FUEL

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NOTE
THE GROUPS MARKED BY ARE NOT IN THIS MANUAL

MULTIPOINT FUEL INJECTION (MPI)

CONTENTS

MULTIPOINT FUEL INJECTION (MPI)

GENERAL INFORMATION

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 trouble-shooting when a problem develops.

FUEL INJECTION CONTROL

The injector drive times and injector timing are controlled so that the optimum air/fuel mixture is supplied to the engine to correspond to the continually-changing engine operation conditions.
A single injector is mounted at the intake port of each cylinder. Fuel is sent under pressure from the fuel tank by the fuel pump, with the pressure being regulated by the fuel pressure regulator. The fuel thus regulated is distributed to each of the injectors.
Fuel injection is normally carried out once for each cylinder for every two rotations of the crankshaft. The firing order is 1-2-3-4-5-6. 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 <if equipped>.

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 air 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 conditioning 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 ignition 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 controlled 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 Compressor Clutch Relay Control
   Turns the compressor clutch of the A/C ON and OFF.
3. Fan Relay Control
   The radiator fan and condenser fan speeds are controlled in response to the engine coolant temperature and vehicle speed.
4. Evaporative Emission Purge Control
   (Refer to GROUP 17.)
5. EGR Control
   (Refer to GROUP 17.)

GENERAL SPECIFICATIONS

Items		Specifications
Throttle body	Throttle bore mm	65
	Throttle position sensor	Variable resistor type
	Idle air control motor	Stepper motor type [Stepper motor type by-pass air control system with the air volume limiter]
	Closed throttle position switch	Rotary contact type, within throttle position sensor
Sensors	Air flow sensor	Karman vortex type
	Barometric pressure sensor	Semiconductor type
	Intake air temperature sensor	Thermistor type
	Engine coolant temperature sensor	Thermistor type
	Oxygen sensor <vehicles with catalytic converter>	Zirconia type
	Vehicle speed sensor	Electromagnetic resistance element type
	Inhibitor switch	Contact switch type
	Camshaft position sensor	Hall element type
	Crankshaft angle sensor	Hall element type
	Power steering pressure switch	Contact switch type
Actuators	Multipoint fuel injection control relay	Contact switch type
	Fuel pump relay	Contact switch type
	Injector type and number	Electromagnetic type, 6
	Injector identification mark	CDH210
	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

MULTIPOINT FUEL INJECTION (MPI) SYSTEM DIAGRAM

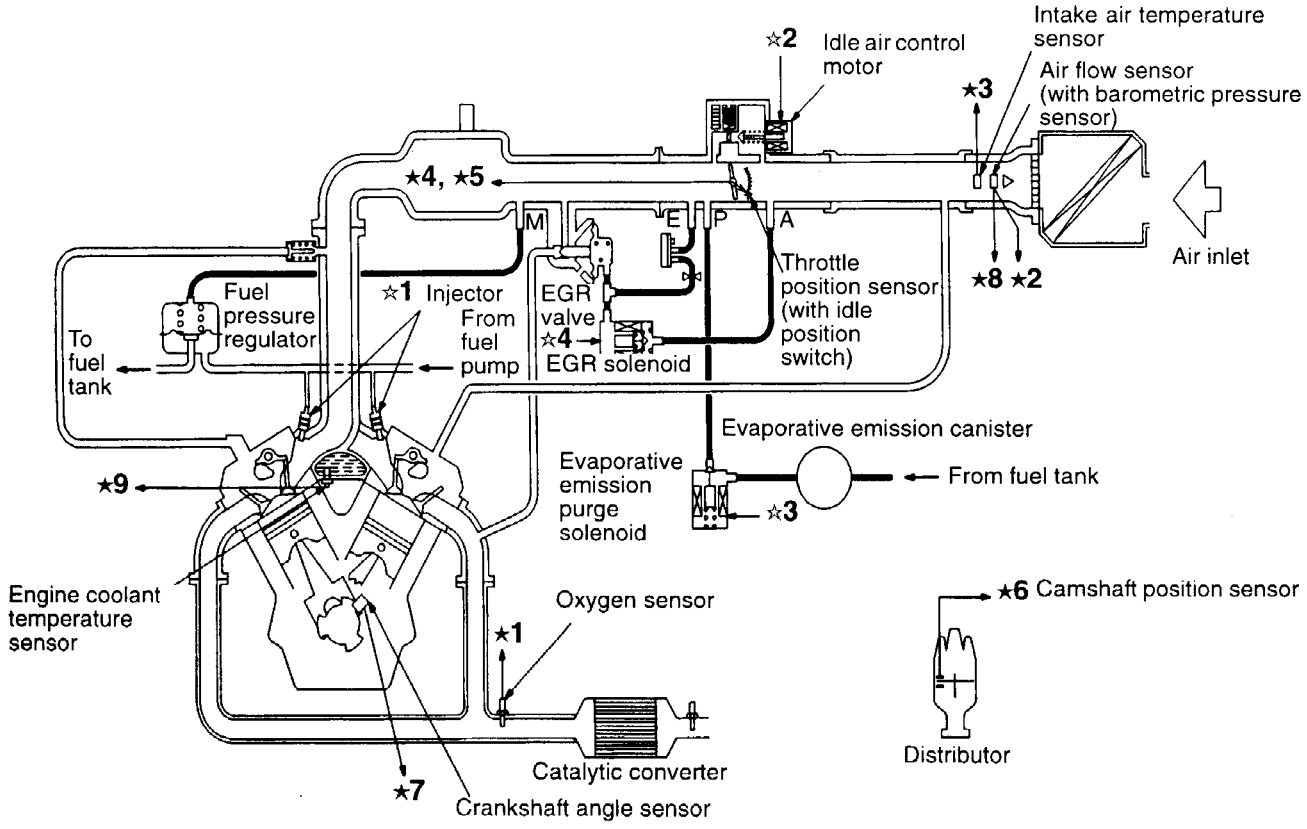
- ★1 Oxygen sensor <vehicles with catalytic converter>
- • Variable resistor <vehicles without catalytic converter>
- ★2 Air flow sensor
- ★3 Intake air temperature sensor
- ★4 Throttle position sensor
- ★5 Idle position switch
- ★6 Camshaft position sensor
- ★7 Crankshaft angle sensor
- ★8 Barometric pressure sensor
- ★9 Engine coolant temperature sensor

- • Power supply
- • Vehicle speed sensor
- • A/C switch
- • Inhibitor switch
- • Power steering pressure switch
- • Ignition switch-ST
- • Ignition switch-IG

⇨ Engine-ECU ⇨

- ☆1 Injector
- ☆2 Idle air control motor
- ☆3 Evaporative emission purge solenoid
- ☆4 EGR solenoid

- • Fuel pump relay
- • Multipoint fuel injection (MPI) relay
- • A/C compressor clutch relay
- • Engine warning lamp (check engine lamp)
- • Diagnosis output
- • Ignition coil, Ignition power transistor



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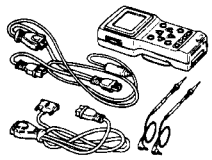
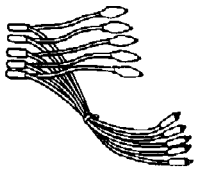
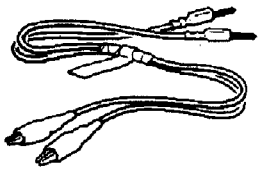
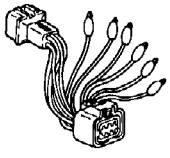
SERVICE SPECIFICATIONS

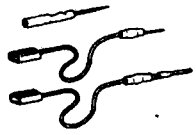
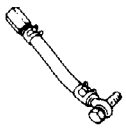
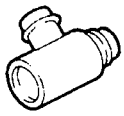
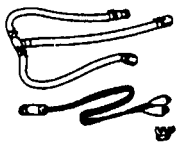
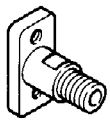
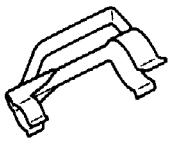
Items			Standard value
Basic ignition timing			5° BTDC ± 3° at curb idle
Curb idle speed r/min			700 ± 100
Idle speed when A/C is ON r/min			900 in Neutral
Basic idle speed r/min			700 ± 50
Throttle position sensor adjusting voltage mV			400–1000
Throttle position sensor resistance kΩ			3.5–6.5
Intake 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 disconnected		330–350 at curb idle
	Vacuum hose connected		Approx. 270 at curb idle
Injector coil resistance Ω			13–16 [at 20°C]

SEALANT

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

SPECIAL TOOLS

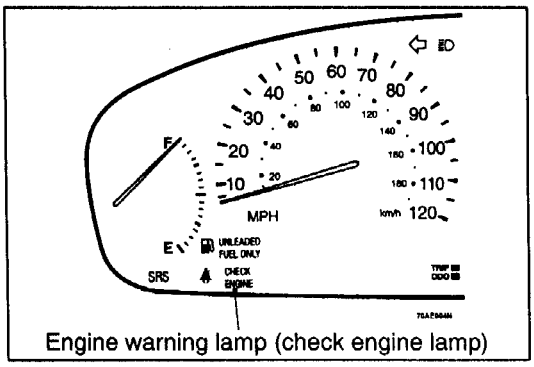
Tool	Number	Name	Use
A  MB991219 B  MB991220 C  MB991221 D  MB991222 MB991223	MB991223 A: MB991219 B: MB991220 C: MB991221 D: MB991222	Harness set A: Test harness B: LED harness C: LED harness adaptor D: Probe	• Fuel gauge simple inspection Measurement of terminal voltage A: Connector pin contact pressure inspection B, C: Power circuit inspection D: Commercial tester connection
	MB991502	MUT-II	• Reading diagnosis codes • MPI system inspection
		ROM pack	
	MB991348	Test harness set	• Adjustment of throttle position switch, throttle position sensor • Inspection using an analyser
	MB991529	Diagnosis code check harness	Checking the diagnosis codes.
	MD998463	Test harness (6 pin, square)	• Inspection of ISC servo motor • Inspection using an analyser

Tool	Number	Name	Use
	MD991223	Test harness	• Inspection of oxygen sensor • Inspection using an analyser
	MD998478	Test harness (3 pin, triangle)	Inspection using an analyser
	MD998709	Adaptor hose	Measurement of fuel pressure
	MD998742	Hose adaptor	
	MD998706	Injector test set	Checking the spray condition of injectors
	MD991607	Injector test harness	
	MD998741	Injector test adaptor	
	MB991608	Clip	

TROUBLESHOOTING

DIAGNOSIS TROUBLESHOOTING FLOW

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



Engine warning lamp (check engine lamp)

DIAGNOSIS FUNCTION

ENGINE WARNING LAMP (CHECK ENGINE LAMP)

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

Engine warning lamp inspection items

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

Caution

Engine warning lamp will come on even when ignition timing check is performed. Therefore, it is not abnormal that the lamp comes on at the time of ignition timing check.

METHOD OF READING AND ERASING DIAGNOSIS CODES

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

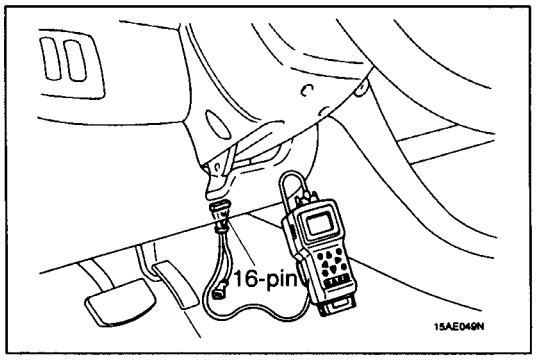
DIAGNOSIS USING DIAGNOSIS 2 MODE

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

NOTE

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

5. Erase the diagnosis codes.



INSPECTION USING MUT-II DATA LIST AND ACTUATOR TESTING

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

FAIL-SAFE FUNCTION REFERENCE TABLE

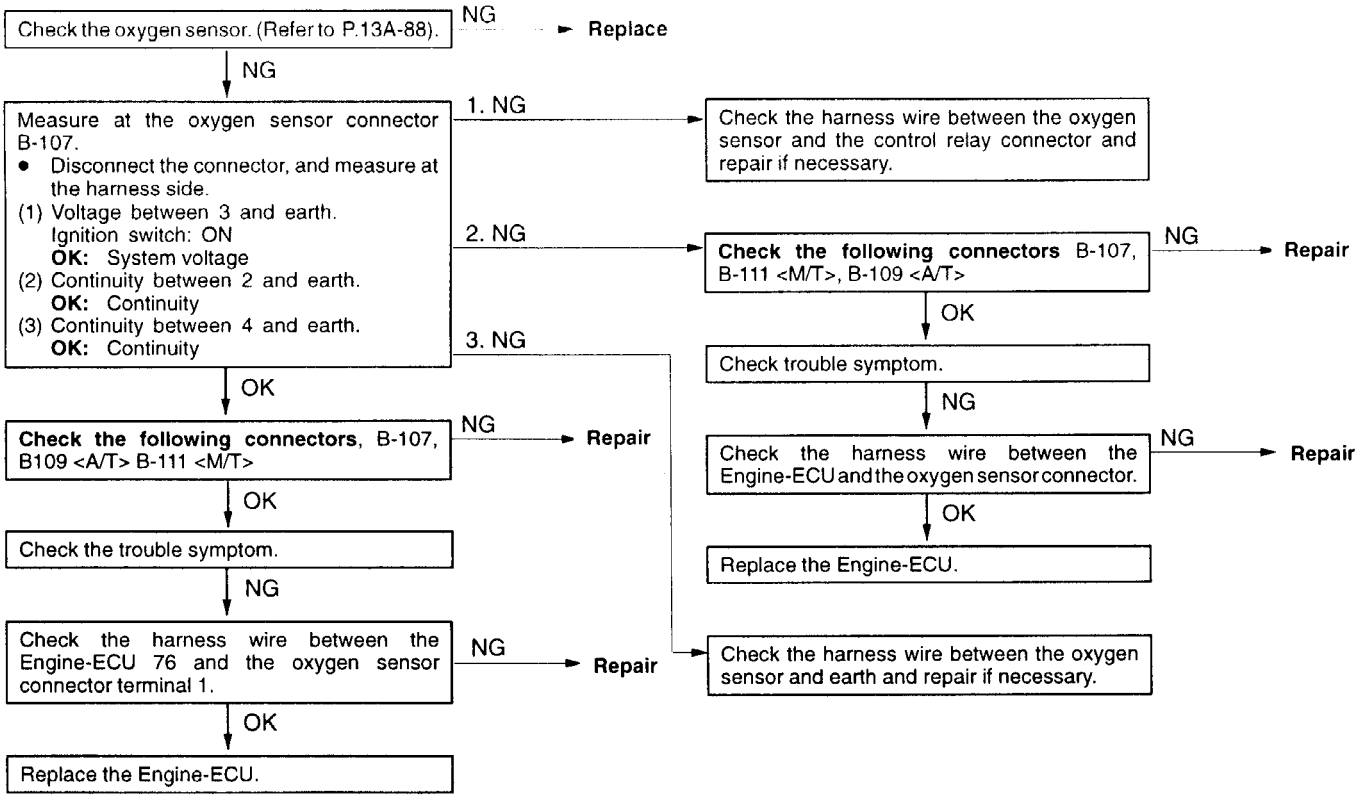
When the main sensor malfunctions are detected by the diagnosis function, the vehicle is controlled by means of the pre-set control logic to maintain safe conditions for driving.

Malfunctioning item	Control contents during malfunction
Air flow sensor	1. Uses the throttle position sensor signal and engine speed signal (crankshaft angle sensor signal) for basic injector drive time and basic ignition timing from the pre-set mapping. 2. Fixes the ISC servo in the appointed position so idle air control is not performed.
Intake air temperature sensor	Controls as if the intake air temperature is 25°C.
Throttle position sensor (TPS)	No increase in fuel injection amount during acceleration due to the unreliable throttle position sensor signal.
Engine coolant temperature sensor	Controls as if the engine coolant temperature is 80°C.
Camshaft position sensor	Injects fuel simultaneously into all cylinders. (After the ignition switch is turned to ON, No. 1 cylinder top dead centre is not detected at all.)
Barometric pressure sensor	Controls as if the barometric pressure is 101 kPa (sea level).
Oxygen sensor	Air/fuel ratio closed loop control is not performed
Communication line with transmission control module	No ignition timing retard (overall engine-transmission control) achieved when transmission speeds are changed.

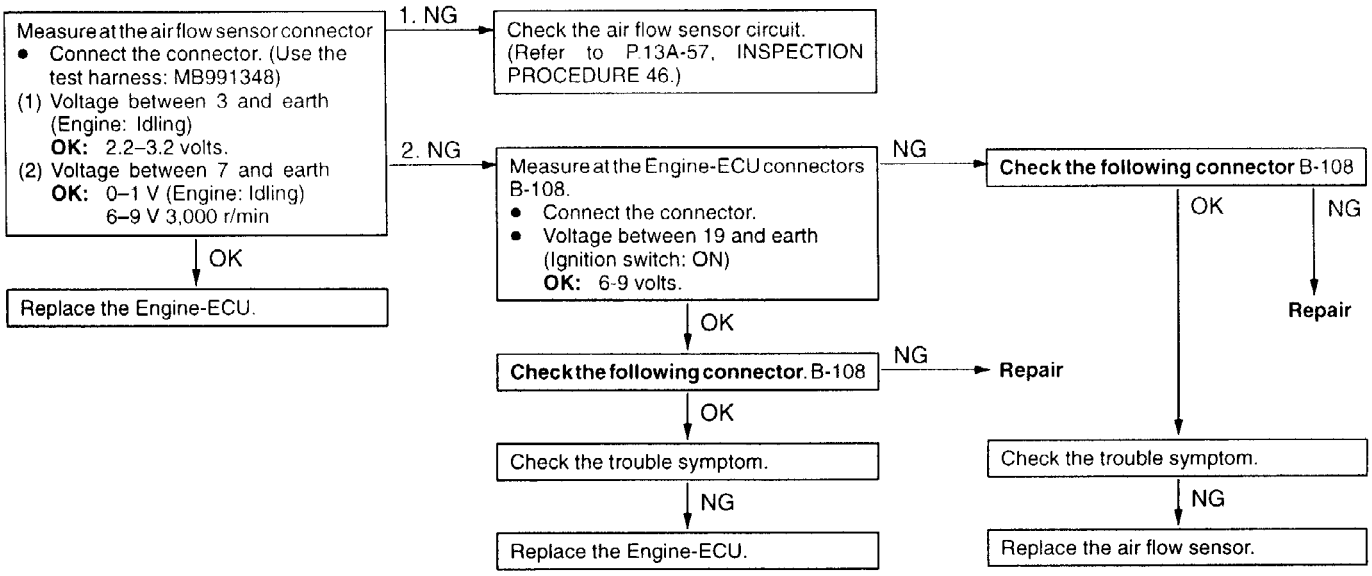
INSPECTION CHART FOR DIAGNOSIS

Code No.	Diagnosis Item	Reference Page
11	Oxygen sensor system <vehicles with catalytic converter>	13A-12
12	Air flow sensor system	13A-13
13	Intake air temperature sensor system	13A-14
14	Throttle position sensor system	13A-15
21	Engine coolant temperature sensor system	13A-16
22	Crankshaft angle sensor system	13A-17
23	Camshaft position sensor system	13A-18
24	Vehicle speed sensor system	13A-19
25	Barometric pressure sensor system	13A-20
41	Injector system	13A-21
44, 52, 53	Ignition coil and power transistor unit system	13A-22
61	Communication with A/T-ECU system <A/T>	13A-23

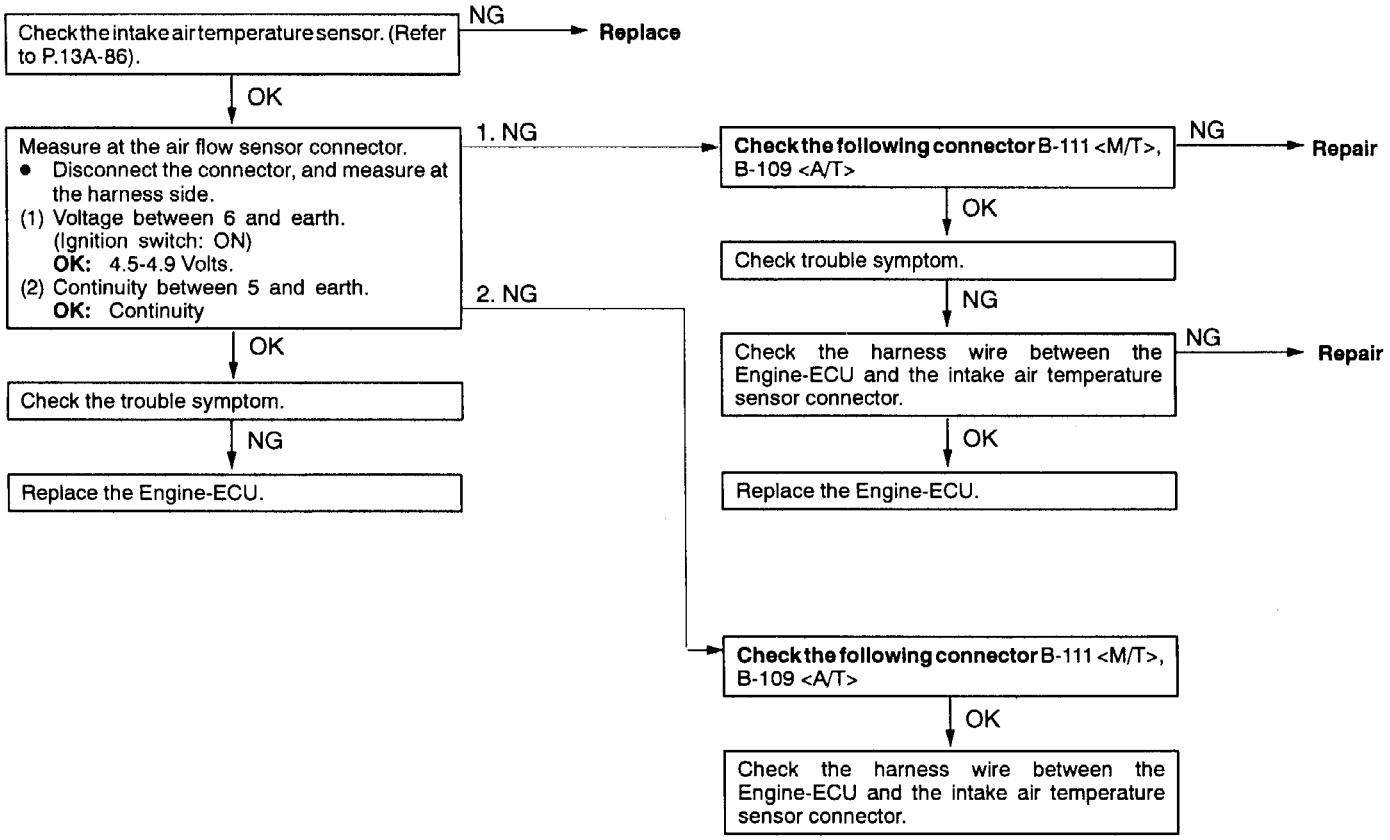
Code No. 11 Oxygen sensor system	Probable cause
Range of Check • 3 minutes have passed after engine was started. • Engine coolant temperature is approx. 80°C or more. • Intake air temperature is 20-50°C. • Engine speed is approx. 2,000-3,000 r/min. • Vehicle is moving at constant speed on a flat, level road surface. Set conditions • The oxygen sensor 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 times in succession, a problem is detected after each operation.	• Malfunction of the oxygen sensor • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the Engine-ECU



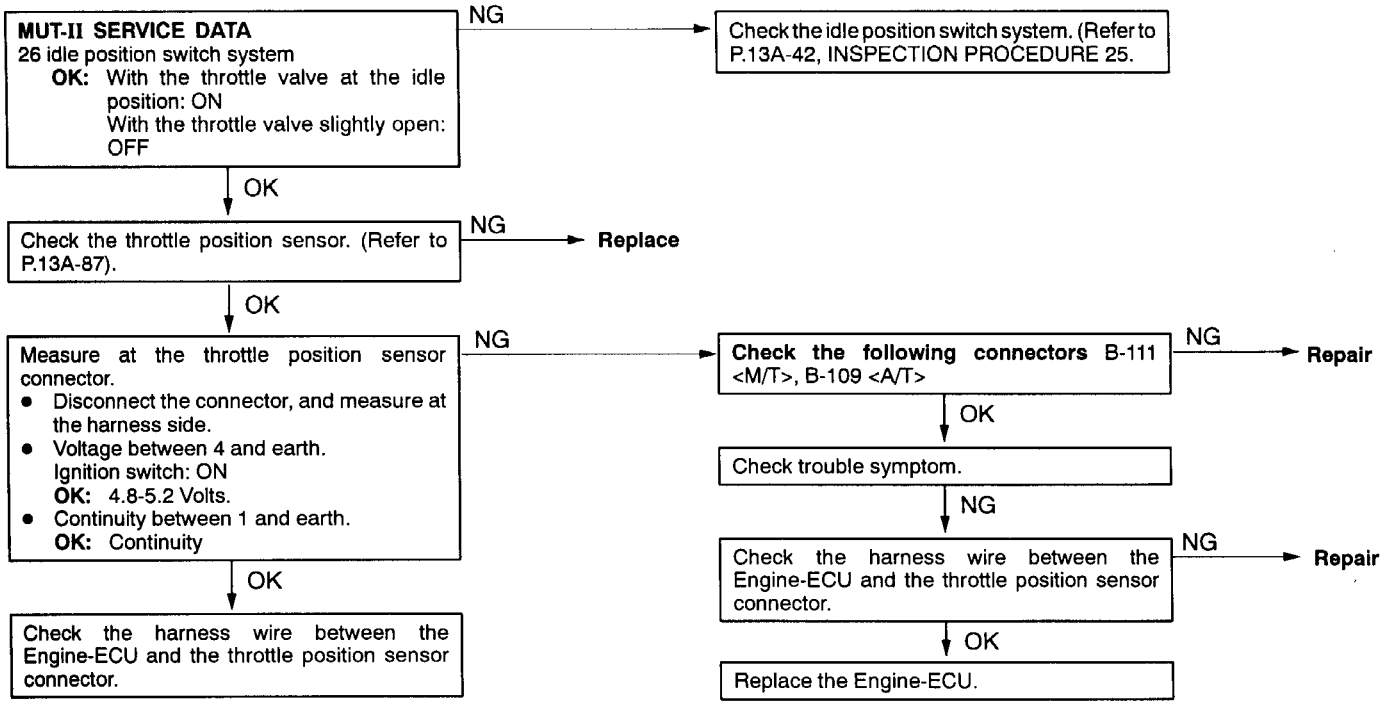
Code No. 12 Air flow sensor system	Probable cause
Range of Check • Engine speed is 500 r/min or more Set conditions • Sensor output frequency is 3 Hz or less for 4 seconds.	• Malfunction of the air flow sensor • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of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



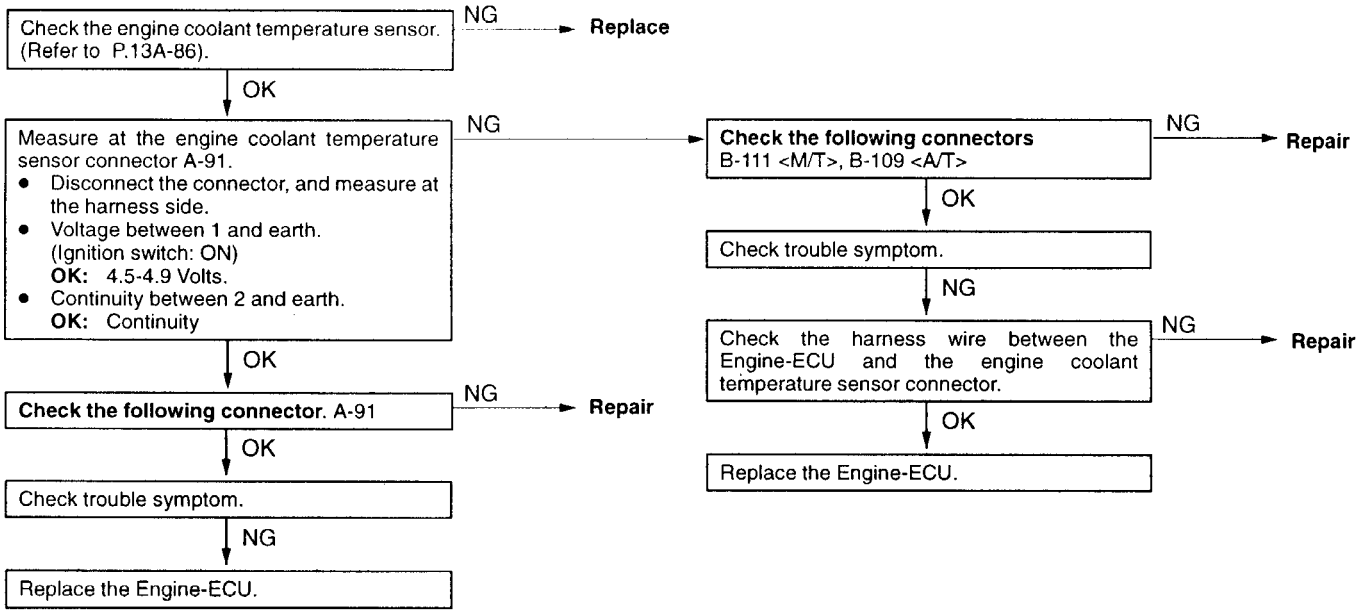
Code No. 13 Intake air temperature sensor system	Probable cause
Range of Check • Ignition switch: ON • Excluding 60 seconds after the ignition is turned to ON or immediately after the engine starts. Set conditions • Sensor output voltage is 4.6 V or more (corresponding to an intake air temperature of -45°C or less) for 4 seconds. or • Sensor output voltage is 0.2 V or more (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



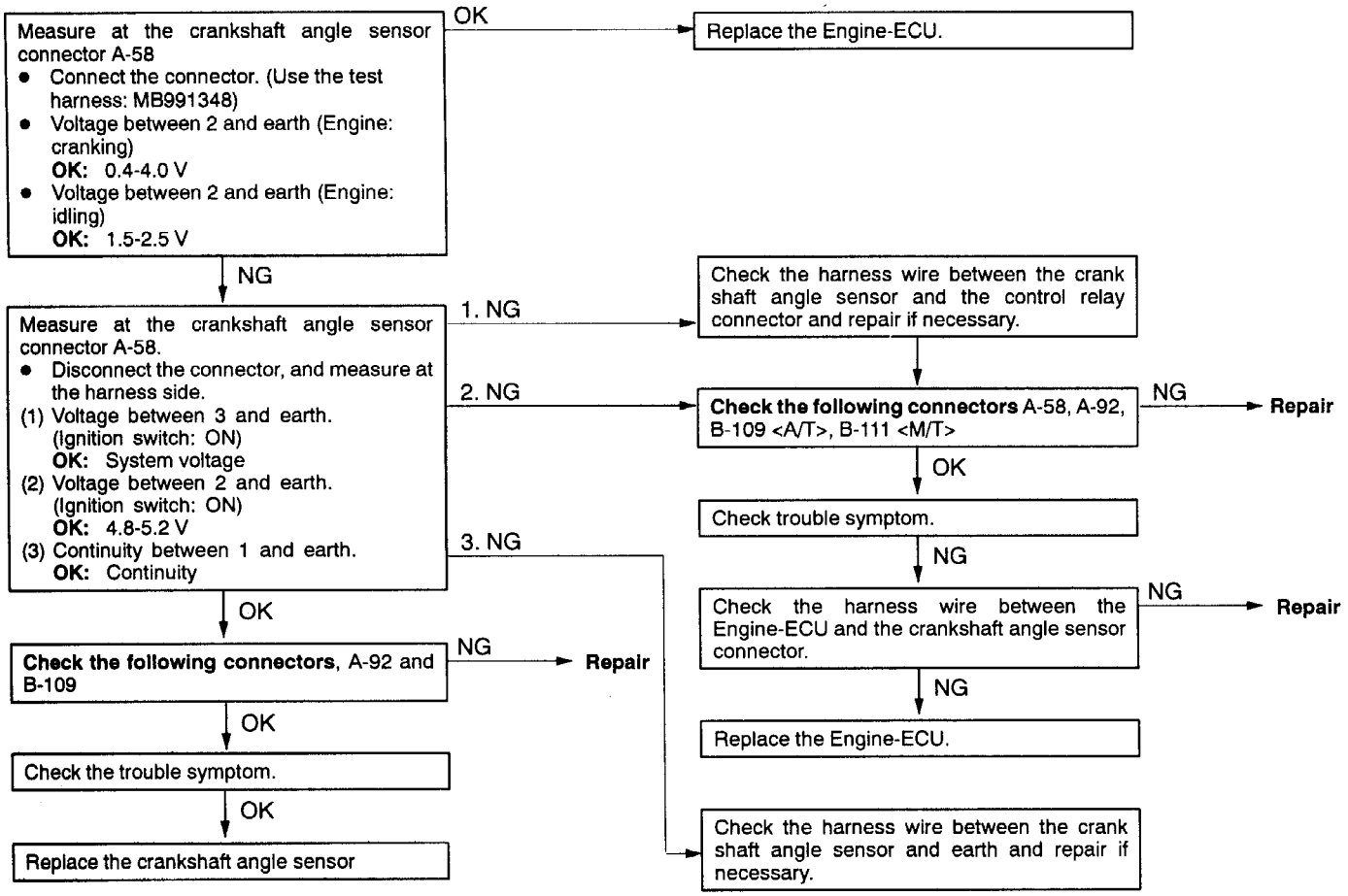
Code No. 14 Throttle position sensor system	Probable cause
Range of Check • Ignition switch: ON • Excluding 60 seconds after the ignition is turned to ON or immediately after the engine starts. Set conditions • When the idle position Switch is ON, the sensor output voltage is 2 Volts or more for 4 seconds or • Sensor output voltage is 0.2 V or less for 4 seconds.	• Malfunction of the throttle sensor or maladjustment • Improper connector contact, open circuit or short-circuited harness wire of the intake air temperature sensor circuit • Malfunction of the Engine-ECU



