# MULTIPOINT FUEL INJECTION (MPI)

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# **MULTIPOINT FUEL INJECTION (MPI)**

13100010265

# **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

## 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 2-cylinder group for every two rotations

#### 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

## **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

#### 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

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.

of the crankshaft. This is called group 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.

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.

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.

- 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

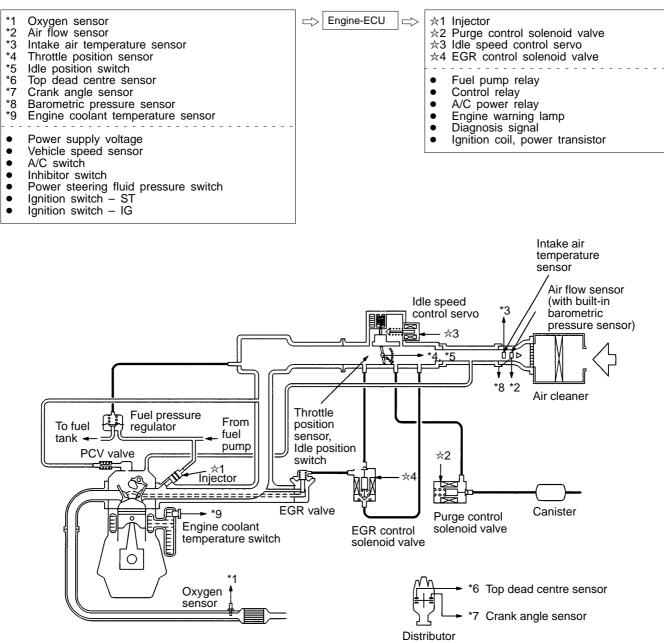
- Turns the compressor clutch of the A/C ON and OFF.

# **GENERAL SPECIFICATIONS**

- 3. Purge Control Solenoid Valve Control Refer to GROUP 17. 4. EGR Control Solenoid Valve Control
- Refer to GROUP 17.

Items		Specifications	
Throttle body	Throttle bore mm	54	
	Throttle position sensor	Variable resistor type	
	Idle speed control servo	Stepper motor type (Stepper motor type by-pass air control system with the air volume limiter)	
	Idle position switch	Rotary contact type, within throttle position sensor	
Engine-ECU	Identification model No.	E2T64271 <4G63 - Vehicles without immobilizer system> E2T64277 <4G63 - Vehicles with immobilizer system> E2T64272 <4G64 - Vehicles without immobilizer system> E2T64276 <4G64 - Vehicles with immobilizer system>	
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	
	Top dead centre sensor	Hall element type	
	Crank angle sensor	Hall element type	
	Power steering fluid pressure switch	Contact switch type	
Actuators	Control relay type	Contact switch type	
	Fuel pump relay type	Contact switch type	
	Injector type and number	Electromagnetic type, 4	
	Injector identification mark	CDH275	
	EGR control solenoid valve	Duty cycle type solenoid valve	
	Purge control solenoid valve	ON/OFF type solenoid valve	
Fuel pressure regulator	Regulator pressure kPa	328	

## MULTIPOINT FUEL INJECTION SYSTEM DIAGRAM



6FU2536

# SERVICE SPECIFICATIONS

13100030216

Items		Specifications
Basic idle speed r/min		750±50
Idle speed when A/C is ON r/	min	900 at neutral position
Throttle position sensor adjust	ing voltage mV	400-1,000
Throttle position sensor resista	ance kΩ	3.5-6.5
Idle speed control servo coil re	sistance Ω	28–33 (at 20°C)
Intake air temperature sensor resistance $k\Omega$	20°C	2.3–3.0
	80°C	0.30-0.42
Engine coolant temperature sensor resistance $k\Omega$	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 $\Omega$		13–16 (at 20°C)

# SEALANT

#### 13100050038

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

# SPECIAL TOOLS

13100060208

ТооІ	Number	Name	Use
A B C D	MB991223 A: MB991219 B: MB991220 C: MB991221 D: MB991222	Harness set A: Test harness B: LED harness C: LED harness adapter D: Probe	Measurement of terminal voltage A: Connector pin contact pressure inspection B, C: Power circuit inspection D: Commercial tester connection
	MB991502	MUT-II sub assembly	<ul> <li>Reading diagnosis code</li> <li>MPI system inspection</li> </ul>
	MB991348	Test harness set	<ul> <li>Adjustment of idle position switch and throttle position sensor</li> <li>Inspection using an analyzer</li> </ul>
	MD998463	Test harness (6-pin, square)	<ul> <li>Inspection of idle speed control servo</li> <li>Inspection using an analyzer</li> </ul>
	MD998464	Test harness (4-pin, triangle)	Inspection of oxygen sensor
	MD998709	Adaptor hose	Measurement of fuel pressure
	MD998742	Hose adaptor	

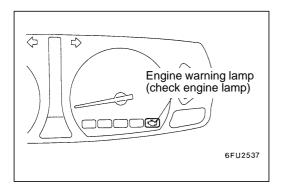
ТооІ	Number	Name	Use
	MD998706	Injector test set	Checking the spray condition of injectors
MB991607	MB991607	Injector test harness	
MD998741	MD998741	Injector test adaptor	
	MB991608	Clip	

# TROUBLESHOOTING

13100850034

# DIAGNOSIS TROUBLESHOOTING FLOW

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



## DIAGNOSIS FUNCTION

13100860211

## 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
Top dead centre sensor
Barometric pressure sensor
Ignition timing adjustment signal
Injector
Immobilizer system

#### Caution

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

# METHOD OF READING AND ERASING DIAGNOSIS CODES

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

# INSPECTION USING MUT- ${\rm II}$ data list and actuator testing

- 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

13100910190

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.

r			
Malfunctioning item	Control contents during malfunction		
Air flow sensor	<ol> <li>Uses the throttle position sensor signal and engine speed signal (crank angle sensor signal) to take reading of the basic injector drive time and basic ignition timing from the pre-set mapping.</li> <li>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	Injects fuel to all cylinders simultaneously. (However, after the ignition switch is turned to ON, the No. 1 cylinder top dead centre is not detected at all.)		
Barometric pressure sensor	Controls as if the barometric pressure is 101 kPa.		
Oxygen sensor	Air/fuel ratio feedback control (closed loop control) is not performed.		

# **INSPECTION CHART FOR DIAGNOSIS CODES**

13100870214

Code No.	Diagnosis item	Reference page
11	Oxygen sensor system	13A-11
12	Air flow sensor system	13A-12
13	Intake air temperature sensor system	13A-12
14	Throttle position sensor system	13A-13
21	Engine coolant temperature sensor system	13A-14
22	Crank angle sensor system	13A-15
23	Top dead centre sensor system	13A-16
24	Vehicle speed sensor system	13A-17
25	Barometric pressure sensor system	13A-18
36*	Ignition timing adjustment signal system	13A-19
41	Injector system	13A-19
54	Immobilizer system	13A-20

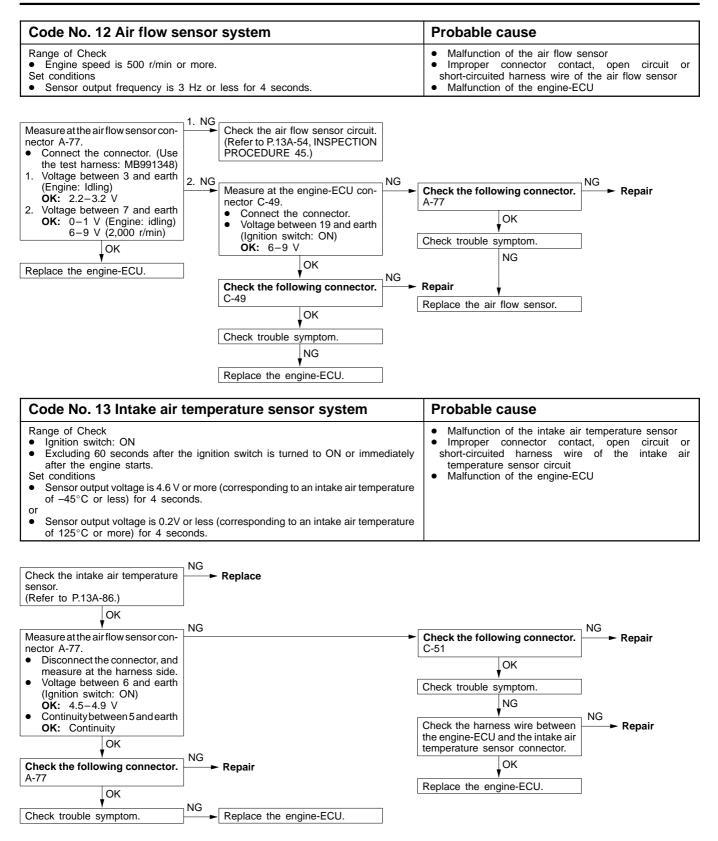
NOTE

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

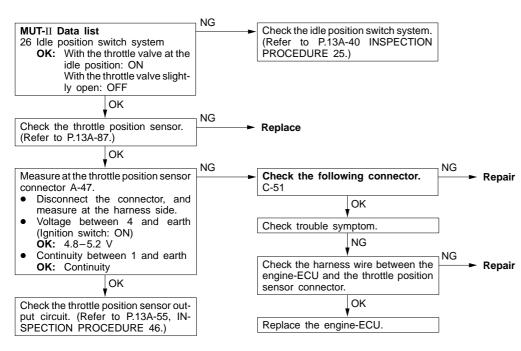
# INSPECTION PROCEDURE FOR DIAGNOSIS CODES

Code No. 11 Oxygen sensor system	Probable cause
<ul> <li>Range of Check</li> <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> <li>Set conditions</li> <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> <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>

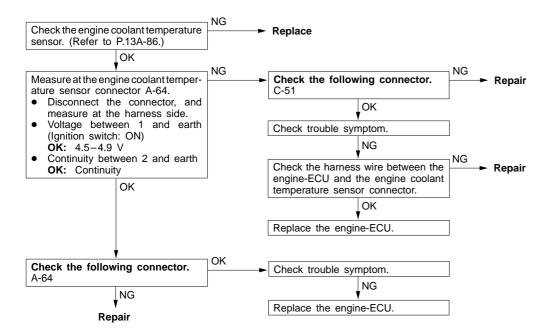
Check the oxygen sensor. (Refer to P.13A-88.)	NG Replace		
OK	1. NG 2. NG (C) (C) (C) (C) (C) (C) (C) (C)	Check the harness wire between the oxygen sensor and the control relay connector, and repair if necessary. Check the following connector. C-51, C-60 OK Check trouble symptom. NG Check the harness wire between the engine-ECU and the oxygen sensor connector. OK	NG ► Repair
<ul> <li>Measure at the engine-ECU connector C-50.</li> <li>Disconnect the connector, and measure at the harness side.</li> <li>Voltage between 35 and earth (Ignition switch: ON) OK: System voltage</li> </ul>	NG C	Replace the engine-ECU. Check the following connector. B-03, C-60	NG ► Repair
OK Check the following connectors. B-03, C-50	⊢ Kepair ∟	Check trouble symptom.	
Check trouble symptom.		engine-ECU and the oxygen sensor connector, and repair if necessary.	
Check the harness wire between the engine-ECU and the oxygen sensor connector.	NG ► Repair		
Replace the engine-ECU.	]		

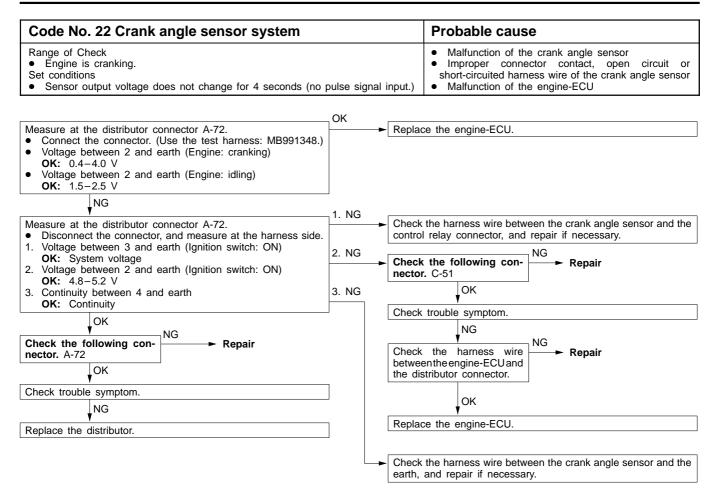


Code No. 14 Throttle position sensor system	Probable cause
<ul> <li>Range of Check</li> <li>Ignition switch: ON</li> <li>Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts.</li> <li>Set conditions</li> <li>When the idle position switch is ON, the sensor output voltage is 2 V or more for 4 seconds.</li> <li>Or</li> <li>The sensor output voltage is 0.2 V or less for 4 seconds.</li> </ul>	<ul> <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>

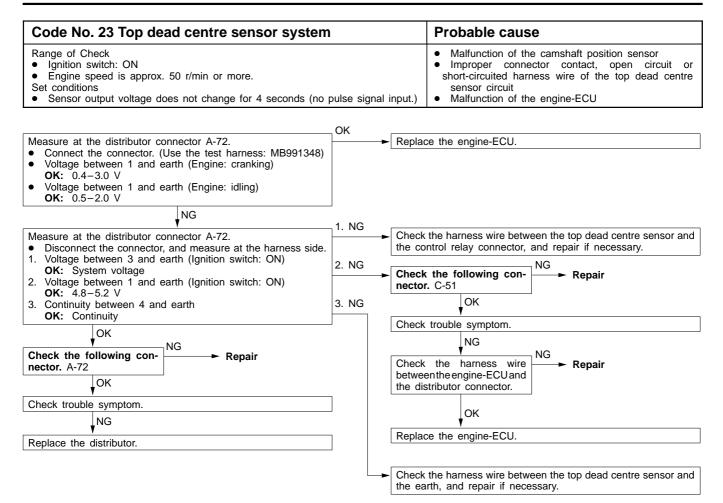


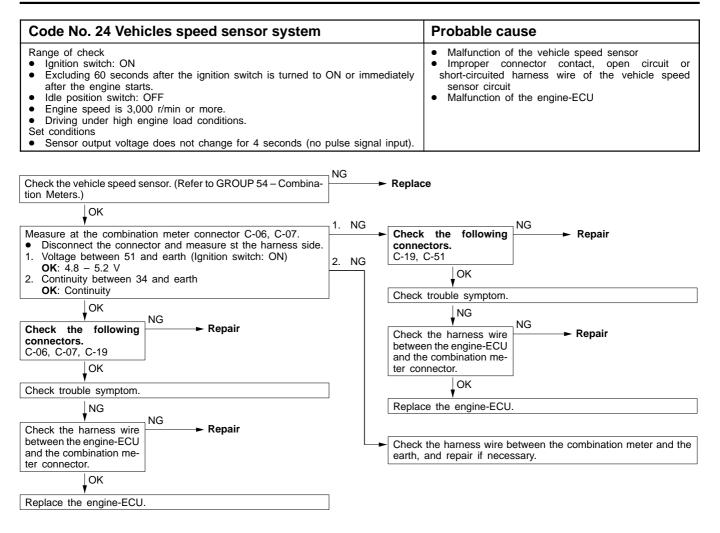
Code No. 21 Engine coolant temperature sensor system	Probable cause
<ul> <li>Range of Check</li> <li>Ignition switch: ON</li> <li>Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts.</li> <li>Set conditions</li> <li>Sensor output voltage is 4.6 V or more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



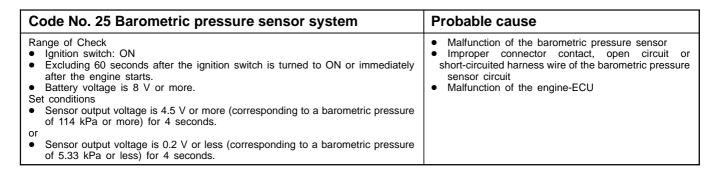


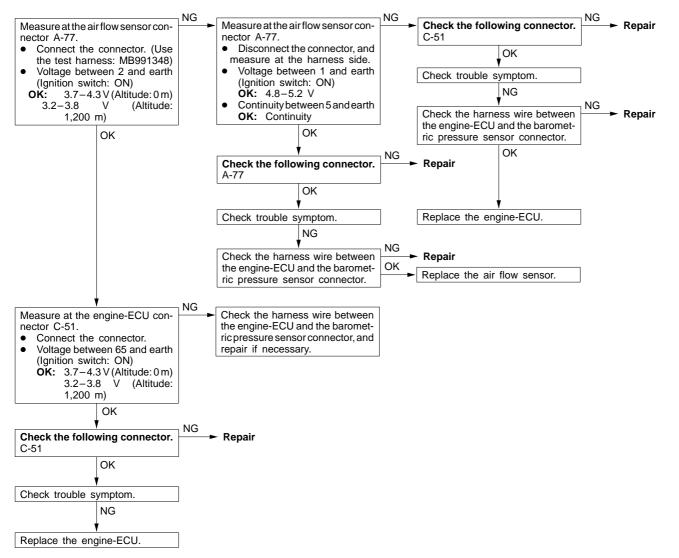
## **MPI** – Troubleshooting

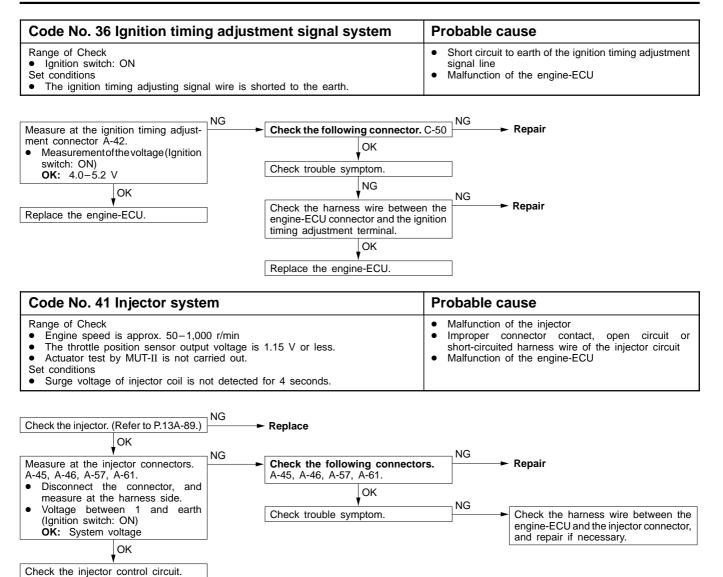




## MPI – Troubleshooting







(Refer to P.13A-55, INSPECTION PRO-

CEDURE 47.)

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

## NOTE

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

	Yes		
Is there another ignition key near the ignition key that is inserted in the ignition switch?			Remove the extra ignition key.
No		NG	•
			Check trouble symptom.
	Yes		
Is a diagnosis code output from the immobilizer-ECU?			Check the immobilizer system. (Refer to GROUP 54 – Ignition
No			Switch and Immobilizer System.)
¥	NG		
Check the following connectors. C-19, C-36, C-50			Repair
ОК	_		
Check trouble symptom.			
NG	- ⊣ OK		
Check the harness wire between the engine-ECU and the immobiliz-			Replace the immobilizer-ECU.
er-ECU.			NG
NG			¥
¥			Check trouble symptom.
Repair			<b>↓</b> NG
			Replace the engine-ECU.

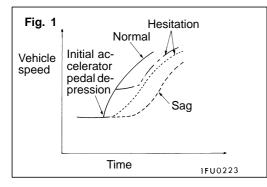
# INSPECTION CHART FOR TROUBLE SYMPTOMS

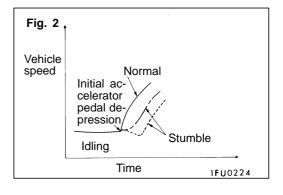
13100880217

Trouble symptom		Inspection procedure No.	Reference page
Communication with MUT-II is	Communication with all systems is not possible.	1	13A-23
impossible.	Communication with engine-ECU only is not possible.	2	13A-24
Engine warning lamp and	The engine warning lamp does not illuminate right after the ignition switch is turned to the ON position.	3	13A-25
related parts	The engine warning lamp remains illuminating and never goes out.	4	13A-25
Starting	No initial combustion (starting impossible)	5	13A-26
	Initial combustion but no complete combustion (starting impossible)	6	13A-27
	Long time to start (improper starting)	7	13A-28
Idling stability (Improper idling)	Unstable idling (Rough idling, hunting)	8	13A-29
(improper idling)	Idling speed is high. (Improper idling speed)	9	13A-30
	Idling speed is low. (Improper idling speed)	10	13A-31
Idling stability	When the engine is cold, it stalls at idling. (Die out)	11	13A-32
(Engine stalls)	When the engine becomes hot, it stalls at idling. (Die out)	12	13A-33
	The engine stalls when starting the car. (Pass out)		13A-34
	The engine stalls when decelerating.	14	13A-34
Driving	Hesitation, sag or stumble	15	13A-35
	The feeling of impact or vibration when accelerating	16	13A-35
	The feeling of impact or vibration when decelerating	17	13A-36
	Poor acceleration Surge		13A-36
			13A-37
	Knocking	20	13A-37
Dieseling		21	13A-37
Too high CO and	HC concentration when idling	22	13A-38

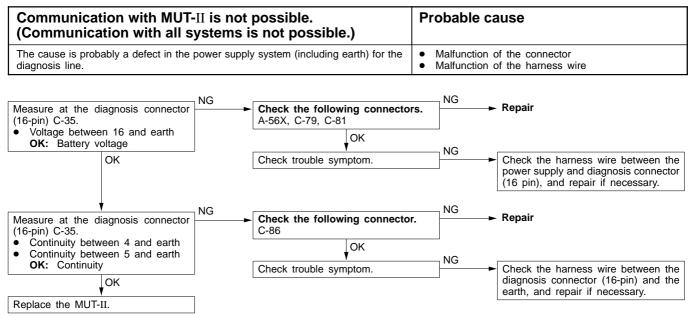
# PROBLEM SYMPTOMS TABLE (FOR YOUR INFORMATION)

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	Hunting	Engine speed doesn't remain constant; changes at idle.
stability	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".



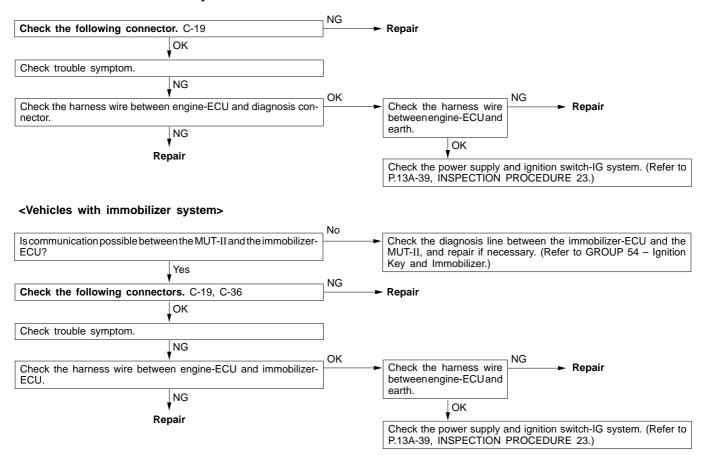


# INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

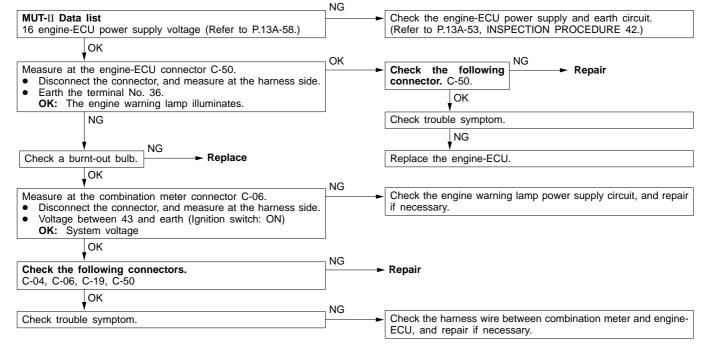


MUT-II communication with engine-ECU is impossible.	Probable cause
<ul> <li>One of the following causes may be suspected.</li> <li>No power supply to engine-ECU.</li> <li>Defective earth circuit of engine-ECU.</li> <li>Defective engine-ECU.</li> <li>Improper communication line between engine-ECU and MUT-II</li> </ul>	<ul> <li><vehicles immobilizer="" system="" without=""></vehicles></li> <li>Malfunction of engine-ECU power supply circuit</li> <li>Malfunction of engine-ECU</li> <li>Open circuit between engine-ECU and diagnosis connector</li> <li><vehicles immobilizer="" system="" with=""></vehicles></li> <li>Malfunction of engine-ECU power supply circuit</li> <li>Malfunction of engine-ECU</li> <li>Malfunction of engine-ECU</li> <li>Malfunction of immobilizer-ECU</li> <li>Open circuit between immobilizer-ECU and diagnosis connector</li> <li>Open circuit between engine-ECU and mobilizer-ECU</li> <li>Open circuit between engine-ECU and mobilizer-ECU</li> </ul>

#### <Vehicles without immobilizer system>

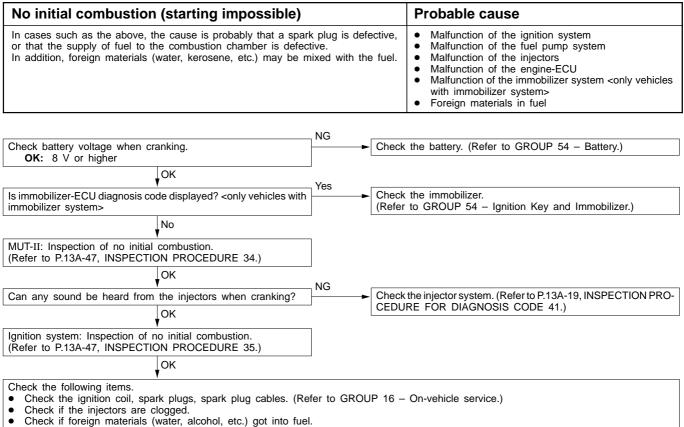


The engine warning lamp does not illuminate right after the ignition switch is turned to the ON position.	Probable cause	
Because there is a burnt-out bulb, the engine-ECU causes the engine warning lamp to illuminate for five seconds immediately after the ignition switch is turned to ON. If the engine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



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.	<ul> <li>Short-circuit between the engine warning lamp and engine-ECU</li> <li>Malfunction of the engine-ECU</li> </ul>
Yes	

MUT-II Self-Diag code Are diagnosis codes displayed?	-	Refer to P.13A-10, INSPECTION CHART FOR DIAGNOSIS CODES
No	NG	
<ul><li>Measure at the combination meter connector C-04.</li><li>Disconnect the connector, and measure at the harness side.</li></ul>		Check the harness wire between combination meter and engine- ECU connector, and repair if necessary.
<ul> <li>Disconnect the engine-ECU connector</li> <li>Continuity between 8 and earth</li> </ul>		
OK: No continuity		
OK		
Replace the engine-ECU.		



Check the compression pressure.

• Check the immobilizer system. (Refer to GROUP 54 - Ignition Key and Immobilizer.) <only vehicles with immobilizer system>

Initial combustion but no complete combustion (starting impossible)	Probable cause	
In such cases as the above, the cause is probably that the spark p sparks but the sparks are weak, or the initial mixture for starting		
Check battery voltage when cranking. <b>OK:</b> 8 V or higher	NG C	neck the battery. (Refer to GROUP 54 - Battery.)
MUT-II: Check if uncompleted combustion occurs. (Refer to P.13A-48, INSPECTION PROCEDURE 36.)		
ок	_ _ NG	
Can any sound be heard from the injectors when cranking?	► C	neck the injector system, (Refer to P.13A-19, INSPECTION PRO-
ОК		EDURE FOR DIAGNOSIS CODE 41.)
Is starting good if the engine is cranked with the accelerator pedal slightly depressed?		heck ISC servo for op- ation sound.
No	(F	INSPECTION PROCE- DURE 31.)
	•	Clean the throttle valve area. (Refer to P.13A-78.) Check and adjust the fixed SAS. (Refer to P.13A-79.)
	_ NG	
Check the ignition timing when cranking. <b>OK:</b> Approx. 5°BTDC		neck that the distributor is installed properly.
ОК		
<ul> <li>Check the following items.</li> <li>Check the ignition coil, spark plugs, spark plug cables. (Re</li> <li>Check if the injectors are clogged.</li> <li>Check the compression pressure. (Refer to GROUP 11 – 0</li> <li>Check fuel lines for clogging.</li> <li>Check if foreign materials (water, alcohol, etc.) got into fue</li> </ul>	On-vehicle Servi	,

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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> <li>Malfunction of the ignition system</li> <li>Malfunction of the injector system</li> <li>Inappropriate gasoline use</li> <li>Poor compression</li> </ul>	
Check battery voltage when cranking	NG	the battery. (Refer to GROUP 54 – Battery.)	
OK: 8 V or higher	- Oneck	the ballety. (Neler to GNOOF 54 - Ballety.)	
ок			
MUT-II: Check if uncomplete combustion occurs. (Refer to P.13A-48, INSPECTION PROCEDURE 36.)			
ок	NG		
Can any sound be heard from the injectors when cranking?		Check the injector system. (Refer to P.13A-19, INSPECTION PRO	
ОК		RE FOR DIAGNOSIS CODE 41.)	
Check the ignition timing when cranking. OK: Approx. 5°BTDC	_ NG ► Check	that the distributor is installed properly.	
ОК	_		
<ul> <li>Check the following items.</li> <li>Check the ignition coil, spark plugs, spark plug cables. (Re</li> <li>Check if the injectors are clogged.</li> <li>Check the compression pressure. (Refer to GROUP 11 – 1</li> <li>Check if foreign materials (water alcohol etc.) got into fue</li> </ul>	On-vehicle Service.)	On-vehicle Service.)	

Check the compression pressure. (Refer to GROOP 11 – Of
 Check if foreign materials (water, alcohol, etc.) got into fuel.

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> <li>Malfunction of air-fuel ratio control system</li> </ul>
	Yes	
Were the battery terminals disconnected?		After warming-up, let the engine run at idling for 10 minutes.
No	Vaa	
MUT-II Self-Diag code Are diagnosis codes displayed?	Yes	Refer to P.13A-10, INSPECTION CHART FOR DIAGNOSIS CODES.
No	」 ┐Yes	
Does idling speed fluctuate excessively?	►	Check if hunting occurs.
No	NG	(Refer to P.13A-48, INSPECTION PROCEDURE 37.)
Check the ISC servo for operation sound. (Refer to P.13A-90.)	►	Check the ISC servo system.
ок	_ NG	(Refer to P.13A-45, INSPECTION PROCEDURE 31.)
Check the injector for operation sound.	►	Check the injector system. (Refer to P.13A-19, INSPECTION PRO-
ок	-	CEDURE FOR DIAGNOSIS CODE 41.)
MUT-II: Check if idling speed is unstable. (Refer to P.13A-49, INSPECTION PROCEDURE 38.)		
OK		
Check the ignition timing. (Refer to GROUP 11 – On-vehicle Service.)	NG	Check that the distributor is installed properly.
ок		
<ul> <li>Check the following items.</li> <li>Check the ignition coil, spark plugs, spark plug cables. (Re</li> <li>Check the purge control system. (Refer to GROUP 17 - E</li> <li>Check the EGR control system. (Refer to GROUP 17 - En</li> <li>Check the compression pressure. (Refer to GROUP 11 - C</li> <li>Check if foreign materials (water, alcohol, etc.) got into fuel</li> </ul>	mission Cont nission Contr Dn-vehicle Se	rol System.)

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><li>Malfunction of the ISC servo system</li><li>Malfunction of the throttle body</li></ul>	
MUT-II Self-Diag code Are diagnosis codes displayed? No Check the ISC servo for operation sound. (Refer to P.13A-90.) OK	Yes NG	CODE	to P.13A-10, INSPECTION CHART FOR DIAGNOSIS S. the ISC servo system. to P.13A-45, INSPECTION PROCEDURE 31.)
MUT-II Data list 26 Idle position switch (Refer to P.13A-57.)		Check (Refer	the idle position switch system. to P.13A-40, INSPECTION PROCEDURE 25.)
MUT-II Data list 21 Engine coolant temperature sensor (Refer to P.13A-57.)	Check		the engine coolant temperature sensor system. to P.13A-14, INSPECTION PROCEDURE FOR DIAGNOSIS 21.)
MUT-II Data list 28 A/C switch (Refer to P.13A-57.)	NG		the A/C switch and A/C relay system. to P.13A-43, INSPECTION PROCEDURE 29.)
Basic idle adjustment (Refer to P.13A-79.)	] NG ►	Clean	the throttle valve area. (Refer to P.13A-78.)
	-	Check	and adjust the fixed SAS. (Refer to P.13A-79.)

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> <li>Malfunction of the ISC servo system</li> <li>Malfunction of the throttle body</li> </ul>
MUT-II Self-Diag code Are diagnosis codes displayed? No Check the ISC servo for operation sound. (Refer to P.13A-90.) OK MUT-II Data list 26 Idle position switch (Refer to P.13A-57.) OK	NG NG NG Che	er to P.13A-10, INSPECTION CHART FOR DIAGNOSIS DES. ck the ISC servo system. er to P.13A-45, INSPECTION PROCEDURE 31.) ck the idle position switch system. er to P.13A-40, INSPECTION PROCEDURE 25.)
MUT-II Data list 21 Engine coolant temperature sensor (Refer to P.13A-57.) OK MUT-II Data list 29 Inhibitor switch (Refer to P.13A-57.)	NG Che	ck the engine coolant temperature sensor system. erto P.13A-14, INSPECTION PROCEDURE FOR DIAGNOSIS DE 21.) ck the ignition switch ST and inhibitor switch system <a t="">. er to P.13A-42, INSPECTION PROCEDURE 27.)</a>
OK Basic idle adjustment (Refer to P.13A-79.)		an the throttle valve area. (Refer to P.13A-78.)

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 in when the engine is cold, or that the intake air volume is insufficient.		<ul> <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>		e body or system
	Yes			
Were the battery terminals disconnected?	163	► After \	varming-up, let the engine run	at idling for 10 minutes.
No	Yes			
MUT-II Self-Diag code Are diagnosis codes displayed?		<ul> <li>Refer</li> <li>CODE</li> </ul>	to P.13A-10, INSPECTION ( S.	CHART FOR DIAGNOSIS
No				
Does the engine stall right after the accelerator pedal is released?	Yes		the throttle valve	Check and adjust the
No		area. (	Refer to P.13A-78.)	fixed SAS. (Refer to P.13A-79.)
	No			
Is engine-idling stable after the warming-up?			if the unstable idling (Rough to P.13A-29, INSPECTION P	
Yes				,
Check the ISC servo for operation sound. (Refer to P.13A-90.	NG Check		the ISC servo system.	
ОК	/	(Refer	to P.13A-45, INSPECTION P	ROCEDURE 31.)
+	NG			
Check the injector for operation sound.			the injector system. (Refer to P.1 RE FOR DIAGNOSIS CODE	
OK		OLDO		+ ı · <i>j</i>
MUT-II Data list	NG	Check	the idle position switch syste	
26 Idle position switch (Refer to P.13A-57.)		(Refer	to P.13A-40, INSPECTION P	ROCEDURE 25.)
ок				
MUT-II Data list	NG		the engine coolant temperatu	
21 Engine coolant temperature sensor (Refer to P.13A-57.)		(Refer CODE	to P.13A-14, INSPECTION PRO 21.)	CEDURE FOR DIAGNOSIS
ОК			,	
MUT-II Actuator test	NG	Check	the EGR control solenoid valve	system. (Refer to P.13A-46,
10 EGR control solenoid valve (Refer to P.13A-62.)			CTION PROCEDURE 33.)	
OK				
Check the fuel pressure. (Refer to P.13A-81.)				
ОК	NG			
Check the ignition timing. (Refer to GROUP 11 - On-vehicle Service.)		Check	that the distributor is installed	b properly.
ОК				
<ul> <li>Check the following items.</li> <li>Check the ignition coil, spark plugs, spark plug cables. (R</li> <li>Check the compression pressure. (Refer to GROUP 11 –</li> </ul>			On-vehicle Service.)	

Check the engine oil viscosity.

When the engine is hot, it stalls at idling. (Die out)		Probable cause	
In such cases as the above, the cause is probably that ignition system idle speed control (ISC) or compression pressure is defective. In addition, if the engine suddenly stalls, the cause may also be a def contact.			<ul> <li>Malfunction of the ignition system</li> <li>Malfunction of air-fuel ratio control system</li> <li>Malfunction of the ISC system</li> <li>Drawing air into intake system</li> <li>Improper connector contact</li> </ul>
[	Yes		
Were the battery terminals disconnected?		After w	varming-up, let the engine run at idling for 10 minutes.
No	Vee		
MUT-II Self-Diag code Are diagnosis codes displayed?	Yes	Refer CODE	to P.13A-10, INSPECTION CHART FOR DIAGNOSIS S.
No			
Obach the ICO serve for exercise events (Defer to D404.00)	NG	Chook	the ISC servo system.
Check the ISC servo for operation sound. (Refer to P.13A-90.)			to P.13A-45, INSPECTION PROCEDURE 31.)
ОК			
<b>V</b>	NG		
Check the injector for operation sound.	┝		the injector system. (Refer to P.13A-19, INSPECTION PRO- RE FOR DIAGNOSIS CODE 41.)
ОК		OLDOI	
,	Yes		
Does the engine stall right after the accelerator pedal is released?	►		the throttle valve Check and adjust the
No		area. (I	Refer to P.13A-78.) fixed SAS. (Refer to P.13A-79.)
			(**************************************
<u>↓</u>	No		
Does the engine stall easily again?	►		carrying out an intermittent malfunction simulation test (Refer DUP 00 – Points to Note for Intermittent Malfunctions.), check
Yes			den changes in the signals shown below.
MUT-II: Engine stalling inspection when the engine is warm and	]		ank angle sensor signal  • Primary and secondary
idling. (Refer to P.13A-50, INSPECTION PROCEDURE 39.)			flow sensor signal ector drive signal • Fuel pump drive signal
ОК		,c	Engine-ECUpowersupply
			voltage
+	NG		
Check the ignition timing.	►	Check	that the distributor is installed properly.
(Refer to GROUP 11 – On-vehicle Service.)			
ОК			
Check the following items.			
<ul> <li>Check the ignition coil, spark plugs, spark plug cables. (Re</li> <li>Check if the injectors are clogged.</li> </ul>	ter to GROU	P 16 –	On-vehicle Service.)
<ul> <li>Check the compression pressure. (Refer to GROUP 11 – C</li> </ul>	On-vehicle Se	ervice.)	

• Check if foreign materials (water, alcohol, etc.) got into fuel.

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> <li>rk,</li> <li>Drawing air into intake system</li> <li>Malfunction of the ignition system</li> </ul>
MUT-II Self-Diag code Are diagnosis codes displayed?		efer to P.13A-10, INSPECTION CHART FOR DIAGNOSIS DDES.
MUT-II Actuator test 10 EGR control solenoid valve (Refer to P.13A-62.)		neck the EGR control solenoid valve system. (Refer to P.13A-46, SPECTION PROCEDURE 33.)
<ul> <li>Check the following items.</li> <li>Check the ignition coil, spark plugs, spark plug cables. (Re</li> <li>Check if air was drawn into the intake system. Broken intake manifold gasket Broken or disconnected vacuum hose Improper operation of the PCV valve Broken air intake hose</li> </ul>	efer to GROUP	6 – On-vehicle Service.)

## **INSPECTION PROCEDURE 14**

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

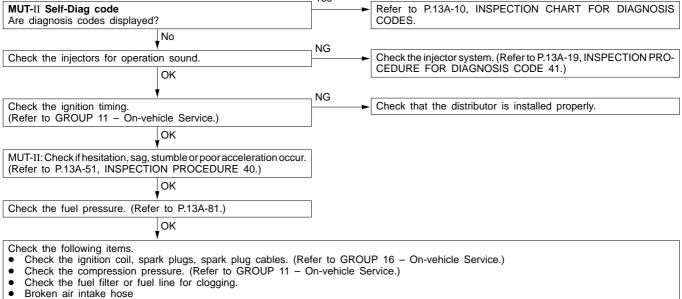
	_ Yes	
Were the battery terminals disconnected?		After warming-up, let the engine run at idling for 10 minutes.
No	_ Yes	
MUT-II Self-Diag code Are diagnosis codes displayed?		Refer to P.13A-10, INSPECTION CHART FOR DIAGNOSIS CODES.
No	_ NG	
MUT-II Data list 26 Idle position switch (Refer to P.13A-57.)		Check the idle position switch system. (Refer to P.13A-40, INSPECTION PROCEDURE 25.)
ОК	_ NG	
<b>MUT</b> -II <b>Data list</b> 14 Throttle position sensor (Refer to P.13A-57.)	-	Check the throttle position sensor system. (Refer to P.13A-13, IN- SPECTION PROCEDURE FOR DIAGNOSIS CODE 14.)
ок	_ _ Yes	
MUT-II Data list 45 ISC servo position	-	Check the vehicle speed sensor system. (Refer to P.13A-17, IN- SPECTION PROCEDURE FOR DIAGNOSIS CODE 24.)
<ul> <li>Is the idle speed control (ISC) servo position drops to 0–2 steps when decelerating (engine r/min less than 1,000)?</li> </ul>		
No	_ NG	
<b>MUT-II Actuator test</b> 10 EGR control solenoid valve (Refer to P.13A-62.)		Check the EGR control solenoid valve system. (Refer to P.13A-46, INSPECTION PROCEDURE 33.)
ок	-	
Check the following items. • Check the ignition coil, spark plugs, spark plug cables. (Re • Check the throttle value area. (Refer to P13A-78.)	efer to GROU	IP 16 – On-vehicle Service.)

Check the throttle valve area. (Refer to P.13A-78.)
Check and adjust the fixed SAS. (Refer to P.13A-79.)

