling is too small.	• Malfunction of the ISC system • Malfunction of the throttle body



NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

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 '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

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

Were the battery terminals disconnected?
- Yes → After warming-up, let the engine run at idling for 10 minutes.
- No ↓

MUT-II Self-Diag code
Are diagnosis codes displayed?
- Yes → Refer to P.13B-3, INSPECTION CHART FOR DIAGNOSIS CODES.
- No ↓

Check the ISC servo for operation sound. (Refer to P.13B-75*.)
- NG → Check the ISC system. (Refer to P.13B-31, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0505.)
- OK ↓

Check the injector for operation sound.
- NG → Check the injector system. (Refer to P.13B-20, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0201, P0202, P0203, P0204.)
- OK ↓

Does the engine stall right after the accelerator pedal is released?
- Yes → Clean the throttle valve area. (Refer to P.13B-65*.)
- No ↓

Does the engine stall easily again?
- No → While carrying out an intermittent malfunction simulation test (Refer to GROUP 00 – Points to Note for Intermittent Malfunctions.), check for sudden changes in the signals shown below.
  - Crank angle sensor signal
  - Injector drive signal
  - Primary and secondary ignition signal
  - Fuel pump drive signal
  - Engine-ECU (engine-A/T-ECU) power supply voltage
- Yes ↓

MUT-II Data list
14 Throttle position sensor (Refer to P.13B-63.)
- NG → Check the throttle position sensor system. (Refer to P.13B-10, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0120.)
- OK ↓

MUT-II Data list
13 Intake air temperature sensor (Refer to P.13B-63.)
- NG → Check the intake air temperature sensor system. (Refer to P.13B-6, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0110.)
- OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13B-63.)
- NG → Check the engine coolant temperature sensor system. (Refer to P.13B-7, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0115.)
- OK ↓

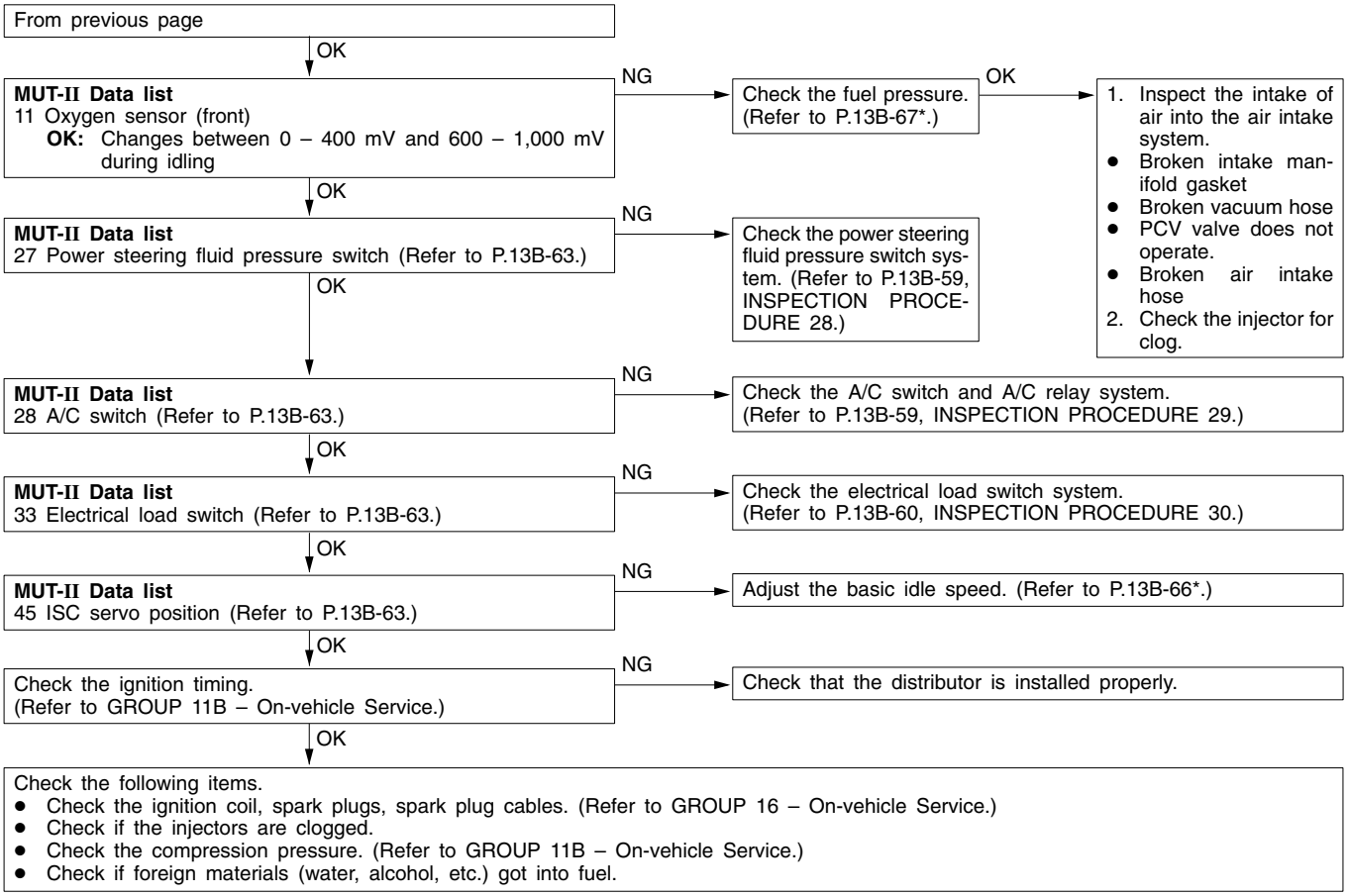
MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13B-68.)
- NG → Check the EGR control solenoid valve system. (Refer to P.13B-27, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0403.)
- OK ↓

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.13B-16, 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.13B-13, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0130.)
- OK ↓

To next page



NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

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

MUT-II Self-Diag code
Are diagnosis codes displayed?
→ Yes → Refer to P.13B-3, INSPECTION CHART FOR DIAGNOSIS CODES.
↓ No

MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13B-68.)
→ NG → Check the EGR control solenoid valve system. (Refer to P.13B-27, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0403.)
↓ OK

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle Service.)
- Check if air was drawn into the intake system.
  - Broken intake manifold gasket
  - Broken or disconnected vacuum hose
  - Improper operation of the PCV valve
  - Broken air intake hose

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

Were the battery terminals disconnected?
→ Yes → After warming-up, let the engine run at idling for 10 minutes.
↓ No

MUT-II Self-Diag code
Are diagnosis codes displayed?
→ Yes → Refer to P.13B-3, INSPECTION CHART FOR DIAGNOSIS CODES.
↓ No

MUT-II Data list
14 Throttle position sensor (Refer to P.13B-63.)
→ NG → Check the throttle position sensor system. (Refer to P.13B-10, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0120.)
↓ OK

MUT-II Data list
45 ISC servo position
- Is the idle speed control (ISC) servo position drops to 0–2 steps when decelerating (engine r/min less than 1,000)?

→ Yes → Check the vehicle speed sensor system. (Refer to P.13B-30, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0500.)
↓ No

MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13B-68.)
→ NG → Check the EGR control solenoid valve system. (Refer to P.13B-27, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0403.)
↓ OK

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle Service.)
- Clean the throttle valve area.

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

MUT-II Self-Diag code
Are diagnosis codes displayed?
Yes → Refer to P.13B-3, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

Check the injectors for operation sound.
NG → Check the injector system. (Refer to P.13B-20, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0201, P0202, P0203, P0204.)
OK ↓

Check the ignition timing.
(Refer to GROUP 11B – On-vehicle Service.)
NG → Check that the distributor is installed properly.
OK ↓

MUT-II Data list
13 Intake air temperature sensor (Refer to P.13B-63.)
NG → Check the intake air temperature sensor system. (Refer to P.13B-6, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0110.)
OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13B-63.)
NG → Check the engine coolant temperature sensor system. (Refer to P.13B-7, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0115.)
OK ↓

MUT-II Data list
14 Throttle position sensor (Refer to P.13B-63.)
NG → Check the throttle position sensor system. (Refer to P.13B-10, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0120.)
OK ↓

MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13B-68.)
NG → Check the EGR control solenoid valve system. (Refer to P.13B-27, 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.13B-16, 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.13B-13, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0130.)
OK ↓

MUT-II Data list
11 Oxygen sensor (front)
OK: Changes between 0 – 400 mV and 600 – 1,000 mV during idling
NG → Check the fuel pressure. (Refer to P.13B-67*.)
OK → 1. Inspect the intake of air into the air intake system.
- Broken intake manifold gasket
- Broken vacuum hose
- PCV valve does not operate.
- Broken air intake hose

2. Check the injector for clog.

OK ↓

Check the fuel pressure. (Refer to P.13B-67*.)
OK ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle Service.)
- Check the EGR control system. (Refer to GROUP 17 – Emission Control System.)
- Check the compression pressure. (Refer to GROUP 11B – On-vehicle Service.)
- Check the fuel filter or fuel line for clogging.

NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

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

MUT-II Self-Diag code
Are diagnosis codes displayed?
Yes → Refer to P.13B-3, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓
Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle Service.)
- Check for occurrence of ignition leak.

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

MUT-II Self-Diag code
Are diagnosis codes displayed?
Yes → Refer to P.13B-3, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓
Check the ISC servo for operation sound. (Refer to P.13B-75*.)
NG → Check the ISC system. (Refer to P.13B-31, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0505.)
OK ↓
MUT-II Data list
14 Throttle position sensor (Refer to P.13B-63.)
NG → Check the throttle position sensor system. (Refer to P.13B-10, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0120.)
OK ↓
Clean the throttle valve area. (Refer to P.13B-65*.)

NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

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

MUT-II Self-Diag code
Are diagnosis codes displayed?
Yes → Refer to P.13B-3, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

Check the injectors for operation sound.
NG → Check the injector system. (Refer to P.13B-20, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0201, P0202, P0203, P0204.)
OK ↓

Check the ignition timing.
(Refer to GROUP 11B – On-vehicle Service.)
NG → Check that the distributor is installed properly.
OK ↓

MUT-II Data list
13 Intake air temperature sensor (Refer to P.13B-63.)
NG → Check the intake air temperature sensor system. (Refer to P.13B-6, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0110.)
OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13B-63.)
NG → Check the engine coolant temperature sensor system. (Refer to P.13B-7, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0115.)
OK ↓

MUT-II Data list
14 Throttle position sensor (Refer to P.13B-63.)
NG → Check the throttle position sensor system. (Refer to P.13B-10, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0120.)
OK ↓

MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13B-68.)
NG → Check the EGR control solenoid valve system. (Refer to P.13B-27, 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.13B-16, 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.13B-13, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0130.)
OK ↓

MUT-II Data list
11 Oxygen sensor (front)
OK: Changes between 0 – 400 mV and 600 – 1,000 mV during idling
NG → Check the fuel pressure. (Refer to P.13B-67*.)
OK → 1. Inspect the intake of air into the air intake system.
- Broken intake manifold gasket
- Broken vacuum hose
- PCV valve does not operate.
- Broken air intake hose

2. Check the injector for clog.

OK ↓

Check the fuel pressure. (Refer to P.13B-67*.)
OK ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle Service.)
- Check the compression pressure. (Refer to GROUP 11B – On-vehicle Service.)
- Check the fuel filter or fuel line for clogging.
- Broken air intake hose
- Clogged air cleaner

NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

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

MUT-II Self-Diag code
Are diagnosis codes displayed?
Yes → Refer to P.13B-3, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

Check the injectors for operation sound.
NG → Check the injector system. (Refer to P.13B-20, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P020, P0202, P0203, P0204.)
OK ↓

Check the ignition timing.
(Refer to GROUP 11B – On-vehicle Service.)
NG → Check that the distributor is installed properly.
OK ↓

MUT-II Data list
13 Intake air temperature sensor (Refer to P.13B-63.)
NG → Check the intake air temperature sensor system. (Refer to P.13B-6, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0110.)
OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13B-63.)
NG → Check the engine coolant temperature sensor system. (Refer to P.13B-7, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0115.)
OK ↓

MUT-II Data list
14 Throttle position sensor (Refer to P.13B-63.)
NG → Check the throttle position sensor system. (Refer to P.13B-10, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0120.)
OK ↓

MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13B-68.)
NG → Check the EGR control solenoid valve system. (Refer to P.13B-27, 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.13B-16, 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.13B-13, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0130.)
OK ↓

MUT-II Data list
11 Oxygen sensor (front)
OK: Changes between 0 – 400 mV and 600 – 1,000 mV during idling
NG → Check the fuel pressure. (Refer to P.13B-67*.)
OK → 1. Inspect the intake of air into the air intake system.
- Broken intake manifold gasket
- Broken vacuum hose
- PCV valve does not operate.
- Broken air intake hose

2. Check the injector for clog.

OK ↓

Check the fuel pressure. (Refer to P.13B-67*.)
OK ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle Service.)
- Check the EGR control system. (Refer to GROUP 17 – Emission Control System.)

NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

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

MUT-II Self-Diag code
Are diagnosis codes displayed?
- Yes → Refer to P.13B-3, INSPECTION CHART FOR DIAGNOSIS CODES.
- No ↓

Does knocking occur when driving with the detonation sensor connector disconnected? At this time, use the MUT-II to check if the timing is retarded compared to when the detonation sensor connector is disconnected.
- No → Check the detonation sensor system. (Refer to P.13B-23, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0325.)
- Yes ↓

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

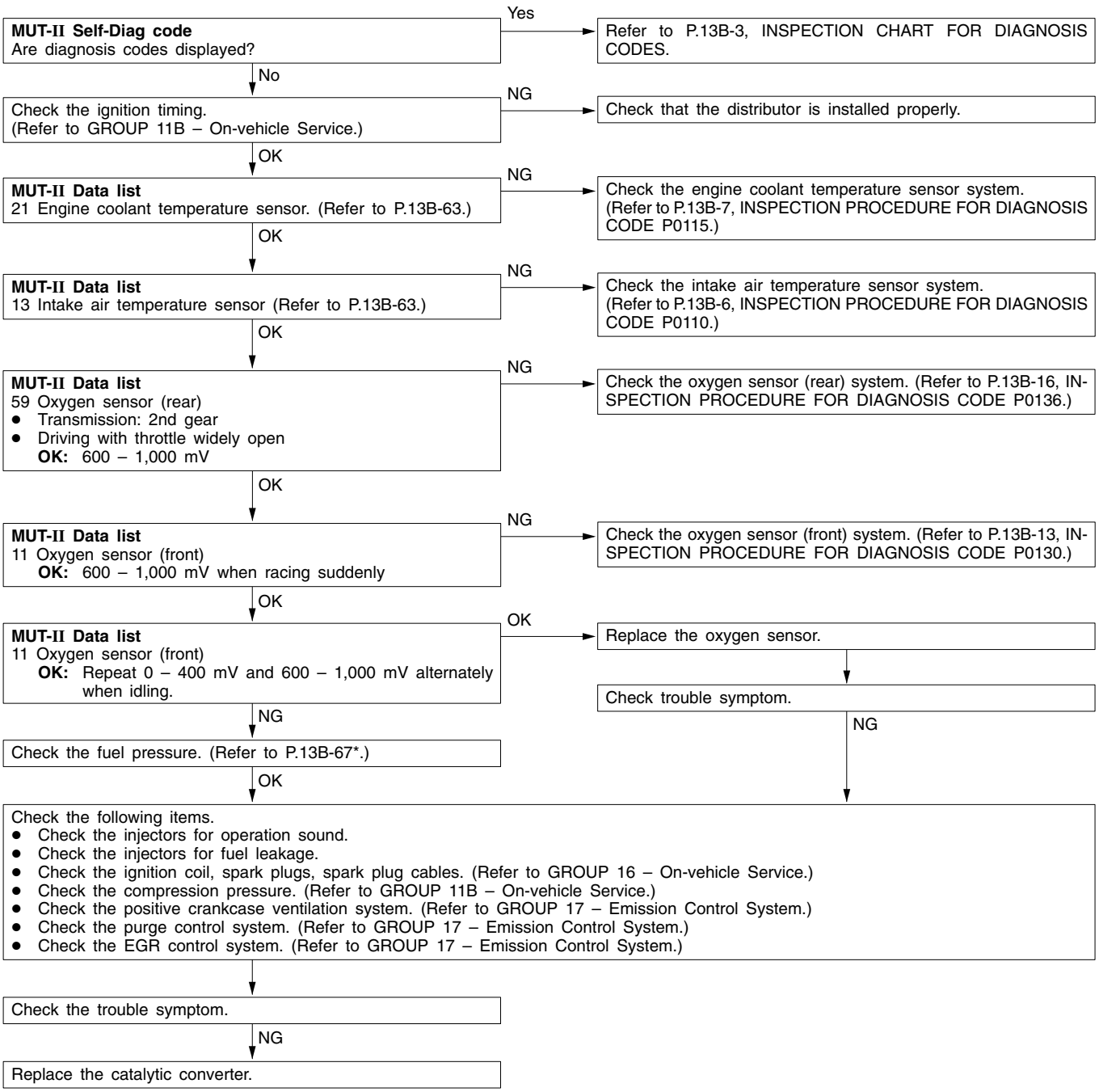
INSPECTION PROCEDURE 21

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

Check the injectors for fuel leakage.

INSPECTION PROCEDURE 22

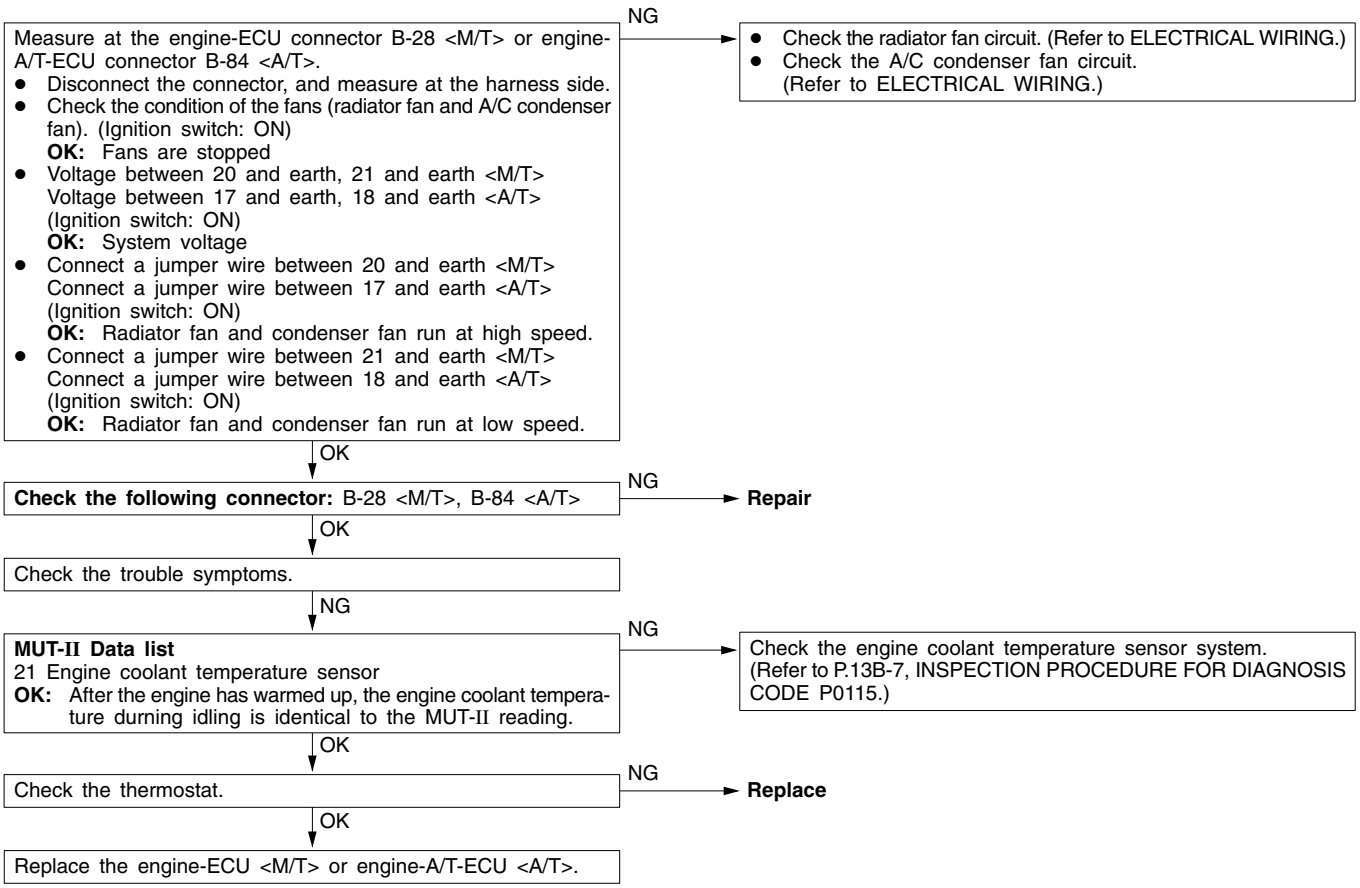
Too high CO and HC concentration when idling	Probable cause
Abnormal air-fuel ratio is suspected.	• Malfunction of the air-fuel ratio control system • Deteriorated catalyst



NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

INSPECTION PROCEDURE 23

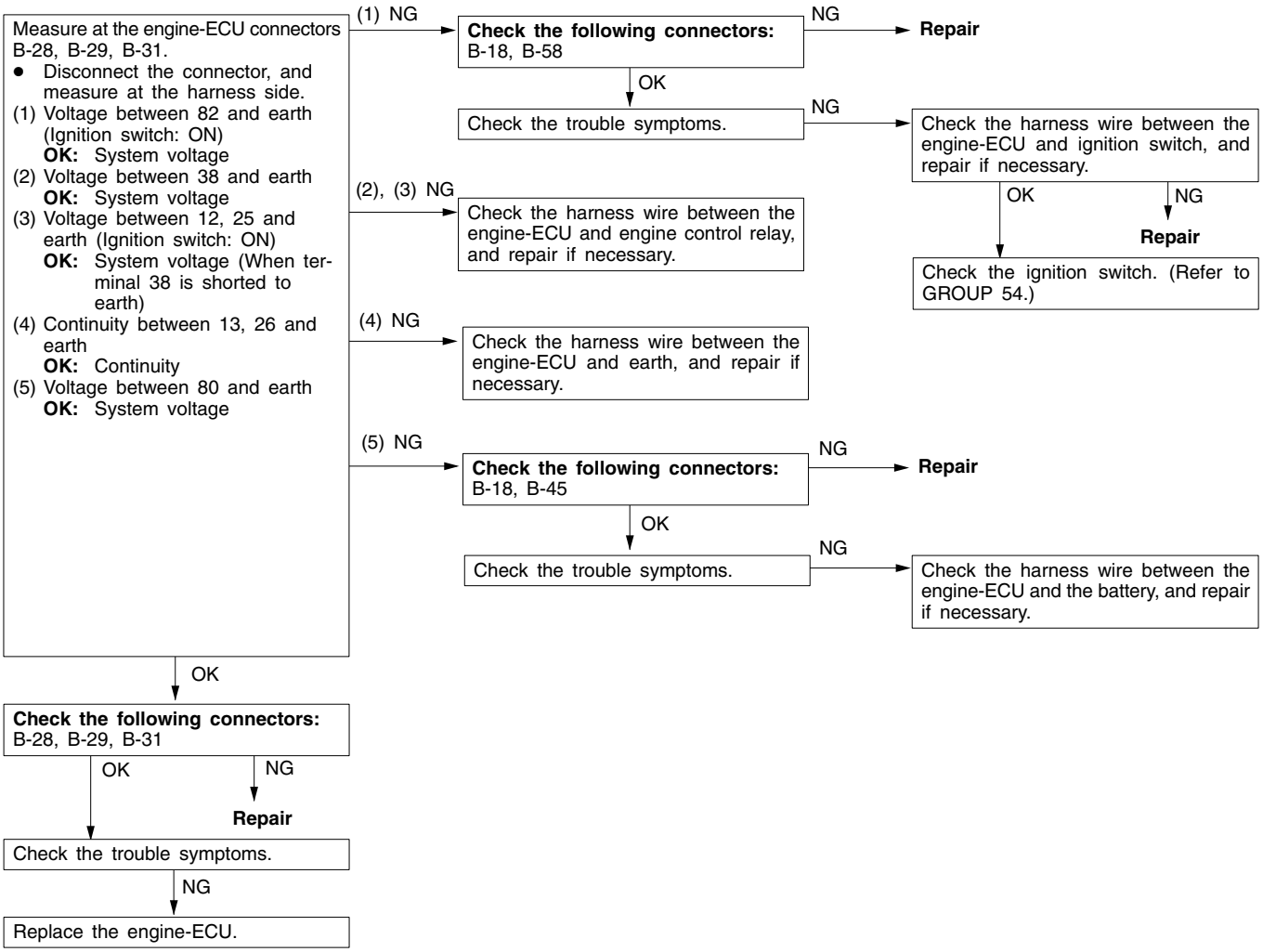
Fans (radiator fan, A/C condenser fan) are inoperative.	Probable cause
The fan motor relay is controlled by the power transistor inside the engine-ECU <M/T> or engine-A/T-ECU <A/T> turning ON and OFF.	• Malfunction of the fan motor relay • Malfunction of the fan motor • Malfunction of the thermostat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