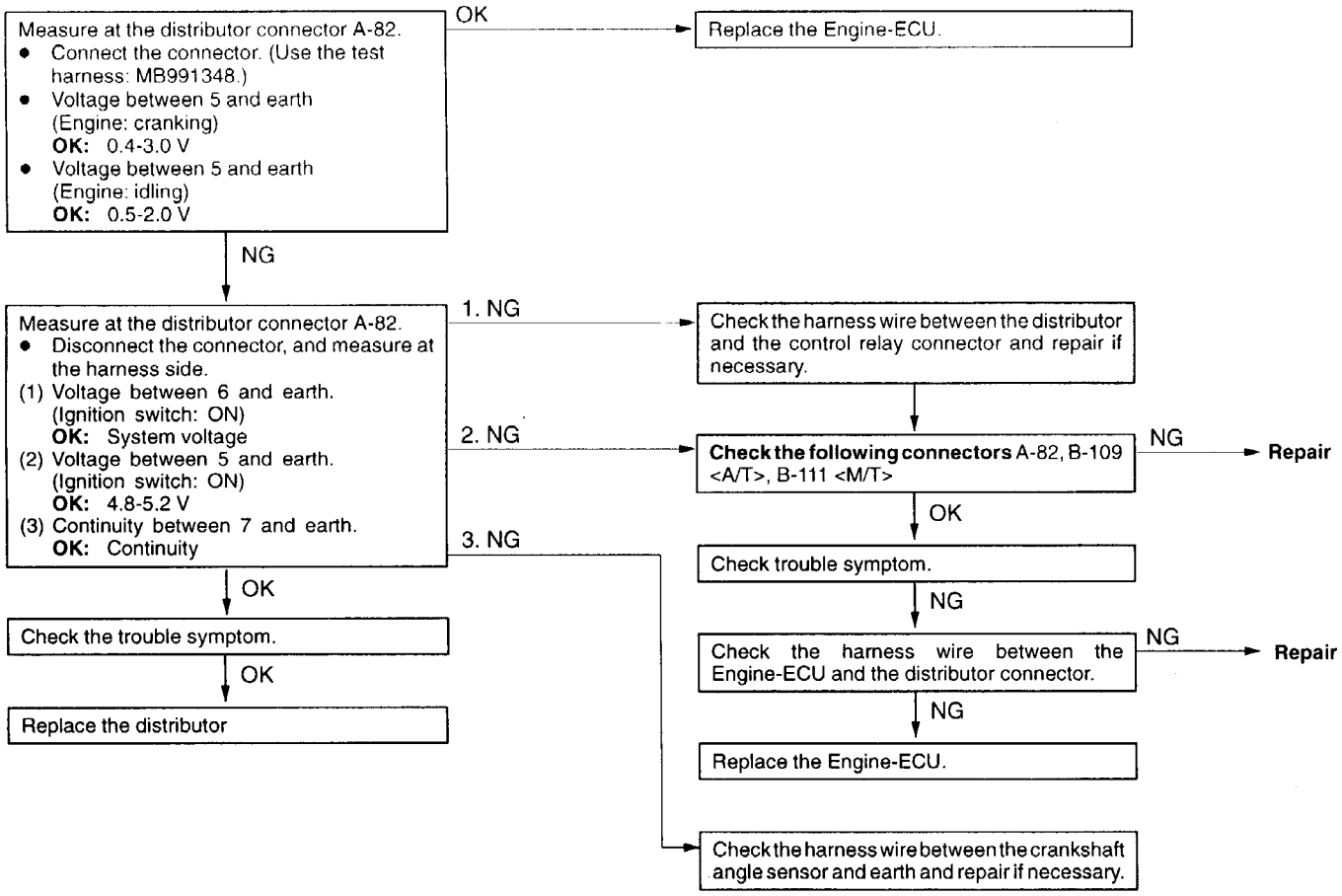
Code No. 21 Engine coolant temperature sensor system	Probable cause
Range of Check • Ignition switch: ON • Excluding 60 seconds after the ignition is turned to ON or immediately after the engine starts. Set conditions • Sensor output voltage is 4.6 V or more (corresponding to an engine coolant temperature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



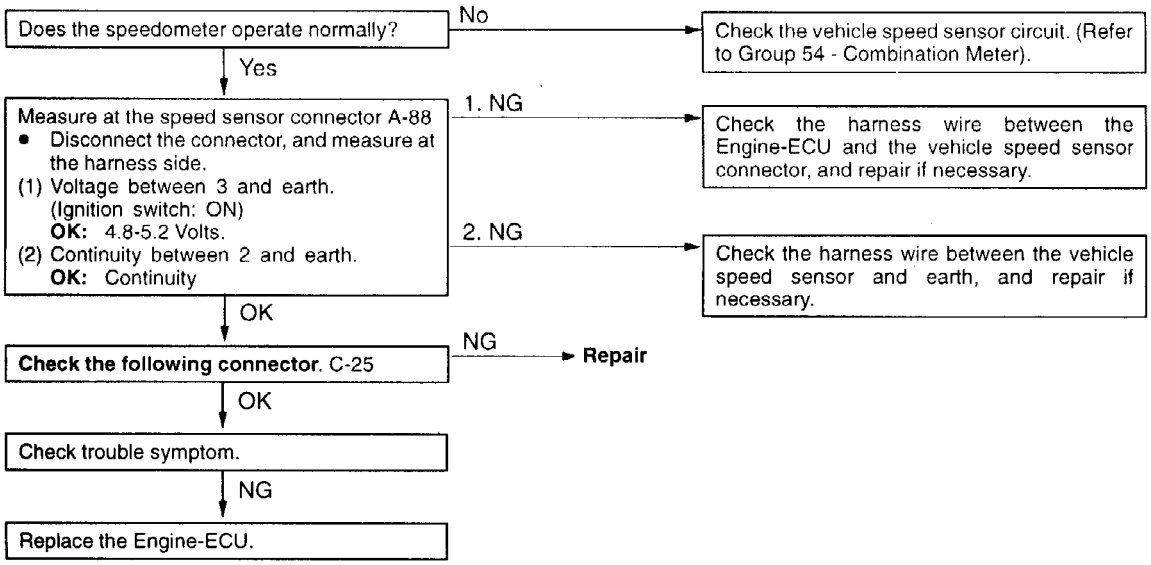
Code No. 22 Crankshaft angle sensor system	Probable cause
Range of Check • Engine is cranking. Set conditions • Sensor output voltage does not change for 4 seconds (no pulse signal input).	• Malfunction of the crankshaft angle sensor • Improper connector contact, open circuit or short-circuited harness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



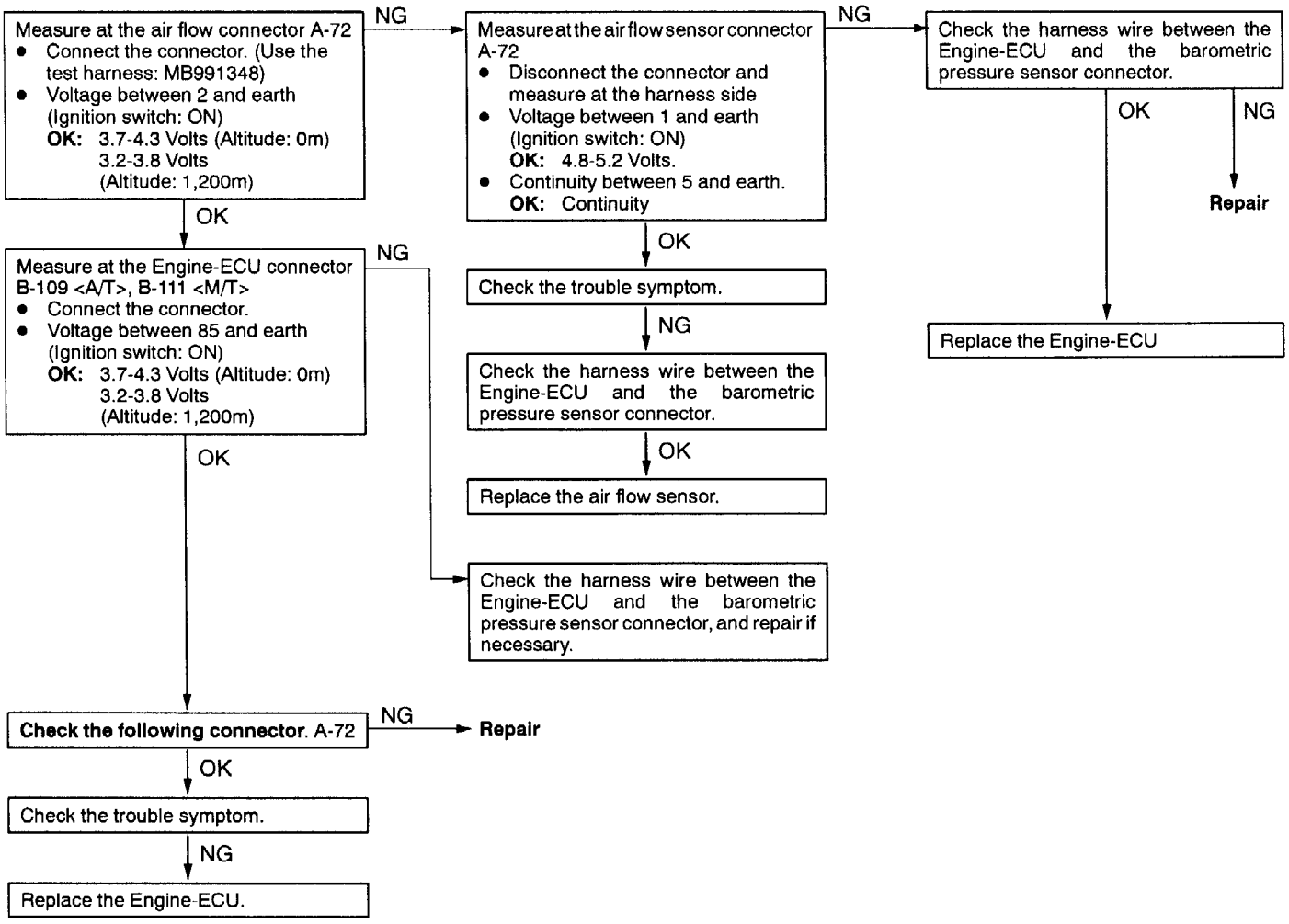
Code No. 23 Camshaft position sensor system	Probable cause
Range of Check • Ignition Switch: ON • Engine speed is approx. 50 r/min or more. Set conditions • Sensor output voltage does not change for 4 seconds (no pulse signal input).	• Malfunction of the crankshaft angle sensor • Improper connector contact,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



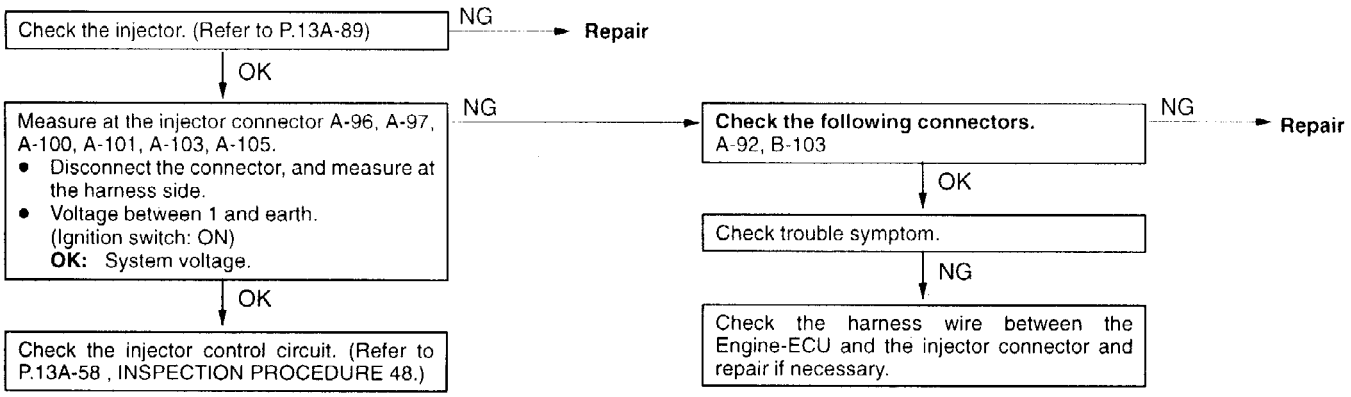
Code No. 24 Vehicle speed sensor system	Probable cause
Range of Check • Ignition Switch: ON • Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts. • Idle position switch: OFF • Engine speed is approx. 50 r/min or more. • Driving under high engine load. 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



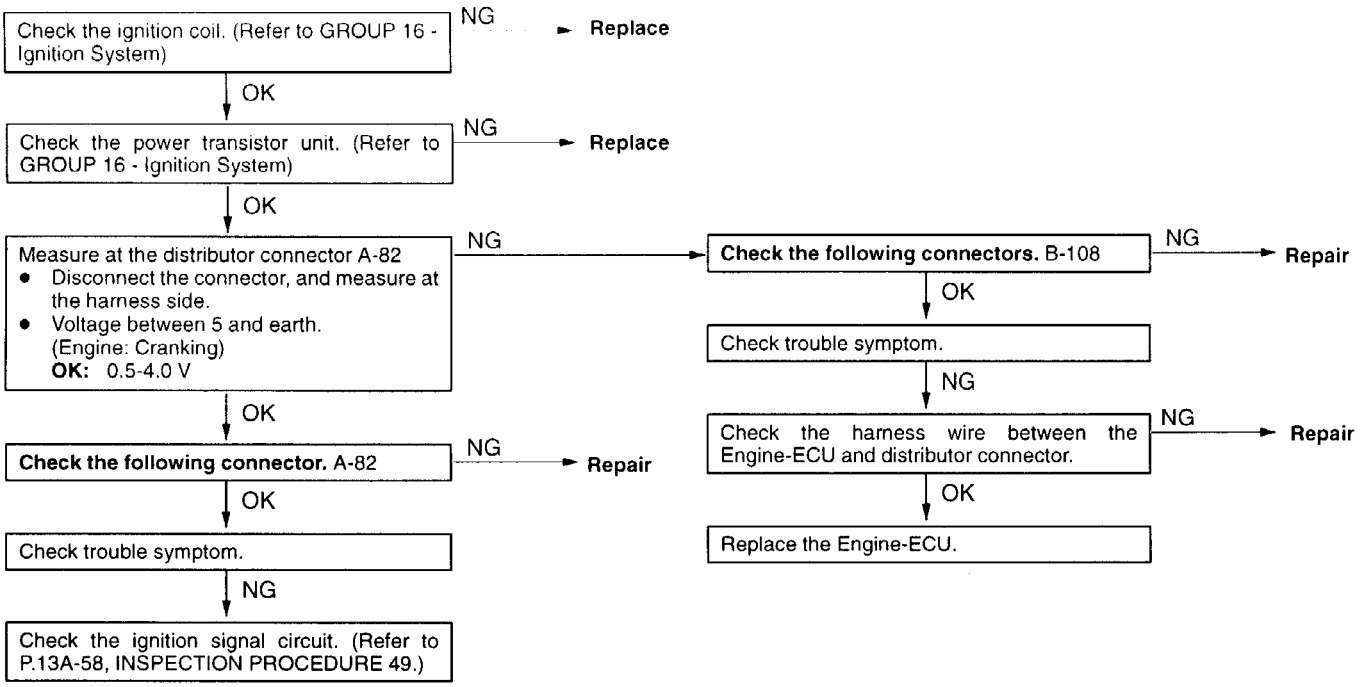
Code No. 25 Barometric pressure sensor system	Probable cause
Range of Check • Ignition Switch: ON • Excluding 60 seconds after the ignition switch is turned ON or immediately after the engine starts. • Battery voltage is 8 Volts or more Set conditions • Sensor output voltage is 4.5 Volts or more (corresponding to a barometric pressure of 114 kPa or more) for 4 seconds or • Sensor output voltage is 0.2 Volts or less (corresponding to a barometric pressure of 5.33 kPa or more) for 4 seconds.	• Malfunction of the vehicle speed sensor • Improper connector contact, open circuit or short-circuited harness wire of the barometric pressure sensor circuit • Malfunction of the Engine-ECU



Code No. 41 Injector system	Probable cause
Range of Check • Engine speed is approx. 50-1000 r/min • Throttle position sensor output voltage is 1.15 Volts or less. • Actuator test by MUT-II is not carried out. Set conditions • Surge voltage of injector coil is not detected for 4 seconds.	• Short circuit to earth of the diagnosis control line. • Improper connector contact, open circuit or short-circuited harness wire of the injector circuit • Malfunction of the Engine-ECU



Code No. 44, 52, 53 Ignition coil and power transistor unit system	Probable cause
Range of Check • Engine speed is approx. 50-4000 r/min • Engine is not cranking. Set conditions • The ignition signal from the same coil is not input for 4 seconds. However, this excludes cases where no ignition signal is input from any coils.	• Malfunction of the ignition coil. • Improper connector contact, open circuit or short-circuited harness wire of the ignition primary circuit • Malfunction of the power transistor unit • Malfunction of the Engine-ECU



Code No. 61 Communication with A/T-ECU System <A/T>	Probable cause
Range of Check • For a period of 60 sec or longer immediately after completing startup • Engine revolutions approximately 50 r/min or faster Set Conditions • The signal from the A/T ECU requesting torque reduction has been continuously input for about 5 sec or longer	• Engine-A/T ECU fault

Replace the Engine-A/T ECU

INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom		Inspection procedure No.	Reference Page
Communication with MUT-II is impossible.	Communication with all systems is not possible.	1	13A-26
	Communication with Engine-ECU only is not possible.	2	13A-26
Check engine/ malfunction indicator lamp and related parts	The engine warning lamp does not illuminate right after the ignition switch is turned to the ON position.	3	13A-27
	The engine warning lamp remains illuminated and never goes out.	4	13A-28
Starting	Cranks, won't start	5	13A-28
	Fires up and dies	6	13A-29
	Hard starting	7	13A-30
Idling stability (Improper idling)	Unstable idle. (Rough idle, hunting)	8	13A-31
	Idle speed is high. (Improper idle speed)	9	13A-32
	Idle speed is low. (Improper idle speed)	10	13A-33
Idling stability (Engine stalls)	When the engine is cold, it stalls at idle (Die out)	11	13A-34
	When the engine becomes hot, it stalls at idle. (Die out)	12	13A-35
	The engine stalls when accelerating. (Pass out)	13	13A-36
	The engine stalls when decelerating.	14	13A-36
Driving	Hesitation, sag or stumble	15	13A-37
	Acceleration shock	16	13A-37
	Deceleration shock	17	13A-38
	Poor acceleration	18	13A-38
	Surge	19	13A-39
	Knocking	20	13A-39
Dieseling		21	13A-39
Too high CO and HC concentration when idling		22	13A-40

PROBLEM SYMPTOMS TABLE (FOR YOUR INFORMATION)

Items		Symptom
Starting	Won't start	The starter is used to crank the engine, but there is no combustion within the cylinders, and the engine won't start.
	Fires up and dies	There is combustion within the cylinders, but then the engine soon stalls.
	Hard starting	Engine starts after cranking a while.
Idling stability	Hunting	Engine speed doesn't remain constant; changes at idle.
	Rough idle	Usually, a judgement can be based upon the movement of the tachometer pointer, and the vibration transmitted to the steering wheel, shift lever, body, etc. This is called rough idle.
	Incorrect idle speed	The engine doesn't idle at the usual correct speed.
	Engine stall (Die out)	The engine stalls when the foot is taken from the accelerator pedal, regardless of whether the vehicle 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 travelling, 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 slight acceleration and deceleration feel usually steady, light throttle cruise. Most notable under light loads.
	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

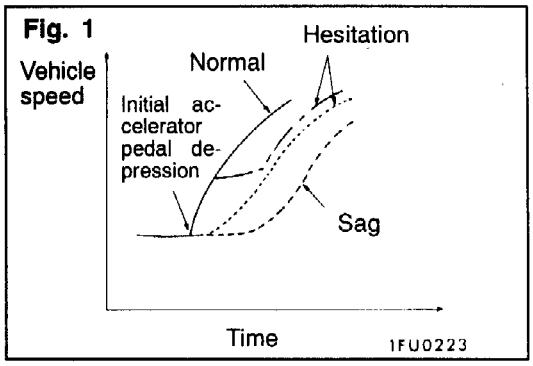
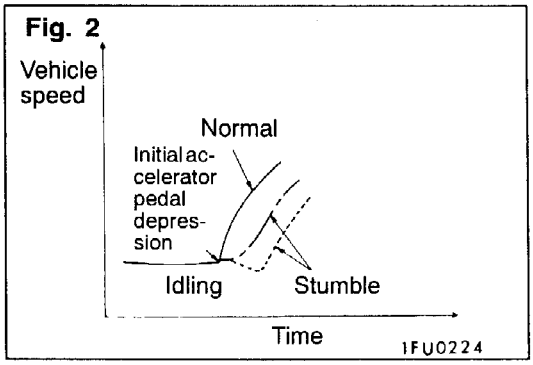


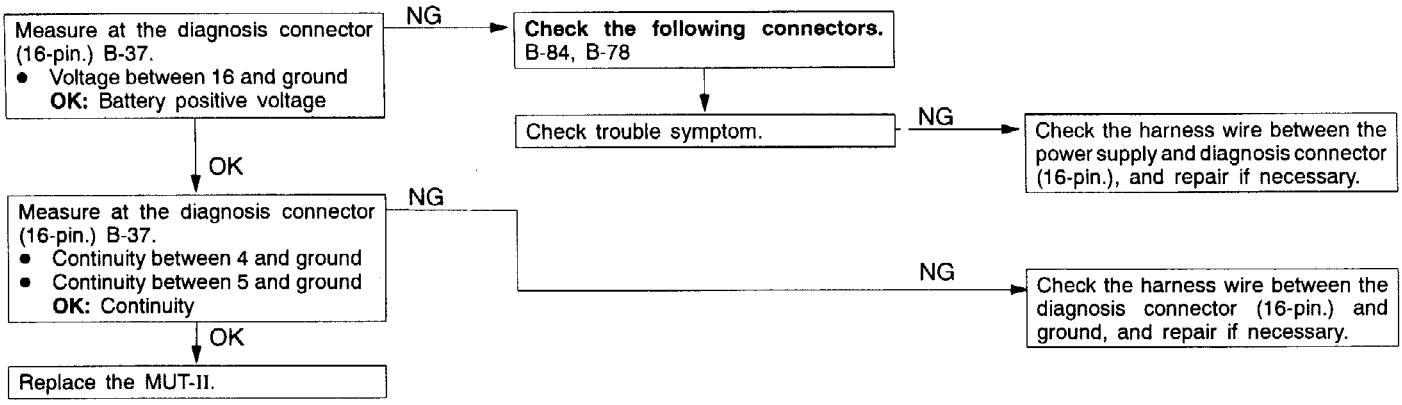
Fig. 2



INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

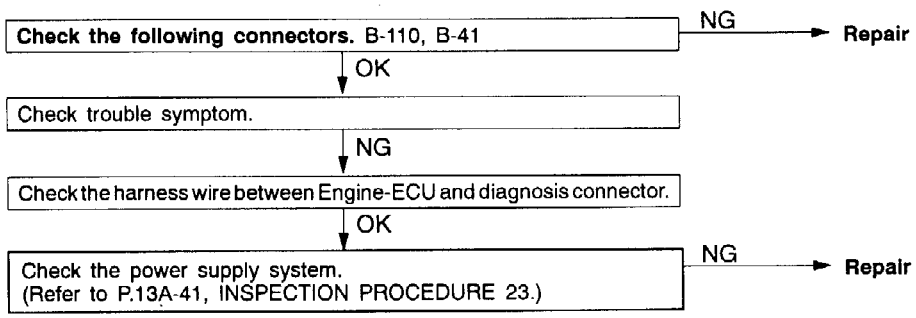
INSPECTION PROCEDURE 1

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 ground) for the diagnosis line.	• Malfunction of the connector • Malfunction of the harness wire



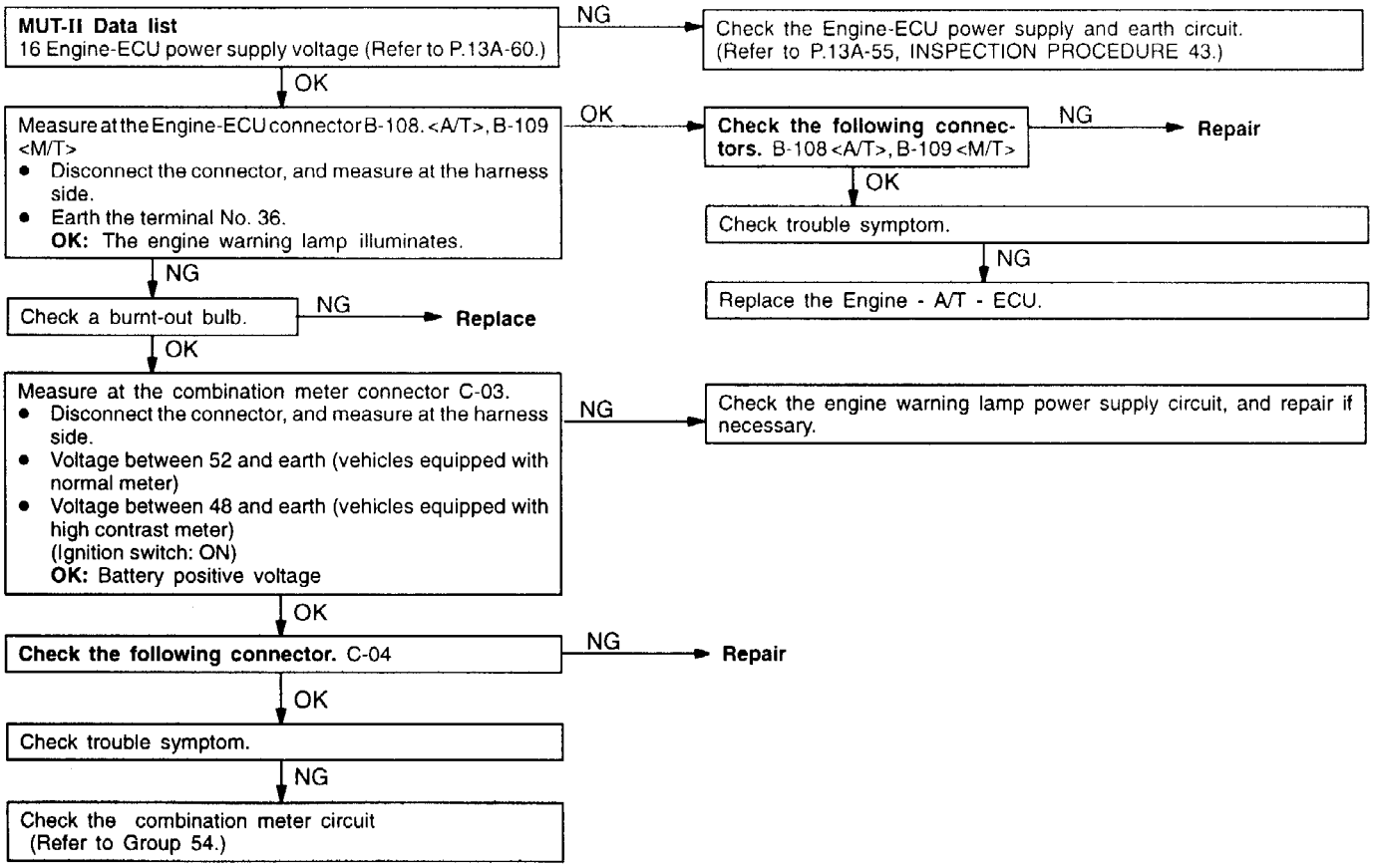
INSPECTION PROCEDURE 2

MUT-II communication with Engine-ECU is not possible.	Probable cause
One of the following causes may be suspected. • No power supply to Engine-ECU • Defective ground 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 the Engine-ECU • Open circuit between Engine-ECU and diagnosis connector



INSPECTION PROCEDURE 3

The engine warning lamp does not illuminate right after the ignition switch is turned to the ON position.	Probable cause
Because maybe 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 these listed at right has probably occurred.	• Burnt-out bulb • Defective engine warning lamp circuit • Malfunction of the Engine-ECU



INSPECTION PROCEDURE 4

The engine warning lamp remains illuminated 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 these listed at right has occurred.	• Short-circuit between the check engine lamp and Engine-ECU • Malfunction of the Engine-ECU

MUT-II diagnosis codes
Are diagnosis codes output?
- YES → Refer to P.13A-11, INSPECTION CHART FOR DIAGNOSIS CODES
- NO ↓

Measure at the instrument panel ECU connector C-11.
- Disconnect the connector, and measure at the harness side.
- Continuity between 63 and ground
  OK: No continuity

NG → Check the harness wire between the instrument panel ECU and Engine-ECU connector, and repair if necessary.

OK ↓

Replace the Engine-ECU.

INSPECTION PROCEDURE 5

Cranks, won't start	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 • Foreign materials in fuel

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

MUT-II: Inspection of no initial combustion. (Refer to P.13A-49, INSPECTION PROCEDURE 35.)
- OK ↓

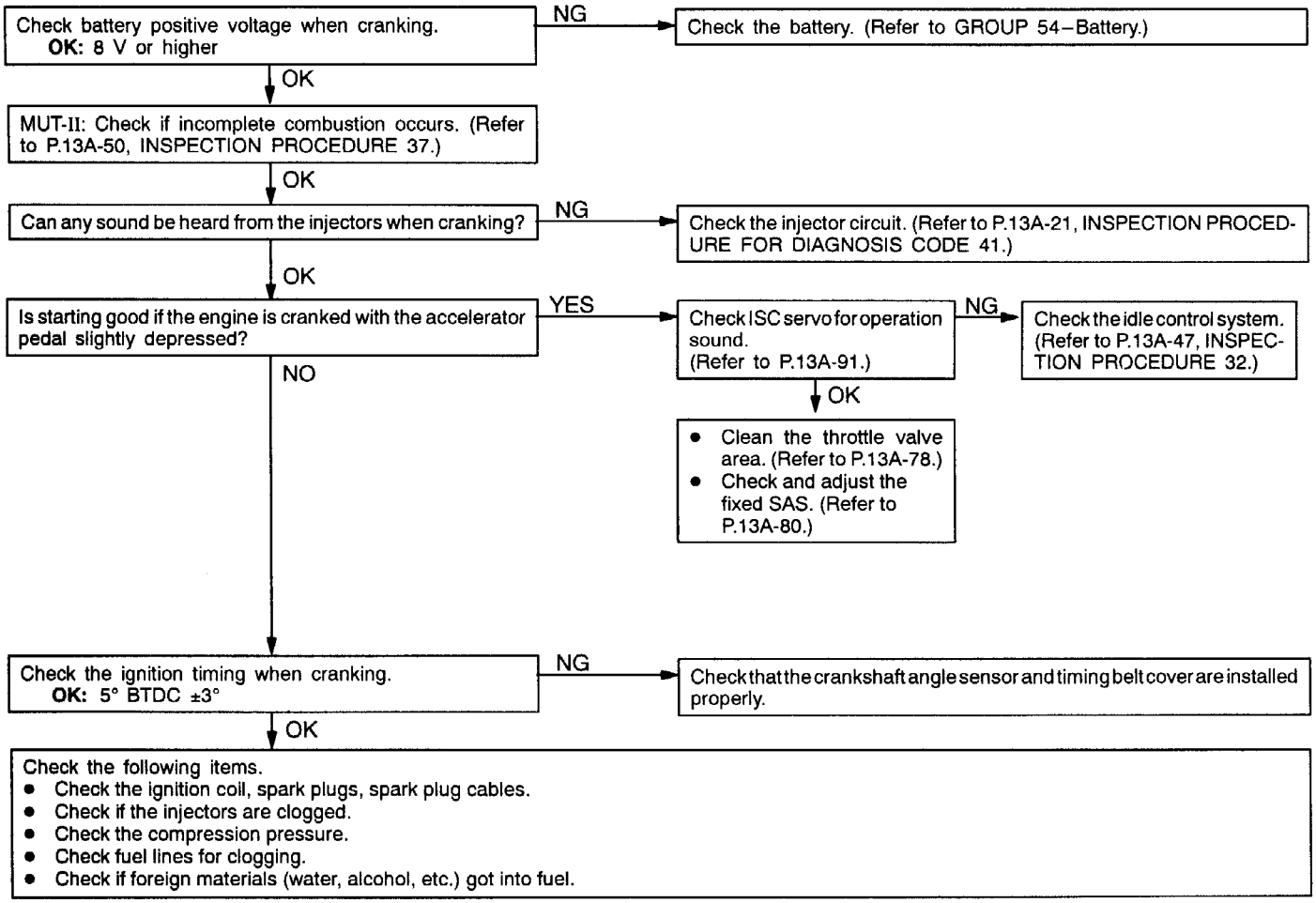
Can any sound be heard from the injectors when cranking?
- NG → Check the injector circuit (Refer to P.13A-21, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 41.)
- OK ↓

Ignition system: Inspection of no initial combustion. (Refer to P.13A-49, INSPECTION PROCEDURE 35.)
- OK ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables.
- Check if the injectors are clogged.
- Check if foreign materials (water, alcohol, etc.) got into fuel.
- Check the compression pressure.

