FUEL

CONTENTS

13109000195

NOTE
THE GROUPS MARKED BY ARE NOT IN THIS MANUAL

MULTIPOINT FUEL INJECTION (MPI)

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MULTIPOINT FUEL INJECTION (MPI) <4G6>

13100010449

GENERAL INFORMATION

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

FUEL INJECTION CONTROL

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

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

Fuel injection is normally carried out once for each cylinder for every two rotations of the crankshaft. The firing order is 1-3-4-2. This is called sequential fuel injection.

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

IDLE AIR CONTROL

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

IGNITION TIMING CONTROL

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

SELF-DIAGNOSIS FUNCTION

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

OTHER CONTROL FUNCTIONS

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

GENERAL SPECIFICATIONS

Items		Specifications
Throttle body	Throttle bore mm	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.	E2T67673
Sensors	Air flow sensor	Karman vortex type
	Barometric pressure sensor	Semiconductor type
	Intake air temperature sensor	Thermistor type
	Engine coolant temperature sensor	Thermistor type
	Oxygen sensor	Zirconia type
	Vehicle speed sensor	Magnetic resistive element type
	Inhibitor switch	Contact switch type
	Camshaft position sensor	Hall element type
	Crank angle sensor	Hall element type
	Detonation sensor	Piezoelectric type
	Power steering fluid pressure switch	Contact switch type
Actuators	Control relay type	Contact switch type
	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	329

MULTIPOINT FUEL INJECTION SYSTEM DIAGRAM

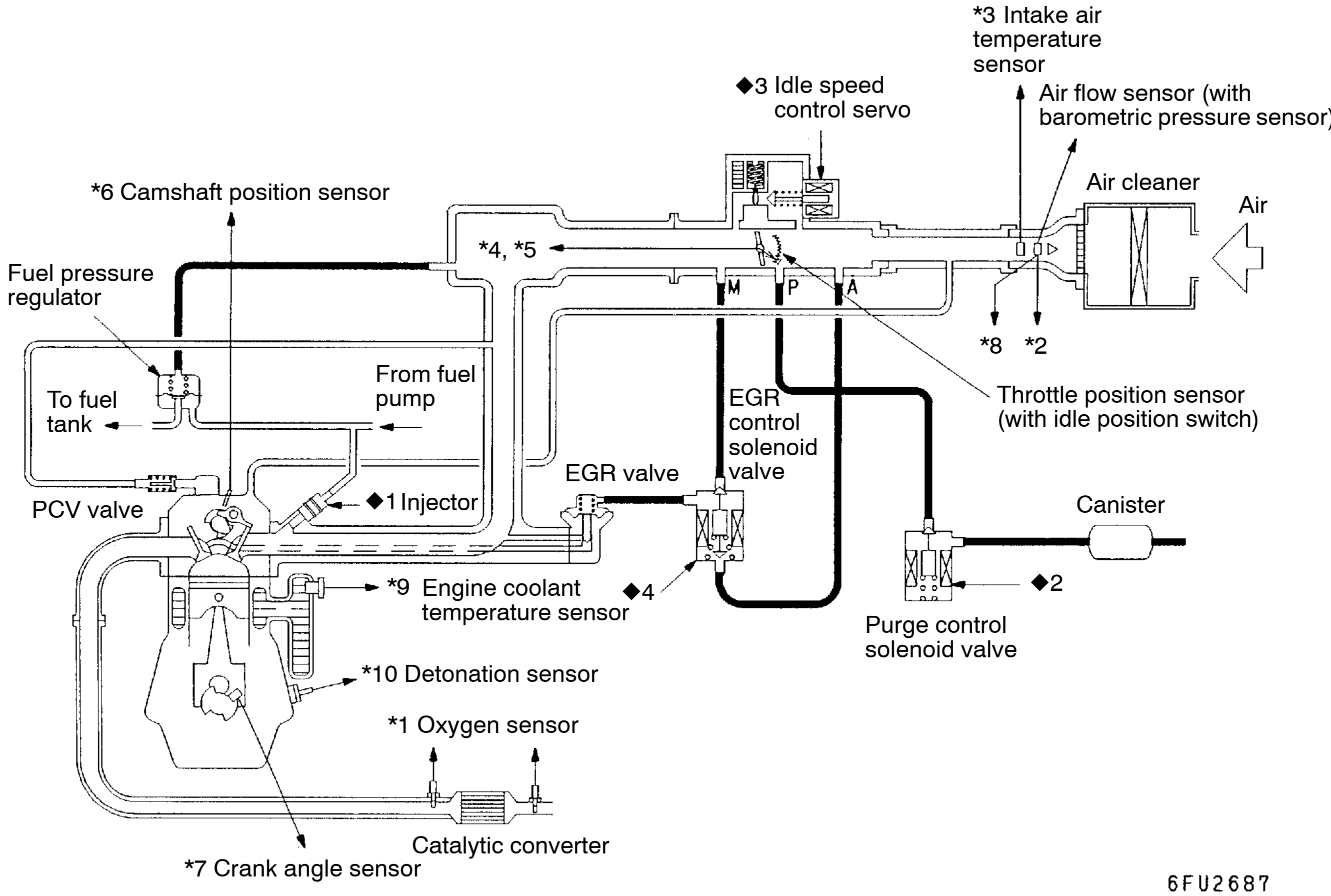
*1 Oxygen sensor (front)
*2 Air flow sensor
*3 Intake air temperature sensor
*4 Throttle position sensor
*5 Idle position switch
*6 Camshaft position sensor
*7 Crank angle sensor
*8 Barometric pressure sensor
*9 Engine coolant temperature sensor
*10 Detonation sensor
*11 Oxygen sensor (rear)

- Power supply voltage
- Vehicle speed sensor
- A/C switch 1, 2
- Inhibitor switch
- Power steering fluid pressure switch
- Ignition switch - ST
- Ignition switch - IG
- Alternator FR terminal
- A/T-ECU

⇨ Engine-ECU ⇨

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

- Fuel pump relay
- Control relay
- A/C power relay
- Engine warning lamp
- Diagnosis signal
- Ignition coil, power transistor
- Fan controller
- Alternator G terminal
- A/T-ECU



SERVICE SPECIFICATIONS

13100030339

Items		Specifications
Basic idle speed r/min		750±50
Throttle position sensor adjusting voltage mV		400 - 1,000
Throttle position sensor resistance kΩ		3.5 - 6.5
Idle speed control servo coil resistance Ω		28 - 33 (at 20°C)
Intake air temperature sensor resistance kΩ	20°C	2.3 - 3.0
	80°C	0.30 - 0.42
Engine coolant temperature sensor resistance kΩ	20°C	2.1 - 2.7
	80°C	0.26 - 0.36
Oxygen sensor output voltage V		0.6 - 1.0
Fuel pressure kPa	Vacuum hose disconnection	324 - 343 at kerb idle
	Vacuum hose connection	Approx. 265 at kerb idle
Injector coil resistance Ω		13 - 16 (at 20°C)

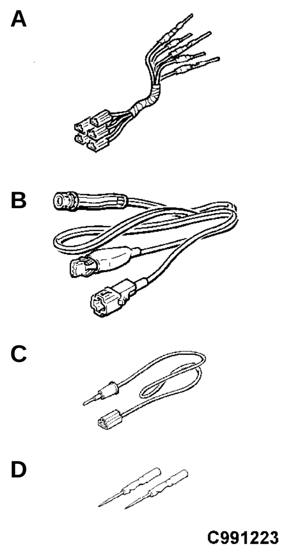
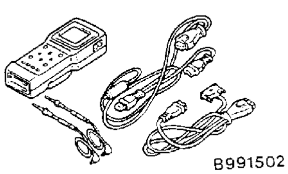
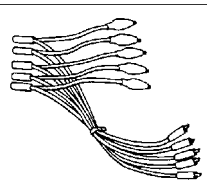
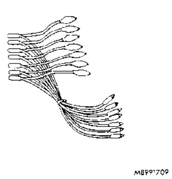
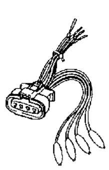
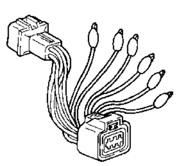
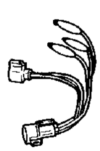
SEALANT

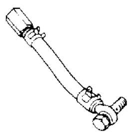
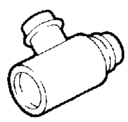
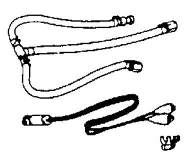
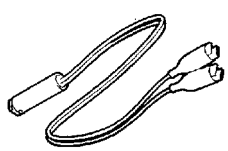
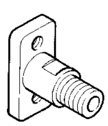
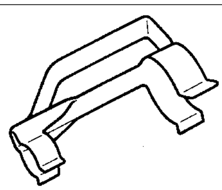
13100050199

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

SPECIAL TOOLS

13100060338

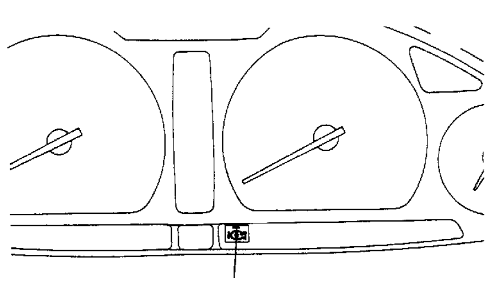
Tool	Number	Name	Use
	MB991223 A: MB991219 B: MB991220 C: MB991221 D: MB991222	Harness set A: Test harness B: LED harness C: LED harness adapter D: Probe	• Fuel gauge simple inspection A: Connector pin contact pressure inspection B: Power circuit inspection C: Power circuit inspection D: Commercial tester connection
	MB991502	MUT-II sub assembly	• Reading diagnosis code • MPI system inspection
	MB991348	Test harness set	• Measurement of voltage during trouble-shooting • Inspection using an analyzer
	MB991709	Test harness	
	MB991519	Alternator harness connector	Measurement of voltage during troubleshooting
	MD998463	Test harness (6-pin, square)	• Inspection of idle speed control servo • Inspection using an analyzer
	MD998478	Test harness (3-pin, triangle)	• Measurement of voltage during trouble-shooting • Inspection using an analyzer

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

TROUBLESHOOTING 13100850256

DIAGNOSIS TROUBLESHOOTING FLOW

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



DIAGNOSIS FUNCTION 13100860358

ENGINE WARNING LAMP (CHECK ENGINE LAMP)

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

Engine warning lamp inspection items

Engine-ECU
Oxygen sensor
Air flow sensor
Intake air temperature sensor
Throttle position sensor
Engine coolant temperature sensor
Crank angle sensor
Camshaft position sensor
Barometric pressure sensor
Detonation sensor
Injector
Ignition coil, power transister
Immobilizer system

METHOD OF READING AND ERASING DIAGNOSIS CODES

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

INSPECTION USING MUT-II DATA LIST AND ACTUATOR TESTING

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

FAIL-SAFE FUNCTION REFERENCE TABLE

13100910299

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

Malfunctioning item	Control contents during malfunction
Air flow sensor	1. Uses the throttle position sensor signal and engine speed signal (crank angle sensor signal) to take reading of the basic injector drive time and basic ignition timing from the pre-set mapping. 2. Fixes the ISC servo in the appointed position so idle control is not performed.
Intake air temperature sensor	Controls as if the intake air temperature is 25°C.
Throttle position sensor (TPS)	No increase in fuel injection amount during acceleration due to the throttle position sensor signal.
Engine coolant temperature sensor	Controls as if the engine coolant temperature is 80°C.
Camshaft position sensor	Injects fuel to all cylinders simultaneously. (However, after the ignition switch is turned to ON, the No. 1 cylinder top dead centre is not detected at all.)
Barometric pressure sensor	Controls as if the barometric pressure is 101 kPa.
Detonation sensor	Switches the ignition timing from ignition timing for super petrol to ignition timing for standard petrol.
Ignition coil, power transistor	Cuts off the fuel supply to cylinders with an abnormal ignition.
Oxygen sensor	Air/fuel ratio feedback control (closed loop control) is not performed.
Communication wire with transmission control unit <A/T>	Ignition timing is not retarded during transmission gear shifting (overall engine and transmission control).
Alternator FR terminal	Does not control the output of the alternator according to an electrical load. (works as a normal alternator)

INSPECTION CHART FOR DIAGNOSIS CODES

13100870375

Code No.	Diagnosis item	Reference page
11	Oxygen sensor (front) system	13A-13
12	Air flow sensor system	13A-14
13	Intake air temperature sensor system	13A-14
14	Throttle position sensor system	13A-15
21	Engine coolant temperature sensor system	13A-16
22	Crank angle sensor system	13A-17
23	Camshaft position sensor	13A-18
24	Vehicle speed sensor system	13A-19
25	Barometric pressure sensor system	13A-20
31	Detonation sensor system	13A-21
41	Injector system	13A-21
44	Ignition coil system	13A-22
54	Immobilizer system	13A-23
59	Oxygen sensor (rear) system	13A-24
61	Communication wire with A/T-ECU system <A/T>	13A-25
64	Alternator FR terminal system	13A-25

INSPECTION PROCEDURE FOR DIAGNOSIS CODES

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

Check the oxygen sensor (front). (Refer to P.13A-92.) — NG → **Replace**

↓ OK

Measure at the oxygen sensor (front) connector C-46.
- Disconnect the connector, and measure at the harness side.

1. Voltage between 3 and earth (Ignition switch: ON)
   OK: System voltage
2. Continuity between 2 and earth
   OK: Continuity

1. NG → Check the harness wire between the oxygen sensor (front) and the control relay connector, and repair if necessary.

2. NG → **Check the following connector:**
C-40 — NG → **Repair**

↓ OK

Check trouble symptom.

↓ NG

Check the harness wire between the engine-ECU and the oxygen sensor (front) connector. — NG → **Repair**

↓ OK

Replace the engine-ECU.

↓ OK (from measurement at C-46)

Measure at the engine-ECU connector C-38.
- Disconnect the connector, and measure at the harness side.
- Voltage between 60 and earth (Ignition switch: ON)
  OK: System voltage

NG → **Check the following connector:**
C-46 — NG → **Repair**

↓ OK

Check trouble symptom.

↓ NG

Check the harness wire between the engine-ECU and the oxygen sensor (front) connector, and repair if necessary.

↓ OK (from measurement at C-38)

Check the following connectors:
C-46, C-38 — NG → **Repair**

↓ OK

Check trouble symptom.

↓ NG

Check the harness wire between the engine-ECU and the oxygen sensor (front) connector. — NG → **Repair**

↓ OK

Replace the engine-ECU.

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

Measure at the air flow sensor connector B-12.
- Connect the connector. (Use the test harness: MB991709)
1. Voltage between 3 and earth (Engine: Idling)
   OK: 2.2-3.2 V
2. Voltage between 7 and earth
   OK: 0-1 V (Engine: idling)
   6-9 V (2,000 r/min)

- OK → Replace the engine-ECU.
- 1. NG → Check the air flow sensor circuit. (Refer to P.13A-59, INSPECTION PROCEDURE 48.)
- 2. NG → Measure at the engine-ECU connector C-34.
  - Connect the connector.
  - Voltage between 19 and earth (Ignition switch: ON)
    OK: 6-9 V

  - NG → **Check the following connector:** B-12
    - NG → **Repair**
    - OK → Check trouble symptom.
      - NG → Replace the air flow sensor.
  - OK → **Check the following connector:** C-34
    - NG → **Repair**
    - OK → Check trouble symptom.
      - NG → Replace the engine-ECU.

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

Check the intake air temperature sensor. (Refer to P.13A-90.)
- NG → **Replace**
- OK → Measure at the air flow sensor connector B-12.
  - Disconnect the connector, and measure at the harness side.
  - Voltage between 6 and earth (Ignition switch: ON)
    OK: 4.5-4.9 V
  - Continuity between 5 and earth
    OK: Continuity

  - NG → **Check the following connector:** C-40
    - NG → **Repair**
    - OK → Check trouble symptom.
      - NG → Check the harness wire between the engine-ECU and the intake air temperature sensor connector.
        - NG → **Repair**
        - OK → Replace the engine-ECU.
  - OK → **Check the following connector:** B-12
    - NG → **Repair**
    - OK → Check trouble symptom.
      - NG → Replace the engine-ECU.

Code No. 14 Throttle position sensor system	Probable cause
Range of Check ● Ignition switch: ON ● Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts. Set conditions ● When the idle position switch is ON, the sensor output voltage is 2 V or more for 4 seconds. or ● The sensor output voltage is 0.2 V or less for 4 seconds.	● Malfunction of the throttle position sensor or maladjustment ● Improper connector contact, open circuit or short-circuited harness wire of the throttle position sensor circuit ● Improper "ON" state of idle position switch ● Short circuit of the idle position switch signal line ● Malfunction of the engine-ECU

MUT-II Data list
26 Idle position switch system
OK: With the throttle valve at the idle position: ON
With the throttle valve slightly open: OFF

NG → Check the idle position switch system. (Refer to P.13A-46, INSPECTION PROCEDURE 28.)

OK ↓

Check the throttle position sensor. (Refer to P.13A-91.)

NG → **Replace**

OK ↓

Measure at the throttle position sensor connector B-07.
- Disconnect the connector, and measure at the harness side.
- Voltage between 1 and earth (Ignition switch: ON)
  OK: 4.8 - 5.2 V
- Continuity between 4 and earth
  OK: Continuity

NG → **Check the following connector:** C-40

- NG → **Repair**
- OK ↓ Check trouble symptom.
- NG ↓ Check the harness wire between the engine-ECU and the throttle position sensor connector.
  - NG → **Repair**
  - OK ↓ Replace the engine-ECU.

OK ↓

Check the throttle position sensor output circuit. (Refer to P.13A-60, INSPECTION PROCEDURE 49.)

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

Check the engine coolant temperature sensor. (Refer to P.13A-90.)

- NG → **Replace**
- OK ↓

Measure at the engine coolant temperature sensor connector B-33.
- Disconnect the connector, and measure at the harness side.
- Voltage between 1 and earth (Ignition switch: ON)
  OK: 4.5 - 4.9 V
- Continuity between 2 and earth
  OK: Continuity

NG →

Check the following connector: C-40

- NG → **Repair**
- OK ↓

Check trouble symptom.

- NG ↓

Check the harness wire between the engine-ECU and the engine coolant temperature sensor connector.

- NG → **Repair**
- OK ↓

Replace the engine-ECU.

OK ↓

Check the following connector: B-33

- NG → **Repair**
- OK →

Check trouble symptom.

- NG ↓

Replace the engine-ECU.

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

Measure at the crank angle sensor connector B-77.
- Connect the connector. (Use the test harness: MD998478.)
- Voltage between 2 and earth (Engine: cranking)
  OK: 0.4 - 4.0 V
- Voltage between 2 and earth (Engine: idling)
  OK: 1.5 - 2.5 V

OK → Replace the engine-ECU.

NG ↓

Measure at the crank angle sensor connector B-77.
- Disconnect the connector, and measure at the harness side.

1. Voltage between 3 and earth (Ignition switch: ON)
   OK: System voltage
2. Voltage between 2 and earth (Ignition switch: ON)
   OK: 4.8 - 5.2 V
3. Continuity between 1 and earth
   OK: Continuity

1\. NG → Check the harness wire between the crank angle sensor and the control relay connector, and repair if necessary.

2\. NG → **Check the following connector:** C-40
- NG → **Repair**
- OK ↓ Check trouble symptom.
  - NG ↓ Check the harness wire between the engine-ECU and the crank angle sensor connector.
    - NG → **Repair**
    - OK ↓ Replace the engine-ECU.

3\. NG → Check the harness wire between the crank angle sensor and the earth, and repair if necessary.

OK ↓ **Check the following connector:** B-77
- NG → **Repair**
- OK ↓ Check trouble symptom.
  - NG ↓ Replace the crank angle sensor.

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

Measure at the camshaft position sensor connector B-64.
- Connect the connector. (Use the test harness: MB991223 and jumper wire.)
- Voltage between 2 and earth (Engine: cranking)
  OK: 0.4 - 3.0 V
- Voltage between 2 and earth (Engine: idling)
  OK: 1.5 - 2.0 V

OK → Replace the engine-ECU.

NG ↓

Measure at the camshaft position sensor connector B-64.
- Disconnect the connector, and measure at the harness side.

1. Voltage between 3 and earth (Ignition switch: ON)
   OK: System voltage
2. Voltage between 2 and earth (Ignition switch: ON)
   OK: 4.8 - 5.2 V
3. Continuity between 1 and earth
   OK: Continuity

1. NG → Check the harness wire between the camshaft position sensor and the control relay connector, and repair if necessary.

2. NG → **Check the following connector:** C-40
- NG → **Repair**
- OK ↓ Check trouble symptom.
- NG ↓ Check the harness wire between the engine-ECU and the camshaft position sensor connector.
- NG → **Repair**
- OK ↓ Replace the engine-ECU.

3. NG → Check the harness wire between the camshaft position sensor and the earth, and repair if necessary.

OK ↓

Check the following connector: B-64
- NG → **Repair**
- OK ↓ Check trouble symptom.
- NG ↓ Replace the camshaft position sensor.

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

Check the vehicle speed sensor. (Refer to GROUP 54 - Combination Meters.) — NG → **Replace**

↓ OK

Measure at the vehicle speed sensor connector B-66 <M/T>, B-67 <A/T>.
- Disconnect the connector, and measure at the harness side.

1. Voltage between 1 and earth (Ignition switch: ON)
   OK: System voltage
2. Voltage between 3 and earth (Ignition switch: ON)
   OK: 4.8 - 5.2 V
3. Continuity between 2 and earth
   OK: Continuity

↓ OK

Check the following connectors: B-66 <M/T>, B-67 <A/T>, C-40 — NG → **Repair**

↓ OK

Check trouble symptom.

↓ NG

Check the harness wire between the engine-ECU and the vehicle speed sensor connector. — NG → **Repair**

↓ OK

Replace the engine-ECU.

1\. NG →

Check the following connectors: B-65 <M/T>, C-90, C-135, C-131 — NG → **Repair**

↓ OK

Check trouble symptom.

↓ NG

Check the harness wire between the vehicle speed sensor and ignition switch connector. — NG → **Repair**

↓ OK

Check the ignition switch. (Refer to GROUP 54 - Ignition Switch.)

2\. NG →

Check the following connectors: B-65 <M/T>, C-48, C-40 — NG → **Repair**

↓ OK

Check trouble symptom.

↓ NG

Check the harness wire between the engine-ECU and the vehicle speed sensor connector. — NG → **Repair**

↓ OK

Replace the engine-ECU.

3\. NG →

Check the following connector: B-65 <M/T> — NG → **Repair**

↓ OK

Check trouble symptom.

↓ OK

Check the harness wire between the vehicle speed sensor and the earth, and repair if necessary.

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

Measure at the air flow sensor connector B-12.
- Connect the connector. (Use the test harness: MB991709)
- Voltage between 2 and earth (Ignition switch: ON)
  OK: 3.7 - 4.3 V (Altitude: 0 m)
  3.2 - 3.8 V (Altitude: 1,200 m)

NG → Measure at the air flow sensor connector B-12.
- Disconnect the connector, and measure at the harness side.
- Voltage between 1 and earth (Ignition switch: ON)
  OK: 4.8 - 5.2 V
- Continuity between 5 and earth
  OK: Continuity

NG → **Check the following connector:** C-40

NG → **Repair**

OK → Check trouble symptom.

NG → Check the harness wire between the engine-ECU and the barometric pressure sensor connector.

NG → **Repair**

OK → Replace the engine-ECU.

OK → **Check the following connector:** B-12

NG → **Repair**

OK → Check trouble symptom.

NG → Check the harness wire between the engine-ECU and the barometric pressure sensor connector.

NG → **Repair**

OK → Replace the air flow sensor.

OK → Measure at the engine-ECU connector C-40.
- Connect the connector.
- Voltage between 85 and earth (Ignition switch: ON)
  OK: 3.7 - 4.3 V (Altitude: 0 m)
  3.2 - 3.8 V (Altitude: 1,200 m)

NG → Check the harness wire between the engine-ECU and the barometric pressure sensor connector, and repair if necessary.

OK → **Check the following connector:** C-40

NG → **Repair**

OK → Check trouble symptom.

NG → Replace the engine-ECU.

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

Measure at the detonation sensor connector B-34.
- Disconnect the connector and measure at the harness side.
- Continuity between 2 and earth
  OK: Continuity

OK → **Check the following connectors:** B-34, C-40
- NG → **Repair**
- OK → Check trouble symptom.
  - NG → Check the harness wire between the engine-ECU and the detonation sensor connector.
    - OK → Replace the detonation sensor. → Check trouble symptom.
      - NG → Replace the engine-ECU.
    - NG → **Repair**

NG → Check the harness wire between the detonation sensor and earth, and repair if necessary.

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

Check the injector. (Refer to P.13A-93.)
- NG → **Replace**
- OK → Measure at the injector connectors B-02, B-03, B-05, B-36.
  - Disconnect the connector, and measure at the harness side.
  - Voltage between 1 and earth (Ignition switch: ON)
    OK: System voltage
  - NG → **Check the following connectors:** B-02, B-03, B-05, B-36
    - NG → **Repair**
    - OK → Check trouble symptom.
      - NG → Check the harness wire between the control relay and the injector connector, and repair if necessary.
  - OK → Check the injector control circuit. (Refer to P.13A-60, INSPECTION PROCEDURE 50.)

Code No. 44 Ignition coil system	Probable cause
Range of Check ● Engine speed is approx. 50 - 4,000 r/min ● Excluding deceleration driving and sudden acceleration or deceleration driving Set conditions ● Misfire occurs in No.1 and No.4 cylinders or No.2 and No.3 cylinders more than predeterminated times per 1,000 r/min.	● Malfunction of the ignition coil ● Improper connector contact, open circuit or short-circuited harness wire of the ignition primary circuit ● Malfunction of the spark plug and spark plug cable ● Improper compression pressure ● Malfunction of the engine-ECU

Measure at the ignition coil connectors B-01, B-11
- Disconnect the connector, and measure at the harness.

1. Voltage between 1 and earth (Ignition switch: ON)
   OK: System voltage
2. Voltage between 3 and earth (Engine: Cranking)
   OK: 0.5 - 4.0 V
3. Continuity between the 2 and earth
   OK: Continuity

1. NG → **Check the following connectors:** C-92, C-131
- OK → Check trouble symptom.
  - NG → Check the harness wire between the ignition coil and ignition switch connector, and repair if necessary.
- NG → **Repair**

2. NG → **Check the following connector:** C-34
- NG → **Repair**
- OK → Check trouble symptom.
  - NG → Check the harness wire between the engine-ECU and ignition coil connector.
    - OK → Replace the engine-ECU.
    - NG → **Repair**

3. NG → Check the harness wire between the ignition coil connector and earth, and repair if necessary.

OK → **Check the following connectors:** B-01, B-11
- NG → **Repair**

↓

Check trouble symptom.

↓ NG

Check the following items.
- Check the spark plugs, spark plug cables.
- Check the compression pressure.

NG → **Repair or replace**

↓ OK

Replace the ignition coil.

↓

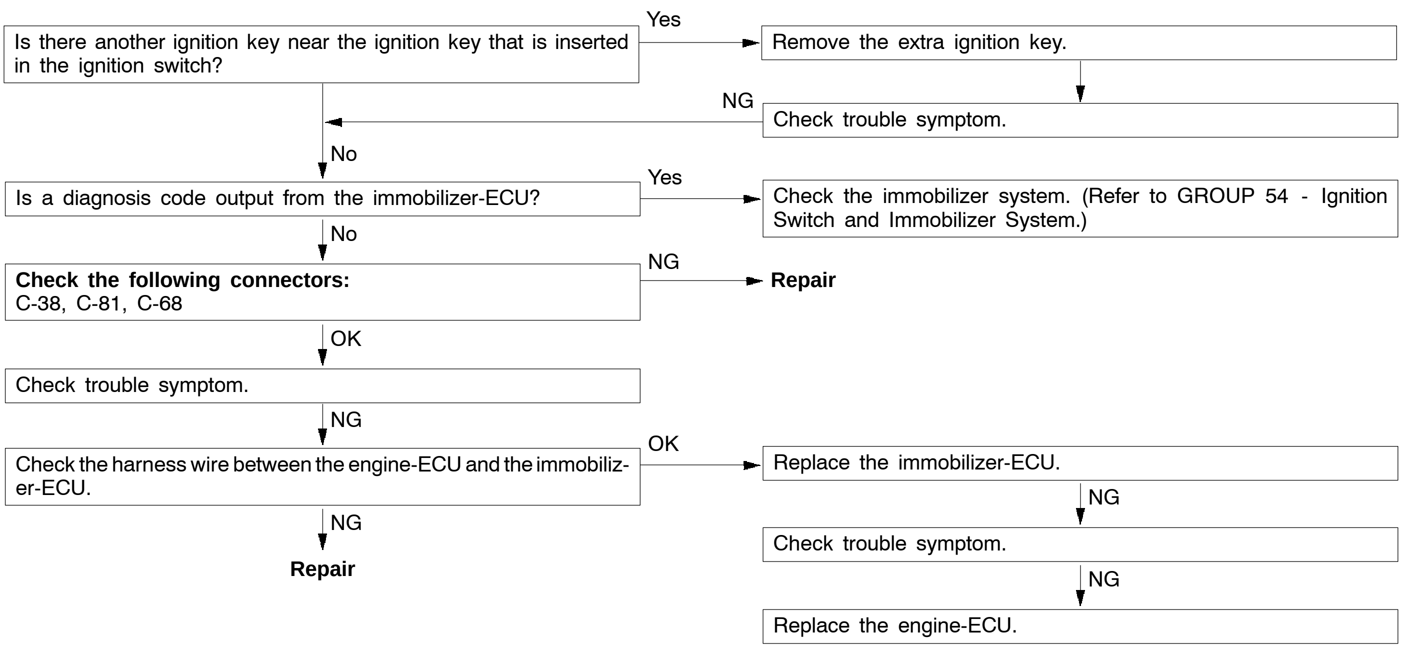
Check trouble symptom.

↓ NG

Replace the engine-ECU.

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

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



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

Check the oxygen sensor (rear). (Refer to P.13A-93.) — NG → **Replace**

↓ OK

Measure at the oxygen sensor (rear) connector C-85.
- Disconnect the connector, and measure at the harness side.

1. Voltage between 3 and earth (Ignition switch: ON)
   OK: System voltage
2. Continuity between 2 and earth
   OK: Continuity
3. Continuity between 4 and earth
   OK: Continuity

1. NG → Check the harness wire between the oxygen sensor (rear) and the control relay connector, and repair if necessary.

2. NG → **Check the following connector:** C-40 — NG → **Repair**
   - ↓ OK
   - Check trouble symptom.
   - ↓ NG
   - Check the harness wire between the engine-ECU and the oxygen sensor (rear) connector. — NG → **Repair**
   - ↓ OK
   - Replace the engine-ECU.

3. NG → Check the harness wire between the oxygen sensor (rear) and the earth, and repair if necessary.

↓ OK

Check the following connectors: C-85, C-40 — NG → **Repair**

↓ OK

Check trouble symptom.

↓ NG

Check the harness wire between the engine-ECU and the oxygen sensor (rear) connector. — NG → **Repair**

↓ OK

Replace the oxygen sensor (rear).

↓

Check trouble symptom.

↓ NG

Replace the engine-ECU.

Code No. 61 Communication wire with A/T-ECU system <A/T>	Probable cause
Range of Check • 60 seconds or more have passed immediately after engine was started. • Engine speed is approx. 50 r/min or more Set conditions The voltage of the torque reduction request signal from the A/T-ECU is LOW for 1.5 seconds or more.	• Malfunction of the harness wire and the connector • Malfunction of the engine-ECU • Malfunction of the A/T-ECU

1. **Check the following connectors:** C-34, C-38, C-30
   - NG → **Repair**
   - OK ↓
2. Check trouble symptom.
   - NG ↓
3. Check the harness wire between the engine-ECU and the A/T-ECU connector.
   - NG → **Repair**
   - OK → Replace the engine-ECU. → Check trouble symptom. → NG → Replace the A/T-ECU.

Code No. 64 Alternator FR Terminal System	Probable cause
Range of Check, Set Conditions • The alternator FR terminal signal voltage remains high for approximately 20 seconds while the engine is running.	• Open circuit in alternator FR terminal circuit • Malfunction of the engine-ECU

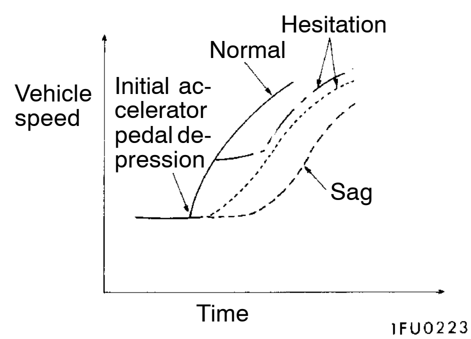
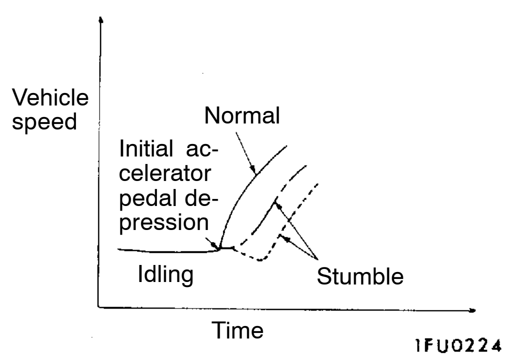
1. Measure at the alternator connector B-38.
   - Connect the connector.
   - Voltage between 4 and earth
     (Engine: Idling)
     (Radiator fan: Stopped)
     (Headlamp: OFF → ON)
     OK: 1.8 - 2.4 → 1.0 - 1.6 V
   - OK → Replace the engine-ECU.
   - NG ↓
2. Measure at the alternator connector B-38.
   - Disconnect the connector, and measure at the harness side.
   - Voltage between 4 and earth
     (Ignition switch: ON)
     OK: 4.8 - 5.2 V
   - NG → **Check the following connectors:** B-31, C-36
     - NG → **Repair**
     - OK → Check trouble symptom. → NG → Check the harness wire between the engine-ECU and the alternator connector.
       - NG → **Repair**
       - OK → Replace the engine-ECU.
   - OK ↓
3. **Check the following connector:** B-38
   - NG → **Repair**
   - OK ↓
4. Check trouble symptom.
   - NG ↓
5. Check the harness wire between the engine-ECU and the alternator connector.
   - NG → **Repair**
   - OK ↓
6. Replace the alternator.

INSPECTION CHART FOR TROUBLE SYMPTOMS

13100880354

Trouble symptom		Inspection procedure No.	Reference page
Communication with MUT-II is impossible.	Communication with all systems is not possible.	1	13A-28
	Communication with engine-ECU only is not possible.	2	13A-29
Engine warning lamp and related parts	The engine warning lamp does not illuminate right after the ignition switch is turned to the ON position.	3	13A-30
	The engine warning lamp remains illuminating and never goes out.	4	13A-30
Starting	No initial combustion (starting impossible)	5	13A-31
	Initial combustion but no complete combustion (starting impossible)	6	13A-32
	Long time to start (improper starting)	7	13A-33
Idling stability (Improper idling)	Unstable idling (Rough idling, hunting)	8	13A-34
	Idling speed is high. (Improper idling speed)	9	13A-35
	Idling speed is low. (Improper idling speed)	10	13A-36
Idling stability (Engine stalls)	When the engine is cold, it stalls at idling. (Die out)	11	13A-37
	When the engine becomes hot, it stalls at idling. (Die out)	12	13A-38
	The engine stalls when starting the car. (Pass out)	13	13A-39
	The engine stalls when decelerating.	14	13A-39
Driving	Hesitation, sag or stumble	15	13A-40
	The feeling of impact or vibration when accelerating	16	13A-40
	The feeling of impact or vibration when decelerating	17	13A-41
	Poor acceleration	18	13A-41
	Surge	19	13A-42
	Knocking	20	13A-42
Dieseling		21	13A-42
Too high CO and HC concentration when idling		22	13A-43
Low alternator output voltage (approx. 12.3 V)		23	13A-44
Idling speed is improper when A/C is operating		24	13A-44
Fans (radiator fan, A/C condensor fan) are inoperative		25	13A-45

PROBLEM SYMPTOMS TABLE (FOR YOUR INFORMATION)

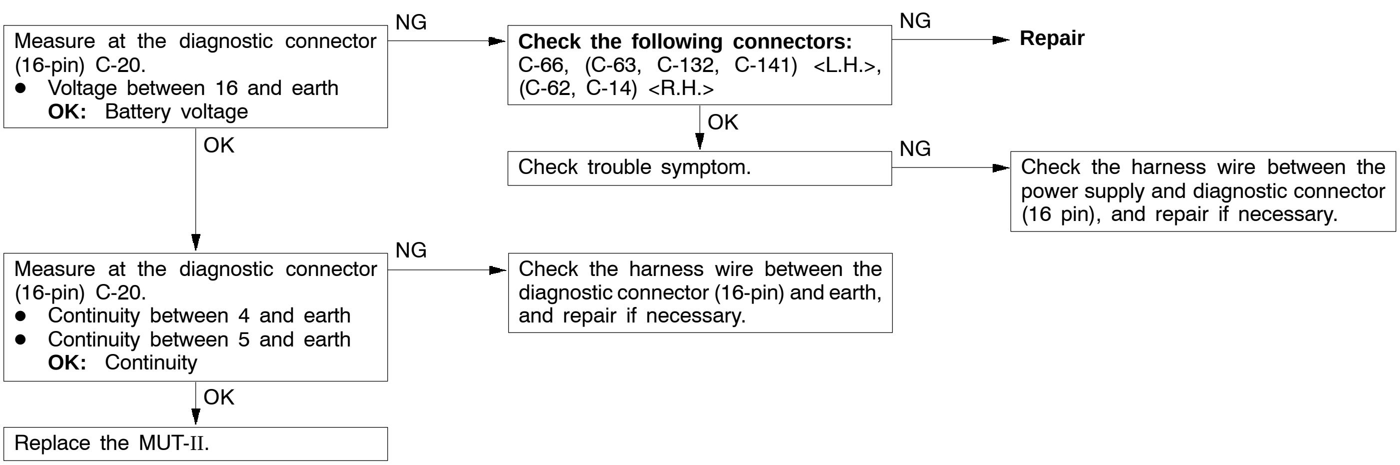
Items		Symptom
Starting	Won’t start	The starter is used to crank the engine, but there is no combustion within the cylinders, and the engine won’t start.
	Fires up and dies	There is combustion within the cylinders, but then the engine soon stalls.
	Hard starting	Engine starts after cranking a while.
Idling stability	Hunting	Engine speed doesn’t remain constant; changes at idle.
	Rough idle	Usually, a judgement can be based upon the movement of the tachometer pointer, and the vibration transmitted to the steering wheel, shift lever, body, etc. This is called rough idle.
	Incorrect idle speed	The engine doesn’t idle at the usual correct speed.
	Engine stall (Die out)	The engine stalls when the foot is taken from the accelerator pedal, regardless of whether the vehicles is moving or not.
	Engine stall (Pass out)	The engine stalls when the accelerator pedal is depressed or while it is being used.
Driving	Hesitation Sag	“Hesitation” is the delay in response of the vehicle speed (engine speed) that occurs when the accelerator is depressed in order to accelerate from the speed at which the vehicle is now traveling, or a temporary drop in vehicle speed (engine speed) during such acceleration. Serious hesitation is called “sag”. 
	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. 

Items		Symptom
Driving	Shock	The feeling of a comparatively large impact or vibration when the engine is accelerated or decelerated.
	Surge	This is repeated surging ahead during constant speed travel or during variable speed travel.
	Knocking	A sharp sound like a hammer striking the cylinder walls during driving and which adversely affects driving.
Stopping	Run on ("Dieseling")	The condition in which the engine continues to run after the ignition switch is turned to OFF. Also called "Dieseling".

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

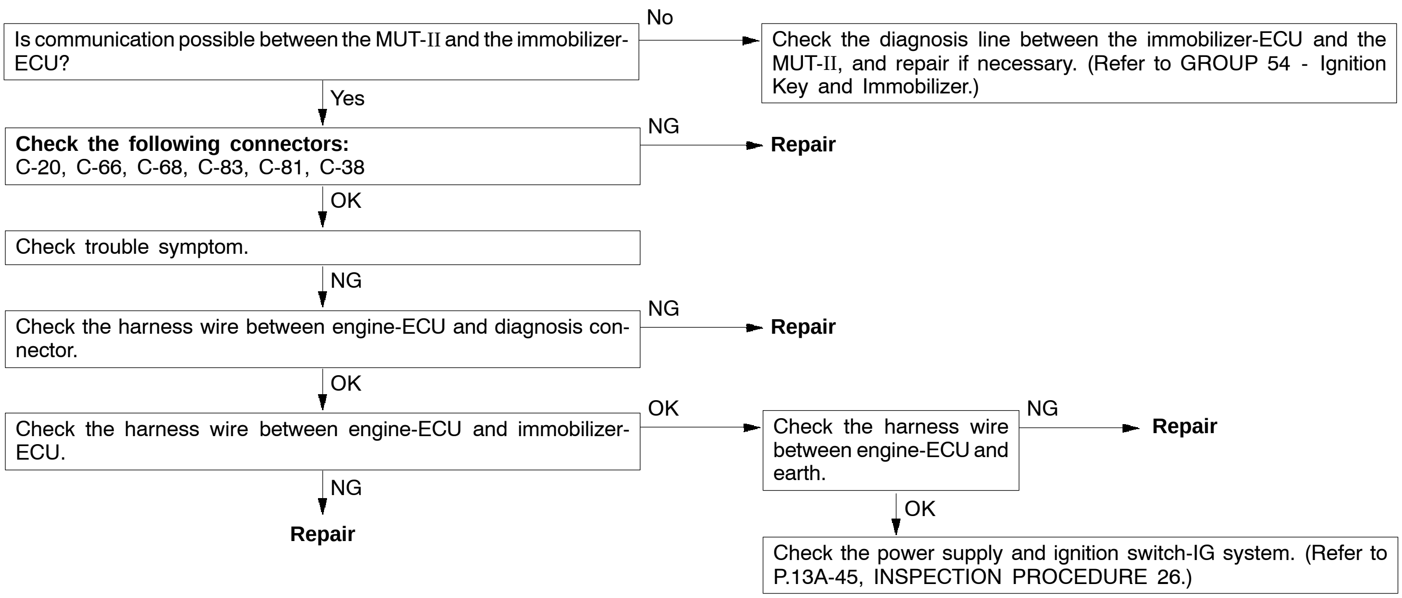
INSPECTION PROCEDURE 1

Communication with MUT-II is not possible. (Communication with all systems is not possible.)	**Probable cause**
The cause is probably a defect in the power supply system (including earth) for the diagnosis line.	• Malfunction of the connector • Malfunction of the harness wire



INSPECTION PROCEDURE 2

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



INSPECTION PROCEDURE 3

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

MUT-II Data list
16 engine-ECU power supply voltage (Refer to P.13A-62.)

NG → Check the engine-ECU power supply and earth circuit. (Refer to P.13A-58, INSPECTION PROCEDURE 45.)

OK ↓

Measure at the engine-ECU connector C-36.
- Disconnect the connector, and measure at the harness side.
- Earth the terminal No. 36.
  OK: The engine warning lamp illuminates.

OK → **Check the following connector:** C-36.
- NG → **Repair**
- OK ↓ Check trouble symptom.
  - NG ↓ Replace the engine-ECU.

NG ↓

Check a burnt-out bulb.

NG → **Replace**

OK ↓

Measure at the combination meter connector D-03.
- Disconnect the connector, and measure at the harness side.
- Voltage between 4 and earth (Ignition switch: ON)
  OK: System voltage

NG → Check the engine warning lamp power supply circuit, and repair if necessary.

OK ↓

Check the following connectors:
D-03, C-90, C-36

NG → **Repair**

OK ↓

Check trouble symptom.

NG → Check the harness wire between combination meter and engine-ECU, and repair if necessary.

INSPECTION PROCEDURE 4

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

MUT-II Self-Diag code
Are diagnosis codes displayed?

Yes → Refer to P.13A-12, INSPECTION CHART FOR DIAGNOSIS CODES

No ↓

Measure at the combination meter connector D-03.
- Disconnect the connector, and measure at the harness side.
- Disconnect the engine-ECU connector
- Continuity between 16 and earth
  OK: No continuity

NG → Check the harness wire between combination meter and engine-ECU connector, and repair if necessary.

OK ↓

Replace the engine-ECU.

INSPECTION PROCEDURE 5

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

Check battery voltage when cranking.
OK: 8 V or higher

→ NG: Check the battery. (Refer to GROUP 54 - Battery.)

↓ OK

Is immobilizer-ECU diagnosis code displayed?

→ Yes: Check the immobilizer. (Refer to GROUP 54 - Ignition Key and Immobilizer.)

↓ No

MUT-II: Inspection of no initial combustion.
(Refer to P.13A-52, INSPECTION PROCEDURE 37.)

↓ OK

Can any sound be heard from the injectors when cranking?

→ NG: Check the injector system. (Refer to P.13A-21, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 41.)

↓ OK

Ignition system: Inspection of no initial combustion.
(Refer to P.13A-52, INSPECTION PROCEDURE 38.)

↓ OK

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

INSPECTION PROCEDURE 6

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

Check battery voltage when cranking.
OK: 8 V or higher

NG → Check the battery. (Refer to GROUP 54 - Battery.)

OK ↓

MUT-II: Check if uncompleted combustion occurs.
(Refer to P.13A-53, INSPECTION PROCEDURE 39.)

OK ↓

Can any sound be heard from the injectors when cranking?

NG → Check the injector system, (Refer to P.13A-21, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 41.)

OK ↓

Is starting good if the engine is cranked with the accelerator pedal slightly depressed?

Yes → Check ISC servo for operation sound. (Refer to P.13A-95.)

- NG → Check the ISC servo system. (Refer to P.13A-50, INSPECTION PROCEDURE 34.)
- OK ↓
  - Clean the throttle valve area. (Refer to P.13A-81.)
  - Check and adjust the fixed SAS. (Refer to P.13A-83.)

No ↓

Check the ignition timing when cranking.
OK: Approx. 5°BTDC

NG → Check that the crank angle sensor is installed properly.

OK ↓

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

INSPECTION PROCEDURE 7

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

Check battery voltage when cranking
OK: 8 V or higher

NG → Check the battery. (Refer to GROUP 54 - Battery.)

↓ OK

MUT-II: Check if uncomplete combustion occurs.
(Refer to P.13A-53, INSPECTION PROCEDURE 39.)

↓ OK

Can any sound be heard from the injectors when cranking?

NG → Check the injector system. (Refer to P.13A-21, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 41.)

↓ OK

Check the ignition timing when cranking.
OK: Approx. 5°BTDC

NG → Check that the crank angle sensor is installed properly.

↓ OK

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.

INSPECTION PROCEDURE 8

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

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

MUT-II Self-Diag code
Are diagnosis codes displayed?
- Yes → Refer to P.13A-12, INSPECTION CHART FOR DIAGNOSIS CODES.
- No ↓

Does idling speed fluctuate excessively?
- Yes → Check if hunting occurs. (Refer to P.13A-53, INSPECTION PROCEDURE 40.)
- No ↓

Check the ISC servo for operation sound. (Refer to P.13A-95.)
- NG → Check the ISC servo system. (Refer to P.13A-50, INSPECTION PROCEDURE 34.)
- OK ↓

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

MUT-II: Check if idling speed is unstable.
(Refer to P.13A-54, INSPECTION PROCEDURE 41.)
- OK ↓

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

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables.
- Check the purge control system.
- Check the EGR control system.
- Check the compression pressure.
- Check if foreign materials (water, alcohol, etc.) got into fuel.

INSPECTION PROCEDURE 9

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

MUT-II Self-Diag code
Are diagnosis codes displayed?

Yes → Refer to P.13A-12, INSPECTION CHART FOR DIAGNOSIS CODES.

No ↓

Check the ISC servo for operation sound. (Refer to P.13A-95.)

NG → Check the ISC servo system. (Refer to P.13A-50, INSPECTION PROCEDURE 34.)

OK ↓

MUT-II Data list
26 Idle position switch (Refer to P.13A-63.)

NG → Check the idle position switch system. (Refer to P.13A-46, INSPECTION PROCEDURE 28.)

OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13A-62.)

NG → Check the engine coolant temperature sensor system. (Refer to P.13A-16, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 21.)

OK ↓

MUT-II Data list
28 A/C switch (Refer to P.13A-63.)

NG → Check the A/C switch and A/C relay system. (Refer to P.13A-49, INSPECTION PROCEDURE 32.)

OK ↓

Basic idle adjustment (Refer to P.13A-83.)

↓

Check trouble symptom.

NG → Clean the throttle valve area. (Refer to P.13A-81.)

↓

Check and adjust the fixed SAS. (Refer to P.13A-83.)

INSPECTION PROCEDURE 10

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

MUT-II Self-Diag code
Are diagnosis codes displayed?

Yes → Refer to P.13A-12, INSPECTION CHART FOR DIAGNOSIS CODES.

No ↓

Check the ISC servo for operation sound. (Refer to P.13A-95.)

NG → Check the ISC servo system. (Refer to P.13A-50, INSPECTION PROCEDURE 34.)

OK ↓

MUT-II Data list
26 Idle position switch (Refer to P.13A-63.)

NG → Check the idle position switch system. (Refer to P.13A-46, INSPECTION PROCEDURE 28.)

OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13A-62.)

NG → Check the engine coolant temperature sensor system. (Refer to P.13A-16, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 21.)

OK ↓

MUT-II Data list
29 Inhibitor switch (Refer to P.13A-63.)

NG → Check the ignition switch ST and inhibitor switch system <A/T>. (Refer to P.13A-48, INSPECTION PROCEDURE 30.)

OK ↓

Basic idle adjustment (Refer to P.13A-83.)

↓

Check trouble symptom.

NG → Clean the throttle valve area. (Refer to P.13A-81.)

↓

Check and adjust the fixed SAS. (Refer to P.13A-83.)

INSPECTION PROCEDURE 11

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

1. Were the battery terminals disconnected?
   - Yes → After warming-up, let the engine run at idling for 10 minutes.
   - No ↓
2. **MUT-II Self-Diag code**
   Are diagnosis codes displayed?
   - Yes → Refer to P.13A-12, INSPECTION CHART FOR DIAGNOSIS CODES.
   - No ↓
3. Does the engine stall right after the accelerator pedal is released?
   - Yes → Clean the throttle valve area. (Refer to P.13A-81.) → Check and adjust the fixed SAS. (Refer to P.13A-83.)
   - No ↓
4. Is engine-idling stable after the warming-up?
   - No → Check if the unstable idling (Rough idling, hunting). (Refer to P.13A-34, INSPECTION PROCEDURE 8.)
   - Yes ↓
5. Check the ISC servo for operation sound. (Refer to P.13A-95.)
   - NG → Check the ISC servo system. (Refer to P.13A-50, INSPECTION PROCEDURE 34.)
   - OK ↓
6. Check the injector for operation sound.
   - NG → Check the injector system. (Refer to P.13A-21, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 41.)
   - OK ↓
7. **MUT-II Data list**
   26 Idle position switch (Refer to P.13A-63.)
   - NG → Check the idle position switch system. (Refer to P.13A-46, INSPECTION PROCEDURE 28.)
   - OK ↓
8. **MUT-II Data list**
   21 Engine coolant temperature sensor (Refer to P.13A-62.)
   - NG → Check the engine coolant temperature sensor system. (Refer to P.13A-16, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 21.)
   - OK ↓
9. **MUT-II Actuator test**
   10 EGR control solenoid valve (Refer to P.13A-65.)
   - NG → Check the EGR control solenoid valve system. (Refer to P.13A-51, INSPECTION PROCEDURE 36.)
   - OK ↓
10. Check the fuel pressure. (Refer to P.13A-85.)
    - OK ↓
11. Check the ignition timing.
    (Refer to GROUP 11A - On-vehicle Service.)
    - NG → Check that the crank angle sensor is installed properly.
    - OK ↓
12. Check the following items.
    - Check the ignition coil, spark plugs, spark plug cables.
    - Check the compression pressure.
    - Check the engine oil viscosity.