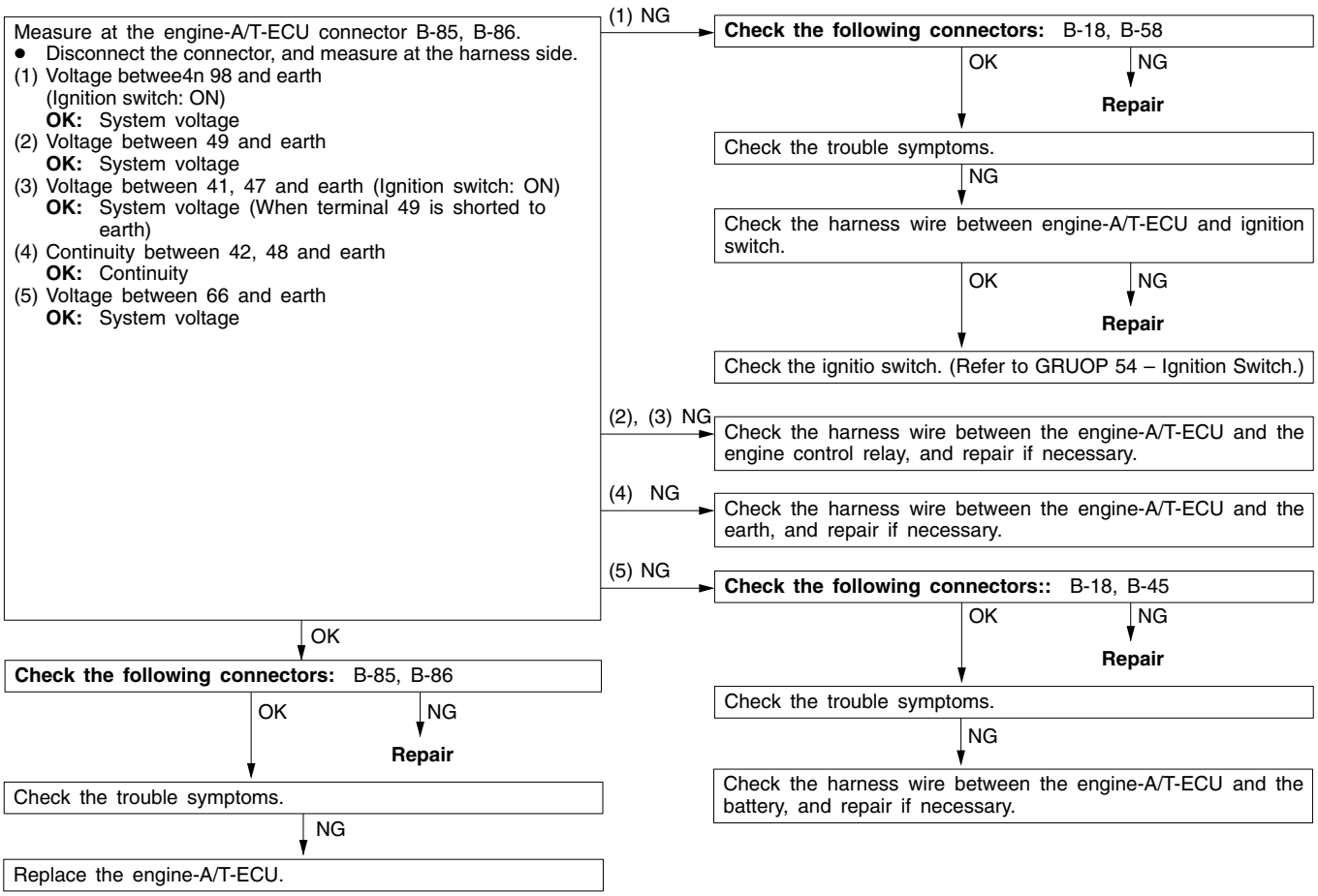
INSPECTION PROCEDURE 24

Engine-ECU (engine-A/T-ECU) power supply and earth circuit system	Probable cause
The cause is probably a malfunction of the engine-ECU <M/T> or engine-A/T-ECU <A/T> or one of the problems listed at right.	• 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> • Malfunction of the engine-A/T-ECU <A/T>

<M/T>

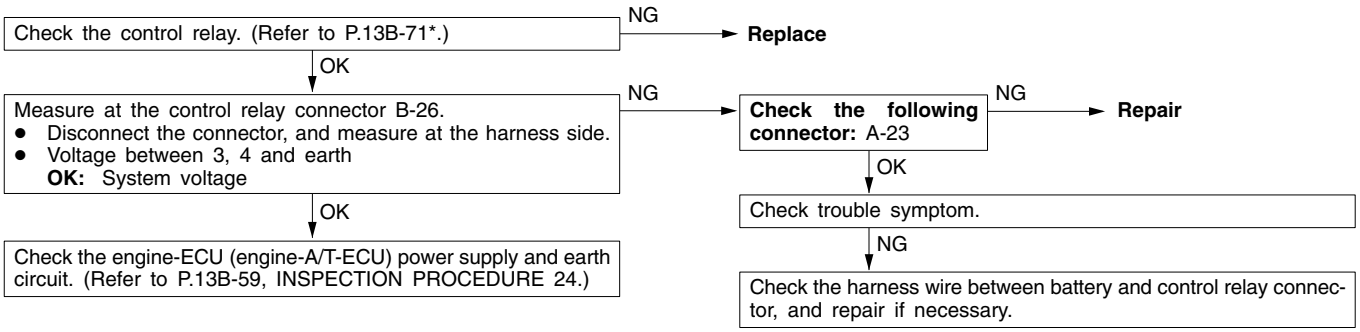


<A/T>



INSPECTION PROCEDURE 25

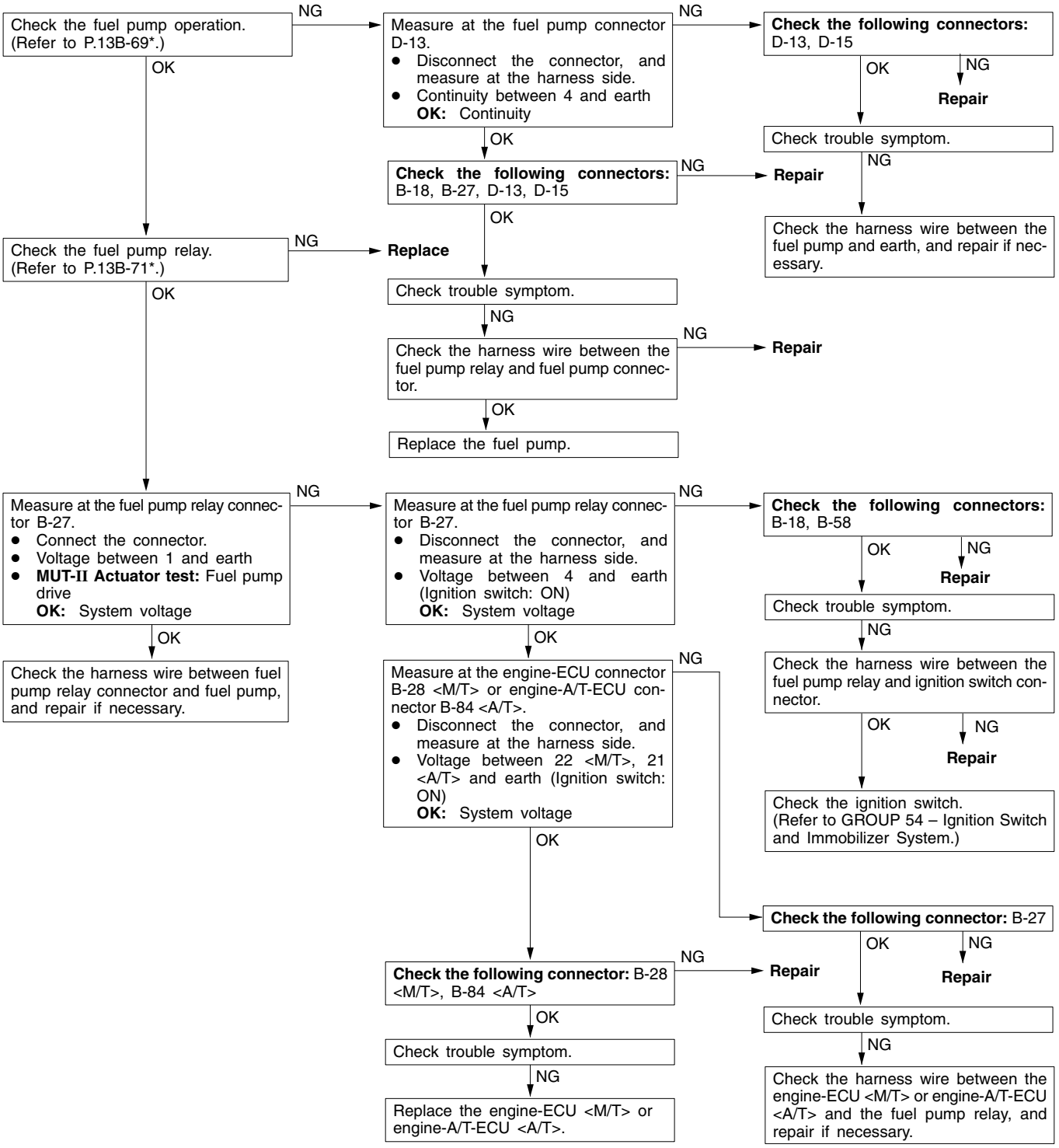
Engine control relay and ignition switch-IG system	Probable cause
When the ignition switch ON signal is input to the engine-ECU <M/T> or engine-A/T-ECU <A/T>, the engine-ECU <M/T> or engine-A/T-ECU <A/T> turns on the engine control relay. This causes system voltage to be supplied to the engine-ECU <M/T>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



NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

INSPECTION PROCEDURE 26

Fuel pump system	Probable cause
The engine-ECU <M/T> or engine-A/T-ECU <A/T> 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 <M/T> • Malfunction of the engine-A/T-ECU <A/T>

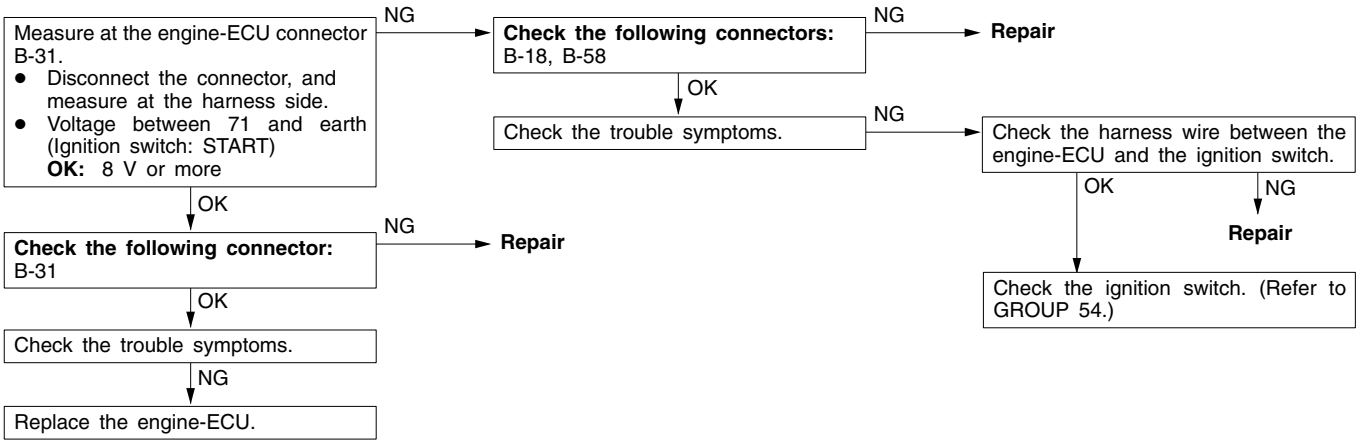


NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

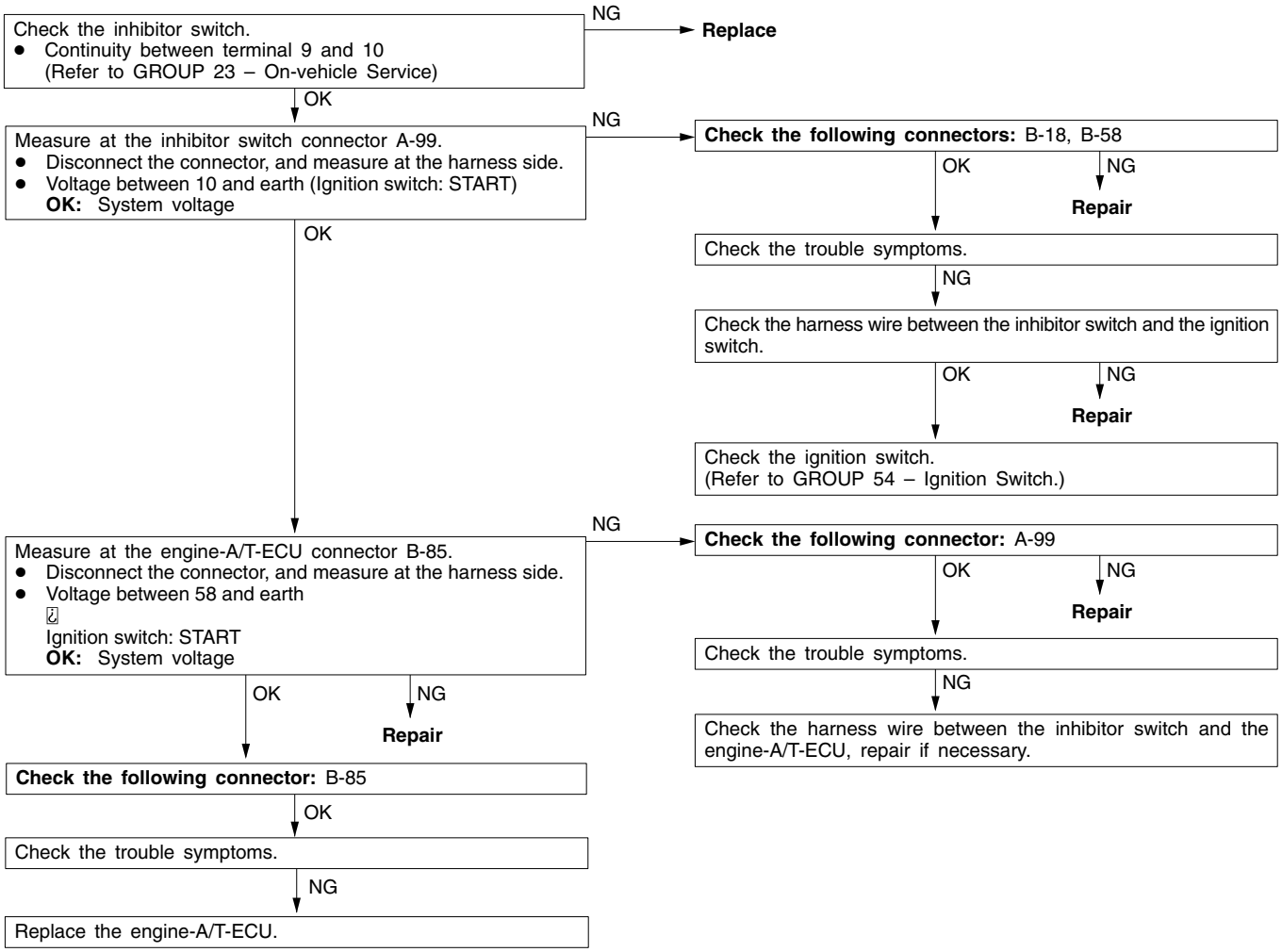
INSPECTION PROCEDURE 27

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>

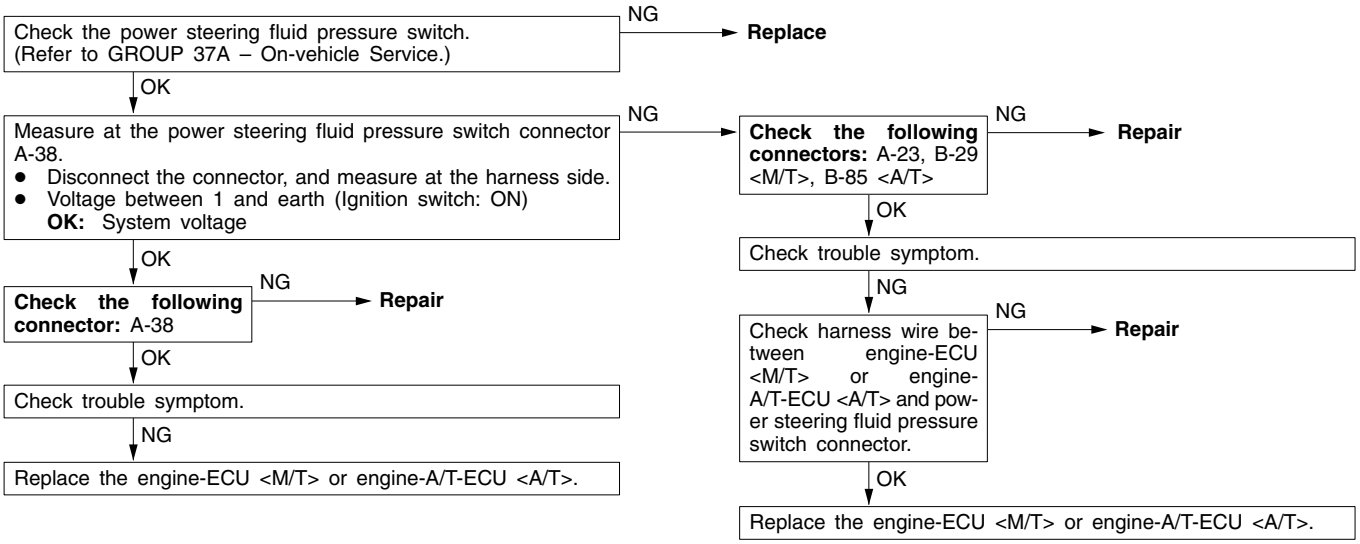


<A/T>



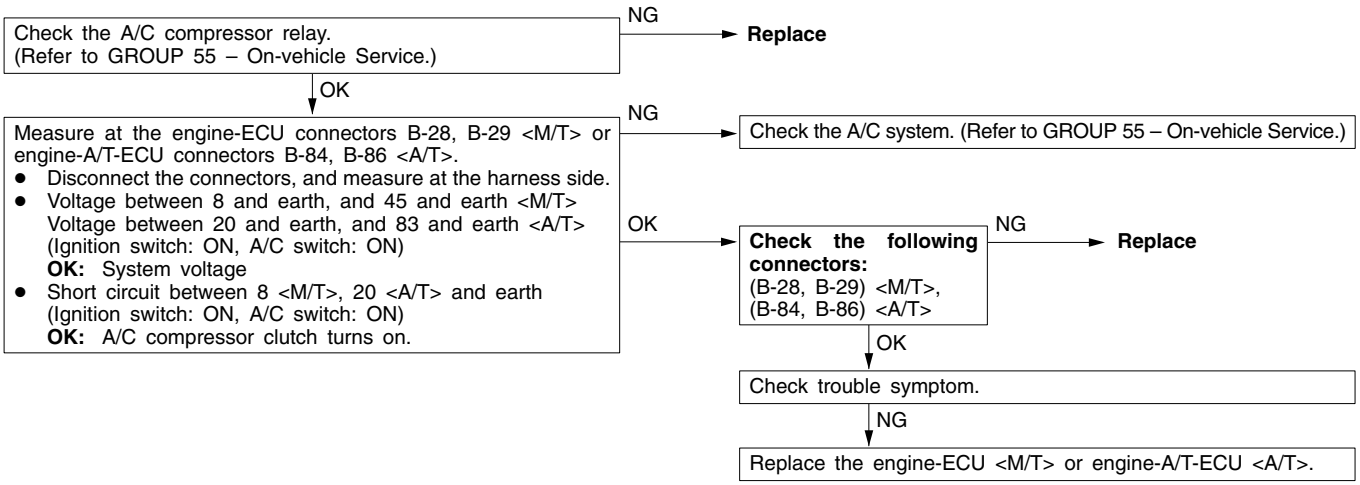
INSPECTION PROCEDURE 28

Power steering fluid pressure switch system	Probable cause
The presence or absence of power steering load 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> 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 <M/T> • Malfunction of the engine-A/T-ECU <A/T>



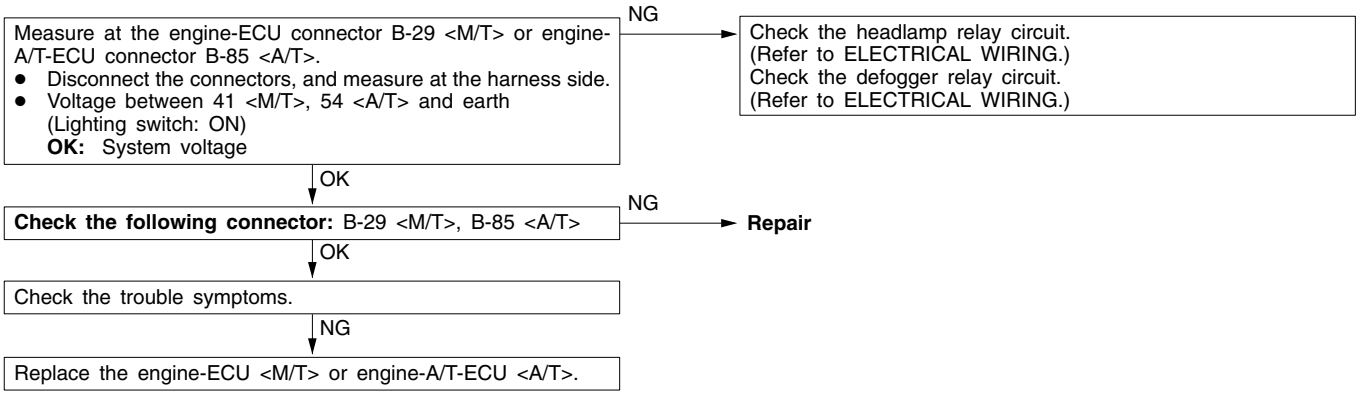
INSPECTION PROCEDURE 29

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> • Malfunction of the engine-A/T-ECU <A/T>



