

# FUEL

## CONTENTS

13109000058

MULTIPOINT FUEL INJECTION (MPI) .....	13A
ELECTRONIC CONTROL TYPE CARBURETTOR .....	13B
CONVENTIONAL TYPE CARBURETTOR .....	13C
VARIABLE VENTURI TYPE CARBURETTOR .....	13D
DIESEL FUEL .....	13E
FUEL SUPPLY .....	13F
TRACTION CONTROL SYSTEM (TCL) .....	13H

### NOTE

THE GROUPS MARKED BY      ARE NOT IN THIS MANUAL

# MULTIPOINT FUEL INJECTION (MPI)

## CONTENTS

13109000065

MULTIPOINT FUEL INJECTION (MPI) .....	4	SEALANT .....	9
GENERAL INFORMATION .....	4	SPECIAL TOOLS .....	10
SERVICE SPECIFICATIONS .....	9	TROUBLESHOOTING .....	11

CONTINUED ON NEXT PAGE

**ON-VEHICLE SERVICE ..... 90**

Throttle Body (Throttle Valve Area) Cleaning .....	90
Idle Position Switch and Throttle Position Sensor Adjustment <Vehicles without TCL> .....	90
Throttle Position Sensor Adjustment <Vehicles with TCL> .....	91
Idle Position Switch and Accelerator Pedal Position Sensor Adjustment <Vehicles with TCL> .....	92
Fixed SAS Adjustment .....	93
Basic Idle Speed Adjustment .....	93
Fuel Pressure Test .....	95
Fuel Pump Connector Disconnection (How to Reduce the Fuel Pressure) .....	98
Fuel Pump Operation Check .....	98
Component Location .....	99
Control Relay Check .....	101
Intake Air Temperature Sensor Check ....	102
Engine Coolant Temperature Sensor Check .....	102
Throttle Position Sensor Check .....	103
Idle Position Switch Check <Vehicles without TCL> .....	103

Idle Position Switch Check <Vehicles with TCL> .....	104
Oxygen Sensor Check .....	104
Injector Check .....	105
Idle Speed Control (ISC) Servo (Stepper Motor) Check .....	107
Purge Control Solenoid Valve Check .....	107
EGR Control Solenoid Valve Check .....	107
Ventilation Control Solenoid Valve Check <Vehicles with TCL> .....	108
Vacuum Control Solenoid Valve Check <Vehicles with TCL> .....	108
Vacuum Tank Check <Vehicles with TCL> .....	109
Vacuum Actuator Check <Vehicles with TCL> .....	110
Throttle Valve Operation Check <Vehicles with TCL> .....	110
Negative Pressure Check during Traction Control Operation <Vehicles with TCL> ...	110

**INJECTOR ..... 111**

**THROTTLE BODY ..... 113**

## MULTIPOINT FUEL INJECTION (MPI)

13100010036

### 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 troubleshooting when a problem develops.

### FUEL INJECTION CONTROL

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

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

Fuel injection is normally carried out once for each cylinder for every two rotations of the

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

### IDLE AIR CONTROL

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

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

### IGNITION TIMING CONTROL

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

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



## SELF-DIAGNOSIS FUNCTION

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

code corresponding to the abnormality is output.

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

## OTHER CONTROL FUNCTIONS

1. Fuel Pump Control  
Turns the fuel pump relay ON so that current is supplied to the fuel pump while the engine is cranking or running.
2. A/C Relay Control  
Turns the compressor clutch of the A/C ON and OFF.
3. Fan Relay Control  
The revolutions of the radiator fan and condenser fan are controlled in response to the engine coolant temperature and vehicle speed.
4. Traction Control  
Engine output torque is reduced based on

signals from the TCL-ECU in response to the conditions under which slipping of the driven wheels and turning of the vehicle occur.

Furthermore, reduction of output torque is performed by closing the throttle valve and retarding the ignition timing.

5. Purge Control Solenoid Valve Control  
Refer to GROUP 17.
6. EGR Control Solenoid Valve Control  
Refer to GROUP 17.

Items		Specifications
Throttle body	Throttle bore mm	50 <4G92, 4G93-SOHC> 54 <4G93-DOHC>
	Throttle position sensor	Variable resistor type
	Accelerator pedal position sensor <Vehicles with TCL>	Variable resistor type
	Idle speed control servo	Stepper motor type (Stepper motor type by-pass air control system with the air volume limiter)
	Idle position switch <Vehicle without TCL>	Rotary contact type, within throttle position sensor
	Idle position switch <Vehicle with TCL>	Rotary contact type, within accelerator pedal position sensor

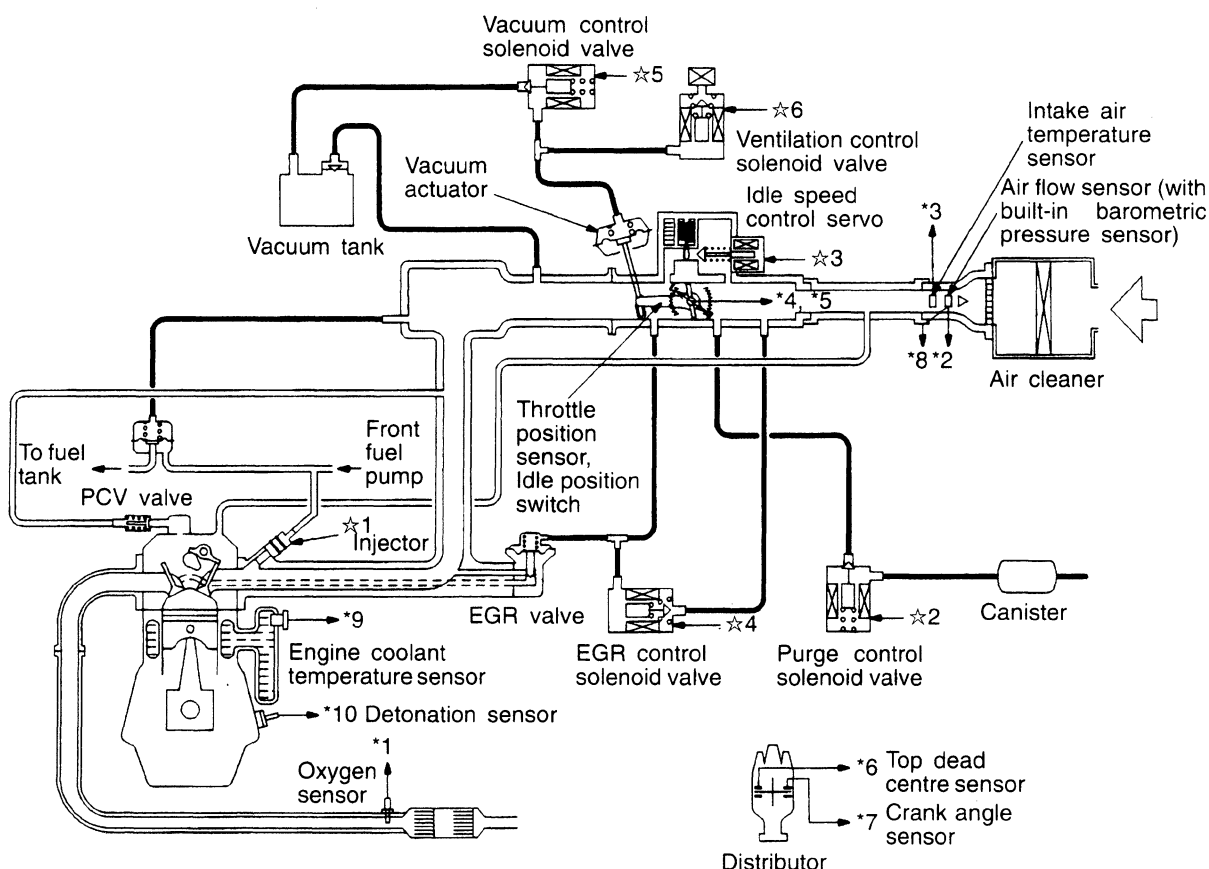
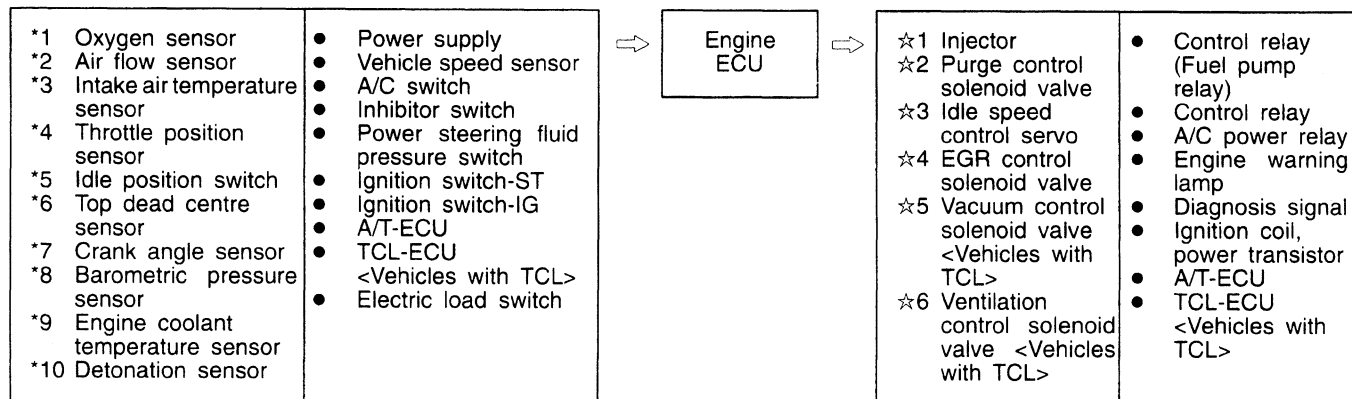
13A-6

MPI – General Information

Items		Specifications
Engine ECU	Identification model No.	E2T63276 <4G92> E2T63277 <4G93-SOHC (Vehicles without TCL)> E2T63278 <4G93-SOHC (Vehicles with TCL)> E2T63279 <4G93-DOHC>
Sensors	Air flow sensor	Karman vortex type
	Barometric pressure sensor	Semiconductor type
	Intake air temperature sensor	Thermistor type
	Engine coolant temperature sensor	Thermistor type
	Oxygen sensor	Zirconia type
	Vehicle speed sensor	Magnetic resistive element type
	Inhibitor switch	Contact switch type
	No. 1 cylinder top dead centre sensor	Hall element type
	Camshaft position sensor	Hall element type
	Crank angle sensor	Hall element type
	Detonation sensor	Piezoelectric type
	Power steering fluid pressure switch	Contact switch type
Actuators	Control relay type	Contact switch type
	Injector type and number	Electromagnetic type, 4
	Injector identification mark	CDH210 <4G92, 4G93-SOHC> CDH275 <4G93-DOHC>
	EGR control solenoid valve	Duty cycle type solenoid valve
	Purge control solenoid valve	ON/OFF type solenoid valve
	Ventilation control solenoid valve	Duty cycle type solenoid valve
	Vacuum control solenoid valve	Duty cycle type solenoid valve
Fuel pressure regulator	Regulator pressure kPa	329

# MULTI POINT FUEL INJECTION SYSTEM DIAGRAM

<4G92, 4G93-SOHC>

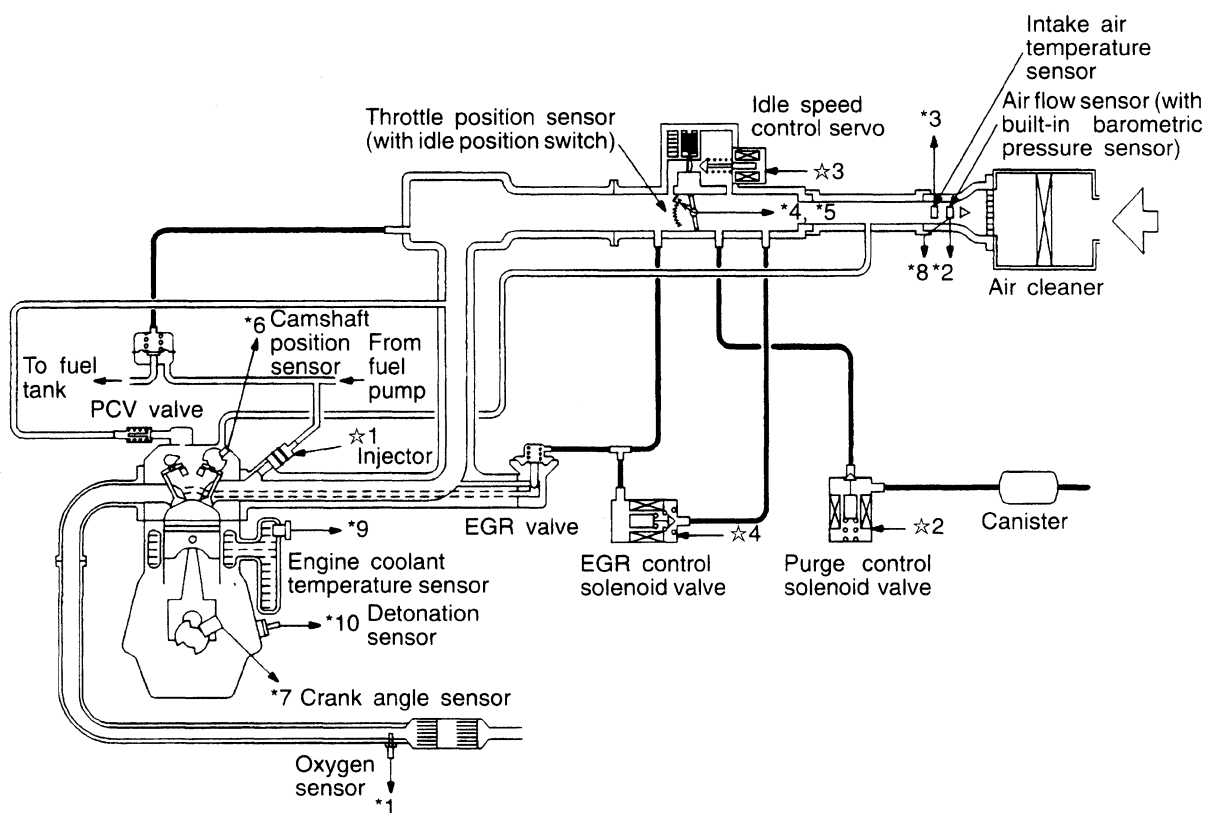
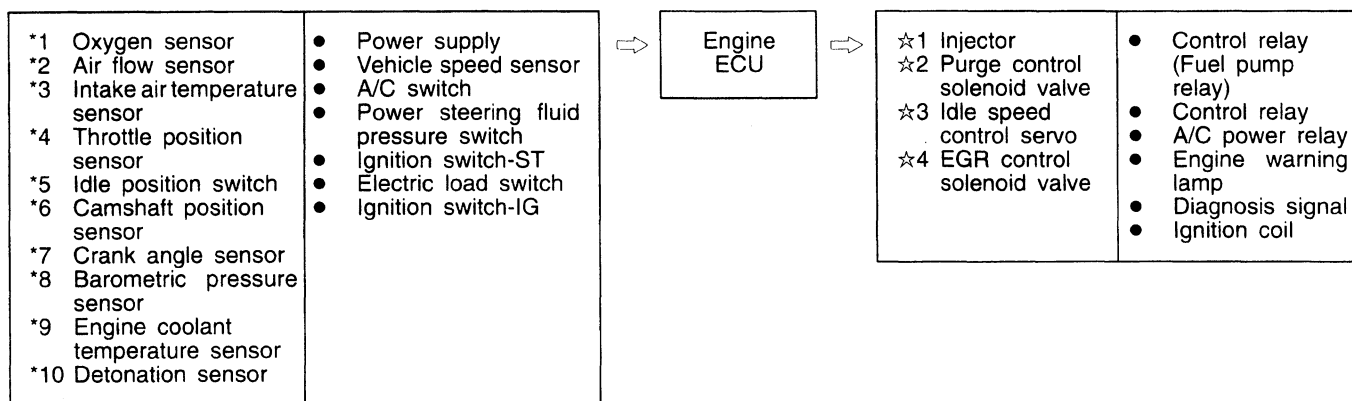


9FU0592

13A-8

MPI – General Information

<4G93-DOHC>



9FU0593

## SERVICE SPECIFICATIONS

13100030032

Items		Specifications
Basic idle speed r/min	4G92	750±50
	4G93	800±50
Idle speed when A/C is ON r/min		850 at neutral position
Throttle position sensor adjusting voltage mV	Vehicles without TCL	400–1,000
	Vehicles with TCL	580–690
Accelerator pedal position sensor adjusting voltage mV		400–1,000
Throttle position sensor resistance kΩ		3.5–6.5
Accelerator pedal position sensor resistance kΩ		3.5–6.5
Idle speed control servo coil resistance Ω		28–33 (at 20°C)
Intake air temperature sensor resistance kΩ	20°C	2.3–3.0
	80°C	0.30–0.42
Engine coolant temperature sensor resistance kΩ	20°C	2.1–2.7
	80°C	0.26–0.36
Oxygen sensor output voltage V		0.6–1.0
Fuel pressure kPa	Vacuum hose disconnection	324–343 at curb idle
	Vacuum hose connection	Approx. 265 at curb idle
Injector coil resistance Ω		13–16 (at 20°C)
Ventilation control solenoid valve coil resistance Ω		36–44 (at 20°C)
Vacuum control solenoid valve coil resistance Ω		36–44 (at 20°C)

## SEALANT

13100050038

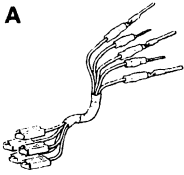
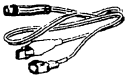



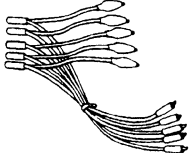




Item	Specified sealant	Remark
Engine coolant temperature sensor threaded portion	3M Nut Locking Part No. 4171 or equivalent	Drying sealant

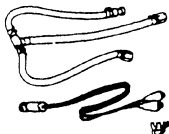
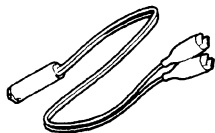
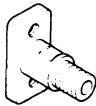
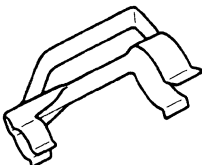
13A-10

MPI – Special Tools

# SPECIAL TOOLS

13100060031

Tool	Number	Name	Use
<p><b>A</b></p>  <p><b>B</b></p>  <p><b>C</b></p>  <p><b>D</b></p> 	<p>MB991223</p> <p>A: MB991219</p> <p>B: MB991220</p> <p>C: MB991221</p> <p>D: MB991222</p>	<p>Harness set</p> <p>A: Test harness</p> <p>B: LED harness</p> <p>C: LED harness adapter</p> <p>D: Probe</p>	<ul style="list-style-type: none"> <li>Fuel gauge simple inspection</li> <li>A: Connector pin contact pressure inspection</li> <li>B, C: Power circuit inspection</li> <li>D: Commercial tester connection</li> </ul>
	MB991502	MUT-II sub assembly	<ul style="list-style-type: none"> <li>Reading diagnosis code</li> <li>MPI system inspection</li> </ul>
	MB991348	Test harness set	Inspection using an analyzer
	MD998463	Test harness (6-pin, square)	<ul style="list-style-type: none"> <li>Inspection of idle speed control servo</li> <li>Inspection using an analyzer</li> </ul>
	MD998478	Test harness (3-pin, triangle)	Inspection using an analyzer
	MD998709	Adaptor hose	Measurement of fuel pressure
	MD998742	Hose adaptor	

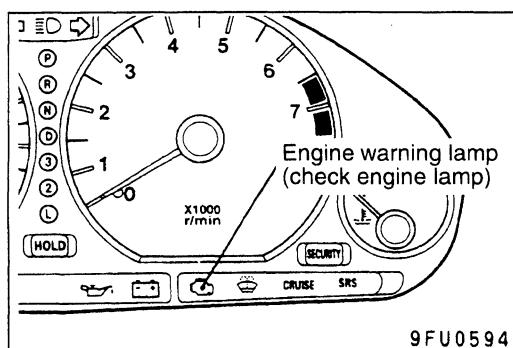
Tool	Number	Name	Use
	MD998706	Injector test set	Checking the spray condition of injectors
 MB991607	MB991607	Injector test harness	
 MD998741	MD998741	Injector test adaptor	
	MB991608	Clip	

## TROUBLESHOOTING

13100850034

### DIAGNOSIS TROUBLESHOOTING FLOW

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



### DIAGNOSIS FUNCTION

13100860037

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

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

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

### Engine warning lamp inspection items

Engine ECU
Oxygen sensor
Air flow sensor
Intake air temperature sensor
Throttle position sensor
Engine coolant temperature sensor
Crank angle sensor
Camshaft position sensor <DOHC>
Barometric pressure sensor
Detonation sensor
Ignition timing adjustment signal
Injector
Ignition coil, power transistor <DOHC>
Immobilizer system
Vacuum control solenoid valve <TCL>
Ventilation control solenoid valve <TCL>

#### Caution

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

### METHOD OF READING AND ERASING DIAGNOSIS CODES

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

### INSPECTION USING MUT-II SERVICE DATA 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

13100910039

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

Malfunctioning item	Control contents during malfunction
Air flow sensor	<ol style="list-style-type: none"> <li>1. Uses the throttle position sensor signal and engine speed signal (crank angle sensor signal) to take readings of the basic injector drive timing and basic ignition timing from the pre-set mapping.</li> <li>2. Fixes the ISC servo in the appointed position so idle control is not performed.</li> </ol>
Intake air temperature sensor	Controls as if the intake air temperature is 25°C.
Throttle position sensor (TPS)	No increase in fuel injection amount during acceleration due to the throttle position sensor signal.
Engine coolant temperature sensor	Controls as if the engine coolant temperature is 80°C.
Top dead centre sensor <SOHC>	Injects fuel into the cylinders in the order 1-3-4-2 with irregular timing. (However, after the ignition switch is turned to ON, the No. 1 cylinder top dead centre is not detected at all.)
Camshaft position sensor <DOHC>	<ol style="list-style-type: none"> <li>1. Injects fuel into the cylinders in the order 1-3-4-2 with irregular timing. (However, after the ignition switch is turned to ON, the No. 1 cylinder top dead centre is not detected at all.)</li> <li>2. Cuts off the fuel supply 4 seconds after a problem is detected. (However, after the ignition switch is turned to ON, the No. 1 cylinder top dead centre is not detected at all.)</li> </ol>
Barometric pressure sensor	Controls as if the barometric pressure is 101 kPa.
Detonation sensor	Switches the ignition timing from ignition timing for super petrol to ignition timing for standard petrol.
Ignition coil, power transistor <DOHC>	Cuts off the fuel supply to cylinders with an abnormal ignition signal.
Oxygen sensor	Air/fuel ratio feedback control (closed loop control) is not performed.
Communication wire with transmission control unit <A/T>	Ignition timing is not retarded during transmission gear shifting (overall engine and transmission control).

### NOTE

When a problem is detected in the vacuum control solenoid valve, ventilation control solenoid valve, crank angle sensor or any of the above items, traction control is not performed <Vehicles with TCL>.

INSPECTION CHART FOR DIAGNOSIS CODES

13100870030

Code No.	Diagnosis item	Reference page
11	Oxygen sensor system	13A-15
12	Air flow sensor system	13A-16
13	Intake air temperature sensor system	13A-16
14	Throttle position sensor system	13A-17
21	Engine coolant temperature sensor system	13A-18
22	Crank angle sensor system	13A-19 <SOHC> 13A-20 <DOHC>
23	Top dead centre sensor <SOHC>	13A-21
	Camshaft position sensor <DOHC>	13A-22
24	Vehicle speed sensor system	13A-23
25	Barometric pressure sensor system	13A-24
31	Detonation sensor system	13A-25
36*1	Ignition timing adjustment signal system	13A-26
41	Injector system	13A-26
44	Ignition coil and power transistor unit system <DOHC>	13A-27
54*2	Immobilizer system	GROUP 54 – Ignition key and Immobilizer
61	Communication wire with A/T-ECU system <A/T>	13A-28
71	Vacuum control solenoid valve system <Vehicles with TCL>	13A-29
72	Ventilation control solenoid valve system <Vehicles with TCL>	13A-30

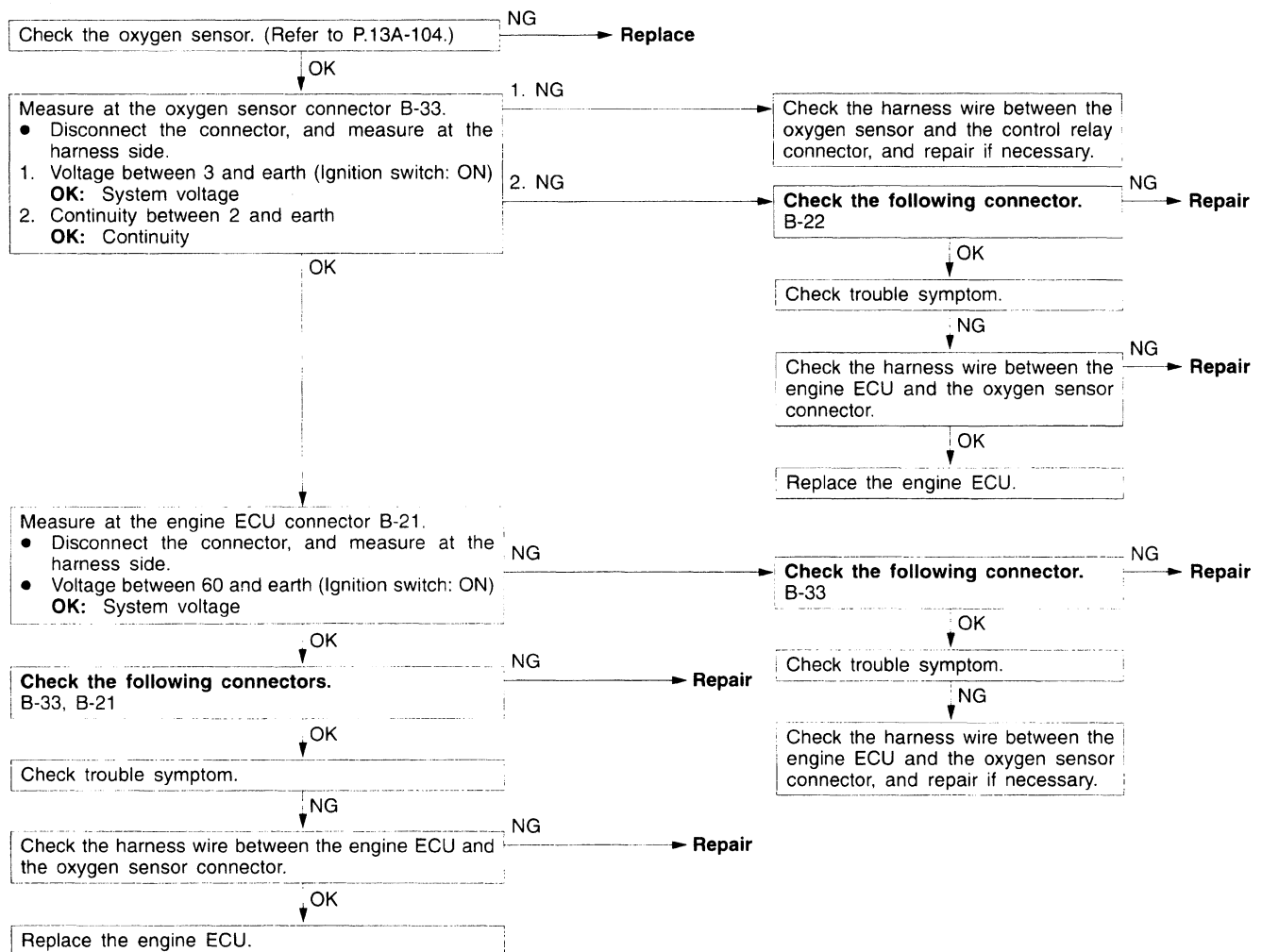
NOTE

\*1: Malfunction code No. 36 is not memorized.

\*2: Refer to GROUP 54 – Ignition key and Immobilizer-Troubleshooting.

## INSPECTION PROCEDURE FOR DIAGNOSIS CODES

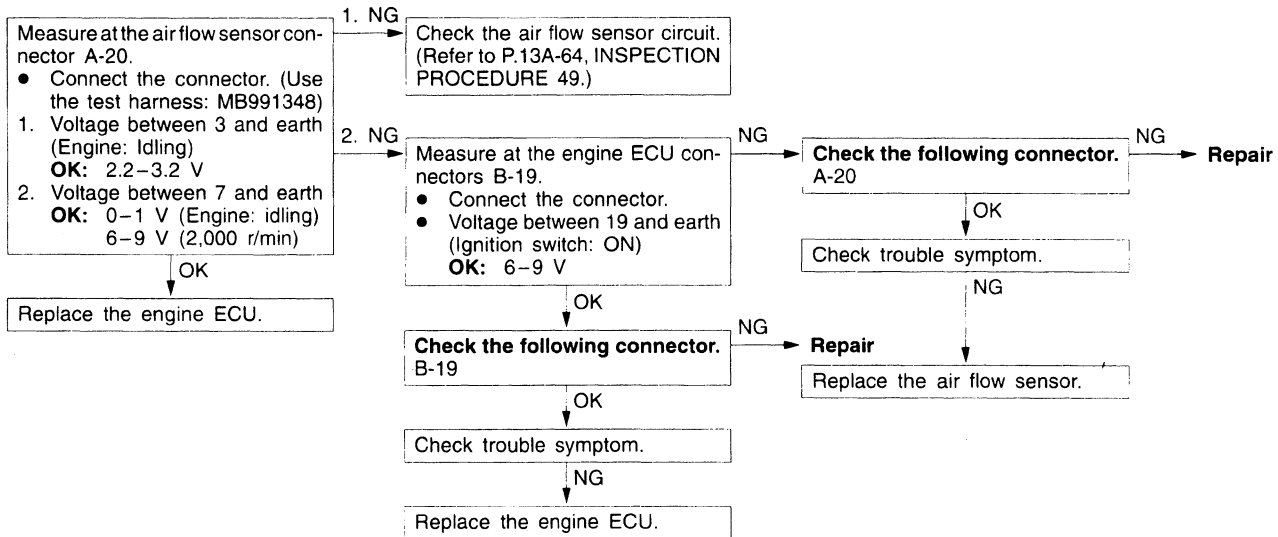
Code No. 11 Oxygen sensor system	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>• 3 minutes have passed after engine was started.</li> <li>• Engine coolant temperature is approx. 80°C or more.</li> <li>• Intake air temperature is 20–50°C.</li> <li>• Engine speed is approx. 2,000–3,000 r/min</li> <li>• Vehicle is moving at constant speed on a flat, level road surface</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>• The oxygen sensor output voltage is around 0.6 V for 30 seconds (does not cross 0.6 V for 30 seconds).</li> <li>• When the range of check operations given above which accompany starting of the engine are carried out four time in succession, a problem is detected after each operation.</li> </ul>	<ul style="list-style-type: none"> <li>• Malfunction of the oxygen sensor</li> <li>• Improper connector contact, open circuit or short-circuited harness wire</li> <li>• Malfunction of the engine ECU</li> </ul>



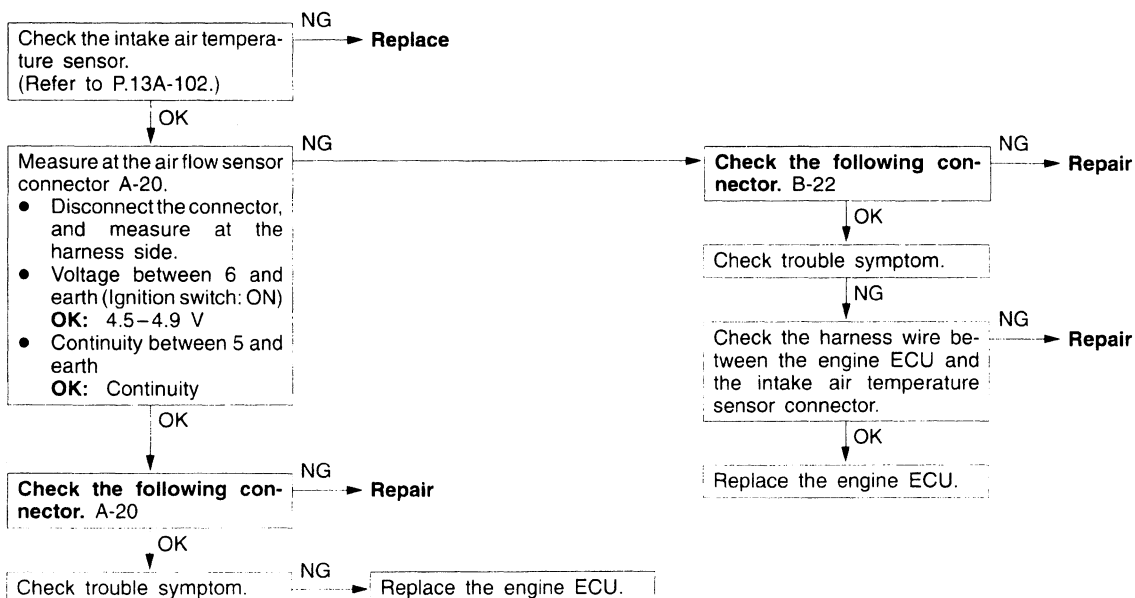
13A-16

MPI – Troubleshooting

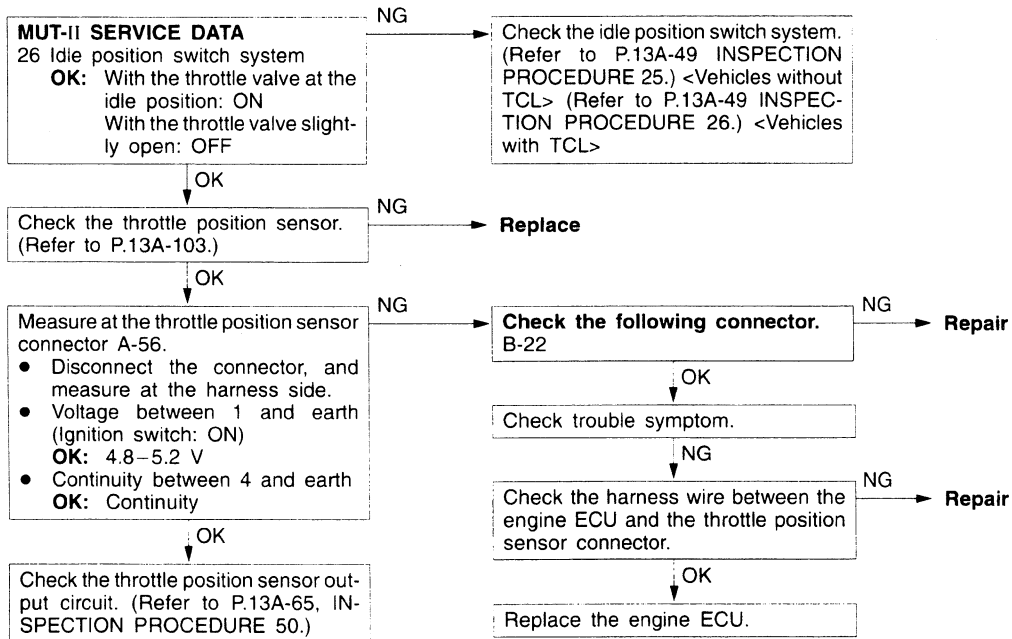
Code No. 12 Air flow sensor system	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>Engine speed is 500 r/min or more.</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>Sensor output frequency is 3 Hz or less for 4 seconds.</li> </ul>	<ul style="list-style-type: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



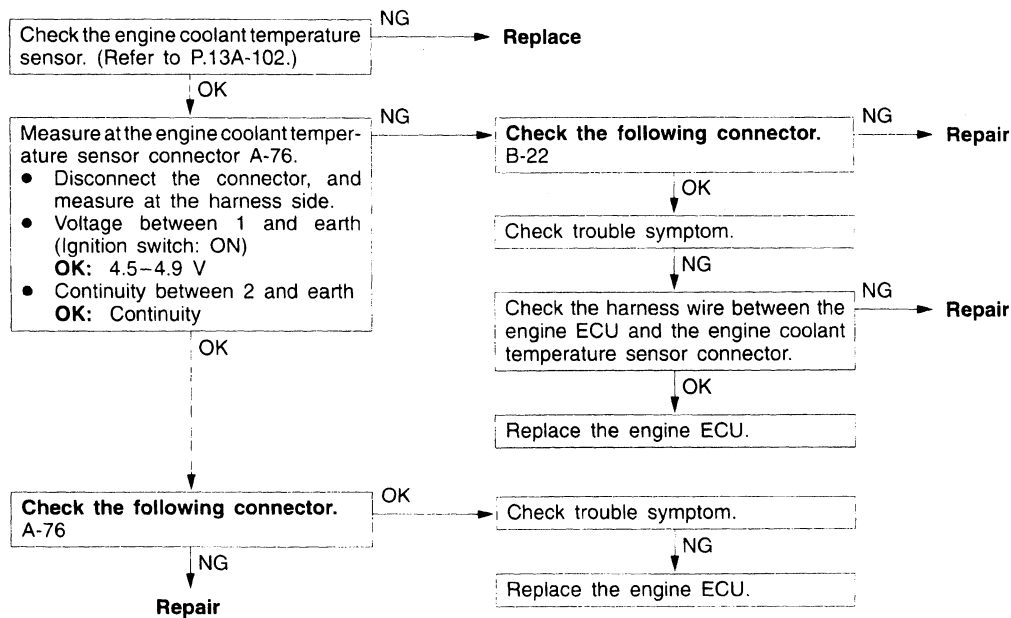
Code No. 13 Intake air temperature sensor system	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>Ignition switch: ON</li> <li>Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts.</li> </ul> <p>Set conditions</p> <ul style="list-style-type: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



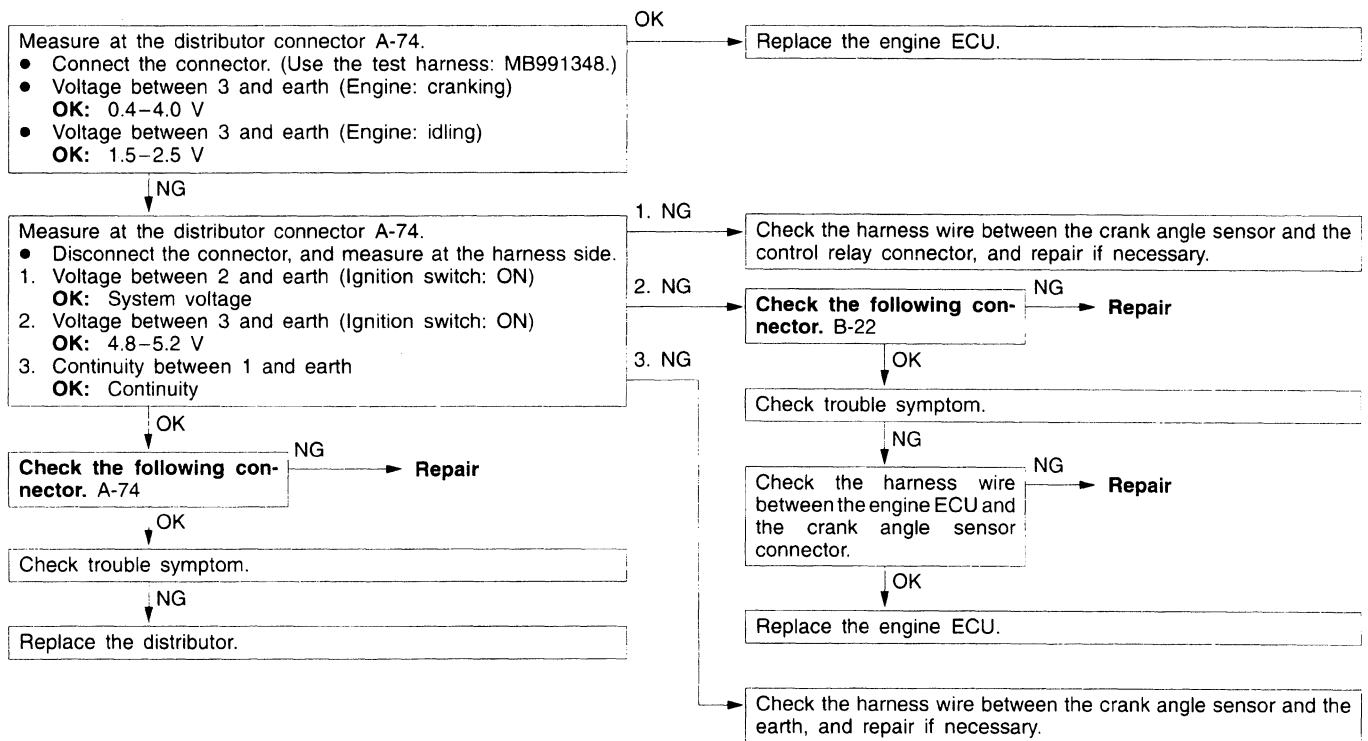
Code No. 14 Throttle position sensor system	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>Ignition switch: ON</li> <li>Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts.</li> </ul> <p>Set conditions</p> <ul style="list-style-type: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



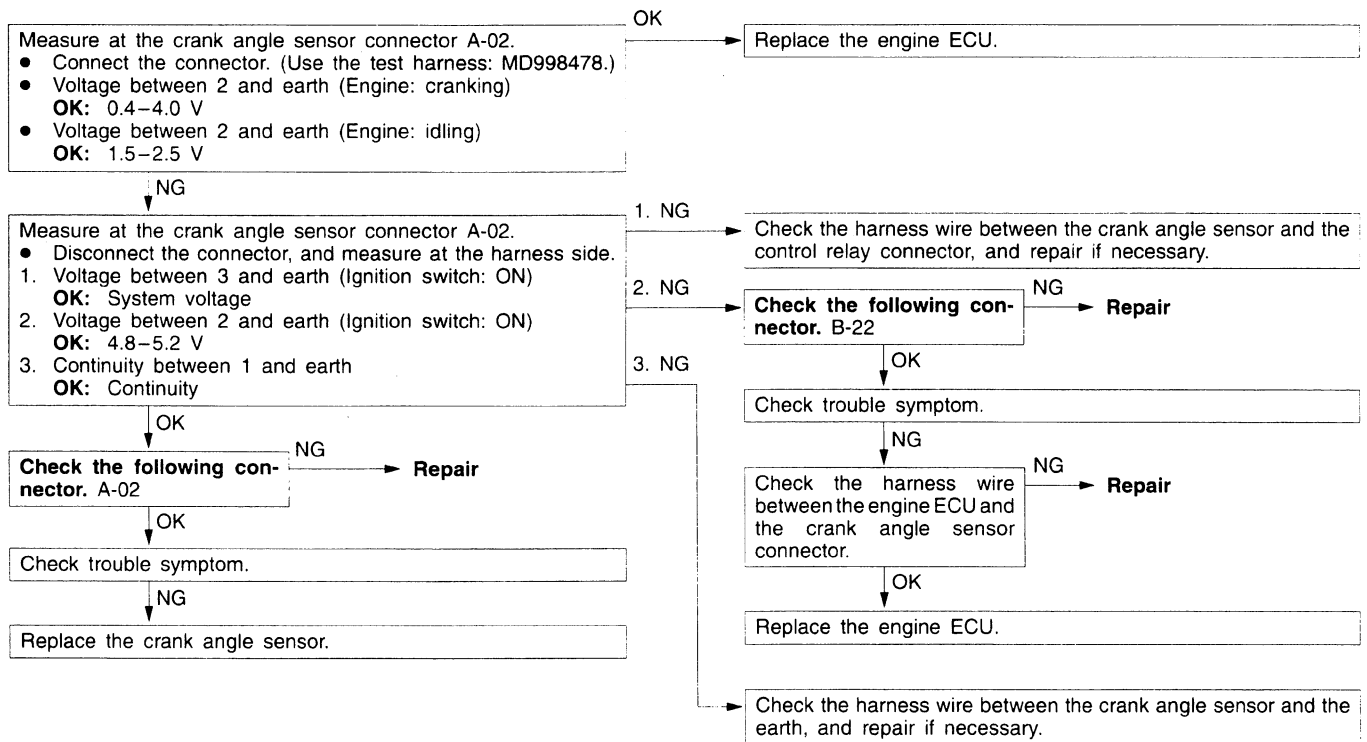
Code No. 21 Engine coolant temperature sensor system	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>Ignition switch: ON</li> <li>Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts.</li> </ul> <p>Set conditions</p> <ul style="list-style-type: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



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

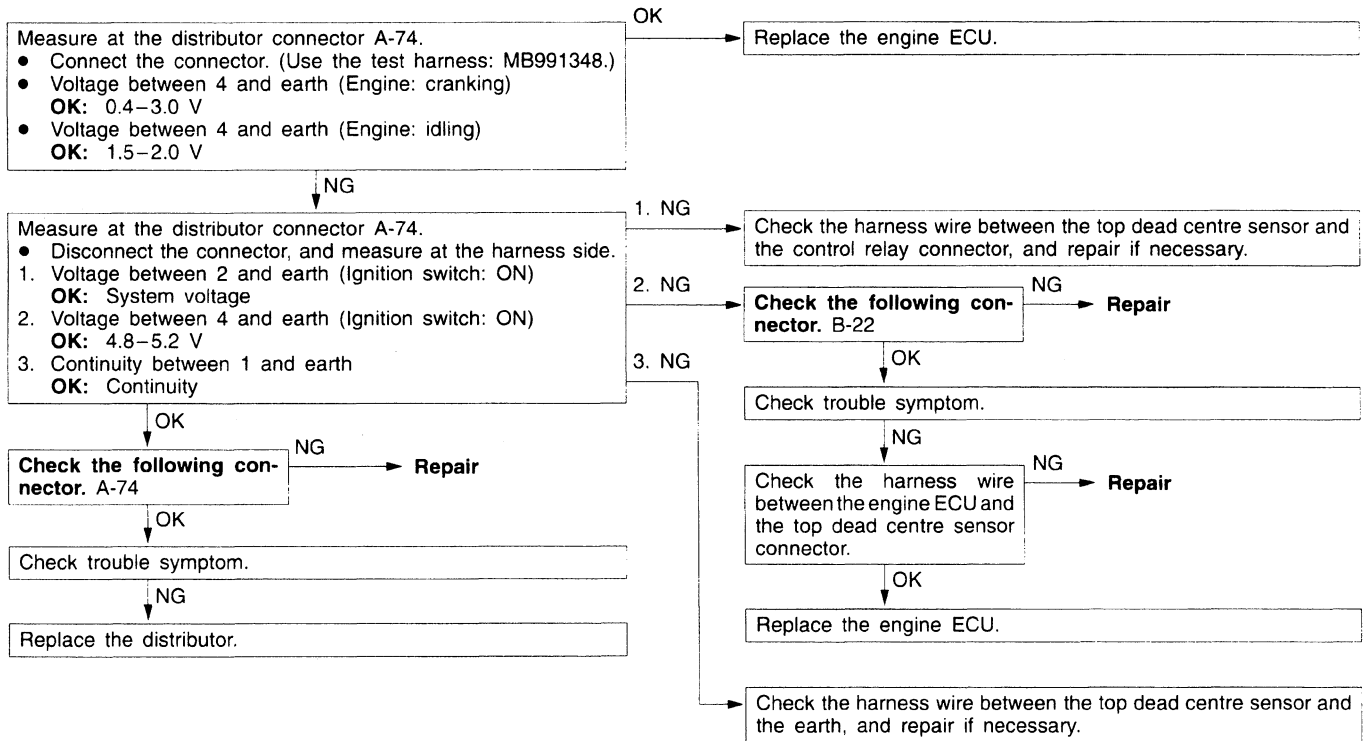


Code No. 22 Crank angle sensor system <DOHC>	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>Engine is cranking.</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>Sensor output voltage does not change for 4 seconds (no pulse signal input.)</li> </ul>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

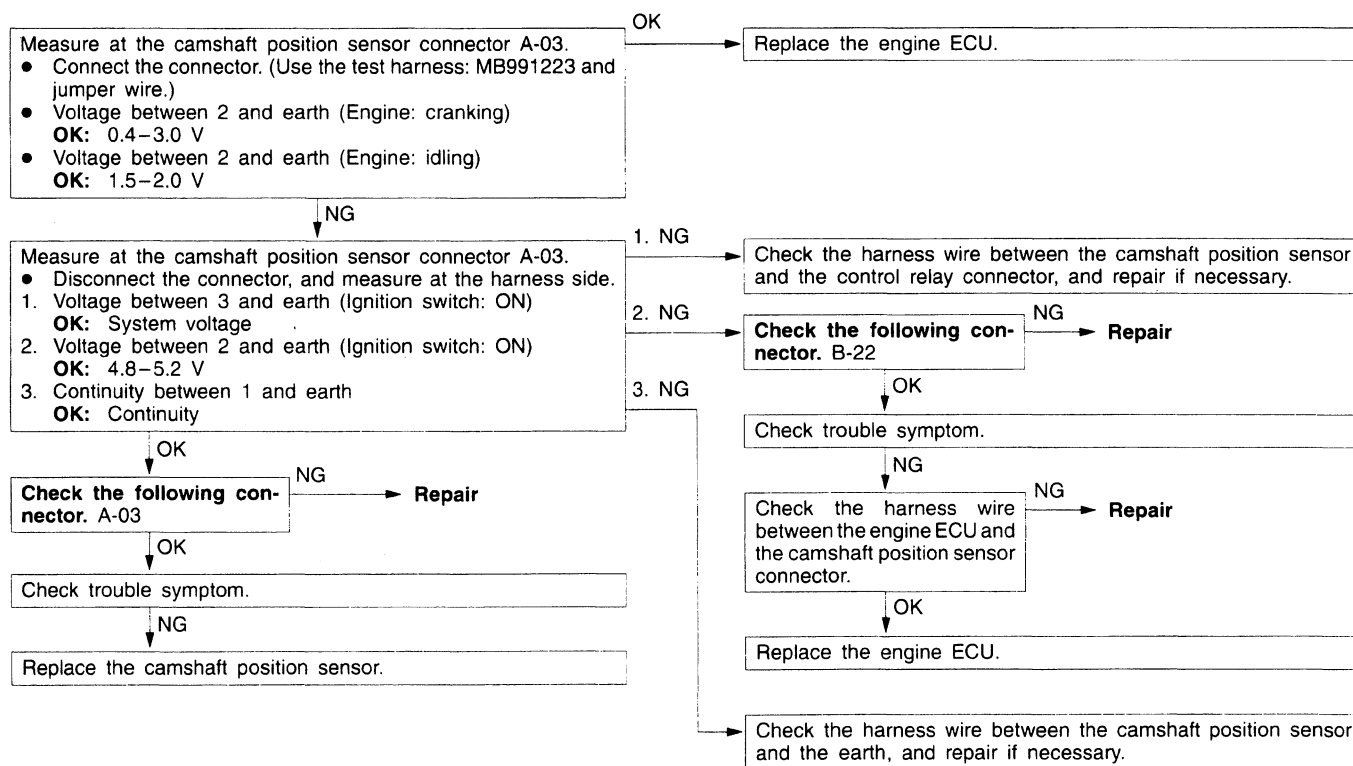




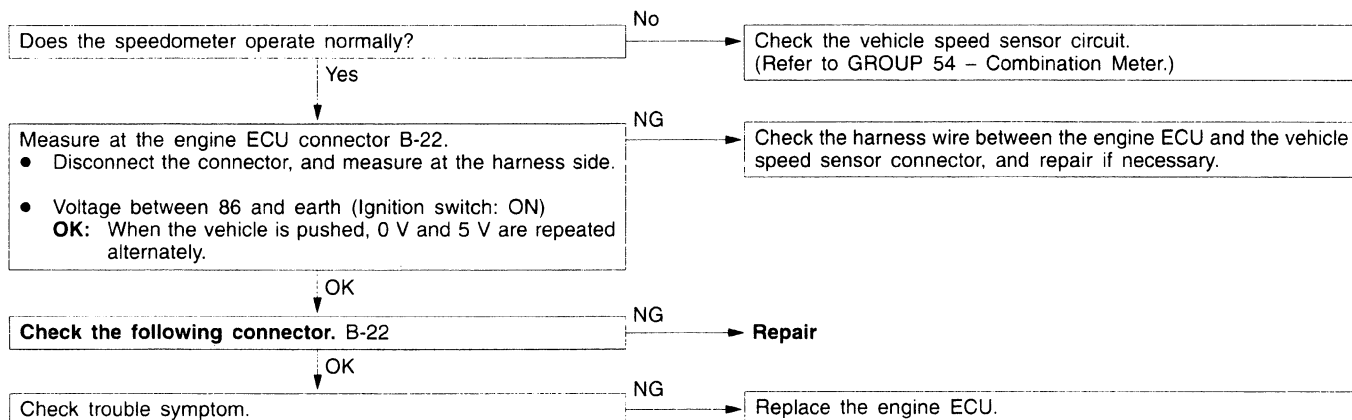
Code No. 23 Top dead centre sensor system <SOHC>	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>Ignition switch: ON</li> <li>Engine speed is approx. 50 r/min or more.</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>Sensor output voltage does not change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