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> <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>	
MUT-II Self-Diag code	Yes	Refer to P.13A-10, INSPECTION CHART FOR DIAGNOSIS	
Are diagnosis codes displayed?		CODES.	
<b>v</b> No	NG		
Check the injectors for operation sound.		Check the injector system. (Refer to P.13A-19, INSPECTION PRO-	
ОК		CEDURE FOR DIAGNOSIS CODE 41.)	
Check the ignition timing.	NG ►	Check that the distributor is installed properly.	
(Refer to GROUP 11 - On-vehicle Service.)	L		
ок			
MUT-II: Check if hesitation, sag, stumble or poor acceleration oc (Refer to P.13A-51, INSPECTION PROCEDURE 40.)	ccur.		
ОК			
Check the fuel pressure. (Refer to P.13A-81.)			
ОК			
<ul> <li>Check the following items.</li> <li>Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 - On-vehicle Service.)</li> <li>Check the EGR control system. (Refer to GROUP 17 - Emission Control System.)</li> <li>Check the compression pressure. (Refer to GROUP 11 - On-vehicle Service.)</li> <li>Check the fuel filter or fuel line for clogging.</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 the accompanying the increase in the spark plug demand volta			

	Yes	
<b>MUT-II Self-Diag code</b> Are diagnosis codes displayed?		► Refer to P.13A-10, INSPECTION CHART FOR DIAGNOSIS CODES.
Are diagnosis codes displayed?		CODES.
No		
Check the following items.		
<ul> <li>Check the ignition coil, spark plugs, spark plug cables.</li> </ul>	Refer to GROU	UP 16 – On-vehicle Service.)
<ul> <li>Check for occurrence of ignition leak.</li> </ul>		

The feeling of impact or vibration when dece	elerating.	Probable cause
Malfunction of the ISC system is suspected.		Malfunction of the ISC system
MUT-II Self-Diag code Are diagnosis codes displayed? No Check the ISC servo for operation sound. (Refer to P.13A-90.) OK MUT-II Data list 14 Throttle position sensor (Refer to P.13A-57.) OK MUT-II Data list 26 Idle position switch (Refer to P.13A-57.) OK Clean the throttle valve area. (Refer to P.13A-78.) INSPECTION PROCEDURE 18	NG NG NG NG NG Chec SPEd	r to P.13A-10, INSPECTION CHART FOR DIAGNOSIS ES. tk the ISC servo system. tr to P.13A-45, INSPECTION PROCEDURE 31.) tk the throttle position sensor system. (Refer to P.13A-13, IN- CTION PROCEDURE FOR DIAGNOSIS CODE 14.) tk the idle position switch system. tr to P.13A-40, INSPECTION PROCEDURE 25.)
Poor acceleration		Probable cause
Defective ignition system, abnormal air-fuel ratio, poor compres are suspected.	ssion pressure, etc.	<ul> <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>
	Yes	



Clogged air cleaner

Surge		Probable cause
Defective ignition system, abnormal air-fuel ratio, etc. are sus	pected.	<ul> <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>
MUT-II Self-Diag code Are diagnosis codes displayed?		lefer to P.13A-10, INSPECTION CHART FOR DIAGNOSIS
Check the injectors for operation sound.		Check the injector system. (Refer to P.13A-19, INSPECTION PRO- EDURE FOR DIAGNOSIS CODE 41.)
Check the ignition timing. (Refer to GROUP 11 – On-vehicle Service.)	NG F	check that the distributor is installed properly.
MUT-II: Check if surge occurs. (Refer to P.13-52, INSPECTION PROCEDURE 41.)		
Check the fuel pressure. (Refer to P.13A-81.)	]	
Check the following items. • Check the ignition coil, spark plugs, spark plug cables. (Re • Check the EGR control system. (Refer to GROUP 17 – Er		

## **INSPECTION PROCEDURE 20**

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

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

## **INSPECTION PROCEDURE 21**

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

Check the injectors for fuel leakage.

Too high CO and HC concentration when id	ling		Probable cause	
Abnormal air-fuel ratio is suspected.			<ul> <li>Malfunction of the air-fuel ratio control system</li> <li>Deteriorated catalyst</li> </ul>	
MUT-II Self-Diag code Are diagnosis codes displayed?	Yes	Refer CODE	to P.13A-10, INSPECTION CHART FOR DIAGNOSIS S.	
Check the ignition timing. (Refer to GROUP 11 – On-vehicle Service.)	_ NG ►	Check	that the distributor is installed properly.	
ок	_ ⊣ NG			
MUT-II Data list 21 Engine coolant temperature sensor. (Refer to P.13A-57.) OK			the engine coolant temperature sensor system. to P.13A-14, INSPECTION PROCEDURE FOR DIAGNOSIS 21.)	
MUT-II Data list 13 Intake air temperature sensor (Refer to P.13A-57.)	NG		the intake air temperature sensor system. (Refer to P.13A-12, CTION PROCEDURE FOR DIAGNOSIS CODE 13.)	
MUT-II Data list	_NG ►		the barometric pressure sensor system. (Refer to P.13A-18,	
25 Barometric pressure sensor (Refer to P.13A-57.)		INSPE	CTION PROCEDURE FOR DIAGNOSIS CODE 25.)	
MUT-II Data list 11 Oxygen sensor OK: 600-1,000mV when racing suddenly (Refer to P.13A-57.)	NG		the oxygen sensor system. (Refer to P.13A-11, INSPECTION EDURE FOR DIAGNOSIS CODE 11.)	
MUT-II Data list	OK►	Replac	be the oxygen sensor.	
11 Oxygen sensor OK: Repeat 0-400 mV and 600-1,000 mV alternately when idling. (Refer to P.13A-57.)		Check	trouble symptom.	
Check the fuel pressure. (Refer to P.13A-81.)			NG	
ок			,	
<ul> <li>Check the following items.</li> <li>Check the injectors for operation sound.</li> <li>Check the injectors for fuel leakage.</li> <li>Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle Service.)</li> <li>Check the compression pressure. (Refer to GROUP 11 – On-vehicle Service.)</li> <li>Check the positive crankcase ventilation system. (Refer to GROUP 17 – Emission Control System.)</li> <li>Check the EGR control system. (Refer to GROUP 17 – Emission Control System.)</li> </ul>				
· · · · · · · · · · · · · · · · · · ·				
Check the trouble symptom.				
Replace the catalytic converter.				

Power supply system and ignition switch-IG system		Probable cause
When an ignition switch ON signal is input to the engine-ECU, the the control relay ON. This causes battery voltage to be supplied injectors and air flow sensor.		<ul> <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>
Check the control relay. (Refer to P.13A-86.) OK Measure at the control relay connector C-53. • Disconnect the connector, and measure at the harness side. • Voltage between 3, 4 and earth OK: System voltage		ice k the harness wire between battery and control relay connector, epair if necessary.
Check the engine-ECU power supply and earth circuit. (Refer to P.13A-53, INSPECTION PROCEDURE 42.)		

Fuel pump system		Pro	bable 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.		nning, • M. • M. • Im sh	alfunction of the fuel pump relay alfunction of the fuel pump proper connector contact, open circuit or ort-circuited harness wire alfunction of the engine-ECU
Check the fuel pump operation. (Refer to P.13A-84.) OK Check the fuel pump relay. (Refer to P.13A-86.)			el pump circuit. 3A-53, INSPECTION PROCEDURE 43.)
Measure at the fuel pump relay connector C-54. • Connect the connector.	NG	Check the fue	al pump drive control circuit. 3A-54, INSPECTION PROCEDURE 44.)
Voltage between 1 and earth     MUT-II Actuator test: Fuel pump drive     OK: System voltage     OK			
Check the harness wire between fuel pump relay connector and fuel pump drive terminal, and repair if necessary.			
INSPECTION PROCEDURE 25			
Idle position switch system		Pro	bable cause
Idle position switch system The idle position switch inputs the condition of the accelerator it is depressed or released (HIGH/LOW), to the engine-ECU. The engine-ECU controls the idle speed control servo based		nether M M M M pc Im sh	bable cause aladjustment of the accelerator pedal aladjustment of the fixed SAS aladjustment of the idle position switch and throttle solition sensor proper connector contact, open circuit or ort-circuited harness wire alfunction of the engine-ECU
The idle position switch inputs the condition of the accelerator it is depressed or released (HIGH/LOW), to the engine-ECU. The engine-ECU controls the idle speed control servo based	on this input.	ether M M M pc Im sh M	aladjustment of the accelerator pedal aladjustment of the fixed SAS aladjustment of the idle position switch and throttle sition sensor proper connector contact, open circuit or ort-circuited harness wire
The idle position switch inputs the condition of the accelerator it is depressed or released (HIGH/LOW), to the engine-ECU.	on this input.	nether M M M M pc Im sh	aladjustment of the accelerator pedal aladjustment of the fixed SAS aladjustment of the idle position switch and throttle sistion sensor proper connector contact, open circuit or ort-circuited harness wire alfunction of the engine-ECU
The idle position switch inputs the condition of the accelerator it is depressed or released (HIGH/LOW), to the engine-ECU. The engine-ECU controls the idle speed control servo based	on this input.	Replace Check the connector. C	Aladjustment of the accelerator pedal aladjustment of the fixed SAS aladjustment of the idle position switch and throttle sistion sensor aproper connector contact, open circuit or ort-circuited harness wire alfunction of the engine-ECU NG -51 OK e symptom.
The idle position switch inputs the condition of the accelerator it is depressed or released (HIGH/LOW), to the engine-ECU. The engine-ECU controls the idle speed control servo based Check the idle position switch. (Refer to P.13A-87.) OK Measure at the throttle position sensor connector A-47. • Disconnect the connector, and measure at the harness side. • Voltage between 2 and earth (Ignition switch: ON) OK: 4 V or higher • Continuity between 1 and earth OK: Continuity	on this input.	Replace Check the connector. C Check the har	Aladjustment of the accelerator pedal aladjustment of the fixed SAS aladjustment of the idle position switch and throttle sistion sensor aproper connector contact, open circuit or ort-circuited harness wire alfunction of the engine-ECU following -51 OK e symptom. NG ness wire between engine-ECU and throttle position
The idle position switch inputs the condition of the accelerator it is depressed or released (HIGH/LOW), to the engine-ECU. The engine-ECU controls the idle speed control servo based Check the idle position switch. (Refer to P.13A-87.) OK Measure at the throttle position sensor connector A-47. • Disconnect the connector, and measure at the harness side. • Voltage between 2 and earth (Ignition switch: ON) OK: 4 V or higher • Continuity between 1 and earth OK: Continuity OK	on this input.	Replace Check the connector. C Check the har sensor conne	Aladjustment of the accelerator pedal aladjustment of the fixed SAS aladjustment of the idle position switch and throttle asition sensor aproper connector contact, open circuit or ort-circuited harness wire alfunction of the engine-ECU following -51 OK e symptom. NG ness wire between engine-ECU and throttle position ctor.
The idle position switch inputs the condition of the accelerator it is depressed or released (HIGH/LOW), to the engine-ECU. The engine-ECU controls the idle speed control servo based Check the idle position switch. (Refer to P.13A-87.) OK Measure at the throttle position sensor connector A-47. • Disconnect the connector, and measure at the harness side. • Voltage between 2 and earth (Ignition switch: ON) OK: 4 V or higher • Continuity between 1 and earth OK: Continuity OK Check the following	on this input.	Replace Check the connector. C Check the connector. C	Aladjustment of the accelerator pedal aladjustment of the fixed SAS aladjustment of the idle position switch and throttle sistion sensor aproper connector contact, open circuit or ort-circuited harness wire alfunction of the engine-ECU following -51 OK e symptom. NG ness wire between engine-ECU and throttle position ctor. OK
The idle position switch inputs the condition of the accelerator it is depressed or released (HIGH/LOW), to the engine-ECU. The engine-ECU controls the idle speed control servo based Check the idle position switch. (Refer to P.13A-87.) OK Measure at the throttle position sensor connector A-47. Disconnect the connector, and measure at the harness side. Voltage between 2 and earth (Ignition switch: ON) OK: 4 V or higher Continuity between 1 and earth OK: Continuity OK Check the following connector. A-47	on this input.	Replace Check the connector. C Check the connector. C	Aladjustment of the accelerator pedal aladjustment of the fixed SAS aladjustment of the idle position switch and throttle sistion sensor aproper connector contact, open circuit or ort-circuited harness wire alfunction of the engine-ECU following -51 OK e symptom. NG ness wire between engine-ECU and throttle position ctor. OK

Replace the engine-ECU.

Ignition switch-ST system <m t=""></m>		Probable cause
The ignition switch-ST inputs a HIGH signal to the engine-ECU cranking. The engine-ECU controls fuel injection, etc. during starting ba	0	<ul> <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>
Measure at the engine-ECU connector C-51. • Disconnect the connector, and measure at the harness side. 1. Voltage between 51 and earth (Ignition switch: START) OK: 8V or more 2. Continuity between 71 and earth OK: Continuity OK Check the following connector. C-51 OK Check trouble symptom. NG Replace the engine-ECU.	2. NG Check Check tween and ig nector	trouble symptom. NG OK trouble symptom. NG NG NG NG NG NG NG Repair NG NG NG NG NG NG NG NG NG NG
		the harness wire between the engine-ECU connector (termi- 0.71) and earth, and repair if necessary.

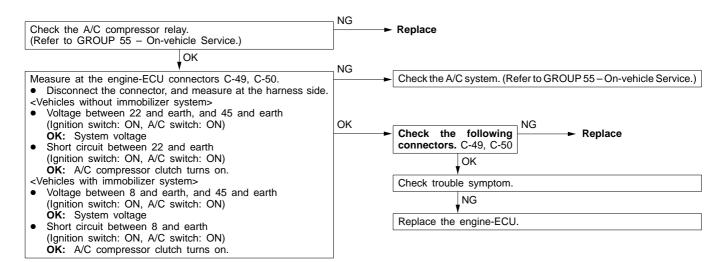
Ignition switch-ST and inhibitor switch systemeters	em </th <th>A/T</th> <th>&gt;</th> <th>Probable cause</th>	A/T	>	Probable cause
<ul> <li>The ignition switch-ST inputs a HIGH signal to the engine-ECU while the engine is cranking.</li> <li>The engine-ECU controls fuel injection, etc. during starting 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> <li>Malfunction of ignition switch</li> <li>Malfunction of inhibitor switch</li> <li>Improper connector contact, open circuit of short-circuited harness wire</li> <li>Malfunction of the engine-ECU.</li> </ul>	
	NO			
Check the inhibitor switch. (Refer to GROUP 23 – On-vehicle Service.)	NG		► Repla	ice
OK	- 			
<ul> <li>Measure at the inhibitor switch connector B-01.</li> <li>Disconnect the connector, and measure at the harness side.</li> <li>Voltage between 6 and earth (Ignition switch: ON) OK: System voltage</li> <li>Continuity between 5 and earth</li> </ul>	1. NG		conn	k the following ectors. C-51, C-57 OK
<b>OK:</b> Continuity 3. Voltage between 6 and earth			Chec	k trouble symptom.
<ul> <li>Ignition switch: START</li> <li>Disconnect engine-ECU connector.</li> <li>OK: System voltage</li> </ul>	3. NG	3	Chec	NG ▼ NG k the harness wire ► Repair
OK				een the engine-ECU ector and inhibitor
Check the following → Repair connector. B-01				OK
OK			Repla	ace the engine-ECU.
Check trouble symptom.	٦ I			
NG Check harness wire be- tween engine-ECU and inhibitorswitch connector. NG ► Repair			conn	k the following ectors. ⟨, C-19, C-57 OK
ок V	,		Chec	k trouble symptom.
Replace the engine-ECU.				NG
				k the harness wire between the inhibitor switch connecto earth, and repair if necessary.
			conn	k the following ector. C-57, C-70 OK
			Chec	k trouble symptom.
			Chec tweet	NG k harness wire be- hinhibitor switch and on switch connector. NG NG ► Repair
				OK k the ignition switch. r to GROUP 54 – Ignition Switch and Immobilizer system

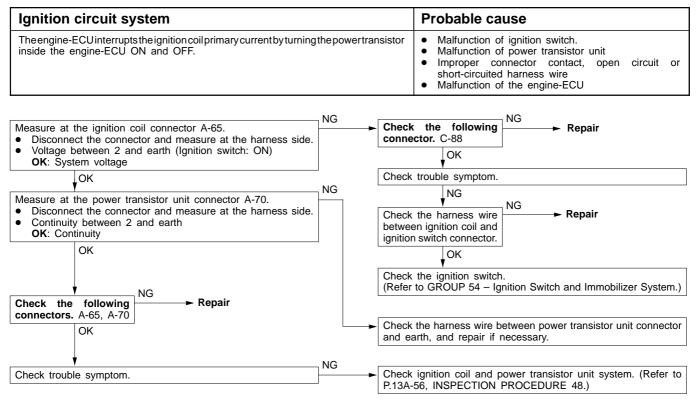
Power steering fluid pressure switch system		Probable cause
The presence or absence of power steering load is input to the the engine-ECU controls the idle speed control (ISC) serve back		<ul> <li>Malfunction of power steering fluid pressure switch</li> <li>Improper connector contact, open circuit or short-circuited harness wire</li> <li>Malfunction of the engine-ECU</li> </ul>
Check the power steering fluid pressure switch. (Refer to GROUP 37A – On-vehicle Service.)	NG ► Repla	ce
<ul> <li>Measure at the power steering fluid pressure switch connector A-74.</li> <li>Disconnect the connector, and measure at the harness side.</li> <li>Voltage between 1 and earth (Ignition switch: ON)</li> <li>OK: System voltage</li> </ul>	conne	k the following ector. C-50 ↓OK ↓
OK V Check the following connector. A-74 ↓ OK Check trouble symptom.	Check tween power	k trouble symptom. NG NG NG NG ► Repair Steering fluid pres- switch connector.
NG	Repla	Ce the engine-ECU.

Replace the engine-ECU.

#### **INSPECTION PROCEDURE 29**

A/C switch and A/C relay system	Probable cause
When an A/C ON signal is input to the engine-ECU, the engine-ECU carries out control of the idle speed control (ISC) servo, and also operates the A/C compressor magnetic clutch.	<ul> <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>





Idle speed control (ISC) servo (Stepper motor) system		n 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> <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>
Check the ISC servo (Refer to P.13A-90.) → Replace	NG	
<ul> <li>Measure at the ISC servo connector A-50.</li> <li>Disconnect the connector and measure at the harness side.</li> <li>Voltage between 2 and earth, and 5 and earth (Ignition switch: ON)</li> <li>OK: System voltage</li> </ul>		Check the harness wire between control relay and ISC servo con- nector, and repair if necessary.
OK V	NG	NG
<ul> <li>Measure at the engine-ECU connector C-49.</li> <li>Disconnect the connector, measure at the harness side.</li> <li>Voltage between each of 4, 5, 17, 18 and earth (Ignition switch: ON)</li> <li>OK: System voltage</li> </ul>		Check the following connector. A-50 OK Check trouble symptom.
Check the following connector. C-49 OK		Check harness wire between engine-ECU and ISC servo connector, and repair if necessary.
Check trouble symptom.	NG	Replace the engine-ECU.

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> <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>

	NG	
Check the purge control solenoid valve. (Refer to GROUP 17 – Emission Control System.)		—► Replace
OK	NG	
<ul> <li>Measure at the purge control solenoid valve connector A-48.</li> <li>Disconnect the connector and measure at the harness side.</li> <li>Voltage between 2 and earth (Ignition switch: ON)</li> <li>OK: System voltage</li> </ul>		<ul> <li>Check the harness wire between control relay and solenoid valve connector, and repair if necessary.</li> </ul>
ОК	NG	NG
<ul> <li>Measure at the engine-ECU connector B-49.</li> <li>Disconnect the connector and measure at the harness side.</li> <li>Voltage between 9 and earth (Ignition switch: ON)</li> </ul>		Check the following Repair
OK: System voltage		
OK		Check trouble symptom.
Check the following Repair		NG
OK		Check the harness wire between engine-ECU and solenoid valve connector, and repair if necessary.
Check trouble symptom.		
NG		
Replace the engine-ECU.	]	

EGR control solenoid valve system	Probable cause	
The EGR control solenoid valve is controlled by the negative pres EGR operation leaking to port "A" of the throttle body.	ssure resulting	<ul> <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>
Check the EGR control solenoid valve. (Refer to GROUP 17 – Emission Control System.)	NG ►	Replace
<ul> <li>OK</li> <li>Measure at the EGR control solenoid valve connector A-49.</li> <li>Disconnect the connector and measure at the harness side.</li> <li>Voltage between 1 and earth (Ignition switch: ON)</li> </ul>		Check the harness wire between control relay and solenoid valve connector, and repair if necessary.
OK: System voltage		Check the following NG
<ul> <li>Measure at the engine-ECU connector C-49.</li> <li>Disconnect the connector and measure at the harness side.</li> <li>Voltage between 6 and earth (Ignition switch: ON) OK: System voltage</li> </ul>		Connector. A-49
OK Check the following → Repair		Check trouble symptom.
Connector. C-49		Check the harness wire between engine-ECU and solenoid valve connector, and repair if necessary.
Check trouble symptom.		
Replace the engine-ECU.		

#### MUT-II: Inspection of no initial combustion

	_ NG	
MUT-II Data list		Check the power supply and ignition switch-IG system.
16 Voltage of engine-ECU power source (Refer to P.13A-57.)		(Refer to P.13A-39, INSPECTION PROCEDURE 23.)
OK	- No	
Does the camshaft rotate at the engine cranking? (When oil filler cap is removed.)	<b>•</b>	Check timing belt for breakage.
Yes	_ Yes	
MUT-II Self-Diag code Are diagnosis codes displayed?	►	Refer to P.13A-10, INSPECTION CHART FOR DIAGNOSIS CODES.
No	– No	
MUT-II Data list 22 Crank angle sensor OK: Cranking speed is displayed.	<b>•</b>	Check the crank angle sensor system. (Referto P.13A-15, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 22.)
ок	_ NG	
MUT-II Actuator test 07 Fuel pump (Refer to P.13A-62.)		Check the fuel pump system. (Refer to P.13A-40, INSPECTION PROCEDURE 24.)
ок	_ NG	
MUT-II Data list 21 Engine coolant temperature sensor (Refer to P.13A-57.)		Check the engine coolant temperature sensor system. (Referto P.13A-14, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 21.)

## **INSPECTION PROCEDURE 35**

#### Ignition system: Inspection of no initial combustion.

 NG

 • Set the tachometer display the cranking speed?

 • Set the tachometer of primary voltage detection type.

 OK

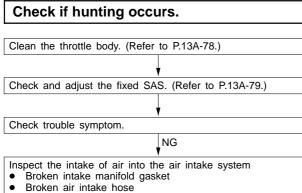
 OK

 Check the ignition timing when cranking.

 OK:

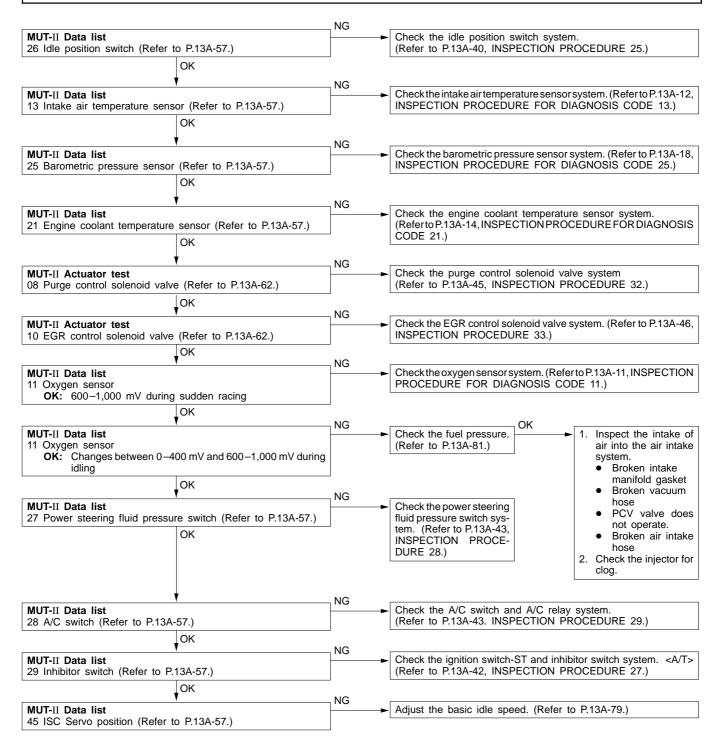
 Approx. 5°BTDC

#### MUT-II: Check if uncomplete combustion occurs. Yes MUT-II Self-Diag code Refer to P.13A-10, INSPECTION CHART FOR DIAGNOSIS CODE Are diagnosis codes displayed? No NG Check the fuel pump system. **MUT-II Actuator test** 07 Fuel pump (Refer to P.13A-62.) (Refer to P.13A-40, INSPECTION PROCEDURE 24.) OK NG Check the engine coolant temperature sensor system. (Refer to P.13A-14, INSPECTION PROCEDURES FOR DIAGNO-SIS CODE 21.) MUT-II Data list 21 Engine coolant temperature sensor (Refer to P.13A-57.) OK NG Check the ignition switch-ST system <M/T>. (Refer to P.13A-41, INSPECTION PROCEDURE 26.) MUT-II Data list 18 Ignition switch-ST (Refer to P.13A-57.) **INSPECTION PROCEDURE 37**

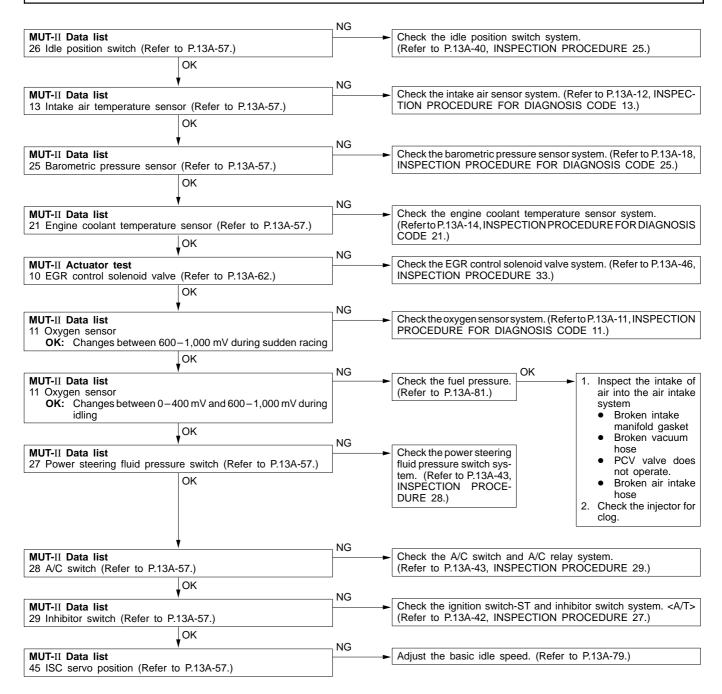


- Broken vacuum hose
- Positive crankcase ventilation valve does not operate.

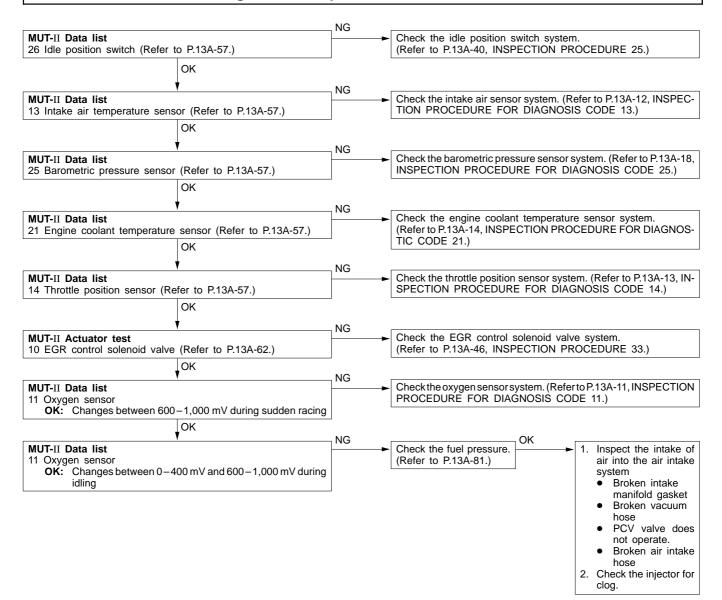
#### MUT-II: Check if idling speed is unstable.



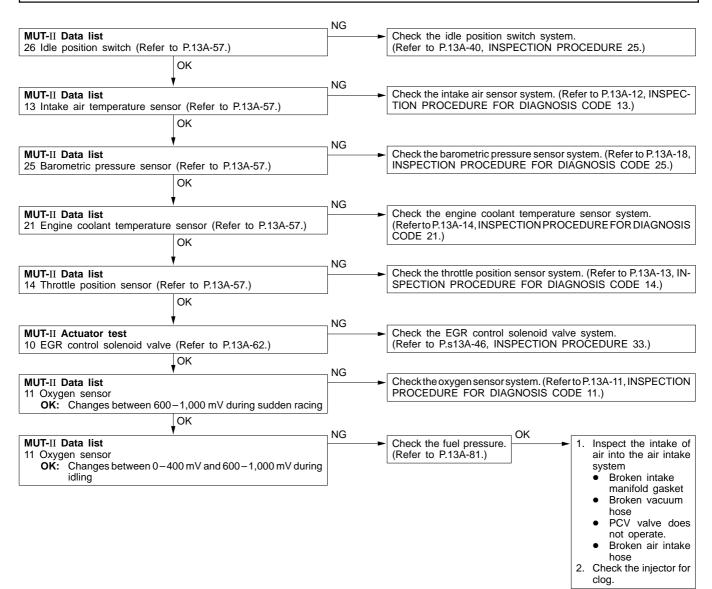
#### MUT-II: Engine stalling inspection when the engine is warmed up and idling.



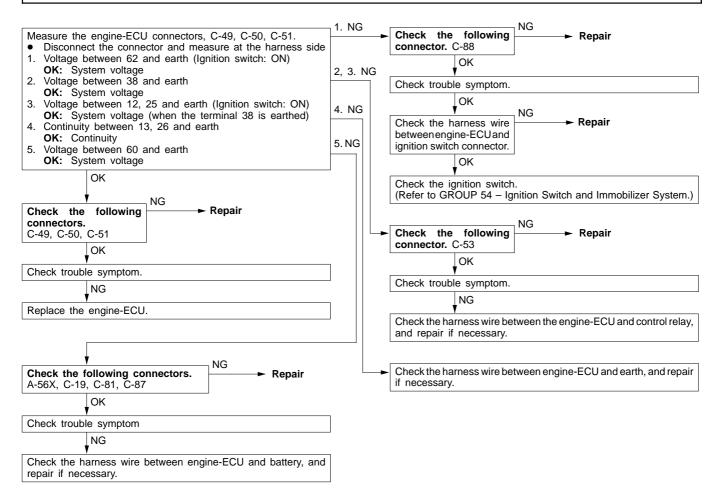
#### MUT-II: Check if hesitation, sug, stumble or poor acceleration occurs.



#### MUT-II: Check if surge occurs.

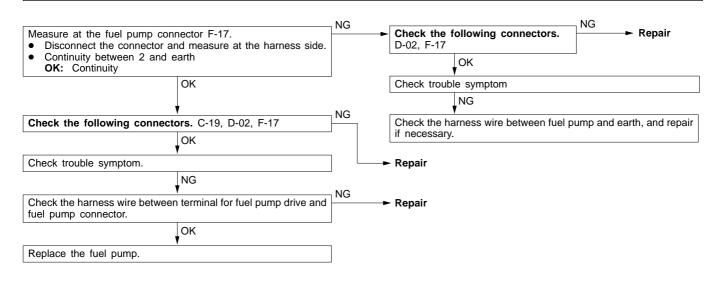


#### Check the engine-ECU power supply and earth circuit.

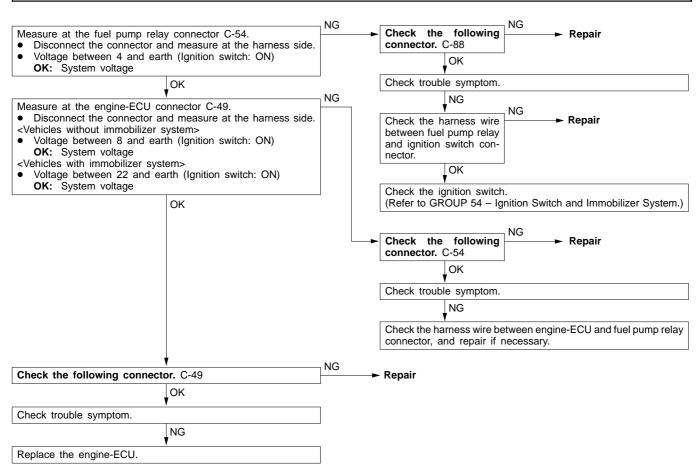


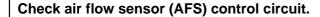
#### **INSPECTION PROCEDURE 43**

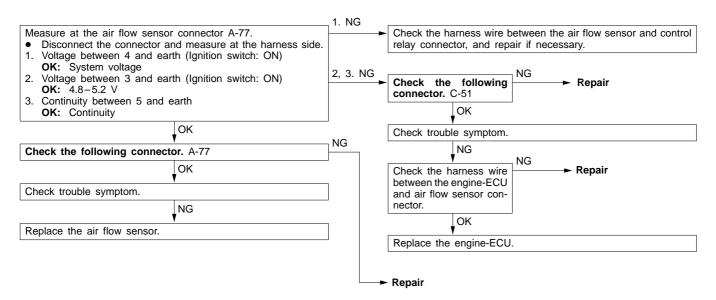
#### Check fuel pump circuit.



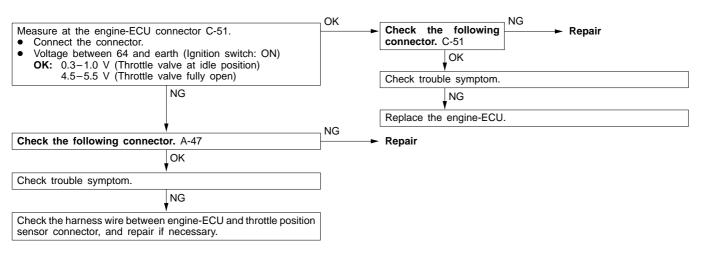
#### Check the fuel pump drive control circuit.







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



#### **INSPECTION PROCEDURE 47**

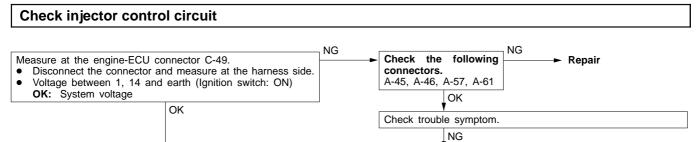
Check the following connector. C-49

Check trouble symptom.

Replace the engine-ECU.

OK

NG

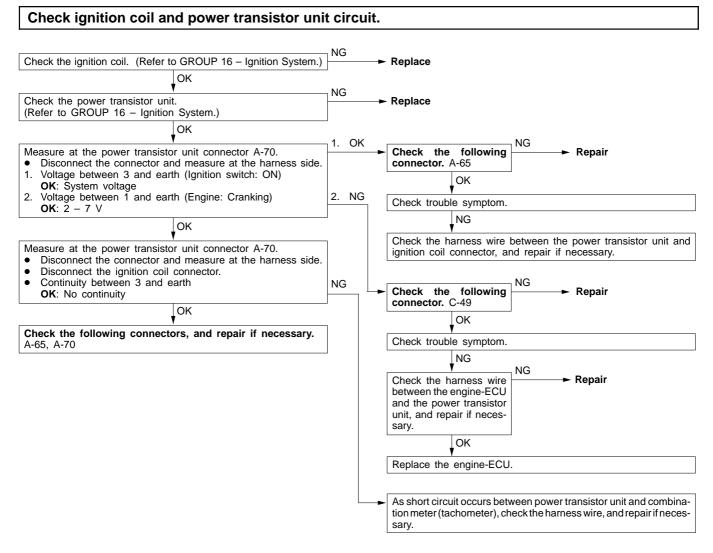


NG

Check the harness between engine-ECU and injector connector,

and repair if necessary.

Repair



## DATA LIST REFERENCE TABLE

#### Caution

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

NOTE

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

ltem 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 de-	When at 4,000 r/min, engine is suddenly decelerated	200 mV or less	Code No. 11	13A-11
		celerating, and is made richer when racing.	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	Engine is idling	400 mV or less (Changes) 600–1,000 mV			
		ratio, and control condition by the en- gine-ECU.	2,500 r/min	400 mV or less (Changes) 600-1,000 mV	-	
12	12 Air flow sensor*1	<ul> <li>Engine coolant temperature: 80-95°C</li> <li>Lamps and all accessories: OFF</li> </ul>	Engine is idling	22 – 48 Hz <4G63> 19 – 45 Hz <4G64>	-	-
		<ul> <li>Transmission: Neutral (A/T: P range)</li> </ul>	2,500 r/min	80 – 120 Hz <4G63> 67 – 107 Hz <4G64>		
			Engine is raced	Frequency increases in response to racing		

13100890180

ltem No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
13	Intake air temperature	Ignition switch: ON or with engine running	When intake air temperature is –20°C	–20°C	Code No. 13	13A-12
	sensor		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	Ignition switch: ON	Set to idle position	300-1,000 mV	Code No.	13A-13
	position sensor		Gradually open	Increases in proportion to throttle opening angle	- 14	
			Open fully	4,500-5,500 mV		
16	Power supply voltage	Ignition switch: ON		System voltage	Procedure No. 23	13A-39
18	Cranking Ignition switch: ON signal (ignition		Engine: Stopped	OFF	Procedure No. 26 <m t=""></m>	13A-41 <m t=""> 13A-42</m>
	switch-ST)	ch-ST)	Engine: Cranking	ON	Procedure No. 27 <a t=""></a>	<m t=""></m>
21	Engine coolant temperature	Ignition switch: ON or with engine running	When engine coolant temperature is –20°C	–20°C	Code No. 21	13A-14
	sensor		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		

ltem No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
22	Crank angle sensor	<ul> <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-15
		<ul> <li>Engine: Idling</li> <li>Idle position switch: ON</li> </ul>	When engine coolant temperature is –20°C	1,275 – 1,475 r/min		
			When engine coolant temperature is 0°C	1,225 – 1,425 r/min		
			When engine coolant temperature is 20°C	1,100 – 1,300 r/min		
	When engine coolant tempera is 40°C	coolant temperature	950 – 1,150 r/min			
			When engine coolant temperature is 80°C	650 – 850 r/min		
25	Barometric	Ignition switch: ON	At altitude of 0 m	101 kPa	Code No.	13A-18
	pressure sensor		At altitude of 600 m	95 kPa	25	
			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	Throttle valve: Set to idle position	ON	Procedure No. 25	13A-40
		repeatedly	Throttle valve: Slightly open	OFF*2		
27	Power steering fluid	Engine: Idling	Steering wheel stationary	OFF	Procedure No. 28	13A-43
	pressure switch		Steering wheel turning	ON		

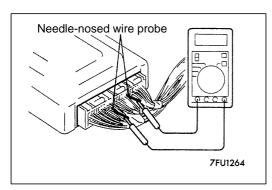
ltem No.	Inspection item	Inspection contents	nspection contents		Inspection procedure No.	Reference page	
28	A/C switch	Engine: Idling (when A/C switch is	A/C switch: OFF	OFF	Procedure No. 29	13A-43	
		ON, A/C compressor should be operating.)	A/C switch: ON	ON			
29	Inhibitor switch	Ignition switch: ON	P or N	P or N	Procedure No. 27	13A-42	
	<a t=""></a>		D, 2, L or R	D, 2, L or R			
41	41 Injectors *3	Engine: Cranking	When engine cool- ant temperature is 0°C	51 – 76 ms <4G63> 60 – 90 ms <4G64>	-	-	
			When engine coolant temperature is 20°C	26 – 38 ms <4G63> 30 – 45 ms <4G64>			
			When engine coolant temperature is 80°C	5.7 – 8.5 ms <4G63> 6.7 – 10.1 ms <4G64>			
	Injectors*4	njectors*4 • Engine coolant temperature: 80–95°C • Lamps and all accessories: OFF • Transmission: Neutral (A/T : P range)	Engine is idling	1.9 – 3.1 ms <4G63> 2.2 – 3.4 ms <4G64>	-		
			2,500 r/min	1.8 – 3.0 ms <4G63> 1.9 – 3.1 ms <4G64>			
			When engine is suddenly raced	Increases			
44	Ignition coils and power	• Engine: After having warmed up	Engine is idling	2-18°BTDC	_	-	
	transistors			2,500 r/min	23 – 43° BTDC <4G63> 27 – 47° BTDC <4G64>		

ltem No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
45	(stepper) temperature: motor 80–95°C	temperature: 80–95°C	A/C switch: OFF	2–25 STEP	_	_
	position * <sup>5</sup>	<ul> <li>Lamps and all accessories: OFF</li> <li>Transmission: Neutral (A/T : P range)</li> </ul>	A/C switch: OFF $\rightarrow$ ON	Increases by 10–70 steps		
		<ul> <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>	<ul> <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. 29	13A-43
		A/C switch: ON	ON (Compressor clutch is operating)			

## ACTUATOR TEST REFERENCE TABLE

13100900210

ltem No.	Inspection item	Drive contents	Inspection contents		Normal condition	Inspection procedure No.	Reference page
01	Injectors	Cut fuel to No.1, No.3 injector	Engine: After having w gine is idling	•	Idling condition becomes different (becomes unsta- ble).	Code No. 41	13A-19
02		Cut fuel to No.2, No.4 injector	injector in turn	(Cut the fuel supply to each injector in turn and check cylinders which don't affect idling.)			
07	7 Fuel pump Fuel pump operates and fuel is recircu lated.		<ul> <li>Engine: Cranking</li> <li>Fuel pump: Forced driving Inspect</li> </ul>	Pinch the return hose with fingers to feel the pulse of the fuel being recirculated.	Pulse is felt.	Procedure No. 24	13A-40
			accord- ing to both the above condi- tions.	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. 32	13A-45
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. 33	13A-46



## CHECK AT THE ENGINE-ECU TERMINALS

13100920186

## 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

			<b>D</b>			D	£	
- N W I	501	8 % 1 0	13	33 32 31	38 37 36 35 34	53 52 51	55 55 54	85 60 19
14	18	223	26 25 24	41 40 39	4 4 5 4 4 3 4 2		6 6 7 6 7 8 6	72 71 70 69

NOTE \*: Vehicles with immobilizer system

Terminal No.	Check item	Check condition (En	gine condition)	Normal condition	
1	No.1, No.3 injector	While engine is idling		From 11–14 V, momentarily	
14	No.2, No.4 injector	warmed up, suddenl accelerator pedal.	y depress the	drops slightly	
4	Stepper motor coil <a1></a1>	Engine: Soon after t	he warmed up	System voltage $\leftrightarrow 0 - 3 \text{ V}$	
17	Stepper motor coil <a2></a2>	engine is started		(Changes repeatedly)	
5	Stepper motor coil <b1></b1>				
18	Stepper motor coil <b2></b2>				
6	EGR control solenoid valve	Ignition switch: ON		System Voltage	
	Valve	While engine is idling the accelerator peda		From system voltage, momentarily drops	
8 or 22*	Fuel pump relay	Ignition switch: ON		System voltage	
		Engine: Idle speed		0-3V	
9 Purge control solenoid	Ignition switch: ON	System voltage			
	valve	Running at 3,000r/m warming up after ha	0-3V		
10	Power transistor unit	Engine r/min: 3,000	r/min	0.3-3.0V	
12	Power supply	Ignition switch: ON		System voltage	
25					
19	Air flow sensor reset	Engine: Idle speed		0-1V	
	signal	Engine r/min: 3,000	r/min	6-9V	
22 or 8*	A/C relay	<ul> <li>Engine: Idle sp</li> <li>A/C switch: OF (A/C compress)</li> </ul>	$F \rightarrow ON$	System voltage or momentarily 6V or more $\rightarrow 0-3V$	
34	Ignition timing adjust- ment terminal	Ignition switch: ON	Earth the ignition timing adjustment terminal	0 – 1 V	
			Remove the earth from the ignition timing adjustment terminal	4.0 – 5.5 V	

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Terminal No.	Check item	Check condition (En	gine condition)	Normal condition
35	Oxygen sensor heater	Engine: Idling after v	varming up	0-3V
		Engine r/min: 5,000r	/min.	System voltage
36	Engine warning lamp	Ignition switch: OFF	$\rightarrow ON$	$0-3V \rightarrow 9-13V$ (After several seconds have elapsed)
37	Power steering fluid pressure switch	Engine: Idling after warming up	When steering wheel is stationary	System voltage
			When steering wheel is turned	0-3V
38	Control relay (Power supply)	Ignition switch: OFF		System voltage
		Ignition switch: ON		0-3V
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
51	Ignition switch – ST	Engine: Cranking		8V or more
52	Intake air temperature Ignition switch: sensor 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
56	Oxygen sensor	Engine: Running at 2,500 r/min after warmed up (Check using a digital type voltmeter)		0 ↔ 0.8V (Changes repeatedly)
60	Backup power supply	Ignition switch: OFF		System voltage
61	Sensor impressed voltage	Ignition switch: ON		4.5-5.5V
62	Ignition switch – IG	Ignition switch: ON		System voltage

Terminal No.	Check item	Check condition (En	gine condition)	Normal condition				
63	Engine coolant temperature sensor	Ignition switch: ON	When engine coolant tempera- ture is 0°C	3.2-3.8V				
			When engine coolant tempera- ture is 20°C	2.3–2.9V				
			When engine coolant tempera- ture is 40°C	1.3–1.9V				
			When engine coolant tempera- ture is 80°C	0.3-0.9V				
64	Throttle position sensor	Ignition switch: ON	Set throttle valve to idle position	0.3-1.0V				
			Fully open throttle valve	4.5-5.5V				
65	Barometric pressure sensor	Ignition switch: ON	When altitude is 0m	3.7-4.3V				
			When altitude is 1,200m	3.2-3.8V				
66	Vehicle speed sensor	<ul><li>Ignition switch:</li><li>Move the vehic</li></ul>	ON cle slowly forward	0 ↔ 5V (Changes repeatedly)				
67	Idle position switch	Ignition switch: ON	Set throttle valve to idle position	0-1V				
			Slightly open throttle valve	4V or more				
68	Top dead centre sensor	Engine: Cranking		0.4-3.0V				
		Engine: Idle speed		0.5-2.0V				
69	Crank angle sensor	Engine: Cranking		0.4-4.0V				
		Engine: Idle speed		1.5-2.5V				
70	Air flow sensor	Engine: Idle speed		2.2-3.2V				
		Engine r/min: 2,500r	/min	1				
71	Inhibitor switch <a t=""></a>	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

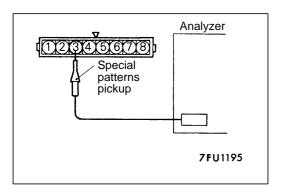
6]	60	59	58	57	56	55	54	53	52	5 1	38	37	36	35	34	3 3	32	3 -	ſ		12		10	ہ د	œ	7	•	ъ	4	ω	2	-
72	71	70	69	89	67	66	65	64	63	62	46	45	44	43	42	41	40	39		26	25	24	23	22	21	20	19	18	17	16	15	- 4

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Terminal No.	Inspection item	Normal condition (Check condition)
1–12	No.1, No.3 injector	6.5 – 8.0 Ω (At 20°C)
14–12	No.2, No.4 injector	

## 13A-68

Terminal No.	Inspection item	Normal condition (Check condition)						
4–12	Stepper motor coil (A1)	28–33 Ω (At 20°C)						
17–12	Stepper motor coil (A2)							
5–12	Stepper motor coil (B1)							
18–12	Stepper motor coil (B2)							
6–12	EGR control solenoid valve	36–44 Ω (At 20°C)						
9–12	Purge control solenoid valve	36-44 Ω (At 20°C)						
13–Body earth	Engine-ECU earth	Continuity (0Ω)						
26–Body earth	Engine-ECU earth							
35–12	Oxygen sensor heater	Approx. 12 Ω (At 20°C)						
52–72	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)						
		$0.30-0.42 \text{ k}\Omega$ (When intake air temperature is $80^\circ \text{C}$						
63–72	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)						
67–72	Idle position switch	Continuity (when throttle valve is at idle position)						
		No continuity (when throttle valve is slightly open)						
71–Body earth	Inhibitor switch <a t=""></a>	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

13100930127

## 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.

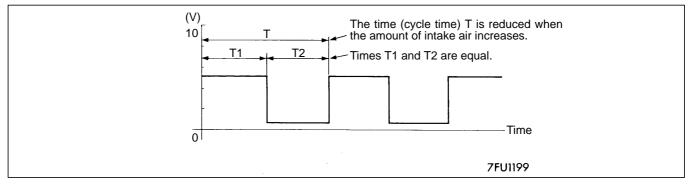
#### Alternate Method (Test harness not available)

1. Connect the analyzer special patterns pickup to engine-ECU terminal 70.

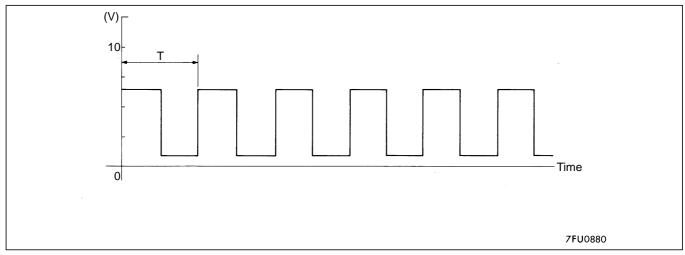
## Standard Wave Pattern Observation conditions

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

## Standard wave pattern



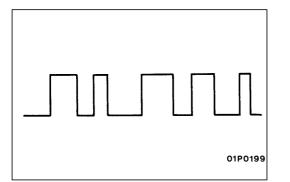
## Observation conditions (from conditions above engine speed is increased by racing.)