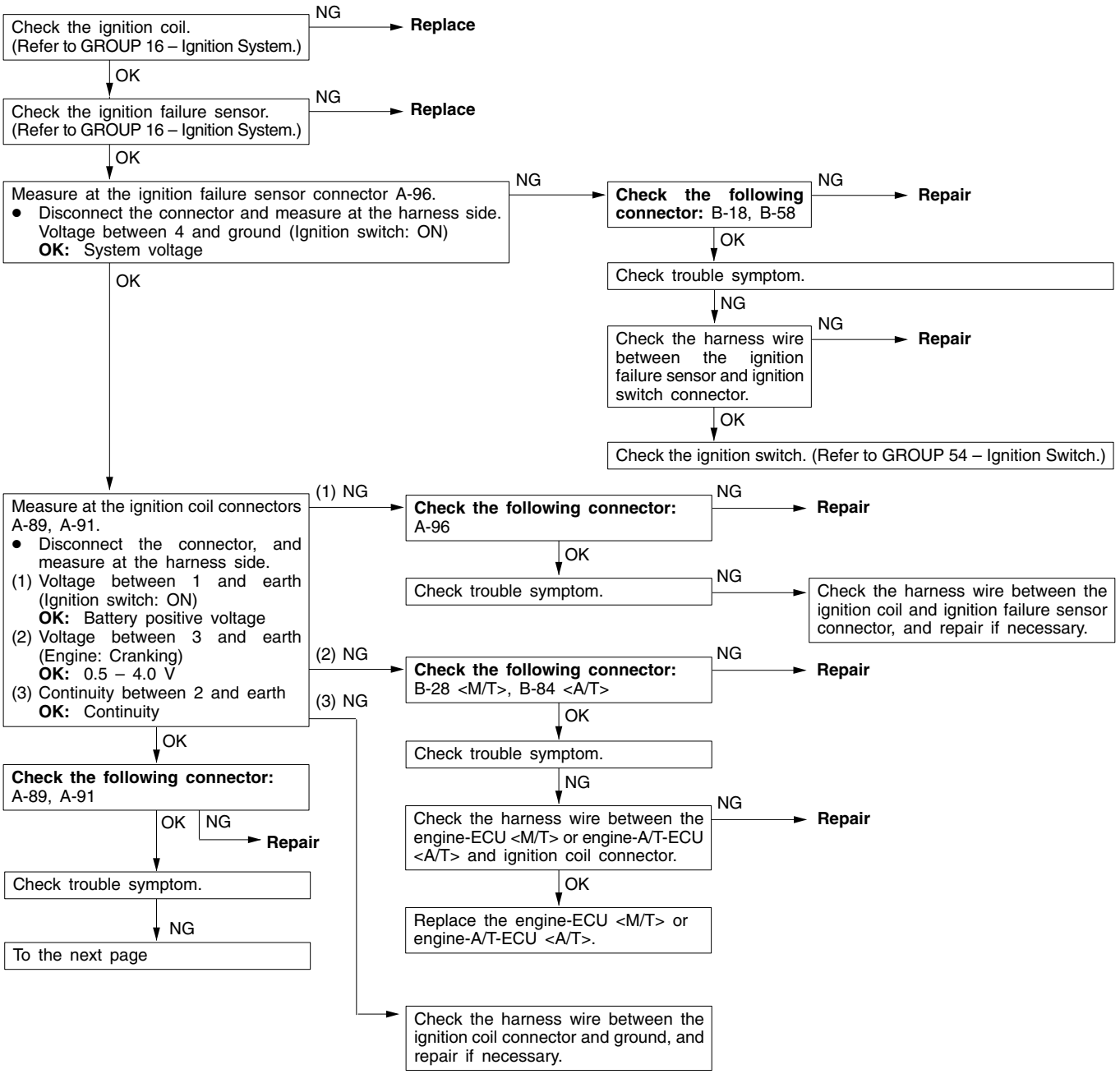
INSPECTION PROCEDURE 30

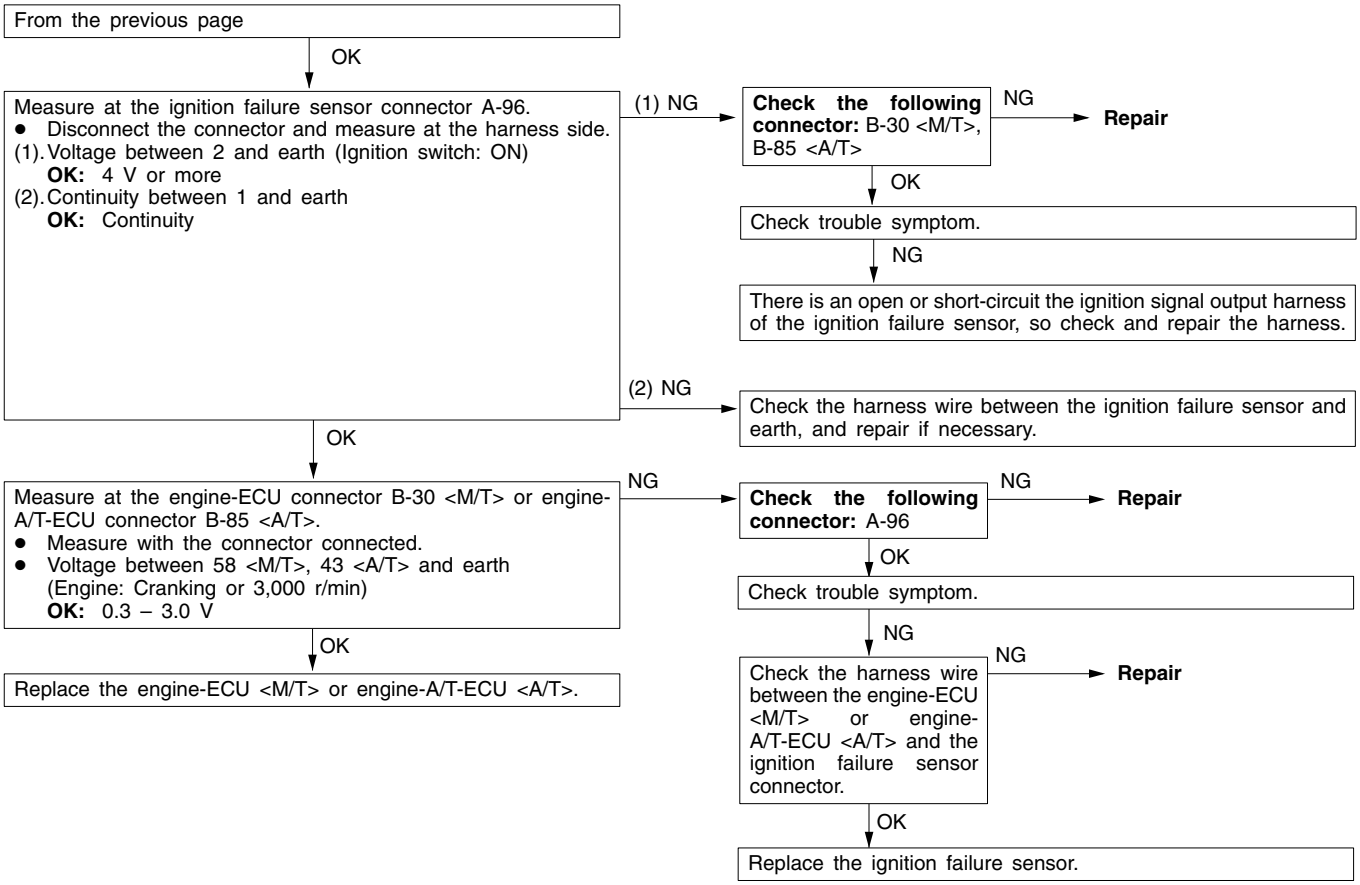
Electrical load switch	Probable cause
During idling, the ON/OFF condition of switches is equipment which have a large electrical load is input to the engine-ECU <M/T> or engine-A/T-ECU <A/T>. The engine-ECU <M/T> or engine-A/T-ECU <A/T> controls the idle speed control servo on this input.	• Improper connector contact, open circuit or short-circuited harness wire in the headlamp relay circuit • Improper connector contact, open circuit or short-circuited harness wire in the defogger relay circuit. • Malfunction of the engine-ECU <M/T> • Malfunction of the engine-A/T-ECU <A/T>



INSPECTION PROCEDURE 31

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> • Malfunction of the engine-A/T-ECU <A/T>




From the previous page
OK
Measure at the ignition failure sensor connector A-96.
● Disconnect the connector and measure at the harness side.
(1). Voltage between 2 and earth (Ignition switch: ON)
OK: 4 V or more
(2). Continuity between 1 and earth
OK: Continuity
(1) NG
Check the following connector: B-30 <M/T>, B-85 <A/T>
NG
Repair
OK
Check trouble symptom.
NG
There is an open or short-circuit the ignition signal output harness of the ignition failure sensor, so check and repair the harness.
(2) NG
Check the harness wire between the ignition failure sensor and earth, and repair if necessary.
OK
Measure at the engine-ECU connector B-30 <M/T> or engine-A/T-ECU connector B-85 <A/T>.
● Measure with the connector connected.
● Voltage between 58 <M/T>, 43 <A/T> and earth (Engine: Cranking or 3,000 r/min)
OK: 0.3 – 3.0 V
NG
Check the following connector: A-96
NG
Repair
OK
Check trouble symptom.
NG
Check the harness wire between the engine-ECU <M/T> or engine-A/T-ECU <A/T> and the ignition failure sensor connector.
NG
Repair
OK
Replace the engine-ECU <M/T> or engine-A/T-ECU <A/T>.
Replace the ignition failure sensor.

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	13B-13
			When engine is suddenly raced	600 – 1,000 mV		
		Engine: After having warmed up The oxygen sensor signal is used to check the air/fuel mixture ratio, and control condition 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	13B-6
			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	13B-10
			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	13B-56
18	Cranking signal (ignition switch-ST)	Ignition switch: ON	Engine: Stopped	OFF	Procedure No. 27	13B-58
			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	13B-7
			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	13B-23
		• Engine: Idling • Idle position switch: ON	When engine coolant temperature is –20°C	1,475 – 1,675 r/min <4G13> 1,375 – 1,575 r/min <4G18>		
			When engine coolant temperature is 0°C	1,345 – 1,545 r/min <4G13> 1,325 – 1,525 r/min <4G18>		
			When engine coolant temperature is 20°C	1,200 – 1,400 r/min <4G13> 1,150 – 1,350 r/min <4G18>		
			When engine coolant temperature is 40°C	1,160 – 1,225 r/min <4G13> 940 – 1,140 r/min <4G18>		
			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 <M/T>	13B-30

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	13B-59
			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	13B-59
			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 (A/T: P range) • Ignition switch: ON	Engine: Stopped (At altitude of 0 m)	101 kPa	Code No. P0105	13B-4
			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		
33	Electrical load switch	All accessories: OFF	Lighting switch only: OFF → ON	OFF → ON	Procedure No. 30	13B-60
41	Injectors*2	Engine: Cranking	When engine coolant temperature is 0°C (injection is carried out for all cylinders simultaneously)	13 – 23 ms <4G13> 13 – 19 ms <4G18>	–	–
			When engine coolant temperature is 20°C	26 – 46 ms <4G13> 26 – 39 ms <4G18>		
			When engine coolant temperature is 80°C	8 – 12 ms <4G13> 6 – 9 ms <4G18>		

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 (A/T: P range)	Engine is idling	1.7 – 2.9 ms <4G13> 1.6 – 2.7 ms <4G18>	–	–
			2,500 r/min	1.4 – 2.6 ms <4G13> 1.3 – 2.4 ms <4G18>		
			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 (A/T: P range) • 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	13B-59
			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	13B-16

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 – 13 %	Code No. P0170	13B-19
82	Short-term fuel compensation	Engine: Warm, 2,500 r/min without any load (during closed loop)		–12.5 – 12.5 %	Code No. P0170	13B-19
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	13B-12
			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	13B-13
			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) 0.6 – 1.0 V		
			2,500 r/min			
A2	Oxygen sensor (rear)	• Transmission: 2nd gear <M/T>, L range <A/T> • Drive with throttle widely open	3,500 r/min	0.6 – 1.0 V	Code No. P0136	13B-16
8A	Throttle position sensor (Throttle opening angle)	• Ignition switch: ON	Set to idle position	6 – 20 %	Code No. P0120	13B-10
			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	13B-20
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	13B-57
				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	13B-29
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	13B-27
20	Condenser fan	Drive the fan motors (condenser)	• Ignition switch: ON • A/C switch: ON		Fan motor runs	Procedure No. 23	13B-54
21	Radiator fan	Drive the fan motors (radiator)	• Ignition switch: ON		Fan motor runs	Procedure No. 23	13B-54

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. The other procedures are the same as the conventional procedures.

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)

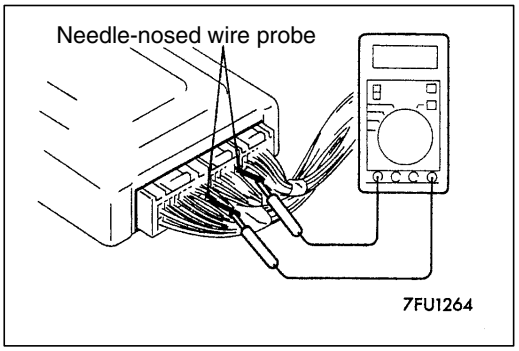
Alternate method (Test harness not available)

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



CHECK AT THE ENGINE-ECU TERMINALS

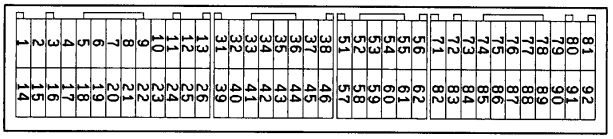
TERMINAL VOLTAGE CHECK CHART

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



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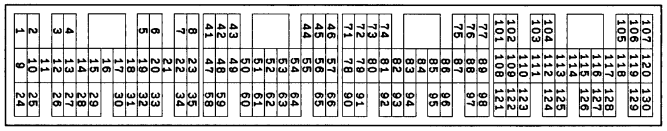
Engine-A/T-ECU <A/T> Connector Terminal Arrangement



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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 <A1>	Engine: Soon after the warmed up engine is started	System voltage 0 V (Changes repeatedly)
17	28	Stepper motor coil <A2>		
5	15	Stepper motor coil <B1>		
18	29	Stepper motor coil <B2>		
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	20	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)		
12	41	Power supply	Ignition switch: ON	System voltage
25	47			

Terminal No. <M/T>	Terminal No. <A/T>	Check item	Check condition (Engine condition)		Normal condition
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 more)		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 operating (Engine coolant temperature is 90 – 105°C or less)		0 – 3 V
22	21	Fuel pump relay	Ignition switch: ON		System voltage
			Engine: Idle speed		0 – 3 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
41	54	Electrical load switch	Engine: Idling	Turn off the lighting switch	0 – 3 V
				Turn on the lighting switch	System voltage
45	83	A/C switch	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
54	26	Oxygen sensor (rear) heater	Engine: Idling after warming up		0 – 3 V
			Engine r/min: 5,000 r/min		System voltage
58	43	Tachometer signal	Engine r/min: 3,000 r/min		0.3 – 3.0 V
60	3	Oxygen sensor (front) heater	Engine: Idling after warming up		0 – 3 V
			Engine r/min: 5,000 r/min.		System voltage

Terminal No. <M/T>	Terminal No. <A/T>	Check item	Check condition (Engine condition)		Normal condition
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	Vacuum sencor (Manifold absolute pressure sensor)	Ignition switch: ON (when altitude is 0 m)		3.7 – 4.3 V
			Ignition switch: ON (when altitude is 1,200 m)		3.2 – 3.8 V
			Engine: Idle speed		0.9 – 1.5 V
			While engine is idling after having warmed up, suddenly depress the accelerator pedal		From 0.9 – 1.5 V, momentarily increases
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

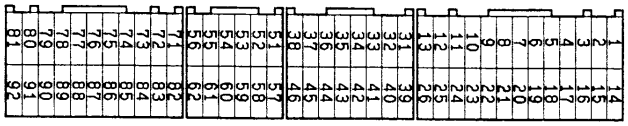
1. Turn the ignition switch to “LOCK” (OFF) position.
2. Disconnect the engine-ECU <M/T> or engine-A/T-ECU <A/T> connector.
3. Measure the resistance and check for continuity between the terminals of the engine-ECU <M/T> or engine-A/T-ECU <A/T> harness-side connector while referring to the check chart.

   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



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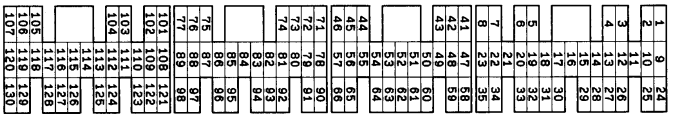
Engine-A/T-ECU <A/T> Harness Side Connector Terminal Arrangement



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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 (A1)	28 – 33 Ω (At 20°C)
17 – 12	28 – 41	Stepper motor coil (A2)	
5 – 12	15 – 41	Stepper motor coil (B1)	
18 – 12	29 – 41	Stepper motor coil (B2)	
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 earth <M/T> Engine-A/T-ECU earth <A/T>	Continuity (0 Ω)
26 – Body earth	48 – Body earth	Engine-ECU earth <M/T> Engine-A/T-ECU earth <A/T>	
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)

SERVICE BULLETIN

MITSUBISHI MOTORS

SERVICE ENGINEERING & PUBLICATION
INTERNATIONAL AFTER-SALES DEPARTMENT. MITSUBISHI MOTORS CORPORATION

SERVICE BULLETIN	NO. : MSB–01E13–503	
	DATE : 2001–11–20	<MODEL> <M/Y> (EC)CARISMA 96–01 (DA0A) (EC)SPACE STAR 99–01 (DG0A)
SUBJECT : CORRECTION TO DIAGNOSIS CODE NO.		
GROUP : FUEL	DRAFTNO. : 01CH502	
CORRECTION	INTERNATIONAL AFTER-SALES DEPARTMENT	T. Inoue – Manager SERVICE ENGINEERING & PUBLICATION

1. Description:

The diagnosis code No. P0420 for the MPI system has been corrected to P0421.

2. Applicable Manuals:

Manual	Pub. No.	Page
'01 CARISMA Workshop Manual Supplement	PWDE9502–E (English) PWDS9503–E (Spanish) PWDF9504–E (French) PWDG9505–E (German) PWDD9506–E (Dutch) PWDW9507–E (Swedish)	13A–5, 7, 9, 37
'96–'01 MY CARISMA Workshop Manual CD–ROM	CDXX 96E1CD (English, Spanish, Swedish) CDXZ 96E1CD (Dutch, French, German)	
'01 SPACE STAR Workshop Manual Supplement	CMXE99E1–A (English) CMXS99E1–A (Spanish) CMXF99E1–A (French) CMXG99E1–A (German) CMXD99E1–A (Dutch) CMXW99E1–A (Swedish) CMXI99E1–A (Italian)	13B–5
'99–'01 MY SPACE STAR Workshop Manual CD–ROM	CMXX 99E2CD (English, Spanish, Swedish) CMXZ 99E2CD (Dutch, French, German, Italian)	

3. Details:

'01 CARISMA Workshop Manual Supplement

Code No.	Diagnosis Item
[illegible]	EGR valve system
~~P0420~~	Catalyst malfunction
P0443	Purge control solenoid valve system
P0505	Idle speed control system
P0551	Power steering fluid pressure switch system

<Incorrect>

<Correct>

P0421

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.

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 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: ~~P0420~~ <Incorrect>
- Oxygen sensor: P0130
- Oxygen sensor heater: P0135, P0141

<Correct>
P0421

INSPECTION CHART FOR DIAGNOSIS CODES

Code No.	Diagnosis item	Reference page
P0100	Air flow sensor system	13A-11
P0105	Barometric pressure sensor system	13A-13
P0110	Intake air temperature sensor system	13A-15
P0115	Engine coolant temperature sensor system	13A-17
P0120	Throttle position sensor system	13A-19
P0125	Feedback system	13A-21
P0130	Oxygen sensor (front) system <sensor 1>	13A-22
P0135	Oxygen sensor heater (front) system <sensor 1>	13A-24
P0136	Oxygen sensor (rear) system <sensor 2>	13A-25
P0141	Oxygen sensor heater (rear) system <sensor 2>	13A-27
P0170	Abnormal fuel system	13A-28
P0201	No. 1 injector system	13A-29
P0202	No. 2 injector system	13A-29
P0203	No. 3 injector system	13A-29
P0204	No. 4 injector system	13A-29
P0300★	Ignition coil (power transistor) system	13A-30
P0301	No. 1 cylinder misfire detected	13A-31
P0302	No. 2 cylinder misfire detected	13A-31
P0303	No. 3 cylinder misfire detected	13A-31
P0304	No. 4 cylinder misfire detected	13A-31
P0325	Detonation sensor system	13A-32
P0335	Crank angle sensor system	13A-32
P0340	Camshaft position sensor system	13A-34
P0403	EGR valve system	13A-36
~~P0420~~	Catalyst malfunction	13A-37
P0443	Purge control solenoid valve system	13A-38
P0500	Vehicle speed sensor system	13A-39
P0505	Idle speed control system	13A-39
P0551	Power steering fluid pressure switch system	13A-42
P1610	Immobilizer system	13A-43

<Incorrect>

~~P0420~~

<Correct>

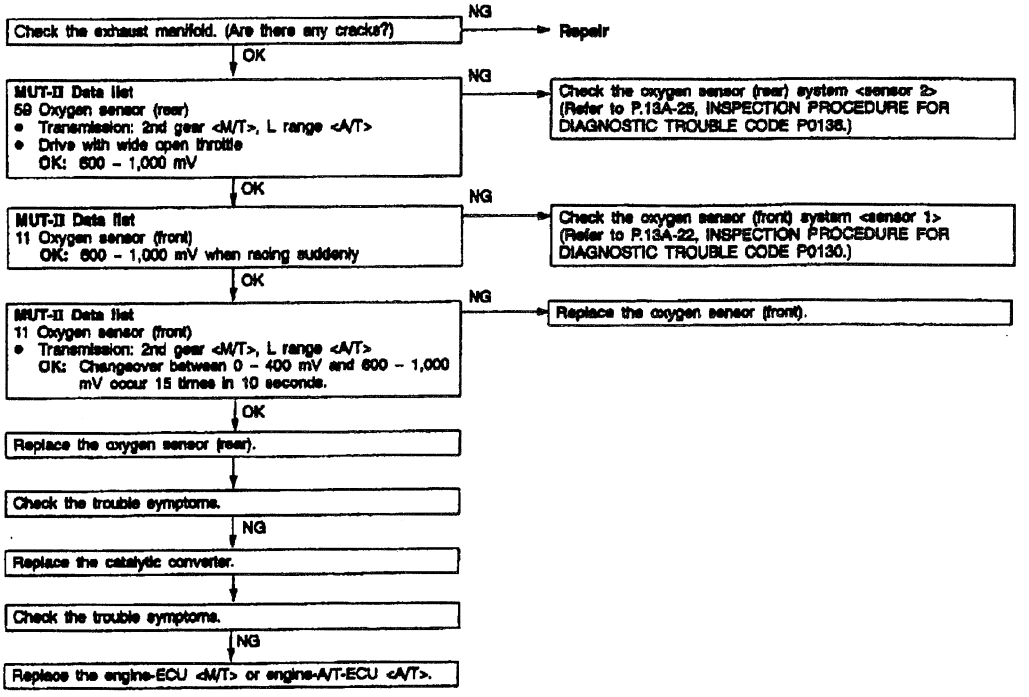
P0421

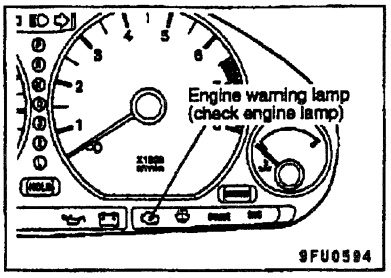
<Correct>

P0421

<Incorrect>

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>





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

<Incorrect>

<Correct>

P0421

SERVICE BULLETIN

MITSUBISHI MOTORS

QUALITY INFORMATION ANALYSIS
OVERSEAS SERVICE DEPT. MITSUBISHI MOTORS CORPORATION

SERVICE BULLETIN	**No.:** MSB-00E13-001	
	Date: 2001-06-03	**<Model>** / **<M/Y>**

Subject: AVAILABILITY OF DRIVE CYCLE PATTERNS FOR 2001 MODEL CARS

Group: FUEL — **Draft No.:** 00AL602317

INFORMATION — **INTERNATIONAL CAR ADMINISTRATION OFFICE**

T.MASAKI-MANAGER
TECHNICAL SERVICE PLANNING

<Model>	<M/Y>
(EC)GALANT(EA0)	01-10
(EC)SPACE STAR	
(EC) SPACE RUNNER/SPACE WAGON(N80, N90)	
(EC)PAJERO SPORT (K80W,K90W)	
(EC)PAJERO/ MONTERO (V60, V70)	
(EC)CARISMA	
(EC)PAJERO PININ (H60,H70)	

1. Description:

On the 2001 model cars equipped with the on-board diagnostics system, the drive cycle patterns have been made available.
Performing the running test of the car using these drive cycle patterns makes it possible to monitor all the diagnosis codes that are required for operation of the car in order to determine if the applicable system is operating properly or not.

2. Applicable Manuals:

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

DRIVE CYCLE

Performing the running test of the car using the following five drive cycle patterns makes it possible to monitor all the diagnosis codes that are required for operation of the car in order to determine if the applicable system is operating properly or not.
In other words, doing such a drive allows to regenerate any kind of trouble which involves illuminating the Engine Warning Lamp (Check Engine Lamp) and to verify the repair procedure has eliminated the trouble [the Engine Warning Lamp (Check Engine Lamp) is no longer illuminated].

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

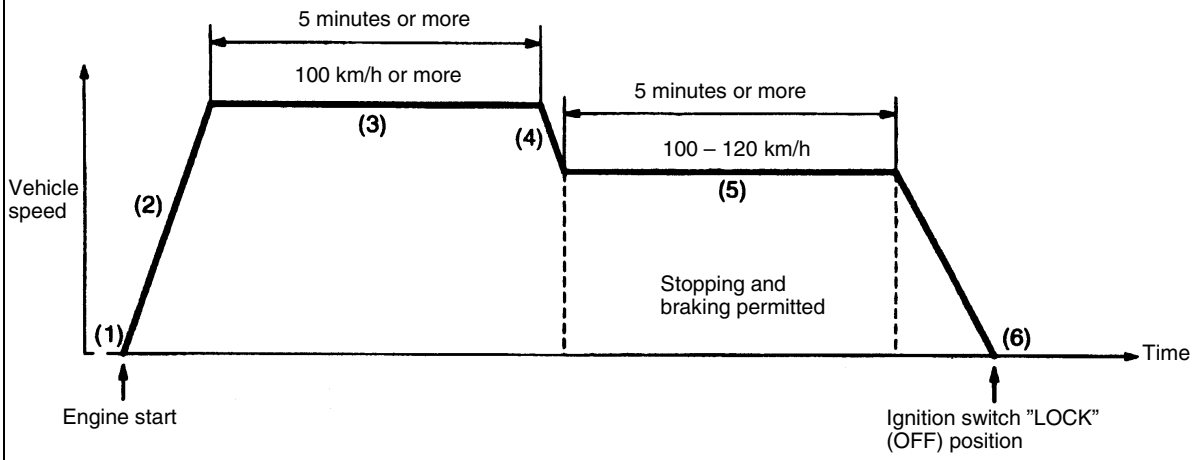
NOTE
Check that the diagnosis code is not output before traveling in the Drive cycle pattern. Erase the diagnosis code if it has been output.