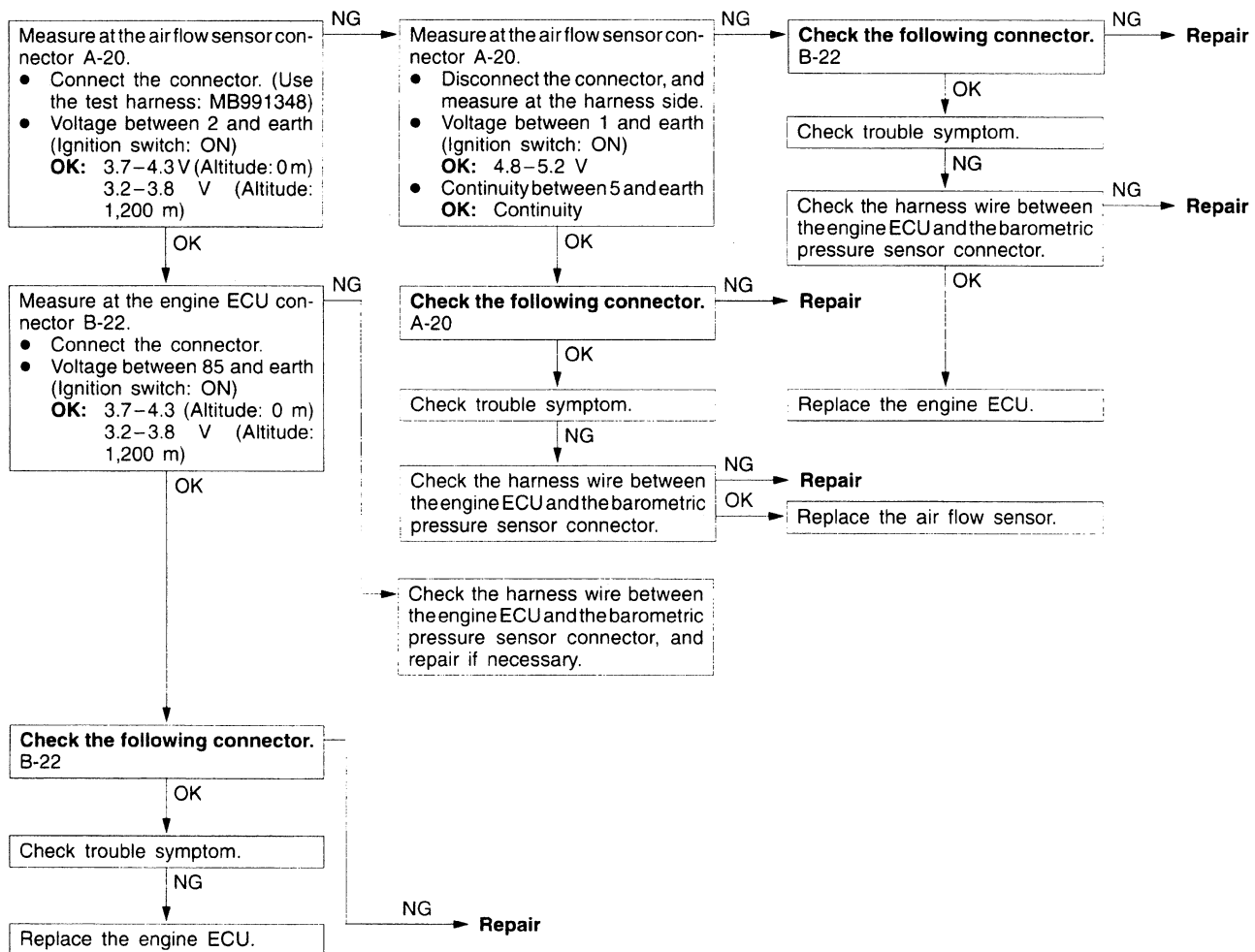
Code No. 23 Camshaft position sensor system <DOHC>	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>Ignition switch: ON</li> <li>Engine speed is approx. 50 r/min or more.</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>Sensor output voltage does not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



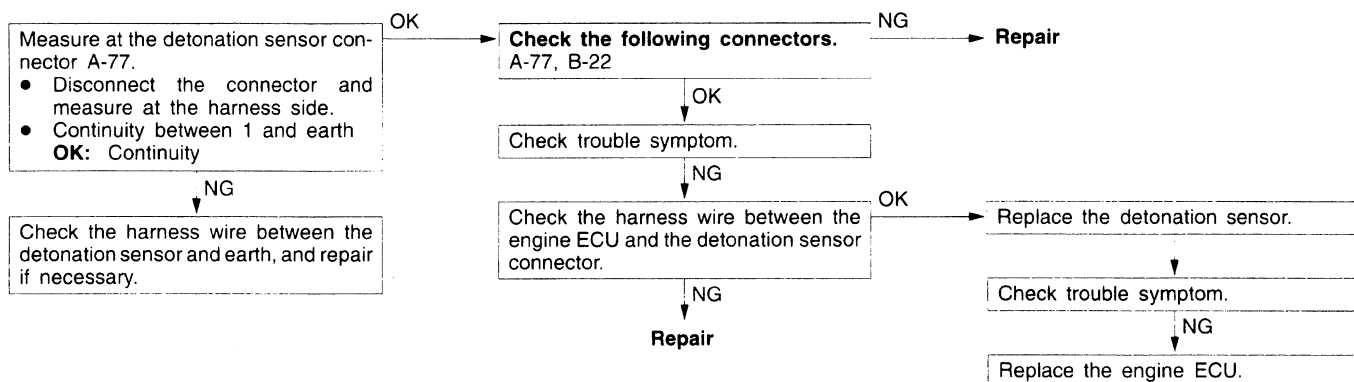
Code No. 24 Vehicles speed sensor system	Probable cause
<p>Range of check</p> <ul style="list-style-type: none"> <li>Ignition switch: ON</li> <li>Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts.</li> <li>Idle position switch: OFF</li> <li>Engine speed is 3,000 r/min or more.</li> <li>Driving under high engine load conditions.</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>Sensor output voltage does not change for 4 seconds (no pulse signal input).</li> </ul>	<ul style="list-style-type: none"> <li>Malfunction of the vehicle speed sensor</li> <li>Improper connector contact, open circuit or short-circuited harness wire of the vehicle speed sensor circuit</li> <li>Malfunction of the engine ECU</li> </ul>



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



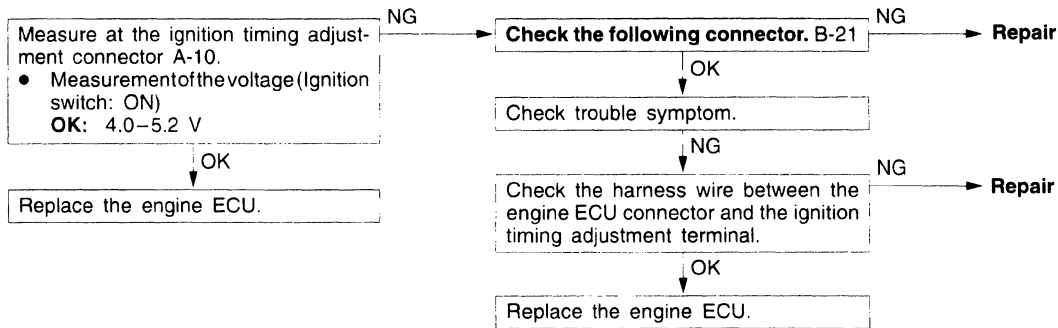
Code No. 31 Detonation sensor system	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>Ignition switch: ON</li> <li>Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts.</li> <li>Engine speed is approx. 5,000 r/min or more</li> </ul> <p>Set conditions</p> <p>The change in the detonation sensor output voltage (detonation sensor peak voltage at each 1/2 revolution of the crankshaft) is less than 0.06 V for 200 times in succession.</p>	<ul style="list-style-type: none"> <li>Malfunction of the detonation sensor</li> <li>Improper connector contact, open circuit or short-circuited harness wire of the detonation sensor circuit</li> <li>Malfunction of the engine ECU</li> </ul>



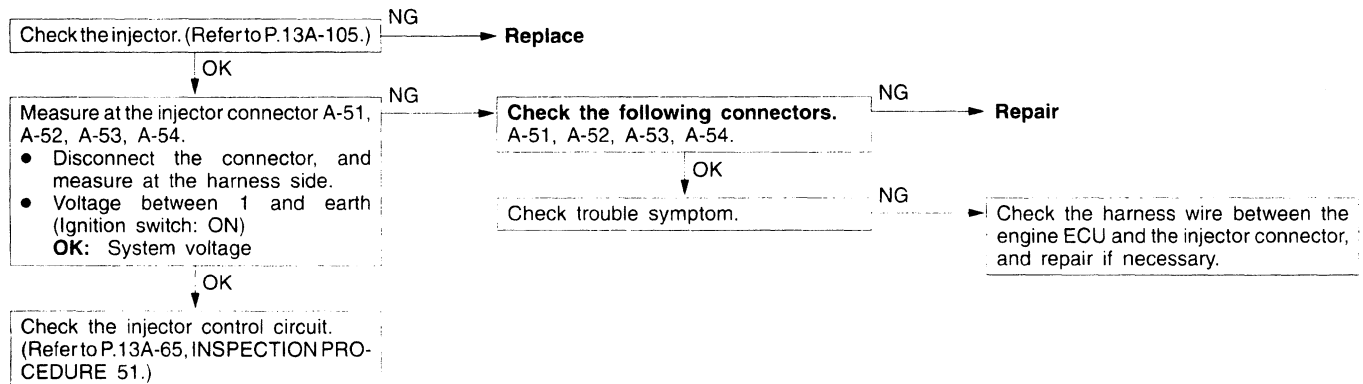
13A-26

MPI – Troubleshooting

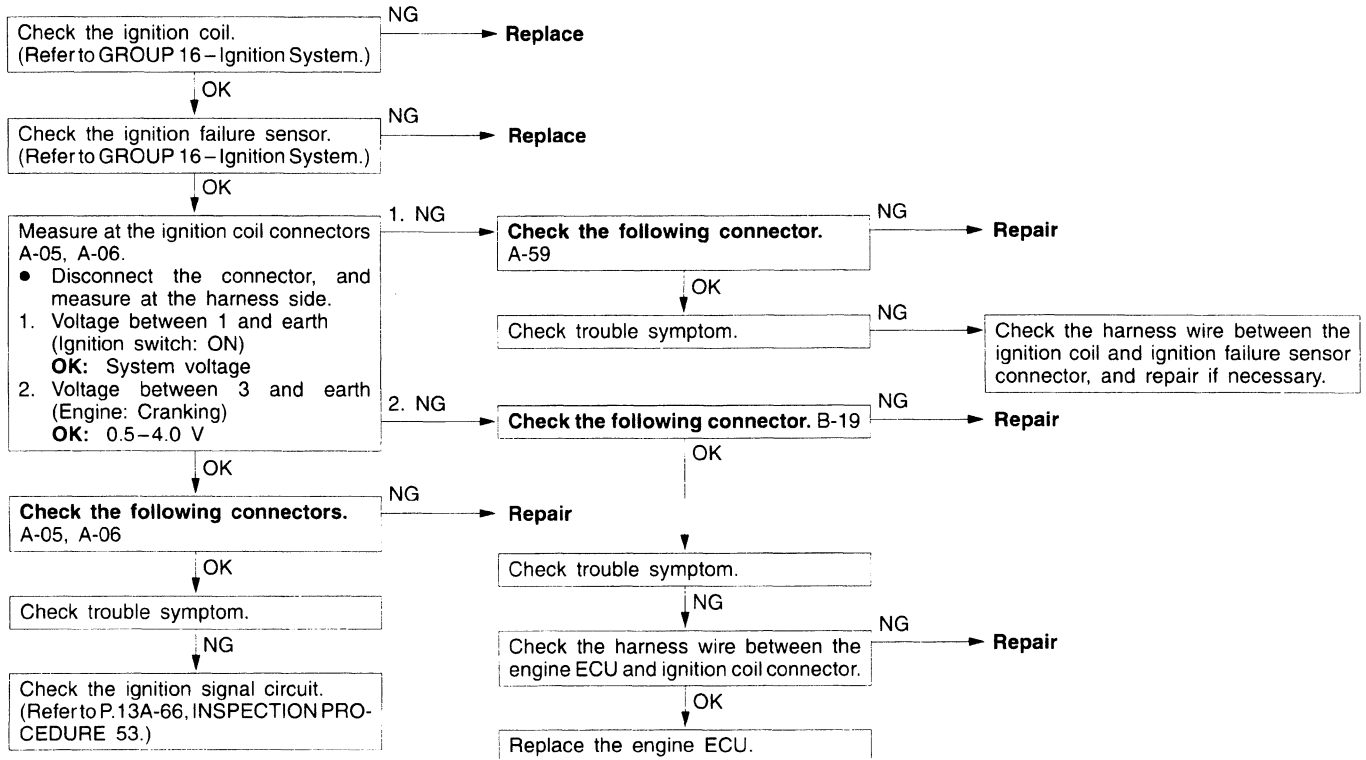
Code No. 36 Ignition timing adjustment signal system	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>Ignition switch: ON</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>The ignition timing adjusting signal wire is shorted to the earth.</li> </ul>	<ul style="list-style-type: none"> <li>Short circuit to earth of the ignition timing adjustment signal line</li> <li>Malfunction of the engine ECU</li> </ul>



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

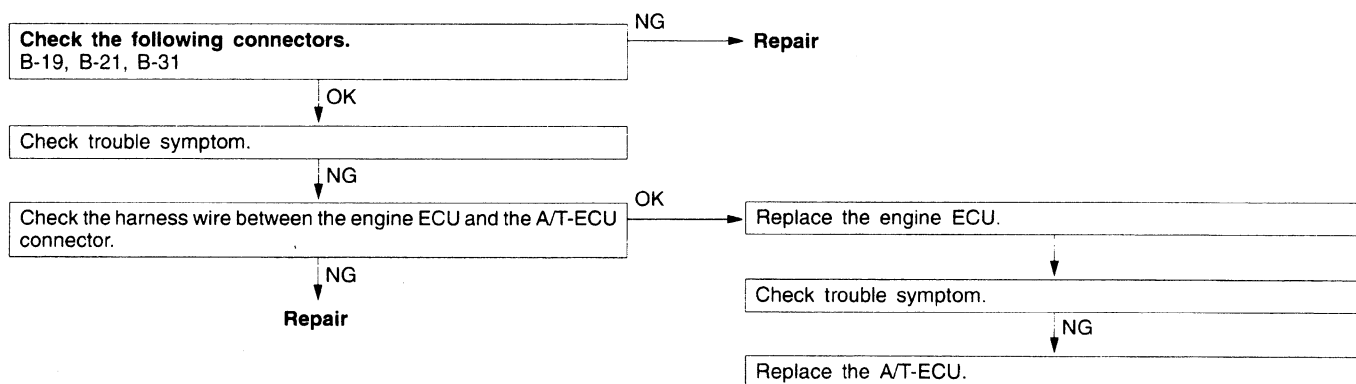


Code No. 44 Ignition coil and power transistor unit system <DOHC>	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>Engine speed is approx. 50–4,000 r/min</li> <li>Engine is not cranking.</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>The ignition signal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

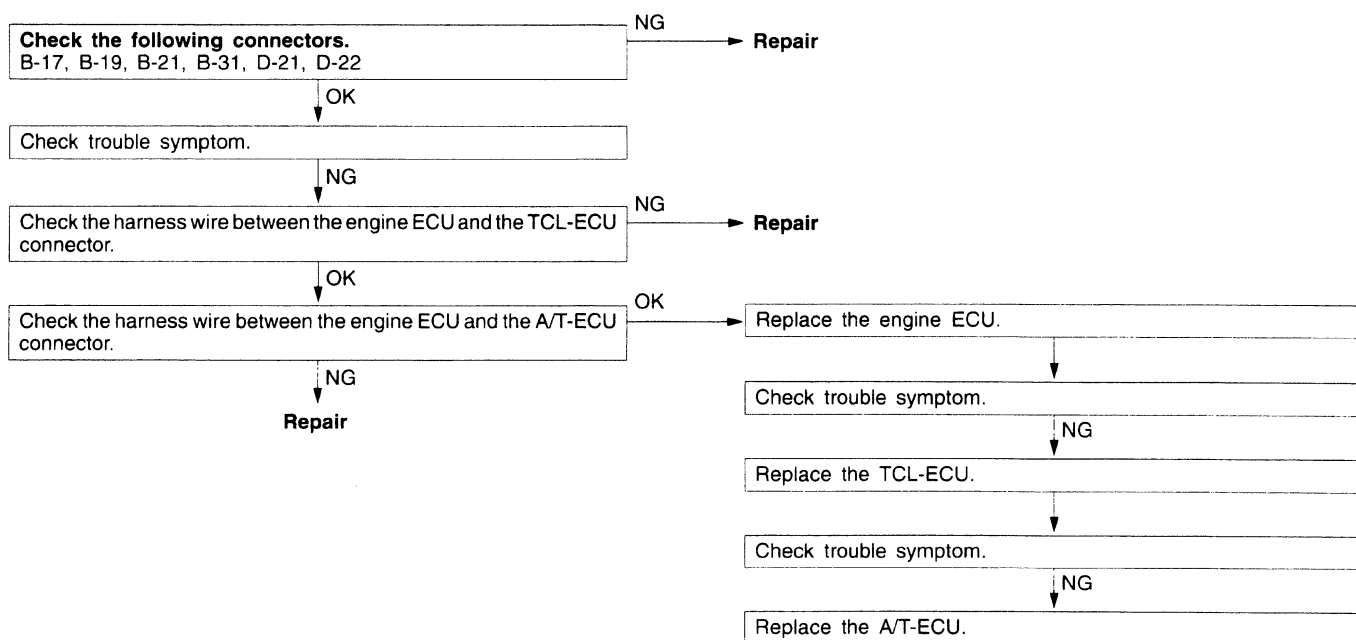


Code No. 61 Communication wire with A/T-ECU system <A/T>	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>60 seconds or more have passed immediately after engine was started.</li> <li>Engine speed is approx. 50 r/min or more</li> </ul> <p>Set conditions</p> <p>The voltage of the torque reduction request signal from the A/T-ECU is LOW for 1.5 seconds or more.</p>	<ul style="list-style-type: none"> <li>Malfunction of the harness wire and the connector</li> <li>Malfunction of the engine ECU</li> <li>Malfunction of the A/T-ECU</li> <li>Malfunction of the TCL-ECU &lt;Vehicles with TCL&gt;</li> </ul>

<Vehicles without TCL>

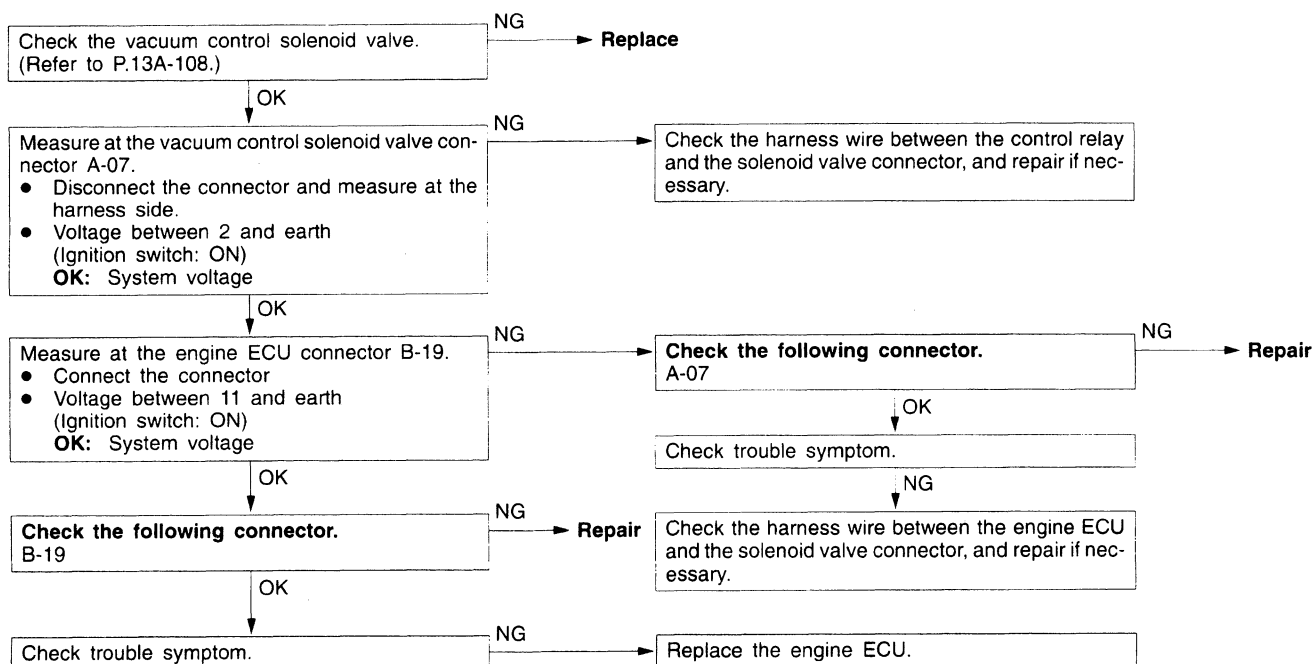


<Vehicles with TCL>

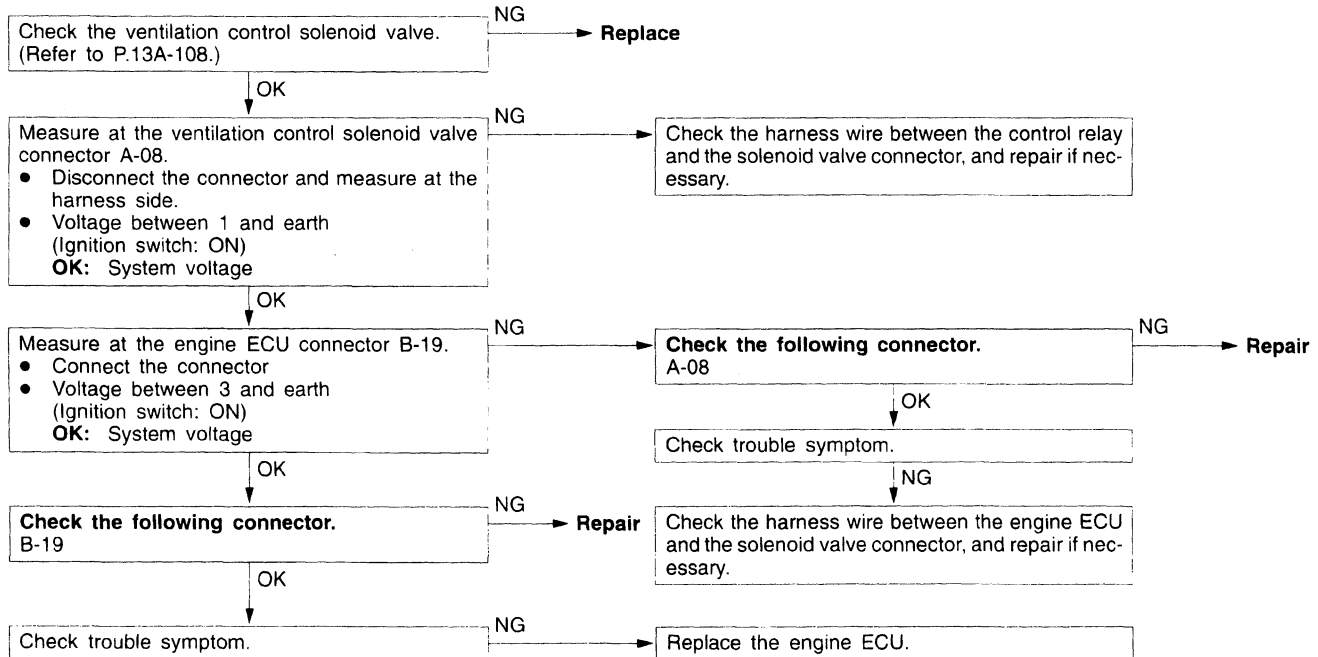




Code No. 71 Vacuum control solenoid valve system <Vehicles with TCL>	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>Ignition switch: ON</li> <li>Excluding 60 seconds immediately after the engine starts.</li> <li>Battery voltage is 10 V or more.</li> <li>Forced actuation by means of MUT-II is not being carried out.</li> </ul> <p>Set condition</p> <p>Solenoid valve drive or non-drive instruction and energized condition of solenoid coil are different.</p>	<ul style="list-style-type: none"> <li>Malfunction of the vacuum control solenoid valve</li> <li>Improper connector contact, open circuit or short-circuited harness wire of the vacuum control solenoid valve</li> <li>Malfunction of the engine ECU</li> </ul>



Code No. 72 Ventilation control solenoid valve system <Vehicles with TCL>	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>Ignition switch: ON</li> <li>Excluding 60 seconds immediately after the engine starts.</li> <li>Battery voltage is 10 V or more.</li> <li>Forced actuation by means of MUT-II is not being carried out.</li> </ul> <p>Set condition</p> <p>Solenoid valve drive or non-drive instruction and energized condition of solenoid coil are different.</p>	<ul style="list-style-type: none"> <li>Malfunction of the ventilation control solenoid valve</li> <li>Improper connector contact, open circuit or short-circuited harness wire of the ventilation control solenoid valve</li> <li>Malfunction of the engine ECU</li> </ul>



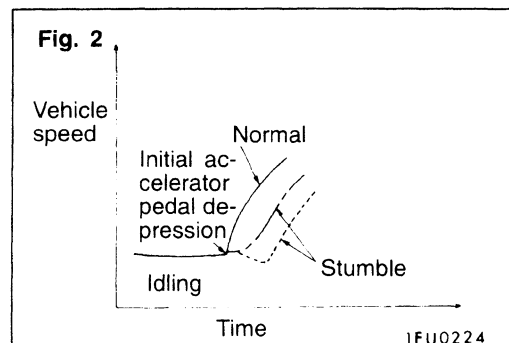
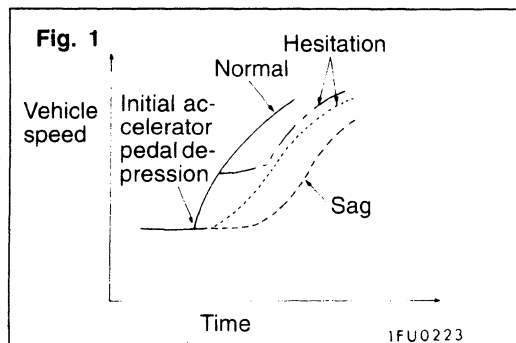
INSPECTION CHART FOR TROUBLE SYMPTOMS

13100880033

Trouble symptom		Inspection procedure No.	Reference page
Communication with MUT-II is impossible.	Communication with all systems is not possible.	1	13A-33
	Communication with engine ECU only is not possible.	2	13A-33
Engine warning lamp and related parts	The engine warning lamp does not illuminate right after the ignition switch is turned to the ON position.	3	13A-34
	The engine warning lamp remains illuminating and never goes out.	4	13A-34
Starting	No initial combustion (starting impossible)	5	13A-35
	Initial combustion but no complete combustion (starting impossible)	6	13A-36
	Long time to start (improper starting)	7	13A-37
Idling stability (Improper idling)	Unstable idling (Rough idling, hunting)	8	13A-38
	Idling speed is high. (Improper idling speed)	9	13A-39
	Idling speed is low. (Improper idling speed)	10	13A-40
Idling stability (Engine stalls)	When the engine is cold, it stalls at idling. (Die out)	11	13A-41
	When the engine becomes hot, it stalls at idling. (Die out)	12	13A-42
	The engine stalls when starting the car. (Pass out)	13	13A-43
	The engine stalls when decelerating.	14	13A-43
Driving	Hesitation, sag or stumble	15	13A-44
	The feeling of impact or vibration when accelerating	16	13A-44
	The feeling of impact or vibration when decelerating	17	13A-45
	Poor acceleration	18	13A-45
	Surge	19	13A-46
	Knocking	20	13A-46
Dieseling		21	13A-46
Too high CO and HC concentration when idling		22	13A-47

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

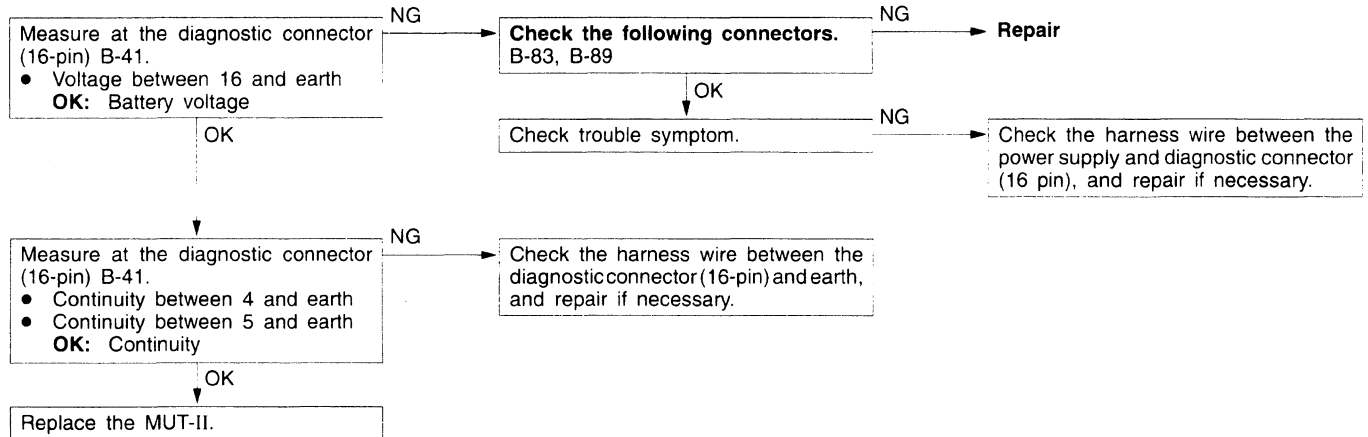
Items		Symptom
Starting	Won't start	The starter is used to crank the engine, but there is no combustion within the cylinders, and the engine won't start.
	Fires up and dies	There is combustion within the cylinders, but then the engine soon stalls.
	Hard starting	Engine starts after cranking a while.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



## INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

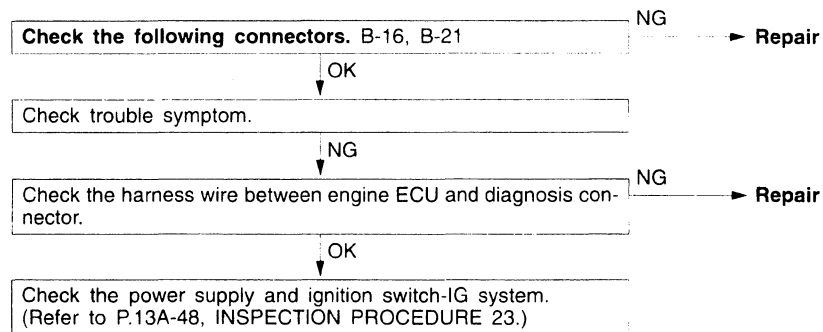
### INSPECTION PROCEDURE 1

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



### INSPECTION PROCEDURE 2

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

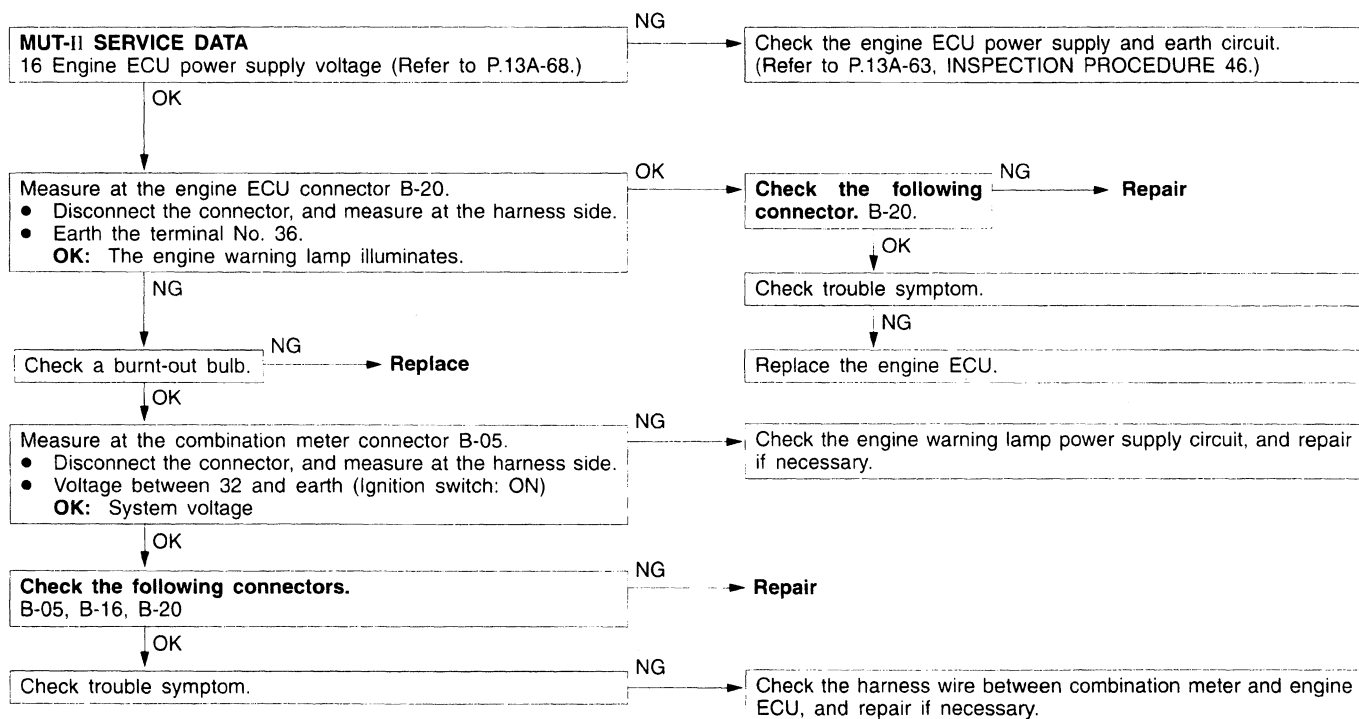


### INSPECTION PROCEDURE 3

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

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

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

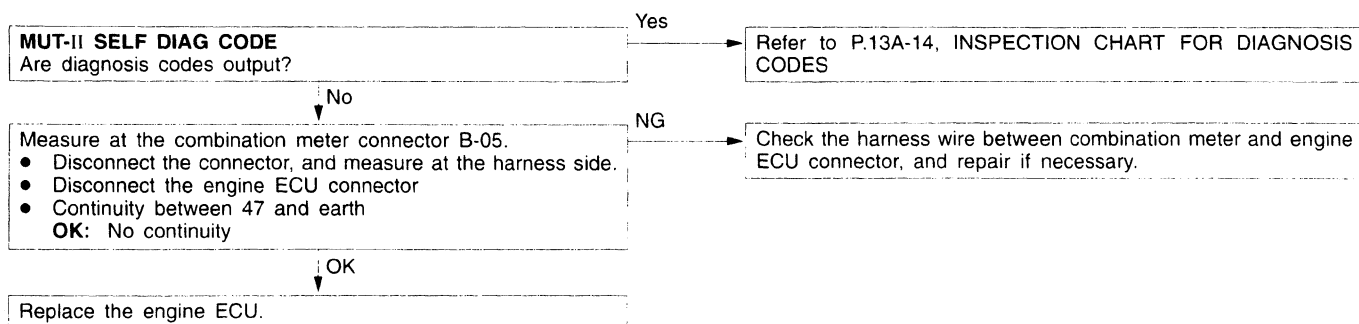


### INSPECTION PROCEDURE 4

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

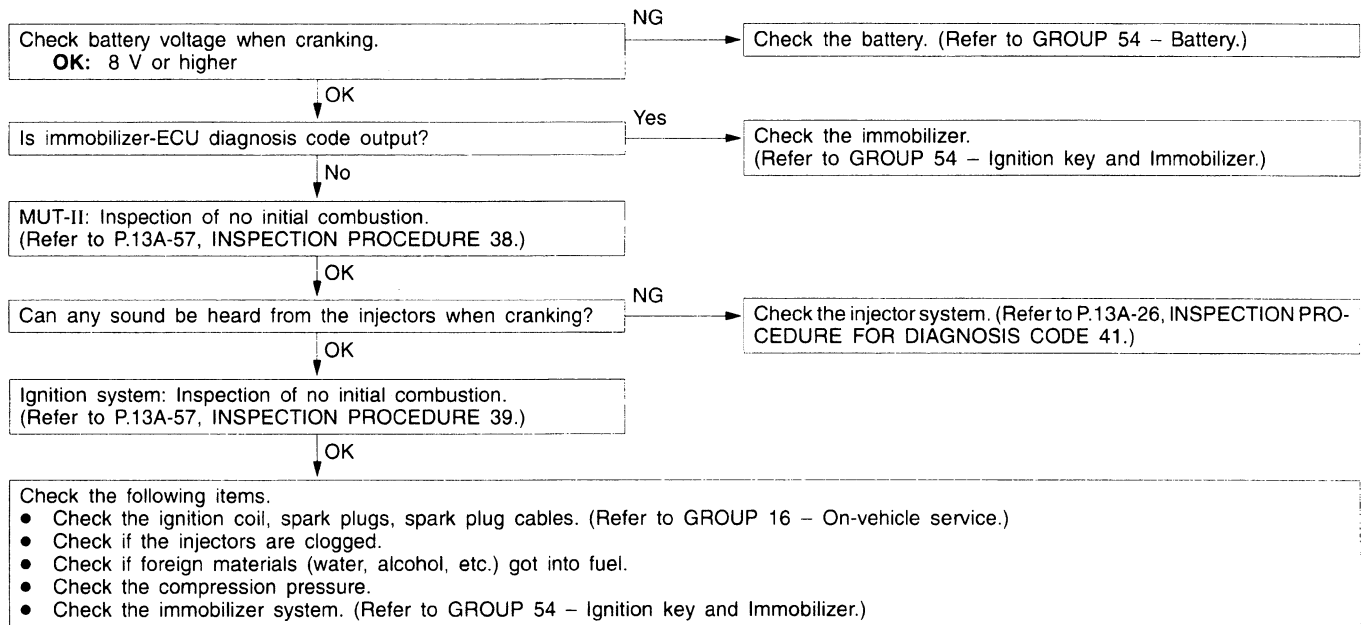
In cases such as the above, the cause is probably that the engine ECU is detecting a problem in a sensor or actuator, or that one of the malfunctions listed at right has occurred.

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



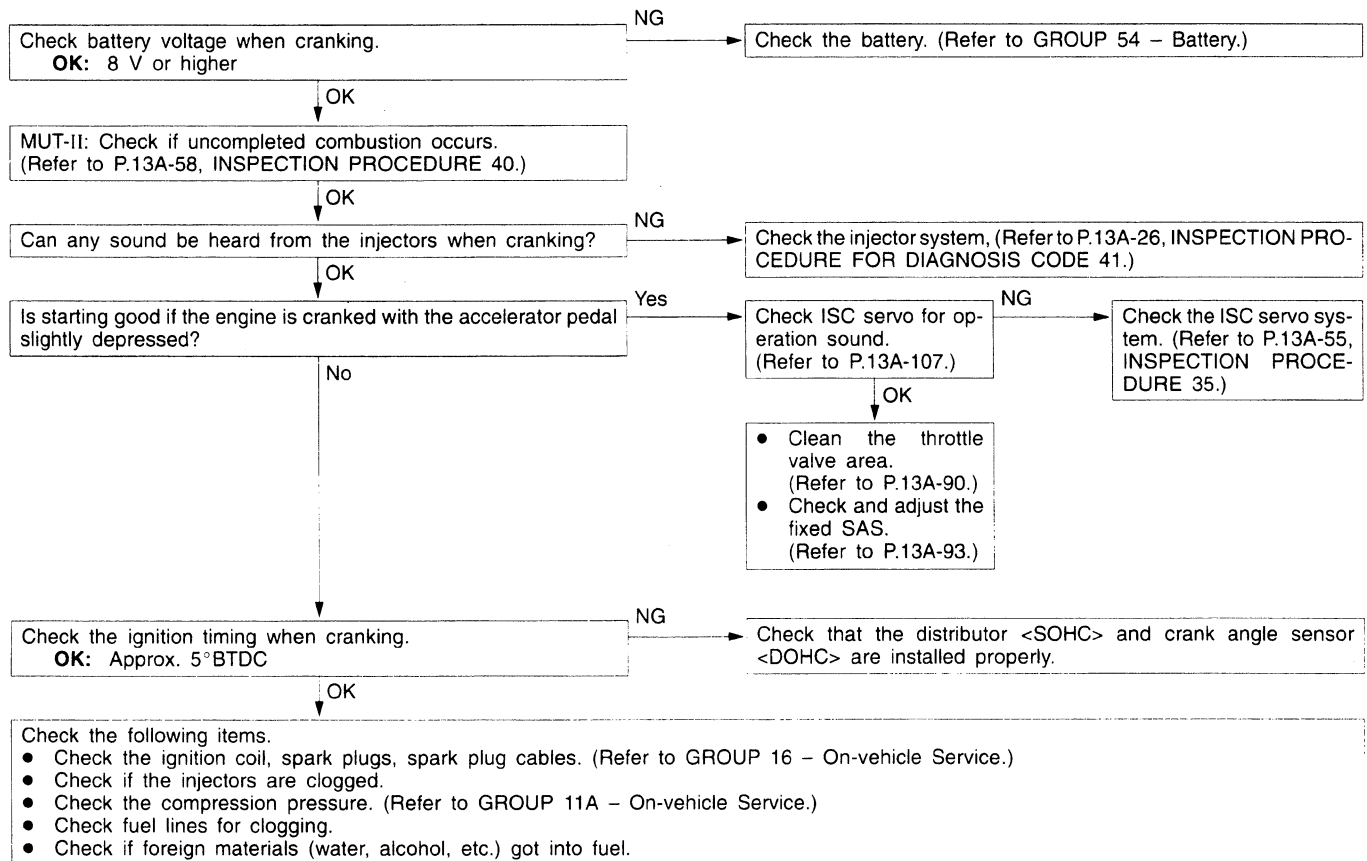
# INSPECTION PROCEDURE 5

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



INSPECTION PROCEDURE 6

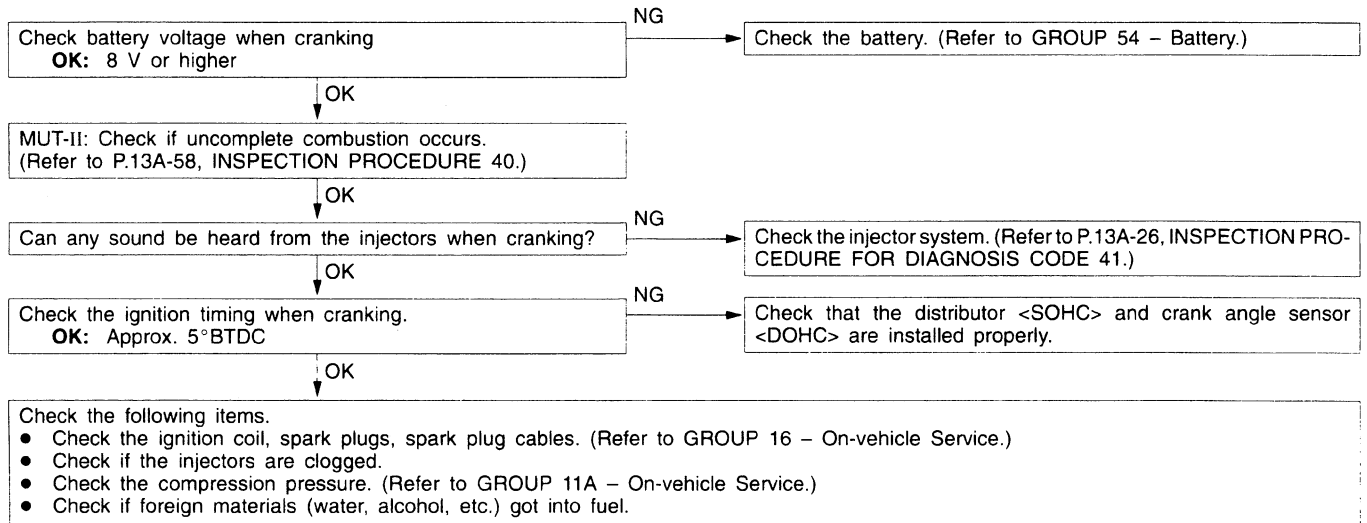
Initial combustion but no complete combustion (starting impossible)	Probable cause
In such cases as the above, the cause is probably that the spark plugs are generating sparks but the sparks are weak, or the initial mixture for starting is not appropriate.	<ul style="list-style-type: none"> <li>• Malfunction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