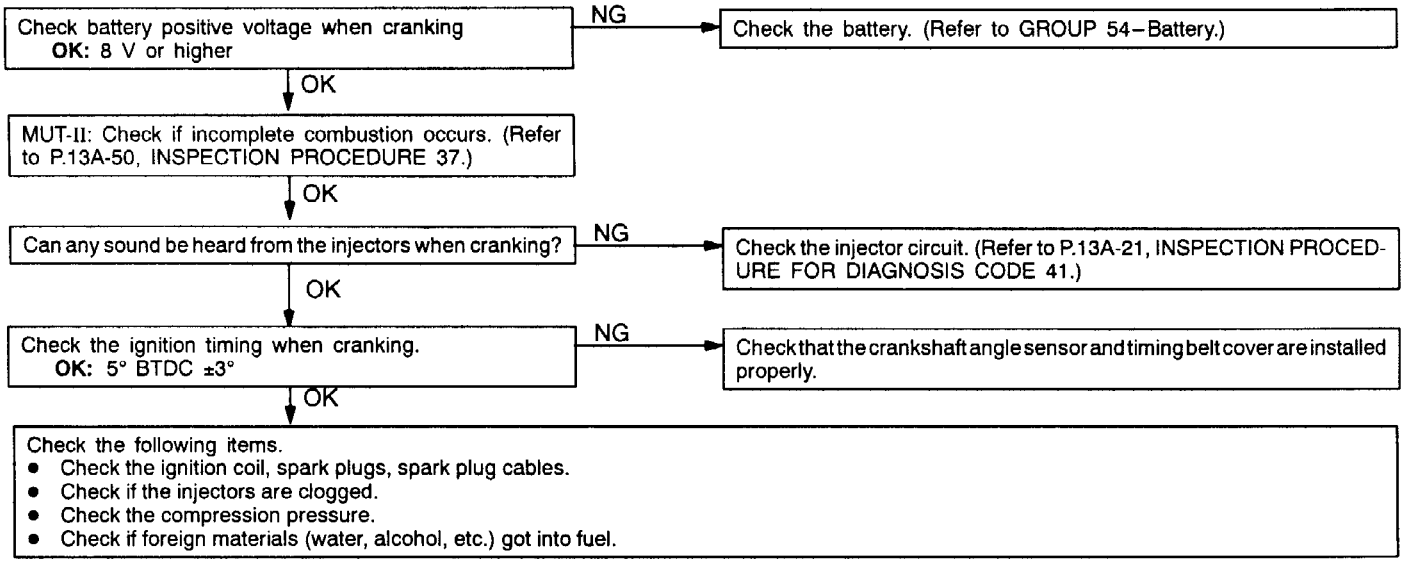
INSPECTION PROCEDURE 6

Fires up and dies.	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



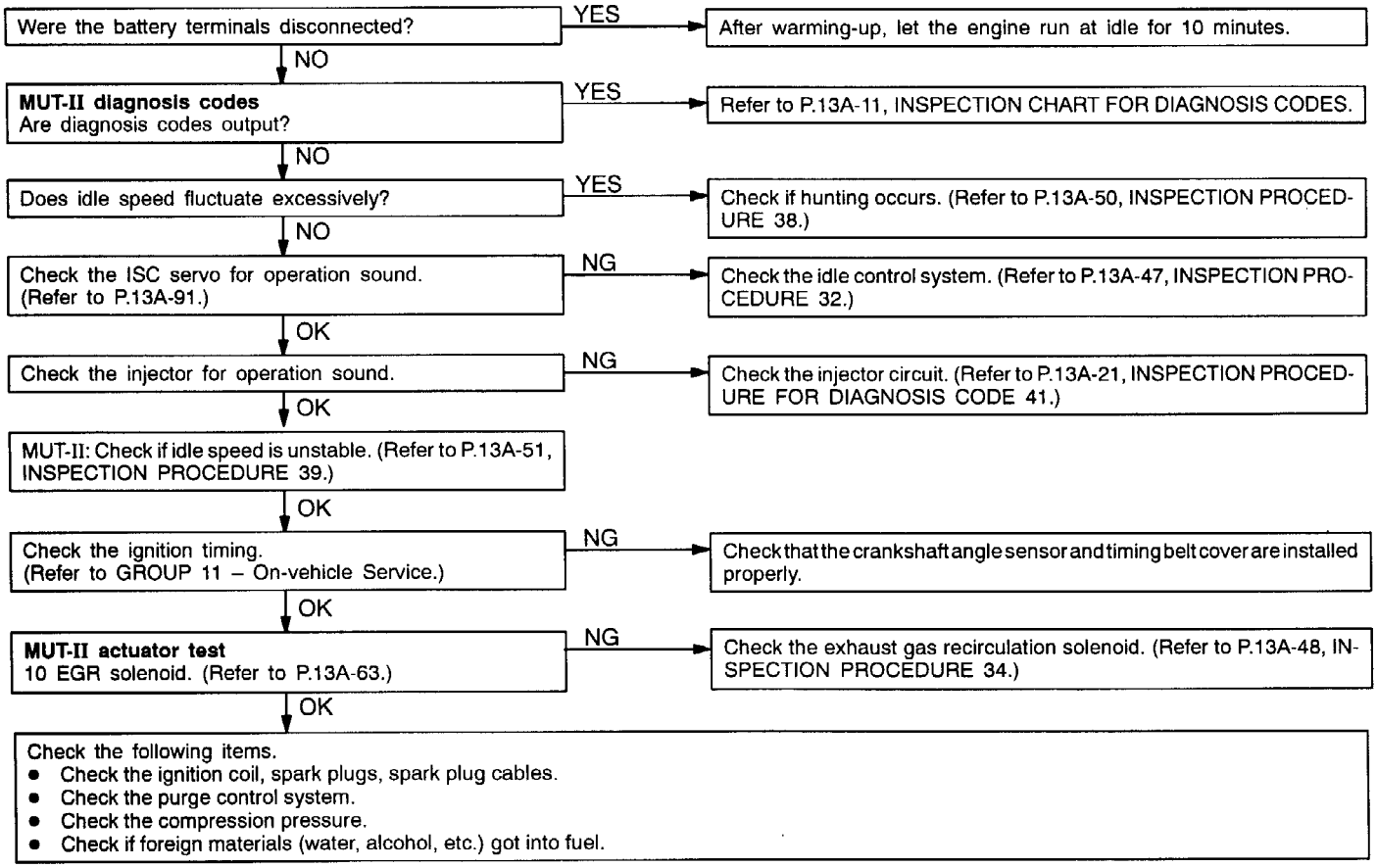
INSPECTION PROCEDURE 7

Hard 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



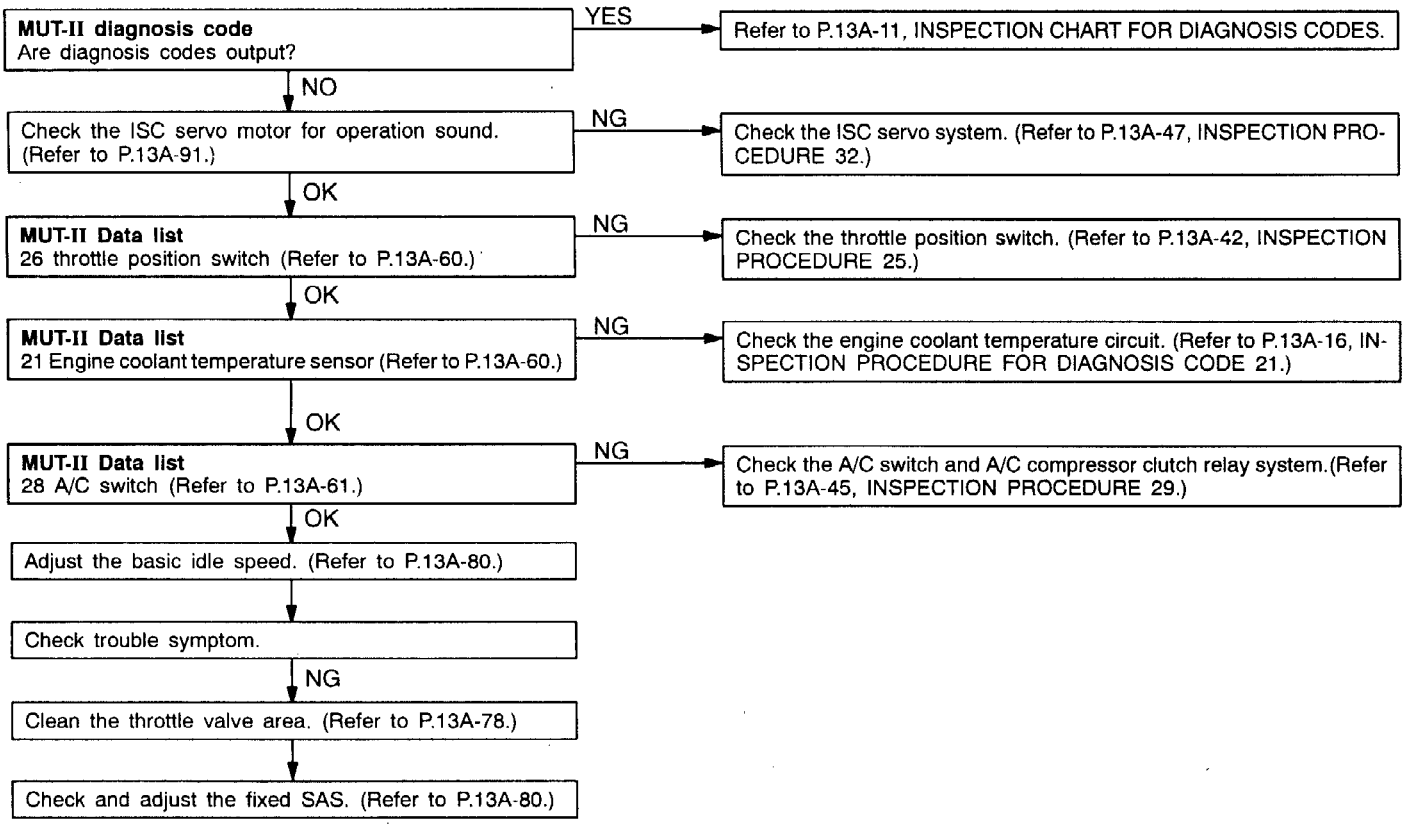
INSPECTION PROCEDURE 8

Unstable idle (Rough idle, hunting)	Probable cause
In cases such as the above, the cause is probably that the ignition system, air/fuel mixture, ISC servo 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 solenoid valve system • Poor compression • Drawing air into exhaust system • Malfunction of the EGR solenoid valve system



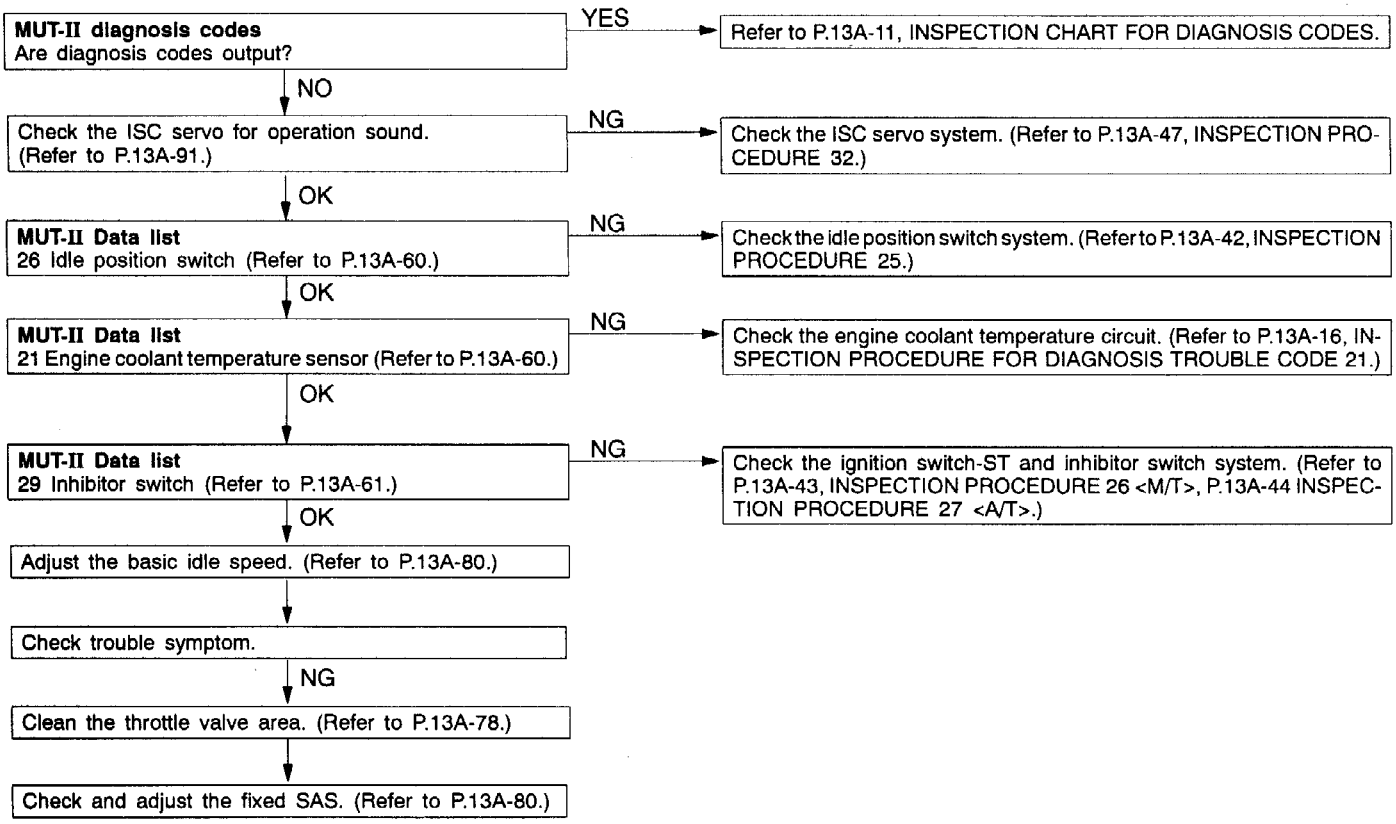
INSPECTION PROCEDURE 9

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



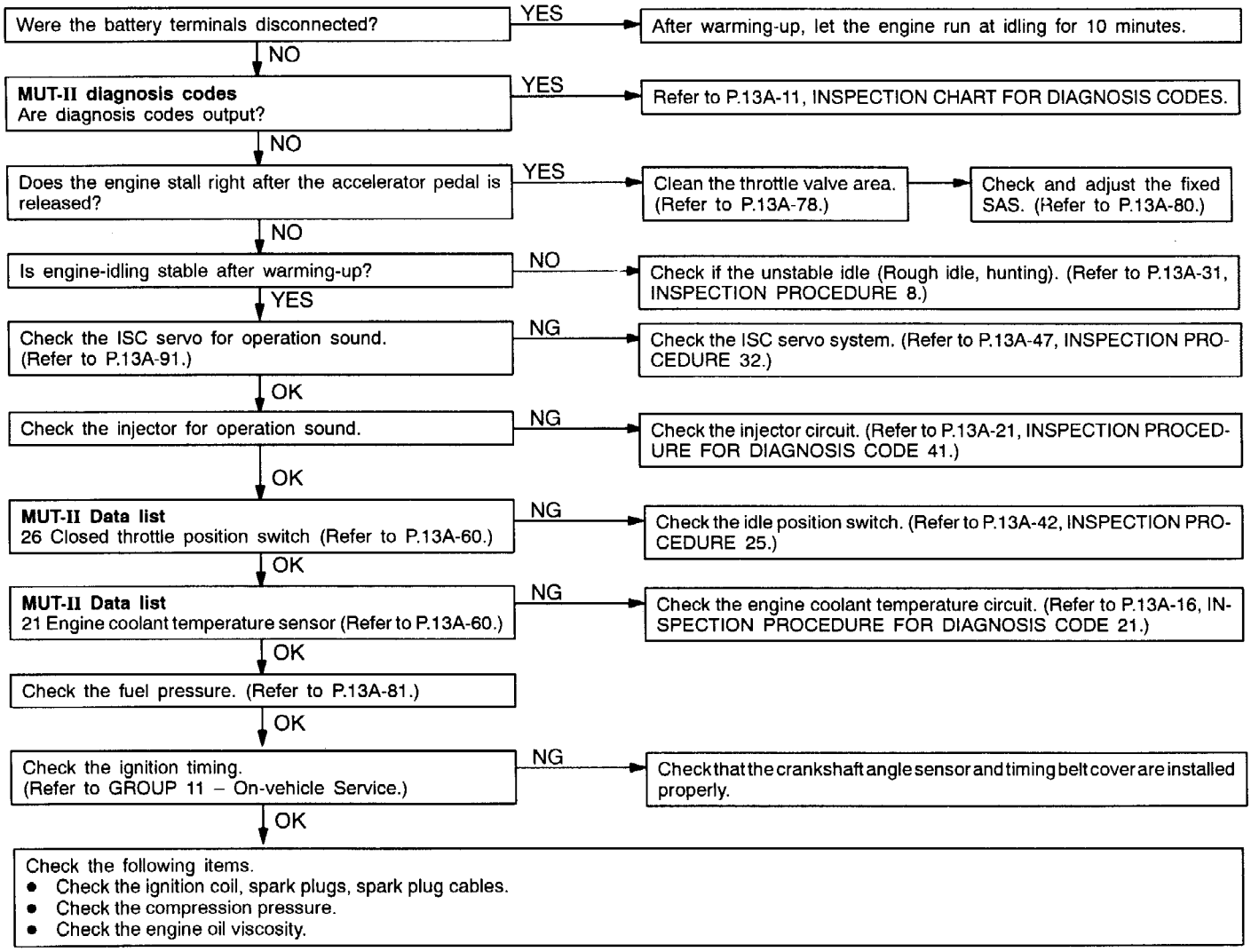
INSPECTION PROCEDURE 10

Idle speed is low. (Improper idle 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



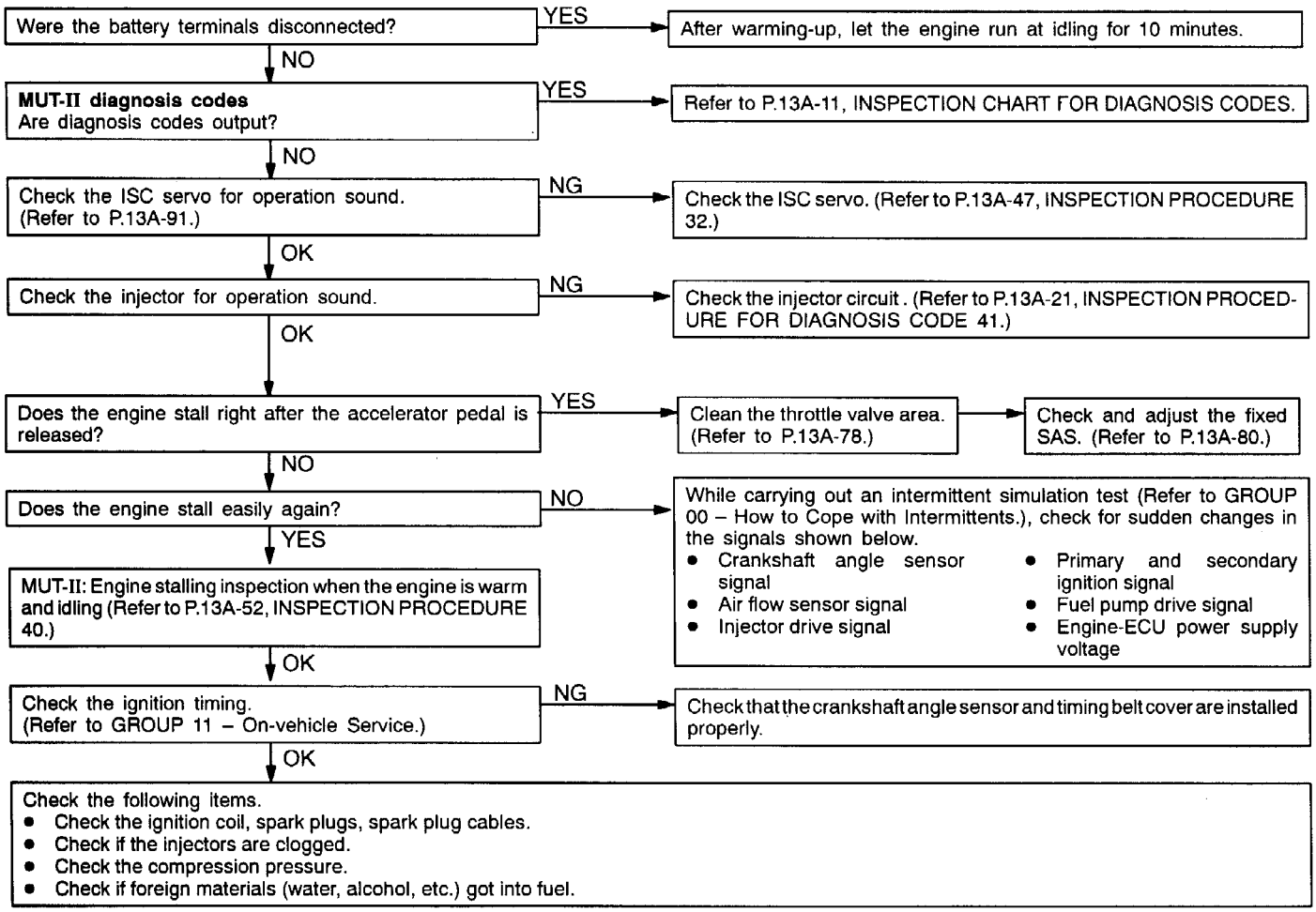
INSPECTION PROCEDURE 11

When the engine is cold, it stalls at idle. (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 idle. (Die out)	Probable cause
In cases such as the above, the cause is probably that ignition system, air/fuel mixture, ISC servo 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



INSPECTION PROCEDURE 13

The engine stalls when accelerating. (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 diagnosis codes
Are diagnosis codes output?
- YES → Refer to P.13A-11, INSPECTION CHART FOR DIAGNOSIS CODES.
- NO ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables.
- 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 ISC servo system.	• Malfunction of the ISC servo system

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

MUT-II diagnosis codes
Are diagnosis codes output?
- YES → Refer to P.13A-11, INSPECTION CHART FOR DIAGNOSIS CODES.
- NO ↓

MUT-II Data list
26 Idle position switch (Refer to P.13A-60.)
- NG → Check the idle position switch. (Refer to P.13A-42, INSPECTION PROCEDURE 25.)
- OK ↓

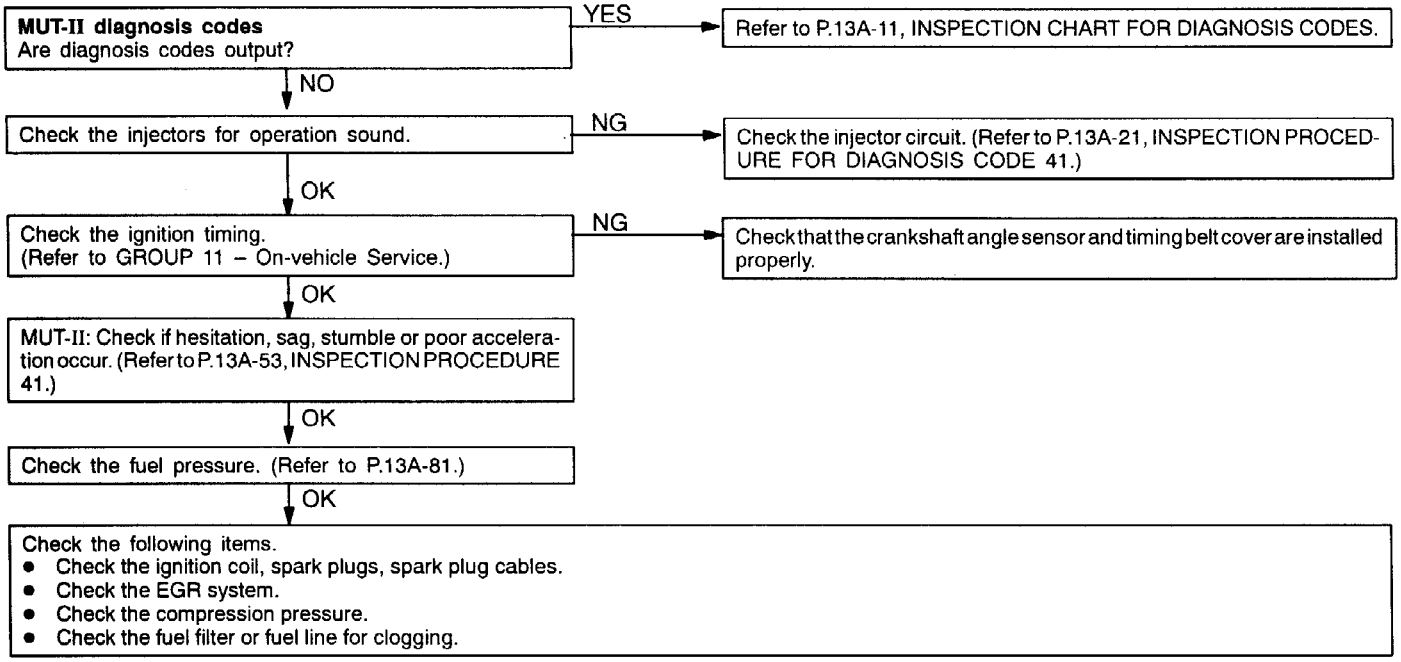
MUT-II Data list
14 Throttle position sensor (Refer to P.13A-60.)
- NG → Check the throttle position sensor circuit. (Refer to P.13A-15, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 14.)
- OK ↓

MUT-II Data list
45 ISC servo position
- Does the ISC servo position drop to 0–2 steps when decelerelating (engine rpm more than 1,000)?
  - YES → Check the vehicle speed sensor circuit. Refer to P.13A-19, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 24.)
  - NO ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables.
- Clean the throttle valve area.
- Check and adjust the fixed SAS.

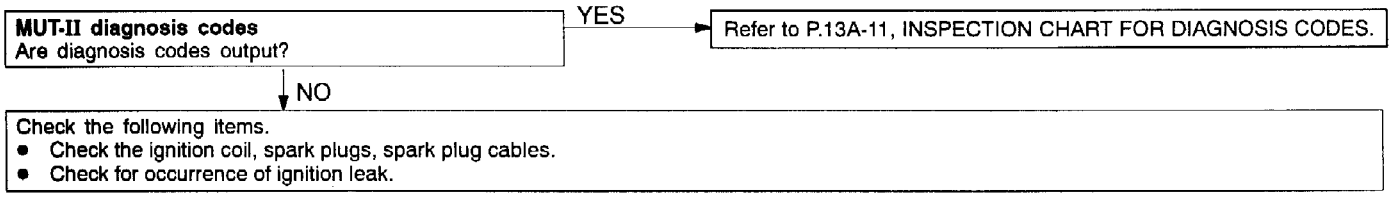
INSPECTION PROCEDURE 15

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 solenoid system • Poor compression



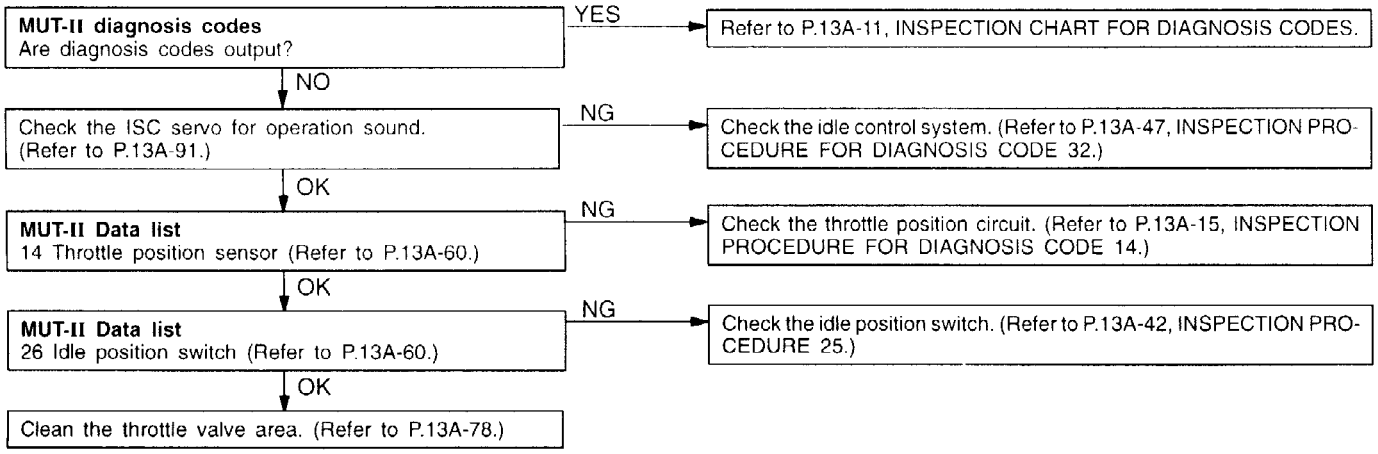
INSPECTION PROCEDURE 16

Acceleration shock	Probable cause
In cases such as the above, the cause is probably that there is an ignition leak accompanying the increase in the spark plug demand voltage during acceleration.	• Malfunction of the ignition system



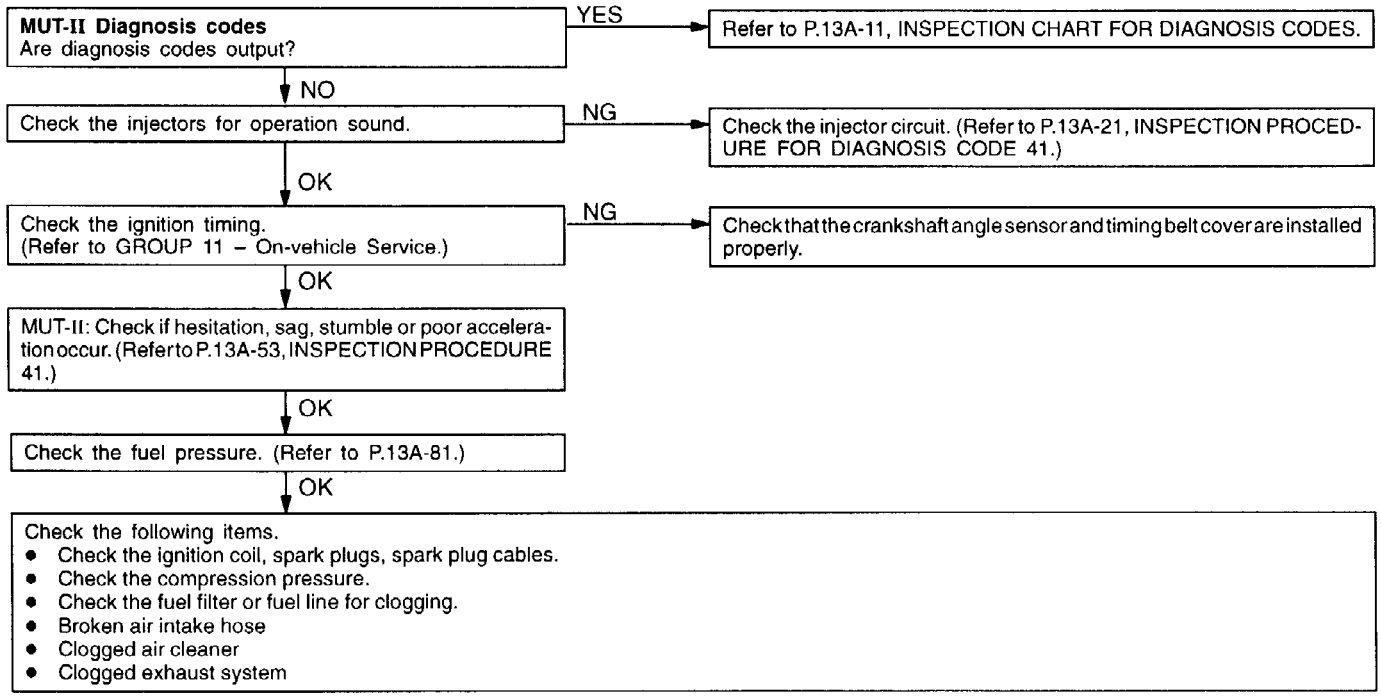
INSPECTION PROCEDURE 17

Deceleration shock	Probable cause
Malfunction of the ISC system is suspected.	• Malfunction of the ISC system



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 • Clogged exhaust system



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 solenoid system

MUT-II Self-Diag codes
Are diagnosis codes output?
YES → Refer to P.13A-11, INSPECTION CHART FOR DIAGNOSIS CODES.
NO ↓

Check the injectors for operation sound.
NG → Check the injector circuit. (Refer to P.13A-21, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 41.)
OK ↓

Check the ignition timing.
(Refer to GROUP 11 – On-vehicle Service.)
NG → Check that the crankshaft angle sensor and timing belt cover are installed properly.
OK ↓

MUT-II: Check if surge occurs. (Refer to P.13A-54, INSPECTION PROCEDURE 42.)
OK ↓

Check the fuel pressure. (Refer to P.13A-81.)
OK ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables.
- Check the EGR system.

INSPECTION PROCEDURE 20

Knocking	Probable cause
In cases such as the above, the cause is probably that the heat value of the spark plug is inappropriate.	• Defective knock sensor • Inappropriate heat value of the spark plug

MUT-II Self-Diag codes
Are diagnosis codes output?
YES → Refer to P.13A-11, INSPECTION CHART FOR DIAGNOSIS CODES.
NO ↓

Check the following items.
- Spark plug heat range.
- 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 codes
Are diagnosis codes output?
YES → Refer to P.13A-11, INSPECTION CHART FOR DIAGNOSIS CODES.
NO ↓

Check the ignition timing.
(Refer to GROUP 11 – On-vehicle Service.)
NG → Check that the crankshaft angle sensor and timing belt cover are installed properly.
OK ↓

MUT-II Data list
21 Engine coolant temperature sensor.
(Refer to P.13A-60.)
NG → Check the engine coolant temperature circuit. (Refer to P.13A-16, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 21.)
OK ↓

MUT-II Data list
13 Intake air temperature sensor (Refer to P.13A-59.)
NG → Check the intake air temperature circuit. (Refer to P.13A-14, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 13.)
OK ↓

MUT-II Data list
25 Barometric pressure sensor (Refer to P.13A-60.)
NG → Check the barometric pressure circuit. (Refer to P.13A-20, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 25.)
OK ↓

MUT-II Data list
11 Oxygen sensor (rear) (Refer to P.13A-59.)
- Transmission : L range
- Driving with the throttle wide open

OK: 600–1,000 mV
NG → Check the oxygen sensor circuit. (Refer to P.13A-12, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 11.)
OK ↓

Check the fuel pressure. (Refer to P.13A-81.)
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.
- Check the compression pressure.
- Check the positive crankcase ventilation system.
- Check the evaporative emission control system.
- Check the EGR system.

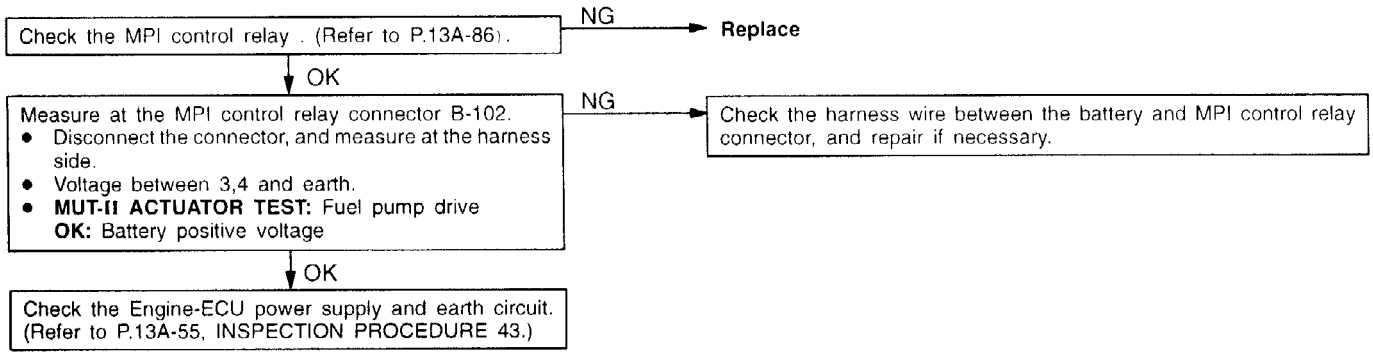
↓

Check trouble symptom.
NG ↓

Replace the three-way catalytic converter.