INSPECTION PROCEDURE 12

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

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

MUT-II Self-Diag code
Are diagnosis codes displayed?
- Yes → Refer to P.13A-12, INSPECTION CHART FOR DIAGNOSIS CODES.
- No ↓

Check the ISC servo for operation sound. (Refer to P.13A-95.)
- NG → Check the ISC servo system. (Refer to P.13A-50, INSPECTION PROCEDURE 34.)
- OK ↓

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

Does the engine stall right after the accelerator pedal is released?
- Yes → Clean the throttle valve area. (Refer to P.13A-81.) → Check and adjust the fixed SAS. (Refer to P.13A-83.)
- No ↓

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

MUT-II: Engine stalling inspection when the engine is warm and idling. (Refer to P.13A-55, INSPECTION PROCEDURE 42.)
- OK ↓

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

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.

INSPECTION PROCEDURE 13

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

MUT-II Self-Diag code
Are diagnosis codes displayed?

- Yes → Refer to P.13A-12, INSPECTION CHART FOR DIAGNOSIS CODES.
- No ↓

MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13A-65.)

- NG → Check the EGR control solenoid valve system. (Refer to P.13A-51, INSPECTION PROCEDURE 36.)
- OK ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables.
- Check if air was drawn into the intake system.
  - Broken intake manifold gasket
  - Broken or disconnected vacuum hose
  - Improper operation of the PCV valve
  - Broken air intake hose

INSPECTION PROCEDURE 14

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

Were the battery terminals disconnected?

- Yes → After warming-up, let the engine run at idling for 10 minutes.
- No ↓

MUT-II Self-Diag code
Are diagnosis codes displayed?

- Yes → Refer to P.13A-12, INSPECTION CHART FOR DIAGNOSIS CODES.
- No ↓

MUT-II Data list
26 Idle position switch (Refer to P.13A-63.)

- NG → Check the idle position switch system. (Refer to P.13A-46, INSPECTION PROCEDURE 28.)
- OK ↓

MUT-II Data list
14 Throttle position sensor (Refer to P.13A-62.)

- NG → Check the throttle position sensor system. (Refer to P.13A-15, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 14.)
- OK ↓

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

- Yes → Check the vehicle speed sensor system. (Refer to P.13A-19, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 24.)
- No ↓

MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13A-65.)

- NG → Check the EGR control solenoid valve system. (Refer to P.13A-51, INSPECTION PROCEDURE 36.)
- 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.

INSPECTION PROCEDURE 15

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

MUT-II Self-Diag code
Are diagnosis codes displayed?

→ Yes: Refer to P.13A-12, INSPECTION CHART FOR DIAGNOSIS CODES.

↓ No

Check the injectors for operation sound.

→ NG: Check the injector system. (Refer to P.13A-21, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 41.)

↓ OK

Check the ignition timing.
(Refer to GROUP 11A - On-vehicle Service.)

→ NG: Check that the crank angle sensor is installed properly.

↓ OK

MUT-II: Check if hesitation, sag, stumble or poor acceleration occur.
(Refer to P.13A-56, INSPECTION PROCEDURE 43.)

↓ OK

Check the fuel pressure. (Refer to P.13A-85.)

↓ OK

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables.
- Check the EGR control system.
- Check the compression pressure.
- Check the fuel filter or fuel line for clogging.

INSPECTION PROCEDURE 16

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

MUT-II Self-Diag code
Are diagnosis codes displayed?

→ Yes: Refer to P.13A-12, INSPECTION CHART FOR DIAGNOSIS CODES.

↓ No

Check the following items.
- 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

MUT-II Self-Diag code
Are diagnosis codes displayed?

Yes → Refer to P.13A-12, INSPECTION CHART FOR DIAGNOSIS CODES.

No ↓

Check the ISC servo for operation sound. (Refer to P.13A-95.)

NG → Check the ISC servo system. (Refer to P.13A-50, INSPECTION PROCEDURE 34.)

OK ↓

MUT-II Data list
14 Throttle position sensor (Refer to P.13A-62.)

NG → Check the throttle position sensor system. (Refer to P.13A-15, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 14.)

OK ↓

MUT-II Data list
26 Idle position switch (Refer to P.13A-63.)

NG → Check the idle position switch system. (Refer to P.13A-46, INSPECTION PROCEDURE 28.)

OK ↓

Clean the throttle valve area. (Refer to P.13A-81.)

INSPECTION PROCEDURE 18

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

MUT-II Self-Diag code
Are diagnosis codes displayed?

Yes → Refer to P.13A-12, INSPECTION CHART FOR DIAGNOSIS CODES.

No ↓

Check the injectors for operation sound.

NG → Check the injector system. (Refer to P.13A-21, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 41.)

OK ↓

Check the ignition timing.
(Refer to GROUP 11A - On-vehicle Service.)

NG → Check that the crank angle sensor is installed properly.

OK ↓

MUT-II: Check if hesitation, sag, stumble or poor acceleration occur.
(Refer to P.13A-56, INSPECTION PROCEDURE 43.)

OK ↓

Check the fuel pressure. (Refer to P.13A-85.)

OK ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables.
- Check the compression pressure.
- Check the fuel filter or fuel line for clogging.
- Broken air intake hose
- Clogged air cleaner

INSPECTION PROCEDURE 19

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

MUT-II Self-Diag code
Are diagnosis codes displayed?
→ Yes: Refer to P.13A-12, INSPECTION CHART FOR DIAGNOSIS CODES.
↓ No

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

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

MUT-II: Check if surge occurs.
(Refer to P.13-57, INSPECTION PROCEDURE 44.)
↓ OK

Check the fuel pressure. (Refer to P.13A-85.)
↓ OK

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

INSPECTION PROCEDURE 20

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

MUT-II Self-Diag code
Are diagnosis codes displayed?
→ Yes: Refer to P.13A-12, INSPECTION CHART FOR DIAGNOSIS CODES.
↓ No

Does knocking occur when driving with the sensor disconnected? At this time, use the MUT-II to check if the timing is retarded compared to when the detonation sensor connector is connected.
→ No: Check the detonation sensor system. (Refer to P.13A-21, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 31.)
↓ Yes

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

INSPECTION PROCEDURE 21

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

Check the injectors for fuel leakage.

INSPECTION PROCEDURE 22

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

MUT-II Self-Diag code
Are diagnosis codes displayed?

- Yes → Refer to P.13A-12, INSPECTION CHART FOR DIAGNOSIS CODES.
- No ↓

Check the ignition timing.
(Refer to GROUP 11A - On-vehicle Service.)

- NG → Check that the crank angle sensor is installed properly.
- OK ↓

MUT-II Data list
21 Engine coolant temperature sensor. (Refer to P.13A-62.)

- NG → Check the engine coolant temperature sensor system. (Refer to P.13A-16, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 21.)
- OK ↓

MUT-II Data list
13 Intake air temperature sensor (Refer to P.13A-62.)

- NG → Check the intake air temperature sensor system. (Refer to P.13A-14, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 13.)
- OK ↓

MUT-II Data list
25 Barometric pressure sensor (Refer to P.13A-63.)

- NG → Check the barometric pressure sensor system. (Refer to P.13A-20, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 25.)
- OK ↓

MUT-II Data list
59 Oxygen sensor (rear) (Refer to P.13A-65.)
● Transmission: 2nd gear <M/T>, L range <A/T>
● Driving with throttle widely open
OK: 600 - 1,000 mV

- NG → Check the oxygen sensor (rear) system. (Refer to P.13A-24, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 59.)
- OK ↓

MUT-II Data list
11 Oxygen sensor
OK: 600 - 1,000 mV when racing suddenly (Refer to P.13A-61.)

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

MUT-II Data list
11 Oxygen sensor
OK: Repeat 0 - 400 mV and 600 - 1,000 mV alternately when idling. (Refer to P.13A-61.)

- OK → Replace the oxygen sensor. ↓ Check trouble symptom. NG ↓ (to "Check the following items.")
- NG ↓

Check the fuel pressure. (Refer to P.13A-85.)

- OK ↓

Check the following items.
● Check the injectors for operation sound.
● Check the injectors for fuel leakage.
● Check the ignition coil, spark plugs, spark plug cables.
● Check the compression pressure.
● Check the positive crankcase ventilation system.
● Check the purge control system.
● Check the EGR control system.

↓

Check the trouble symptom.

- NG ↓

Replace the catalytic converter.

INSPECTION PROCEDURE 23

Low alternator output voltage (approx. 12.3 V)	Probable cause
The alternator may be defective, or malfunctions, which are listed in the right column, may be suspected.	• Malfunction of charging system • Short circuit in harness between alternator G terminal and engine-ECU • Malfunction of engine-ECU

Measure at the alternator connector side. B-38
- Connect the connector. (Test harness: MB991519)
- Voltage between 1 (black clip) and earth
  Engine: at idle
  Radiator fan: does not run
  Headlamp: OFF → ON
  Brake lamp: OFF → ON
  Rear defogger switch: OFF → ON
  OK: Voltages rises by 0.2 - 3.5 V.

OK → Check the alternator. (Refer to GROUP 16 - Charging System.)

NG → Measure at the alternator connector. B-38
- Disconnect the connector, and measure at the harness side.
- Disconnect the engine-ECU connector.
- Continuity between 1 and earth
  OK: No continuity

NG → Check the harness wire between the alternator and the engine-ECU connector, and repair if necessary.

OK → Check the harness wire between the alternator and the engine-ECU connector.

NG → **Repair**

OK → Replace the engine-ECU.

INSPECTION PROCEDURE 24

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

Measure at the engine-ECU connector C-34.
- Connect the connector.
- Voltage between 24 and earth (Engine: at idle, outside air temperature: 25°C or more)
  OK: 0 - 3 V [When A/C is MAX. COOL condition (when the load by A/C is high)]
  System voltage [When A/C is MAX. HOT condition (when the load by A/C is low)]

NG → Check the A/C system. (Refer to GROUP 55 - On-vehicle Service.)

OK → **Check the following connector:**
C-34

NG → **Repair**

OK → Check trouble symptom.

NG → Replace the engine-ECU.

INSPECTION PROCEDURE 25

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

Measure at the engine-ECU connector C-34.
- Disconnect the connector, and measure at the harness side.
- Voltage between 21 and earth (Ignition switch: ON)
  OK: 4.8 - 5.2 V (Fan rotates at high speed.)
- Connect a jumper cable between 21 and earth (Ignition switch: ON)
  OK: Fan stops

NG → Check the harness wire between the engine-ECU and the fan controller connector.
- NG → **Repair**
- OK → Check the radiator fan and condenser fan circuit. (Refer to GROUP 14 - Troubleshooting.)

OK → **Check the following connector:** C-34
- NG → **Repair**
- OK → Check trouble symptom.
  - NG → Replace the engine-ECU.

INSPECTION PROCEDURE 26

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

Check the control relay. (Refer to P.13A-90.)
- NG → **Replace**
- OK ↓

Measure at the control relay connector C-31.
- Disconnect the connector, and measure at the harness side.
- Voltage between 3, 4 and earth
  OK: System voltage

NG → **Check the following connector:** B-30
- NG → **Repair**
- OK → Check trouble symptom.
  - NG → Check the harness wire between battery and control relay connector, and repair if necessary.

OK → Check the engine-ECU power supply and earth circuit. (Refer to P.13A-58, INSPECTION PROCEDURE 45.)

INSPECTION PROCEDURE 27

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.	● Malfunction of the fuel pump relay ● Malfunction of the fuel pump ● Improper connector contact, open circuit or short-circuited harness wire ● Malfunction of the engine-ECU

Check the fuel pump operation. (Refer to P.13A-88.)
- NG → Check the fuel pump circuit. (Refer to P.13A-58, INSPECTION PROCEDURE 46.)
- OK ↓

Check the fuel pump relay. (Refer to P.13A-90.)
- NG → **Replace**
- OK ↓

Measure at the fuel pump relay connector C-32.
- Connect the connector.
- Voltage between 1 and earth
- MUT-II Actuator test: Fuel pump drive
  OK: System voltage

- NG → Check the fuel pump drive control circuit. (Refer to P.13A-59, INSPECTION PROCEDURE 47.)
- OK ↓

Check the harness wire between fuel pump relay connector and fuel pump drive terminal, and repair if necessary.

INSPECTION PROCEDURE 28

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

Check the idle position switch. (Refer to P.13A-91.)
- NG → Replace the throttle position sensor.
- OK ↓

Measure at the throttle position sensor connector B-07.
- Disconnect the connector, and measure at the harness side.
- Voltage between 3 and earth (Ignition switch: ON)
  OK: 4 V or higher
- Continuity between 4 and earth
  OK: Continuity

- NG → **Check the following connector:** C-40
  - NG → **Repair**
  - OK ↓ Check trouble symptom.
  - NG ↓ Check the harness wire between engine-ECU and throttle position sensor connector.
    - OK ↓ Replace the engine-ECU.
    - NG ↓ **Repair**
- OK ↓

Check the following connector: B-07
- NG → **Repair**
- OK ↓

Check trouble symptom.
- NG ↓

Replace the engine-ECU.

INSPECTION PROCEDURE 29

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

Measure at the engine-ECU connector C-40.
- Disconnect the connector, and measure at the harness side.

1. Voltage between 71 and earth (Ignition switch: START)
   OK: 8V or more
2. Continuity between 91 and earth
   OK: Continuity

OK → **Check the following connector:** C-40 — NG → **Repair**

OK → Check trouble symptom.

NG → Replace the engine-ECU.

1. NG → **Check the following connector:** C-92 — NG → **Repair**

OK → Check trouble symptom.

NG → Check harness wire between the engine-ECU and ignition switch connector. — NG → **Repair**

OK → Check the ignition switch.
(Refer to GROUP 54 - Ignition Switch and Immobilizer system.)

2. NG → Check the harness wire between engine-ECU connector (terminal No. 91) and earth, and repair if necessary.

INSPECTION PROCEDURE 30

Ignition switch-ST and inhibitor switch system <A/T>	Probable cause
• The ignition switch-ST inputs a HIGH signal to the engine-ECU while the engine is cranking. The engine-ECU controls fuel injection, etc. during starting based on this input. • The inhibitor switch inputs the condition of the select lever, i.e. whether it is in P or N range or in some other range, to the engine-ECU. The engine-ECU controls the idle speed control (ISC) servo based on this input.	• Malfunction of ignition switch • Malfunction of inhibitor switch • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the engine-ECU.

Check the inhibitor switch.
(Refer to GROUP 23A - On-vehicle Service.)

NG → **Replace**

OK ↓

Measure at the inhibitor switch connector B-72.
- Disconnect the connector, and measure at the harness side.
1. Voltage between 10 and earth (Ignition switch: ON)
   OK: System voltage
2. Continuity between 9 and earth
   OK: Continuity
3. Voltage between 10 and earth
   - Ignition switch: START
   - Disconnect engine-ECU connector.

   OK: System voltage

1. NG → Check harness wire between engine-ECU and inhibitor switch connector.
   - NG → **Repair**
   - OK ↓ Replace the engine-ECU.

2. NG → Check harness wire between inhibitor switch connector and starter S terminal, and repair if necessary.

3. NG → **Check the following connector:** C-92
   - NG → **Repair**
   - OK ↓ Check trouble symptom.
   - NG ↓ Check harness wire between inhibitor switch and ignition switch connector.
     - NG → **Repair**
     - OK ↓ Check the ignition switch.
       (Refer to GROUP 54 - Ignition Switch and Immobilizer system.)

OK ↓

Check the following connector: B-72

NG → **Repair**

OK ↓

Check trouble symptom.

NG ↓

Check harness wire between engine-ECU and inhibitor switch connector.

NG → **Repair**

OK ↓

Replace the engine-ECU.

INSPECTION PROCEDURE 31

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

Check the power steering fluid pressure switch.
(Refer to GROUP 37A - On-vehicle Service.)

NG → **Replace**

OK ↓

Measure at the power steering fluid pressure switch connector B-76.
- Disconnect the connector, and measure at the harness side.
- Voltage between 1 and earth (Ignition switch: ON)
  OK: System voltage

NG → **Check the following connector:** C-36
- NG → **Repair**
- OK ↓ Check trouble symptom.
- NG ↓ Check harness wire between engine-ECU and power steering fluid pressure switch connector.
  - NG → **Repair**
  - OK ↓ Replace the engine-ECU.

OK ↓

Check the following connector: B-76

NG → **Repair**

OK ↓

Check trouble symptom.

NG ↓

Replace the engine-ECU.

INSPECTION PROCEDURE 32

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

Check the A/C compressor relay.
(Refer to GROUP 55 - On-vehicle Service.)

NG → **Replace**

OK ↓

Measure at the engine-ECU connectors C-34, C-36.
- Disconnect the connector, and measure at the harness side.
- Voltage between 8 and earth, and 45 and earth
  (Ignition switch: ON)
  OK: 0 - 3 V (A/C switch: OFF)
  System voltage (A/C switch: ON)
- Short circuit between 8 and earth
  (Ignition switch: ON, A/C switch: ON)
  OK: A/C compressor clutch turns on.

NG → Check the A/C system. (Refer to GROUP 55 - Troubleshooting.)

OK → **Check the following connectors:** C-34, C-36
- NG → **Replace**
- OK ↓ Check trouble symptom.
- NG ↓ Replace the engine-ECU.

INSPECTION PROCEDURE 33

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

Measure at the ignition coil connectors B-01, B-11.
- Disconnect the connector and measure at the harness side.
1. Voltage between 1 and earth (Ignition switch: ON)
   OK: System voltage
2. Continuity between 2 and earth
   OK: Continuity

1. NG → **Check the following connectors:** C-92, C-131 — NG → **Repair**
   - OK → Check trouble symptom.
   - NG → Check the harness wire between ignition coil and ignition switch connector. — NG → **Repair**
   - OK → Check the ignition switch. (Refer to GROUP 54 - Ignition Switch and Immobilizer System.)

2. NG → Check the harness wire between power transistor unit connector and earth, and repair if necessary.

OK → **Check the following connectors:** B-01, B-11 — NG → **Repair**

OK → Check trouble symptom. — NG → Check ignition coil and power transistor unit system. (Refer to P.13A-22, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 44.)

INSPECTION PROCEDURE 34

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

Check the ISC servo (Refer to P.13A-95.) — NG → **Replace**

OK → Measure at the ISC servo connector B-10.
- Disconnect the connector and measure at the harness side.
- Voltage between 2 and earth, and 5 and earth (Ignition switch: ON)
  OK: System voltage

NG → Check the harness wire between control relay and ISC servo connector, and repair if necessary.

OK → Measure at the engine-ECU connector C-34.
- 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:** B-10 — NG → **Repair**
- OK → Check trouble symptom.
- NG → Check harness wire between engine-ECU and ISC servo connector, and repair if necessary.

OK → **Check the following connector:** C-34 — NG → **Repair**

OK → Check trouble symptom. — NG → Replace the engine-ECU.

INSPECTION PROCEDURE 35

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

Check the purge control solenoid valve.
(Refer to GROUP 17 - Emission Control System.)
NG → **Replace**
OK ↓

Measure at the purge control solenoid valve connector B-04.
- Disconnect the connector and measure at the harness side.
- Voltage between 2 and earth (Ignition switch: ON)
  OK: System voltage

NG → Check the harness wire between control relay and solenoid valve connector, and repair if necessary.
OK ↓

Measure at the engine-ECU connector C-34.
- 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:** B-04
- NG → **Repair**
- OK ↓ Check trouble symptom.
- NG ↓ Check the harness wire between engine-ECU and solenoid valve connector, and repair if necessary.

OK ↓

Check the following connector: C-34
NG → **Repair**
OK ↓

Check trouble symptom.
NG ↓

Replace the engine-ECU.

INSPECTION PROCEDURE 36

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

Check the EGR control solenoid valve.
(Refer to GROUP 17 - Emission Control System.)
NG → **Replace**
OK ↓

Measure at the EGR control solenoid valve connector B-06.
- Disconnect the connector and measure at the harness side.
- Voltage between 1 and earth (Ignition switch: ON)
  OK: System voltage

NG → Check the harness wire between control relay and solenoid valve connector, and repair if necessary.
OK ↓

Measure at the engine-ECU connector C-34.
- Disconnect the connector and measure at the harness side.
- Voltage between 6 and earth (Ignition switch: ON)
  OK: System voltage

NG → **Check the following connector:**
B-06
- NG → **Repair**
- OK ↓ Check trouble symptom.
- NG ↓ Check the harness wire between engine-ECU and solenoid valve connector, and repair if necessary.

OK ↓

Check the following connector: C-34
NG → **Repair**
OK ↓

Check trouble symptom.
NG ↓

Replace the engine-ECU.

INSPECTION PROCEDURE 37

MUT-II: Inspection of no initial combustion

MUT-II Data list
16 Power supply voltage (Refer to P.13A-62.)

NG → Check the power supply and ignition switch-IG system.
(Refer to P.13A-45, INSPECTION PROCEDURE 26.)

OK ↓

Does the camshaft rotate at the engine cranking?
(When oil filler cap is removed.)

No → Check timing belt for breakage.

Yes ↓

MUT-II Self-Diag code
Are diagnosis codes displayed?

Yes → Refer to P.13A-12, INSPECTION CHART FOR DIAGNOSIS CODES.

No ↓

MUT-II Data list
22 Crank angle sensor
OK: Cranking speed is displayed.

No → Check the crank angle sensor system.
(Refer to P.13A-17, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 22.)

OK ↓

MUT-II Actuator test
07 Fuel pump (Refer to P.13A-65.)

NG → Check the fuel pump system.
(Refer to P.13A-46, INSPECTION PROCEDURE 27.)

OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13A-62.)

NG → Check the engine coolant temperature sensor system.
(Refer to P.13A-16, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 21.)

INSPECTION PROCEDURE 38

Ignition system: Inspection of no initial combustion.

Check ignition circuit system.
(Refer to P.13A-50, INSPECTION PROCEDURE 33.)

OK ↓

Check the ignition timing when cranking.
OK: Approx. 5°BTDC

NG → Check that the crank angle sensor is installed properly.

INSPECTION PROCEDURE 39

MUT-II: Check if uncomplete combustion occurs.

MUT-II Self-Diag code
Are diagnosis codes displayed?

Yes → Refer to P.13A-12, INSPECTION CHART FOR DIAGNOSIS CODE

No ↓

MUT-II Actuator test
07 Fuel pump (Refer to P.13A-65.)

NG → Check the fuel pump system. (Refer to P.13A-46, INSPECTION PROCEDURE 27.)

OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13A-62.)

NG → Check the engine coolant temperature sensor system. (Refer to P.13A-16, INSPECTION PROCEDURES FOR DIAGNOSIS CODE 21.)

OK ↓

MUT-II Data list
18 Ignition switch-ST (Refer to P.13A-62.)

NG → Check the ignition switch-ST system <M/T>. (Refer to P.13A-47, INSPECTION PROCEDURE 29.) Check the ignition switch-ST and inhibitor switch system <A/T>. (Refer to P.13A-48, INSPECTION PROCEDURE 30.)

INSPECTION PROCEDURE 40

Check if hunting occurs.

Clean the throttle body. (Refer to P.13A-81.)

↓

Check and adjust the fixed SAS. (Refer to P.13A-83.)

↓

Check trouble symptom.

NG ↓

Inspect the intake of air into the air intake system
- Broken intake manifold gasket
- Broken air intake hose
- Broken vacuum hose
- Positive crankcase ventilation valve does not operate.

INSPECTION PROCEDURE 41

MUT-II: Check if idling speed is unstable.

MUT-II Data list
26 Idle position switch (Refer to P.13A-63.)
- NG → Check the idle position switch system. (Refer to P.13A-46, INSPECTION PROCEDURE 28.)

OK ↓

MUT-II Data list
13 Intake air temperature sensor (Refer to P.13A-62.)
- NG → Check the intake air temperature sensor system. (Refer to P.13A-14, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 13.)

OK ↓

MUT-II Data list
25 Barometric pressure sensor (Refer to P.13A-63.)
- NG → Check the barometric pressure sensor system. (Refer to P.13A-20, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 25.)

OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13A-62.)
- NG → Check the engine coolant temperature sensor system. (Refer to P.13A-16, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 21.)

OK ↓

MUT-II Actuator test
08 Purge control solenoid valve (Refer to P.13A-65.)
- NG → Check the purge control solenoid valve system (Refer to P.13A-51, INSPECTION PROCEDURE 35.)

OK ↓

MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13A-65.)
- NG → Check the EGR control solenoid valve system. (Refer to P.13A-51, INSPECTION PROCEDURE 36.)

OK ↓

MUT-II Data list
59 Oxygen sensor (rear) (Refer to P.13A-65.)
- Transmission: 2nd gear <M/T>, L range <A/T>
- Driving with throttle widely open

OK: 600 - 1,000 mV
- NG → Check the oxygen sensor (rear) system. (Refer to P.13A-24, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 59.)

OK ↓

MUT-II Data list
11 Oxygen sensor
OK: 600 - 1,000 mV during sudden racing
- NG → Check the oxygen sensor (front) system. (Refer to P.13A-13, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 11.)

OK ↓

MUT-II Data list
11 Oxygen sensor
OK: Changes between 0 - 400 mV and 600 - 1,000 mV during idling
- NG → Check the fuel pressure. (Refer to P.13A-85.)
  - OK →
    1. Inspect the intake of air into the air intake system.
       - Broken intake manifold gasket
       - Broken vacuum hose
       - PCV valve does not operate.
       - Broken air intake hose
    2. Check the injector for clog.

OK ↓

MUT-II Data list
27 Power steering fluid pressure switch (Refer to P.13A-63.)
- NG → Check the power steering fluid pressure switch system. (Refer to P.13A-49, INSPECTION PROCEDURE 31.)

OK ↓

MUT-II Data list
28 A/C switch (Refer to P.13A-63.)
- NG → Check the A/C switch and A/C relay system. (Refer to P.13A-49. INSPECTION PROCEDURE 32.)

OK ↓

MUT-II Data list
29 Inhibitor switch (Refer to P.13A-63.)
- NG → Check the ignition switch-ST and inhibitor switch system. <A/T> (Refer to P.13A-48, INSPECTION PROCEDURE 30.)

OK ↓

MUT-II Data list
45 ISC Servo position (Refer to P.13A-64.)
- NG → Adjust the basic idle speed. (Refer to P.13A-83.)

INSPECTION PROCEDURE 42

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

Check (OK → next check)	NG →
MUT-II Data list 26 Idle position switch (Refer to P.13A-63.)	Check the idle position switch system. (Refer to P.13A-46, INSPECTION PROCEDURE 28.)
MUT-II Data list 13 Intake air temperature sensor (Refer to P.13A-62.)	Check the intake air sensor system. (Refer to P.13A-14, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 13.)
MUT-II Data list 25 Barometric pressure sensor (Refer to P.13A-63.)	Check the barometric pressure sensor system. (Refer to P.13A-20, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 25.)
MUT-II Data list 21 Engine coolant temperature sensor (Refer to P.13A-62.)	Check the engine coolant temperature sensor system. (Refer to P.13A-16, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 21.)
MUT-II Actuator test 10 EGR control solenoid valve (Refer to P.13A-65.)	Check the EGR control solenoid valve system. (Refer to P.13A-51, INSPECTION PROCEDURE 36.)
MUT-II Data list 59 Oxygen sensor (rear) (Refer to P.13A-65.) ● Transmission: 2nd gear <M/T>, L range <A/T> ● Driving with throttle widely open **OK**: 600 - 1,000 mV	Check the oxygen sensor (rear) system. (Refer to P.13A-24, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 59.)
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-13, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 11.)
MUT-II Data list 11 Oxygen sensor **OK:** Changes between 0 - 400 mV and 600 - 1,000 mV during idling	Check the fuel pressure. (Refer to P.13A-85.) OK → 1. Inspect the intake of air into the air intake system ● Broken intake manifold gasket ● Broken vacuum hose ● PCV valve does not operate. ● Broken air intake hose 2. Check the injector for clog.
MUT-II Data list 27 Power steering fluid pressure switch (Refer to P.13A-63.)	Check the power steering fluid pressure switch system. (Refer to P.13A-49, INSPECTION PROCEDURE 31.)
MUT-II Data list 28 A/C switch (Refer to P.13A-63.)	Check the A/C switch and A/C relay system. (Refer to P.13A-49, INSPECTION PROCEDURE 32.)
MUT-II Data list 29 Inhibitor switch (Refer to P.13A-63.)	Check the ignition switch-ST and inhibitor switch system. <A/T> (Refer to P.13A-48, INSPECTION PROCEDURE 30.)
MUT-II Data list 45 ISC servo position (Refer to P.13A-64.)	Adjust the basic idle speed. (Refer to P.13A-83.)

INSPECTION PROCEDURE 43

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

MUT-II Data list
26 Idle position switch (Refer to P.13A-63.)

NG → Check the idle position switch system. (Refer to P.13A-46, INSPECTION PROCEDURE 28.)

OK ↓

MUT-II Data list
13 Intake air temperature sensor (Refer to P.13A-62.)

NG → Check the intake air sensor system. (Refer to P.13A-14, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 13.)

OK ↓

MUT-II Data list
25 Barometric pressure sensor (Refer to P.13A-63.)

NG → Check the barometric pressure sensor system. (Refer to P.13A-20, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 25.)

OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13A-62.)

NG → Check the engine coolant temperature sensor system. (Refer to P.13A-16, INSPECTION PROCEDURE FOR DIAGNOSTIC CODE 21.)

OK ↓

MUT-II Data list
14 Throttle position sensor (Refer to P.13A-62.)

NG → Check the throttle position sensor system. (Refer to P.13A-15, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 14.)

OK ↓

MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13A-65.)

NG → Check the EGR control solenoid valve system. (Refer to P.13A-51, INSPECTION PROCEDURE 36.)

OK ↓

MUT-II Data list
59 Oxygen sensor (rear) (Refer to P.13A-65.)
- Transmission: 2nd gear <M/T>, L range <A/T>
- Driving with throttle widely open

OK: 600 - 1,000 mV

NG → Check the oxygen sensor (rear) system. (Refer to P.13A-24, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 59.)

OK ↓

MUT-II Data list
11 Oxygen sensor
OK: Changes between 600 - 1,000 mV during sudden racing

NG → Check the oxygen sensor (front) system. (Refer to P.13A-13, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 11.)

OK ↓

MUT-II Data list
11 Oxygen sensor
OK: Changes between 0 - 400 mV and 600 - 1,000 mV during idling

NG → Check the fuel pressure. (Refer to P.13A-85.)

OK →

1. Inspect the intake of air into the air intake system
   - Broken intake manifold gasket
   - Broken vacuum hose
   - PCV valve does not operate.
   - Broken air intake hose
2. Check the injector for clog.

INSPECTION PROCEDURE 44

MUT-II: Check if surge occurs.

MUT-II Data list
26 Idle position switch (Refer to P.13A-63.)

NG → Check the idle position switch system. (Refer to P.13A-46, INSPECTION PROCEDURE 28.)

OK ↓

MUT-II Data list
13 Intake air temperature sensor (Refer to P.13A-62.)

NG → Check the intake air sensor system. (Refer to P.13A-14, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 13.)

OK ↓

MUT-II Data list
25 Barometric pressure sensor (Refer to P.13A-63.)

NG → Check the barometric pressure sensor system. (Refer to P.13A-20, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 25.)

OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13A-62.)

NG → Check the engine coolant temperature sensor system. (Refer to P.13A-16, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 21.)

OK ↓

MUT-II Data list
14 Throttle position sensor (Refer to P.13A-62.)

NG → Check the throttle position sensor system. (Refer to P.13A-15, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 14.)

OK ↓

MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13A-65.)

NG → Check the EGR control solenoid valve system. (Refer to P.13A-51, INSPECTION PROCEDURE 36.)

OK ↓

MUT-II Data list
59 Oxygen sensor (rear) (Refer to P.13A-65.)
- Transmission: 2nd gear <M/T>, L range <A/T>
- Driving with throttle widely open

OK: 600 - 1,000 mV

NG → Check the oxygen sensor (rear) system. (Refer to P.13A-24, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 59.)

OK ↓

MUT-II Data list
11 Oxygen sensor
OK: Changes between 600 - 1,000 mV during sudden racing

NG → Check the oxygen sensor (front) system. (Refer to P.13A-13, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 11.)

OK ↓

MUT-II Data list
11 Oxygen sensor
OK: Changes between 0 - 400 mV and 600 - 1,000 mV during idling

NG → Check the fuel pressure. (Refer to P.13A-85.)

OK →

1. Inspect the intake of air into the air intake system
   - Broken intake manifold gasket
   - Broken vacuum hose
   - PCV valve does not operate.
   - Broken air intake hose
2. Check the injector for clog.

INSPECTION PROCEDURE 45

Check the engine-ECU power supply and earth circuit.

Measure the engine-ECU connectors, C-34, C-36, C-40.
- Disconnect the connector and measure at the harness side

1. Voltage between 82 and earth (Ignition switch: ON)
   OK: System voltage
2. Voltage between 38 and earth
   OK: System voltage
3. Voltage between 12, 25 and earth (Ignition switch: ON)
   OK: System voltage (when the terminal 38 is earthed)
4. Continuity between 13, 26 and earth
   OK: Continuity
5. Voltage between 80 and earth
   OK: System voltage

OK → **Check the following connectors:** C-34, C-36, C-40 — NG → **Repair**

OK → Check trouble symptom.

NG → Replace the engine-ECU.

1. NG → **Check the following connectors:** C-92, C-131 — NG → **Repair**

OK → Check trouble symptom.

OK → Check the harness wire between engine-ECU and ignition switch connector. — NG → **Repair**

OK → Check the ignition switch. (Refer to GROUP 54 - Ignition Switch and Immobilizer System.)

2, 3. NG → Check the harness wire between engine-ECU and control relay connector, and repair if necessary.

4. NG → Check the harness wire between engine-ECU and earth, and repair if necessary.

5. NG → **Check the following connectors:** C-47, C-83, C-66, (C-63, C-132, C-141) <L.H.>, (C-62, C-14) <R.H.> — NG → **Repair**

OK → Check trouble symptom

NG → Check the harness wire between engine-ECU and battery, and repair if necessary.

INSPECTION PROCEDURE 46

Check fuel pump circuit.

Measure at the fuel pump connector E-16.
- Disconnect the connector and measure at the harness side.
- Continuity between 2 and earth
  OK: Continuity

NG → **Check the following connector:** E-11 — NG → **Repair**

OK → Check trouble symptom

NG → Check the harness wire between fuel pump and earth, and repair if necessary.

OK → **Check the following connectors:** E-16, E-11, C-123, C-92, B-09 — NG → **Repair**

OK → Check trouble symptom.

NG → Check the harness wire between terminal for fuel pump drive and fuel pump connector. — NG → **Repair**

OK → Replace the fuel pump.

INSPECTION PROCEDURE 47

Check the fuel pump drive control circuit.

Measure at the fuel pump relay connector C-32.
- Disconnect the connector and measure at the harness side.
- Voltage between 3, 4 and earth (Ignition switch: ON)
  OK: System voltage

NG → **Check the following connectors:** C-92, C-131
- NG → **Repair**
- OK → Check trouble symptom.
  - NG → Check the harness wire between fuel pump relay and ignition switch connector.
    - NG → **Repair**
    - OK → Check the ignition switch. (Refer to GROUP 54 - Ignition Switch and Immobilizer System.)

OK ↓

Measure at the engine-ECU connector C-34.
- Disconnect the connector and measure at the harness side.
- Voltage between 22 and earth (Ignition switch: ON)
  OK: System voltage

NG → Check the harness wire between engine-ECU and fuel pump relay connector, and repair if necessary.

OK ↓

Check the following connector: C-34
- NG → **Repair**
- OK → Check trouble symptom.
  - NG → Replace the engine-ECU.

INSPECTION PROCEDURE 48

Check air flow sensor (AFS) control circuit.

Measure at the air flow sensor connector B-12.
- Disconnect the connector and measure at the harness side.

1. Voltage between 4 and earth (Ignition switch: ON)
   OK: System voltage
2. Voltage between 3 and earth (Ignition switch: ON)
   OK: 4.8 - 5.2 V
3. Continuity between 5 and earth
   OK: Continuity

1. NG → Check the harness wire between the air flow sensor and control relay connector, and repair if necessary.

2, 3. NG → **Check the following connector:** C-40
- NG → **Repair**
- OK → Check trouble symptom.
  - NG → Check the harness wire between the engine-ECU and air flow sensor connector.
    - NG → **Repair**
    - OK → Replace the engine-ECU.

OK ↓

Check the following connector: B-12
- NG → **Repair**
- OK → Check trouble symptom.
  - NG → Replace the air flow sensor.

INSPECTION PROCEDURE 49

Check throttle position sensor (TPS) output circuit.

Measure at the engine-ECU connector C-40.
- Connect the connector.
- Voltage between 84 and earth (Ignition switch: ON)
  OK: 0.3 - 1.0 V (Throttle valve at idle position)
  4.5 - 5.5 V (Throttle valve fully open)

- OK → **Check the following connector:** C-40
  - NG → **Repair**
  - OK → Check trouble symptom.
    - NG → Replace the engine-ECU.
- NG → Check the harness wire between engine-ECU and throttle position sensor connector, and repair if necessary.

INSPECTION PROCEDURE 50

Check injector control circuit

Measure at the engine-ECU connector C-34.
- Disconnect the connector and measure at the harness side.
- Voltage between 1, 2, 14, 15 and earth (Ignition switch: ON)
  OK: System voltage

- NG → **Check the following connectors:** B-02, B-03, B-05, B-36
  - NG → **Repair**
  - OK → Check trouble symptom.
    - NG → Check the harness between engine-ECU and injector connector, and repair if necessary.
- OK → **Check the following connector:** C-34
  - NG → **Repair**
  - OK → Check trouble symptom.
    - NG → Replace the engine-ECU.

DATA LIST REFERENCE TABLE

13100890289

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	Oxygen sensor (front)	Engine: After having warmed up Air/fuel mixture is made leaner when decelerating, and is made richer when racing.	When at 4,000 r/min, engine is suddenly decelerated	200 mV or less	Code No. 11	13A-13
			When engine is suddenly raced	600 - 1,000 mV		
		Engine: After having warmed up The oxygen sensor signal is used to check the air/fuel mixture ratio, and control condition is also checked by the ECU.	Engine is idling	400 mV or less (Changes) 600 - 1,000 mV		
			2,500 r/min			
12	Air flow sensor*1	• Engine coolant temperature: 80 - 95°C • Lamps, electric cooling fan and all accessories: OFF • Transmission: Neutral (A/T: P range)	Engine is idling	17 - 43 Hz	-	-
			2,500 r/min	70 - 110 Hz		
			Engine is raced	Frequency increases in response to racing		
13	Intake air temperature sensor	Ignition switch: ON or with engine running	When intake air temperature is -20°C	-20°C	Code No. 13	13A-14
			When intake air temperature is 0°C	0°C		
			When intake air temperature is 20°C	20°C		
			When intake air temperature is 40°C	40°C		
			When intake air temperature is 80°C	80°C		

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
14	Throttle position sensor	Ignition switch: ON	Set to idle position	300 - 1,000 mV	Code No. 14	13A-15
			Gradually open	Increases in proportion to throttle opening angle		
			Open fully	4,500 - 5,500 mV		
16	Power supply voltage	Ignition switch: ON		System voltage	Procedure No. 26	13A-45
18	Cranking signal (ignition switch-ST)	Ignition switch: ON	Engine: Stopped	OFF	Procedure No. 29 <M/T> Procedure No. 30 <A/T>	13A-47 <M/T> 13A-48 <M/T>
			Engine: Cranking	ON		
21	Engine coolant temperature sensor	Ignition switch: ON or with engine running	When engine coolant temperature is -20°C	-20°C	Code No. 21	13A-16
			When engine coolant temperature is 0°C	0°C		
			When engine coolant temperature is 20°C	20°C		
			When engine coolant temperature is 40°C	40°C		
			When engine coolant temperature is 80°C	80°C		

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
22	Crank angle sensor	• Engine: Cranking • Tachometer: Connected	Compare the engine speed readings on the tachometer and the MUT-II.	Accord	Code No. 22	13A-17
		• Engine: Idling • Idle position switch: ON	When engine coolant temperature is -20°C	1,275 - 1,475 rpm		
			When engine coolant temperature is 0°C	1,225 - 1,425 rpm		
			When engine coolant temperature is 20°C	1,100 - 1,300 rpm		
			When engine coolant temperature is 40°C	950 - 1,150 rpm		
			When engine coolant temperature is 80°C	650 - 850 rpm		
25	Barometric pressure sensor	Ignition switch: ON	At altitude of 0 m	101 kPa	Code No. 25	13A-20
			At altitude of 600 m	95 kPa		
			At altitude of 1,200 m	88 kPa		
			At altitude of 1,800 m	81 kPa		
26	Idle position switch	Ignition switch: ON Check by operating accelerator pedal repeatedly	Throttle valve: Set to idle position	ON	Procedure No. 28	13A-46
			Throttle valve: Slightly open	OFF*2		
27	Power steering fluid pressure switch	Engine: Idling	Steering wheel stationary	OFF	Procedure No. 31	13A-49
			Steering wheel turning	ON		
28	A/C switch	Engine: Idling (when A/C switch is ON, A/C compressor should be operating.)	A/C switch: OFF	OFF	Procedure No. 32	13A-49
			A/C switch: ON	ON		
29	Inhibitor switch <A/T>	Ignition switch: ON	P or N	P or N	Procedure No. 30	13A-48
			D, 2, L or R	D, 2, L or R		

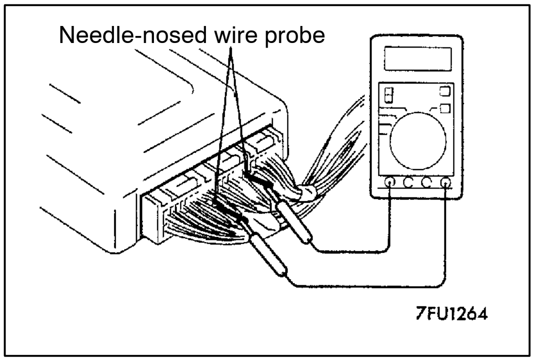
Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
41	Injectors *3	Engine: Cranking	When engine coolant temperature is 0°C (injection is carried out for all cylinders simultaneously)	12 - 19 ms	-	-
			When engine coolant temperature is 20°C	26 - 40 ms		
			When engine coolant temperature is 80°C	6.0 - 9.1 ms		
	Injectors*4	• Engine coolant temperature: 80–95°C • Lamps, electric cooling fan and all accessories: OFF • Transmission: Neutral (A/T : P range)	Engine is idling	1.6 - 2.8 ms		
			2,500 r/min	1.4 - 2.6 ms		
			When engine is suddenly raced	Increases		
44	Ignition coils and power transistors	• Engine: After having warmed up • Timing lamp is set. (The timing lamp is set in order to check actual ignition timing.)	Engine is idling	2 - 18°BTDC	-	-
			2,500 r/min	18 - 38°BTDC		
45	ISC (stepper) motor position *5	• Engine coolant temperature: 80 - 95°C • Lamps, electric cooling fan and all accessories: OFF • Transmission: Neutral (A/T : P range) • Idle position switch: ON • Engine: Idling • When A/C switch is ON, A/C compressor should be operating	A/C switch: OFF	2 - 25 STEP	-	-
			A/C switch: OFF → ON	Increases by 10 - 70 steps		
			• A/C switch: OFF • Select lever: N range → D range	Increases by 5 - 50 steps		
49	A/C relay	Engine: After having warmed up/Engine is idling	A/C switch: OFF	OFF (Compressor clutch is not operating)	Procedure No. 32	13A-49
			A/C switch: ON	ON (Compressor clutch is operating)		

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
59	Oxygen sensor (rear)	• Transmission: 2nd gear <M/T>, L range <A/T> • Drive with throttle widely open	3,500 r/min	600 - 1,000 mV	Code No. 59	13A-24

ACTUATOR TEST REFERENCE TABLE

13100900357

Item No.	Inspection item	Drive contents	Inspection contents		Normal condition	Inspection procedure No.	Reference page
01	Injectors	Cut fuel to No. 1 injector	Engine: After having warmed up/Engine is idling (Cut the fuel supply to each injector in turn and check cylinders which don't affect idling.)		Idling condition becomes different (becomes unstable).	Code No. 41	13A-21
02		Cut fuel to No. 2 injector					
03		Cut fuel to No. 3 injector					
04		Cut fuel to No. 4 injector					
07	Fuel pump	Fuel pump operates and fuel is recirculated.	• Engine: Cranking • Fuel pump: Forced driving Inspect according to both the above conditions.	Pinch the return hose with fingers to feel the pulse of the fuel being recirculated.	Pulse is felt.	Procedure No. 27	13A-46
				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. 35	13A-51
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. 36	13A-51
17	Basic ignition timing	Set to ignition timing adjustment mode	Engine: Idling Timing light is set		5°BTDC	-	-
21	Fan controller	Drive the fan motor	Ignition switch: ON		Radiator fan and condenser fan operate at high speed	Procedure No. 25	13A-45



CHECK AT THE ENGINE-ECU TERMINALS

13100920285

TERMINAL VOLTAGE CHECK CHART

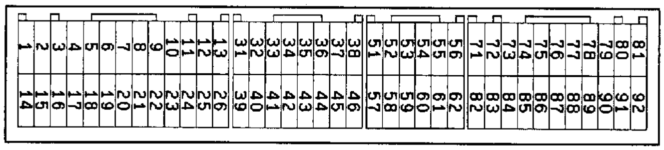
1. Connect a needle-nosed wire probe (test harness: MB991223 or paper clip) to a voltmeter probe.
2. Insert the needle-nosed wire probe into each of the engine-ECU connector terminals from the wire side, and measure the voltage while referring to the check chart.

   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



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Terminal No.	Check item	Check condition (Engine condition)	Normal condition
1	No. 1 injector	While engine is idling after having warmed up, suddenly depress the accelerator pedal.	From 11 - 14 V, momentarily drops slightly
14	No. 2 injector		
2	No. 3 injector		
15	No. 4 injector		
4	Stepper motor coil <A1>	Engine: Soon after the warmed up engine is started	System voltage ↔ 0 V (Changes repeatedly)
17	Stepper motor coil <A2>		
5	Stepper motor coil <B1>		
18	Stepper motor coil <B2>		
6	EGR control solenoid valve	Ignition switch: ON	System Voltage
		While engine is idling, suddenly depress the accelerator pedal.	From system voltage, momentarily drops
8	A/C relay	• Engine: Idle speed • A/C switch: OFF → ON (A/C compressor is operating)	System voltage or momentarily 6V or more → 0 - 3V
9	Purge control solenoid valve	Ignition switch: ON	System voltage
		Running at 3,000r/min while engine is warming up after having been started.	0 - 3V
10	Ignition coil - No. 1, No. 4 (power transistor)	Engine r/min: 3,000 r/min	0.3 - 3.0V
23	Ignition coil - No. 2, No. 3 (power transistor)		
12	Power supply	Ignition switch: ON	System voltage
25			
19	Air flow sensor reset signal	Engine: Idle speed	0 - 1V
		Engine r/min: 3,000 r/min	6 - 9V
21	Fan controller	Radiator fan and condenser fan are not operating	0 - 0.3 V
		Radiator fan and condenser fan are operating	0.7 V or more

Terminal No.	Check item	Check condition (Engine condition)		Normal condition
22	Fuel pump relay	Ignition switch: ON		System voltage
		Engine: Idle speed		0 - 3V
24	A/C switch 2	● Engine: Idling ● Outside air temperature: 25°C or more	When A/C is MAX. COOL condition (when the load by A/C is high)	0 - 3 V
			(When A/C is MAX. HOT condition (when the load by A/C is low)	System voltage
33	Alternator G terminal	● Engine: Warm, idle (radiator fan: OFF) ● Headlamp: OFF to ON ● Rear defogger switch: OFF to ON ● Brake lamp: ON		Voltage rises by 0.2 - 3.5 V.
41	Alternator FR terminal	● Engine: Warm, idle (radiator fan: OFF) ● Headlamp: OFF to ON ● Rear defogger switch: OFF to ON ● Brake lamp: ON		Voltage drops by 0.2 - 3.5 V.
36	Engine warning lamp	Ignition switch: OFF → ON		0 - 3V → 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 1	Engine: Idle speed	Turn the A/C switch OFF	0 - 3V
			Turn the A/C switch ON (A/C compressor is operating)	System voltage
58	Tachometer signal	Engine r/min: 3,000 r/min		0.3 - 3.0V
60	Oxygen sensor heater	Engine: Idling after warming up		0 - 3V
		Engine r/min: 5,000r/min.		System voltage
71	Ignition switch - ST	Engine: Cranking		8V or more

Terminal No.	Check item	Check condition (Engine condition)		Normal condition
72	Intake air temperature sensor	Ignition switch: ON	When intake air temperature is 0°C	3.2 - 3.8V
			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
75	Oxygen sensor (rear)	● Transmission: 2nd gear <M/T>, L range <A/T> ● Engine r/min: 3,500 r/min or more ● Driving with the throttle valve widely open		0.6 - 1.0 V
76	Oxygen sensor (front)	Engine: Running at 2,500 r/min after warmed up (Check using a digital type voltmeter)		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
83	Engine coolant temperature sensor	Ignition switch: ON	When engine coolant temperature is 0°C	3.2 - 3.8V
			When engine coolant temperature is 20°C	2.3 - 2.9V
			When engine coolant temperature is 40°C	1.3 - 1.9V
			When engine coolant temperature is 80°C	0.3 - 0.9V
84	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	● Ignition switch: ON ● Move the vehicle slowly forward		0 ↔ 5V (Changes repeatedly)

Terminal No.	Check item	Check condition (Engine condition)		Normal condition
87	Idle position switch	Ignition switch: ON	Set throttle valve to idle position	0 - 1V
			Slightly open throttle valve	4V or more
88	Camshaft position 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: 2,500r/min		
91	Inhibitor switch <A/T>	Ignition switch: ON	Set selector lever to P or N	0 - 3V
			Set selector lever to Other than P or N	8 - 14V

CHECK CHART FOR RESISTANCE AND CONTINUITY BETWEEN TERMINALS

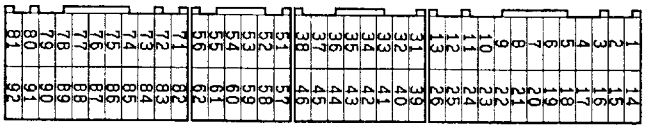
1. Turn the ignition switch to OFF.
2. Disconnect the engine-ECU connector.
3. Measure the resistance and check for continuity between the terminals of the engine-ECU harness-side connector while referring to the check chart.

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

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

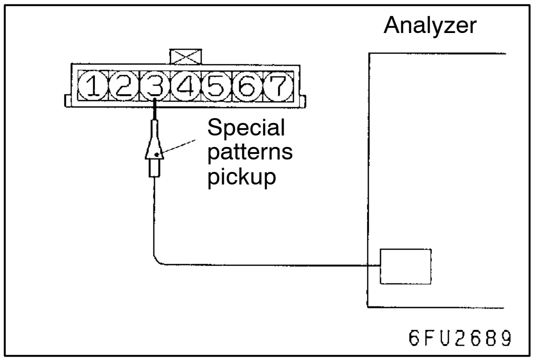
4. If the ohmmeter shows any deviation from the standard value, check the corresponding sensor, actuator and related electrical wiring, and then repair or replace.
5. After repair or replacement, recheck with the ohmmeter to confirm that the repair or replacement has corrected the problem.