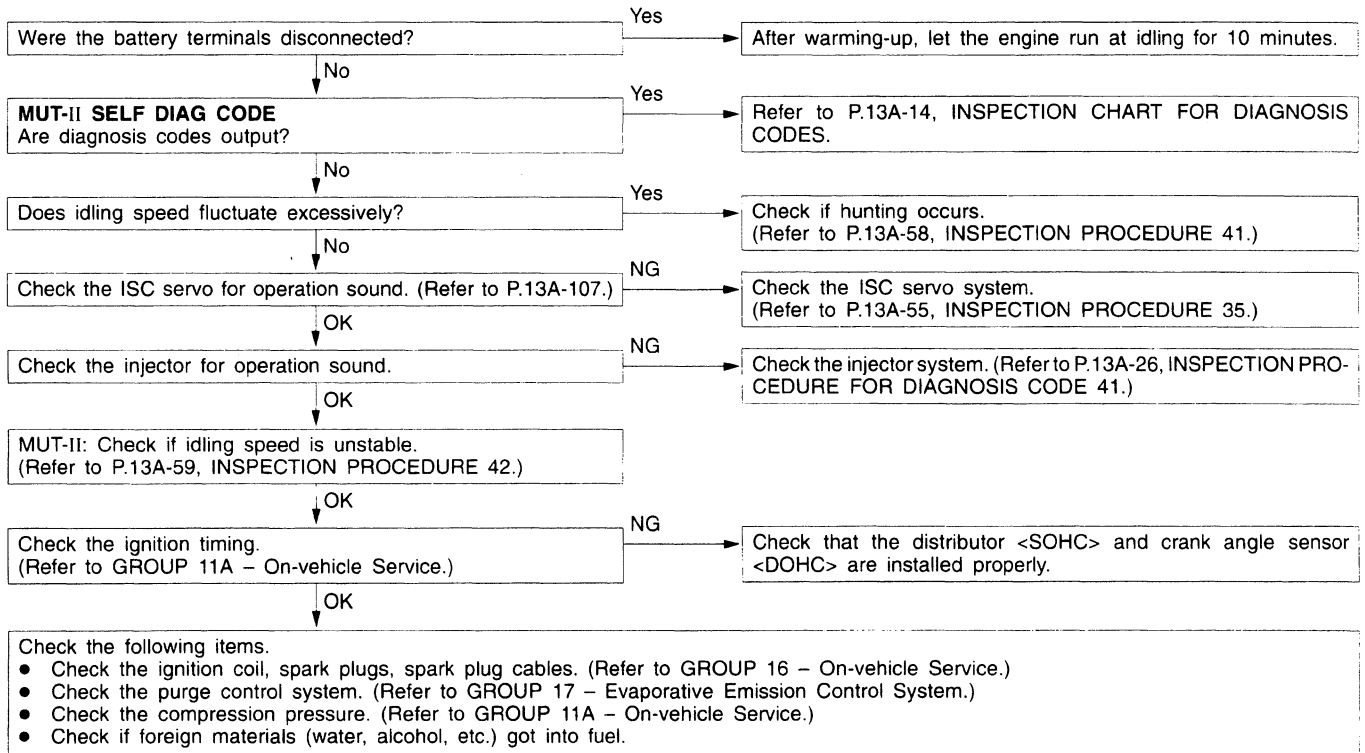
# INSPECTION PROCEDURE 7

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



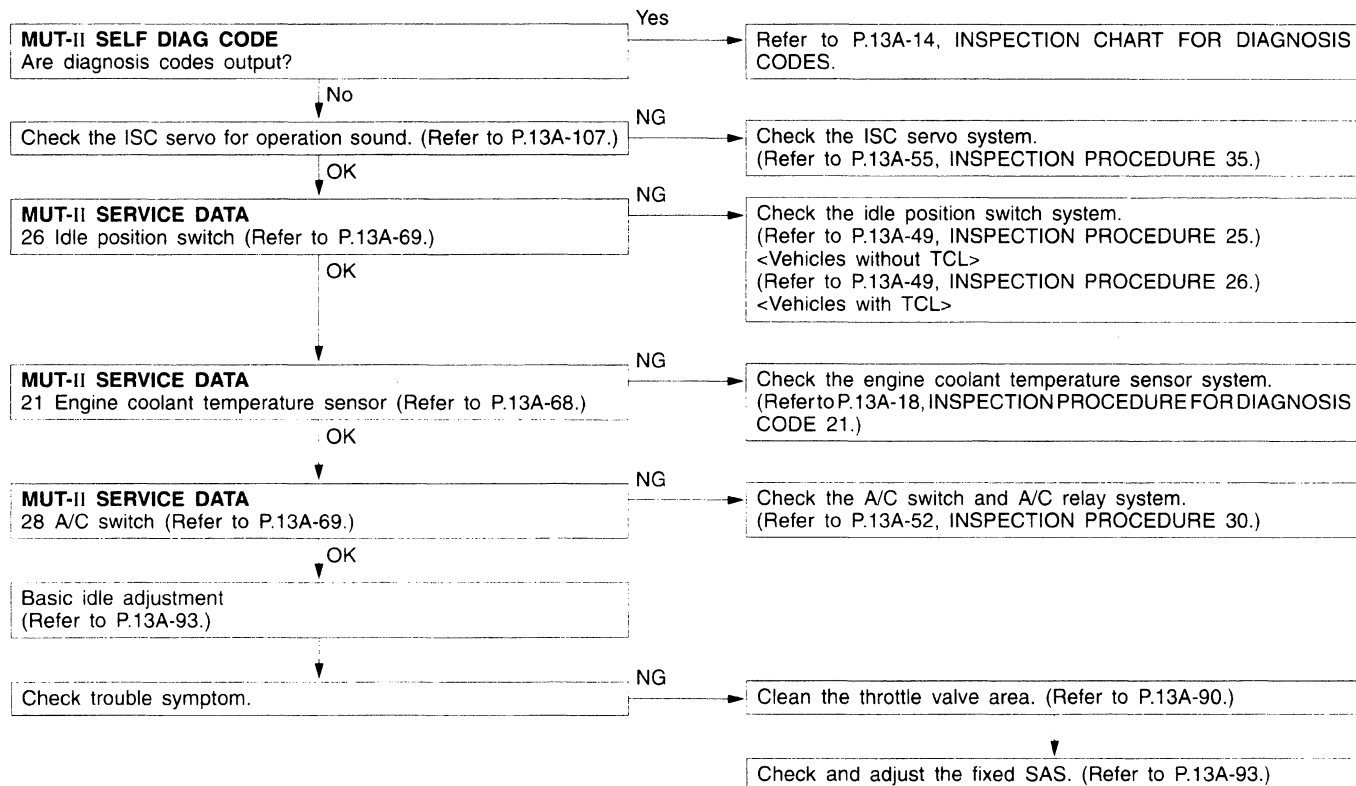
INSPECTION PROCEDURE 8

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



# INSPECTION PROCEDURE 9

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

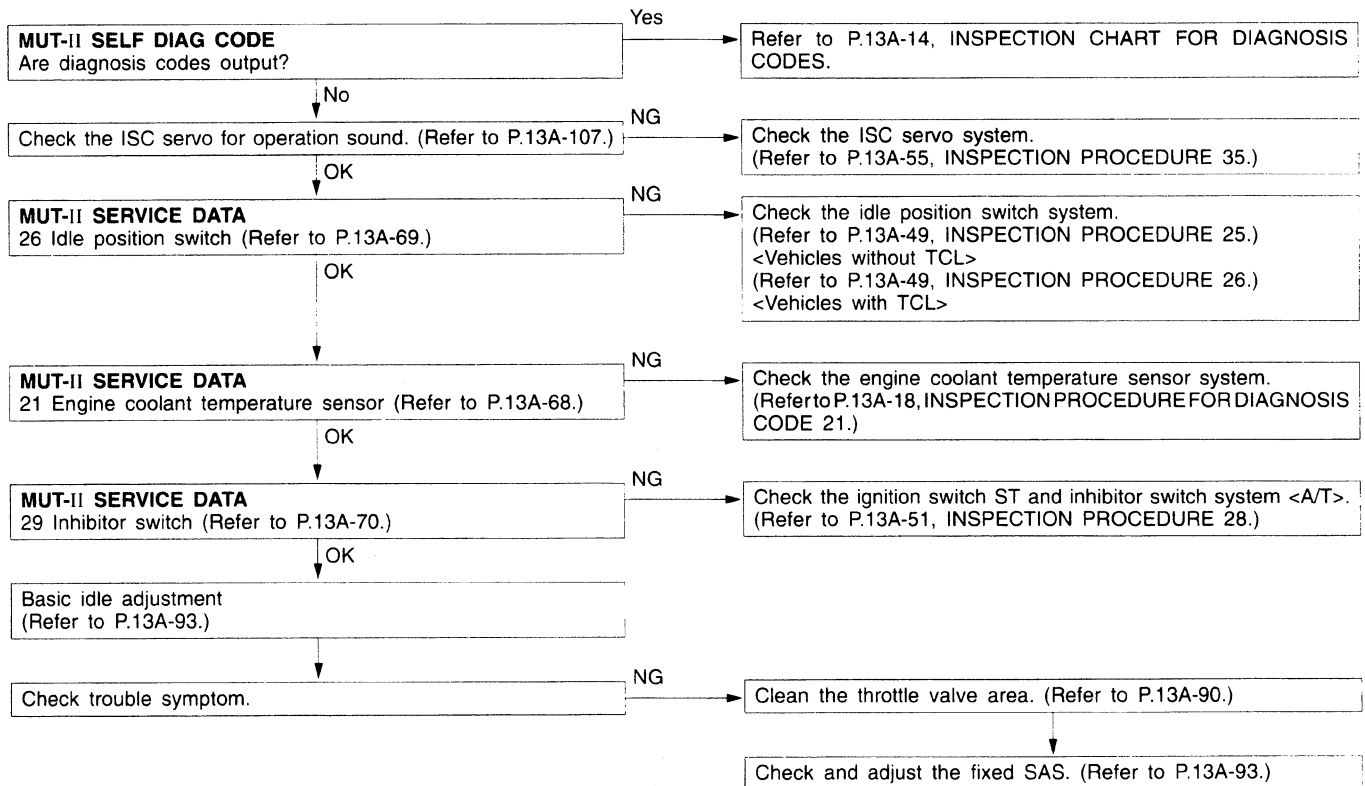


13A-40

MPI – Troubleshooting

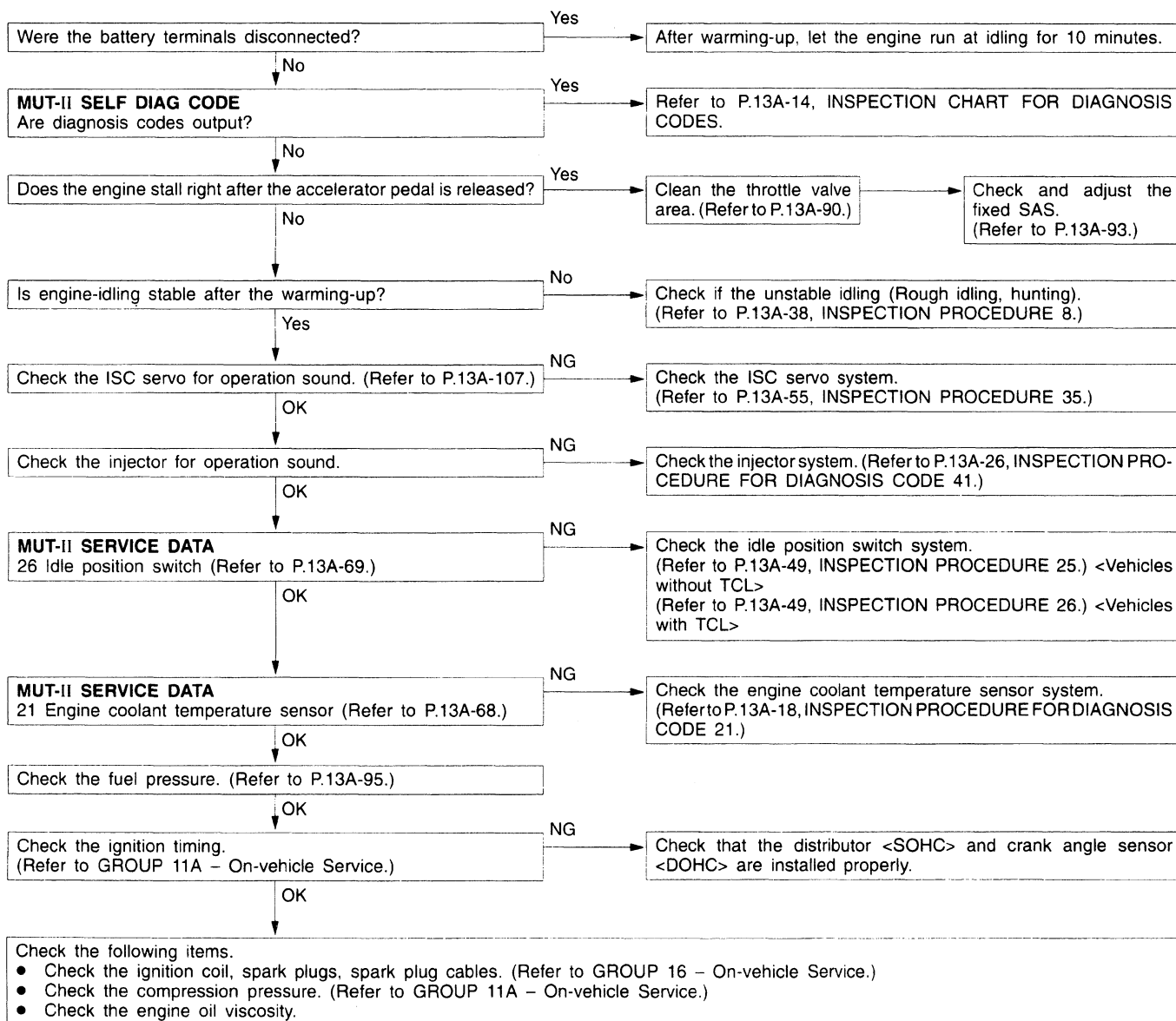
INSPECTION PROCEDURE 10

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

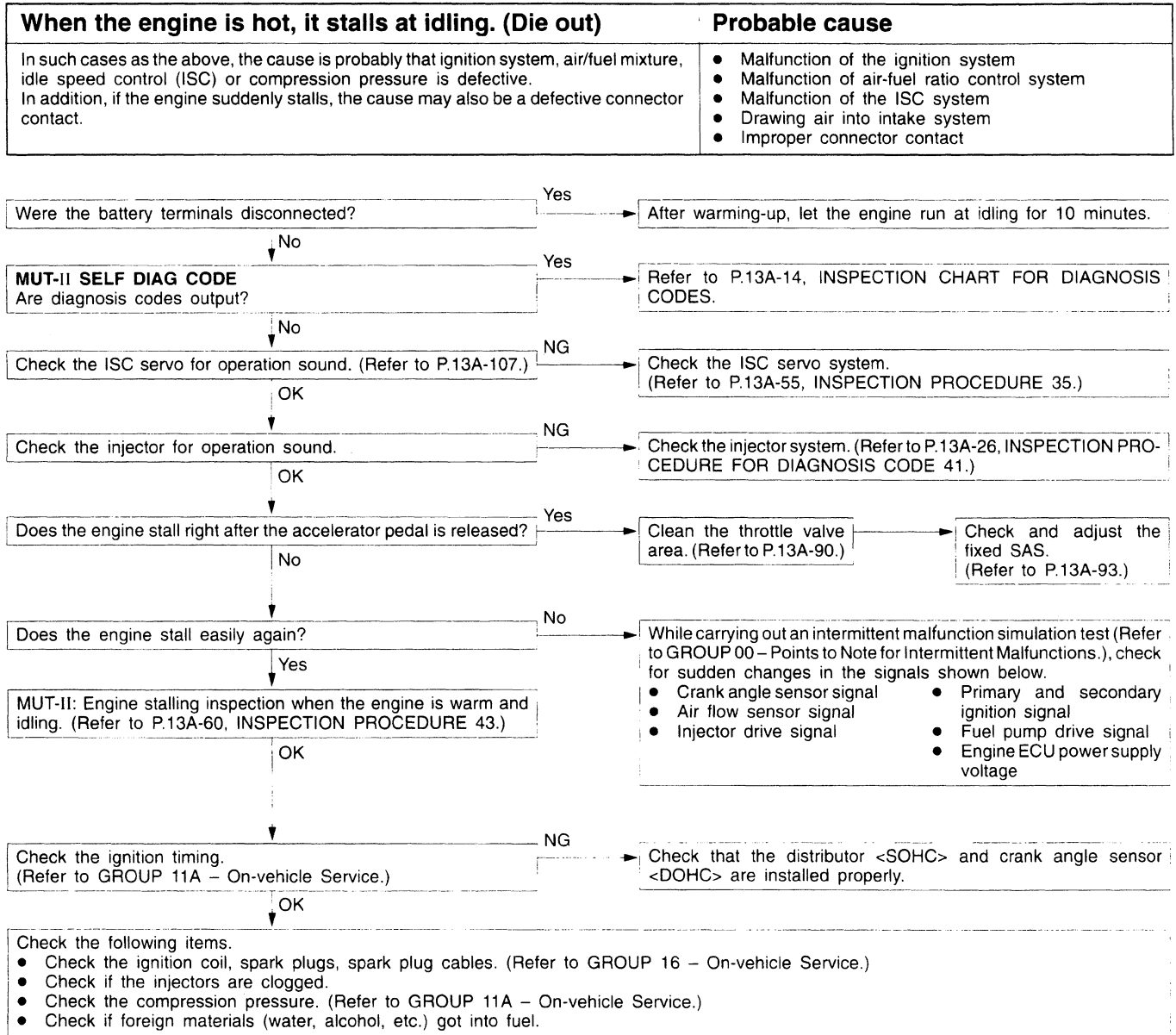


## INSPECTION PROCEDURE 11

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

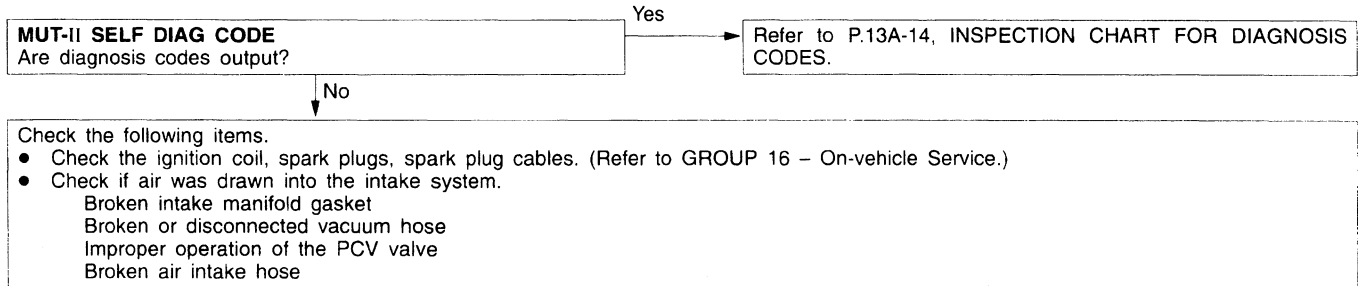


INSPECTION PROCEDURE 12



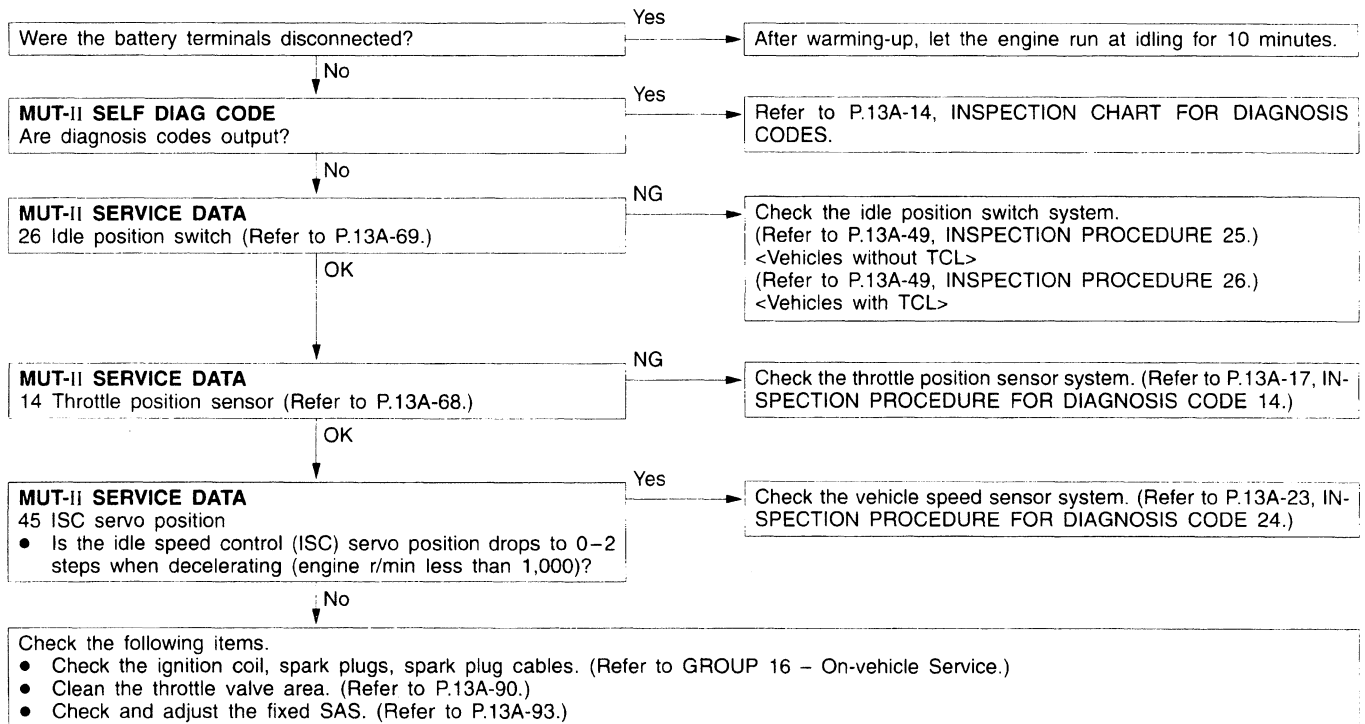
### INSPECTION PROCEDURE 13

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



### INSPECTION PROCEDURE 14

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

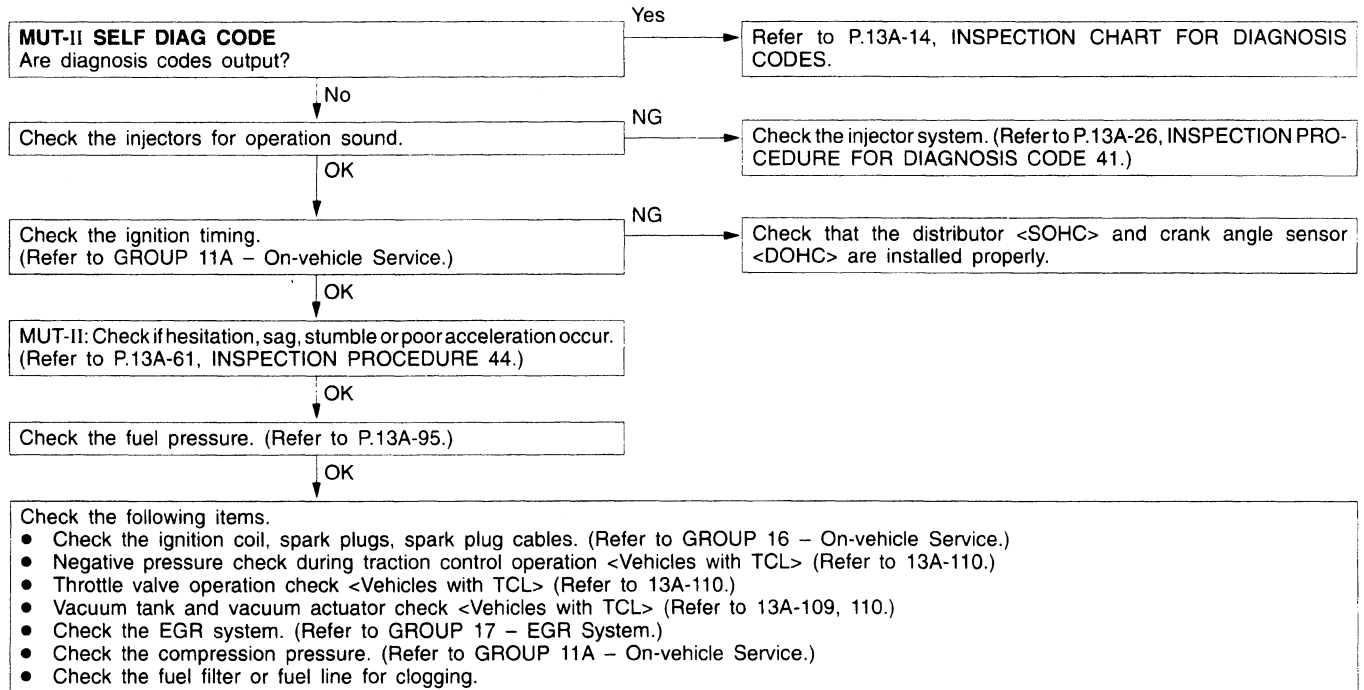


# 13A-44

## MPI – Troubleshooting

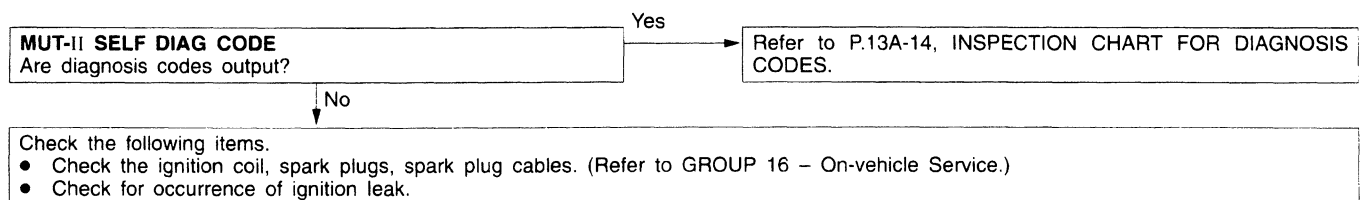
### INSPECTION PROCEDURE 15

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



### INSPECTION PROCEDURE 16

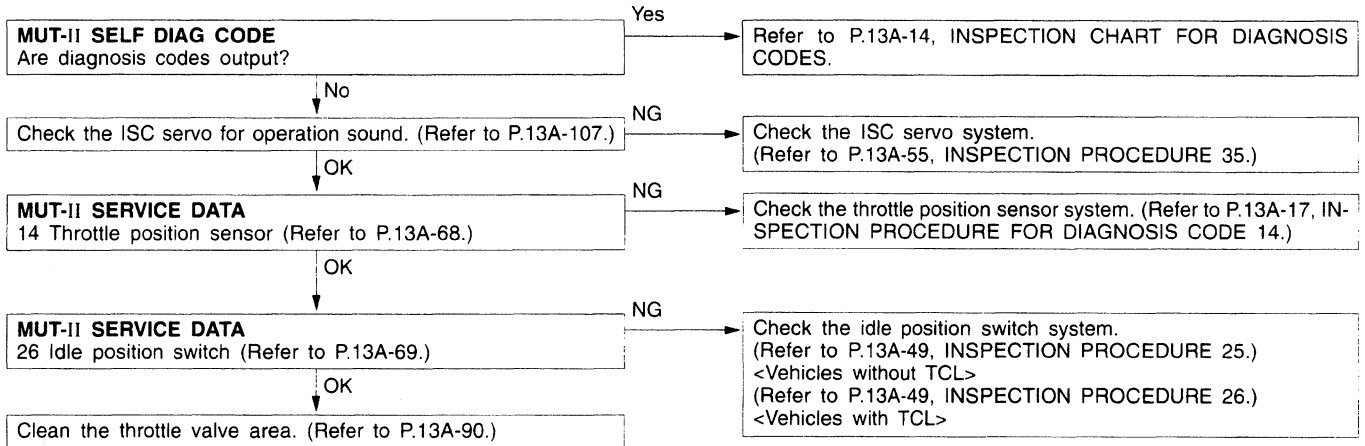
The feeling of impact or vibration when accelerating	Probable cause
In cases such as the above, the cause is probably that there is an ignition leak accompanying the increase in the spark plug demand voltage during acceleration.	<ul style="list-style-type: none"> <li>Malfunction of the ignition system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





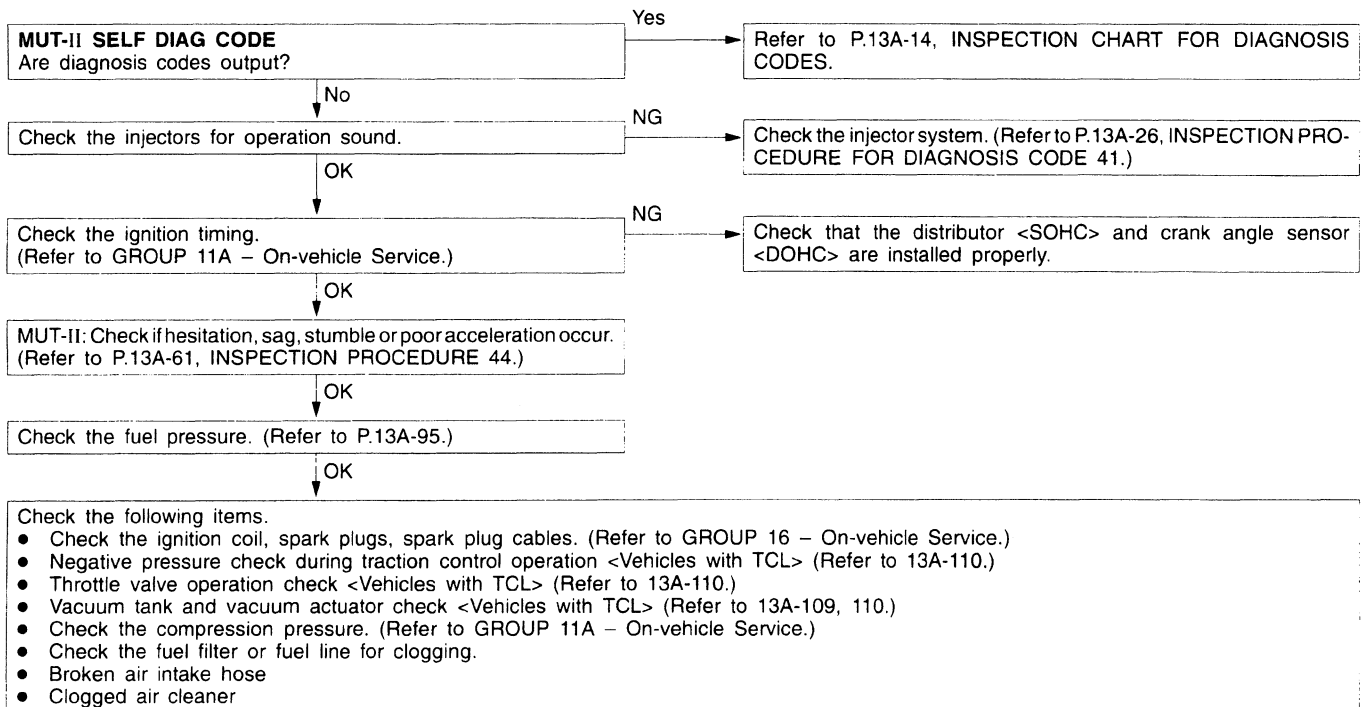
## INSPECTION PROCEDURE 17

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



## INSPECTION PROCEDURE 18

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

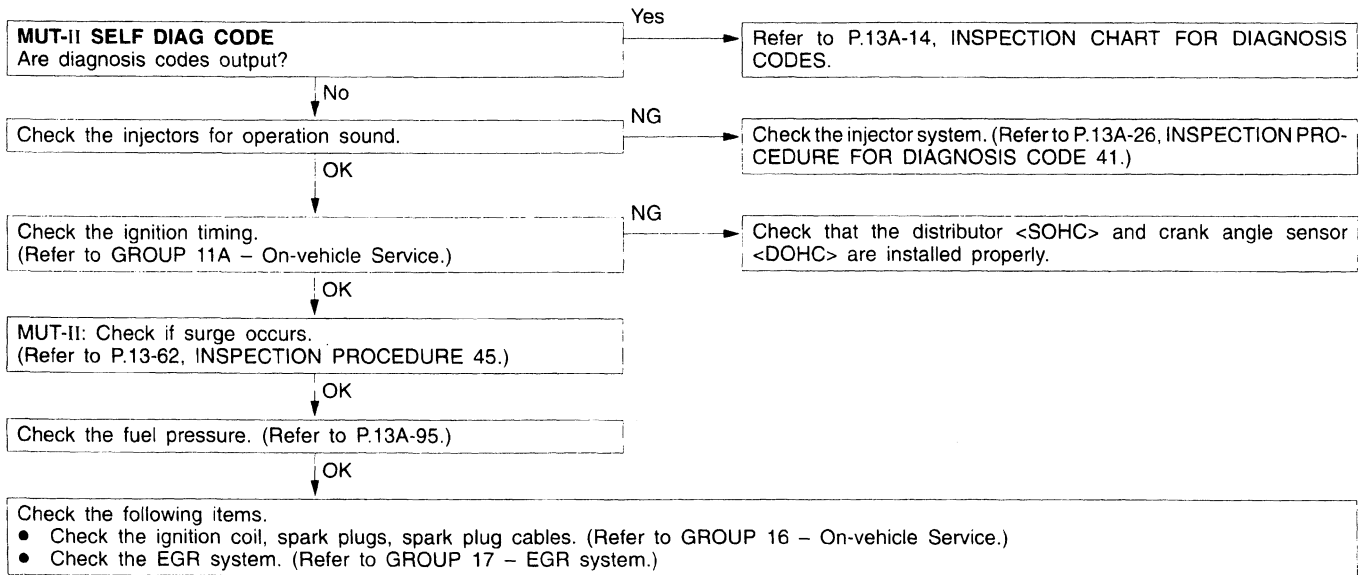


## 13A-46

## MPI – Troubleshooting

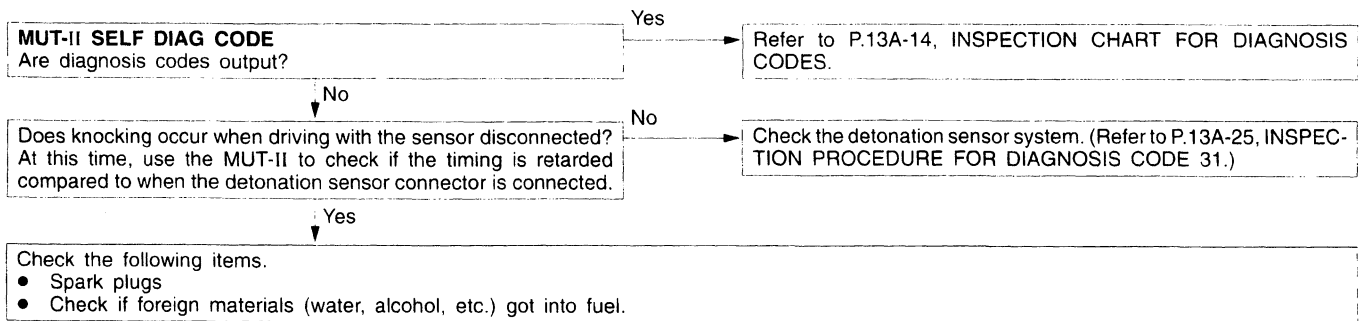
### INSPECTION PROCEDURE 19

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



### INSPECTION PROCEDURE 20

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



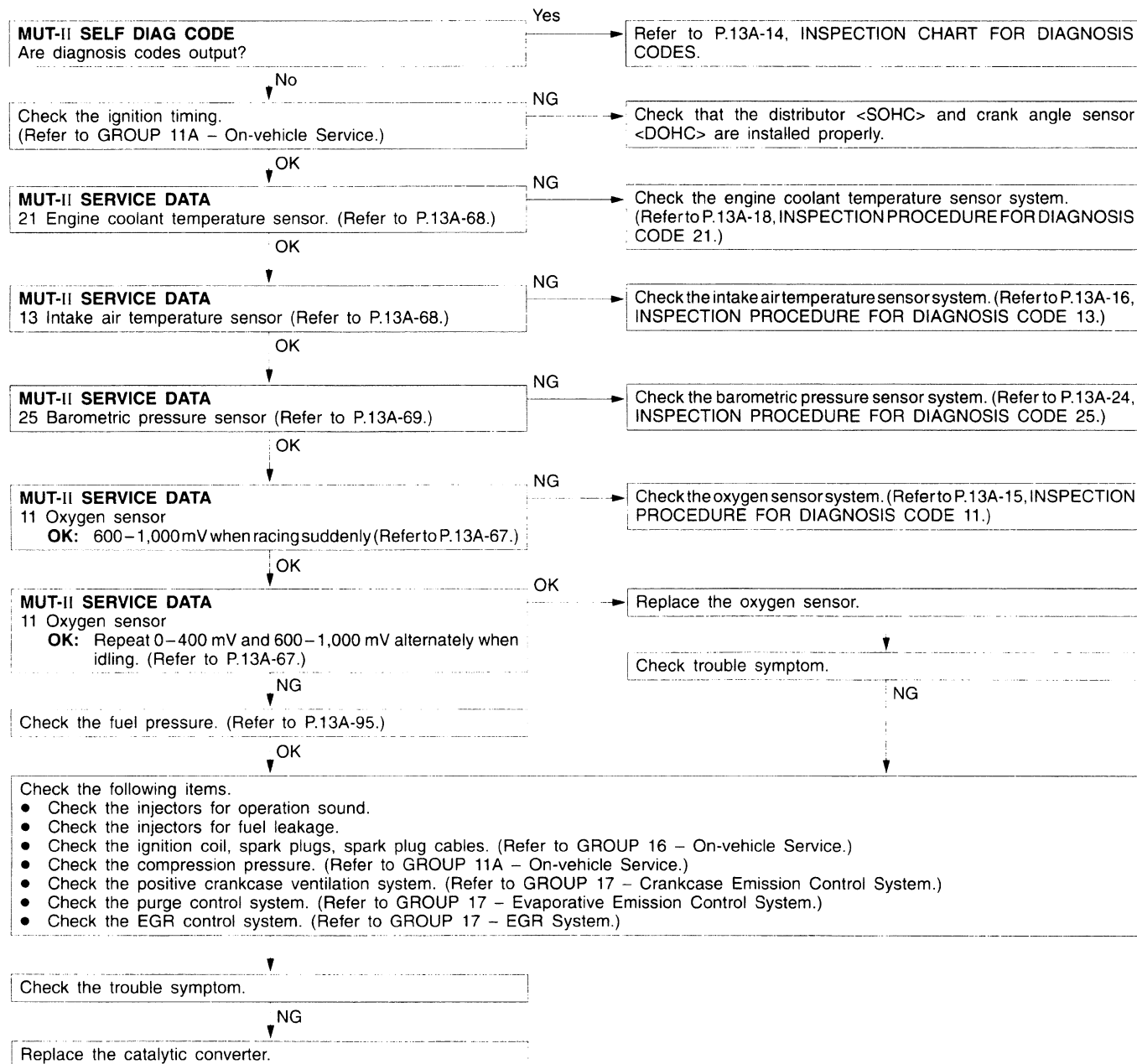
### INSPECTION PROCEDURE 21

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

Check the injectors for fuel leakage.

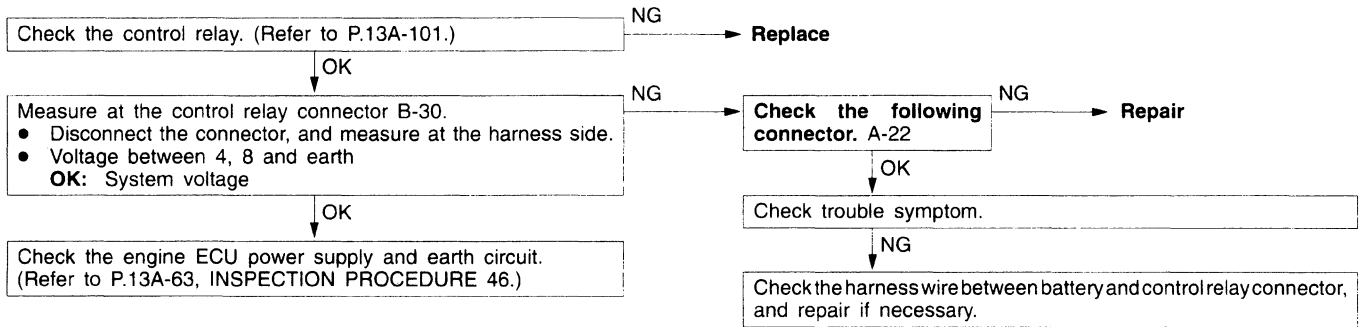
## INSPECTION PROCEDURE 22

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



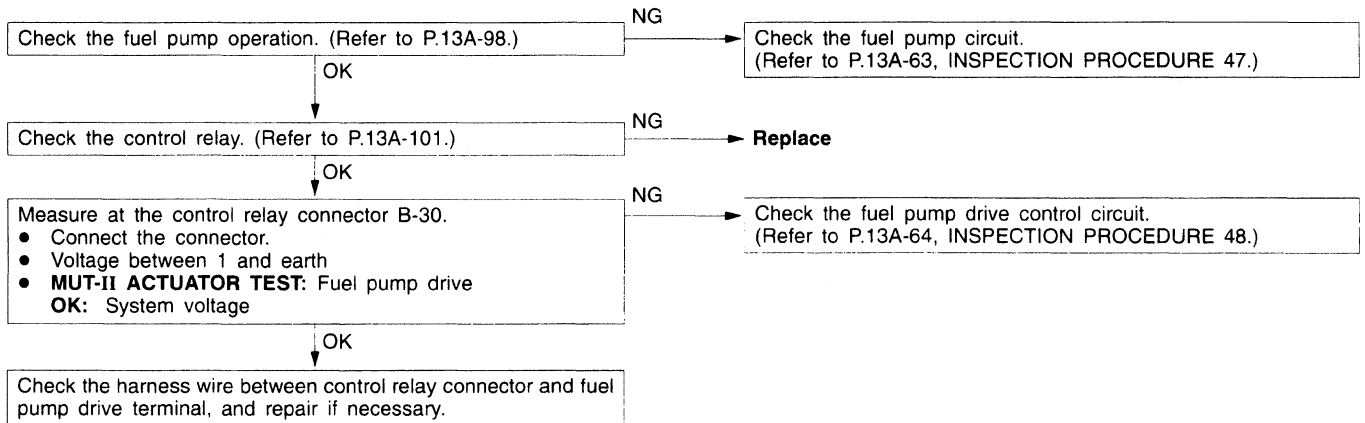
### INSPECTION PROCEDURE 23

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



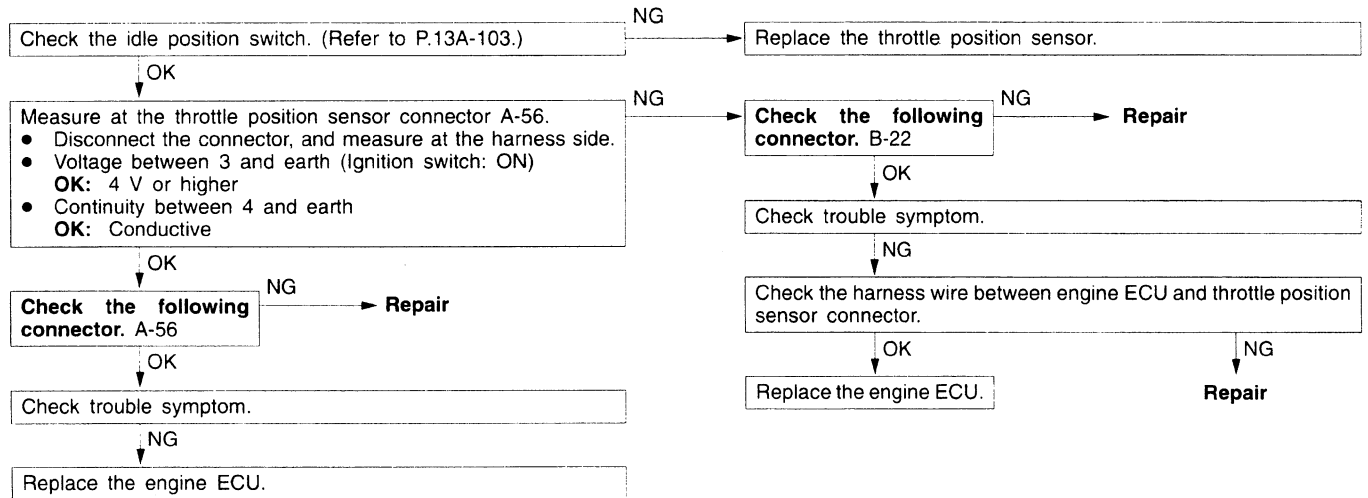
### INSPECTION PROCEDURE 24

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



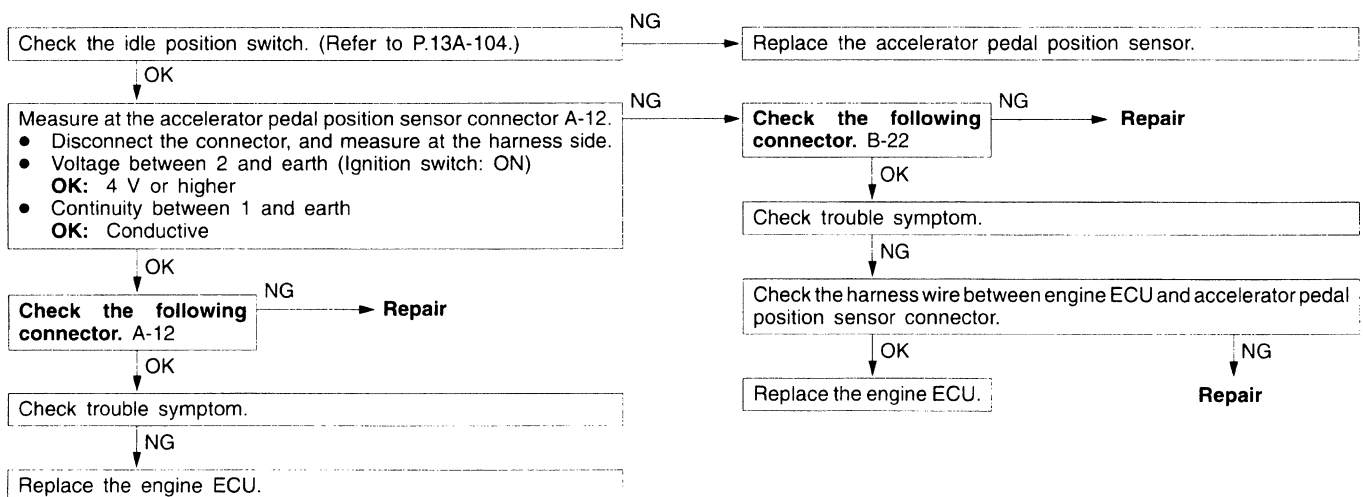
## INSPECTION PROCEDURE 25

Idle position switch system <Vehicles without TCL>	Probable cause
<p>The idle position switch inputs the condition of the accelerator pedal, i.e. whether it is depressed or released (HIGH/LOW), to the engine ECU. The engine ECU controls the idle speed control servo based on this input.</p>	<ul style="list-style-type: none"> <li>• Maladjustment of the accelerator pedal</li> <li>• Maladjustment of the fixed SAS</li> <li>• Maladjustment of the idle position switch and throttle position sensor</li> <li>• Improper connector contact, open circuit or short-circuited harness wire</li> <li>• Malfunction of the engine ECU</li> </ul>



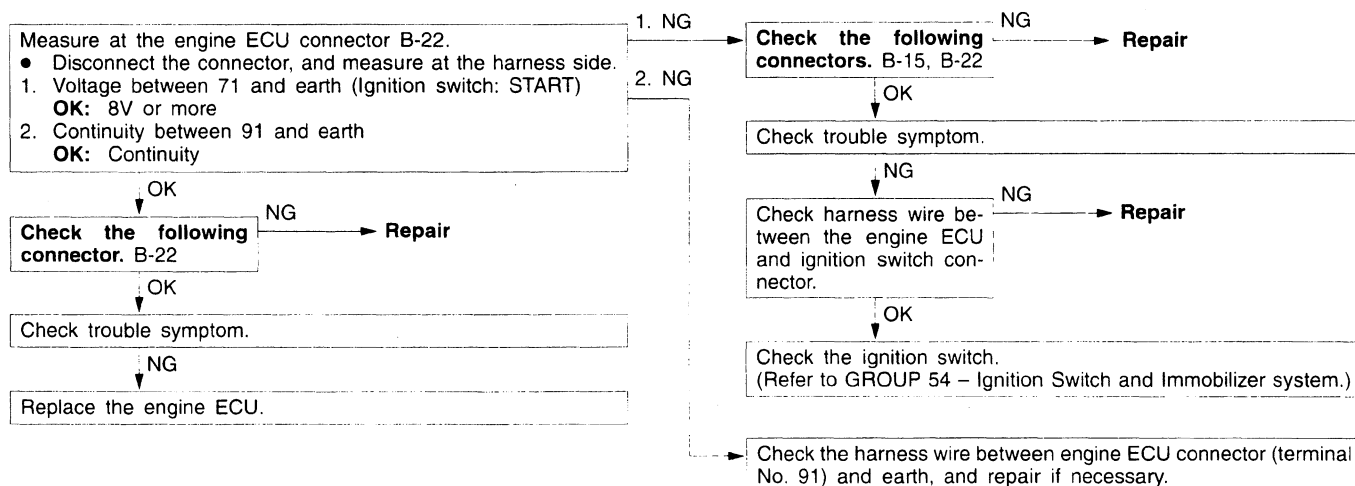
## INSPECTION PROCEDURE 26

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



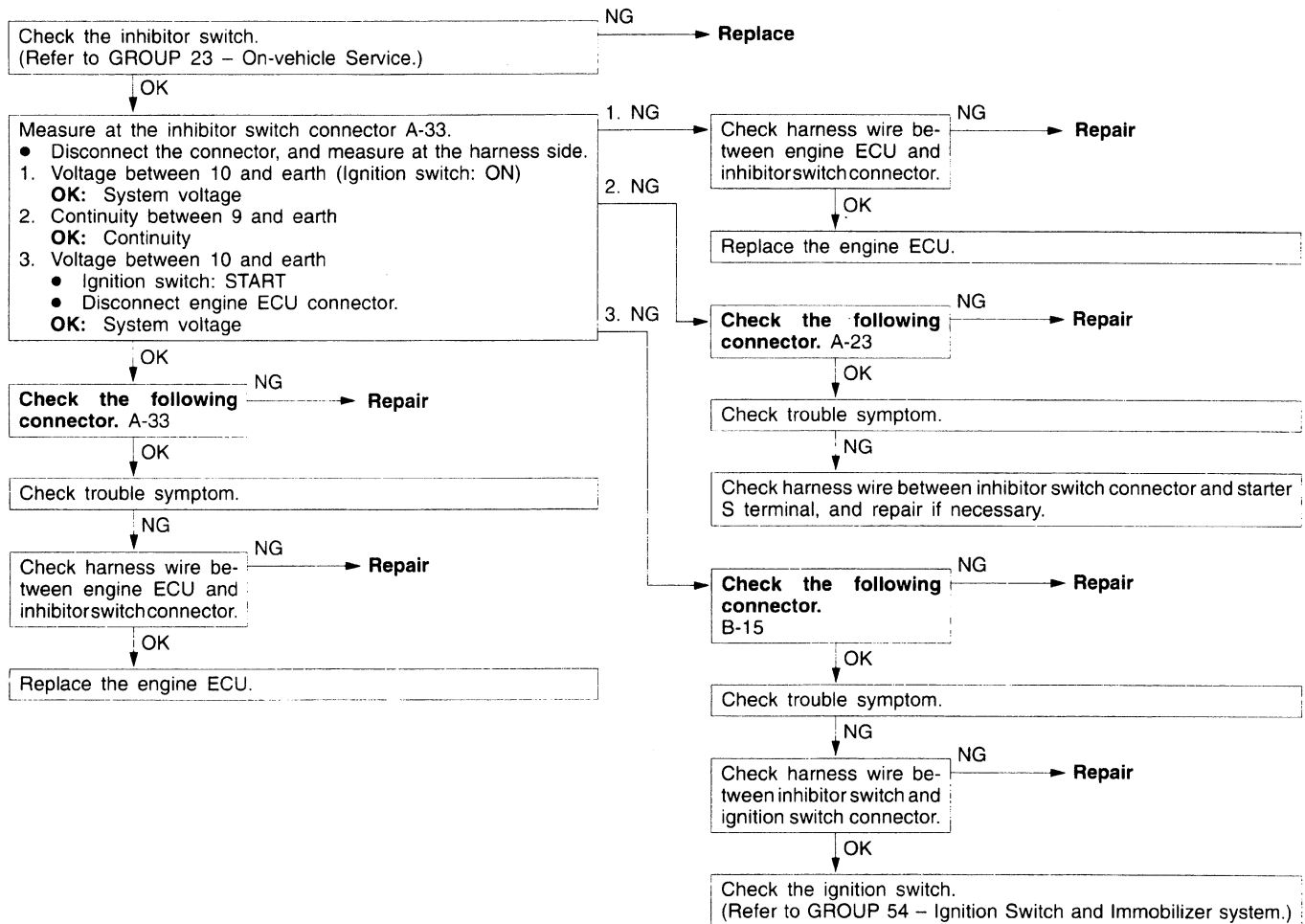
### INSPECTION PROCEDURE 27

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



# INSPECTION PROCEDURE 28

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



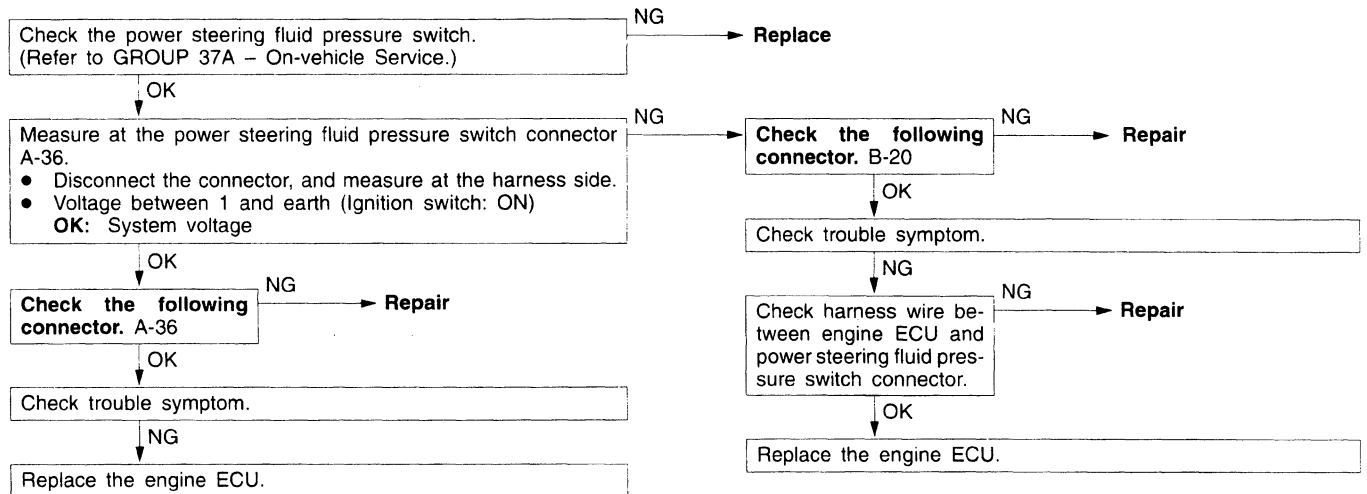


13A-52

MPI – Troubleshooting

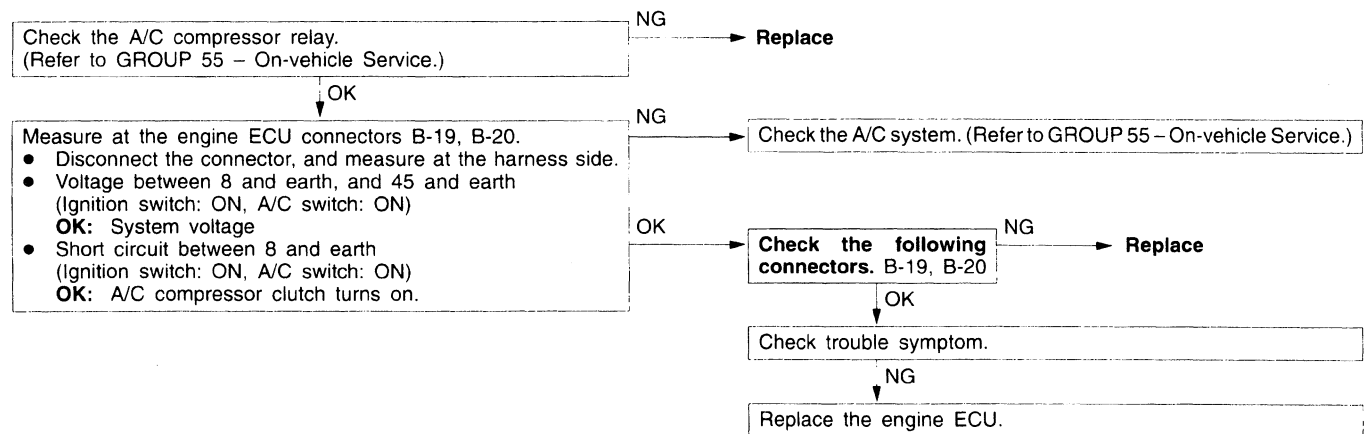
INSPECTION PROCEDURE 29

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



INSPECTION PROCEDURE 30

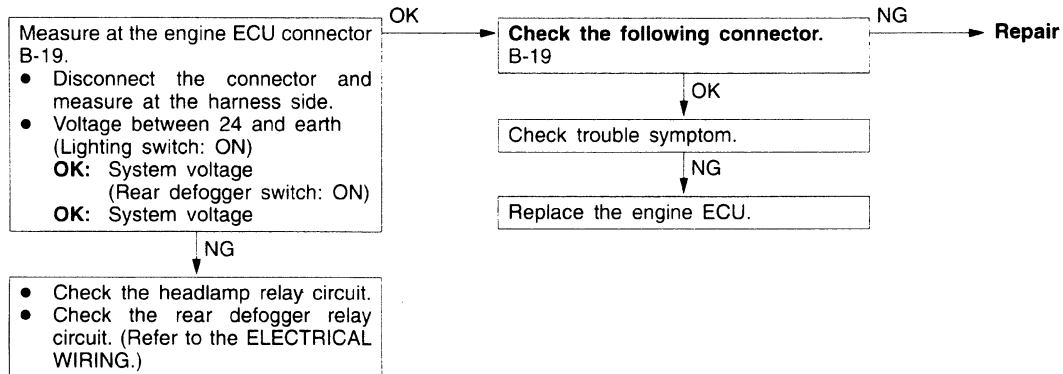
A/C switch and A/C relay system	Probable cause
When an A/C ON signal is input to the engine ECU, the engine ECU carries out control of the idle speed control (ISC) servo, and also operates the A/C compressor magnetic clutch.	<ul style="list-style-type: none"> <li>• Malfunction of A/C control system</li>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





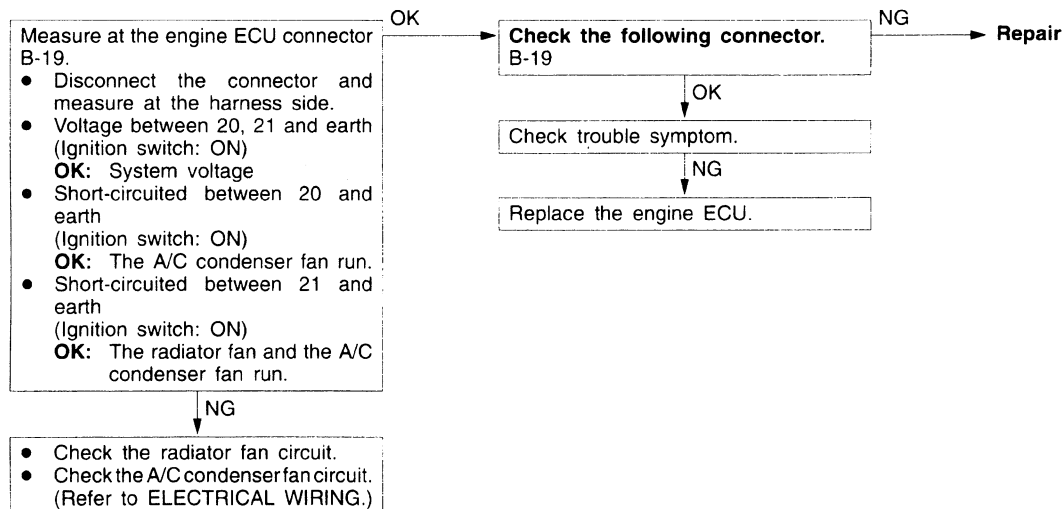
### INSPECTION PROCEDURE 31

Electrical load switch system	Probable cause
The electrical load switch inputs ON/OFF state of the switch of equipment that consumes much power during idling, namely with a large electrical load, to the engine ECU. Based on this signal the engine ECU controls idle speed control servo.	<ul style="list-style-type: none"> <li>Improper connector contact, open circuit or short-circuited harness wire of the headlamp relay</li> <li>Improper connector contact, open circuit or short-circuited harness wire of the rear defogger relay.</li> <li>Malfunction of the engine ECU</li> </ul>



### INSPECTION PROCEDURE 32

Fan motor relay (Radiator fan, A/C condenser fan) system	Probable cause
The fan motor relay is controlled by the power transistor inside the engine ECU turning ON and OFF.	<ul style="list-style-type: none"> <li>Malfunction of the fan motor relay</li> <li>Malfunction of the fan motor</li> <li>Improper connector contact, open circuit or short-circuited harness wire</li> <li>Malfunction of the engine ECU</li> </ul>