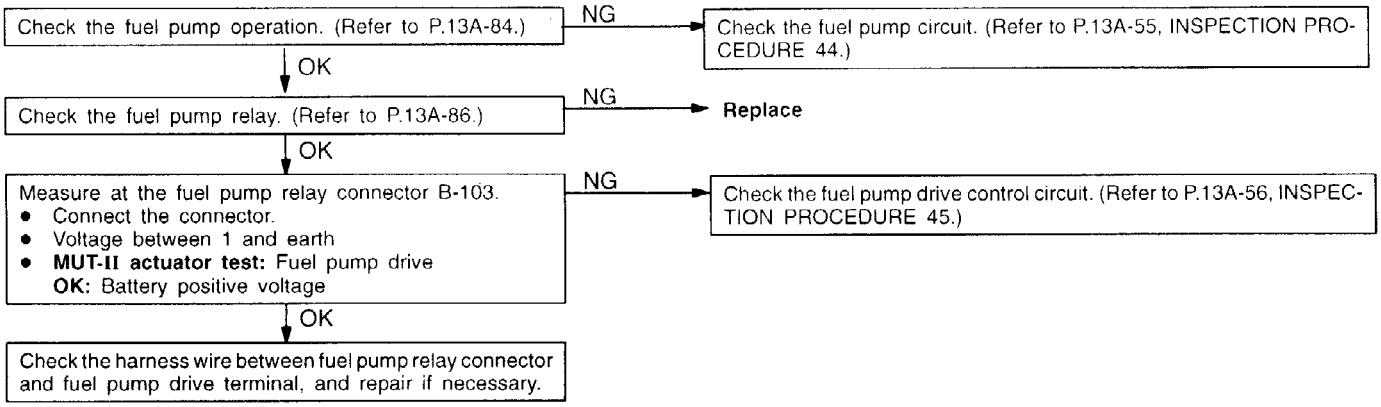
INSPECTION PROCEDURE 23

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 MPI control relay ON. This causes battery positive voltage to be supplied to the Engine-ECU, injectors and air flow sensor.	• Malfunction of the ignition switch • Malfunction of the MPI control relay • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the Engine-ECU



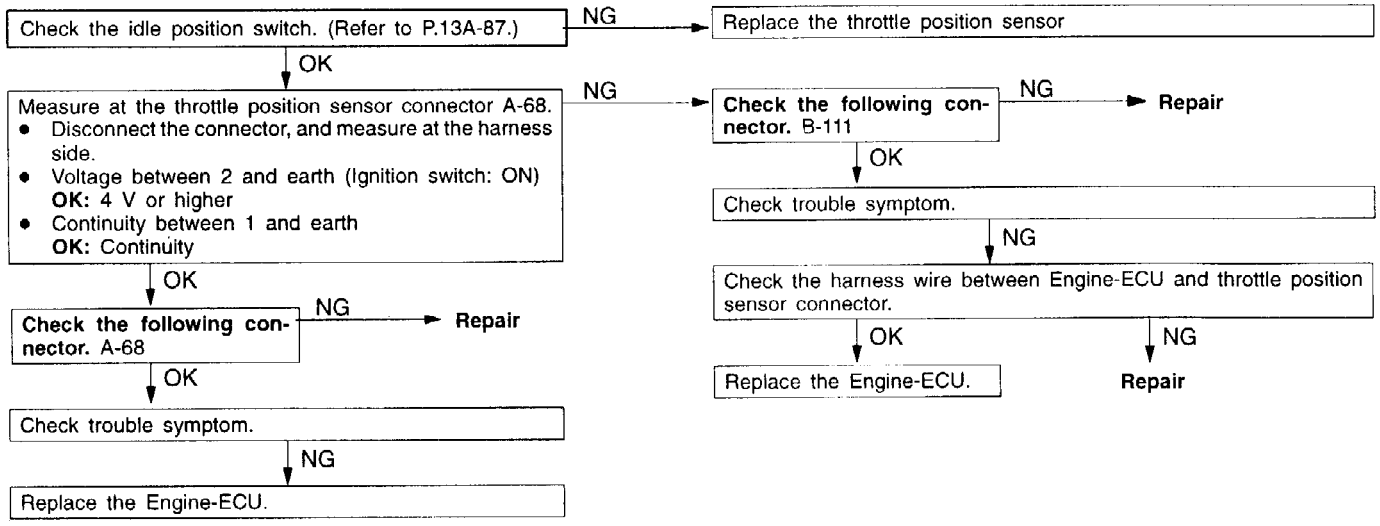
INSPECTION PROCEDURE 24

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



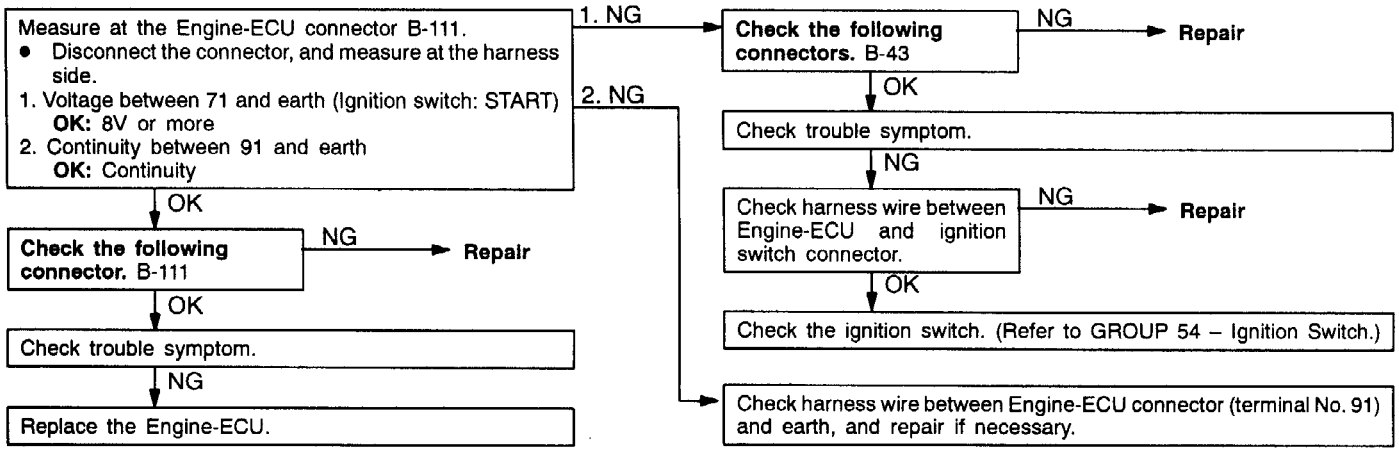
INSPECTION PROCEDURE 25

Idle position switch system	Probable cause
The idle position switch inputs the condition of the accelerator pedal, i.e. whether it is depressed or released (HIGH/LOW), to the Engine-ECU. The Engine-ECU controls the ISC servo based on this input.	• Maladjustment of the accelerator pedal • Maladjustment of the fixed SAS • Maladjustment of the idle position switch and throttle position sensor • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the Engine-ECU



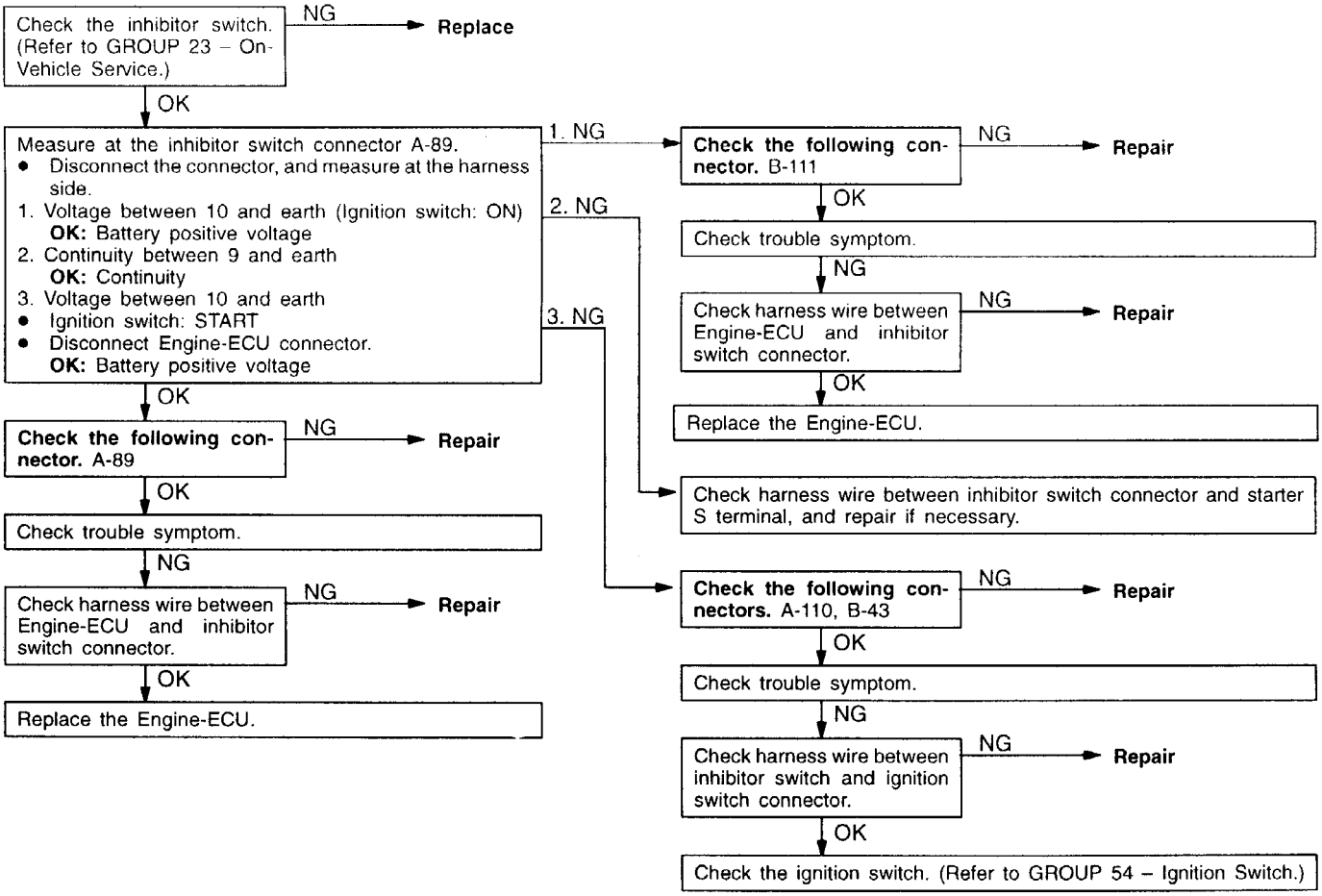
INSPECTION PROCEDURE 26

Ignition switch-ST system <M/T>	Probable cause
The ignition switch-ST inputs a HIGH signal to the engine-ECU while the engine is cranking. The Engine-ECU controls the 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.



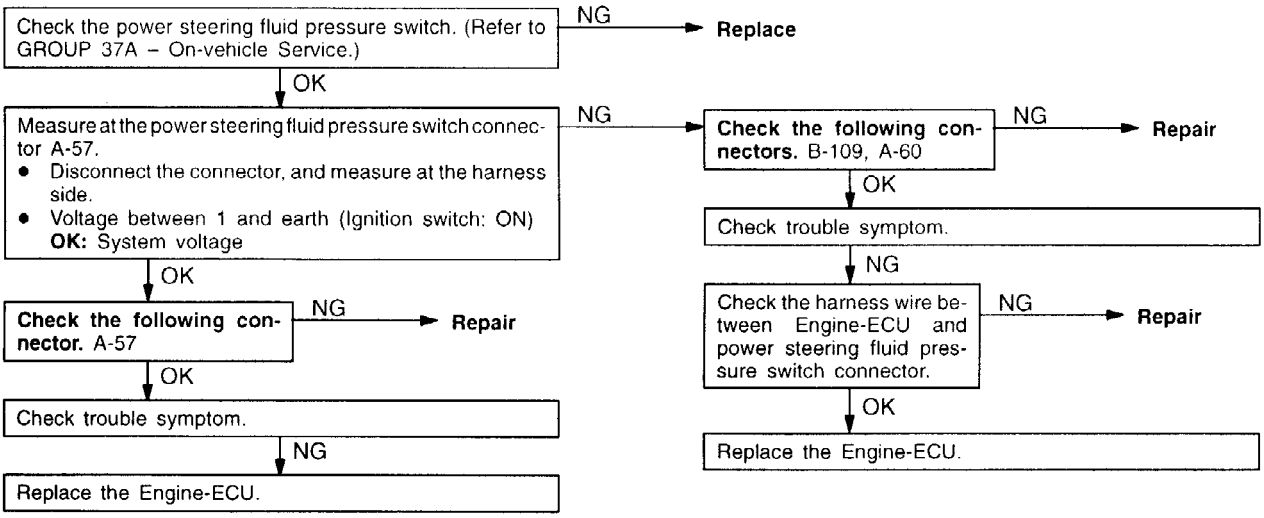
INSPECTION PROCEDURE 27

Ignition switch-ST and inhibitor switch system <A/T>	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. • The inhibitor switch inputs the condition of the select lever, i.e. whether it is in P or N range or in some other range, to the Engine-ECU. The Engine-ECU controls the ISC servo based on this input.	• Malfunction of ignition switch • Malfunction of inhibitor switch • Improper connector contact, open circuit or short circuited harness wire • Malfunction of the Engine-ECU.



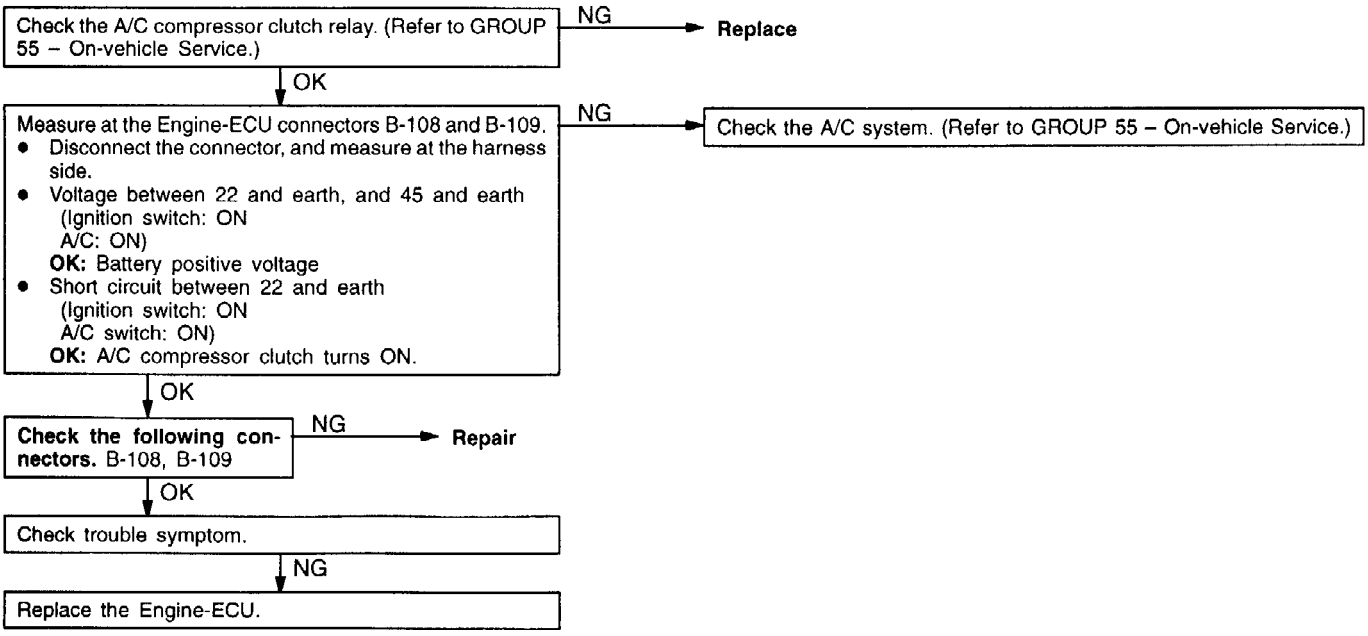
INSPECTION PROCEDURE 28

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 Engine-ECU



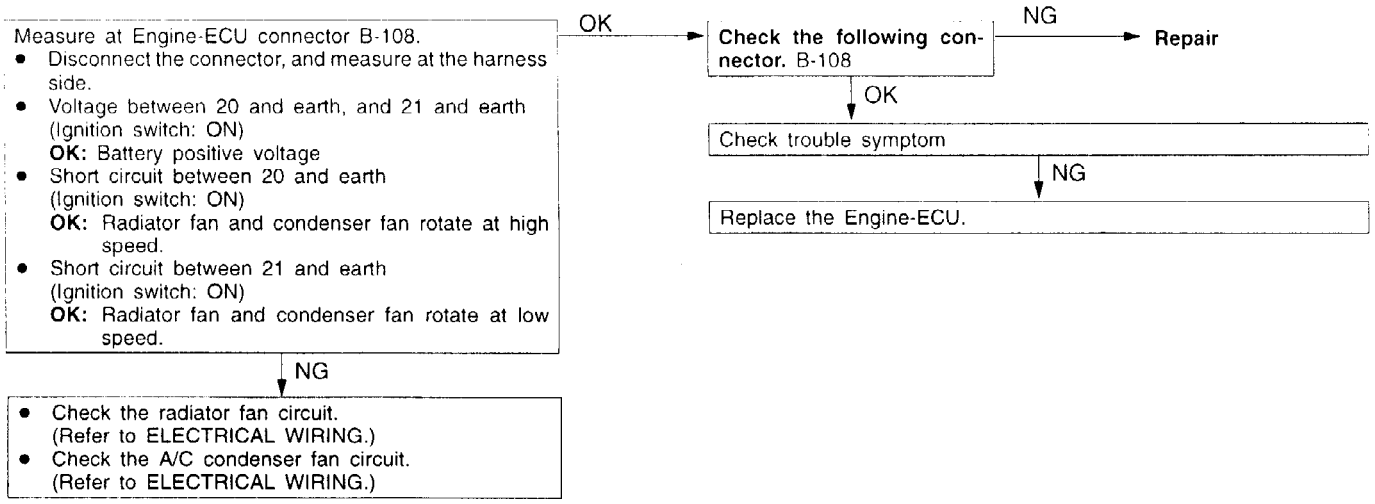
INSPECTION PROCEDURE 29

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 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 Engine-ECU



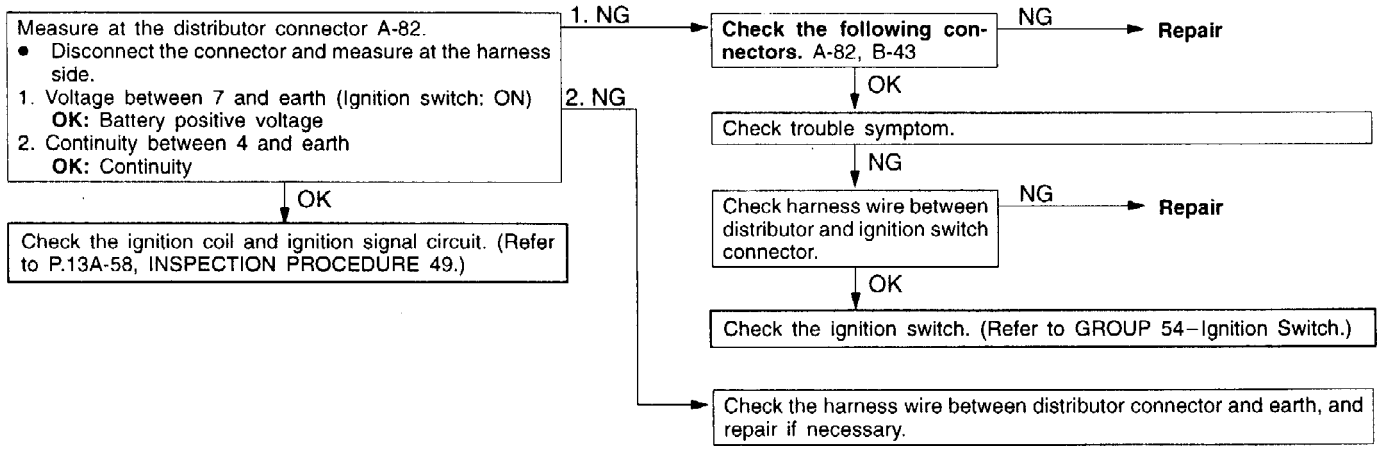
INSPECTION PROCEDURE 30

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



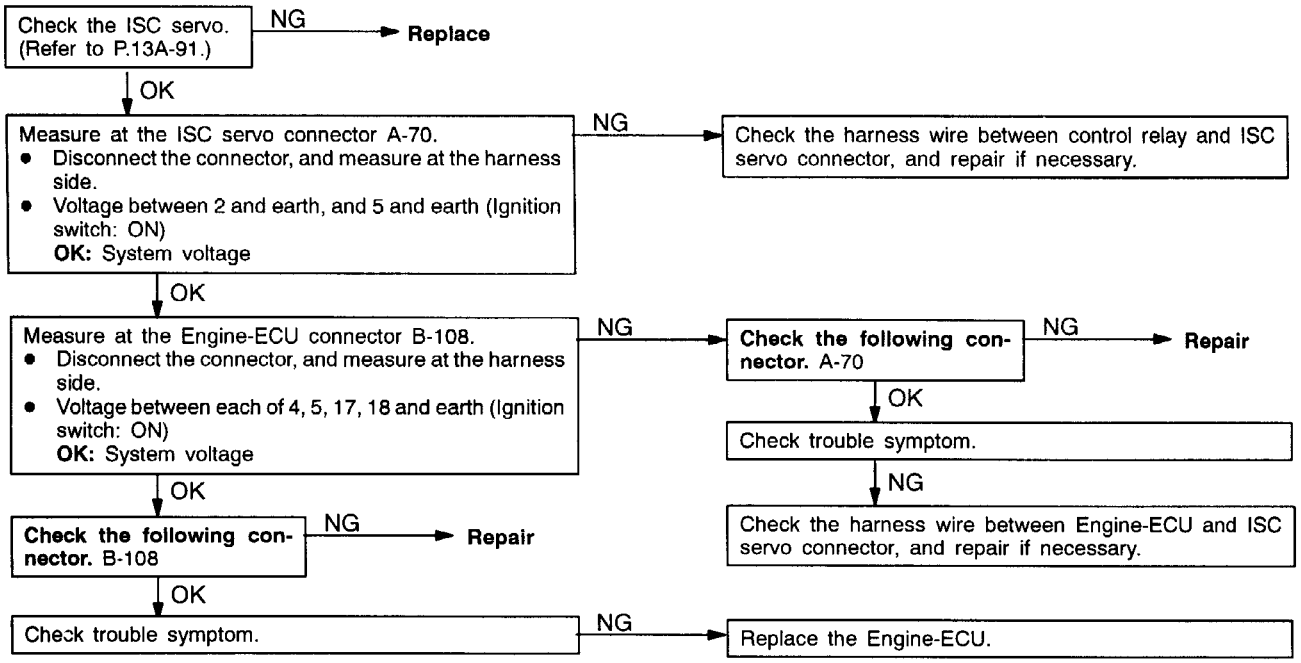
INSPECTION PROCEDURE 31

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



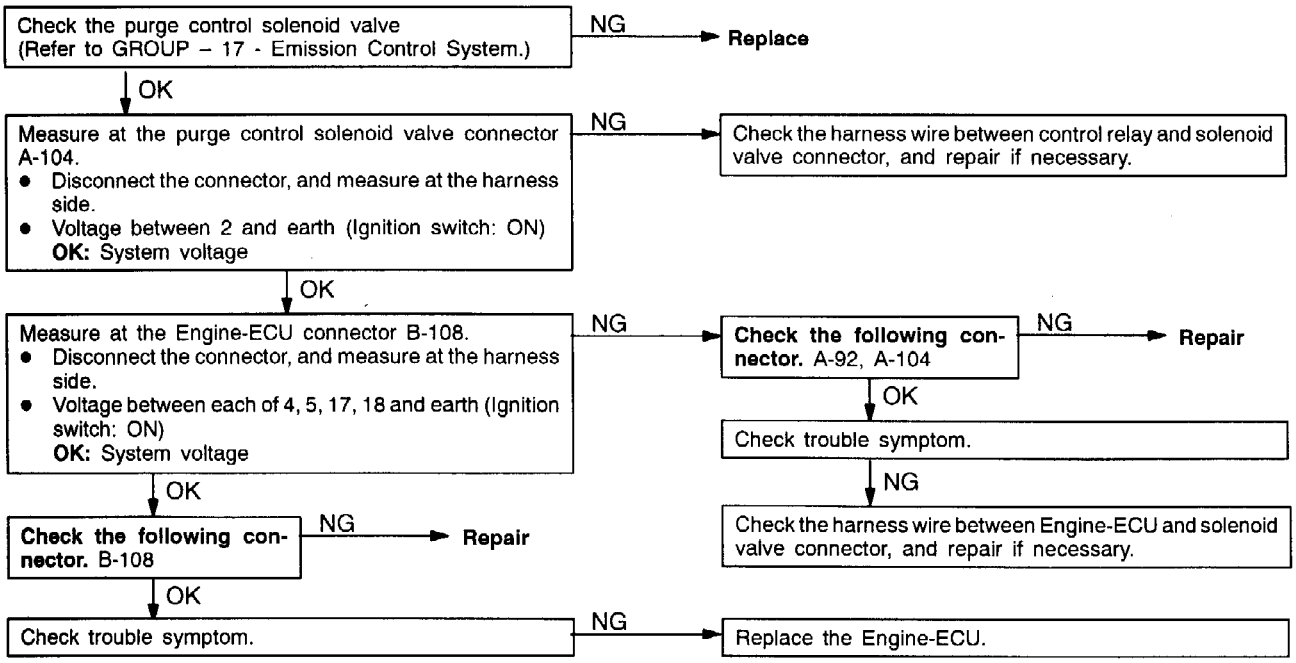
INSPECTION PROCEDURE 32

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



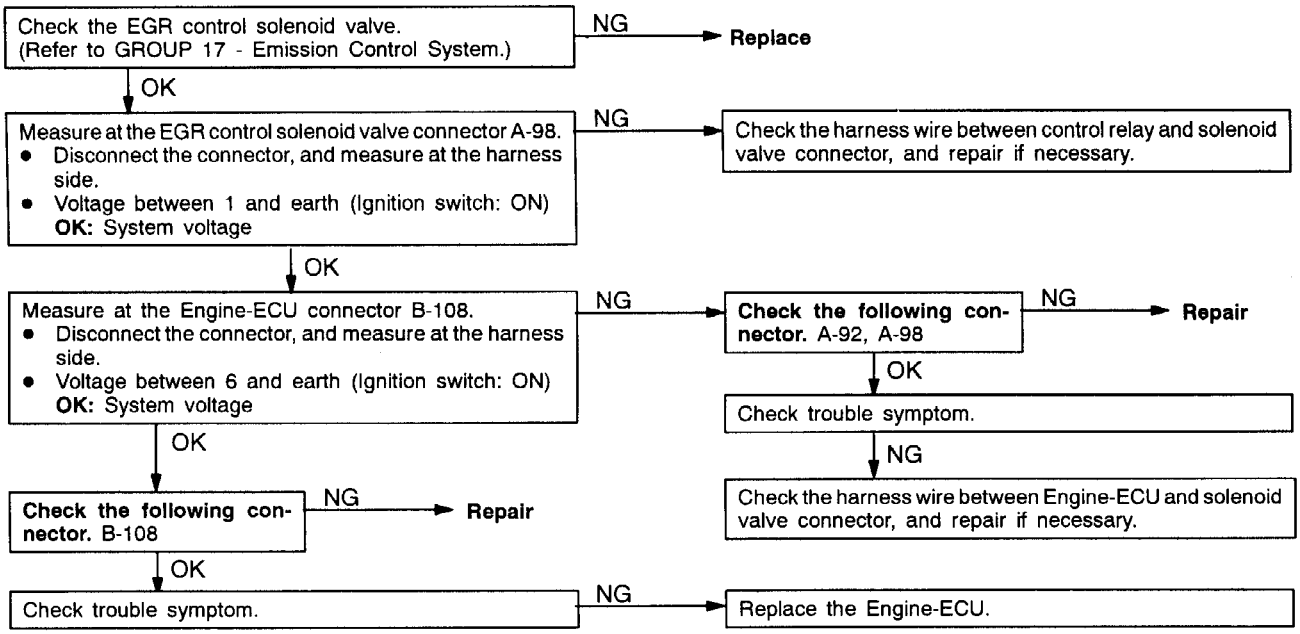
INSPECTION PROCEDURE 33

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



INSPECTION PROCEDURE 35

MUT-II: Inspection of no initial combustion

MUT-II Data list
16 Voltage of Engine-ECU power source (Refer to P.13A-60.)
→ NG → Check the power supply system. (Refer to P.13A-41, INSPECTION PROCEDURE 23.)
↓ 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 codes
Are the diagnosis codes output ?
→ YES → INSPECTION CHART FOR DIAGNOSIS CODES. (Refer to P.13A-11.)
↓ NO

MUT-II Data list
22 Crankshaft angle sensor
OK: Cranking speed is displayed.
→ NG → Check the crankshaft angle circuit. (Refer to P.13A-17, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 22.)
↓ OK

MUT-II actuator test
07 Fuel pump (Refer to P.13A-61.)
→ NG → Check the fuel pump system. (Refer to P.13A-42, INSPECTION PROCEDURE 24.)
↓ OK

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13A-60.)
→ NG → Check the engine coolant temperature circuit. (Refer to P.13A-16, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 21.)

INSPECTION PROCEDURE 36

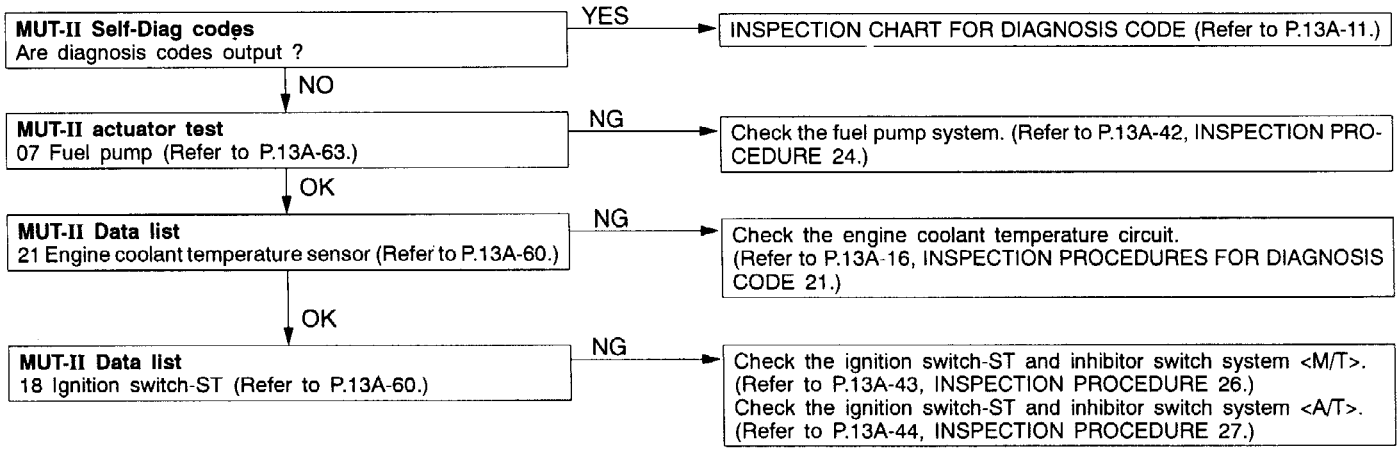
Ignition system: Inspection of no initial combustion

Does the engine tachometer display the cranking speed?
• Connect tachometer to engine speed detection terminal.
→ NG → Check the ignition circuit system (Refer to P.13A-46, INSPECTION PROCEDURE 31.)
↓ OK

Check the ignition timing when cranking.
OK: 5° BTDC ±3°
→ NG → Check for the correct installation condition of crankshaft angle sensor and timing belt cover.

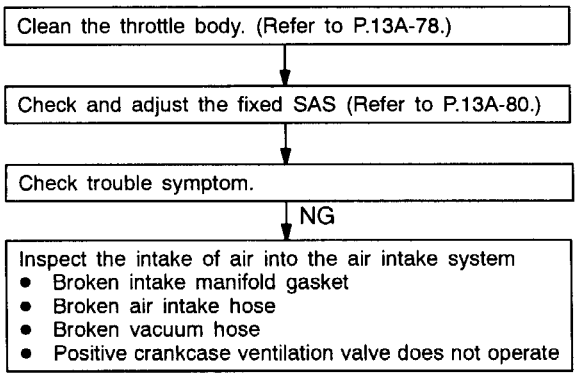
INSPECTION PROCEDURE 37

MUT-II: Check if incomplete combustion occurs.



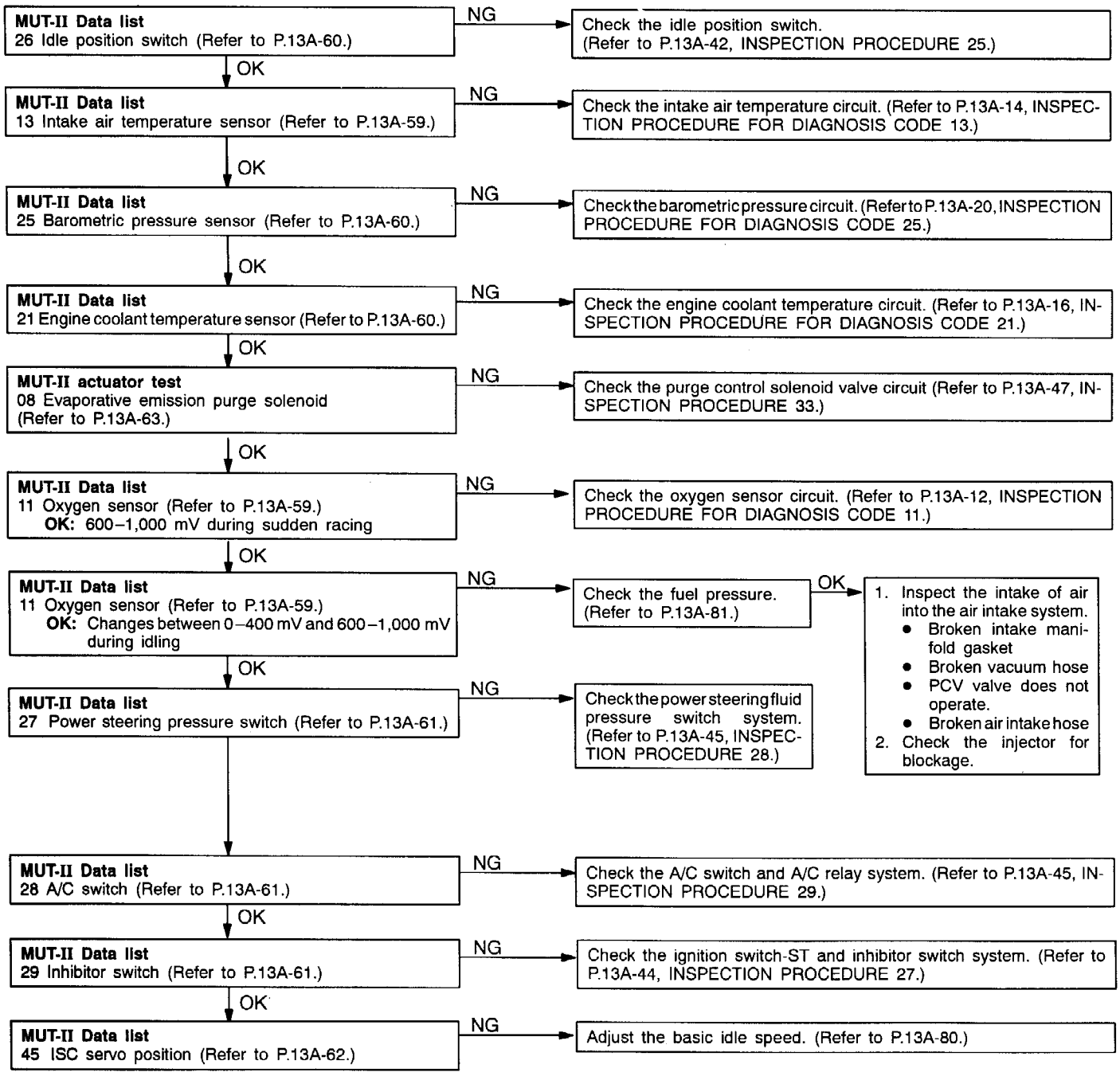
INSPECTION PROCEDURE 38

Check if hunting occurs.



INSPECTION PROCEDURE 39

MUT-II: Check if idle speed is unstable.



INSPECTION PROCEDURE 40

MUT-II: Engine stalling inspection when the engine is warm and idling.

MUT-II Data list
26 Idle position switch (Refer to P.13A-60.)
NG → Check the idle position switch. (Refer to P.13A-42, INSPECTION PROCEDURE 25.)
OK ↓

MUT-II Data list
13 Intake air temperature sensor (Refer to P.13A-59.)
NG → Check the intake air temperature circuit. (Refer to P.13A-14, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 13.)
OK ↓

MUT-II Data list
25 Barometric pressure sensor (Refer to P.13A-60.)
NG → Check the barometric pressure circuit. (Refer to P.13A-20, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 25.)
OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13A-60.)
NG → Check the engine coolant temperature circuit. (Refer to P.13A-16, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 21.)
OK ↓

MUT-II Data list
11 Heated oxygen sensor (Refer to P.13A-59.)
OK: Changes between 600–1,000 mV during sudden racing
NG → Check the oxygen sensor circuit. (Refer to P.13A-12, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 11.)
OK ↓

MUT-II Data list
11 Heated oxygen sensor (Refer to P.13A-59.)
OK: Changes between 0–400 mV and 600–1,000 mV during idling
NG → Check the fuel pressure. (Refer to P.13A-81.)
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 blockage.