Engine-ECU Harness Side Connector Terminal Arrangement



9FU0392

Terminal No.	Inspection item	Normal condition (Check condition)
1 - 12	No. 1 injector	13 - 16 Ω (At 20°C)
14 - 12	No. 2 injector	
2 - 12	No. 3 injector	
15 - 12	No. 4 injector	
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	11 - 18 Ω (At 20°C)
72 - 92	Intake air temperature sensor	5.3 - 6.7 kΩ (When intake air temperature is 0°C)
		2.3 - 3.0 kΩ (When intake air temperature is 20°C)
		1.0 - 1.5 kΩ (When intake air temperature is 40°C)
		0.30 - 0.42 kΩ (When intake air temperature is 80°C)
83 - 92	Engine coolant temperature sensor	5.1 - 6.5 kΩ (When coolant temperature is 0°C)
		2.1 - 2.7 kΩ (When coolant temperature is 20°C)
		0.9 - 1.3 kΩ (When coolant temperature is 40°C)
		0.26 - 0.36 kΩ (When coolant temperature is 80°C)
87 - 92	Idle position switch	Continuity (when throttle valve is at idle position)
		No continuity (when throttle valve is slightly open)
91 - Body earth	Inhibitor switch <A/T>	Continuity (when select lever is at P or N)
		No continuity (when select lever is at D, 2, L or R)



INSPECTION PROCEDURE USING AN ANALYZER

13100930219

AIR FLOW SENSOR (AFS)

Measurement Method

1. Disconnect the air flow 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 air flow sensor connector terminal 3.

Alternate Method (Test harness not available)

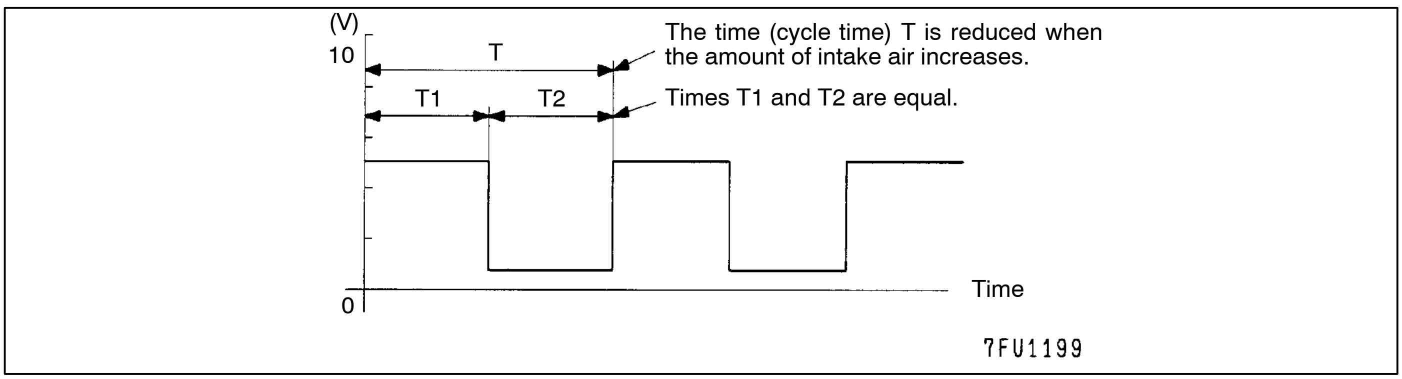
1. Connect the analyzer special patterns pickup to engine-ECU terminal 90.

Standard Wave Pattern

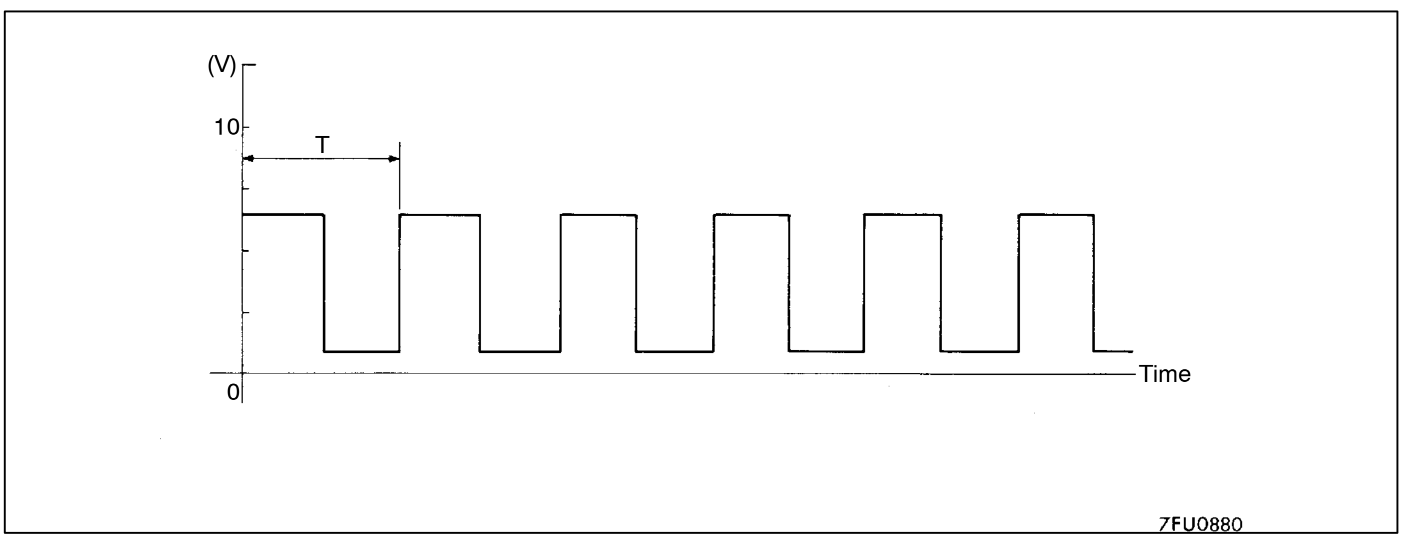
Observation conditions

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

Standard wave pattern

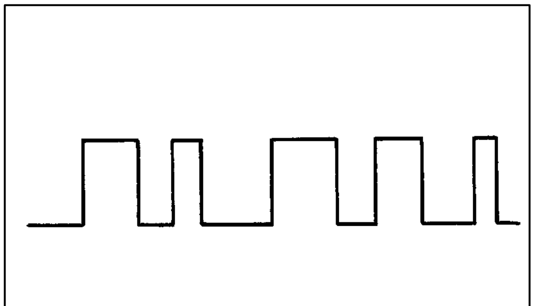


Observation conditions (from conditions above engine speed is increased by racing.)



Wave Pattern Observation Points

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

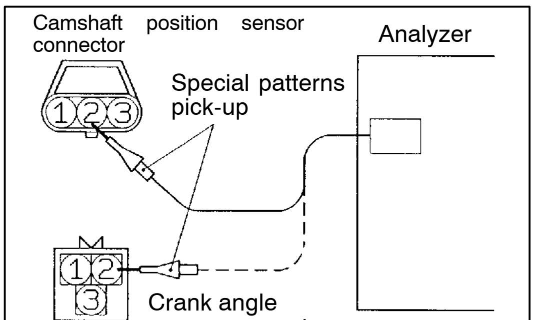
- Example 2

  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.



6FU2690

CAMSHAFT POSITION SENSOR AND CRANK ANGLE SENSOR

Measurement Method

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

Alternate Method (Test harness not available)

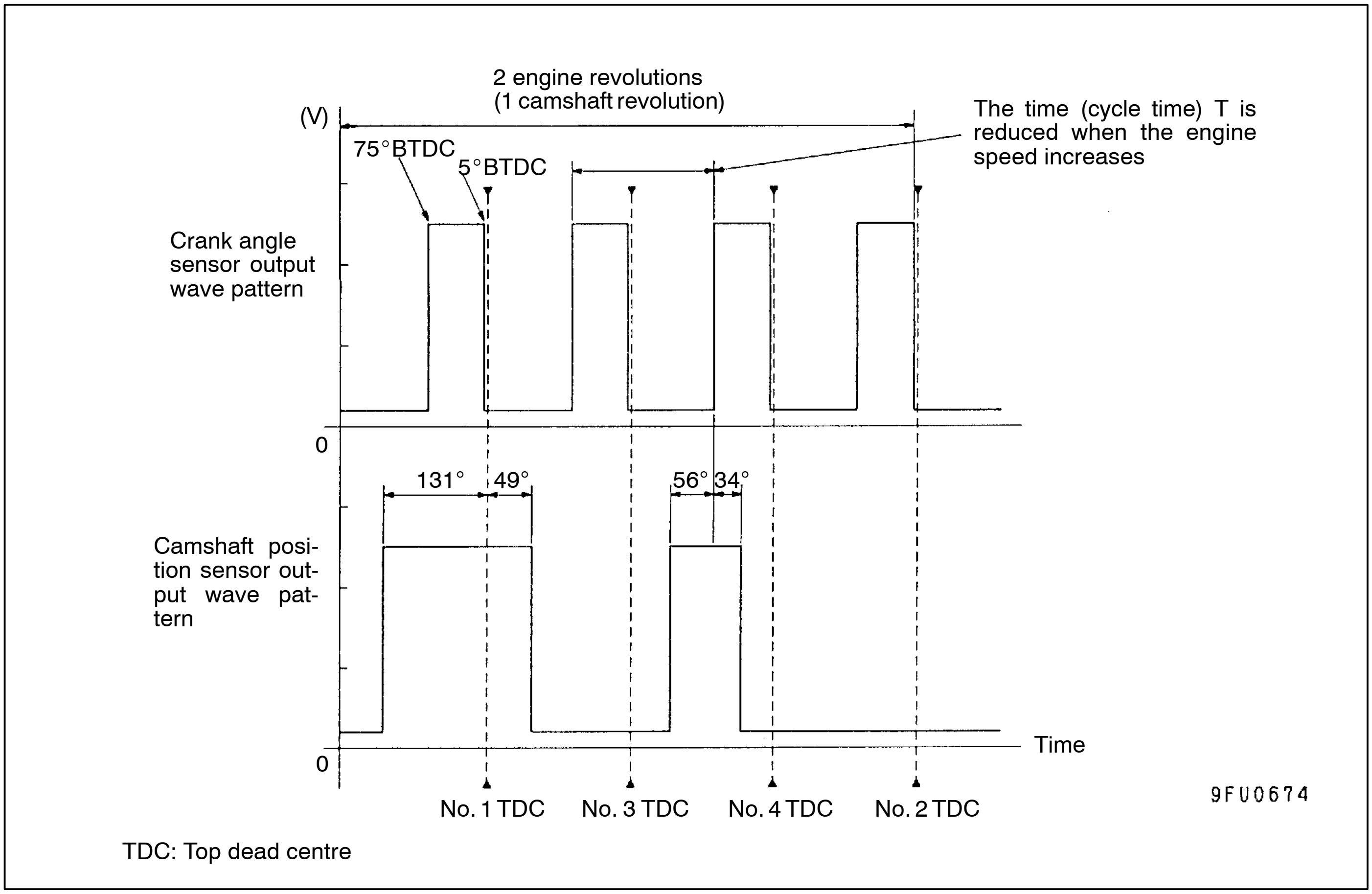
1. Connect the analyzer special patterns pickup to engine-ECU terminal 88. (When checking the camshaft position sensor signal wave pattern.)
2. Connect the analyzer special patterns pickup to engine-ECU terminal 89. (When checking the crank angle sensor signal wave pattern.)

Standard Wave Pattern

Observation conditions

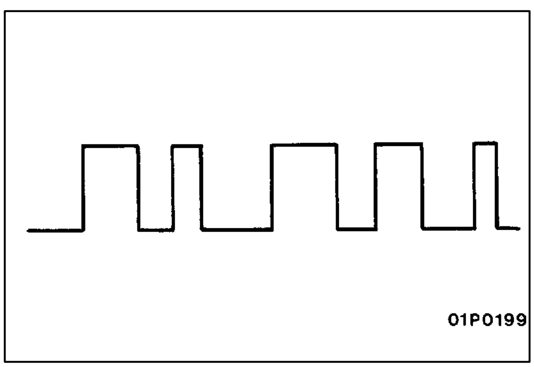
Function	Special patterns
Pattern height	Low
Pattern selector	Display
Engine r/min	Idle speed

Standard wave pattern



Wave Pattern Observation Points

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



Examples of Abnormal Wave Patterns

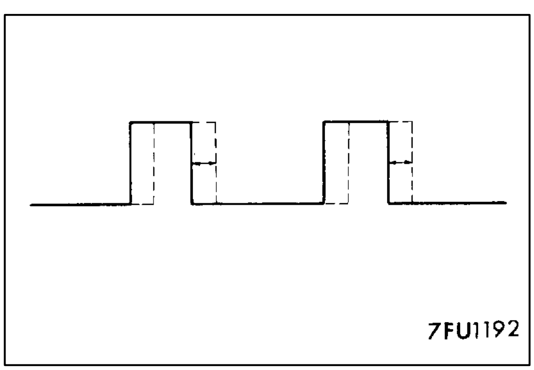
- Example 1

  Cause of problem

  Sensor interface malfunction

  Wave pattern characteristics

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



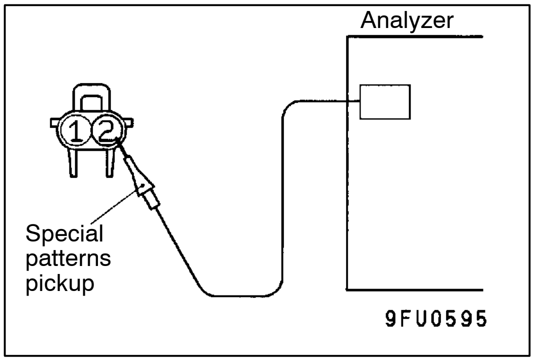
- Example 2

  Cause of problem

  Loose timing belt
  Abnormality in sensor disk

  Wave pattern characteristics

  Wave pattern is displaced to the left or right.



INJECTOR

Measurement Method

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

Alternate Method (Test harness not available)

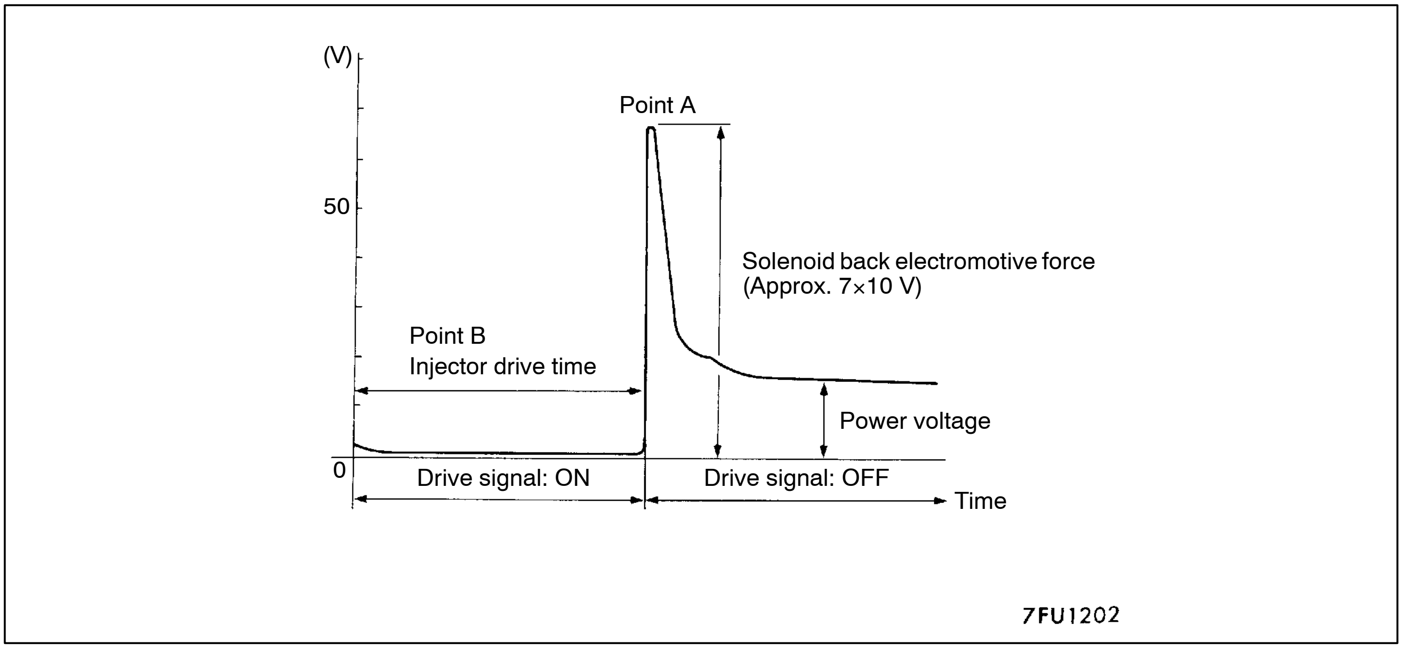
1. Connect the analyzer special patterns pickup to engine-ECU terminal 1. (When checking the No. 1 cylinder.)
2. Connect the analyzer special patterns pickup to engine-ECU terminal 14. (When checking the No. 2 cylinder.)
3. Connect the analyzer special patterns pickup to engine-ECU terminal 2. (When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

Standard Wave Pattern

Observation conditions

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

Standard wave pattern

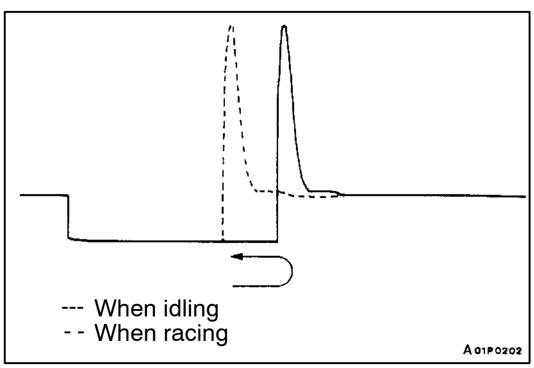


Wave Pattern Observation Points

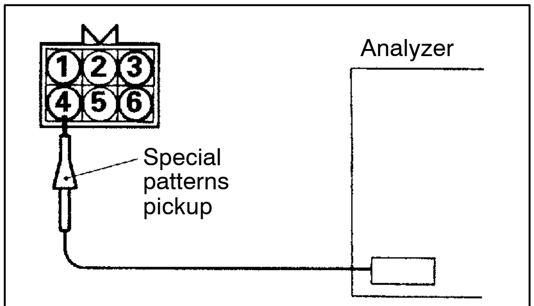
Point A: Height of solenoid back electromotive force

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

Point B: Injector drive time



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



7FU1203

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)

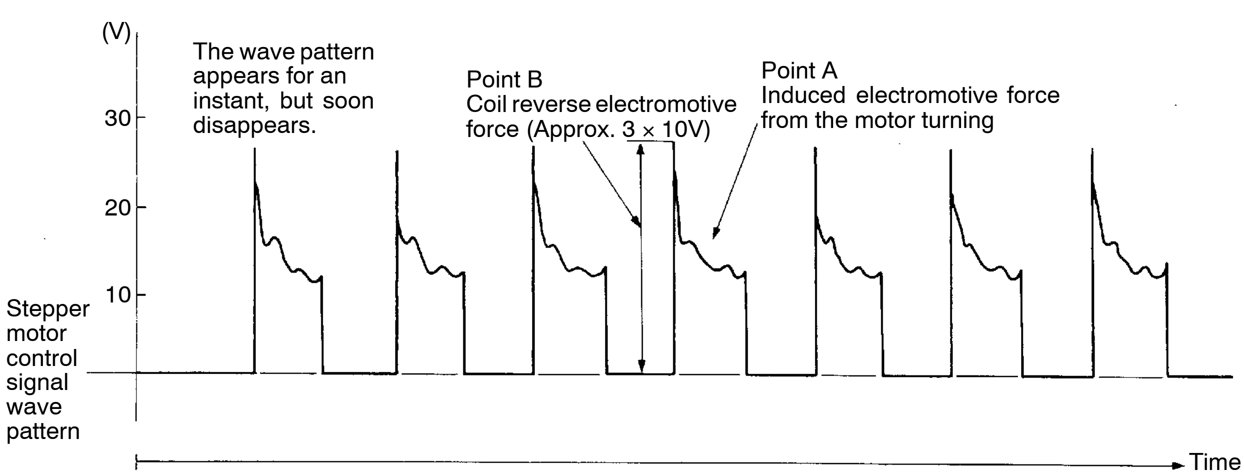
1. Connect the analyzer special patterns pickup to engine-ECU terminal 4, connection terminal 5, connection terminal 17, and connection terminal 18 respectively.

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 OFF to ON (without starting the engine).
	While the engine is idling, turn the A/C switch to ON.
	Immediately after starting the warm engine

Standard wave pattern



7FU1204

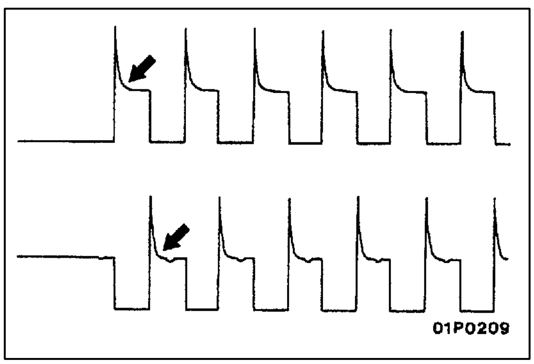
Wave Pattern Observation Points

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

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

Point B: Height of coil reverse electromotive force

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



Examples of Abnormal Wave Pattern

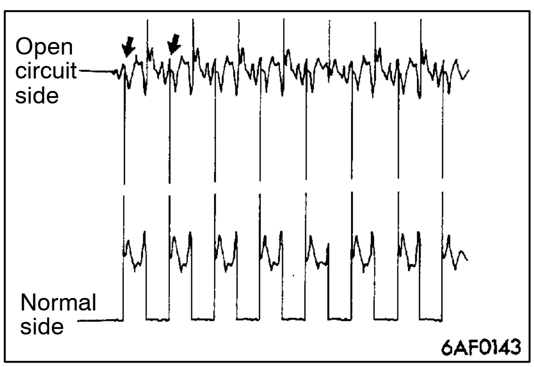
- Example 1

  Cause of problem

  Motor is malfunctioning. (Motor is not operating.)

  Wave pattern characteristics

  Induced electromotive force from the motor turning does not appear.



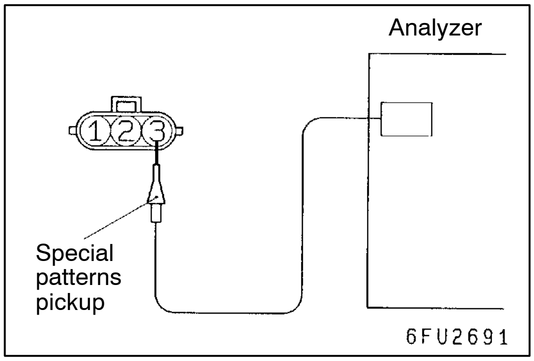
- Example 2

  Cause of problem

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

  Wave pattern characteristics

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



IGNITION COIL AND POWER TRANSISTOR

Power transistor control signal

Measurement Method

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

Alternate Method (Test harness not available)

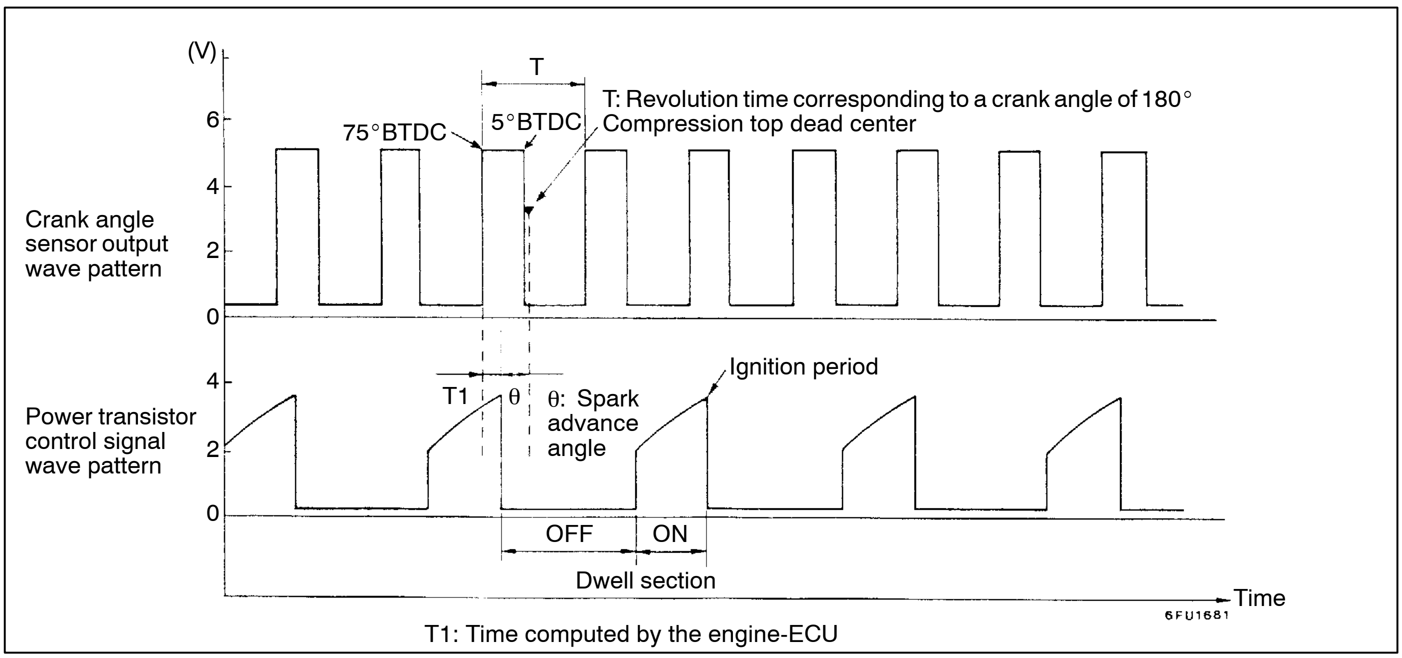
1. Connect the analyzer special patterns pickup to engine-ECU terminal 10 (No. 1 - No. 4), terminal 23 (No. 2 - No. 3) respectively.

Standard Wave Pattern

Observation condition

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

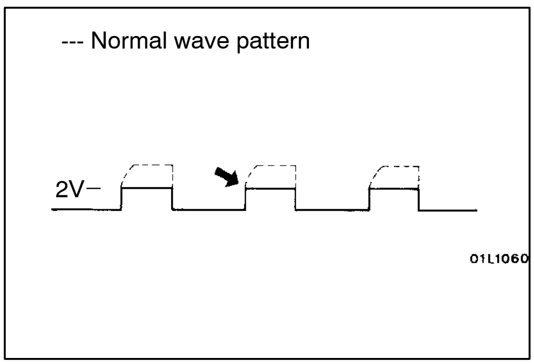
Standard wave pattern

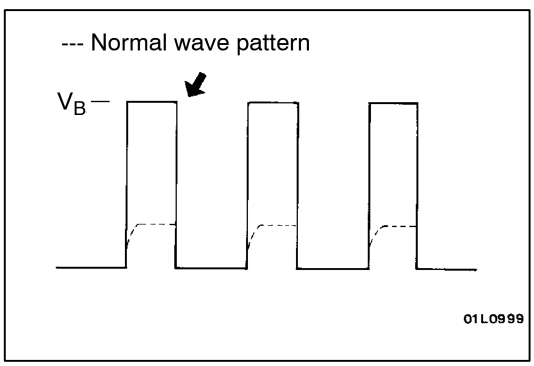


Wave Pattern Observation Points

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

Condition 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

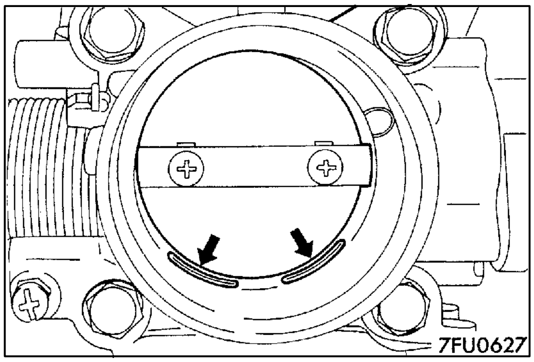
  Wave pattern characteristics

  Power voltage results when the power transistor is ON.

ON-VEHICLE SERVICE 13100100306

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.

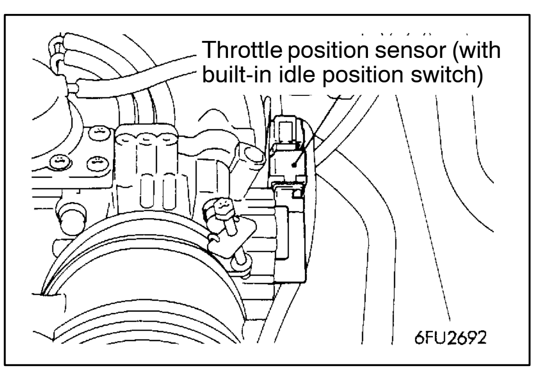

7FU0627

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-83.)

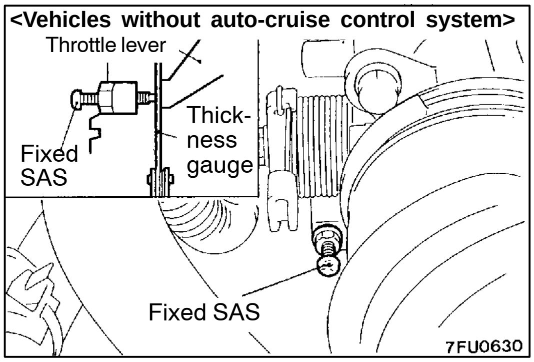
    NOTE
    If the engine hunts while idling after adjustment of the basic idle speed, disconnect the (–) cable from the battery for 10 seconds or more, and then reconnect it and run the engine at idle for about 10 minutes.



6FU2692

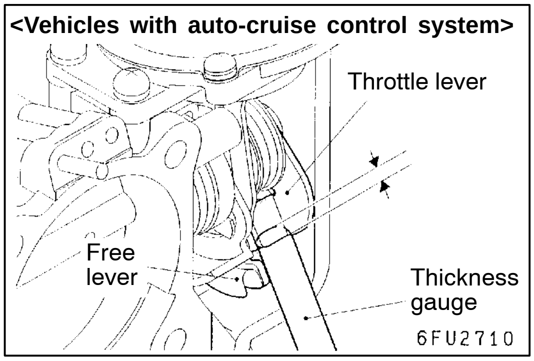
IDLE POSITION SWITCH AND THROTTLE POSITION SENSOR ADJUSTMENT 13100130268

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



2. Insert a thickness gauge as follows:

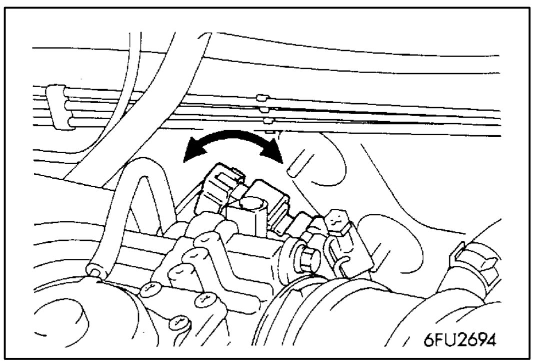
<Vehicles without auto-cruise control system>
Insert a thickness gauge with a thickness of 0.45 mm between the fixed SAS and the throttle lever.



<Vehicles with auto-cruise control system>
Insert a 1.4-mm thick thickness gauge up to approx. 3 mm between the levers shown in the figure.

NOTE
Do not insert the thickness gauge 3 mm or more. If doing that, the throttle lever opening angle becomes larger than the predetermined angle, causing maladjustment.

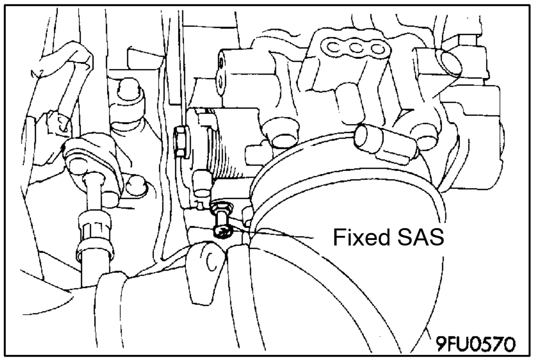
3. Turn the ignition switch to ON (but do not start the engine).



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

   Standard value: 400 - 1,000 mV

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



FIXED SAS ADJUSTMENT 13100150301

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-81).

BASIC IDLE SPEED ADJUSTMENT 13100180348

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

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

   NOTE
   When the MUT-II is connected, the diagnosis control terminal should be earthed.
3. Start the engine and run at idle.

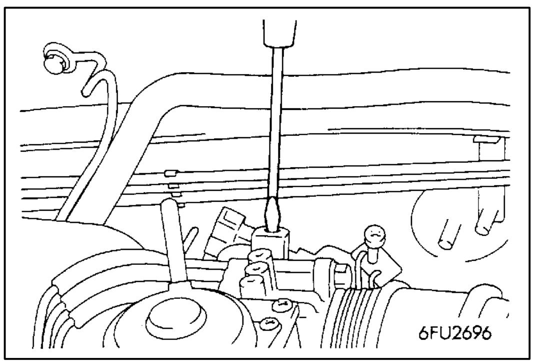
4. Select the item No.30 of the MUT-II Actuator test.

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

5. Check the idle speed.

   Standard value:
   750 ± 50 r/min

   NOTE
   (1) The engine speed may be 20 to 100 r/min lower than indicated above for a new vehicle [driven approximately 500 km or less], but no adjustment is necessary.
   (2) If the engine stalls or the engine speed is low even though the vehicle has been driven approximately 500 km or more, it is probable that deposits are adhered to the throttle valve, so clean it. (Refer to P.13A-81.)



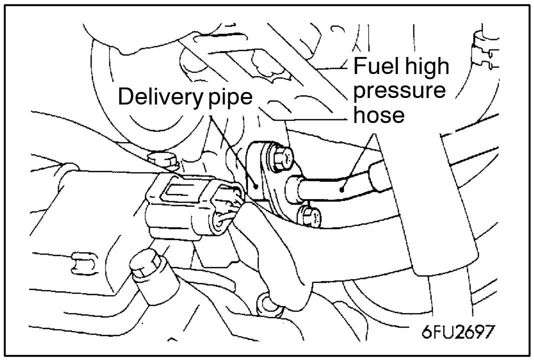
6. If not within the standard value range, turn the speed adjusting screw (SAS) to make the necessary adjustment.

   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.

7. Press the MUT-II clear key, and release the ISC servo from the Actuator test mode.

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

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

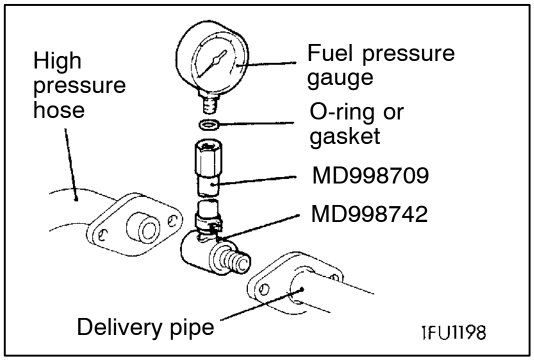


FUEL PRESSURE TEST

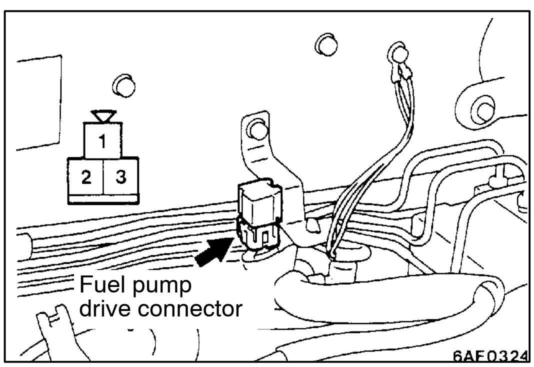
13100190303

1. Release residual pressure from the fuel pipe line to prevent fuel gush out. (Refer to P.13A-88.)
2. Disconnect the fuel high pressure hose at the delivery pipe side.

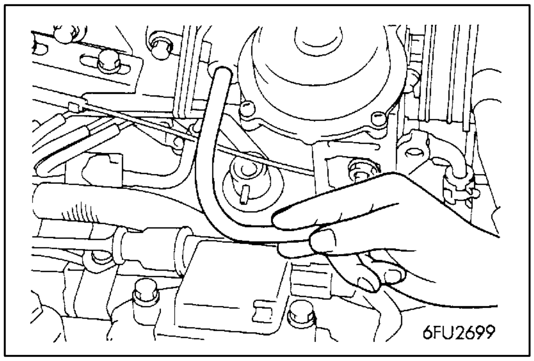
Caution
Cover the hose connection with rags to prevent splash of fuel that could be caused by some residual pressure in the fuel pipe line.



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



6. Connect the No. 2 terminal of 3 pin connector (fuel pump drive terminal) shown in the figure at left to 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 kerb 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
• Fuel pressure too low • Fuel pressure drops after racing • No fuel pressure in fuel return hose	Clogged fuel filter	Replace fuel filter
	Fuel leaking to return side due to poor fuel regulator valve seating or settled spring	Replace fuel pressure regulator
	Low fuel pump delivery pressure	Replace fuel pump
Fuel pressure too high	Binding valve in fuel pressure regulator	Replace fuel pressure regulator
	Clogged fuel return hose or pipe	Clean or replace hose or pipe
Same fuel pressure when vacuum hose is connected and when disconnected	Damaged vacuum hose or clogged nipple	Replace vacuum hose or clean nipple

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

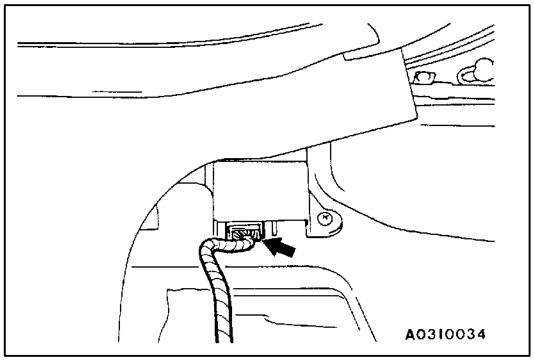
15. Release residual pressure from the fuel pipe line. (Refer to P.13A-88.)
16. Remove the fuel pressure gauge and special tool from the delivery pipe.

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.

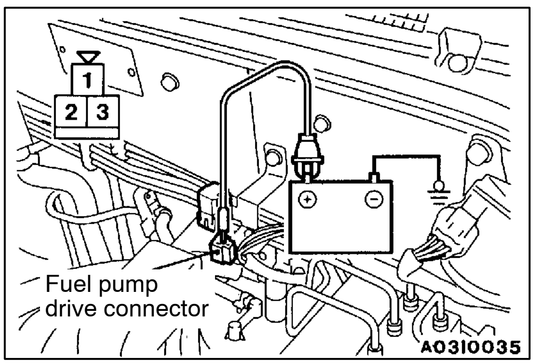


FUEL PUMP CONNECTOR DISCONNECTION (HOW TO REDUCE THE FUEL PRESSURE)

13100090252

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

1. Raise the rear seat cushion.
2. Disconnect the floor wiring harness and fuel wiring harness under the floor carpet.
3. After starting the engine and letting it run until it stops naturally, turn the ignition switch to OFF.
4. Connect the fuel wiring harness and floor wiring harness.
5. Install the rear seat cushion.



FUEL PUMP OPERATION CHECK

13100200105

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.

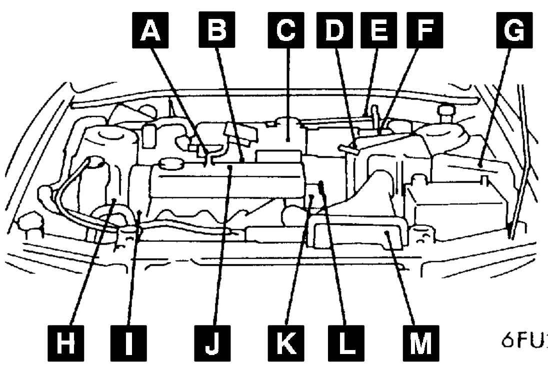
   NOTE
   As the fuel pump is an in-tank type, the fuel pump sound is hard to hear, so remove the fuel filler cap and check from the tank inlet.

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

COMPONENT LOCATION

13100210368

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



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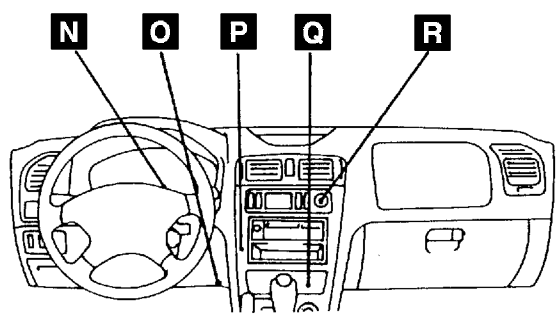

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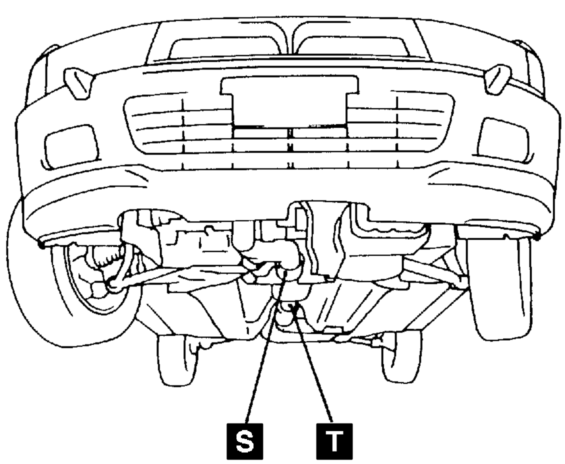
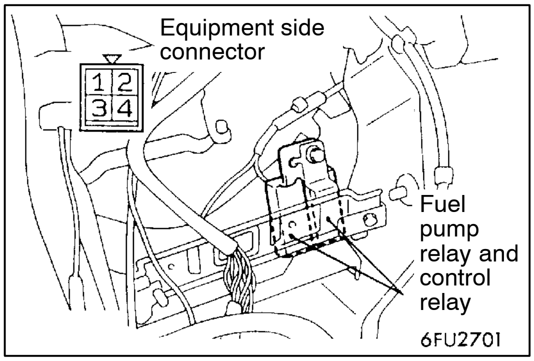


6FU2698

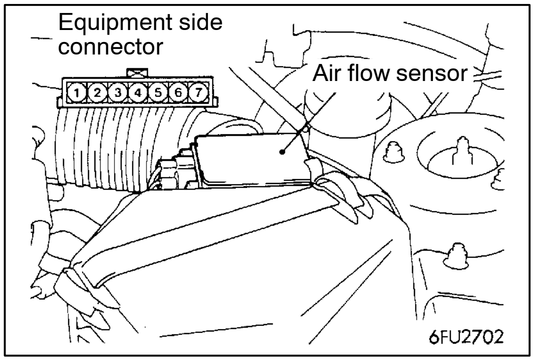
6FU2700



CONTROL RELAY AND FUEL PUMP RELAY CONTINUITY CHECK

13100990170

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

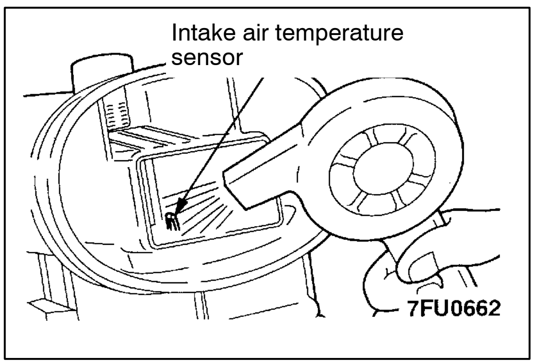


INTAKE AIR TEMPERATURE SENSOR CHECK

13100280239

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

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

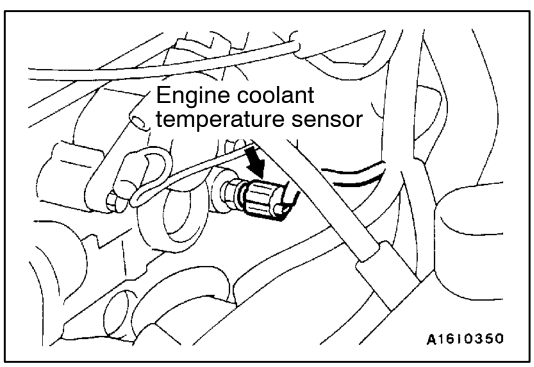


3. Measure resistance while heating the sensor using a hair drier.

Normal condition:

Temperature (°C)	Resistance (kΩ)
Higher	Smaller

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



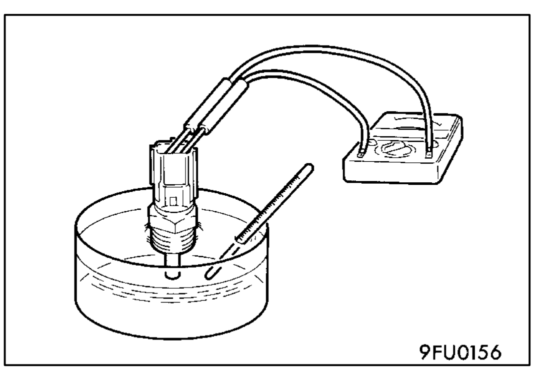
ENGINE COOLANT TEMPERATURE SENSOR CHECK

13100310242

Caution

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

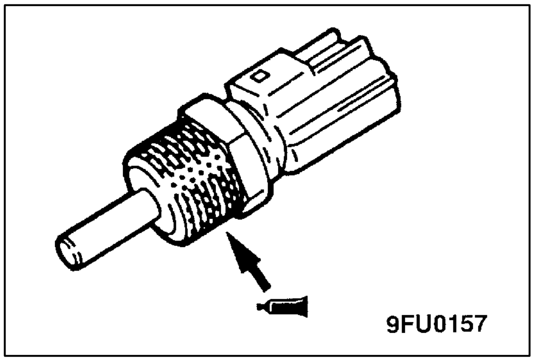
1. Remove the engine coolant temperature sensor.



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

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

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

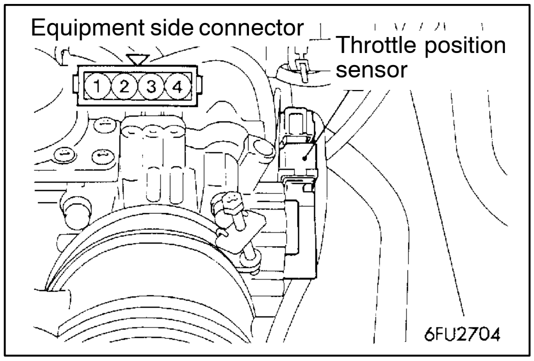


4. Apply sealant to threaded portion.

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

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

   Tightening torque: 29 Nm



THROTTLE POSITION SENSOR CHECK 13100320276

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

   Standard value: 3.5 - 6.5 kΩ

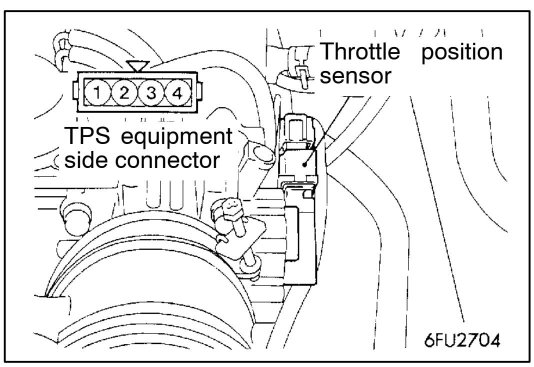
3. Measure the resistance between the throttle position sensor side connector terminal 2 and terminal 4.

   Normal condition:

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

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

   NOTE
   For the throttle position sensor adjustment procedure, refer to P.13A-81.



IDLE POSITION SWITCH CHECK 13100330262

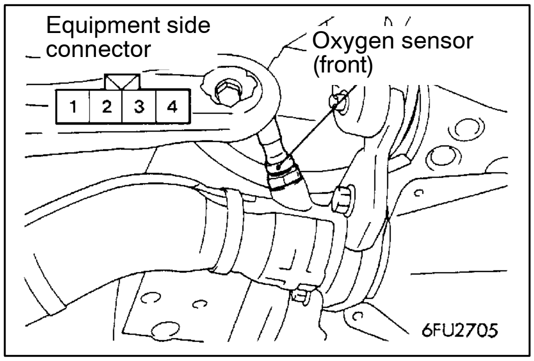
1. Disconnect the throttle position sensor connector.
2. Check the continuity between the throttle position sensor connector side terminal 3 and terminal 4.

   Normal condition:

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

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

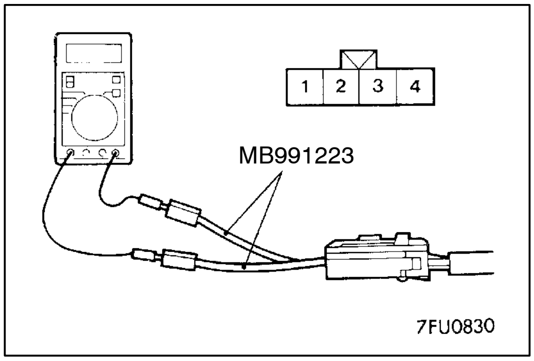
   NOTE
   After replacement, the idle position switch and throttle position sensor should be adjusted. (Refer to P.13A-81.)



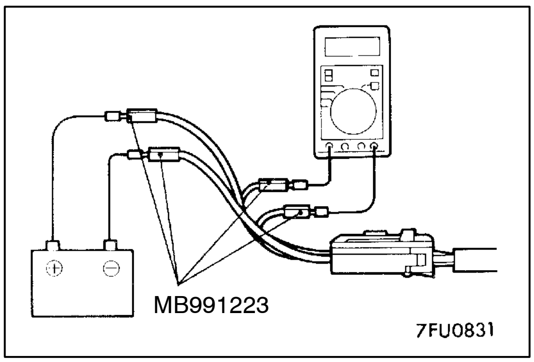
OXYGEN SENSOR CHECK 13100510161

<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 (11 - 18 Ω at 20°C) between terminal 3 and terminal 4 on the oxygen sensor connector.



3. If there is no continuity, replace the oxygen sensor.
4. Warm up the engine until engine coolant is 80°C or higher.



5. Use the jumper wire to connect terminal 3 of the oxygen sensor connector to the battery (+) terminal and terminal 4 to the battery (-) terminal.

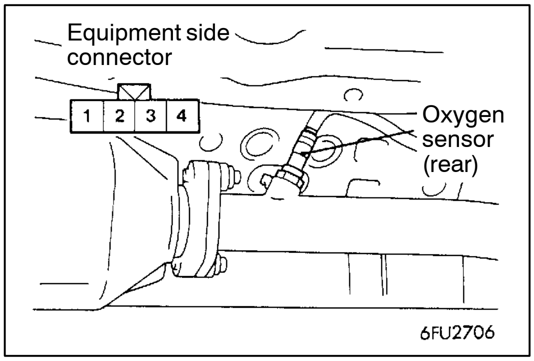
   Caution
   Be very careful when connecting the jumper wire; incorrect connection can damage the oxygen sensor.
6. Connect a digital voltage meter between terminal 1 and terminal 2.
7. While repeatedly racing the engine, measure the oxygen sensor output voltage.