## Wave Pattern Observation Points

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

## **MPI** – Troubleshooting



#### **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.

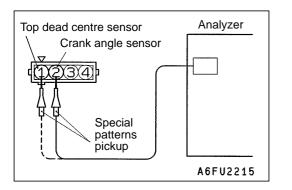
• Example 2

#### 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

#### **Measurement Method**

- 1. Disconnect the top dead centre sensor connector and connect the special tool (test harness: MB9981348) in between. (All terminal should be connected.)
- 2. Connect the analyzer special patterns pickup to distributor terminal 1. (when checking the top dead centre sensor signal wave pattern.)
- 3. Connect the analyzer special patterns pickup to distributor terminal 2. (when checking the crank angle sensor signal wave pattern.)

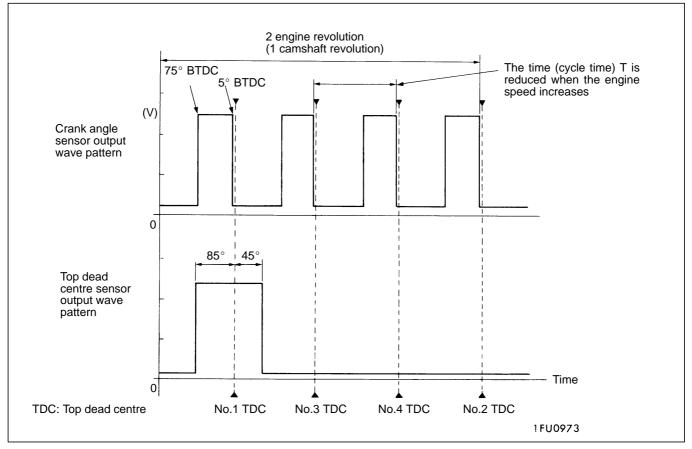
#### Alternate Method (Test harness not available)

- 1. Connect the analyzer special patterns pickup to engine-ECU terminal 68. (when checking the top dead centre sensor signal wave pattern.)
- 2. Connect the analyzer special patterns pickup to engine-ECU terminal 69. (when checking the crank angle sensor signal wave pattern.)

## Standard Wave Pattern Observation conditions

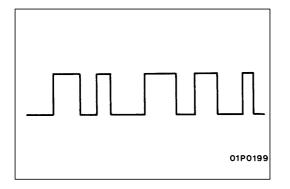
Function	Special patterns
Pattern height	Low
Pattern selector	Display
Engine r/min	Idle speed

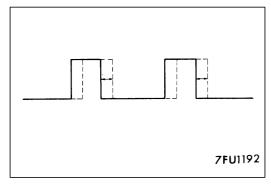
## Standard wave pattern



## 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

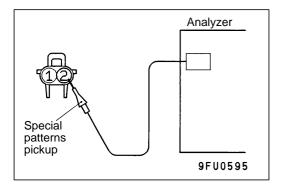
Rectangular wave pattern is output even when the engine is not started.

Example 2
 Cause of problem
 Loose timing belt

Abnormality in sensor disk

## Wave pattern characteristics

Wave pattern is displaced to the left or right.



#### INJECTOR

#### **Measurement Method**

- 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)

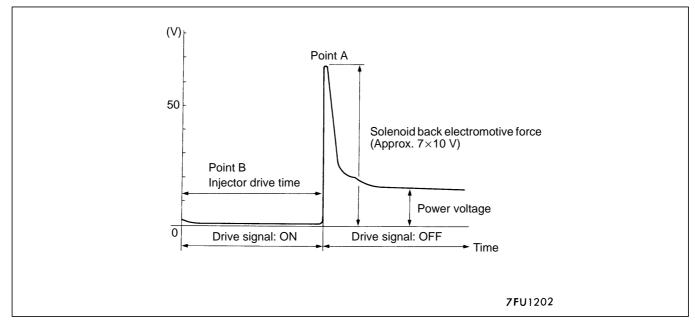
- 1. Connect the analyzer special patterns pickup to engine-ECU terminal 1. (when checking the No.1, No.3 cylinder.)
- 2. Connect the analyzer special patterns pickup to engine-ECU terminal 14. (when checking the No.2, No.4 cylinder.)

## **Standard Wave Pattern**

#### **Observation conditions**

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

## Standard wave pattern



# Wave Pattern Observation Points

#### Explanation of Wave Pattern

NOTE

 Because the fuel injection method is a group injection method (injection with injectors grouped together in sets of two). If there is an abnormality in the drive circuit or one of the injectors in a group, the drive circuit of the other injector may still the normal, and in this case a normal wave pattern will be output.

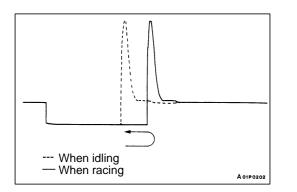
• If there is an abnormality in the engine-ECU power transistor that drives the injectors, an abnormal wave pattern will be output.

#### **Wave Pattern Observation Points**

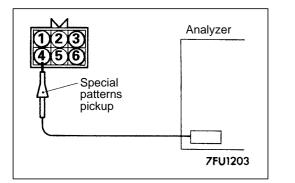
Point A: Height of solenoid back electromotive force

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

Point B: Injector drive time



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



# **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.

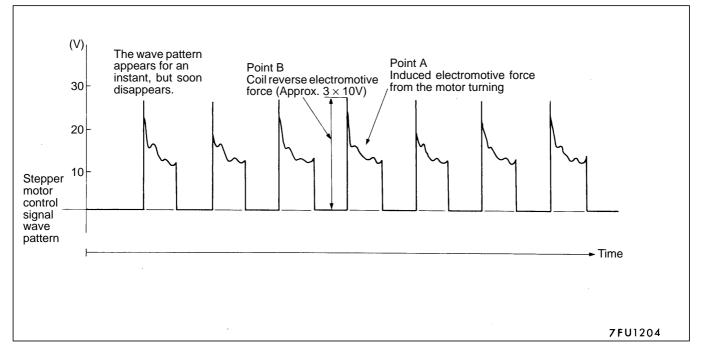
## Alternate Method (Test harness not available)

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

# Standard Wave Pattern Observation conditions

Function	Special patterns	
Pattern height	High	
Pattern selector	Display	
Engine condition	When the engine coolant temperature is 20°C or below, turn the ignition switch from OF to ON (without starting the engine).	
While the engine is idling, turn the A/C switch to ON.		
	Immediately after starting the warm engine (approx. 1 minute)	

# Standard wave pattern



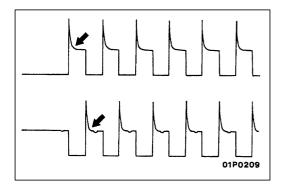
# Wave Pattern Observation Points

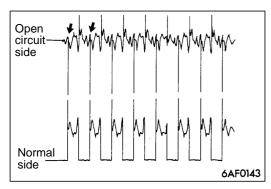
Check that the standard wave pattern appears when the stepper motor is operating. Point A: Presence or absence of induced electromotive force from the motor turning. (Refer to the abnormal wave pattern.)

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

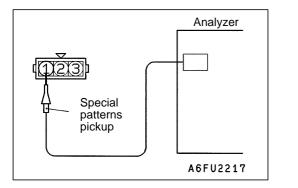
Open circuit in the line between the stepper motor and the engine-ECU.

#### 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.

# **MPI** – Troubleshooting



# **IGNITION COIL AND POWER TRANSISTOR**

- Ignition coil primary signal
   Refer to GROUP 16 Ignition
- 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 power transistor unit connector terminal 1.

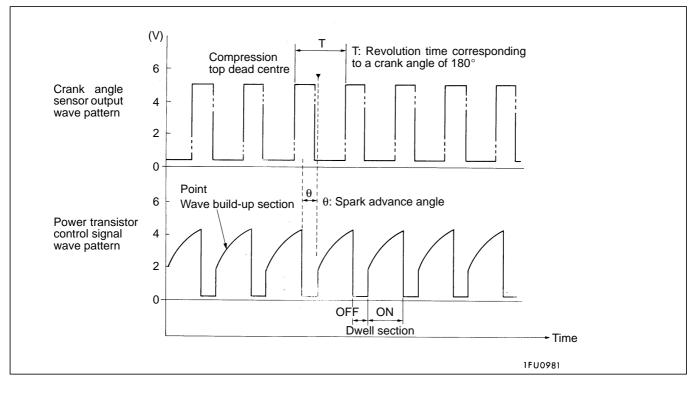
## Alternate Method (Test harness not available)

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

# Standard Wave Pattern Observation condition

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

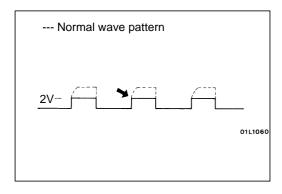
# Standard wave pattern

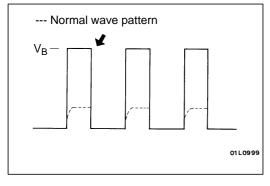


# Wave Pattern Observation Points

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

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





# **Examples of Abnormal Wave Patterns**

Example 1
 Wave pattern during engine cranking
 Cause of problem
 Open-circuit in ignition primary circuit

# Wave pattern characteristics

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

• Example 2

Wave pattern during engine cranking

# Cause of problem

Malfunction in power transistor

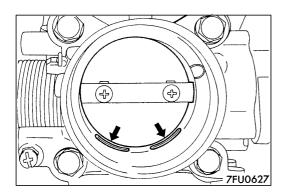
# Wave pattern characteristics

Power voltage results when the power transistor is ON.

# ON-VEHICLE SERVICE

# 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.

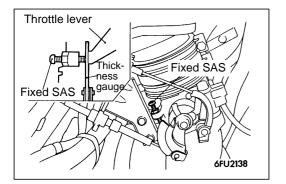
- 4. Spray cleaning solvent into the valve through the throttle body intake port and leave it for about 5 minutes.
- 5. Start the engine, race it several times and idle it for about 1 minute. If the idling speed becomes unstable (or if the engine stalls) due to the bypass passage being plugged, slightly 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-79.)

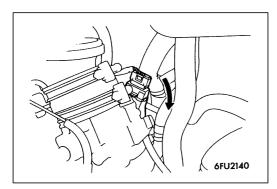
#### NOTE

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 13100130183

- 1. Connect the MUT-II to the diagnosis connector (16-pin).
- 2. Insert a thickness gauge with a thickness of 0.45 mm between the fixed SAS and the throttle lever.
- 3. Turn the ignition switch to ON (but do not start the engine).
- 6FU2139
- 4. Use a 4 mm-Allen Key to loosen the throttle position sensor mounting bolt.
- 5. Turn the throttle position sensor anti-clockwise as far as it will go.
- 6. Check that the idle position switch is on at this position.

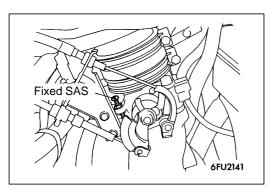




- 7. Slowly turn the throttle position sensor clockwise and find the point where the idle position switch turns off. Securely tighten the throttle position sensor mounting bolt at this point.
- 8. Check the throttle position sensor output voltage.

# Standard value: 400–1,000 mV

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



# FIXED SAS ADJUSTMENT

13100150202

13100180128

## 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. Adjust the idle position switch and the throttle position sensor (P.13A-78).

# BASIC IDLE SPEED ADJUSTMENT

NOTE

- 1. The standard idling speed has been adjusted, by the speed adjusting screw (SAS), by the manufacturer, and there should usually be no need for readjustment.
- 2. If the adjustment has been changed by mistake, the idle speed may become too high or the idle speed may drop too low when loads from components such as the A/C are placed on the engine. If this occurs, adjust by the following procedure.

- 3. The adjustment, if made, should be made after first confirming that the spark plugs, the injectors, the idle speed control servo, the compression pressure, etc., are all normal.
- 1. Before inspection and adjustment, set the vehicle to the pre-inspection condition.
- 2. Connect the MUT-II to the diagnosis connector (16-pin). NOTE

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

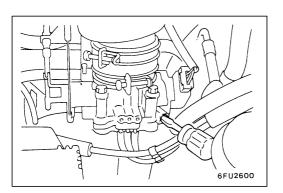
- 3. Remove the waterproof female connector from the ignition timing adjustment connector.
- 4. Use a jumper wire to earth the ignition timing adjustment terminal.

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

## Standard value: 750 $\pm$ 50 r/min

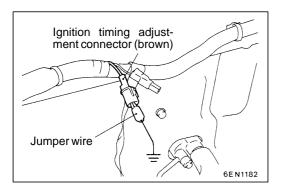
NOTE

- 1. The engine speed may be 20 to 100 r/min lower than indicated above for a new vehicle [driven approximately 500 km or less], but no adjustment is necessary.
- 2. If the engine stalls or the engine speed is low even though the vehicle has been driven approximately 500 km or more, it is probable that deposits are adhered to the throttle valve, so clean it. (Refer to P.13A-78.)



 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. Disconnect the MUT-II.
  - 11. Start the engine again and let it run at idle speed for about 10 minutes; check that the idling condition is normal.

# FUEL PRESSURE TEST

13100190181

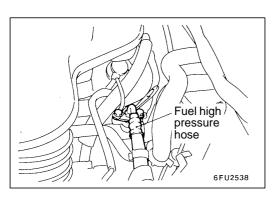
- 1. Release residual pressure from the fuel pipe line to prevent fuel gush out. (Refer to P.13A-84.)
- 2. Disconnect the fuel high pressure hose at the delivery pipe side.

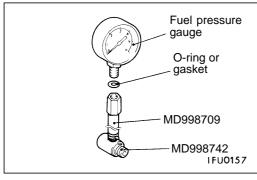
#### Caution

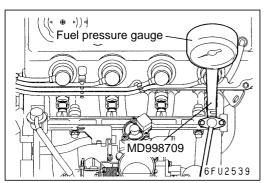
Cover the hose connection with rags to prevent splash of fuel that could be caused by some residual pressure in the fuel pipe line.

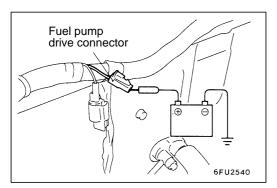
- 3. Remove the union joint and bolt from the special tool (adapter hose MD998709) and instead attach the special tool (hose adapter MD998742) to the adapter hose.
- Install a fuel pressure gauge on the adapter hose that was set up in step 3. Use a suitable O-ring or gasket between the fuel pressure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

 Connect the fuel pump drive connector 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 kerb idle

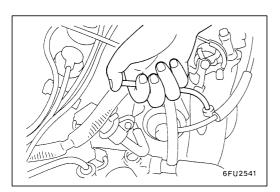
- 11. Check to see that fuel pressure at idle does not drop even after the engine has been raced several times.
- 12. Racing the engine repeatedly, hold the fuel return hose lightly with fingers to feel that fuel pressure is present in the return hose.

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> <li>Fuel pressure too low</li> <li>Fuel pressure drops after racing</li> </ul>	Clogged fuel filter	Replace fuel filter
<ul> <li>No fuel pressure in fuel return hose</li> </ul>	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-84.)
- 16. Remove the fuel pressure gauge and special tool from the delivery pipe.

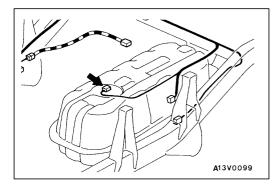
#### Caution

#### 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.

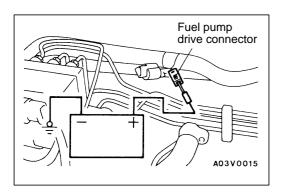


# FUEL PUMP CONNECTOR DISCONNECTION (HOW TO REDUCE THE FUEL PRESSURE)

13100090191

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) Disconnect the fuel pump connector.
- (2) After starting the engine and letting it run until it stops naturally, turn the ignition switch to OFF.
- (3) Connect the fuel pump connector.



# FUEL PUMP OPERATION CHECK

13100200167

- 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

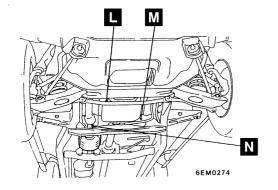
As the fuel pump is an in-tank type, the fuel pump sound is hard to hear, so remove the fuel filler cap and check from the tank inlet.

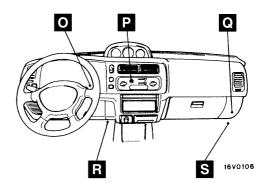
(3) Check the fuel pressure by pinching the fuel hose with the fingertips.

# **COMPONENT LOCATION**

Name	Symbol	Name	Symbol
A/C relay	G	Fuel pump check terminal	А
A/C switch	Р	Idle speed control servo	D
Air flow sensor (with intake air temperature sensor and barometric pressure sensor)	В	Ignition coil and power transistor unit	J
Control relay and fuel pump relay	S	Inhibitor switch <a t=""></a>	L
Diagnosis connector	R	Injectors	С
Distributor (with incorporated crank angle sensor and top dead centre sensor)	I	Oxygen sensor	N
EGR control solenoid valve	F	Power steering fluid pressure switch	н
Engine coolant temperature sensor	к	Purge control solenoid valve	F
Engine-ECU	Q	Throttle position sensor (with idle position switch)	E
Engine warning lamp (check engine lamp)	0	Vehicle speed sensor	М

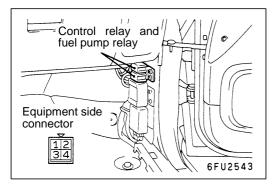


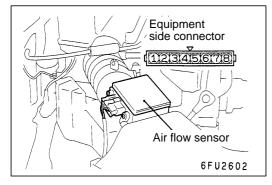


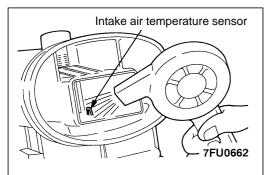


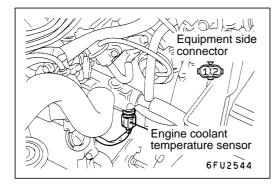
6FU2542

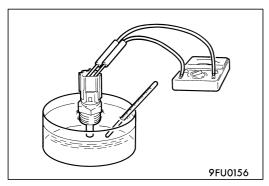
13100210238











# CONTROL RELAY AND FUEL PUMP RELAY CONTINUITY CHECK

Terminal No.			
1	2	3	4
	0		O
0	Θ	———————————————————————————————————————	
	1 		

# INTAKE AIR TEMPERATURE SENSOR CHECK

13100280147

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

Standard value: 2.3 – 3.0 k $\Omega$  (at 20°C)  $0.30 - 0.42 \text{ k}\Omega$  (at  $80^{\circ}\text{C}$ )

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

## Normal condition:

[	Temperature (°C)	Resistance (kΩ)
[	Higher	Smaller

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

#### ENGINE COOLANT TEMPERATURE SENSOR CHECK 13100310150

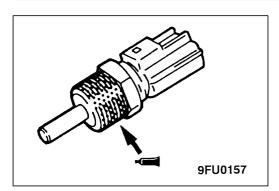
# Caution

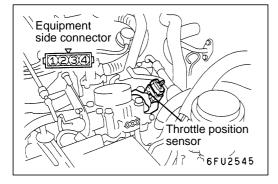
Be careful not to touch the connector (resin section) with the tool when removing and installing.

- Remove the engine coolant temperature sensor. 1.
- 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<sup>6</sup>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
- Install the engine coolant temperature sensor and tighten 5 it to the specified torque.

Tightening torque: 29 Nm

# THROTTLE POSITION SENSOR CHECK 13100320177

- 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 1 and terminal 3.

# Normal condition:

Throttle valve slowly open Changes smoothly in until fully open from the idle proportion to the opening position 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-78.

# **IDLE POSITION SWITCH CHECK**

13100330187

**TPS** equipment side connector Throttle position sensor <sup>−</sup>6FU2545 17

1. Disconnect the throttle position sensor connector.

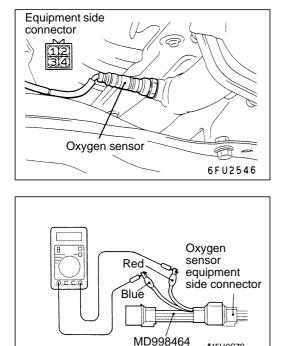
2. Check the continuity between the throttle position sensor connector side terminal 1 and terminal 2.

# Normal condition:

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

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-78.)



# Jumper wire Black Red $\mathcal{A}$ Blue White A1FU0980 MD998464

A1FU0979

# **OXYGEN SENSOR CHECK**

13100510116

- 1. Disconnect the oxygen sensor connector and connect the special tool (test harness) to the connector on the oxygen sensor side.
- 2. Make sure that there is continuity  $(7 40 \Omega \text{ at } 20^{\circ}\text{C})$ between terminal 1 (red clip of special tool) and terminal 3 (blue clip of special tool) on the oxygen sensor connector.
- 3. If there is no continuity, replace the oxygen sensor.
- 4. Warm up the engine until engine coolant is 80°C or higher.

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

#### Caution

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

- 6. Connect a digital voltage meter between terminal 2 (black clip) and terminal 4 (white clip).
- 7. While repeatedly racing the engine, measure the oxygen sensor output voltage.

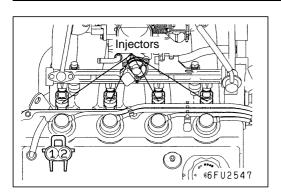
#### Standard value:

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

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

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

13100520171



# **INJECTOR CHECK**

# Measurement of Resistance between Terminals

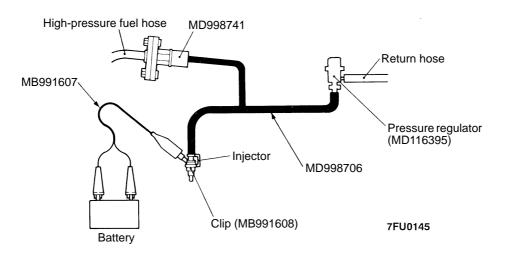
- 1. Remove the injector connector.
- 2. Measure the resistance between terminals.

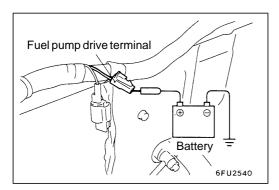
Standard value: 13–16  $\Omega$  (at 20°C)

3. Install the injector connector.

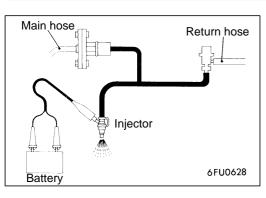
# Checking the Injection Condition

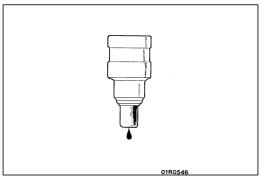
- 1. Following the steps below, bleed out the residual pressure within the fuel pipe line to prevent flow of the fuel. (Refer to P.13-84.)
- 2. Remove the injector.
- 3. Arrange the special tool (injector test set), adaptor, fuel pressure regulator and clips as shown in the illustration below.

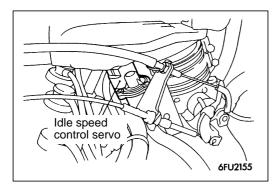


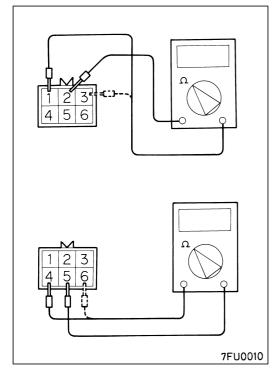


4. Apply battery voltage to the fuel pump drive terminal (black) and activate the fuel pump.









- 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

13100540177

# 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

13100560111

Refer to GROUP 17 - Emission Control System.

# EGR CONTROL SOLENOID VALVE CHECK

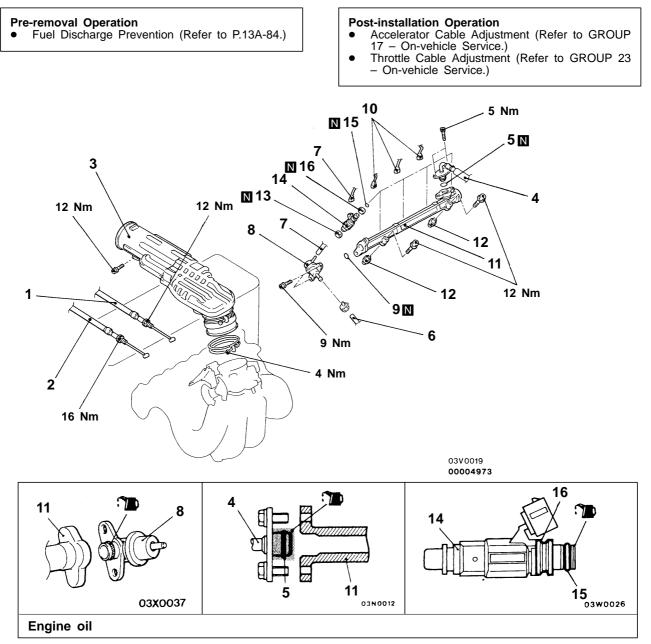
13100570107

Refer to GROUP 17 - Emission Control System.

# **INJECTOR**

#### 13100710226

# **REMOVAL AND INSTALLATION**



#### **Removal steps**

- 1. Accelerator cable connection
- 2. Throttle cable connection <A/T>
- 3. Resonance tank
- 4. High-pressure fuel hose connection 5. O-ring
  - 6. Fuel return hose connection
  - 7. Vacuum hose connection
- ►A 8. Fuel pressure regulator
- 9. O-ring 10. Injector connectors 11. Delivery pipe 12. Insulators 13. Insulators 14. Injectors 4 15. O-rings 16. Grommets

# **REMOVAL SERVICE POINT**

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

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

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

# INSTALLATION SERVICE POINT

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

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

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

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

Tightening torque:

9 Nm (Fuel pressure regulator) 5 Nm (High-pressure fuel hose)

# THROTTLE BODY

#### 13100770200

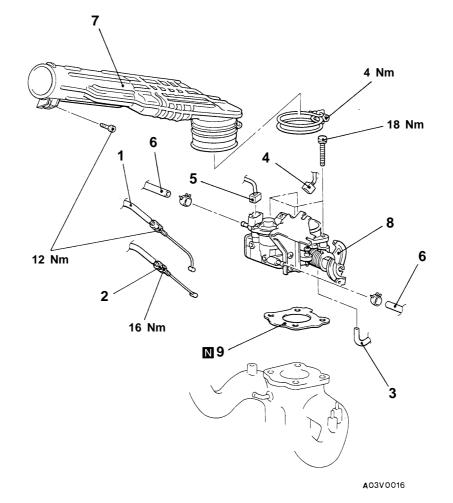
# **REMOVAL AND INSTALLATION**

**Pre-removal Operation** •

Engine Coolant Draining

#### **Post-installation Operation**

- Accelerator Cable Adjustment (Refer to GROUP 17 On-vehicle Service.) •
- Throttle Cable Adjustment (Refer to GROUP 23 On-vehicle Service.) •
- .
  - Engine Coolant Supplying



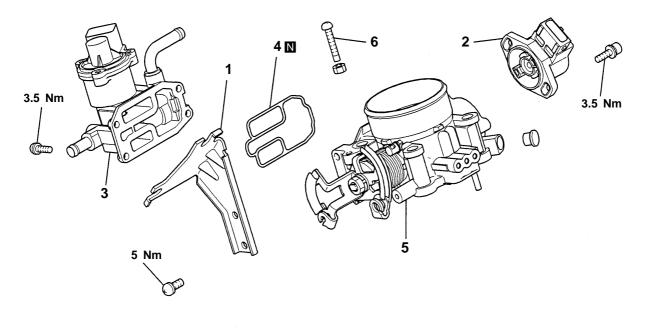
#### **Removal steps**

- 1. Accelerator cable connection
- 2. Throttle cable connection
- 3. Vacuum hose connection
- 4. Throttle position sensor connector
- 5. Idle speed control motor connector

- 6. Water hose connection
- 7. Resonance tank
- 8. Throttle body
- 9. Gasket

# DISASSEMBLY AND REASSEMBLY

#### 13100970204



6FU2185

#### **Disassembly steps**

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

NOTE

- The fixed SAS is correctly adjusted at the factory and 1. should not be removed.
- If the fixed SAS should happen to have been 2. removed, carry out fixed SAS adjustment. (Refer to page 13A-79.)

# **CLEANING THROTTLE BODY PARTS**

1. Clean all throttle body parts.

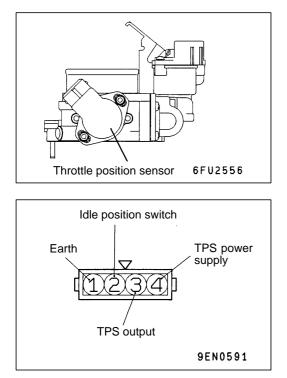
Do not use solvent to clean the following parts:

- Throttle position sensor ٠
- 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 POINT

#### ►A THROTTLE POSITION SENSOR (TPS) INSTALLATION

- 1. Install the TPS so that it faces as shown in the illustration, and then tighten it with the screw.
- 2. Connect a multimeter between terminal (4) (TPS power supply) and terminal (3) (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. Check the continuity between terminal (2) (idle position switch) and terminal (1) (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.

# **GROUP 13A**

# MULTIPOINT FUEL INJECTION (MPI)

# **GENERAL**

# **OUTLINE OF CHANGES**

- •
- The 76-pin type engine-ECU has been adopted. The sequential fuel injection system has been adopted. ٠

# **GENERAL INFORMATION**

Items	·	Specifications
Engine-ECU	Identification model No.	E2T69171 <4G63> E2T69172 <4G63 – Vehicles with immobilizer system> E2T69173 <4G64> E2T69174 <4G64 – Vehicles with immobilizer system>

# TROUBLESHOOTING

# **INSPECTION CHART FOR DIAGNOSIS CODES**

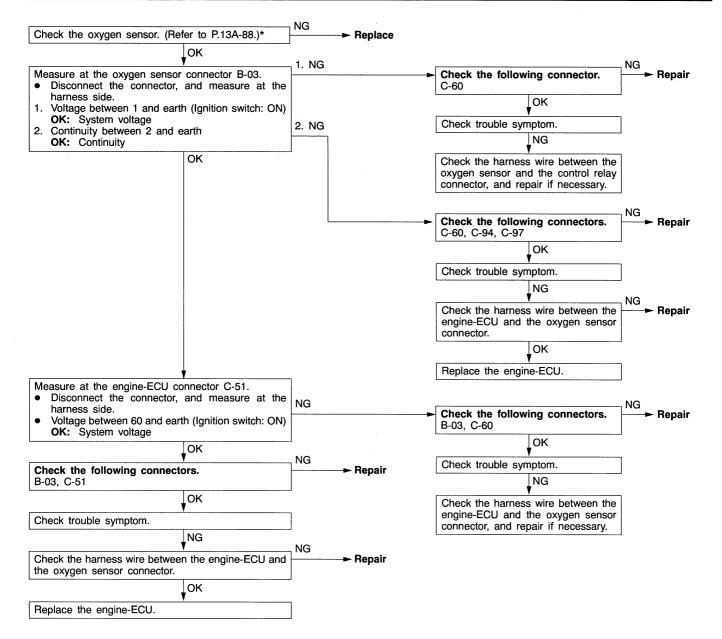
Code No.	Diagnosis item	Reference page
11	Oxygen sensor system	13A-3
12	Air flow sensor system	13A-4
13	Intake air temperature sensor system	13A-4
14	Throttle position sensor system	13A-5
21	Engine coolant temperature sensor system	13A-6
22	Crank angle sensor system	13A-7
23	Top dead centre sensor system	13A-8
24	Vehicle speed sensor system	13A-9
25	Barometric pressure sensor system	13A-10
36*	Ignition timing adjustment signal system	13A-11
41	Injector system	13A-11
54	Immobilizer system	13A-12

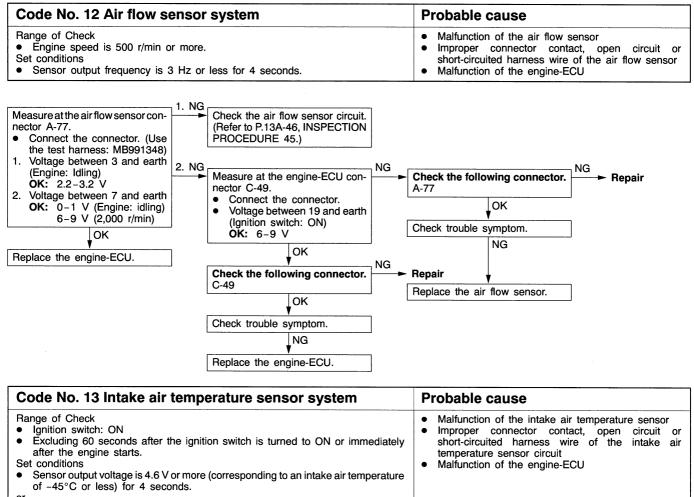
NOTE

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

# **INSPECTION PROCEDURE FOR DIAGNOSIS CODES**

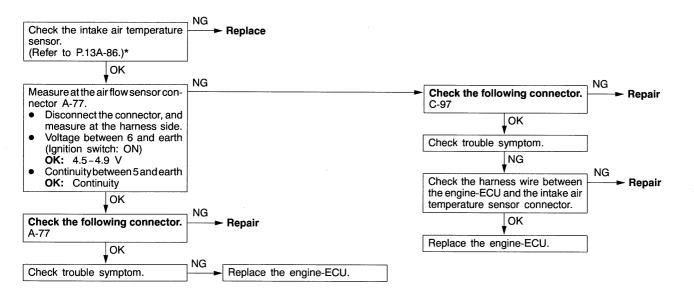
Code No. 11 Oxygen sensor system	Probable cause
<ul> <li>Range of Check</li> <li>3 minutes have passed after engine was started.</li> <li>Engine coolant temperature is approx. 80°C or more.</li> <li>Intake air temperature is 20-50°C.</li> <li>Engine speed is approx. 2,000-3,000 r/min</li> <li>Vehicle is moving at constant speed on a flat, level road surface</li> <li>Set conditions</li> <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>	



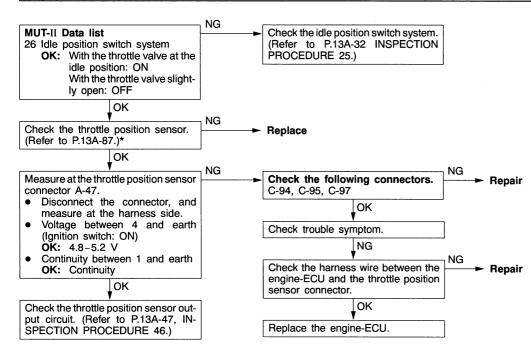


or

Sensor output voltage is 0.2V or less (corresponding to an intake air temperature • of 125°C or more) for 4 seconds.