DRIVE CYCLE PATTERN LIST

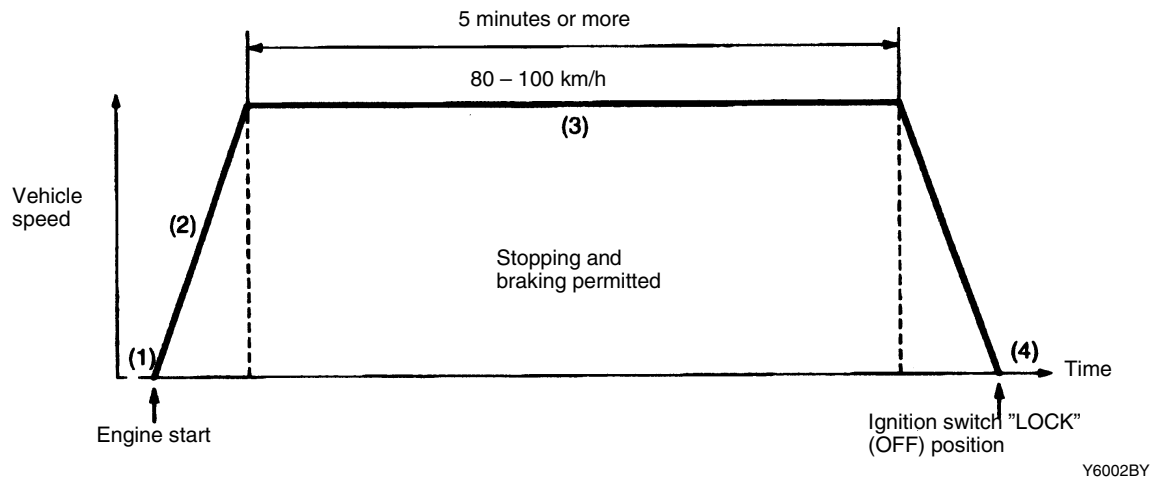
PROCEDURE	MONITOR ITEM	DIAGNOSIS CODE
1	Catalytic converter monitor	P0420
2	Heated oxygen sensor <front> monitor	P0130
3	Fuel trim monitor	P0170
4	Feed back monitor	P0125
5	Other monitor	P0136, P0201, P0202, P0203, P0204, P0300, P0301, P0302, P0303, P0304, P0325

NOTE
The vehicle speed sensor (P0500) and the power steering fluid pressure switch (P0551) are used to determine if the system is operating properly or not through use of the Data List function of the MUT-II.

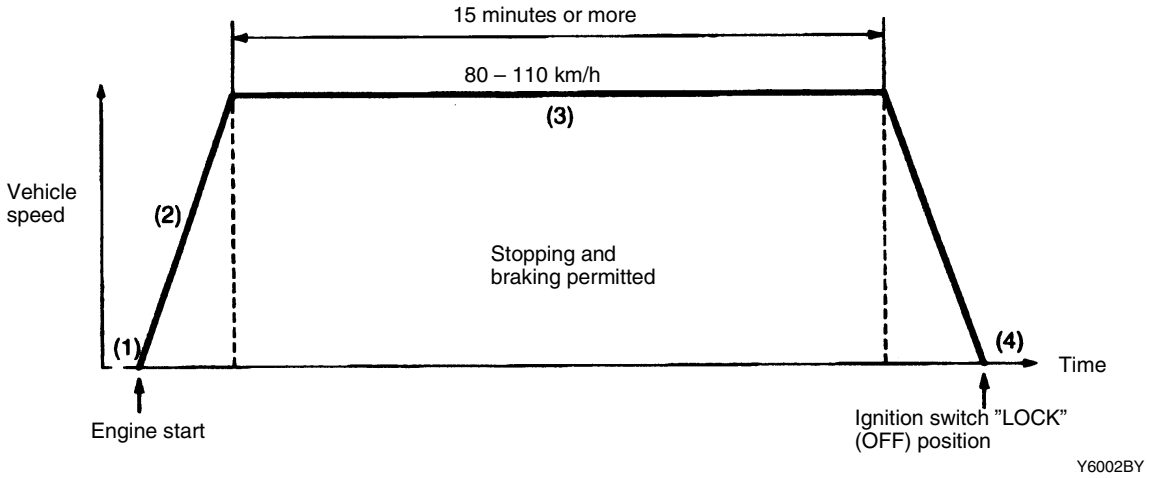
PROCEDURE 1

Monitor item	**CATALYTIC CONVERTER MONITOR (P0420)**
Drive cycle pattern	One trip monitor [from start to ignition switch to “LOCK” (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 10 minutes or more. 
Inspection conditions	• Atmospheric temperature :-10 °C or more • Condition of A/T :Selector lever D range, overdrive switch “ON” position
Test procedure	1. Engine : start 2. Accelerate until the vehicle speed is 100 km/h or more. 3. Travel for 5 minutes or more while keeping the vehicle speed is 100 km/h or more. 4. Decelerate until the vehicle speed is 100 – 120 km/h or less. 5. While keeping the accelerator pedal opening degree constant, keep the vehicle speed at 100 – 120 km/h and travel for 5 minutes or more. • Stopping and braking during this operation are permitted. 6. Return the vehicle to the shop, then turn the ignition switch “LOCK” (OFF) position.

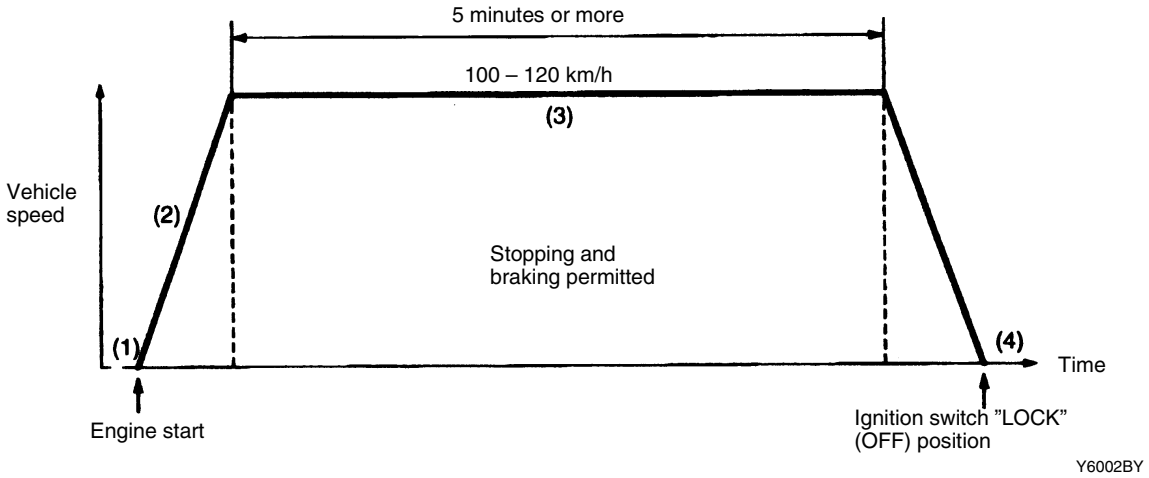
PROCEDURE 2

OXYGEN SENSOR <FRONT> MONITOR (P0130)	
Drive cycle pattern	One trip monitor [from start to ignition switch to “LOCK” (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 5 minutes or more. 
Inspection conditions	• Engine coolant temperature : 85 °C or more • Atmospheric temperature : -10 °C or more • Condition of A/T :Selector lever D range, overdrive switch “ON” position
Test procedure	1. Engine : start 2. Accelerate until the vehicle speed is 80 – 100 km/h. 3. While keeping the accelerator pedal opening degree constant, keep the vehicle speed at 80 – 100 km/h and travel for 5 minutes or more. • Stopping and braking during this operation are permitted. Keep the accelerator pedal opening degree constant for 1 minute or more after each acceleration. 4. Return the vehicle to the shop, then turn the ignition switch “LOCK” (OFF) position.

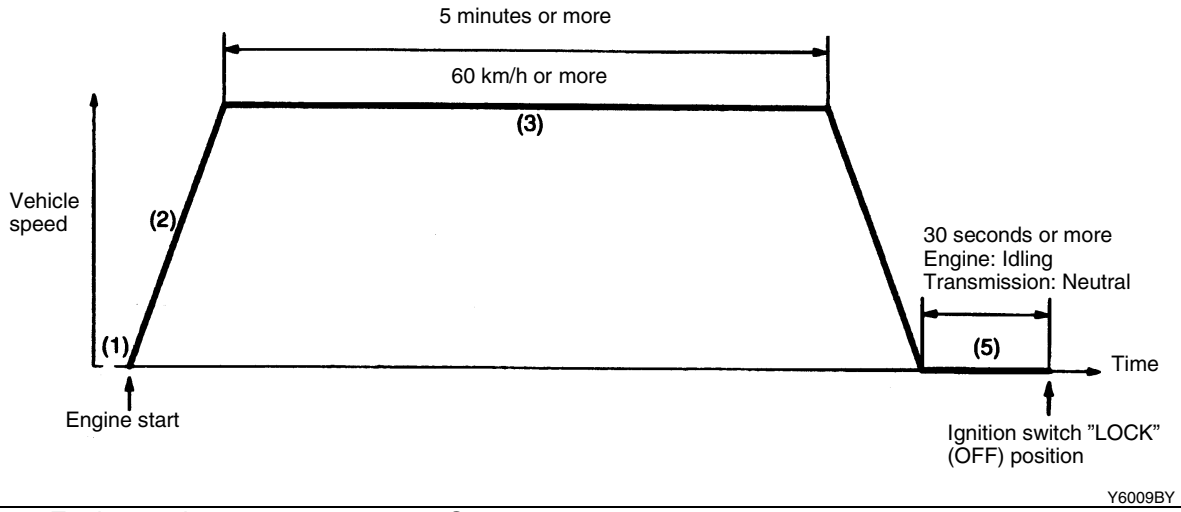
PROCEDURE 3

monitor item	**FUEL TRIM MONITOR (P0170)**
Drive cycle pattern	One trip monitor [from start to ignition switch to “LOCK” (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 15 minutes or more. 
Inspection conditions	• Engine coolant temperature : 85 °C or more • Atmospheric temperature : -10 °C or more • Condition of A/T :Selector lever D range, overdrive switch “ON” position
Test procedure	1. Engine : start 2. Accelerate until the vehicle speed is 80 – 110 km/h. 3. While keeping the accelerator pedal opening degree constant, keep the vehicle speed at 80 – 110 km/h and travel for 15 minutes or more. 4. Return the vehicle to the shop, then turn the ignition switch “LOCK” (OFF) position.

PROCEDURE 4

monitor item	**FEED BACK MONITOR (PO125)**
Drive cycle pattern	One trip monitor [from start to ignition switch to “LOCK” (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 5 minutes or more. 
Inspection conditions	• Engine coolant temperature : 85 °C or more • Atmospheric temperature : -10 °C or more • Condition of A/T :Selector lever D range, overdrive switch “ON” position
Test procedure	1. Engine : start 2. Accelerate until the vehicle speed is 100 – 120 km/h. 3. While keeping the accelerator pedal opening degree constant, keep the vehicle speed at 100 – 120 km/h and travel for 5 minutes or more. 4. Return the vehicle to the shop, then turn the ignition switch “LOCK” (OFF) position.

PROCEDURE 5

monitor item	**OTHER MONITOR**
Diagnosis code No.	P0136, P0201, P0202, P0203, P0204, P0300, P0301, P0302, P0303, P0304, P0325
Drive cycle pattern	One trip monitor [from start to ignition switch to “LOCK” (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 6 minutes or more. 
Inspection conditions	• Engine coolant temperature : 85 °C or more • Atmospheric temperature : -10 °C or more • Condition of A/T :Selector lever D range, overdrive switch “ON” position
Test procedure	1. Engine : start 2. Accelerate until the vehicle speed is 60 km/h. 3. While keeping the accelerator pedal opening degree constant, keep the vehicle speed at 60km/h or more and travel for 5 minutes or more. 4. Return the vehicle to the shop 5. After stopping the vehicle, continue idling for 30 seconds, and then turn the ignition switch to ”LOCK” (OFF) position. • A/C switch : OFF • Light and all accessories : OFF • Transmission : Neutral

DRIVE CYCLE

Performing the running test of the car using the following five drive cycle patterns makes it possible to monitor all the diagnosis codes that are required for operation of the car in order to determine if the applicable system is operating properly or not.
In other words, doing such a drive allows to regenerate any kind of trouble which involves illuminating the Engine Warning Lamp (Check Engine Lamp) and to verify the repair procedure has eliminated the trouble [the Engine Warning Lamp (Check Engine Lamp) is no longer illuminated].

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

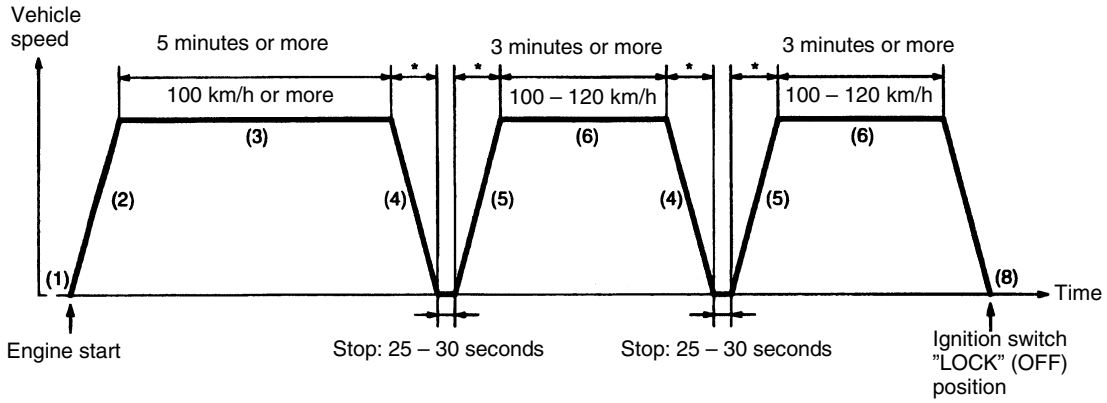
NOTE
Check that the diagnosis code is not output before traveling in the Drive cycle pattern. Erase the diagnosis code if it has been output.

DRIVE CYCLE PATTERN LIST

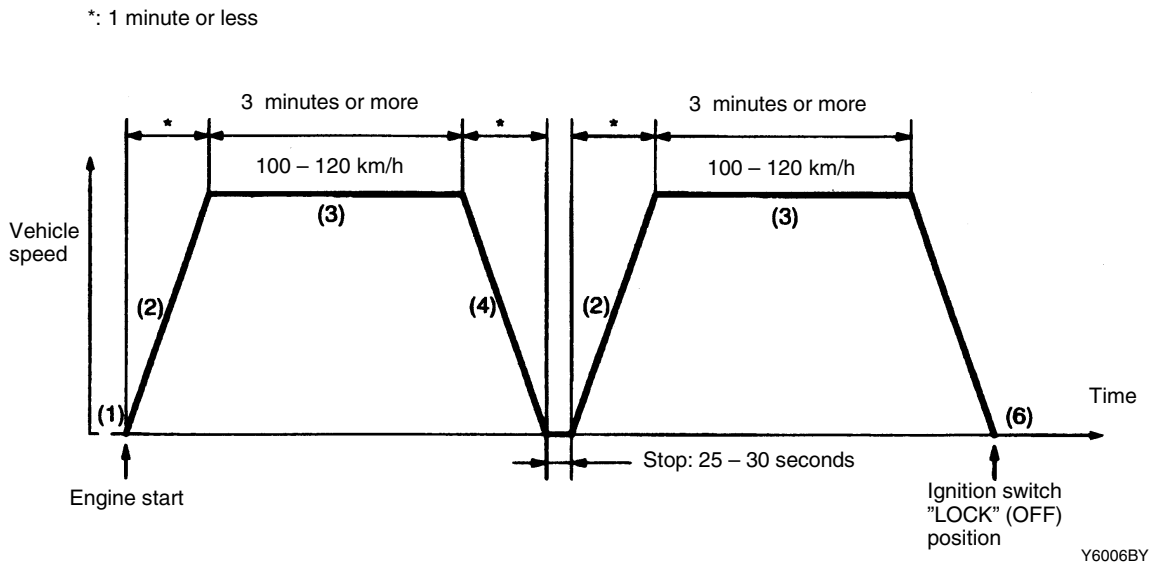
PROCEDURE	MONITOR ITEM	DIAGNOSIS CODE
1	Catalytic converter monitor	P0420
	Catalyst temperature sensor <M/T> monitor (DX only)	P0425
2	Heated oxygen sensor <front> monitor	P0130
3	Fuel trim monitor	P0170
4	Feed back monitor	P0125
5	Other monitor	P0136, P0201, P0202, P0203, P0204, P0300, P0301, P0302, P0303, P0304, P0325

NOTE
The vehicle speed sensor (P0500) and the power steering fluid pressure switch (P0551) are used to determine if the system is operating properly or not through use of the Data List function of the MUT-II.

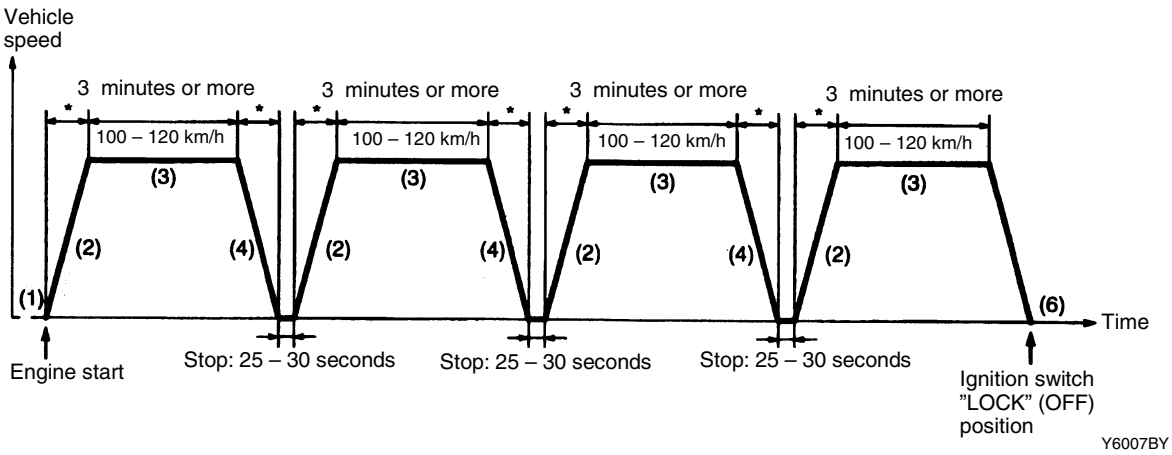
PROCEDURE 1

monitor item	**CATALYTIC CONVERTER MONITOR (P0420)** **CATALYTIC TEMPERATURE SENSOR <M/T> MONITOR (P0425)**
Drive cycle pattern	One trip monitor [from start to ignition switch to “LOCK” (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 12 minutes or more. *: 1 minute or less  Y6004BY
Inspection conditions	• Engine coolant temperature : 85 °C or more • Atmospheric temperature : -10 °C or more • Condition of A/T :Selector lever D range, overdrive switch “ON” position
Test procedure	1. Engine : start 2. Accelerate until the vehicle speed is 100 km/h. 3. Travel for 5 minutes or more while keeping the vehicle speed is 100 km/h or more. 4. Decelerate until the vehicle speed is 0 km/h within 1 minute and stop for 25 – 30 seconds. 5. Accelerate until the vehicle speed at 100 – 120 km/h within 1 minute. 6. While keeping the accelerator pedal opening degree constant, keep the vehicle speed at 100 - 120 km/h and travel for 3 minutes or more. 7. Repeat the above procedure 4 – 6. 8. Return the vehicle to the shop, then turn the ignition switch ”LOCK” (OFF) position.

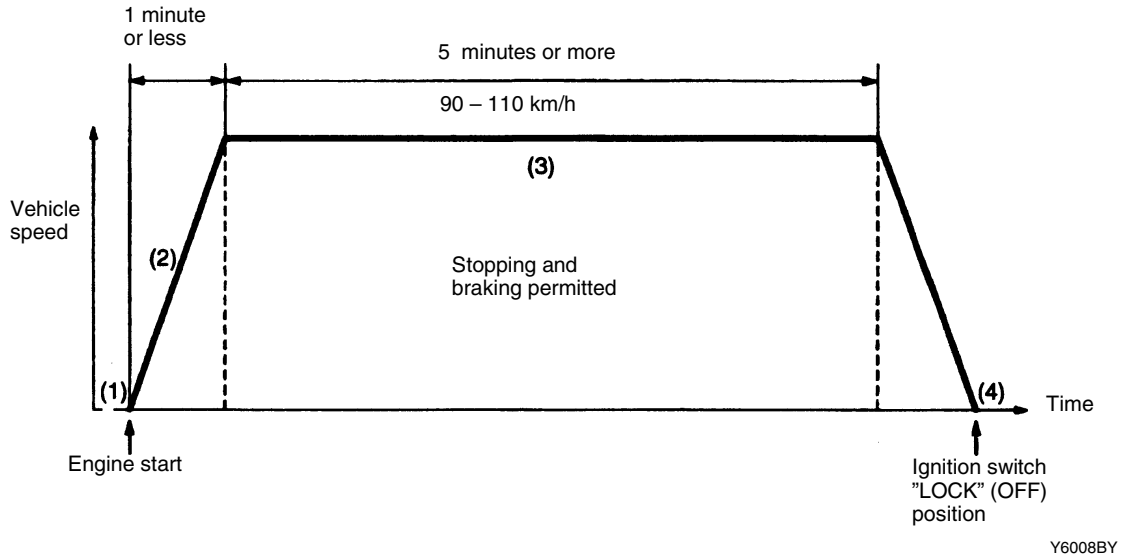
PROCEDURE 2

monitor item	**OXYGEN SENSOR <FRONT> MONITOR (P0130)**
Drive cycle pattern	One trip monitor [from start to ignition switch to “LOCK” (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 7 minutes or more. 
Inspection conditions	• Engine coolant temperature : 85 °C or more • Atmospheric temperature : -10 °C or more • Condition of A/T :Selector lever D range, overdrive switch “ON” position
Test procedure	1. Engine : start 2. Accelerate until the vehicle speed is 100 – 120 km/h within 1 minute. 3. While keeping the accelerator pedal opening degree constant, keep the vehicle speed at 100 – 120 km/h and travel for 3 minutes or more. 4. Decelerate until the vehicle speed is 0 km/h within 1 minute and stop for 25 – 30 seconds. 5. Repeat the above procedure 2 – 3. 6. Return the vehicle to the shop, then turn the ignition switch “LOCK” (OFF) position.

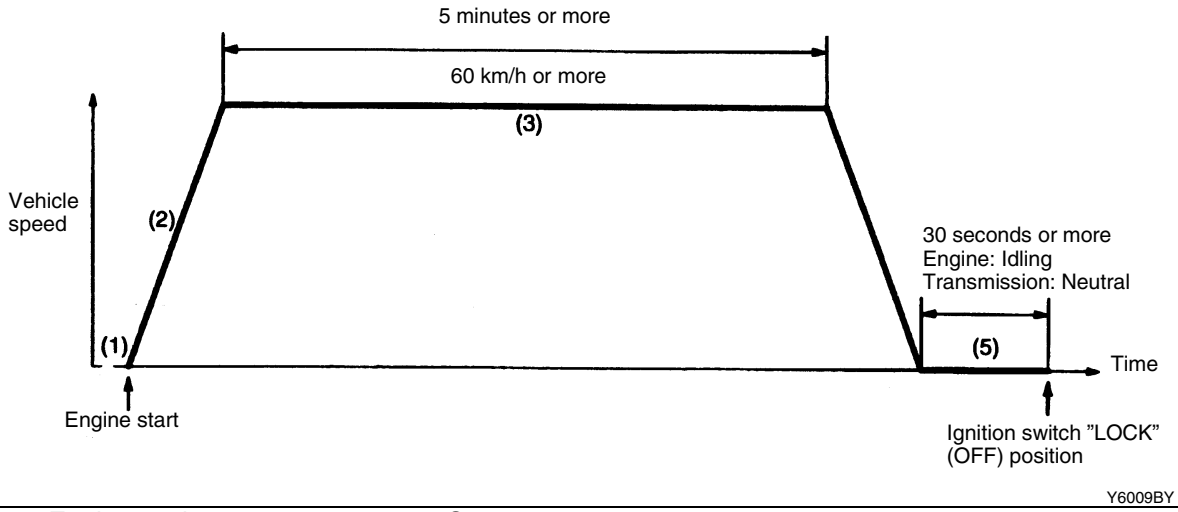
PROCEDURE 3

monitor item	**FUEL TRIM MONITOR (P0170)**
Drive cycle pattern	One trip monitor [from start to ignition switch to “LOCK” (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 13 minutes or more. *: 1 minute or less 
Inspection conditions	• Engine coolant temperature : 85 °C or more • Atmospheric temperature : -10 °C or more • Condition of A/T :Selector lever D range, overdrive switch “ON” position
Test procedure	1. Engine : start 2. Accelerate until the vehicle speed is 100 – 120 km/h within 1 minute. 3. While keeping the accelerator pedal opening degree constant, keep the vehicle speed at 100 – 120 km/h and travel for 3 minutes or more. 4. Decelerate until the vehicle speed is 0 km/h within 1 minute and stop for 25 – 30 seconds. 5. Repeat the above procedure 2 - 4 two times and 2 - 3 one time. 6. Return the vehicle to the shop, then turn the ignition switch “LOCK” (OFF) position.