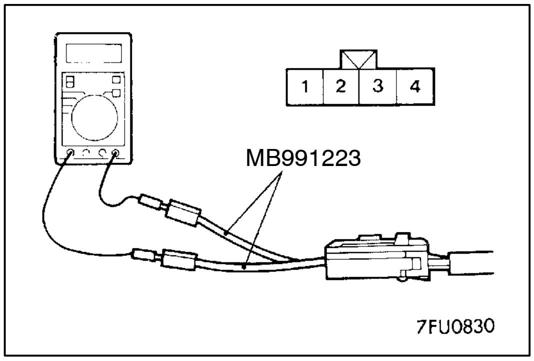
   Standard value:

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

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

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

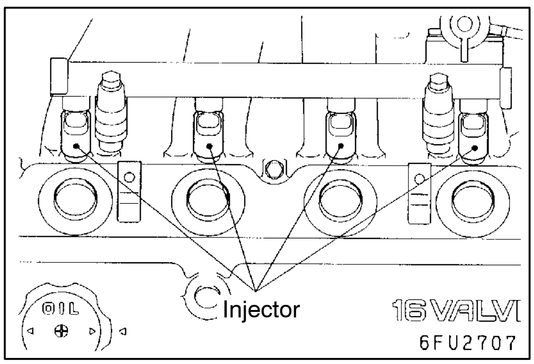




<Oxygen sensor (rear)>

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

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



INJECTOR CHECK 13100520287

Measurement of Resistance between Terminals

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

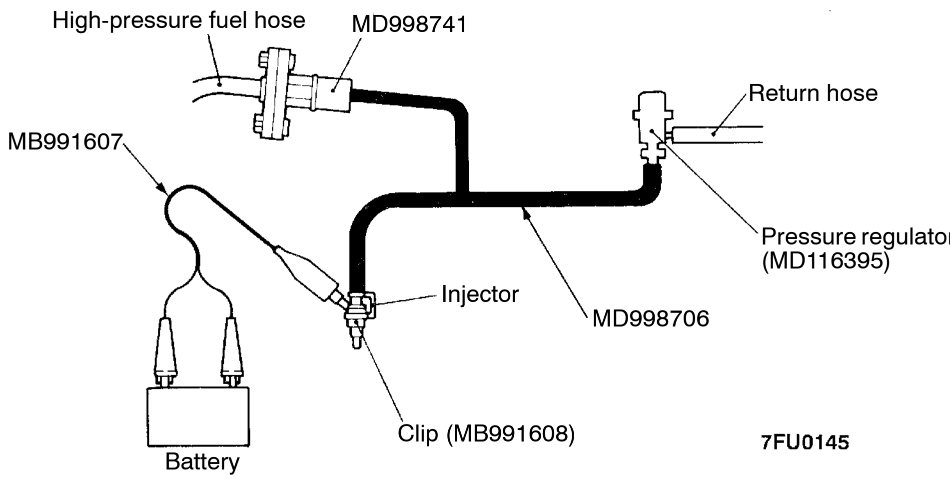
   Standard value: 13 - 16 Ω (at 20°C)

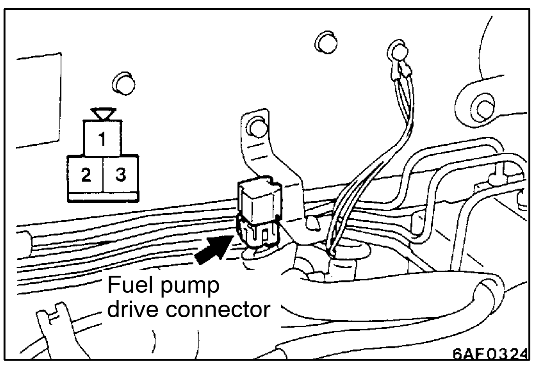
3. Install the injector connector.

Checking the Injection Condition

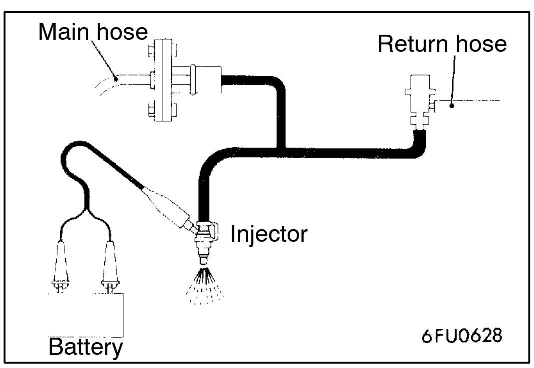
1. Following the steps below, bleed out the residual pressure within the fuel pipe line to prevent flow of the fuel. (Refer to P.13-88.)
2. Remove the injector.

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

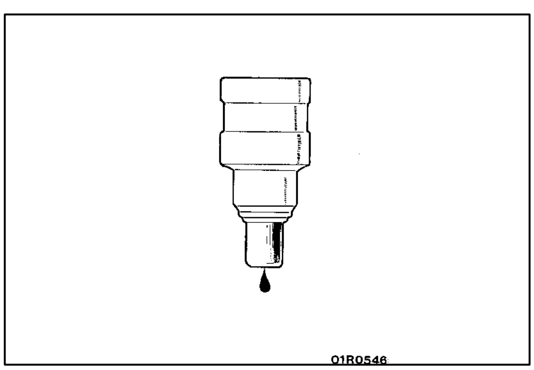




4. Apply battery voltage to the No. 2 terminal of 3 pin connector (fuel pump drive connector) shown in the figure at left and drive the fuel pump.



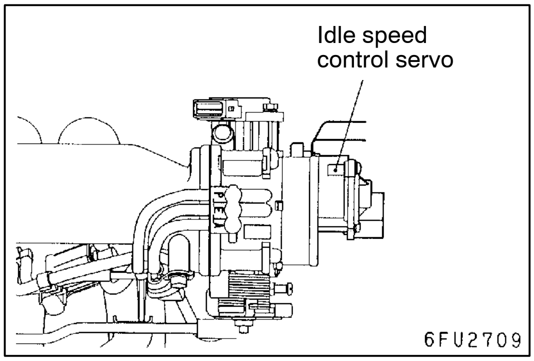
5. Activate the injector and check the atomized spray condition of the fuel.
The condition can be considered satisfactory unless it is extremely poor.

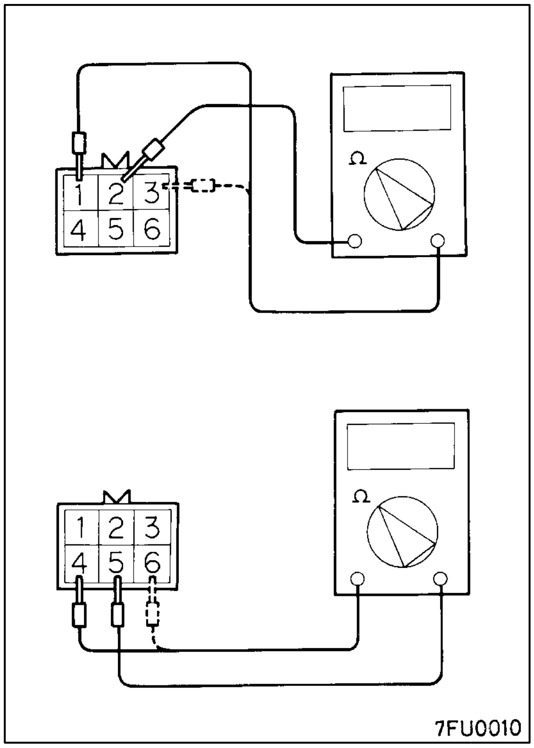


6. Stop the actuation of the injector, and check for leakage from the injector's nozzle.

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

13100540238

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 Ω (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 Ω (at 20°C)

PURGE CONTROL SOLENOID VALVE CHECK

13100560241

Refer to GROUP 17 - Emission Control System.

EGR CONTROL SOLENOID VALVE CHECK

13100570206

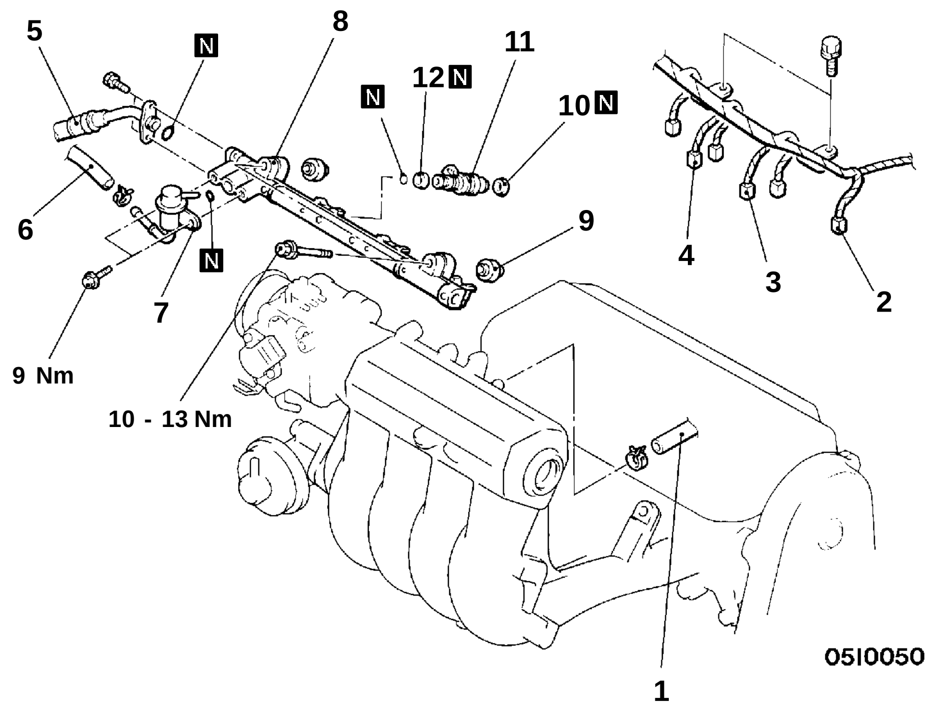
Refer to GROUP 17 - Emission Control System.

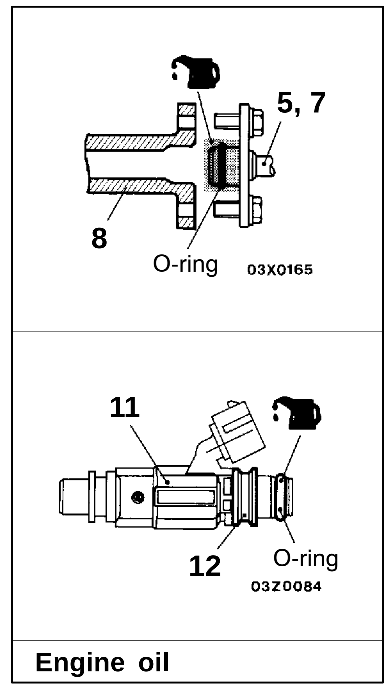
INJECTOR

13100710332

REMOVAL AND INSTALLATION

Pre-removal Operation
- Fuel Discharge Prevention (Refer to P.13A-88.)





00006518

Removal steps

1. PCV hose connection
2. Injector connector
3. Purge control solenoid valve connector
4. EGR solenoid valve connector
5. ▶A◀ High-pressure fuel hose connection
6. Fuel return hose connection
7. ▶A◀ Fuel pressure regulator
8. ◀A▶ Delivery pipe
9. Insulator
10. Insulator
11. ◀A▶ ▶A◀ Injector
12. Grommet

REMOVAL SERVICE POINT

◀A▶ DELIVERY PIPE/INJECTOR REMOVAL

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

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

INSTALLATION SERVICE POINT

▶A◀ INJECTOR/FUEL PRESSURE REGULATOR/ HIGH-PRESSURE FUEL HOSE INSTALLATION

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

   Caution
   Be sure not to let engine oil 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 to the standard torque, and tighten the fuel pressure regulator to the specified torque.

   Tightening torque:
   9 Nm (Fuel pressure regulator)

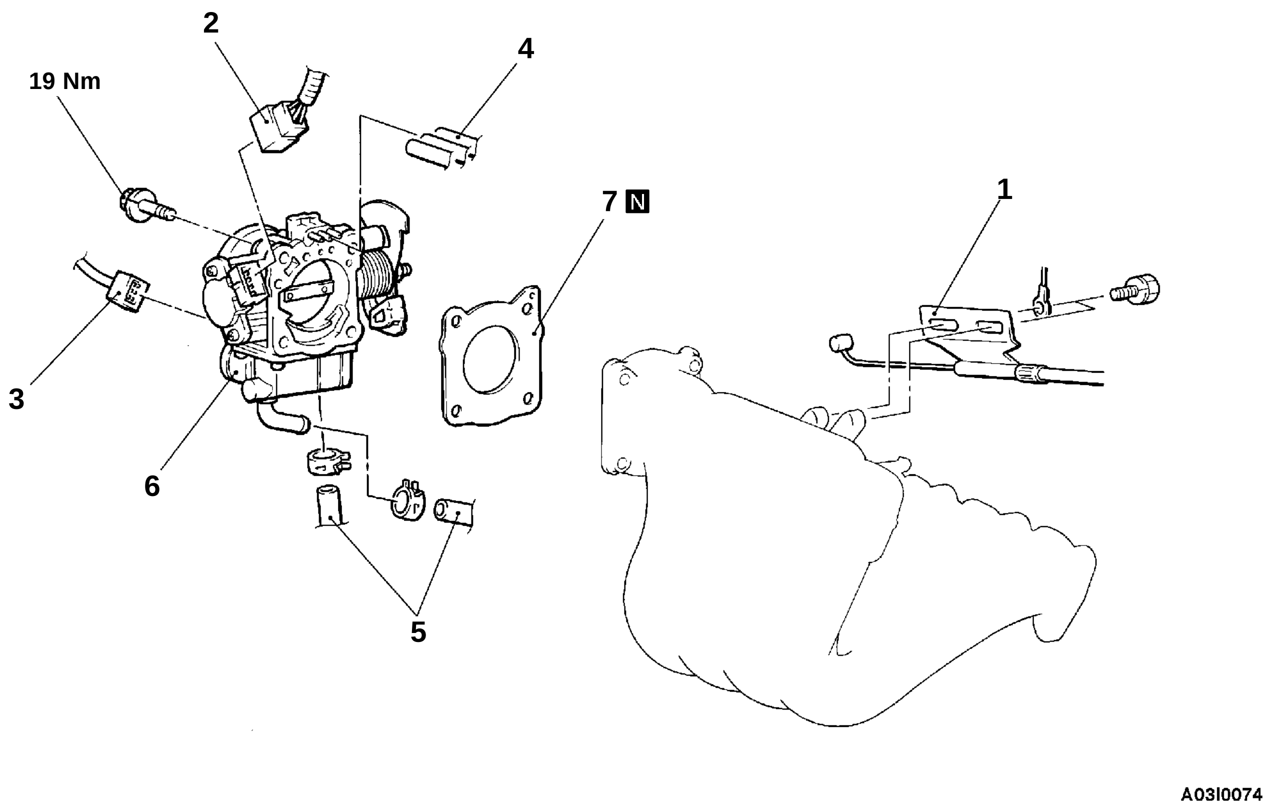
THROTTLE BODY

13100770132

REMOVAL AND INSTALLATION

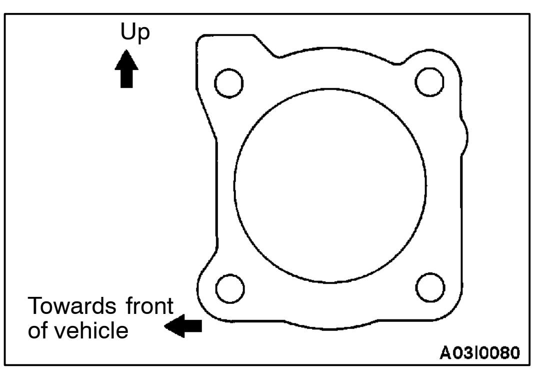
Pre-removal Operation
- Engine Coolant Draining
  (Refer to GROUP 14 - On-vehicle Service.)
- Air Cleaner Removal

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



Removal steps

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

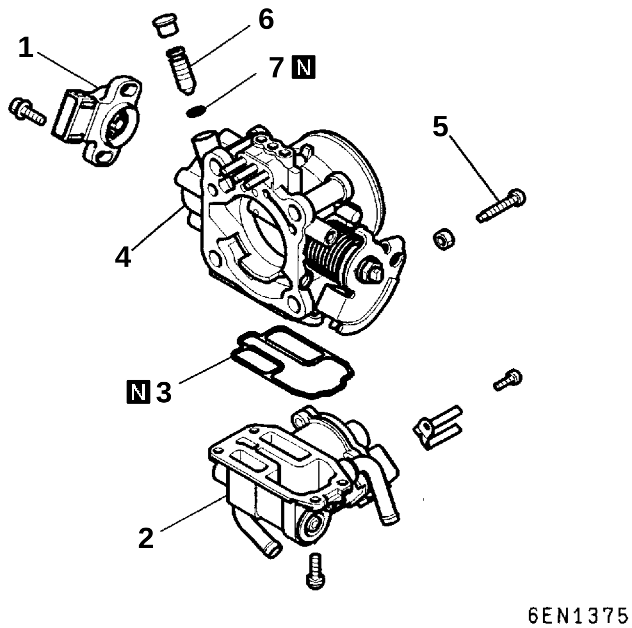


INSTALLATION SERVICE POINT

▶A◀ THROTTLE BODY GASKET INSTALLATION

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

DISASSEMBLY AND REASSEMBLY
13100970280
<Vehicles without auto-cruise control system>

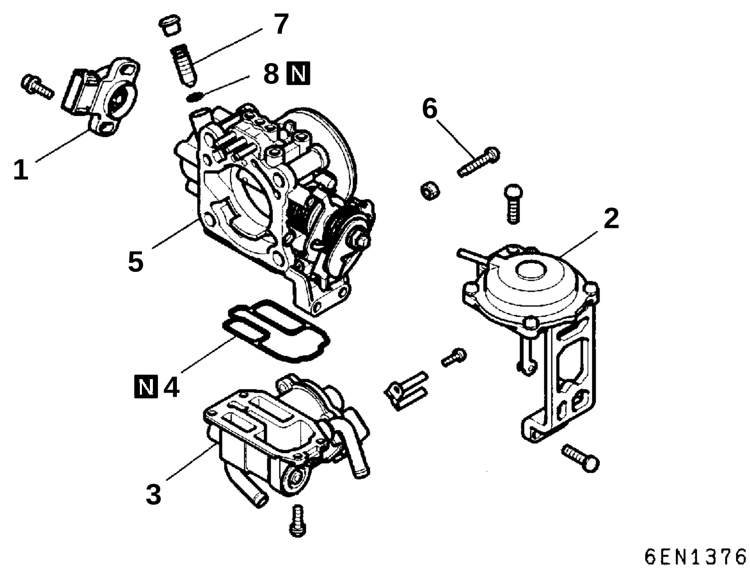


Disassembly steps

▶A◀ 1. Throttle position sensor
2. Idle speed control body assembly
3. O-ring
4. Throttle body
5. Fixed SAS
6. Speed adjusting screw
7. O-ring

NOTE
1. The fixed SAS and the speed adjusting screw are correctly adjusted at the factory and should not be removed.
2. If the fixed SAS should happen to have been removed, carry out fixed SAS adjustment. (Refer to page 13A-83.)
3. If the speed adjusting screw should happen to have been removed, carry out speed adjusting screw adjustment. (Refer to 13A-83.)

<Vehicles with auto-cruise control system>



Disassembly steps

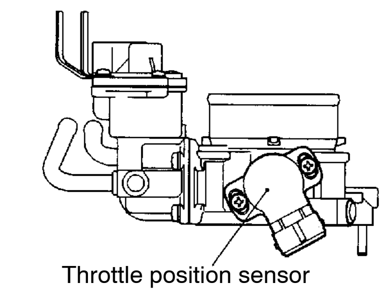
▶A◀ 1. Throttle position sensor
2. Lever assembly
3. Idle speed control body assembly
4. O-ring
5. Throttle body
6. Fixed SAS
7. Speed adjusting screw
8. O-ring

NOTE
1. The fixed SAS and the speed adjusting screw are correctly adjusted at the factory and should not be removed.
2. If the fixed SAS should happen to have been removed, carry out fixed SAS adjustment. (Refer to page 13A-83.)
3. If the speed adjusting screw should happen to have been removed, carry out speed adjusting screw adjustment. (Refer to 13A-83.)

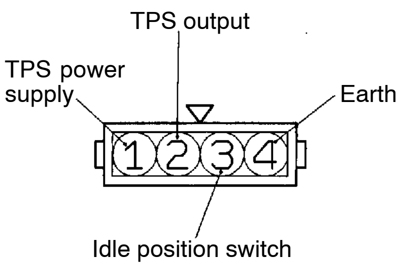
CLEANING THROTTLE BODY PARTS

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

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



9EN0592



9EN0591

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 (1) (TPS power supply) and terminal (2) (TPS output) of the TPS connector, and check that the resistance increases gradually as the throttle valve is opened slowly to the fully-open position.
3. For vehicles without TCL, check the continuity between terminal (3) (idle position switch) and terminal (4) (earth) of the TPS connector when the throttle valve is fully closed and fully open.

   Normal condition:

Throttle valve condition	Continuity
Fully closed	Continuity
Fully open	No continuity

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

MULTIPOINT FUEL INJECTION (MPI) <6A1>

13100010456

GENERAL INFORMATION

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

FUEL INJECTION CONTROL

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

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

IDLE AIR CONTROL

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

IGNITION TIMING CONTROL

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

SELF-DIAGNOSIS FUNCTION

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

OTHER CONTROL FUNCTIONS

1. Fuel Pump Control
   Turn 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
   Turn the compressor clutch of the A/C ON and OFF.
3. Fan Relay Control
   The revolutions of the radiator fan and condenser fan are controlled in response to the engine coolant temperature and vehicle speed.
4. Traction Control
   Engine output torque is reduced based on signals from the TCL-ECU in response to the conditions under which slipping of the driven wheels and turning of the vehicle occur.
   Furthermore, reduction of output torque is performed by closing the throttle valve and retarding the ignition timing.
5. Purge Control Solenoid Valve Control
   Refer to GROUP 17.
6. EGR Control Solenoid Valve Control
   Refer to GROUP 17.

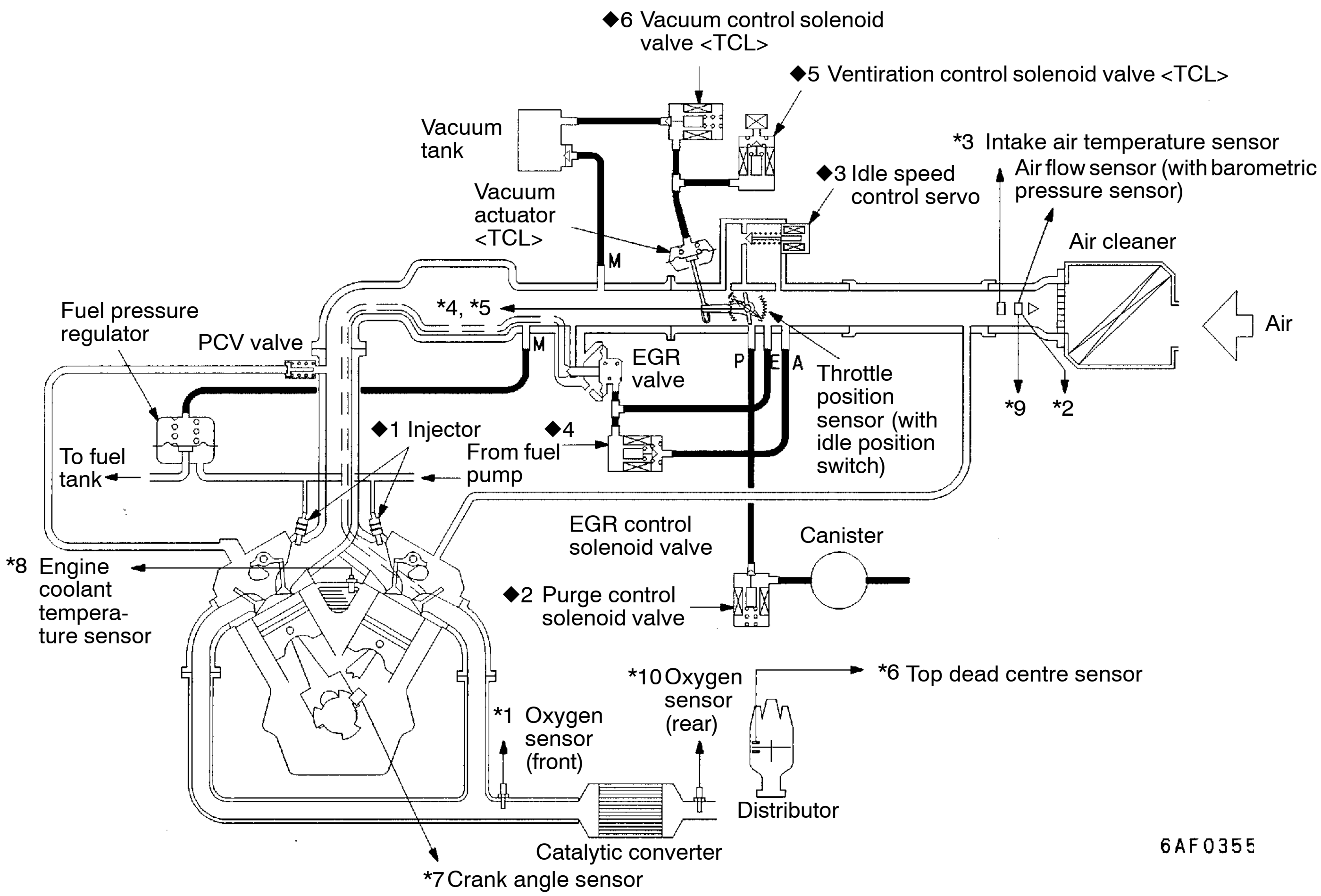
GENERAL SPECIFICATIONS

Items		Specifications
Throttle body	Throttle bore mm	60
	Throttle position sensor	Variable resistor type
	Accelerator pedal 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 <Vehicles without TCL>	Rotary contact type, within throttle position sensor
	Idle position switch <Vehicles with TCL>	Rotary contact type, within accelerator pedal position sensor
Engine-ECU	Identification model No.	E2T66876 <Vehicles without TCL> E2T66877 <Vehicles with TCL>
Sensors	Air flow sensor	Karman vortex type
	Barometric pressure sensor	Semiconductor type
	Intake air temperature sensor	Thermistor type
	Engine coolant temperature sensor	Thermistor type
	Oxygen sensor	Zirconia type
	Vehicle speed sensor	Magnetic resistive element type
	Inhibitor switch	Contact switch type
	Top dead centre sensor	Hall element type
	Crank angle sensor	Hall element type
	Detonation sensor	Piezoelectric type
	Power steering fluid pressure switch	Contact switch type

Items		Specifications
Actuators	Control relay type	Contact switch type
	Fuel pump relay type	Contact switch type
	Injector type and number	Electromagnetic type, 6
	Injector identification mark	CDH210
	EGR control solenoid valve	Duty cycle type solenoid valve
	Purge control solenoid valve	ON/OFF type solenoid valve
	Ventilation control solenoid valve	Duty cycle type solenoid valve
	Vacuum control solenoid valve	Duty cycle type solenoid valve
Fuel pressure regulator	Regulator pressure kPa	329

MULTIPOINT FUEL INJECTION SYSTEM DIAGRAM

Inputs		Outputs
*1 Oxygen sensor (front) *2 Air flow sensor *3 Intake air temperature sensor *4 Throttle position sensor *5 Idle position switch *6 Top dead centre sensor *7 Crank angle sensor *8 Engine coolant temperature sensor *9 Barometric pressure sensor *10 Oxygen sensor (rear) ● Power supply voltage ● Vehicle speed sensor ● A/C switch 1, 2 ● Inhibitor switch ● Power steering fluid pressure switch ● Ignition switch - ST ● Ignition switch - IG ● Alternator FR terminal ● A/T-ECU ● TCL-ECU <TCL>	⇨ Engine-ECU ⇨	◆1 Injector ◆2 Purge control solenoid valve ◆3 Idle speed control servo ◆4 EGR control solenoid valve ◆5 Ventilation control solenoid valve <TCL> ◆6 Vacuum control solenoid valve <TCL> ● Fuel pump relay ● Control relay ● A/C power relay ● Engine warning lamp ● Diagnosis signal ● Ignition coil, power transistor ● Fan controller ● Alternator G terminal ● A/T-ECU ● TCL-ECU <TCL>



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SERVICE SPECIFICATIONS

13100030346

Items		Specifications
Basic idle speed r/min		650±50
Throttle position sensor adjusting voltage mV	Vehicles without TCL	400 - 1,000
	Vehicles with TCL	580 - 690
Accelerator pedal position sensor adjusting voltage mV		400 - 1,000
Throttle position sensor resistance kΩ		3.5 - 6.5
Accelerator pedal position sensor resistance kΩ		3.5 - 6.5
Idle speed control servo coil resistance Ω		28 - 33 (at 20°C)
Intake air temperature sensor resistance kΩ	20°C	2.3 - 3.0
	80°C	0.30 - 0.42
Engine coolant temperature sensor resistance kΩ	20°C	2.1 - 2.7
	80°C	0.26 - 0.36
Oxygen sensor output voltage V		0.6 - 1.0
Fuel pressure kPa	Vacuum hose disconnection	324 - 343 at kerb idle
	Vacuum hose connection	Approx. 265 at kerb idle
Injector coil resistance Ω		13 - 16 (at 20°C)
Ventilation control solenoid valve coil resistance Ω		36 - 44 (at 20°C)
Vacuum control solenoid valve coil resistance Ω		36 - 44 (at 20°C)

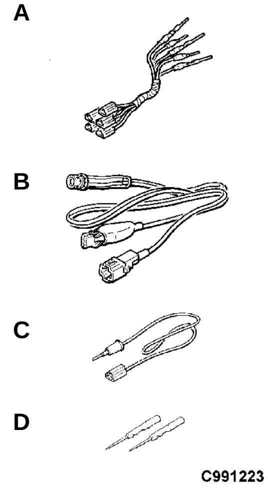
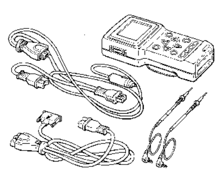
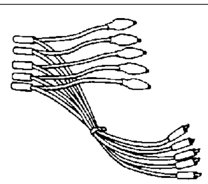
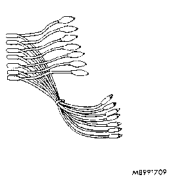
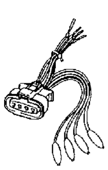
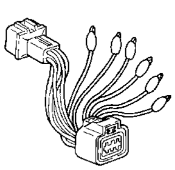
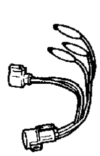
SEALANT

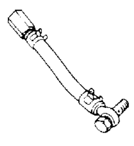
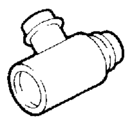
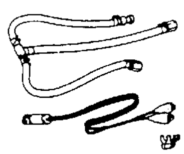
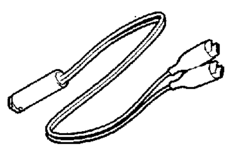
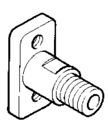
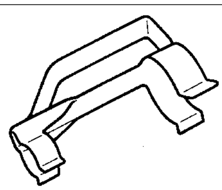
13100050205

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

SPECIAL TOOLS

13100060345

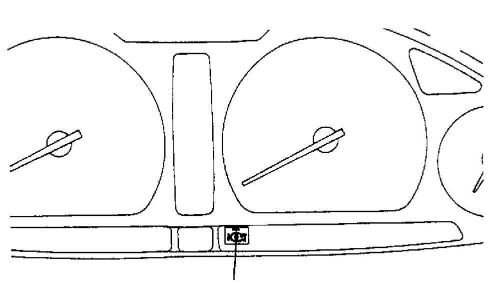
Tool	Number	Name	Use
	MB991223 A: MB991219 B: MB991220 C: MB991221 D: MB991222	Harness set A: Test harness B: LED harness C: LED harness adapter D: Probe	• Fuel gauge simple inspection A: Connector pin contact pressure inspection B: Power circuit inspection C: Power circuit inspection D: Commercial tester connection
	MB991502	MUT-II sub assembly	• Reading diagnosis code • MPI system inspection
	MB991348	Test harness set	• Measurement of voltage during trouble-shooting • Inspection using an analyzer
	MB991709	Test harness	
	MB991519	Alternator harness connector	Measurement of voltage during troubleshooting
	MD998463	Test harness (6-pin, square)	• Inspection of idle speed control servo • Inspection using an analyzer
	MD998478	Test harness (3-pin, triangle)	• Measurement of voltage during trouble-shooting • Inspection using an analyzer

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

TROUBLESHOOTING 13100850256

DIAGNOSIS TROUBLESHOOTING FLOW

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



DIAGNOSIS FUNCTION 13100860365

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
Detonation sensor
Injector
Vacuum control solenoid valve <TCL>
Ventilation control solenoid valve <TCL>
Immobilizer system

METHOD OF READING AND ERASING DIAGNOSIS CODES

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

INSPECTION USING MUT-II DATA LIST AND ACTUATOR TESTING

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

FAIL-SAFE FUNCTION REFERENCE TABLE

13100910305

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

Malfunctioning item	Control contents during malfunction
Air flow sensor	1. Uses the throttle position sensor signal and engine speed signal (crank angle sensor signal) to take reading of the basic injector drive time and basic ignition timing from the pre-set mapping. 2. Fixes the ISC servo in the appointed position so idle control is not performed.
Intake air temperature sensor	Controls as if the intake air temperature is 25°C.
Throttle position sensor (TPS)	No increase in fuel injection amount during acceleration due to the throttle position sensor signal.
Engine coolant temperature sensor	Controls as if the engine coolant temperature is 80°C.
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.
Detonation sensor	Switches the ignition timing from ignition timing for super petrol to ignition timing for standard petrol.
Oxygen sensor	Air/fuel ratio feedback control (closed loop control) is not performed.
Communication wire with transmission control unit <A/T>	Ignition timing is not retarded during transmission gear shifting (overall engine and transmission control).
Alternator FR terminal	Does not control the output of the alternator according to an electrical load. (works as a normal alternator)

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

INSPECTION CHART FOR DIAGNOSIS CODES

13100870382

Code No.	Diagnosis item	Reference page
11	Oxygen sensor (front) system	13A-112
12	Air flow sensor system	13A-113
13	Intake air temperature sensor system	13A-113
14	Throttle position sensor system	13A-114
21	Engine coolant temperature sensor system	13A-115
22	Crank angle sensor system	13A-116
23	Top dead centre sensor	13A-117
24	Vehicle speed sensor system	13A-118
25	Barometric pressure sensor system	13A-119
31	Detonation sensor system	13A-120
41	Injector system	13A-120
54	Immobilizer system	13A-121
59	Oxygen sensor (rear) system	13A-122
61	Communication wire with A/T-ECU system <A/T>	13A-123
64	Alternator FR terminal system	13A-123
71	Vacuum control solenoid valve system <Vehicles with TCL>	13A-124
72	Ventilation control solenoid valve system <Vehicles with TCL>	13A-125

INSPECTION PROCEDURE FOR DIAGNOSIS CODES

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

Check the oxygen sensor (front). (Refer to P.13A-196.)
- NG → **Replace**
- OK ↓

Measure at the oxygen sensor (front) connector C-46.
- Disconnect the connector, and measure at the harness side.

1. Voltage between 3 and earth (Ignition switch: ON)
   OK: System voltage
2. Continuity between 2 and earth
   OK: Continuity
3. Continuity between 4 and earth
   OK: Continuity

- 1. NG → Check the harness wire between the oxygen sensor (front) and the control relay connector, and repair if necessary.
- 2. NG → **Check the following connector:** C-39
  - NG → **Repair**
  - OK ↓ Check trouble symptom.
  - NG ↓ Check the harness wire between the engine-ECU and the oxygen sensor (front) connector.
    - NG → **Repair**
    - OK ↓ Replace the engine-ECU.
- 3. NG → Check the harness wire between the oxygen sensor (front) and the earth, and repair if necessary.
- OK ↓

Check the following connectors: C-46, C-39
- NG → **Repair**
- OK ↓

Check trouble symptom.
- NG ↓

Check the harness wire between the engine-ECU and the oxygen sensor (front) connector.
- NG → **Repair**
- OK ↓

Replace the engine-ECU.

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

Measure at the air flow sensor connector B-12.
- Connect the connector. (Use the test harness: MB991709)

1. Voltage between 3 and earth (Engine: Idling)
   OK: 2.2 - 3.2 V
2. Voltage between 7 and earth
   OK: 0 - 1 V (Engine: idling)
   6 - 9 V (2,000 r/min)

→ 1. NG → Check the air flow sensor circuit. (Refer to P.13A-159, INSPECTION PROCEDURE 49.)

→ 2. NG → Measure at the engine-ECU connector C-33.
- Connect the connector.
- Voltage between 19 and earth (Ignition switch: ON)
  OK: 6 - 9 V

  → NG → **Check the following connector:** B-12
  - NG → **Repair**
  - OK → Check trouble symptom. → NG → Replace the air flow sensor.

  → OK → **Check the following connector:** C-33
  - NG → **Repair**
  - OK → Check trouble symptom. → NG → Replace the engine-ECU.

→ OK → Replace the engine-ECU.

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

Check the intake air temperature sensor. (Refer to P.13A-193.)
- NG → **Replace**
- OK ↓

Measure at the air flow sensor connector B-12.
- Disconnect the connector, and measure at the harness side.
- Voltage between 6 and earth (Ignition switch: ON)
  OK: 4.5 - 4.9 V
- Continuity between 5 and earth
  OK: Continuity

→ NG → **Check the following connector:** C-39
- NG → **Repair**
- OK → Check trouble symptom. → NG → Check the harness wire between the engine-ECU and the intake air temperature sensor connector.
  - NG → **Repair**
  - OK → Replace the engine-ECU.

→ OK → **Check the following connector:** B-12
- NG → **Repair**
- OK → Check trouble symptom. → NG → Replace the engine-ECU.

Code No. 14 Throttle position sensor system	Probable cause
Range of Check ● Ignition switch: ON ● Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts. Set conditions ● When the idle position switch is ON, the sensor output voltage is 2 V or more for 4 seconds. or ● The sensor output voltage is 0.2 V or less for 4 seconds.	● Malfunction of the throttle position sensor or maladjustment ● Improper connector contact, open circuit or short-circuited harness wire of the throttle position sensor circuit ● Improper “ON” state of idle position switch ● Short circuit of the idle position switch signal line ● Malfunction of the engine-ECU

MUT-II Data list
26 Idle position switch system
OK: With the throttle valve at the idle position: ON
With the throttle valve slightly open: OFF

NG → Check the idle position switch system. (Refer to P.13A-146, INSPECTION PROCEDURE 28.) <Vehicles without TCL>
(Refer to P.13A-147, INSPECTION PROCEDURE 29.) <Vehicles with TCL>

OK ↓

Check the throttle position sensor. (Refer to P.13A-194.)

NG → **Replace**

OK ↓

Measure at the throttle position sensor connector B-07.
- Disconnect the connector, and measure at the harness side.
- Voltage between 4 and earth (Ignition switch: ON)
  OK: 4.8 - 5.2 V
- Continuity between 1 and earth
  OK: Continuity

NG → **Check the following connector:** C-39

NG → **Repair**

OK ↓

Check trouble symptom.

NG ↓

Check the harness wire between the engine-ECU and the throttle position sensor connector.

NG → **Repair**

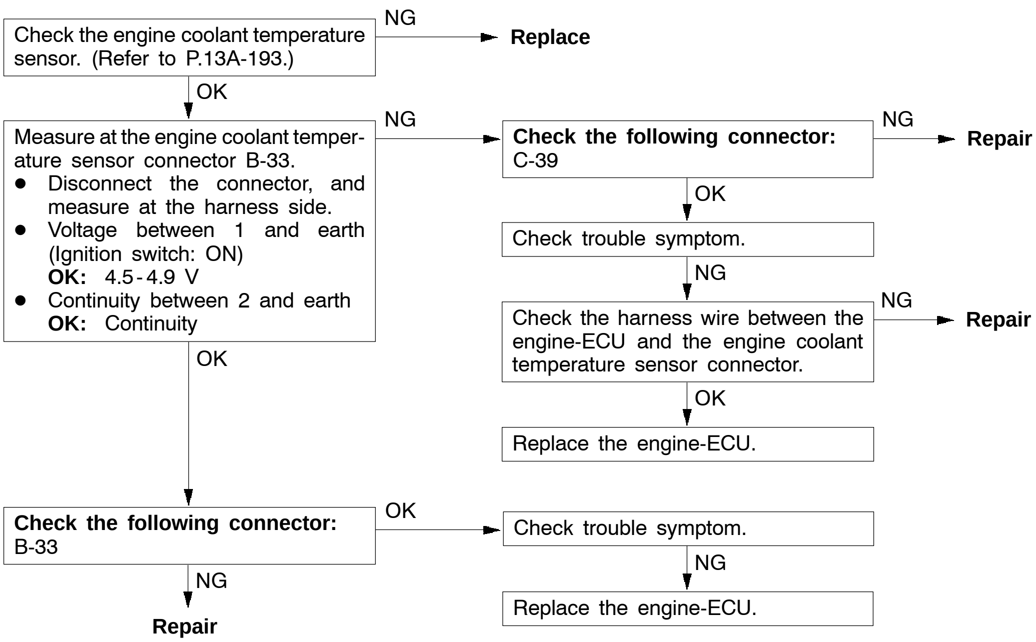
OK ↓

Replace the engine-ECU.

OK ↓ (from the measurement at connector B-07)

Check the throttle position sensor output circuit. (Refer to P.13A-160, INSPECTION PROCEDURE 50.)

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



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

Measure at the crank angle sensor connector B-77.
- Connect the connector. (Use the test harness: MD998478.)
- Voltage between 2 and earth (Engine: cranking)
  OK: 0.4 - 4.0 V
- Voltage between 2 and earth (Engine: idling)
  OK: 1.5 - 2.5 V

OK → Replace the engine-ECU.

NG ↓

Measure at the crank angle sensor connector B-77.
- Disconnect the connector, and measure at the harness side.

1. Voltage between 3 and earth (Ignition switch: ON)
   OK: System voltage
2. Voltage between 2 and earth (Ignition switch: ON)
   OK: 4.8 - 5.2 V
3. Continuity between 1 and earth
   OK: Continuity

1. NG → Check the harness wire between the crank angle sensor and the control relay connector, and repair if necessary.

2. NG → **Check the following connector:** C-39
- NG → **Repair**
- OK ↓ Check trouble symptom.
- NG ↓ Check the harness wire between the engine-ECU and the crank angle sensor connector.
- NG → **Repair**
- OK ↓ Replace the engine-ECU.

3. NG → Check the harness wire between the crank angle sensor and the earth, and repair if necessary.

OK ↓

Check the following connector: B-77
- NG → **Repair**
- OK ↓ Check trouble symptom.
- NG ↓ Replace the crank angle sensor.

Code No.23 Top dead centre sensor system	Probable cause
Range of Check ● Ignition switch: ON ● Engine speed is approx. 50 r/min or more. Set conditions ● Sensor output voltage does not change for 4 seconds (no pulse signal input.)	● Malfunction of the top dead centre sensor ● Improper connector contact, open circuit or short-circuited harness wire of the top dead centre sensor circuit ● Malfunction of the engine-ECU

Measure at the distributor connector B-42.
- Connect the connector. (Use the test harness: MB991348 and jumper wire.)
- Voltage between 5 and earth (Engine: cranking)
  OK: 0.4 - 3.0 V
- Voltage between 5 and earth (Engine: idling)
  OK: 1.5 - 2.0 V

OK → Replace the engine-ECU.

NG ↓

Measure at the distributor connector B-42.
- Disconnect the connector, and measure at the harness side.
1. Voltage between 6 and earth (Ignition switch: ON)
   OK: System voltage
2. Voltage between 5 and earth (Ignition switch: ON)
   OK: 4.8 - 5.2 V
3. Continuity between 7 and earth
   OK: Continuity

1. NG → Check the harness wire between the top dead centre sensor and the control relay connector, and repair if necessary.

2. NG → **Check the following connector:** C-39 — NG → **Repair**
- OK ↓ Check trouble symptom.
- NG ↓ Check the harness wire between the engine-ECU and the top dead centre sensor connector. — NG → **Repair**
- OK ↓ Replace the engine-ECU.

3. NG → Check the harness wire between the top dead centre sensor and the earth, and repair if necessary.

OK ↓

Check the following connector: B-42 — NG → **Repair**

OK ↓

Check trouble symptom.

NG ↓

Replace the distributor

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

Check the vehicle speed sensor. (Refer to GROUP 54 - Combination Meters.)
- NG → **Replace**
- OK ↓

Measure at the vehicle speed sensor connector B-66 <M/T>, B-67 <A/T>.
- Disconnect the connector, and measure at the harness side.

1. Voltage between 1 and earth (Ignition switch: ON)
   OK: System voltage
2. Voltage between 3 and earth (Ignition switch: ON)
   OK: 4.8 - 5.2 V
3. Continuity between 2 and earth
   OK: Continuity

OK ↓

Check the following connectors:
B-66 <M/T>, B-67 <A/T>
- NG → **Repair**
- OK ↓

Check trouble symptom.
- NG ↓

Check the harness wire between the engine-ECU and the vehicle speed sensor connector.
- NG → **Repair**
- OK ↓

Replace the engine-ECU.

1. NG →

Check the following connectors:
B-65 <M/T>, C-90, C-135, C-131
- NG → **Repair**
- ↓

Check trouble symptom.
- NG ↓

Check the harness wire between the vehicle speed sensor and ignition switch connector.
- NG → **Repair**
- OK ↓

Check the ignition switch. (Refer to GROUP 54 - Ignition Switch.)

2. NG →

Check the following connectors:
B-65 <M/T>, C-48, C-39
- NG → **Repair**
- OK ↓

Check trouble symptom.
- NG ↓

Check the harness wire between the engine-ECU and the vehicle speed sensor connector.
- NG → **Repair**
- OK ↓

Replace the engine-ECU.

3. NG →

Check the following connector:
B-65 <M/T>
- NG → **Repair**
- OK ↓

Check trouble symptom.
- NG ↓

Check the harness wire between the vehicle speed sensor and the earth, and repair if necessary.

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

Measure at the air flow sensor connector B-12.
- Connect the connector. (Use the test harness: MB991709)
- Voltage between 2 and earth (Ignition switch: ON)
  OK: 3.7 - 4.3 V (Altitude: 0 m)
  3.2 - 3.8 V (Altitude: 1,200 m)

NG → Measure at the air flow sensor connector B-12.
- Disconnect the connector, and measure at the harness side.
- Voltage between 1 and earth (Ignition switch: ON)
  OK: 4.8 - 5.2 V
- Continuity between 5 and earth
  OK: Continuity

NG → **Check the following connector:** C-39
NG → **Repair**
OK → Check trouble symptom.
NG → Check the harness wire between the engine-ECU and the barometric pressure sensor connector.
NG → **Repair**
OK → Replace the engine-ECU.

OK → **Check the following connector:** B-12
NG → **Repair**
OK → Check trouble symptom.
NG → Check the harness wire between the engine-ECU and the barometric pressure sensor connector.
NG → **Repair**
OK → Replace the air flow sensor.

OK → Measure at the engine-ECU connector C-39.
- Connect the connector.
- Voltage between 85 and earth (Ignition switch: ON)
  OK: 3.7 - 4.3 V (Altitude: 0 m)
  3.2 - 3.8 V (Altitude: 1,200 m)

NG → Check the harness wire between the engine-ECU and the barometric pressure sensor connector, and repair if necessary.

OK → **Check the following connector:** C-39
NG → **Repair**
OK → Check trouble symptom.
NG → Replace the engine-ECU.

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

Measure at the detonation sensor connector B-34.
- Disconnect the connector and measure at the harness side.
- Continuity between 2 and earth
  OK: Continuity

NG → Check the harness wire between the detonation sensor and earth, and repair if necessary.

OK → **Check the following connectors:** B-34, C-39

NG → **Repair**

OK → Check trouble symptom.

NG → Check the harness wire between the engine-ECU and the detonation sensor connector.

NG → **Repair**

OK → Replace the detonation sensor. → Check trouble symptom.

NG → Replace the engine-ECU.

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

Check the injector. (Refer to P.13A-197.)

NG → **Replace**

OK → Measure at the injector connectors B-02, B-03, B-05, B-36, B-40, B-44.
- Disconnect the connector, and measure at the harness side.
- Voltage between 1 and earth (Ignition switch: ON)
  OK: System voltage

OK → Check the injector control circuit. (Refer to P.13A-159, INSPECTION PROCEDURE 51.)

NG → **Check the following connectors:** B-02, B-03, B-05, B-36, B-40, B-44.

NG → **Repair**

OK → Check trouble symptom.

NG → Check the harness wire between the engine-ECU and the injector connector, and repair if necessary.

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

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

Is there another ignition key near the ignition key that is inserted in the ignition switch?
→ Yes: Remove the extra ignition key.
→ Check trouble symptom.
→ NG: (return to main flow)
→ No

Is a diagnosis code output from the immobilizer-ECU?
→ Yes: Check the immobilizer system. (Refer to GROUP 54 - Ignition Switch and Immobilizer System.)
→ No

Check the following connectors:
C-37, C-81, C-68
→ NG: **Repair**
→ OK

Check trouble symptom.
→ NG

Check the harness wire between the engine-ECU and the immobilizer-ECU.
→ NG: **Repair**
→ OK: Replace the immobilizer-ECU.
→ NG: Check trouble symptom.
→ NG: Replace the engine-ECU.

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

Check the oxygen sensor (rear). (Refer to P.13A-197.)
- NG → **Replace**
- OK ↓

Measure at the oxygen sensor (rear) connector C-85.
- Disconnect the connector, and measure at the harness side.

1. Voltage between 3 and earth (Ignition switch: ON)
   OK: System voltage
2. Continuity between 2 and earth
   OK: Continuity
3. Continuity between 4 and earth
   OK: Continuity

- 1. NG → Check the harness wire between the oxygen sensor (rear) and the control relay connector, and repair if necessary.
- 2. NG → **Check the following connector:** C-39
  - NG → **Repair**
  - OK → Check trouble symptom.
    - NG → Check the harness wire between the engine-ECU and the oxygen sensor (rear) connector.
      - NG → **Repair**
      - OK → Replace the engine-ECU.
- 3. NG → Check the harness wire between the oxygen sensor (rear) and the earth, and repair if necessary.
- OK ↓

Check the following connectors: C-85, C-39
- NG → **Repair**
- OK ↓

Check trouble symptom.
- NG ↓

Check the harness wire between the engine-ECU and the oxygen sensor (rear) connector.
- NG → **Repair**
- OK ↓

Replace the oxygen sensor (rear).
↓

Check trouble symptom.
- NG ↓

Replace the engine-ECU.

Code No. 61 Communication wire with A/T-ECU system <A/T>	Probable cause
Range of Check ● 60 seconds or more have passed immediately after engine was started. ● Engine speed is approx. 50 r/min or more Set conditions The voltage of the torque reduction request signal from the A/T-ECU is LOW for 1.5 seconds or more.	● Malfunction of the harness wire and the connector ● Malfunction of the engine-ECU ● Malfunction of the A/T-ECU

Check the following connectors.
(C-30, C-37) <Vehicles without TCL>,
(C-28, C-35) <Vehicles with TCL>

NG → **Repair**

OK ↓

Check trouble symptom.

NG ↓

Check the harness wire between the engine-ECU and the A/T-ECU connector.

OK → Replace the engine-ECU. ↓ Check trouble symptom. NG ↓ Replace the A/T-ECU.

NG ↓ **Repair**

Code No. 64 Alternator FR Terminal System	Probable cause
Range of Check, Set Conditions ● The alternator FR terminal signal voltage remains high for approximately 20 seconds while the engine is running.	● Open circuit in alternator FR terminal circuit ● Malfunction of the engine-ECU

Measure at the alternator connector B-38.
- Connect the connector.
- Voltage between 4 and earth
  (Engine: Idling)
  (Radiator fan: Stopped)
  (Headlamp: OFF → ON)
  OK: 1.8 - 2.4 → 1.0 - 1.6 V

OK → Replace the engine-ECU.

NG ↓

Measure at the alternator connector B-38.
- Disconnect the connector, and measure at the harness side.
- Voltage between 4 and earth
  (Ignition switch: ON)
  OK: 4.8 - 5.2 V

NG → **Check the following connectors:** B-31, C-37
- NG → **Repair**
- OK ↓ Check trouble symptom.
- NG ↓ Check the harness wire between the engine-ECU and the alternator connector.
- NG → **Repair**
- OK ↓ Replace the engine-ECU.