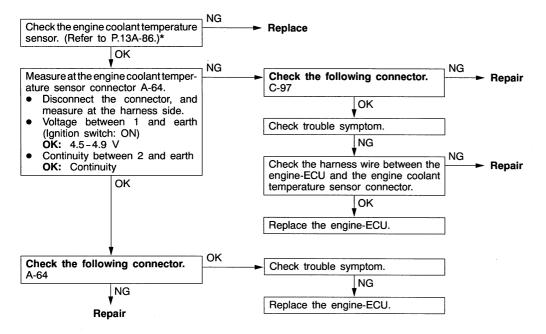


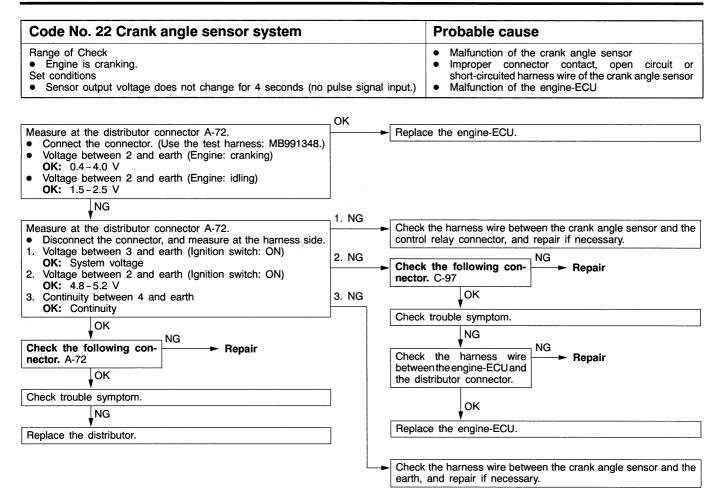
Code No. 14 Throttle position sensor system	Probable cause	
<ul> <li>Range of Check</li> <li>Ignition switch: ON</li> <li>Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts.</li> <li>Set conditions</li> <li>When the idle position switch is ON, the sensor output voltage is 2 V or more for 4 seconds.</li> <li>or</li> <li>The sensor output voltage is 0.2 V or less for 4 seconds.</li> </ul>	<ul> <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>	



# 13A-6

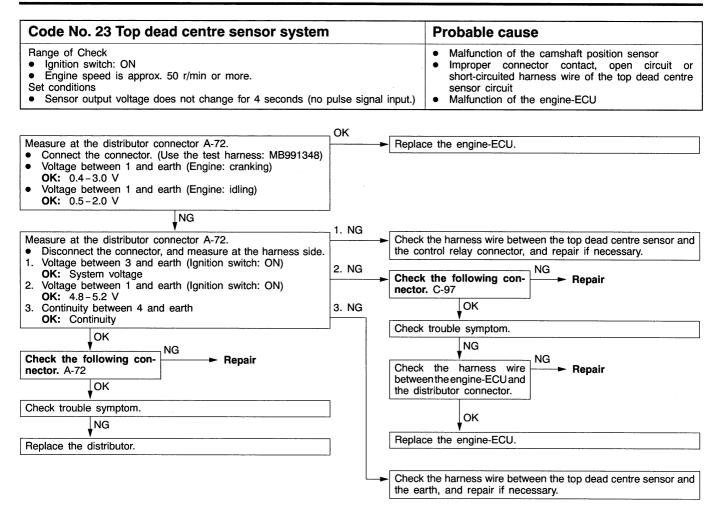
Code No. 21 Engine coolant temperature sensor system	Probable cause
<ul> <li>Range of Check</li> <li>Ignition switch: ON</li> <li>Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts.</li> <li>Set conditions</li> <li>Sensor output voltage is 4.6 V or more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

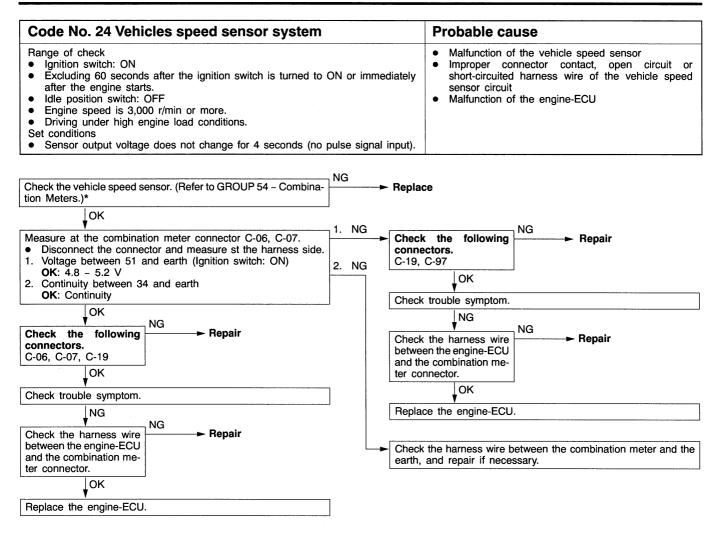




# 13A-8

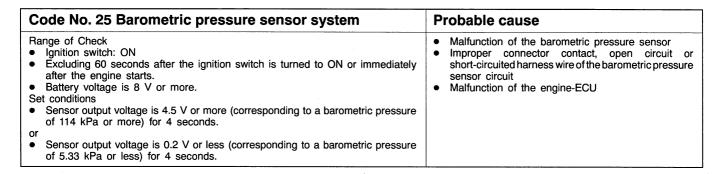
# **MPI** – Troubleshooting

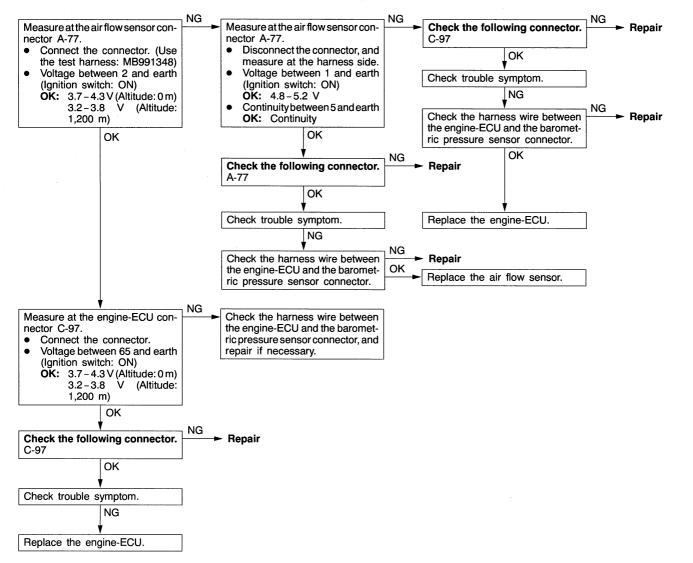




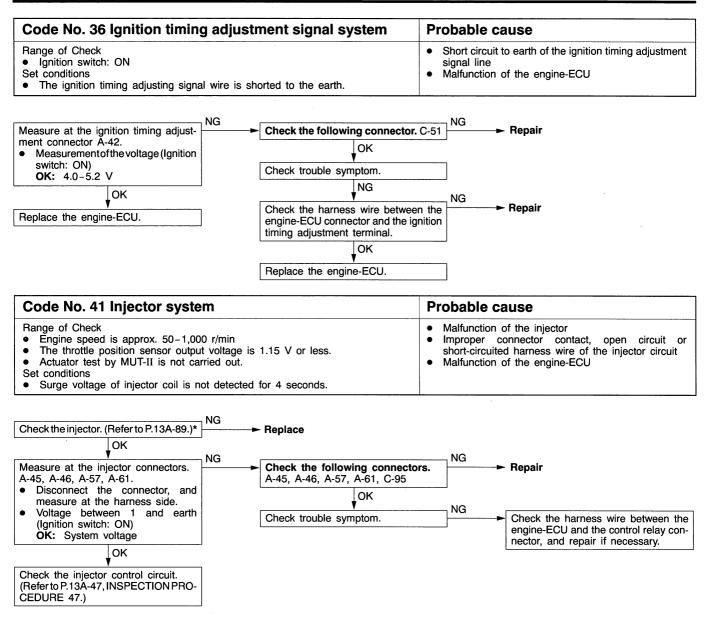
# 13A-10

# **MPI** – Troubleshooting









# 13A-12

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

NOTE

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

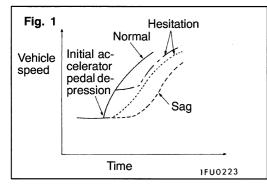
		. Yes	
Is there another ignition key nea in the ignition switch?	r the ignition key that is inserted		Remove the extra ignition key.
L	N-	J	、 · · · · · · · · · · · · · · · · · · ·
	No	NC	Check trouble symptom.
		_ Yes	
Is a diagnosis code output fror	n the immobilizer-ECU?		Check the immobilizer system. (Refer to GROUP 54 - Ignition
	1		Switch and Immobilizer System.)*
	No		
Check the following connected	ore	NG	► Repair
C-19, C-36, C-51	015.		
L	ок	-	
Check trouble symptom.		]	
	NG		
Check the harness wire between t	he engine-ECU and the immobiliz-		Replace the immobilizer-ECU.
er-ECU.	3		NG
	NG		↓ NG
			Check trouble symptom.
Re	pair		
-			<b>N</b> G
			Replace the engine-ECU.

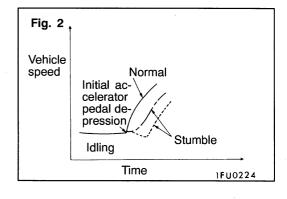
# INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom		Inspection procedure No.	Reference page
Communication Communication with all systems is not possible.		1	13A-15
impossible.	Communication with engine-ECU only is not possible.	2	13A-16
Engine warning lamp and	The engine warning lamp does not illuminate right after the ignition switch is turned to the ON position.	3	13A-17
related parts	The engine warning lamp remains illuminating and never goes out.	4	13A-17
Starting	No initial combustion (starting impossible)	5	13A-18
•	Initial combustion but no complete combustion (starting impossible)	6	13A-19
	Long time to start (improper starting)	7	13A-20
Idling stability	Unstable idling (Rough idling, hunting)	8	13A-21
(Improper idling)	Idling speed is high. (Improper idling speed)	9	13A-22
	Idling speed is low. (Improper idling speed)	10	13A-23
Idling stability When the engine is cold, it stalls at idling. (Die out) (Engine stalls)		11	13A-24
(Lingine Stails)	When the engine becomes hot, it stalls at idling. (Die out)	12	13A-25
The engine stalls when starting the car. (Pass out)		13	13A-26
	The engine stalls when decelerating.	14	13A-26
Driving	Hesitation, sag or stumble	15	13A-27
	The feeling of impact or vibration when accelerating	16	13A-27
	The feeling of impact or vibration when decelerating	17	13A-28
	Poor acceleration	18	13A-28
	Surge		13A-29
	Knocking	20	13A-29
Dieseling		21	13A-29
Too high CO and	HC concentration when idling	22	13A-30

# PROBLEM SYMPTOMS TABLE (FOR YOUR INFORMATION)

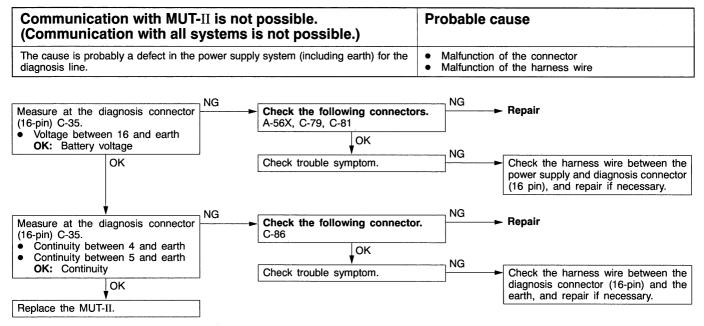
Items		Symptom				
Starting Won't start		The starter is used to crank the engine, but there is no combustion within the cylinders, and the engine won't start.				
	Fires up and dies	There is combustion within the cylinders, but then the engine soon stalls.				
	Hard starting	Engine starts after cranking a while.				
Idling stability Rough idle		Engine speed doesn't remain constant; changes at idle.				
		Usually, a judgement can be based upon the movement of the tachomet pointer, and the vibration transmitted to the steering wheel, shift lever, body, et 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, regardle 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".				





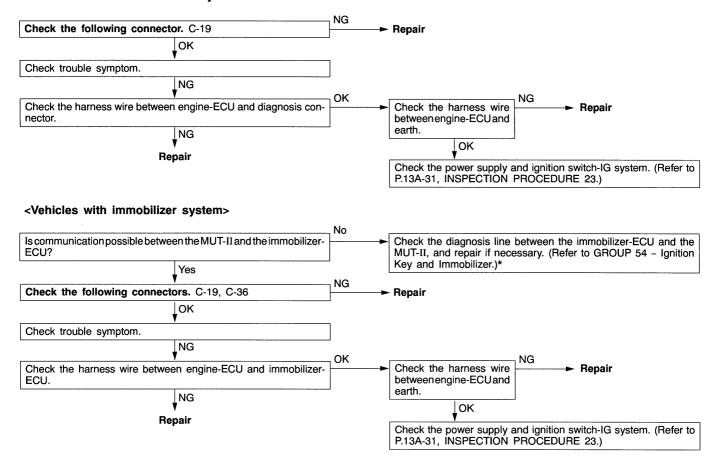
# INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

### **INSPECTION PROCEDURE 1**



MUT-II communication with engine-ECU is impossible.	Probable cause
<ul> <li>One of the following causes may be suspected.</li> <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> <li><vehicles immobilizer="" system="" without=""></vehicles></li> <li>Malfunction of engine-ECU power supply circuit</li> <li>Malfunction of engine-ECU</li> <li>Open circuit between engine-ECU and diagnosis connector</li> <li><vehicles immobilizer="" system="" with=""></vehicles></li> <li>Malfunction of engine-ECU power supply circuit</li> <li>Malfunction of engine-ECU</li> <li>Malfunction of engine-ECU</li> <li>Malfunction of engine-ECU</li> <li>Malfunction of engine-ECU</li> <li>Malfunction of immobilizer-ECU</li> <li>Open circuit between immobilizer-ECU and diagnosis connector</li> <li>Open circuit between engine-ECU and immobilizer-ECU</li> </ul>

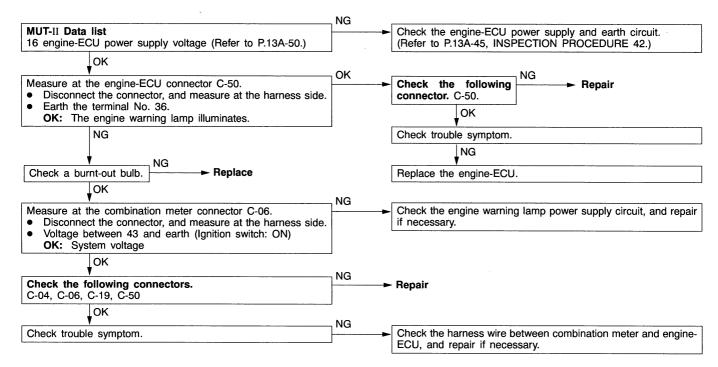
#### <Vehicles without immobilizer system>



#### The engine warning lamp does not illuminate right after **Probable cause** the ignition switch is turned to the ON position. Because there is a burnt-out bulb, the engine-ECU causes the engine warning lamp Burnt-out bulb • to illuminate for five seconds immediately after the ignition switch is turned to ON. ٠

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.

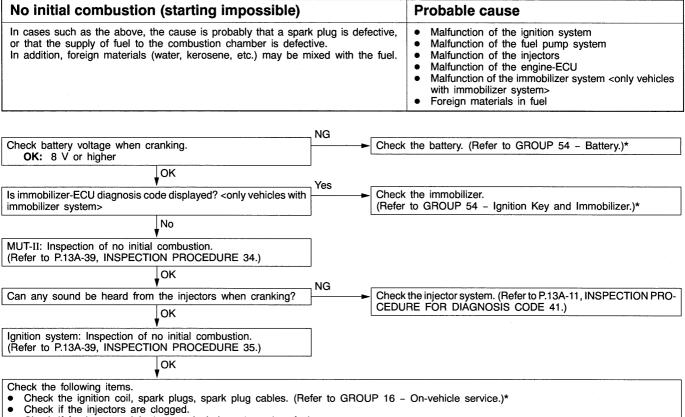
- Defective warning lamp circuit • Malfunction of the engine-ECU



#### **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.	<ul> <li>Short-circuit between the engine warning lamp and engine-ECU</li> <li>Malfunction of the engine-ECU</li> </ul>		

MUT-II Self-Diag code Are diagnosis codes displayed?	Yes Refer to P.13A-2, INSPECTION CHART FOR DIAGNOSIS CODES
No	
<ul> <li>Measure at the combination meter connector C-04.</li> <li>Disconnect the connector, and measure at the harness side.</li> <li>Disconnect the engine-ECU connector</li> <li>Continuity between 8 and earth</li> <li>OK: No continuity</li> </ul>	Check the harness wire between combination meter and engine-
ОК	-
Replace the engine-ECU.	



· Check if foreign materials (water, alcohol, etc.) got into fuel.

• Check the compression pressure.

• Check the immobilizer system. (Refer to GROUP 54 - Ignition Key and Immobilizer.)\* <only vehicles with immobilizer system>

Initial combustion but no complete combus (starting impossible)	Probable cause		
In such cases as the above, the cause is probably that the spark sparks but the sparks are weak, or the initial mixture for startin		<ul> <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>	
Check battery voltage when cranking. <b>OK:</b> 8 V or higher	NG Check	k the battery. (Refer to GROUP 54 - Battery.)*	
MUT-II: Check if uncompleted combustion occurs. (Refer to P.13A-40, INSPECTION PROCEDURE 36.)			
Can any sound be heard from the injectors when cranking?	CEDU	k the injector system, (Refer to P.13A-11, INSPECTION PRO- JRE FOR DIAGNOSIS CODE 41.)	
Is starting good if the engine is cranked with the accelerator peda slightly depressed?	eratior (Refer	k ISC servo for op- in sound. r to P.13A-90.)* OK Lean the throttle valve area. (Refer to P.13A-78.)* heck and adjust the fixed SAS. (Refer to P.13A-79.)*	
Check the ignition timing when cranking. OK: Approx. 5°BTDC	NG Check	k that the distributor is installed properly.	
<ul> <li>Check the following items.</li> <li>Check the ignition coil, spark plugs, spark plug cables. (R</li> <li>Check if the injectors are clogged.</li> <li>Check the compression pressure. (Refer to GROUP 11 -</li> <li>Check fuel lines for clogging.</li> <li>Check if foreign materials (water, alcohol, etc.) got into fue</li> </ul>	On-vehicle Service.)*		

,

In takes too long time to start. (Incorrect sta	Probable cause		
In cases such as the above, the cause is probably that the spark is difficult, the initial mixture for starting is not appropriate, or sup pressure is not being obtained.		<ul> <li>Malfunction of the ignition system</li> <li>Malfunction of the injector system</li> <li>Inappropriate gasoline use</li> <li>Poor compression</li> </ul>	
	_ NG		
Check battery voltage when cranking           OK:         8 V or higher	► Chec	k the battery. (Refer to GROUP 54 - Battery.)*	
ок			
MUT-II: Check if uncomplete combustion occurs. (Refer to P.13A-40, INSPECTION PROCEDURE 36.)			
ок	NG		
Can any sound be heard from the injectors when cranking?	Chec	k the injector system. (Refer to P.13A-11, INSPECTION PRO-	
ок		JRE FOR DIAGNOSIS CODE 41.)	
Check the ignition timing when cranking. OK: Approx. 5°BTDC	NG Chec	k that the distributor is installed properly.	
ок	-		
<ul> <li>Check the following items.</li> <li>Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 - On-vehicle Service.)*</li> <li>Check if the injectors are clogged.</li> <li>Check the compression pressure. (Refer to GROUP 11 - On-vehicle Service.)*</li> <li>Check if foreign materials (water, alcohol, etc.) got into fuel.</li> </ul>			

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.		simple	<ul> <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>Malfunction of the EGR solenoid valve system</li> <li>Poor compression</li> <li>Drawing air into exhaust system</li> </ul>		
Were the battery terminals disconnected?	Yes	After wa	rming-up, let the engine run at idling for 10 minutes.		
No	<b>_</b>	L	5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5		
MUT-II Self-Diag code Are diagnosis codes displayed?	Yes ►	Refer to CODES.	er to P.13A-2, INSPECTION CHART FOR DIAGNOS DES.		
No					
Does idling speed fluctuate excessively?	Yes	Check if	hunting occurs.		
No		(Refer to	P.13A-40, INSPECTION PROCEDURE 37.)		
Check the ISC servo for operation sound. (Refer to P.13A-90.)*	NG ►	Check th	ne ISC servo system.		
LOK		(Refer to	P.13A-37, INSPECTION PROCEDURE 31.)		
Check the injector for operation sound.	NG ►	Check th	ck the injector system. (Refer to P.13A-11, INSPECTION PR		
ок		CEDUR	E FOR DIÁGNOSIS CODE 41.)		
MUT-II: Check if idling speed is unstable. (Refer to P.13A-41, INSPECTION PROCEDURE 38.)					
ОК	- 				
Check the ignition timing. (Refer to GROUP 11 – On-vehicle Service.)*	NG ►	Check that the distributor is installed properly			
ок	-				
Check the following items. • Check the ignition coil, spark plugs, spark plug cables. (Re • Check the purge control system. (Refer to GROUP 17 – E • Check the EGR control system. (Refer to GROUP 17 – Er • Check the compression pressure. (Refer to GROUP 11 – C • Check if foreign materials (water, alcohol, etc.) got into fuel	mission Con nission Conti Dn-vehicle So	rol Syster	n.)*		

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.		ring <ul> <li>Malfunction of the ISC servo system</li> <li>Malfunction of the throttle body</li> </ul>
MUT-II Self-Diag code Are diagnosis codes displayed? No Check the ISC servo for operation sound. (Refer to P.13A-90.)*	] NG I	Refer to P.13A-2, INSPECTION CHART FOR DIAGNOSIS CODES. Check the ISC servo system. Refer to P.13A-37, INSPECTION PROCEDURE 31.)
MUT-II Data list 26 Idle position switch (Refer to P.13A-49.) OK	NG	Check the idle position switch system. Refer to P.13A-32, INSPECTION PROCEDURE 25.)
MUT-II Data list 21 Engine coolant temperature sensor (Refer to P.13A-49.) OK		Check the engine coolant temperature sensor system. Refer to P.13A-6, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 21.)
MUT-II Data list 28 A/C switch (Refer to P.13A-49.) OK		Check the A/C switch and A/C relay system. Refer to P.13A-35, INSPECTION PROCEDURE 29.)
Basic idle adjustment (Refer to P.13A-79.)*	] ]►[	Clean the throttle valve area. (Refer to P.13A-78.)*
		Check and adjust the fixed SAS. (Refer to P.13A-79.)*

Idling speed is low. (Improper idling speed)	Probable cause	
In cases such as the above, the cause is probably that the intak- idling is too small.	e air volume dur	<ul> <li>Malfunction of the ISC servo system</li> <li>Malfunction of the throttle body</li> </ul>
	Yes	
MUT-II Self-Diag code Are diagnosis codes displayed?		efer to P.13A-2, INSPECTION CHART FOR DIAGNOSIS ODES.
No Check the ISC servo for operation sound. (Refer to P.13A-90.)*	NG	heck the ISC servo system.
	(F	Refer to P.13A-37, INSPECTION PROCEDURE 31.)
MUT-II Data list 26 Idle position switch (Refer to P.13A-49.)		heck the idle position switch system. Refer to P.13A-32, INSPECTION PROCEDURE 25.)
ок	NG —	
MUT-II Data list           21 Engine coolant temperature sensor (Refer to P.13A-49.)           OK	C (F	heck the engine coolant temperature sensor system. Refer to P.13A-6, INSPECTION PROCEDURE FOR DIAGNOSIS ODE 21.)
MUT-II Data list	NG	book the implicition quiteb CT and inhibitor quiteb suctors AT
29 Inhibitor switch (Refer to P.13A-49.)	(F	heck the ignition switch ST and inhibitor switch system <a t="">. Refer to P.13A-34, INSPECTION PROCEDURE 27.)</a>
	, 1	
Basic idle adjustment (Refer to P.13A-79.)*		
Check trouble symptom.	] <mark></mark> C	lean the throttle valve area. (Refer to P.13A-78.)*
	C	heck and adjust the fixed SAS. (Refer to P.13A-79.)*

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 mix when the engine is cold, or that the intake air volume is insu	ture is inappro fficient.	reisinappropriate itent. Malfunction of the ISC se Malfunction of the throttle Malfunction of the injector Malfunction of the ignition		body system	
	_ Yes				
Were the battery terminals disconnected?	] <b>&gt;</b>	After warr	ning-up, let the	engine run	at idling for 10 minutes.
No	-, Yes				
MUT-II Self-Diag code Are diagnosis codes displayed?		Refer to CODES.	P.13A-2, INSP	ECTION CH	IART FOR DIAGNOSIS
No	Vee				
Does the engine stall right after the accelerator pedal is released?	►		throttle valve		Check and adjust the
No		area. (Refer to	P.13A-78.)*		fixed SAS. (Refer to P.13A-79.)*
	- No		1.0.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1		
Is engine-idling stable after the warming-up?	<b></b>	- Check if the unstable idling (Rough idling, hunting). (Refer to P.13A-21, INSPECTION PROCEDURE 8.)			
Yes		(10101 10			
Check the ISC servo for operation sound. (Refer to P.13A-90.)*	_NG }►	Check the	e ISC servo sys	stem.	
ОК		(Refer to	Refer to P.13A-37, INSPECTION PROCEDURE 31.)		
	, NG				
Check the injector for operation sound.	<b> </b>		heck the injector system. (Refer to P.13A-11, INSPECTION PRO- EDURE FOR DIAGNOSIS CODE 41.)		
ОК		0100112			•••
MUT-II Data list	_NG ►	Check the	idle position s	witch system	1.
26 Idle position switch (Refer to P.13A-49.)		(Refer to P.13A-32, INSPECTION PROCEDUR		OCEDURE 25.)	
ок	NO				
MUT-II Data list 21 Engine coolant temperature sensor (Refer to P.13A-49.)	NG►	Check the engine coolant temperature sensor system. (Refer to P.13A-6, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 21.)			
ок			•)		
MUT-II Actuator test	NG	Check the	EGB control sol	enoid valve s	vstem (Befer to P134-38
10 EGR control solenoid valve (Refer to P.13A-54.)		<ul> <li>Check the EGR control solenoid valve system. (Refer to P.13A-3) INSPECTION PROCEDURE 33.)</li> </ul>			
ок					
Check the fuel pressure. (Refer to P.13A-81.)*	]				
OK	NC				
Check the ignition timing. (Refer to GROUP 11 - On-vehicle Service.)*	¬NG ►	Check that	at the distributor	r is installed	properly.
OK	-				
<ul> <li>Check the following items.</li> <li>Check the ignition coil, spark plugs, spark plug cables. (Re</li> <li>Check the compression pressure. (Refer to GROUP 11 - C</li> <li>Check the engine oil viscosity.</li> </ul>	efer to GROL Dn-vehicle Se	P 16 – Or ervice.)*	-vehicle Service	ə.)*	

When the engine is hot, it stalls at idling. (Di	e out)	Probable cause			
In such cases as the above, the cause is probably that ignition syste idle speed control (ISC) or compression pressure is defective. In addition, if the engine suddenly stalls, the cause may also be a contact.		<ul> <li>Malfunction of air-fuel ratio control system</li> </ul>			
Were the battery terminals disconnected?	Yes	After warming-up, let the engine run at idling for 10 minutes.			
· · · · · · · · · · · · · · · · · · ·		Alter warning-up, let the engine full at luning for to finitutes.			
No	Yes				
MUT-II Self-Diag code Are diagnosis codes displayed?	►	► Refer to P.13A-2, INSPECTION CHART FOR DIAGNOSIS CODES.			
No					
Check the ISC servo for operation sound. (Refer to P.13A-90.)*	NG ►	Check the ISC servo system. (Refer to P.13A-37, INSPECTION PROCEDURE 31.)			
ОК	<u>-</u>				
	NG				
Check the injector for operation sound.	<b> </b>	Check the injector system. (Refer to P.13A-11, INSPECTION PRO- CEDURE FOR DIAGNOSIS CODE 41.)			
OK					
Does the engine stall right after the accelerator pedal is released?	Yes	Clean the throttle valve			
No	J	area. (Refer to P.13A-78.)*			
	NI-				
Does the engine stall easily again?	No	- While carrying out an intermittent malfunction simulation test (Refer			
Yes	J	to GROUP $00$ – Points to Note for Intermittent Malfunctions.)*, check for sudden changes in the signals shown below.			
MUT-II: Engine stalling inspection when the engine is warm and idling. (Refer to P.13A-42, INSPECTION PROCEDURE 39.)		<ul> <li>Crank angle sensor signal</li> <li>Air flow sensor signal</li> <li>Injector drive signal</li> <li>Fuel pump drive signal</li> </ul>			
OK		Engine-ECUpowersupply voltage			
L L L L L L L L L L L L L L L L L L L					
Check the ignition timing.	NG	Check that the distributor is installed properly.			
(Refer to GROUP 11 – On-vehicle Service.)*					
OK					
Check the following items.					
<ul> <li>Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle Service.)*</li> <li>Check if the injectors are cleared.</li> </ul>					
<ul> <li>Check if the injectors are clogged.</li> <li>Check the compression pressure. (Refer to GROUP 11 - C</li> </ul>	On-vehicle Se	ervice.)*			
Check if foreign materials (water, alcohol, etc.) got into fuel					

.

The engine stalls when starting the car. (Pass out)		Probable cause		
In cases such as the above, the cause is probably misfiring du or an inappropriate air/fuel mixture when the accelerator peda	e to a weak I is depresse	spark, d.	<ul><li>Drawing air into intake system</li><li>Malfunction of the ignition system</li></ul>	
	N			
MUT-II Self-Diag code Are diagnosis codes displayed?	Yes ►	Refer CODE	to P.13A-2, INSPECTION CHART FOR DIAGNOSIS S.	
No		L	en e	
MUT-II Actuator test 10 EGR control solenoid valve (Refer to P.13A-54.)	NG ►	Check INSPE	the EGR control solenoid valve system. (Refer to P.13A-38, CTION PROCEDURE 33.)	
ок				
<ul> <li>Check the following items.</li> <li>Check the ignition coil, spark plugs, spark plug cables. (Re</li> <li>Check if air was drawn into the intake system. Broken intake manifold gasket Broken or disconnected vacuum hose Improper operation of the PCV valve Broken air intake hose</li> <li>INSPECTION PROCEDURE 14</li> </ul>	fer to GROU	IP 16 -	On-vehicle Service.)*	
The engine stalls when decelerating. Probable cause				
In cases such as the above, the cause is probably that the intake air volume is insufficient due to a defective idle speed control (ISC) servo system.			Malfunction of the ISC system	
Were the battery terminals disconnected?	Yes ├───►	After v	varming-up, let the engine run at idling for 10 minutes.	
No				
MUT-II Self-Diag code Are diagnosis codes displayed?	Yes	Refer CODE	to P.13A-2, INSPECTION CHART FOR DIAGNOSIS S.	
No				
MUT-II Data list	NG		the idle position switch system.	
26 Idle position switch (Refer to P.13A-49.)		(Heter	to P.13A-32, INSPECTION PROCEDURE 25.)	
MUT-II Data list	NG	Chaele	the threttle negitive concerning (Defends D104 5 IN	
14 Throttle position sensor (Refer to P.13A-49.)			the throttle position sensor system. (Refer to P.13A-5, IN- TION PROCEDURE FOR DIAGNOSIS CODE 14.)	
ок				
MUT-II Data list	Yes ├►	Check	the vehicle speed sensor system. (Refer to P.13A-9, IN-	
<ul> <li>45 ISC servo position</li> <li>Is the idle speed control (ISC) servo position drops to 0-2 steps when decelerating (engine r/min less than 1,000)?</li> </ul>		SPEC	TION PROCEDURE FOR DIAGNOSIS CODE 24.)	
No				
MUT-II Actuator test 10 EGR control solenoid valve (Refer to P.13A-54.)	NG	Check INSPE	the EGR control solenoid valve system. (Refer to P.13A-38, CTION PROCEDURE 33.)	
ок	L			
Check the following items. • Check the ignition coil, spark plugs, spark plug cables. (Re • Check the throttle valve area. (Refer to P.13A-78.)*	fer to GROU	P 16 -	On-vehicle Service.)*	

• Check and adjust the fixed SAS. (Refer to P.13A-79.)\*

Hesitation, sag or stumble			Probable cause
In cases such as the above, the cause is probably that ignition syst or compression pressure is defective.	tem, air/fuel m	ixture	<ul> <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>
MUT-II Self-Diag code	Yes	Refer	to P.13A-2, INSPECTION CHART FOR DIAGNOSIS
Are diagnosis codes displayed?		CODE	
No	_ NG		
Check the injectors for operation sound.			the injector system. (Refer to P.13A-11, INSPECTION PRO-
ок	- [	CEDU	RE FOR DIAGNOSIS CODE 41.)
Check the ignition timing. (Refer to GROUP 11 – On-vehicle Service.)*	_NG ┣	Check	that the distributor is installed properly.
ОК			
MUT-II: Check if hesitation, sag, stumble or poor acceleration occur. (Refer to P.13A-43, INSPECTION PROCEDURE 40.)			
ОК	-		
Check the fuel pressure. (Refer to P.13A-81.)*			
ок	-		
Check the following items. • Check the ignition coil, spark plugs, spark plug cables. (Re • Check the EGR control system. (Refer to GROUP 17 – En • Check the compression pressure. (Refer to GROUP 11 – C • Check the fuel filter or fuel line for clogging.	mission Contro	ol Syste	On-vehicle Service.)* em.)*
INSPECTION PROCEDURE 16			
The feeling of impact or vibration when acce	elerating		Probable cause
In cases such as the above, the cause is probably that there accompanying the increase in the spark plug demand voltage of			Malfunction of the ignition system

MUT-II Self-Diag code Are diagnosis codes displayed?	Yes	Refer to CODES.	P.13A-2,	INSPECTION	CHART	FOR	DIAGNOSIS
No	-						
Check the following items. • Check the ignition coil, spark plugs, spark plug cables. (Re • Check for occurrence of ignition leak.	fer to GROU	P 16 – Or	n-vehicle S	Service.)*			

The feeling of impact or vibration when decelerating			Probable cause
Malfunction of the ISC system is suspected.			Malfunction of the ISC system
	_		
MUT-II Self-Diag code Are diagnosis codes displayed?	_ Yes ┣───►	Refer CODE	to P.13A-2, INSPECTION CHART FOR DIAGNOSIS S.
No			
Check the ISC servo for operation sound. (Refer to P.13A-90.)*	_NG }►	Check	the ISC servo system.
OK	NO	(Heter	to P.13A-37, INSPECTION PROCEDURE 31.)
MUT-II Data list 14 Throttle position sensor (Refer to P.13A-49.)	_NG }	Check SPEC	the throttle position sensor system. (Refer to P.13A-5, IN- TION PROCEDURE FOR DIAGNOSIS CODE 14.)
ок	_ ¬ NG		
MUT-II Data list 26 Idle position switch (Refer to P.13A-49.)			the idle position switch system. to P.13A-32, INSPECTION PROCEDURE 25.)
ок			
Clean the throttle valve area. (Refer to P.13A-78.)*	]		
INSPECTION PROCEDURE 18			
Poor acceleration Probable cause			
Defective ignition system, abnormal air-fuel ratio, poor compres are suspected.	ssion pressur	e, etc.	<ul> <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>
	.,		
MUT-II Self-Diag code Are diagnosis codes displayed?	_ Yes	Refer CODE	to P.13A-2, INSPECTION CHART FOR DIAGNOSIS S.
No	_ -, NG		
Check the injectors for operation sound.		Check	the injector system. (Refer to P.13A-11, INSPECTION PRO- RE FOR DIAGNOSIS CODE 41.)
OK		0200	
Check the ignition timing. (Refer to GROUP 11 – On-vehicle Service.)*	NG	Check	that the distributor is installed properly.
ОК			
MUT-II: Check if hesitation, sag, stumble or poor acceleration occur. (Refer to P.13A-43, INSPECTION PROCEDURE 40.)			
ок			
Check the fuel pressure. (Refer to P.13A-81.)*	]		
ок			
Check the following items. • Check the ignition coil, spark plugs, spark plug cables. (Re • Check the compression pressure. (Refer to GROUP 11 – C • Check the fuel filter or fuel line for clogging. • Broken air intake hose • Clogged air cleaner			On-vehicle Service.)*

Surge			Probable cause
Defective ignition system, abnormal air-fuel ratio, etc. are susp	pected.		<ul> <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>
MUT-II Self-Diag code Are diagnosis codes displayed?	Yes	Refer to CODES.	P.13A-2, INSPECTION CHART FOR DIAGNOSIS
No Check the injectors for operation sound.	NG►	Check th CEDURI	e injector system. (Refer to P.13A-11, INSPECTION PRO- E FOR DIAGNOSIS CODE 41.)
Check the ignition timing. (Refer to GROUP 11 – On-vehicle Service.)*	NG ┣───►	Check th	hat the distributor is installed properly.
ок	1.		
MUT-II: Check if surge occurs. (Refer to P.13-44, INSPECTION PROCEDURE 41.)			
ок			
Check the fuel pressure. (Refer to P.13A-81.)*	]		
ОК			
Check the following items. • Check the ignition coil, spark plugs, spark plug cables. (Re • Check the EGR control system. (Refer to GROUP 17 – En	fer to GROUF hission Contro	P 16 – C I System	)n-vehicle Service.)* 1.)*

### **INSPECTION PROCEDURE 20**

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

Check the following items.

•

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

# **INSPECTION PROCEDURE 21**

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

Check the injectors for fuel leakage.

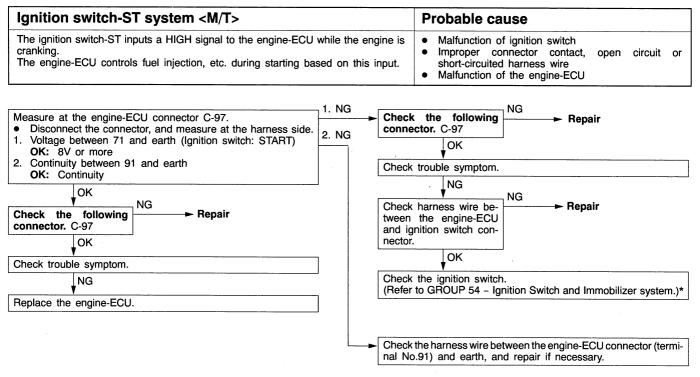
Too high CO and HC concentration when id	ling		Probable cause
Abnormal air-fuel ratio is suspected.			<ul> <li>Malfunction of the air-fuel ratio control system</li> <li>Deteriorated catalyst</li> </ul>
MUT-II Self-Diag code Are diagnosis codes displayed?	Yes	Refer CODE	to P.13A-2, INSPECTION CHART FOR DIAGNOSIS S.
Check the ignition timing.	NG ►	Check	that the distributor is installed properly.
(Refer to GROUP 11 – On-vehicle Service.)* OK MUT-II Data list 21 Engine coolant temperature sensor. (Refer to P.13A-49.) OK	NG ►		the engine coolant temperature sensor system. to P.13A-6, INSPECTION PROCEDURE FOR DIAGNOSIS 21.)
MUT-II Data list 13 Intake air temperature sensor (Refer to P.13A-49.)	NG►	Check INSPE	the intake air temperature sensor system. (Refer to P.13A-4, CTION PROCEDURE FOR DIAGNOSIS CODE 13.)
OK       WUT-II Data list       25 Barometric pressure sensor (Refer to P.13A-49.)       OK	NG		the barometric pressure sensor system. (Refer to P.13A-10, CTION PROCEDURE FOR DIAGNOSIS CODE 25.)
WUT-II Data list 11 Oxygen sensor OK: 600-1,000 mV when racing suddenly (Refer to P.13A-49.)	NG		the oxygen sensor system. (Refer to P.13A-3, INSPECTION EDURE FOR DIAGNOSIS CODE 11.)
MUT-II Data list 11 Oxygen sensor OK: Repeat 0-400 mV and 600-1,000 mV alternately when idling. (Refer to P.13A-49.)	ОК		trouble symptom.
Check the fuel pressure. (Refer to P.13A-81.)*			
Check the following items. • Check the injectors for operation sound. • Check the injectors for fuel leakage. • Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 11 – • Check the compression pressure. (Refer to GROUP 11 – • Check the positive crankcase ventilation system. (Refer to • Check the purge control system. (Refer to GROUP 17 – E • Check the EGR control system. (Refer to GROUP 17 – E • Check the trouble symptom.	On-vehicle Se GROUP 17 Emission Con	ervice.)* - Emissi trol Syst	ion Control System.)* em.)*

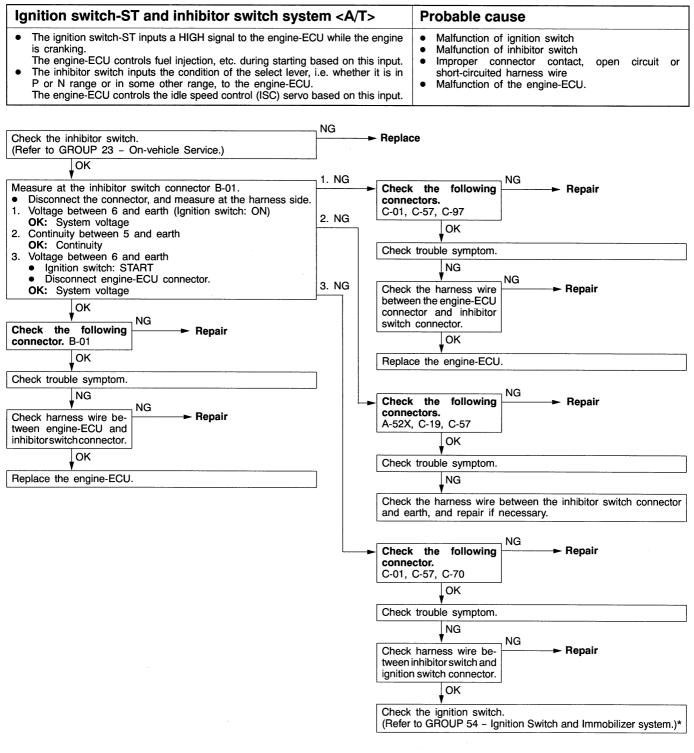
\*: Refer to '97 L200 Workshop Manual (Pub. No. PWTE96E1).

Replace the catalytic converter.

Power supply system and ignition switch-IG	system	Probable cause
When an ignition switch ON signal is input to the engine-ECU, the the control relay ON. This causes battery voltage to be supplied injectors and air flow sensor.		<ul> <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>
Check the control relay. (Refer to P.13A-86.)*	NG ► Replac	ce
ОК		
<ul> <li>Measure at the control relay connector C-53.</li> <li>Disconnect the connector, and measure at the harness side.</li> <li>Voltage between 3, 4 and earth OK: System voltage</li> </ul>		the harness wire between battery and control relay connector, pair if necessary.
ок	-	
Check the engine-ECU power supply and earth circuit. (Refer to P.13A-45, INSPECTION PROCEDURE 42.)	]	

Fuel pump system			Probable cause
The engine-ECU turns the control relay ON when the engine is a and this supplies power to drive the fuel pump.	ranking or ru	unning,	<ul> <li>Malfunction of the fuel pump 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>
	NG		
Check the fuel pump operation. (Refer to P.13A-84.)*	] <b>&gt;</b>	Check	the fuel pump circuit. to P.13A-45, INSPECTION PROCEDURE 43.)
OK		(	
Check the fuel pump relay. (Refer to P.13A-86.)*	NG ►	<ul> <li>Replace</li> </ul>	e
ок	_ ∧NG		
Measure at the fuel pump relay connector C-54. • Connect the connector.	<b> </b> ™G		the fuel pump drive control circuit. to P.13A-46, INSPECTION PROCEDURE 44.)
<ul> <li>Voltage between 1 and earth</li> <li>MUT-II Actuator test: Fuel pump drive OK: System voltage</li> </ul>			
ок			
Check the harness wire between fuel pump relay connector and fuel pump drive terminal, and repair if necessary.			
INSPECTION PROCEDURE 25	-		
Idle position switch system			Probable cause
The idle position switch inputs the condition of the accelerator it is depressed or released (HIGH/LOW), to the engine-ECU. The engine-ECU controls the idle speed control servo based			<ul> <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>
	NG		
Check the idle position switch. (Refer to P.13A-87.)*		<ul> <li>Replace</li> </ul>	ce
v v v v v v v v v v v v v v v v v v v	¬ NG	·	NG
<ul> <li>Measure at the throttle position sensor connector A-47.</li> <li>Disconnect the connector, and measure at the harness side.</li> <li>Voltage between 2 and earth (Ignition switch: ON)</li> </ul>			the following ► Repair ctors. C-94, C-97 OK
<ul> <li>OK: 4 V or higher</li> <li>Continuity between 1 and earth</li> </ul>		Check	trouble symptom.
OK: Continuity		L	NG
V NG Check the following connector. A-47			the harness wire between engine-ECU and throttle position connector.
ок			OK NG
Check trouble symptom.	]	Replac	e the engine-ECU. Repair
NG	-		
Replace the engine-ECU.			