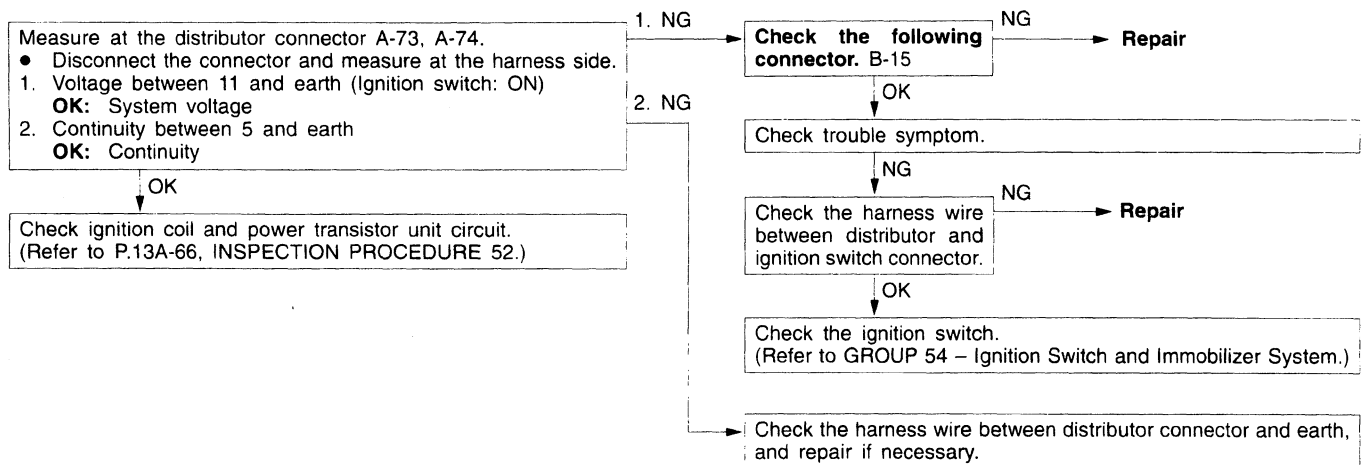


13A-54

MPI – Troubleshooting

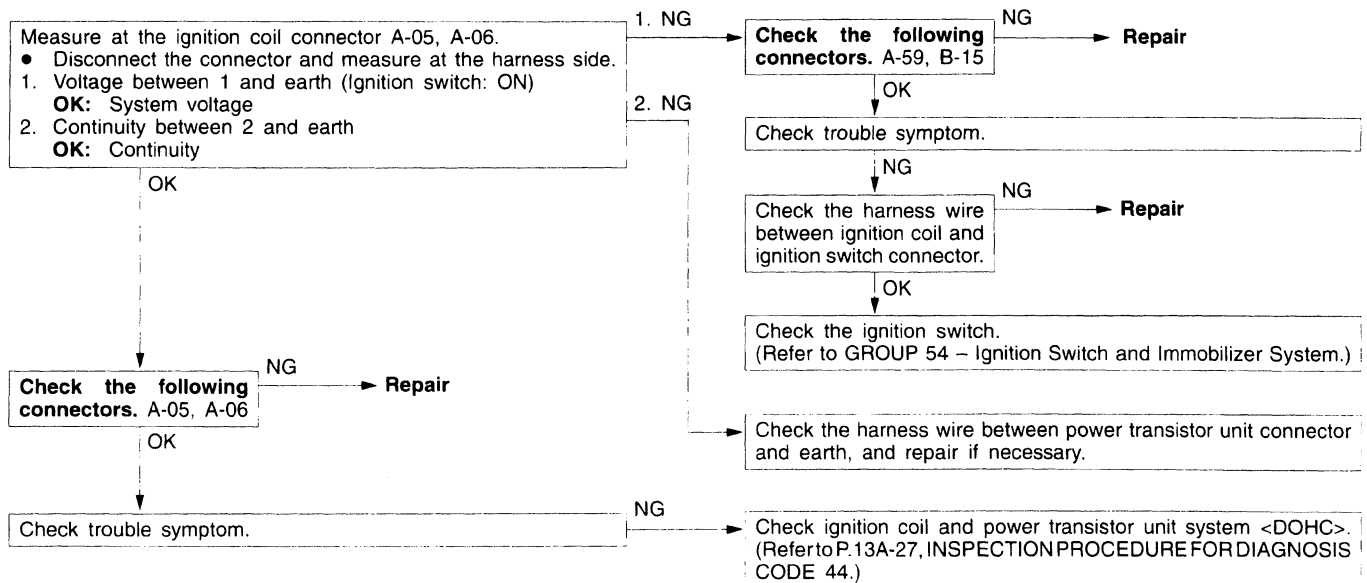
INSPECTION PROCEDURE 33

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



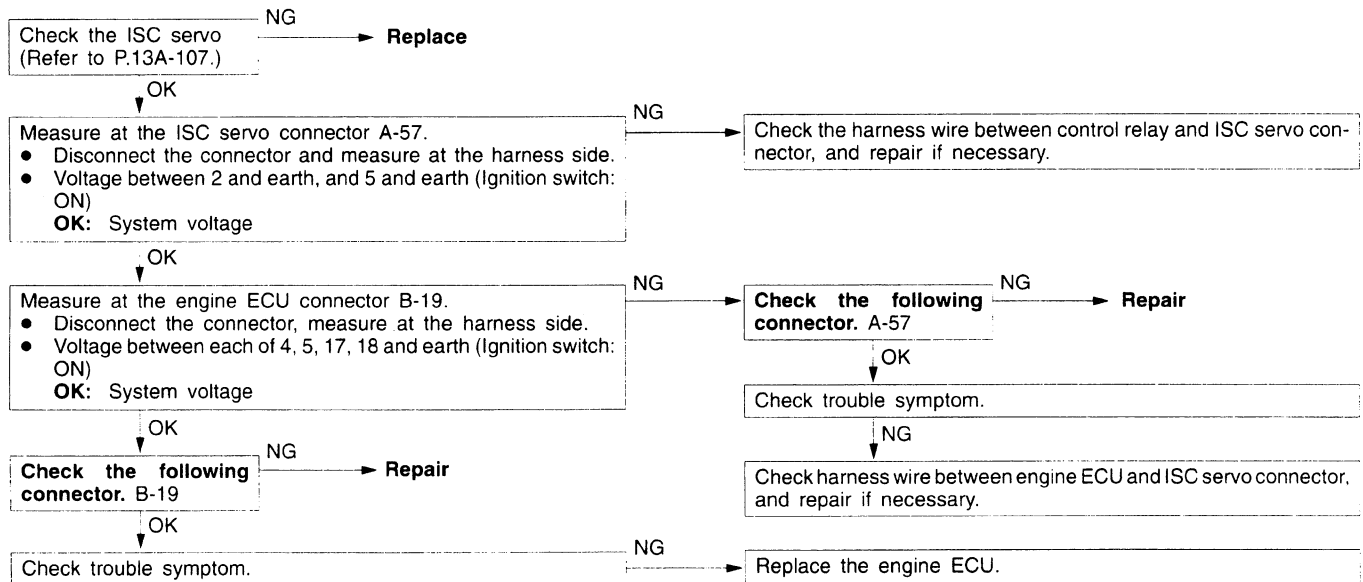
INSPECTION PROCEDURE 34

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



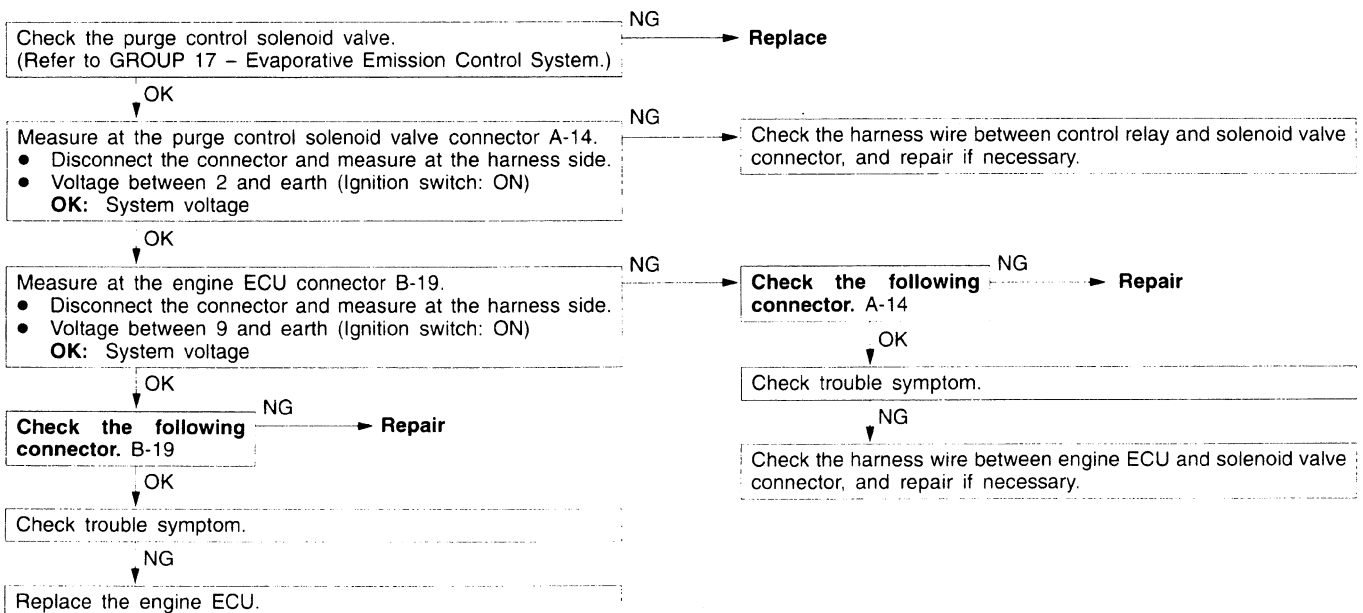
### INSPECTION PROCEDURE 35

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



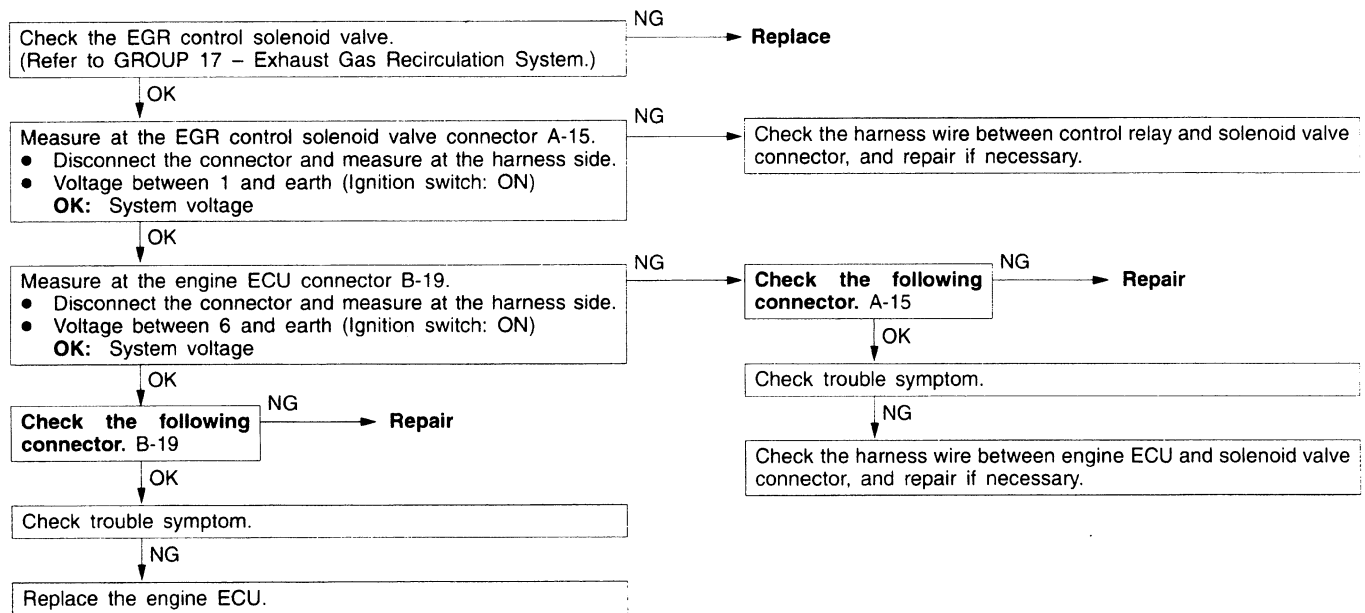
### INSPECTION PROCEDURE 36

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



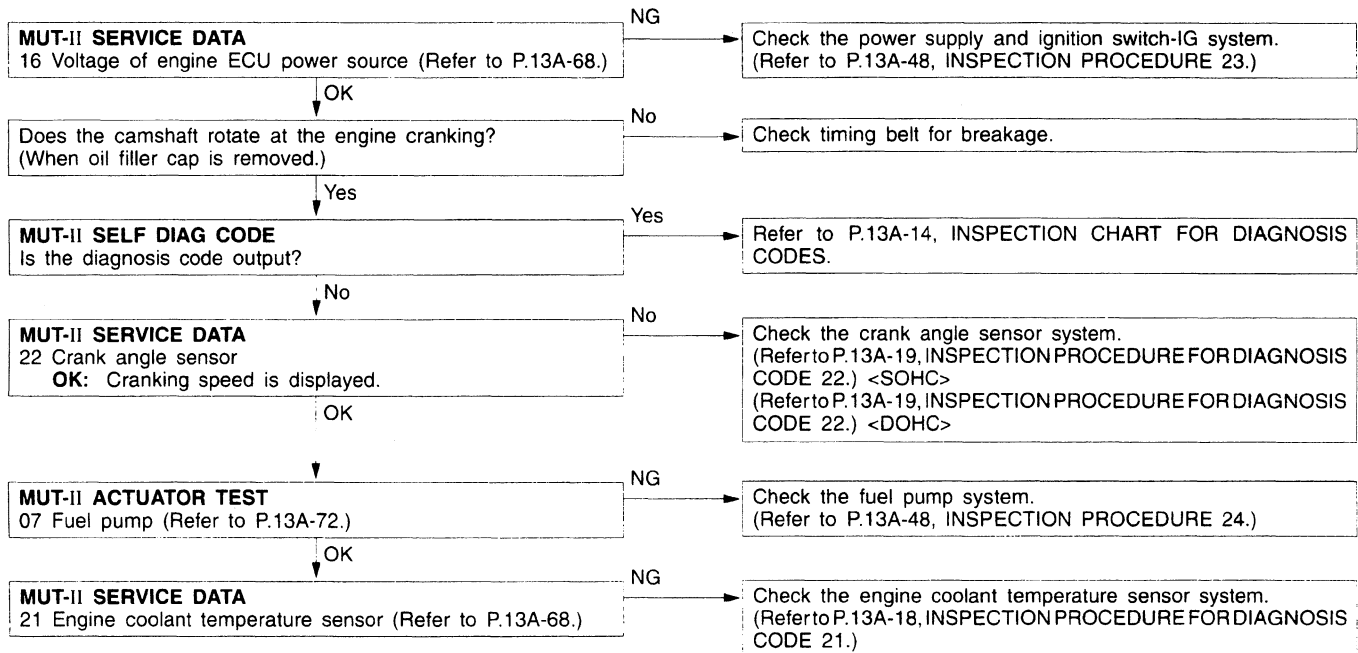
INSPECTION PROCEDURE 37

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



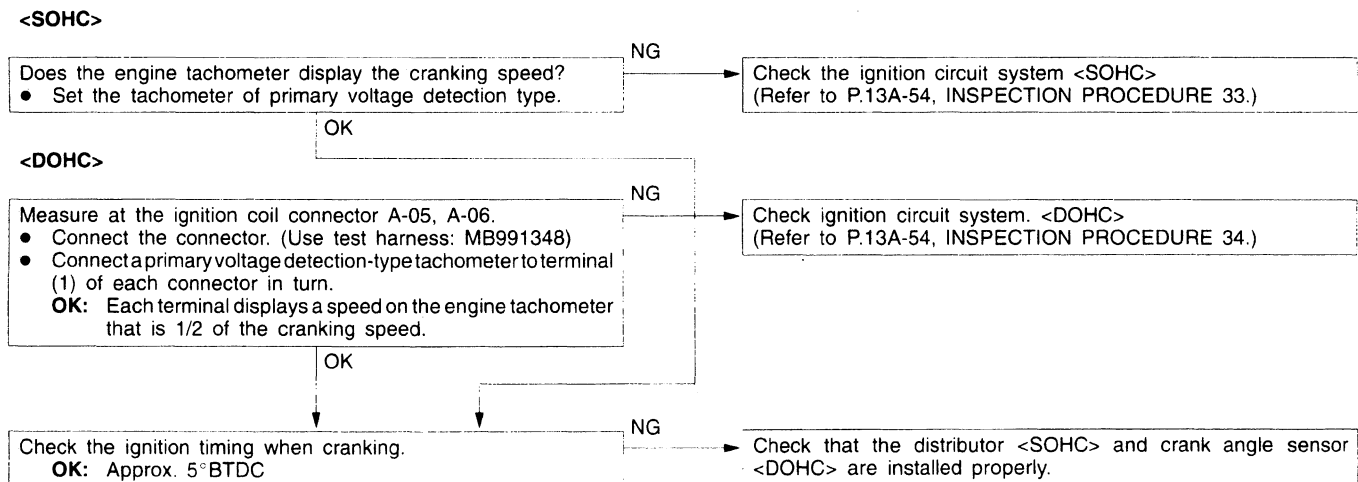
# INSPECTION PROCEDURE 38

## MUT-II: Inspection of no initial combustion



# INSPECTION PROCEDURE 39

## Ignition system: Inspection of no initial combustion.

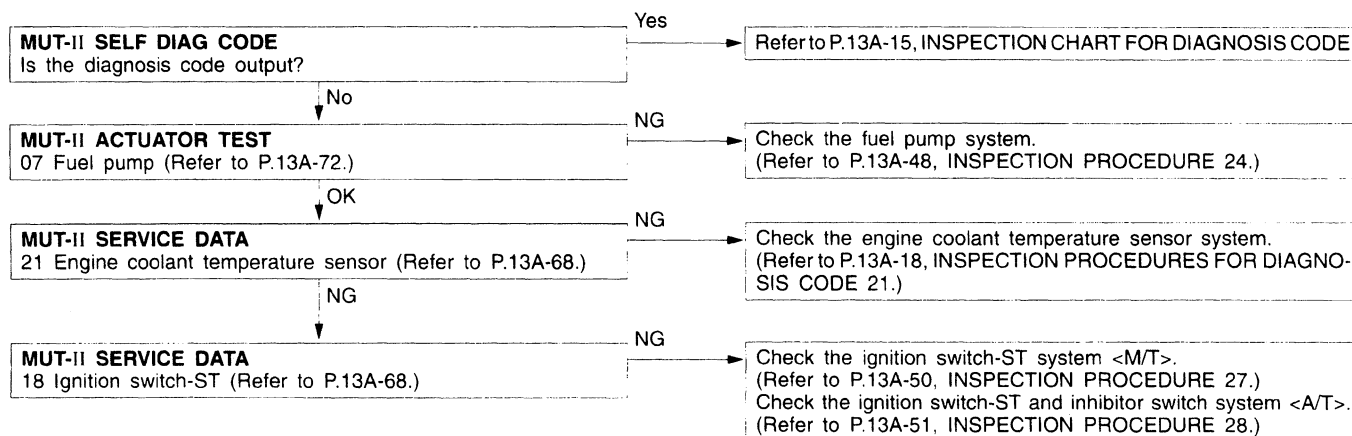


# 13A-58

## MPI – Troubleshooting

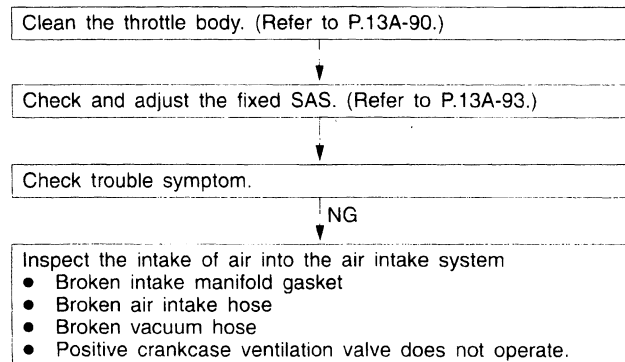
### INSPECTION PROCEDURE 40

#### MUT-II: Check if incomplete combustion occurs.



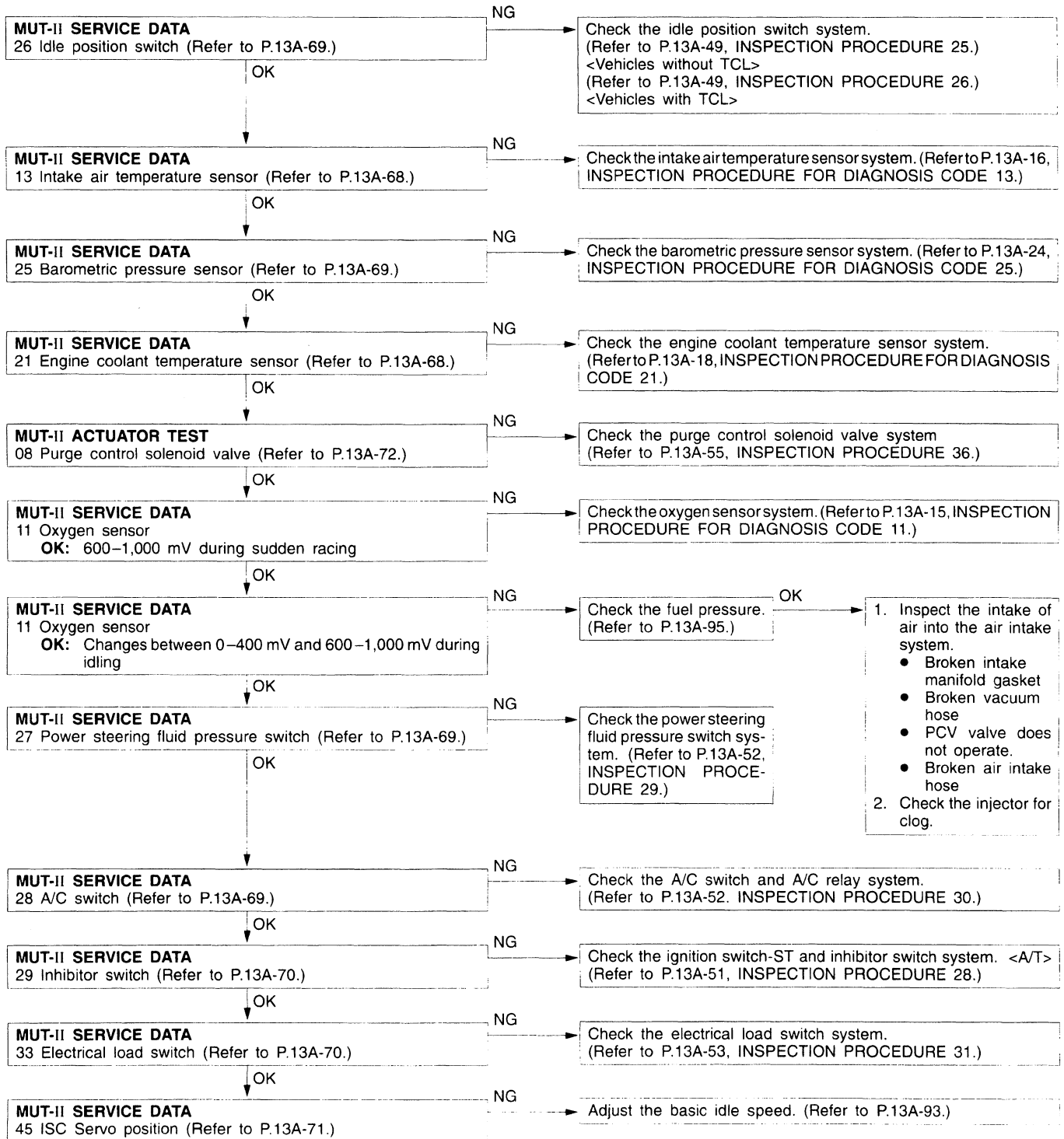
### INSPECTION PROCEDURE 41

#### Check if hunting occurs.



INSPECTION PROCEDURE 42

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



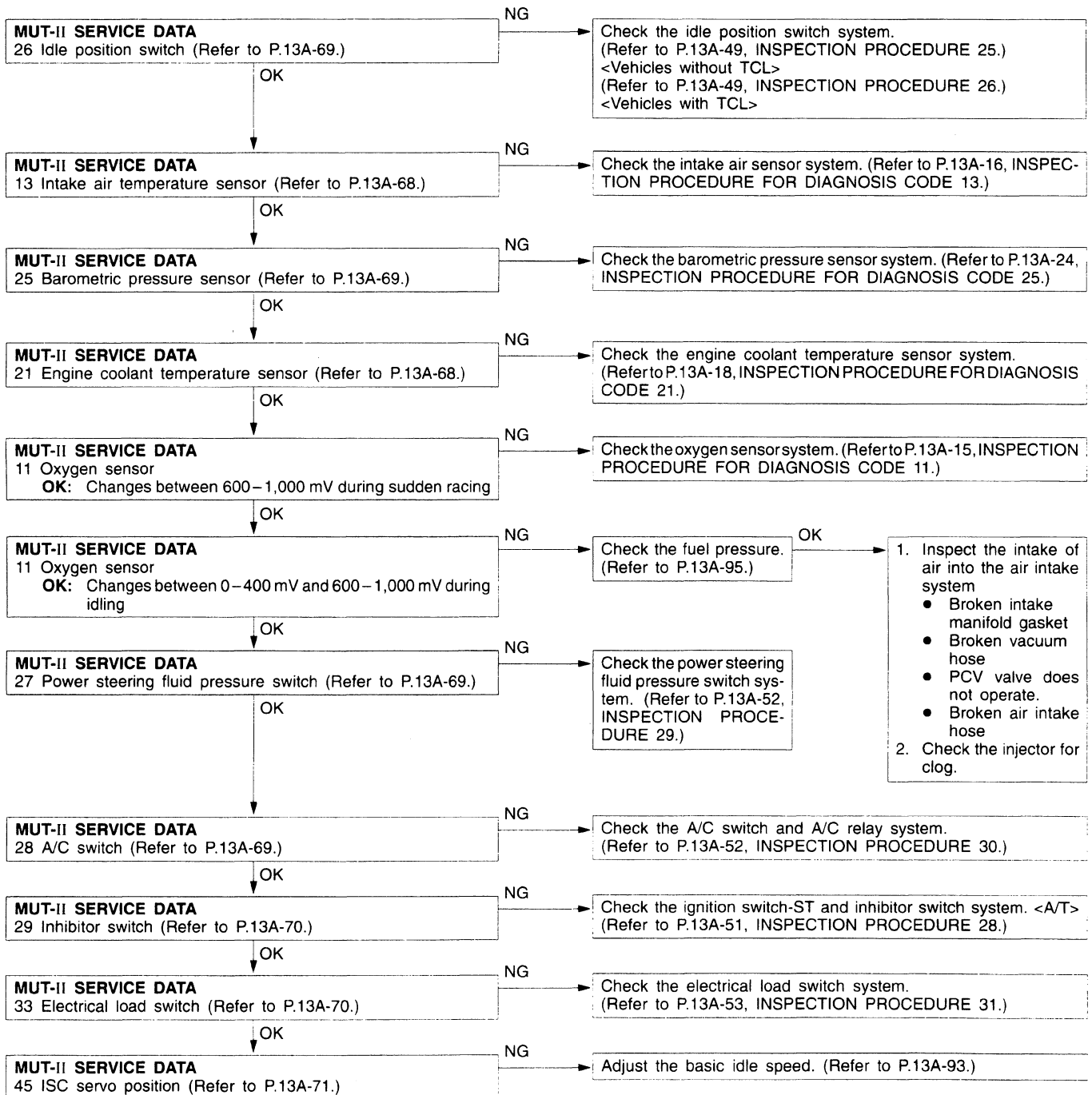


13A-60

MPI – Troubleshooting

INSPECTION PROCEDURE 43

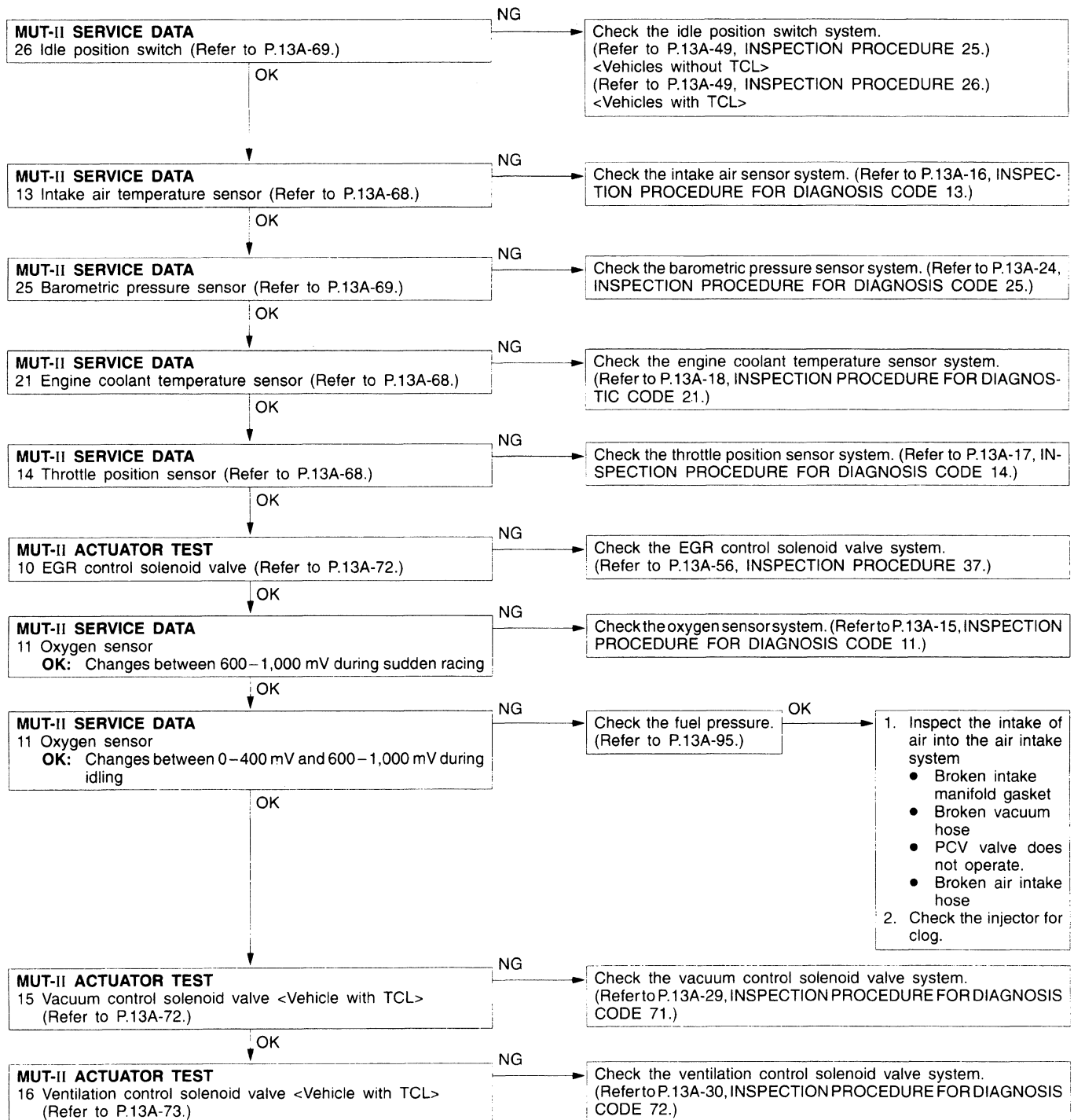
**MUT-II: Engine stalling inspection when the engine is warmed up and idling.**





INSPECTION PROCEDURE 44

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

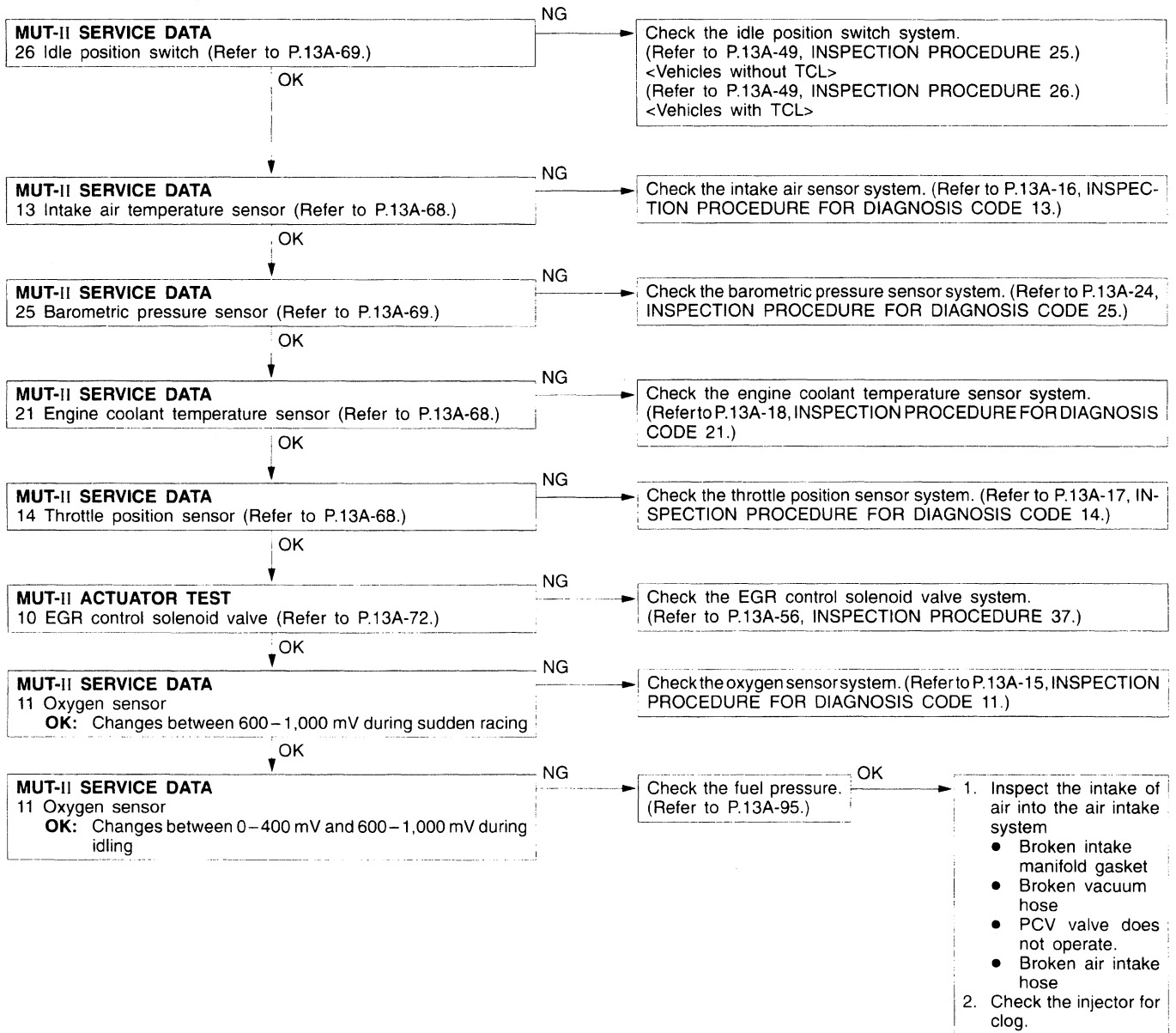


13A-62

MPI – Troubleshooting

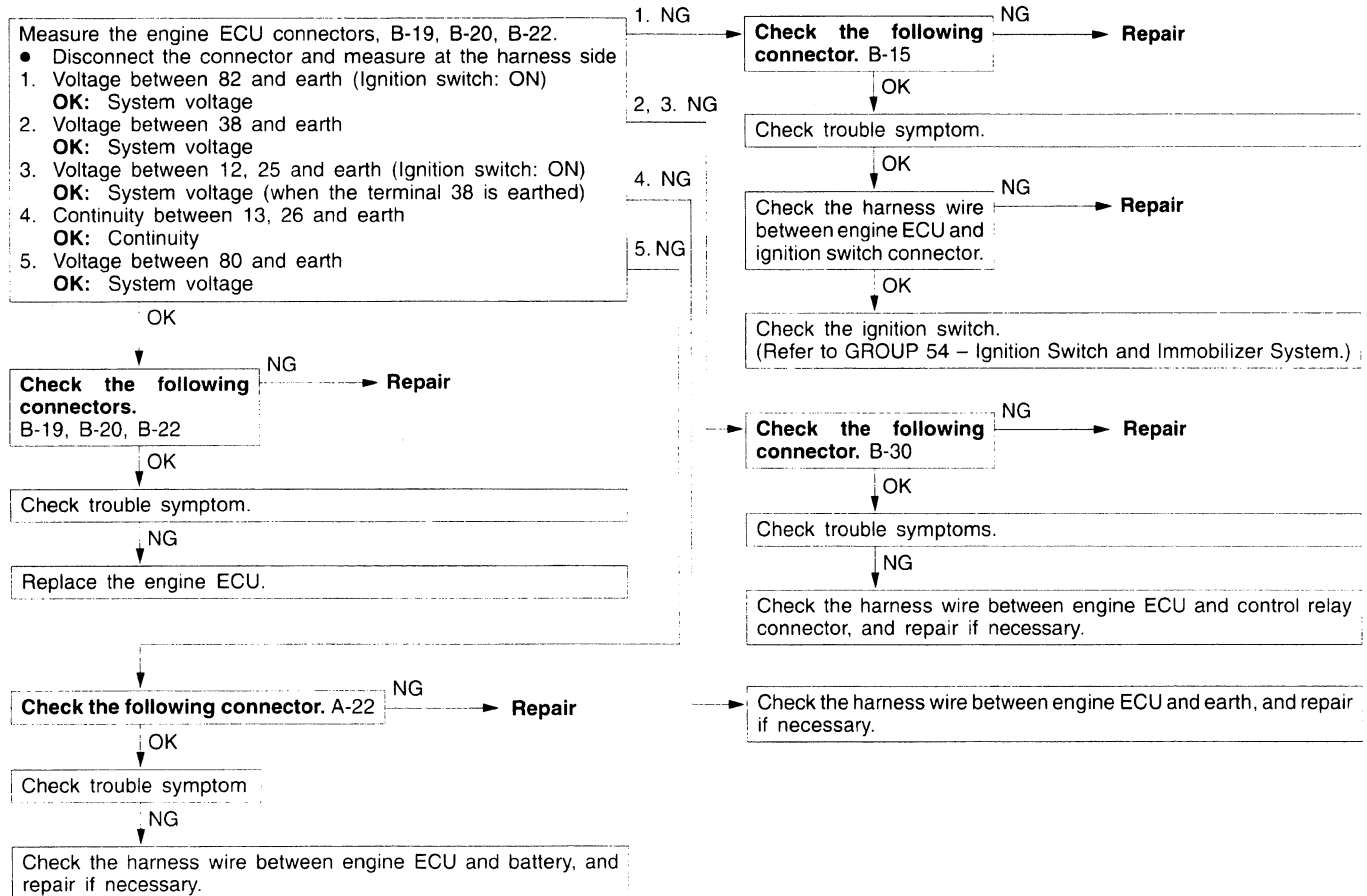
INSPECTION PROCEDURE 45

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



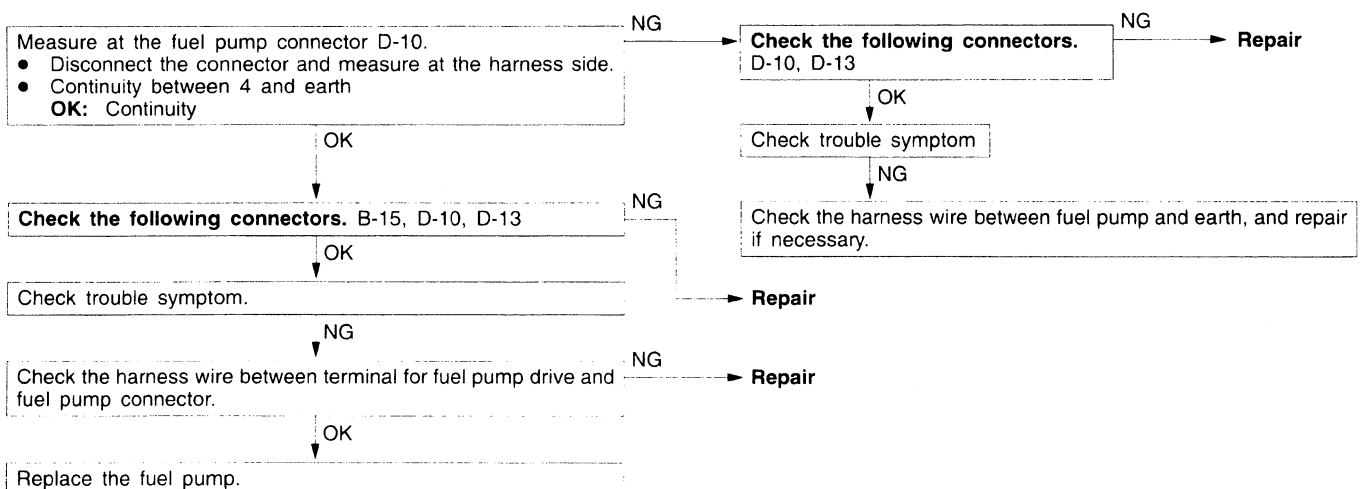
## INSPECTION PROCEDURE 46

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



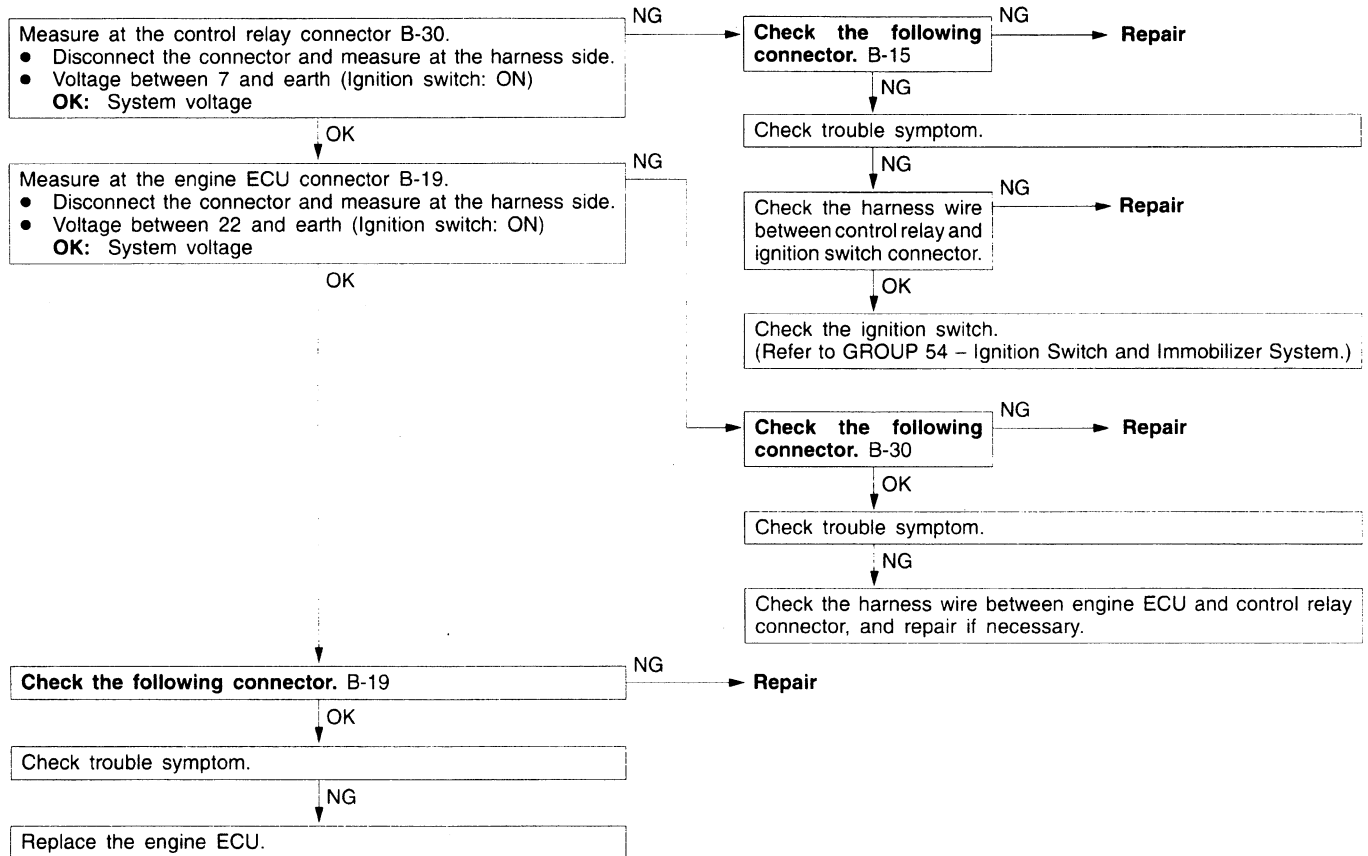
## INSPECTION PROCEDURE 47

### Check fuel pump circuit.



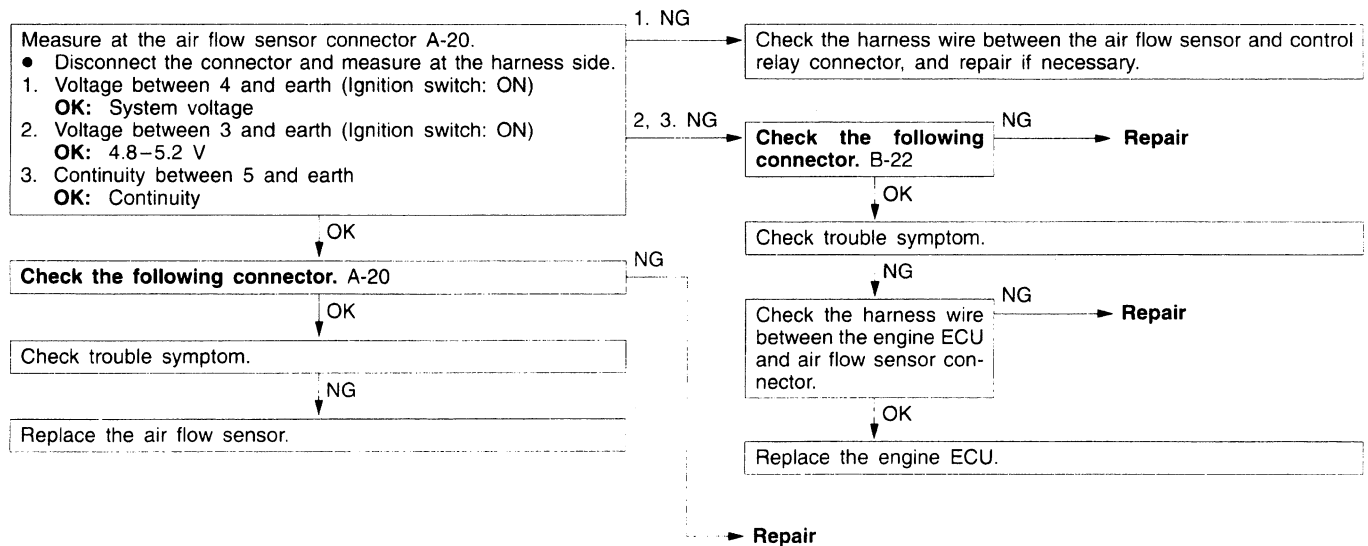
## INSPECTION PROCEDURE 48

### Check the fuel pump drive control circuit.



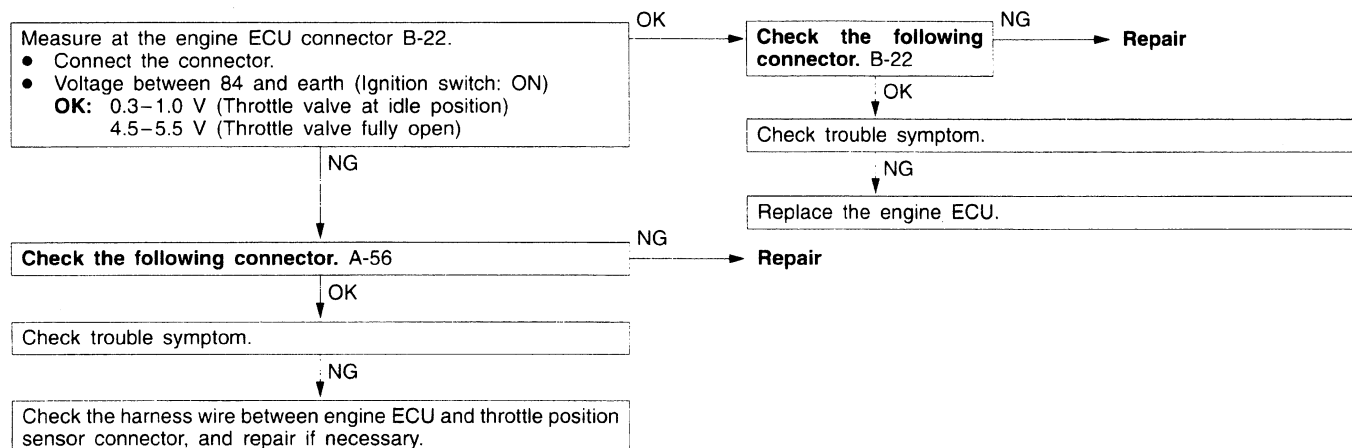
## INSPECTION PROCEDURE 49

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



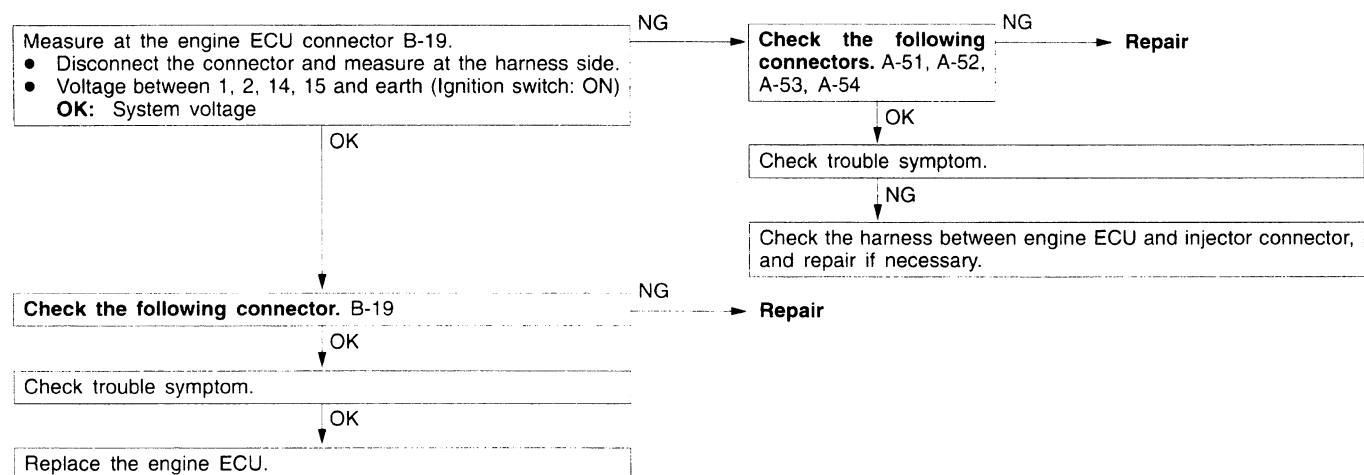
## INSPECTION PROCEDURE 50

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



## INSPECTION PROCEDURE 51

### Check injector control circuit

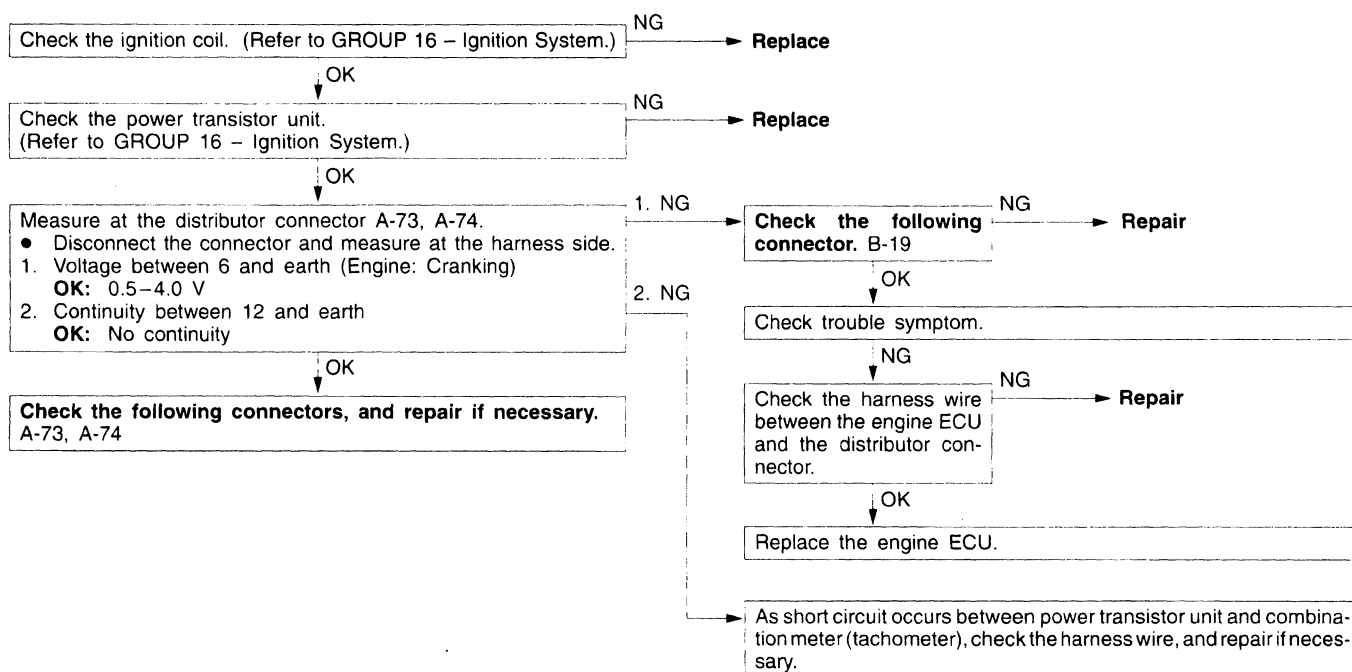


# 13A-66

## MPI – Troubleshooting

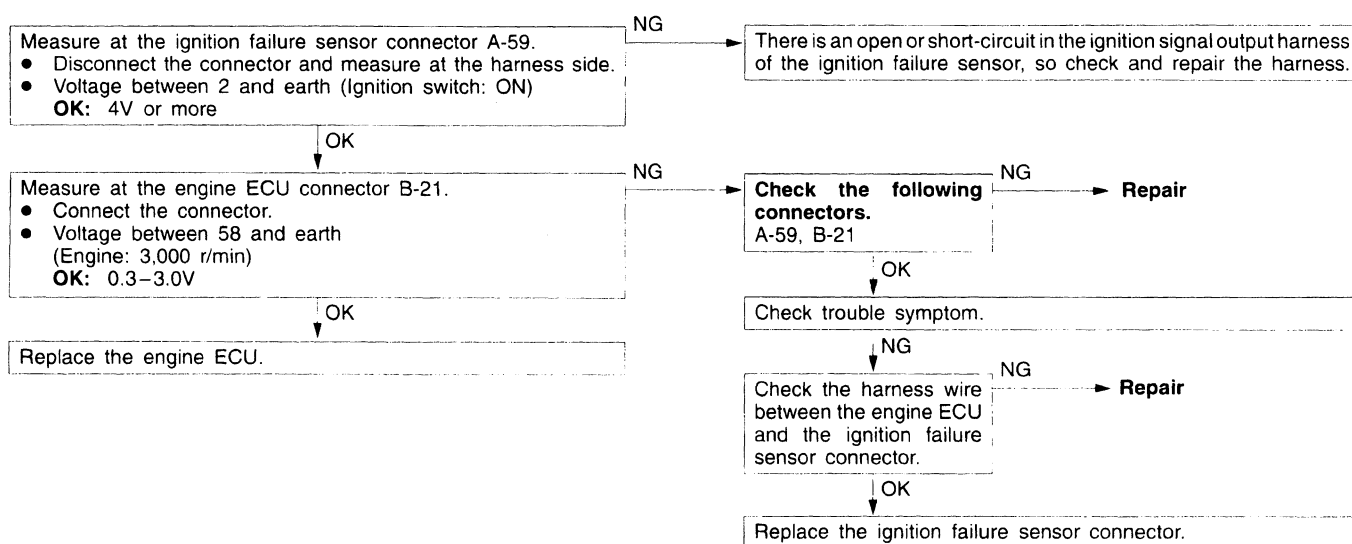
### INSPECTION PROCEDURE 52

#### Check ignition coil and power transistor unit circuit. <SOHC>



### INSPECTION PROCEDURE 53

#### Check ignition signal circuit. <DOHC>



# SERVICE DATA REFERENCE TABLE

13100890036

## Caution

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

## NOTE

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

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
11	Oxygen sensor	Engine:After having warmed up Air/fuel mixture is made leaner when decelerating, and is made richer when racing.	When at 4,000 r/min, engine is suddenly decelerated	200 mV or less	Code No. 11	13A-15
			When engine is suddenly raced	600–1,000 mV		
		Engine:After having warmed up The oxygen sensor signal is used to check the air/fuel mixture ratio, and control condition is also checked by the ECU.	Engine is idling	400 mV or less (Changes)		
			2,500 r/min	600–1,000 mV		
12	Air flow sensor*1	<ul style="list-style-type: none"> <li>• Engine coolant temperature: 80–95°C</li> <li>• Lamps and all accessories: OFF</li> <li>• Transmission: Neutral (A/T: P range)</li> </ul>	Engine is idling	25–51 Hz	–	–
			2,500 r/min	80–120 Hz <4G92> 74–114 Hz <4G93 – SOHC> 55–95 Hz <4G93 – DOHC>		
			Engine is raced	Frequency increases in response to racing		