OK ↓

Check the following connector: B-38

NG → **Repair**

OK ↓

Check trouble symptom.

NG ↓

Check the harness wire between the engine-ECU and the alternator connector.

NG → **Repair**

OK ↓

Replace the alternator.

Code No. 71 Vacuum control solenoid valve system <Vehicles with TCL>	Probable cause
Range of Check ● Ignition switch: ON ● Excluding 60 seconds immediately after the engine starts. ● Battery voltage is 10 V or more. ● Forced actuation by means of MUT-II is not being carried out. Set condition Solenoid valve drive or non-drive instruction and energized condition of solenoid coil are different.	● Malfunction of the vacuum control solenoid valve ● Improper connector contact, open circuit or short-circuited harness wire of the vacuum control solenoid valve ● Malfunction of the engine-ECU

Check the vacuum control solenoid valve. (Refer to P.13A-201.)
- NG → **Replace**
- OK ↓

Measure at the vacuum control solenoid valve connector B-78.
- Disconnect the connector and measure at the harness side.
- Voltage between 2 and earth (Ignition switch: ON)
  OK: System voltage

NG → Check the harness wire between the vacuum control solenoid valve connector and the control relay connector, and repair if necessary.

OK ↓

Measure at the engine-ECU connector C-35.
- Disconnect the connector and measure at the harness side.
- Voltage between 32 and earth (Ignition switch: ON)
  OK: System voltage

NG → **Check the following connector:** B-78
- NG → **Repair**
- OK ↓ Check trouble symptom.
  - NG ↓ Check the harness wire between the engine-ECU and the vacuum control solenoid valve connector, and repair if necessary.

OK ↓

Check the following connector: C-35
- NG → **Repair**
- OK ↓

Check trouble symptom.
- NG → Replace the engine-ECU.

Code No. 72 Ventilation control solenoid valve system <Vehicles with TCL>	Probable cause
Range of Check ● Ignition switch: ON ● Excluding 60 seconds immediately after the engine starts. ● Battery voltage is 10 V or more. ● Forced actuation by means of MUT-II is not being carried out. Set condition Solenoid valve drive or non-drive instruction and energized condition of solenoid coil are different.	● Malfunction of the ventilation control solenoid valve ● Improper connector contact, open circuit or short-circuited harness wire of the ventilation control solenoid valve ● Malfunction of the engine-ECU

Check the ventilation control solenoid valve. (Refer to P.13A-201.)

NG → **Replace**

OK ↓

Measure at the ventilation control solenoid valve connector B-79.
- Disconnect the connector and measure at the harness side.
- Voltage between 1 and earth (Ignition switch: ON)
  OK: System voltage

NG → Check the harness wire between the control relay and the ventilation control solenoid valve connector, and repair if necessary.

OK ↓

Measure at the engine-ECU connector C-35.
- Disconnect the connector and measure at the harness side.
- Voltage between 31 and earth (Ignition switch: ON)
  OK: System voltage

NG → **Check the following connector:** B-79

- NG → **Repair**
- OK ↓ Check trouble symptom.
- NG ↓ Check the harness wire between the engine-ECU and the ventilation control solenoid valve connector, and repair if necessary.

OK ↓

Check the following connector: C-35

NG → **Repair**

OK ↓

Check trouble symptom.

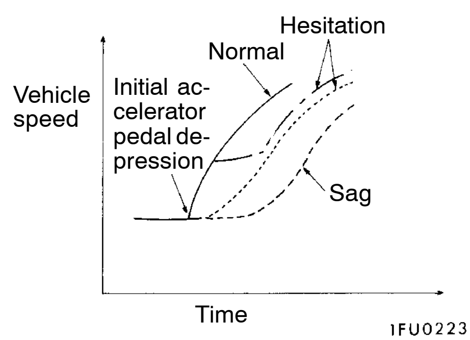
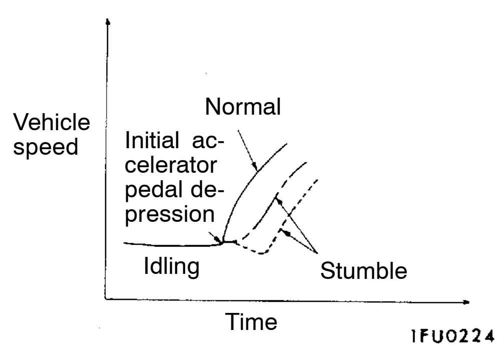
NG → Replace the engine-ECU.

INSPECTION CHART FOR TROUBLE SYMPTOMS

13100880361

Trouble symptom		Inspection procedure No.	Reference page
Communication with MUT-II is impossible.	Communication with all systems is not possible.	1	13A-128
	Communication with engine-ECU only is not possible.	2	13A-129
Engine warning lamp and related parts	The engine warning lamp does not illuminate right after the ignition switch is turned to the ON position.	3	13A-130
	The engine warning lamp remains illuminating and never goes out.	4	13A-130
Starting	No initial combustion (starting impossible)	5	13A-131
	Initial combustion but no complete combustion (starting impossible)	6	13A-132
	Long time to start (improper starting)	7	13A-133
Idling stability (Improper idling)	Unstable idling (Rough idling, hunting)	8	13A-134
	Idling speed is high. (Improper idling speed)	9	13A-135
	Idling speed is low. (Improper idling speed)	10	13A-136
Idling stability (Engine stalls)	When the engine is cold, it stalls at idling. (Die out)	11	13A-137
	When the engine becomes hot, it stalls at idling. (Die out)	12	13A-138
	The engine stalls when starting the car. (Pass out)	13	13A-139
	The engine stalls when decelerating.	14	13A-139
Driving	Hesitation, sag or stumble	15	13A-140
	The feeling of impact or vibration when accelerating	16	13A-140
	The feeling of impact or vibration when decelerating	17	13A-141
	Poor acceleration	18	13A-141
	Surge	19	13A-142
	Knocking	20	13A-142
Dieseling		21	13A-142
Too high CO and HC concentration when idling		22	13A-143
Low alternator output voltage (approx. 12.3 V)		23	13A-144
Idling speed is improper when A/C is operating		24	13A-144
Fans (radiator fan, A/C condensor fan) are inoperative		25	13A-145

PROBLEM SYMPTOMS TABLE (FOR YOUR INFORMATION)

Items		Symptom
Starting	Won’t start	The starter is used to crank the engine, but there is no combustion within the cylinders, and the engine won’t start.
	Fires up and dies	There is combustion within the cylinders, but then the engine soon stalls.
	Hard starting	Engine starts after cranking a while.
Idling stability	Hunting	Engine speed doesn’t remain constant; changes at idle.
	Rough idle	Usually, a judgement can be based upon the movement of the tachometer pointer, and the vibration transmitted to the steering wheel, shift lever, body, etc. This is called rough idle.
	Incorrect idle speed	The engine doesn’t idle at the usual correct speed.
	Engine stall (Die out)	The engine stalls when the foot is taken from the accelerator pedal, regardless of whether the vehicles is moving or not.
	Engine stall (Pass out)	The engine stalls when the accelerator pedal is depressed or while it is being used.
Driving	Hesitation Sag	“Hesitation” is the delay in response of the vehicle speed (engine speed) that occurs when the accelerator is depressed in order to accelerate from the speed at which the vehicle is now traveling, or a temporary drop in vehicle speed (engine speed) during such acceleration. Serious hesitation is called “sag”. 
	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. 

Items		Symptom
Driving	Shock	The feeling of a comparatively large impact or vibration when the engine is accelerated or decelerated.
	Surge	This is repeated surging ahead during constant speed travel or during variable speed travel.
	Knocking	A sharp sound like a hammer striking the cylinder walls during driving and which adversely affects driving.
Stopping	Run on ("Dieseling")	The condition in which the engine continues to run after the ignition switch is turned to OFF. Also called "Dieseling".

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

INSPECTION PROCEDURE 1

Communication with MUT-II is not possible. (Communication with all systems is not possible.)	Probable cause
The cause is probably a defect in the power supply system (including earth) for the diagnosis line.	• Malfunction of the connector • Malfunction of the harness wire

Measure at the diagnostic connector (16-pin) C-20.
- Voltage between 16 and earth
  OK: Battery voltage

NG → **Check the following connectors:** C-66, (C-63, C-132, C-141) <L.H.>, (C-62, C-14) <R.H.>
- NG → **Repair**
- OK → Check trouble symptom.
  - NG → Check the harness wire between the power supply and diagnostic connector (16 pin), and repair if necessary.

OK ↓

Measure at the diagnostic connector (16-pin) C-20.
- Continuity between 4 and earth
- Continuity between 5 and earth
  OK: Continuity

NG → Check the harness wire between the diagnostic connector (16-pin) and earth, and repair if necessary.

OK ↓

Replace the MUT-II.

INSPECTION PROCEDURE 2

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

Is communication possible between the MUT-II and the immobilizer-ECU?

- No → Check the diagnosis line between the immobilizer-ECU and the MUT-II, and repair if necessary. (Refer to GROUP 54 - Ignition Key and Immobilizer.)
- Yes ↓

Check the following connectors: C-37, C-81, C-68

- NG → **Repair**
- OK ↓

Check trouble symptom.

- NG ↓

Check the harness wire between engine-ECU and diagnosis connector.

- NG → **Repair**
- OK ↓

Check the harness wire between engine-ECU and immobilizer-ECU.

- NG → **Repair**
- OK → Check the harness wire between engine-ECU and earth.
  - NG → **Repair**
  - OK → Check the power supply and ignition switch-IG system. (Refer to P.13A-145, INSPECTION PROCEDURE 26.)

INSPECTION PROCEDURE 3

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

MUT-II Data list
16 Engine-ECU power supply voltage (Refer to P.13A-163.)

NG → Check the engine-ECU power supply and earth circuit. (Refer to P.13A-158, INSPECTION PROCEDURE 46.)

OK ↓

Measure at the engine-ECU connector C-35.
- Disconnect the connector, and measure at the harness side.
- Earth the terminal No. 36.

  OK: The engine warning lamp illuminates.

OK → **Check the following connector:** C-35.
- NG → **Repair**
- OK ↓ Check trouble symptom.
- NG ↓ Replace the engine-ECU.

NG ↓

Check a burnt-out bulb.

NG → **Replace**

OK ↓

Measure at the combination meter connector D-03.
- Disconnect the connector, and measure at the harness side.
- Voltage between 4 and earth (Ignition switch: ON)

  OK: System voltage

NG → Check the engine warning lamp power supply circuit, and repair if necessary.

OK ↓

Check the following connectors:
D-03, C-90, C-35

NG → **Repair**

OK ↓

Check trouble symptom.

NG → Check the harness wire between combination meter and engine-ECU, and repair if necessary.

INSPECTION PROCEDURE 4

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

MUT-II Self-Diag code
Are diagnosis codes displayed?

Yes → Refer to P.13A-111, INSPECTION CHART FOR DIAGNOSIS CODES

No ↓

Measure at the combination meter connector D-03.
- Disconnect the connector, and measure at the harness side.
- Disconnect the engine-ECU connector
- Continuity between 16 and earth

  OK: No continuity

NG → Check the harness wire between combination meter and engine-ECU connector, and repair if necessary.

OK ↓

Replace the engine-ECU.

INSPECTION PROCEDURE 5

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

Check battery voltage when cranking.
OK: 8 V or higher

NG → Check the battery. (Refer to GROUP 54 - Battery.)

OK ↓

Is immobilizer-ECU diagnosis code displayed?

Yes → Check the immobilizer. (Refer to GROUP 54 - Ignition Key and Immobilizer.)

No ↓

MUT-II: Inspection of no initial combustion.
(Refer to P.13A-152, INSPECTION PROCEDURE 38.)

OK ↓

Can any sound be heard from the injectors when cranking?

NG → Check the injector system. (Refer to P.13A-120, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 41.)

OK ↓

Ignition system: Inspection of no initial combustion.
(Refer to P.13A-153, INSPECTION PROCEDURE 39.)

OK ↓

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

INSPECTION PROCEDURE 6

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

Check battery voltage when cranking.
OK: 8 V or higher

NG → Check the battery. (Refer to GROUP 54 - Battery.)

OK ↓

MUT-II: Check if uncompleted combustion occurs.
(Refer to P.13A-153, INSPECTION PROCEDURE 40.)

OK ↓

Can any sound be heard from the injectors when cranking?

NG → Check the injector system, (Refer to P.13A-120, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 41.)

OK ↓

Is starting good if the engine is cranked with the accelerator pedal slightly depressed?

Yes → Check ISC servo for operation sound.
(Refer to P.13A-199.)

NG → Check the ISC servo system. (Refer to P.13A-151, INSPECTION PROCEDURE 35.)

OK ↓

- Clean the throttle valve area. (Refer to P.13A-184.)
- Check and adjust the fixed SAS. (Refer to P.13A-187.)

No ↓

Check the ignition timing when cranking.
OK: Approx. 5°BTDC

NG → Check that the crank angle sensor is installed properly.

OK ↓

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

INSPECTION PROCEDURE 7

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

Check battery voltage when cranking
OK: 8 V or higher

NG → Check the battery. (Refer to GROUP 54 - Battery.)

OK ↓

MUT-II: Check if uncomplete combustion occurs.
(Refer to P.13A-153, INSPECTION PROCEDURE 40.)

OK ↓

Can any sound be heard from the injectors when cranking?

NG → Check the injector system. (Refer to P.13A-120, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 41.)

OK ↓

Check the ignition timing when cranking.
OK: Approx. 5°BTDC

NG → Check that the crank angle sensor is installed properly.

OK ↓

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.

INSPECTION PROCEDURE 8

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

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

MUT-II Self-Diag code
Are diagnosis codes displayed?
- Yes → Refer to P.13A-111, INSPECTION CHART FOR DIAGNOSIS CODES.
- No ↓

Does idling speed fluctuate excessively?
- Yes → Check if hunting occurs. (Refer to P.13A-153, INSPECTION PROCEDURE 41.)
- No ↓

Check the ISC servo for operation sound. (Refer to P.13A-199.)
- NG → Check the ISC servo system. (Refer to P.13A-151, INSPECTION PROCEDURE 35.)
- OK ↓

Check the injector for operation sound.
- NG → Check the injector system. (Refer to P.13A-120, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 41.)
- OK ↓

MUT-II: Check if idling speed is unstable.
(Refer to P.13A-153, INSPECTION PROCEDURE 41.)
- OK ↓

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

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables.
- Check the purge control system.
- Check the EGR control system.
- Check the compression pressure.
- Check if foreign materials (water, alcohol, etc.) got into fuel.
- Check the operation of the power steering control valve.

INSPECTION PROCEDURE 9

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

MUT-II Self-Diag code
Are diagnosis codes displayed?

Yes → Refer to P.13A-111, INSPECTION CHART FOR DIAGNOSIS CODES.

No ↓

Check the ISC servo for operation sound. (Refer to P.13A-199.)

NG → Check the ISC servo system. (Refer to P.13A-151, INSPECTION PROCEDURE 35.)

OK ↓

MUT-II Data list
26 Idle position switch (Refer to P.13A-164.)

NG → Check the idle position switch system.
(Refer to P.13A-146, INSPECTION PROCEDURE 28.) <Vehicles without TCL>
(Refer to P.13A-147, INSPECTION PROCEDURE 29.) <Vehicles with TCL>

OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13A-163.)

NG → Check the engine coolant temperature sensor system. (Refer to P.13A-115, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 21.)

OK ↓

MUT-II Data list
28 A/C switch (Refer to P.13A-164.)

NG → Check the A/C switch and A/C relay system. (Refer to P.13A-149, INSPECTION PROCEDURE 33.)

OK ↓

Basic idle adjustment (Refer to P.13A-188.)

↓

Check trouble symptom.

NG → Clean the throttle valve area. (Refer to P.13A-184.)

↓

Check and adjust the fixed SAS. (Refer to P.13A-187.)

INSPECTION PROCEDURE 10

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

MUT-II Self-Diag code
Are diagnosis codes displayed?

- Yes → Refer to P.13A-111, INSPECTION CHART FOR DIAGNOSIS CODES.
- No ↓

Check the ISC servo for operation sound. (Refer to P.13A-199.)

- NG → Check the ISC servo system. (Refer to P.13A-151, INSPECTION PROCEDURE 35.)
- OK ↓

MUT-II Data list
26 Idle position switch (Refer to P.13A-164.)

- NG → Check the idle position switch system. (Refer to P.13A-146, INSPECTION PROCEDURE 28.) <Vehicles without TCL> (Refer to P.13A-147, INSPECTION PROCEDURE 29.) <Vehicles with TCL>
- OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13A-163.)

- NG → Check the engine coolant temperature sensor system. (Refer to P.13A-115, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 21.)
- OK ↓

MUT-II Data list
29 Inhibitor switch (Refer to P.13A-164.)

- NG → Check the ignition switch ST and inhibitor switch system <A/T>. (Refer to P.13A-148, INSPECTION PROCEDURE 31.)
- OK ↓

Basic idle adjustment (Refer to P.13A-188.)

↓

Check trouble symptom.

- NG → Clean the throttle valve area. (Refer to P.13A-184.) ↓ Check and adjust the fixed SAS. (Refer to P.13A-187.)

INSPECTION PROCEDURE 11

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

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

MUT-II Self-Diag code
Are diagnosis codes displayed?
- Yes → Refer to P.13A-111, INSPECTION CHART FOR DIAGNOSIS CODES.
- No ↓

Does the engine stall right after the accelerator pedal is released?
- Yes → Clean the throttle valve area. (Refer to P.13A-184.) → Check and adjust the fixed SAS. (Refer to P.13A-187.)
- No ↓

Is engine-idling stable after the warming-up?
- No → Check if the unstable idling (Rough idling, hunting). (Refer to P.13A-134, INSPECTION PROCEDURE 8.)
- Yes ↓

Check the ISC servo for operation sound. (Refer to P.13A-199.)
- NG → Check the ISC servo system. (Refer to P.13A-151, INSPECTION PROCEDURE 35.)
- OK ↓

Check the injector for operation sound.
- NG → Check the injector system. (Refer to P.13A-120, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 41.)
- OK ↓

MUT-II Data list
26 Idle position switch (Refer to P.13A-164.)
- NG → Check the idle position switch system. (Refer to P.13A-146, INSPECTION PROCEDURE 28.) <Vehicles without TCL> (Refer to P.13A-147, INSPECTION PROCEDURE 29.) <Vehicles with TCL>
- OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13A-163.)
- NG → Check the engine coolant temperature sensor system. (Refer to P.13A-115, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 21.)
- OK ↓

MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13A-167.)
- NG → Check the EGR control solenoid valve system. (Refer to P.13A-152, INSPECTION PROCEDURE 37.)
- OK ↓

Check the fuel pressure. (Refer to P.13A-189.)
- OK ↓

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

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables.
- Check the compression pressure.
- Check the engine oil viscosity.

INSPECTION PROCEDURE 12

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

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

MUT-II Self-Diag code
Are diagnosis codes displayed?
- Yes → Refer to P.13A-111, INSPECTION CHART FOR DIAGNOSIS CODES.
- No ↓

Check the ISC servo for operation sound. (Refer to P.13A-199.)
- NG → Check the ISC servo system. (Refer to P.13A-151, INSPECTION PROCEDURE 35.)
- OK ↓

Check the injector for operation sound.
- NG → Check the injector system. (Refer to P.13A-120, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 41.)
- OK ↓

Does the engine stall right after the accelerator pedal is released?
- Yes → Clean the throttle valve area. (Refer to P.13A-184.) → Check and adjust the fixed SAS. (Refer to P.13A-187.)
- No ↓

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

MUT-II: Engine stalling inspection when the engine is warm and idling. (Refer to P.13A-155, INSPECTION PROCEDURE 43.)
- OK ↓

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

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.

INSPECTION PROCEDURE 13

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

MUT-II Self-Diag code
Are diagnosis codes displayed?

Yes → Refer to P.13A-111, INSPECTION CHART FOR DIAGNOSIS CODES.

No ↓

MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13A-167.)

NG → Check the EGR control solenoid valve system. (Refer to P.13A-152, INSPECTION PROCEDURE 37.)

OK ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables.
- Check if air was drawn into the intake system.
  - Broken intake manifold gasket
  - Broken or disconnected vacuum hose
  - Improper operation of the PCV valve
  - Broken air intake hose

INSPECTION PROCEDURE 14

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

Were the battery terminals disconnected?

Yes → After warming-up, let the engine run at idling for 10 minutes.

No ↓

MUT-II Self-Diag code
Are diagnosis codes displayed?

Yes → Refer to P.13A-111, INSPECTION CHART FOR DIAGNOSIS CODES.

No ↓

MUT-II Data list
26 Idle position switch (Refer to P.13A-164.)

NG → Check the idle position switch system.
(Refer to P.13A-146, INSPECTION PROCEDURE 28.) <Vehicles without TCL>
(Refer to P.13A-147, INSPECTION PROCEDURE 29.) <Vehicles with TCL>

OK ↓

MUT-II Data list
14 Throttle position sensor (Refer to P.13A-163.)

NG → Check the throttle position sensor system. (Refer to P.13A-114, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 14.)

OK ↓

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

Yes → Check the vehicle speed sensor system. (Refer to P.13A-119, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 25.)

No ↓

MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13A-167.)

NG → Check the EGR control solenoid valve system. (Refer to P.13A-152, INSPECTION PROCEDURE 37.)

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.

INSPECTION PROCEDURE 15

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

MUT-II Self-Diag code
Are diagnosis codes displayed?

Yes → Refer to P.13A-111, INSPECTION CHART FOR DIAGNOSIS CODES.

No ↓

Check the injectors for operation sound.

NG → Check the injector system. (Refer to P.13A-120, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 41.)

OK ↓

Check the ignition timing.
(Refer to GROUP 11B - On-vehicle Service.)

NG → Check that the crank angle sensor is installed properly.

OK ↓

MUT-II: Check if hesitation, sag, stumble or poor acceleration occur.
(Refer to P.13A-156, INSPECTION PROCEDURE 44.)

OK ↓

Check the fuel pressure. (Refer to P.13A-189.)

OK ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables.
- Check the injector operating sound at the rear bank.
- Check the operation vacuum of the traction control (TCL).
- Check the operation of the throttle valve.
- Check the vacuum tank and vacuum actuator.
- Check the EGR control system.
- Check the compression pressure.
- Check the fuel filter or fuel line for clogging.

INSPECTION PROCEDURE 16

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

MUT-II Self-Diag code
Are diagnosis codes displayed?

Yes → Refer to P.13A-111, INSPECTION CHART FOR DIAGNOSIS CODES.

No ↓

Check the following items.
- 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

MUT-II Self-Diag code
Are diagnosis codes displayed?

- Yes → Refer to P.13A-111, INSPECTION CHART FOR DIAGNOSIS CODES.
- No ↓

Check the ISC servo for operation sound. (Refer to P.13A-199.)

- NG → Check the ISC servo system. (Refer to P.13A-151, INSPECTION PROCEDURE 35.)
- OK ↓

MUT-II Data list
14 Throttle position sensor (Refer to P.13A-163.)

- NG → Check the throttle position sensor system. (Refer to P.13A-114, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 14.)
- OK ↓

MUT-II Data list
26 Idle position switch (Refer to P.13A-164.)

- NG → Check the idle position switch system. (Refer to P.13A-146, INSPECTION PROCEDURE 28.) <Vehicles without TCL> (Refer to P.13A-147, INSPECTION PROCEDURE 29.) <Vehicles with TCL>
- OK ↓

Clean the throttle valve area. (Refer to P.13A-184.)

INSPECTION PROCEDURE 18

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

MUT-II Self-Diag code
Are diagnosis codes displayed?

- Yes → Refer to P.13A-111, INSPECTION CHART FOR DIAGNOSIS CODES.
- No ↓

Check the injectors for operation sound.

- NG → Check the injector system. (Refer to P.13A-120, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 41.)
- OK ↓

Check the ignition timing.
(Refer to GROUP 11B - On-vehicle Service.)

- NG → Check that the crank angle sensor is installed properly.
- OK ↓

MUT-II: Check if hesitation, sag, stumble or poor acceleration occur.
(Refer to P.13A-156, INSPECTION PROCEDURE 44.)

- OK ↓

Check the fuel pressure. (Refer to P.13A-189.)

- OK ↓

Check the following items.

- Check the ignition coil, spark plugs, spark plug cables.
- Check the injector operating sound at the rear bank.
- Check the operation vacuum of the traction control (TCL).
- Check the operation of the throttle valve.
- Check the vacuum tank and vacuum actuator.
- Check the compression pressure.
- Check the fuel filter or fuel line for clogging.
- Broken air intake hose
- Clogged air cleaner

INSPECTION PROCEDURE 19

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

MUT-II Self-Diag code
Are diagnosis codes displayed?

Yes → Refer to P.13A-111, INSPECTION CHART FOR DIAGNOSIS CODES.

No ↓

Check the injectors for operation sound.

NG → Check the injector system. (Refer to P.13A-120, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 41.)

OK ↓

Check the ignition timing.
(Refer to GROUP 11B - On-vehicle Service.)

NG → Check that the crank angle sensor is installed properly.

OK ↓

MUT-II: Check if surge occurs.
(Refer to P.13-157, INSPECTION PROCEDURE 45.)

OK ↓

Check the fuel pressure. (Refer to P.13A-189.)

OK ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables.
- Check the injector operation sound at the rear bank.
- Check the EGR control system.

INSPECTION PROCEDURE 20

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

MUT-II Self-Diag code
Are diagnosis codes displayed?

Yes → Refer to P.13A-111, INSPECTION CHART FOR DIAGNOSIS CODES.

No ↓

Does knocking occur when driving with the sensor disconnected? At this time, use the MUT-II to check if the timing is retarded compared to when the detonation sensor connector is connected.

No → Check the detonation sensor system. (Refer to P.13A-120, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 31.)

Yes ↓

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

INSPECTION PROCEDURE 21

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

Check the injectors for fuel leakage.

INSPECTION PROCEDURE 22

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

MUT-II Self-Diag code
Are diagnosis codes displayed?
- Yes → Refer to P.13A-111, INSPECTION CHART FOR DIAGNOSIS CODES.
- No ↓

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

MUT-II Data list
21 Engine coolant temperature sensor. (Refer to P.13A-163.)
- NG → Check the engine coolant temperature sensor system. (Refer to P.13A-115, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 21.)
- OK ↓

MUT-II Data list
13 Intake air temperature sensor (Refer to P.13A-163.)
- NG → Check the intake air temperature sensor system. (Refer to P.13A-113, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 13.)
- OK ↓

MUT-II Data list
25 Barometric pressure sensor (Refer to P.13A-164.)
- NG → Check the barometric pressure sensor system. (Refer to P.13A-119, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 25.)
- OK ↓

MUT-II Data list
59 Oxygen sensor (rear) (Refer to P.13A-166.)
- Transmission: 2nd gear <M/T>, L range <A/T>
- Driving with throttle widely open

OK: 600 - 1,000 mV
- NG → Check the oxygen sensor (rear) system. (Refer to P.13A-122, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 59.)
- OK ↓

MUT-II Data list
11 Oxygen sensor (front)
OK: 600 - 1,000 mV when racing suddenly (Refer to P.13A-162.)
- NG → Check the oxygen sensor (front) system. (Refer to P.13A-112, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 11.)
- OK ↓

MUT-II Data list
11 Oxygen sensor (front)
OK: Repeat 0 - 400 mV and 600 - 1,000 mV alternately when idling. (Refer to P.13A-162.)
- OK → Replace the oxygen sensor (front). → Check trouble symptom. → NG → Check the following items.
- NG ↓

Check the fuel pressure. (Refer to P.13A-189.)
- OK ↓

Check the following items.
- Check the injectors for operation sound.
- Check the injectors for fuel leakage.
- Check the ignition coil, spark plugs, spark plug cables.
- Check the compression pressure.
- Check the positive crankcase ventilation system.
- Check the purge control system.
- Check the EGR control system.

↓

Check the trouble symptom.
- NG ↓

Replace the catalytic converter.

INSPECTION PROCEDURE 23

Low alternator output voltage (approx. 12.3 V)	Probable cause
The alternator may be defective, or malfunctions, which are listed in the right column, may be suspected.	● Malfunction of charging system ● Short circuit in harness between alternator G terminal and engine-ECU ● Malfunction of engine-ECU

Measure at the alternator connector side. B-38
- Connect the connector. (Test harness: MB991519)
- Voltage between 1 (black clip) and earth
  Engine: at idle
  Radiator fan: does not run
  Headlamp: OFF → ON
  Brake lamp: OFF → ON
  Rear defogger switch: OFF → ON
  OK: Voltage rises by 0.2 - 3.5 V.

OK → Check the alternator. (Refer to GROUP 16 - Charging System.)

NG → Measure at the alternator connector. B-38
- Disconnect the connector, and measure at the harness side.
- Disconnect the engine-ECU connector.
- Continuity between 1 and earth
  OK: No continuity

NG → Check the harness wire between the alternator and the engine-ECU connector, and repair if necessary.

OK → Check the harness wire between the alternator and the engine-ECU connector.

NG → **Repair**

OK → Replace the engine-ECU.

INSPECTION PROCEDURE 24

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

Measure at the engine-ECU connector C-37.
- Connect the connector.
- Voltage between 57 and earth (Engine: at idle, outside air temperature: 25°C or more)
  OK: 0 - 3 V [When A/C is MAX. COOL condition (when the load by A/C is high)]
  System voltage [When A/C is MAX. HOT condition (when the load by A/C is low)]

NG → Check the A/C system. (Refer to GROUP 55 - On-vehicle Service.)

OK → **Check the following connector:** C-37

NG → **Repair**

OK → Check trouble symptom.

NG → Replace the engine-ECU.

INSPECTION PROCEDURE 25

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

Measure at the engine-ECU connector C-33.
- Disconnect the connector, and measure at the harness side.
- Voltage between 21 and earth (Ignition switch: ON)
  OK: 4.8 - 5.2 V (Fan rotates at high speed.)
- Connect a jumper cable between 21 and earth (Ignition switch: ON)
  OK: Fan stops

NG → Check the harness wire between the engine-ECU and the fan controller connector.
- NG → **Repair**
- OK → Check the radiator fan and condenser fan circuit. (Refer to GROUP 14 - Troubleshooting.)

OK ↓

Check the following connector:
C-33

NG → **Repair**

OK ↓

Check trouble symptom.

NG ↓

Replace the engine-ECU.

INSPECTION PROCEDURE 26

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

Check the control relay. (Refer to P.13A-193.)

NG → **Replace**

OK ↓

Measure at the control relay connector C-31.
- Disconnect the connector, and measure at the harness side.
- Voltage between 3, 4 and earth
  OK: System voltage

NG → **Check the following connector:** B-30
- NG → **Repair**
- OK → Check trouble symptom.
  - NG → Check the harness wire between battery and control relay connector, and repair if necessary.

OK ↓

Check the engine-ECU power supply and earth circuit. (Refer to P.13A-158, INSPECTION PROCEDURE 46.)

INSPECTION PROCEDURE 27

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.	● Malfunction of the fuel pump relay ● Malfunction of the fuel pump ● Improper connector contact, open circuit or short-circuited harness wire ● Malfunction of the engine-ECU

Check the fuel pump operation. (Refer to P.13A-191.)
- NG → Check the fuel pump circuit. (Refer to P.13A-158, INSPECTION PROCEDURE 47.)
- OK ↓

Check the fuel pump relay. (Refer to P.13A-193.)
- NG → **Replace**
- OK ↓

Measure at the fuel pump relay connector C-32.
- Connect the connector.
- Voltage between 1 and earth
- MUT-II Actuator test: Fuel pump drive
  OK: System voltage

- NG → Check the fuel pump drive control circuit. (Refer to P.13A-159, INSPECTION PROCEDURE 48.)
- OK ↓

Check the harness wire between fuel pump relay connector and fuel pump drive terminal, and repair if necessary.

INSPECTION PROCEDURE 28

Idle position switch system <Vehicles without TCL>	Probable cause
The idle position switch inputs the condition of the accelerator pedal, i.e. whether it is depressed or released (HIGH/LOW), to the engine-ECU. The engine-ECU controls the idle speed control servo based on this input.	● Maladjustment of the accelerator pedal ● Maladjustment of the fixed SAS ● Maladjustment of the idle position switch and throttle position sensor ● Improper connector contact, open circuit or short-circuited harness wire ● Malfunction of the engine-ECU

Check the idle position switch. (Refer to P.13A-195.)
- NG → Replace the throttle position sensor.
- OK ↓

Measure at the throttle position sensor connector B-07.
- 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

- NG → **Check the following connector:** C-39
  - NG → **Repair**
  - OK ↓ Check trouble symptom.
  - NG ↓ Check the harness wire between engine-ECU and throttle position sensor connector.
    - OK ↓ Replace the engine-ECU.
    - NG ↓ **Repair**
- OK ↓

Check the following connector: B-07
- NG → **Repair**
- OK ↓

Check trouble symptom.
- NG ↓

Replace the engine-ECU.

INSPECTION PROCEDURE 29

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

- Check the idle position switch. (Refer to P.13A-195.)
  - NG → Replace the accelerator pedal position sensor.
  - OK ↓
- Measure at the accelerator pedal position sensor connector B-41.
  - Disconnect the connector, and measure at the harness side.
  - Voltage between 3 and earth (Ignition switch: ON)
    OK: 4 V or higher
  - Continuity between 4 and earth
    OK: Continuity
  - NG → **Check the following connector:** C-39
    - NG → **Repair**
    - OK ↓ Check trouble symptom.
    - NG ↓ Check the harness wire between engine-ECU and accelerator pedal position sensor connector.
      - OK ↓ Replace the engine-ECU.
      - NG ↓ **Repair**
  - OK ↓
- **Check the following connector:** B-41
  - NG → **Repair**
  - OK ↓
- Check trouble symptom.
  - NG ↓
- Replace the engine-ECU.

INSPECTION PROCEDURE 30

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

- Measure at the engine-ECU connector C-39.
  - Disconnect the connector, and measure at the harness side.
  1. Voltage between 71 and earth (Ignition switch: START)
     OK: 8V or more
  2. Continuity between 91 and earth
     OK: Continuity
  - 1. NG → **Check the following connector:** C-92
    - NG → **Repair**
    - OK ↓ Check trouble symptom.
    - NG ↓ Check harness wire between the engine-ECU and ignition switch connector.
      - NG → **Repair**
      - OK ↓ Check the ignition switch. (Refer to GROUP 54 - Ignition Switch and Immobilizer system.)
  - 2. NG → Check the harness wire between engine-ECU connector (terminal No. 91) and earth, and repair if necessary.
  - OK ↓
- **Check the following connector:** C-39
  - NG → **Repair**
  - OK ↓
- Check trouble symptom.
  - NG ↓
- Replace the engine-ECU.

INSPECTION PROCEDURE 31

Ignition switch-ST and inhibitor switch system <A/T>	Probable cause
• The ignition switch-ST inputs a HIGH signal to the engine-ECU while the engine is cranking. The engine-ECU controls fuel injection, etc. during starting based on this input. • The inhibitor switch inputs the condition of the select lever, i.e. whether it is in P or N range or in some other range, to the engine-ECU. The engine-ECU controls the idle speed control (ISC) servo based on this input.	• Malfunction of ignition switch • Malfunction of inhibitor switch • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the engine-ECU.

Check the inhibitor switch.
(Refer to GROUP 23A - On-vehicle Service.)

NG → **Replace**

OK ↓

Measure at the inhibitor switch connector B-72.
- Disconnect the connector, and measure at the harness side.

1. Voltage between 10 and earth (Ignition switch: ON)
   OK: System voltage
2. Continuity between 9 and earth
   OK: Continuity
3. Voltage between 10 and earth
   - Ignition switch: START
   - Disconnect engine-ECU connector.

   OK: System voltage

1. NG → Check harness wire between engine-ECU and inhibitor switch connector.
   - NG → **Repair**
   - OK → Replace the engine-ECU.

2. NG → Check harness wire between inhibitor switch connector and starter S terminal, and repair if necessary.

3. NG → **Check the following connector:** C-92
   - NG → **Repair**
   - OK → Check trouble symptom.
   - NG → Check harness wire between inhibitor switch and ignition switch connector.
     - NG → **Repair**
     - OK → Check the ignition switch. (Refer to GROUP 54 - Ignition Switch and Immobilizer system.)

OK ↓

Check the following connector: B-72

NG → **Repair**

OK ↓

Check trouble symptom.

NG ↓

Check harness wire between engine-ECU and inhibitor switch connector.

NG → **Repair**

OK ↓

Replace the engine-ECU.

INSPECTION PROCEDURE 32

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

Check the power steering fluid pressure switch.
(Refer to GROUP 37A - On-vehicle Service.)

NG → **Replace**

OK ↓

Measure at the power steering fluid pressure switch connector B-76.
- Disconnect the connector, and measure at the harness side.
- Voltage between 1 and earth (Ignition switch: ON)
  OK: System voltage

NG → **Check the following connector:** C-35

- NG → **Repair**
- OK ↓ Check trouble symptom.
- NG ↓ Check harness wire between engine-ECU and power steering fluid pressure switch connector.
  - NG → **Repair**
  - OK ↓ Replace the engine-ECU.

OK ↓

Check the following connector: B-76

NG → **Repair**

OK ↓

Check trouble symptom.

NG ↓

Replace the engine-ECU.

INSPECTION PROCEDURE 33

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

Check the A/C compressor relay.
(Refer to GROUP 55 - On-vehicle Service.)

NG → **Replace**

OK ↓

Measure at the engine-ECU connectors C-33, C-35.
- Disconnect the connector, and measure at the harness side.
- Voltage between 8 and earth, and 45 and earth
  (Ignition switch: ON)
  OK: 0 - 3 V (A/C switch: OFF)
  System voltage (A/C switch: ON)
- Short circuit between 8 and earth
  (Ignition switch: ON, A/C switch: ON)
  OK: A/C compressor clutch turns on.

NG → Check the A/C system. (Refer to GROUP 55 - Troubleshooting.)

OK → **Check the following connectors:** C-33, C-35

- NG → **Replace**
- OK ↓ Check trouble symptom.
- NG ↓ Replace the engine-ECU.

INSPECTION PROCEDURE 34

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

Measure at the distributor connector B-42.
- Disconnect the connector and measure at the harness side.

1. Voltage between 1 and earth (Ignition switch: ON)
   OK: System voltage
2. Continuity between 4 and earth
   OK: Continuity

OK → Check ignition coil and power transistor unit circuit. (Refer to P.13A-161, INSPECTION PROCEDURE 52.)

1. NG → **Check the following connectors:** C-92, C-131

- NG → **Repair**
- OK → Check trouble symptom.
  - NG → Check the harness wire between distributor and ignition switch connector.
    - NG → **Repair**
    - OK → Check the ignition switch. (Refer to GROUP 54 - Ignition Switch and Immobilizer System.)

2. NG → Check the harness wire between distributor connector and earth, and repair if necessary.

INSPECTION PROCEDURE 35

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

Check the ISC servo (Refer to P.13A-199.)
- NG → **Replace**
- OK ↓

Measure at the ISC servo connector B-10.
- Disconnect the connector and measure at the harness side.
- Voltage between 2 and earth, and 5 and earth (Ignition switch: ON)
  OK: System voltage
- NG → Check the harness wire between control relay and ISC servo connector, and repair if necessary.
- OK ↓

Measure at the engine-ECU connector C-33.
- 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:** B-10
  - NG → **Repair**
  - OK ↓ Check trouble symptom.
    - NG ↓ Check harness wire between engine-ECU and ISC servo connector, and repair if necessary.
- OK ↓

Check the following connector: C-33
- NG → **Repair**
- OK ↓

Check trouble symptom.
- NG → Replace the engine-ECU.

INSPECTION PROCEDURE 36

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

Check the purge control solenoid valve. (Refer to GROUP 17 - Emission Control System.)
- NG → **Replace**
- OK ↓

Measure at the purge control solenoid valve connector B-04.
- Disconnect the connector and measure at the harness side.
- Voltage between 2 and earth (Ignition switch: ON)
  OK: System voltage
- NG → Check the harness wire between control relay and solenoid valve connector, and repair if necessary.
- OK ↓

Measure at the engine-ECU connector C-33.
- Disconnect the connector and measure at the harness side.
- Voltage between 24 and earth (Ignition switch: ON)
  OK: System voltage
- NG → **Check the following connector:** B-04
  - NG → **Repair**
  - OK ↓ Check trouble symptom.
    - NG ↓ Check the harness wire between engine-ECU and solenoid valve connector, and repair if necessary.
- OK ↓

Check the following connector: C-33
- NG → **Repair**
- OK ↓

Check trouble symptom.
- NG ↓

Replace the engine-ECU.

INSPECTION PROCEDURE 37

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

Check the EGR control solenoid valve.
(Refer to GROUP 17 - Emission Control System.)

NG → **Replace**

OK ↓

Measure at the EGR control solenoid valve connector B-06.
- Disconnect the connector and measure at the harness side.
- Voltage between 1 and earth (Ignition switch: ON)

OK: System voltage

NG → Check the harness wire between control relay and solenoid valve connector, and repair if necessary.

OK ↓

Measure at the engine-ECU connector C-33.
- Disconnect the connector and measure at the harness side.
- Voltage between 6 and earth (Ignition switch: ON)

OK: System voltage

NG → **Check the following connector:** B-06

- NG → **Repair**
- OK ↓ Check trouble symptom.
- NG ↓ Check the harness wire between engine-ECU and solenoid valve connector, and repair if necessary.

OK ↓

Check the following connector: C-33

NG → **Repair**

OK ↓

Check trouble symptom.

NG ↓

Replace the engine-ECU.

INSPECTION PROCEDURE 38

MUT-II: Inspection of no initial combustion

MUT-II Data list
16 Voltage of engine-ECU power source (Refer to P.13A-163.)

NG → Check the power supply and ignition switch-IG system. (Refer to P.13A-145, INSPECTION PROCEDURE 26.)

OK ↓

Does the camshaft rotate at the engine cranking?
(When oil filler cap is removed.)

No → Check timing belt for breakage.

Yes ↓

MUT-II Self-Diag code
Are diagnosis codes displayed?

Yes → Refer to P.13A-111, INSPECTION CHART FOR DIAGNOSIS CODES.

No ↓

MUT-II Data list
22 Crank angle sensor
OK: Cranking speed is displayed.

No → Check the crank angle sensor system. (Refer to P.13A-116, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 22.)

OK ↓

MUT-II Actuator test
07 Fuel pump (Refer to P.13A-167.)

NG → Check the fuel pump system. (Refer to P.13A-146, INSPECTION PROCEDURE 27.)

OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13A-163.)

NG → Check the engine coolant temperature sensor system. (Refer to P.13A-115, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 21.)

INSPECTION PROCEDURE 39

Ignition system: Inspection of no initial combustion.

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

NG → Check the ignition circuit system (Refer to P.13A-150, INSPECTION PROCEDURE 34.)

OK ↓

Check the ignition timing when cranking.
OK: Approx. 5°BTDC

NG → Check the installation condition of crank angle sensor and timing belt cover.

INSPECTION PROCEDURE 40

MUT-II: Check if uncomplete combustion occurs.

MUT-II Self-Diag code
Are diagnosis codes displayed?

Yes → Refer to P.13A-111, INSPECTION CHART FOR DIAGNOSIS CODE

No ↓

MUT-II Actuator test
07 Fuel pump (Refer to P.13A-167.)

NG → Check the fuel pump system. (Refer to P.13A-146, INSPECTION PROCEDURE 27.)

OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13A-163.)

NG → Check the engine coolant temperature sensor system. (Refer to P.13A-115, INSPECTION PROCEDURES FOR DIAGNOSIS CODE 21.)

OK ↓

MUT-II Data list
18 Ignition switch-ST (Refer to P.13A-163.)

NG → Check the ignition switch-ST system <M/T>. (Refer to P.13A-147, INSPECTION PROCEDURE 30.) Check the ignition switch-ST and inhibitor switch system <A/T>. (Refer to P.13A-148, INSPECTION PROCEDURE 31.)

INSPECTION PROCEDURE 41

Check if hunting occurs.

Clean the throttle body. (Refer to P.13A-184.)

↓

Check and adjust the fixed SAS. (Refer to P.13A-187.)

↓

Check trouble symptom.

NG ↓

Inspect the intake of air into the air intake system
- Broken intake manifold gasket
- Broken air intake hose
- Broken vacuum hose
- Positive crankcase ventilation valve does not operate.

INSPECTION PROCEDURE 42

MUT-II: Check if idling speed is unstable.

MUT-II Data list
26 Idle position switch (Refer to P.13A-164.)

NG → Check the idle position switch system.
(Refer to P.13A-146, INSPECTION PROCEDURE 28.) <Vehicles without TCL>
(Refer to P.13A-147, INSPECTION PROCEDURE 29.) <Vehicles with TCL>

OK ↓

MUT-II Data list
13 Intake air temperature sensor (Refer to P.13A-163.)

NG → Check the intake air temperature sensor system. (Refer to P.13A-113, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 13.)

OK ↓

MUT-II Data list
25 Barometric pressure sensor (Refer to P.13A-164.)

NG → Check the barometric pressure sensor system. (Refer to P.13A-119, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 25.)

OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13A-163.)

NG → Check the engine coolant temperature sensor system.
(Refer to P.13A-115, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 21.)

OK ↓

MUT-II Actuator test
08 Purge control solenoid valve (Refer to P.13A-167.)

NG → Check the purge control solenoid valve system
(Refer to P.13A-151, INSPECTION PROCEDURE 36.)

OK ↓

MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13A-167.)

NG → Check the EGR control solenoid valve system. (Refer to P.13A-152, INSPECTION PROCEDURE 37.)

OK ↓

MUT-II Data list
59 Oxygen sensor (rear) (Refer to P.13A-166.)
- Transmission: 2nd gear <M/T>, L range <A/T>
- Driving with throttle widely open

OK: 600 - 1,000 mV

NG → Check the oxygen sensor (rear) system. (Refer to P.13A-122, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 59.)

OK ↓

MUT-II Data list
11 Oxygen sensor (front)
OK: 600 - 1,000 mV during sudden racing

NG → Check the oxygen sensor (front) system. (Refer to P.13A-112, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 11.)

OK ↓

MUT-II Data list
11 Oxygen sensor (front)
OK: Changes between 0 - 400 mV and 600 - 1,000 mV during idling

NG → Check the fuel pressure. (Refer to P.13A-189.)

OK →
1. Inspect the intake of air into the air intake system.
   - Broken intake manifold gasket
   - Broken vacuum hose
   - PCV valve does not operate.
   - Broken air intake hose
2. Check the injector for clog.

OK ↓

MUT-II Data list
27 Power steering fluid pressure switch (Refer to P.13A-164.)

NG → Check the power steering fluid pressure switch system. (Refer to P.13A-149, INSPECTION PROCEDURE 32.)

OK ↓

MUT-II Data list
28 A/C switch (Refer to P.13A-164.)

NG → Check the A/C switch and A/C relay system.
(Refer to P.13A-149. INSPECTION PROCEDURE 33.)

OK ↓

MUT-II Data list
29 Inhibitor switch (Refer to P.13A-164.)

NG → Check the ignition switch-ST and inhibitor switch system. <A/T>
(Refer to P.13A-148, INSPECTION PROCEDURE 31.)

OK ↓

MUT-II Data list
45 ISC Servo position (Refer to P.13A-166.)

NG → Adjust the basic idle speed. (Refer to P.13A-188.)

INSPECTION PROCEDURE 43

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

MUT-II Data list
26 Idle position switch (Refer to P.13A-164.)

NG → Check the idle position switch system.
(Refer to P.13A-146, INSPECTION PROCEDURE 28.) <Vehicles without TCL>
(Refer to P.13A-147, INSPECTION PROCEDURE 29.) <Vehicles with TCL>

OK ↓

MUT-II Data list
13 Intake air temperature sensor (Refer to P.13A-163.)

NG → Check the intake air sensor system. (Refer to P.13A-113, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 13.)

OK ↓

MUT-II Data list
25 Barometric pressure sensor (Refer to P.13A-164.)

NG → Check the barometric pressure sensor system. (Refer to P.13A-119, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 25.)

OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13A-163.)

NG → Check the engine coolant temperature sensor system.
(Refer to P.13A-115, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 21.)

OK ↓

MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13A-167.)

NG → Check the EGR control solenoid valve system. (Refer to P.13A-152, INSPECTION PROCEDURE 37.)

OK ↓

MUT-II Data list
59 Oxygen sensor (rear) (Refer to P.13A-166.)
- Transmission: 2nd gear <M/T>, L range <A/T>
- Driving with throttle widely open

OK: 600 - 1,000 mV

NG → Check the oxygen sensor (rear) system. (Refer to P.13A-122, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 59.)

OK ↓

MUT-II Data list
11 Oxygen sensor (front)
OK: Changes between 600 - 1,000 mV during sudden racing

NG → Check the oxygen sensor (front) system. (Refer to P.13A-112, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 11.)

OK ↓

MUT-II Data list
11 Oxygen sensor (front)
OK: Changes between 0 - 400 mV and 600 - 1,000 mV during idling

NG → Check the fuel pressure. (Refer to P.13A-189.)

OK →
1. Inspect the intake of air into the air intake system
   - Broken intake manifold gasket
   - Broken vacuum hose
   - PCV valve does not operate.
   - Broken air intake hose
2. Check the injector for clog.

OK ↓

MUT-II Data list
27 Power steering fluid pressure switch (Refer to P.13A-164.)

NG → Check the power steering fluid pressure switch system. (Refer to P.13A-149, INSPECTION PROCEDURE 32.)

OK ↓

MUT-II Data list
28 A/C switch (Refer to P.13A-164.)

NG → Check the A/C switch and A/C relay system.
(Refer to P.13A-149, INSPECTION PROCEDURE 33.)

OK ↓

MUT-II Data list
29 Inhibitor switch (Refer to P.13A-164.)

NG → Check the ignition switch-ST and inhibitor switch system. <A/T>
(Refer to P.13A-148, INSPECTION PROCEDURE 31.)

OK ↓

MUT-II Data list
34 Air flow sensor reset signal (Refer to P.13A-165.)

NG → Check the air flow sensor system. (Refer to P.13A-113, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 12.)

OK ↓

MUT-II Data list
45 ISC servo position (Refer to P.13A-166.)

NG → Adjust the basic idle speed. (Refer to P.13A-188.)

INSPECTION PROCEDURE 44

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

MUT-II Data list
26 Idle position switch (Refer to P.13A-164.)

- NG → Check the idle position switch system. (Refer to P.13A-146, INSPECTION PROCEDURE 28.) <Vehicles without TCL> (Refer to P.13A-147, INSPECTION PROCEDURE 29.) <Vehicles with TCL>
- OK ↓

MUT-II Data list
13 Intake air temperature sensor (Refer to P.13A-163.)

- NG → Check the intake air sensor system. (Refer to P.13A-113, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 13.)
- OK ↓

MUT-II Data list
25 Barometric pressure sensor (Refer to P.13A-164.)

- NG → Check the barometric pressure sensor system. (Refer to P.13A-119, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 25.)
- OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13A-163.)

- NG → Check the engine coolant temperature sensor system. (Refer to P.13A-115, INSPECTION PROCEDURE FOR DIAGNOSTIC CODE 21.)
- OK ↓

MUT-II Data list
14 Throttle position sensor (Refer to P.13A-163.)

- NG → Check the throttle position sensor system. (Refer to P.13A-114, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 14.)
- OK ↓

MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13A-167.)