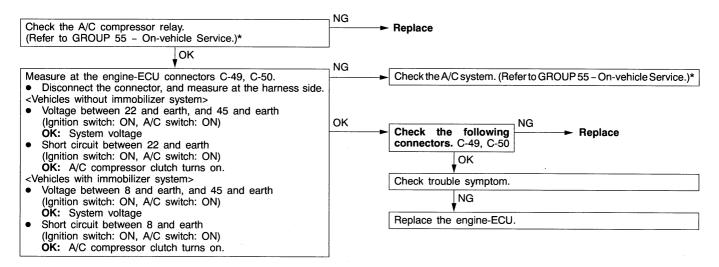


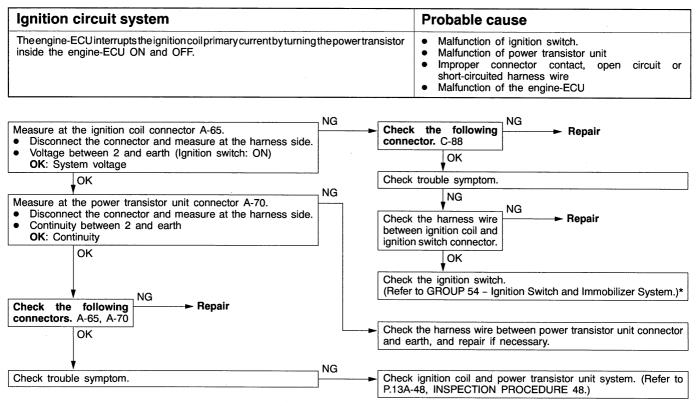


Power steering fluid pressure switch system	n	Probable cause
The presence or absence of power steering load is input to the engine-ECU controls the idle speed control (ISC) servo be		<ul> <li>Malfunction of power steering fluid pressure switch</li> <li>Improper connector contact, open circuit or short-circuited harness wire</li> <li>Malfunction of the engine-ECU</li> </ul>
Check the power steering fluid pressure switch. (Refer to GROUP 37A – On-vehicle Service.)*	NG ► Repla	ce
↓ok	- NG	
<ul> <li>Measure at the power steering fluid pressure switch connector A-74.</li> <li>Disconnect the connector, and measure at the harness side.</li> <li>Voltage between 1 and earth (Ignition switch: ON)</li> </ul>	Check	k the following ector. C-50 ↓OK
OK: System voltage	Check	trouble symptom.
OK Check the following connector. A-74 ↓OK	tween	NG harness wire be- engine-ECU and steering fluid pres- witch connector. NG ► Repair
Check trouble symptom.	]	OK
<b>N</b> G	Repla	ce the engine-ECU.
Replace the engine-ECU.		

#### **INSPECTION PROCEDURE 29**

A/C switch and A/C relay system	Probable cause
When an A/C ON signal is input to the engine-ECU, the engine-ECU carries out control of the idle speed control (ISC) servo, and also operates the A/C compressor magnetic clutch.	<ul> <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>





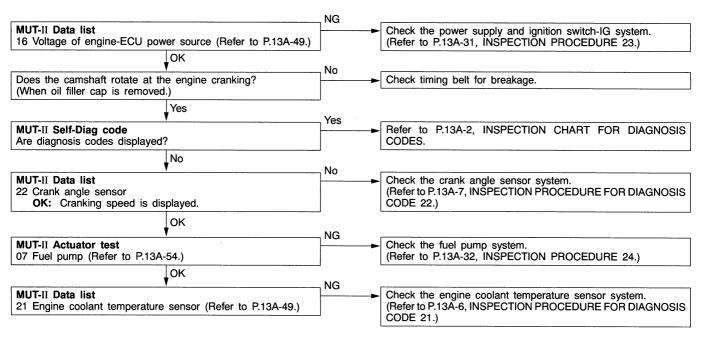
Idle speed control (ISC) servo (Stepper moto	or) systen	m Probable cause
The engine-ECU controls the intake air volume during idling by o the servo valve located in the bypass air passage.	pening and cl	<ul> <li>Malfunction of ISC servo</li> <li>Improper connector contact, open circuit or short-circuited harness wire</li> <li>Malfunction of the engine-ECU</li> </ul>
NG         Check the ISC servo (Refer to P.13A-90.)*         OK         OK         Measure at the ISC servo connector A-50.         • Disconnect the connector and measure at the harness side.         • Voltage between 2 and earth, and 5 and earth (Ignition switch: ON)         OK:	NG	Check the following connector. C-95 OK Check trouble symptom. NG Check the harness wire between control relay and ISC servo con- nector, and repair if necessary.
OK Measure at the engine-ECU connector C-49. Disconnect the connector, measure at the harness side. Voltage between each of 4, 5, 17, 18 and earth (Ignition switch: ON) OK: System voltage	NG	Check the following connector. A-50 ↓ OK Check trouble symptom.
OK Check the following connector. C-49 OK V	NG	NG Check harness wire between engine-ECU and ISC servo connector, and repair if necessary.
NSPECTION PROCEDURE 32 Purge control solenoid valve system		Probable cause
The purge control solenoid valve controls the purging of air from t inside the intake manifold.	the canister lo	
Check the purge control solenoid valve. (Refer to GROUP 17 - Emission Control System.)*	NG	- Replace
<ul> <li>OK</li> <li>Measure at the purge control solenoid valve connector A-48.</li> <li>Disconnect the connector and measure at the harness side.</li> <li>Voltage between 2 and earth (Ignition switch: ON)</li> <li>OK: System voltage</li> </ul>	NG	- Check the harness wire between control relay and solenoid valve connector, and repair if necessary.
OK Measure at the engine-ECU connector C-49. Disconnect the connector and measure at the harness side. Voltage between 9 and earth (Ignition switch: ON) OK: System voltage	NG	Check the following connector. A-48 ↓OK ↓ Check trouble symptom.
Check the following connector. C-49 OK		Check trouble symptom. NG Check the harness wire between engine-ECU and solenoid valve connector, and repair if necessary.

\*: Refer to '97 L200 Workshop Manual (Pub. No. PWTE96E1).

Replace the engine-ECU.

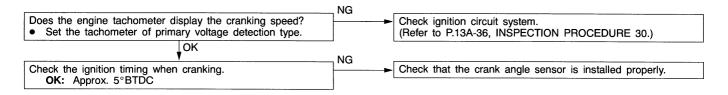
EGR control solenoid valve system	······	Probable cause
The EGR control solenoid valve is controlled by the negative pres EGR operation leaking to port "A" of the throttle body.	ssure resulting fro	<ul> <li>Malfunction of solenoid valve</li> <li>Improper connector contact, open circuit or short-circuited harness wire.</li> <li>Malfunction of the engine-ECU</li> </ul>
Check the EGR control solenoid valve. (Refer to GROUP 17 – Emission Control System.)* OK Measure at the EGR control solenoid valve connector A-49. • Disconnect the connector and measure at the harness side. • Voltage between 1 and earth (Ignition switch: ON) OK: System voltage OK Measure at the engine-ECU connector C-49. • Disconnect the connector and measure at the harness side.	NG Ch	
<ul> <li>Voltage between 6 and earth (Ignition switch: ON)</li> <li>OK: System voltage</li> </ul>		ок
ОК	Ch	eck trouble symptom.
Check the following ► Repair connector. C-49		NG
ок V		eck the harness wire between engine-ECU and solenoid valve nector, and repair if necessary.
Check trouble symptom.	]	
NG		
Replace the engine-ECU.	]	

#### **MUT-II: Inspection of no initial combustion**



# **INSPECTION PROCEDURE 35**

#### Ignition system: Inspection of no initial combustion.



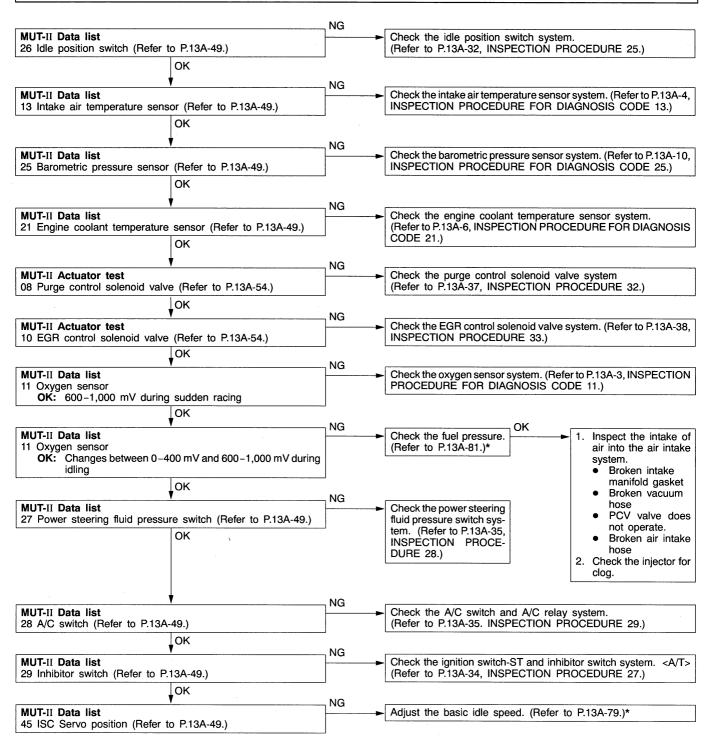
MUT-II: Check if uncomplete combustion of	curs.	
MUT-II Self-Diag code Are diagnosis codes displayed?	Yes	► Refer to P.13A-2, INSPECTION CHART FOR DIAGNOSIS CODE
MUT-II Actuator test 07 Fuel pump (Refer to P.13A-54.)	NG	← Check the fuel pump system. (Refer to P.13A-32, INSPECTION PROCEDURE 24.)
WUT-II Data list 21 Engine coolant temperature sensor (Refer to P.13A-49.) OK	NG	<ul> <li>Check the engine coolant temperature sensor system. (Refer to P.13A-6, INSPECTION PROCEDURES FOR DIAGNO- SIS CODE 21.)</li> </ul>
MUT-II Data list 18 Ignition switch-ST (Refer to P.13A-49.)	NG	← Check the ignition switch-ST system <m t="">. (Refer to P.13A-33, INSPECTION PROCEDURE 26.)</m>

# **INSPECTION PROCEDURE 37**

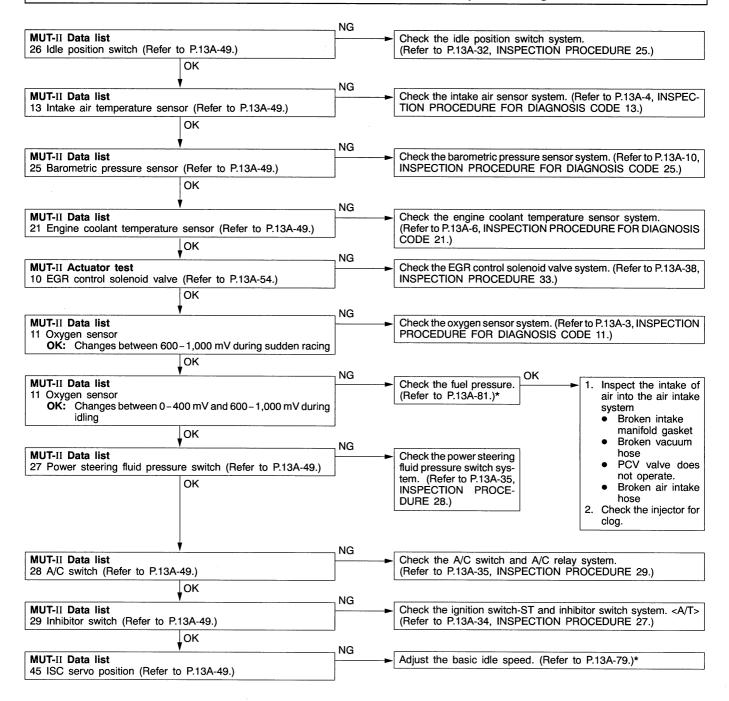
# Check if hunting occurs.

Clean the throttle body. (Refer to P.13A-78.)*		
•		
Check and adjust the fixed SAS. (Refer to P.13A-79.)*		
· .		
Check trouble symptom.		
<b>V</b> NG		
<ul> <li>Inspect the intake of air into the air intake system</li> <li>Broken intake manifold gasket</li> <li>Broken air intake hose</li> <li>Broken vacuum hose</li> <li>Positive crankcase ventilation valve does not operate.</li> </ul>		

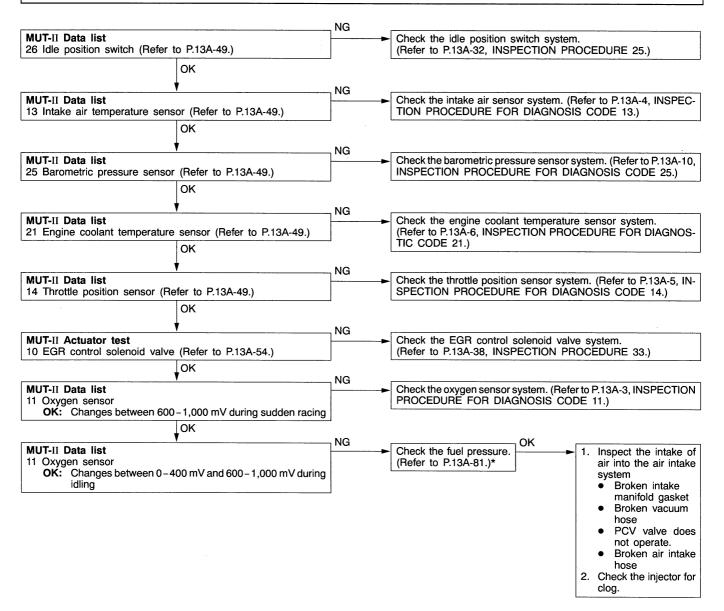
#### MUT-II: Check if idling speed is unstable.



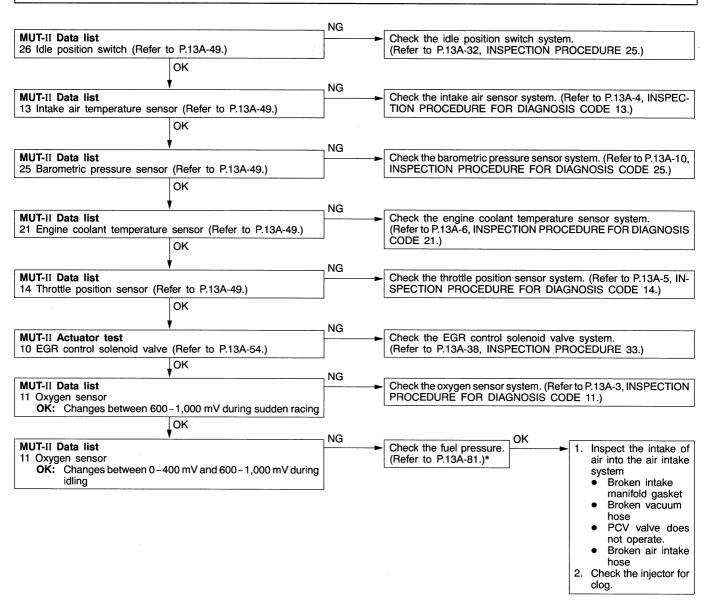
#### MUT-II: Engine stalling inspection when the engine is warmed up and idling.



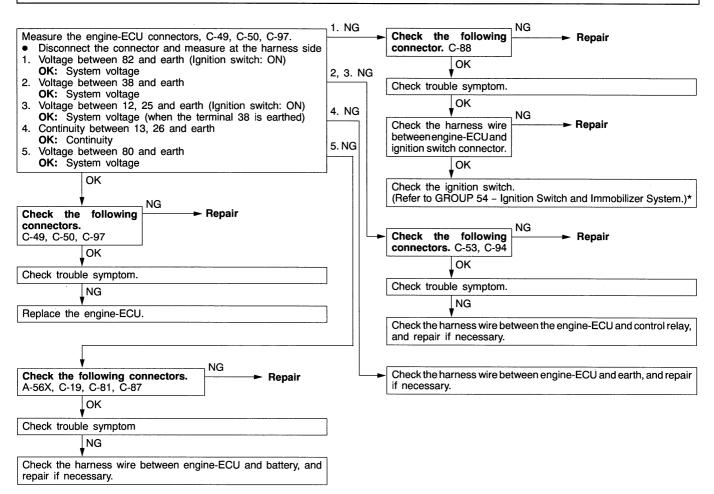
#### MUT-II: Check if hesitation, sug, stumble or poor acceleration occurs.



#### MUT-II: Check if surge occurs.

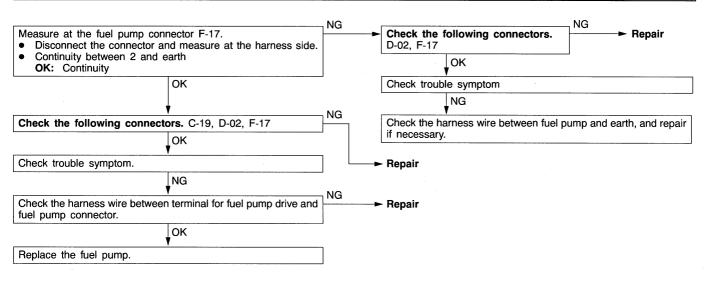


#### Check the engine-ECU power supply and earth circuit.

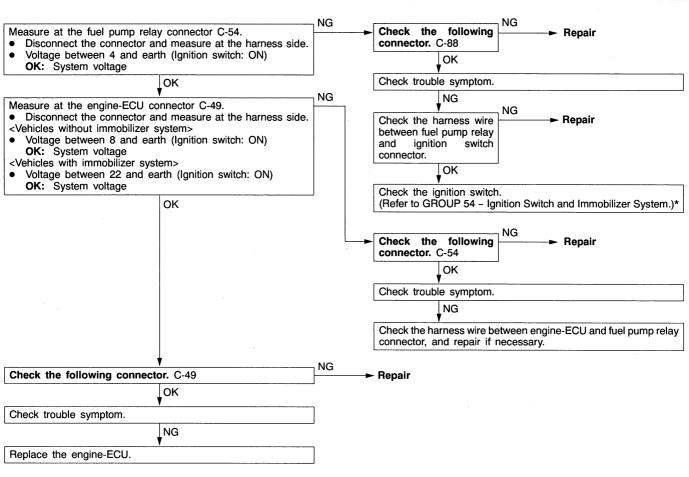


### **INSPECTION PROCEDURE 43**

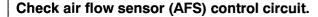
#### Check fuel pump circuit.

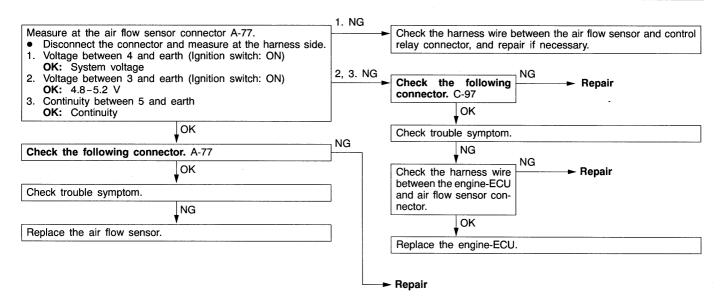


## Check the fuel pump drive control circuit.

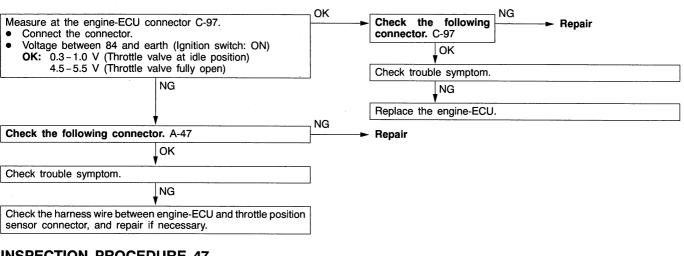


# **INSPECTION PROCEDURE 45**



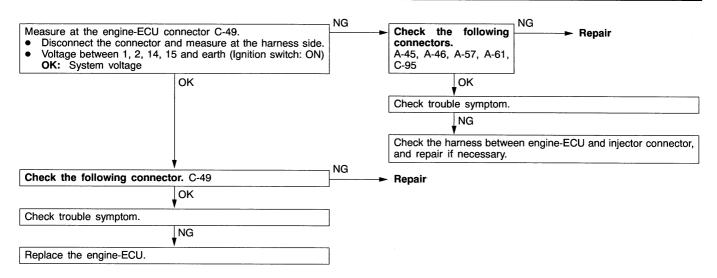


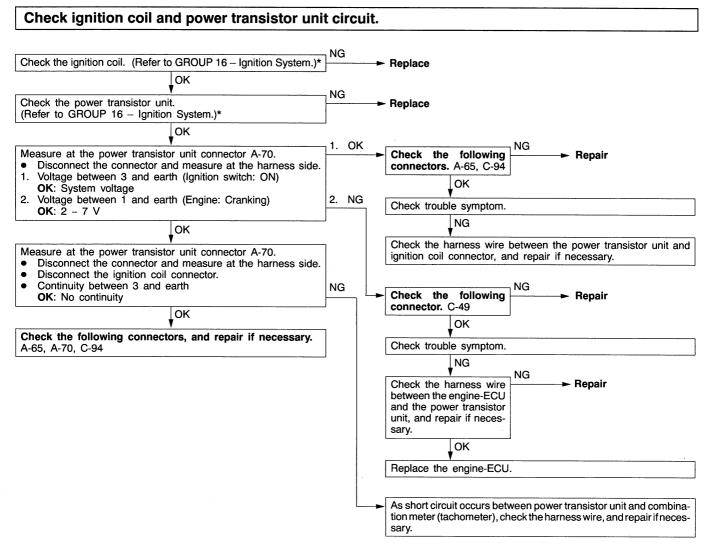
### Check throttle position sensor (TPS) output circuit.



### **INSPECTION PROCEDURE 47**

Check injector control circuit





#### 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.
- \*<sup>2</sup>. 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 idle position switch turns back on after the throttle position sensor voltage has been by 100 mV and the throttle valve has been opened, the idle position switch and the throttle position sensor need to be adjusted.
- \*3. The injector drive time represents the time when the cranking speed is at 250 r/min or below when the power supply voltage is 11 V.
- \*4. In a new vehicle [driven approximately 500 km or less], the injector drive time is sometimes 10% longer than the standard time.
- \*5. 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.

ltem No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
11	Oxygen sensor	Engine:After having warmed up Air/fuel mixture is	When at 4,000 r/min, engine is suddenly decelerated	200 mV or less	Code No. 11	13A-3
		made leaner when de- celerating, and is made richer when racing.	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	Engine is idling	400 mV or less (Changes) 600 – 1,000 mV		
		condition by the en- gine-ECU.	2,500 r/min	400 mV or less (Changes) 600 – 1,000 mV		
12	Air flow sensor* <sup>1</sup>	<ul> <li>Engine coolant temperature: 80 – 95°C</li> <li>Lamps and all accessories: OFF</li> </ul>	Engine is idling	22 – 48 Hz <4G63> 19 – 45 Hz <4G64>	-	-
		<ul> <li>Transmission: Neutral (A/T: P range)</li> </ul>	2,500 r/min	80 – 120 Hz <4G63> 67 – 107 Hz <4G64>	_	
			Engine is raced	Frequency increases in response to racing		

ltem No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
13	Intake air temperature	Ignition switch: ON or with engine running	When intake air temperature is –20°C	–20°C	Code No. 13	13A-4
	sensor		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	Ignition switch: ON	Set to idle position	300 – 1,000 mV	Code No.	13A-5
	position sensor		Gradually open	Increases in proportion to throttle opening angle	- 14	
			Open fully	4,500 – 5,500 mV		
16	Power supply voltage	Ignition switch: ON	·	System voltage	Procedure No. 23	13A-31
18	Cranking signal (ignition	Ignition switch: ON	Engine: Stopped	OFF	Procedure No. 26 <m t=""></m>	13A-33 <m t=""> 13A-34</m>
	switch-ST)		Engine: Cranking	ON	Procedure No. 27 <a t=""></a>	<a t=""></a>
21	Engine coolant temperature	Ignition switch: ON or with engine running	When engine coolant temperature is -20°C	–20°C	Code No. 21	13A-6
	sensor		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> <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-7
		<ul> <li>Engine: Idling</li> <li>Idle position switch: ON</li> </ul>	When engine coolant temperature is –20°C	1,275 – 1,475 r/min		
			When engine coolant temperature is 0°C	1,225 – 1,425 r/min		
			When engine coolant temperature is 20°C	1,100 – 1,300 r/min		
			When engine coolant temperature is 40°C	950 – 1,150 r/min		
			When engine coolant temperature is 80°C	650 – 850 r/min	-	
25	Barometric	Ignition switch: ON	At altitude of 0 m	101 kPa	Code No.	13A-10
	pressure sensor		At altitude of 600 m	95 kPa	25	
			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	Throttle valve: Set to idle position	ON	Procedure No. 25	13A-32
		accelerator pedal repeatedly	Throttle valve: Slightly open	OFF* <sup>2</sup>		
27	Power Engine: Idling steering fluid pressure		Steering wheel stationary	OFF	Procedure No. 28	13A-35
	pressure switch		Steering wheel turning			

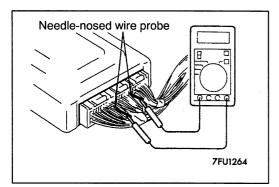
# 13A-52

ltem No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
28	A/C switch	Engine: Idling (when A/C switch is	A/C switch: OFF	OFF	Procedure No. 29	13A-35
		ON, A/C compressor should be operating.)	A/C switch: ON	ON		
29	Inhibitor switch	Ignition switch: ON	P or N	P or N	Procedure No. 27	13A-34
	<a t=""></a>		D, 2, L or R	D, 2, L or R	110.27	
41	Injectors * <sup>3</sup>	Engine: Cranking	When engine cool- ant temperature is 0°C	51 – 76 ms <4G63> 60 – 90 ms <4G64>	-	-
			When engine coolant temperature is 20°C	26 – 38 ms <4G63> 30 – 45 ms <4G64>		
			When engine coolant temperature is 80°C	5.7 – 8.5 ms <4G63> 6.7 – 10.1 ms <4G64>		
	Injectors* <sup>4</sup>	<ul> <li>Engine coolant temperature: 80–95°C</li> <li>Lamps and all accessories: OFF</li> </ul>	Engine is idling	1.9 – 3.1 ms <4G63> 2.2 – 3.4 ms <4G64>		
		<ul> <li>Transmission: Neutral (A/T :</li> </ul>	2,500 r/min	1.8 – 3.0 ms <4G63>		
		P range)		1.9 – 3.1 ms <4G64>		
			When engine is suddenly raced	Increases	_	
44	Ignition coils and power	• Engine: After having warmed up	Engine is idling	2 – 18°BTDC	-	-
	transistors	• Timing lamp is set. (The timing lamp	2,500 r/min	23 – 43° BTDC <4G63>	_	
	is set in order to check actual ignition timing.)			27 – 47° BTDC <4G64>		

ltem No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
45	ISC (stepper) motor position * <sup>5</sup>	<ul> <li>Engine coolant temperature: 80 - 95°C</li> <li>Lamps and all</li> </ul>	A/C switch: OFF	2 – 25 STEP	-	-
	position	<ul> <li>accessories: OFF</li> <li>Transmission: Neutral (A/T : P range)</li> </ul>	A/C switch: OFF → ON	Increases by 10 – 70 steps		
		<ul> <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>	range	Increases by 5 – 50 steps		
49	A/C relay	Engine: After having warmed up/Engine is idling	A/C switch: OFF	OFF (Compressor clutch is not operating)	Procedure No. 29	13A-35
			A/C switch: ON	ON (Compressor clutch is operating)		

# ACTUATOR TEST REFERENCE TABLE

ltem No.	Inspection item	Drive contents	Inspection con	tents	Normal condition	Inspection procedure No.	Reference page
01	Injectors	Cut fuel to No.1 injector	Engine: After having w		Idling condition becomes different	Code No. 41	13A-11
02	-	Cut fuel to No.2 injector	up/Engine is ic (Cut the fuel si injector in turn	upply to each and check	(becomes unsta- ble).		
03		Cut fuel to No.3 injector	cylinders whicl idling.)	n don't affect			
04		Cut fuel to No.4 injector	·				
07	Fuel pump	Fuel pump operates and fuel is recircu- lated.	<ul> <li>Engine: Cranking</li> <li>Fuel pump: Forced driving Inspect accord-</li> </ul>	Pinch the return hose with fingers to feel the pulse of the fuel being recirculated.	Pulse is felt.	Procedure No. 24	13A-32
			ing to both the above condi- tions.	Listen near the fuel tank for the sound of fuel pump operation.	Sound of opera- tion 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. 32	13A-37
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. 33	13A-38



# CHECK AT THE ENGINE-ECU TERMINALS

### **TERMINAL VOLTAGE CHECK CHART**

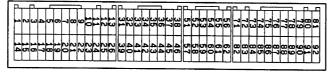
- 1. Connect a needle-nosed wire probe (test harness: MB991223 or paper clip) to a voltmeter probe.
- 2. Insert the needle-nosed wire probe into each of the engine-ECU connector terminals from the wire side, and measure the voltage while referring to the check chart. NOTE
  - 1. Make the voltage measurement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

NOTE \*: Vehicles with immobilizer system

Terminal No.	Check item	Check condition (En	gine condition)	Normal condition		
1	No.1 injector	While engine is idlin	From 11 – 14 V, momentarily			
14	No.2 injector	warmed up, sudden accelerator pedal.	drops slightly			
2	No.3 injector	-				
15	No.4 injector	-				
4	Stepper motor coil <a1></a1>	Engine: Soon after t	he warmed up	System voltage ↔ 0 – 3 V		
17	Stepper motor coil <a2></a2>	engine is started		(Changes repeatedly)		
5	Stepper motor coil <b1></b1>	-				
18	Stepper motor coil <b2></b2>					
6	EGR control solenoid	Ignition switch: ON		System Voltage		
	valve	While engine is idlin the accelerator peda	g, suddenly depress al.	From system voltage, momentarily drops		
8 or 22*	Fuel pump relay	Ignition switch: ON	Ignition switch: ON System			
		Engine: Idle speed		0 – 3V		
9	Purge control solenoid	Ignition switch: ON		System voltage		
	valve	Running at 3,000r/m warming up after ha		0 – 3V		
10	Power transistor unit	Engine r/min: 3,000	r/min	0.3 – 3.0V		
12	Power supply	Ignition switch: ON		System voltage		
25						
19	Air flow sensor reset	Engine: Idle speed		0 – 1V		
	signal	Engine r/min: 3,000	r/min	6 – 9V		
22 or 8*	A/C relay	<ul> <li>Engine: Idle sp</li> <li>A/C switch: OF (A/C compress)</li> </ul>	eed F → ON or is operating)	System voltage or momentarily 6V or more $\rightarrow 0 - 3V$		
52	Ignition timing adjust- ment terminal	Ignition switch: ON	Earth the ignition timing adjustment terminal	0 – 1 V		
			Remove the earth from the ignition timing adjustment terminal	4.0 – 5.5 V		

Terminal No.	Check item	Check condition (En	gine condition)	Normal condition
60	Oxygen sensor heater	Engine: Idling after v	0 – 3V	
		Engine r/min: 5,000	System voltage	
36	Engine warning lamp	Ignition switch: OFF	→ ON	$0 - 3V \rightarrow 9 - 13V$ (After several seconds have elapsed)
37	Power steering fluid pressure switch	Engine: Idling after warming up	When steering wheel is stationary	System voltage
			When steering wheel is turned	0 – 3V
38	Control relay	Ignition switch: OFF	J	System voltage
	(Power supply)	Ignition switch: ON		0 – 3V
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
71	Ignition switch – ST	Engine: Cranking		8V or more
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	Oxygen sensor	Engine: Running at warmed up (Check v voltmeter)	2,500 r/min after using a digital type	0 ↔ 0.8V (Changes repeatedly)
80	Backup power supply	Ignition switch: OFF	System voltage	
81	Sensor impressed voltage	Ignition switch: ON		4.5 – 5.5V
82	Ignition switch – IG	Ignition switch: ON		System voltage

Terminal No.	Check item	Check condition (En	gine condition)	Normal condition
83	Engine coolant temperature sensor	Ignition switch: ON	When engine coolant tempera- ture is 0°C	3.2 – 3.8V
			When engine coolant tempera- ture is 20°C	2.3 – 2.9V
			When engine coolant tempera- ture is 40°C	1.3 – 1.9V
			When engine coolant tempera- ture is 80°C	0.3 – 0.9V
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	Barometric pressure sensor	Ignition switch: ON	When altitude is 0m	3.7 – 4.3V
			When altitude is 1,200m	3.2 – 3.8V
86	Vehicle speed sensor	<ul><li>Ignition switch:</li><li>Move the vehic</li></ul>	ON cle slowly forward	0 ↔ 5V (Changes repeatedly)
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
89	Crank angle sensor	Engine: Cranking		0.4 – 4.0V
		Engine: Idle speed		1.5 – 2.5V
90	Air flow sensor	Engine: Idle speed		2.2 – 3.2V
		Engine r/min: 2,500	/min	-
91	Inhibitor switch <a t=""></a>	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

	61 1	178	77	76	75	74	73	d 72	471	55	5	54	5 G	52	4 5 1	38	37	96 1	35	34	55 -	32	1		12	1	10	9	8	-7	<u>б</u>	- S	4	ω	J	7	
91 92	90	68	88	87	86	85	84	83 3	82	62	5	60	59	58	57	46	45	44	43	42	41	40	39	26	25	24	23	22	21	20	19	18	-;	16	5		

9FU0392

Terminal No.	Inspection item	Normal condition (Check condition)
1 – 12	No.1 injector	6.5 – 8.0 Ω (At 20°C)
14 – 12	No.2 injector	
2 – 12	No.3 injector	
15 – 12	No.4 injector	

# 13A-60

Terminal No.	Inspection item	Normal condition (Check condition)
4 - 12	Stepper motor coil (A1)	28 – 33 Ω (At 20°C)
17 – 12	Stepper motor coil (A2)	
5 – 12	Stepper motor coil (B1)	
18 – 12	Stepper motor coil (B2)	
6 – 12	EGR control solenoid valve	36 – 44 Ω (At 20°C)
9 – 12	Purge control solenoid valve	36 – 44 Ω (At 20°C)
13 – Body earth	Engine-ECU earth	Continuity (0Ω)
26 – Body earth	Engine-ECU earth	
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)
		$0.30$ – $0.42k\Omega$ (When intake air temperature is 80 $^\circ\text{C}$ )
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 $80^\circ\text{C})$
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=""></a>	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 AIR FLOW SENSOR (AFS)

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

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

# TOP DEAD CENTRE SENSOR AND CRANK ANGLE SENSOR

#### 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.)

#### **INJECTOR**

#### 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).

#### STEPPER MOTOR

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

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

#### **IGNITION COIL AND POWER TRANSISTOR**

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

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

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

# GROUP 13A MULTIPOINT FUEL INJECTION (MPI)

# GENERAL

# **OUTLINE OF CHANGE**

The service procedures have been revised due to the following change.

• The immobilizer system has been revised.

# **GENERAL INFORMATION**

Item		Specifications	7
Engine-ECU	Identification model No.	E2T69184 <4G63–Vehicles with immobilizer system> E2T69185 <4G64–Vehicles with immobilizer system>	

# TROUBLESHOOTING

NOTE:

If the engine-ECU is replaced, the immobilizer-ECU and the ignition key should be replaced together with it.

# INSPECTION CHART FOR DIAGNOSIS CODES

For vehicles with immobilizer system, the inspection procedure "Code No.54 – Immobilizer system" has been changed.

Code No.	Diagnosis system	Reference page
54	Immobilizer system	13A-2.

# **INSPECTION PROCEDURE FOR DIAGNOSIS CODES**

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

#### NOTE

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

	Yes		
Is there another ignition key near the ignition key that is inserted in the ignition switch?			Remove the extra ignition key.
No	]	NG	•
			Check trouble symptom.
	_, Yes		
Is a diagnosis code output from the immobilizer-ECU?		Þ	Check the immobilizer system. (Refer to GROUP 54 – Ignition Switch and Immobilizer System.)
No	NG	l	
Check the following connectors. C-19, C-36, C-51			Repair
↓ oк			
Check trouble symptom.			
NG	ok		
Check the harness wire between the engine-ECU and the immobilizer-ECU.		►[	Replace the engine-ECU and immobilizer-ECU.
NG			
Repair			

# INSPECTION CHART FOR TROUBLE SYMPTOMS

For vehicles with immobilizer system, inspection procedure No.2 has been changed.

Trouble symptom		Inspection procedure No.	Reference page
Communication with MUT-II is	Communication with all systems is not possible.	1	13A-15*
impossible.	Communication with engine-ECU only is not possible.	2	13A-3

\*: Refer to '98 L200 Workshop Manual (Pub.No. PWTE96E1-B).

# INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

# **INSPECTION PROCEDURE 2**

MUT-II communication with engine-ECU is impose	sible. Probable cause
<ul> <li>One of the following causes may be suspected.</li> <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> <li>Malfunction of engine-ECU power supply circuit</li> <li>Malfunction of engine-ECU</li> <li>Open circuit between engine-ECU and diagnosis connector</li> </ul>
Check the following connector. C-19	—► Repair
ок	
Check trouble symptom.	
NG	
Check the harness wire between engine-ECU and diagnosis con- nector.	← Check the harness wire ← Repair betweenengine-ECUand
NG	earth.
Repair	VOK
	Check the power supply and ignition switch-IG system. (Refer to P.13A-31, INSPECTION PROCEDURE 23.)*

# MULTIPOINT FUEL INJECTION (MPI)

# CONTENTS

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# GENERAL

# **OUTLINE OF CHANGES**

With the modification below, the service procedure of the part that is different from previous part has been established.

- Adopting On-board Diagnostics System filled out the diagnostic item and modified diagnostic code numbering system.
- The distributorless 2 coil ignition system has been adopted.
- The crank angle sensor has been adopted on the crank shaft.
- Camshaft position sensor has been added. (the function is same as the function of the previous top dead center sensor of distributor)
- Oxygen sensor (rear) has been added.
- Ignition timing adjustment terminal has been abolished.

# **GENERAL INFORMATION**

# **SELF-DIAGNOSIS FUNCTION**

The functions below have been added.

 The engine-ECU records the engine operating condition when the diagnosis code is set. This data is called "freeze frame" data. This data can be read by using the MUT-II, and can be used in simulation tests for troubleshooting.

## **GENERAL SPECIFICATIONS**

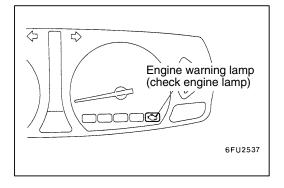
Items		Specifications
Engine-ECU	Identification No.	E6T32473 <vehicle immobilizer="" system="" without=""> E6T32474 <vehicle immobilizer="" system="" with=""></vehicle></vehicle>
Sensors	Camshaft position sensor	Hall element type
	Crank angle sensor	Hall element type
Actuators	Injector identification mark	CDH240

# SERVICE SPECIFICATIONS

Items		Standard value
Oxygen sensor output voltage (during revving) V		0.6 – 1.0
Oxygen sensor heater resistance (at 20°C) $\Omega$ Front		4.5 - 8.0
	Rear	11 – 18

# SPECIAL TOOLS

Tool	Number	Name	Use
в991658	MB991658	Test harness set	<ul> <li>Measurement of voltage during troubleshooting</li> </ul>
В991709	MB991709	Test harness	<ul> <li>Measurement of voltage during troubleshooting</li> <li>Inspection using an analyzer</li> </ul>
	MD998478	Test harness (3-pin, triangle)	<ul> <li>Measurement of voltage during troubleshooting</li> <li>Inspection using an analyzer</li> </ul>



# TROUBLESHOOTING

# **DIAGNOSIS FUNCTION**

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

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

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

#### Engine warning lamp inspection items

Code No.	Diagnosis item
-	Engine-ECU
P0100	Air flow sensor system
P0105	Barometric pressure sensor system
P0110	Intake air temperature sensor system
P0115	Engine coolant temperature sensor system
P0120	Throttle position sensor system
P0125	Feedback system
P0130	Oxygen sensor (front) system <sensor 1=""></sensor>
P0135	Oxygen sensor heater (front) system <sensor 1=""></sensor>

Code No.	Diagnosis item
P0136	Oxygen sensor (rear) system <sensor 2=""></sensor>
P0141	Oxygen sensor heater (rear) system <sensor 2=""></sensor>
P0170	Abnormal fuel system
P0201	No. 1 injector system
P0202	No. 2 injector system
P0203	No. 3 injector system
P0204	No. 4 injector system
P0300★	Ignition coil (power transistor) system
P0301	No. 1 cylinder misfire detected
P0302	No. 2 cylinder misfire detected
P0303	No. 3 cylinder misfire detected
P0304	No. 4 cylinder misfire detected
P0335	Crank angle sensor system
P0340	Camshaft position sensor system
P0403	EGR valve system
P0420	Catalyst malfunction
P0443	Purge control solenoid valve system
P0505	Idle speed control system
P0510	Idle position switch system
P0551	Power steering fluid pressure switch system

#### NOTE

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

# METHOD OF READING AND ERASING DIAGNOSIS CODES

Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points on the '97 L200 Workshop Manual (Pub. No. PWTE96E1).

#### DIAGNOSIS USING DIAGNOSIS 2 MODE

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

NOTE

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

5. Erase the diagnosis codes.

# INSPECTION USING MUT-II DATA LIST AND ACTUATOR TESTING

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

#### FREEZE FRAME DATA

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

The display items of freeze frame data are shown below.

#### Display item list

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

#### NOTE

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

#### **READINESS TEST STATUS**

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

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

- Catalyst: P0420
- Oxygen sensor: P0130
- Oxygen sensor heater: P0135, P0141

# FAIL-SAFE FUNCTION REFERENCE TABLE

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

Malfunctioning item	Control contents during malfunction
Air flow sensor	<ol> <li>Uses the throttle position sensor signal and engine speed signal (crank angle sensor signal) to take reading of the basic injector drive time and basic ignition timing from the pre-set mapping.</li> <li>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 sen- sor (TPS)	No increase in fuel injection amount during acceleration due to the throttle position sensor signal.
Engine coolant tem- perature sensor	Controls as if the engine coolant temperature is 80°C.
Camshaft position sensor	Injects fuel to all cylinders simultaneously. (However, after the ignition switch is turned to ON, the No. 1 cylinder top dead centre is not detected at all.)
Barometric pressure sensor	Controls as if the barometric pressure is 101 kPa.
Ignition coil, power transistor	Cuts off the fuel supply to cylinders with an abnormal ignition.
Oxygen sensor (front)	Air/fuel ratio feedback control (closed loop control) is not performed.
Oxygen sensor (rear)	Performs the feedback control (closed loop control) of the air/fuel ratio by using only the signal of the oxygen sensor (front) installed on the front of the catalytic converter.
Misfiring	If the detected misfiring causes damage to the catalyst, the misfiring cylinder will be shut down.