PROCEDURE 4

monitor item	**FEED BACK MONITOR (P0125)**
Drive cycle pattern	One trip monitor [from start to ignition switch to “LOCK” (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 5 minutes or more. 
Inspection conditions	• Engine coolant temperature : 85 °C or more • Atmospheric temperature : -10 °C or more • Condition of A/T :Selector lever D range, overdrive switch “ON” position
Test procedure	1. Engine : start 2. Accelerate until the vehicle speed is 90 – 110 km/h within 1 minute. 3. While keeping the accelerator pedal opening degree constant, keep the vehicle speed at 90 – 110 km/h and travel for 5 minutes or more. 4. Return the vehicle to the shop, then turn the ignition switch “LOCK” (OFF) position.

PROCEDURE 5

OTHER MONITOR	
Diagnosis code No.	P0136, P0201, P0202, P0203, P0204, P0300, P0301, P0302, P0303, P0304, P0325
Drive cycle pattern	One trip monitor [from start to ignition switch to “LOCK” (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 6 minutes or more. 
Inspection conditions	• Engine coolant temperature : 85 °C or more • Atmospheric temperature : -10 °C or more • Condition of A/T :Selector lever D range, overdrive switch “ON” position
Test procedure	1. Engine : start 2. Accelerate until the vehicle speed is 60 km/h. 3. While keeping the accelerator pedal opening degree constant, keep the vehicle speed at 60km/h or more and travel for 5 minutes or more. 4. Return the vehicle to the shop 5. After stopping the vehicle, continue idling for 30 seconds, and then turn the ignition switch to ”LOCK” (OFF) position. • A/C switch : OFF • Light and all accessories : OFF • Transmission : Neutral

DRIVE CYCLE

Performing the running test of the car using the following five drive cycle patterns makes it possible to monitor all the diagnosis codes that are required for operation of the car in order to determine if the applicable system is operating properly or not.
In other words, doing such a drive allows to regenerate any kind of trouble which involves illuminating the Engine Warning Lamp (Check Engine Lamp) and to verify the repair procedure has eliminated the trouble [the Engine Warning Lamp (Check Engine Lamp) is no longer illuminated].

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

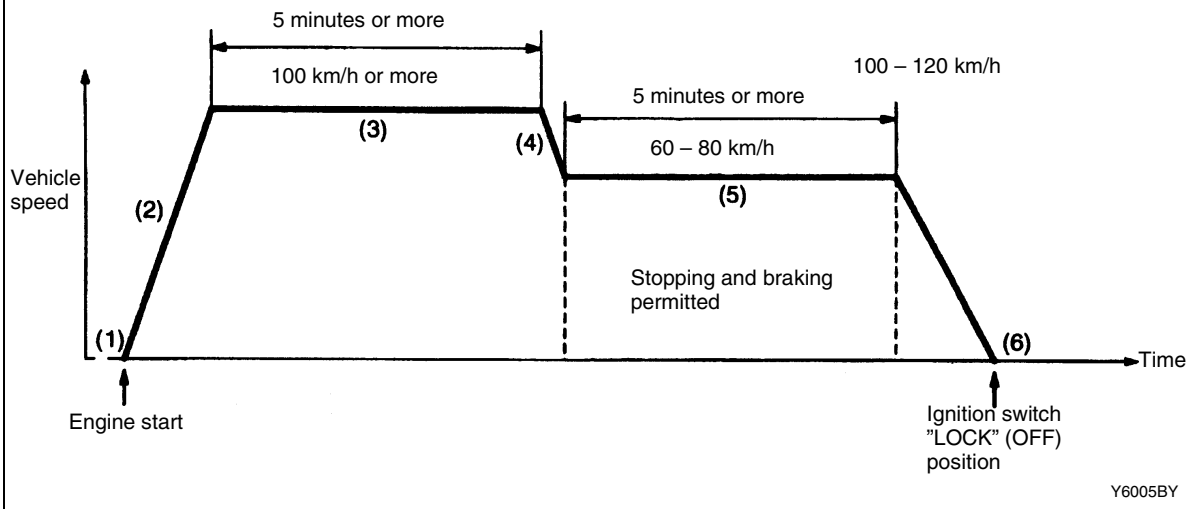
NOTE
Check that the diagnosis code is not output before traveling in the Drive cycle pattern. Erase the diagnosis code if it has been output.

DRIVE CYCLE PATTERN LIST

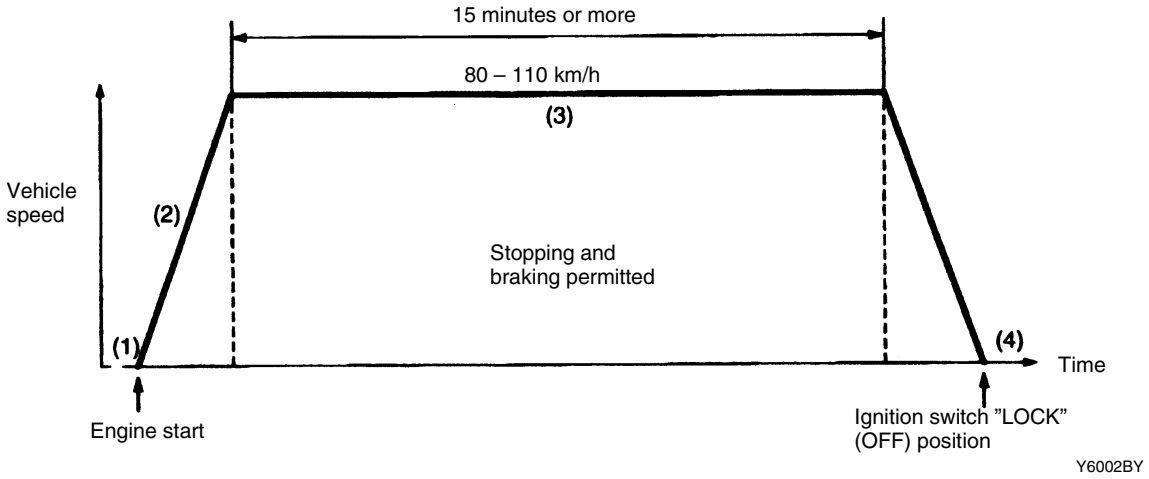
PROCEDURE	MONITOR ITEM	DIAGNOSIS CODE
1	Catalytic converter monitor	P0420
	Heated oxygen sensor <front> monitor	P0130
2	Fuel trim monitor	P0170
3	Feed back monitor	P0125
4	Other monitor	P0136, P0201, P0202, P0203, P0204, P0205, P0206, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0325

NOTE
The vehicle speed sensor (P0500) and the power steering fluid pressure switch (P0551) are used to determine if the system is operating properly or not through use of the Data List function of the MUT-II.

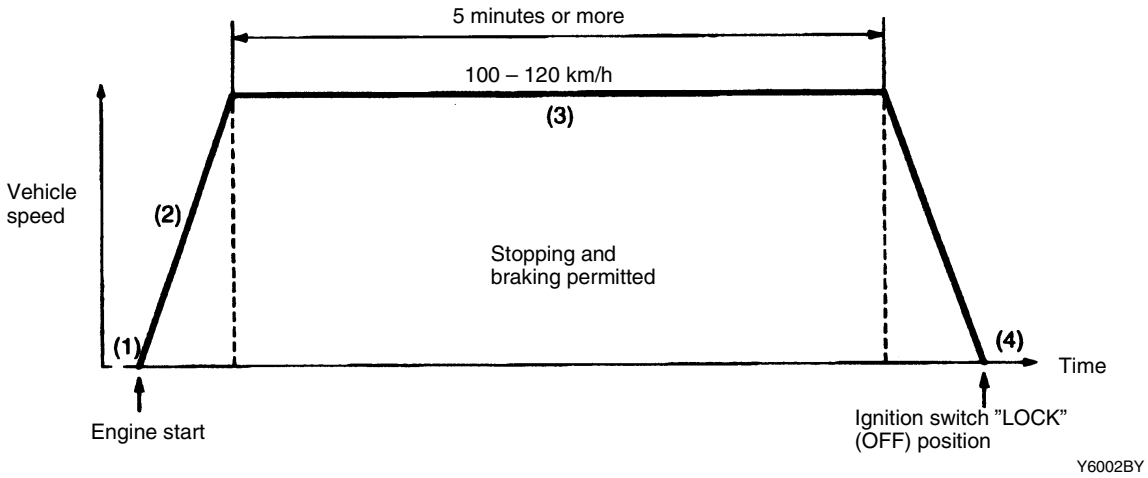
PROCEDURE 1

monitor item	**CATALYTIC CONVERTER MONITOR (P0420)** **OXYGEN SENSOR <FRONT> MONITOR (P0130)**
Drive cycle pattern	One trip monitor [from start to ignition switch to “LOCK” (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 10 minutes or more. 
Inspection conditions	• Atmospheric temperature : -10 °C or more • Condition of A/T :Selector lever D range, overdrive switch “ON” position
Test procedure	1. Engine : start 2. Accelerate until the vehicle speed is 100 km/h or more. 3. Travel for 5 minutes or more while keeping the vehicle speed is 100 km/h or more. 4. Decelerate until the vehicle speed is 60 - 80 km/h or less. 5. While keeping the accelerator pedal opening degree constant, keep the vehicle speed at 60 - 80 km/h and travel for 5 minutes or more. • Stopping and braking during this operation are permitted. 6. Return the vehicle to the shop, then turn the ignition switch ”LOCK” (OFF) position.

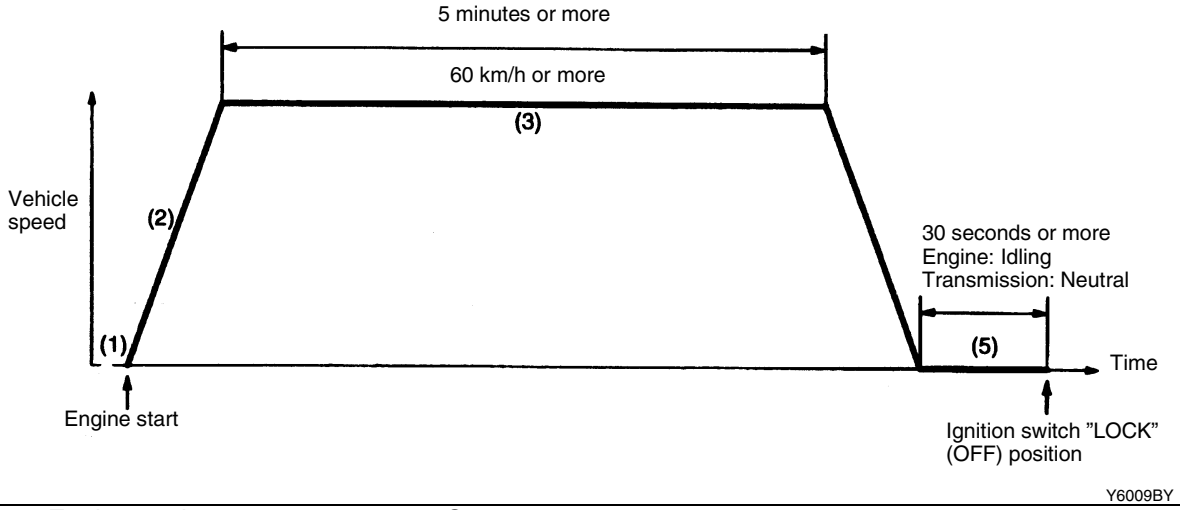
PROCEDURE 2

monitor item	**FUEL TRIM MONITOR (P0170)**
Drive cycle pattern	One trip monitor [from start to ignition switch to “LOCK” (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 15 minutes or more. 
Inspection conditions	• Engine coolant temperature : 85 °C or more • Atmospheric temperature : -10 °C or more • Condition of A/T :Selector lever D range, overdrive switch “ON” position
Test procedure	1. Engine : start 2. Accelerate until the vehicle speed is 80 – 110 km/h. 3. While keeping the accelerator pedal opening degree constant, keep the vehicle speed at 80 – 110 km/h and travel for 15 minutes or more. 4. Return the vehicle to the shop, then turn the ignition switch “LOCK” (OFF) position.

PROCEDURE 3

monitor item	**FEED BACKK MONITOR (P0125)**
Drive cycle pattern	One trip monitor [from start to ignition switch to “LOCK” (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 5 minutes or more. 
Inspection conditions	• Engine coolant temperature : 85 °C or more • Atmospheric temperature : -10 °C or more • Condition of A/T :Selector lever D range, overdrive switch “ON” position
Test procedure	1. Engine : start 2. Accelerate until the vehicle speed is 100 – 120 km/h. 3. While keeping the accelerator pedal opening degree constant, keep the vehicle speed at 100 – 120 km/h and travel for 5 minutes or more. 4. Return the vehicle to the shop, then turn the ignition switch “LOCK” (OFF) position.

PROCEDURE 4

monitor item	**OTHER MONITOR**
Diagnosis code No.	P0136, P0201, P0202, P0203, P0204, P0205, P0206, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0325
Drive cycle pattern	One trip monitor [from start to ignition switch to “LOCK” (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 6 minutes or more. 
Inspection conditions	• Engine coolant temperature : 85 °C or more • Atmospheric temperature : -10 °C or more • Condition of A/T :Selector lever D range, overdrive switch “ON” position
Test procedure	1. Engine : start 2. Accelerate until the vehicle speed is 60 km/h. 3. While keeping the accelerator pedal opening degree constant, keep the vehicle speed at 60 km/h or more and travel for 5 minutes or more. 4. Return the vehicle to the shop 5. After stopping the vehicle, continue idling for 30 seconds, and then turn the ignition switch to ”LOCK” (OFF) position. • A/C switch : OFF • Light and all accessories: OFF • Transmission : Neutral

DRIVE CYCLE

Performing the running test of the car using the following five drive cycle patterns makes it possible to monitor all the diagnosis codes that are required for operation of the car in order to determine if the applicable system is operating properly or not.
In other words, doing such a drive allows to regenerate any kind of trouble which involves illuminating the Engine Warning Lamp (Check Engine Lamp) and to verify the repair procedure has eliminated the trouble [the Engine Warning Lamp (Check Engine Lamp) is no longer illuminated].

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

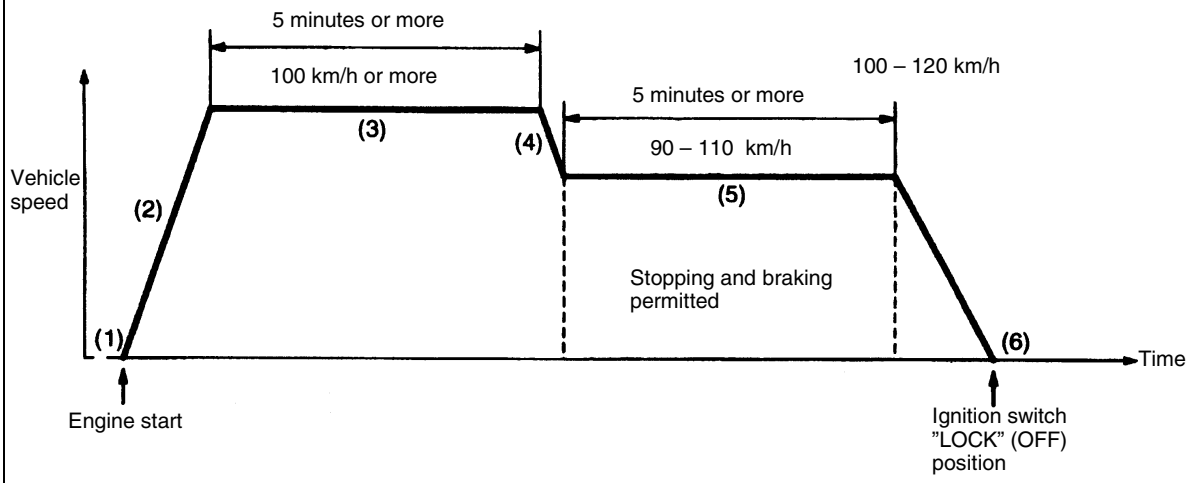
NOTE
Check that the diagnosis code is not output before traveling in the Drive cycle pattern. Erase the diagnosis code if it has been output.

DRIVE CYCLE PATTERN LIST

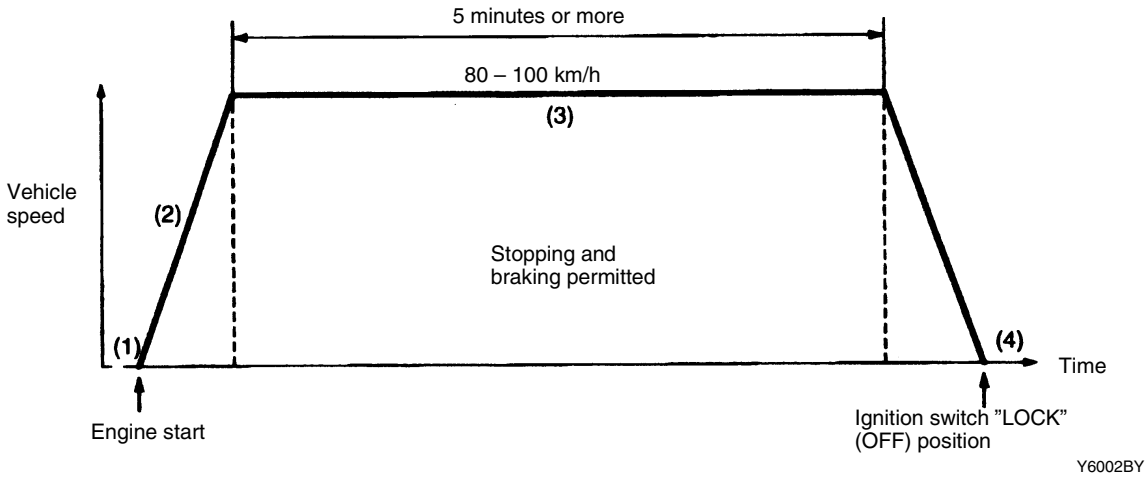
PROCEDURE	MONITOR ITEM	DIAGNOSIS CODE
1	Catalytic converter monitor	P0420
2	Heated oxygen sensor <front> monitor	P0130
3	Fuel trim monitor	P0170
4	Feed back monitor	P0125
5	Other monitor	P0136, P0201, P0202, P0203, P0204, P0300, P0301, P0302, P0303, P0304, P0325

NOTE
The vehicle speed sensor (P0500) and the power steering fluid pressure switch (P0551) are used to determine if the system is operating properly or not through use of the Data List function of the MUT-II.

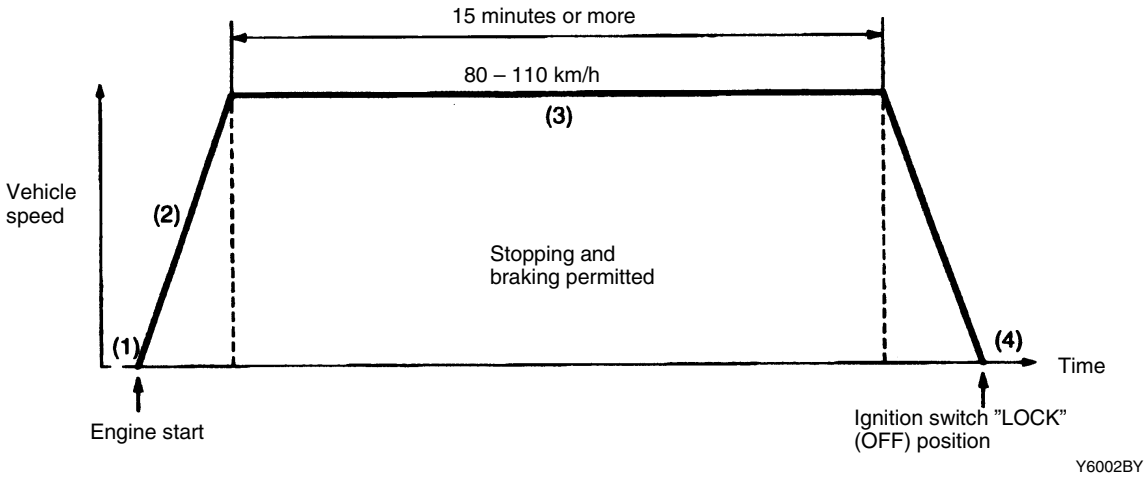
PROCEDURE 1

monitor item	**CATALYTIC CONVERTER MONITOR (P0420)**
Drive cycle pattern	One trip monitor [from start to ignition switch to “LOCK” (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 10 minutes or more. 
Inspection conditions	• Atmospheric temperature : -10 °C or more • Condition of A/T :Selector lever D range, overdrive switch “ON” position
Test procedure	1. Engine : start 2. Accelerate until the vehicle speed is 100 km/h or more. 3. Travel for 5 minutes or more while keeping the vehicle speed is 100 km/h or more. 4. Decelerate until the vehicle speed is 90 –110 km/h or less. 5. While keeping the accelerator pedal opening degree constant, keep the vehicle speed at 90 - 110 km/h and travel for 5 minutes or more. • Stopping and braking during this operation are permitted. 6. Return the vehicle to the shop, then turn the ignition switch ”LOCK” (OFF) position.

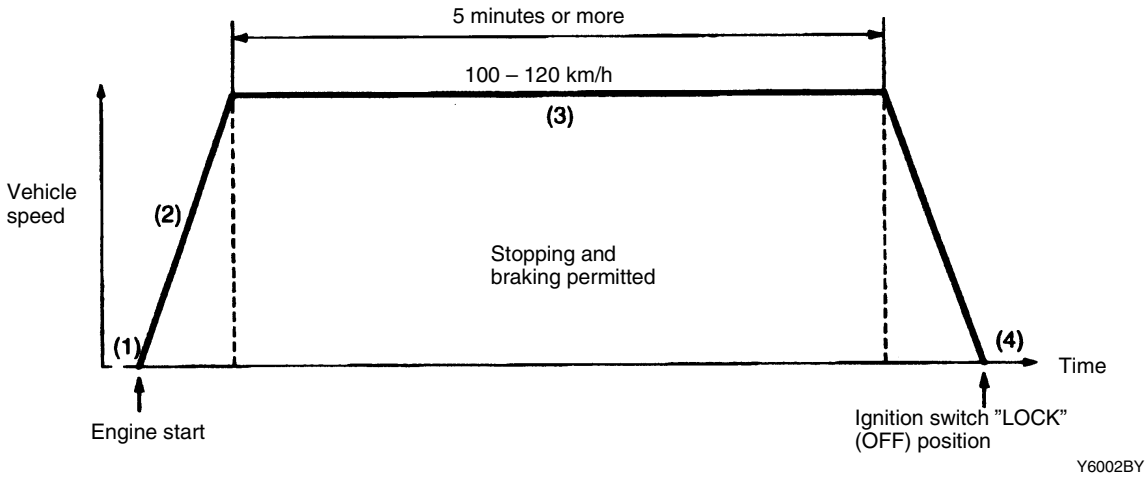
PROCEDURE 2

OXYGEN SENSOR <FRONT> MONITOR (P0130)	
Drive cycle pattern	One trip monitor [from start to ignition switch to “LOCK” (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 5 minutes or more. 
Inspection conditions	• Engine coolant temperature : 85 °C or more • Atmospheric temperature : -10 °C or more • Condition of A/T :Selector lever D range, overdrive switch “ON” position
Test procedure	1. Engine : start 2. Accelerate until the vehicle speed is 80 – 100 km/h. 3. While keeping the accelerator pedal opening degree constant, keep the vehicle speed at 80 – 100 km/h and travel for 5 minutes or more. • Stopping and braking during this operation are permitted. Keep the accelerator pedal opening degree constant for 1 minute or more after each acceleration. 4. Return the vehicle to the shop, then turn the ignition switch “LOCK” (OFF) position.