OK ↓

MUT-II Data list
27 Power steering pressure switch (Refer to P.13A-61.)
NG → Check the power steering fluid pressure switch circuit (Refer to P.13A-45, INSPECTION PROCEDURE 28.)
OK ↓

MUT-II Data list
28 A/C switch (Refer to P.13A-61.)
NG → Check the A/C switch and A/C compressor clutch relay system. (Refer to P.13A-45, INSPECTION PROCEDURE 29.)
OK ↓

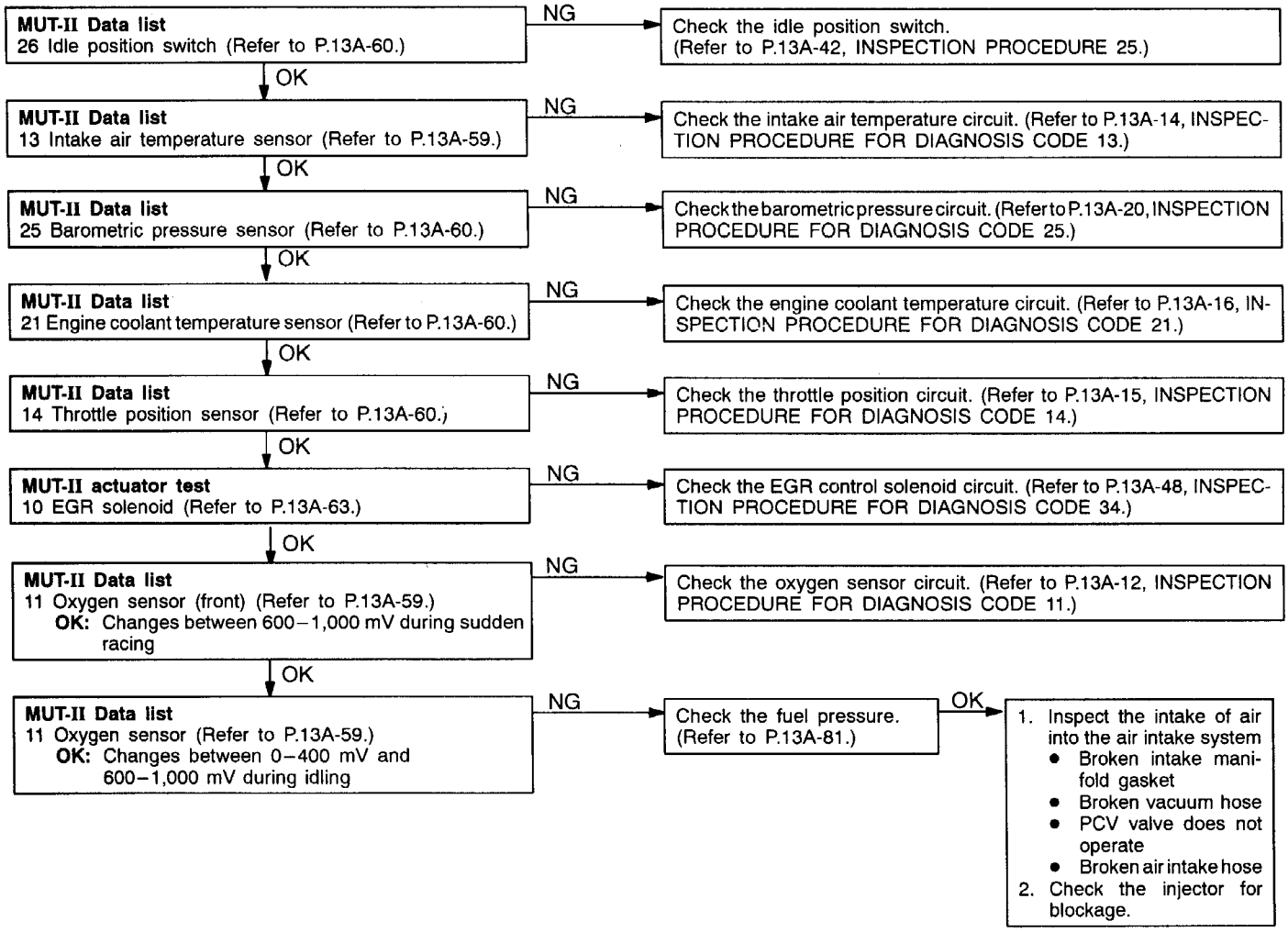
MUT-II Data list
29 Inhibitor switch (Refer to P.13A-61.)
NG → Check the ignition switch-ST and inhibitor switch system. (Refer to P.13A-44, INSPECTION PROCEDURE 27.)
OK ↓

MUT-II Data list
34 Air flow sensor reset signal (Refer to P.13A-61.)
NG → Check the air flow sensor circuit. (Refer to P.13A-57, INSPECTION PROCEDURE 46.)
OK ↓

MUT-II Data list
45 ISC servo position (Refer to P.13A-62.)
NG → Adjust the basic idle speed. (Refer to P.13A-80.)

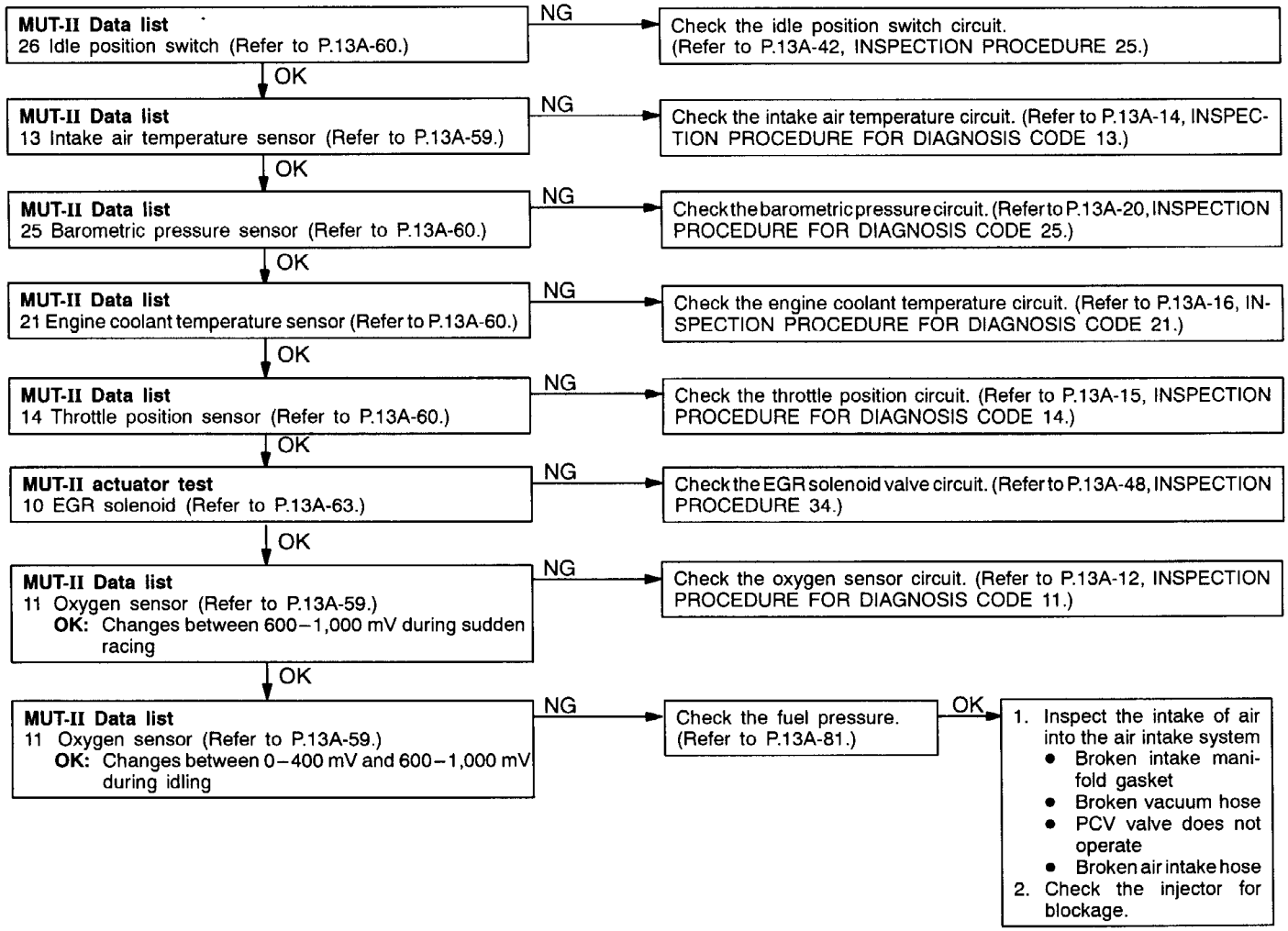
INSPECTION PROCEDURE 41

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



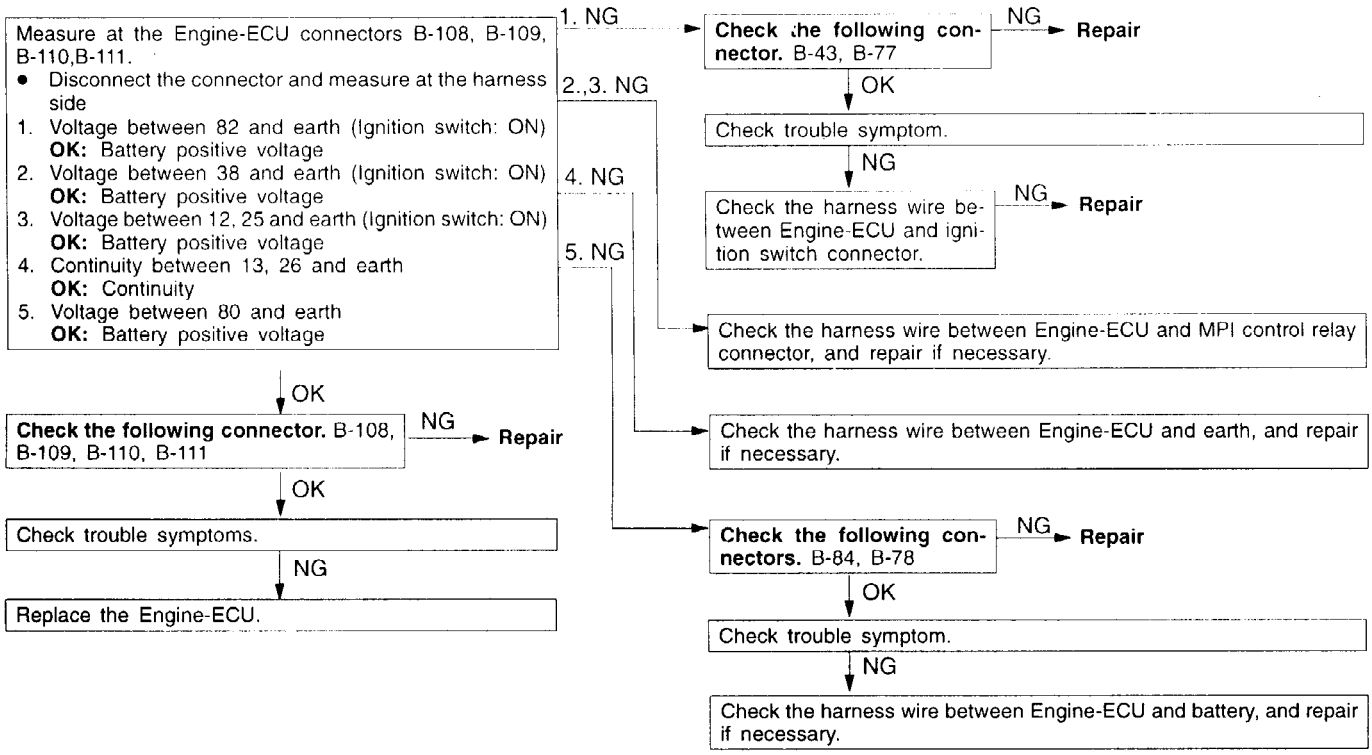
INSPECTION PROCEDURE 42

MUT-II: Check if surge occurs.



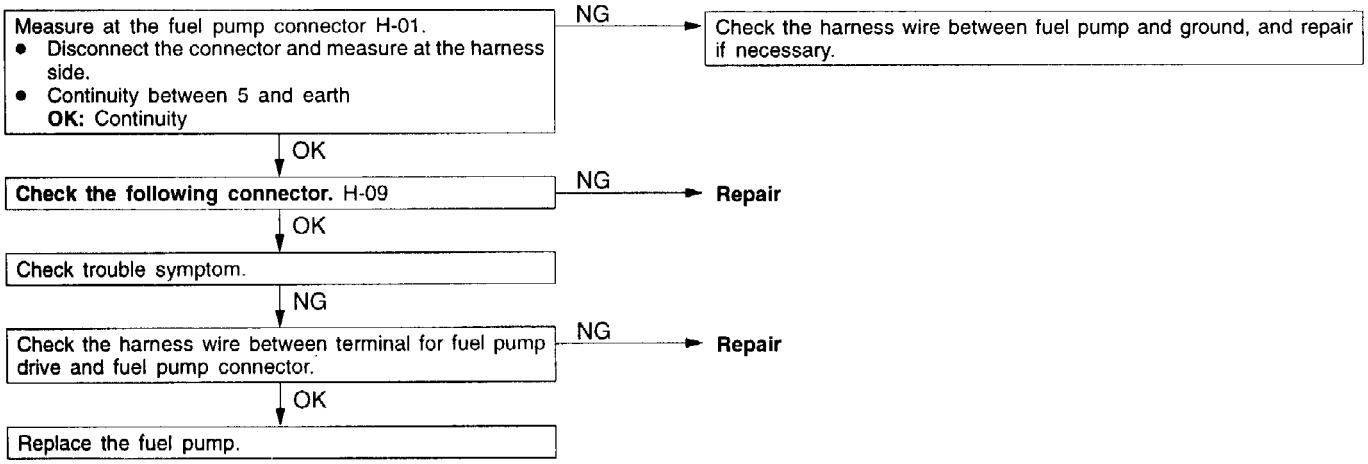
INSPECTION PROCEDURE 43

Check the Engine-ECU power supply and ground circuit.



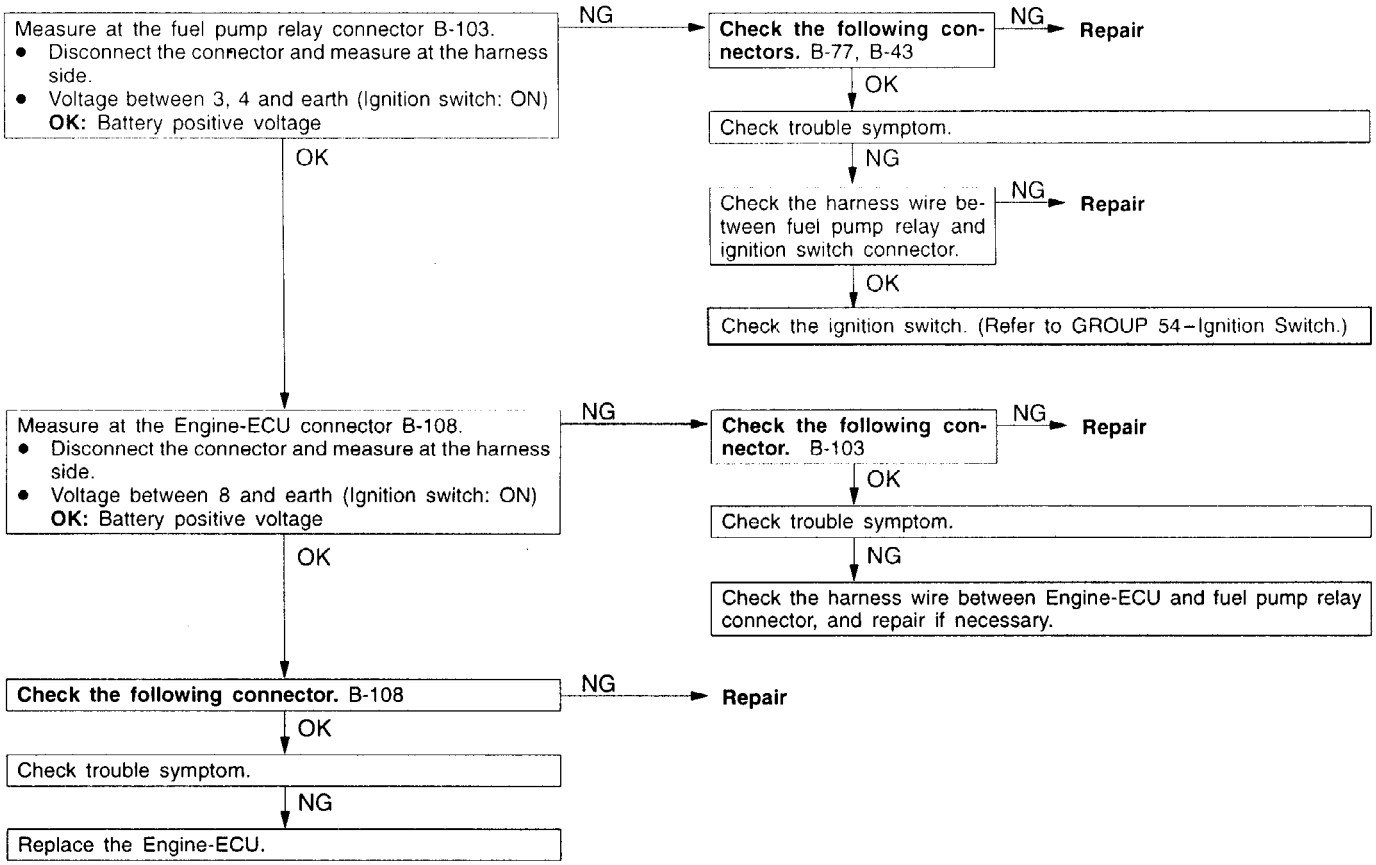
INSPECTION PROCEDURE 44

Check fuel pump circuit.



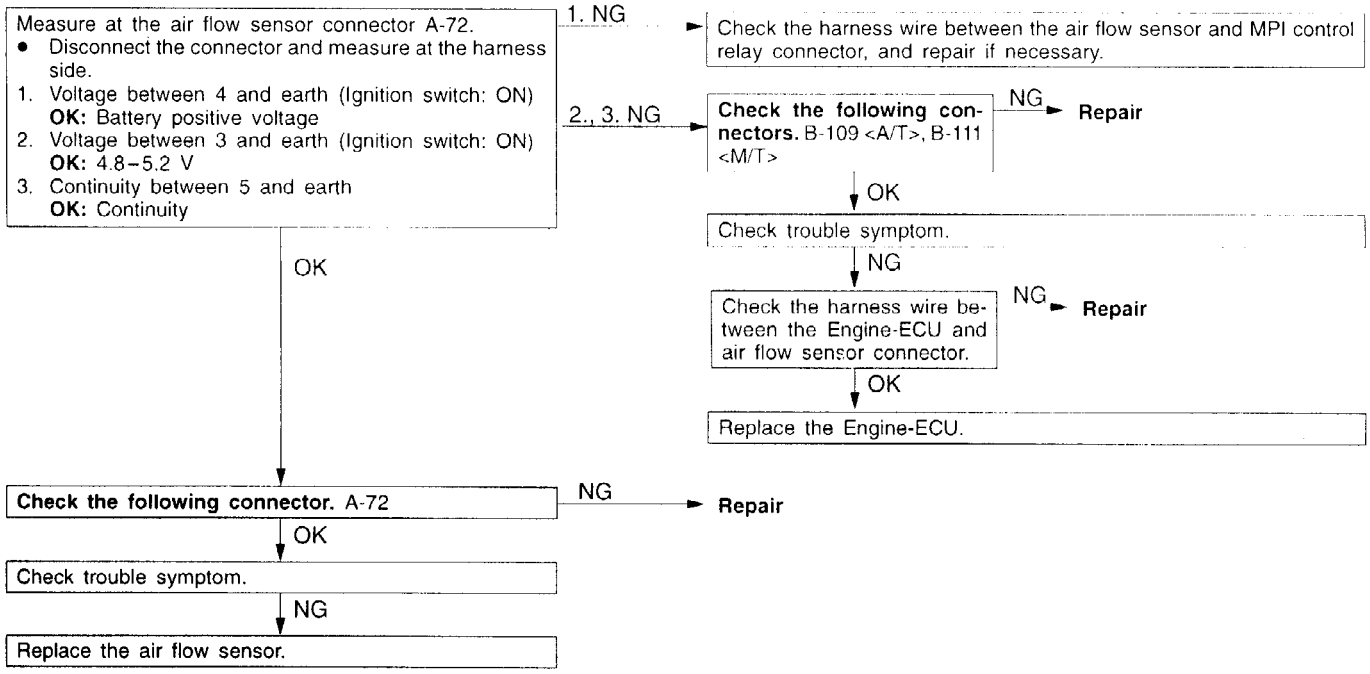
INSPECTION PROCEDURE 45

Check the fuel pump drive control circuit.



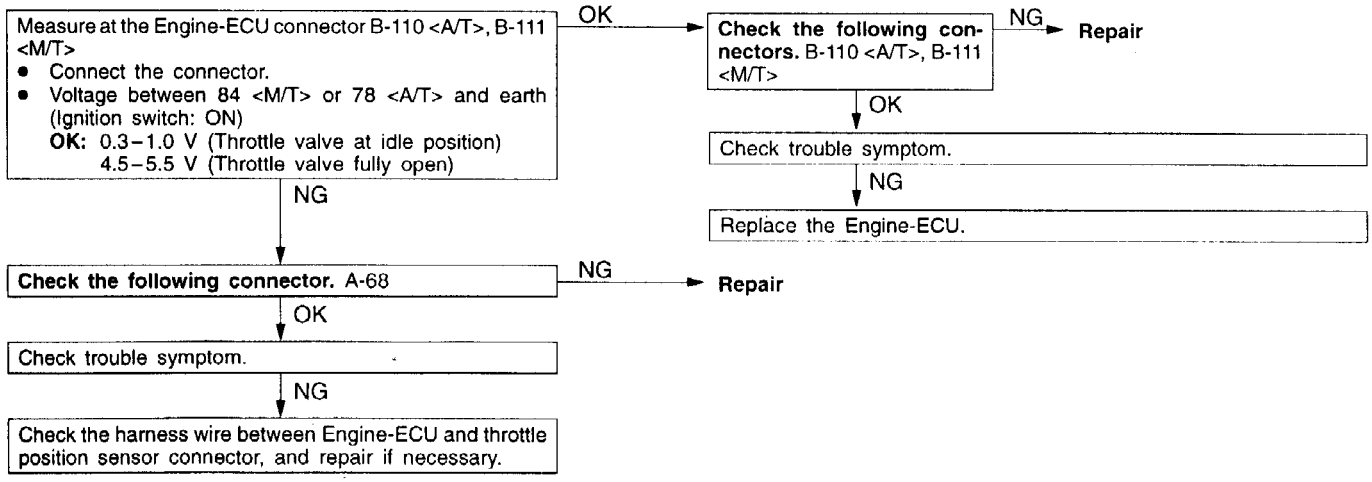
INSPECTION PROCEDURE 46

Check air flow sensor control circuit.



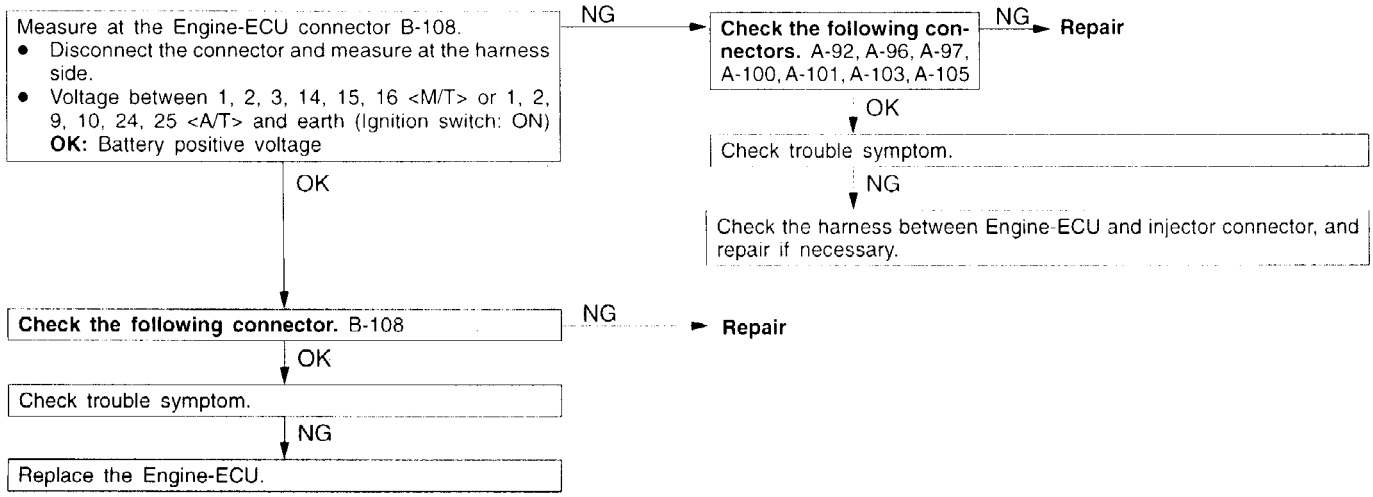
INSPECTION PROCEDURE 47

Check throttle position sensor (TPS) output circuit.



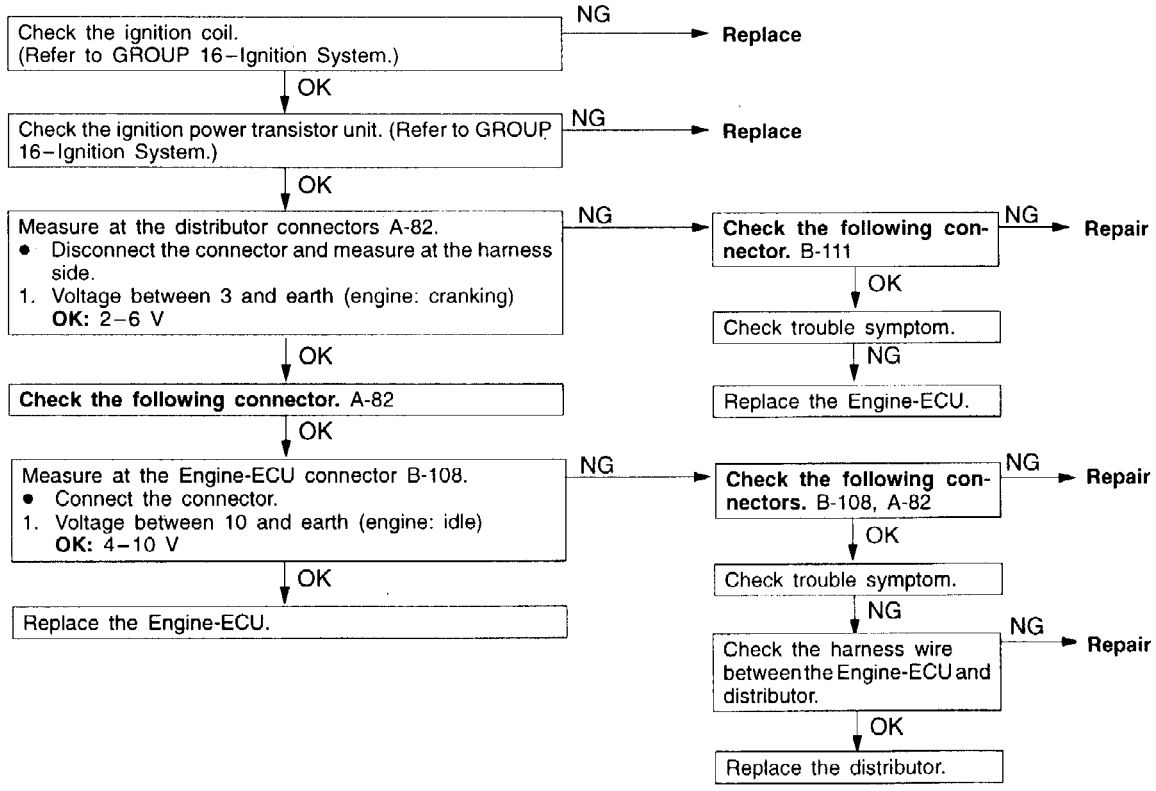
INSPECTION PROCEDURE 48

Check injector control circuit



INSPECTION PROCEDURE 49

Check ignition signal circuit.



DATA LIST REFERENCE TABLE

Caution

1. **When shifting the select lever to D range, the brakes should be applied so that the vehicle does not move forward.**
2. **Driving tests always need another personnel.**

*1: In a new vehicle [driven approximately 500 km or less], the air flow sensor output frequency is sometimes 10% higher than the standard frequency.
*2: After performing a warm up idle from an initial engine temperature of –20°C, if the idle speed is lower than the standard value then it is assumed that the air volume limiter in the throttle body is defective (even if the ISC motor is fully open).
*3: The injector drive time represents the time when the cranking speed is at 250 r/min or below when the power supply voltage is 11 V.
*4: In a new vehicle [driven approximately 500 km or less], the injector drive time is sometimes 10% longer than the standard time.
*5: The idle position switch normally turns off when the voltage of the throttle position sensor is 50 – 100mV higher than the voltage at the idle position. If the closed throttle position switch turns back on after the throttle position sensor voltage has risen by 100mV and the throttle valve has opened, the closed throttle position switch and the throttle position sensor need to be adjusted.
*6: In a new vehicle [driven approximately 500 km or less], the step of the stepper motor is sometimes 3 steps greater than the standard value.

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
11	Oxygen sensor	Engine: Warm (Air/fuel mixture is made leaner when decelerating, and is made richer when racing.)	When at 4,000 r/min, engine is suddenly decelerated	200 mV or less	Code No. 11	13A-12
			When engine is suddenly raced	600–1,000 mV		
		Engine: Warm (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	400 mV or less ↔ 600–1,000 mV (Changes)		
			2,500 r/min			
12	Air flow sensor	• Engine coolant temperature: 80–95°C • Lights, electric cooling fan and all accessories: OFF • Transmission: Neutral (A/T: P range)	Engine is idling	18–44 Hz	Code No. 12	13A-13
			2,500 r/min	43–83 Hz		
			Engine is raced	Frequency increases in response to racing		
13	Intake air temperature sensor	Ignition switch: ON or with engine running	When intake air temperature is –20°C	–20°C	Code No. 13	13A-14
			When intake air temperature is 0°C	0°C		
			When intake air temperature is 20°C	20°C		
			When intake air temperature is 40°C	40°C		
			When intake air temperature is 80°C	80°C		

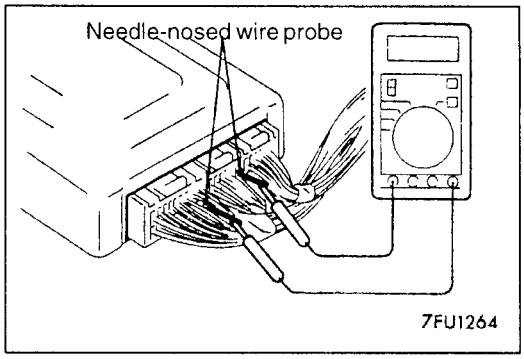
Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
14	Throttle position sensor	Ignition switch: ON	Set to idle position	300–1,000 mV (6–20%)	Code No. 14	13A-15
			Gradually open	Increases in proportion to throttle opening angle		
			Open fully	4,500–5,500 mV (80–100%)		
16	Power supply voltage	Ignition switch: ON		Battery positive voltage	Procedure No. 23	13A-41
18	Cranking signal (ignition switch-ST)	Ignition switch: ON	Engine: Stopped	OFF	Procedure No. 26 <M/T> Procedure No. 27 <A/T>	13A-43 <M/T> 13A-44 <A/T>
			Engine: Cranking	ON		
21	Engine coolant temperature sensor	Ignition switch: ON or with engine running	When engine coolant temperature is –20°C	–20°C	Code No. 21	13A-16
			When engine coolant temperature is 0°C	0°C		
			When engine coolant temperature is 20°C	20°C		
			When engine coolant temperature is 40°C	40°C		
			When engine coolant temperature is 80°C	80°C		
22	Crankshaft angle sensor *2	• Engine: Cranking • Tachometer: Connected	Compare the rpm of the tachometer with the one of the MUT-II.	Identical	Code No. 22	13A-17
		• Engine: Idling • Idle position switch: ON	When engine coolant temperature is –20°C	1,300–1,500 r/min		
			When engine coolant temperature is 0°C	1,300–1,500 r/min		
			When engine coolant temperature is 20°C	1,300–1,500 r/min		
			When engine coolant temperature is 40°C	1,050–1,250 r/min		
			When engine coolant temperature is 80°C	600–800 r/min		
24	Vehicle speed sensor	Drive at 40 km/h		Approx. 40 km/h	Code No. 24	13A-19
25	Barometric pressure sensor	Ignition switch: ON	At altitude of 0 m	101 kPa	Code No. 25	13A-20
			At altitude of 600m	95 kPa		
			At altitude of 1,200 m	88 kPa		
			At altitude of 1,800 m	81 kPa		
26	Idle position switch	Ignition switch: ON Check by operating accelerator pedal repeatedly	Throttle valve: Set to idle position	ON	Procedure No. 25	13A-42
			Throttle valve: Slightly open	OFF*5		

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
27	Power steering pressure switch	Engine: Idling	Steering wheel stationary	OFF	Procedure No. 28	13A-45
			Steering wheel turning	ON		
28	A/C switch	Engine: Idling (When A/C switch is ON, A/C compressor should be operating.)	A/C switch: OFF	OFF	Procedure No. 29	13A-45
			A/C switch: ON	ON		
29	Inhibitor switch <A/T>	Ignition switch: ON	P or N	P or N	Procedure No. 27	13A-44
			D,3, 2, L or R	D,3, 2, L or R		
34	Air flow sensor reset signal	Engine: Warm	Engine is idling	ON	–	–
			2,500 r/min	OFF		
37	Volumetric efficiency	• Engine coolant temperature: 80–95°C • Lights, electric cooling fan and all accessories: OFF • Transmission: P range	Engine is idling	15–35 %	–	–
			2,500 r/min	15–35 %		
			When engine is suddenly raced	Volumetric efficiency increases in response to racing		
38	Crankshaft angle sensor	• Engine cranking (reading is possible at 2,000 r/min or less) • Tachometer: connected		Engine speeds displayed on the MUT-II and tachometer are identical.	–	–
41, 47	Injectors *3	Engine: Cranking	When engine coolant temperature is 20°C	12–18 ms	–	–
			When engine coolant temperature is 20°C	30–44 ms		
			When engine coolant temperature is 80°C	8–12 ms		
	Injectors *4	• Engine coolant temperature: 80–95°C • Lights, electric cooling fan and all accessories: OFF • Transmission: P range	Engine is idling	2.2–3.4 ms		
			2,500 r/min	2.0–3.2 ms		
			When engine is suddenly raced	Increases		
44	Ignition coils and ignition power transistors	• Engine: After having warmed up • Timing light is set. (The timing light is set in order to check actual ignition timing.)	Engine is idling	2–18 °BTDC	–	–
			2,500 r/min	25–45 °BTDC		

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
45	ISC servo (stepper motor) position *6	• Engine coolant temperature: 80 – 95°C • Lights, electric cooling fan and all accessories: OFF • Transmission: P range) • Idle position switch: ON • Engine: Idling (When A/C switch is ON, A/C compressor should be operating)	A/C switch: OFF	Increases by 2–25 steps	–	–
			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 compressor clutch relay	Engine: After having warmed up /Engine is idling	A/C switch: OFF	OFF (Compressor clutch is not operating)	Procedure No. 29	13A-45
			A/C switch: ON	ON (Compressor clutch is operating		

ACTUATOR TEST REFERENCE TABLE

Item No.	Inspection item	Drive contents	Inspection contents		Normal condition	Inspection procedure No.	Reference page
01	Injectors	Cut fuel to No. 1 injector	Engine: Warm, idle (Cut the fuel supply to each injector in turn and check cylinders which don't affect idling.)		Idle speed drops equally for each injector	Code No. 41	13A-21
02		Cut fuel to No. 2 injector					
03		Cut fuel to No. 3 injector					
04		Cut fuel to No. 4 injector					
05		Cut fuel to No. 5 injector					
06		Cut fuel to No. 6 injector					
07	Fuel pump	Fuel pump operates and fuel is recirculated.	• Engine: Cranking • Fuel pump: Activated 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. 24	13A-42
				Listen near the fuel tank for the sound of fuel pump operation.	Typical electric fuel pump whine.		
08	Purge control solenoid valve	Solenoid valve turns from OFF to ON.	Ignition switch: ON		Clicks when solenoid valve is driven.	Procedure No. 33	13A-47
10	EGR control solenoid valve	Solenoid valve turns from OFF to ON.	Ignition switch: ON		Clicks when solenoid valve is driven.	Procedure No. 34	13A-48
17	Basic ignition timing	Set to ignition timing adjustment mode	Engine: Idle Timing light is set		5°BTDC	–	–
20	Radiator fan (Hi) Condenser fan (Hi)	Drive the fan motors (radiator and condenser).	Ignition switch: ON A/C switch: ON		Fan motor operates at high speed.	Procedure No. 30	13A-46
21	Radiator fan (Hi) Condenser fan (Low)	Drive the fan motors (radiator and condenser).	Ignition switch: ON A/C switch: ON		Fan motor operates at low speed.	Procedure No. 30	13A-46



CHECK AT THE ENGINE-ECU TERMINALS

TERMINAL VOLTAGE CHECK CHART

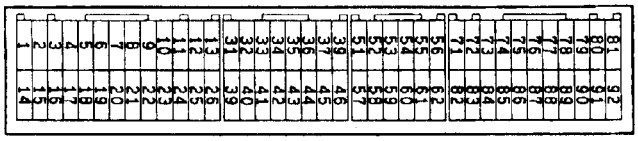
1. Connect a needle-nosed wire probe (paper clip etc.) to a voltmeter probe.
2. Insert the needle-nosed wire probe into each of the Engine-ECU connector terminals from the wire side, and measure the voltage while referring to the check chart.