# INSPECTION CHART FOR DIAGNOSIS CODES

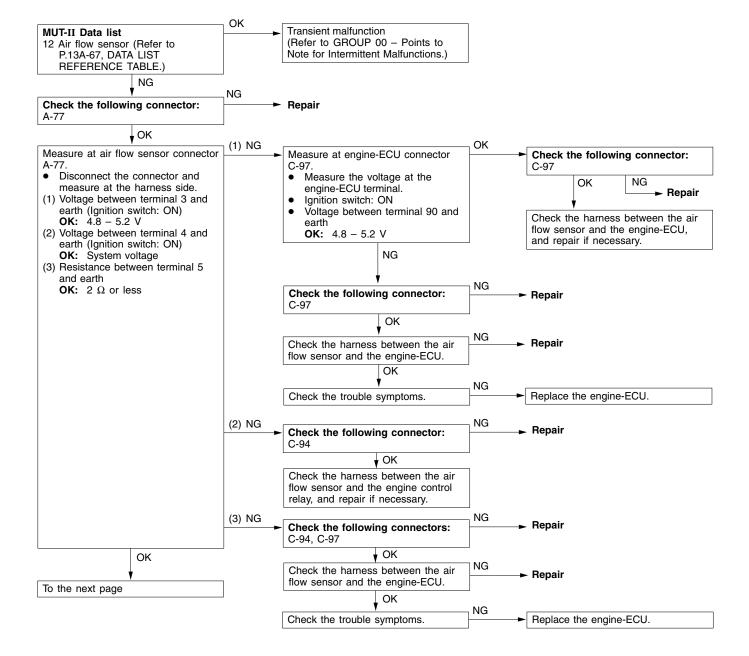
Code No.	Diagnosis item	Reference page
P0100	Air flow sensor system	13A-10
P0105	Barometric pressure sensor system	13A-12
P0110	Intake air temperature sensor system	13A-14
P0115	Engine coolant temperature sensor system	13A-16
P0120	Throttle position sensor system	13A-18
P0125	Feedback system	13A-20
P0130	Oxygen sensor (front) system <sensor 1=""></sensor>	13A-21
P0135	Oxygen sensor heater (front) system <sensor 1=""></sensor>	13A-23
P0136	Oxygen sensor (rear) system <sensor 2=""></sensor>	13A-24
P0141	Oxygen sensor heater (rear) system <sensor 2=""></sensor>	13A-25
P0170	Abnormal fuel system	13A-26
P0201	No. 1 injector system	13A-27
P0202	No. 2 injector system	13A-27
P0203	No. 3 injector system	13A-27
P0204	No. 4 injector system	13A-27
P0300★	Ignition coil (power transistor) system	13A-28
P0301	No. 1 cylinder misfire detected	13A-29
P0302	No. 2 cylinder misfire detected	13A-29
P0303	No. 3 cylinder misfire detected	13A-29
P0304	No. 4 cylinder misfire detected	13A-29
P0335	Crank angle sensor system	13A-31
P0340	Camshaft position sensor system	13A-32
P0403	EGR valve system	13A-33
P0420	Catalyst malfunction	13A-34
P0443	Purge control solenoid valve system	13A-35
P0500	Vehicle speed sensor system	13A-36
P0505	Idle speed control system	13A-37
P0510	Idle position switch system	13A-39
P0551	Power steering fluid pressure switch system	13A-40
P1610	Immobilizer system	13A-41

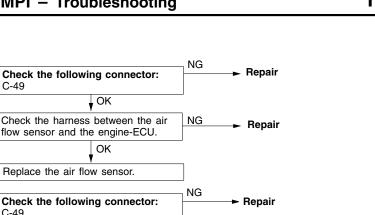
NOTE

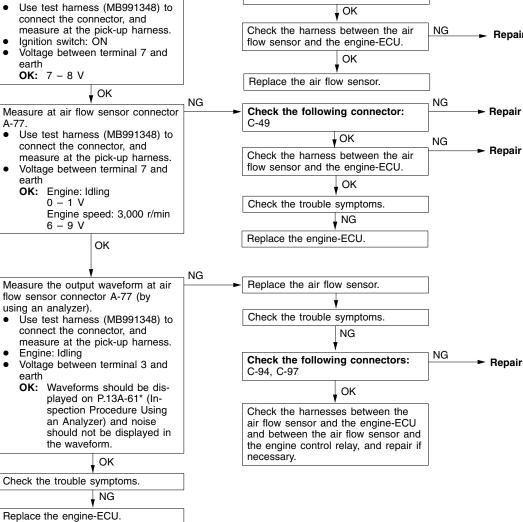
- 1. Do not replace the engine-ECU until a through terminal check reveals there are no short/open circuit.
- Check that the engine-ECU earth circuit is normal before checking for the cause of the problem.
   After the engine-ECU has detected a malfunction, a diagnosis code is recorded the next time the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

### **INSPECTION PROCEDURE CLASSIFIED BY DIAGNOSIS CODE**

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







C-49

#### NOTE:

From the previous page

A-77.

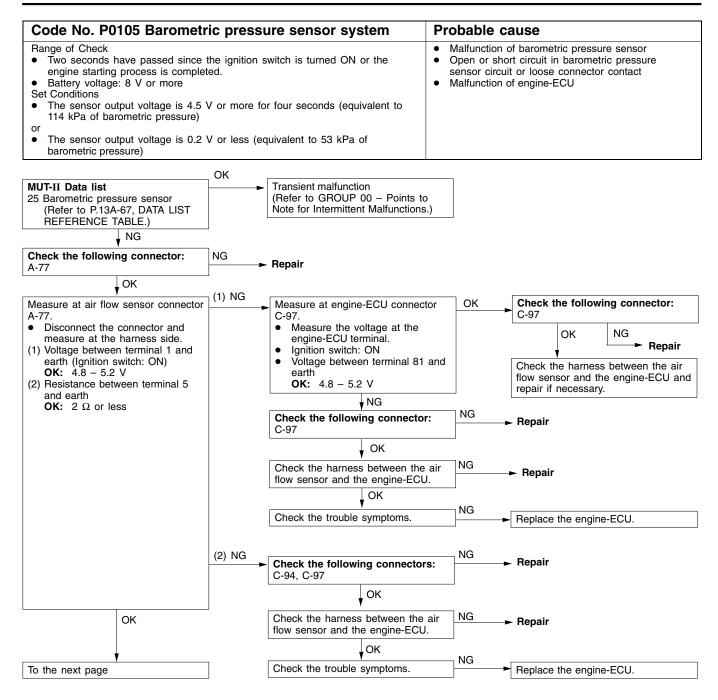
OK

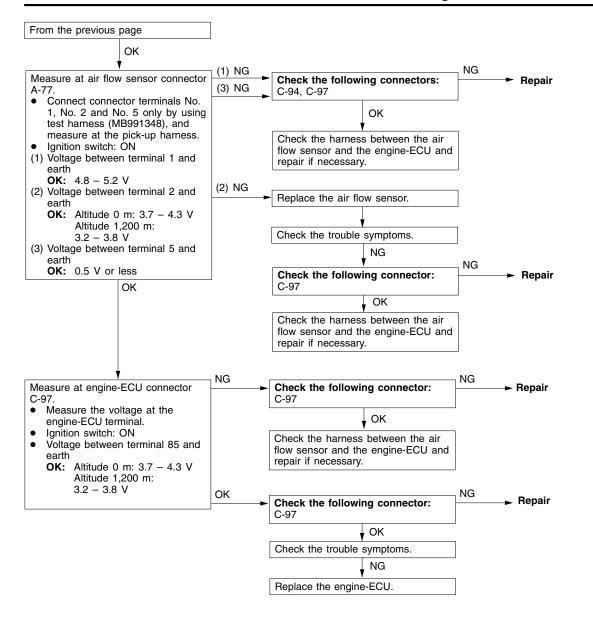
Measure at air flow sensor connector

NG

# 13A-12

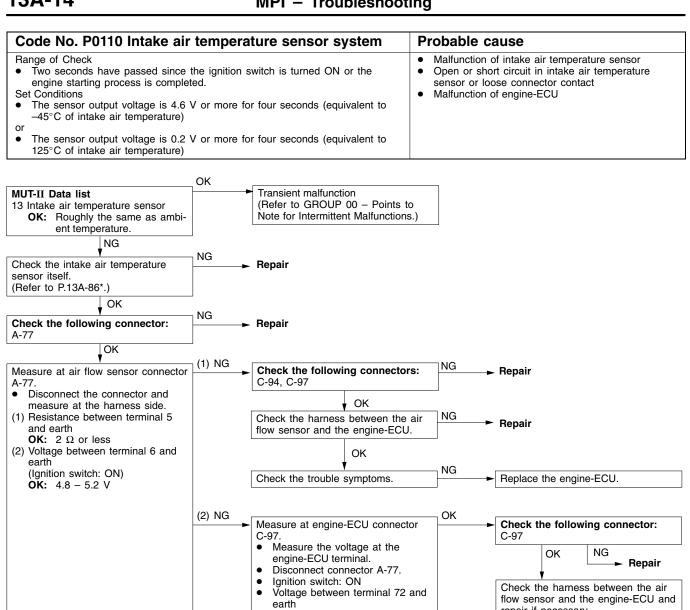
## MPI – Troubleshooting





# 13A-14

## MPI – Troubleshooting



OK: 4.8 - 5.2 V

C-97

NG

OK

OK

Check the following connector:

Check the harness between the air flow sensor and the engine-ECU.

Check the trouble symptoms.

NG

NG

NG

repair if necessary.

Replace the engine-ECU

- Repair

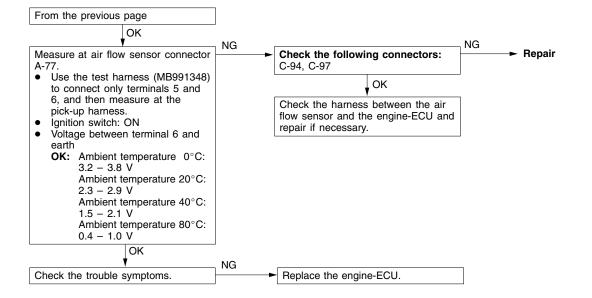
Repair

#### NOTE:

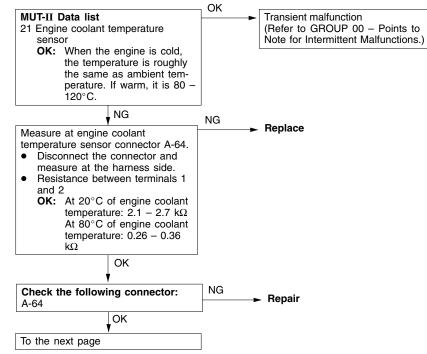
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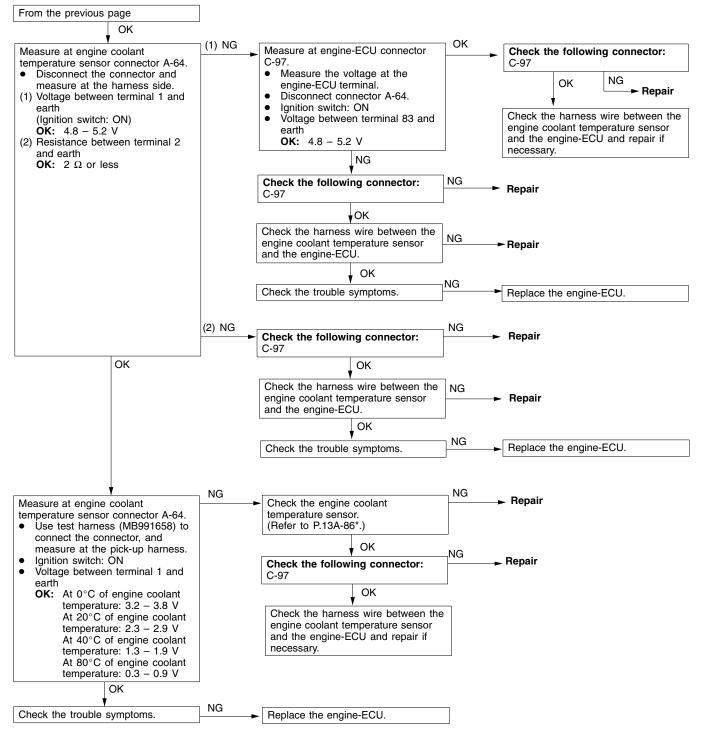
OK





Code No. P0115 Engine coolant temperature sensor system	Probable cause
<ul> <li>Range of Check</li> <li>Engine: Two seconds after the engine has been started</li> <li>Set Conditions</li> <li>The sensor output voltage is 4.6 V or more for four seconds (equivalent to -45°C or lower of engine coolant temperature)</li> <li>or</li> <li>The sensor output voltage is 0.1 V or less for four seconds (equivalent to 140°C or higher of engine coolant temperature)</li> </ul>	<ul> <li>Malfunction of engine coolant temperature sensor</li> <li>Open or short circuit in the engine coolant temperature sensor circuit or loose connector contact</li> <li>Malfunction of engine-ECU</li> </ul>
<ul> <li>Range of Check</li> <li>Engine: After starting</li> <li>Set Conditions</li> <li>The engine coolant temperature has reduced from over 40°C to less than 40°C, and that condition has lasted for five minutes or more.</li> </ul>	

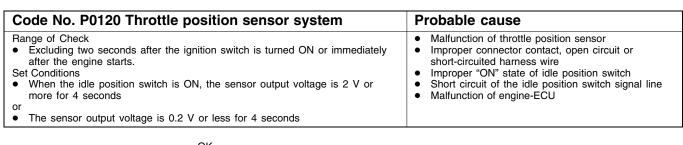


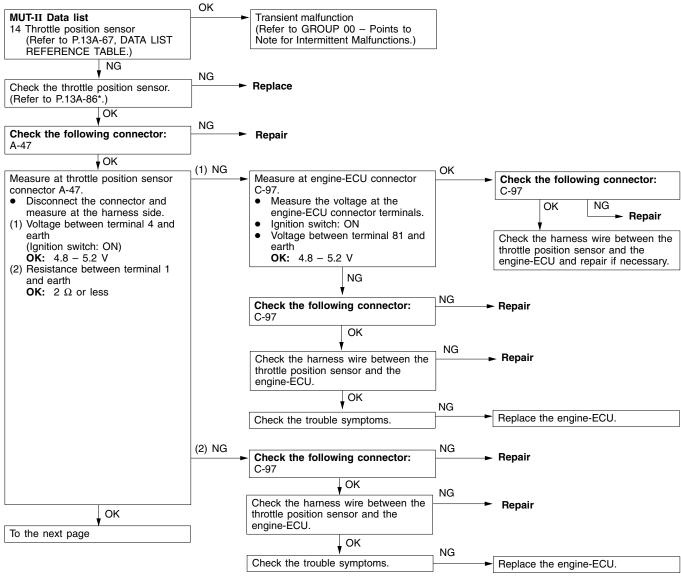


#### NOTE:

# 13A-18

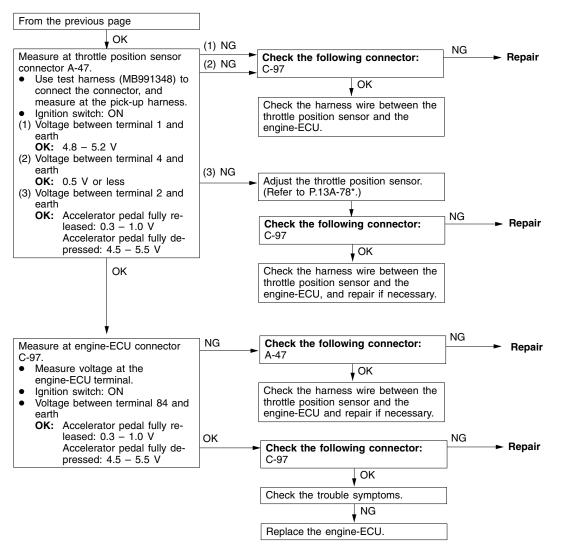
## **MPI** – Troubleshooting





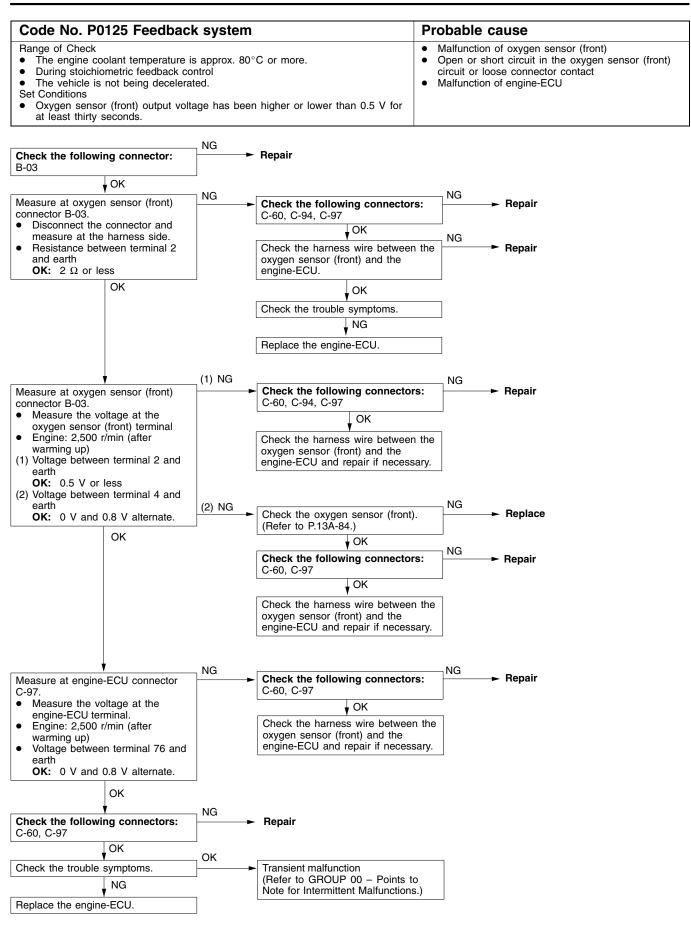
#### NOTE:



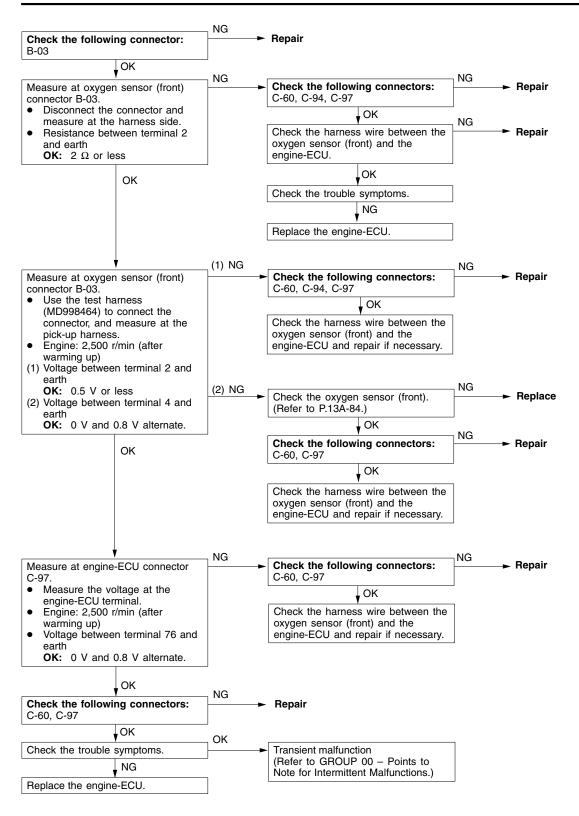


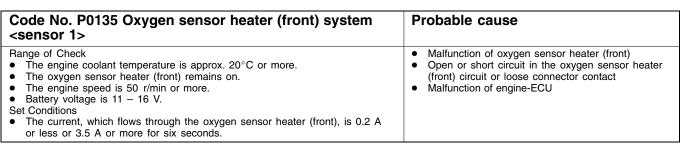
NOTE:

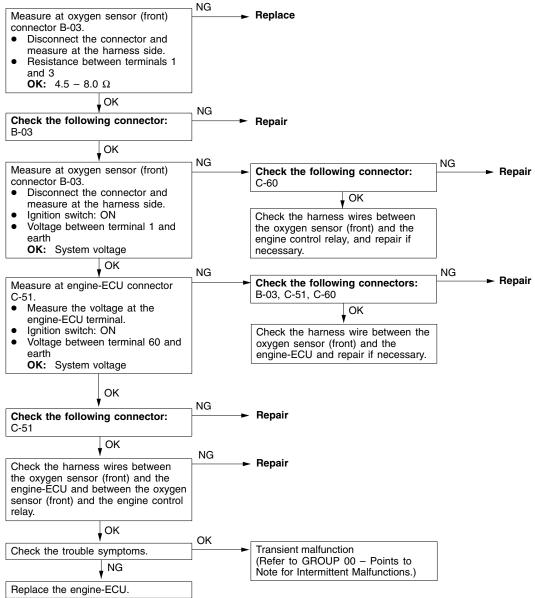
#### **MPI** – Troubleshooting

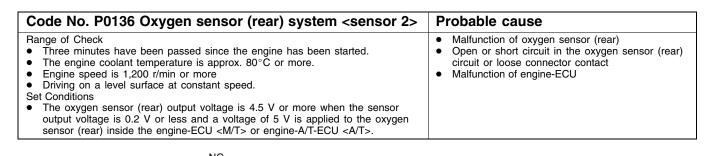


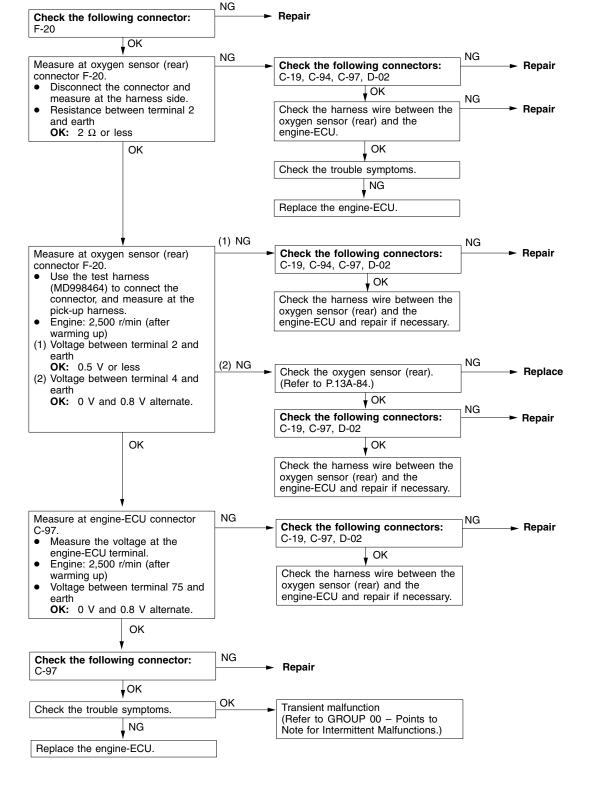
Code No. P0130 Oxygen sensor (front) system <sensor 1=""></sensor>	Probable cause
<ul> <li>Range of Check</li> <li>Three minutes have been passed since the engine has been started.</li> <li>The engine coolant temperature is approx. 80°C or more.</li> <li>Engine speed is 1,200 r/min or more</li> <li>Driving on a level surface at constant speed.</li> <li>Set Conditions</li> <li>The oxygen sensor (front) output voltage is 4.5 V or more when the sensor output voltage is 0.2 V or less and a voltage of 5 V is applied to the oxygen sensor (front) inside the engine-ECU.</li> </ul>	<ul> <li>Malfunction of oxygen sensor (front)</li> <li>Open or short circuit in the oxygen sensor (front) circuit or loose connector contact</li> <li>Malfunction of engine-ECU</li> </ul>
<ul> <li>Range of Check</li> <li>Engine speed is 2,800 r/min or less</li> <li>During driving</li> <li>During air/fuel ratio feedback control</li> <li>Set Conditions</li> <li>The oxygen sensor (front) output frequency is six or less per 10 seconds on average.</li> </ul>	

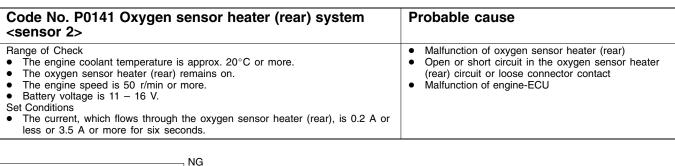


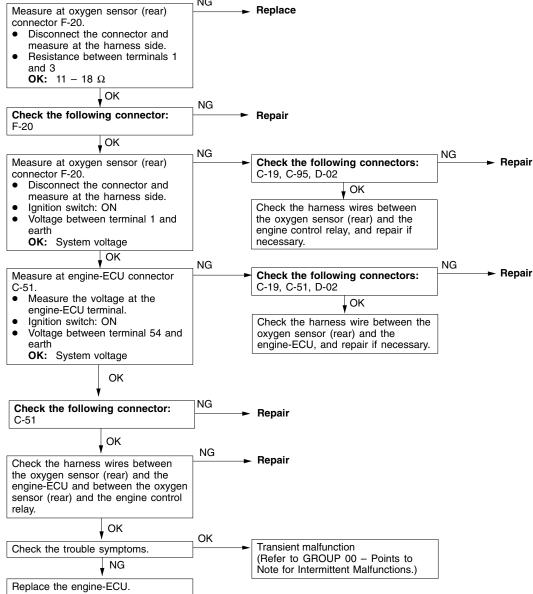






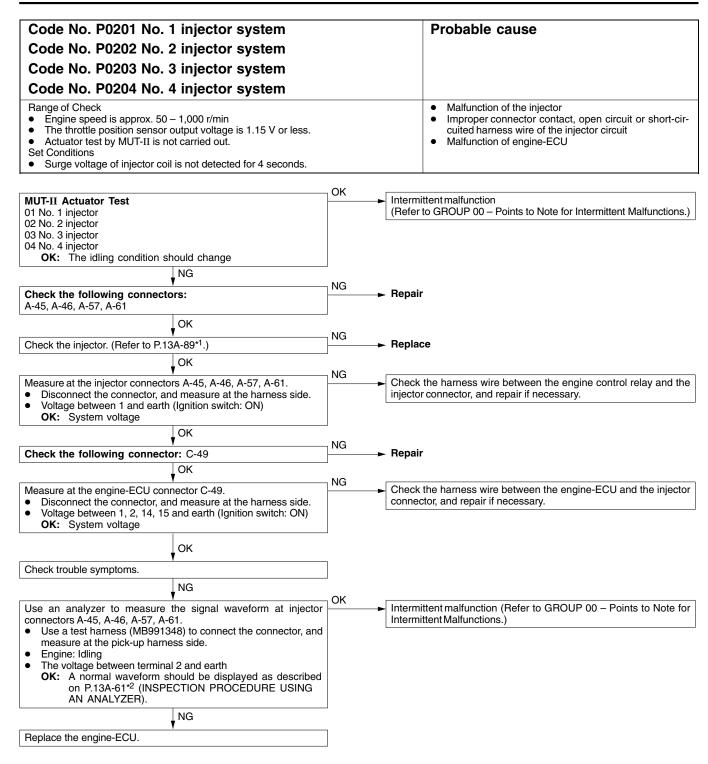






# MPI – Troubleshooting

Code No. P0170 Abnormal fuel system		Probable cause
<ul> <li>Range of Check</li> <li>Engine: Being learning the air/fuel ratio Set Conditions</li> <li>Ten seconds or more have been passed while the fue compensation value is too low.</li> <li>or</li> <li>Ten seconds or more have been passed while the fue compensation value is too high.</li> </ul>		<ul> <li>Malfunction of barometric pressure sensor</li> <li>Malfunction of air flow sensor</li> </ul>
	NG	
MUT-II Data list 13 Intake air temperature sensor (Refer to P.13A-67.) OK		- Check the intake air temperature sensor system. (Refer to P.13A-14, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0110.)
MUT-II Data list 21 Engine coolant temperature sensor (Refer to P.13A-67.)	NG ►	- Check the engine coolant temperature sensor system. (Refer to P.13A-16, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0115.)
MUT-II Data list	NG	- Check the barometric pressure sensor system. (Refer to P.13A-12,
25 Barometric pressure sensor (Refer to P.13A-67.)		INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0105.)
OK	NG	<b>–</b> .
Check the injector (Refer to P.13A-89*.)	」 ¬ NG	- Replace
Check the following connectors: A-45, A-46, A-57, A-61, C-49		- Repair
Check the harness wire between the engine-ECU and the injector connector.	NG►	- Repair
ОК	-	
Check the fuel pressure (Refer to P.13A-81*.)	]	
ОК	More than	
MUT-II Data list 81 Long-term fuel compensation (Refer to P.13A-67.) • Is fuel trim more or less than zero?	zero	Check if air was drawn into the intake system. ► Repair
Less than zero	_	↓ OK
<ul> <li>Mutrui Data list</li> <li>12 Volume air flow sensor (Refer to P.13A-67.)</li> <li>Does the tester indicate more than the standard value?</li> <li>Yes</li> <li>Replace the volume air flow sensor.</li> <li>No</li> <li>Check for fuel leaks from injector.</li> <li>Check for entry of foreign matter (water, kerosene, etc.) into the fuel.</li> <li>OK</li> <li>Replace the volume air flow sensor.</li> </ul>		MUT-II Data list 12 Volume air flow sensor (Refer to P.13A-67.) • Does the tester indi- cate less than the standard value? Yes Replace the volume air flow sensor. • Check the fuel filter and fuel line. • Check the fuel pump (insufficient discharge rate.) • Check for exhaust leaks (oxygen sensor installation section, cracks in exhaust manifold, cracks in front pipe, etc.). • Check for entry of foreign matter (water, kerosene, etc.) into the fuel. • OK
		Replace the engine-ECU.
		Replace the engine-ECU.



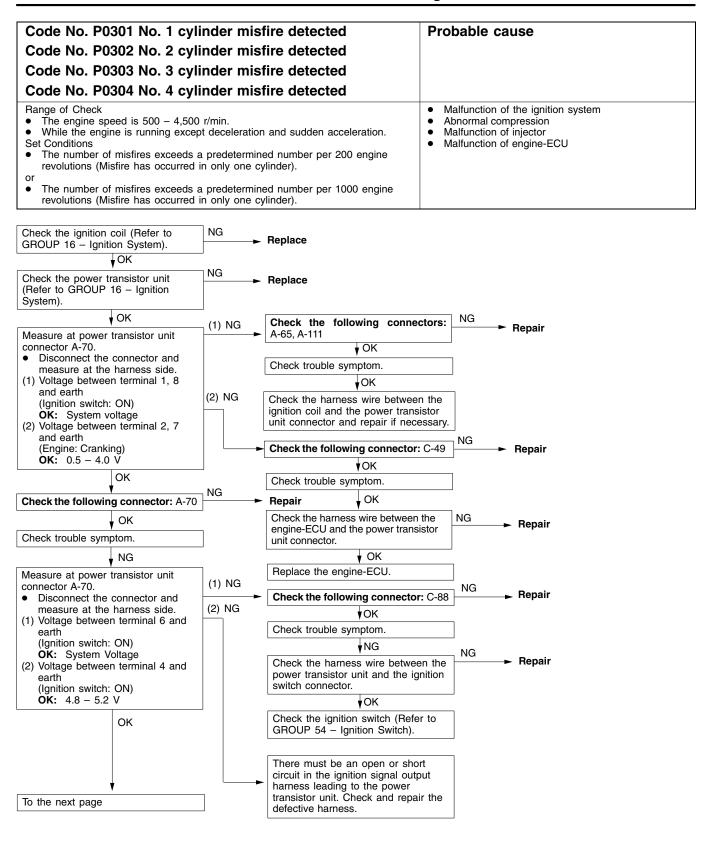
#### NOTE:

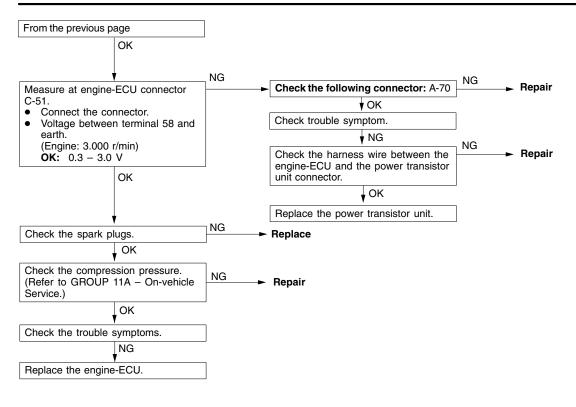
- \*1: Refer to the '97 L200 Workshop Manual (Pub. No. PWTE96E1)
- \*2: Refer to the '98 L200 Workshop Manual (Pub. No. PWTE96E1-B)

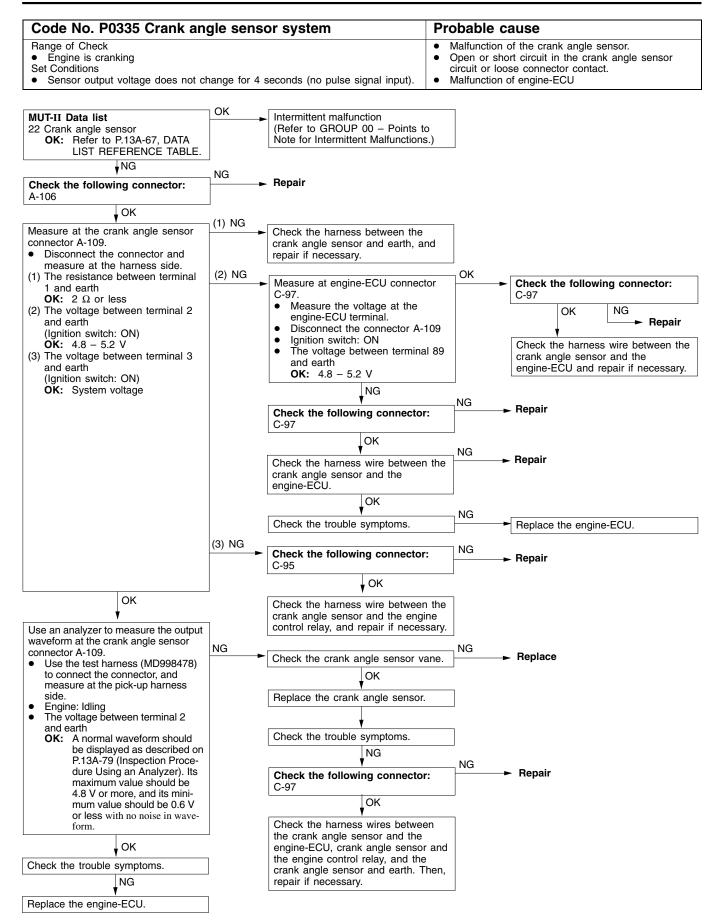
# 13**A-28**

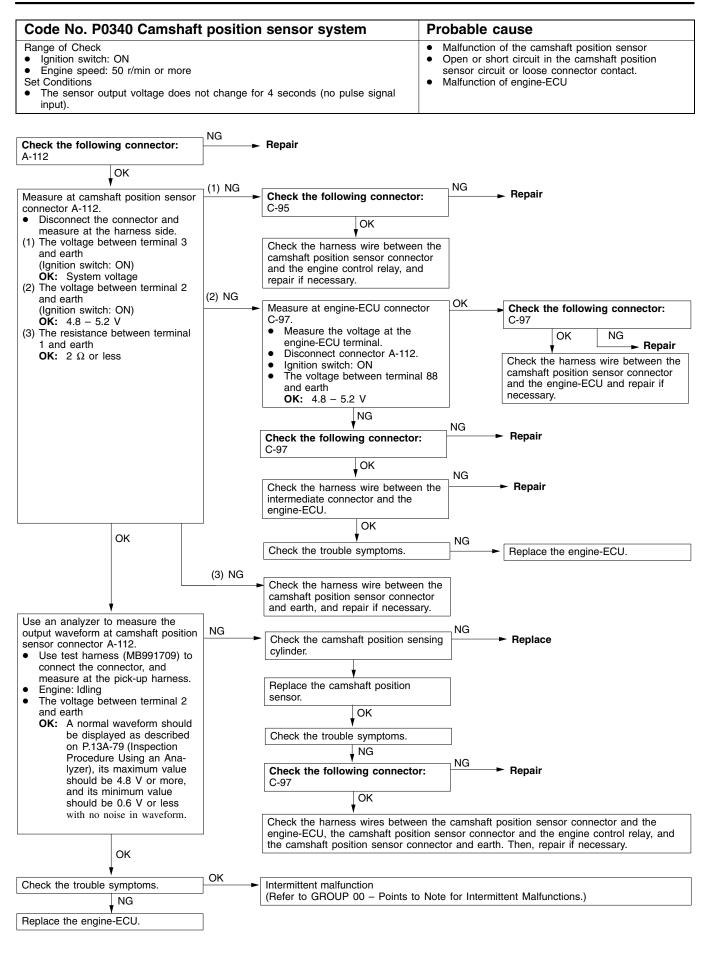
# MPI – Troubleshooting

Code No. P0300 Random cylinder misfire de	etected		Probable cause			
<ul> <li>Range of Check</li> <li>Engine speed is approx. 50 – 4,500 r/min.</li> <li>When the engine is running except deceleration and sudden acceleration Set Conditions</li> <li>The number of misfire exceeds a predetermined number per 200 engine revolutions.</li> <li>The number of misfire exceeds a predetermined number per 1,000 engine revolutions.</li> </ul>			<ul> <li>Malfunction of the ignition system</li> <li>Abnormal compression</li> <li>Malfunction of injector</li> <li>Abnormal signal from the crank angle sensor</li> <li>Malfunction of the air/fuel mixture ratio control system</li> <li>Malfunction of the engine coolant temperature sensor</li> <li>Missing timing belt teeth</li> <li>Malfunction of the EGR valve</li> <li>Malfunction of engine-ECU</li> </ul>			
<ul> <li>MUT-II Data list</li> <li>22 Crankshaft position sensor (Refer to P.13A-67.)</li> <li>Crankshaft position sensor wave form check</li> <li>Engine speed: stable</li> <li>OK: Constant pulse range</li> </ul>	NG	P.13A-3	the crankshaft positron sensor system. (Refer to 31, INSPECTION PROCEDURE FOR DIAGNOSIS P0335.)			
ОК	¬ NG					
Check the injector (Refer to P.13A-89*.)						
OK	¬ NG					
Check the following connectors: A-45, A-46, A-57, A-61, C-49	Repair ►					
ок						
Check the harness wire between the engine-ECU and the injector connector	] <mark>NG</mark> ►	Repair				
ок						
MUT-II Data list 81 Long-term fuel compensation (Refer to P.13A-67.)	NG					
NG		<b>V</b>				
<b>MUT-II Data list</b> 82 Short-term fuel compensation (Refer to P.13A-67.)	NG		the abnormal fuel system (Refer to P.13A-26,			
OK		INSPE	CTION PROCEDURE FOR DIAGNOSIS CODE P0170.)			
¥	1	Ohaali				
<b>MUT-II Data list</b> 21 Engine coolant temperature sensor (Refer to P.13A-67.)	NG	P.13A-	k the engine coolant temperature sensor system (Refer to -16, INSPECTION PROCEDURE FOR DIAGNOSIS			
NG	-	CODE	P0115.)			
<ul> <li>Check the following items:</li> <li>Check the ignition coils, spark plugs, spark plug cables, power transistor unit.</li> <li>Check the compression pressure.</li> <li>Check the timing belt for missing teeth.</li> <li>Check the EGR system and EGR valve.</li> </ul>						

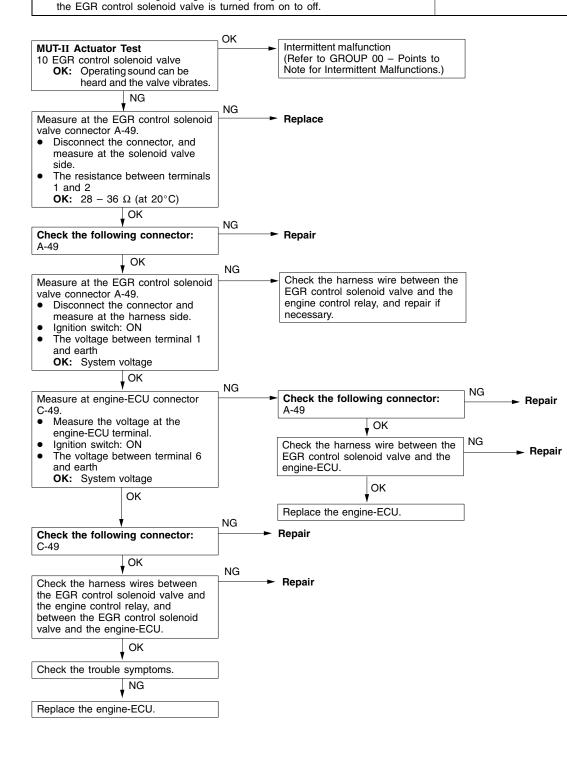






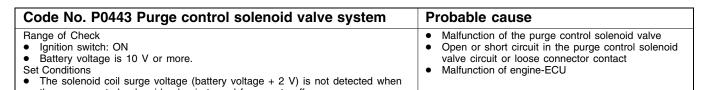


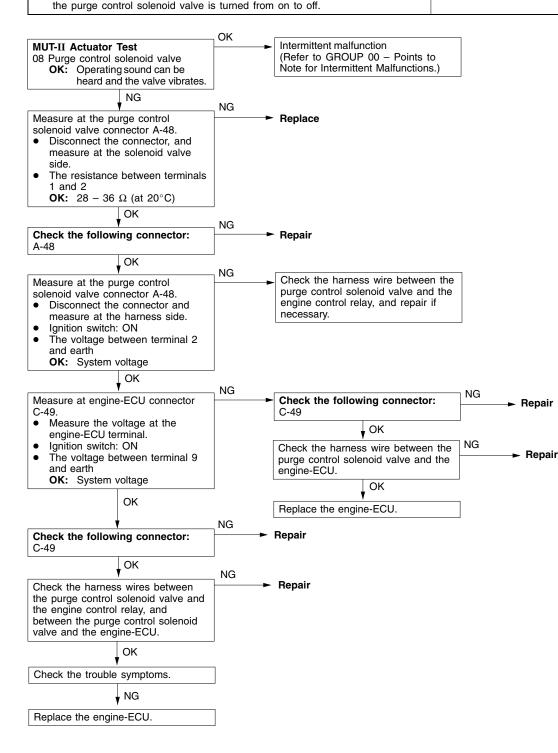
Code No. P0403 EGR control solenoid valve system	Probable cause		
Range of Check <ul> <li>Ignition switch: ON</li> </ul>	<ul> <li>Malfunction of the EGR control solenoid valve</li> <li>Open or short circuit in the EGR control solenoid</li> </ul>		
Battery voltage is 10 V or more.	valve circuit or loose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



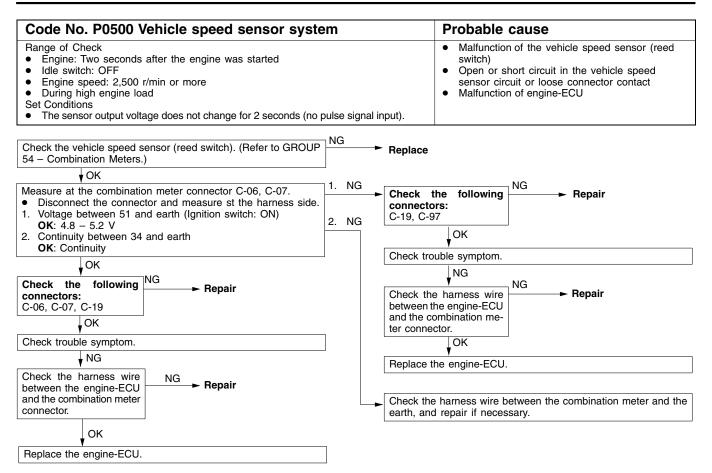
# MPI – Troubleshooting

Code No. P0420 Catalyst malfunction		Pr	obable cause	
<ul> <li>Range of Check</li> <li>The engine speed is 3,000 r/min or less.</li> <li>During driving</li> <li>During air/fuel ratio feedback control Set Conditions</li> <li>The ratio between the oxygen sensor (rear) and the oxyge output frequencies reaches 0.8 per 12 seconds on average</li> </ul>		•	Malfunction of catalyst Malfunction of the oxygen sensor (front) Malfunction of the oxygen sensor (rear) Malfunction of engine-ECU	
	_ NG			
Check the exhaust manifold. (Are there any cracks?)	►	→ Repair		
OK				
MUT-II Data list         59 Oxygen sensor (rear)         Transmission: 2nd gear         Drive with wide open throttle         OK:       600 – 1,000 mV	¬ NG ►	(Refer to P.	oxygen sensor (rear) system <sensor 2=""> 13A-24, INSPECTION PROCEDURE FOR IC TROUBLE CODE P0136.)</sensor>	
ОК	NG			
MUT-II Data list 11 Oxygen sensor (front) OK: 600 – 1,000 mV when racing suddenly	▶	(Refer to P.	oxygen sensor (front) system <sensor 1=""> .13A-21, INSPECTION PROCEDURE FOR IC TROUBLE CODE P0130.)</sensor>	
OK				
<ul> <li>MUT-II Data list</li> <li>11 Oxygen sensor (front)</li> <li>Transmission: 2nd gear</li> <li>OK: Changeover between 0 - 400 mV and 600 - 1,000 mV occur 15 times in 10 seconds.</li> </ul>	_ NG ►	Replace the	e oxygen sensor (front).	
OK				
Replace the oxygen sensor (rear).				
Check the trouble symptoms.				
NG				
Replace the catalytic converter.				
•				
Check the trouble symptoms.				
NG				
Replace the engine-ECU.				