- NG → Check the EGR control solenoid valve system. (Refer to P.13A-152, INSPECTION PROCEDURE 37.)
- OK ↓

MUT-II Data list
59 Oxygen sensor (rear) (Refer to P.13A-166.)
- Transmission: 2nd gear <M/T>, L range <A/T>
- Driving with throttle widely open

OK: 600 - 1,000 mV

- NG → Check the oxygen sensor (rear) system. (Refer to P.13A-122, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 59.)
- OK ↓

MUT-II Data list
11 Oxygen sensor (front)
OK: Changes between 600 - 1,000 mV during sudden racing

- NG → Check the oxygen sensor (front) system. (Refer to P.13A-112, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 11.)
- OK ↓

MUT-II Data list
11 Oxygen sensor (front)
OK: Changes between 0 - 400 mV and 600 - 1,000 mV during idling

- NG → Check the fuel pressure. (Refer to P.13A-189.)
  - OK →
    1. Inspect the intake of air into the air intake system
       - Broken intake manifold gasket
       - Broken vacuum hose
       - PCV valve does not operate.
       - Broken air intake hose
    2. Check the injector for clog.
- OK ↓

MUT-II Actuator test
15 Vacuum control solenoid valve <Vehicles with TCL> (Refer to P.13A-167.)

- NG → Check the vacuum control solenoid valve system. (Refer to P.13A-124, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 71.)
- OK ↓

MUT-II Actuator test
16 Ventilation control solenoid valve <Vehicles with TCL> (Refer to P.13A-167.)

- NG → Check the ventilation control solenoid valve system. (Refer to P.13A-125, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 72.)

INSPECTION PROCEDURE 45

MUT-II: Check if surge occurs.

MUT-II Data list
26 Idle position switch (Refer to P.13A-164.)

NG → Check the idle position switch system.
(Refer to P.13A-146, INSPECTION PROCEDURE 28.) <Vehicles without TCL>
(Refer to P.13A-147, INSPECTION PROCEDURE 29.) <Vehicles with TCL>

OK ↓

MUT-II Data list
13 Intake air temperature sensor (Refer to P.13A-163.)

NG → Check the intake air sensor system. (Refer to P.13A-113, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 13.)

OK ↓

MUT-II Data list
25 Barometric pressure sensor (Refer to P.13A-164.)

NG → Check the barometric pressure sensor system. (Refer to P.13A-119, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 25.)

OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13A-163.)

NG → Check the engine coolant temperature sensor system.
(Refer to P.13A-115, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 21.)

OK ↓

MUT-II Data list
14 Throttle position sensor (Refer to P.13A-163.)

NG → Check the throttle position sensor system. (Refer to P.13A-114, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 14.)

OK ↓

MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13A-167.)

NG → Check the EGR control solenoid valve system.
(Refer to P.13A-152, INSPECTION PROCEDURE 37.)

OK ↓

MUT-II Data list
59 Oxygen sensor (rear) (Refer to P.13A-166.)
- Transmission: 2nd gear <M/T>, L range <A/T>
- Driving with throttle widely open

  OK: 600 - 1,000 mV

NG → Check the oxygen sensor (rear) system. (Refer to P.13A-122, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 59.)

OK ↓

MUT-II Data list
11 Oxygen sensor (front)
OK: Changes between 600 - 1,000 mV during sudden racing

NG → Check the oxygen sensor (front) system. (Refer to P.13A-112, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 11.)

OK ↓

MUT-II Data list
11 Oxygen sensor (front)
OK: Changes between 0 - 400 mV and 600 - 1,000 mV during idling

NG → Check the fuel pressure. (Refer to P.13A-189.)

OK →

1. Inspect the intake of air into the air intake system
   - Broken intake manifold gasket
   - Broken vacuum hose
   - PCV valve does not operate.
   - Broken air intake hose
2. Check the injector for clog.

INSPECTION PROCEDURE 46

Check the engine-ECU power supply and earth circuit.

Measure the engine-ECU connectors, C-33, C-35, C-39.
- Disconnect the connector and measure at the harness side

1. Voltage between 82 and earth (Ignition switch: ON)
   OK: System voltage
2. Voltage between 38 and earth
   OK: System voltage
3. Voltage between 12, 25 and earth (Ignition switch: ON)
   OK: System voltage (when the terminal 38 is earthed)
4. Continuity between 13, 26 and earth
   OK: Continuity
5. Voltage between 80 and earth
   OK: System voltage

1. NG → **Check the following connectors:** C-92, C-131
- NG → **Repair**
- OK → Check trouble symptom.
- OK → Check the harness wire between engine-ECU and ignition switch connector.
  - NG → **Repair**
  - OK → Check the ignition switch. (Refer to GROUP 54 - Ignition Switch and Immobilizer System.)

2, 3. NG → Check the harness wire between engine-ECU and control relay connector, and repair if necessary.

4. NG → Check the harness wire between engine-ECU and earth, and repair if necessary.

5. NG → **Check the following connectors:** C-47, C-83, C-66, (C-63, C-132, C-141) <L.H.>, (C-62, C-14) <R.H.>
- NG → **Repair**
- OK → Check trouble symptom
- NG → Check the harness wire between engine-ECU and battery, and repair if necessary.

OK → **Check the following connectors:** C-33, C-35, C-39
- NG → **Repair**
- OK → Check trouble symptom.
- NG → Replace the engine-ECU.

INSPECTION PROCEDURE 47

Check fuel pump circuit.

Measure at the fuel pump connector E-16.
- Disconnect the connector and measure at the harness side.
- Continuity between 2 and earth
  OK: Continuity

NG → **Check the following connectors:** E-11
- NG → **Repair**
- OK → Check trouble symptom
- NG → Check the harness wire between fuel pump and earth, and repair if necessary.

OK → **Check the following connectors:** E-16, E-11, C-123, C-92, B-09
- NG → **Repair**
- OK → Check trouble symptom.
- NG → Check the harness wire between terminal for fuel pump drive and fuel pump connector.
  - NG → **Repair**
  - OK → Replace the fuel pump.

INSPECTION PROCEDURE 48

Check the fuel pump drive control circuit.

Measure at the fuel pump relay connector C-32.
- Disconnect the connector and measure at the harness side.
- Voltage between 3, 4 and earth (Ignition switch: ON)
  OK: System voltage

NG → **Check the following connectors:** C-92, C-131
- NG → **Repair**
- OK → Check trouble symptom.
  - NG → Check the harness wire between fuel pump relay and ignition switch connector.
    - NG → **Repair**
    - OK → Check the ignition switch. (Refer to GROUP 54 - Ignition Switch and Immobilizer System.)

OK ↓

Measure at the engine-ECU connector C-33.
- Disconnect the connector and measure at the harness side.
- Voltage between 22 and earth (Ignition switch: ON)
  OK: System voltage

NG → **Check the following connector:** C-32
- NG → **Repair**
- OK → Check trouble symptom.
  - NG → Check the harness wire between engine-ECU and fuel pump relay connector, and repair if necessary.

OK ↓

Check the following connector: C-33
- NG → **Repair**
- OK → Check trouble symptom.
  - NG → Replace the engine-ECU.

INSPECTION PROCEDURE 49

Check air flow sensor (AFS) control circuit.

Measure at the air flow sensor connector B-12.
- Disconnect the connector and measure at the harness side.

1. Voltage between 4 and earth (Ignition switch: ON)
   OK: System voltage
2. Voltage between 3 and earth (Ignition switch: ON)
   OK: 4.8 - 5.2 V
3. Continuity between 5 and earth
   OK: Continuity

1. NG → Check the harness wire between the air flow sensor and control relay connector, and repair if necessary.

2, 3. NG → **Check the following connector:** C-39
- NG → **Repair**
- OK → Check trouble symptom.
  - NG → Check the harness wire between the engine-ECU and air flow sensor connector.
    - NG → **Repair**
    - OK → Replace the engine-ECU.

OK ↓

Check the following connector: B-12
- NG → **Repair**
- OK → Check trouble symptom.
  - NG → Replace the air flow sensor.

INSPECTION PROCEDURE 50

Check throttle position sensor (TPS) output circuit.

Measure at the engine-ECU connector C-39.
- Connect the connector.
- Voltage between 84 and earth (Ignition switch: ON)
  OK: 0.3 - 1.0 V (Throttle valve at idle position)
  4.5 - 5.5 V (Throttle valve fully open)

OK → **Check the following connector:** C-39

NG → **Repair**

OK

Check trouble symptom.

NG

Replace the engine-ECU.

NG

Check the following connector: B-07

NG → **Repair**

OK

Check trouble symptom.

NG

Check the harness wire between engine-ECU and throttle position sensor connector, and repair if necessary.

INSPECTION PROCEDURE 51

Check injector control circuit

Measure at the engine-ECU connector C-33.
- Disconnect the connector and measure at the harness side.
- Voltage between 1, 2, 3, 14, 15, 16 and earth (Ignition switch: ON)
  OK: System voltage

NG → **Check the following connectors:** B-02, B-03, B-05, B-36, B-40, B-44

NG → **Repair**

OK

Check trouble symptom.

NG

Check the harness between engine-ECU and injector connector, and repair if necessary.

OK

Check the following connector: C-33

NG → **Repair**

OK

Check trouble symptom.

NG

Replace the engine-ECU.

INSPECTION PROCEDURE 52

Check ignition coil and power transistor unit circuit.

Check the ignition coil. (Refer to GROUP 16 – Ignition System.)

- NG → **Replace**
- OK ↓

Check the power transistor unit.
(Refer to GROUP 16 – Ignition System.)

- NG → **Replace**
- OK ↓

Measure at the distributor connector B-42.

- Disconnect the connector and measure at the harness side.

1. Voltage between 3 and earth (Ignition switch: START)
   OK: 2 - 7 V
2. Continuity between 2 and earth
   OK: No continuity

- OK ↓ **Check the following connectors, and repair if necessary.** B-42
- 1. NG → **Check the following connector:** C-33
  - NG → **Repair**
  - OK ↓ Check trouble symptom.
    - NG ↓ Check the harness wire between the engine-ECU and the distributor connector.
      - NG → **Repair**
      - OK ↓ Replace the engine-ECU.
- 2. NG → As short circuit occurs between distributor and combination meter (tachometer), check the harness wire, and repair if necessary.

DATA LIST REFERENCE TABLE

13100890296

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	Oxygen sensor (front)	Engine: After having warmed up Air/fuel mixture is made leaner when decelerating, and is made richer when racing.	When at 4,000 r/min, engine is suddenly decelerated	200 mV or less	Code No. 11	13A-112
			When engine is suddenly raced	600 - 1,000 mV		
		Engine: After having warmed up The oxygen sensor signal is used to check the air/fuel mixture ratio, and control condition is also checked by the ECU.	Engine is idling	400 mV or less (Changes) 600 - 1,000 mV		
			2,500 r/min			
12	Air flow sensor*1	• Engine coolant temperature: 80 - 95°C • Lamps, electric cooling fan and all accessories: OFF • Transmission: Neutral (A/T: P range)	Engine is idling	14 - 40 Hz	-	-
			2,500 r/min	42 - 82 Hz		
			Engine is raced	Frequency increases in response to racing		

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
13	Intake air temperature sensor	Ignition switch: ON or with engine running	When intake air temperature is -20°C	-20°C	Code No. 13	13A-113
			When intake air temperature is 0°C	0°C		
			When intake air temperature is 20°C	20°C		
			When intake air temperature is 40°C	40°C		
			When intake air temperature is 80°C	80°C		
14	Throttle position sensor	Ignition switch: ON	Set to idle position	300 - 1,000 mV	Code No. 14	13A-114
			Gradually open	Increases in proportion to throttle opening angle		
			Open fully	4,500 - 5,500 mV		
16	Power supply voltage	Ignition switch: ON		System voltage	Procedure No. 25	13A-145
18	Cranking signal (ignition switch-ST)	Ignition switch: ON	Engine: Stopped	OFF	Procedure No. 30 <M/T> Procedure No. 31 <A/T>	13A-147 <M/T> 13A-148 <M/T>
			Engine: Cranking	ON		
21	Engine coolant temperature sensor	Ignition switch: ON or with engine running	When engine coolant temperature is -20°C	-20°C	Code No. 21	13A-115
			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	• Engine: Cranking • Tachometer: Connected	Compare the engine speed readings on the tachometer and the MUT-II.	Accord	Code No. 22	13A-116
		• Engine: Idling • Idle position switch: ON	When engine coolant temperature is -20°C	1,300 - 1,500 rpm		
			When engine coolant temperature is 0°C	1,300 - 1,500 rpm		
			When engine coolant temperature is 20°C	1,300 - 1,500 rpm		
			When engine coolant temperature is 40°C	1,100 - 1,300 rpm		
			When engine coolant temperature is 80°C	550 - 750 rpm		
25	Barometric pressure sensor	Ignition switch: ON	At altitude of 0 m	101 kPa	Code No. 25	13A-119
			At altitude of 600 m	95 kPa		
			At altitude of 1,200 m	88 kPa		
			At altitude of 1,800 m	81 kPa		
26	Idle position switch	Ignition switch: ON Check by operating accelerator pedal repeatedly	Throttle valve: Set to idle position	ON	Procedure No.28 <Vehicles without TCL> Procedure No.29 <Vehicles with TCL>	13A-146 <Vehicles without TCL> 13A-147 <Vehicles with TCL>
			Throttle valve: Slightly open	OFF*2		
27	Power steering fluid pressure switch	Engine: Idling	Steering wheel stationary	OFF	Procedure No. 32	13A-149
			Steering wheel turning	ON		
28	A/C switch	Engine: Idling (when A/C switch is ON, A/C compressor should be operating.)	A/C switch: OFF	OFF	Procedure No. 33	13A-149
			A/C switch: ON	ON		
29	Inhibitor switch <A/T>	Ignition switch: ON	P or N	P or N	Procedure No. 31	13A-148
			D, 2, L or R	D, 2, L or R		

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
34	Air flow sensor reset signal	Engine: After having warmed up	Engine is idling	ON	Code No.12	13A-113
			2,000 r/min	OFF		
37	Volumetric efficiency	• Engine coolant temperature: 80 - 95 °C • Lights, power cooling fan and all accessories: OFF • Transmission: Neutral (A/T: P range)	Engine is idling	15 - 35 %	-	-
			2,000 r/min	15 - 35 %		
			Engine is suddenly raced	Volumetric efficiency increases in response to racing		
38	Crank angle sensor	• Engine: Cranking [reading is possible at 2,000 r/min or less] • Tachometer: Connected		Engine speeds displayed on the MUT-II and tachometer are identical.	-	-
41	Injectors *3	Engine: Cranking	When engine coolant temperature is 0°C (injection is carried out for all cylinders simultaneously)	23 - 80 ms	-	-
			When engine coolant temperature is 20°C	12 - 40 ms		
			When engine coolant temperature is 80°C	2.0 - 8.0 ms		
	Injectors*4	• Engine coolant temperature: 80–95°C • Lamps, electric cooling fan and all accessories: OFF • Transmission: Neutral (A/T : P range)	Engine is idling	2.6 - 3.8 ms		
			2,500 r/min	1.8 - 3.0 ms		
			When engine is suddenly raced	Increases		
44	Ignition coils and power transistors	• Engine: After having warmed up • Timing lamp is set. (The timing lamp is set in order to check actual ignition timing.)	Engine is idling	1 - 15°BTDC	-	-
			2,500 r/min	23 - 43°BTDC		

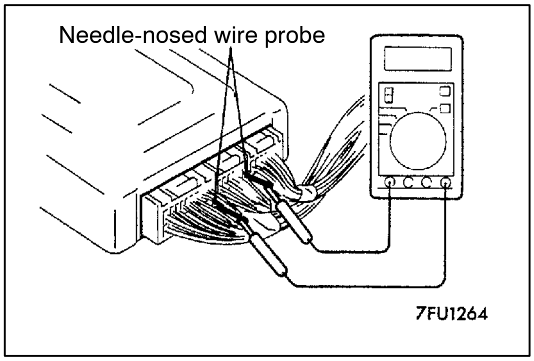
Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
45	ISC (stepper) motor position *5	• Engine coolant temperature: 80 - 95°C • Lamps, electric cooling fan and all accessories: OFF • Transmission: Neutral (A/T : P range) • Idle position switch: ON • Engine: Idling • When A/C switch is ON, A/C compressor should be operating	A/C switch: OFF	2 - 25 STEP	-	-
			A/C switch: OFF → ON	Increases by 10 - 70 steps		
			• A/C switch: OFF • Select lever: N range → D range	Increases by 5 - 50 steps		
49	A/C relay	Engine: After having warmed up/Engine is idling	A/C switch: OFF	OFF (Compressor clutch is not operating)	Procedure No. 33	13A-149
			A/C switch: ON	ON (Compressor clutch is operating)		
59	Oxygen sensor (rear)	• Transmission: 2nd gear <M/T>, L range <A/T> • Drive with throttle widely open	3,500 r/min	600 - 1,000 mV	Code No. 59	13A-122

ACTUATOR TEST REFERENCE TABLE

13100900364

Item No.	Inspection item	Drive contents	Inspection contents	Normal condition	Inspection procedure No.	Reference page
01	Injectors	Cut fuel to No. 1 injector	Engine: After having warmed up/ Engine is idling (Cut the fuel supply to each injector in turn and check cylinders which don't affect idling.)	Idling condition becomes different (becomes unstable).	Code No. 41	13A-120
02		Cut fuel to No. 2 injector				
03		Cut fuel to No. 3 injector				
04		Cut fuel to No. 4 injector				
05		Cut fuel to No. 5 injector				
06		Cut fuel to No. 6 injector				

<table>
<tr><th>Item No.</th><th>Inspection item</th><th>Drive contents</th><th colspan="2">Inspection contents</th><th>Normal condition</th><th>Inspection procedure No.</th><th>Reference page</th></tr>
<tr><td rowspan="2">07</td><td rowspan="2">Fuel pump</td><td rowspan="2">Fuel pump operates and fuel is recirculated.</td><td rowspan="2">● Engine: Cranking
● Fuel pump: Forced driving
Inspect according to both the above conditions.</td><td>Pinch the return hose with fingers to feel the pulse of the fuel being recirculated.</td><td>Pulse is felt.</td><td rowspan="2">Procedure No. 27</td><td rowspan="2">13A-146</td></tr>
<tr><td>Listen near the fuel tank for the sound of fuel pump operation.</td><td>Sound of operation is heard.</td></tr>
<tr><td>08</td><td>Purge control solenoid valve</td><td>Solenoid valve turns from OFF to ON.</td><td colspan="2">Ignition switch: ON</td><td>Sound of operation can be heard when solenoid valve is driven.</td><td>Procedure No. 36</td><td>13A-151</td></tr>
<tr><td>10</td><td>EGR control solenoid valve</td><td>Solenoid valve turns from OFF to ON.</td><td colspan="2">Ignition switch: ON</td><td>Sound of operation can be heard when solenoid valve is driven.</td><td>Procedure No. 37</td><td>13A-152</td></tr>
<tr><td>15</td><td>Vacuum control solenoid valve <Vehicles with TCL></td><td>Solenoid valve turns from OFF to ON.</td><td colspan="2">Ignition switch: ON</td><td>Sound of operation can be heard when solenoid valve is driven.</td><td>Code No. 71</td><td>13A-124</td></tr>
<tr><td>16</td><td>Ventilation control solenoid valve <Vehicles with TCL></td><td>Solenoid valve turns from OFF to ON.</td><td colspan="2">Ignition switch: ON</td><td>Sound of operation can be heard when solenoid valve is driven.</td><td>Code No. 72</td><td>13A-125</td></tr>
<tr><td>17</td><td>Basic ignition timing</td><td>Set to ignition timing adjustment mode</td><td colspan="2">Engine: Idling
Timing light is set</td><td>5°BTDC</td><td>-</td><td>-</td></tr>
<tr><td>21</td><td>Fan controller</td><td>Drive the fan motor</td><td colspan="2">● Ignition switch: ON</td><td>Radiator fan and condenser fan rotate at high speed</td><td>Procedure No. 25</td><td>13A-145</td></tr>
</table>



CHECK AT THE ENGINE-ECU TERMINALS

13100920292

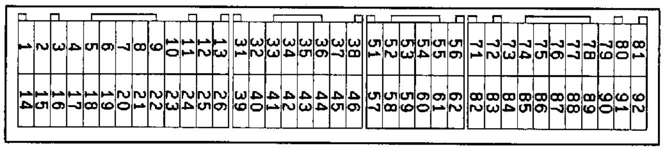
TERMINAL VOLTAGE CHECK CHART

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



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Terminal No.	Check item	Check condition (Engine condition)	Normal condition
1	No. 1 injector	While engine is idling after having warmed up, suddenly depress the accelerator pedal.	From 11 - 14 V, momentarily drops slightly
14	No. 2 injector		
2	No. 3 injector		
15	No. 4 injector		
3	No. 5 injector		
16	No. 6 injector		
4	Stepper motor coil <A1>	Engine: Soon after the warmed up engine is started	System voltage ↔ 0 V (Changes repeatedly)
17	Stepper motor coil <A2>		
5	Stepper motor coil <B1>		
18	Stepper motor coil <B2>		
6	EGR control solenoid valve	Ignition switch: ON	System Voltage
		While engine is idling, suddenly depress the accelerator pedal.	From system voltage, momentarily drops
8	A/C relay	• Engine: Idle speed • A/C switch: OFF → ON (A/C compressor is operating)	System voltage or momentarily 6V or more → 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 signal	Engine: Idle speed	0 - 1V
		Engine r/min: 3,000 r/min	6 - 9V
21	Fan controller	When the radiator fan and condenser fan are not operating	0 - 0.3 V
		When the radiator fan and condenser fan are operating	0.7 V or more
22	Fuel pump relay	Ignition switch: ON	System voltage
		Engine: Idle speed	0 - 3V

Terminal No.	Check item	Check condition (Engine condition)		Normal condition
24	Purge control solenoid valve	Ignition switch: ON		System voltage
		Running at 3,000 r/min while engine is warming up after having been started.		0 - 3V
31	Ventilation control solenoid valve <Vehicles with TCL>	Ignition switch: ON		System voltage
32	Vacuum control solenoid valve <Vehicles with TCL>	Ignition switch: ON		System voltage
36	Engine warning lamp	Ignition switch: OFF → ON		0 - 3V → 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 1	Engine: Idle speed	Turn the A/C switch OFF	0 - 3V
			Turn the A/C switch ON (A/C compressor is operating)	System voltage
54	Alternator G terminal	• Engine: Warm, idle (radiator fan: OFF) • Headlamp: OFF to ON • Rear defogger switch: OFF to ON • Brake lamp: ON		Voltage rises by 0.2 - 3.5 V.
55	Alternator FR terminal	• Engine: Warm, idle (radiator fan: OFF) • Headlamp: OFF to ON • Rear defogger switch: OFF to ON • Brake lamp: ON		Voltage drops by 0.2 - 3.5 V.
57	A/C switch 2	• Engine: Idling • Outside air temperature: 25°C or more	When A/C is MAX. COOL condition (when the load by A/C is high)	0 - 3 V
			When A/C is MAX. HOT condition (When the load by A/C is low)	System voltage
71	Ignition switch - ST	Engine: Cranking		8V or more

Terminal No.	Check item	Check condition (Engine condition)		Normal condition
72	Intake air temperature sensor	Ignition switch: ON	When intake air temperature is 0°C	3.2 - 3.8V
			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
75	Oxygen sensor (rear)	● Transmission: 2nd gear <M/T>, L range <A/T> ● Engine r/min: 3,500 r/min or more ● Driving with the throttle valve widely open		0.6 - 1.0 V
76	Oxygen sensor (front)	Engine: Running at 2,500 r/min after warmed up (Check using a digital type voltmeter)		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
83	Engine coolant temperature sensor	Ignition switch: ON	When engine coolant temperature is 0°C	3.2 - 3.8V
			When engine coolant temperature is 20°C	2.3 - 2.9V
			When engine coolant temperature is 40°C	1.3 - 1.9V
			When engine coolant temperature is 80°C	0.3 - 0.9V
84	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	● Ignition switch: ON ● Move the vehicle slowly forward		0 ↔ 5V (Changes repeatedly)

<table>
<tr><th>Terminal No.</th><th>Check item</th><th colspan="2">Check condition (Engine condition)</th><th>Normal condition</th></tr>
<tr><td rowspan="2">87</td><td rowspan="2">Idle position switch</td><td rowspan="2">Ignition switch: ON</td><td>Set throttle valve to idle position</td><td>0 - 1V</td></tr>
<tr><td>Slightly open throttle valve</td><td>4V or more</td></tr>
<tr><td rowspan="2">88</td><td rowspan="2">Top dead centre sensor</td><td colspan="2">Engine: Cranking</td><td>0.4 - 3.0V</td></tr>
<tr><td colspan="2">Engine: Idle speed</td><td>0.5 - 2.0V</td></tr>
<tr><td rowspan="2">89</td><td rowspan="2">Crank angle sensor</td><td colspan="2">Engine: Cranking</td><td>0.4 - 4.0V</td></tr>
<tr><td colspan="2">Engine: Idle speed</td><td>1.5 - 2.5V</td></tr>
<tr><td rowspan="2">90</td><td rowspan="2">Air flow sensor</td><td colspan="2">Engine: Idle speed</td><td rowspan="2">2.2 - 3.2V</td></tr>
<tr><td colspan="2">Engine r/min: 2,500r/min</td></tr>
<tr><td rowspan="2">91</td><td rowspan="2">Inhibitor switch <A/T></td><td rowspan="2">Ignition switch: ON</td><td>Set selector lever to P or N</td><td>0 - 3V</td></tr>
<tr><td>Set selector lever to Other than P or N</td><td>8 - 14V</td></tr>
</table>

CHECK CHART FOR RESISTANCE AND CONTINUITY BETWEEN TERMINALS

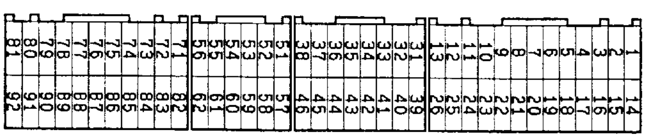
1. Turn the ignition switch to OFF.
2. Disconnect the engine-ECU connector.
3. Measure the resistance and check for continuity between the terminals of the engine-ECU harness-side connector while referring to the check chart.

   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



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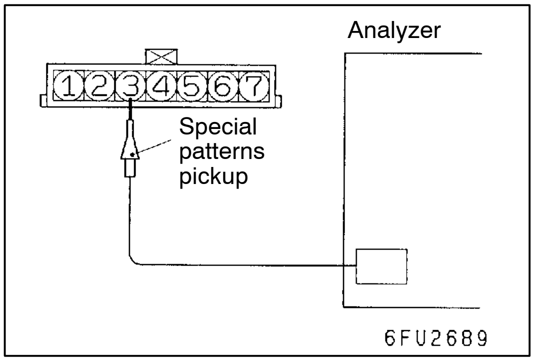
Terminal No.	Inspection item	Normal condition (Check condition)
1 - 12	No. 1 injector	13 - 16 Ω (At 20°C)
14 - 12	No. 2 injector	
2 - 12	No. 3 injector	
15 - 12	No. 4 injector	
3 - 12	No. 5 injector	
16 - 12	No. 6 injector	

Terminal No.	Inspection item	Normal condition (Check condition)
4 - 12	Stepper motor coil (A1)	28 - 33 Ω (At 20°C)
17 - 12	Stepper motor coil (A2)	
5 - 12	Stepper motor coil (B1)	
18 - 12	Stepper motor coil (B2)	
6 - 12	EGR control solenoid valve	36 - 44 Ω (At 20°C)
24 - 12	Purge control solenoid valve	36 - 44 Ω (At 20°C)
13 - Body earth	Engine-ECU earth	Continuity (0 Ω)
26 - Body earth	Engine-ECU earth	
31 - 12	Ventilation control solenoid valve <Vehicles with TCL>	36 - 44 Ω (At 20 °C)
32 - 12	Vacuum control solenoid valve <Vehicles with TCL>	36 - 44 Ω (At 20 °C)
72 - 92	Intake air temperature sensor	5.3 - 6.7 kΩ (When intake air temperature is 0°C)
		2.3 - 3.0 kΩ (When intake air temperature is 20°C)
		1.0 - 1.5 kΩ (When intake air temperature is 40°C)
		0.30 - 0.42 kΩ (When intake air temperature is 80°C)
83 - 92	Engine coolant temperature sensor	5.1 - 6.5 kΩ (When coolant temperature is 0°C)
		2.1 - 2.7 kΩ (When coolant temperature is 20°C)
		0.9 - 1.3 kΩ (When coolant temperature is 40°C)
		0.26 - 0.36 kΩ (When coolant temperature is 80°C)
87 - 92	Idle position switch	Continuity (when throttle valve is at idle position)
		No continuity (when throttle valve is slightly open)
91 - Body earth	Inhibitor switch <A/T>	Continuity (when select lever is at P or N)
		No continuity (when select lever is at D, 2, L or R)



INSPECTION PROCEDURE USING AN ANALYZER

13100930226

AIR FLOW SENSOR (AFS)

Measurement Method

1. Disconnect the air flow 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 air flow sensor connector terminal 3.

Alternate Method (Test harness not available)

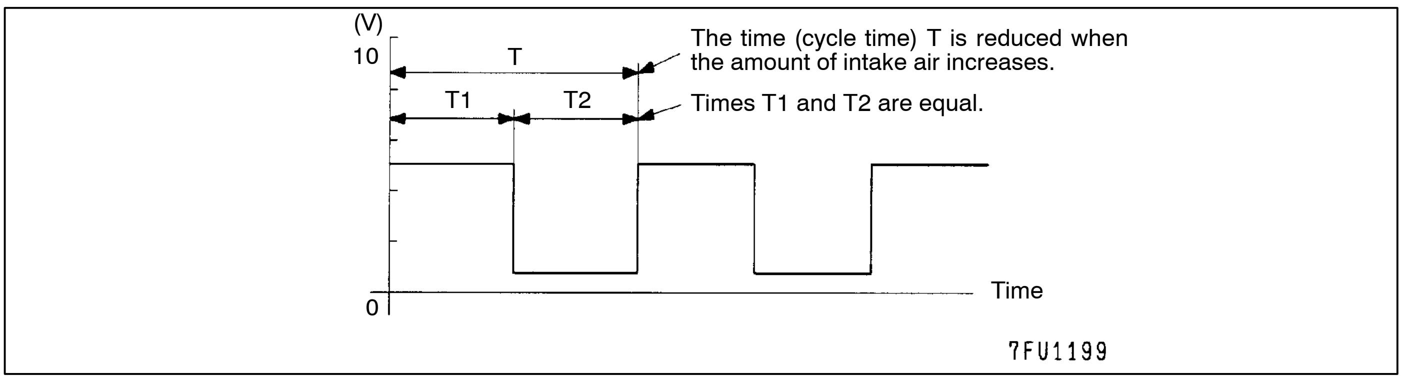
1. Connect the analyzer special patterns pickup to engine-ECU terminal 90.

Standard Wave Pattern

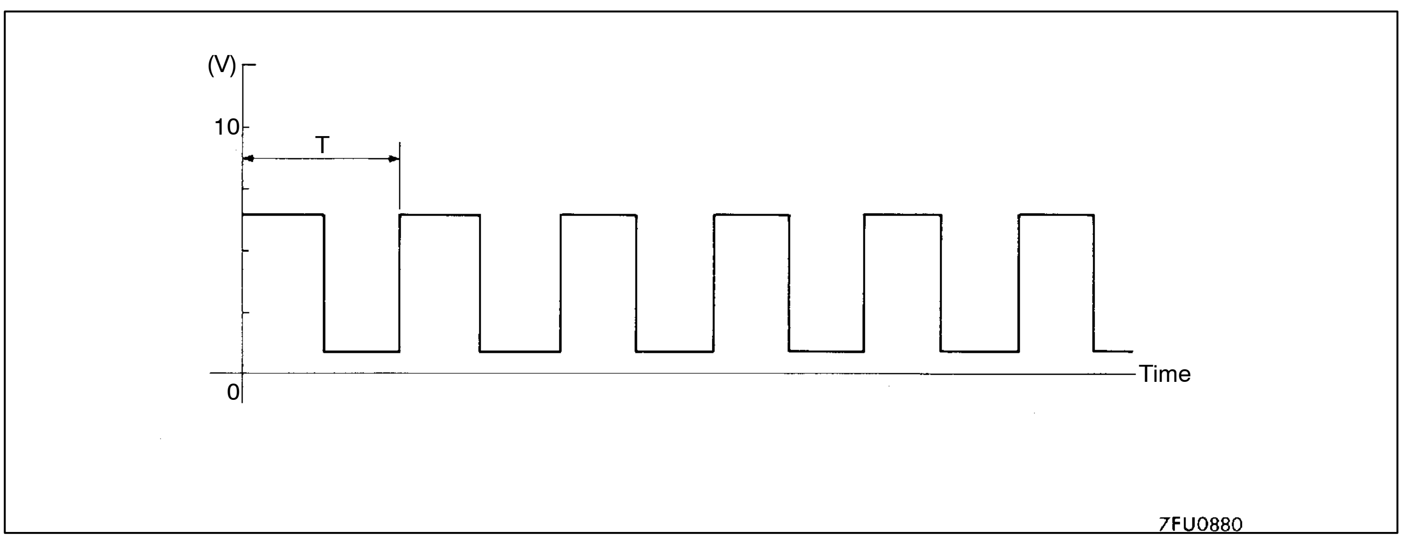
Observation conditions

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

Standard wave pattern

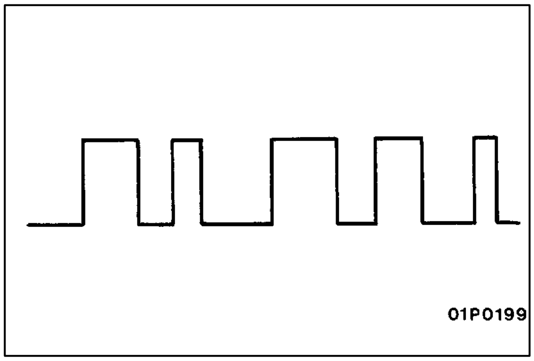


Observation conditions (from conditions above engine speed is increased by racing.)



Wave Pattern Observation Points

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



Examples of Abnormal Wave Patterns

- Example 1

  Cause of problem

  Sensor interface malfunction

  Wave pattern characteristics

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

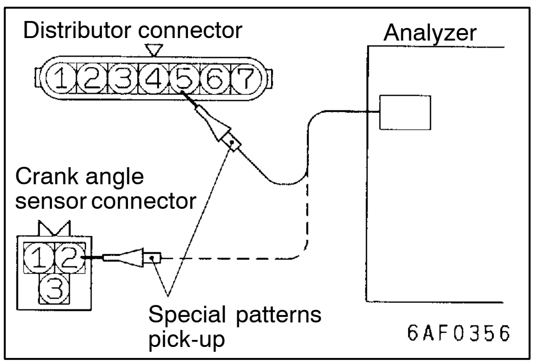
- Example 2

  Cause of problem

  Damaged rectifier or vortex generation column

  Wave pattern characteristics

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



TOP DEAD CENTER SENSOR AND CRANK ANGLE SENSOR

Measurement Method

1. Disconnect the distributor connector and connect the special tool (test harness: MB991348) and jumper wire in between. (All terminals should be connected.)
2. Connect the analyzer special patterns pickup to distributor terminal 5 (top dead centre sensor).
3. Disconnect the crank angle sensor connector and connect the special tool (test harness: MD998478) in between.
4. Connect the analyzer special patterns pickup to crank angle sensor terminal 2.

Alternate Method (Test harness not available)

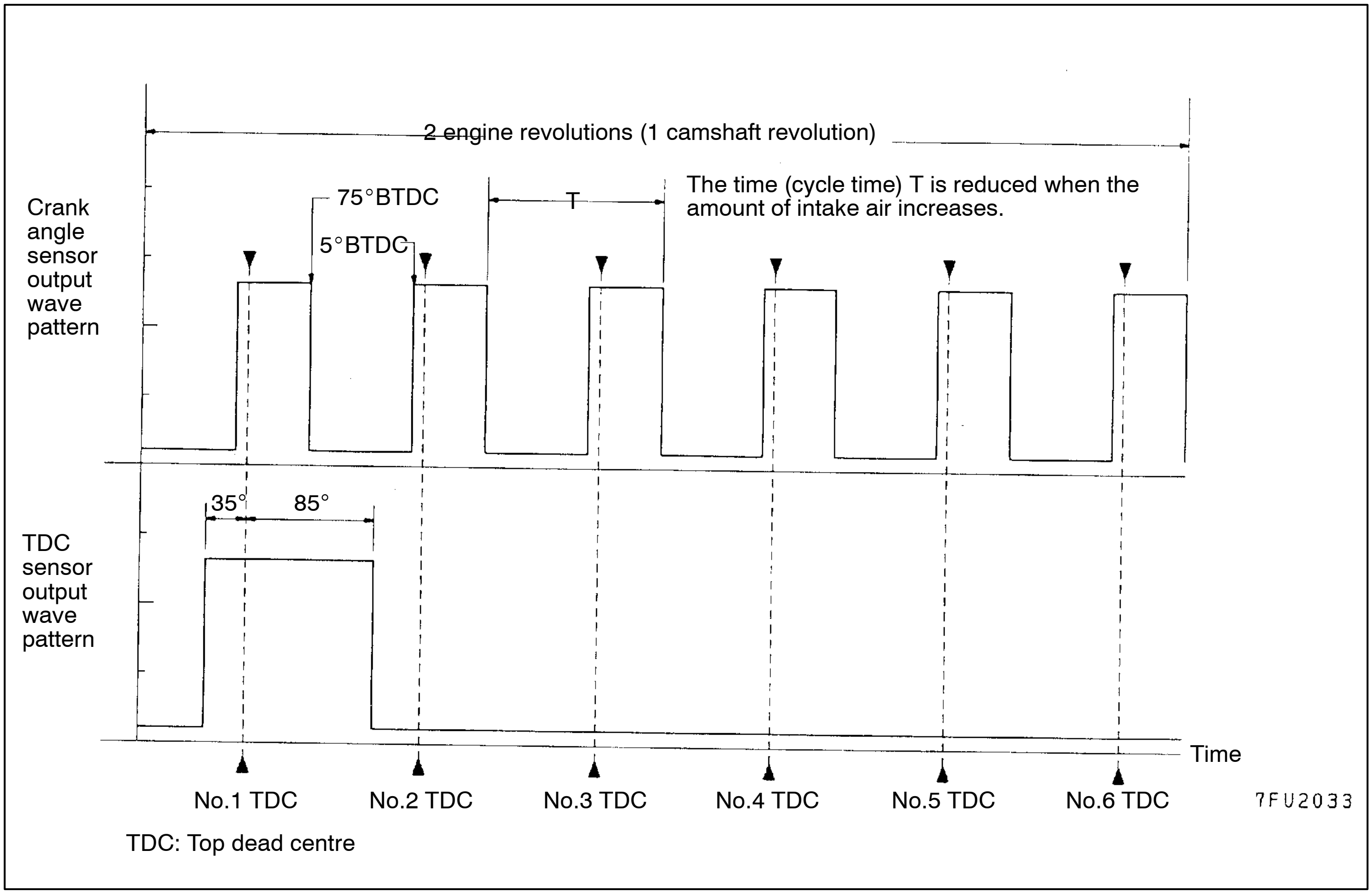
1. Connect the analyzer special patterns pickup to engine-ECU terminal 88. (When checking the top dead centre sensor signal wave pattern.)
2. Connect the analyzer special patterns pickup to engine-ECU terminal 89. (When checking the crank angle sensor signal wave pattern.)

Standard Wave Pattern

Observation conditions

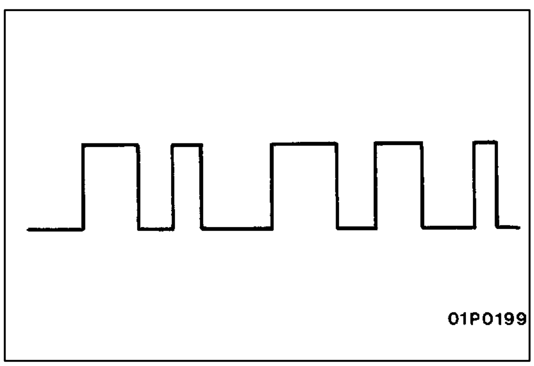
Function	Special patterns
Pattern height	Low
Pattern selector	Display
Engine r/min	Idle speed

Standard wave pattern



Wave Pattern Observation Points

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



Examples of Abnormal Wave Patterns

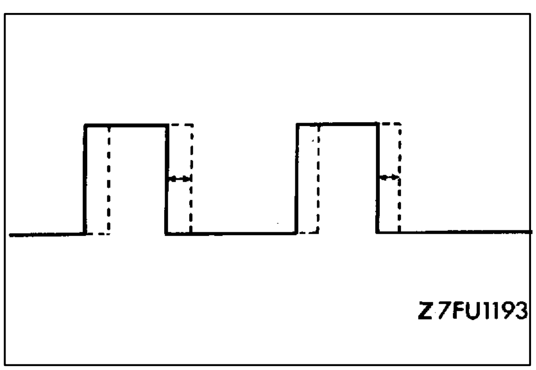
- Example 1

  Cause of problem

  Sensor interface malfunction

  Wave pattern characteristics

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



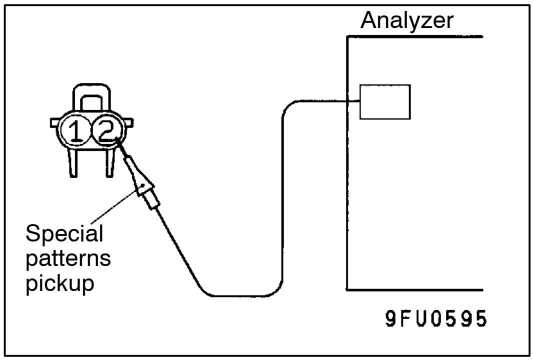
- Example 2

  Cause of problem

  Loose timing belt
  Abnormality in sensor disk

  Wave pattern characteristics

  Wave pattern is displaced to the left or right.

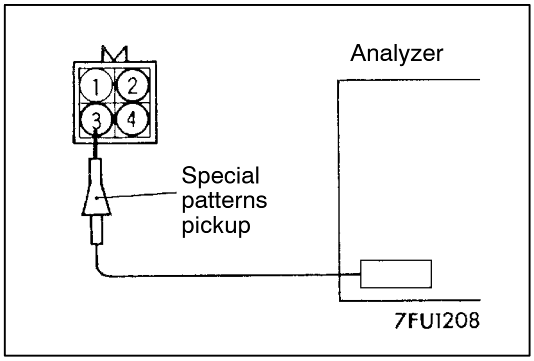


INJECTOR

Measurement Method

Measurement at the front bank (No.2, No.4, or No.6 cylinder)

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



Measurement at the rear bank (No.1, No.3, or No.5 cylinder)

1. Disconnect the injector intermediate harness connector, and connect the special tool (test harness: MD998464) in between.
2. Connect the probe of the oscilloscope to the following terminal: terminal 2 (the black clip of the special tool) when observing at the No.1 cylinder; terminal 3 (the blue clip) when observing at the No.3 cylinder; terminal 4 (the white clip) when observing at the No.5 cylinder

Alternate Method (Test harness not available)

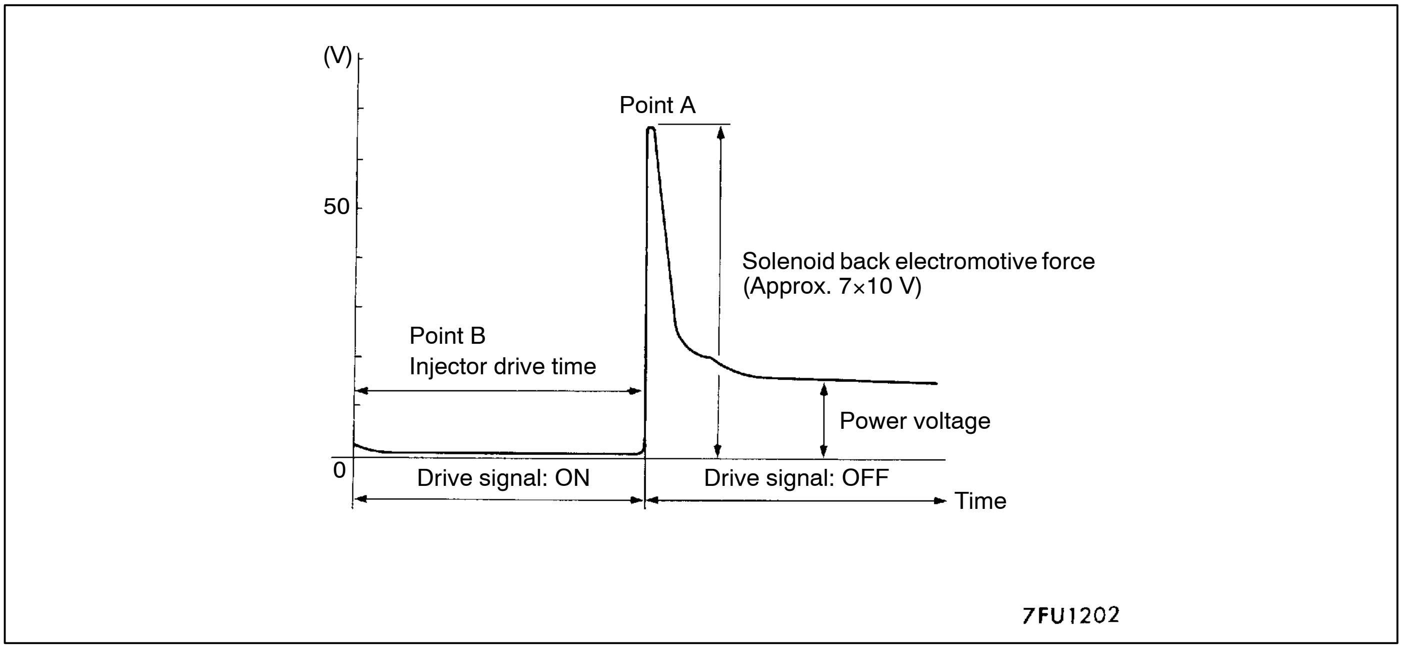
1. Connect the analyzer special patterns pickup to engine-ECU terminal 1. (When checking the No. 1 cylinder.)
2. Connect the analyzer special patterns pickup to engine-ECU terminal 14. (When checking the No. 2 cylinder.)
3. Connect the analyzer special patterns pickup to engine-ECU terminal 2. (When checking the No. 3 cylinder.)
4. Connect the analyzer special patterns pickup to engine-ECU terminal 15. (When checking the No. 4 cylinder.)
5. Connect the analyzer special patterns pickup to engine-ECU terminal 3. (When checking the No. 5 cylinder.)
6. Connect the analyzer special patterns pickup to engine-ECU terminal 16. (When checking the No. 6 cylinder.)

Standard Wave Pattern

Observation conditions

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

Standard wave pattern

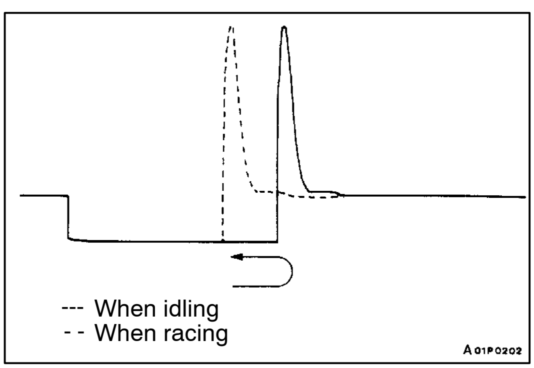


Wave Pattern Observation Points

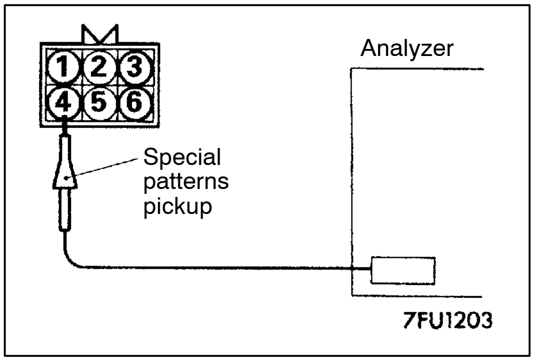
Point A: Height of solenoid back electromotive force

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

Point B: Injector drive time



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



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)

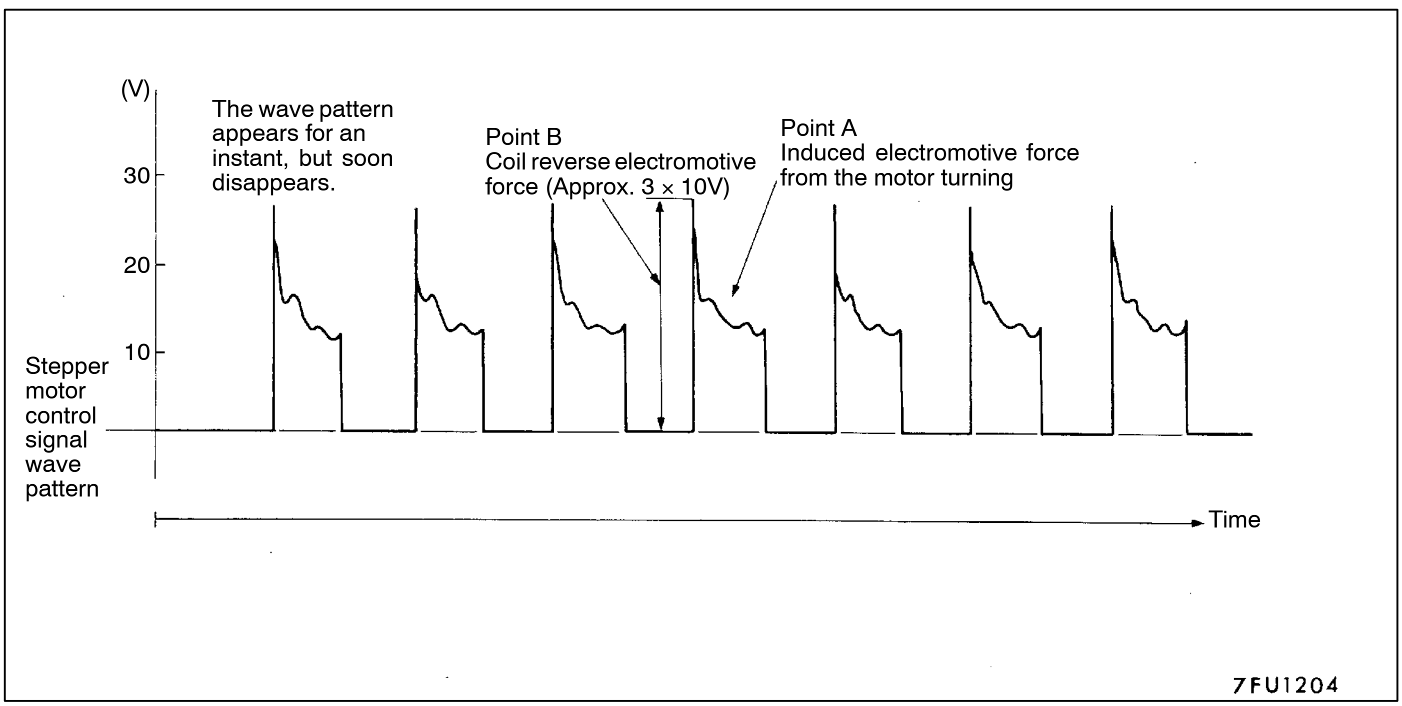
1. Connect the analyzer special patterns pickup to engine-ECU terminal 4, connection terminal 5, connection terminal 17, and connection terminal 18 respectively.