13A-68

MPI – Troubleshooting

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
13	Intake air temperature sensor	Ignition switch: ON or with engine running	When intake air temperature is -20°C	-20°C	Code No. 13	13A-16
			When intake air temperature is 0°C	0°C		
			When intake air temperature is 20°C	20°C		
			When intake air temperature is 40°C	40°C		
			When intake air temperature is 80°C	80°C		
14	Throttle position sensor	Ignition switch: ON	Set to idle position	300–1,000 mV	Code No. 14	13A-17
			Gradually open	Increases in proportion to throttle opening angle		
			Open fully	4,500–5,500 mV		
16	Power supply voltage	Ignition switch: ON		System voltage	Procedure No. 23	13A-48
18	Cranking signal (ignition switch-ST)	Ignition switch: ON	Engine: Stopped	OFF	Procedure No. 27 <M/T>	13A-50 13A-51
			Engine: Cranking	ON	Procedure No. 28 <A/T>	
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-18
			When engine coolant temperature is 0°C	0°C		
			When engine coolant temperature is 20°C	20°C		
			When engine coolant temperature is 40°C	40°C		
			When engine coolant temperature is 80°C	80°C		



Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
22	Crank angle sensor	<ul style="list-style-type: none"> <li>Engine: Cranking</li> <li>Tachometer: Connected</li> </ul>	Compare the engine speed readings on the tachometer and the MUT-II.	Accord	Code No. 22	13A-19 <SOHC> 13A-20 <DOHC>
			When engine coolant temperature is -20°C	1,400–1,600 rpm		
		<ul style="list-style-type: none"> <li>Engine: Idling</li> <li>Idle position switch: ON</li> </ul>	When engine coolant temperature is 0°C	1,350–1,550 rpm		
			When engine coolant temperature is 20°C	1,300–1,500 rpm <4G92, 4G93 – DOHC> 1,250–1,200 rpm <4G93 – SOHC>		
			When engine coolant temperature is 40°C	1,100–1,300 rpm <4G92, 4G93 – DOHC> 1,000–1,200 rpm <4G93 – SOHC>		
			When engine coolant temperature is 80°C	650–850 rpm <4G92> 700–900 rpm <4G93>		
25	Barometric pressure sensor	Ignition switch: ON	At altitude of 0 m	101 kPa	Code No. 25	13A-24
			At altitude of 600 m	95 kPa		
			At altitude of 1,200 m	88 kPa		
			At altitude of 1,800 m	81 kPa		
26	Idle position switch	Ignition switch: ON Check by operating accelerator pedal repeatedly	Throttle valve: Set to idle position	ON	Procedure No. 25 <Vehicles without TCL>	13A-49
			Throttle valve: Slightly open	OFF*5	Procedure No. 26 <Vehicles with TCL>	
27	Power steering fluid pressure switch	Engine: Idling	Steering wheel stationary	OFF	Procedure No. 29	13A-52
			Steering wheel turning	ON		
28	A/C switch	Engine: Idling (when A/C switch is ON, A/C compressor should be operating.)	A/C switch: OFF	OFF	Procedure No. 30	13A-52
			A/C switch: ON	ON		

13A-70

MPI – Troubleshooting

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
29	Inhibitor switch <A/T>	Ignition switch: ON	P or N	P or N	Procedure No. 28	13A-51
			D, 2, L or R	D, 2, L or R		
33	Electrical load switch	All accessories: OFF	Lighting switch only: OFF → ON	OFF → ON	Procedure No. 31	13A-53
			Rear defogger switch only: OFF → ON	OFF → ON		
41	Injectors *2	Engine: Cranking	When engine coolant temperature is 0°C (injection is carried out for all cylinders simultaneously)	13–19 ms <4G92> 15–22 ms <4G93 – SOHC> 12–18 ms <4G93 – DOHC>	–	–
			When engine coolant temperature is 20°C	27–40 ms <4G92> 31–46 ms <4G93 – SOHC> 25–38 ms <4G93 – DOHC>		
			When engine coolant temperature is 80°C	5.9–8.9 ms <4G92> 7.2–10.8 ms <4G93 – SOHC> 6.0–9.0 ms <4G93 – DOHC>		
	Injectors*3	<ul style="list-style-type: none"> <li>Engine coolant temperature: 80–95°C</li> <li>Lamps and all accessories: OFF</li> <li>Transmission: Neutral (A/T : P range)</li> </ul>	Engine is idling	1.7–2.9 ms <4G92> 2.2–3.4 ms <4G93 – SOHC> 2.0–3.2 ms <4G93 – DOHC>		
			2,500 r/min	1.4–2.6 ms <4G92, 4G93 – DOHC> 2.0–3.2 ms <4G93 – DOHC>		
			When engine is suddenly raced	Increases		

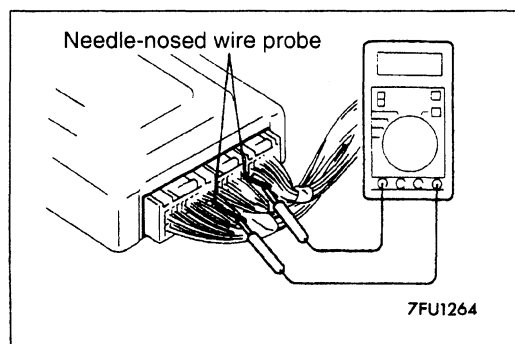
Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
44	Ignition coils and power transistors	<ul style="list-style-type: none"> <li>Engine: After having warmed up</li> <li>Timing lamp is set. (The timing lamp is set in order to check actual ignition timing.)</li> </ul>	Engine is idling	2–18 °BTDC <4G92, 4G93 – DOHC> 0–16 °BTDC <4G93 – SOHC>		
			2,500 r/min	30–50 °BTDC <4G92> 22–42 °BTDC <4G93>		
45	ISC (stepper) motor position *4	<ul style="list-style-type: none"> <li>Engine coolant temperature: 80–95°C</li> <li>Lamps and all accessories: OFF</li> <li>Transmission: Neutral (A/T : P range)</li> <li>Idle position switch: ON</li> <li>Engine: Idling</li> <li>When A/C switch is ON, A/C compressor should be operating</li> </ul>	A/C switch: OFF	2–25 STEP	–	–
			A/C switch: OFF → ON	Increases by 10–70 steps		
			<ul style="list-style-type: none"> <li>A/C switch: OFF</li> <li>Select lever: N range → D range</li> </ul>	Increases by 5–50 steps		
49	A/C relay	Engine: After having warmed up/Engine is idling	A/C switch: OFF	OFF (Compressor clutch is not operating)	Procedure No. 30	13A-52
			A/C switch: ON	ON (Compressor clutch is operating)		

ACTUATOR TEST REFERENCE TABLE

13100900036

Item No.	Inspection item	Drive contents	Inspection contents		Normal condition	Inspection procedure No.	Reference page
01	Injectors	Cut fuel to No. 1 injector	Engine: After having warmed up/Engine is idling (Cut the fuel supply to each injector in turn and check cylinders which don't affect idling.)		Idling condition becomes different (becomes unstable).	Code No. 41	13A-26
02		Cut fuel to No. 2 injector					
03		Cut fuel to No. 3 injector					
04		Cut fuel to No. 4 injector					
07	Fuel pump	Fuel pump operates and fuel is recirculated.	<ul style="list-style-type: none"> <li>Engine: Cranking</li> <li>Fuel pump: Forced driving</li> </ul> Inspect according to both the above conditions.	Pinch the return hose with fingers to feel the pulse of the fuel being recirculated.	Pulse is felt.	Procedure No. 24	13A-48
				Listen near the fuel tank for the sound of fuel pump operation.	Sound of operation is heard.		
08	Purge control solenoid valve	Solenoid valve turns from OFF to ON.	Ignition switch: ON		Sound of operation can be heard when solenoid valve is driven.	Procedure No. 36	13A-55
10	EGR control solenoid valve	Solenoid valve turns from OFF to ON.	Ignition switch: ON		Sound of operation can be heard when solenoid valve is driven.	Procedure No. 37	13A-56
15	Vacuum control solenoid valve <Vehicles with TCL>	Solenoid valve turns from OFF to ON.	Ignition switch: ON		Sound of operation can be heard when solenoid valve is driven.	Code No. 71	13A-29

Item No.	Inspection item	Drive contents	Inspection contents	Normal condition	Inspection procedure No.	Reference page
16	Ventilation control solenoid valve <Vehicles with TCL>	Solenoid valve turns from OFF to ON.	Ignition switch: ON	Sound of operation can be heard when solenoid valve is driven.	Code No. 72	13A-30
21	Radiator fan Condenser fan	Drive the fan motors (radiator and condenser).	Ignition switch: ON A/C switch: ON	Fan motor operates at low speed.	Procedure No. 32	13A-53



## CHECK AT THE ENGINE ECU TERMINALS

13100920032

### TERMINAL VOLTAGE CHECK CHART

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

#### NOTE

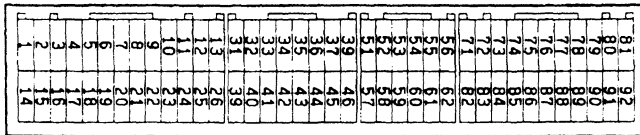
1. Make the voltage measurement with the engine ECU connectors connected.
2. You may find it convenient to pull out the engine ECU to make it easier to reach the connector terminals.
3. The checks can be carried out off the order given in the chart.

#### Caution

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

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

Engine ECU Connector Terminal Arrangement



9FU0393

Terminal No. <SOHC>	Terminal No. <DOHC>	Check item	Check condition (Engine condition)	Normal condition
1	1	No. 1 injector	While engine is idling after having warmed up, suddenly depress the accelerator pedal.	From 11 – 14 V, momentarily drops slightly
14	14	No. 2 injector		
2	2	No. 3 injector		
15	15	No. 4 injector		
3	–	Ventilation control solenoid valve <Vehicles with TCL>	Ignition switch: ON	System Voltage
4	4	Stepper motor coil <A1>	Engine: Soon after the warmed up engine is started	System voltage ↔ 0 V (Changes repeatedly)
17	17	Stepper motor coil <A2>		
5	5	Stepper motor coil <B1>		
18	18	Stepper motor coil <B2>		
6	6	EGR control solenoid valve	Ignition switch: ON	System Voltage
			While engine is idling, suddenly depress the accelerator pedal.	From system voltage, momentarily drops

Terminal No. <SOHC>	Terminal No. <DOHC>	Check item	Check condition (Engine condition)		Normal condition
8	8	A/C relay	<ul style="list-style-type: none"> <li>Engine: Idle speed</li> <li>A/C switch: OFF → ON (A/C compressor is operating)</li> </ul>		System voltage or momentarily 6V or more → 0–3V
9	9	Purge control solenoid valve	Ignition switch: ON		System voltage
			Running at 3,000r/min while engine is warming up after having been started.		0–3V
10	–	Power transistor unit	Engine r/min: 3,000 r/min		0.3–3.0V
–	10	Ignition coil – No. 1, No. 4 (power transistor)	Engine r/min: 3,000 r/min		0.3–3.0V
–	23	Ignition coil – No. 2, No. 3 (power transistor)			
11	–	Vacuum control solenoid valve <Vehicles with TCL>	Ignition switch: ON		System voltage
12	12	Power supply	Ignition switch: ON		System voltage
25	25				
19	19	Air flow sensor reset signal	Engine: Idle speed		0–1V
			Engine r/min: 3,000 r/min		6–9V
21	21	Fan motor relay	Engine: Idle speed	Radiator fan is not operating	System voltage
				Radiator fan is operating	0–3V
22	22	Control relay (Fuel pump)	Ignition switch: ON		System voltage
			Engine: Idle speed		0–3V
36	36	Engine warning lamp	Ignition switch: OFF → ON		0–3V → 9–13V (After several seconds have elapsed)
37	37	Power steering fluid pressure switch	Engine: Idling after warming up	When steering wheel is stationary	System voltage
				When steering wheel is turned	0–3V

13A-76

MPI – Troubleshooting

Terminal No. <SOHC>	Terminal No. <DOHC>	Check item	Check condition (Engine condition)		Normal condition
38	38	Control relay (Power supply)	Ignition switch: OFF		System voltage
			Ignition switch: ON		0–3V
45	45	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)	System voltage
52	52	Ignition timing adjustment terminal	Ignition switch: ON	Earth the ignition timing adjustment terminal	0–1V
				Remove the earth connection from the ignition timing adjustment terminal	4.0–5.5V
–	58	Engine ignition signal	Engine r/min: 3,000 r/min		0.3–3.0V
60	60	Oxygen sensor heater	Engine: Idling after warming up		0–3V
			Engine r/min: 5,000r/min.		System voltage
71	71	Ignition switch – ST	Engine: Cranking		8V or more
72	72	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 intake air temperature is 40°C	1.5–2.1V
				When intake air temperature is 80°C	0.4–1.0V
76	76	Oxygen sensor	Engine: Running at 2,000 r/min after warmed up (Check using a digital type voltmeter)		0 ↔ 0.8V (Changes repeatedly)
80	80	Backup power supply	Ignition switch: OFF		System voltage
81	81	Sensor impressed voltage	Ignition switch: ON		4.5–5.5V
82	82	Ignition switch – IG	Ignition switch: ON		System voltage



Terminal No. <SOHC>	Terminal No. <DOHC>	Check item	Check condition (Engine condition)		Normal condition
83	83	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	84	Throttle position sensor	Ignition switch: ON	Set throttle valve to idle position	0.3–1.0V
				Fully open throttle valve	4.5–5.5V
85	85	Barometric pressure sensor	Ignition switch: ON	When altitude is 0m	3.7–4.3V
				When altitude is 1,200m	3.2–3.8V
86	86	Vehicle speed sensor	<ul style="list-style-type: none"><li>Ignition switch: ON</li><li>Move the vehicle slowly forward</li></ul>		0 ↔ 5V (Changes repeatedly)
87	87	Idle position switch	Ignition switch: ON	Set throttle valve to idle position	0–1V
				Slightly open throttle valve	4V or more
88	–	Top dead centre sensor	Engine: Cranking		0.4–3.0V
			Engine: Idle speed		0.5–2.0V
–	88	Camshaft position sensor	Engine: Cranking		0.4–3.0V
			Engine: Idle speed		0.5–2.0V
89	89	Crank angle sensor	Engine: Cranking		0.4–4.0V
			Engine: Idle speed		1.5–2.5V
90	90	Air flow sensor	Engine: Idle speed		2.2–3.2V
			Engine r/min: 2,000r/min		
91	–	Inhibitor switch <A/T>	Ignition switch: ON	Set selector lever to P or N	0–3V
				Set selector lever to Other than P or N	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. Checking need not be carried out in the order given in the chart.

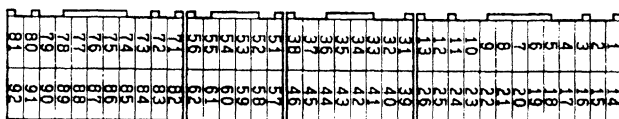
## Caution

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

**Be careful to prevent this!**

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

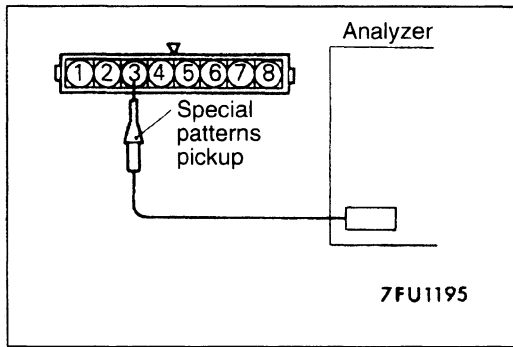
## Engine ECU Harness Side Connector Terminal Arrangement



9FU0392

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

Terminal No.	Inspection item	Normal condition (Check condition)
3-12	Ventilation control solenoid valve <Vehicles with TCL>	36-44 $\Omega$ (At 20°C)
4-12	Stepper motor coil (A1)	28-33 $\Omega$ (At 20°C)
17-12	Stepper motor coil (A2)	
5-12	Stepper motor coil (B1)	
18-12	Stepper motor coil (B2)	
6-12	EGR control solenoid valve	62-74 $\Omega$ (At 20°C)
9-12	Purge control solenoid valve	62-74 $\Omega$ (At 20°C)
11-12	Vacuum control solenoid valve <Vehicles with TCL>	36-44 $\Omega$ (At 20°C)
13-Body earth	ENGINE ECU earth	Continuity (0 $\Omega$ )
26-Body earth	ENGINE ECU earth	
60-12	Oxygen sensor heater	Approx. 12 $\Omega$ (At 20°C)
72-92	Intake air temperature sensor	5.3-6.7 k $\Omega$ (When intake air temperature is 0°C)
		2.3-3.0 k $\Omega$ (When intake air temperature is 20°C)
		1.0-1.5 k $\Omega$ (When intake air temperature is 40°C)
		0.30-0.42 k $\Omega$ (When intake air temperature is 80°C)
83-92	Engine coolant temperature sensor	5.1-6.5 k $\Omega$ (When coolant temperature is 0°C)
		2.1-2.7 k $\Omega$ (When coolant temperature is 20°C)
		0.9-1.3 k $\Omega$ (When coolant temperature is 40°C)
		0.26-0.36 k $\Omega$ (When coolant temperature is 80°C)
87-92	Idle position switch	Continuity (when throttle valve is at idle position)
		No continuity (when throttle valve is slightly open)
91-Body earth	Inhibitor switch <A/T>	Continuity (when select lever is at P or N)
		No continuity (when select lever is at D, 2, L or R)



## INSPECTION PROCEDURE USING AN ANALYZER

13100930035

### AIR FLOW SENSOR (AFS)

#### 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 analyzer special patterns pickup to air flow sensor connector terminal 3.

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

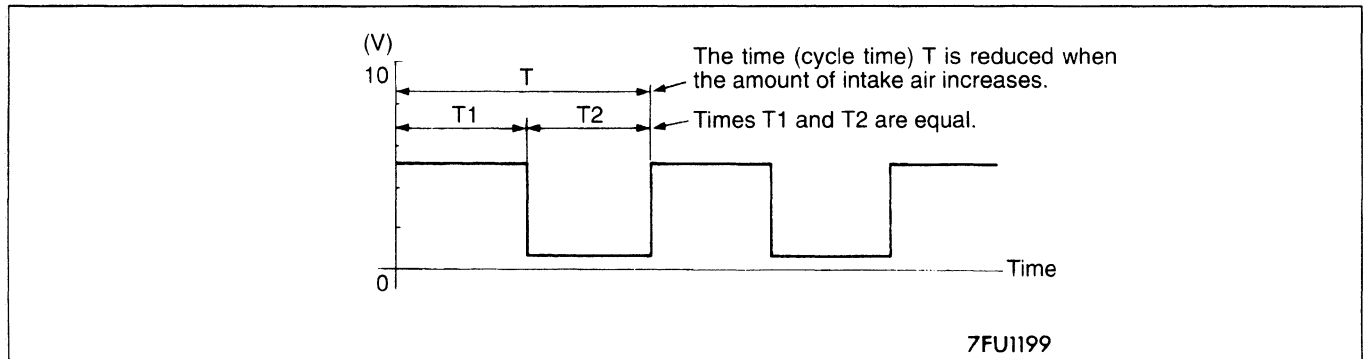
1. Connect the analyzer special patterns pickup to engine ECU terminal 90.

#### Standard Wave Pattern

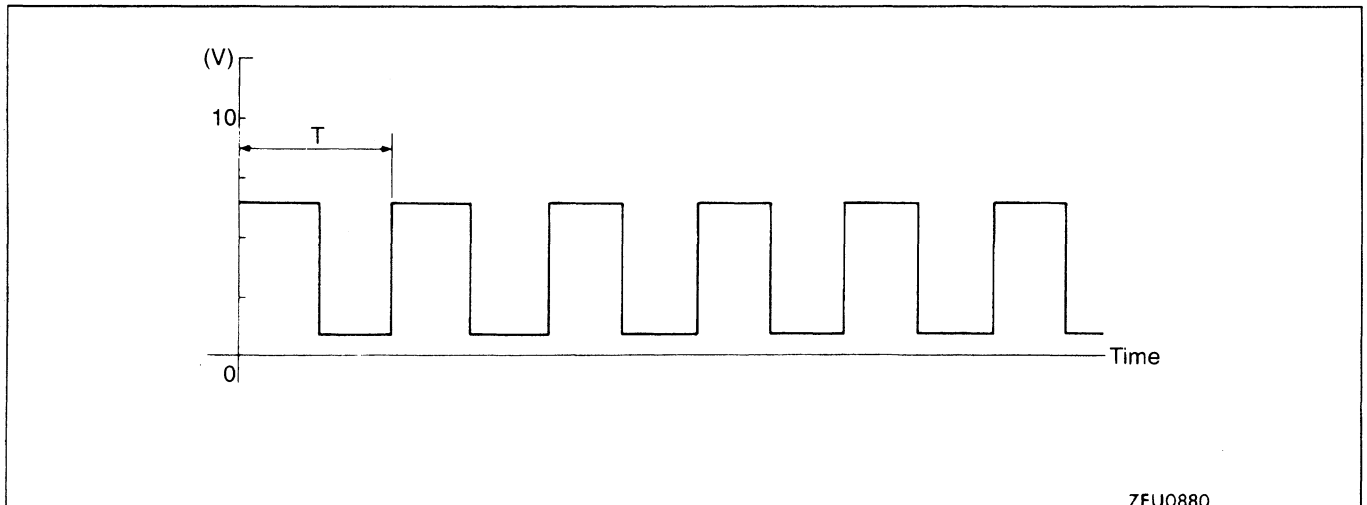
##### Observation conditions

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

#### Standard wave pattern

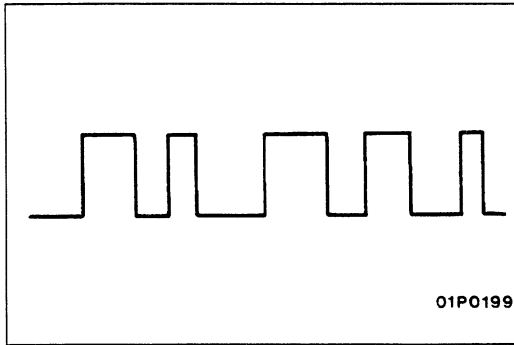


#### Observation conditions (from conditions above engine speed is increased by racing.)



#### Wave Pattern Observation Points

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



### Examples of Abnormal Wave Patterns

- Example 1

#### Cause of problem

Sensor interface malfunction

#### Wave pattern characteristics

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

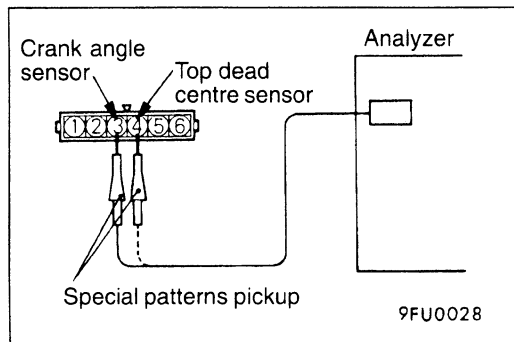
- Example 2

#### Cause of problem

Damaged rectifier or vortex generation column

#### Wave pattern characteristics

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



### TOP DEAD CENTRE SENSOR AND CRANK ANGLE SENSOR <SOHC>

#### Measurement Method

1. Disconnect the distributor (top dead centre sensor and crank angle sensor) connector and connect the special tool (test harness: MB991348) in between. (All terminals should be connected.)
2. Connect the analyzer special patterns pickup to distributor terminal 4. (When checking the top dead centre sensor signal wave pattern)
3. Connect the analyzer special patterns pickup to distributor connector terminal 3. (When inspecting the crank angle sensor signal wave pattern.)

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

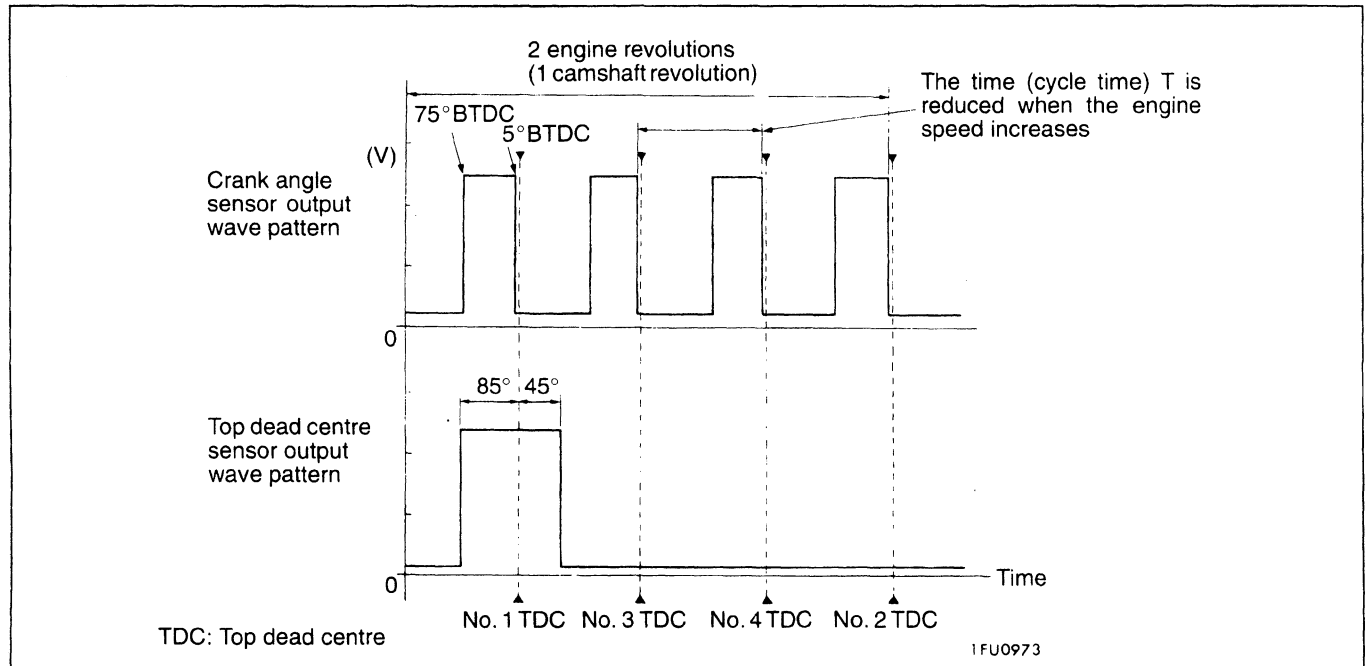
1. Connect the analyzer special patterns pickup to engine ECU terminal 88. (When checking the top dead centre sensor signal wave pattern.)
2. Connect the analyzer special patterns pickup to engine ECU terminal 89. (When checking the crank angle sensor signal wave pattern.)

## Standard Wave Pattern

### Observation conditions

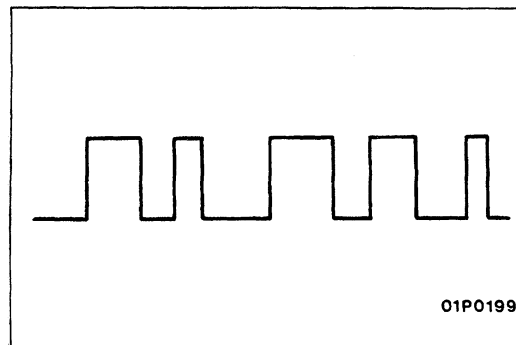
Function	Special patterns
Pattern height	Low
Pattern selector	Display
Engine r/min	Idle speed

### Standard wave pattern



### Wave Pattern Observation Points

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



#### Examples of Abnormal Wave Patterns

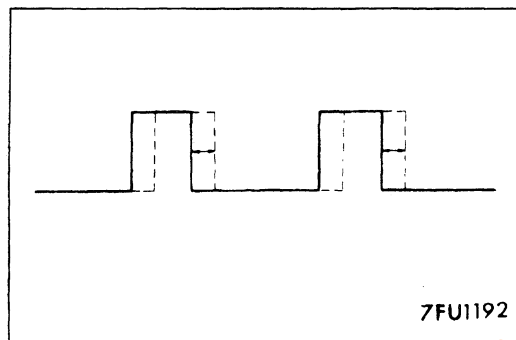
##### • Example 1

##### Cause of problem

Sensor interface malfunction

##### Wave pattern characteristics

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



##### • Example 2

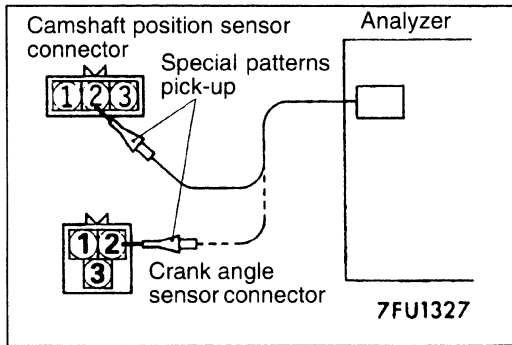
##### Cause of problem

Loose timing belt

Abnormality in sensor disk

##### Wave pattern characteristics

Wave pattern is displaced to the left or right.



## CAMSHAFT POSITION SENSOR AND CRANK ANGLE SENSOR <DOHC>

### Measurement Method

1. Disconnect the camshaft position sensor connector and connect the special tool (test harness: MB991223) and jumper wire in between. (All terminals should be connected.)
2. Connect the analyzer special patterns pickup to camshaft position sensor terminal 2.
3. Disconnect the crank angle sensor connector and connect the special tool (test harness: MD998478) in between.
4. Connect the analyzer special patterns pickup to crank angle sensor terminal 2.

### Alternate Method (Test harness not available)

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

### Standard Wave Pattern

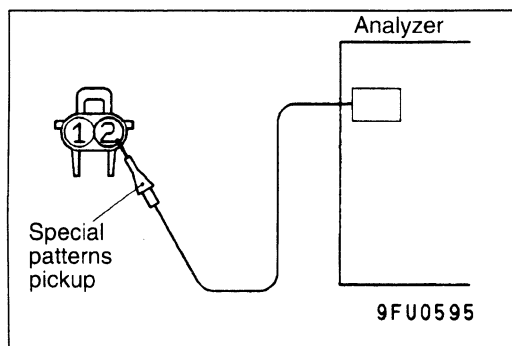
### Observation conditions

### Standard wave pattern

### Wave Pattern Observation Points

### Examples of Abnormal Wave Patterns

Refer to P.13A-82.



## INJECTOR

### Measurement Method

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

### Alternate Method (Test harness not available)

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

# 13A-84

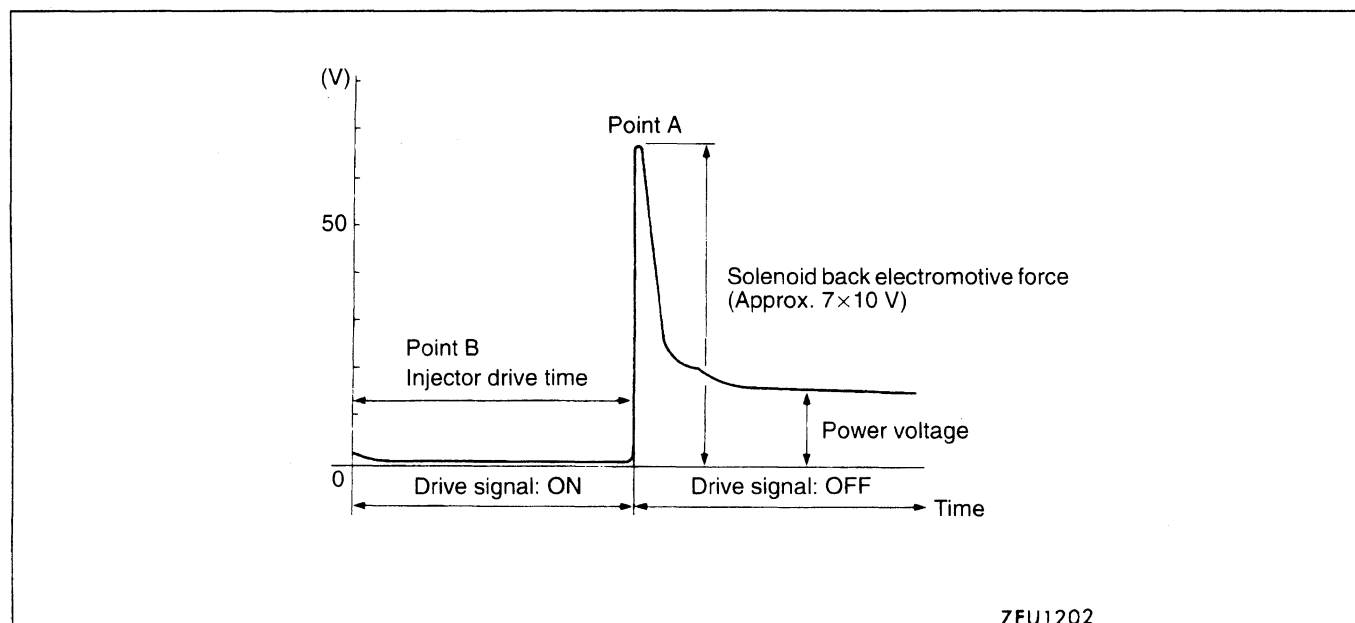
## MPI – Troubleshooting

### Standard Wave Pattern

#### Observation conditions

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

### Standard wave pattern



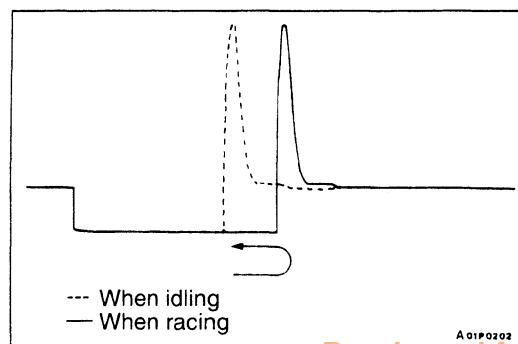
### Wave Pattern Observation Points

#### Explanation of Wave Pattern

Point A: Height of solenoid back electromotive force

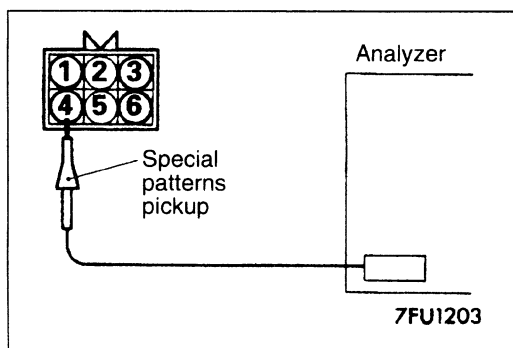
Contrast with standard wave pattern	Probable cause
Solenoid coil back electromotive force is low or doesn't appear at all.	Short in the injector solenoid

Point B: Injector drive time



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





## STEPPER MOTOR

### Measurement Method

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

### Alternate Method (Test harness not available)

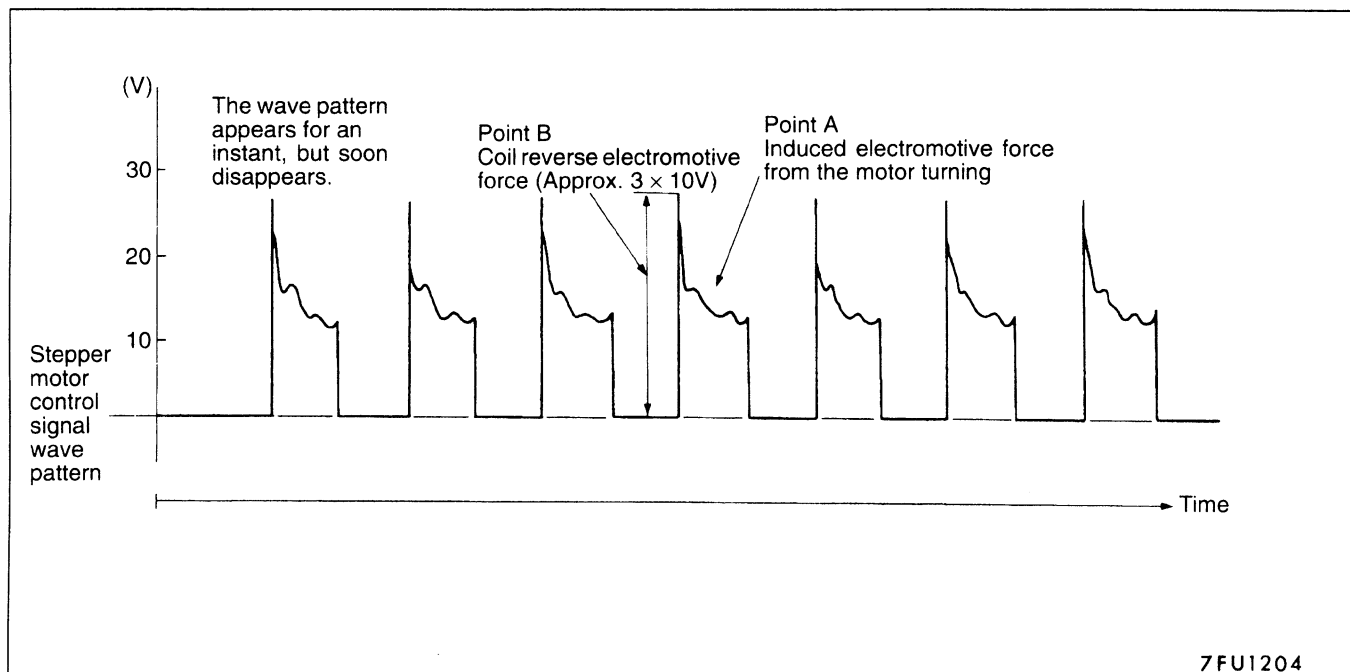
1. Connect the analyzer special patterns pickup to ECU terminal 4, connection terminal 5, connection terminal 17, and connection terminal 18 respectively.

### Standard Wave Pattern

#### Observation conditions

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

### Standard wave pattern



### Wave Pattern Observation Points

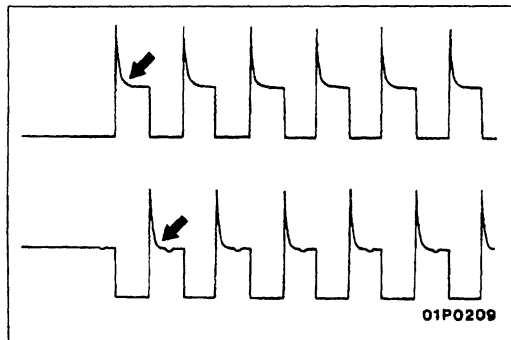
Check that the standard wave pattern appears when the stepper motor is operating.

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

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

Point B: Height of coil reverse electromotive force

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



### Examples of Abnormal Wave Pattern

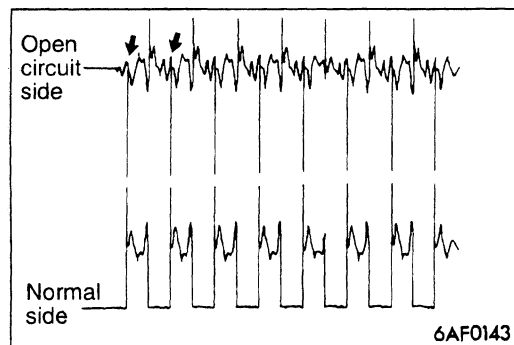
#### • Example 1

##### Cause of problem

Motor is malfunctioning. (Motor is not operating.)

##### Wave pattern characteristics

Induced electromotive force from the motor turning does not appear.



#### • Example 2

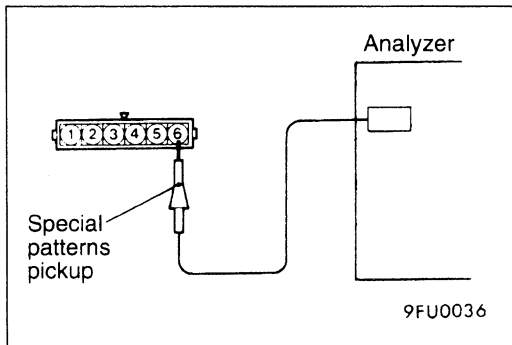
##### Cause of problem

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

##### Wave pattern characteristics

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

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



### IGNITION COIL AND POWER TRANSISTOR <SOHC>

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

#### Measurement Method

1. Disconnect the distributor connector, and connect the special tool (test harness: MB991348) in between. (All terminals should be connected.)
2. Connect the analyzer special patterns pickup to distributor connector terminal 6.

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

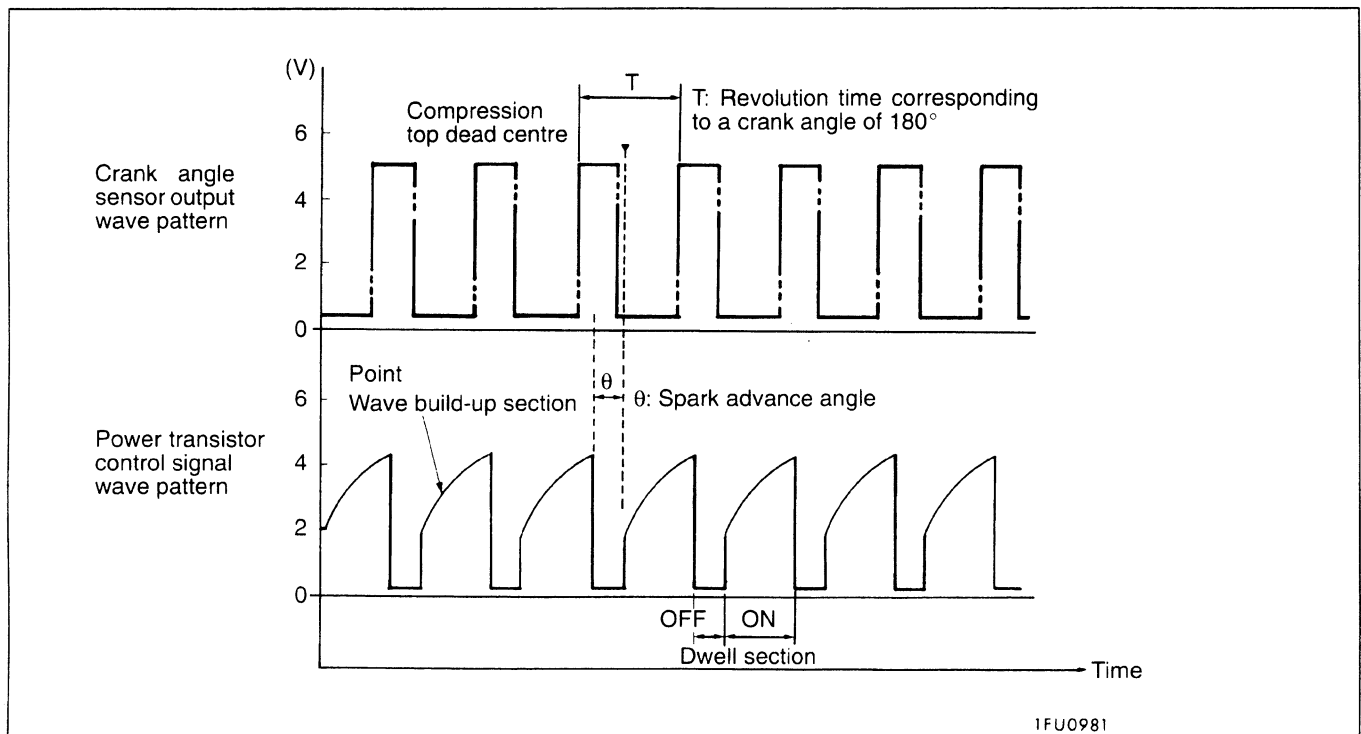
1. Connect the analyzer special patterns pickup to engine ECU terminal 10.

### Standard Wave Pattern

#### Observation condition

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

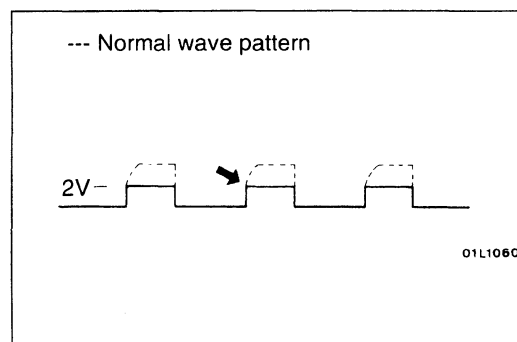
#### Standard wave pattern



### Wave Pattern Observation Points

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

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



### Examples of Abnormal Wave Patterns

#### • Example 1

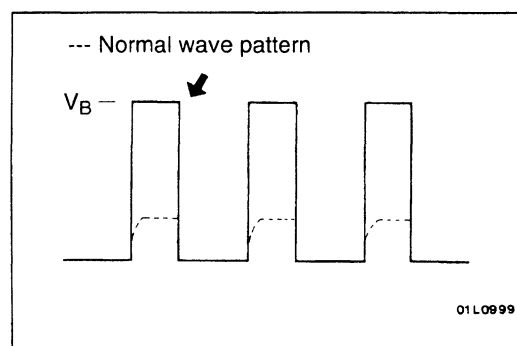
Wave pattern during engine cranking

#### Cause of problem

Open-circuit in ignition primary circuit

#### Wave pattern characteristics

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



#### • Example 2

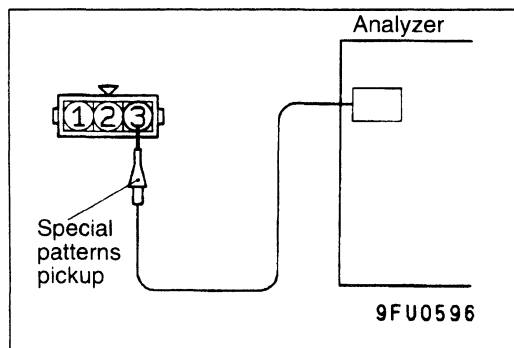
Wave pattern during engine cranking

#### Cause of problem

Malfunction in power transistor

#### Wave pattern characteristics

Power voltage results when the power transistor is ON.



### IGNITION COIL AND POWER TRANSISTOR <DOHC>

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

#### Measurement Method

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

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

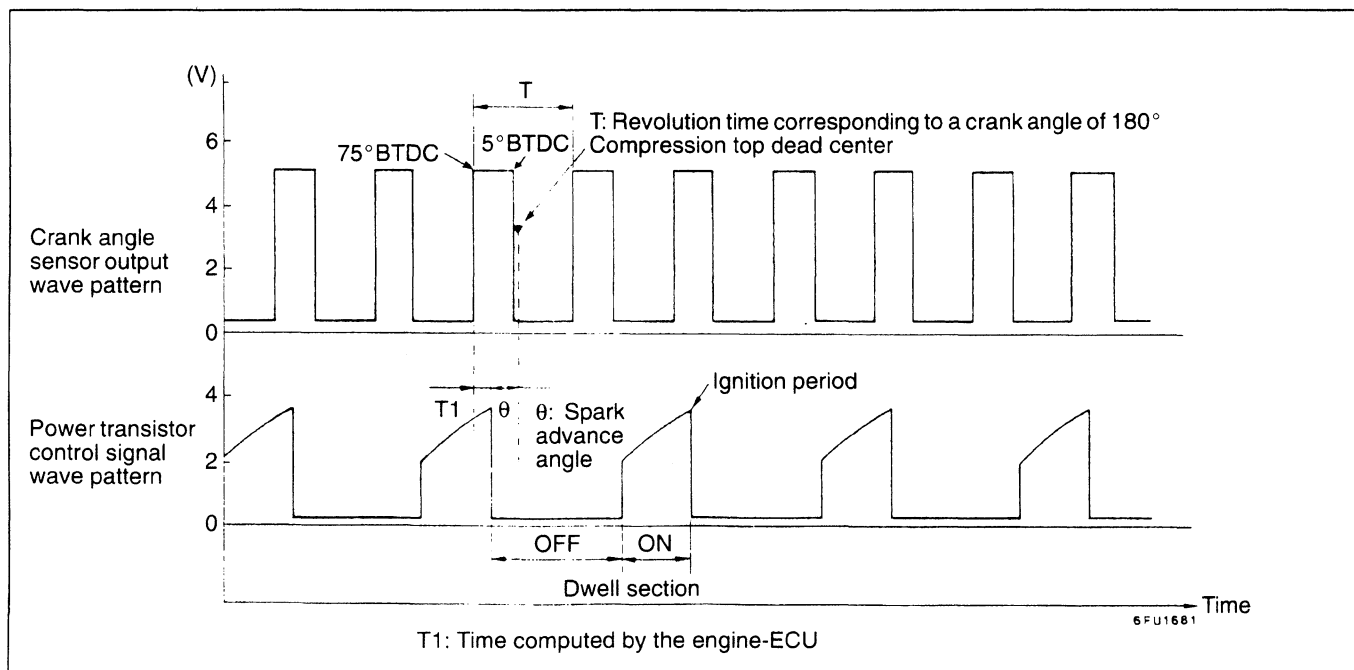
1. Connect the analyzer special patterns pickup to engine ECU terminal 10 (No. 1 – No. 4), terminal 23 (No. 2 – No. 3) respectively.

### Standard Wave Pattern

#### Observation condition

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

### Standard wave pattern



### Wave Pattern Observation Points

### Examples of Abnormal Wave Patterns

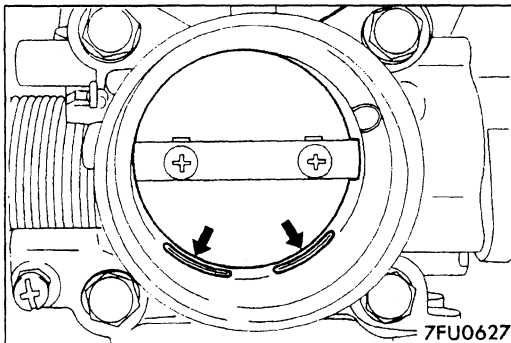
Refer to P.13A-88.

## ON-VEHICLE SERVICE

13100100030

### THROTTLE BODY (THROTTLE VALVE AREA) CLEANING

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



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

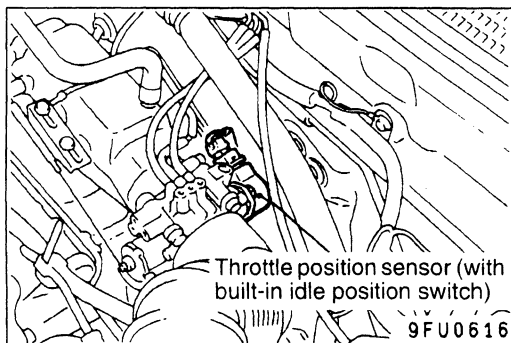
#### Caution

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

4. Spray cleaning solvent into the valve through the throttle body intake port and leave it for about 5 minutes.
5. Start the engine, race it several times and idle it for about 1 minute. If the idling speed becomes unstable (or if the engine stalls) due to the bypass passage being plugged, slightly open the throttle valve to keep the engine running.
6. If the throttle valve deposits are not removed, repeat steps 4 and 5.
7. Unplug the bypass passage inlet.
8. Attach the air intake hose.
9. Use the MUT-II to erase the self-diagnosis code.
10. Adjust the basic idle speed. (Refer to P.13A-93.)

#### 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.

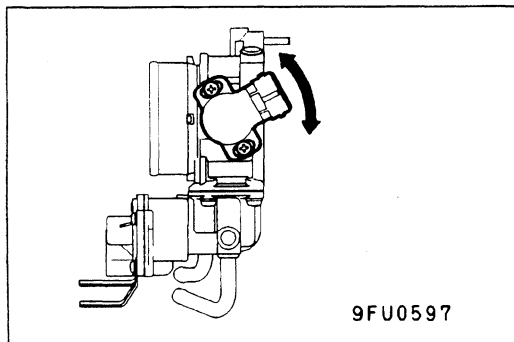
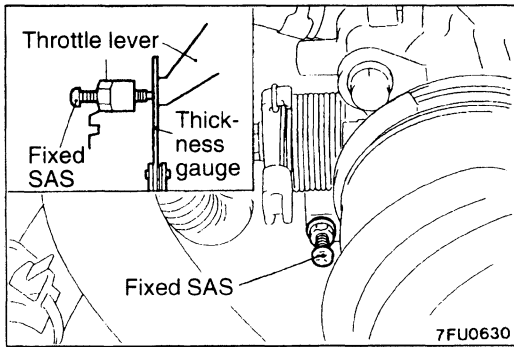


### IDLE POSITION SWITCH AND THROTTLE POSITION SENSOR ADJUSTMENT

#### <Vehicles without TCL>

13100130039

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



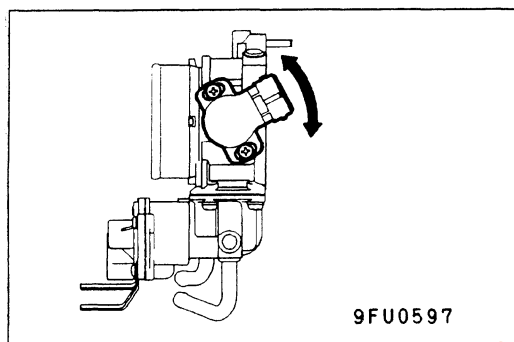
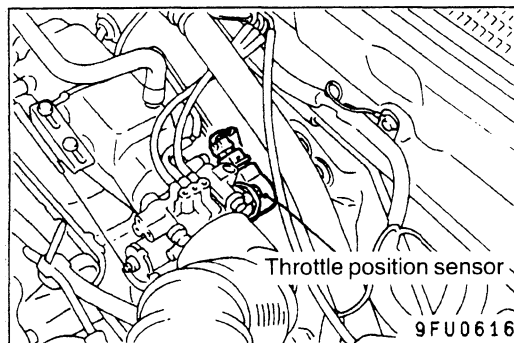
2. Insert a thickness gauge with a thickness of 0.65 mm between the fixed SAS and the throttle lever.
3. Turn the ignition switch to ON (but do not start the engine).