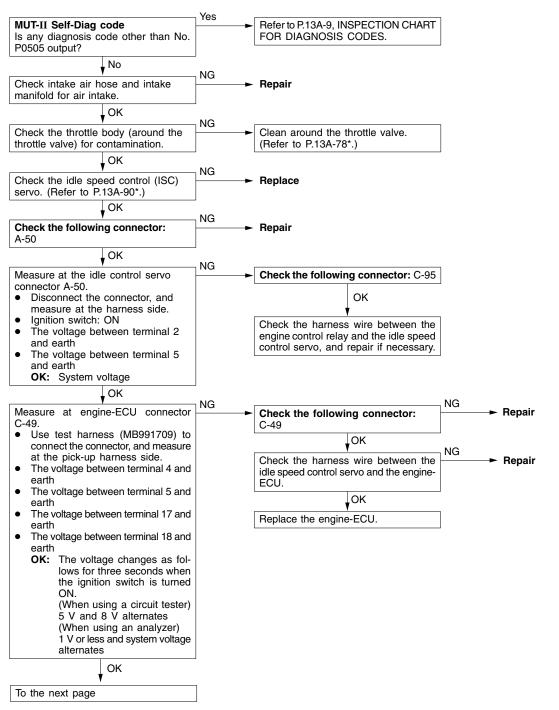




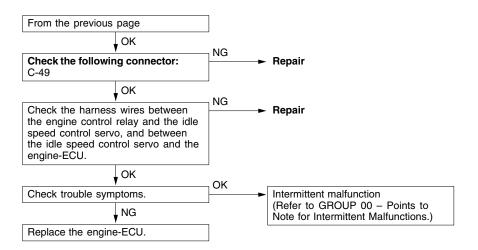




Code No. P0505 Idle speed control (ISC) system	Probable cause		
Check Area Vehicle speed has reached 1.5 km/h at least once. Under the closed loop idle speed control. Judgment Criteria Actual idle speed has continued to be higher than the target idle speed by 300 r/min or more for 10 sec. Check Area Vehicle speed has reached 1.5 km/h at least once. During idle speed closed loop control. The highest temperature at the last drive is 45°C or less. Engine coolant temperature is approx. 80°C or more. Battery voltage is 10 V or more. Judgment Criteria Actual idle speed has been minimum 200 r/min higher than the target idle speed for ten seconds. Check Area During idle speed closed loop control. The highest temperature is -10°C or more. Battery voltage is 10 V or more. Judgment Criteria Actual idle speed closed loop control. Engine coolant temperature is about 80°C or higher. Engine coolant temperature is about 80°C or higher. Battery voltage is 10 V or higher. Power steering switch is off. Volumetric efficiency is 40 % or lower. Barometric pressure is 76 kPa or higher. Intake air temperature is -10°C or more. Actual idle speed has been minimum 100 r/min higher than the target idle speed for ten seconds.	<ul> <li>Malfunction of idle speed control (ISC) servo</li> <li>Improper connector contact, open circuit or short-circuit harness wire</li> <li>Malfunction of engine-ECU</li> </ul>		

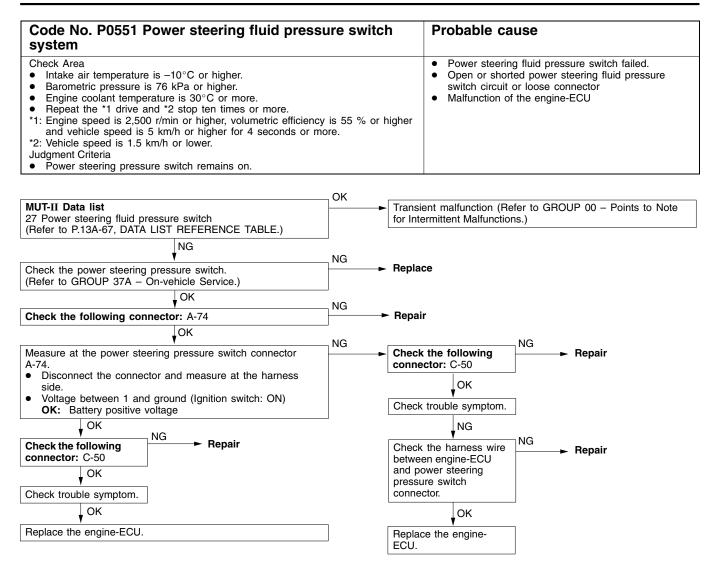


NOTE:



Code No. P0510 Idle position switch syste	em		Probable ca	ause	
<ul> <li>Check Area</li> <li>Throttle position sensor output voltage is 2.0 V or more. Judgment Criteria</li> <li>Idle position switch has been turned on. Check Area</li> <li>Repeat the *1 drive and *2 stop 15 times or more.</li> <li>*1 drive: The vehicle remains under the following conditions seconds; engine speed is 1,500 rpm or higher, air flow s waveform is 100 Hz or higher, and vehicle speed is more two seconds.</li> <li>*2 stop: The vehicle remains under the following conditions seconds; engine speed is 800 rpm or lower, and vehicle 1.5 km/h.</li> <li>Judgment Criteria</li> <li>Idle position switch remains off.</li> </ul>	ensor output e than 30 km/h for at least two	n for			circuit, or
MUT-II Data list 26 Idle position switch (Refer to P.13A-67, DATA LIST REFERENCE TABLE.)	ОК		t malfunction (Rentification in the second sec	efer to GROUP 00 – Poins.)	pints to Note
NG					
Check the idle position switch. (Refer to P.13A-87*.)	NG	Beplace	the throttle posit	tion sensor (TPS).	
Check the following connector: A-47	NG	<ul> <li>Repair</li> </ul>			
OK		•			
<ul> <li>Measure at the throttle position sensor connector A-47.</li> <li>Disconnect the connector, and measure at the harness side.</li> <li>Voltage between 2 and ground (Ignition switch: ON) OK: 4 V or higher</li> </ul>	NG		he following or: C-97	NG ► Repair	
Continuity between 1 and ground     OK: Continuity		Check tr	ouble symptom.		
			NG		
MG ► Repair Check the following connector: C-97			ne harness wire sensor connecto	between engine-ECU a r.	nd throttle
			ок		NG
Check trouble symptom.			the engine-		Repair
		ECU.			
Replace the engine-ECU.					

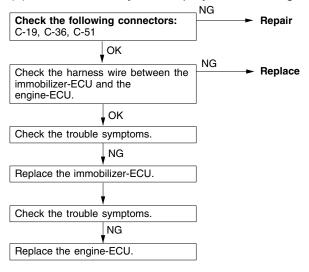
## NOTE:



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

NOTE

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

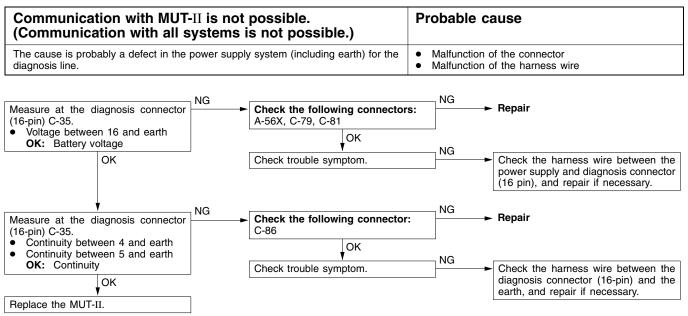


# INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom		Inspection procedure No.	Reference page
Communication with MUT-II is	Communication with all systems is not possible.	1	13A-43
impossible.	Communication with engine-ECU is not possible.	2	13A-43
Engine warning lamp does not illuminate right after the ignition switch is turned to the ON position.		3	13A-44
related parts	The engine warning lamp remains illuminating and never goes out.	4	13A-44
Starting	No initial combustion (Starting impossible)	5	13A-45
	Initial combustion but no complete combustion (Starting impossible)	6	13A-46
	Long time to start (Improper starting)	7	13A-47
Idling stability	Unstable idling (Rough idling, hunting)	8	13A-48
(Improper idling)	Idling speed is high. (Improper idling speed)	9	13A-50
	Idling speed is low. (Improper idling speed)	10	13A-50
Idling stability When the engine is cold, it stalls at idling. (Die out)		11	13A-51
(Engine stalls)	When the engine becomes hot, it stalls at idling. (Die out)	12	13A-52
The engine stalls when starting the car. (Pass out)		13	13A-54
	The engine stalls when decelerating.	14	13A-54
Driving	Hesitation, sag or stumble	15	13A-55
	The feeling of impact or vibration when accelerating	16	13A-56
	The feeling of impact or vibration when decelerating	17	13A-56
	Poor acceleration	18	13A-57
	Surge	19	13A-59
	Knocking	20	13A-60
Dieseling		21	13A-60
Too high CO and	HC concentration when idling	22	13A-61

# INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

# **INSPECTION PROCEDURE 1**



## **INSPECTION PROCEDURE 2**

MUT-II communication with engine-ECU is impossible.	Probable cause	
<ul> <li>One of the following causes may be suspected.</li> <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> <li>Malfunction of engine-ECU power supply circuit</li> <li>Malfunction of engine-ECU</li> <li>Open circuit between the engine-ECU and diagnosi connector</li> </ul>	
Check the following connectors: C-19, C-35, C-51 NG ► Repair	r	

C-19, C-35, C-51	
, ОК	-
Check trouble symptom.	
NG	NG
Check the harness wire between engine-ECU and diagnosis connector.	► Repair
• ОК	
Check the engine-ECU power supply and earth circuit system. (Refer to P.13A-62, INSPECTION PROCEDURE 23.)	

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 lam 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 switc is turned to ON, one of the malfunctions listed at right has probably occurred.		to ON. switch	<ul> <li>Burnt-out bulb</li> <li>Defective warning lamp circuit</li> <li>Malfunction of the engine-ECU</li> </ul>	
	_ NG			
MUT-II Data list 16 engine-ECU power supply voltage (Refer to P.13A-67.)			the engine-ECU power supply and earth circuit. to P.13A-62, INSPECTION PROCEDURE 23.)	
OK	ок	Cheek	the following NG	
<ul> <li>Measure at the engine-ECU connector C-50.</li> <li>Disconnect the connector, and measure at the harness side.</li> <li>Earth the terminal No. 36.</li> <li>OK: The engine warning lamp illuminates.</li> </ul>			the following → Repair ctor: C-50. OK	
NG		Check	trouble symptom.	
Check a burnt-out bulb. NG Replace		Beplac	vG ∎ the engine-ECU.	
	- NG			
<ul> <li>Measure at the combination meter connector C-06.</li> <li>Disconnect the connector, and measure at the harness side.</li> <li>Voltage between 43 and earth (Ignition switch: ON)</li> <li>OK: System voltage</li> </ul>		if nece	the engine warning lamp power supply circuit, and repair ssary.	
OK	J ¬ NG			
Check the following connectors: C-04, C-06, C-19, C-50		- Repair		
ок	- NG		· · · · · · · · · · · · · · · · · · ·	
Check trouble symptom.	╞		the harness wire between combination meter and engine- and repair if necessary.	

# **INSPECTION PROCEDURE 4**

The engine warning lamp remains illuminati goes out.	r 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.		
MUT-II Self-Diag code Are diagnosis codes displayed?	Yes Ret	er to P.13A-9, INSPECTION CHART FOR DIAGNOSIS CODES
No Measure at the combination meter connector C-04. Disconnect the connector, and measure at the harness side. Disconnect the engine-ECU connector Continuity between 8 and earth OK: No continuity		eck the harness wire between combination meter and engine- U connector, and repair if necessary.
OK	_	
Replace the engine-ECU.		

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> <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>	
	_ NG			
Check battery voltage when cranking. <b>OK:</b> 8 V or higher	<b>•</b>	Check	the battery. (Refer to GROUP 54 - Battery.)	
ОК				
Is immobilizer-ECU diagnosis code displayed?	_ Yes ┣───►		the immobilizer.	
No		(Refer to GROUP 54 – Ignition Key and Immobilizer.)		
MUT-II Data list 16 Power supply voltage (Refer to P.13A-67.)	_ NG ►		the power supply and ignition switch-IG system. to P.13A-62, INSPECTION PROCEDURE 23.)	
ОК				
Does the camshaft rotate at the engine cranking? (When oil filler cap is removed.)	_ No  ►	Check	timing belt for breakage.	
Yes	_ _ Yes			
MUT-II Self-Diag code Are diagnosis codes displayed?	<b></b>	- Refer CODE	to P.13A-9, INSPECTION CHART FOR DIAGNOSIS S.	
No	_ No			
MUT-II Data list 22 Crank angle sensor OK: Cranking speed is displayed			the crank angle sensor system. (Refer to P.13A-31, INSPEC- PROCEDURE FOR DIAGNOSIS CODE P0335.)	
ОК	_ ⊣ NG			
MUT-II Actuator test 07 Fuel pump (Refer to P.13A-72.)			the fuel pump system. to P.13A-63, INSPECTION PROCEDURE 25.)	
ОК				
MUT-II Data list 21 Engine coolant temperature sensor (Refer to P.13A-67.)	_NG ►	Check the engine coolant temperature sensor system	to P.13A-16, INSPECTION PROCEDURE FOR DIAGNOSIS	
ОК	_ No			
Can any sound be heard from the injectors when cranking? Yes			the injector system. (Refer to P.13A-27, INSPECTION PRO- RE FOR DIAGNOSIS CODE P0201, P0202, P0203, P0204.)	
Y	No	Ohaala		
<ul> <li>Measure at the ignition coil connectors A-65 and A-111.</li> <li>Connectors connected</li> <li>Check by connecting the timing light to terminal 1 of each connector (Engine: Cranking)</li> <li>OK: The timing light flashes.</li> </ul>			the ignition circuit system. (Refer to P.13A-66, INSPECTION EDURE 28.)	
ок				
<ul> <li>Check the following items.</li> <li>Check the ignition coil, spark plugs, spark plug cables.</li> <li>Check if the injectors are clogged.</li> <li>Check if foreign materials (water, alcohol, etc.) got into fuel.</li> </ul>				

Check the compression pressure. Check the immobilizer system. •

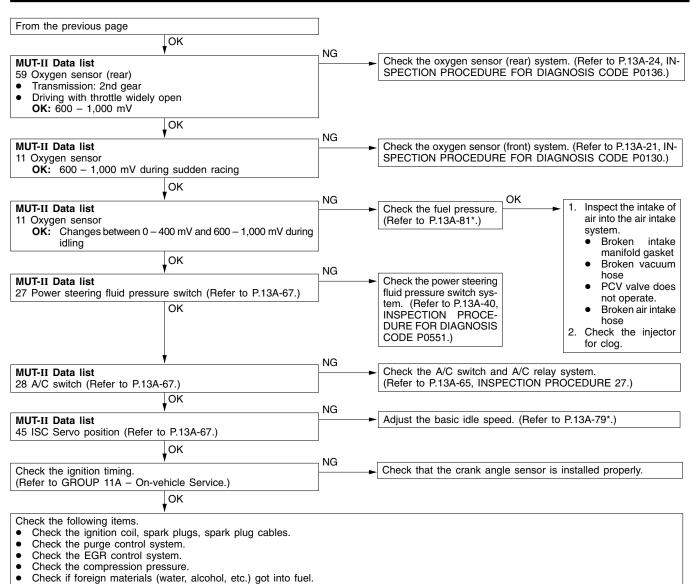
Initial combustion but no complete combus (Starting impossible)	Probable cause	
In such cases as the above, the cause is probably that the spark plugs are generating sparks but the sparks are weak, or the initial mixture for starting is not appropriate.		
	_ NG	
Check battery voltage when cranking. OK: 8 V or higher	<b></b>	Check the battery. (Refer to GROUP 54 – Battery.)
ок	_ Yes	
MUT-II Self-Diag code Are diagnosis codes displayed?		- Refer to P.13A-9, INSPECTION CHART FOR DIAGNOSIS CODE.
No	NG I	[ <u>•</u>
MUT-II Actuator test 07 Fuel pump (Refer to P.13A-72.)		- Check the fuel pump system. (Refer to P.13A-63, INSPECTION PROCEDURE 25.)
ОК	NG I	
MUT-II Data list 21 Engine coolant temperature sensor (Refer to P.13A-67.)		Check the engine coolant temperature sensor system. (Refer to P.13A-16, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0115.)
ок	ן NG ו	
MUT-II Data list 18 Ignition switch-ST (Refer to P.13A-67.)		- Check the ignition switch-ST system. (Refer to P.13A-65, INSPECTION PROCEDURE 26.)
ОК	, NG	[]
Can any sound be heard from the injectors when cranking?	╞	- Check the injector system. (Refer to P.13A-27, INSPECTION PRO- CEDURE FOR DIAGNOSIS CODE P0201, P0202, P0203, P0204.)
Is starting good if the engine is cranked with the accelerator pedal	Yes	Check ISC servo for op-
slightly depressed?		eration sound. (Refer to P.13A-90*.) tem. (Refer to P.13A-37, INSPECTION PROCE-
		OK DURE FOR DIAGNOSIS CODE P0505.)
		<ul> <li>Clean the throttle valve area. (Refer to P.13A-78*.)</li> <li>Check and adjust the fixed SAS. (Refer to P.13A-79*.)</li> </ul>
Check the ignition timing when cranking. <b>OK:</b> Approx. 5°BTDC	NG ►	Check that the crank angle sensor is installed properly.
ок		
<ul> <li>Check the following items.</li> <li>Check the ignition coil, spark plugs, spark plug cables.</li> <li>Check if the injectors are clogged.</li> <li>Check the compression pressure.</li> <li>Check fuel lines for clogging.</li> <li>Check if foreign materials (water, alcohol, etc.) got into fuel.</li> </ul>		

It takes too long time to start. (Incorrect starting)			Probable cause
In cases such as the above, the cause is probably that the spark is weak and ignition is difficult, the initial mixture for starting is not appropriate, or sufficient compression pressure is not being obtained.		ssion	<ul> <li>Malfunction of the ignition system</li> <li>Malfunction of the injector system</li> <li>Inappropriate gasoline use</li> <li>Poor compression</li> </ul>
Check battery voltage when cranking OK: 8 V or higher	NG	Check tl	ne battery. (Refer to GROUP 54 – Battery.)
MUT-II Self-Diag code Are diagnosis codes displayed?	Yes	Refer to	P.13A-9, INSPECTION CHART FOR DIAGNOSIS CODE.
MUT-II Actuator test 07 Fuel pump (Refer to P.13A-72.)	NG ►		he fuel pump system. p P.13A-63, INSPECTION PROCEDURE 25.)
OK MUT-II Data list 21 Engine coolant temperature sensor (Refer to P.13A-67.)	NG ►►		ne engine coolant temperature sensor system. P.13A-16, INSPECTION PROCEDURE FOR DIAGNOSIS
MUT-II Data list	└CODE NG Check		P0115.) ne ignition switch-ST system.
18 Ignition switch-ST (Refer to P.13A-67.)			P.13A-65, INSPECTION PROCEDURE 26.)
Can any sound be heard from the injectors when cranking?	NG	CEDURI	e injector system. (Refer to P.13A-27, INSPECTION PRO- E FOR DIAGNOSIS CODE P0201, P0202, P0203, P0204.)
Check the ignition timing when cranking. <b>OK:</b> Approx. 5°BTDC		Check ti	hat the crank angle sensor is installed properly.
Check the following items. • Check the ignition coil, spark plugs, spark plug cables. • Check if the injectors are clogged. • Check the compression pressure.			

• Check if foreign materials (water, alcohol, etc.) got into fuel.

Unstable idling (Rough idling, hunting)	Probable cause	
In cases as the above, the cause is probably that the ignition system, air/fuel mixt idle speed control (ISC) or compression pressure is defective. Because the range of possible causes is broad, inspection is narrowed down to sir items.		<ul> <li>Malfunction of air/fuel ratio control system</li> </ul>
	_ Yes	
Were the battery terminals disconnected?	<b>→</b>	After warming-up, let the engine run at idling for 10 minutes.
No	Vee	
MUT-II Self-Diag code Are diagnosis codes displayed?	Yes	Refer to P.13A-9, INSPECTION CHART FOR DIAGNOSIS
No	M	
Does idling speed fluctuate excessively?	_ Yes  ──►	Clean the throttle body. (Refer to P.13A-78*.)
No		¥
		Check and adjust the fixed SAS. (Refer to P.13A-79*.)
		Check trouble symptom.
		NG
		<ul> <li>Inspect the intake of air into the air intake system</li> <li>Broken intake manifold gasket</li> </ul>
		Broken air intake hose
		Broken vacuum hose
		• Positive crankcase ventilation valve does not operate.
Check the ISC servo for operation sound. (Refer to P.13A-90*.)	_ NG  ►	Check the ISC system. (Refer to P.13A-37, INSPECTION PROCE
ОК		DURE FOR DIÁGNOSIS CODE P0505.)
	NG	Check the injector system (Defects D 104.07, INCDECTION DDC
Check the injector for operation sound.	▶	<ul> <li>Check the injector system. (Refer to P.13A-27, INSPECTION PRC CEDURE FOR DIAGNOSIS CODE P0201, P0202, P0203, P0204.</li> </ul>
<b>I</b>	¬ NG	
MUT-II Data list 26 Idle position switch (Refer to P.13A-67.)		- Check the idle position switch system. (Refer to P.13A-39, INSPEC TION PROCEDURE FOR DIAGNOSIS CODE P0510.)
ОК	¬ NG	
MUT-II Data list 13 Intake air temperature sensor (Refer to P.13A-67.)		Check the intake air temperature sensor system. (Refer to P.13A-14 INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0110.)
OK	NO	
MUT-II Data list 25 Barometric pressure sensor (Refer to P.13A-67.)	_NG ►	Check the barometric pressure sensor system. (Refer to P.13A-12 INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0105.)
OK	-	
MUT-II Data list 21 Engine coolant temperature sensor (Refer to P.13A-67.)	NG	Check the engine coolant temperature sensor system. (Refer to P.13A-16, INSPECTION PROCEDURE FOR DIAGNOSIS
ОК		CODE P0115.)
MUT-II Actuator test 08 Purge control solenoid valve (Refer to P.13A-72.)	NG	<ul> <li>Check the purge control solenoid valve system (Refer to P.13A-35, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0443.)</li> </ul>
OK	_ NG	
MUT-II Actuator test 10 EGR control solenoid valve (Refer to P.13A-72.)		Check the EGR control solenoid valve system. (Refer to P.13A-33 INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0403.)
To the next page	7	

# NOTE:



### NOTE:

Idling speed is high. (Improper idling speed	)	Probable cause
In such cases as the above, the cause is probably that the intak idling is too great.	e air volume du	<ul> <li>Malfunction of the ISC system</li> <li>Malfunction of the throttle body</li> </ul>
MUT-II Self-Diag code Are diagnosis codes displayed? No Check the ISC servo for operation sound. (Refer to P.13A-90*.) OK MUT-II Data list 26 Idle position switch (Refer to P.13A-67.)		tefer to P.13A-9, INSPECTION CHART FOR DIAGNOSIS CODES. Check the ISC system. (Refer to P.13A-37, INSPECTION PROCE- URE FOR DIAGNOSIS CODE P0505.) Check the idle position switch system. (Refer to P.13A-39, INSPEC- ION PROCEDURE FOR DIAGNOSIS CODE P0510.)
OK MUT-II Data list 21 Engine coolant temperature sensor (Refer to P.13A-67.) OK MUT-II Data list 28 A/C switch (Refer to P.13A-67.) OK Basic idle adjustment (Refer to P.13A-79*.)		check the engine coolant temperature sensor system. Refer to P.13A-16, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0115.) Check the A/C switch and A/C relay system. Refer to P.13A-65, INSPECTION PROCEDURE 27.)
Check trouble symptom.		Clean the throttle valve area. (Refer to P.13A-78*.)

## NOTE:

\*: Refer to the '97 L200 Workshop Manual (Pub. No. PWTE96E1)

# **INSPECTION PROCEDURE 10**

Idling speed is low. (Improper idling speed)		I	Probable cause
In cases such as the above, the cause is probably that the intak- idling is too small.	e air volume di	uring	<ul><li>Malfunction of the ISC system</li><li>Malfunction of the throttle body</li></ul>
MUT-II Self-Diag code Are diagnosis codes displayed? No Check the ISC servo for operation sound. (Refer to P.13A-90*.) OK MUT-II Data list 26 Idle position switch (Refer to P.13A-67.) VOK MUT-II Data list 21 Engine coolant temperature sensor (Refer to P.13A-67.)	] NG → [ ] NG → [ ] NG →	CODES. Check the DURE Fo Check the TION PR	P.13A-9, INSPECTION CHART FOR DIAGNOSIS e ISC system. (Refer to P.13A-37, INSPECTION PROCE- OR DIAGNOSIS CODE P0505.) e idle position switch system. (Refer to P.13A-18, INSPEC- CCEDURE FOR DIAGNOSIS CODE P0120.) e engine coolant temperature sensor system. P.13A-16, INSPECTION PROCEDURE FOR DIAGNOSIS 0115.)
OK Basic idle adjustment (Refer to P.13A-79*.)			e throttle valve area. (Refer to P.13A-78*.)

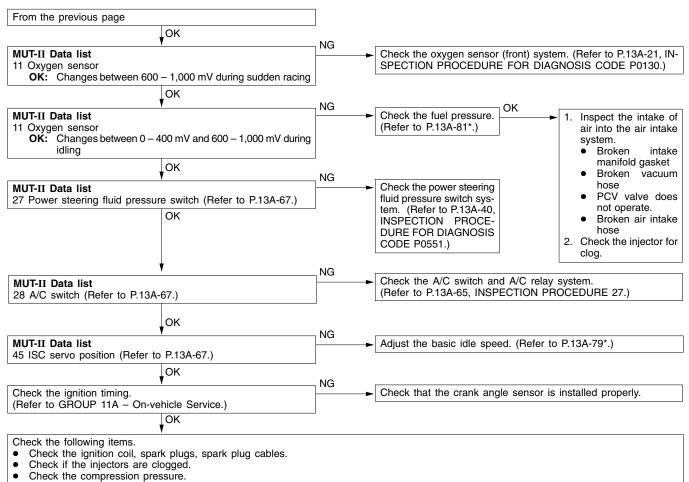
### NOTE:

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> <li>Malfunction of the ISC system</li> <li>Malfunction of the throttle body</li> <li>Malfunction of the injector system</li> <li>Malfunction of the ignition system</li> </ul>		
	N/ -			
Were the battery terminals disconnected?	Yes	After v	warming-up, let the engine run at idling for 10 minutes.	
No				
MUT-II Self-Diag code Are diagnosis codes displayed?	Yes	Refer CODE	to P.13A-9, INSPECTION CHART FOR DIAGNOSIS	
No	_ Yes			
Does the engine stall right after the accelerator pedal is released?			the throttle valve Check and adjust the	
No		area. (Refer	to P.13A-78*.) fixed SAS. (Refer to P.13A-79*.)	
Is engine-idling stable after the warming-up?	_No ►	Check	if the unstable idling (Rough idling, hunting).	
Yes		(Refer	to P.13A-48, INSPECTION PROCEDURE 8.)	
Check the ISC servo for operation sound. (Refer to P.13A-90*.)	NG		Check the ISC system. (Refer to P.13A-37, INSPECTION PROC	
OK		DURE	FOR DIAGNOSIS CODE P0505.)	
Check the injector for operation sound.	NG	Check the injector system. (Refer to P.13A-27, INSPECTION PRO-		
ОК		CEDURE FOR DIAGNOSIS CODE P0201, P0202, P0203, P0204.)		
MUT-II Data list 26 Idle position switch (Refer to P.13A-67.)	NG	G Check the idle position switch system. (Refer to P.13A-39, INSP TION PROCEDURE FOR DIAGNOSIS CODE P0510.)		
ΓΟΚ	_		,	
MUT-II Data list 21 Engine coolant temperature sensor (Refer to P.13A-67.)	NG ►	Check the engine coolant temperature sensor system.     (Refer to P.13A-16, INSPECTION PROCEDURE FOR DIAGNOS		
ОК	_	CODE	P0115.)	
MUT-II Actuator test 10 EGR control solenoid valve (Refer to P.13A-72.)	NG►		the EGR control solenoid valve system. (Refer to P.13A-33, ECTION PROCEDURE FOR DIAGNOSIS CODE P0403.)	
ОК				
Check the fuel pressure. (Refer to P.13A-81*.)	]			
ОК				
Check the ignition timing. (Refer to GROUP 11A – On-vehicle Service.)	NG	Check	that the crank angle sensor is installed properly.	
ОК				
<ul> <li>Check the following items.</li> <li>Check the ignition coil, spark plugs, spark plug cables.</li> <li>Check the compression pressure.</li> <li>Check the engine oil viscosity.</li> </ul>				

# NOTE:

When the engine is hot, it stalls at idling. (Die out)			Probable cause	
In such cases as the above, the cause is probably that ignition system, air/fuel mixture, idle speed control (ISC) or compression pressure is defective. In addition, if the engine suddenly stalls, the cause may also be a defective connector contact.		<ul> <li>Malfunction of the ignition system</li> <li>Malfunction of air/fuel ratio control system</li> <li>Malfunction of the ISC system</li> <li>Drawing air into intake system</li> <li>Improper connector contact</li> </ul>		
	Yes			
Were the battery terminals disconnected?	<u>}</u>	After v	varming-up, let the engine run at idling for 10 minutes.	
No	Yes			
MUT-II Self-Diag code Are diagnosis codes displayed?		Refer CODE	to P.13A-9, INSPECTION CHART FOR DIAGNOSIS S.	
No		L		
Check the ISC servo for operation sound. (Refer to P.13A-90*.)	NG►		the ISC system. (Refer to P.13A-37, INSPECTION PROCE-	
ОК		DURE	FOR DIAGNOSIS CODE P0505.)	
Check the injector for operation sound.	NG		the injector system. (Refer to P.13A-27, INSPECTION PRO-	
ОК	-	CEDU	RE FOR DIAGNOSIS CODE P0201, P0202, P0203, P0204.)	
Does the engine stall right after the accelerator pedal is released?	Yes ►		the throttle valve	
No		area. (Refer	to P.13A-78*.) fixed SAS. (Refer to P.13A-79*.)	
	No			
Does the engine stall easily again? Yes		to GRC	carrying out an intermittent malfunction simulation test (Refer DUP 00 – Points to Note for Intermittent Malfunctions.), check Iden changes in the signals shown below.	
		<ul> <li>Crank angle sensor signal</li> <li>Air flow sensor signal</li> <li>Injector drive signal</li> <li>Primary and secondary ignition signal</li> <li>Fuel pump drive signal</li> <li>Engine-ECU power supply voltage</li> </ul>		
MUT-II Data list	NG	Check	the idle position switch system. (Refer to P.13A-39, INSPEC-	
26 Idle position switch (Refer to P.13A-67.)			PROCEDURE FOR DIAGNOSIS CODE P0510.)	
ок	NG			
MUT-II Data list 13 Intake air temperature sensor (Refer to P.13A-67.)			the intake air temperature sensor system. (Refer to P.13A-14, CTION PROCEDURE FOR DIAGNOSIS CODE P0110.)	
ок	NG			
MUT-II Data list 25 Barometric pressure sensor (Refer to P.13A-67.)	►		the barometric pressure sensor system. (Refer to P.13A-12, CTION PROCEDURE FOR DIAGNOSIS CODE P0105.)	
ok	NG			
MUT-II Data list 21 Engine coolant temperature sensor (Refer to P.13A-67.)		(Refer	the engine coolant temperature sensor system. to P13A-16, INSPECTION PROCEDURE FOR DIAGNOSIS	
ОК		CODE	P0115.)	
MUT-II Actuator test 10 EGR control solenoid valve (Refer to P.13A-72.)	NG ►		the EGR control solenoid valve system. (Refer to P.13A-33, CTION PROCEDURE FOR DIAGNOSIS CODE P0403.)	
ОК				
<ul> <li>MUT-II Data list</li> <li>59 Oxygen sensor (rear)</li> <li>Transmission: 2nd gear</li> <li>Driving with throttle widely open OK: 600 - 1,000 mV</li> </ul>	NG ▶		the oxygen sensor (rear) system. (Refer to P.13A-24, IN- TION PROCEDURE FOR DIAGNOSIS CODE P0136.)	
	7			
To the next page				

# NOTE:



• Check if foreign materials (water, alcohol, etc.) got into fuel.

#### NOTE:

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> <li>ark,</li> <li>Drawing air into intake system</li> <li>Malfunction of the ignition system</li> </ul>
MUT-II Self-Diag code	Yes	Refer to P.13A-9, INSPECTION CHART FOR DIAGNOSIS
Are diagnosis codes displayed?		CODES.
No		
MUT-II Actuator test 10 EGR control solenoid valve (Refer to P.13A-72.)		Check the EGR control solenoid valve system. (Refer to P.13A-33, NSPECTION PROCEDURE FOR DIAGNOSIS CODE P0403.)
ОК		
<ul> <li>Check the following items.</li> <li>Check the ignition coil, spark plugs, spark plug cables.</li> <li>Check if air was drawn into the intake system. Broken intake manifold gasket Broken or disconnected vacuum hose Improper operation of the PCV valve Broken air intake hose</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) system.	Malfunction of the ISC system
Yes	
	varming-up, let the engine run at idling for 10 minutes.

No	Yes	
MUT-II Self-Diag code Are diagnosis codes displayed?	res	Refer to P.13A-9, INSPECTION CHART FOR DIAGNOSIS CODES.
No		CODES.
	NG	
MUT-II Data list 26 Idle position switch (Refer to P.13A-67.)	-	Check the idle position switch system. (Refer to P.13A-39, INSPEC- TION PROCEDURE FOR DIAGNOSIS CODE P0510.)
OK	_ ¬ NG	
MUT-II Data list 14 Throttle position sensor (Refer to P.13A-67.)	►	Check the throttle position sensor system. (Refer to P.13A-18, IN- SPECTION PROCEDURE FOR DIAGNOSIS CODE P0120.)
ОК	Yes	
MUT-II Data list 45 ISC servo position		Check the vehicle speed sensor system. (Refer to P.13A-36, IN- SPECTION PROCEDURE FOR DIAGNOSIS CODE P0500.)
<ul> <li>Is the idle speed control (ISC) servo position drops to 0 – 2 steps when decelerating (engine r/min less than 1,000)?</li> </ul>		· · · · · · · · · · · · · · · · · · ·
No	- ¬ NG	
MUT-II Actuator test	►	Check the EGR control solenoid valve system. (Refer to P.13A-33,
10 EGR control solenoid valve (Refer to P.13A-72.)		INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0403.)
OK		
Check the following items. • Check the ignition coil, spark plugs, spark plug cables.		

Clean the throttle valve area.Check and adjust the fixed SAS.

Hesitation, sag or stumble		Probable cause				
In cases such as the above, the cause is probably that ignition sys or compression pressure is defective.	tem, air/fuel mi	ixture	<ul> <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>			
	_ Yes _					
MUT-II Self-Diag code Are diagnosis codes displayed?		Refer CODE	to P.13A-9, INSPECTION CHART FOR DIAGNOSIS S.			
No						
Check the injectors for operation sound.	] <mark>───</mark> ►	Check	the injector system. (Refer to P.13A-27, INSPECTION PRO-			
ок		CEDU	RE FOR DIAGNOSIS CODE P0201, P0202, P0203, P0204.)			
Check the ignition timing. (Refer to GROUP 11A – On-vehicle Service.)	NG ┣──►	Check	that the crank angle sensor is installed properly.			
ОК						
MUT-II Data list 26 Idle position switch (Refer to P.13A-67.)	NG►	(Refer	the idle position switch system. to P.13A-39, INSPECTION PROCEDURE FOR DIAGNOSIS			
ок		CODE	P0510.)			
MUT-II Data list 13 Intake air temperature sensor (Refer to P.13A-67.)	NG		the intake air temperature sensor system. (Refer to P.13A-14, CTION PROCEDURE FOR DIAGNOSIS CODE P0110.)			
ОК						
MUT-II Data list 25 Barometric pressure sensor (Refer to P.13A-67.)	NG►	Check INSPE	the barometric pressure sensor system. (Refer to P.13A-12, CTION PROCEDURE FOR DIAGNOSIS CODE P0105.)			
ок	_ _ NG _					
MUT-II Data list 21 Engine coolant temperature sensor (Refer to P.13A-67.)		(Refer	the engine coolant temperature sensor system. to P.13A-16, INSPECTION PROCEDURE FOR DIAGNOSIS P0115.)			
ок		CODE	F0113.)			
MUT-II Data list 14 Throttle position sensor (Refer to P.13A-67.)			the throttle position sensor system. (Refer to P.13A-18, IN- TION PROCEDURE FOR DIAGNOSIS CODE P0120.)			
ок						
MUT-II Actuator test 10 EGR control solenoid valve (Refer to P.13A-72.)	NG	(Refer	the EGR control solenoid valve system. to P.13A-33, INSPECTION PROCEDURE FOR DIAGNOSIS			
oĸ			P0403.)			
MUT-II Data list         59 Oxygen sensor (rear)         • Transmission: 2nd gear         • Driving with throttle widely open         • K: 600 - 1,000 mV	NG ▶		the oxygen sensor (rear) system. (Refer to P.13A-24, IN- TION PROCEDURE FOR DIAGNOSIS CODE P0136.)			
ок	- ¬NG -					
MUT-II Data list 11 Oxygen sensor OK: Changes between 600 – 1,000 mV during sudden racing			the oxygen sensor (front) system. (Refer to P.13A-21, IN- TION PROCEDURE FOR DIAGNOSIS CODE P0130.)			
<u>↓</u>	7					
To the next page						

# 13A-56

From the previous page		
ОК		
MUT-II Data list 11 Oxygen sensor OK: Changes between 0 – 400 mV and 600 – 1,000 mV during idling OK	NG Check the fuel pressure. (Refer to P.13A-81*.)	<ol> <li>Inspect the intake of air into the air intake system.</li> <li>Broken intake manifold gasket</li> <li>Broken vacuum</li> </ol>
Check the fuel pressure. (Refer to P.13A-81*.)		<ul> <li>hose</li> <li>PCV valve does</li> </ul>
OK		not operate.
<ul> <li>Check the following items.</li> <li>Check the ignition coil, spark plugs, spark plug cables.</li> <li>Check the EGR control system.</li> <li>Check the compression pressure.</li> <li>Check the fuel filter or fuel line for clogging.</li> </ul>		<ul> <li>Broken air intake hose</li> <li>Check the injector for clog.</li> </ul>

#### NOTE:

\*: Refer to the '97 L200 Workshop Manual (Pub. No. PWTE96E1)

### **INSPECTION PROCEDURE 16**

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

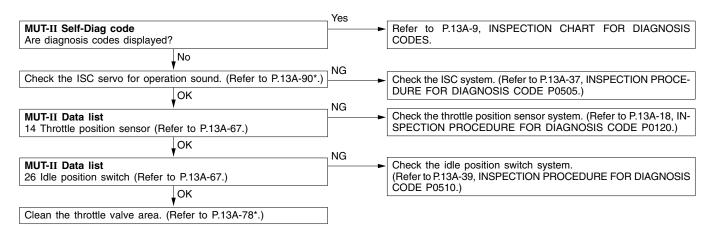
MUT-II Self-Diag code Are diagnosis codes displayed?		 Refer to CODES.	P.13A-9,	INSPECTION	CHART	FOR	DIAGNOSIS
	No						
Check the following items.	k pluga spork plug opplaa						

Check the ignition coil, spark plugs, spark plug cables. Check for occurrence of ignition leak.