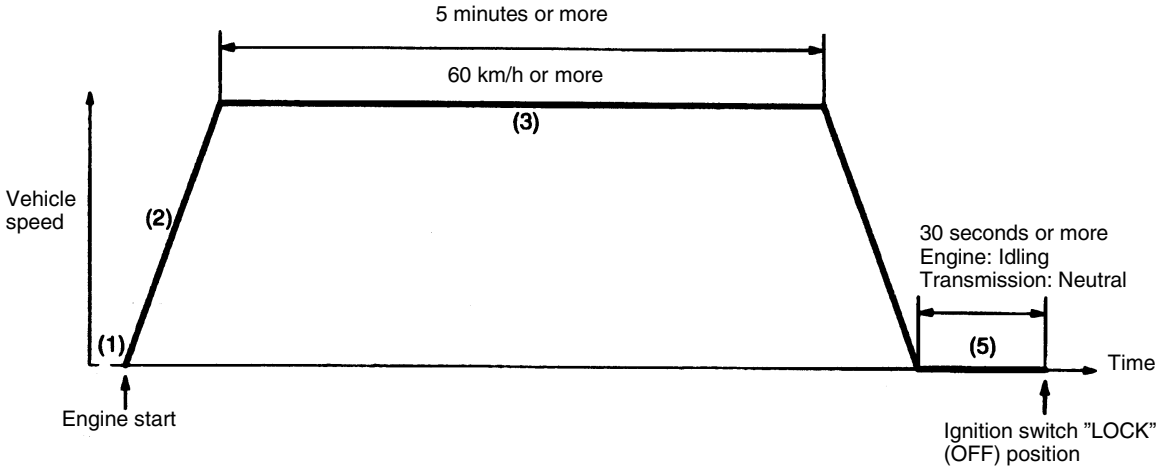
PROCEDURE 3

Monitor item	**FUEL TRIM MONITOR (P0170)**
Drive cycle pattern	One trip monitor [from start to ignition switch to “LOCK” (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 15 minutes or more. 
Inspection conditions	• Engine coolant temperature : 85 °C or more • Atmospheric temperature : -10 °C or more • Condition of A/T :Selector lever D range, overdrive switch “ON” position
Test procedure	1. Engine : start 2. Accelerate until the vehicle speed is 80 – 100 km/h. 3. While keeping the accelerator pedal opening degree constant, keep the vehicle speed at 80 – 110 km/h and travel for 15 minutes or more. 4. Return the vehicle to the shop, then turn the ignition switch “LOCK” (OFF) position.

PROCEDURE 4

Monitor item	**FEED BACK MONITOR (P0125)**
Drive cycle pattern	One trip monitor [from start to ignition switch to “LOCK” (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 5 minutes or more. 
Inspection conditions	• Engine coolant temperature : 85 °C or more • Atmospheric temperature : -10 °C or more • Condition of A/T :Selector lever D range, overdrive switch “ON” position
Test procedure	1. Engine : start 2. Accelerate until the vehicle speed is 100 – 120 km/h. 3. While keeping the accelerator pedal opening degree constant, keep the vehicle speed at 100 – 120 km/h and travel for 15 minutes or more. 4. Return the vehicle to the shop, then turn the ignition switch “LOCK” (OFF) position.

PROCEDURE 5

monitor item	**OTHER MONITOR**
Diagnosis code No.	P0136, P0201, P0202, P0203, P0204, P0300, P0301, P0302, P0303, P0304, P0325
Drive cycle pattern	One trip monitor [from start to ignition switch to “LOCK” (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 6 minutes or more. 
Inspection conditions	• Engine coolant temperature : 85 °C or more • Atmospheric temperature : -10 °C or more • Condition of A/T :Selector lever D range, overdrive switch “ON” position
Test procedure	1. Engine : start 2. Accelerate until the vehicle speed is 60 km/h. 3. While keeping the accelerator pedal opening degree constant, keep the vehicle speed at 60 km/h or more and travel for 5 minutes or more. 4. Return the vehicle to the shop 5. After stopping the vehicle, continue idling for 30 seconds, and then turn the ignition switch to ”LOCK” (OFF) position. • A/C switch : OFF • Light and all accessories: OFF • Transmission : Neutral

DRIVE CYCLE

Performing the running test of the car using the following five drive cycle patterns makes it possible to monitor all the diagnosis codes that are required for operation of the car in order to determine if the applicable system is operating properly or not.
In other words, doing such a drive allows to regenerate any kind of trouble which involves illuminating the Engine Warning Lamp (Check Engine Lamp) and to verify the repair procedure has eliminated the trouble [the Engine Warning Lamp (Check Engine Lamp) is no longer illuminated].

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

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

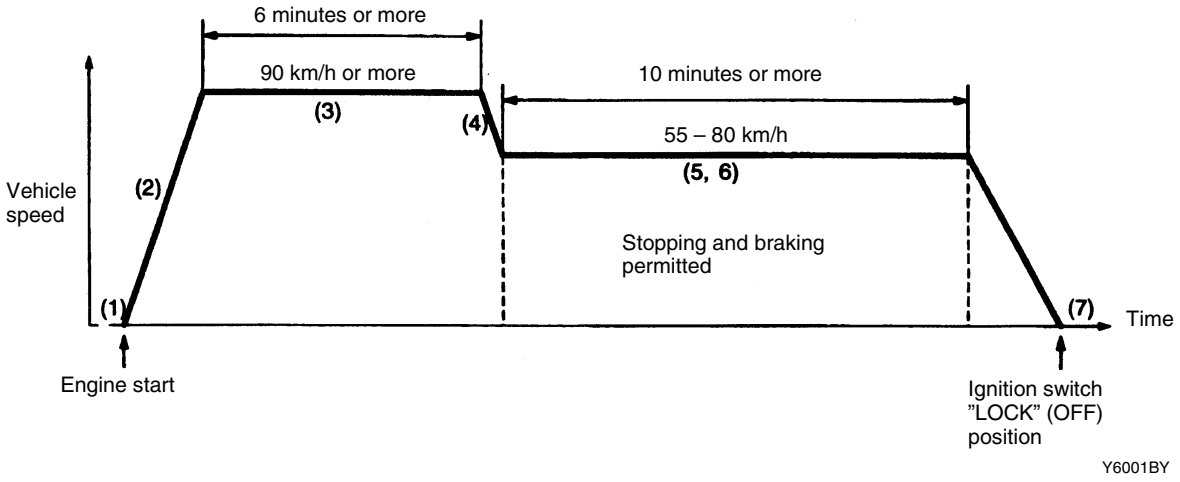
DRIVE CYCLE PATTERN LIST

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

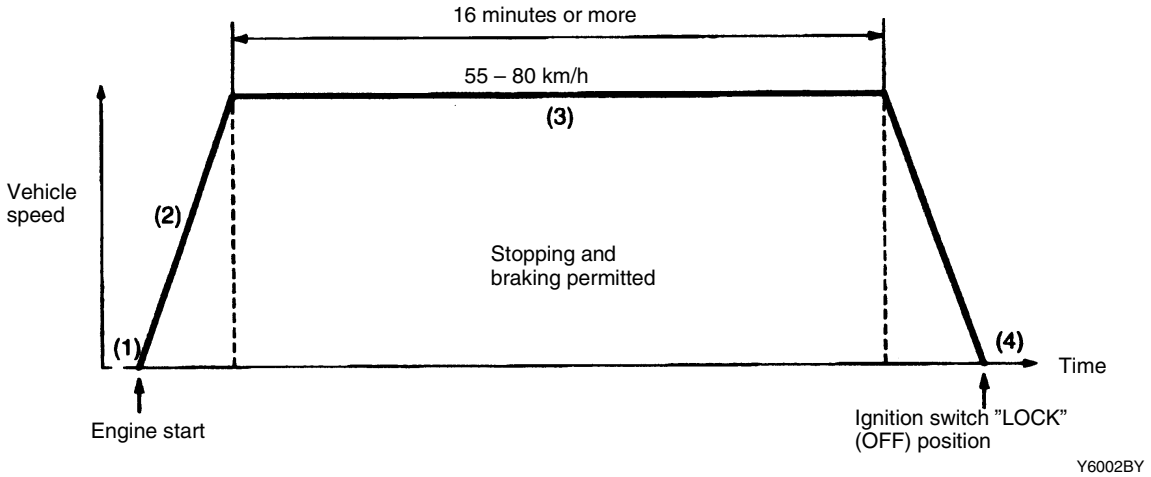
NOTE
*1: 4G63
*2: 4G13, 4G92, 4G93, 6A13, 6G72
*3: 6A13, 6G72
*4: 4G13, 4G63, 4G92, 4G93, 6A13

GDI - Troubleshooting

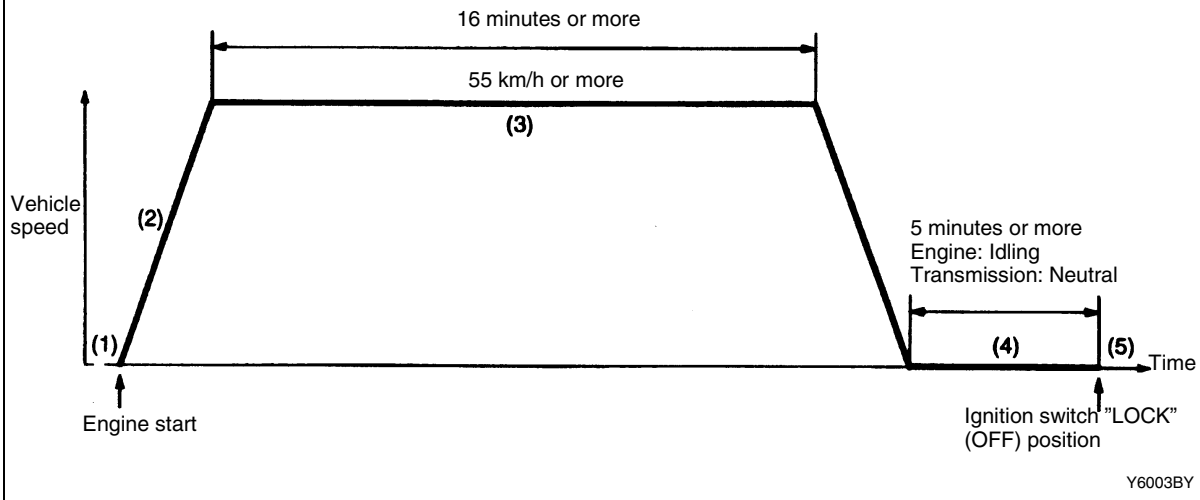
PROCEDURE 1

CATALYTIC CONVERTER MONITOR	
Diagnosis code No.	P0420, P0421, P0431
Drive cycle pattern	One trip monitor [from start to ignition switch to “LOCK” (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 16 minutes or more. 
Inspection conditions	• Atmospheric temperature : -10 °C or more • Condition of A/T :Selector lever D range, overdrive switch “ON” position
Test procedure	1. Engine : start 2. Accelerate until the vehicle speed is 90 km/h or more. 3. Travel for 6 minutes or more while keeping the vehicle speed is 90 km/h or more. 4. Decelerate until the vehicle speed is 80 km/h or less. 5. While traveling at 55 – 80 km/h for 10 minutes or more, fully close the throttle at least once in 2 minutes and decelerate for 10 seconds or more. • Do not repeat deceleration too often. • Vehicle speed may go below 55 km/h after the deceleration. • Stopping and braking during this operation are permitted. (If stopped or drive at 55 km/h or less for more than 5 minutes the monitoring may be stopped. In this case please restart monitoring from the beginning.) 6. After completing the above deceleration, bring the vehicle speed back to 55 – 80 km/h and keep it in the range until starting the deceleration again. • Repeat the above deceleration at least 5 times. 7. Return the vehicle to the shop, the turn the ignition switch ”LOCK” (OFF) position.

PROCEDURE 2

OXYGEN SENSOR <FRONT> MONITOR	
Diagnosis code No.	P0130
Drive cycle pattern	One trip monitor [from start to ignition switch to “LOCK” (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 16 minutes or more. 
Inspection conditions	• Engine coolant temperature : After engine warm up. • Atmospheric temperature : -10 °C or more • Condition of A/T :Selector lever D range, overdrive switch “ON” position
Test procedure	1. Engine : start 2. Accelerate until the vehicle speed is 55 – 80 km/h. 3. While keeping the accelerator pedal opening degree constant, keep the vehicle speed at 55 –80 km/h and travel for 16 minutes or more. • Stopping and braking during this operation are permitted. 4. Return the vehicle to the shop, then turn the ignition switch “LOCK” (OFF) position.

PROCEDURE 3

OTHER MONITOR	
Diagnosis code No.	P0136, P0201, P0202, P0203, P0204, P0205, P0206, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0325, P0500, P0551
Drive cycle pattern	One trip monitor [from start to ignition switch to “LOCK” (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 21 minutes or more. 
Inspection conditions	• Engine coolant temperature : After engine warm up. • Atmospheric temperature : -10 °C or more • Condition of A/T :Selector lever D range, overdrive switch “ON” position
Test procedure	1. Engine : start 2. Accelerate until the vehicle speed is 55 km/h. 3. While keeping the accelerator pedal opening degree constant, keep the vehicle speed at 55 km/h or more and travel for 16 minutes or more. 4. Return the vehicle to the shop 5. After stopping the vehicle, continue idling for 5 minutes, and then turn the ignition switch to ”LOCK” (OFF) position.

SERVICE BULLETIN

MITSUBISHI MOTORS

QUALITY INFORMATION ANALYSIS
OVERSEAS SERVICE DEPT. MITSUBISHI MOTORS CORPORATION

SERVICE BULLETIN	**No.:** ESB-01E54-009	
	Date: 2002-05-03	**<Model>** (EC)SPACE STAR (DG0A) **<M/Y>** 01-10
Subject: CHANGE TO BACK-UP POWER SUPPLY CIRCUITS FOR ECUs		
Group: CHASSIS ELECTRICAL	**Draft No.:** 01CH009	
INFORMATION	**INTERNATIONAL CAR ADMINISTRATION OFFICE**	T.Inoue - Manager SERVICE PUBLICATION

1. Description:

This Service Bulletin informs you of change to the backup-power supply circuits for the engine-ECU and engine-A/T-ECU.

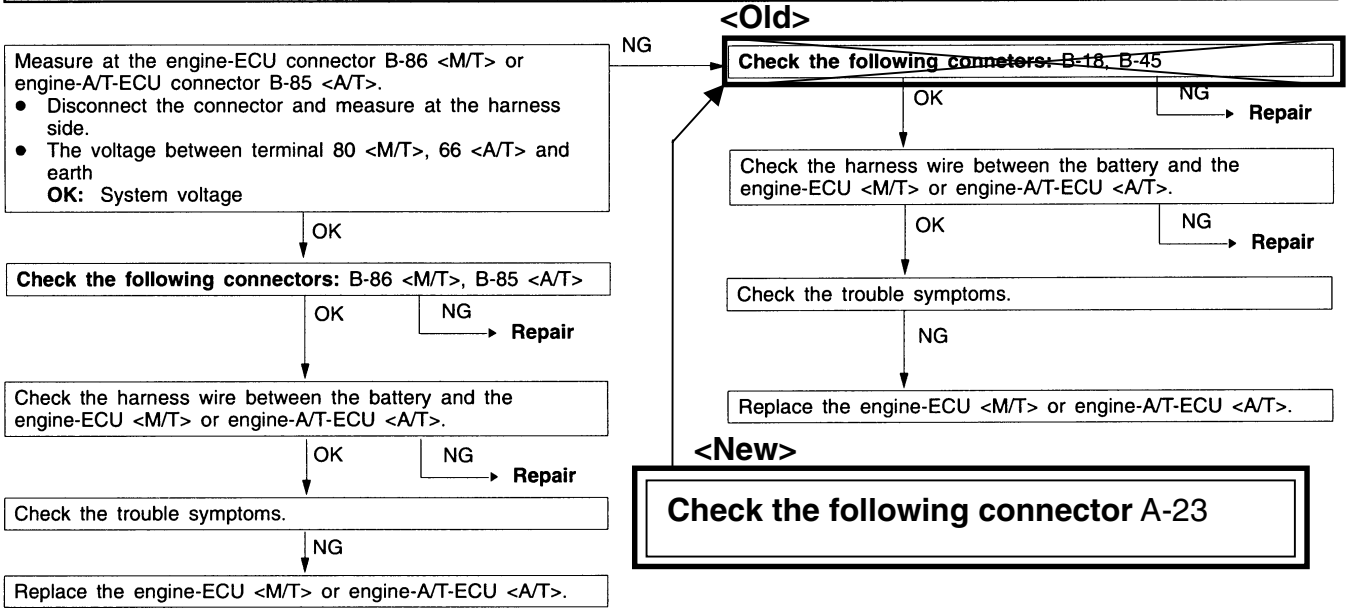
2. Applicable Manuals:

Manual	Pub. No.	Language	Page(s)
'02 SPACESTAR Workshop Manual chassis SUPPLEMENT	CMXE99E1-B	(English)	13A-12 13B-33, 55, 56
	CMXS99E1-B	(Spanish)	
	CMXF99E1-B	(French)	
	CMXG99E1-B	(German)	
	CMXD99E1-B	(Dutch)	
	CMXW99E1-B	(Swedish)	
'02 SPACESTAR Workshop Manual electrical wiring SUPPLEMENT	EMXE99E1-B	(English)	4-6, 12, 18, 30, 44, 50, 52, 58
	EMXS99E1-B	(Spanish)	
	EMXF99E1-B	(French)	
	EMXG99E1-B	(German)	
	EMXD99E1-B	(Dutch)	
	EMXW99E1-B	(Swedish)	
'01 SPACESTAR Workshop Manual chassis SUPPLEMENT	CMXE99E1-A	(English)	13A-90, 91
	CMXS99E1-A	(Spanish)	
	CMXF99E1-A	(French)	
	CMXG99E1-A	(German)	
	CMXD99E1-A	(Dutch)	
	CMXW99E1-A	(Swedish)	
	CMXI99E1-A	(Italian)	

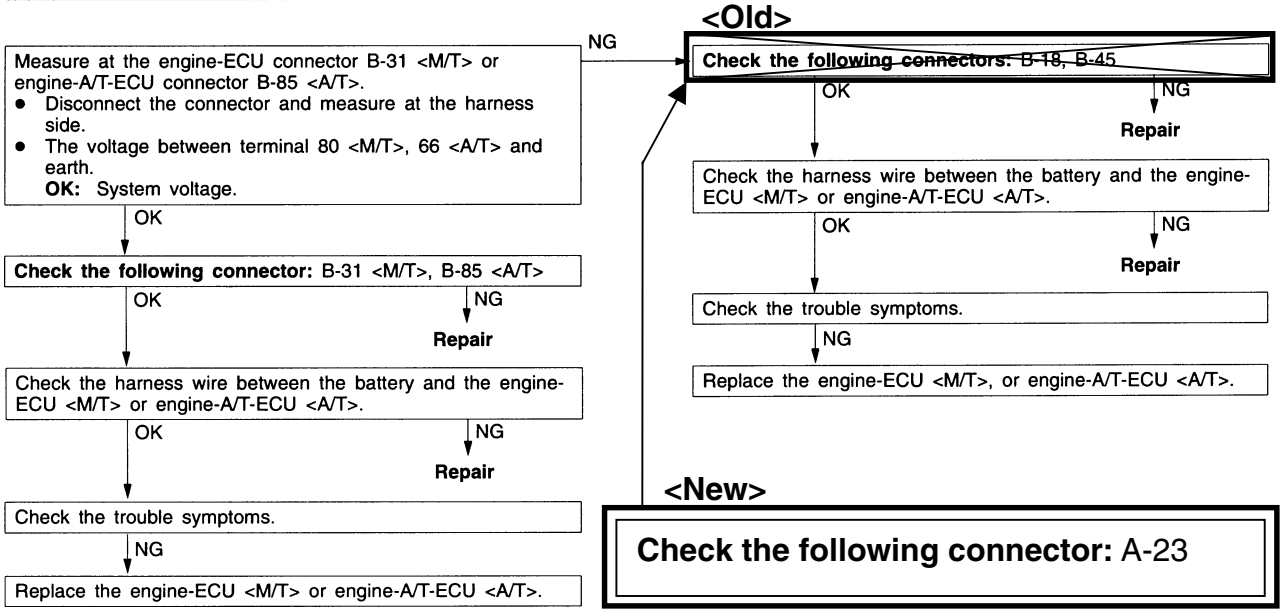
3. Effective Date (Effective Model):

From October 30, 2001
(029200 and up)

Code No. P1603 Battery back-up line system	Probable cause
Range of Check • Ignition swtich: ON Set Conditions • An open circuit is detected in the battery back-up line.	• Open or short circuit in the battery back-up line or loose connector contact • Malfunction of engine-ECU <M/T> • Malfunction of engine-A/T-ECU <A/T>



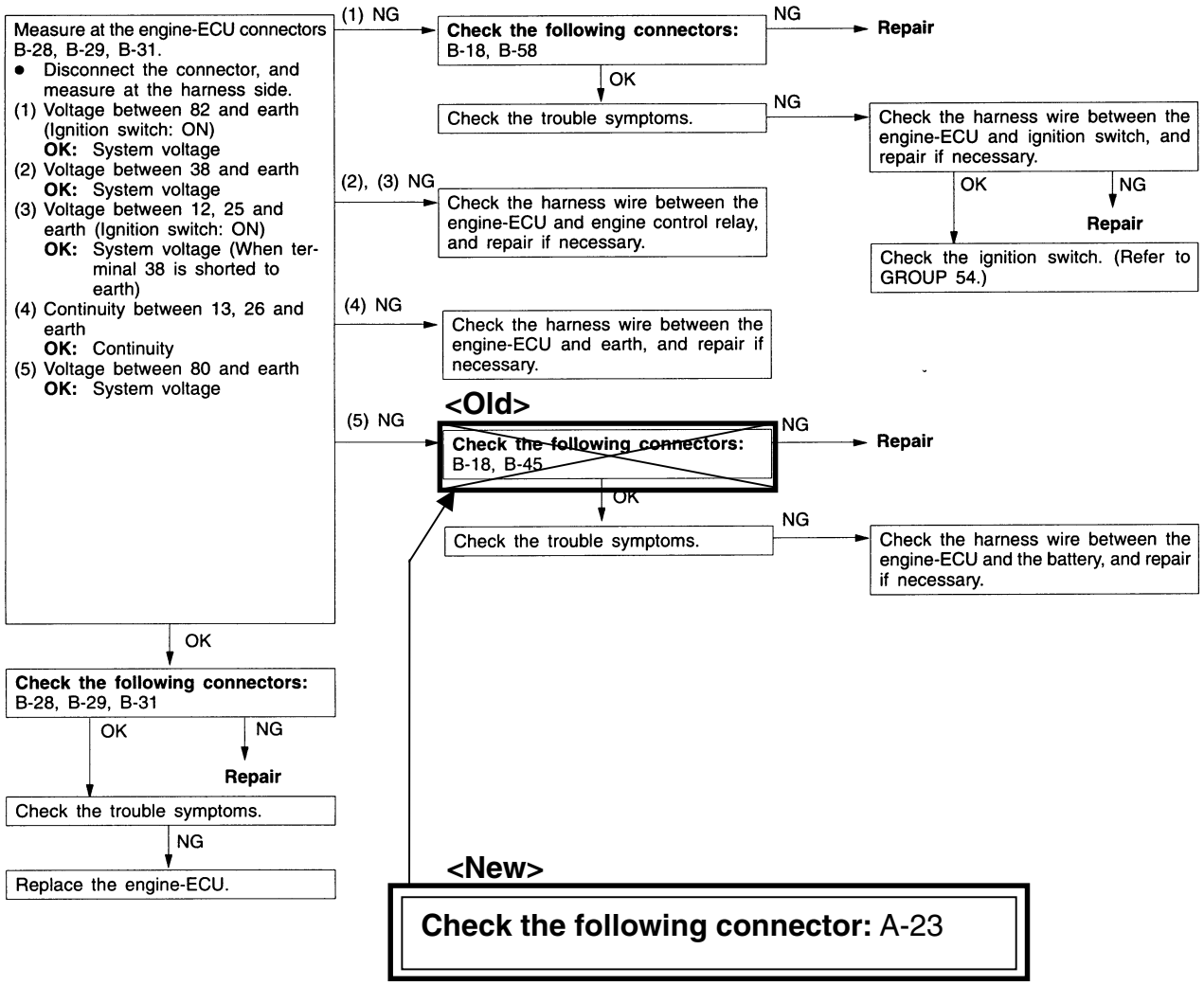
Code No. P1603 Battery back-up line system	Probable cause
Range of Check • Ignition switch: ON Set Conditions • An open circuit was detected in the battery back-up line.	• Open or short circuit in the battery back-up line or loose connector contact • Malfunction of the engine-ECU <M/T> • Malfunction of the engine-A/T-ECU <A/T>