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

7. Check the throttle position sensor output voltage.

**Standard value: 400–1,000 mV**

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



## THROTTLE POSITION SENSOR ADJUSTMENT <Vehicles with TCL>

13100110026

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

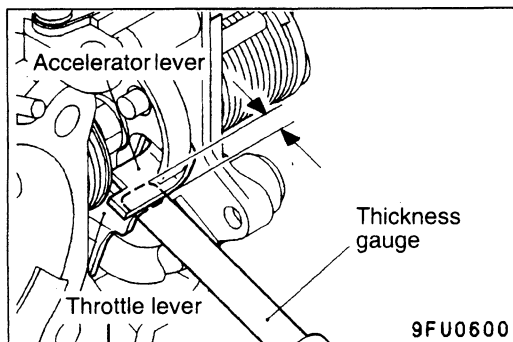
**Standard value: 580–690 mV**

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

**IDLE POSITION SWITCH AND ACCELERATOR  
PEDAL POSITION SENSOR ADJUSTMENT**  
**<Vehicles with TCL>**

13100140025

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

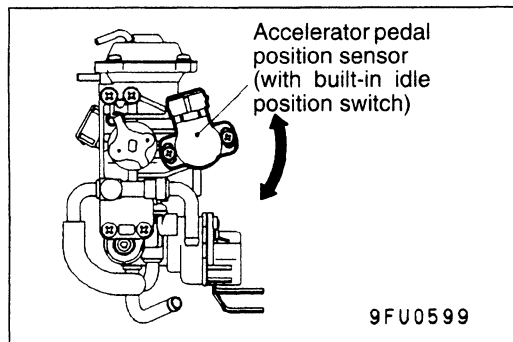


2. Insert a thickness gauge with a thickness of 0.5 mm in between the accelerator lever and throttle lever to a depth of approximately 3 mm.

**NOTE**

If the thickness gauge is inserted more than 3 mm, the accelerator lever opening angle will become greater than the set opening angle, which will result in defective adjustment.

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



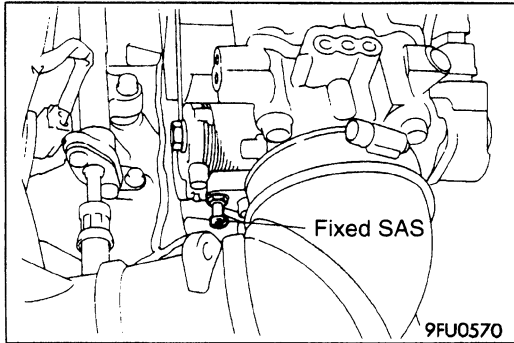
4. Loosen the accelerator pedal position sensor mounting bolt, and then turn the accelerator pedal position sensor clockwise as far as it will go.
5. Check that the accelerator pedal position switch is on at this position.
6. Slowly turn the accelerator pedal position sensor anti-clockwise and find the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

7. Select "Traction Control System" on the MUT-II.
8. Check the accelerator pedal position sensor output voltage.

**Standard value: 400–1,000 mV**

9. If the voltage is outside the standard value, check the accelerator pedal position sensor and related harnesses.
10. Remove the thickness gauge.
11. Turn the ignition switch to OFF.
12. Disconnect the MUT-II.





## FIXED SAS ADJUSTMENT

13100150035

### NOTE

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

1. Loosen the tension of the accelerator cable sufficiently.
2. Back out the fixed SAS lock nut.
3. Turn the fixed SAS counterclockwise until it is sufficiently backed out, and fully close the throttle valve.
4. Tighten the fixed SAS until the point where the throttle lever is touched (i.e., the point at which the throttle valve begins to open) is found.  
From that point, tighten the fixed SAS 1-1/4 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 idling speed.
8. For vehicles without TCL, adjust the idle position switch and the throttle position sensor (P.13A-90).  
For vehicles with TCL, adjust the throttle position sensor, idle position switch and accelerator pedal position sensor (P.13A-91, 92).

## BASIC IDLE SPEED ADJUSTMENT

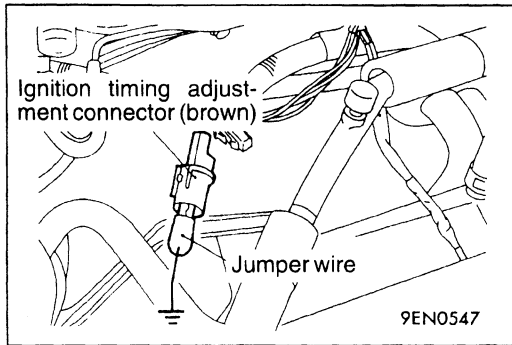
13100180041

### NOTE

1. The standard idling speed has been adjusted, by the speed adjusting screw (SAS), by the manufacturer, and there should usually be no need for readjustment.
  2. If the adjustment has been changed by mistake, the idle speed may become too high or the idle speed may drop too low when loads from components such as the A/C are placed on the engine. If this occurs, adjust by the following procedure.
  3. The adjustment, if made, should be made after first confirming that the spark plugs, the injectors, the idle speed control servo, the compression pressure, etc., are all normal.
1. Before inspection and adjustment, set the vehicle to the pre-inspection condition.
  2. Connect the MUT-II to the diagnosis connector (16-pin).

### NOTE

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



3. Remove the waterproof female connector from the ignition timing adjustment connector.
4. Use a jumper wire to earth the ignition timing adjustment terminal.

5. Start the engine and run at idle.
6. Check the idle speed.

**Standard value:**

**750±50 r/min <4G92>**

**800±50 r/min <4G93>**

**NOTE**

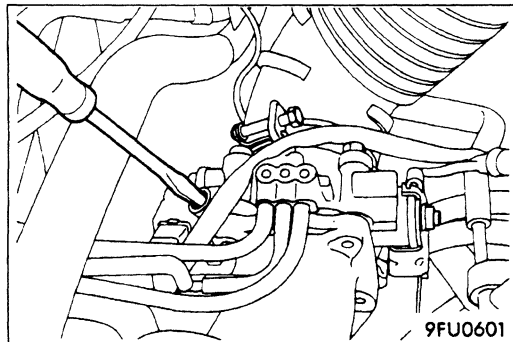
1. The engine speed may be 20 to 100 r/min lower than indicated above for a new vehicle [driven approximately 500 km or less], but no adjustment is necessary.
2. If the engine stalls or the engine speed is low even though the vehicle has been driven approximately 500 km or more, it is probable that deposits are adhered to the throttle valve, so clean it. (Refer to P.13A-90.)

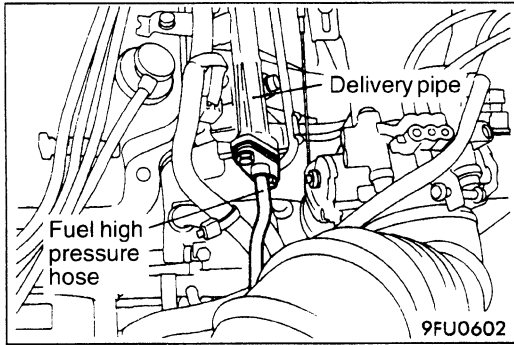
7. If not within the standard value range, turn the speed adjusting screw (SAS) to make the necessary adjustment.

**NOTE**

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

8. Switch OFF the ignition switch.
9. Disconnect the jumper wire from the ignition timing adjustment terminal and return the connector to its original condition.
10. Start the engine again and let it run at idle speed for about 10 minutes; check that the idling condition is normal.





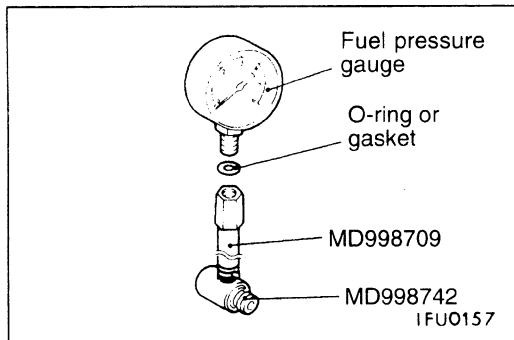
## FUEL PRESSURE TEST

13100190037

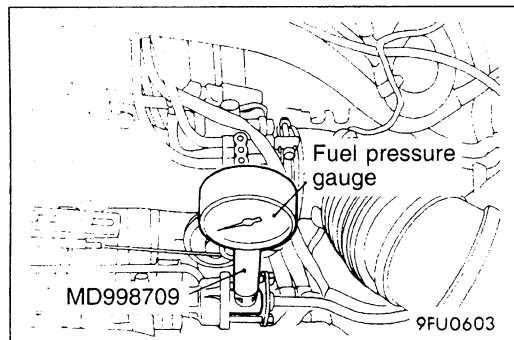
1. Release residual pressure from the fuel pipe line to prevent fuel gush out. (Refer to P.13A-98.)
2. Disconnect the fuel high pressure hose at the delivery pipe side.

### Caution

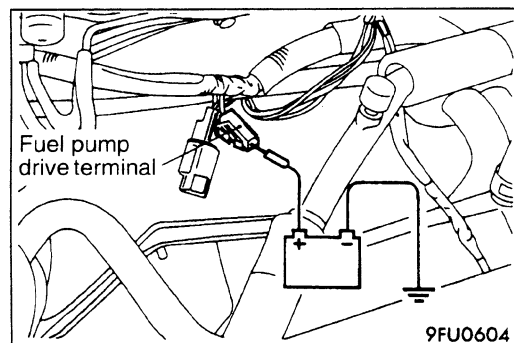
**Cover the hose connection with rags to prevent splash of fuel that could be caused by some residual pressure in the fuel pipe line.**



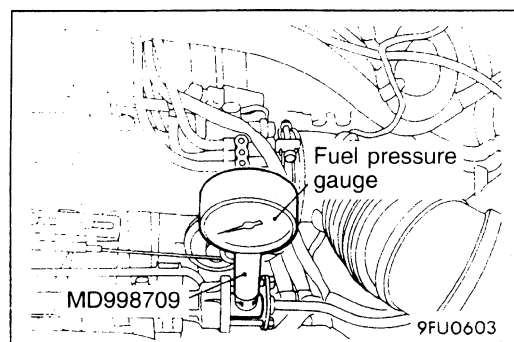
3. Remove the union joint and bolt from the special tool (adapter hose MD998709) and instead attach the special tool (hose adapter MD998742) to the adapter hose.
4. Install a fuel pressure gauge on the adapter hose that was set up in step 3.  
Use a suitable O-ring or gasket between the fuel pressure 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 set in place in steps 3 and 4 between the delivery pipe and the high pressure hose.



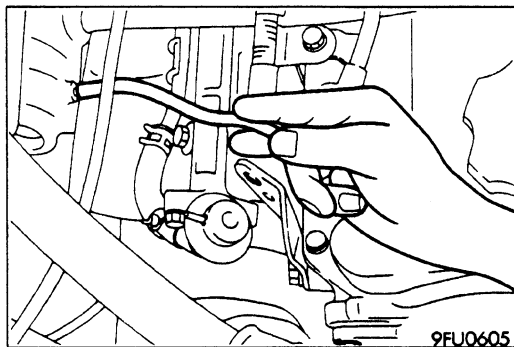
6. Connect the fuel pump drive terminal with the battery (+) terminal using a jumper wire and drive the fuel pump. Under fuel pressure, check the fuel pressure gauge and special tool connections for leaks.
7. Disconnect the jumper wire from the fuel pump drive terminal to stop the fuel pump.
8. Start the engine and run at idle.



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

### Standard value:

**Approx. 265 kPa at curb idle**



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

**Standard value:**

**324–343 kPa at curb idle**

11. Check to see that fuel pressure at idle does not drop even after the engine has been raced several times.
12. 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.

13. If any of fuel pressure measured in steps 9 to 12 is out of specification, troubleshoot and repair according to the table below.

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

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

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

15. Release residual pressure from the fuel pipe line. (Refer to P.13A-98.)
16. Remove the fuel pressure gauge and special tool from the delivery pipe.

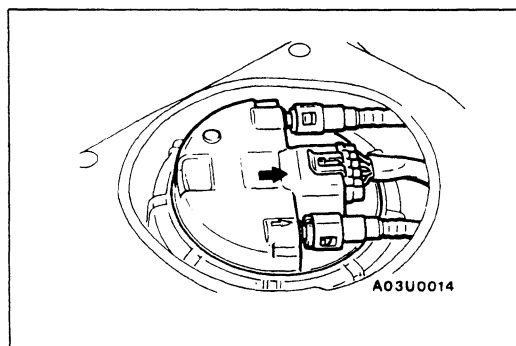
**Caution**

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

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

**Tightening torque: 5 Nm**

19. Check for fuel leaks.
  - (1) Apply the battery voltage to the fuel pump drive terminal to drive the fuel pump.
  - (2) Under fuel pressure, check the fuel line for leaks.

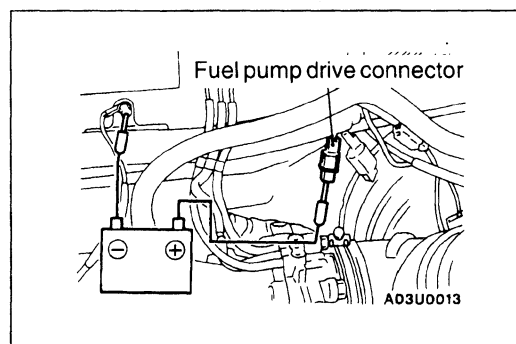


## FUEL PUMP CONNECTOR DISCONNECTION (HOW TO REDUCE THE FUEL PRESSURE)

13100090030

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) Raise the rear seat cushion.
- (2) Remove the protector.
- (3) Disconnect the harness connector.
- (4) After starting the engine and letting it run until it stops naturally, turn the ignition switch to OFF.
- (5) Connect the fuel wiring harness and floor wiring harness.
- (6) Install the rear seat cushion.



## FUEL PUMP OPERATION CHECK

13100200044

1. Check the operation of the fuel pump by using the MUT-II to force-drive the fuel pump.
2. If the fuel pump will not operate, check by using the following procedure, and if it is normal, check the drive circuit.
  - (1) Turn the ignition switch to OFF.
  - (2) When the fuel pump drive connector (black) 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 filler cap and check from the tank inlet.

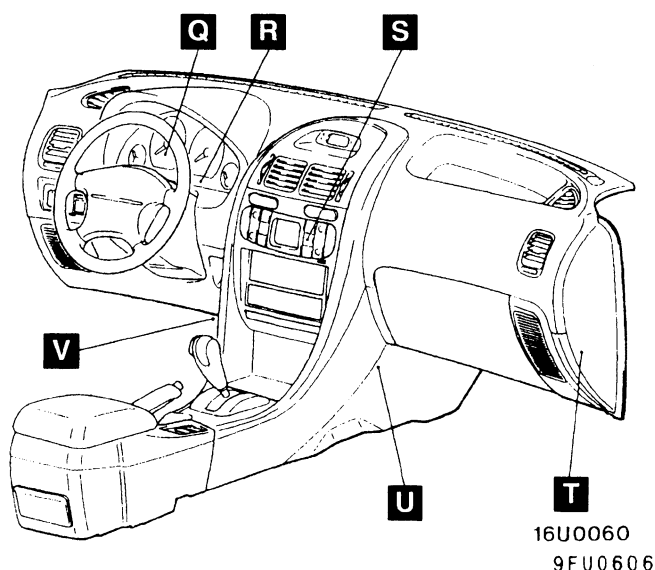
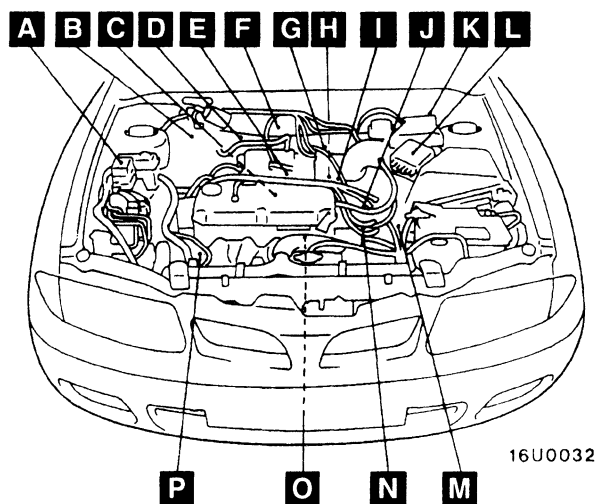
- (3) Check the fuel pressure by pinching the fuel hose with the fingertips.

# COMPONENT LOCATION

13100210054

&lt;SOHC&gt;

Name	Symbol	Name	Symbol
Accelerator pedal position sensor (with idle position switch) <Vehicles with TCL>	I	Fuel pump check terminal	D
A/C relay	A	Idle speed control servo	H
A/C switch	S	Ignition timing adjustment connector	D
Air flow sensor (with intake air temperature sensor and barometric pressure sensor)	L	Inhibitor switch <A/T>	M
Control relay	U	Injector	E
Detonation sensor	C	Oxygen sensor	O
Diagnosis connector	V	Power steering fluid pressure switch	P
Distributor (with ignition coil, power transistor, top dead centre sensor and crank angle sensor)	J	Purge control solenoid valve <L.H. drive vehicles>	K
EGR control solenoid valve <L.H. drive vehicles>	K	Purge control solenoid valve <R.H. drive vehicles>	B
EGR control solenoid valve <R.H. drive vehicles>	B	Throttle position sensor <Vehicles with TCL>	G
Engine coolant temperature sensor	N	Throttle position sensor (with idle position switch) <Vehicles without TCL>	G
Engine ECU	T	Vacuum control solenoid valve <Vehicles with TCL>	F
Engine warning lamp (check engine lamp)	R	Vehicle speed sensor	Q
		Ventilation control solenoid valve <Vehicles with TCL>	F



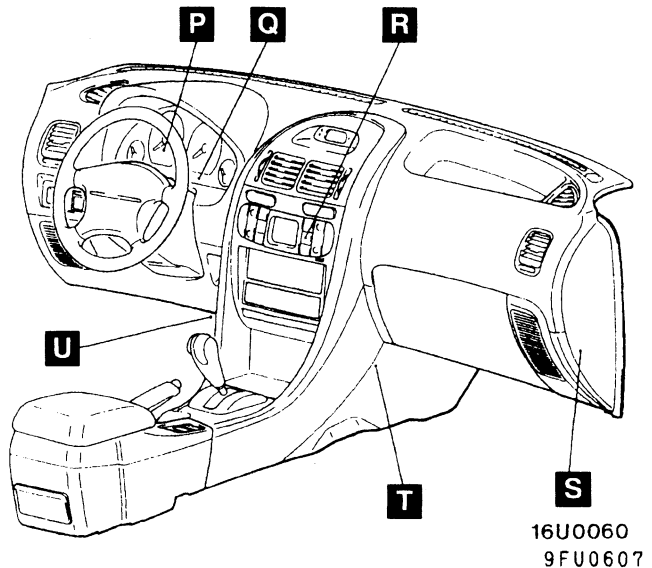
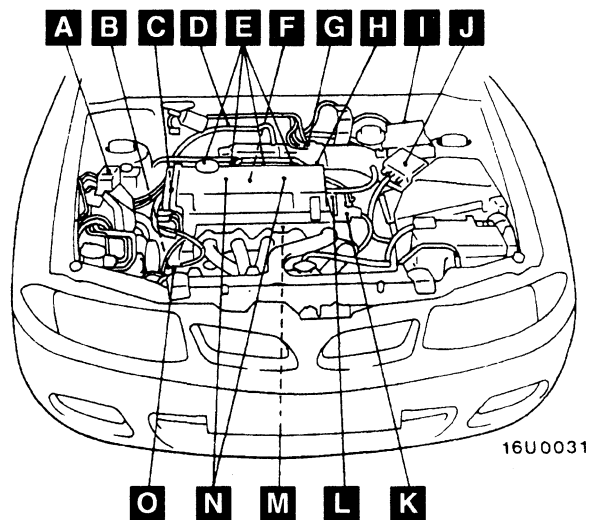


13A-100

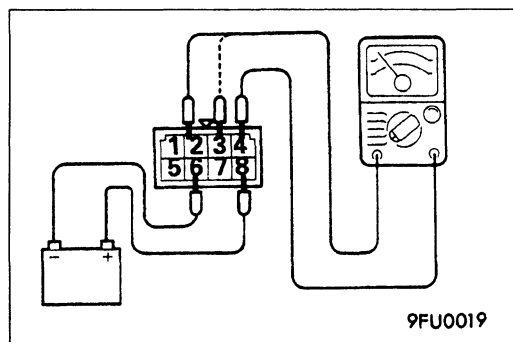
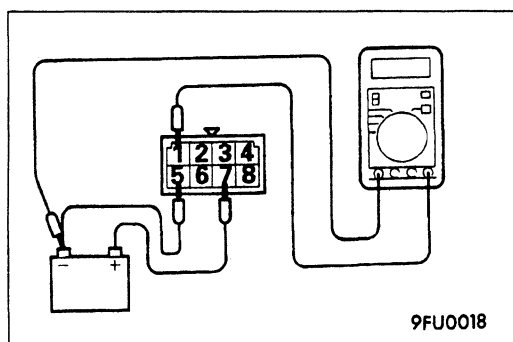
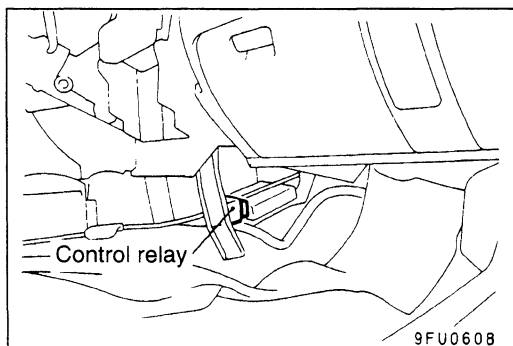
MPI – On-vehicle Service

<DOHC>

Name	Symbol	Name	Symbol
A/C relay	A	Engine warning lamp (check engine lamp)	Q
A/C switch	R	Fuel pump check terminal	D
Air flow sensor (with intake air temperature sensor and barometric pressure sensor)	J	Idle speed control servo	H
		Ignition coil	N
Camshaft position sensor	C	Ignition failure sensor	L
Control relay	T	Ignition timing adjustment connector	D
Crank angle sensor	B	Injector	E
Detonation sensor	F	Oxygen sensor	M
Diagnosis connector	U	Power steering fluid pressure switch	O
EGR control solenoid valve	I	Purge control solenoid valve	I
Engine coolant temperature sensor	K	Throttle position sensor (with idle position switch)	G
Engine ECU	S	Vehicle speed sensor	P







## CONTROL RELAY CHECK

13100800039

1. Remove the control relay.
2. Check the continuity between the control relay terminals.

**Normal condition:**

Inspection terminals	Continuity
5-7	Continuity
6-8	Continuity in one direction

3. Use jumper leads to connect control relay terminal 7 to the battery (+) terminal and terminal 5 to the battery (-) terminal.

### Caution

**When connecting the jumper leads, be careful not to mistake the connection terminals, as damage to the relay will result.**

4. Check the voltage at control relay terminal 1 while connecting and disconnecting the jumper lead at the battery (-) terminal.

**Normal condition:**

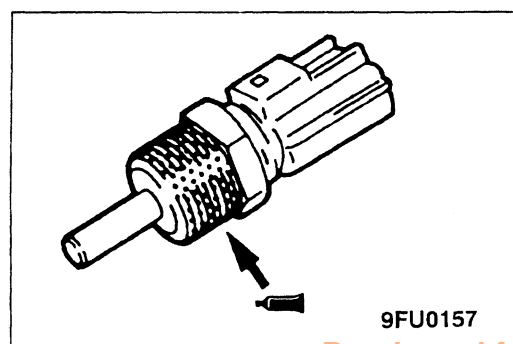
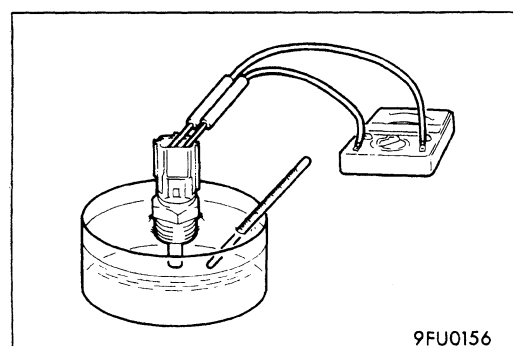
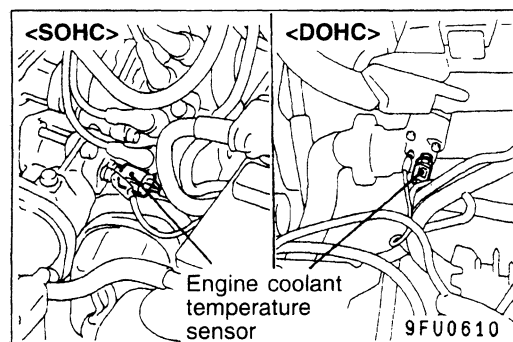
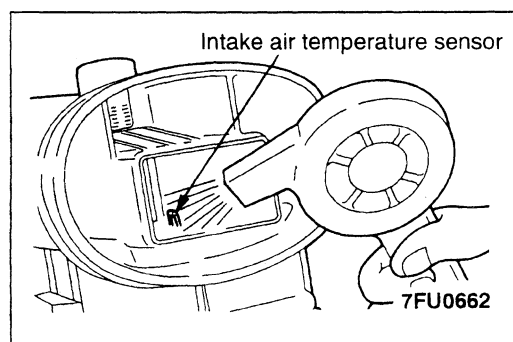
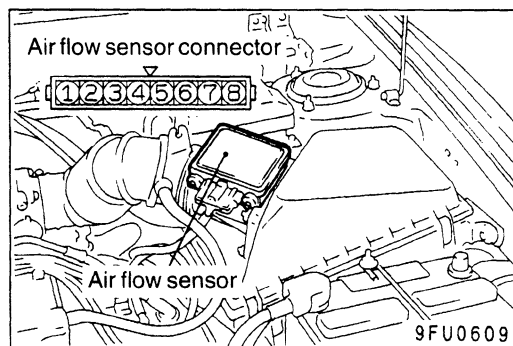
Jumper lead	Voltage at terminal 1
Connected	S V
Disconnected	0 V

5. Use the jumper leads to connect control relay terminal 8 to the battery (+) terminal and terminal 6 to the battery (-) terminal.
6. Check the continuity between control relay terminals 2 - 4 and terminals 3 - 4 while connecting and disconnecting the jumper lead at the battery (-) terminal.

**Normal condition**

Jumper lead	Continuity between terminals 2 - 4	Continuity between terminals 3 - 4
Connected	Continuity (0Ω)	Continuity (0Ω)
Disconnected	No continuity (∞Ω)	No continuity (∞Ω)

7. If there is a defect, replace the control relay.



## INTAKE AIR TEMPERATURE SENSOR CHECK

13100280031

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

### Standard value:

2.3–3.0 k $\Omega$  (at 20°C)

0.30–0.42 k $\Omega$  (at 80°C)

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

### Normal condition:

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

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

## ENGINE COOLANT TEMPERATURE SENSOR CHECK

13100310037

### Caution

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

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

### Standard value:

2.1–2.7 k $\Omega$  (at 20°C)

0.26–0.36 k $\Omega$  (at 80°C)

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

4. Apply sealant to threaded portion.

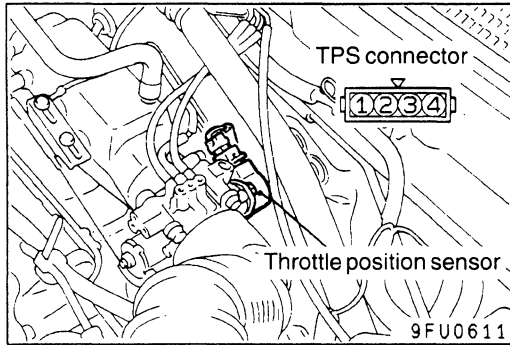
### Specified sealant:

3M NUT locking Part No. 4171 or equivalent

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

**Sensor tightening torque: 30 Nm**

6. Fasten harness connectors securely.



## THROTTLE POSITION SENSOR CHECK 13100320030

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 k $\Omega$**

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

### Normal condition:

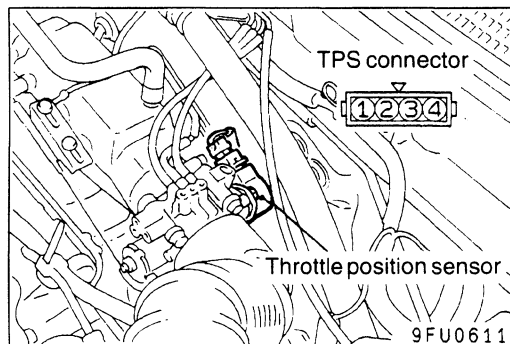
Throttle valve slowly open until fully open from the idle position

Changes smoothly in proportion to the opening angle of the throttle valve

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

### NOTE

For the throttle position sensor adjustment procedure, refer to P.13A-90 <Vehicles without TCL>, P.13A-91 <Vehicles with TCL>.



## IDLE POSITION SWITCH CHECK <Vehicles without TCL>

13100330033

1. Disconnect the throttle position sensor connector.
2. Check the continuity between the throttle position sensor connector side terminal 3 and terminal 4.

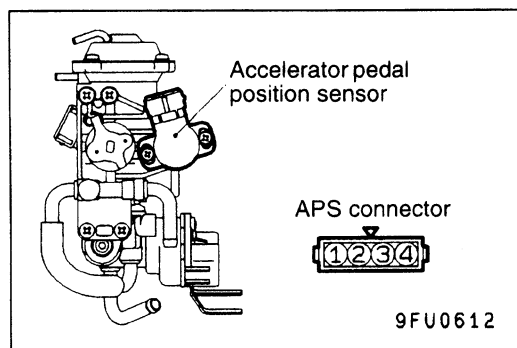
### Normal condition:

Accelerator pedal	Continuity
Depressed	Non-conductive ( $\infty \Omega$ )
Released	Conductive (0 $\Omega$ )

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

### NOTE

After replacement, the idle position switch and throttle position sensor should be adjusted. (Refer to P.13A-91, 92.)



## IDLE POSITION SWITCH CHECK

### <Vehicles with TCL>

13100330040

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

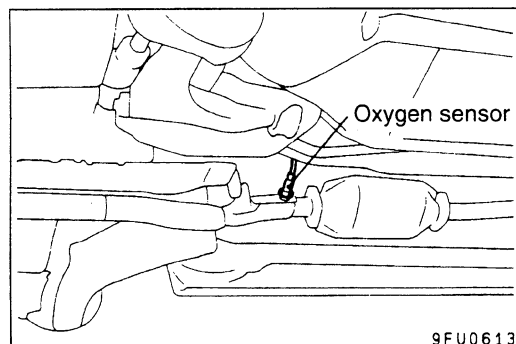
#### Normal condition:

Accelerator pedal	Continuity
Depressed	Non-conductive ( $\infty \Omega$ )
Released	Conductive ( $0 \Omega$ )

3. If out of specification, replace the accelerator pedal position sensor.

#### NOTE

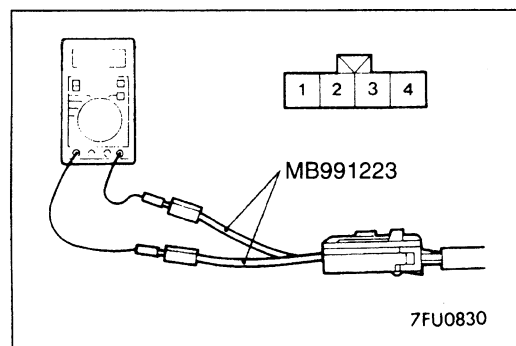
After replacement, the idle position switch and accelerator pedal position sensor should be adjusted. (Refer to P.13A-92.)



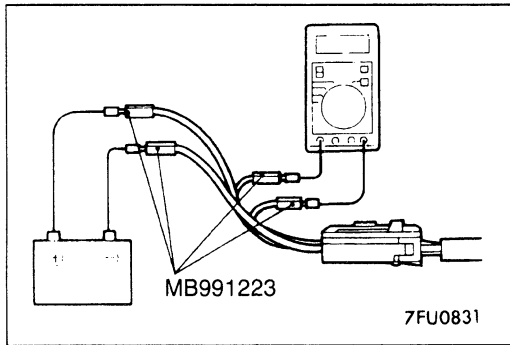
## OXYGEN SENSOR CHECK

13100510017

1. Disconnect the oxygen sensor connector and connect the special tool (test harness set) to the connector on the oxygen sensor side.



2. Make sure that there is continuity ( $7-40 \Omega$  at  $20^\circ\text{C}$ ) between terminal 3 and terminal 4 on the oxygen sensor connector.
3. If there is no continuity, replace the oxygen sensor.



4. Warm up the engine until engine coolant is 80°C or higher.
5. Use the jumper wires to connect terminal 3 of the oxygen sensor connector to the battery (+) terminal and terminal 4 to the battery (-) terminal.

**Caution**

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

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

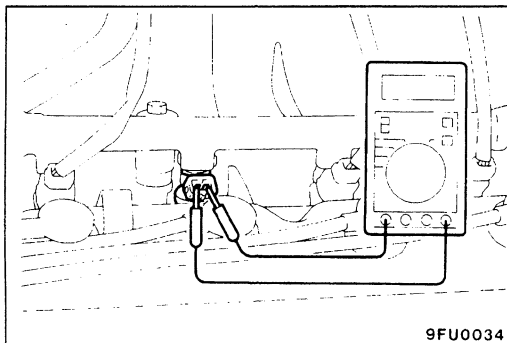
**Normal condition:**

Engine	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 oxygen sensor will output a voltage of 0.6–1.0V.

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

**NOTE**

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



**INJECTOR CHECK**

13100520034

**Measurement of Resistance between Terminals**

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

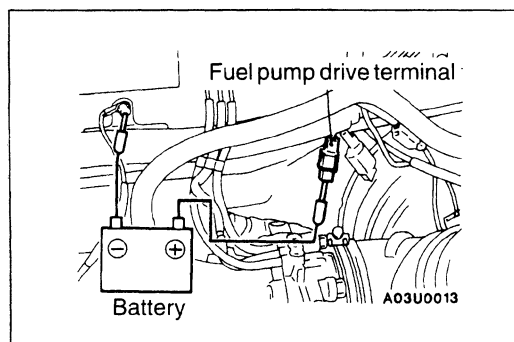
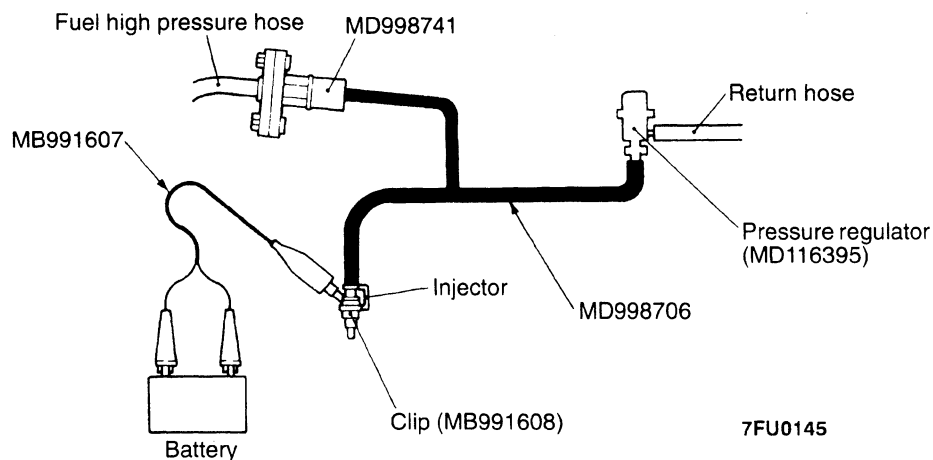
**Standard value: 13–16 Ω (at 20°C)**

3. Install the injector connector.

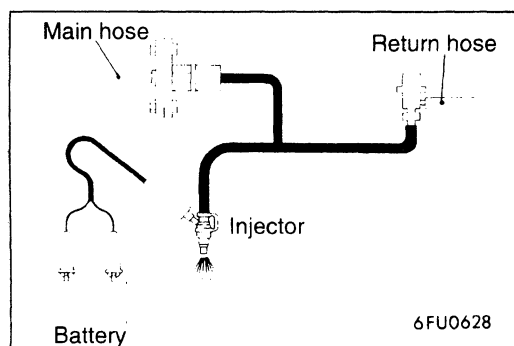
**Checking the Injection Condition**

1. Following the steps below, bleed out the residual pressure within the fuel pipe line to prevent flow of the fuel. (Refer to P.13-98.)
2. Remove the injector.

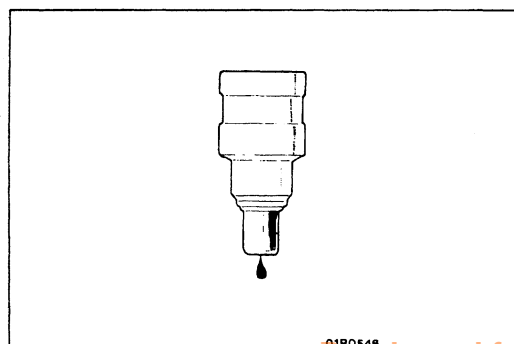
3. Arrange the special tool (injector test set), adaptor, fuel pressure regulator and clips as shown in the illustration below.



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



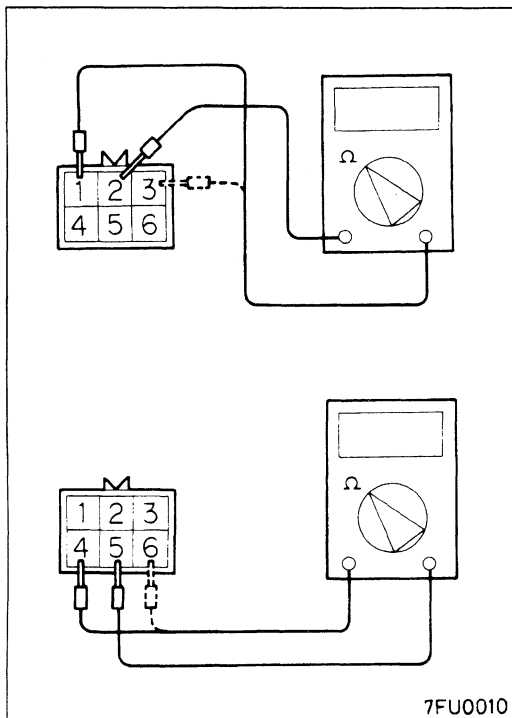
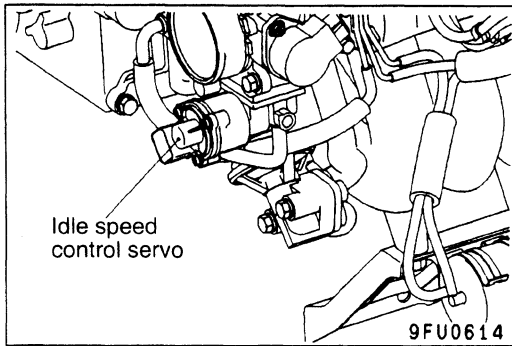
5. Activate the injector and check the atomized spray condition of the fuel. The condition can be considered satisfactory unless it is extremely poor.



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

13100540054

### Checking the Operation Sound

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

#### NOTE

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

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

### Checking the Coil Resistance

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

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

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

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

## PURGE CONTROL SOLENOID VALVE CHECK

13100560036

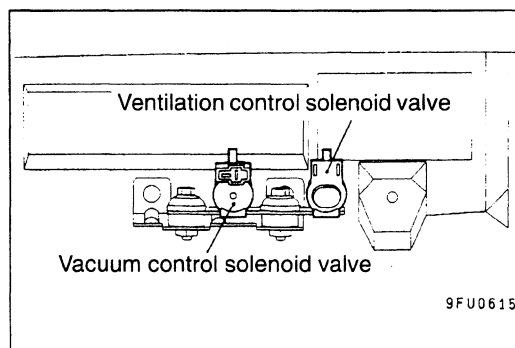
Refer to GROUP 17 – Evaporative Emission Control System.

## EGR CONTROL SOLENOID VALVE CHECK

13100570039

Refer to GROUP 17 – Exhaust Gas Recirculation (EGR) System.





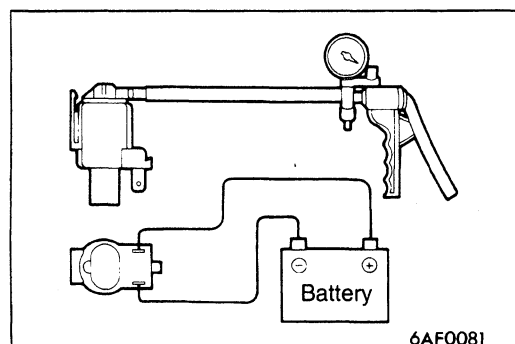
## VENTILATION CONTROL SOLENOID VALVE CHECK <Vehicles with TCL>

13100630027

### NOTE

When disconnecting the vacuum hose, always make a mark so that it can be reconnected at original position.

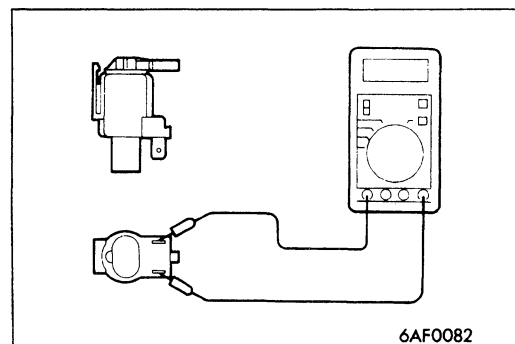
1. Disconnect the vacuum hose (black) from the solenoid valve.
2. Disconnect the harness connector.



3. Connect a hand vacuum pump to the nipple.
4. Check air-tightness by applying a vacuum with voltage applied directly from the battery to the solenoid valve and without applying voltage.

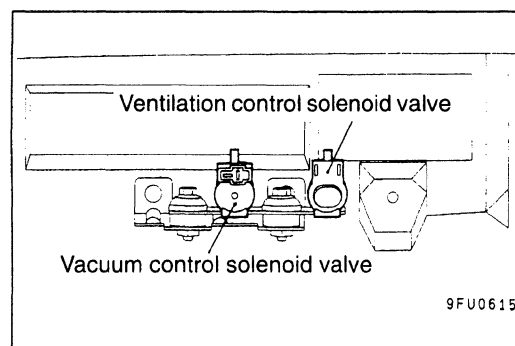
### Normal condition:

Battery voltage	Normal condition
Applied	Vacuum maintained
Not applied	Vacuum leaks



5. Measure the resistance between the terminals of the solenoid valve.

**Standard value: 36–44  $\Omega$  (at 20°C)**



## VACUUM CONTROL SOLENOID VALVE CHECK <Vehicles with TCL>

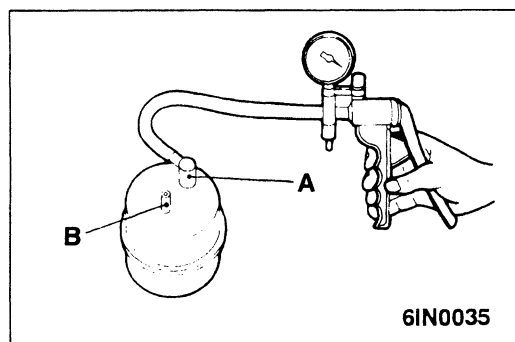
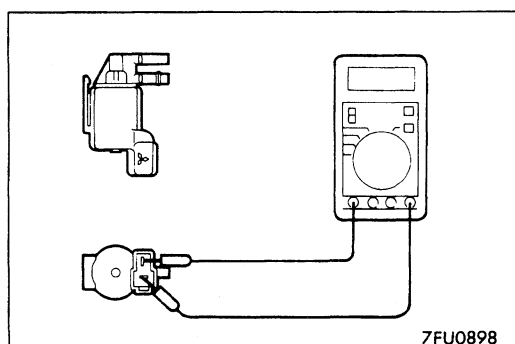
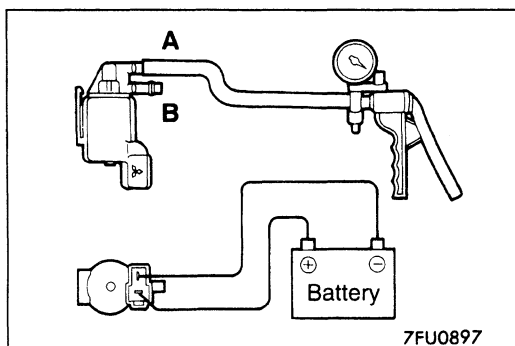
13100620024

### NOTE

When disconnecting the vacuum hose, always make a mark so that it can be reconnected at original position.

1. Disconnect the vacuum hose (blue stripe, green stripe) from the solenoid valve.
2. Disconnect the harness connector.





3. Connect a hand vacuum pump to nipple A of the solenoid valve.
4. Use jumper wires to connect the terminals of the solenoid valve and the battery.
5. Check the air-tightness when negative pressure is applied while the jumper wire is connected to the battery (–) terminal and while it is disconnected.

**Normal condition:**

Jumper wire	Nipple B condition	Normal condition
Connected	Open	Negative pressure leaks
	Closed	Negative pressure is maintained
Disconnected	Open	Negative pressure is maintained

6. Measure the resistance between the terminals of the solenoid valve.

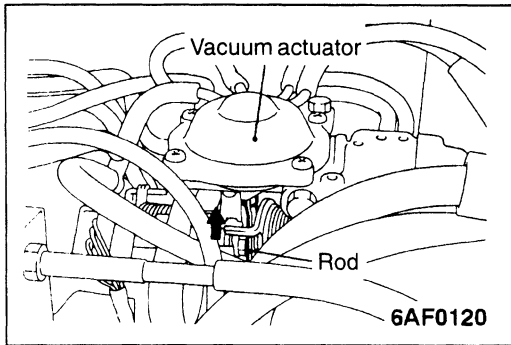
**Standard value: 36–44  $\Omega$  (at 20°C)**

**VACUUM TANK CHECK**

13100810025

**<Vehicles with TCL>**

1. Connect a hand vacuum pump to vacuum tank A nipple, apply 67 kPa of vacuum and check that the vacuum is held.
2. Connect a hand vacuum pump to vacuum tank B nipple.
3. First, close A nipple with your finger and apply 67 kPa of vacuum. Then, check that the vacuum leaks immediately when you remove the finger blocking the nipple.

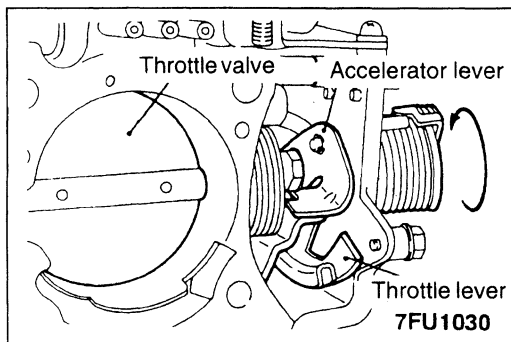


## VACUUM ACTUATOR CHECK

13100820028

### <Vehicles with TCL>

1. Remove the vacuum hose (green stripe) from the vacuum actuator and connect a hand vacuum pump to the vacuum actuator.
2. With the accelerator pedal depressed, check that the rod is pulled up and that vacuum is held when 27 kPa of vacuum is applied.

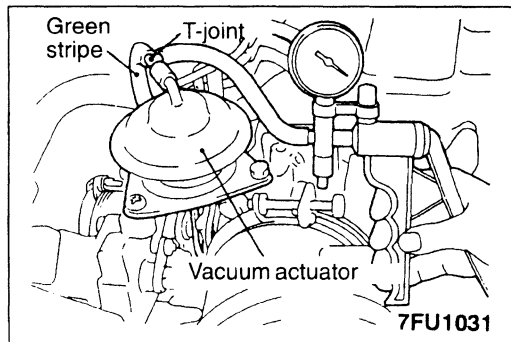


## THROTTLE VALVE OPERATION CHECK

13100830021

### <Vehicles with TCL>

1. Check that the throttle valve opens and closes smoothly (throttle lever moves) according to the opening and closing of the accelerator lever.
2. If the throttle valve does not open and close smoothly, there might be a deposit on the throttle valve, so clean the throttle body. (Refer to page 13A-90.)



## NEGATIVE PRESSURE CHECK DURING TRACTION CONTROL OPERATION

13100840024

### <Vehicles with TCL>

1. Disconnect the vacuum hose (green stripe) from the vacuum actuator, connect a hand vacuum pump between the actuator nipple and the vacuum hose via a T-joint. Set the hand vacuum pump near the driver's seat so that the negative pressure check can be carried out at the driver's seat.
2. Check the negative pressure during traction control operation.

Inspection service points are the same as for the traction control operation inspection.

(Refer to GROUP 13H or 23 – On-vehicle Service.)

### Normal condition:

Vehicle condition	Normal negative pressure when accelerator pedal is depressed
Vehicle is lifted up	20 kPa or more
Driving on a dry, sealed road surface	No change

### NOTE

The traction control system function will stop 20 seconds after the accelerator pedal has been depressed, and negative pressure will gradually drop.

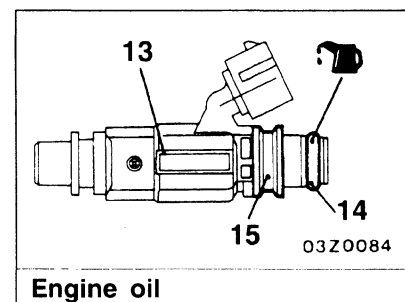
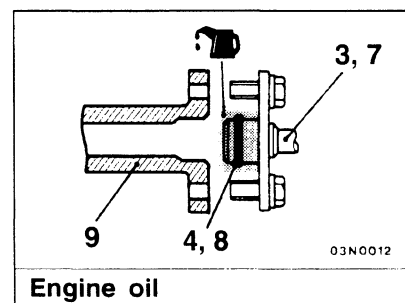
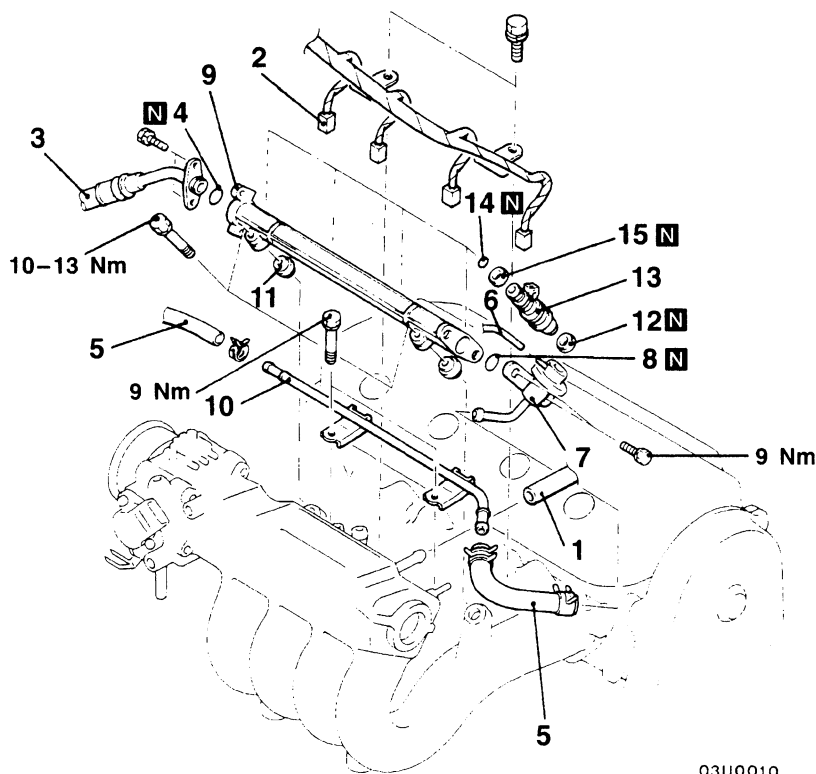
# INJECTOR

13100710042

## REMOVAL AND INSTALLATION

### Pre-removal Operation

- Fuel Discharge Prevention (Refer to P.13A-98.)