•

## **INSPECTION PROCEDURE 17**

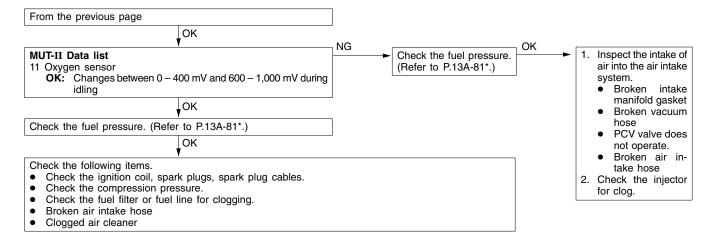
The feeling of impact or vibration when decelerating.	Probable cause
Malfunction of the ISC system is suspected.	Malfunction of the ISC system



#### NOTE:

Poor acceleration	Probable cause	
Defective ignition system, abnormal air/fuel ratio, poor compres are suspected.	<ul> <li>e, etc.</li> <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>	
	_Yes _	
MUT-II Self-Diag code Are diagnosis codes displayed?	<b></b>	Refer to P.13A-9, INSPECTION CHART FOR DIAGNOSIS CODES.
No	_ NG _	
Check the injectors for operation sound.		Check the injector system. (Refer to P.13A-27, INSPECTION PRO- CEDURE FOR DIAGNOSIS CODE P0201, P0202, P0203, P0204.)
ОК		CEDORE FOR DIAGNOSIS CODE F0201, F0202, F0203, F0204.)
Check the ignition timing. (Refer to GROUP 11A – On-vehicle Service.)		Check that the crank angle sensor is installed properly.
ок	- ¬NG _	
MUT-II Data list 26 Idle position switch (Refer to P.13A-67.)		Check the idle position switch system. (Refer to P.13A-39, INSPECTION PROCEDURE FOR DIAGNOSIS
ок	L	CODE P0510.)
MUT-II Data list 13 Intake air temperature sensor (Refer to P.13A-67.)		Check the intake air temperature sensor system. (Refer to P.13A-14, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0110.)
ОК	_ NG _	
MUT-II Data list 25 Barometric pressure sensor (Refer to P.13A-67.)		Check the barometric pressure sensor system. (Refer to P.13A-12, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0105.)
ок		
MUT-II Data list 21 Engine coolant temperature sensor (Refer to P.13A-67.)		Check the engine coolant temperature sensor system. (Refer to P.13A-16, INSPECTION PROCEDURE FOR DIAGNOSIS
ок		CODE P0115.)
MUT-II Data list 14 Throttle position sensor (Refer to P.13A-67.)		Check the throttle position sensor system. (Refer to P.13A-18, IN- SPECTION PROCEDURE FOR DIAGNOSIS CODE P0120.)
ОК		
MUT-II Actuator test 10 EGR control solenoid valve (Refer to P.13A-72.)		Check the EGR control solenoid valve system. (Refer to P.13A-33, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0403.)
MUT-II Data list		Check the oxygen sensor (rear) system. (Refer to P.13A-24, IN-
59 Oxygen sensor (rear) • Transmission: 2nd gear		SPECTION PROCEDURE FOR DIAGNOSIS CODE P0136.)
<ul> <li>Driving with throttle widely open</li> <li>OK: 600 - 1,000 mV</li> </ul>		
ок	¬NG ┌	
MUT-II Data list 11 Oxygen sensor OK: Changes between 600–1,000 mV during sudden racing		Check the oxygen sensor (front) system. (Refer to P.13A-21, IN- SPECTION PROCEDURE FOR DIAGNOSIS CODE P0130.)
	7	
To the next page		

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#### NOTE:

\*: Refer to the '97 L200 Workshop Manual (Pub. No. PWTE96E1)

Surge			Probable cause
Defective ignition system, abnormal air/fuel ratio, etc. are suspe	ected.		<ul> <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>
	_ Yes		
MUT-II Self-Diag code Are diagnosis codes displayed?	<b></b>	Refer CODE	to P.13A-9, INSPECTION CHART FOR DIAGNOSIS S.
No	_ NG		
Check the injectors for operation sound.	<b></b>		the injector system. (Refer to P.13A-27, INSPECTION PRO- RE FOR DIAGNOSIS CODE P0201, P0202, P0203, P0204.)
Check the ignition timing. (Refer to GROUP 11A – On-vehicle Service.)	NG	Check	that the crank angle sensor is installed properly.
MUT-II Data list	NG	Check	the idle position switch system. (Refer to P.13A-39, INSPEC-
26 Idle position switch (Refer to P.13A-67.)			PROCEDURE FOR DIAGNOSIS CODE P0510.)
OK	_ NG		
MUT-II Data list 13 Intake air temperature sensor (Refer to P.13A-67.)			the intake air temperature sensor system. (Refer to P.13A-14, CTION PROCEDURE FOR DIAGNOSIS CODE P0110.)
ОК	¬ NG		
MUT-II Data list 25 Barometric pressure sensor (Refer to P.13A-67.)			the barometric pressure sensor system. (Refer to P.13A-12, CTION PROCEDURE FOR DIAGNOSIS CODE P0105.)
ок	_ NG		
MUT-II Data list 21 Engine coolant temperature sensor (Refer to P.13A-67.) OK		(Refer	the engine coolant temperature sensor system. to P.13A-16, INSPECTION PROCEDURE FOR DIAGNOSIS P0115.)
Ţ	ר NG		
MUT-II Data list 14 Throttle position sensor (Refer to P.13A-67.)			the throttle position sensor system. (Refer to P.13A-18, IN- TION PROCEDURE FOR DIAGNOSIS CODE P0120.)
ОК	¬ NG	_	
MUT-II Actuator test 10 EGR control solenoid valve (Refer to P.13A-72.)		(Refer	the EGR control solenoid valve system. to P.13A-33, INSPECTION PROCEDURE FOR DIAGNOSIS P0403.)
ОК	_ NG		,
<ul> <li>MUT-II Data list</li> <li>59 Oxygen sensor (rear)</li> <li>Transmission: 2nd gear</li> <li>Driving with throttle widely open</li> <li>OK: 600 - 1,000 mV</li> </ul>		Check SPEC	the oxygen sensor (rear) system. (Refer to P.13A-24, IN- TION PROCEDURE FOR DIAGNOSIS CODE P0136.)
ОК			
MUT-II Data list 11 Oxygen sensor (front) OK: Changes between 600 – 1,000 mV during sudden racing	NG		the oxygen sensor (front) system. (Refer to P.13A-21, IN- TION PROCEDURE FOR DIAGNOSIS CODE P0130.)
LOK			
MUT-II Data list 11 Oxygen sensor (front) OK: Changes between 0 – 400 mV and 600 – 1,000 mV during idling	NG		<ul> <li>OK</li> <li>1. Inspect the intake of air into the air intake system.</li> <li>Broken intake manifold gasket</li> </ul>
ок			<ul> <li>Broken vacuum</li> </ul>
Check the fuel pressure. (Refer to P.13A-81*.)			<ul><li>hose</li><li>PCV valve does</li></ul>
ок			not operate. • Broken air intake
<ul> <li>Check the following items.</li> <li>Check the ignition coil, spark plugs, spark plug cables.</li> <li>Check the EGR control system.</li> </ul>			<ul> <li>Broken an intake hose</li> <li>2. Check the injector for clog.</li> </ul>

NOTE: \*: Refer to the '97 L200 Workshop Manual (Pub. No. PWTE96E1)

Knocking	Probable cause
In cases as the above, the cause is probably that the heat value of the spark plug is inappropriate.	Inappropriate heat value of the spark plug
Check the following items.	
<ul> <li>Spark plugs</li> <li>Check if foreign materials (water, alcohol, etc.) got into fuel.</li> </ul>	

#### **INSPECTION PROCEDURE 21**

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

Check the injectors for fuel leakage.

Too high CO and HC concentration when idling			Probable cause		
Abnormal air/fuel ratio is suspected.			<ul><li>Malfunction of the air/fuel ratio control system</li><li>Deteriorated catalyst</li></ul>		
	_ Yes				
MUT-II Self-Diag code Are diagnosis codes displayed?		► Refer CODE	to P.13A-9, INSPECTION CHART FOR DIAGNOSIS S.		
No	_ _ NG				
Check the ignition timing. (Refer to GROUP 11A – On-vehicle Service.)		► Check	that the crank angle sensor is installed properly.		
ок	_ ⊣ NG				
MUT-II Data list 21 Engine coolant temperature sensor. (Refer to P.13A-67.)		(Refer	the engine coolant temperature sensor system. to P.13A-16, INSPECTION PROCEDURE FOR DIAGNOSIS P0115.)		
ОК	– NG	CODE			
MUT-II Data list 13 Intake air temperature sensor (Refer to P.13A-67.)			the intake air temperature sensor system. (Refer to P.13A-14, CTION PROCEDURE FOR DIAGNOSIS CODE P0110.)		
ок	– NG				
MUT-II Data list 25 Barometric pressure sensor (Refer to P.13A-67.)			the barometric pressure sensor system. (Refer to P.13A-12, CTION PROCEDURE FOR DIAGNOSIS CODE P0105.)		
ок	_ NG				
MUT-II Data list         59 Oxygen sensor (rear)         • Transmission: 2nd gear         • Driving with throttle widely open         • OK: 600 - 1,000 mV			the oxygen sensor (rear) system. (Refer to P.13A-24, IN- TION PROCEDURE FOR DIAGNOSIS CODE P0136.)		
ок					
MUT-II Data list 11 Oxygen sensor (front) OK: 600 – 1,000 mV when racing suddenly.	NG		the oxygen sensor (front) system. (Refer to P.13A-21, IN- TION PROCEDURE FOR DIAGNOSIS CODE P0130.)		
OK	_				
MUT-II Data list	ОК	► Replac	ce the oxygen sensor.		
11 Oxygen sensor (front) OK: Repeat 0 – 400 mV and 600 – 1,000 mV alternately when			V		
idling.		Check	trouble symptom.		
Check the fuel pressure. (Refer to P.13A-81*.)	7		NG		
<ul> <li>Check the following items.</li> <li>Check the injectors for operation sound.</li> <li>Check the injectors for fuel leakage.</li> <li>Check the ignition coil, spark plugs, spark plug cables.</li> <li>Check the compression pressure.</li> <li>Check the positive crankcase ventilation system.</li> <li>Check the purge control system.</li> <li>Check the EGR control system.</li> </ul>			, , , , , , , , , , , , , , , , , , ,		
<b>\</b>	_				
Check the trouble symptom.					
NG	_				

Replace the catalytic converter.

#### NOTE:

\*: Refer to the '97 L200 Workshop Manual (Pub. No. PWTE96E1)

Engine-ECU power supply and earth circuit	Probable cause			
The engine-ECU may be defective, or that one of the malfunctions listed at right has occurred.			<ul> <li>Improper connector contact, open circuit or short-circuited harness wire in the engine-ECU power supply circuit.</li> <li>Open circuit or short-circuited harness wire in the engine-ECU earth circuit</li> <li>Malfunction of the engine-ECU</li> </ul>	
<ul> <li>(2) Voltage between 38 and earth</li> <li>OK: System voltage</li> <li>(3) Voltage between 12, 25 and earth (Ignition switch: ON)</li> <li>OK: System voltage (when the terminal 38 is earthed)</li> <li>(4) Continuity between 13, 26 and earth</li> <li>OK: Continuity</li> <li>(5) Voltage between 80 and earth</li> <li>OK: System voltage</li> </ul>		(2), (3) NG (4) NG		G OK OK Check trouble symptom.
		NG		Check the harness wire between engine-ECU and ignition switch connector. OK Check the ignition switch. (Refer to GROUP 54 – Ignition Switch.)
Check the following connectors: C-49, C-50, C-97 OK				► Check the following connector: C-94 V OK Check the trouble symptom.
Check trouble symptom. NG Replace the engine-ECU.	]			VG Check the harness wire between engine-ECU and engine control relay connector, and repair if necessary.
			<b>→</b>	<ul> <li>Check the harness wire between engine-ECU and earth, and repair if necessary.</li> <li>Check the following NG</li> <li>Check the following Connectors: C-19, C-81, C-87</li> <li>OK</li> <li>Check the trouble symptom.</li> </ul>
				Connectors: C-19, C-81, C-87 OK Check the trouble symptom.

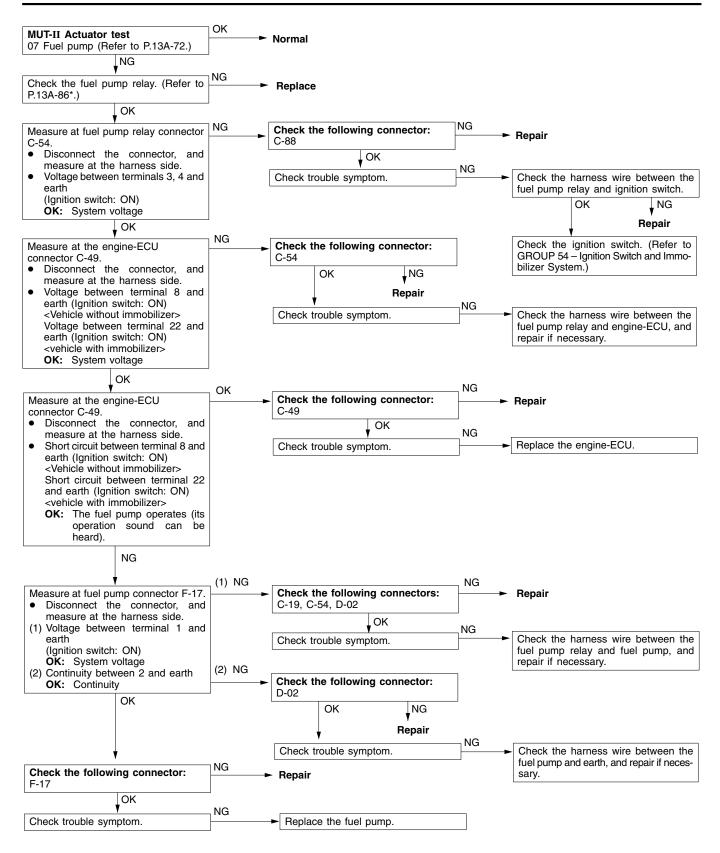
Power supply system and ignition switch-IG	Probable cause	
When an ignition switch ON signal is input to the engine-ECU, the the engine control relay ON. This causes battery voltage to engine-ECU, injectors and air flow sensor.	<ul> <li>Malfunction of the ignition switch</li> <li>Malfunction of the engine 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>	
Check the engine control relay. (Refer to P.13A-86*.)	NG ► Replac	ce
ок	NG	
<ul> <li>Measure at the engine control relay connector C-53.</li> <li>Disconnect the connector, and measure at the harness side.</li> <li>Voltage between 3, 4 and earth</li> <li>OK: System voltage</li> </ul>	Check	the harness wire between battery and engine control relay ctor, and repair if necessary.
ок	_	
Check the engine-ECU power supply and earth circuit. (Refer to P.13A-62, INSPECTION PROCEDURE 23.)	]	

#### NOTE:

\*: Refer to the '97 L200 Workshop Manual (Pub. No. PWTE96E1)

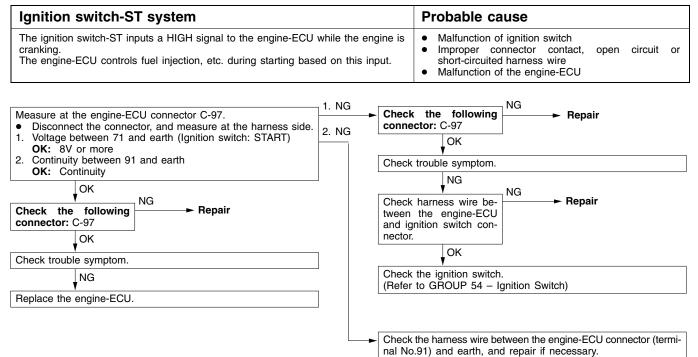
#### **INSPECTION PROCEDURE 25**

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> <li>Malfunction of the fuel pump 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>



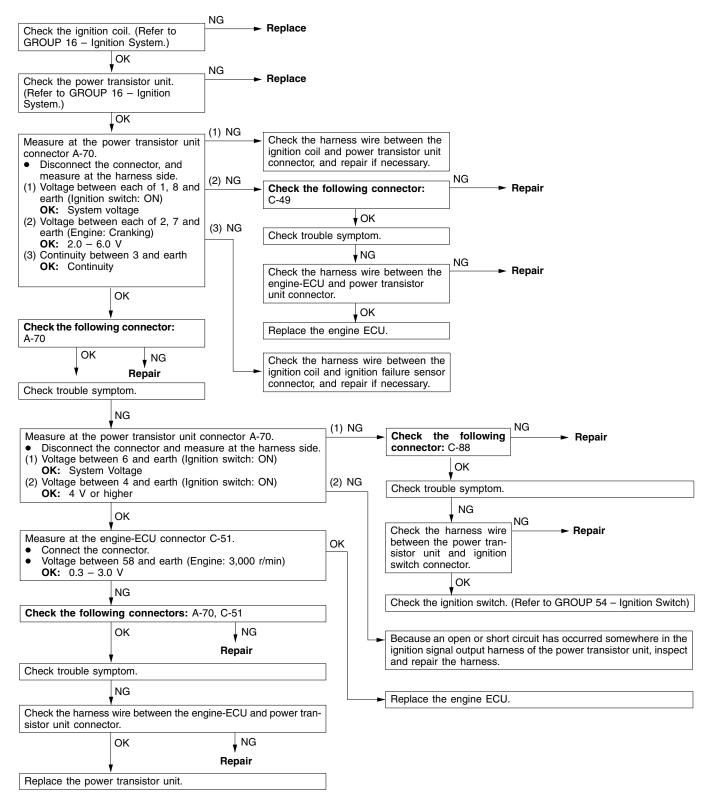
#### NOTE:

\*: Refer to the '97 L200 Workshop Manual (Pub. No. PWTE96E1)



#### **INSPECTION PROCEDURE 27** 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 Malfunction of A/C control system • control of the idle speed control (ISC) servo, and also operates the A/C compressor Malfunction of A/C switch magnetic clutch. . Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the engine-ECU NG Check the A/C compressor relay. Replace (Refer to GROUP 55 - On-vehicle Service.) OK NG Measure at the engine-ECU connectors C-49, C-50. Check the A/C system. (Refer to GROUP 55 – Troubleshooting.) Disconnect the connector, and measure at the harness side. Voltage between 22 and earth, and 45 and earth . (Ignition switch: ON) <Vehicles without immobilizer> Voltage between 8 and earth, and 45 and earth OK NG (Ignition switch: ON) <vehicles with immobilizer> OK: 0 - 3 V (A/C switch: OFF) Check the following Replace connectors: System voltage (A/C switch: ON) Short circuit between 22 and earth C-49, C-50 . (Ignition switch: ON, A/C switch: ON) OK Vehicles without immobilizer> Short circuit between 8 and earth (Ignition switch: ON) Check trouble symptom. <vehicles with immobilizer> NG OK: A/C compressor clutch turns on. Replace the engine-ECU.

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



#### DATA LIST REFERENCE TABLE

#### Caution

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

NOTE

- \*1. In a new vehicle [driven approximately 500 km or less], the air flow sensor output frequency is sometimes 10 % higher than the standard frequency.
- \*2. The 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.
- \*3. The injector drive time represents the time when the cranking speed is at 250 r/min or below when the power supply voltage is 11 V.
- \*4. In a new vehicle [driven approximately 500 km or less], the injector drive time is sometimes 10 % longer than the standard time.
- \*5. In a new vehicle [driven approximately 500 km or less], the step of the stepper motor is sometimes 30 steps greater than the standard value.

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
11	sensor warmed up (front) Air/fuel mixture is		When at 4,000 r/min, engine is suddenly decelerated	200 mV or less	Code No. P0130	13A-21
		made leaner when de- celerating, and is made richer when racing.	When engine is sud- denly raced	600 – 1,000 mV		
		Engine: After having warmed up The oxygen sensor signal is used to check	Engine is idling	400 mV or less (Changes) 600 – 1,000 mV		
	the air/fuel mixture ratio, and control con- dition is also checked by the ECU.		2,500 r/min			
12	Air flow sen- sor* <sup>1</sup>	<ul> <li>Engine coolant temperature:</li> </ul>	Engine is idling	19 – 45 Hz	_	-
	80 − 95°C • Lamps, electric	2,500 r/min	67 – 107 Hz	_		
	<ul> <li>cooling fan and all accessories: OFF</li> <li>Transmission: Neutral</li> </ul>		Engine is raced			Frequency in- creases in re- sponse to racing

ltem No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
13	Intake air temperature	erature with engine running	When intake air tem- perature is –20°C	–20°C	Code No. P0110	13A-14
	sensor		When intake air tem- perature is 0°C	0°C		
			When intake air tem- perature is 20°C	20°C	-	
			When intake air tem- perature is 40°C	40°C	-	
			When intake air tem- perature is 80°C	80°C	-	
14	Throttle	Ignition switch: ON	Set to idle position	300 – 1,000 mV	Code No.	13A-18
position sensor			Gradually open	Increases in pro- portion to throttle opening angle	P0120	
			Open fully	4,500 – 5,500 mV		
16	Power sup- ply voltage	Ignition switch: ON		System voltage	Procedure No. 23	13A-62
18 Cranking signal		Ignition switch: ON	Engine: Stopped	OFF	Procedure No. 26	13A-65
	(ignition switch-ST)		Engine: Cranking	ON		
21	Engine cool- ant tempera- ture sensor	Ignition switch: ON or with engine running	When engine cool- ant temperature is –20°C	–20°C	Code No. P0115	13A-16
			When engine cool- ant temperature is 0°C	0°C		
			When engine cool- ant temperature is 20°C	20°C	-	
			When engine cool- ant temperature is 40°C	40°C		
			When engine cool- ant temperature is 80°C	80°C		

<b>Froubleshooting</b>	

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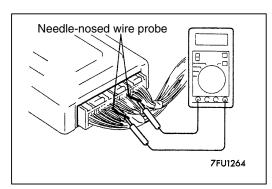
ltem No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
22	Crank angle sensor	<ul> <li>Engine: Cranking</li> <li>Tachometer: Connected</li> </ul>	Code No. P0335	13A-31		
		<ul> <li>Engine: Idling</li> <li>Idle position switch: ON</li> </ul>	When engine cool- ant temperature is -20°C	1,275 – 1,475 rpm		
			When engine cool- ant temperature is 0°C	1,225 – 1,425 rpm		
			When engine cool- ant temperature is 20°C	1,100 – 1,300 rpm		
			When engine cool- ant temperature is 40°C	950 – 1,150 rpm		
			When engine cool- ant temperature is 80°C	650 – 850 rpm		
24	Vehicle speed sen- sor	Drive at 40 km/h		Approximately 40 km/h	Code No. P0500	13A-36
25	Barometric	Ignition switch: ON	At altitude of 0 m	101 kPa	Code No.	13A-12
	pressure sensor		At altitude of 600 m	95 kPa	P0105	
			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	Throttle valve: Set to idle position	ON	Code No. P0510	13A-39
		accelerator pedal re- peatedly	Throttle valve: Slightly open	OFF* <sup>2</sup>	-	
27	Power steer- ing fluid	Engine: Idling	Steering wheel sta- tionary	OFF	Code No. P0551	13A-40
	pressure switch		Steering wheel turn- ing	ON		
28	A/C switch	Engine: Idling (when A/C switch is	A/C switch: OFF	OFF	Procedure No. 27	13A-65
		ON, A/C compressor should be operating.)	A/C switch: ON	ON	110. 21	

ltem No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page	
41	Injectors* <sup>3</sup>	Engine: Cranking	When engine cool- ant temperature is 0°C (injection is car- ried out for all cylin- ders simultaneously)	60 – 90 ms	-	-	
			When engine cool- ant temperature is 20°C	30 – 45 ms			
			When engine cool- ant temperature is 80°C	6.7 – 10.1 ms			
	Injectors*4	<ul> <li>Engine coolant temperature: 80 – 95°C</li> </ul>	Engine is idling	2.2 – 3.4 ms			
		<ul> <li>Lamps, electric cooling fan and all accessories: OFF</li> </ul>	2,500 r/min	1.9 – 3.1 ms			
		<ul> <li>Transmission: Neutral (A/T: P range)</li> </ul>	When engine is sud- denly raced	Increases			
44	Ignition coils and power transistors	<ul> <li>Engine: After hav- ing warmed up</li> <li>Timing lamp is set.</li> </ul>	Engine is idling	2 – 18°BTDC	Code No. P0300	13A-28	
		(The timing lamp is set in order to check actual igni- tion timing.)	2,500 r/min	27 – 47° BTDC			
45	ISC (step- per) motor position* <sup>5</sup>	<ul> <li>Engine coolant temperature: 80 – 95°C</li> <li>Lamps, electric cooling fan and all accessories: OFF</li> <li>Transmission:</li> </ul>	A/C switch: OFF	2 – 25 STEP	-	-	
		<ul> <li>Neutral</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 → ON	Increases by 10 – 70 steps			
49	A/C relay	Engine: After having warmed up/Engine is idling	A/C switch: OFF	OFF (Compressor clutch is not oper- ating)	Procedure No. 27	13A-65	
			A/C switch: ON	ON (Compressor clutch is operat- ing)			

ltem No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page	
59	Oxygen sensor (rear)	<ul> <li>Transmission: 2nd gear</li> <li>Drive with throttle widely open</li> </ul>	3,500 r/min	600 – 1,000 mV	Code No. P0136	13A-24	
81	Long-term fuel com- pensation	Engine: Warm, 2,500 r (during closed loop)	/min without any load	-12.5 - 12.5 %	Code No. P0170	13A-26	
82	Short-term fuel com- pensation	Engine: Warm, 2,500 r (during closed loop)	/min without any load	-30 - 25 %	Code No. P0170	13A-26	
87	Calculation	Engine: Warm	Engine: Idling	15 – 35 %	-	_	
	load value		2,500 r/min	15 – 35 %			
88	Fuel control	Engine: Warm	2,500 r/min	Closed loop	Code No.	13A-20	
	condition		When engine is sud- denly raced	Open loop – drive condition	P0125		
A1	Oxygen	Engine: After having	Idling	0 V	Code No.	13A-21	
	sensor (sensor 1)	warmed up	Sudden racing	0.6 – 1.0 V	P0130		
			2,500 r/min	0.4 V or less and 0.6 – 1.0 V alter- nates	-		
A2	Oxygen sensor (sensor 2)	<ul> <li>Transmission: 2nd gear</li> <li>Drive with throttle widely open</li> </ul>	3,500 r/min	0.6 – 1.0 V	Code No. P0136	13A-24	
8A	Throttle position	<ul> <li>Engine coolant temperature:</li> </ul>	Release the acceler- ator pedal.	6 – 12 %	Code No. P0120	13A-18	
	sensor (Throttle valve open- ing angle)	<ul> <li>80 – 95°C</li> <li>Ignition switch: ON (Engine: Stopped)</li> </ul>	Depress the acceler- ator pedal gradually	Increase in re- sponse to pedal depression stroke.			
			Depress the acceler- ator pedal fully.	80 – 100 %			

#### ACTUATOR TEST REFERENCE TABLE

ltem No.	Inspection item	Drive contents	Inspection conte	ents	Normal condition	Inspection procedure No.	Reference page
01	Injectors	Cut fuel to No. 1 injector	Engine: After ha up/Engine is idli	ng	Idling condition becomes different (becomes unsta-	Code No. P0201	13A-27
02		Cut fuel to No. 2 injector	(Cut the fuel sup injector in turn a cylinders which	ind check	ble).	Code No. P0202	13A-27
03		Cut fuel to No. 3 injector	idling.)			Code No. P0203	13A-27
04		Cut fuel to No. 4 injector	-			Code No. P0204	13A-27
07	Fuel pump	Fuel pump operates and fuel is recircu- lated.	<ul> <li>Engine: Cranking</li> <li>Fuel pump: Forced driving Inspect</li> </ul>	Pinch the return hose with fingers to feel the pulse of the fuel being recirculated.	Pulse is felt.	Procedure No. 25	13A-63
			according to both the above conditions.	Listen near the fuel tank for the sound of fuel pump operation.	Sound of opera- tion is heard.		
08	Purge control solenoid valve	Solenoid valve turns from OFF to ON.	Ignition switch:	ON	Sound of opera- tion can be heard when solenoid valve is driven.	Code No. P0443	13A-35
10	EGR con- trol sole- noid valve	Solenoid valve turns from OFF to ON.	Ignition switch:	ON	Sound of opera- tion can be heard when solenoid valve is driven.	Code No. P0403	13A-33
17	Basic igni- tion timing	Set to ignition timing adjust- ment mode	Engine: Idling Timing light is s	et	5°BTDC	-	-



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

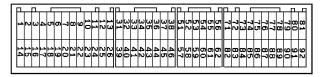
- 1. Connect a needle-nosed wire probe (test harness: MB991223 or paper clip) to a voltmeter probe.
- Insert the needle-nosed wire probe into each of the engine-ECU connector terminals from the wire side, and measure the voltage while referring to the check chart. NOTE
  - (1) Make the voltage measurement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

NOTE:

\*: Vehicles with immobilizer system

Terminal No.	Check item	Check condition (Engine condition)	Normal condition			
1	No. 1 injector	While engine is idling after having	From 11 – 14 V, momentarily			
14	No. 2 injector	warmed up, suddenly depress the accelerator pedal.	drops slightly			
2	No. 3 injector					
15	No. 4 injector					
4	Stepper motor coil <a1></a1>	Engine: Soon after the warmed up	System voltage ↔ 0 – 3 V			
17	Stepper motor coil <a2></a2>	engine is started	(Changes repeatedly)			
5	Stepper motor coil <b1></b1>					
18	Stepper motor coil <b2></b2>					
6	EGR control solenoid	Ignition switch: ON	System Voltage			
	valve	While engine is idling, suddenly depress the accelerator pedal.	From system voltage, momentarily drops			
8 or 22*	Fuel pump relay	Ignition switch: ON	System voltage			
		Engine: Idle speed	0 – 3 V			
9	Purge control solenoid	Ignition switch: ON	System voltage			
	valve	Running at 3,000 r/min while engine is warming up after having been started.	0 – 3 V			
10	Power transistor (Ignition coil–No. 1, No. 4)	Engine r/min: 3,000 r/min	0.3 – 3.0 V			
23	Power transistor (Ignition coil–No. 2, No. 3)					
12	Power supply	Ignition switch: ON	System voltage			
25						
19	Air flow sensor reset	Engine: Idle speed	0 – 1 V			
	signal	Engine r/min: 3,000 r/min	6 – 9 V			
22 or 8*	A/C relay	<ul> <li>Engine: idle speed</li> <li>A/C switch: OFF → ON (A/C compressor is operating)</li> </ul>	System voltage or momentarily 6 V or more $\rightarrow 0 - 3$ V			

Terminal No.	Check item	Check condition (En	gine condition)	Normal condition				
36	Engine warning lamp	Ignition switch: OFF	$\rightarrow$ ON	$\begin{array}{c} 0-3 \ V \rightarrow 9-13 \ V \\ (After several seconds have elapsed) \end{array}$				
37	Power steering fluid pressure switch	Engine: Idling after warming up	When steering wheel is stationary	System voltage				
			When steering wheel is turned	0 – 3 V				
38	Control relay	Ignition switch: OFF		System voltage				
	(Power supply)	Ignition switch: ON		0 – 3 V				
45	A/C switch	Engine: Idle speed	Turn the A/C switch OFF	0 – 3 V				
			Turn the A/C switch ON (A/C compressor is operating)	System voltage				
54	Oxygen sensor (rear) heater	Engine: Idling after h	naving warmed up	0 – 3 V				
	neater	Engine r/min: 5,000	System voltage					
58	Spark check signal	Engine r/min: 3,000	r/min	0.3 – 3.0 V				
60	Oxygen sensor (front) heater	Engine: Idling after v	varming up	0 – 3 V				
	neater	Engine r/min: 5,000	System voltage					
71	Ignition switch-ST	Engine: Cranking		8 V or more				
72	Intake air temperature sensor	Ignition switch: ON	When intake air temperature is 0°C	3.2 – 3.8 V				
			When intake air temperature is 20°C	2.3 – 2.9 V				
			When intake air temperature is 40°C	1.5 – 2.1 V				
			When intake air temperature is 80°C	0.4 – 1.0 V				
75	Oxygen sensor (rear)	<ul> <li>Transmission: 2</li> <li>Engine r/min: 3</li> <li>Driving with the widely open</li> </ul>	,500 r/min	0.6 – 1.0 V				
76	Oxygen sensor (front)	Engine: Running at a warmed up (Check u voltmeter)		0 ↔ 0.8 V (Changes repeatedly)				

Terminal No.	Check item	Check condition (En	gine condition)	Normal condition				
80	Backup power supply	Ignition switch: OFF		System voltage				
81	Sensor impressed voltage	Ignition switch: ON		4.5 – 5.5 V				
82	Ignition switch-IG	Ignition switch: ON		System voltage				
83	Engine coolant temperature sensor	Ignition switch: ON	When engine coolant tempera- ture is 0°C	3.2 – 3.8 V				
			When engine coolant tempera- ture is 20°C	2.3 – 2.9 V				
			When engine coolant tempera- ture is 40°C	1.3 – 1.9 V				
			When engine coolant tempera- ture is 80°C	0.3 – 0.9 V				
84	Throttle position sensor	Ignition switch: ON	Set throttle valve to idle position	0.3 – 1.0 V				
			Fully open throttle valve	4.5 – 5.5 V				
85	Barometric pressure sensor	Ignition switch: ON	When altitude is 0 m	3.7 – 4.3 V				
			When altitude is 1,200 m	3.2 – 3.8 V				
86	Vehicle speed sensor	<ul><li>Ignition switch:</li><li>Move the vehic</li></ul>	ON le slowly forward	0 ↔ 5 V (Changes repeatedly)				
87	Idle position switch	Ignition switch: ON	Set throttle valve to idle position	0 – 1 V				
			Slightly open throttle valve	4 V or more				
88	Camshaft position sensor	Engine: Cranking	·	0.4 – 3.0 V				
		Engine: Idle speed		0.5 – 2.0 V				
89	Crank angle sensor	Engine: Cranking		0.4 – 4.0 V				
		Engine: Idle speed		1.5 – 2.5 V				
90	Air flow sensor	Air flow sensor     Engine: Idle speed						
		Engine r/min: 2,500	r/min					

## CHECK CHART FOR RESISTANCE AND CONTINUITY BETWEEN TERMINALS

- 1. Turn the ignition switch to OFF.
- 2. Disconnect the engine-ECU connector.
- 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

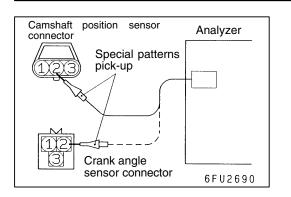
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Terminal No.	Inspection item	Normal condition (Check condition)
1 – 12	No. 1 injector	13 – 16 Ω (At 20°C)
14 – 12	No. 2 injector	
2 – 12	No. 3 injector	
15 – 12	No. 4 injector	

## 13**A-7**8

Terminal No.	Inspection item	Normal condition (Check condition)					
4 – 12	Stepper motor coil (A1)	28 – 33 Ω (At 20°C)					
17 – 12	Stepper motor coil (A2)						
5 – 12	Stepper motor coil (B1)						
18 – 12	Stepper motor coil (B2)						
6 – 12	EGR control solenoid valve	36 – 44 Ω (At 20°C)					
9 – 12	Purge control solenoid valve	30 – 34 Ω (At 20°C)					
13 – Body earth	Engine-ECU earth	Continuity (0 Ω)					
26 – Body earth	Engine-ECU earth						
54 – 12	Oxygen sensor (rear) heater	11 – 18 Ω (At 20°C)					
60 – 12	Oxygen sensor (front) heater	4.5 – 8.0 Ω (At 20°C)					
72 – 92	Intake air temperature sensor	$5.3 - 6.7 \text{ k}\Omega$ (When intake air temperature is 0°C)					
		2.3 – 3.0 k $\Omega$ (When intake air temperature is 20 $^{\circ}\text{C})$					
		1.0 – 1.5 k $\Omega$ (When intake air temperature is 40 $^{\circ}C)$					
		$0.30-0.42k\Omega$ (When intake air temperature is $80^\circ\text{C})$					
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 $40^\circ\text{C})$					
		$0.26 - 0.36 \text{ k}\Omega$ (When coolant temperature is $80^{\circ}\text{C}$ )					
87 – 92	Idle position switch	Continuity (When throttle valve is at idle position)					
		No continuity (When throttle valve is slightly open)					



# INSPECTION PROCEDURE USING AN ANALYZER

## CAMSHAFT POSITION SENSOR AND CRANK ANGLE SENSOR

#### **Measurement Method**

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

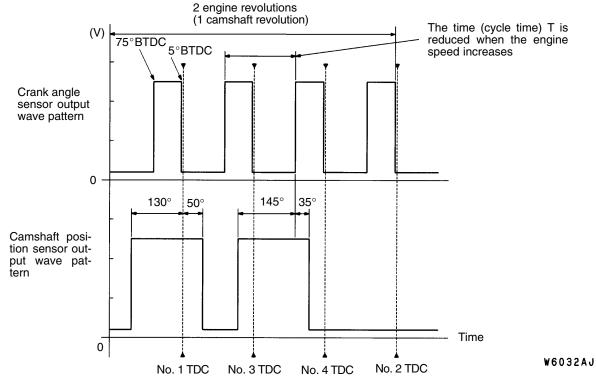
#### Alternate Method (Test harness not available)

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

#### Standard Wave Pattern Observation conditions

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

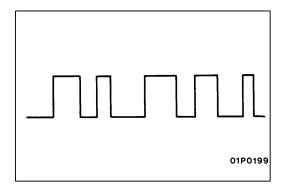
#### Standard wave pattern

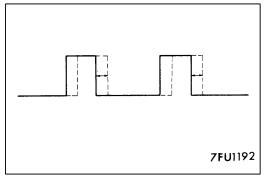


TDC: Top dead centre

#### Wave Pattern Observation Points

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





#### **Examples of Abnormal Wave Patterns**

• Example 1

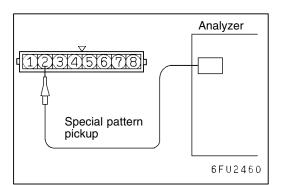
#### Cause of problem

Sensor interface malfunction

#### Wave pattern characteristics

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

Example 2
 Cause of problem
 Loose timing belt
 Abnormality in sensor disk
 Wave pattern characteristics
 Wave pattern is displaced to the left or right.



#### **IGNITION COIL AND POWER TRANSISTOR**

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

#### Measurement Method

- 1. Disconnect the power transistor connector, and connect the special tool (test harness: MB991348) in between. (All terminals should be connected.)
- Connect the analyzer special pattern pickup to the power transistor connector terminal 2 (No.2 – No.3) and terminal 7 (No.1 – No.4) respectively.

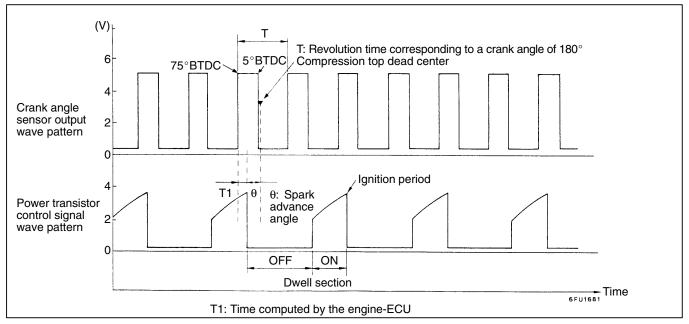
#### Alternate Method (Test harness not available)

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

#### Standard Wave Pattern Observation condition

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

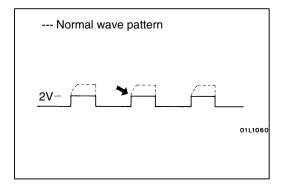
#### Standard wave pattern

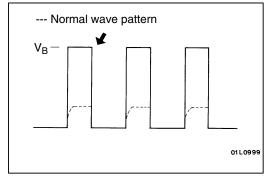


#### Wave Pattern Observation Points

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

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





#### **Examples of Abnormal Wave Patterns**

- Example 1
   Wave pattern during engine cranking
   Cause of problem
   Open-circuit in ignition primary circuit
   Wave pattern characteristics
   Top-right part of the build-up section cannot be seen, and voltage value is approximately 2V too low.
- Example 2

Wave pattern during engine cranking

#### Cause of problem

Malfunction in power transistor

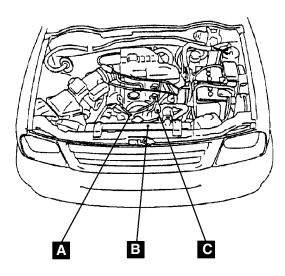
#### Wave pattern characteristics

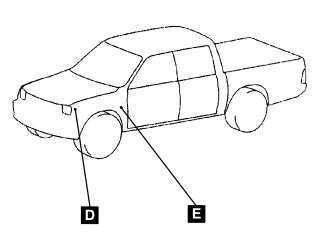
Power voltage results when the power transistor is ON.

## **ON-VEHICLE SERVICE**

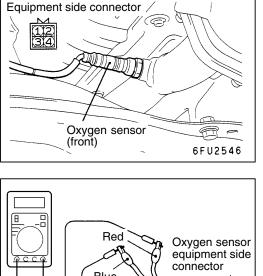
## COMPONENT LOCATION

Name	Symbol	Name	Symbol
Camshaft position sensor	А	Oxygen sensor (front)	D
Crank angle sensor	В	Oxygen sensor (rear)	E
Ignition coil	С	Power transistor unit	A



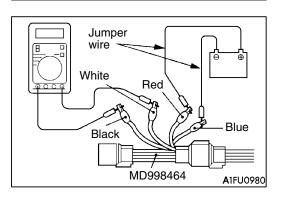


Y6035AA



# MD998464

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### **OXYGEN SENSOR CHECK**

#### <Oxygen sensor (front)>

- 1. Disconnect the oxygen sensor connector and connect the special tool (test harness) to the connector on the oxygen sensor side.
- 2. Make sure that there is continuity  $(4.5 8.0 \Omega \text{ at } 20^{\circ}\text{C})$ between terminal 1 (red clip of special tool) and terminal 3 (blue clip of special tool) on the oxygen sensor connector.
- 3. If there is no continuity, replace the oxygen sensor.
- 4. Warm up the engine until engine coolant is 80°C or higher.
- 5. Use a jumper wire to connect terminal 1 (red clip) of the oxygen sensor connector to the battery (+) terminal and terminal 3 (blue clip) to the battery (-) terminal.

#### Caution

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

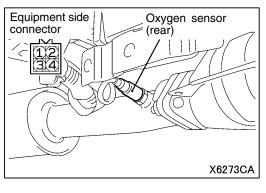
- 6. Connect a digital voltage meter between terminal 2 (black clip) and terminal 4 (white clip).
- 7. While repeatedly racing the engine, measure the oxygen sensor output voltage.

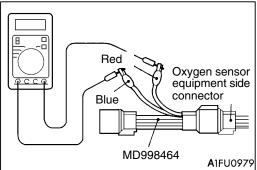
#### Standard value:

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

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

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





#### <Oxygen sensor (rear)>

- 1. Disconnect the oxygen sensor connector and connect the special tool (test harness set) to the connector on the oxygen sensor side.
- 2. Make sure that there is continuity  $(11 18 \Omega \text{ at } 20^{\circ}\text{C})$  between terminal 1 (red clip of special tool) and terminal 3 (blue clip of special tool) on the oxygen sensor connector.
- 3. If there is no continuity, replace the oxygen sensor. NOTE
  - (1) If the MUT-II does not display the standard value although no abnormality is found by the above mentioned continuity test and harness check, replace the oxygen sensor (rear).
  - (2) For removal and installation of the oxygen sensor, refer to GROUP 15 Exhaust Pipe and Main Muffler.

#### NOTES