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 OFF to ON (without starting the engine).
	While the engine is idling, turn the A/C switch to ON.
	Immediately after starting the warm engine

Standard wave pattern



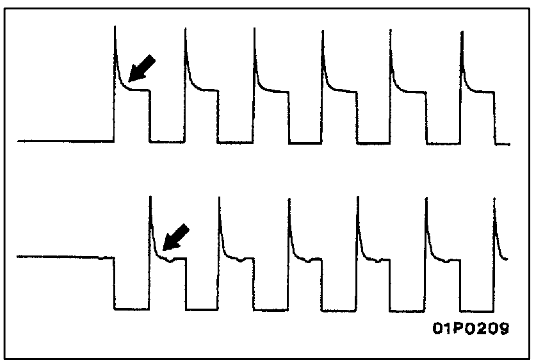
Wave Pattern Observation Points

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

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

Point B: Height of coil reverse electromotive force

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



Examples of Abnormal Wave Pattern

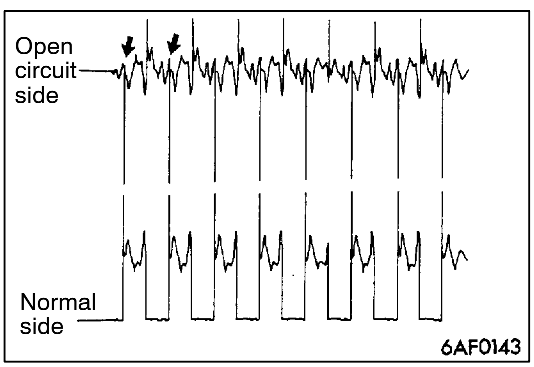
- Example 1

Cause of problem

Motor is malfunctioning. (Motor is not operating.)

Wave pattern characteristics

Induced electromotive force from the motor turning does not appear.



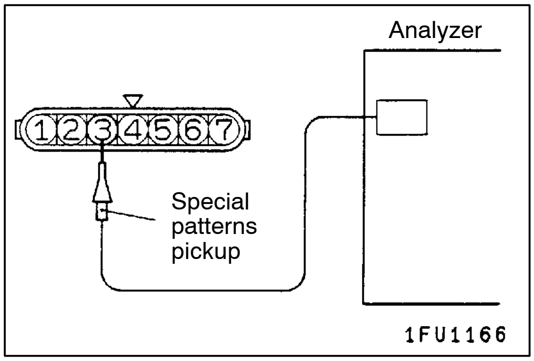
- Example 2

Cause of problem

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

Wave pattern characteristics

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



IGNITION COIL AND POWER TRANSISTOR

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

Measurement Method

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

Alternate Method (Test harness not available)

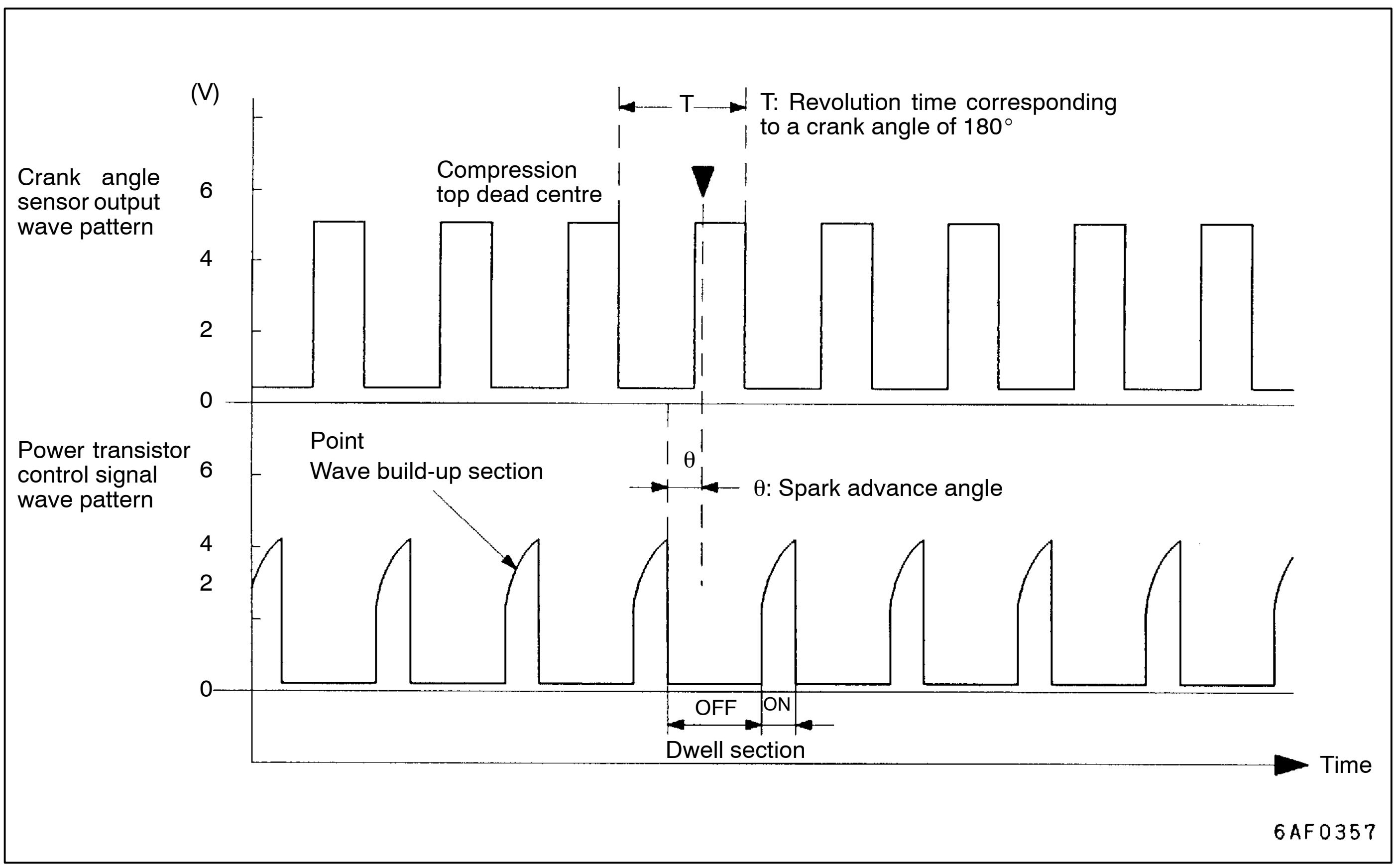
1. Connect the analyzer special patterns pickup to engine-ECU terminal 10.

Standard Wave Pattern

Observation condition

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

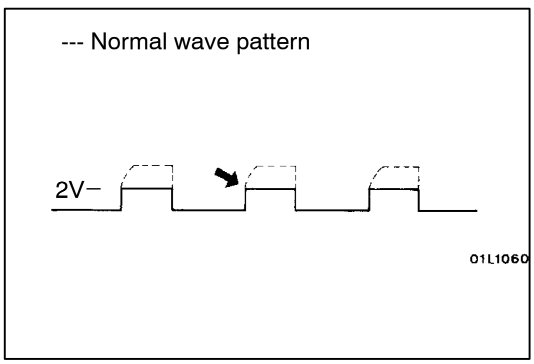
Standard wave pattern

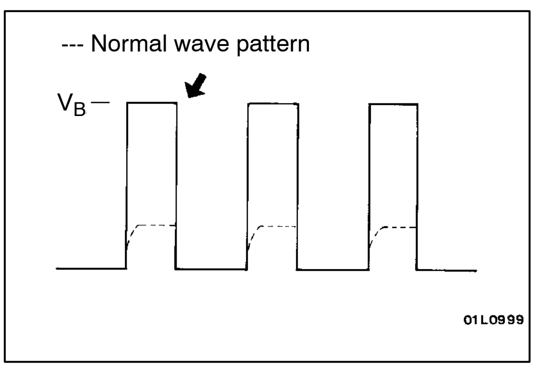


Wave Pattern Observation Points

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

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





Examples of Abnormal Wave Patterns

- Example 1

  Wave pattern during engine cranking

  Cause of problem

  Open-circuit in ignition primary circuit

  Wave pattern characteristics

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

- Example 2

  Wave pattern during engine cranking

  Cause of problem

  Malfunction in power transistor

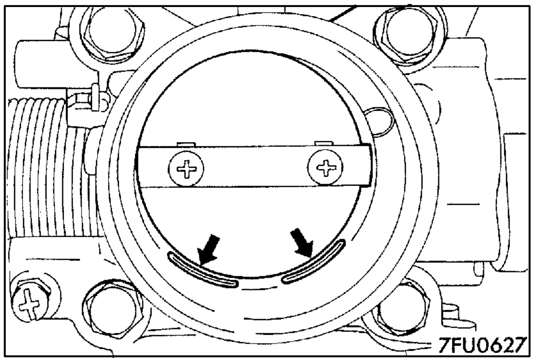
  Wave pattern characteristics

  Power voltage results when the power transistor is ON.

ON-VEHICLE SERVICE
13100100313

THROTTLE BODY (THROTTLE VALVE AREA) CLEANING

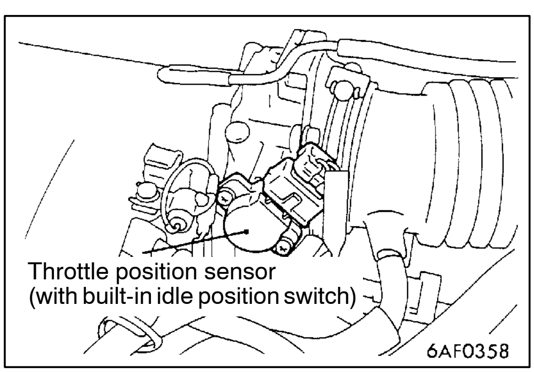
1. Start the engine and warm it up until the coolant is heated to 80°C or higher and then stop the engine.
2. Remove the air intake hose from the throttle body.



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

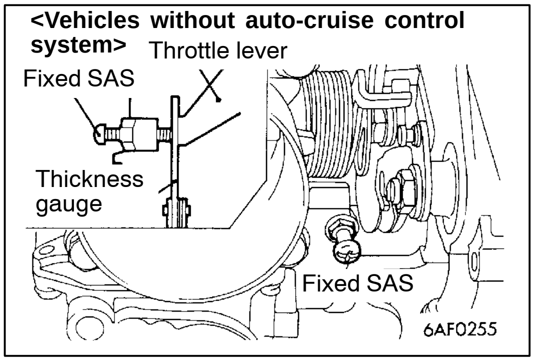
   Caution
   Do not allow cleaning solvent to enter the bypass passage.
4. Spray cleaning solvent into the valve through the throttle body intake port and leave it for about 5 minutes.
5. Start the engine, race it several times and idle it for about 1 minute. If the idling speed becomes unstable (or if 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-188.)

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



IDLE POSITION SWITCH AND THROTTLE POSITION SENSOR ADJUSTMENT (Vehicles without TCL>
13100130275

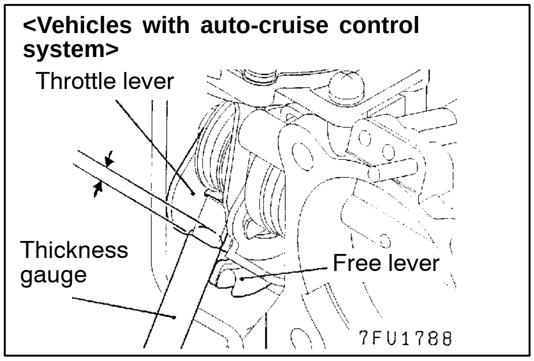
1. Connect the MUT-II to the diagnosis connector.



2. Insert a thickness gauge as follows:

<Vehicles without auto-cruise control system>

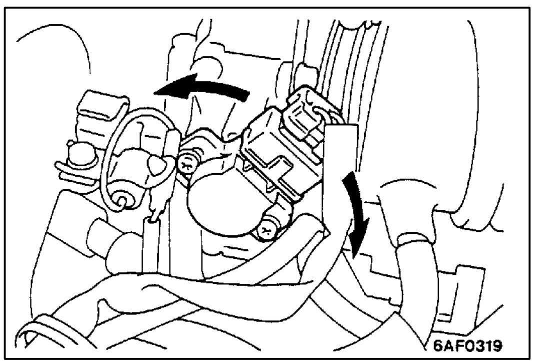
Insert a thickness gauge with a thickness of 0.65 mm between the fixed SAS and the throttle lever.



<Vehicles with auto-cruise control system>
Insert a 1.4-mm thick thickness gauge up to approx. 3 mm between the levers shown in the figure.

NOTE
Do not insert the thickness gauge 3 mm or more. If doing that, the throttle lever opening angle becomes larger than the predetermined angle, causing maladjustment.

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



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

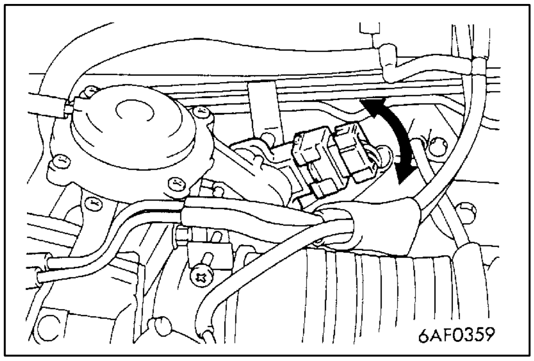
   Standard value: 400 - 1,000 mV

8. If there is a deviation from the standard value, check the throttle position sensor and the related harness.
9. Remove the thickness gauge.
10. Turn the ignition switch to OFF.
11. Disconnect the MUT-II.
    When the MUT-II is not used, remove the special tool, and connect the throttle position sensor.

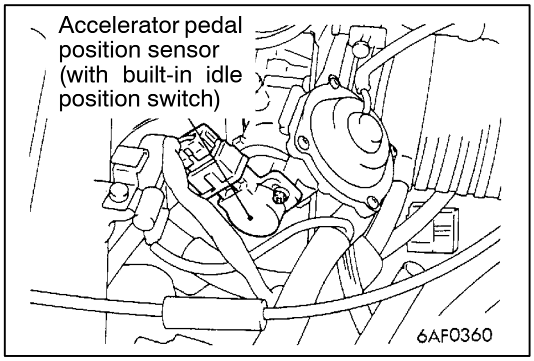
THROTTLE POSITION SENSOR ADJUSTMENT <Vehicles with TCL> 13100110040

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

Standard value: 580 - 690 mV



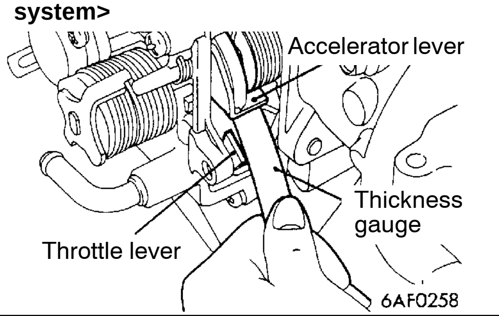
4. If the voltage is outside the standard value, adjust by loosening the throttle position sensor mounting bolts and turning the throttle position sensor body. After adjusting, tighten the bolts securely.
5. Turn the ignition switch to OFF.
6. If a diagnosis code is output while adjusting the throttle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



IDLE POSITION SWITCH AND ACCELERATOR PEDAL POSITION SENSOR ADJUSTMENT <Vehicles with TCL> 13100140049

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

<Vehicles without auto-cruise control system>

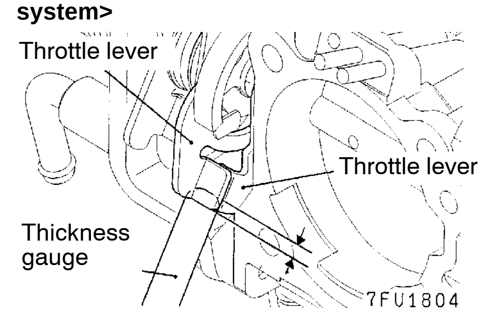


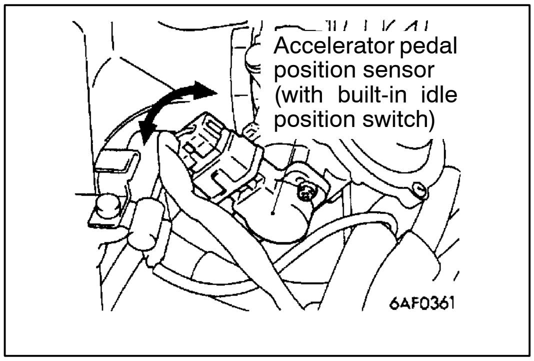
2. Insert a thickness gauge with a thickness of 0.5 mm in between the accelerator lever and throttle lever to a depth of approximately 3 mm.

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

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

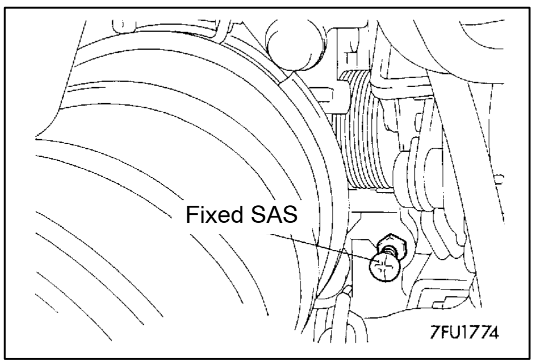
<Vehicles with auto-cruise control system>





4. Loosen the accelerator pedal position sensor mounting bolt, and then turn the accelerator pedal position sensor counterclockwise as far as it will go.
5. Check that the idle position switch is ON at this position.
6. Slowly turn the accelerator pedal position sensor clockwise and find the point where the idle position switch turns off.
   Securely tighten the accelerator pedal position sensor mounting bolt at this point.
7. Select "Traction Control System" on the MUT-II.
8. Check the accelerator pedal position sensor output voltage.

   Standard value: 400 - 1,000 mV
9. If the voltage is outside the standard value, check the accelerator pedal position sensor and related harnesses.
10. Remove the thickness gauge.
11. Turn the ignition switch to OFF.
12. Disconnect the MUT-II.



FIXED SAS ADJUSTMENT 13100150318

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 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 throttle position sensor <vehicles without TCL> (P.13A-184), throttle position sensor <vehicles with TCL> (P.13A-186), idle position switch and accelerator pedal position sensor <vehicles with TCL> (P.13A-186).

BASIC IDLE SPEED ADJUSTMENT 13100180355

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

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

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

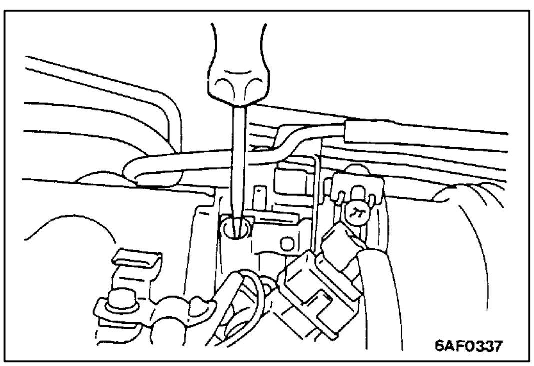
3. Start the engine and run at idle.
4. Select the item No.30 of the MUT-II Actuator test.

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

5. Check the idle speed.

   Standard value: 650 ± 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-184.)



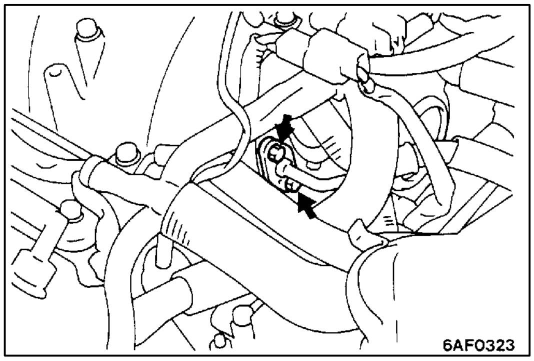
6. If not within the standard value range, turn the speed adjusting screw (SAS) to make the necessary adjustment.

   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.

7. Press the MUT-II clear key, and release the ISC servo from the Actuator test mode.

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

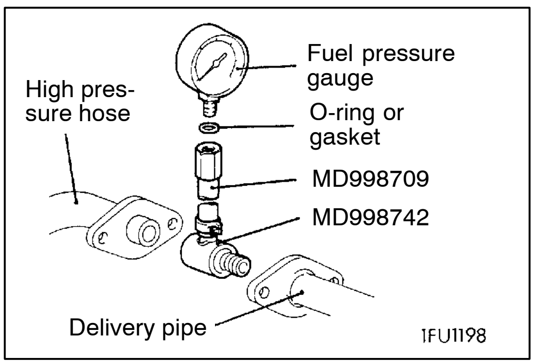
8. Switch OFF the ignition switch.
9. Disconnect the MUT-II.
10. Start the engine again and let it run at idle speed for about 10 minutes; check that the idling condition is normal.



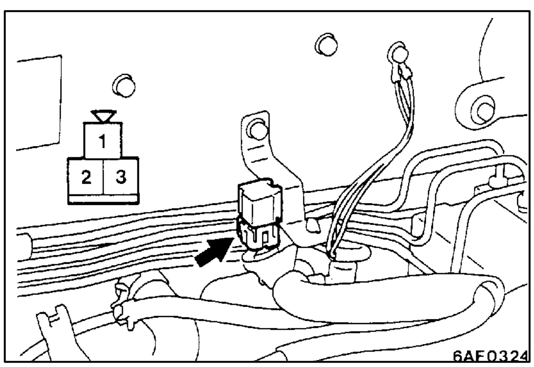
FUEL PRESSURE TEST 13100190310

1. Release residual pressure from the fuel pipe line to prevent fuel gush out. (Refer to P.13A-191.)
2. Disconnect the fuel high pressure hose at the delivery pipe side.

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

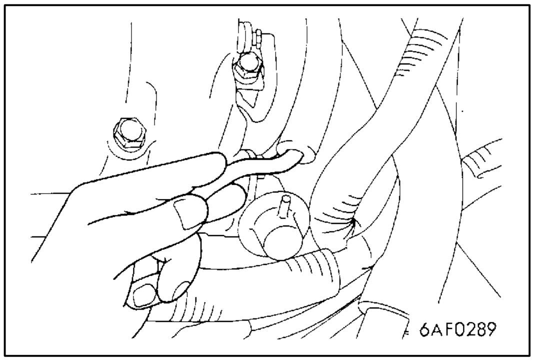


3. Remove the union joint and bolt from the special tool (adapter hose MD998709) and instead attach the special tool (hose adapter MD998742) to the adapter hose.
4. Install a fuel pressure gauge on the adapter hose that was set up in step 3.
   Use a suitable O-ring or gasket between the fuel pressure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



6. Use a jumper wire to connect the terminal No.2 (fuel pump drive terminal) of the 3-pin connector shown in the illustration to the battery (+) terminal in order to activate 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 kerb 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
• Fuel pressure too low • Fuel pressure drops after racing • No fuel pressure in fuel return hose	Clogged fuel filter	Replace fuel filter
	Fuel leaking to return side due to poor fuel regulator valve seating or settled spring	Replace fuel pressure regulator
	Low fuel pump delivery pressure	Replace fuel pump
Fuel pressure too high	Binding valve in fuel pressure regulator	Replace fuel pressure regulator
	Clogged fuel return hose or pipe	Clean or replace hose or pipe
Same fuel pressure when vacuum hose is connected and when disconnected	Damaged vacuum hose or clogged nipple	Replace vacuum hose or clean nipple

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-191.)
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.
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)

13100090269

Refer to P.13A-88.

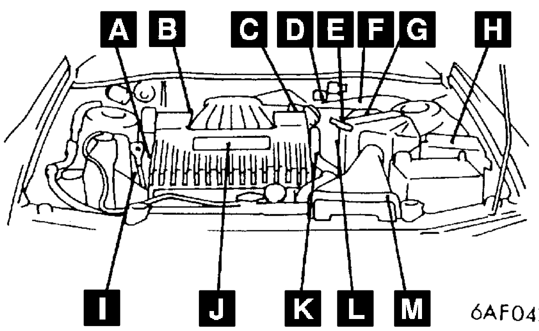
FUEL PUMP OPERATION CHECK 13100200242

Refer to P.13A-88.

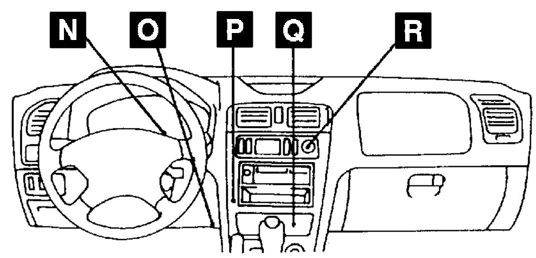
COMPONENT LOCATION

13100210375

Name	Symbol	Name	Symbol
A/C relay	H	Fuel pump check terminal	F
A/C switch	R	Idle speed control servo	C
Accelerator pedal position sensor (with idle position switch) <Vehicles with TCL>	C	Inhibitor switch <A/T>	M
Air flow sensor (with intake air temperature sensor and barometric pressure sensor)	G	Injectors	J
Control relay and fuel pump relay	P	Oxygen sensor (front)	S
Crank angle sensor	A	Oxygen sensor (rear)	T
Detonation sensor <Vehicles for Hong Kong and Singapore>	J	Power steering fluid pressure switch	I
Diagnosis connector	O	Purge control solenoid valve	B
Distributor (with top dead centre sensor and ignition coil)	L	Throttle position sensor <Vehicles with TCL>	C
EGR control solenoid valve	B	Throttle position sensor (with idle position switch) <Vehicles without TCL>	C
Engine coolant temperature sensor	K	Vacuum control solenoid valve <Vehicles with TCL>	D
Engine-ECU	Q	Vehicle speed sensor	E
Engine warning lamp (check engine lamp)	N	Ventilation control solenoid valve <Vehicles with TCL>	D



6AF0420



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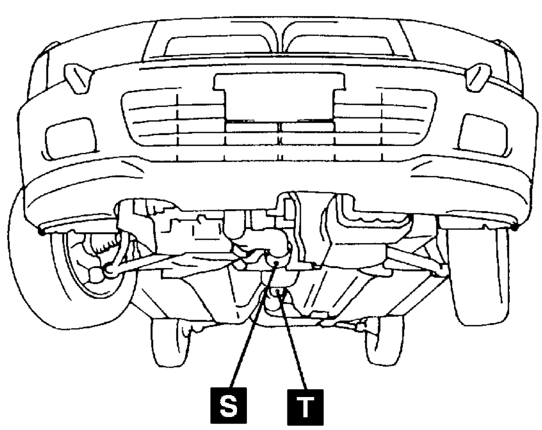

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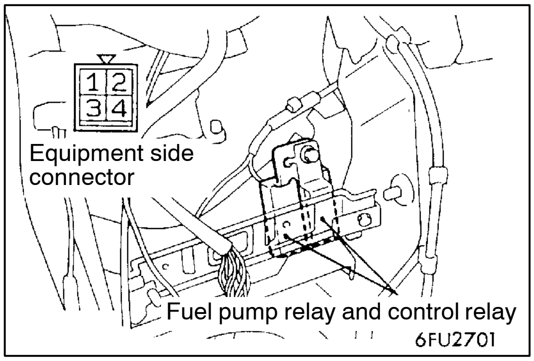
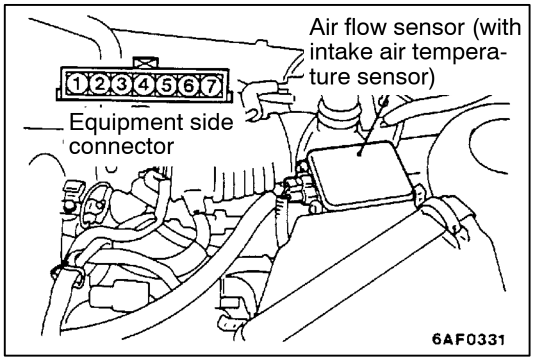


CONTROL RELAY AND FUEL PUMP RELAY CONTINUITY CHECK

13100990187

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



INTAKE AIR TEMPERATURE SENSOR CHECK

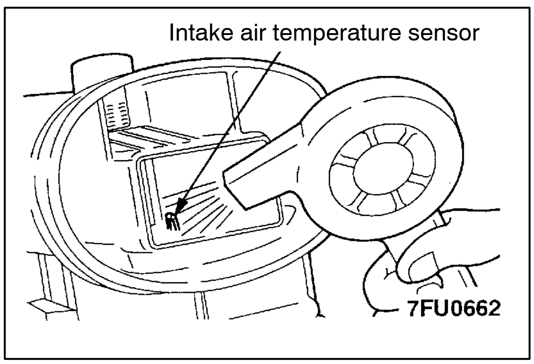
13100280246

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

   Standard value:

   2.3 - 3.0 kΩ (at 20°C)

   0.30 - 0.42 kΩ (at 80°C)

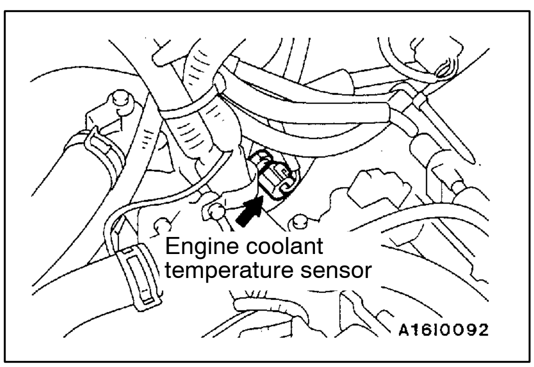


3. Measure resistance while heating the sensor using a hair drier.

   Normal condition:

Temperature (°C)	Resistance (kΩ)
Higher	Smaller

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



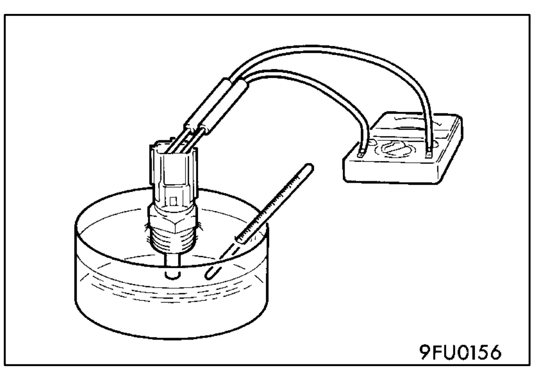
ENGINE COOLANT TEMPERATURE SENSOR CHECK

13100310259

Caution

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

1. Remove the engine coolant temperature sensor.



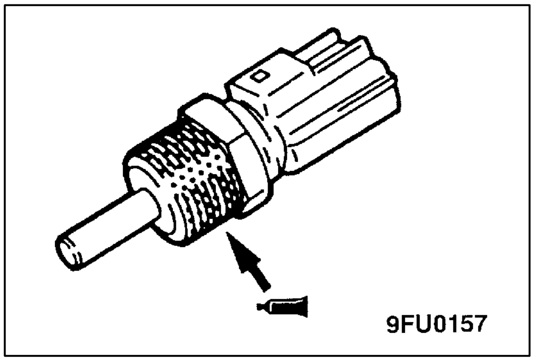
2. With temperature sensing portion of engine coolant temperature sensor immersed in hot water, check resistance.

   Standard value:

   2.1 - 2.7 kΩ (at 20°C)

   0.26 - 0.36 kΩ (at 80°C)

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

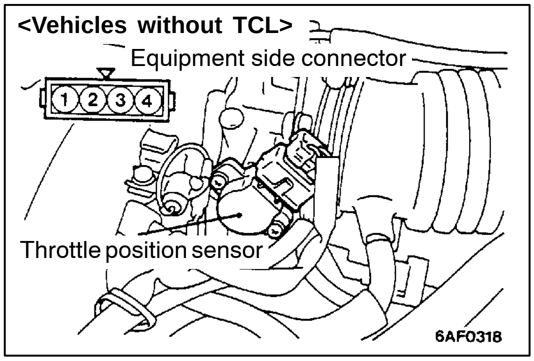


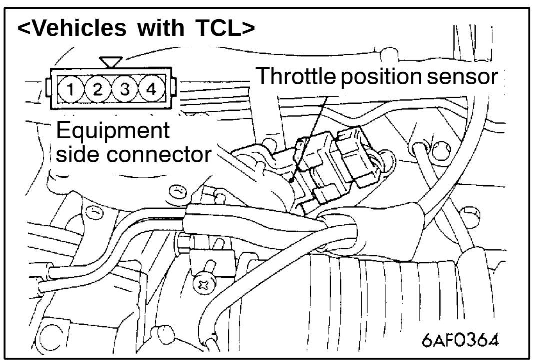
4. Apply sealant to threaded portion.

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

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

   Tightening torque: 29 Nm





THROTTLE POSITION SENSOR CHECK 13100320283

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

   Standard value: 3.5 - 6.5 kΩ

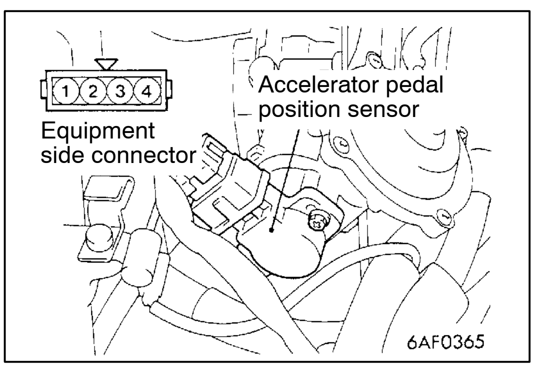
3. Measure the resistance between the throttle position sensor side connector terminal 3 and terminal 4.

   Normal condition:

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

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

   NOTE
   For the throttle position sensor adjustment procedure, refer to P.13A-184 <Vehicles without TCL>, P.13A-186 <Vehicles with TCL>.



ACCELERATOR PEDAL POSITION SENSOR CHECK <Vehicles with TCL> 13100340012

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

   Standard value: 3.5 - 6.5 kΩ

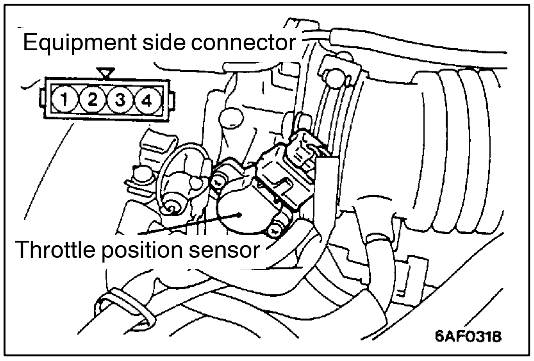
3. Measure the resistance between the accelerator pedal position sensor side connector terminal 1 and terminal 2.

   Normal condition:

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

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

NOTE
For the accelerator pedal position sensor adjustment procedure, refer to P.13A-186.



IDLE POSITION SWITCH CHECK <Vehicles without TCL>

13100330279

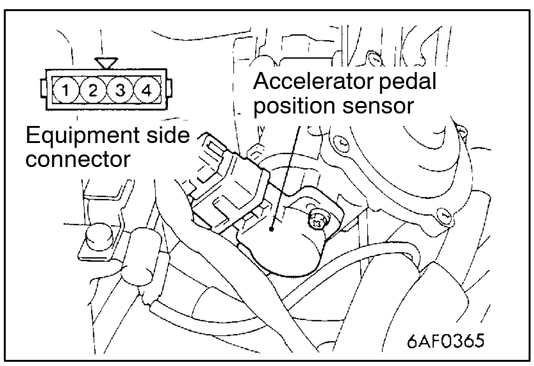
1. Disconnect the throttle position sensor connector.
2. Check the continuity between the throttle position sensor connector side terminal 1 and terminal 2.

Normal condition:

Accelerator pedal	Continuity
Depressed	Non-conductive
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-184.)



IDLE POSITION SWITCH CHECK <Vehicles with TCL>

13100330286

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

Normal condition:

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

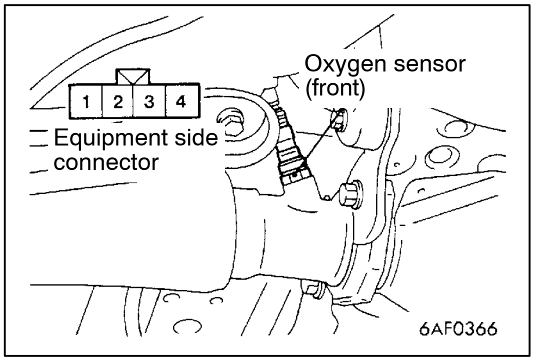
3. If out of specification, replace the accelerator pedal position sensor.

NOTE
After replacement, the idle position switch and accelerator pedal position sensor should be adjusted. (Refer to P.13A-186.)

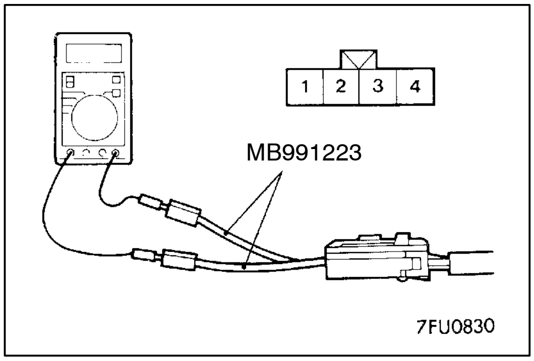
OXYGEN SENSOR CHECK

13100510178

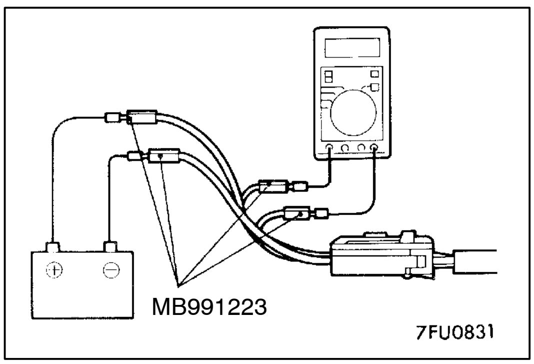
<Oxygen sensor (front)>



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 (11 - 18 Ω at 20°C) between terminal 3 and terminal 4 on the oxygen sensor connector.



3. If there is no continuity, replace the oxygen sensor.
4. Warm up the engine until engine coolant is 80°C or higher.



5. Use the jumper wire to connect terminal 3 of the oxygen sensor connector to the battery (+) terminal and terminal 4 to the battery (-) terminal.

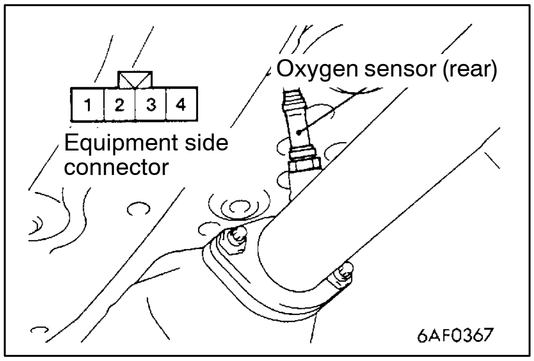
   Caution
   Be very careful when connecting the jumper wire; incorrect connection can damage the oxygen sensor.
6. Connect a digital voltage meter between terminal 1 and terminal 2.
7. While repeatedly racing the engine, measure the oxygen sensor output voltage.

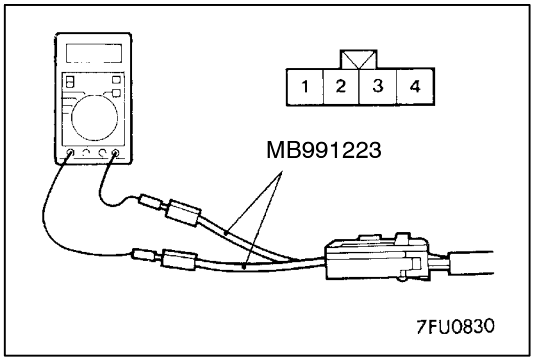
   Standard value:

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

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

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

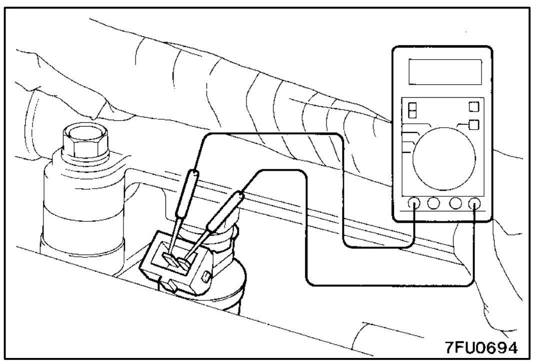




<Oxygen sensor (rear)>

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

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



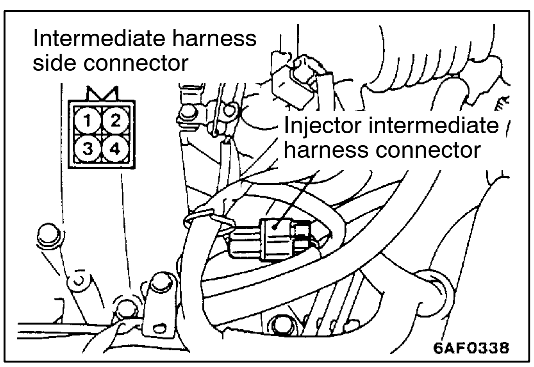
INJECTOR CHECK 13100520294

Measurement of Resistance between Terminals

- Front bank side (No.2, No.4, No.6 cylinders)

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

Standard value: 13 - 16 Ω (at 20°C)



- Rear bank side (No.1, No.3, No.5 cylinders)

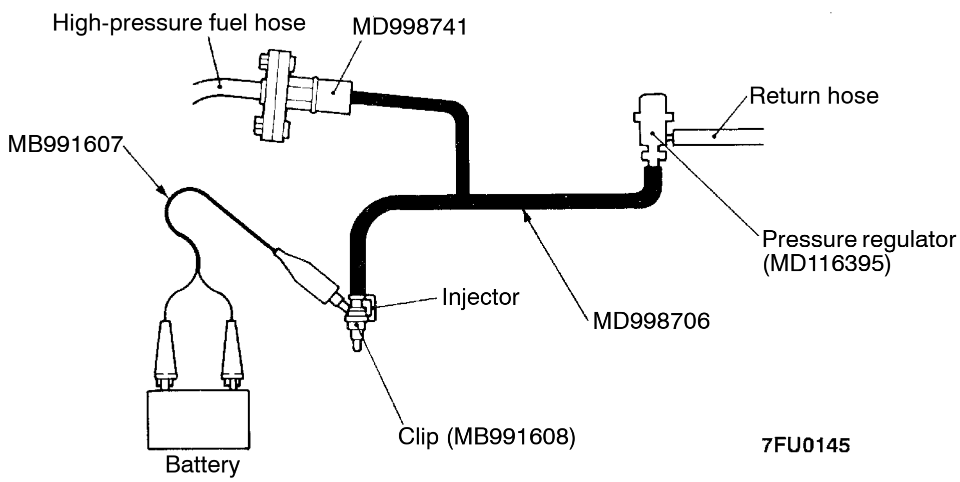
1. Disconnect the injector intermediate harness connectors.
2. Measure the resistance between terminals.

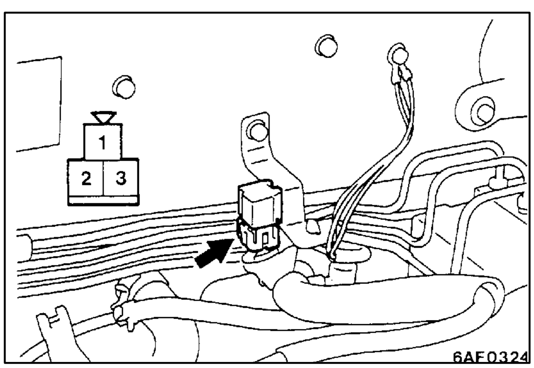
Standard value: 13 - 16 Ω (at 20°C)

Injector	Measurement probe
No.1 cylinder	1 - 2
No.3 cylinder	1 - 3
No.5 cylinder	1 - 4

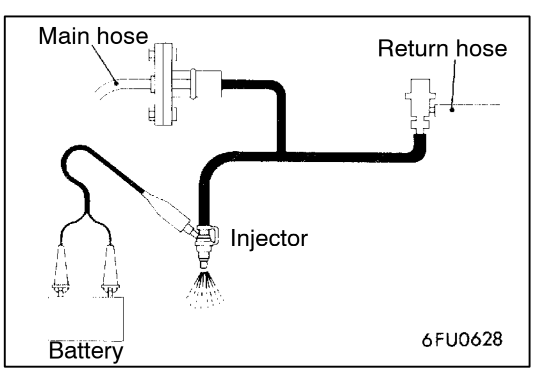
Checking the Injection Condition

1. Following the steps below, bleed out the residual pressure within the fuel pipe line to prevent flow of the fuel. (Refer to P.13-191.)
2. Remove the injector.
3. Arrange the special tool (injector test set), adaptor, fuel pressure regulator and clips as shown in the illustration below.

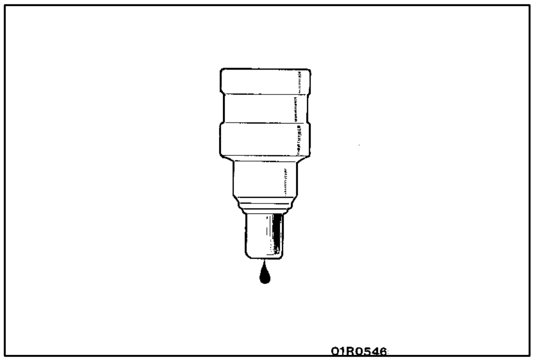




4. Apply battery voltage to terminal 2 (fuel pump drive terminal) of the 3-pin connector shown in the illustration, and activate the fuel pump



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

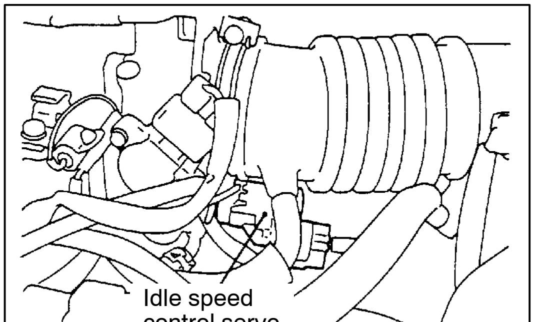


01R0546

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.



6AF0339

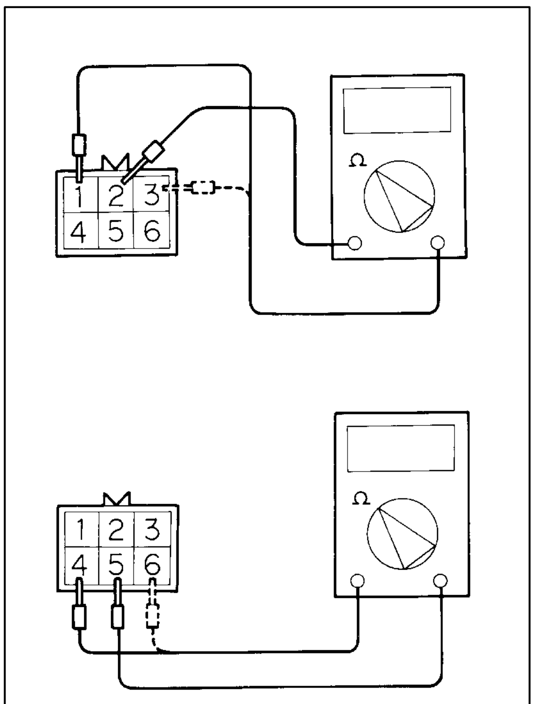
IDLE SPEED CONTROL (ISC) SERVO (STEPPER MOTOR) CHECK 13100540245

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.



7FU0010

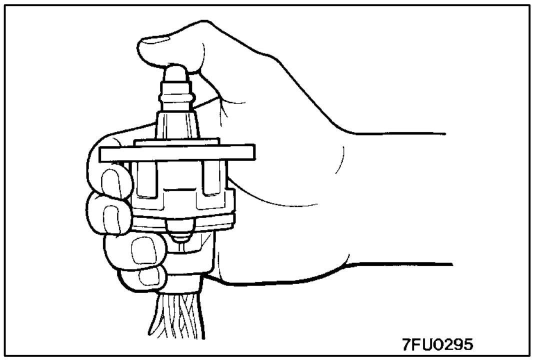
Checking the Coil Resistance

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 Ω (at 20°C)

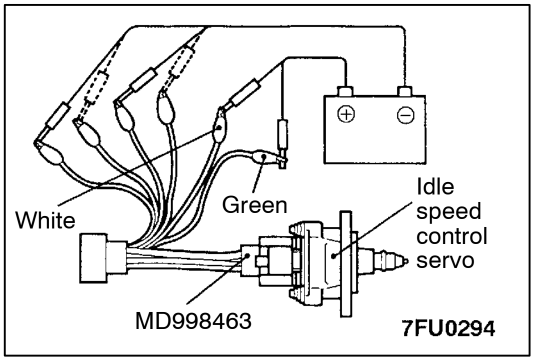
3. Measure the resistance between terminal 5 (green clip of the special tool) and either terminal 6 (yellow clip) or terminal 4 (black clip) of the connector at the idle speed control servo side.

   Standard value: 28 - 33 Ω (at 20°C)



Operation Check

1. Remove the throttle body.
2. Remove the stepper motor.



3. Connect the special tool (test harness) to the idle speed control servo connector.
4. Connect the positive (+) terminal of a power supply (approx. 6 V) to the white clip and the green clip.
5. With the idle speed control servo as shown in the illustration, connect the negative (-) terminal of the power supply to each clip as described in the following steps, and check whether or not a vibrating feeling (a feeling of very slight vibration of the stepper motor) is generated as a result of the activation of the stepper motor.
   (1) Connect the negative (-) terminal of the power supply to the red and black clip.
   (2) Connect the negative (-) terminal of the power supply to the blue and black clip.
   (3) Connect the negative (-) terminal of the power supply to the blue and yellow clip.
   (4) Connect the negative (-) terminal of the power supply to the red and yellow clip.
   (5) Connect the negative (-) terminal of the power supply to the red and black clip.
   (6) Repeat the tests in sequence from (5) to (1).
6. If, as a result of these tests, vibration is detected, the stepper motor can be considered to be normal.

PURGE CONTROL SOLENOID VALVE CHECK

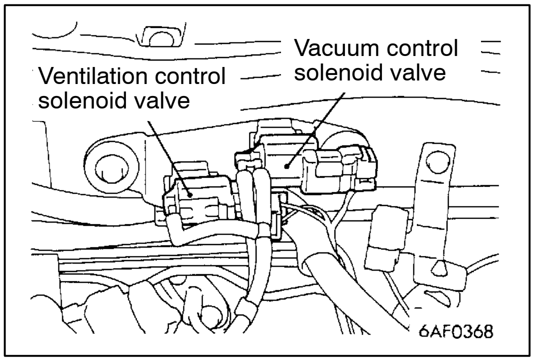
13100560241

Refer to GROUP 17 - Emission Control System.

EGR CONTROL SOLENOID VALVE CHECK

13100570206

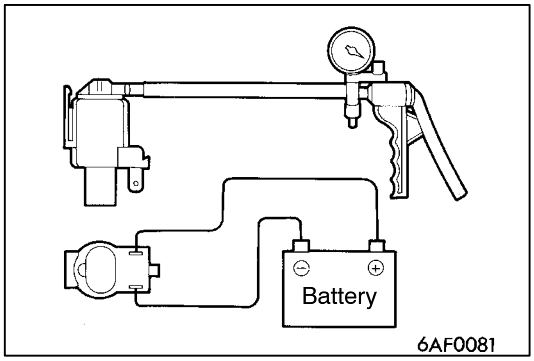
Refer to GROUP 17 - Emission Control System.



VENTILATION CONTROL SOLENOID VALVE CHECK <Vehicles with TCL> 13100630041

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

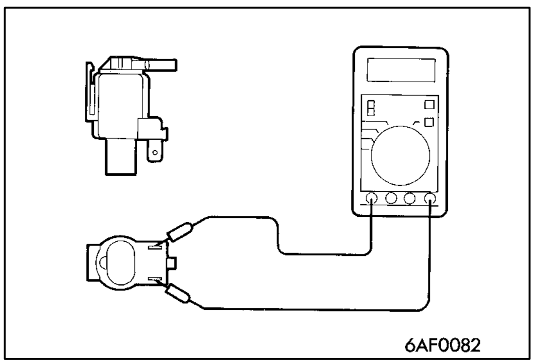
1. Disconnect the vacuum hose (green stripe) from the solenoid valve.
2. Disconnect the harness connector.