00003384

### Removal steps

- |                                |         |                  |
|--------------------------------|---------|------------------|
| 1. PCV hose                    |         | 8. O-ring        |
| 2. Injector connector          | ◀A▶     | 9. Delivery pipe |
| 3. Fuel high pressure hose     |         | 10. Return pipe  |
| 4. O-ring                      |         | 11. Insulator    |
| 5. Fuel return hose connection |         | 12. Insulator    |
| 6. Vacuum hose                 | ◀A▶ ▶A▶ | 13. Injector     |
| 7. Fuel pressure regulator     |         | 14. O-ring       |
|                                |         | 15. Grommet      |

### REMOVAL SERVICE POINT

#### ◀A▶ DELIVERY PIPE/INJECTOR REMOVAL

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

#### Caution

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

### INSTALLATION SERVICE POINT

#### ►A◄ INJECTOR/FUEL PRESSURE REGULATOR/FUEL HIGH PRESSURE HOSE INSTALLATION

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

#### **Caution**

**Be sure not to let engine oil in the delivery pipe.**

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

#### **Specified tightening torque:**

**9 Nm (Fuel pressure regulator)**

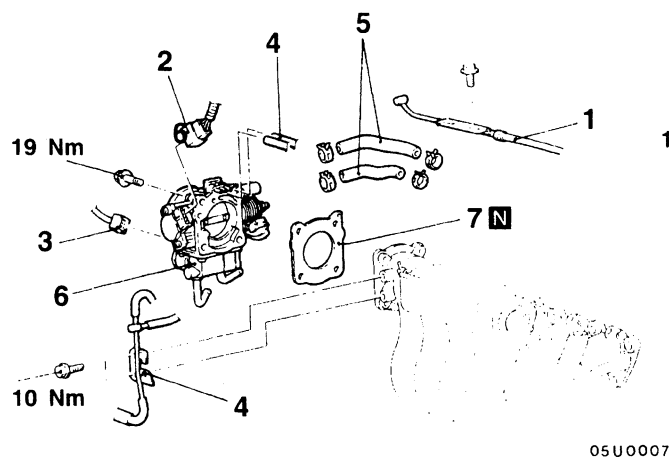
## THROTTLE BODY

### REMOVAL AND INSTALLATION

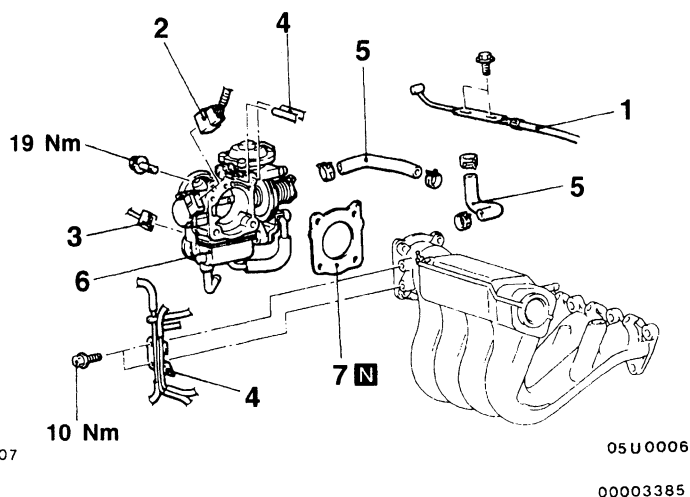
#### Pre-removal and Post-installation Operation

- (1) Engine Coolant Draining and Supplying
- (2) Air Cleaner Removal and Installation

#### <Vehicles without TCL>



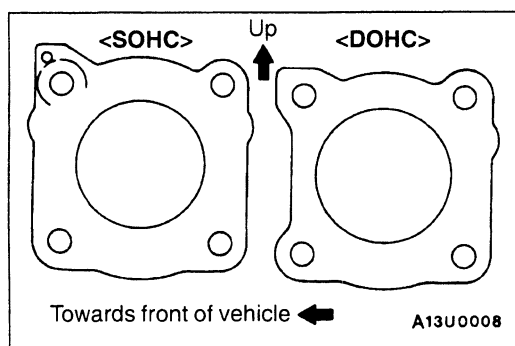
#### <Vehicles with TCL>



#### Removal steps

1. Accelerator cable connection
2. Throttle position sensor connector
3. Idle speed control motor connector

4. Vacuum pipe and hose assembly
5. Water hose connection
6. Throttle body
7. Gasket



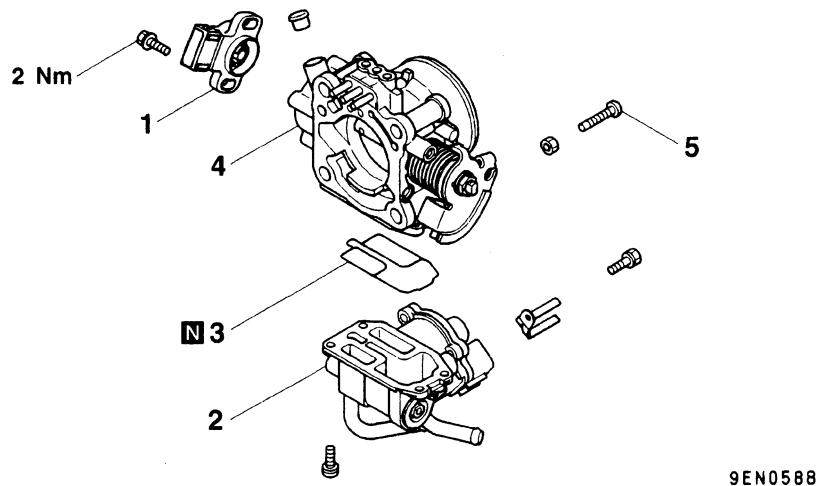
### INSTALLATION SERVICE POINT

#### ▶◀ THROTTLE BODY GASKET INSTALLATION

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

DISASSEMBLY AND REASSEMBLY <Vehicles without TCL>

13100970013



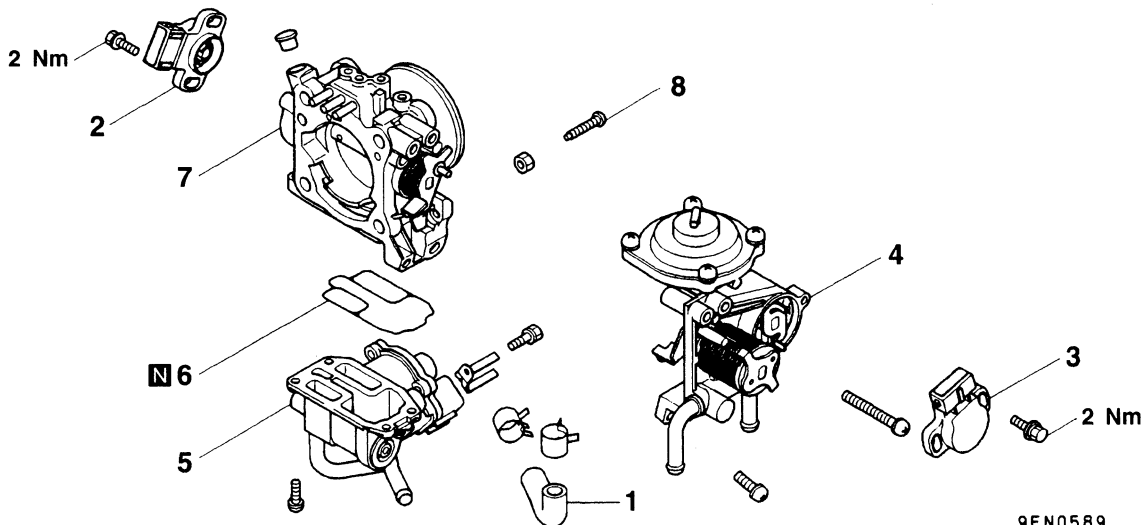
**Disassembly steps**

- B◄
1. Throttle position sensor
  2. Idle speed control body assembly
  3. O-ring
  4. Throttle body
  5. Fixed SAS

**NOTE**

1. The fixed SAS is correctly adjusted at the factory and should not be removed.
2. If the fixed SAS should happen to have been removed, carry out fixed SAS adjustment. (Refer to page 13A – 93.)

DISASSEMBLY AND REASSEMBLY <Vehicles with TCL>



**Disassembly steps**

- B◄  
►A◄
1. Water hose
  2. Throttle position sensor
  3. Accelerator pedal position sensor
  4. Lever assembly
  5. Idle speed control body assembly

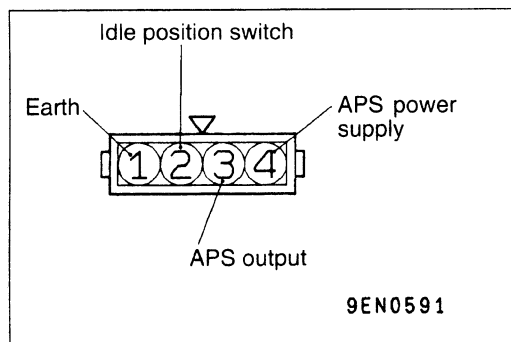
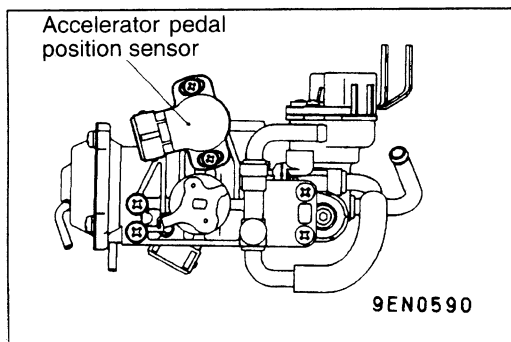
6. O-ring
7. Throttle body
8. Fixed SAS

**NOTE**

1. The fixed SAS is correctly adjusted at the factory and should not be removed.
2. If the fixed SAS should happen to have been removed, carry out fixed SAS adjustment. (Refer to page 13A – 93.)

## CLEANING THROTTLE BODY PARTS

- (1) Clean all throttle body parts.  
Do not use solvent to clean the following parts:
  - Throttle position sensor
  - Accelerator pedal position sensor
  - Idle speed control body assembly
 If these parts are immersed in solvent, their insulation will deteriorate.  
Wipe them with cloth only.
- (2) Check if the vacuum port or passage is clogged. Use compressed air to clean the vacuum passage.



## REASSEMBLY SERVICE POINTS

### ▶◀ ACCELERATOR PEDAL POSITION SENSOR (APS) INSTALLATION

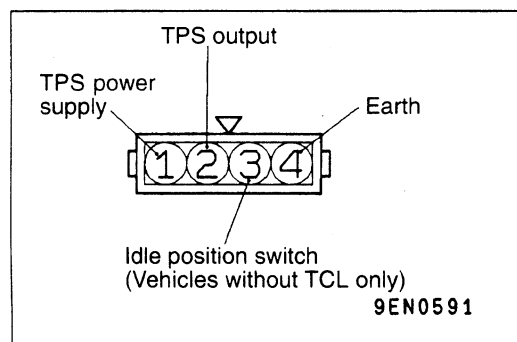
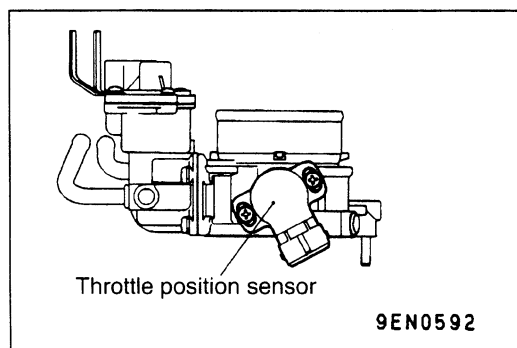
- (1) Install the APS so that it faces as shown in the illustration, and then tighten it with the screw.
- (2) Connect a multimeter between terminal (3) (APS output) and terminal (4) (APS power supply) of the APS connector, and check that the resistance increases gradually as the throttle valve is opened slowly to the fully-open position.
- (3) Check the continuity between terminal (2) (idle position switch) and terminal (1) (earth) of the APS connector when the throttle valve is fully closed and fully open.

#### Normal condition:

Throttle valve condition	Continuity
Fully closed	Continuity
Fully open	No continuity

If there is no continuity when the throttle valve is fully closed, turn the APS body clockwise and then check again.

- (4) If there is an abnormality, replace the APS.



### ►B◄ THROTTLE POSITION SENSOR (TPS) INSTALLATION

- (1) Install the TPS so that it faces as shown in the illustration, and then tighten it with the screw.
- (2) Connect a multimeter between terminal (1) (TPS power supply) and terminal (2) (TPS output) of the TPS connector, and check that the resistance increases gradually as the throttle valve is opened slowly to the fully-open position.
- (3) For vehicles without TCL, check the continuity between terminal (3) (idle position switch) and terminal (4) (earth) of the TPS connector when the throttle valve is fully closed and fully open.

#### Normal condition:

Throttle valve condition	Continuity
Fully closed	Continuity
Fully open	No continuity

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

- (4) If there is an abnormality, replace the TPS.



---

# FUEL SUPPLY

## CONTENTS

13509000036

FUEL TANK .....	2	SPECIAL TOOL .....	2
GENERAL INFORMATION .....	2	FUEL TANK .....	3

13F-2

FUEL SUPPLY – Fuel Tank

## FUEL TANK

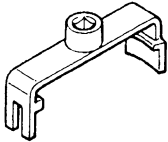
13500010038

### 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.
- (3) A plastic fuel tank has been adopted to reduce weight, and improve anti-corrosion effectiveness.

### SPECIAL TOOL

13500060026

Tool	Number	Name	Use
	MB996009	Tank cap wrench	Installation of tank cap

# FUEL TANK

13500190046

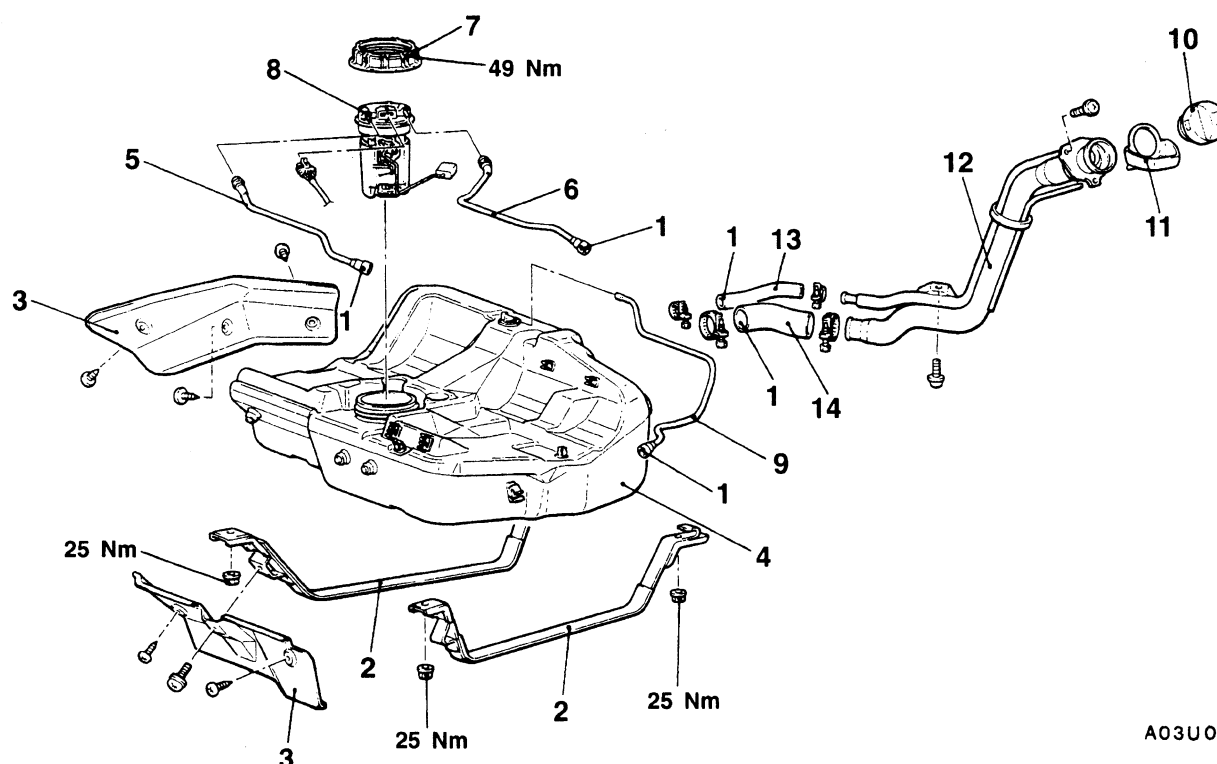
## REMOVAL AND INSTALLATION

### Pre-removal Operation

- (1) Draining the Fuel
- (2) Reduce the Inner Pressure of Fuel Line and Hose (Refer to GROUP 13A – On-vehicle Service.)
- (3) Removal of the Center Exhaust Pipe (Refer to GROUP 15.)

### Post-installation Operation

- (1) Installation of Exhaust Pipe (Refer to GROUP 15.)
- (2) Refilling the Fuel.
- (3) Checking for Fuel Leaks

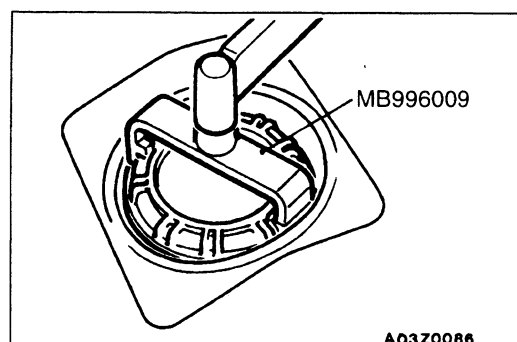


A03U0015

### Removal steps

1. Hoses connection
2. Band
3. Protector
4. Fuel tank assembly
5. Fuel main hose
6. Fuel return hose
7. Cap

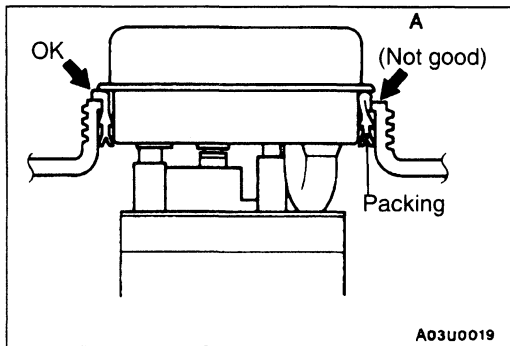
8. Fuel pump module
9. Fuel vapor hose
10. Fuel filler cap
11. Fuel rubber drain
12. Filler neck assembly
13. Leveling hose
14. Filler hose



A03Z0086

### INSTALLATION SERVICE POINT

#### ►A◄ CAP INSTALLATION



- (5) Check to be sure that the fuel tank packing is not damaged or deformed, and then securely install the packing.

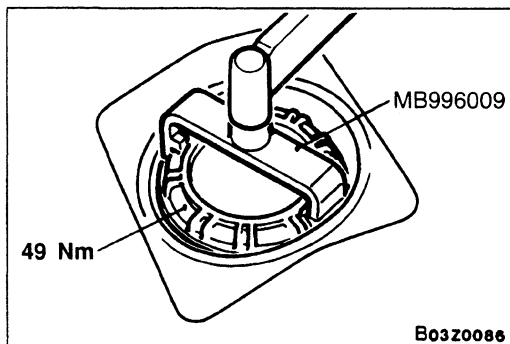
**NOTE**

If the packing is damaged or deformed, replace with new packing.

- (6) Apply soapy water to the inside of the packing, and then install the fuel pump module.

**Caution**

- Do not tilt the fuel pump module when installing.
- The packing should not be folded over as shown by (A) in the illustration.



- (7) Use the special tool to tighten the cap to the specified torque.

- (8) Check for leaks from the installation section of the fuel pump module by the following procedure.

1. Apply soapy water to the circumference of the cap.
2. Choke the vapor hose and main hose, apply an internal pressure of 10 kPa or less from the return hose and check to be sure that no bubbles form in the soapy water.

**FUEL GAUGE CHECK**

13500310039

Refer to GROUP 54 – Combination Meter.

---

**NOTES**

# TRACTION CONTROL SYSTEM (TCL)

## CONTENTS

1360900022

<b>GENERAL INFORMATION</b> .....	<b>2</b>	Wheel Speed Sensor Check .....	27
<b>SERVICE SPECIFICATION</b> .....	<b>3</b>	Vacuum Solenoid Valve Check .....	27
<b>SPECIAL TOOLS</b> .....	<b>3</b>	Ventilation Solenoid Valve Check .....	27
<b>TROUBLESHOOTING</b> .....	<b>3</b>	Vacuum Tank Check .....	27
<b>ON-VEHICLE SERVICE</b> .....	<b>25</b>	Vacuum Actuator Check .....	27
System Check Using the TCL Indicator		Accelerator Pedal Position Sensor (APS)	
Lamps .....	25	Check .....	27
TCL Operation Check .....	25	<b>TCL SWITCH</b> .....	<b>28</b>
Stop Lamp Switch Check .....	27	<b>TCL-ECU*</b> .....	<b>28</b>

### WARNINGS REGARDING SERVICING OF SUPPLEMENTAL RESTRAINT SYSTEM (SRS) EQUIPPED VEHICLES

#### WARNING!

- (1) Improper service or maintenance of any component of the SRS, or any SRS-related component, can lead to personal injury or death to service personnel (from inadvertent firing of the air bag) or to the driver and passenger (from rendering the SRS inoperative).
- (2) Service or maintenance of any SRS component or SRS-related component must be performed only at an authorized MITSUBISHI dealer.
- (3) MITSUBISHI dealer personnel must thoroughly review this manual, and especially its GROUP 52B – Supplemental Restraint System (SRS) before beginning any service or maintenance of any component of the SRS or any SRS-related component.

#### NOTE

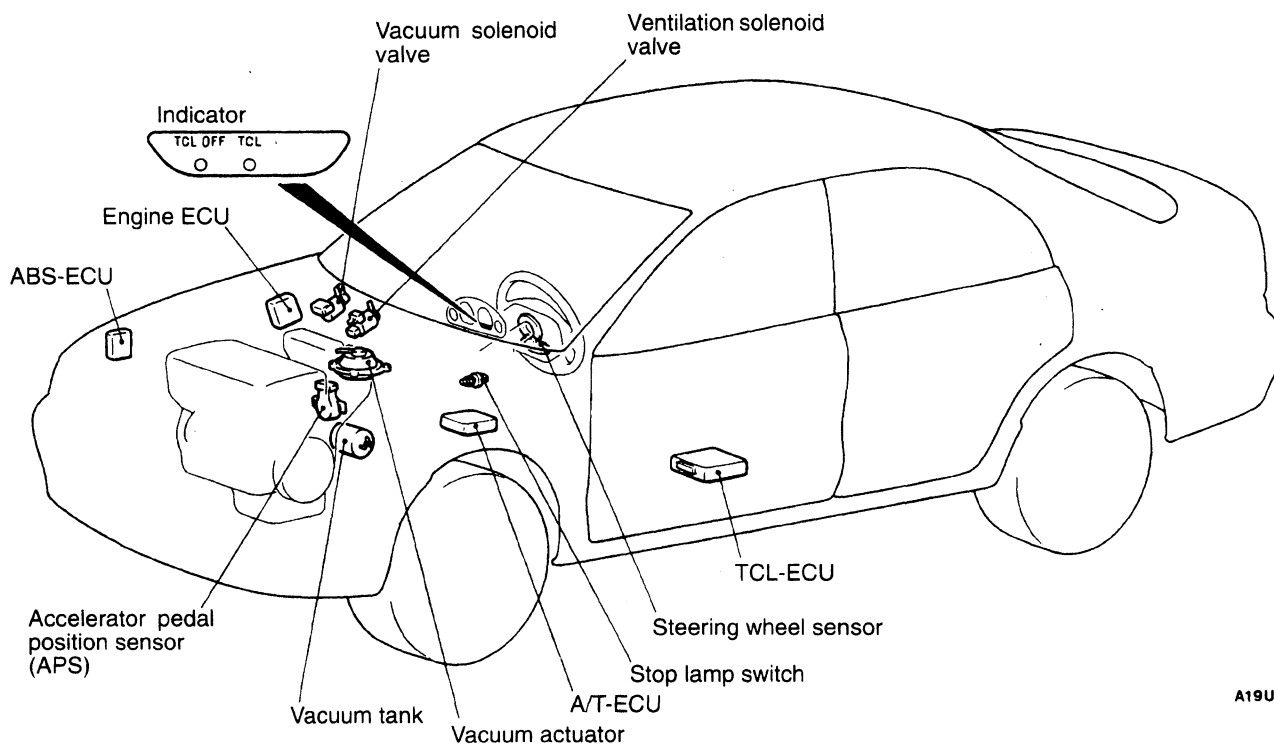
The SRS includes the following components: SRS-ECU, SRS warning lamp, air bag module, clock spring and interconnecting wiring. Other SRS-related components (that may have to be removed/installed in connection with SRS service or maintenance) are indicated in the table of contents by an asterisk (\*)

## GENERAL INFORMATION

13600010024

For GLS, the TCL system (slip control and trace control) is available as an option. This system facilitates starting, accelerating, and cornering on

slippery roads such as snowy roads. In addition, this system improves driveability while cornering on normal roads and contributes to easier driving.



A19U0026

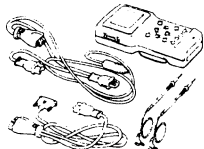
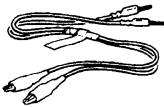
## SERVICE SPECIFICATION

13600030013

Item	Standard value
Accelerator pedal position sensor resistance kΩ	3.5–6.5

## SPECIAL TOOLS

13600060012

Tool	Number	Name	Use
	MB991502	MUT-II sub assembly	For checking of TCL (Diagnosis code display when using the MUT-II)
	MB991529	Diagnosis code check harness	For checking of TCL (Diagnosis code display when using the TCL-OFF warning lamp)

## TROUBLESHOOTING

13600070022

### STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING

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

#### NOTE

Before carrying out trouble diagnosis, check to be sure that all of the following items are normal.

- Is the standard steering wheel being used, and has it been correctly installed to the straight-ahead position on the steering shaft?
- Are the size, specifications, air pressure, balance and wear conditions of the tyres and wheels normal?
- Is the wheel alignment normal?
- Have any other modifications been made to the engine or suspension which could conceivably have an effect on the TCL system?

### DIAGNOSTIC FUNCTION

#### METHOD OF READING THE DIAGNOSIS CODES

Use the MUT-II or the warning lamp to read the diagnosis codes.

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

#### NOTE

Connect the MUT-II to the diagnosis connector (16 pin) under the instrument under cover.

#### METHOD OF ERASING THE DIAGNOSIS CODES

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



13H-4

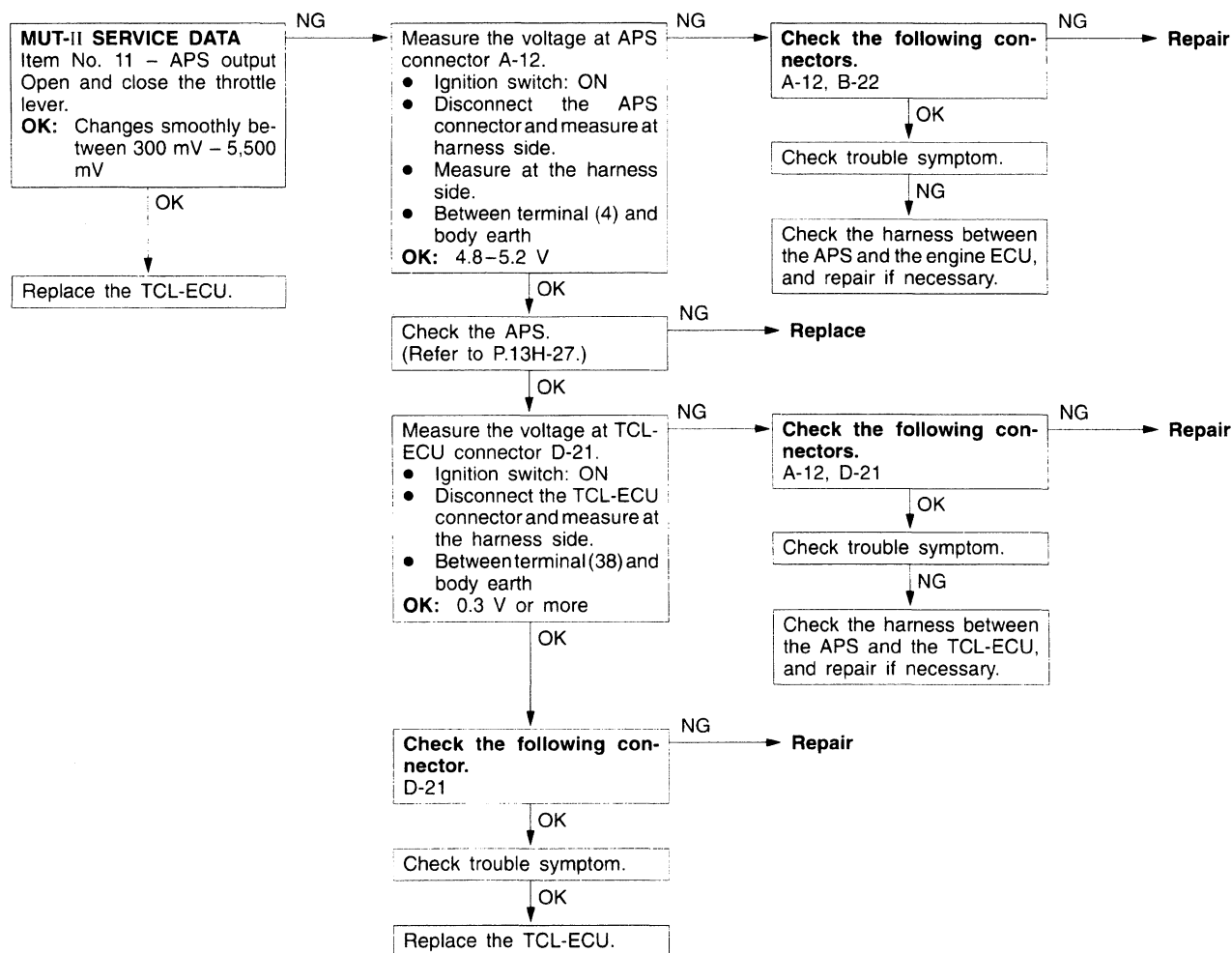
TCL – Troubleshooting

INSPECTION CHART FOR DIAGNOSIS CODES

Code No.	Diagnosis item	Reference page
11	APS circuit system	13H-5
12	APS or TPS circuit system	13H-6
13	TPS or APS circuit system	13H-7
23	Stop lamp switch circuit system	13H-7
24	TCL switch circuit system	13H-8
26	Ignition switch (IG2) circuit system	13H-8
27	TCL-ECU power supply voltage circuit (engine control relay circuit) system	13H-9
31	Front right wheel speed sensor circuit system	13H-10
32	Front left wheel speed sensor circuit system	13H-10
33	Rear right wheel speed sensor circuit system	13H-10
34	Rear left wheel speed sensor circuit system	13H-10
35	Rear wheel speed sensor circuit system (1)	13H-11
36	Rear wheel speed sensor circuit system (2)	13H-11
41	Steering wheel sensor (ST-1) circuit system (open circuit)	13H-12
42	Steering wheel sensor (ST-2) circuit system (open circuit)	13H-12
43	Steering wheel sensor (ST-N) circuit system (open circuit)	13H-12
44	Steering wheel sensor circuit system (short circuit)	13H-13
45	Steering wheel sensor (ST-N) circuit system (short circuit)	13H-13
71	Engine ECU communication circuit system	13H-14
72	Engine ECU circuit system	GROUP 13A – Troubleshooting
73		
74	A/T-ECU communication circuit system	13H-14
76	ABS circuit system	13H-15

# INSPECTION PROCEDURES FOR DIAGNOSIS CODES

Code No. 11 APS circuit system	Probable cause
This diagnosis code is output if the APS output voltage is less than 0.2 V due to an open circuit or other malfunction in the APS circuit. The APS power supply and earth are supplied from the engine ECU, and the output signal is used by the A/T-ECU and auto-cruise control-ECU as well as by the TCL-ECU.	<ul style="list-style-type: none"> <li>Malfunction of APS</li> <li>Malfunction of TCL-ECU</li> <li>Malfunction of engine ECU</li> <li>Malfunction of harness or connector</li> </ul>

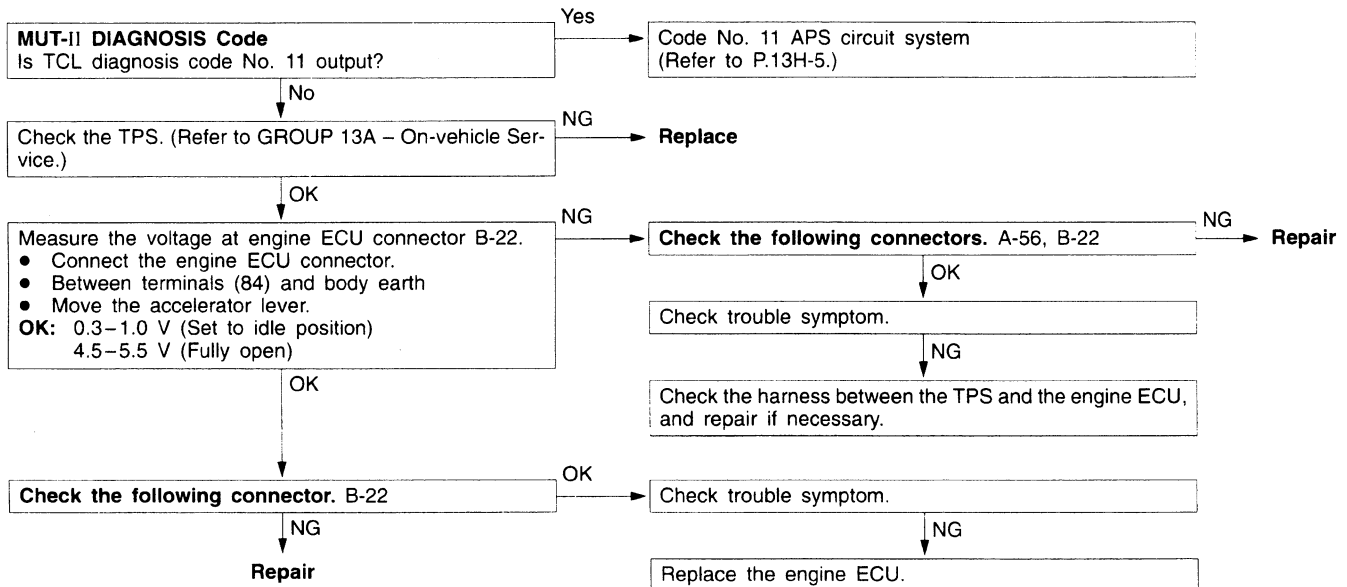


```

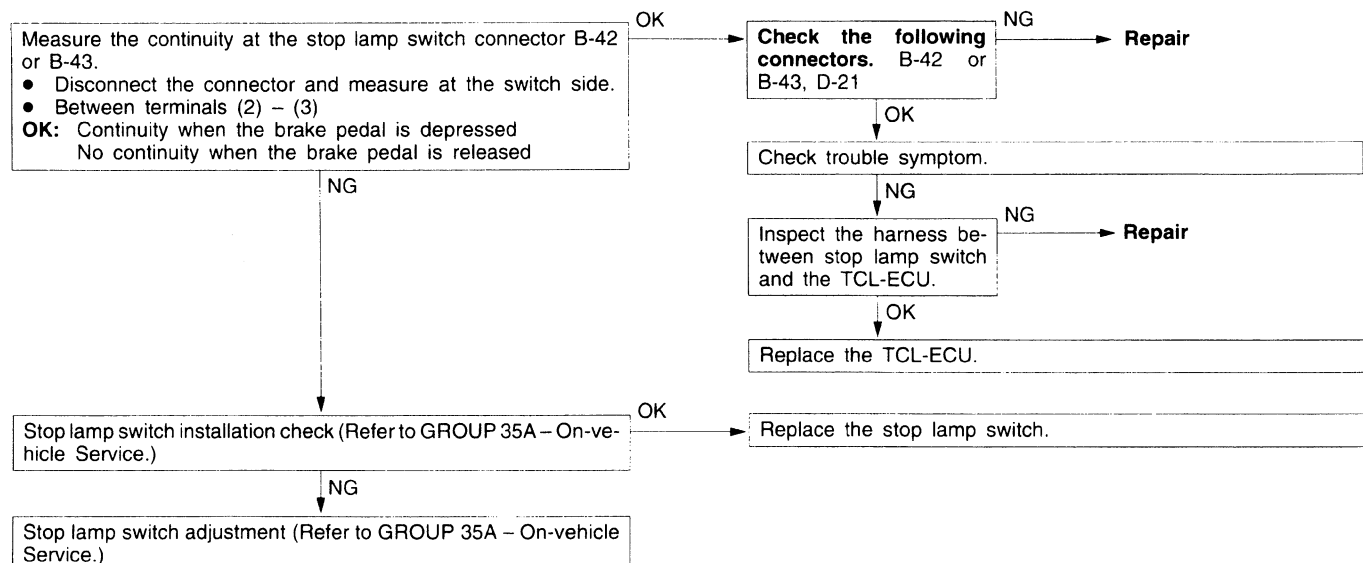
graph TD
    Start([Start]) --> MUTII[MUT-II SERVICE DATA  
Item No. 13 – TPS output  
Open and close the throttle lever.  
OK: Changes smoothly between 300 mV – 5,500 mV]
    MUTII -- OK --> APS[Check the APS.  
(Refer to P.13H-27.)]
    APS -- NG --> ReplaceAPS[Replace]
    APS -- OK --> Connectors1[Check the following connectors.  
A-12, D-21]
    Connectors1 -- NG --> Repair1[Repair]
    Connectors1 -- OK --> Trouble1[Check trouble symptom.]
    Trouble1 -- NG --> Harness1[Check the harness between the APS and the TCL-ECU, and repair if necessary.]
    Trouble1 -- OK --> MeasureTPS[Measure the voltage at TPS connector A-56.  
• Ignition switch: ON  
• Disconnect the TPS connector and measure at the harness side.  
• Between terminal (1) and body earth  
OK: 4.8–5.2 V]
    MeasureTPS -- NG --> Connectors2[Check the following connectors.  
A-56, B-22]
    Connectors2 -- NG --> Repair2[Repair]
    Connectors2 -- OK --> Trouble2[Check trouble symptom.]
    Trouble2 -- NG --> Harness2[Check the harness between the TPS and the engine ECU, and repair if necessary.]
    Trouble2 -- OK --> ReplaceECU1[Replace the engine ECU.]
    MeasureTPS -- OK --> TPS[Check the TPS.  
(Refer to GROUP 13A – On-vehicle Service.)]
    TPS -- NG --> ReplaceTPS[Replace]
    TPS -- OK --> MeasureECU[Measure the voltage at engine ECU connector B-22.  
• Ignition switch: ON  
• Connect the engine ECU connector.  
• Between terminal (84) and body earth.  
Move the accelerator lever  
OK: 0.3–1.0 V (Set to idle position)  
4.5–5.5 V (Fully open)]
    MeasureECU -- NG --> Connectors3[Check the following connectors.  
A-56, B-22]
    Connectors3 -- NG --> Repair3[Repair]
    Connectors3 -- OK --> Trouble3[Check trouble symptom.]
    Trouble3 -- NG --> Harness3[Check the harness between the TPS and the engine ECU, and repair if necessary.]
    Trouble3 -- OK --> CheckConnectorB22[Check the following connector.  
B-22]
    CheckConnectorB22 -- NG --> Repair4[Repair]
    CheckConnectorB22 -- OK --> Trouble4[Check trouble symptom.]
    Trouble4 -- NG --> ReplaceECU2[Replace the engine ECU.]
    Trouble4 -- OK --> End([End])

```

Code No. 13 TPS or APS circuit system	Probable cause
This diagnosis code is output if the TPS opening angle is 20° or greater than the APS opening angle because of a short in the TPS or an open circuit in the APS. If there is an open circuit in the APS, diagnosis code No. 11 is output at the same time. Accordingly, if only diagnosis code No. 11 is output, the cause is probably an abnormality in the TPS circuit system.	<ul style="list-style-type: none"> <li>• Malfunction of APS</li> <li>• Malfunction of TPS</li> <li>• Malfunction of harness or connector</li> <li>• Malfunction of engine ECU</li> </ul>



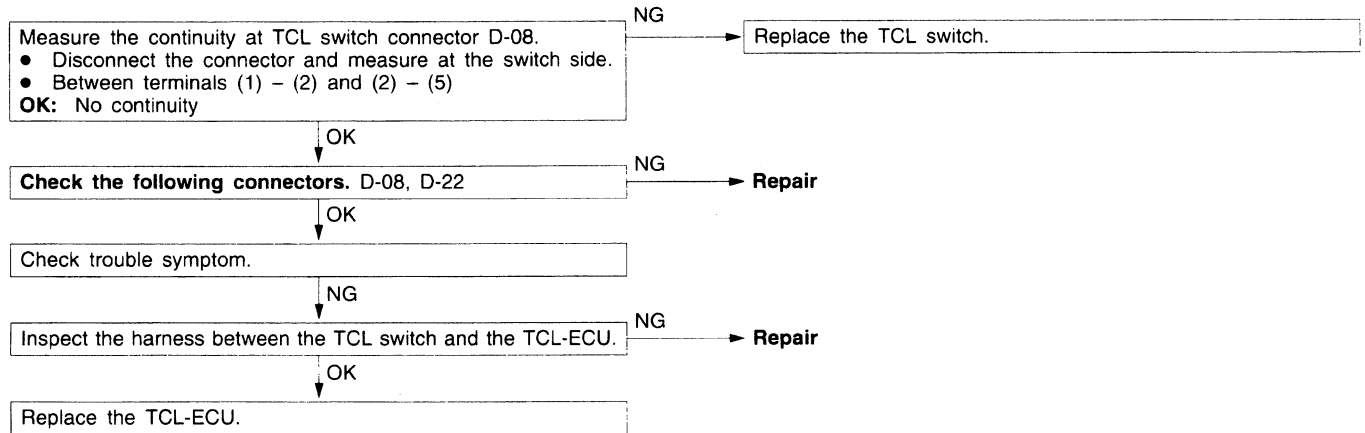
Code No. 23 Stop lamp switch circuit system	Probable cause
This diagnosis code is output if the stop lamp switch remains ON for a continuous period of 15 minutes or more, or for a continuous period of 1 minute or more when driving at a speed of 10 km/h or more, because of a short circuit or defective adjustment of the stop lamp switch. This diagnosis code No. may also occur while driving in traffic jams or if the foot is resting on the brake pedal with driving.	<ul style="list-style-type: none"> <li>• Malfunction of stop lamp switch</li> <li>• Malfunction of harness or connector</li> <li>• Malfunction of TCL-ECU</li> </ul>



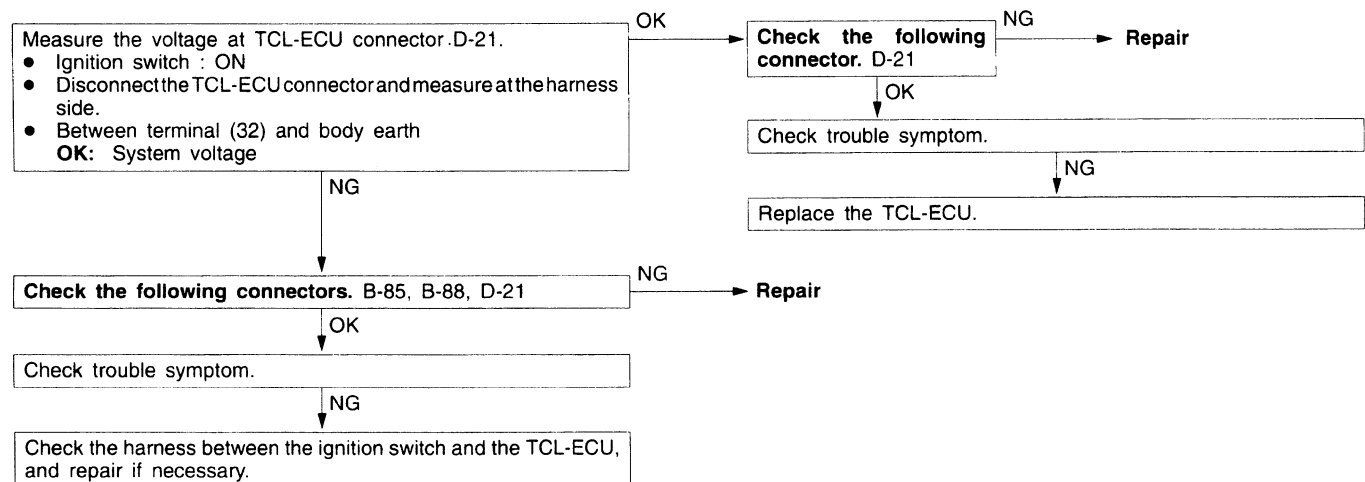
13H-8

TCL – Troubleshooting

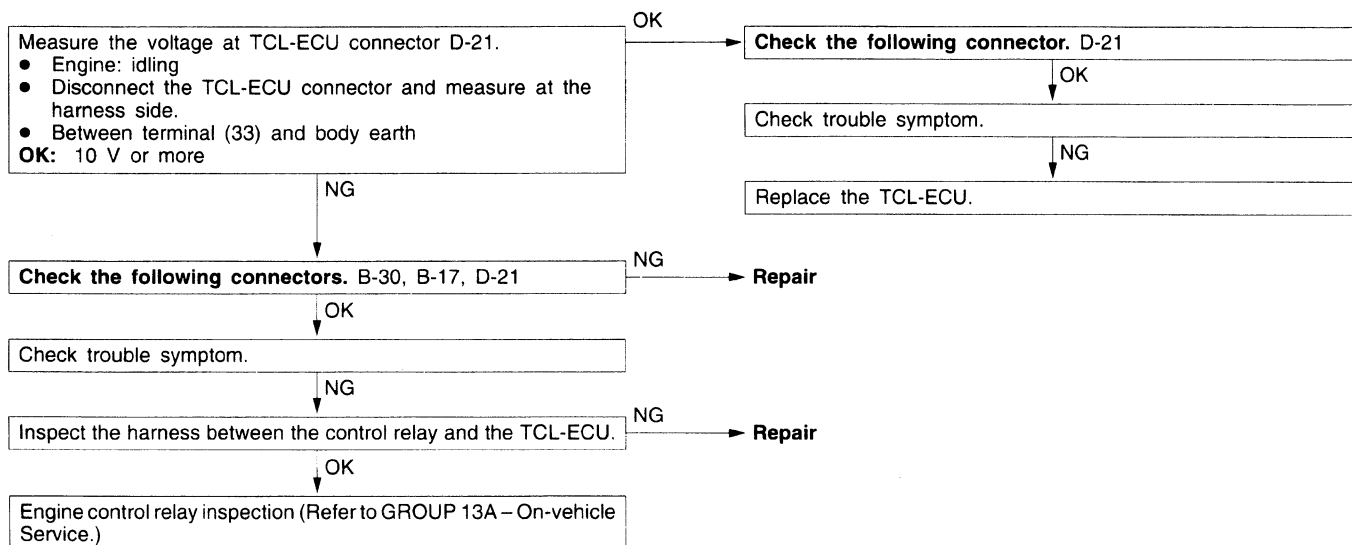
Code No. 24 TCL switch circuit system	Probable cause
This diagnosis code is output if signals are input simultaneously from both the TCL-OFF and TCL-ON positions because of a short circuit in the TCL switch circuit.	<ul style="list-style-type: none"> <li>• Malfunction of the TCL switch</li> <li>• Malfunction of harness or connector</li> <li>• Malfunction of TCL-ECU</li> </ul>



Code No. 26 Ignition switch (IG2) circuit system	Probable cause
This diagnosis code is output if the IG2 power supply is not distributed, even though the engine speed is 450 r/min or more.	<ul style="list-style-type: none"> <li>• Malfunction of harness or connector</li> <li>• Malfunction of TCL-ECU</li> </ul>



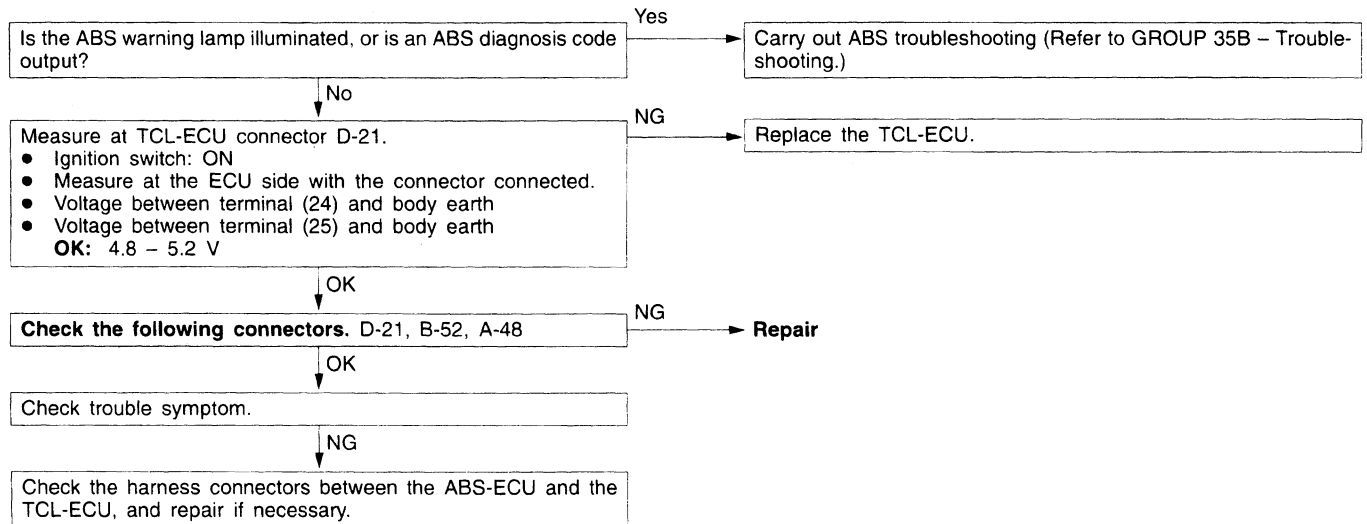
Code No. 27 TCL-ECU power supply voltage circuit (engine control relay circuit) system	Probable cause
<p>This diagnosis code is output if the TCL-ECU power supply voltage (engine control relay supply voltage) is lower than the specified value. If the voltage returns to the specified value or greater, the diagnosis code is erased.</p>	<ul style="list-style-type: none"> <li>• Malfunction of control relay</li> <li>• Malfunction of harness or connector</li> <li>• Malfunction of TCL-ECU</li> </ul>



Code No. 31 Front right wheel speed sensor circuit system Code No. 32 Front left wheel speed sensor circuit system	Probable cause
These diagnosis codes are output if a pulse (from the front wheels) indicates that the difference between the front wheels and the rear wheels is 8km/h or more because of an open or short circuit in a wheel speed sensor or a malfunction of sensor.	<ul style="list-style-type: none"> <li>• Malfunction of front speed sensor</li> <li>• Malfunction of harness or connector</li> <li>• Malfunction of TCL-ECU</li> <li>• Malfunction of ABS-ECU</li> </ul>

**NOTE**

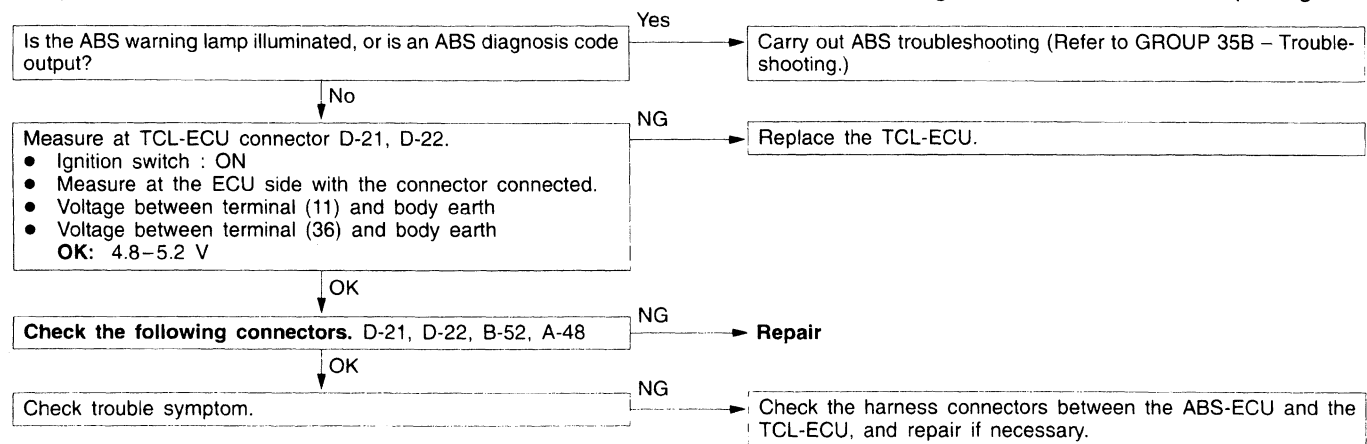
When these diagnosis codes are output, erase the diagnosis code memory after carrying out repairs, and then carry out a road test at 20 km/h or more and check to be sure that the diagnosis codes are not output again.



Code No. 33 Rear right wheel speed sensor circuit system Code No. 34 Rear left wheel speed sensor circuit system	Probable cause
These diagnosis codes are output if a pulse (from the wheels on one side of rear ) indicates that the difference between the left wheel and the right wheel is 8km/h or more because of an open or short circuit in a wheel speed sensor or a defective sensor.	<ul style="list-style-type: none"> <li>• Malfunction of rear wheel speed sensor</li> <li>• Malfunction of harness or connector</li> <li>• Malfunction of TCL-ECU</li> <li>• Malfunction of ABS-ECU</li> </ul>

**NOTE**

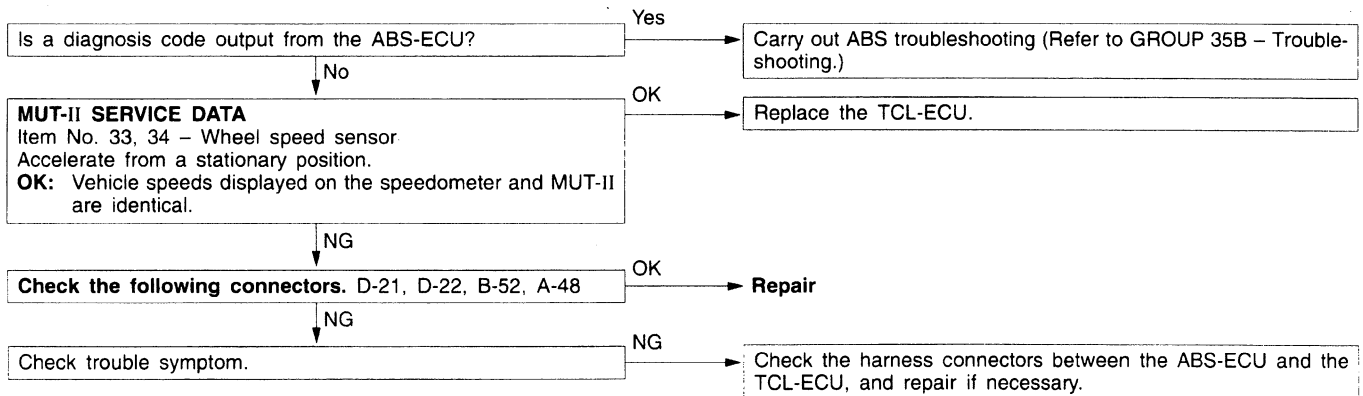
When these diagnosis codes are output, erase the diagnosis code memory after carrying out repairs, and then carry out a road test at 20 km/h or more and check to be sure that the diagnosis codes are not output again.