   NOTE
   1. Measure voltage with the Engine-ECU connectors connected.
   2. You may find it convenient to pull out the Engine-ECU to make it easier to reach the connector terminals.
   3. Checks don't have to be carried out in the order given in the chart.

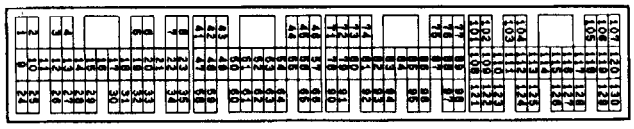
   Caution
   Short-circuiting the positive (+) probe between a connector terminal and ground could damage the vehicle wiring, the sensor, Engine-ECU, or all three. Use care to prevent this!
3. If voltmeter shows any deviation from standard value, check the corresponding sensor, actuator and related electrical 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 Connector Terminal Arrangement

<M/T>



<A/T>



Terminal No.		Check item	Check condition (Engine condition)	Normal condition
M/T	A/T			
1	1	No. 1 injector	While engine is idling after having warmed up, suddenly depress the accelerator pedal slightly	From 11–14 V momentarily drops
14	9	No. 2 injector		
2	24	No. 3 injector		
15	2	No. 4 injector		
3	10	No. 5 injector		
16	25	No. 6 injector		
4	14	Stepper motor coil<A1>	Engine: Soon after the warmed up engine is started	SV ↔ 0–3V (Changes repeatedly)
17	28	Stepper motor coil<A2>		
5	15	Stepper motor coil<B1>		
18	29	Stepper motor coil<B2>		
8	20	A/C relay	• Engine: Idle speed • A/C switch: OFF → ON (A/C compressor is operating)	SV or momentarily 6V or more → 0.3 V

Terminal No.		Check item	Check condition (Engine condition)		Normal condition
M/T	A/T				
10	11	Power transistor unit	Engine: 3,000 r/min		0.3–3.0 V
12	41	Power supply	Ignition switch: ON		SV
25	47				
19	19	Volume air flow sensor reset signal	Engine: idle speed		0–1V
			Engine: 3,000 r/min		6-9V
20	17	Fan motor relay (High)	Radiator fan is not operating (Engine coolant temperature is 90°C or less)		SV
			Radiator fan is operating at high speed (Engine coolant temperature is 105°C or more)		0–3V
21	18	Fan motor relay (Low)	Radiator fan is not operating (Engine coolant temperature is 90°C or less)		SV
			Radiator fan is operating at low speed (Engine coolant temperature is 90–105°C)		0–3V
22	21	Fuel Pump relay	Ignition switch: ON		SV
			Engine: idle speed		0–3V
36	22	Engine warning lamp	Ignition switch: OFF → ON		0–3V → 9–13 (after several seconds have elapsed)
37	52	Power steering pressure switch	Engine: Idling after warmed up	When steering wheel is stationary	SV
				When steering wheel is turned	0–3V
38	49	Control relay (Power supply)	Ignition switch: OFF		SV
			Ignition switch: ON		0–3V
45	83	A/C switch	Engine: idle speed	Turn the A/C switch OFF	0–3V
				Turn the A/C switch ON (A/C compressor is operating)	SV
71	58	Ignition switch – ST	Engine: Cranking		8V or more
72	64	Intake air temperature sensor	Ignition switch: ON	When intake air temperature is 0°C	3.2–3.8V
				When intake air temperature is 20°C	2.3–2.9V
				When engine coolant temperature is 40°C	1.5–2.1V
				When engine coolant temperature is 80°C	0.4–1.0V
76	71	Oxygen sensor <if equipped>	Engine: Running at 2,500 r/min after warmed up (Check using a digital type voltmeter)		0 ← → 0.8V (Changes repeatedly)
		Variable resistor	Ignition switch: ON		1–4V
80	66	Backup power supply	Ignition switch: OFF		SV
81	48	Sensor impressed voltage	Ignition switch: ON		4.5–5.5V
82	98	Ignition switch – IG	Ignition switch: ON		SV

Terminal No.		Check item	Check condition (Engine condition)		Normal condition
M/T	A/T				
83	44	Engine coolant temperature sensor	Ignition switch: ON	When engine coolant temperature is 0°C	3.2–3.8V
				When engine coolant temperature is 20°C	2.3–2.9V
				When engine coolant temperature is 40°C	1.3–1.9V
				When engine coolant temperature is 80°C	0.3–0.9V
84	78	Throttle Position sensor	Ignition switch: ON (Check for smooth voltage increase as throttle valve is moved from idle position to wide open throttle)	Idle	0.3–1.0V
				Wide open throttle valve	4.5–5.5V
—	—	Barometric pressure sensor	Ignition switch: ON	When altitude is 0m	3.7–4.3 V
				When altitude is 1,200m	3.2–3.8V
86	80	Vehicle speed sensor	• Ignition switch: ON • Move the vehicle slowly forward		0 ← → 5V (Changes repeatedly)
87	79	Idle position switch	Ignition switch: ON	Set throttle valve to idle position	0–1V
				Slightly open throttle valve	4V or more
88	56	Top dead centre sensor	Engine: Cranking		0.4–3.0V
			Engine: idle speed		0.5–2.0V
89	45	Crankshaft angle sensor	Engine: Cranking		0.4–4.0V
			Engine: idle speed		1.5–2.5V
90	65	Volume air flow sensor	Engine: idle speed		2.2–3.2V
			Engine: 2500 rpm		
	59	Inhibitor switch <A/T>	Ignition switch: ON	Set selector lever to P or N	0–3V
				Set selector lever to D, 3, 2, L or R	8–14V

CHECK CHART FOR RESISTANCE AND CONTINUITY BETWEEN TERMINALS

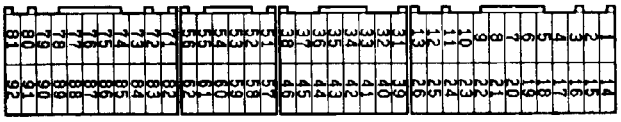
1. Turn the ignition switch to OFF.
2. Disconnect the Engine-ECU connector.
3. Measure the resistance and check for continuity between the terminals of the Engine-ECU harness-side connector while referring to the check chart.

   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. Checks do not have to be carried out in the order given in this chart.

   Caution
   If resistance or continuity checks are performed on the wrong terminals, damage to the vehicle wiring, sensors, Engine-ECU, and/or ohmmeter may occur. Use care to prevent this!
4. If the ohmmeter shows any deviation from the normal condition, 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

<M/T>



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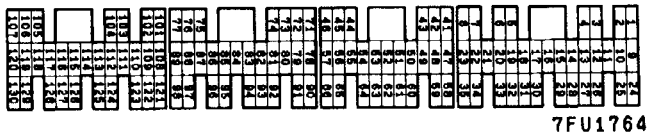
<A/T>



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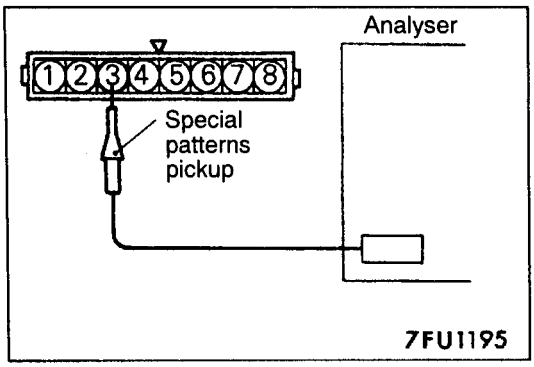
Terminal No.		Inspection item	Normal condition (Check condition)
<M/T>	<A/T>		
1–12	1–41	No. 1 injector	13–16 kΩ (At 20°C)
14–12	9–41	No. 2 injector	
2–12	24–41	No. 3 injector	
15–12	2–41	No. 4 injector	
3–12	10–41	No. 5 injector	
16–12	25–41	No. 6 injector	
4–12	14–41	Stepper motor coil<A1>	28–33 Ω (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		EGR control solenoid valve	34–44 Ω (At 20°C)
9–12		Purge control solenoid valve	34–44 Ω (At 20°C)
13–Body earth	42–Body earth	Engine-ECU earth	Continuity (0Ω)
26–Body earth	48–Body earth	Engine-ECU earth	

Terminal No.		Inspection item	Normal condition (Check condition)
<M/T>	<A/T>		
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)
			0.80–0.42 kΩ (When intake air temperature is 80°C)
83–92	44–57	Engine coolant temperature sensor	5.1–6.5 kΩ (When engine coolant temperature is 0°C)
			2.1–2.7 kΩ (When engine coolant temperature is 20°C)
			0.9–1.3 kΩ (When engine coolant temperature is 40°C)
			0.26–0.36 kΩ (When engine coolant temperature is 80°C)
87–92	79–57	Idle position switch	Continuity (When throttle valve is idle position)
			No Continuity (When throttle valve is slightly open)
	59–Body earth	Inhibitor switch <A/T>	No Continuity (When select lever is at P or N)
			Continuity (When select lever is at D, 2, 1 or R)



INSPECTION PROCEDURE USING AN ANALYSER

AIR FLOW SENSOR

Measurement Method

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

Alternate method (Test harness not available)

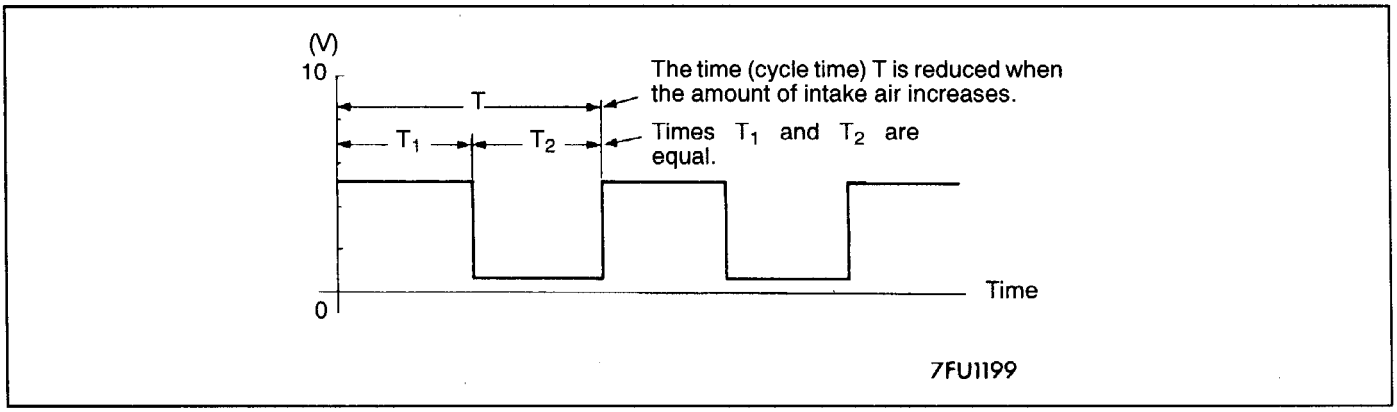
1. Connect the analyser special patterns pickup to Engine-ECU terminal 90.

Standard Wave Pattern

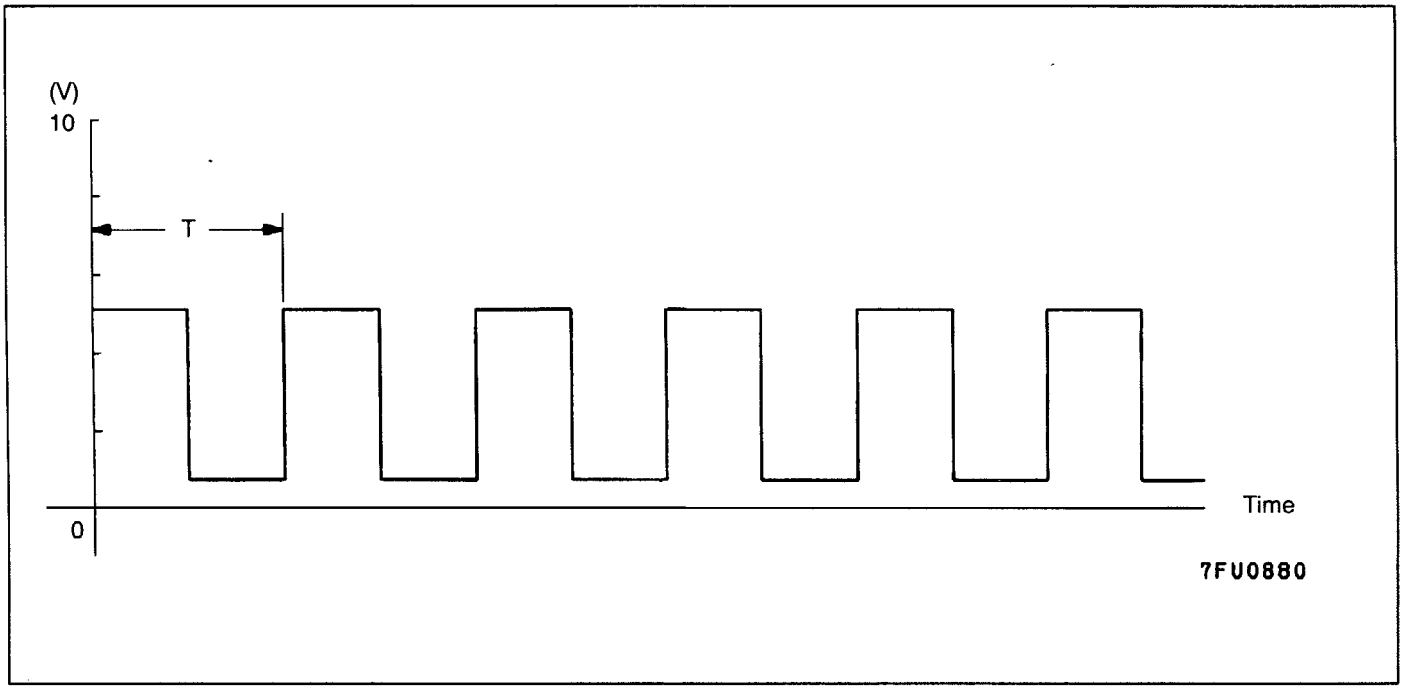
Observation conditions

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

Standard wave pattern

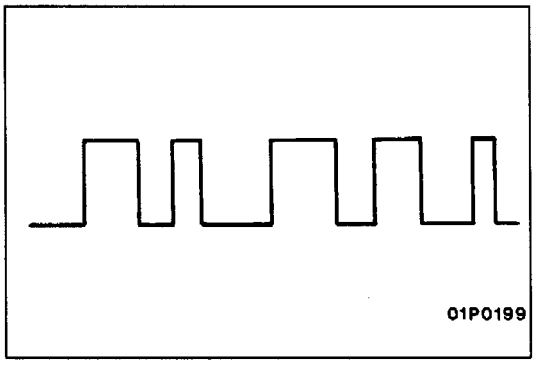


Observation Conditions (pattern changes with engine speed changes.)



Wave Pattern Observation Points

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



Examples of Abnormal Wave Patterns

- Example 1

  CAUSE OF PROBLEM

  Sensor interface malfunction

  WAVE PATTERN CHARACTERISTICS

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

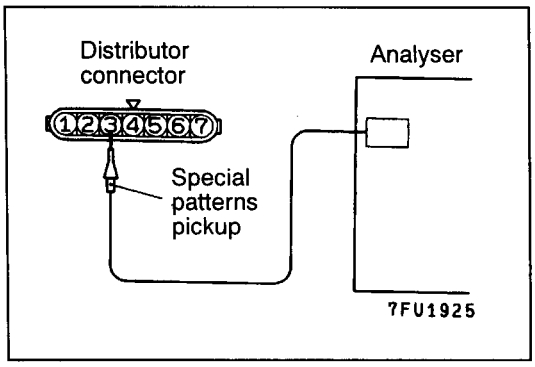
- Example 2

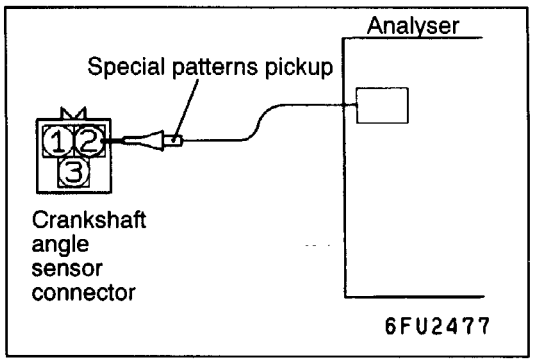
  CAUSE OF PROBLEM

  Damaged rectifier or vortex generation column

  WAVE PATTERN CHARACTERISTICS

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





CAMSHAFT POSITION SENSOR AND CRANKSHAFT ANGLE SENSOR

Measurement Method

1. Disconnect the distributor (camshaft position sensor) connector and connect the special tool (test harness: MB991348) in between. (All terminals should be connected.)
2. Connect the analyser special patterns pickup to distributor connector terminal 5.
3. Disconnect the crankshaft angle sensor connector and connect the special tool (test harness: MD998478) in between.
4. Connect the analyser special patterns pickup to crankshaft angle sensor connector terminal 2.

Alternate method (Test harness not available)

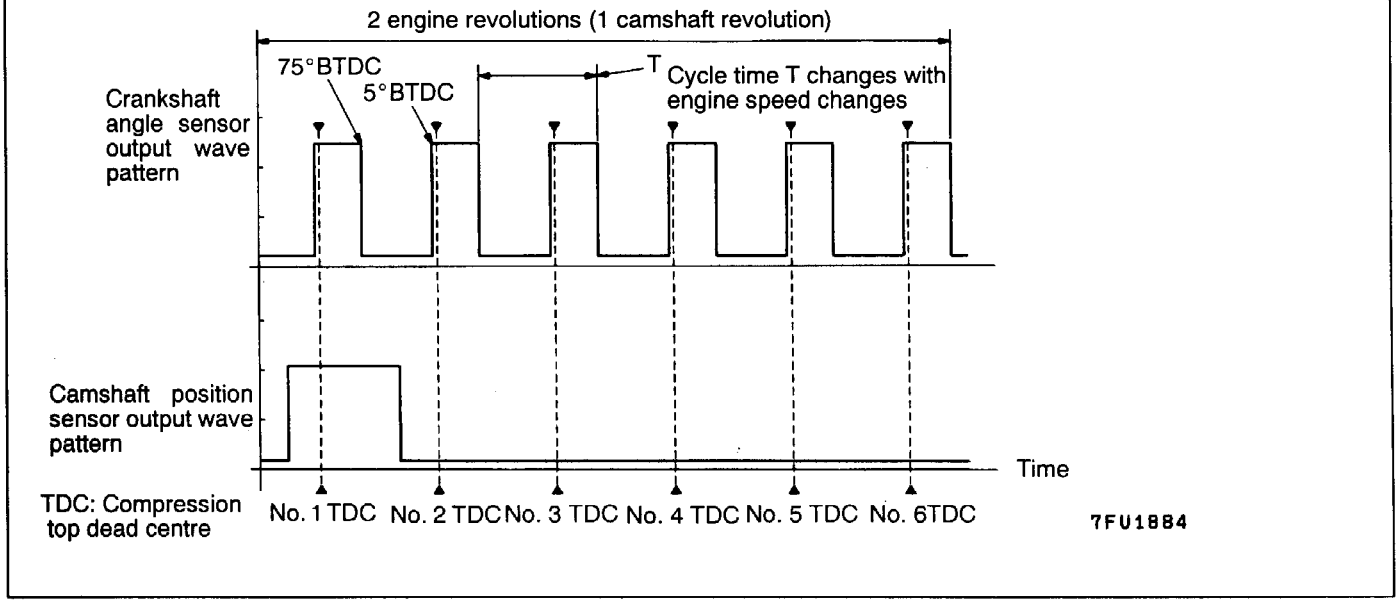
1. Connect the analyser special patterns pickup to Engine-ECU terminal 88. (When checking the camshaft position sensor signal wave pattern)
2. Connect the analyser special patterns pickup to Engine-ECU terminal 89. (When checking the crankshaft angle sensor signal wave pattern)

Standard Wave Pattern

Observation conditions

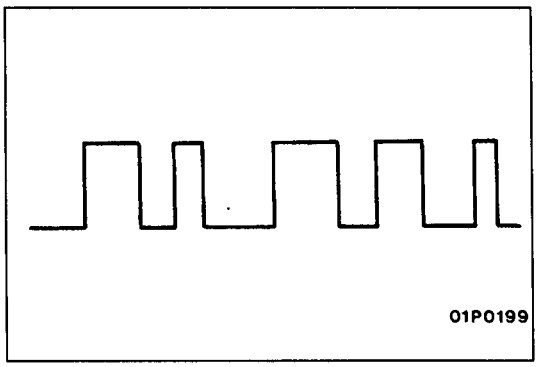
Function	Special patterns
Pattern height	Low
Pattern selector	Display
Engine r/min	Idle

Standard wave pattern



Wave Pattern Observation Points

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



Examples of Abnormal Wave Patterns

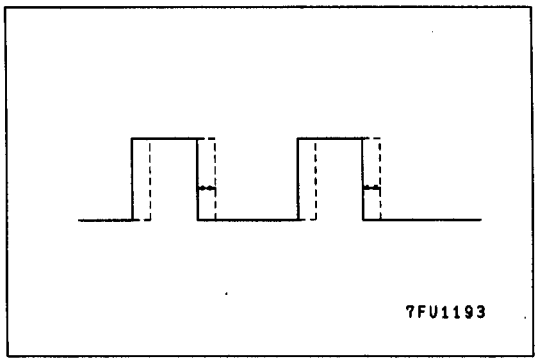
- Example 1

  CAUSE OF PROBLEM

  Sensor interface malfunction

  WAVE PATTERN CHARACTERISTICS

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



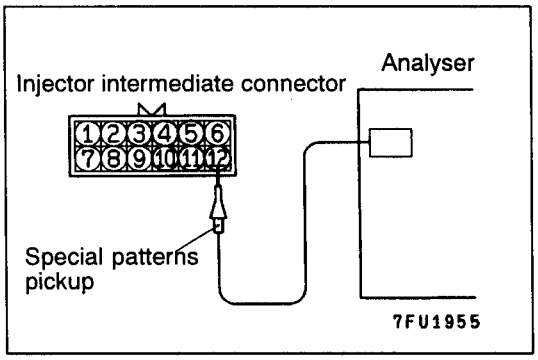
- Example 2

  CAUSE OF PROBLEM

  Loose timing belt
  Abnormality in sensor disk

  WAVE PATTERN CHARACTERISTICS

  Wave pattern jumps to the left or right.



INJECTOR

Measurement Method

1. Disconnect the injector intermediate connector and connect the special tool (test harness: MB991348) in between.
2. Connect the analyser special patterns pickup to injector intermediate connector terminal 12 to analyse the No.1 cylinder,connection terminal 5 for No.2 cylinder, connection terminal 11 for No.3 cylinder, connection terminal 4 for No.4 cylinder, connection terminal 10 for No.5 cylinder, connection terminal 3 for No.6 cylinder respectively.

Alternate method (Test harness not available)

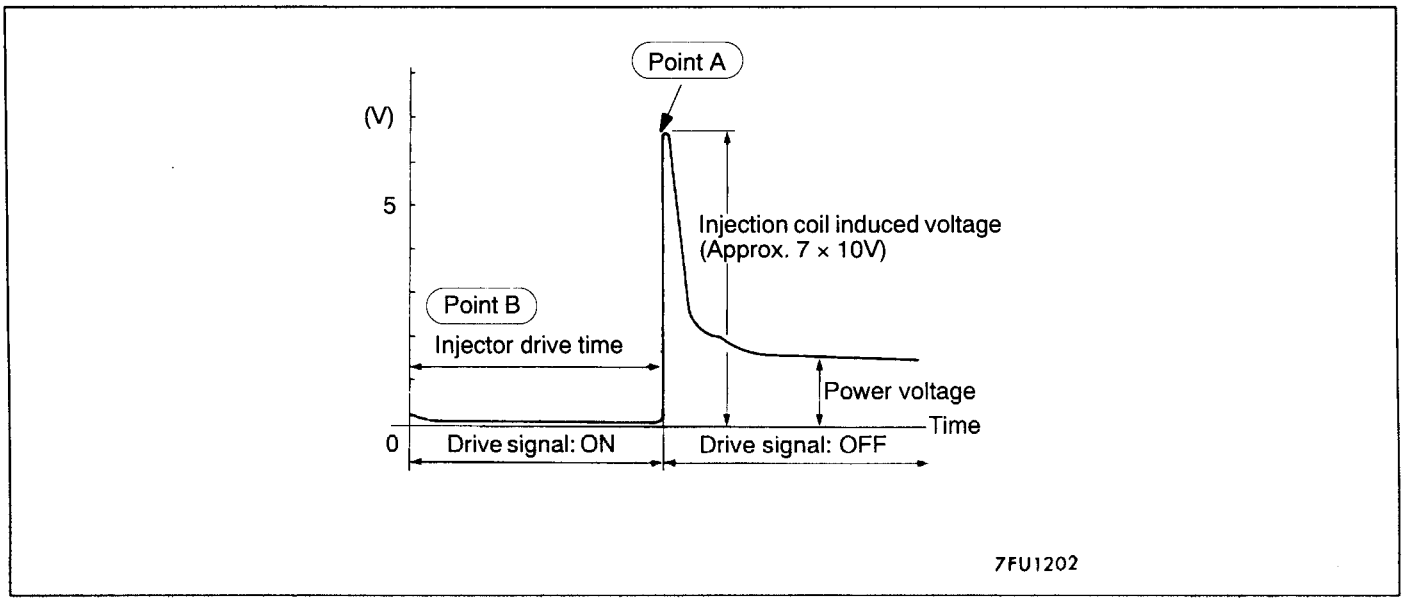
1. Connect the analyser special patterns pickup to Engine-ECU terminal 1 to analyse the No.1 cylinder, connection terminal 2 to analyse the No.3 cylinder, connection terminal 3 to analyse the No.5 cylinder, connection terminal 14 to analyse the No.2 cylinder, connection terminal 15 to analyse the No.4 cylinder, and connection terminal 16 to analyse No.6 respectively.

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

Standard wave pattern

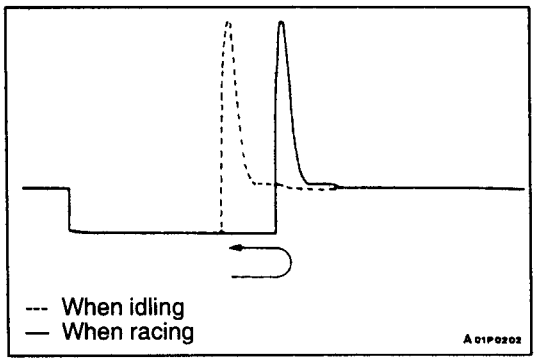


Wave Pattern Observation Points

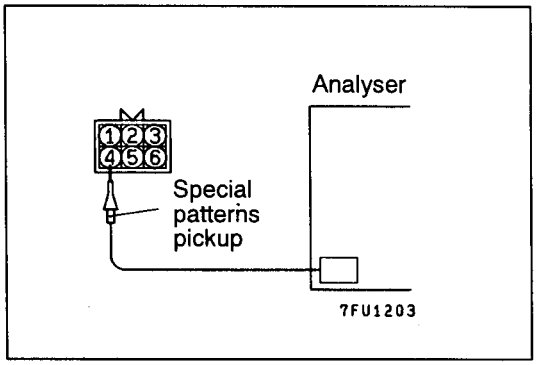
Point A: Height of injector coil induced voltage

Contrast with standard wave pattern	Probable cause
Injector coil induced voltage is low or doesn't appear at all.	Short in the injector solenoid

Point B: Injector drive time



- The injector drive time will be synchronised 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.



ISC STEPPER MOTOR

Measurement Method

1. Disconnect the ISC stepper motor connector, and connect the special tool (test harness: MB998463) in between.
2. Connect the analyser special patterns pickup to the ISC stepper motor connector terminal 1 (red clip of the special tool), terminal 3 (green clip), terminal 4 (black clip) and terminal 6 (yellow clip) respectively.

Alternate method (Test harness not available)

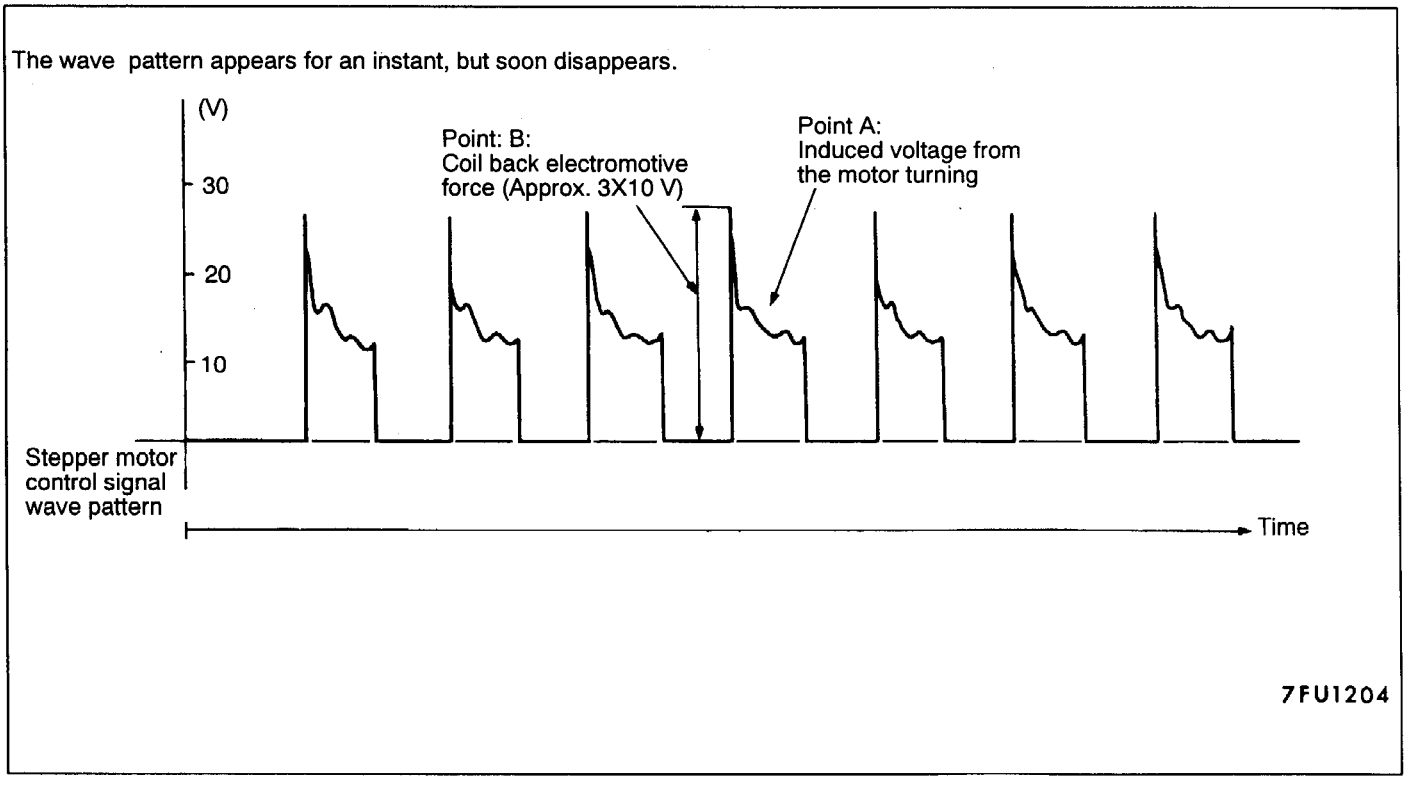
1. Connect the analyser special patterns pickup to Engine-ECU terminals 4, 5, 17, and 18.(signal wave pattern.)

Standard Wave Pattern

Observation conditions

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

Standard wave pattern



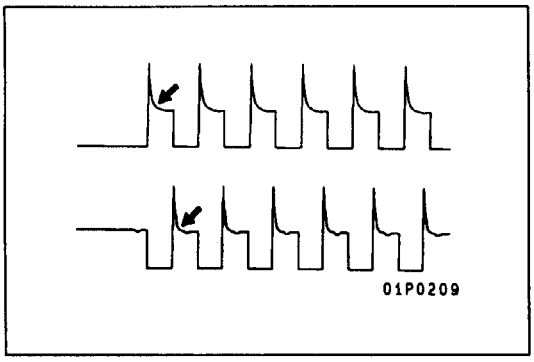
Wave Pattern Observation Points

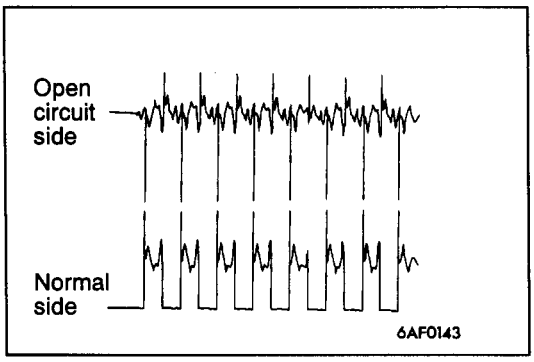
Check that the standard wave pattern appears when the idle air control motor is operating.
Point A: Condition of wave pattern build-up section and maximum voltage (Refer to abnormal wave pattern.)

Contrast with standard wave pattern	Probable cause
Induced electromotive force does not appear or is extremely small.	Malfunction of motor

Point B: Height of coil back electromotive force.

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

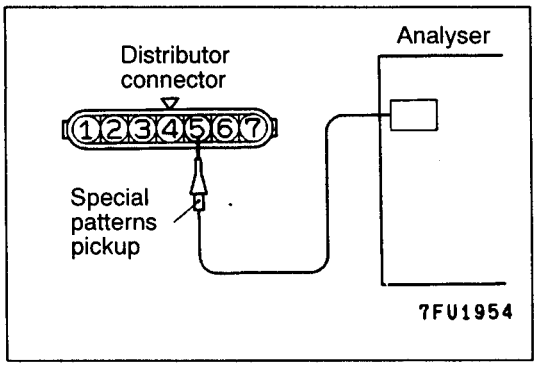




Examples of Abnormal Wave Patterns

- Example 1
  CAUSE OF PROBLEM
  Malfunction of motor (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 stepper motor and 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 wave pattern at the normal side is slightly different from the normal wave pattern.



IGNITION COIL AND IGNITION POWER TRANSISTOR

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

Measurement Method

1. Disconnect the distributor (ignition power transistor) connector, and connect the special tool (test harness: MB991348) in between. (All terminals should be connected.)
2. Connect the analyser special patterns pickup to distributor connector terminal 5.