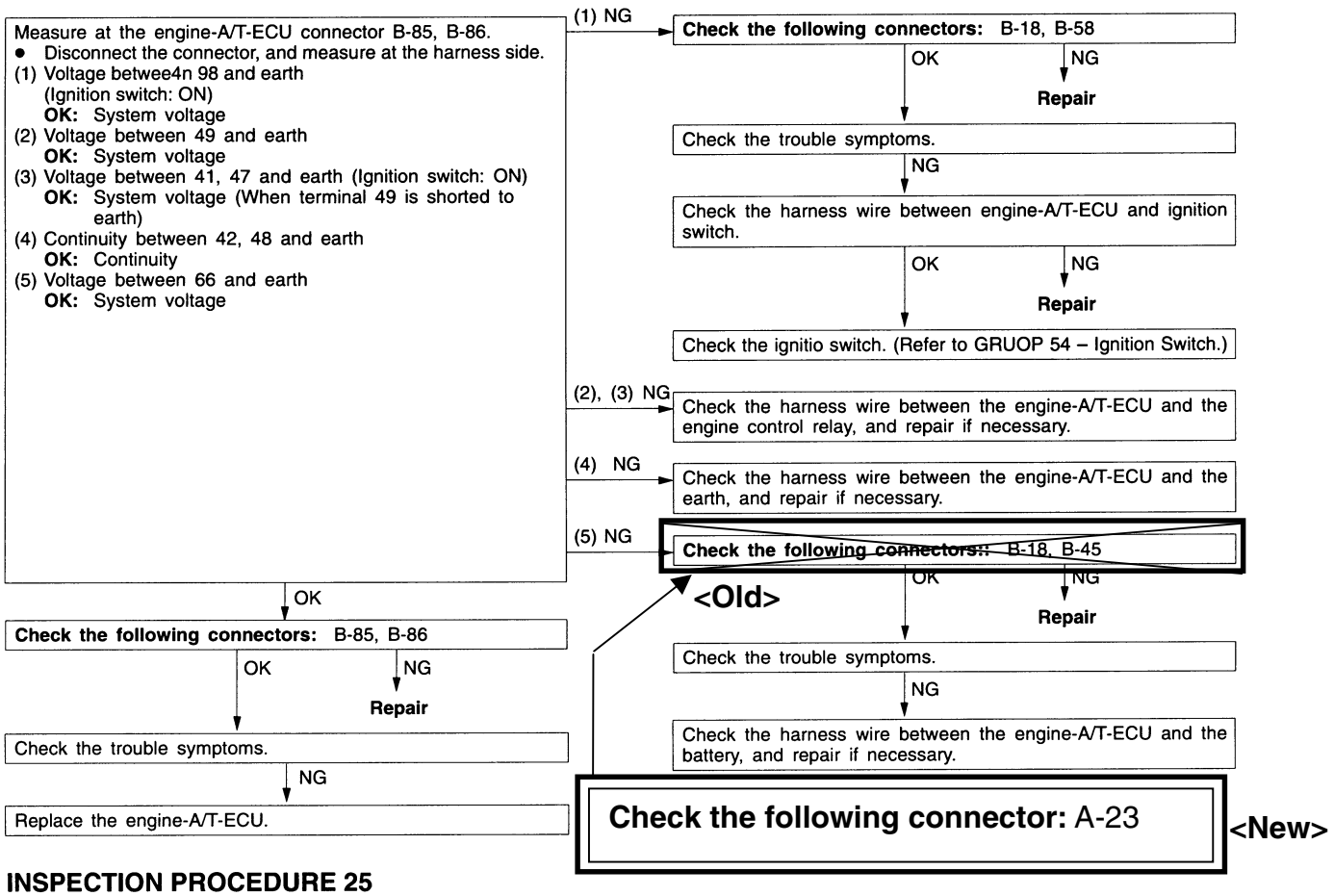
INSPECTION PROCEDURE 24

Engine-ECU (engine-A/T-ECU) power supply and earth circuit system	Probable cause
The cause is probably a malfunction of the engine-ECU <M/T> or engine-A/T-ECU <A/T> or one of the problems listed at right.	• 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> • Malfunction of the engine-A/T-ECU <A/T>

<M/T>

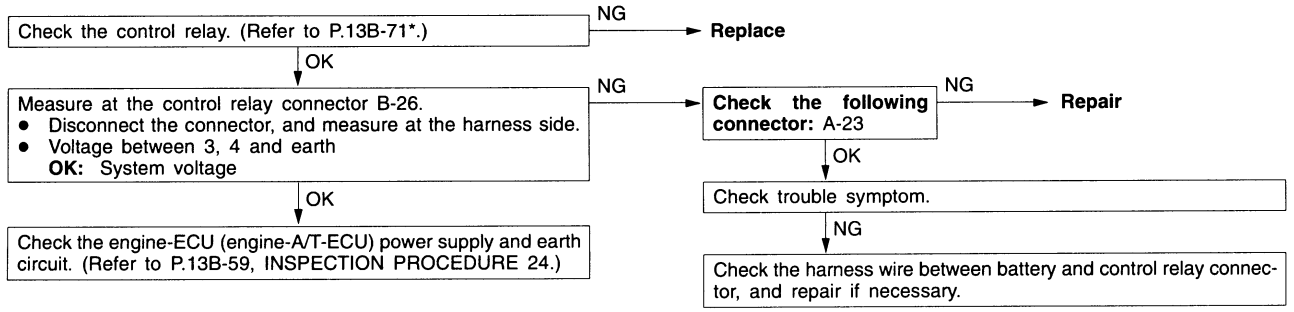


<A/T>



INSPECTION PROCEDURE 25

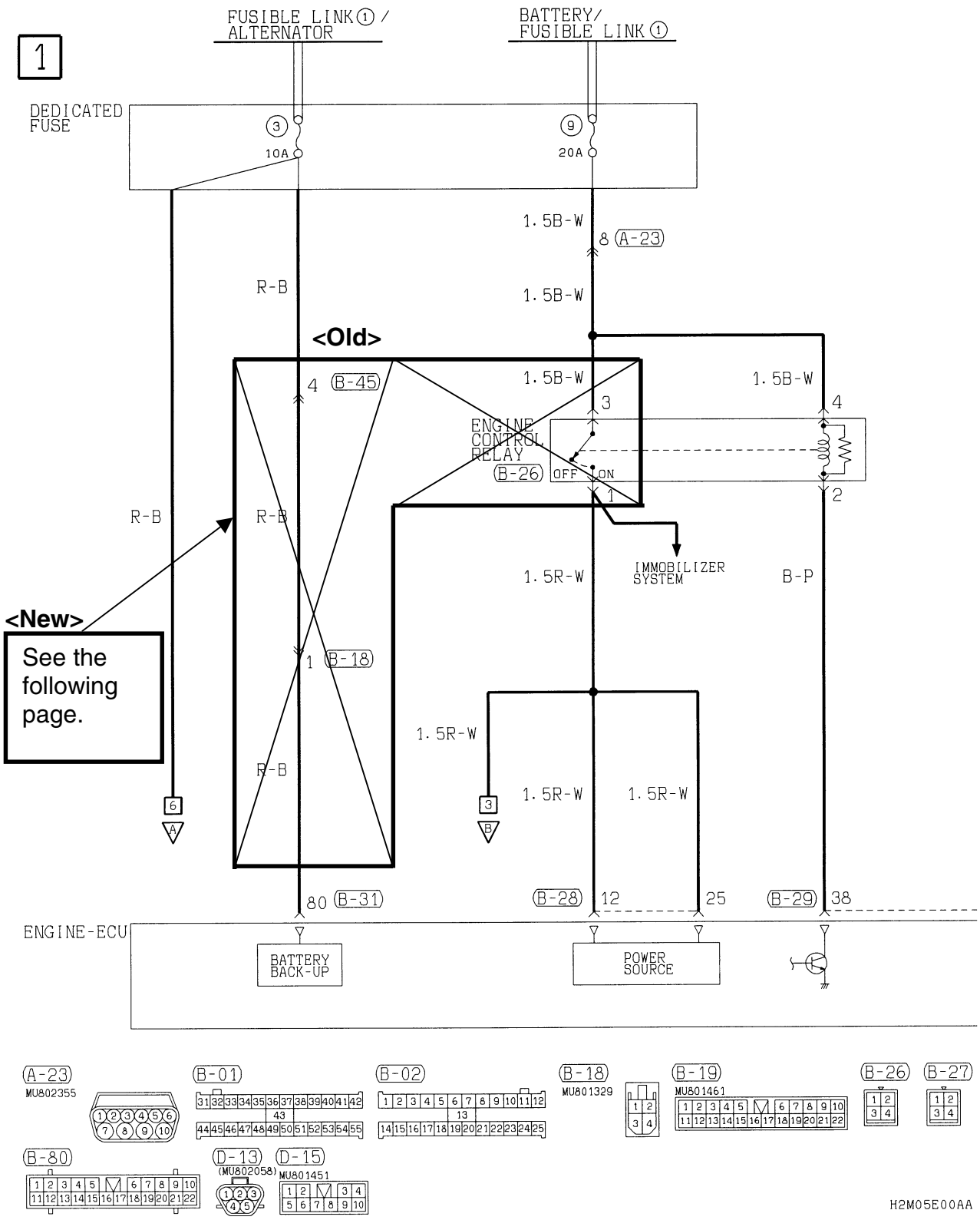
Engine control relay and ignition switch-IG system	Probable cause
When the ignition switch ON signal is input to the engine-ECU <M/T> or engine-A/T-ECU <A/T>, the engine-ECU <M/T> or engine-A/T-ECU <A/T> turns on the engine control relay. This causes system voltage to be supplied to the engine-ECU <M/T>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



NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

ENGINE CONTROL SYSTEM

4G1 engine-M/T



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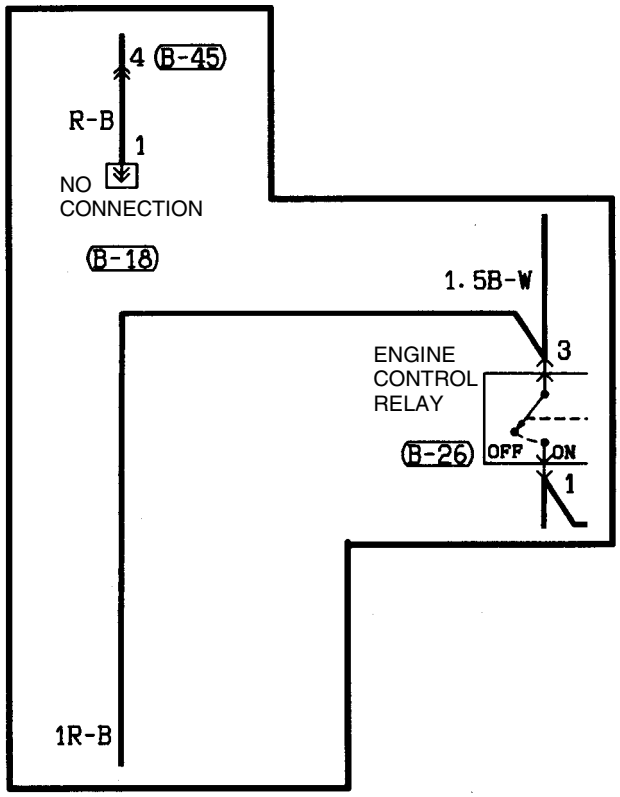
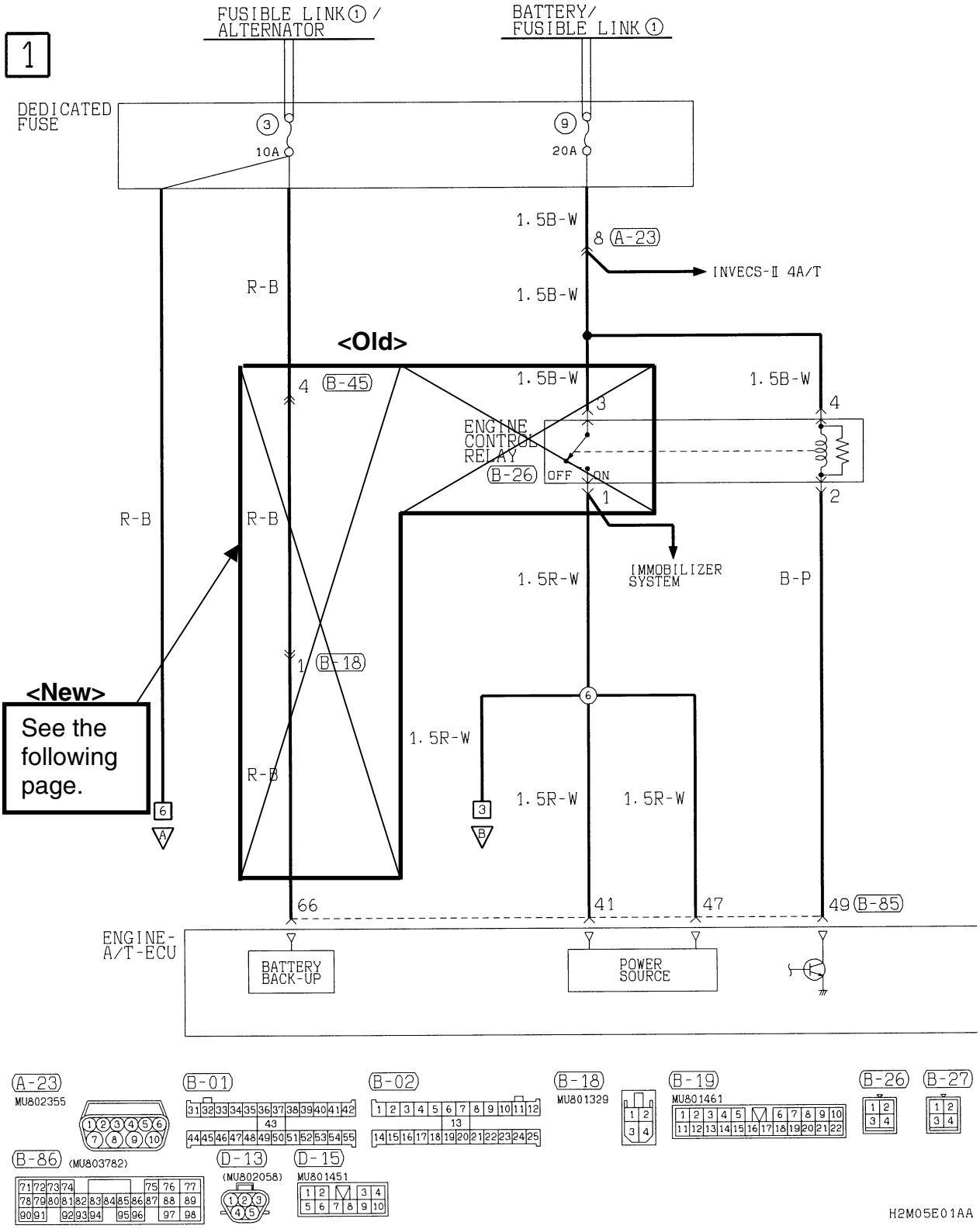

4 B-45
R-B
1
NO
CONNECTION
B-18
1.5B-W
3
ENGINE
CONTROL
RELAY
B-26
OFF
ON
1
1R-B

ENGINE CONTROL SYSTEM

4G1 engine-A/T



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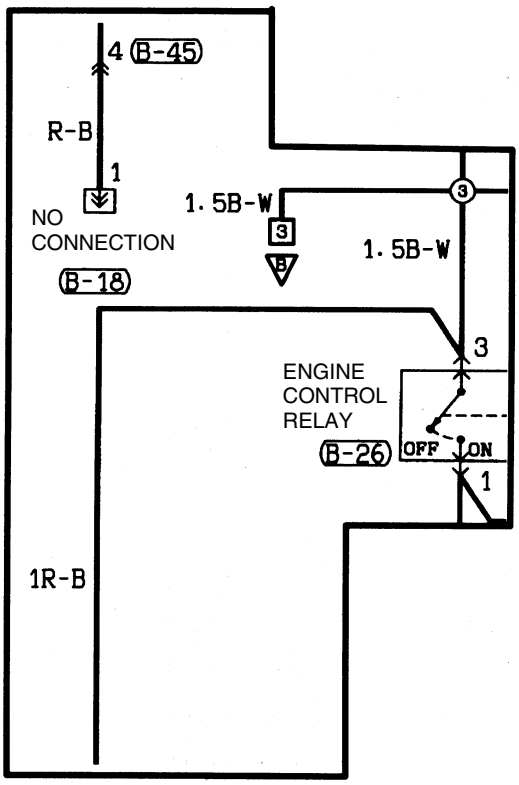
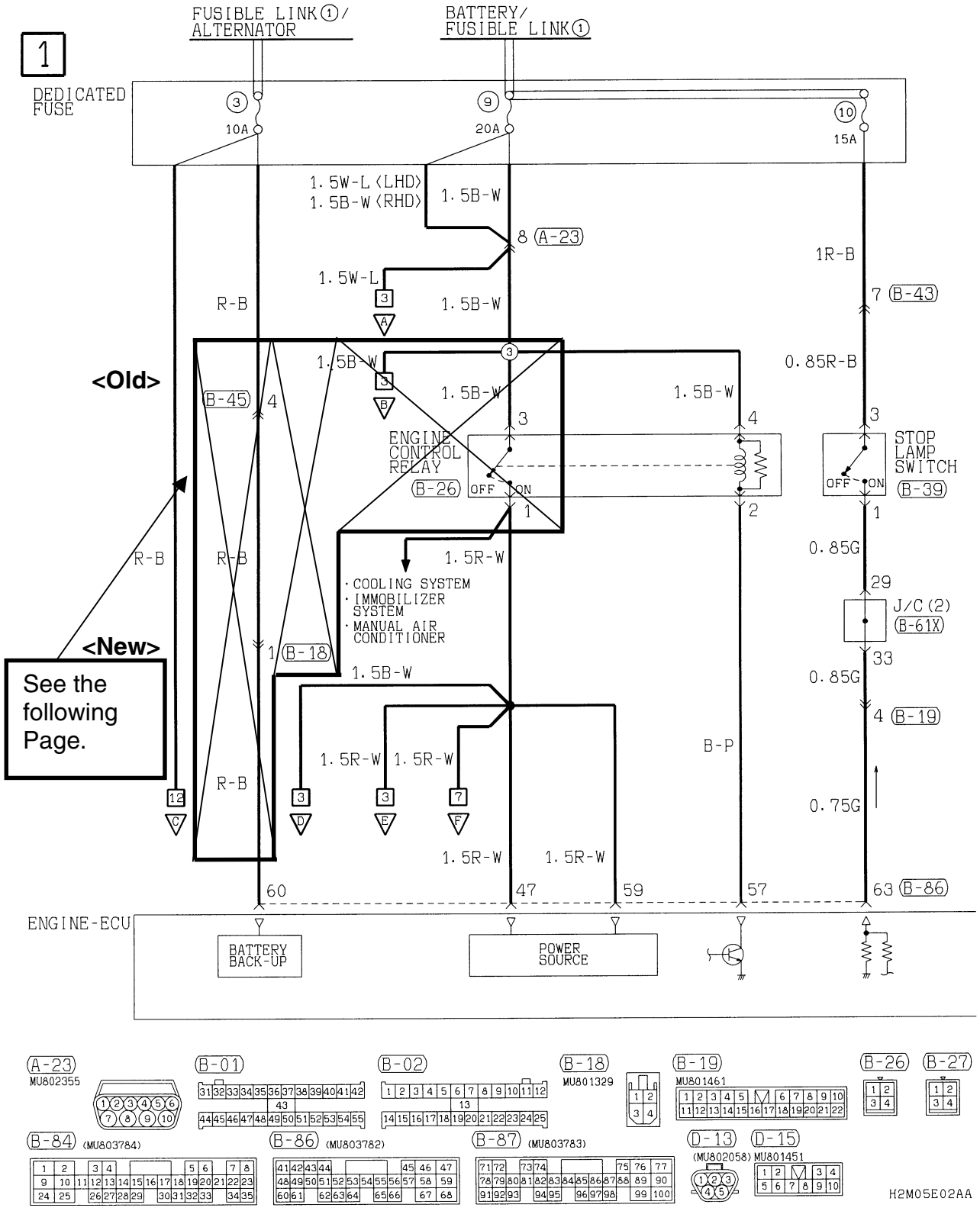
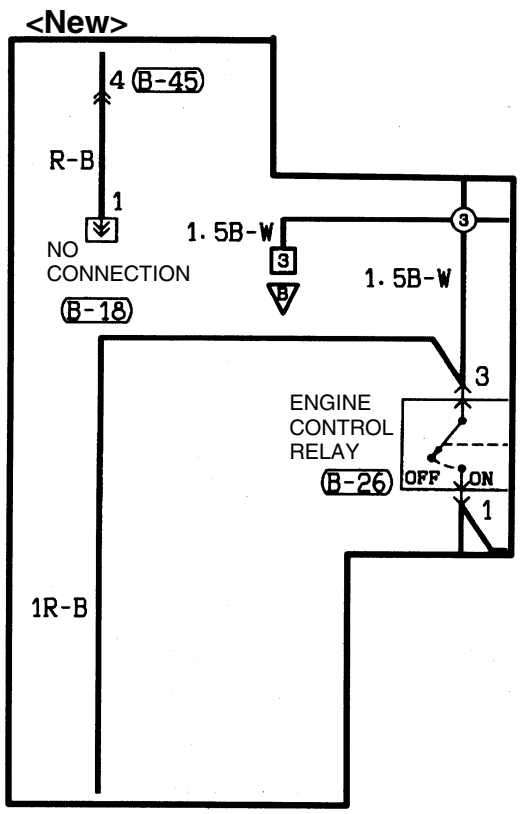

4 B-45
R-B
1
NO
CONNECTION
B-18
1.5B-W
3
B
1.5B-W
3
ENGINE
CONTROL
RELAY
B-26
OFF
ON
1
1R-B

ENGINE CONTROL SYSTEM

4G93 engine-M/T

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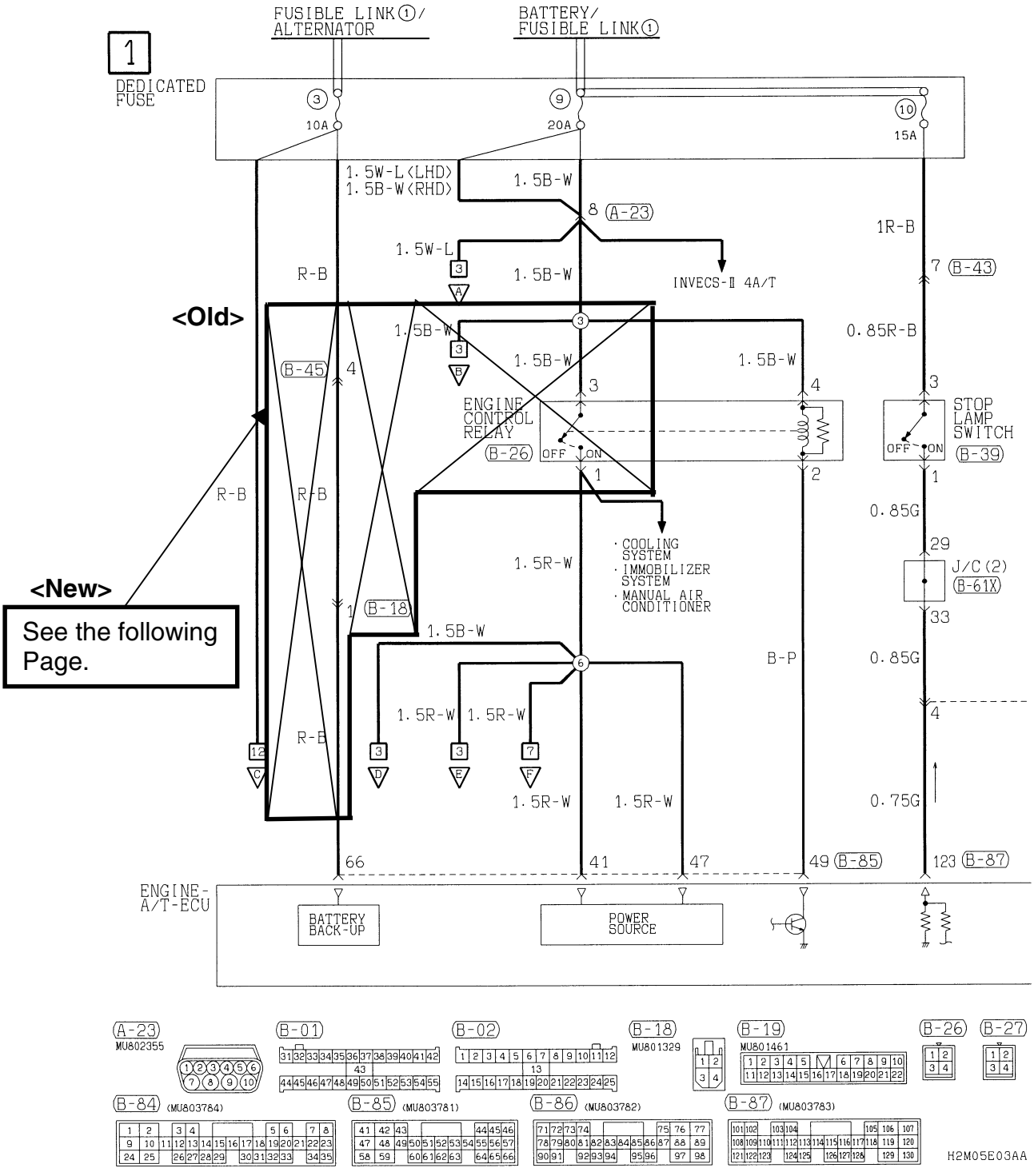
4 B-45
R-B
1
NO
CONNECTION
B-18
1.5B-W
3
B
1.5B-W
3
ENGINE
CONTROL
RELAY
B-26
OFF
ON
1
1R-B