Code No. 35 Rear wheel speed sensor circuit system (1) Code No. 36 Rear wheel speed sensor circuit system (2)	Probable cause
<p>Diagnosis code No. 35 is output if the pulse signal from a rear wheel sensor is momentarily interrupted (0.02 sec.) because of a transient open circuit in a rear wheel speed sensor.</p> <p>Diagnosis code No. 36 is output if a rear wheel speed sensor abnormality is judged when the turning speed of both rear wheels is 0 km/h for 20 seconds or more while TCL is operating.</p>	<ul style="list-style-type: none"> <li>• Malfunction of rear wheel speed sensor</li> <li>• Malfunction of harness or connector</li> <li>• Malfunction of ABS-ECU</li> <li>• Malfunction of TCL-ECU</li> </ul>

**NOTE**

- (1) If the front wheels only are turning while the rear wheels are stationary (wheel slip), the TCL-OFF indicator will start flashing after 20 seconds, and the system will be isolated.
- (2) When these diagnosis codes are output, erase the diagnosis code memory after carrying out repairs, and then carry out a road test at 20 km/h or more and check to be sure that the diagnosis codes are not output again.

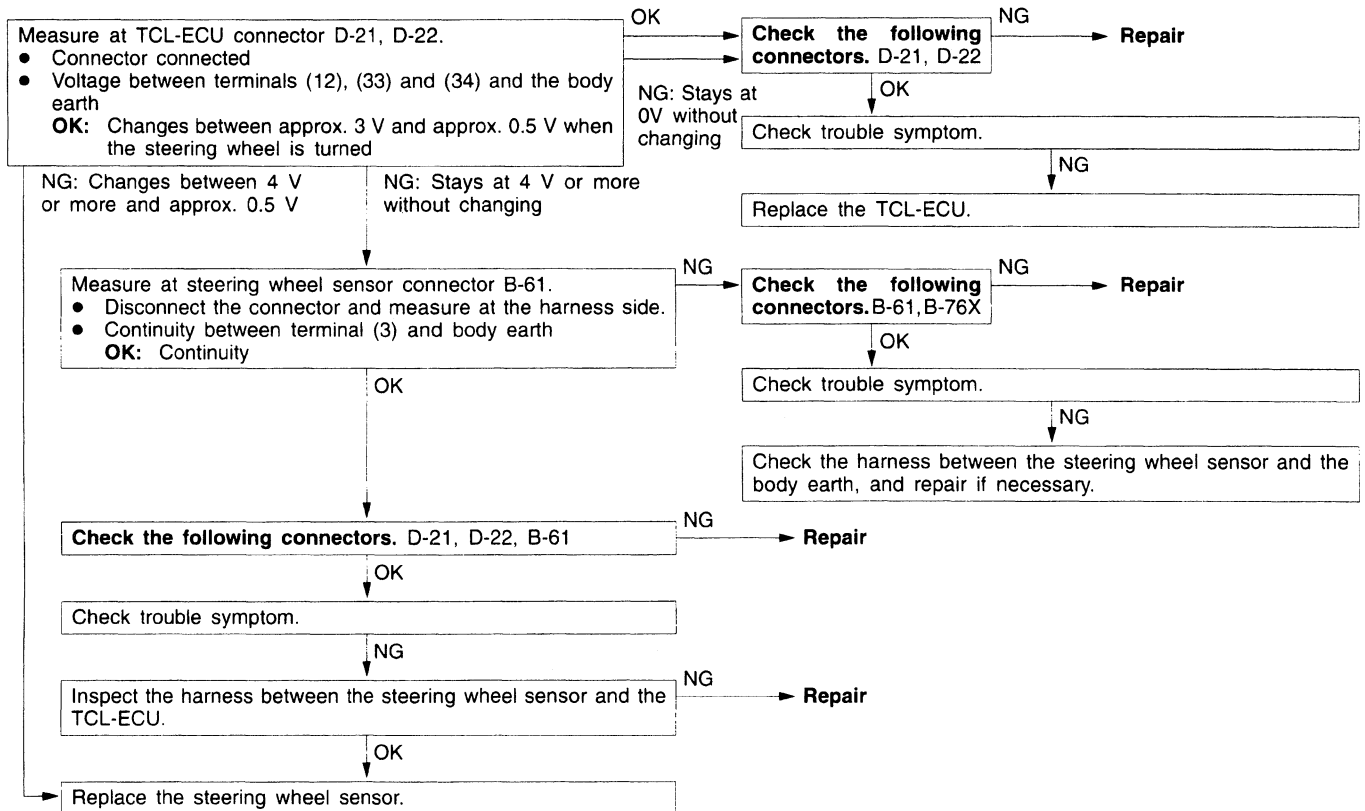




13H-12

TCL – Troubleshooting

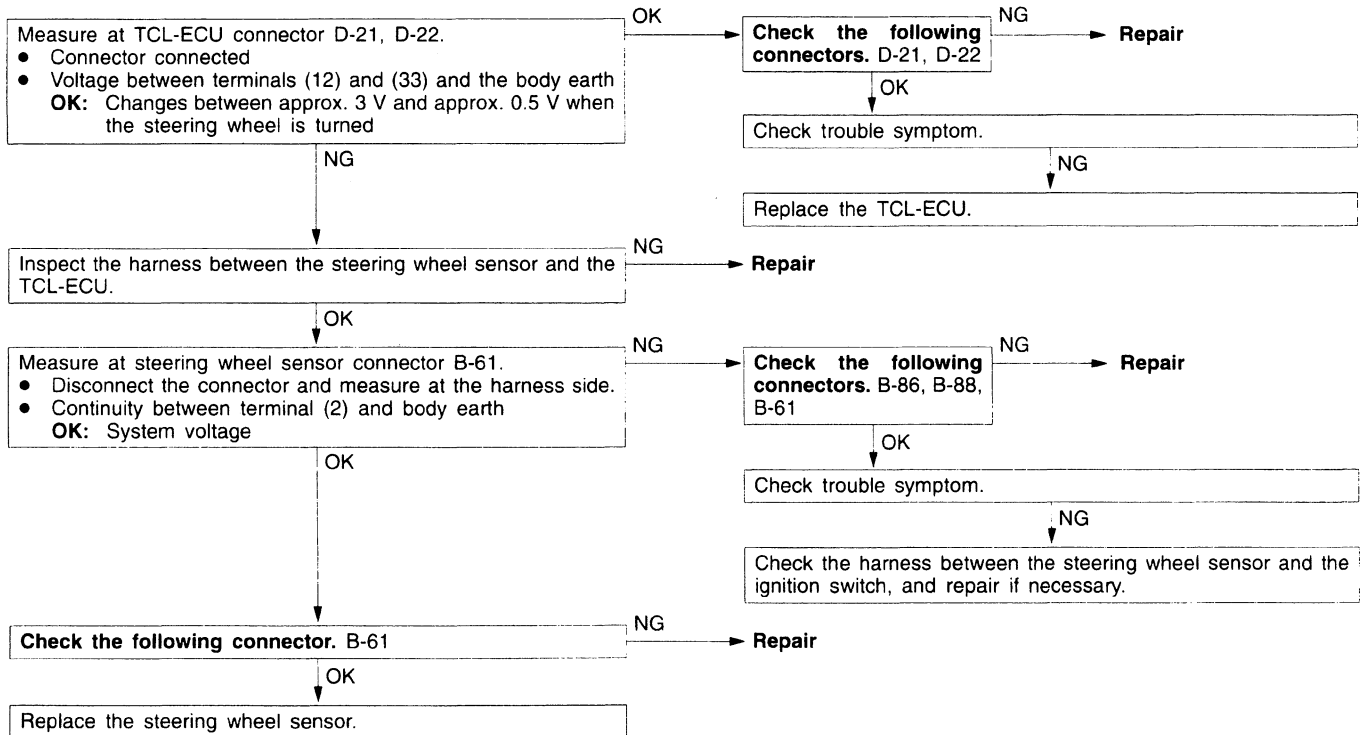
<b>Code No. 41 Steering wheel sensor (ST-1) circuit system (open circuit)</b>	<b>Probable cause</b>
<b>Code No. 42 Steering wheel sensor (ST-2) circuit system (open circuit)</b>	
<b>Code No. 43 Steering wheel sensor (ST-N) circuit system (open circuit)</b>	
These diagnosis codes are output if there is an open circuit in the output wire of the steering wheel sensor circuit.	<ul style="list-style-type: none"><li>● Malfunction of harness or connector</li><li>● Malfunction of steering wheel sensor</li><li>● Malfunction of TCL-ECU</li></ul>



### Code No. 44 Steering wheel sensor circuit system (short circuit) Probable cause

This diagnosis code is output when no steering angle signal is output because there is a short-circuit in either steering wheel sensor ST-1 or steering wheel sensor ST-2 when the speed averages output by the left and right rear wheel speed sensors are 10 km/h or more.

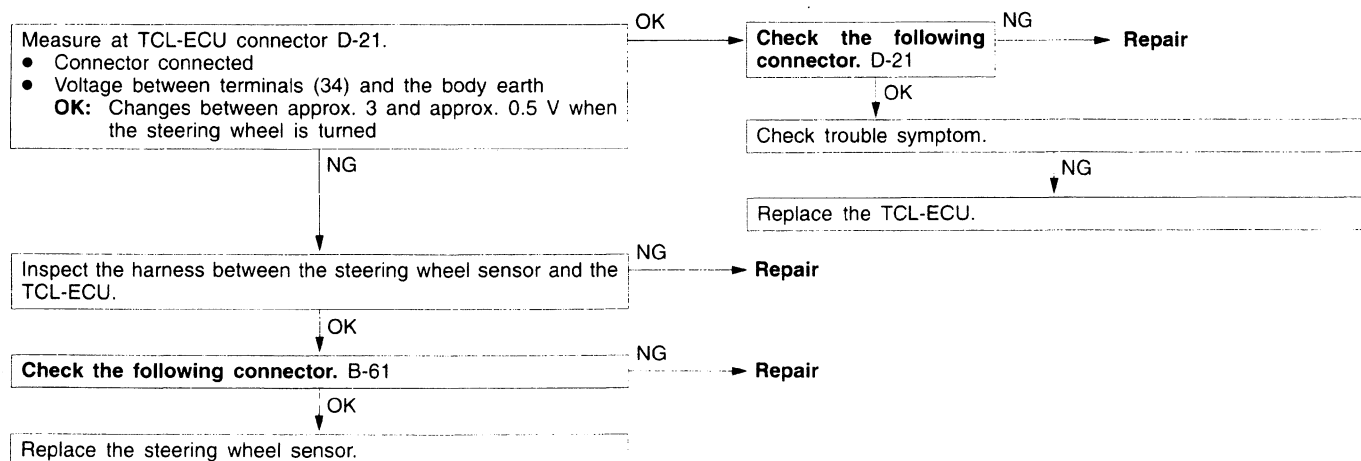
- Malfunction of harness or connector
- Malfunction of steering wheel sensor
- Malfunction of TCL-ECU



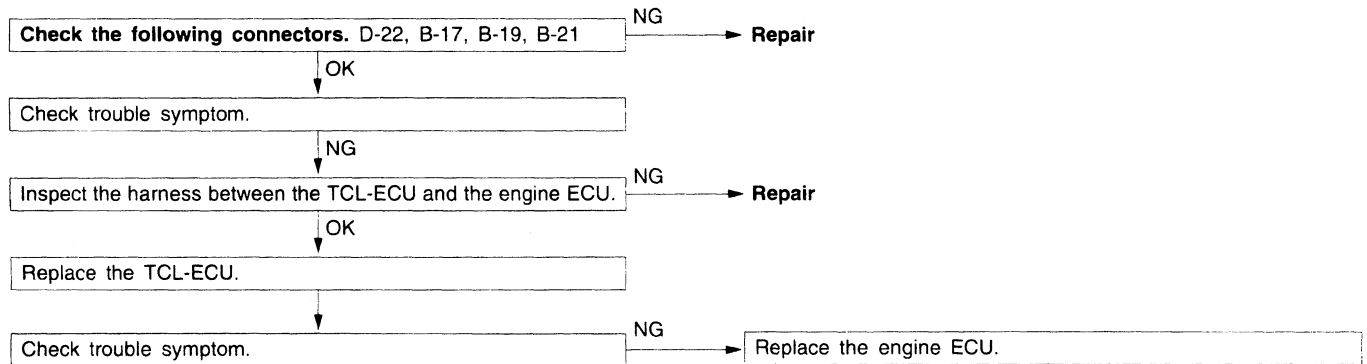
### Code No. 45 Steering wheel sensor (ST-N) circuit system (short circuit) Probable cause

This diagnosis code is output if it is considered that there is an abnormality in the steering wheel sensor (ST-N) circuit system when the straight-ahead position is continuously detected even though the steering wheel is turned 20° or more.

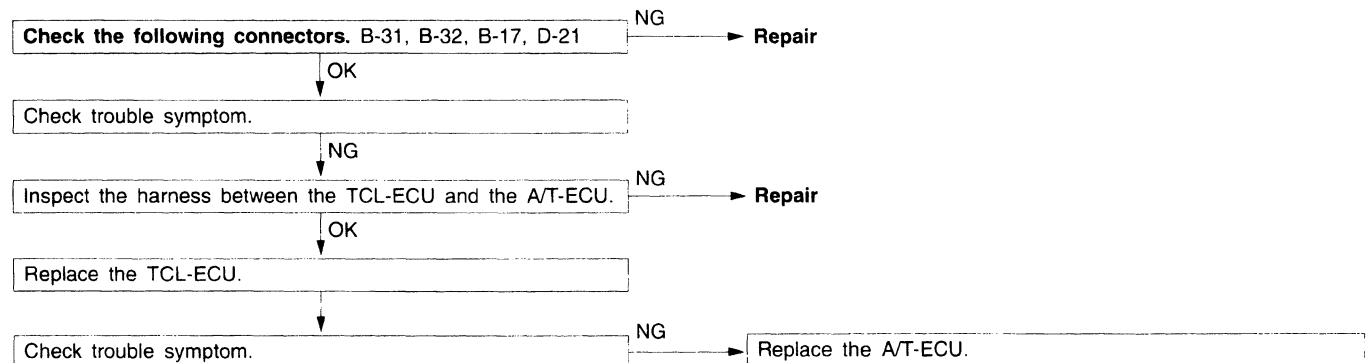
- Malfunction of steering wheel sensor
- Malfunction of harness or connector
- Malfunction of TCL-ECU



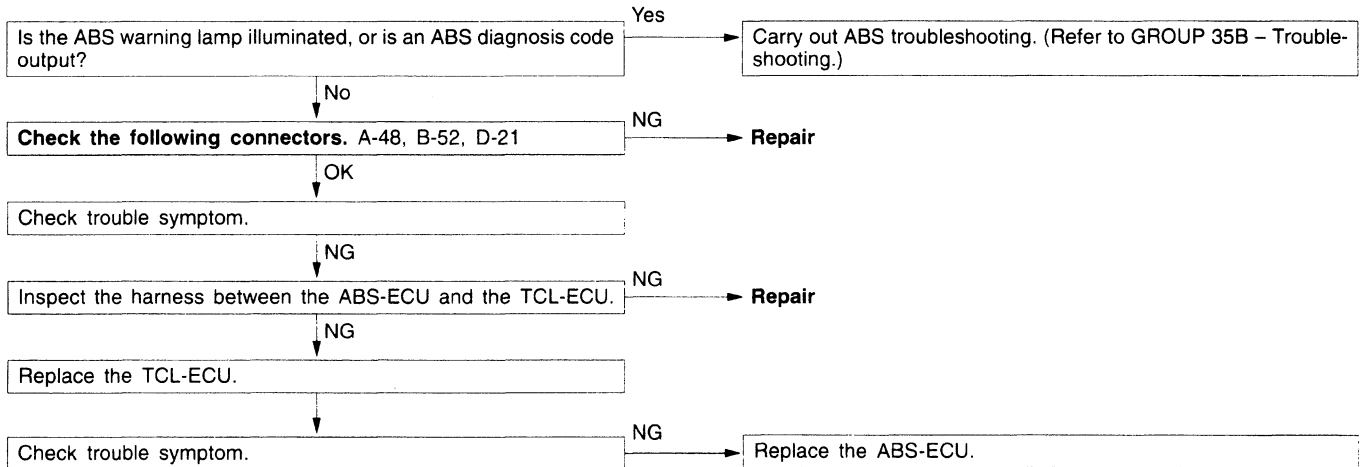
Code No. 71 Engine-ECU communication circuit system	Probable cause
This diagnosis code is output if an error is detected in the communication contents because of an open or short circuit in the serial communication circuit between the TCL-ECU and the engine ECU, a malfunction of ECU and a defective shielding of the shield wire.	<ul style="list-style-type: none"> <li>• Malfunction of harness or connector</li> <li>• Malfunction of TCL-ECU</li> <li>• Malfunction of engine ECU</li> </ul>



Code No. 74 A/T-ECU communication circuit system	Probable cause
This diagnosis code is output if an error is detected in the communication contents because of an open or short circuit in the serial communication circuit between the TCL-ECU and the A/T-ECU, a malfunction of ECU and a defective shielding of the shield wire.	<ul style="list-style-type: none"> <li>• Malfunction of harness or connector</li> <li>• Malfunction of TCL-ECU</li> <li>• Malfunction of A/T-ECU</li> </ul>



Code No. 76 ABS circuit system	Probable cause
This diagnosis code is output if the ABS-ECU detects the system abnormality (when ABS warning lamp illumination is controlled).	<ul style="list-style-type: none"> <li>• Malfunction of harness or connector</li> <li>• Malfunction of TCL-ECU</li> <li>• Malfunction of ABS-ECU</li> </ul>



## INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom		Inspection procedure No.	Reference page
Communication with the MUT-II is not possible.	Communication with all systems is not possible.	1	13H-16
	Communication with TCL-ECU only is not possible.	2	13H-17
Malfunction of TCL indicator lamp display	None of the TCL indicator lamps (TCL OFF, TCL) illuminate when the ignition switch is ON.	3	13H-18
	One of the TCL indicator lamps does not illuminate when the ignition switch is ON (Another lamp does illuminate).	4	13H-18
	TCL OFF indicator lamp remains illuminated even after the engine is started.	5	13H-19
	TCL OFF indicator lamp flashes after the engine is started.		
	TCL remains illuminated even after the engine is started.	6	13H-19
	TCL OFF indicator lamp does not illuminate even if the TCL switch is continuously pressed to the OFF side while the engine is idling.	7	13H-20
Malfunction of TCL operation	TCL illuminates in the TCL operation range, but torque is not reduced.	8	13H-20
Poor starting Poor acceleration	Engine output is reduced in the TCL non-operation range (TCL indicator lamp does not illuminate) and starting and acceleration performance is poor.		

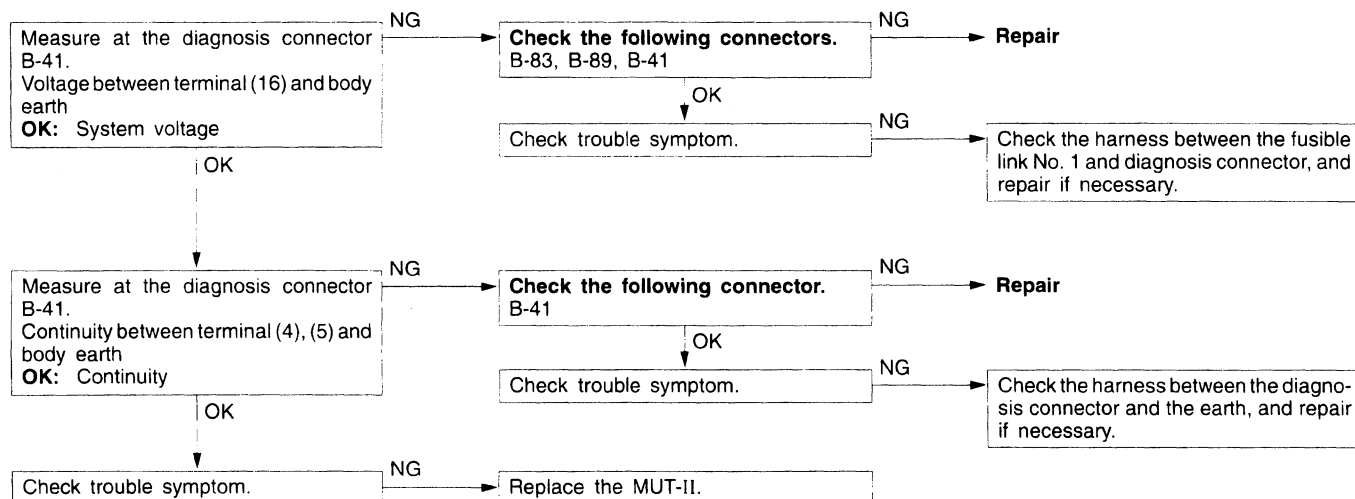
# INSPECTION PROCEDURES FOR EACH TROUBLE SYMPTOM

## Inspection Procedure 1

**Communication with the MUT-II is not possible. Probable cause  
(Communication with all systems is not possible.)**

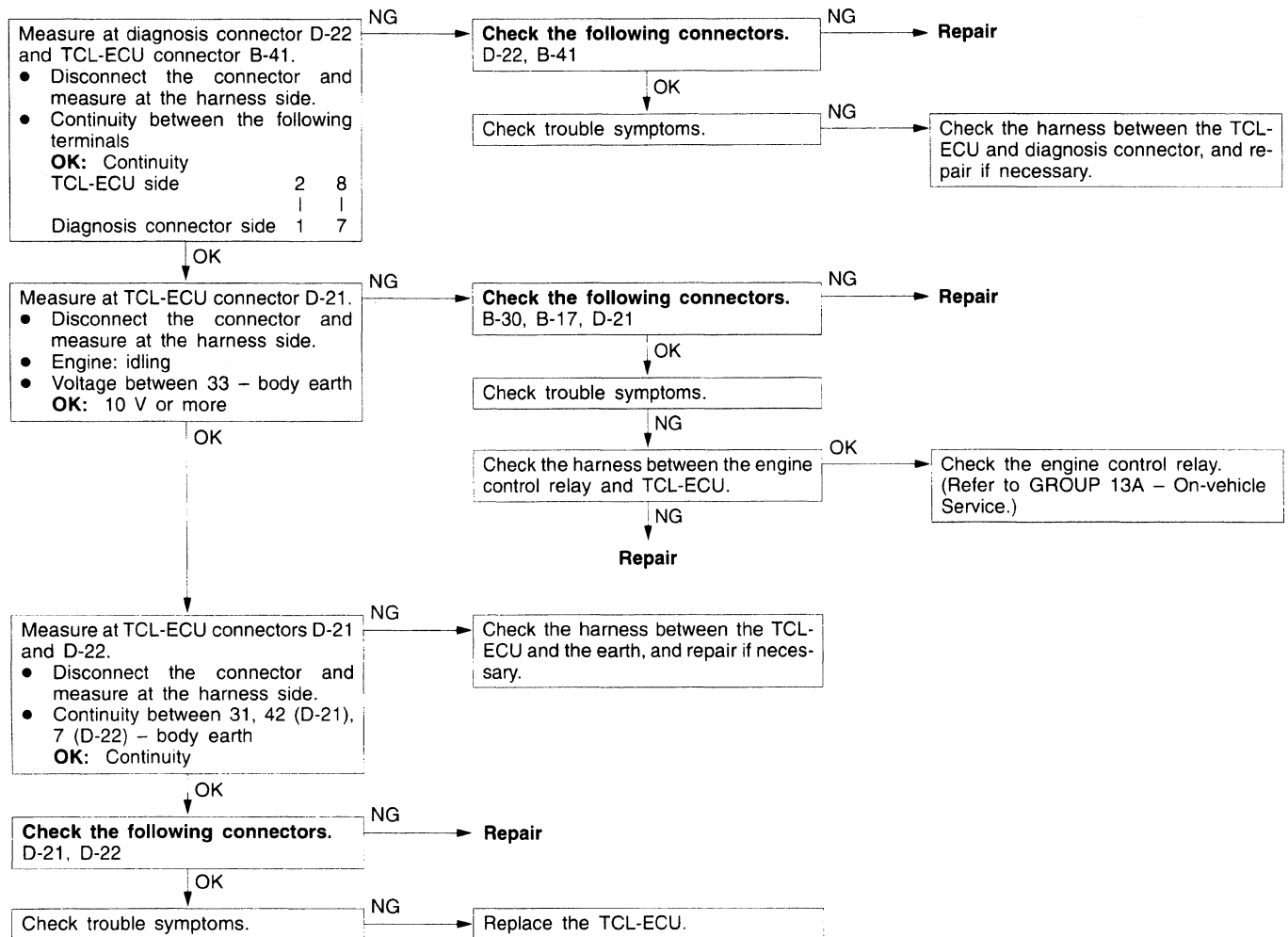
The cause is probably a defective power supply system (including earth) for the diagnosis line.

- Malfunction of connector
- Malfunction of harness



Inspection Procedure 2

Communication with the MUT-II is not possible. (Communication with TCL-ECU only is not possible.)	Probable cause
If the MUT-II cannot communicate with the TCL-ECU only, the cause is probably an abnormality in the TCL diagnosis line or in the TCL-ECU power supply line or earth line.	<ul style="list-style-type: none"> <li>• Malfunction of harness or connector</li> <li>• Malfunction of engine control relay</li> <li>• Malfunction of TCL-ECU</li> </ul>

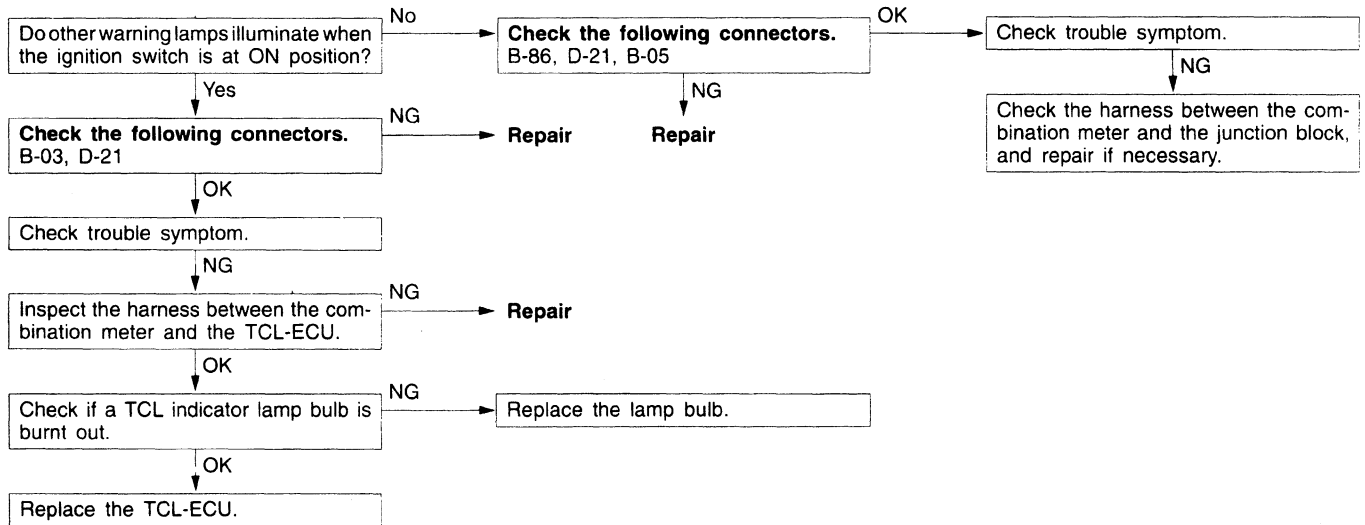


13H-18

TCL – Troubleshooting

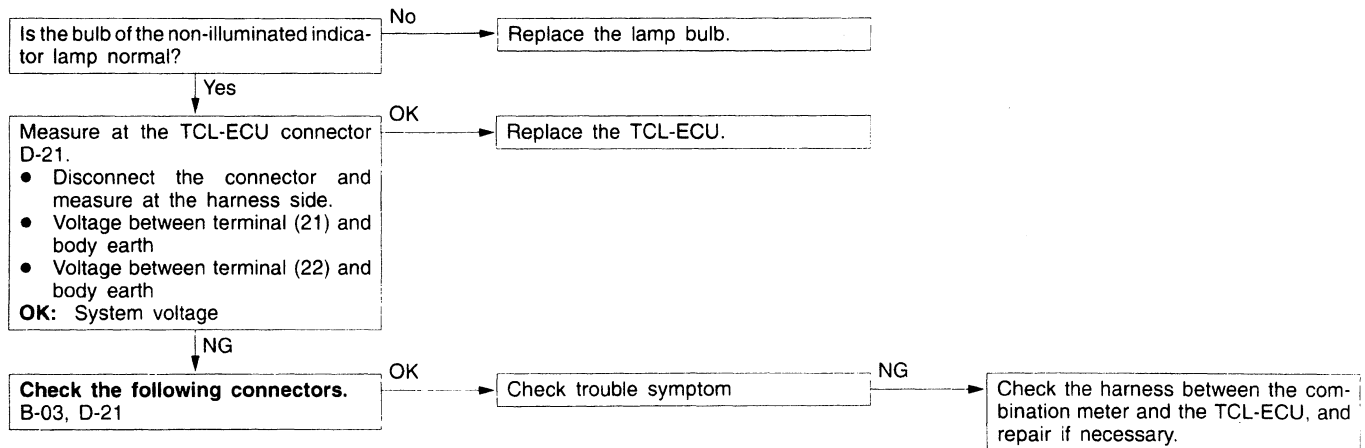
Inspection Procedure 3

None of the TCL indicator lamps (TCL OFF, TCL) illuminate when the ignition switch is ON.	Probable cause
The main cause is an open circuit in the indicator circuit because of a burnt-out indicator lamp bulb.	<ul style="list-style-type: none"> <li>• Malfunction of harness or connector</li> <li>• Malfunction of TCL-ECU</li> <li>• Malfunction of indicator lamp bulb</li> </ul>



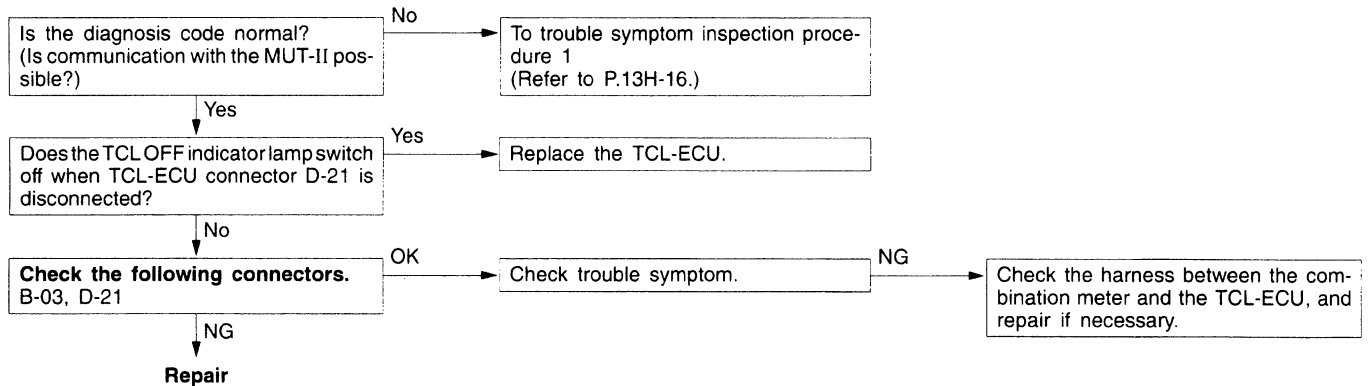
Inspection Procedure 4

One of the TCL indicator lamps does not illuminate when the ignition switch is ON.	Probable cause
Because the TCL indicators utilise shared power supply circuits, if one of the indicator lamps is illuminated, the power supply circuit can be judged to be normal.	<ul style="list-style-type: none"> <li>• Open circuit in indicator lamp power supply circuit.</li> <li>• Burnt-out indicator lamp bulb</li> </ul>



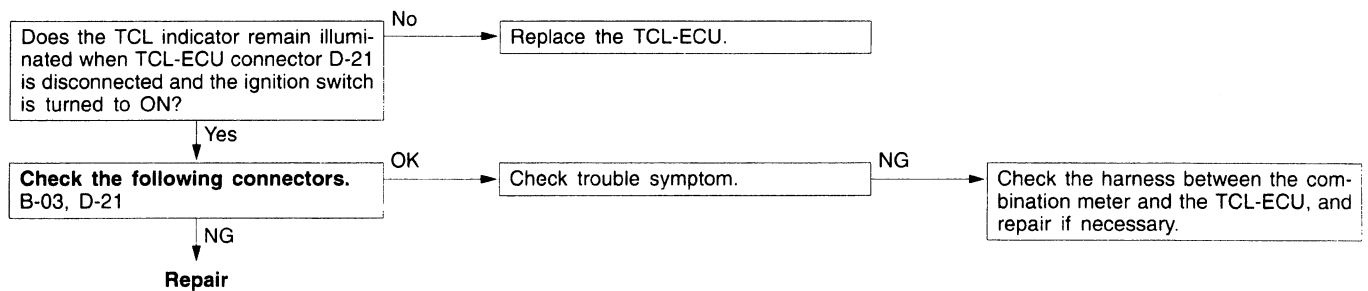
### Inspection Procedure 5

<ul style="list-style-type: none"> <li>• <b>TCL OFF indicator lamp remains illuminated even after the engine is started.</b></li> <li>• <b>TCL OFF indicator lamp illuminate after the engine is started.</b></li> </ul>	<b>Probable cause</b>
<p>The TCL-OFF indicator is also used as a system warning indicator. If there is a system abnormality, this indicator will illuminate or flash.</p>	<ul style="list-style-type: none"> <li>• Other system related to the TCL</li> <li>• Malfunction of harness or connector</li> </ul>



### Inspection Procedure 6

<b>TCL indicator lamp remains illuminated even after the engine is started.</b>	<b>Probable cause</b>
<p>The TCL indicator lamp only illuminates while the engine is running if the TCL is operating.</p>	<ul style="list-style-type: none"> <li>• Malfunction of TCL indicator power supply circuit</li> <li>• Malfunction of TCL-ECU</li> <li>• Malfunction of harness or connector</li> </ul>



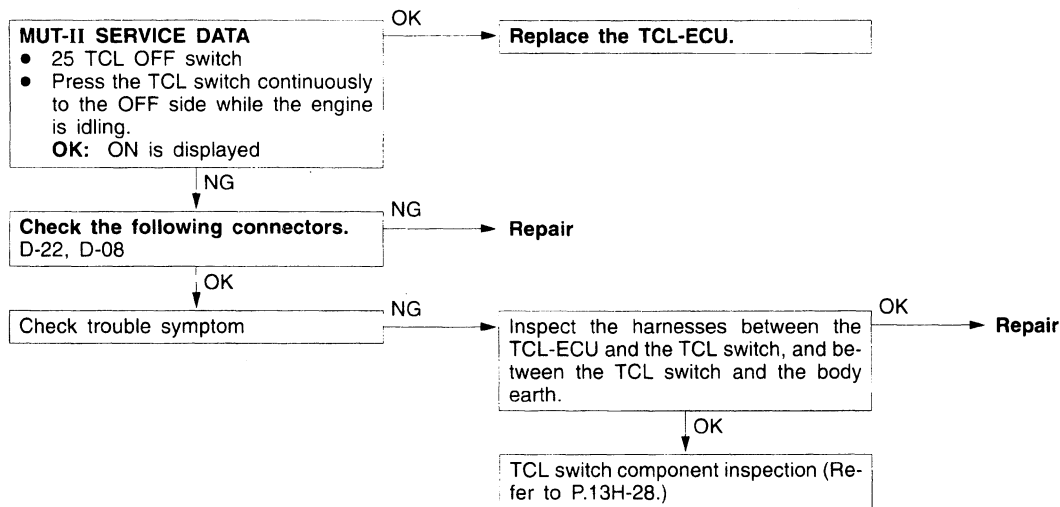


13H-20

TCL – Troubleshooting

Inspection Procedure 7

<ul style="list-style-type: none"> <li><b>TCL OFF indicator lamp does not illuminate even if the TCL switch is continuously pressed to the OFF side while the engine is idling.</b></li> </ul>	<b>Probable cause</b>
<p>If the indicator lamp does not illuminate when the switch is operated, there is a malfunction in the switch, switch circuit or in the TCL-ECU.</p>	<ul style="list-style-type: none"> <li>Malfunction of harness or connector</li> <li>Malfunction of TCL switch</li> <li>Malfunction of TCL-ECU</li> </ul>



Inspection Procedure 8

<ul style="list-style-type: none"> <li><b>TCL illuminates in the TCL operation range, but torque is not reduced.</b></li> <li><b>Engine output is reduced in the TCL non-operation range (TCL indicator lamp does not illuminate) and starting and acceleration performance is poor.</b></li> </ul>	<b>Probable cause</b>
<p>In cases such as the above, the electrical system is normal, and the cause is probably an abnormality in the mechanical system (vacuum actuator).</p>	<ul style="list-style-type: none"> <li>Malfunction of vacuum solenoid valve</li> <li>Malfunction of ventilation solenoid valve</li> <li>Malfunction of vacuum actuator</li> <li>Incorrect vacuum hose connector</li> <li>Malfunction of throttle link</li> <li>Malfunction of vacuum tank</li> <li>Blocked air cleaner element</li> </ul>

As the cause is probably a malfunction of the vacuum actuator system, carry out inspection of the following items in order.

- Vacuum solenoid valve operation inspection (Refer to GROUP 13A – On-vehicle Service.)
- Ventilation solenoid valve operation inspection (Refer to GROUP 13A – On-vehicle Service.)
- Disconnected or mis-connected vacuum hose inspection (Refer to GROUP 13A – On-vehicle Service.)
- Throttle link operation inspection (Refer to GROUP 13A – On-vehicle Service.)
- Vacuum tank inspection (Refer to GROUP 13A – On-vehicle Service.)
- Air cleaner element blockage inspection

**SERVICE DATA REFERENCE TABLE**

No.	Check item	Check condition	Normal condition
11	APS	Accelerator pedal position Engine stop Selector lever position: P	Fully closed
			Depressed
			Fully open
13	TPS	Accelerator pedal position Engine stop Selector lever position: P	Fully closed
			Depressed
			Fully open
15*1	Inhibitor switch	Ignition switch: ON Engine stop	Selector lever: P position
			Selector lever: R position
			Selector lever: N position
			Selector lever: D position
			Selector lever: 3 position
			Selector lever: 2 position
			Selector lever: L position
16*1	Shift position	Shift lever position: D	Driving at constant speed of 10 km/h in 1 range
			Driving at constant speed of 30 km/h in 2 range
			Driving at constant speed of 50 km/h in 3 range
			Driving at constant speed of 70 km/h in 4 range
21	Idle switch	Accelerator pedal position Ignition switch: ON	Depressed
			Released
22	Ignition switch	Ignition switch: ON	ON
		Ignition switch: OFF	OFF
23	Stop lamp switch	Brake pedal position Ignition switch: ON	Depressed
			Released
24	TCL ON switch	TCL ON switch operation Ignition switch : ON	Pressed
			Released
25	TCL OFF switch	TCL OFF switch operation Ignition switch: ON	Pressed
			Released

13H-22

TCL – Troubleshooting

No.	Check item	Check condition	Normal condition
27	ECU power supply voltage	Ignition switch: ON	System voltage
31	Front right wheel speed sensor	Engine running Selector lever position: D	Vehicle stopped 0 km/h
			Driving at 40 km/h 40 km/h
32	Front left wheel speed sensor	Engine running Selector lever position: D	Vehicle stopped 0 km/h
			Driving at 40 km/h 40 km/h
33	Rear right wheel speed sensor	Engine running Selector lever position: D	Vehicle stopped 0 km/h
			Driving at 40 km/h 40 km/h
34	Rear left wheel speed sensor	Engine running Selector lever position: D	Vehicle stopped 0 km/h
			Driving at 40 km/h 40 km/h
40	Engine speed	Ignition switch: ON	Engine: idling Engine speeds displayed on the MUT-II and tachometer are identical.
44	Steering angle	Steering wheel position Ignition switch: ON	Turned 90° to the right R 88 deg or R 92 deg
			Turned 90° to the left L 88 deg or L 92 deg
45	Steering straight-ahead point learning	Steering wheel position Ignition switch: ON	Immediately after ignition switch is ON OFF
			Immediately after city driving ON
51	Slip control	TCL switch: ON Driving on low frictional resistance road	TCL indicator lamp illuminated ON
			TCL indicator lamp switched off OFF
52	Trace control	TCL switch: ON Driving on winding road	TCL indicator lamp illuminated ON
			TCL indicator lamp switched off OFF
74	Steering wheel sensor (ST-N)	Steering wheel position Engine idling	Neutral position LOW
			Steering wheel turned 90° from neutral position HIGH
75	Steering wheel sensor (ST-1)	Steering wheel position Ignition switch: ON	Steering wheel turned slowly to left HIGH and LOW display alternately
76	Steering wheel sensor (ST-2)	Steering wheel position Ignition switch: ON	Steering wheel turned slowly to right HIGH and LOW display alternately
81	Engine model	Ignition switch: ON	4G93
82	Valve type	Ignition switch: ON	SOHC
83	Aspiration type	Ignition switch: ON	N/A
84	Engine classification	Ignition switch: ON	NORMAL
85	Destination	Ignition switch: ON	EC*2

NOTE

1. \*1: A/T

2. \*2: Indicates European Communities.

# CHECK AT ECU TERMINALS

1	2	3	4	5	6	21	22	23	24	25	26	27	28	29	30	31
7	8	9	10	11	12	32	33	34	35	36	37	38	39	40	41	42

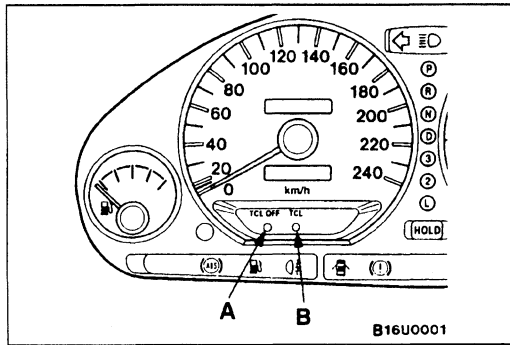
03U0030

Terminal No.	Check item	Measurement condition	Normal condition
2	Diagnosis control	Do not connect the MUT-II	Approx. 12V
		Connect the MUT-II	0V
3	TCL ON switch	Ignition switch: ON TCL switch: Pressed to ON side	2V or less
		Ignition switch: ON TCL switch: Release	System voltage
4	Engine ECU data communication	Engine: Idling	Other than 0V
7	Earth	At all times	0V
8	Diagnosis data input	Connect the MUT-II	Serial communication with MUT-II
		Do not connect the MUT-II	1V or less
9	TCL OFF switch	Ignition switch: ON TCL switch: Pressed to OFF side	2V or less
		Ignition switch: ON TCL switch: Release	System voltage
10	Engine ECU data communication	Engine: Idling	Other than 0V
11	Rear left wheel speed sensor input	Engine: Idling Vehicle slowly moving forward	Changes between 0V and approx. 5V
12	Steering wheel sensor ST1 input	Ignition switch: ON Steering wheel turned slowly	Flashes between 0V and approx. 3V
21	TCL OFF indicator	Ignition switch: ON TCL ON condition	System voltage
		Ignition switch: ON TCL OFF condition	2V or less
22	TCL indicator	Ignition switch: ON TCL ON condition	2V or less
		Ignition switch: ON TCL OFF condition	System voltage
24	Front left wheel speed sensor input	Engine: Idling Vehicle slowly moving forward	Changes between 0V and approx. 5V
25	Front right wheel speed sensor input	Engine: Idling Vehicle slowly moving forward	Changes between 0V and approx. 5V

13H-24

TCL – Troubleshooting

Terminal No.	Check item	Measurement condition	Normal condition
27	Stop lamp switch input	Ignition switch: ON Brake pedal depressed	System voltage
		Ignition switch: ON Brake pedal released	0V
29	A/T-ECU data communication	Engine: Idling	Other than 0V
30	ECU power supply	Ignition switch: ON	System voltage
31	Earth	At all times	0V
32	Ignition switch (IG2)	Ignition switch: ON	System voltage
33	Steering wheel sensor ST2 input	Ignition switch: ON Steering wheel turned slowly	Flashes between 0V and approx. 3V
34	Steering wheel sensor STN input	Engine: Idling Steering wheel in straight-ahead position	0.5V or less
		Engine: Idling Steering wheel turned 90° straight-ahead position	2.5–3.5V
36	Rear right wheel speed sensor input	Engine: Idling Vehicle slowly moving forward	Flashes between 0V and approx. 5V
38	APS output	Ignition switch: ON Accelerator pedal fully open	4.5–5.5V
		Ignition switch: ON Accelerator pedal fully closed	0.3–1.0V
39	ABS fail signal	During ABS fail	2V or less
		When ABS is normal	System voltage
40	A/T-ECU data communication	Engine: Idling	Other than 0V
41	ECU back-up power supply	At all times	System voltage
42	Earth	At all times	0V



## ON-VEHICLE SERVICE

13600090028

### SYSTEM CHECK USING THE TCL INDICATOR LAMPS

Press the TCL switch and check if each TCL indicator lamp illuminates or switches off.

TCL switch mode	Inspection conditions	TCL OFF indicator (A)	TCL indicator (B)
Switch does not operate	Turn the ignition switch to the ON position.	○	○
	Start the engine.	×	×
TCL OFF mode	Engine is idling.	○	–
TCL ON mode	Drive the vehicle at 30 km/h for 2 minutes or more.	No illumination	–

#### NOTE

O: illuminated, X: extinguished; – : not relevant

#### Caution

If a different result is obtained when checking, refer to the “Troubleshooting” section for remedy.

## TCL OPERATION CHECK

13600110021

### <When using the MUT-II>

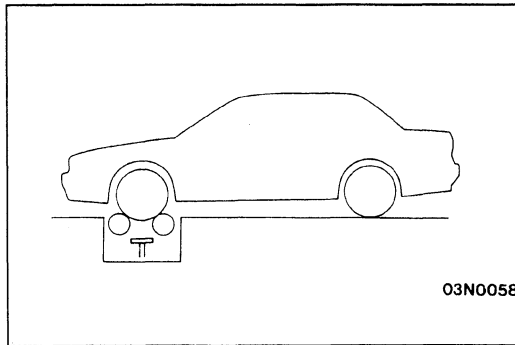
1. Connect the MUT-II to the diagnosis connector.
2. Move the selector lever to P range <A/T>, or move the shift lever to the neutral position <M/T>.
3. Start the engine.
4. Turn the TCL switch to ON.
5. Operate the MUT-II to start the actuator test (item No. 05) and fully depress the accelerator pedal at the same time. Check that the engine speed is kept down to 3,000 r/min at this time.

#### Caution

The actuator test should only be carried out for 3 seconds. Because the engine speed will increase once the actuator test is stopped, the accelerator pedal should be released quickly after it has been depressed.

#### NOTE

The TCL-ECU will output a “request torque: 0” signal to the engine-ECU for 3 seconds while the actuator test is being carried out, and the TCL OFF indicator will illuminate during this time.



**<When not using the MUT-II>**

1. Turn the TCL switch to ON.
2. Place the front wheels onto a speedometer tester or a chassis dynamo and start the engine. (The front wheels may also be jacked up.)
3. Move the shift lever to 1st position <M/T> or the selector lever to D range <A/T>.
4. Check to be sure that the engine speed is restrained when the accelerator pedal is depressed.

**NOTE**

If the following symptoms occur when the accelerator pedal is depressed, refer to "Troubleshooting."

1. If the TCL indicator lamp does not illuminate
2. If the TCL indicator lamp illuminates but the engine is not restrained

**Caution**

1. **Inspection should be completed within 20 seconds after the accelerator pedal was depressed. If it takes longer than 20 seconds, the TCL system function will stop and the engine speed will gradually increase.**
2. **Because the TCL OFF indicator will flash when the TCL system operation is stopped, the diagnosis codes should be erased if you notice that the indicator is flashing. (Refer to P.13H-3.)**

### STOP LAMP SWITCH CHECK

13600120024

Refer to GROUP 35A – On-vehicle Service.

### WHEEL SPEED SENSOR CHECK

13600130027

Refer to GROUP 35B – On-vehicle Service.

### VACUUM SOLENOID VALVE CHECK

13600390012

Refer to GROUP 13A – On-vehicle Service.

### VENTILATION SOLENOID VALVE CHECK

13600400012

Refer to GROUP 13A – On-vehicle Service.

### VACUUM TANK CHECK

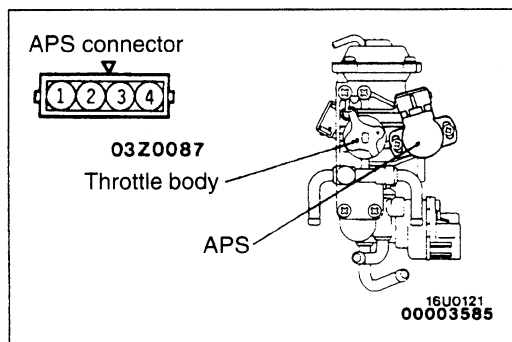
13600410015

Refer to GROUP 13A – On-vehicle Service.

### VACUUM ACTUATOR CHECK

13600420018

Refer to GROUP 13A – On-vehicle Service.



### ACCELERATOR PEDAL POSITION SENSOR (APS) CHECK.

13600430011

1. Disconnect the APS connector.
2. Measure the resistance between terminals (1) and (4) of the APS connector.

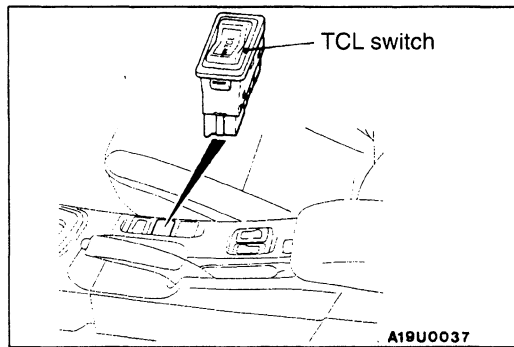
**Standard value: 3.5–6.5 kΩ**

3. When the accelerator pedal is gradually depressed, check that the resistance between terminals (1) and (3) of the APS connector changes smoothly in proportion to the pedal opening amount.
4. If the resistance is outside the standard value, or if the resistance does not change smoothly, replace the APS. Adjust the APS after it has been replaced.  
(Refer to GROUP 13A – On-vehicle Service.)



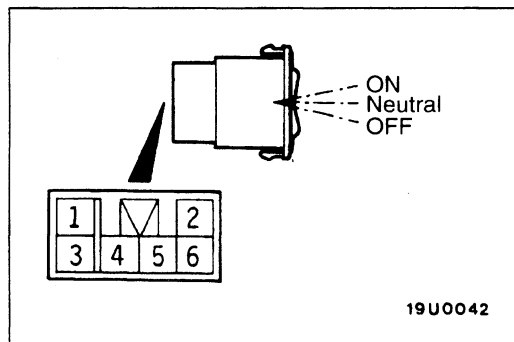
13H-28

TCL – TCL Switch/TCL-ECU



## TCL SWITCH REMOVAL AND INSTALLATION

13600160026



## INSPECTION TCL SWITCH CONTINUITY CHECK

13600170029

Switch position	Terminal No.						
	1	2	4	5	3	-	6
ON	○	○					
Neutral					○	⊕	○
OFF	○			○			

## TCL-ECU

13600280029

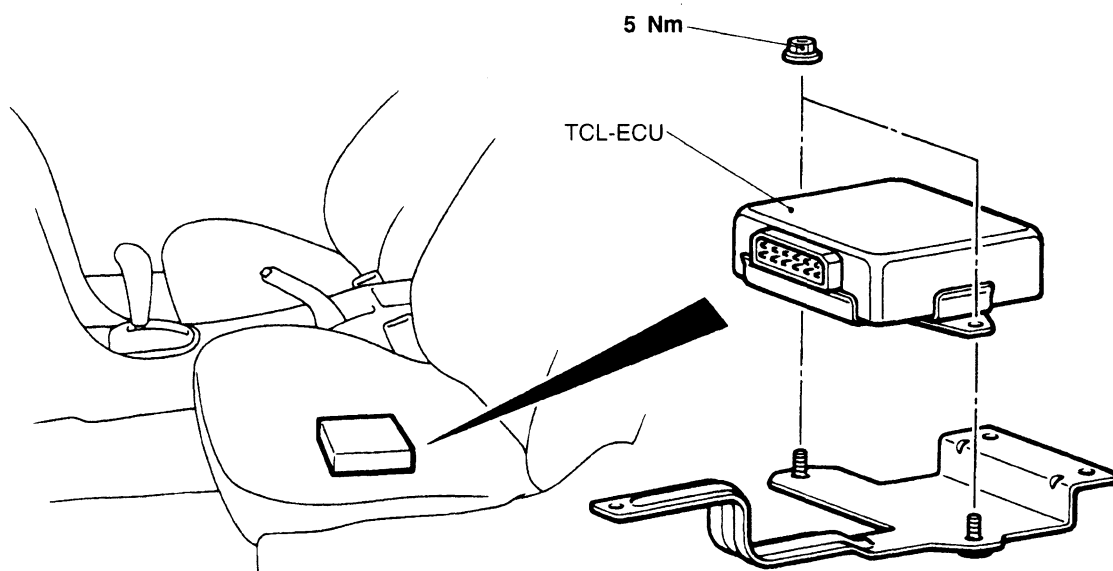
### REMOVAL AND INSTALLATION

#### Pre-removal and Post-installation Operation

- Left Side Front Seat Assembly Removal and Installation (Refer to GROUP 52A.).

#### CAUTION: SRS

When removing and installing the floor console assembly from vehicles equipped with SRS, do not let it bump against the SRS-ECU or other components.



A03U0021