Alternate method (Test harness not available)

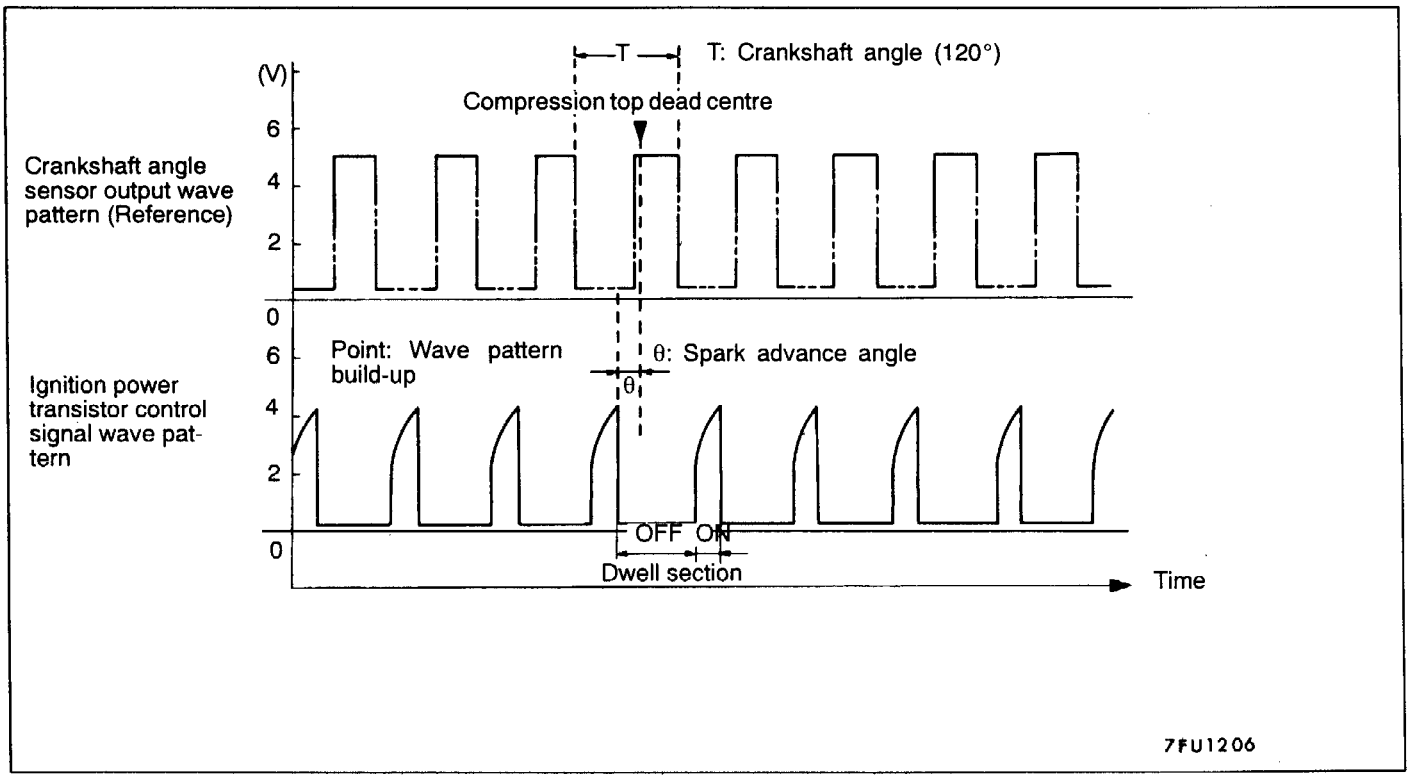
1. Connect the analyser special patterns pickup to Engine-ECU terminal 10.

Standard Wave Pattern

Observation conditions

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

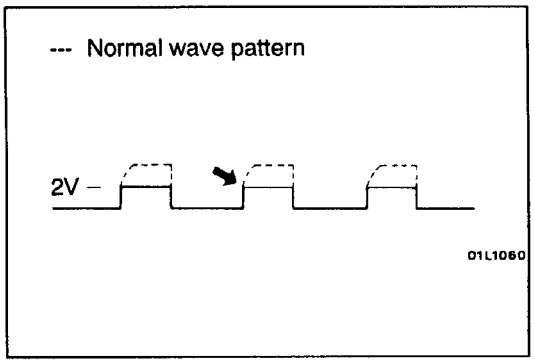
Standard wave pattern

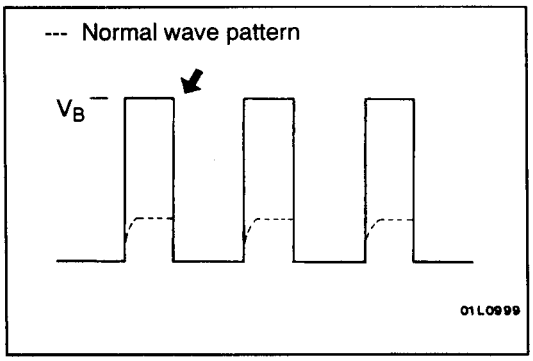


Wave Pattern Observation Points

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	Ignition power transistor malfunction





Examples of Abnormal Wave Patterns

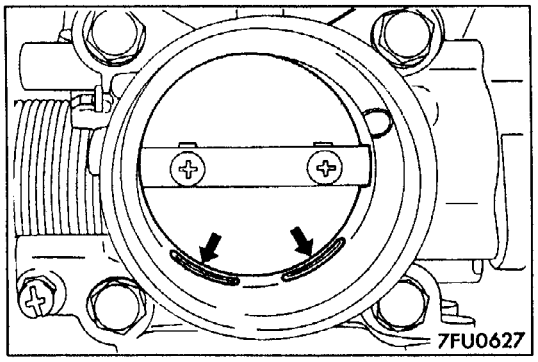
- Example 1
  Wave pattern during engine cranking
  CAUSE OF PROBLEM
  Open-circuit in ignition primary circuit
  WAVE PATTERN CHARACTERISTICS
  Top-right part of the build-up section cannot be seen, and voltage value is approximately 2V too low.

- Example 2
  Wave pattern during engine cranking
  CAUSE OF PROBLEM
  Malfunction in ignition power transistor
  WAVE PATTERN CHARACTERISTICS
  Power voltage results when the ignition power transistor is ON.

ON-VEHICLE SERVICE

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.

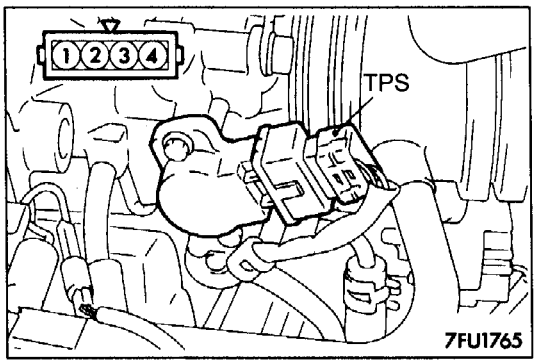


3. Plug the bypass passage inlet (arrow) of the throttle body.

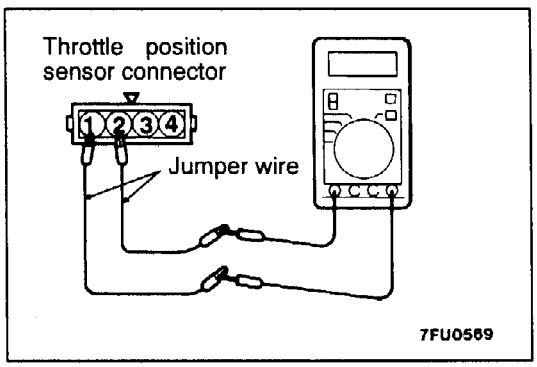
   Caution
   Do not allow cleaning solvent to enter the bypass passage.
4. Spray cleaning solvent into the valve through the throttle body intake port and leave it for about 5 minutes.
5. Start the engine, race it several times and idle it for about 1 minute. If the idling speed becomes unstable (or if 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 diagnostic trouble code.
10. Adjust the basic idle speed. (Refer to P.13A-80.)

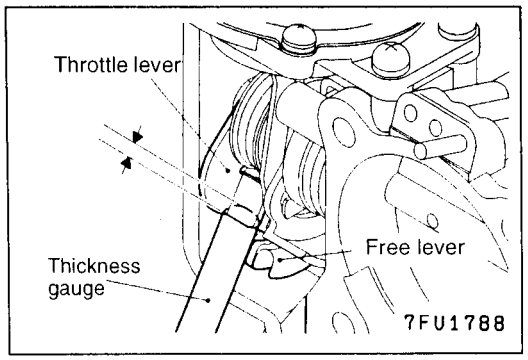
    NOTE
    If the engine hunts while idling after adjustment of the basic idle speed, disconnect the (–) cable from the battery for 10 seconds or more, and then reconnect it and run the engine at idle for about 10 minutes.

IDLE POSITION SWITCH AND THROTTLE POSITION SENSOR ADJUSTMENT



1. Connect the MUT-II to the diagnosis connector. When not using the MUT-II, proceed as follows.
   (1) Disconnect the connector of the throttle position sensor.
   (2) Connect an ohmmeter between terminal 2 (closed throttle position switch) and 1 (sensor ground) by using jumper wires.

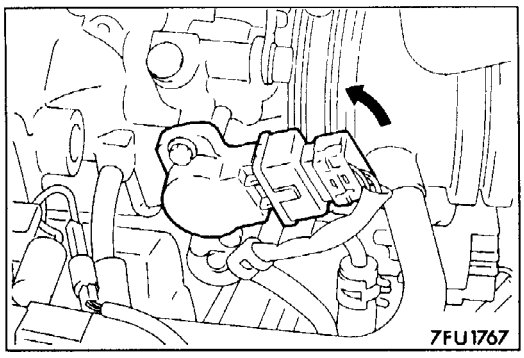




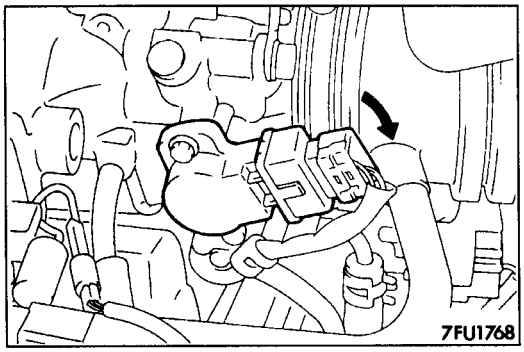
2. Insert a feeler gauge with a thickness of 1.4 mm between the levers shown in the illustration to a depth of no more than 3 mm.

   NOTE
   Inserting the feeler gauge more than 3mm will result in incorrect adjustment.

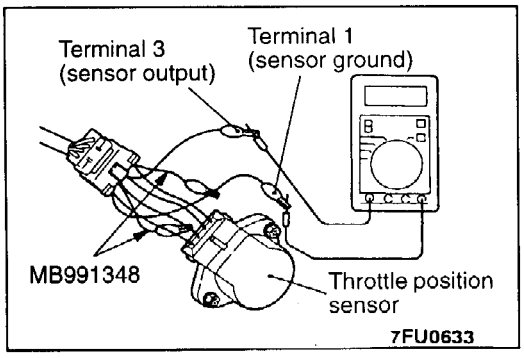
3. When using the MUT-II, turn the ignition switch ON. (Engine does not start.)



4. Loosen the throttle position sensor mounting bolt; then turn the throttle position sensor body fully anti-clockwise.
5. In this condition, make sure that the idle position switch is ON. (There is continuity between terminals 1 and 2.)

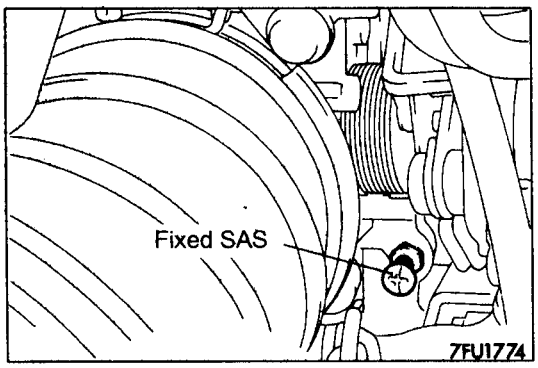


6. Slowly turn the throttle position sensor clockwise until the point at which the idle switch is turned off (continuity between terminals 1 and 2 changes to non-continuity) is found.
   Tighten the throttle position sensor installation bolt at that position.



7. When not using the MUT-II, proceed as follows:
   (1) Connect the special tool (test harness set) between the throttle position sensor connectors which have been disconnected. (Connect all terminals taking care not to mistake the terminal No.)
   (2) Connect a digital voltmeter between the throttle position sensor terminal 1 (sensor ground) and terminal 3 (sensor output.)
   (3) Turn the ignition switch ON (but do not start the engine).
8. Check the throttle position sensor output voltage.

   Standard value: 400–1,000 mV
9. If there is a deviation from the standard value, check the throttle position sensor and the related harness.
10. Remove the feeler gauge.
11. Switch OFF the ignition switch.



FIXED SAS ADJUSTMENT

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

1. Loosen the tension of the accelerator cable sufficiently.
2. Back out the fixed SAS lock nut.
3. Turn the fixed SAS anti-clockwise until it is sufficiently backed out, and fully close the throttle valve.
4. Turn the fixed SAS clockwise until the throttle lever is touched (i.e., the point at which the throttle valve begins to open).
   From that point, turn the fixed SAS clockwise another 1-1/4 turn.
5. While holding the fixed SAS so that it doesn't move, tighten the lock nut securely.
6. Adjust the tension of the accelerator cable.
7. Adjust the basic idle speed.
8. Adjust the idle position switch and the throttle position sensor. (Refer to P.13A-78.)

BASIC IDLE SPEED ADJUSTMENT

NOTE
1. The standard idle speed has been adjusted, by the engine speed adjusting screw, by the manufacturer, and there should usually be no need for readjustment.
2. The adjustment, if made, should be made after first confirming that the spark plugs, the injectors, the ISC servo, the compression pressure, etc., are all normal.

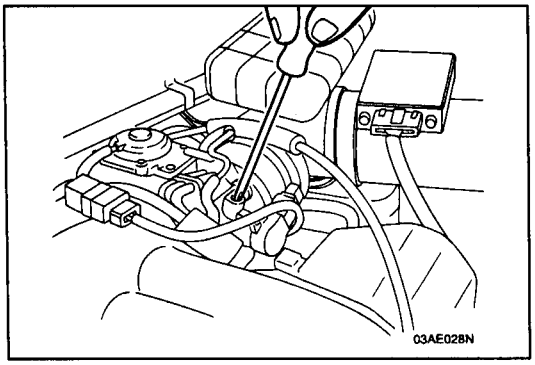
1. The vehicle should be set in the pre-adjustment condition before inspection and adjustment.
2. Connect the MUT-II to the diagnosis connector (16-pin)

   NOTE
   When the MUT-II is connected, the diagnosis control terminal should be grounded.
3. Start the engine and run at idle.
4. Select item No. 30 of the MUT-II ACTUATOR TEST.

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

   Standard value: 700 ± 100 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 rpm is low even though the vehicle has been driven approximately 500 km or more, it is probable that deposits are adhered to the throttle valve, so clean it. (Refer to P.13A-78.)



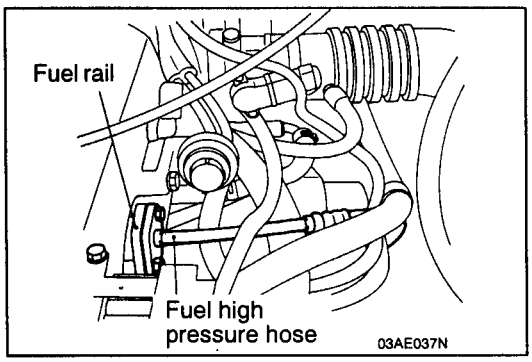
6. If not within the standard value range, turn the engine speed adjusting screw to make the necessary adjustment.

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

7. Press the clear key and release the ISC servo from the ACTUATOR TEST mode.

   NOTE
   Unless the ISC servo is released, the ACTUATOR TEST mode will continue 27 minutes.

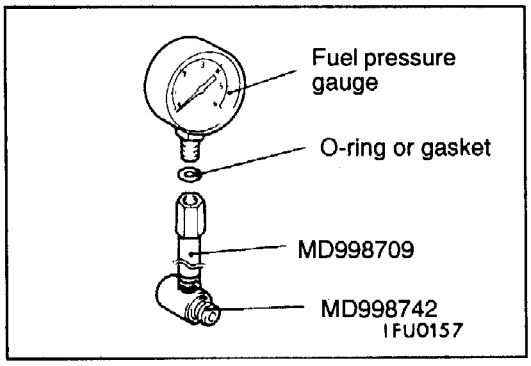
8. Switch OFF the ignition switch.
9. Disconnect the MUT-II.
10. Start the engine again and let it run at idle speed for about 10 minutes; check that the idling condition is normal.



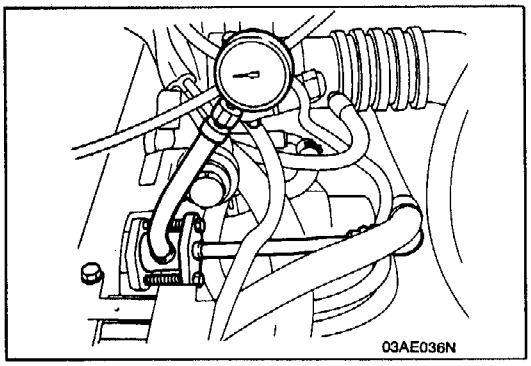
FUEL PRESSURE TEST

1. Release residual pressure from the fuel line to prevent fuel spray. (Refer to P.13A-83.)
2. Disconnect the fuel high pressure hose at the fuel rail 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.

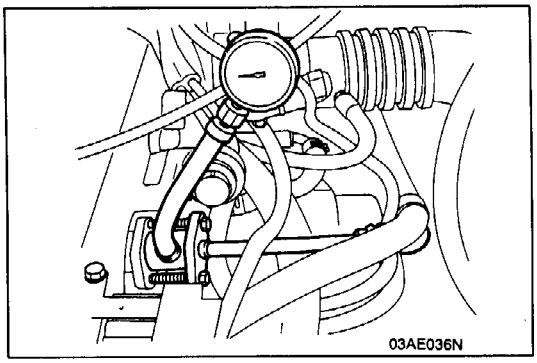


3. Remove the union joint and bolt from the special tool (adaptor hose MD998709) and instead attach the special tool (hose adaptor MD998742) to the adaptor hose.
4. Install a fuel pressure gauge on the adaptor hose that was set up in step 3.
   Use a suitable O-ring or gasket between the fuel pressure gauge and the special tool so as to seal in order to prevent fuel leakage at this time.



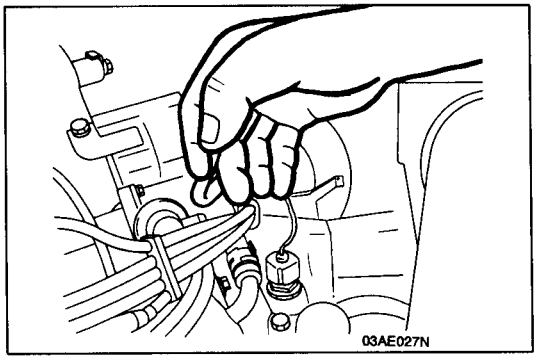
5. Install the special tool, which was assembled in steps 3 and 4 between the fuel rail and the high pressure hose.

6. Use the MUT-II to operate the fuel pump. Check the connections between the fuel pressure gauge and the special tool for leaks.
7. Start the engine and run at idle.



8. Measure fuel pressure while the engine is running at idle.

   Standard value:
   Approx. 270 kPa at curb idle



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

   Standard value:
   330–350 kPa at curb idle

10. Check to see that fuel pressure at idle does not drop even after the engine has been raced several times.
11. 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.

12. If any of fuel pressure measured in steps 8 to 11 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

13. Stop the engine and observe 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

14. Release residual pressure from the fuel pipe line. (Refer to P.13A-83.)
15. Remove the fuel pressure gauge and special tool from the fuel rail.

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

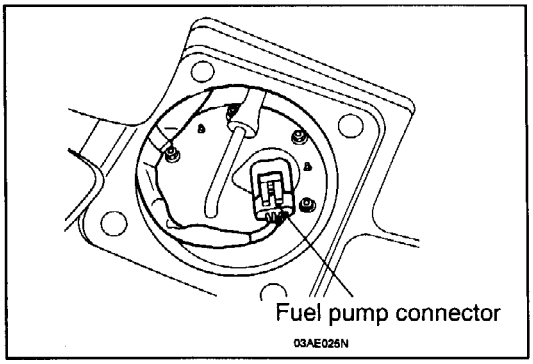
16. Replace the O-ring at the end of the fuel high pressure hose with a new one.
17. Fit the fuel high pressure hose into the fuel rail and tighten the bolts to specified torque.

    Tightening torque: 5 Nm

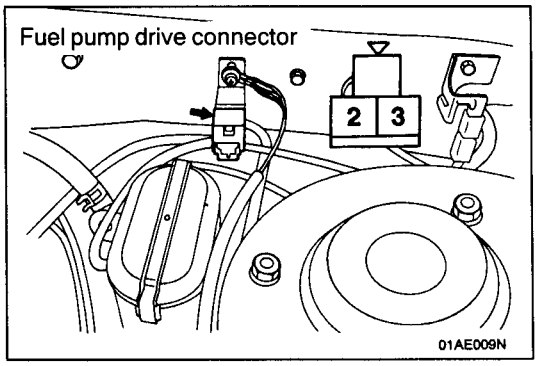
18. Check for fuel leaks.
    (1) Use the MUT-II to operate the fuel pump.
    (2) Check the fuel line for leaks, repair as needed.

FUEL PUMP CONNECTOR DISCONNECTION (HOW TO REDUCE PRESSURISED FUEL LINES)

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



1. Remove the rear seat cushion. (Refer to GROUP 52A – Rear Seat.)
2. Remove the fuel pump/fuel gauge floor cover plate and disconnect the wiring connector at the fuel pump/gauge assembly.
3. Start the engine and let it run until it stops naturally, turn the ignition switch to OFF.
4. Re-connect the fuel pump/gauge wiring harness connector.
5. Install the rear seat cushion.



FUEL PUMP OPERATION CHECK

1. Check the operation of the fuel pump by using the MUT-II to force-drive the fuel pump.
2. If the fuel pump will not operate, check by using the following procedure. If normal, check the fuel pump drive circuit.
   (1) Turn the ignition switch to OFF.
   (2) When the fuel pump drive checking terminal (terminal 2) is attached directly to the battery, check if the sound of the fuel pump operation can be heard.

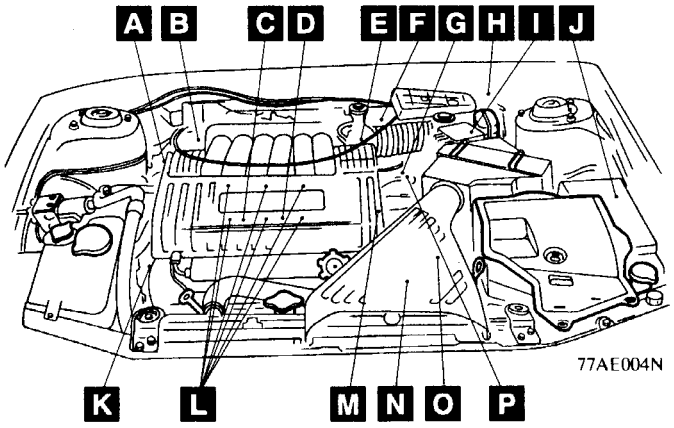
   NOTE
   As the fuel pump is an in-tank type, the fuel pump sound is hard to hear, so remove the fuel tank filler tube cap and check from the tank inlet.

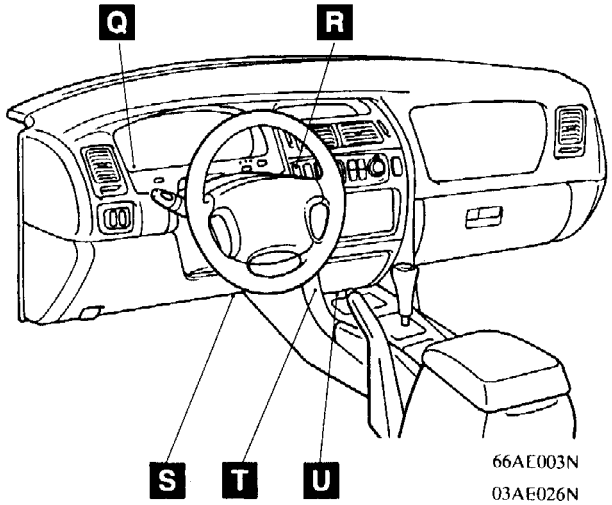
   (3) Check the fuel pressure by pinching the fuel hose with the fingertips.

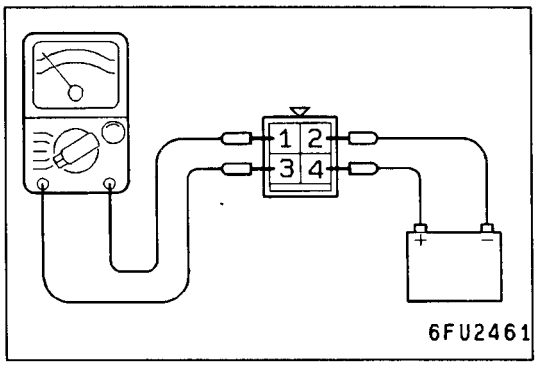
ON-VEHICLE INSPECTION OF MPI COMPONENTS

COMPONENT LOCATION

Name	Symbol	Name	Symbol
Air conditioning compressor clutch relay	J	Oxygen sensor	B
Air conditioner switch	R	Idle speed control servo	F
Camshaft position sensor <in distributor>	G	Ignition coil and ignition power transistor <in distributor>	P
Engine warning lamp (check engine lamp)	Q	Injector	L
Crankshaft angle sensor	K	Multipoint fuel injection (MPI) relay/Fuel pump relay	T
Diagnosis connector	S	Inhibitor switch	0
EGR control solenoid valve	D	Power steering pressure switch	A
Engine-ECU	U	Throttle position sensor (with built-in idle position switch)	E
Engine coolant temperature sensor	M	Vehicle speed sensor	N
Purge control solenoid valve	C	Air flow sensor (with built-in intake air temperature sensor and barometric pressure sensor)	I
Fuel pump check terminal	H		

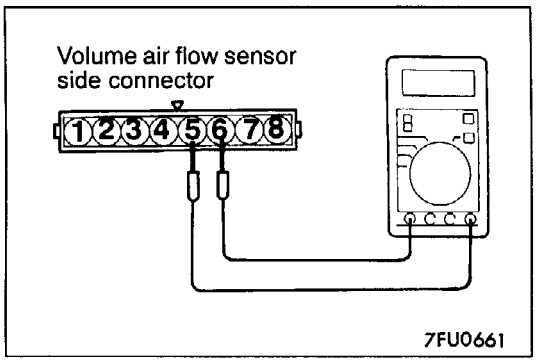






MPI CONTROL RELAY AND FUEL PUMP RELAY CONTINUITY CHECK

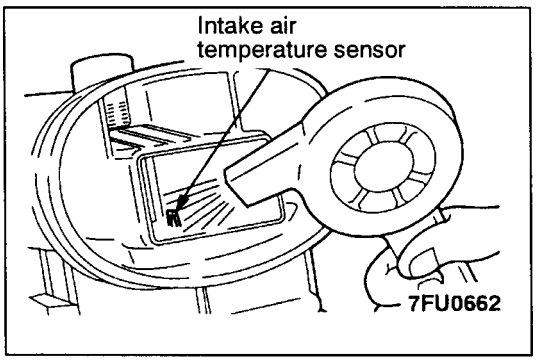
Battery voltage	Terminal No.			
	1	2	3	4
Not supplied		○		○
Supplied	○	⊖	○	⊕



INTAKE AIR TEMPERATURE SENSOR CHECK

1. Disconnect the air flow sensor connectors.
2. Measure resistance between terminals 5 and 6.

Temperature [°C]	Resistance (kΩ)
0	5.3–6.7
20	2.3–3.0
80	0.30–0.42



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

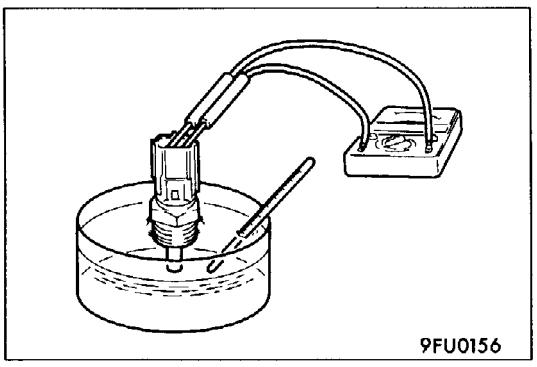
Temperature	Resistance
Higher	Smaller

4. If resistance does not decrease as heat increases, replace the volume air flow sensor assembly.

ENGINE COOLANT TEMPERATURE SENSOR CHECK

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

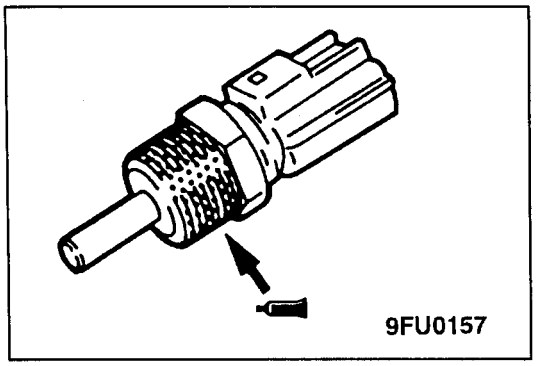
1. Remove engine coolant temperature sensor from the intake manifold.



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

Temperature [°C]	Resistance (kΩ)
0	5.1–6.5
20	2.1–2.7
40	0.9–1.3
80	0.26–0.36

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



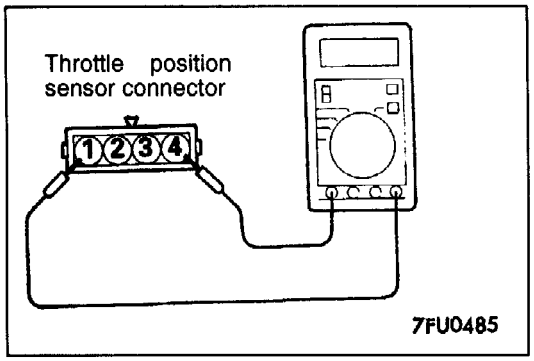
4. Apply sealant threaded portion.

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

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

   Sensor tightening torque: 30 Nm

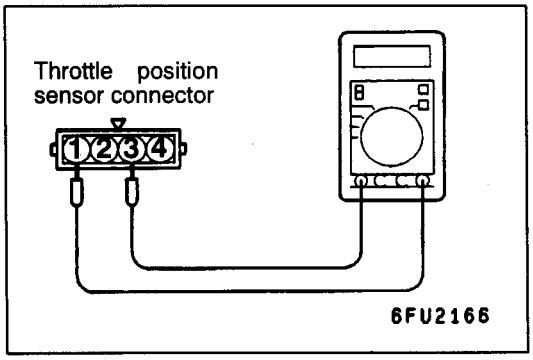
6. Fasten harness connectors securely.



THROTTLE POSITION SENSOR CHECK

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

   Standard value: 3.5–6.5 kΩ

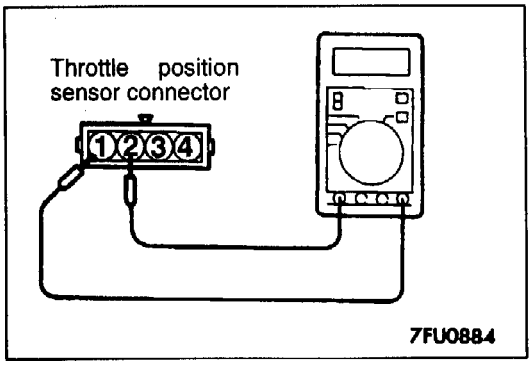


3. Measure the resistance between the throttle position sensor side connector terminal 1 and terminal 3.

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
   After replacement, the throttle position sensor adjustment procedure, should be adjusted.



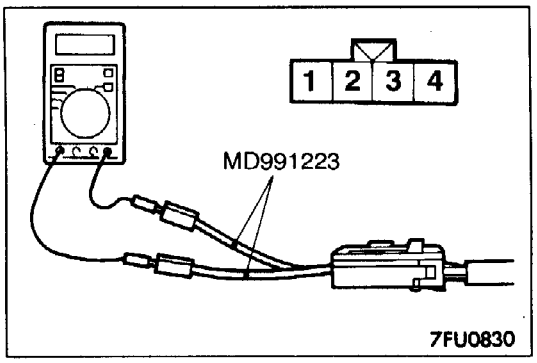
IDLE POSITION SWITCH CHECK

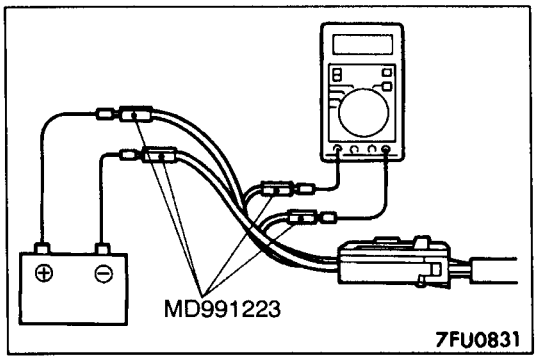
1. Disconnect the throttle position sensor connector.
2. Check the continuity between the throttle position sensor connector side terminal 1 and terminal 2.

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

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

NOTE
After replacement, the closed throttle position switch and throttle position sensor should be adjusted. (Refer to P.13A-78.)





OXYGEN SENSOR CHECK

<Vehicles with catalytic converter>

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 [7–40 Ω at 20°C] between terminal 3 and terminal 4 on the heated oxygen sensor connector.
3. If there is no continuity, replace the heated oxygen sensor.
4. Warm up the engine until engine coolant is 80°C or higher.
5. Use the jumper wires to connect terminal 3 of the heated oxygen sensor connector to the battery (+) terminal and terminal 4 to the battery (–) terminal.

Caution
Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor.

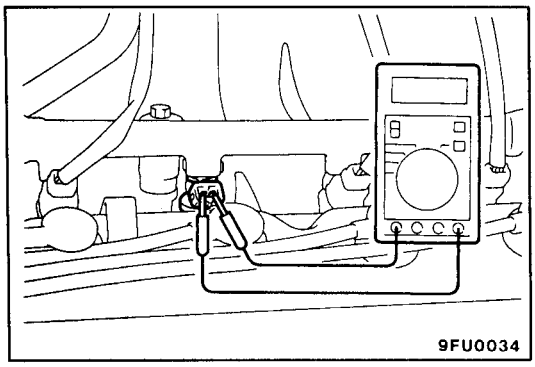
6. Connect a digital voltage meter between terminal 1 and terminal 2.
7. While repeatedly racing the engine, measure the heated oxygen sensor output voltage.