ENGINE CONTROL SYSTEM

4G93 engine-A/T



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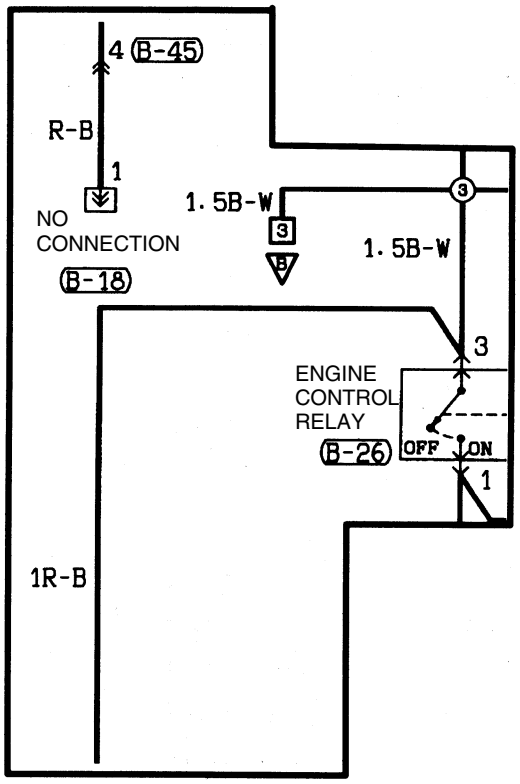
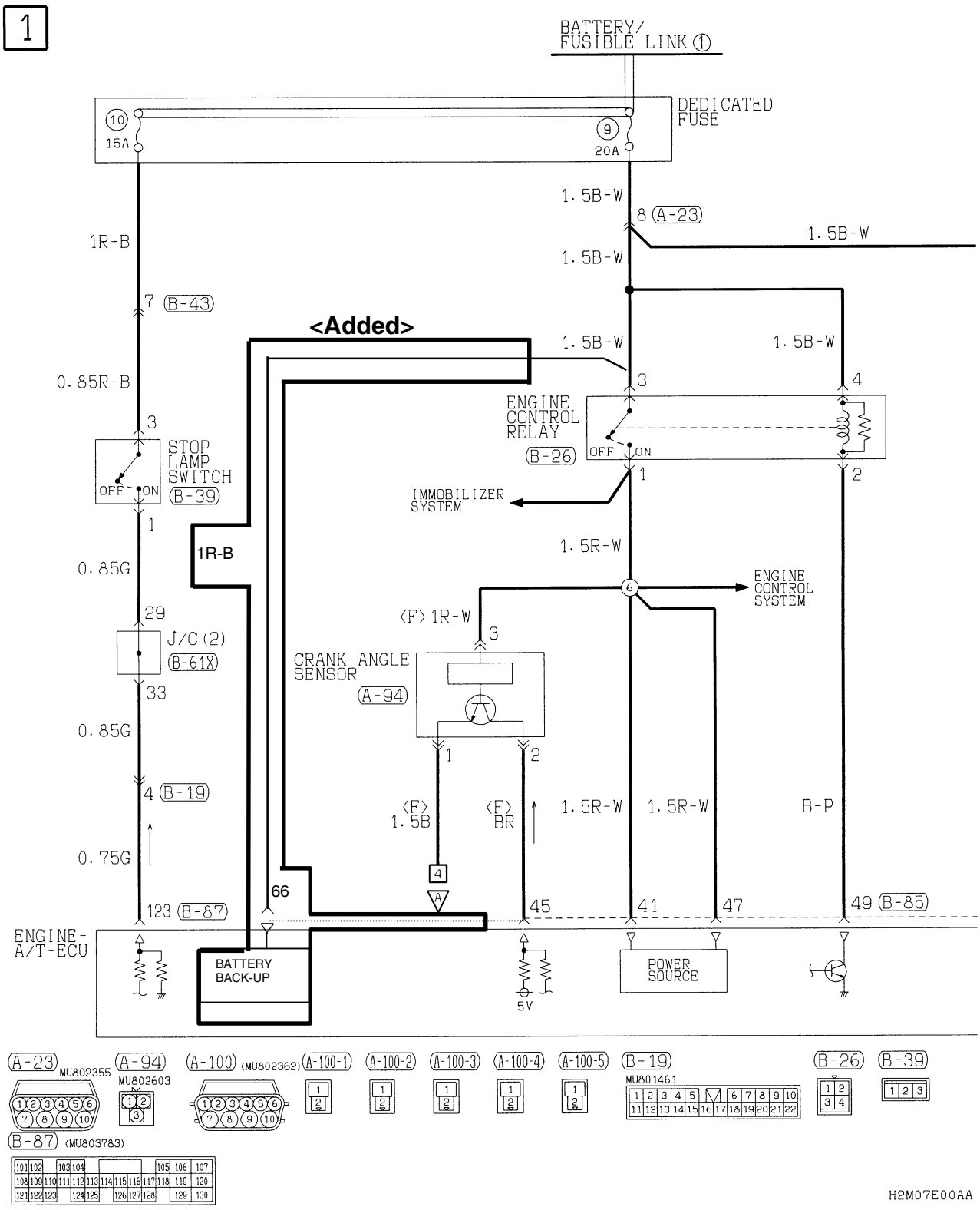
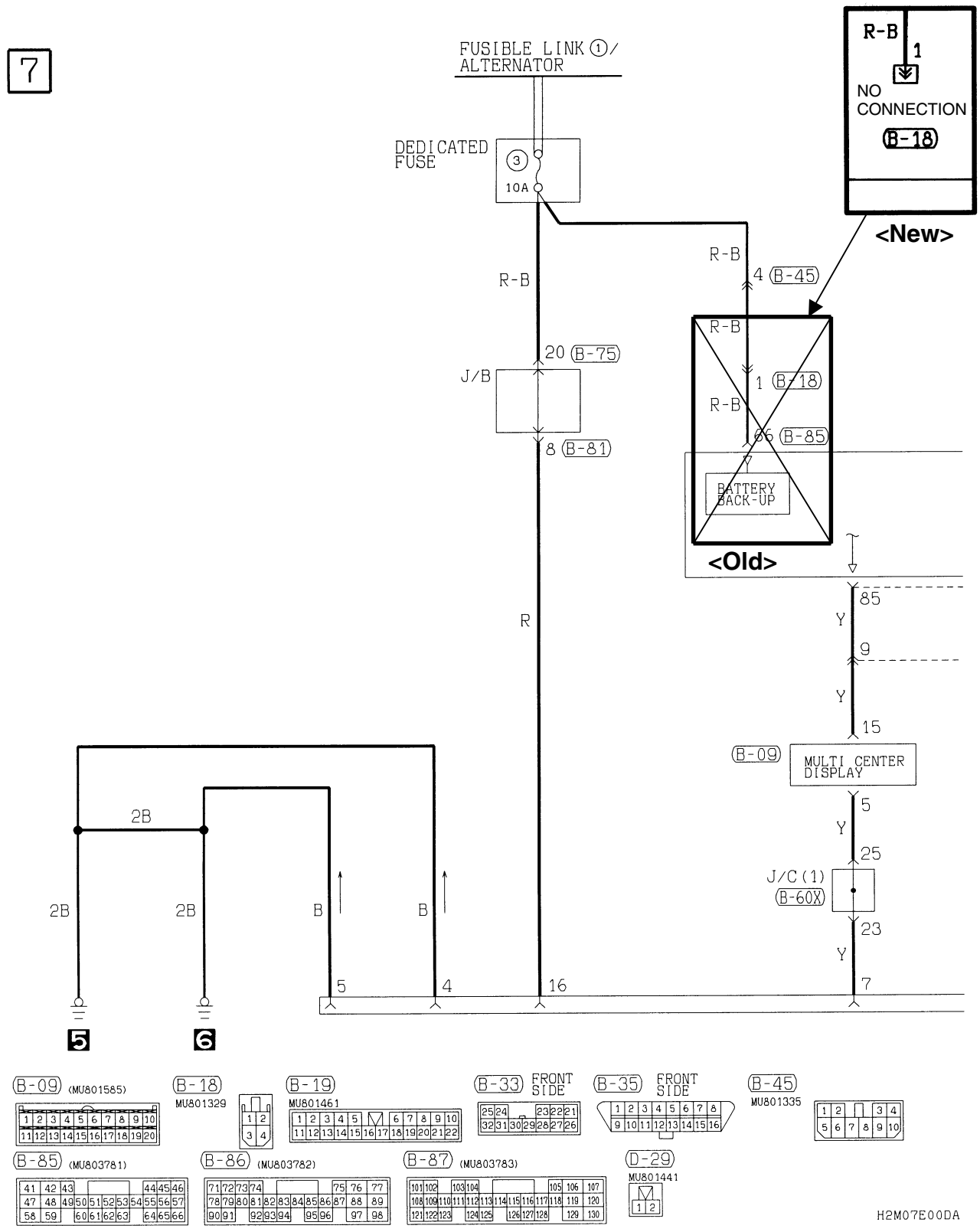

4 B-45
R-B
1
NO
CONNECTION
B-18
1.5B-W
3
B
1.5B-W
3
3
ENGINE
CONTROL
RELAY
B-26
OFF
ON
1
1R-B

INVECS-II 4A/T

4G1 engine

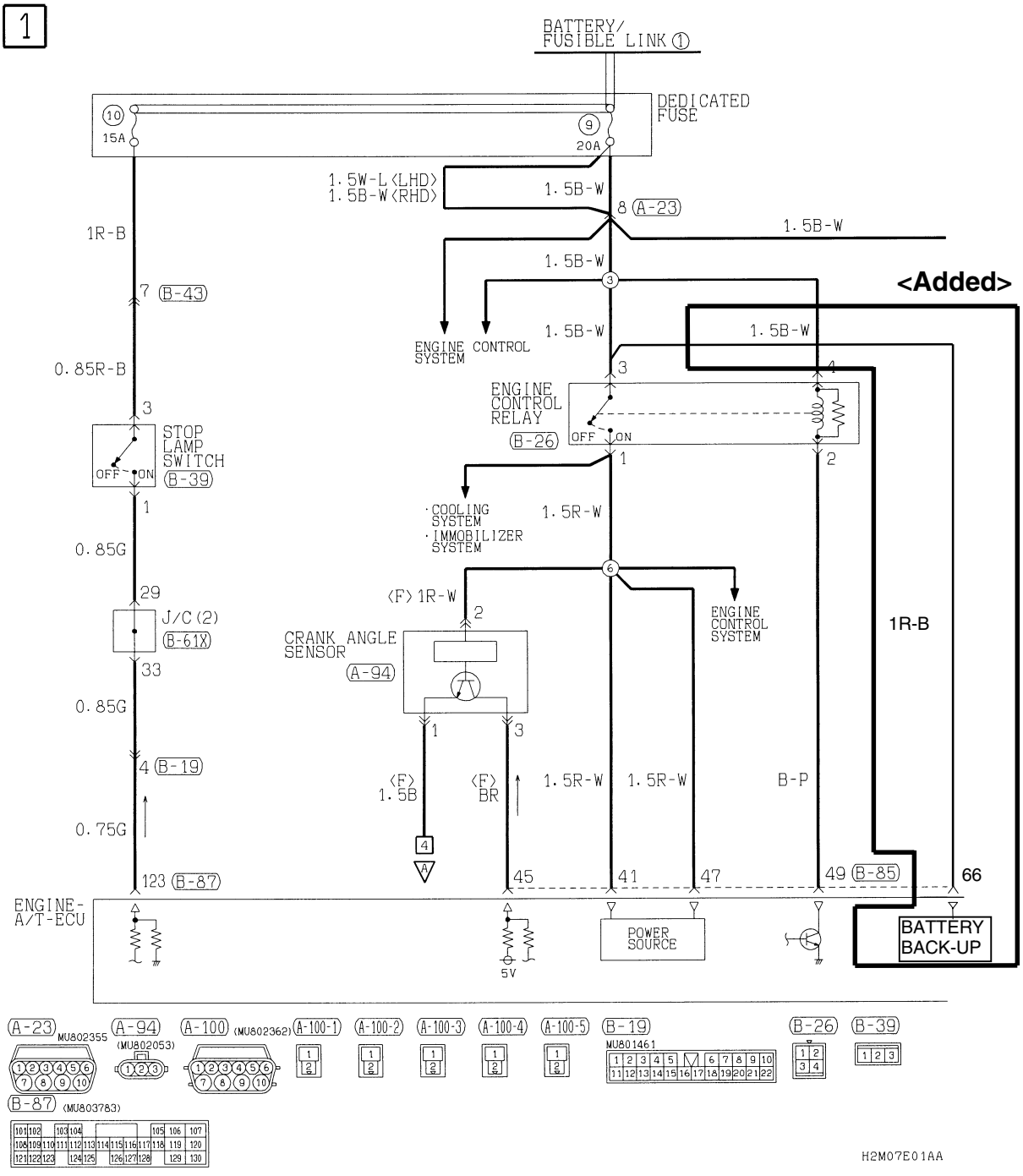


INVECS-II 4A/T <4G1 engine> (CONTINUED)

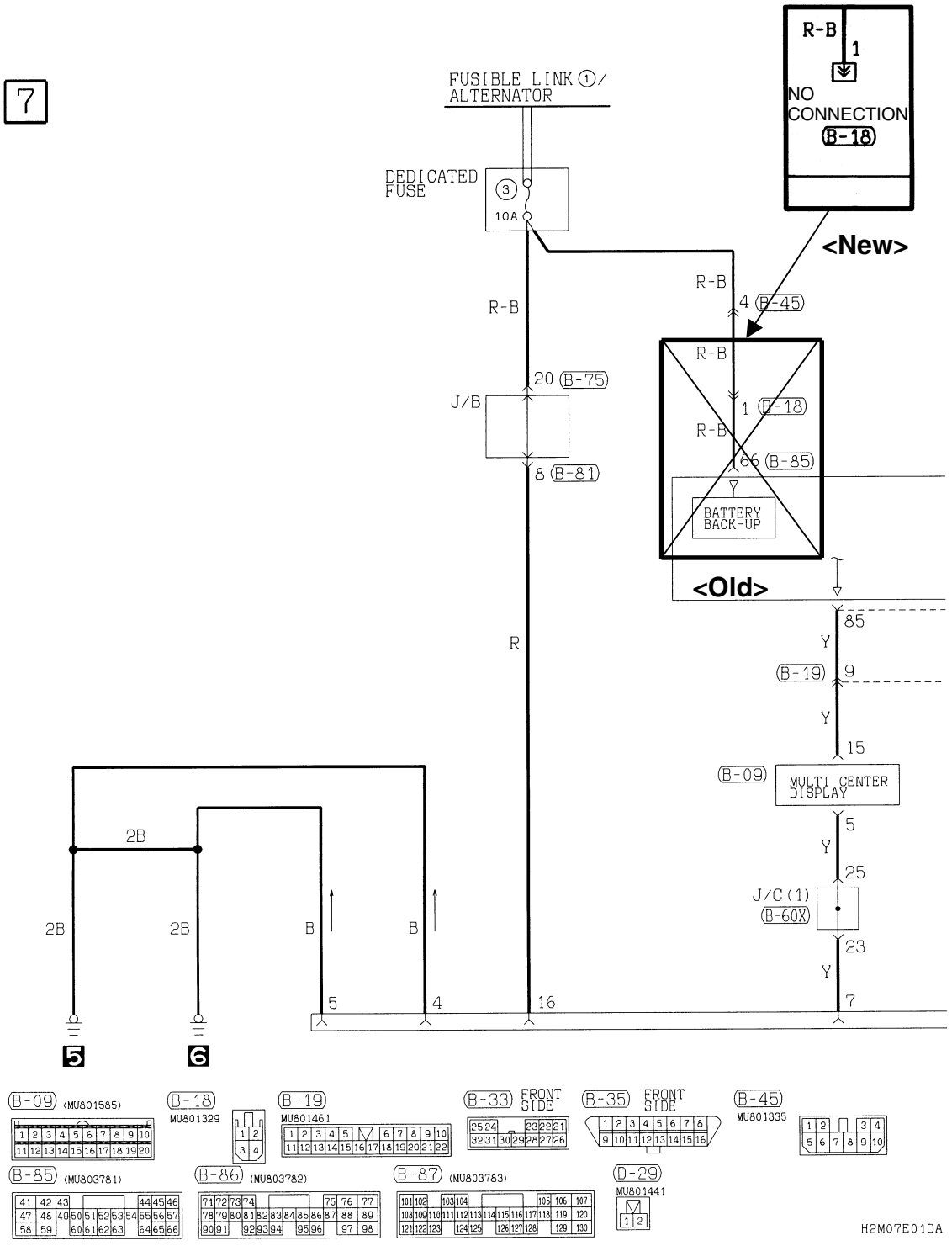


INVECS-II 4A/T

4G93 engine



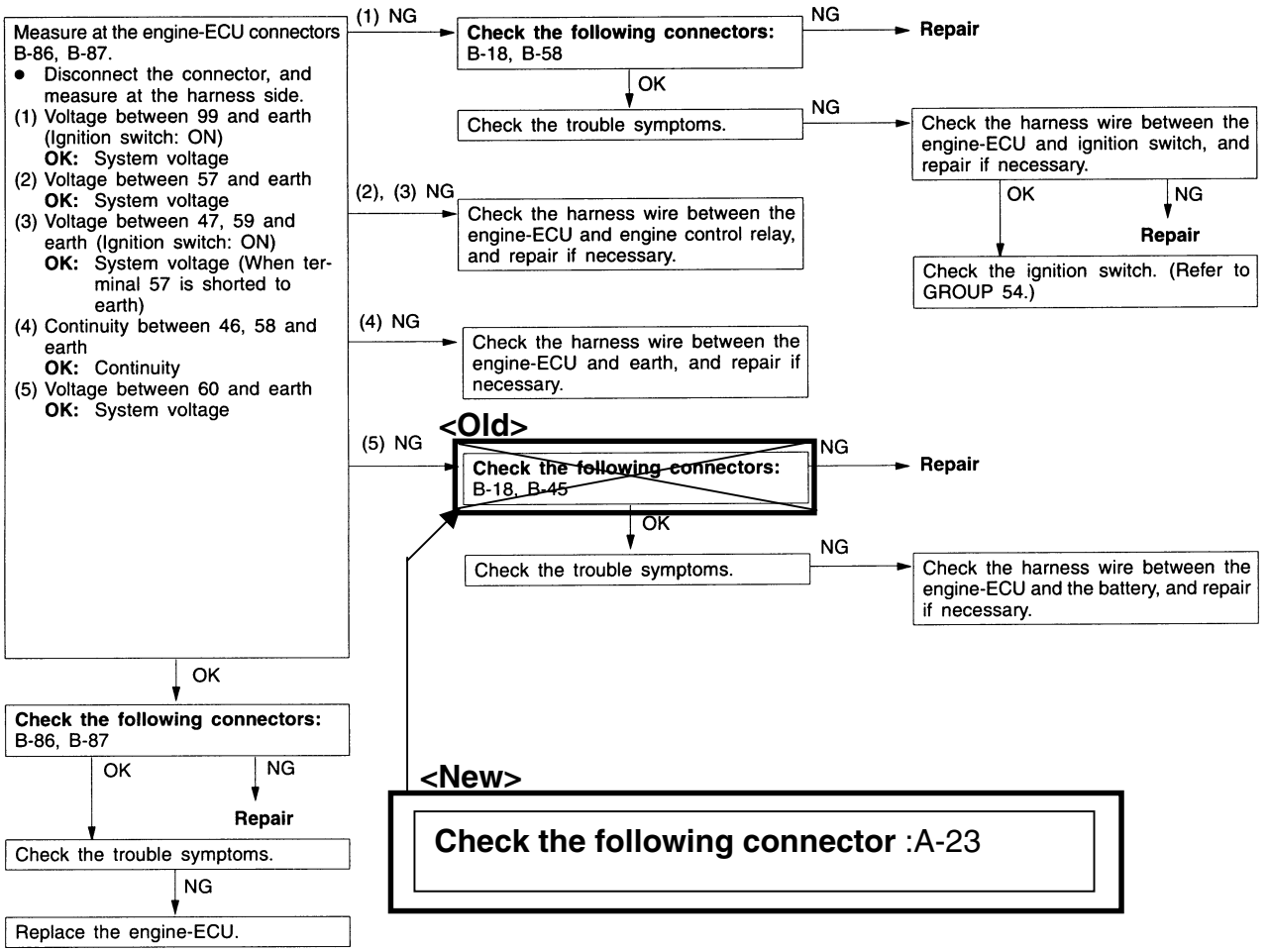
INVECS-II 4A/T <4G93 engine> (CONTINUED)



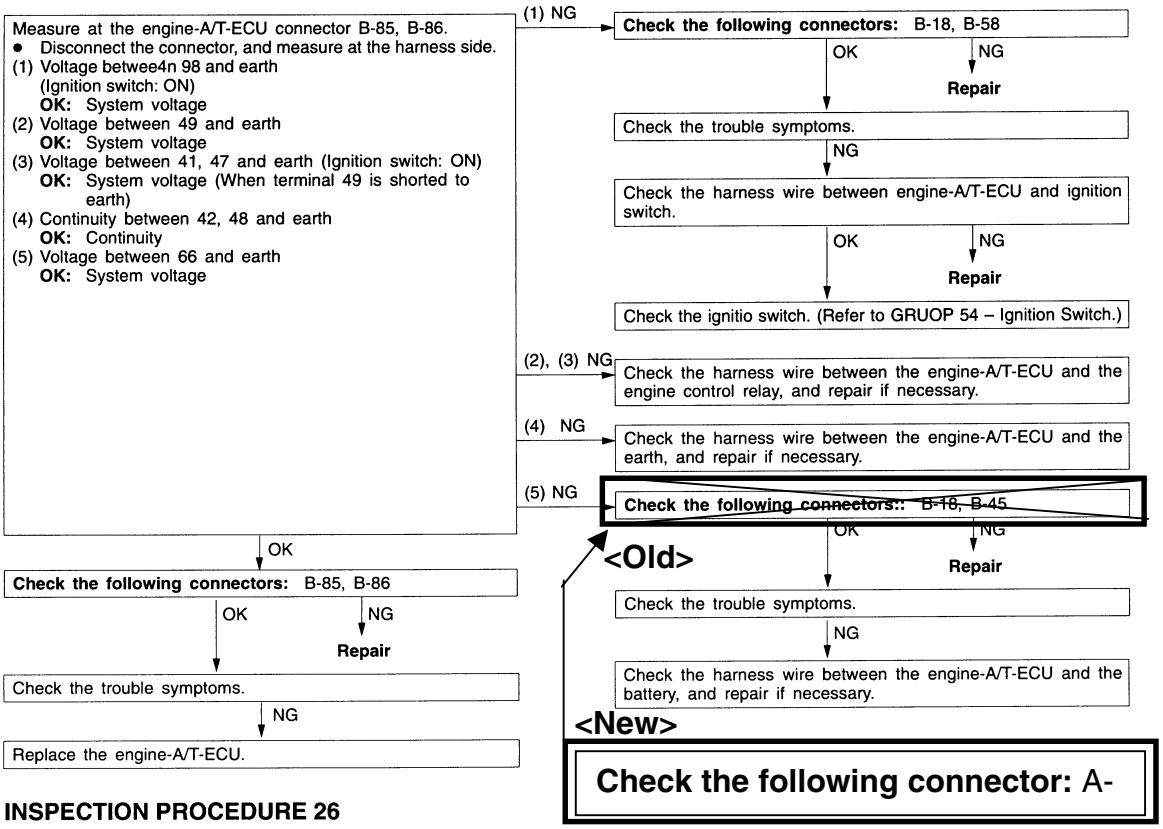
INSPECTION PROCEDURE 25

Engine-ECU (engine-A/T-ECU) power supply and earth circuit system	Probable cause
The cause is probably a malfunction of the engine-ECU <M/T> or engine-A/T-ECU <A/T> or one of the problems listed at right.	• 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> • Malfunction of the engine-A/T-ECU <A/T>

<M/T>

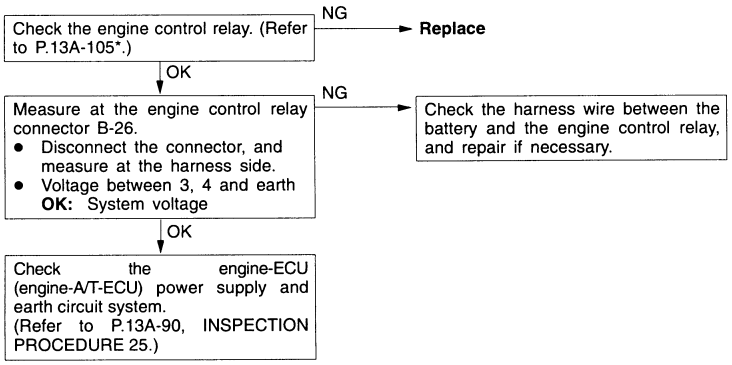


<A/T>



INSPECTION PROCEDURE 26

Engine control relay and ignition switch-IG system	Probable cause
When the 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 on the engine control relay. This causes system voltage to be supplied to the engine-ECU <M/T> or engine-A/T-ECU <A/T> and to the sensors and actuators.	• Malfunction of the ignition switch • Malfunction of the engine control relay • Open circuit or short-circuited harness wire of the engine control relay circuit • Malfunction of the engine-ECU <M/T> • Malfunction of the engine-A/T-ECU <A/T>



NOTE
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)