Standard value:

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

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

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

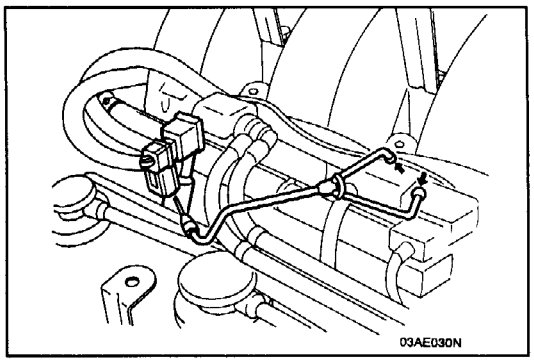


INJECTOR CHECK

Measurement of Resistance between Terminals

1. Remove the injector connector.
2. Measure the resistance between terminals.

   Standard value: 13–16 Ω [at 20°C]
3. Install the injector connector



Checking operation sound

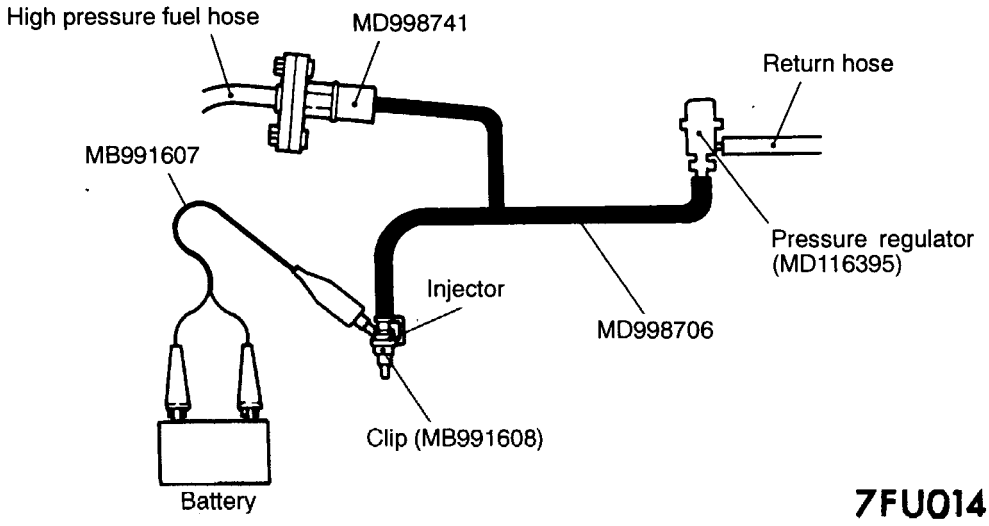
Using a stethoscope or long blade screwdriver, check the operation sound ("chi-chi-chi") of injectors during idling or during cranking
Check that as the engine speed increases, the frequency of the operating sound also increases.

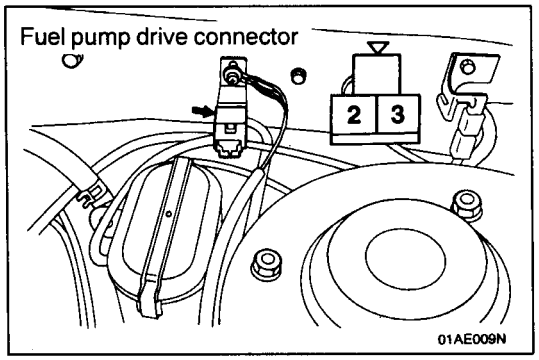
Caution
Note that even if the injector you are checking is not operating, you will hear the operating sound of the other injectors.

NOTE
If no operating sound is heard from the injector that is being checked, check the injector drive circuit. If there is nothing wrong with the circuit, a defective injector or Engine-ECU is suspected

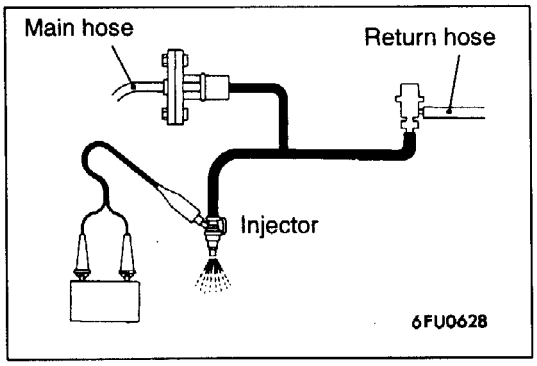
Checking the Injector Condition

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

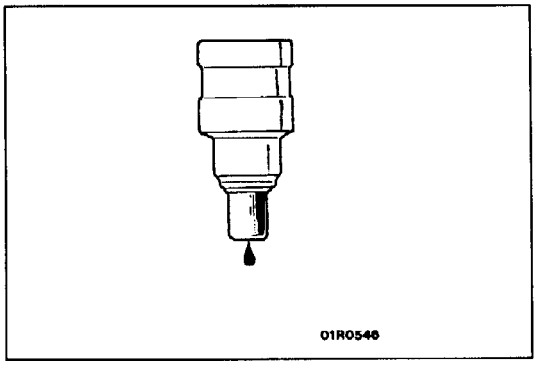




4. Apply battery voltage to the fuel pump drive terminal (black) and activate the fuel pump.



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



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

   Standard value: 1 drop or less per minute

7. 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.

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

Use a stethoscope or long blade screwdriver to check if the sound of the idle air control motor operating can be heard immediately after the ignition switch is turned to "ON".

NOTE
If the motor operation cannot be heard, check the motor drive circuit and the idle air control motor.

PURGE CONTROL SOLENOID VALVE CHECK

<Evaporative emission purge solenoid>

Refer to GROUP 17 – Emission Control System.

EGR CONTROL SOLENOID VALVE CHECK

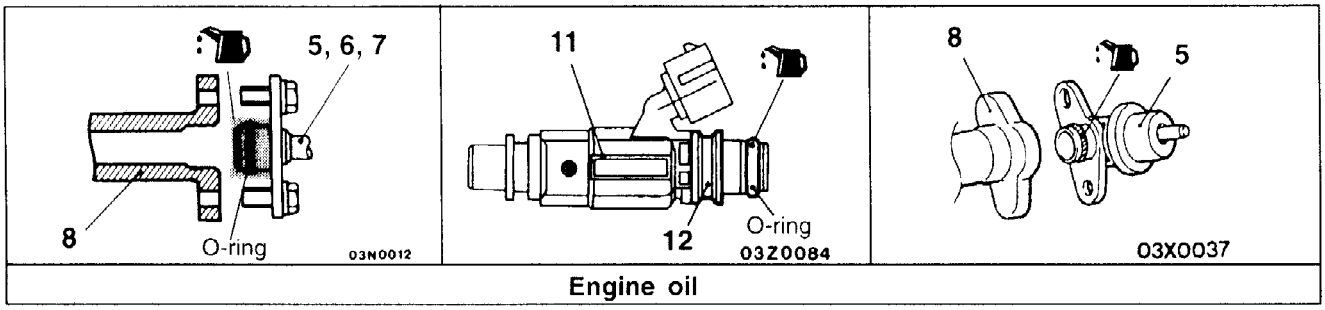
Refer to GROUP 17 – Emission Control System.

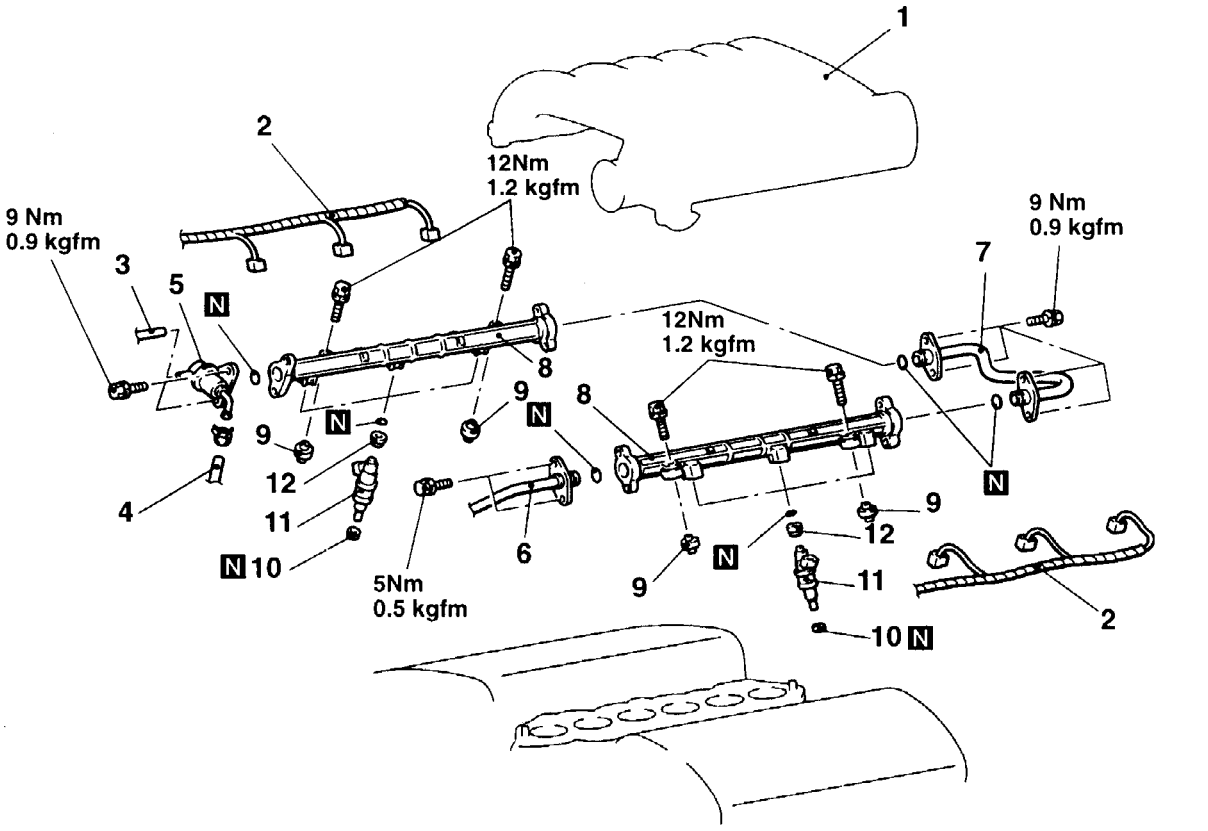
INJECTOR

REMOVAL AND INSTALLATION

Pre-removal Operation
- Fuel Discharge Prevention (Refer to P.13A-83.)

Post-installation Operation
- Accelerator Cable Adjustment (Refer to GROUP 17 – On-vehicle Service.)
- Fuel Leakage Inspection





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Removal steps

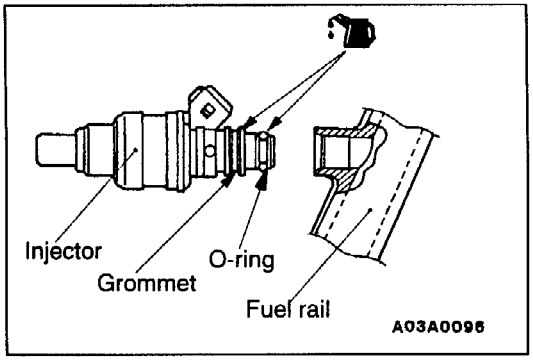
1. Intake manifold plenum (Refer GROUP 15)
2. Injector connectors
3. Vacuum hose connection
4. Fuel return hose connection
▶B◀ 5. Fuel pressure regulator
▶C◀ 6. High-pressure fuel hose connection
◀A▶ 7. Fuel pipe
◀A▶ 8. Fuel rail
9. Insulators
10. Insulators
◀A▶ ▶A◀ 11. Injectors
12. Grommet

REMOVAL SERVICE POINT

◀A▶ FUEL RAIL/INJECTOR REMOVAL

Remove the fuel rail (with the injectors attached to it.)

Caution
Care must be taken, when removing the fuel rail, not to drop the injector.

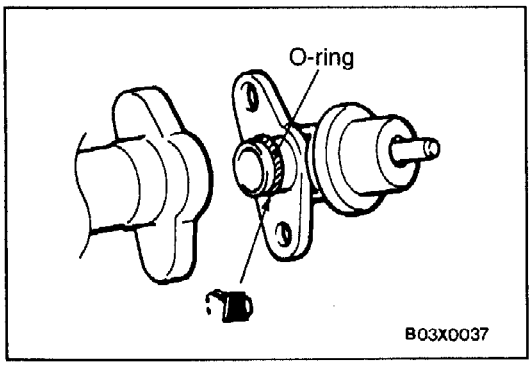


INSTALLATION SERVICE POINTS

▶A◀ INJECTOR INSTALLATION

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

   Caution
   Be sure not to let engine oil in the fuel rail.
2. While turning the injector to the left and right, install it to the fuel rail.
3. Check to be sure that the injector turns smoothly.
   If it does not turn smoothly, the O-ring may be trapped, remove the injector and then re-insert it into the fuel rail and check once again.

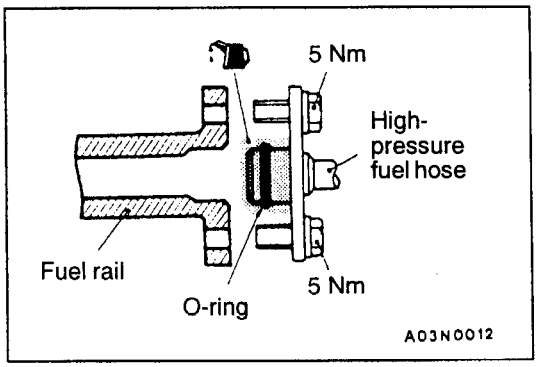


▶B◀ FUEL PRESSURE REGULATOR INSTALLATION

1. When connecting the fuel-pressure regulator to the fuel rail, apply a drop of new engine oil to the O-ring, and then insert, being careful not to damage the O-ring.

   Caution
   Be sure not to let engine oil in the fuel rail.
2. Check to be sure that the fuel pressure regulator turns smoothly.
   If it does not turn smoothly, the O-ring may be trapped, remove the fuel pressure regulator and then re-insert it into the fuel rail and check once again.
3. Tighten the bolts to the specified torque.

   Specified tightening torque : 9 Nm



▶C◀ HIGH-PRESSURE FUEL HOSE INSTALLATION

1. When connecting the high-pressure fuel hose to the fuel rail, apply a drop of new engine oil to the O-ring, and then insert, being careful not to damage the O-ring.

   Caution
   Be sure not to let engine oil in the fuel rail.
2. Check to be sure that the high-pressure fuel hose turns smoothly.
   If it does not turn smoothly, the O-ring may be trapped. Remove the high-pressure fuel hose and then re-insert it into the fuel rail and check once again.
3. Tighten the bolts to the specified torque.

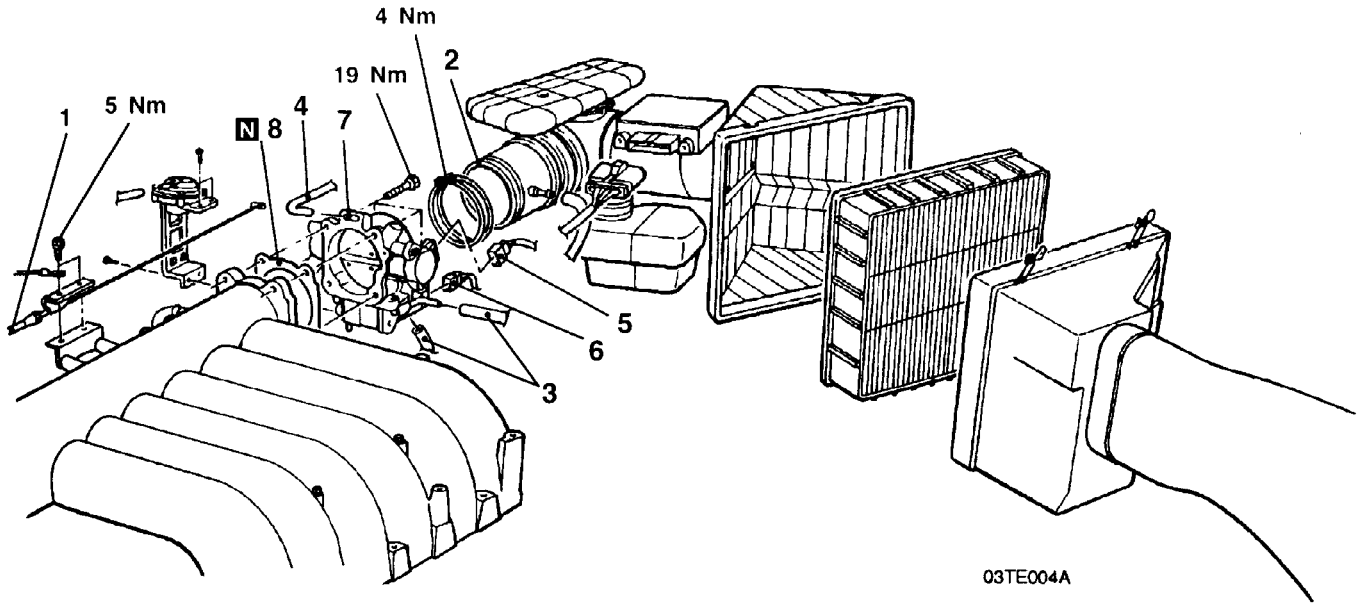
   Specified tightening torque : 5Nm

THROTTLE BODY

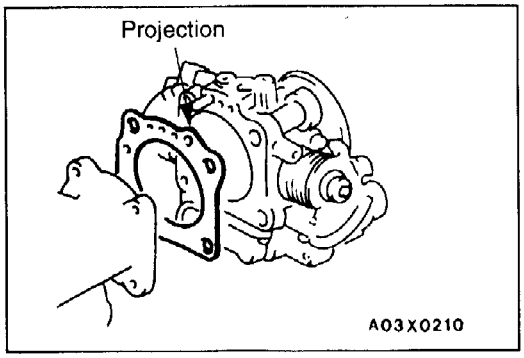
REMOVAL AND INSTALLATION

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

Post-installation Operation
- 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. Air intake hose
3. Heater hose connection
4. Vacuum hose connection
5. Throttle position sensor connector
6. Idle speed control servo connector
7. Throttle body
▶A◀ 8. Gasket



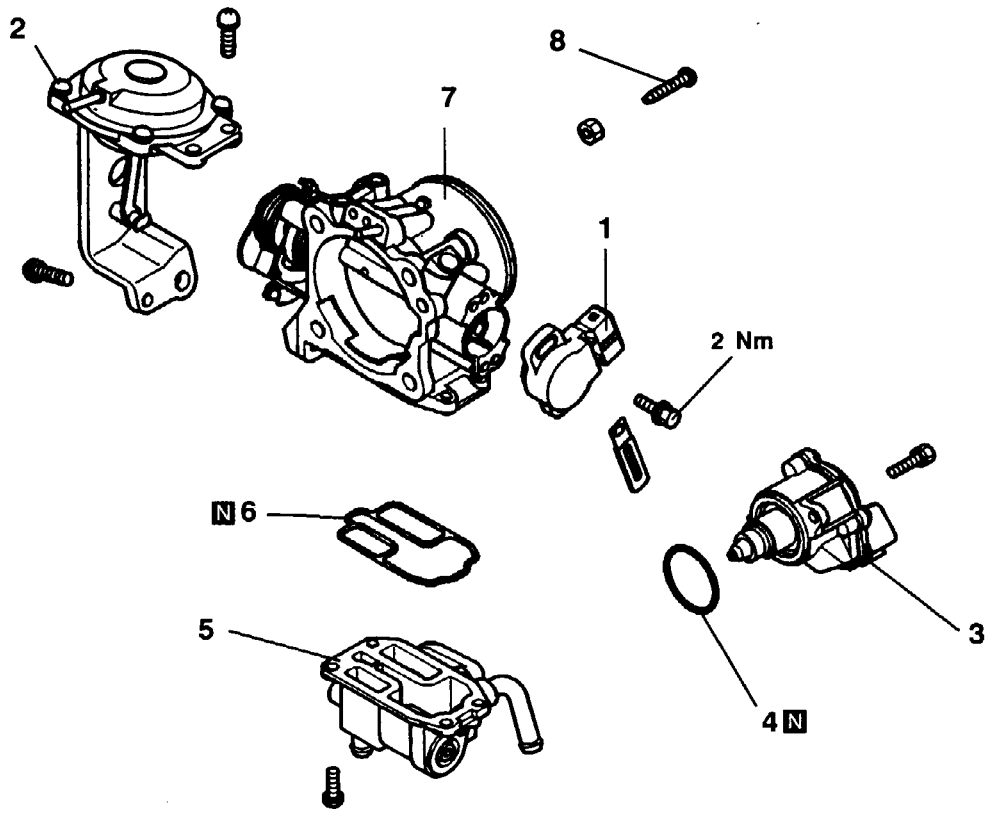
INSTALLATION SERVICE POINT

▶A◀ GASKET INSTALLATION

Install the gasket so that the projection is where shown in the illustration.

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

DISASSEMBLY AND REASSEMBLY



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Disassembly steps

◀A▶ ▶A◀ 1. Throttle position sensor (with idle position switch)
2. Vacuum actuator
◀A▶ 3. Idle speed control servo
4. O-ring
5. Idle speed control body assembly
6. Gasket
◀B▶ 7. Throttle body
8. Fixed SAS

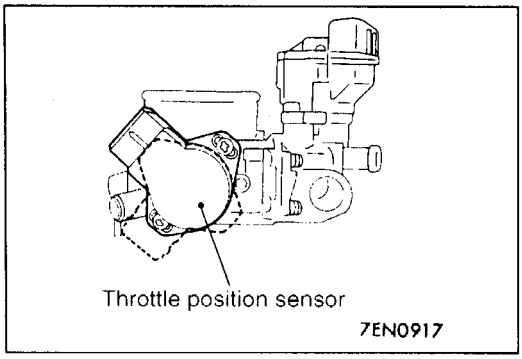
DISASSEMBLY SERVICE POINT

◀A▶ THROTTLE POSITION SENSOR AND IDLE SPEED CONTROL SERVO REMOVAL

1. Do not immerse in solvent to clean the sensor and servo. Clean them with shop towel.

◀B▶ THROTTLE BODY REMOVAL

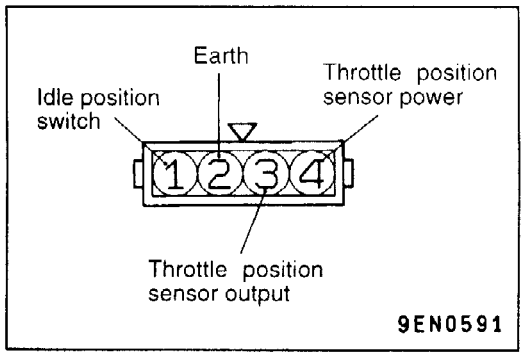
1. Do not remove the throttle valve.
2. Check if the vacuum port or passage is clogged. Use compressed air to clean the vacuum passage.



REASSEMBLY SERVICE POINT

▶A◀ THROTTLE POSITION SENSOR INSTALLATION

1. Set the throttle position sensor to the throttle body as shown in the diagram.
2. Turn throttle position sensor 90° in the clockwise direction to set it, and tighten screws.



3. Check for continuity across terminals 1 (idle position switch) and 2 (earth) with the throttle valve both fully closed and fully open.

Throttle valve position	Continuity
Fully closed	Conductive
Fully open	Non-conductive

If there is not continuity with the throttle valve fully closed, turn the throttle position sensor anti-clockwise, and then check again.

FUEL SUPPLY

CONTENTS

FUEL TANK

GENERAL INFORMATION

1. The fuel tank is located under the floor of the rear seats to provide increased safety and a wider luggage space.
2. A fuel cut-off valve has been adopted to prevent fuel from leaking out in the event of a collision.

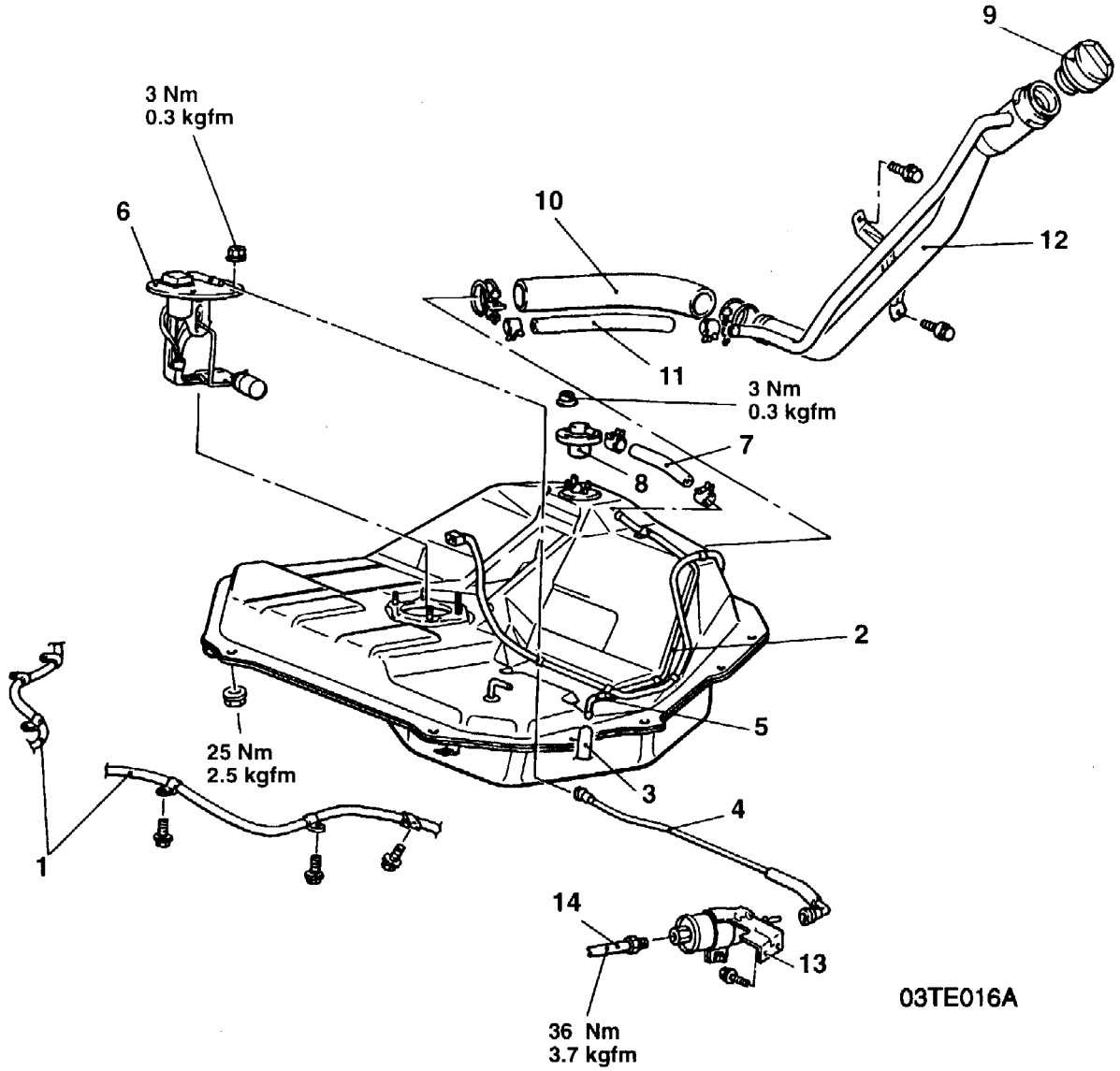
Items	Specifications
Fuel tank capacity (litres)	71
Fuel pump type	Electrical, in-tank type

FUEL TANK

REMOVAL AND INSTALLATION

Pre-removal Operation
Reduce the Inner Pressure of Fuel Line and Hose.
(Refer to GROUP 13A – On-vehicle Service.)

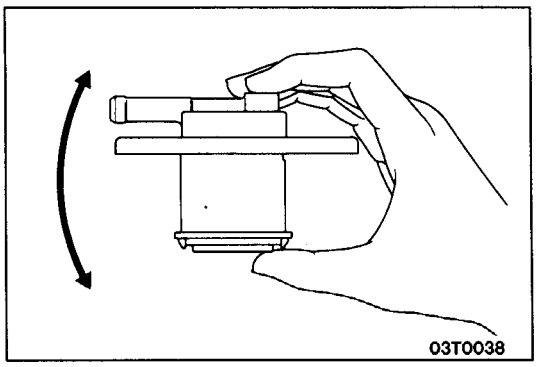
Post-installation Operation
Checking for Fuel Leaks



Removal steps

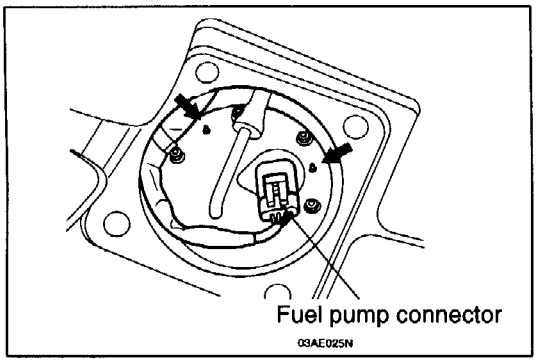
1. Parking brake cable connection
2. Fuel tank
3. Vapour hose
4. Pressure hose
5. Vapour hose connection
6. Fuel pump and gauge assembly
7. Vapour hose
8. Valve assembly
9. Fuel filler cap
10. Filler hose
11. Vapour hose
12. Fuel filler neck
13. Fuel filter assembly
14. Fuel pipe

NOTE
When replacing the fuel gauge unit assembly only, it is possible to work from the service holes underneath the rear seat cushion without having to remove the fuel tank. (Refer to P.13F-4.)



FUEL CUT OFF VALVE CHECK

If the sound of the float valve moving (knocking sound) can be heard when the valve assembly is gently shaken up and down, then the valve is okay.



FUEL GAUGE UNIT AND PUMP ASSEMBLY REPLACEMENT

1. Remove the rear seat cushion.
   (Refer to GROUP 52A – Rear Seat.)
2. Remove the cover plate.
3. Disconnect the connector from the fuel gauge unit and pump assembly, and then remove the fuel gauge unit.
4. When installing the fuel gauge unit and pump assembly, tilt the float at the end to the left and insert into the fuel tank.

   NOTE
   As there is a reservoir inside the fuel tank, if the fuel gauge unit and pump assembly is tilted to the right and inserted, the fuel gauge unit and pump assembly will touch the reservoir.
5. Align the packing positioning projections (locations indicated by arrows) with the holes in the fuel gauge unit and pump assembly.

FUEL GAUGE UNIT CHECK

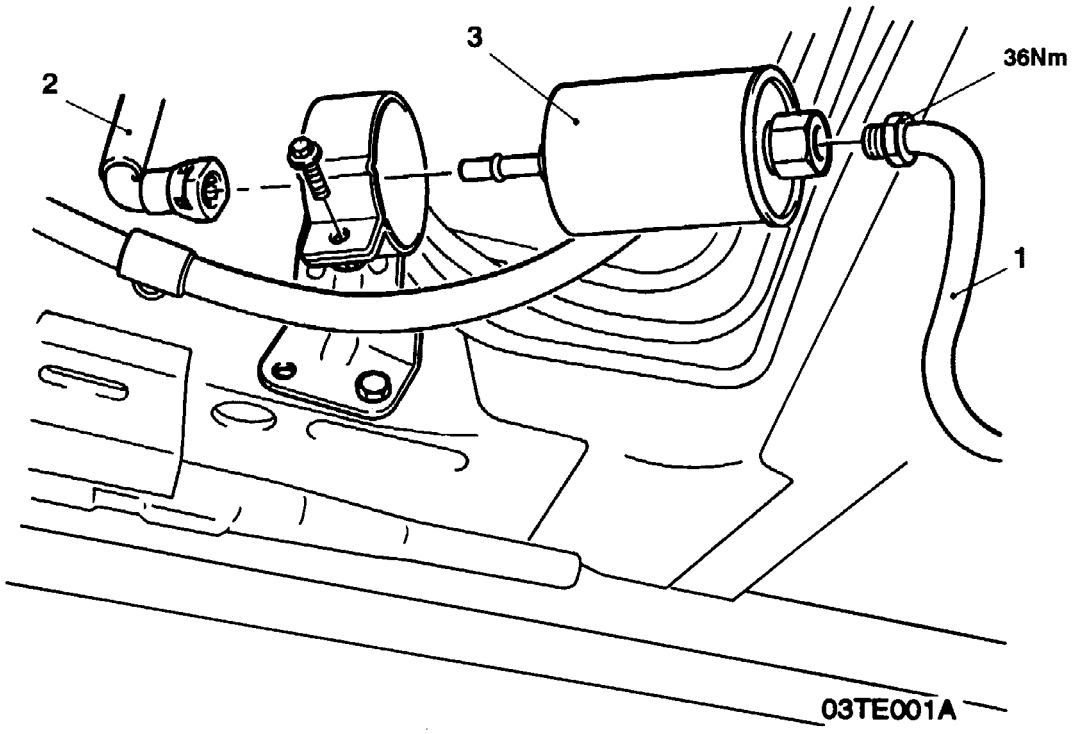
Refer to GROUP 54 – Combination Meter.

FUEL FILTER

REMOVAL AND INSTALLATION

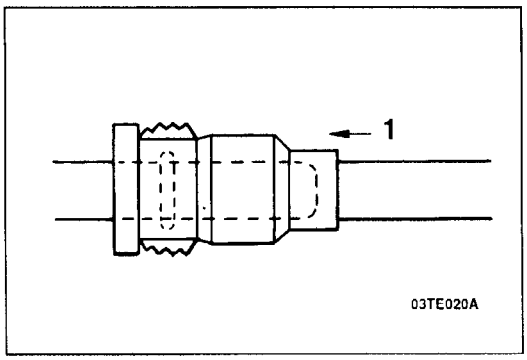
Pre-removal Operation
Reduce the Inner Pressure of Fuel Line and Hose.
(Refer to GROUP 13A – On-vehicle Service.)

Post-installation Operation
Checking for Fuel Leaks



Removal steps

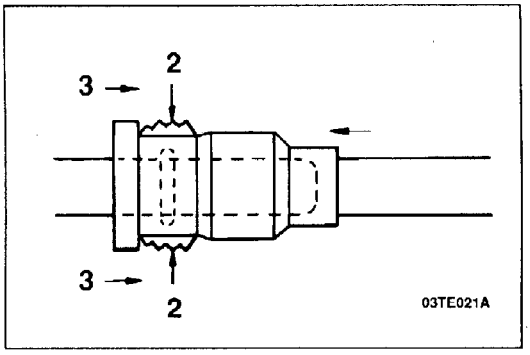
◀A▶ ▶A◀ 1. Fuel pipe
2. Pressure hose
3. Fuel filter



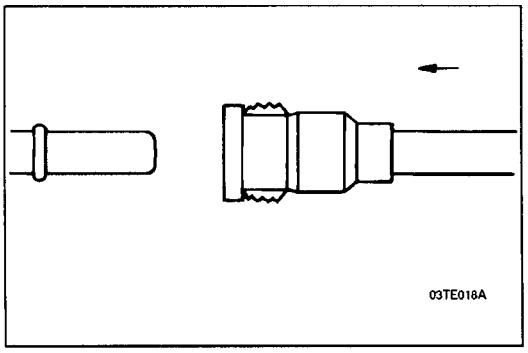
REMOVAL SERVICE POINTS

◀A▶ PRESSURE HOSE REMOVAL

1. Push the connector body gently in the direction shown in the illustration.



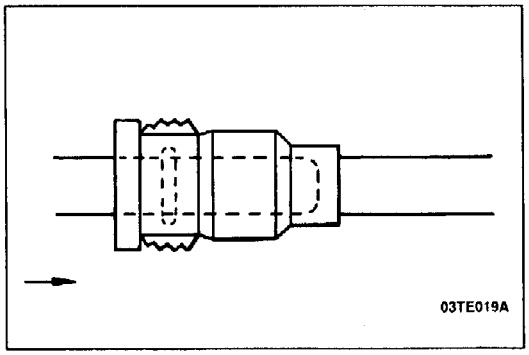
2. Grip the removal tabs at each side
3. Push in the direction of removal.



INSTALLATION SERVICE POINTS

▶A◀ PRESSURE HOSE INSTALLATION

1. Push the connector over the pipe until the connector stops with a click.



2. Push the connector gently in the direction of removal to ensure that the connector is installed correctly.