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

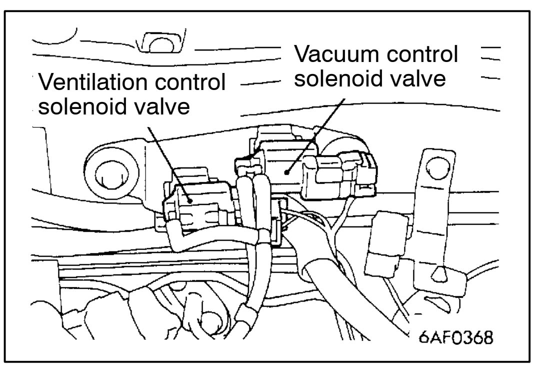
Normal condition:

Battery voltage	Normal condition
Applied	Vacuum maintained
Not applied	Vacuum leaks



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

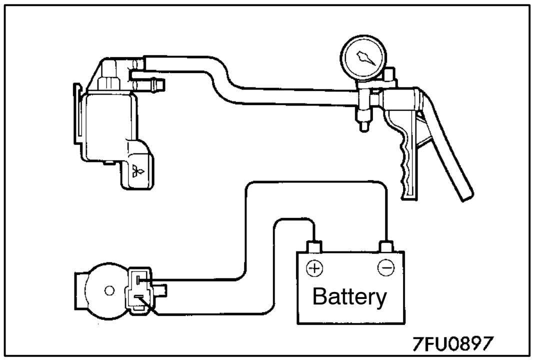
Standard value: 36 - 44 Ω (at 20°C)



VACUUM CONTROL SOLENOID VALVE CHECK <Vehicles with TCL> 13100620048

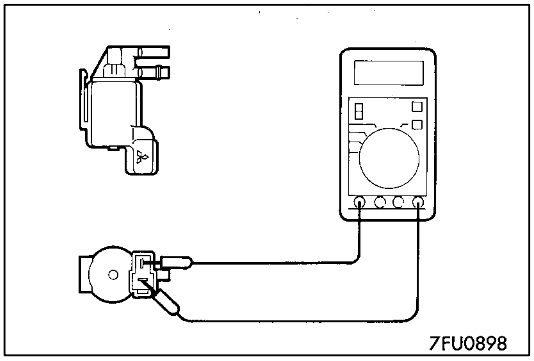
NOTE
When disconnecting the vacuum hose, always make a mark so that it can be reconnected at original position.

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



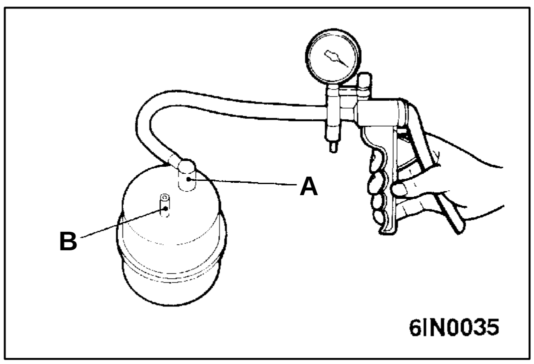
3. Connect a hand vacuum pump to the nipple to which the blue-striped vacuum hose was connected.
4. Check air-tightness by applying a vacuum with voltage applied directly from the battery to the solenoid valve and without applying voltage.

Battery voltage	Normal condition
Applied	Vacuum leaks
Not applied	Vacuum maintained



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

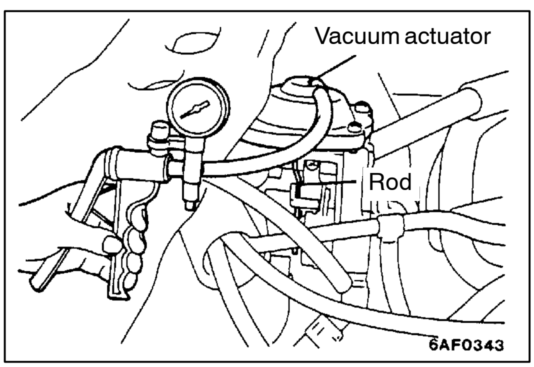
Standard value: 36 - 44 Ω (at 20°C)



VACUUM TANK CHECK 13100810049

<Vehicles with TCL>

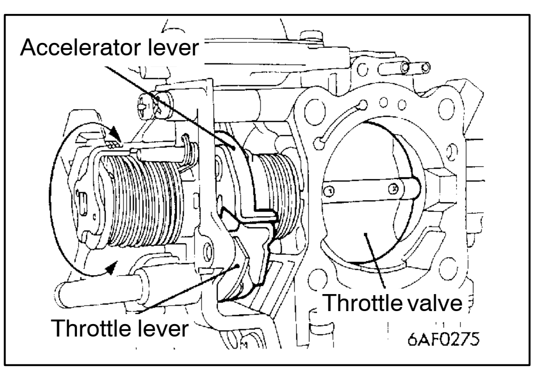
1. Connect a hand vacuum pump to vacuum tank A nipple, apply 67 kPa of vacuum and check that the vacuum is held.
2. Connect a hand vacuum pump to vacuum tank B nipple.
3. First, close A nipple with your finger and apply 67 kPa of vacuum. Then, check that the vacuum leaks immediately when you remove the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



VACUUM ACTUATOR CHECK 13100820042

<Vehicles with TCL>

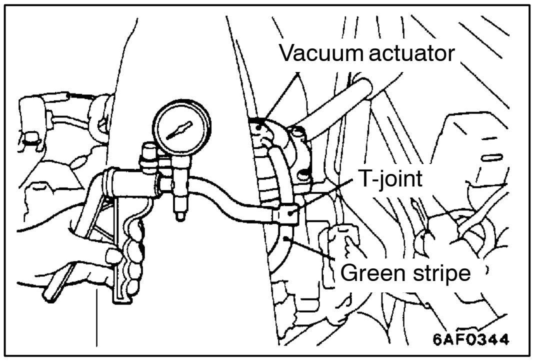
1. Remove the vacuum hose (green stripe) from the vacuum actuator and connect a hand vacuum pump to the vacuum actuator.
2. With the accelerator pedal depressed, check that the rod is pulled up and that vacuum is held when 27 kPa of vacuum is applied.



THROTTLE VALVE OPERATION CHECK 13100830052

<Vehicles with TCL>

1. Check that the throttle valve opens and closes smoothly (throttle lever moves) according to the opening and closing of the accelerator lever.
2. If the throttle valve does not open and close smoothly, there might be a deposit on the throttle valve, so clean the throttle body. (Refer to P.13A-184.)



NEGATIVE PRESSURE CHECK DURING TRACTION CONTROL OPERATION 13100840055

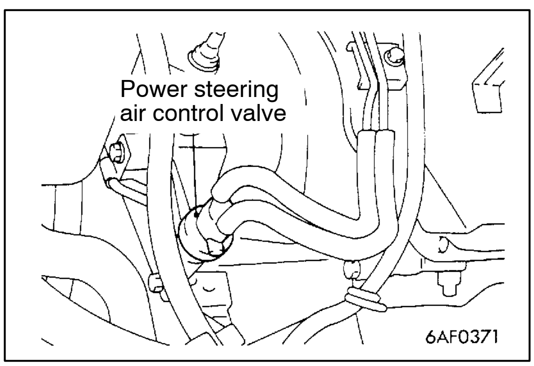
<Vehicles with TCL>

1. Disconnect the vacuum hose (green stripe) from the vacuum actuator, connect a hand vacuum pump between the actuator nipple and the vacuum hose via a T-joint. Set the hand vacuum pump near the driver's seat so that the negative pressure check can be carried out at the driver's seat.
2. Check the negative pressure during traction control operation.
   Inspection service points are the same as for the traction control operation inspection.
   (Refer to GROUP 13H or 23 - On-vehicle Service.)

   Normal condition:

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

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



POWER STEERING AIR CONTROL VALVE OPERATION CHECK 13101180019

1. Disconnect the vacuum hose (connected to air intake hose) from the power steering air control valve, and plug the vacuum hose.
2. Connect a vacuum gauge to the power steering air control valve nipple from which the vacuum hose has been disconnected.
3. Start the engine and run at idle.
4. Check that the value of the vacuum gauge changes from 0 kPa (barometric pressure) to 60 kPa or more when turning the steering wheel.

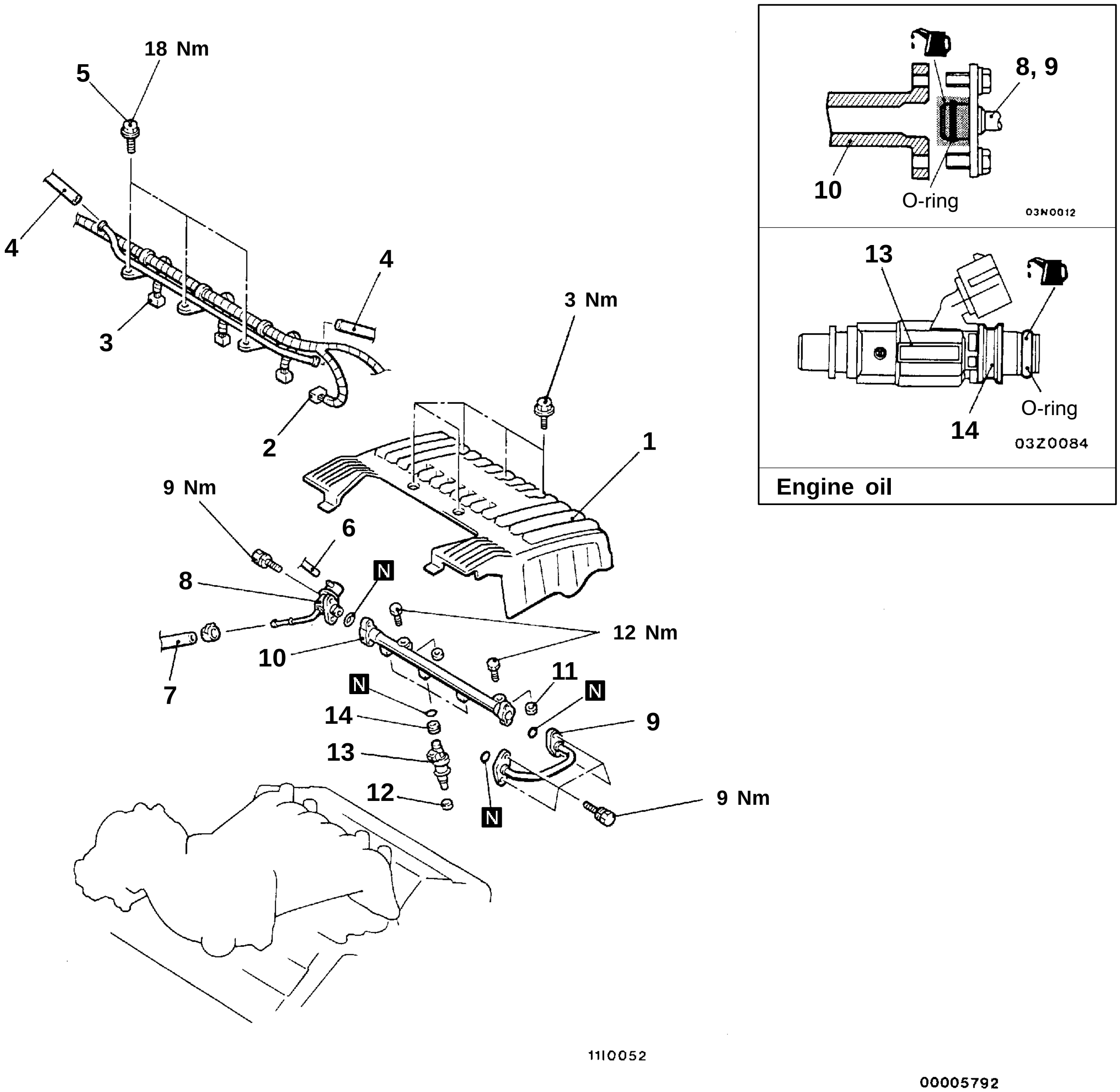
INJECTOR

13100710349

REMOVAL AND INSTALLATION

<Front bank>

Pre-removal Operation
- Fuel Discharge Prevention (Refer to P.13A-88.)



Removal steps

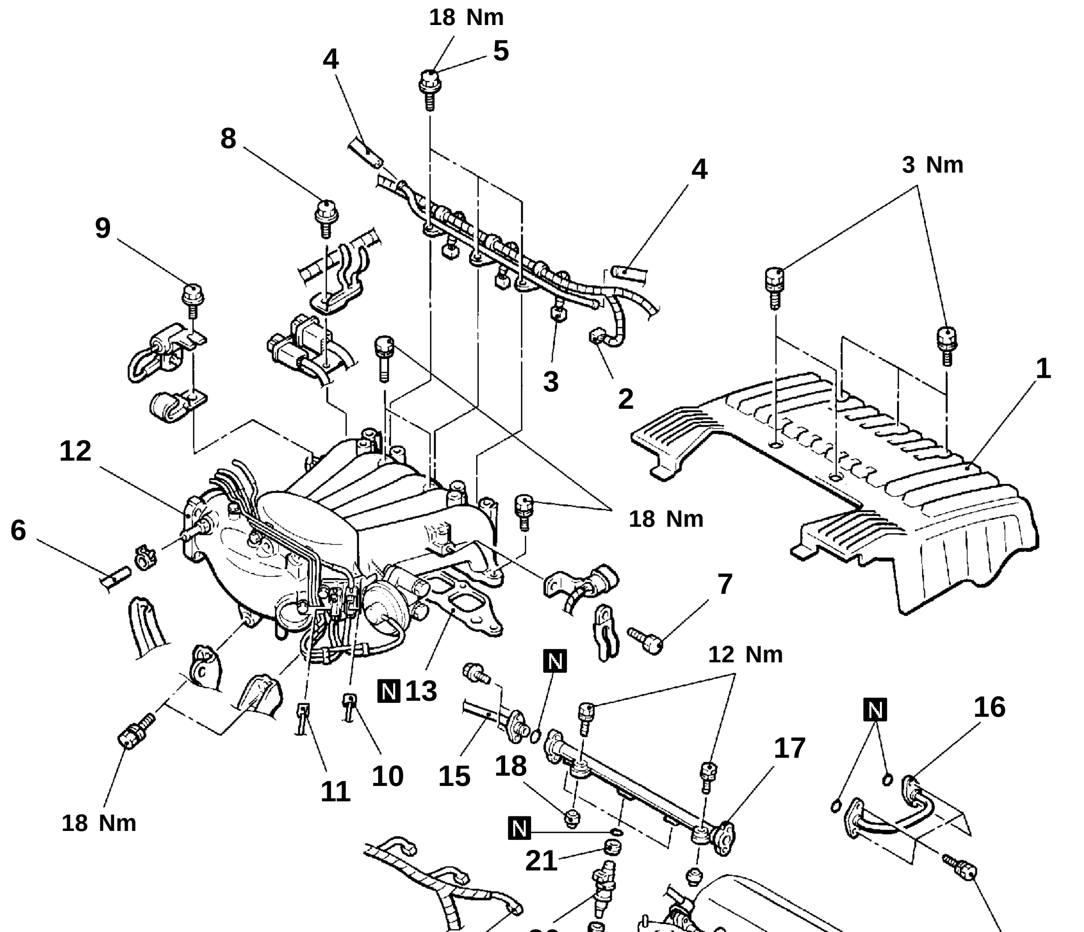
1. Engine cover
2. Crank angle sensor connector
3. Injector connector
4. Vacuum hose connection
5. Air pipe assembly mounting bolt
6. Vacuum hose connection
7. Fuel return hose connection

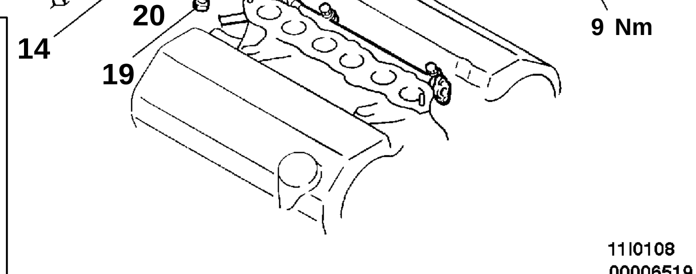
▶A◀ 8. Fuel pressure regulator
▶A◀ 9. Fuel pipe assembly
◀A▶ 10. Delivery pipe
11. Insulator
12. Insulator
◀A▶ ▶A◀ 13. Injector
14. Grommets

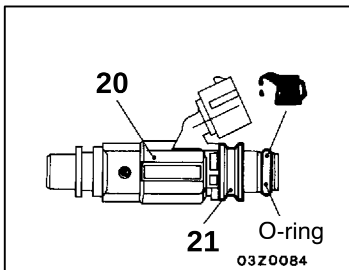
<Rear bank>

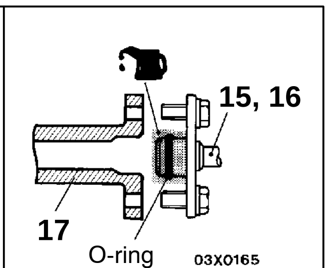
Pre-removal Operation
- Fuel Discharge Prevention (Refer to P.13A-88.)
- Air Cleaner Removal

Post-installation operation
- Air Cleaner Installation
- Accelerator Cable Adjustment (Refer to GROUP 17 - On-vehicle service.)









Engine oil

Removal steps

1. Engine cover
2. Crank angle sensor connector
3. Injector connector
4. Vacuum hose
5. Air pipe assembly mounting bolt
6. Brake booster vacuum hose connection
7. Connector bracket mounting bolt
8. Connector bracket mounting bolt
9. Noise condenser mounting bolt
10. EGR solenoid valve connector
11. Purge control solenoid valve connector
12. Air intake plenum
13. Air intake plenum gasket
14. Injector connector
15. ▶A◀ High pressure fuel hose connection
16. ▶A◀ Fuel pipe assembly
17. ◀A▶ Delivery pipe
18. Insulator
19. Insulator
20. ◀A▶ ▶A◀ Injector
21. 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 PIPE ASSEMBLY/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, fuel pipe assembly, 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.
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 to the standard torque, and tighten the fuel pressure regulator and fuel pipe assembly to the specified torque.

   Tightening torque:
   9 Nm (Fuel pressure regulator)

THROTTLE BODY

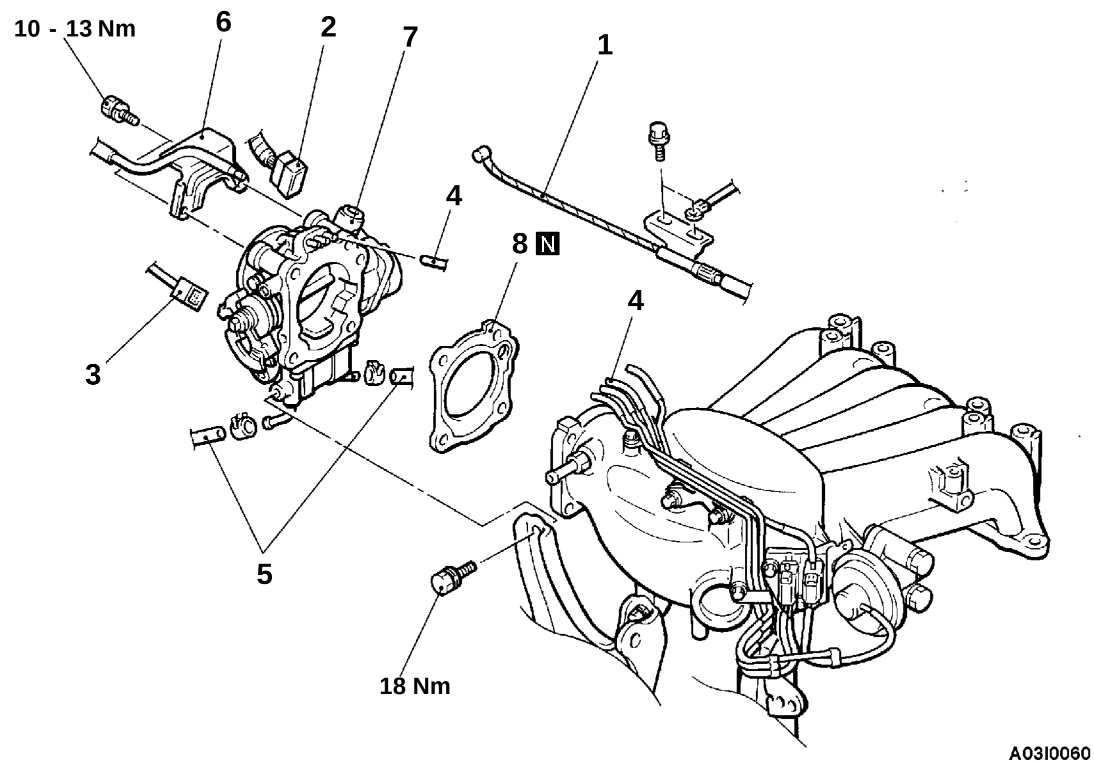
13100770293

REMOVAL AND INSTALLATION

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

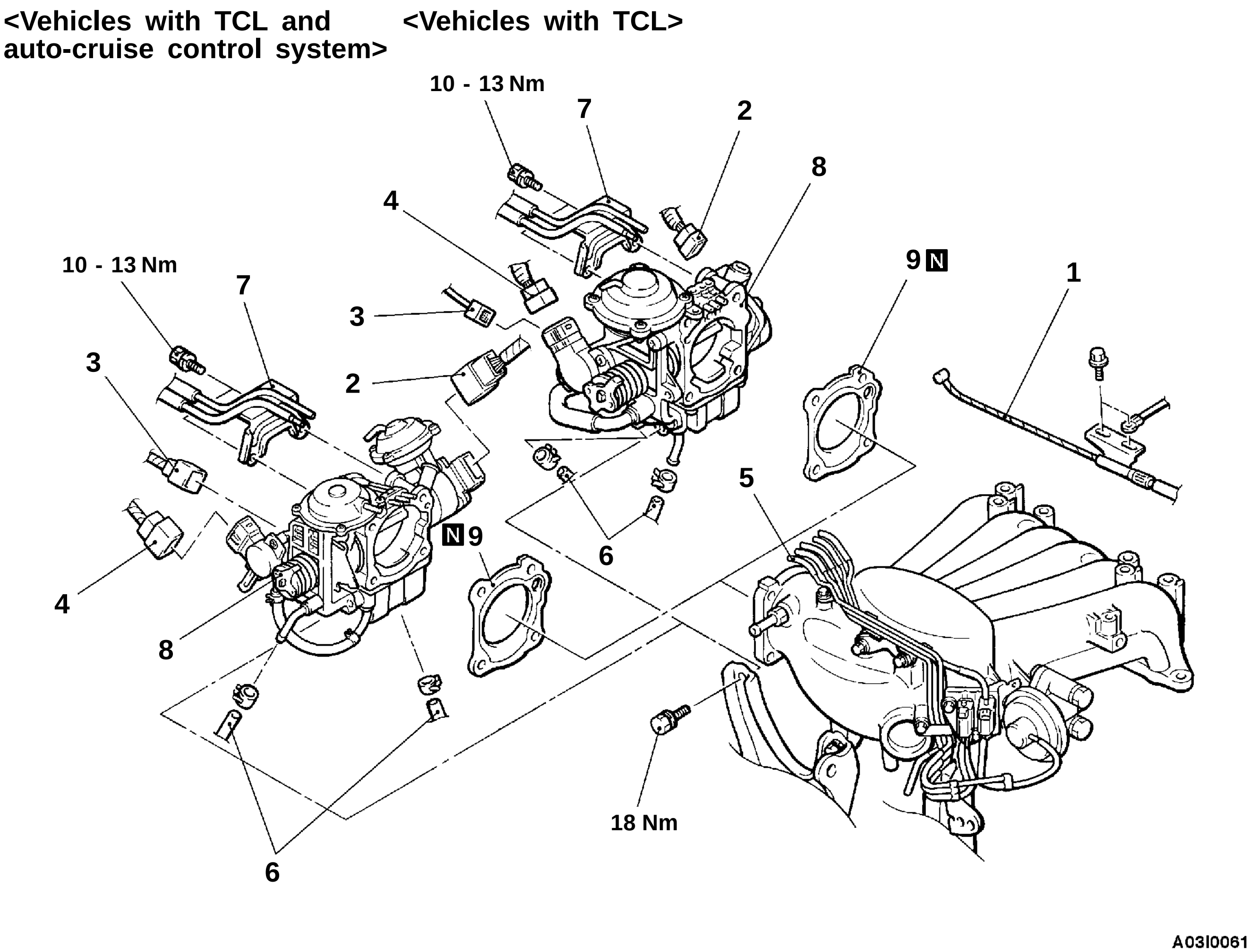
Post-installation Operation
- Air Cleaner Installation
- Engine Coolant Supplying
  (Refer to GROUP 14 - On-vehicle Service.)
- Accelerator Cable Adjustment
  (Refer to GROUP 17 - On-vehicle Service.)

<Vehicles without traction control system>



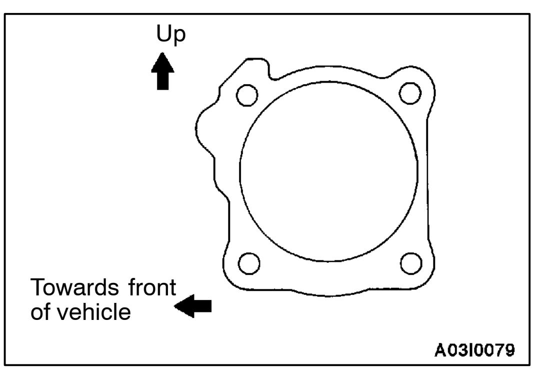
Removal steps

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



Removal steps

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



INSTALLATION SERVICE POINT

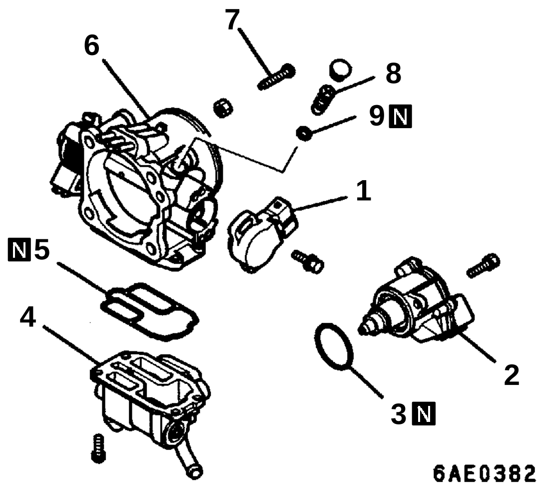
▶A◀ THROTTLE BODY GASKET INSTALLATION

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

DISASSEMBLY AND REASSEMBLY

13100970297

<Vehicles without TCL and auto-cruise control system>

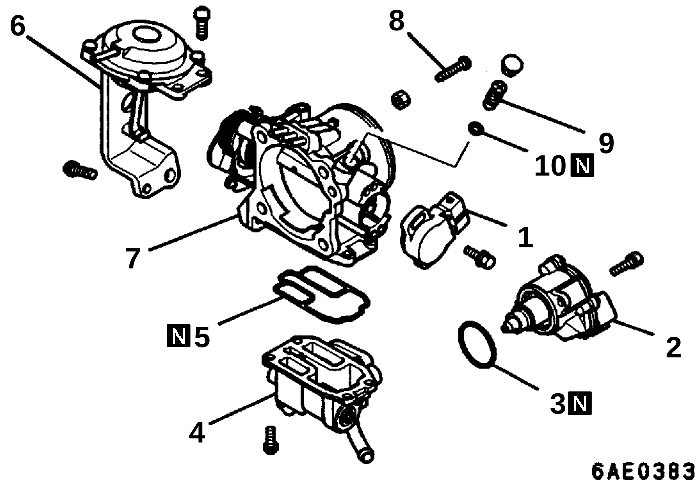


Disassembly steps

▶B◀ 1. Throttle position sensor
2. Idle speed control servo (Stepper motor)
3. O-ring
4. Fast idle air valve
5. O-ring
6. Throttle body
7. Fixed SAS
8. Speed adjusting screw
9. O-ring

NOTE
1. The fixed SAS and the speed adjusting screw are correctly adjusted at the factory and should not be removed.
2. If the fixed SAS should happen to have been removed, carry out fixed SAS adjustment. (Refer to page 13A-187.)
3. If the speed adjusting screw should happen to have been removed, carry out speed adjusting screw adjustment. (Refer to 13A-188.)

<Vehicles with auto-cruise control system>

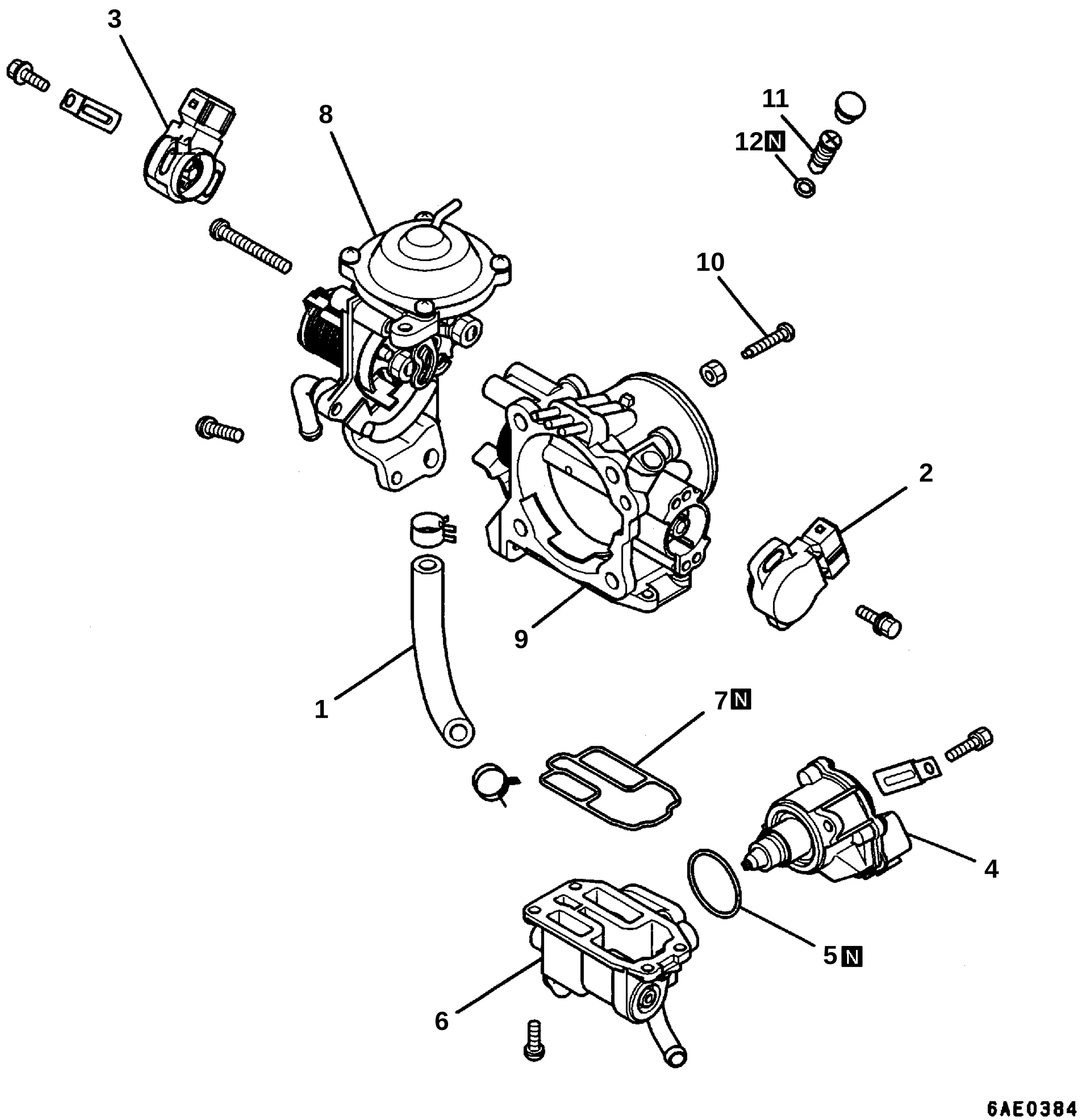


Disassembly steps

▶B◀ 1. Throttle position sensor
2. Idle speed control servo (Stepper motor)
3. O-ring
4. Fast idle air valve
5. O-ring
6. Lever assembly
7. Throttle body
8. Fixed SAS
9. Speed adjusting screw
10. O-ring

NOTE
1. The fixed SAS and the speed adjusting screw are correctly adjusted at the factory and should not be removed.
2. If the fixed SAS should happen to have been removed, carry out fixed SAS adjustment. (Refer to page 13A-187.)
3. If the speed adjusting screw should happen to have been removed, carry out speed adjusting screw adjustment. (Refer to 13A-188.)

<Vehicles with TCL>

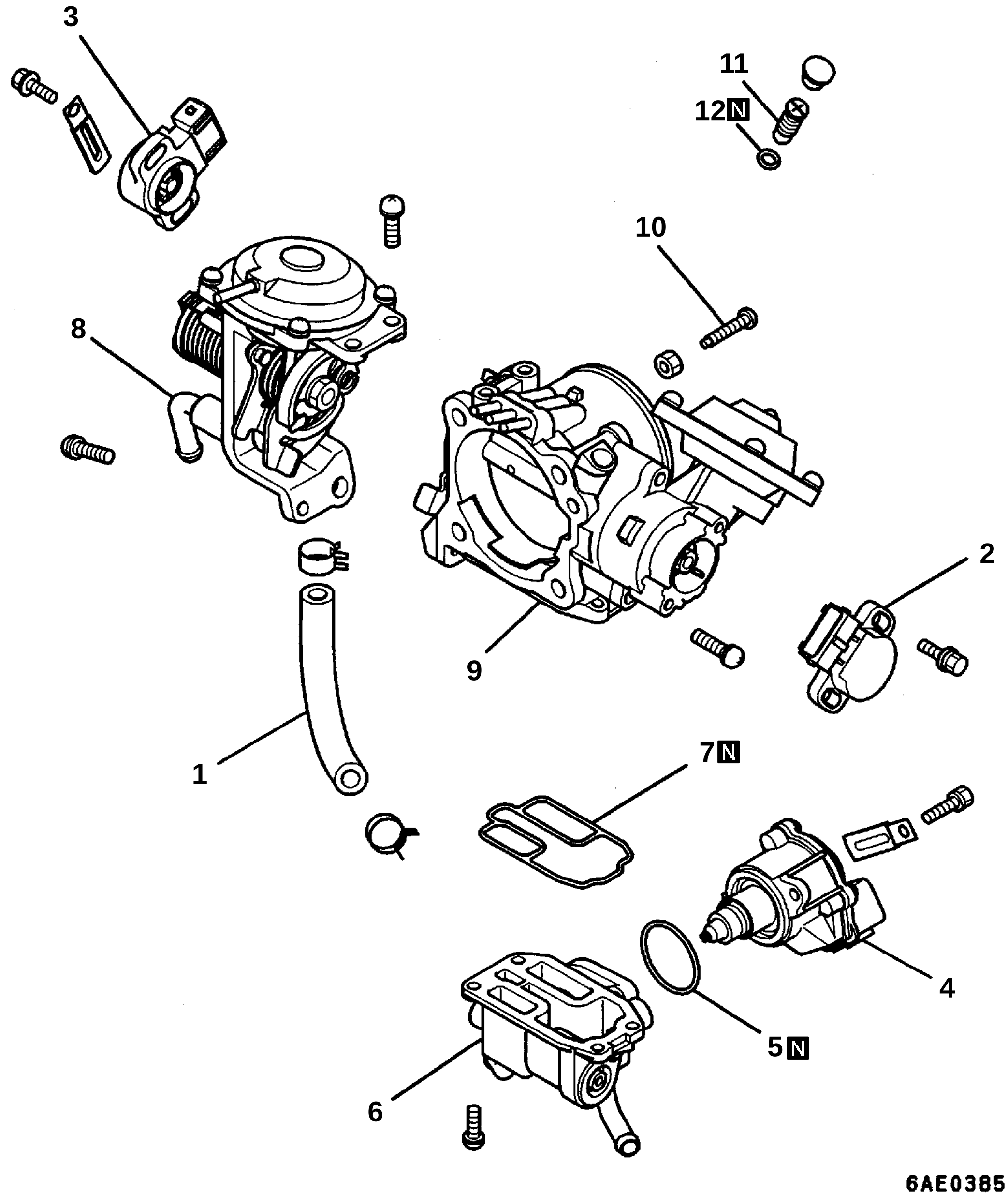


Disassembly steps

1. Water hose
▶B◀ 2. Throttle position sensor
▶A◀ 3. Accelerator pedal position sensor
4. Idle speed control servo (Stepper motor)
5. O-ring
6. Fast idle air valve
7. O-ring
8. Throttle lever
9. Throttle body
10. Fixed SAS
11. Speed adjusting screw
12. O-ring

NOTE
1. The fixed SAS and the speed adjusting screw are correctly adjusted at the factory and should not be removed.
2. If the fixed SAS should happen to have been removed, carry out fixed SAS adjustment. (Refer to 13A-187.)
3. If the speed adjusting screw should happen to have been removed, carry out speed adjusting screw adjustment. (Refer to 13A-188.)

<Vehicles with TCL and auto-cruise control system>



Disassembly steps

1. Water hose
2. ▶B◀ Throttle position sensor
3. ▶A◀ Accelerator pedal position sensor
4. Idle speed control servo (Stepper motor)
5. O-ring
6. Fast idle air valve
7. O-ring
8. Throttle lever
9. Throttle body
10. Fixed SAS
11. Speed adjusting screw
12. O-ring

NOTE

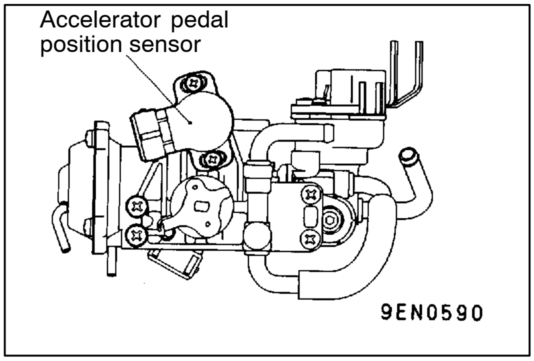
1. The fixed SAS and the speed adjusting screw are correctly adjusted at the factory and should not be removed.
2. If the fixed SAS should happen to have been removed, carry out fixed SAS adjustment. (Refer to 13A-187.)
3. If the speed adjusting screw should happen to have been removed, carry out speed adjusting screw adjustment. (Refer to 13A-188.)

CLEANING THROTTLE BODY PARTS

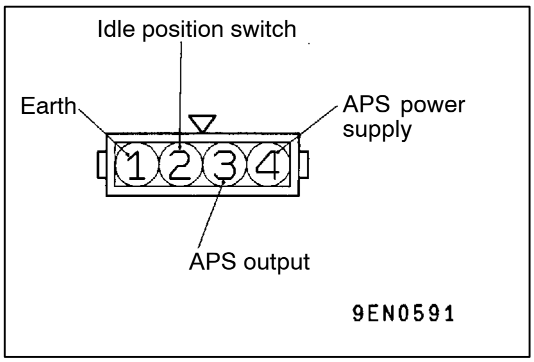
1. Clean all throttle body parts.
   Do not use solvent to clean the following parts:
   - Throttle position sensor
   - Accelerator pedal position sensor
   - Idle speed control body assembly

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

REASSEMBLY SERVICE POINTS



▶A◀ ACCELERATOR PEDAL POSITION SENSOR (APS) INSTALLATION

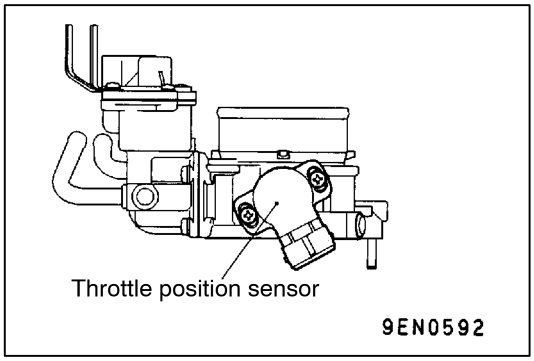


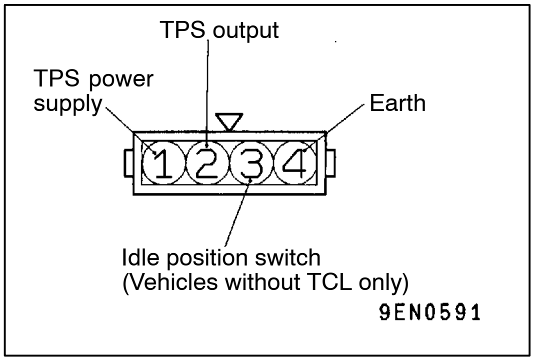
1. Install the APS so that it faces as shown in the illustration, and then tighten it with the screw.
2. Connect a multimeter between terminal (3) (APS output) and terminal (4) (APS power supply) of the APS connector, and check that the resistance increases gradually as the throttle valve is opened slowly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

   Normal condition:

Throttle valve condition	Continuity
Fully closed	Continuity
Fully open	No continuity

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





▶B◀ THROTTLE POSITION SENSOR (TPS) INSTALLATION

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

   Normal condition:

Throttle valve condition	Continuity
Fully closed	Continuity
Fully open	No continuity

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

DIESEL FUEL

CONTENTS

13309000047

GENERAL INFORMATION

13300010063

The electronically-controlled fuel injection system consists of sensors which detect the condition of the diesel engine, an engine-ECU which controls the system based on signals from these sensors, and actuators which operate according to control commands from the engine-ECU.
The engine-ECU carries out operations such as fuel injection rate control, fuel injection timing control and idle up control. In addition, the engine-ECU is equipped with several self-diagnosis functions which make troubleshooting easier in the event that a problem develops.

FUEL INJECTION RATE CONTROL

The fuel injection completion timing is controlled by means of a solenoid-type spill valve to ensure that the optimum amount of fuel is supplied to the engine in accordance with gradual changes in the engine running condition.
Before fuel injection starts, the solenoid-type spill valve is on (energized), so that the valve is closed. As the plunger turns and rises, fuel is sent out under pressure, and when the fuel flow rate reaches the target value for fuel injection, the solenoid-type spill valve turns off. When the solenoid-type spill valve turns off, the fuel under high pressure inside the plunger is leaked out into the pump chamber and fuel injection is completed.

FUEL INJECTION TIMING CONTROL

The position of the injection pump timer piston is controlled so that fuel injection is carried out at the optimum timing in accordance with the engine running condition.
The timer piston position is determined by duty control of the timing control solenoid valve which is located in the line between the high-pressure chamber and the low-pressure chamber of the timer piston.
The fuel injection timing is advanced by increasing the control duty of the timing control solenoid valve.

IDLE SPEED CONTROL

Controlling the fuel injection rate in accordance with the engine running condition maintains the idle speed at the optimum condition.

SELF-DIAGNOSIS FUNCTION

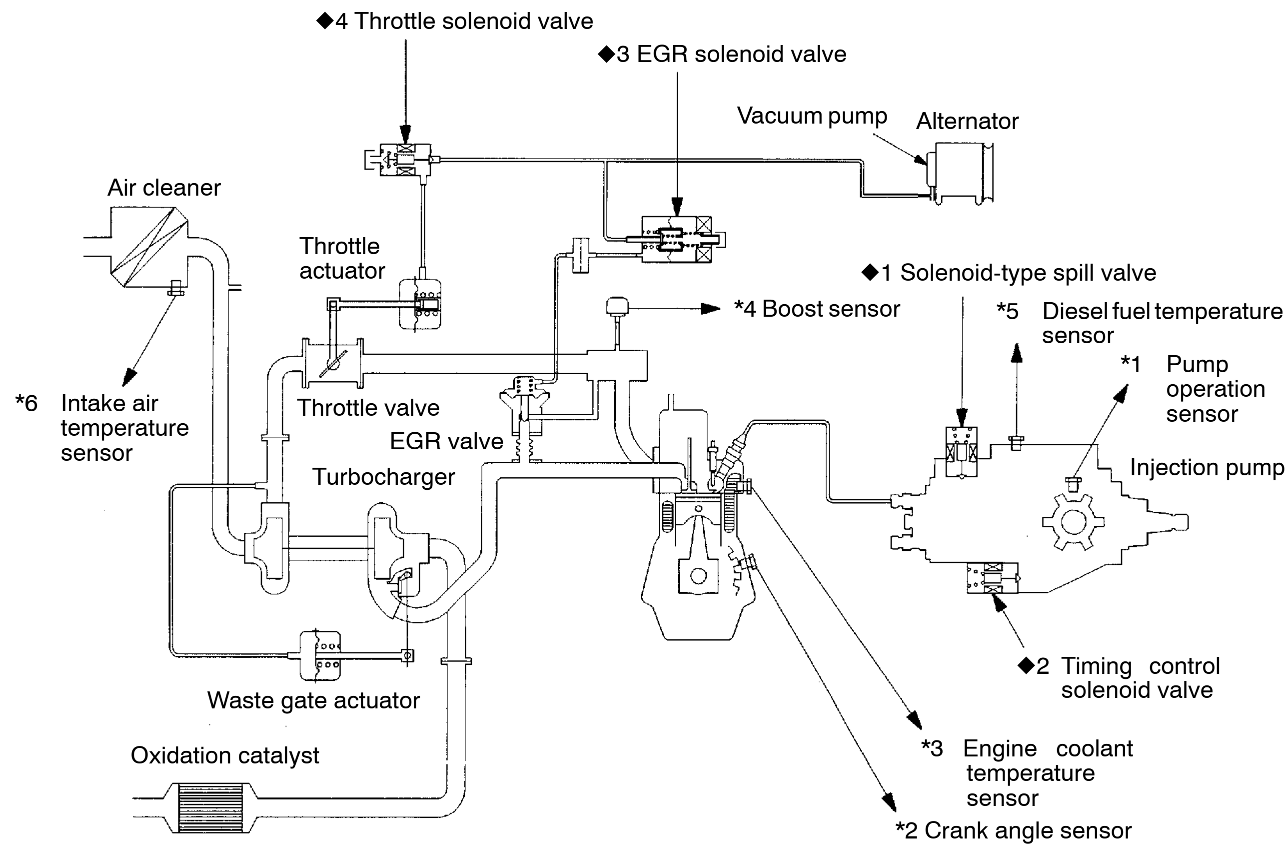
- When an abnormality is detected in any of the sensors or actuators, the engine warning lamp illuminates to warn the driver.
- When an abnormality is detected in any of the sensors or actuators, a diagnosis code number corresponding to the problem which occurred is output.
- The RAM data relating to the sensors and actuators which is stored in the engine-ECU can be read using the MUT-II. In addition, the actuators can be force-driven under certain conditions.

OTHER CONTROL FUNCTIONS

1. Power Supply Control
   When the ignition switch is turned to ON, the relay turns on and power is supplied to components such as the timing control solenoid valve.
2. Intake Air Throttle Control
   When the engine is idling after having warmed up, the throttle valve is half opened to restrict the amount of intake air in order to reduce vibration and noise.
3. A/C Relay Control
   Turns the compressor clutch of the A/C ON and OFF
4. Fan motor relay control
   The radiator fan and condenser fan operating speeds are controlled in accordance with the engine coolant temperature and the vehicle speed.
5. Glow Control
   Refer to GROUP 16.
6. EGR Control
   Refer to GROUP 17.

DIESEL FUEL SYSTEM DIAGRAM

Inputs		Outputs
*1 Pump operation sensor *2 Crank angle sensor *3 Engine coolant temperature sensor *4 Boost sensor *5 Diesel fuel temperature sensor *6 Intake air temperature sensor ● Accelerator pedal position sensor ● Idle position switch 1 ● Idle position switch 2 ● Power supply voltage ● Ignition switch-IG ● Ignition switch-ST ● Vehicle speed sensor ● A/C switch ● Injection timing correction resistor ● Injection rate correction resistor	⇨ Engine-ECU ⇨	◆1 Solenoid-type spill valve ◆2 Timing control solenoid valve ◆3 EGR solenoid valve ◆4 Throttle solenoid valve ● Control relay ● Solenoid-type spill valve relay ● Glow plug relay ● A/C power relay ● Fan motor relay ● Engine warning lamp ● Glow indicator lamp ● Diagnosis signal



DFU0661

SERVICE SPECIFICATIONS

13300030069

Items		Specifications
Accelerator pedal position sensor adjusting voltage mV		530 - 570
Idle position switch 1 check voltage mV		875 - 925
Intake air temperature sensor resistance kΩ	At 20 °C	2.3 - 3.0
	At 80 °C	0.30 - 0.42
Engine coolant temperature sensor resistance kΩ	At 20 °C	2.1 - 2.7
	At 80 °C	0.26 - 0.36
Resistance between accelerator pedal position sensor terminals (1) and (4) kΩ		3.5 - 6.5
Solenoid-type spill valve resistance Ω		1 - 2 (at 20 °C)
Timing control solenoid valve resistance Ω		8 - 12 (at 20 °C)
Diesel fuel temperature sensor resistance kΩ		2.2 - 2.7 (at 20 °C)
Pump operation sensor resistance Ω		215 - 245 (at 20 °C)
Injection timing correction resistor resistance kΩ		0.1 - 2.5 (at 20 °C)
Injection rate correction resistor resistance kΩ		0.1 - 2.5 (at 20 °C)
Fuel cut solenoid valve resistance Ω		8 - 10
Throttle solenoid valve resistance Ω		36 - 44 (at 20 °C)

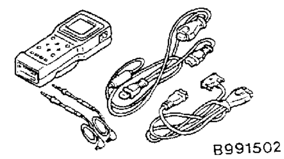
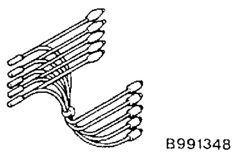
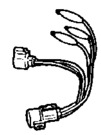
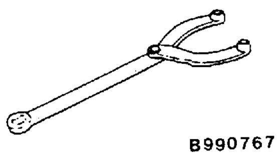
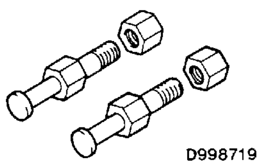
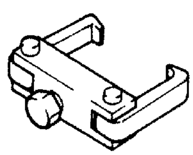
SEALANT

13300050010

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

SPECIAL TOOLS

13300060068

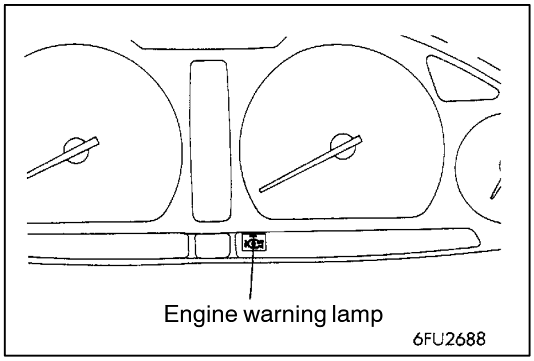
Tool	Number	Name	Use
	MB991502	MUT-II sub assembly	• Reading diagnosis code • Checking the electronically-controlled fuel injection system
	MB991348	Test harness set	Inspection using an analyzer
	MD998478	Test harness (3 pin, triangle)	Inspection using an analyzer
	MB990767	End yoke holder	Fuel injection pump sprocket holding
	MD998719	Crankshaft pulley holder pin	
	MD998388	Sprocket puller	Fuel injection pump sprocket removal

TROUBLESHOOTING

13300370024

DIAGNOSIS TROUBLESHOOTING FLOW

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



DIAGNOSIS FUNCTION

13300380027

ENGINE WARNING LAMP (CHECK ENGINE LAMP)

If an abnormality occurs in any of the following items which are related to the electronically-controlled fuel injection 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

Accelerator pedal position sensor
Boost sensor
Barometric pressure sensor
Diesel fuel temperature sensor
Engine coolant temperature sensor
Intake air temperature sensor
Pump operation sensor
Crank angle sensor
Idle position switch 1
Idle position switch 2
Throttle solenoid valve system
Timing control solenoid valve system
Solenoid-type spill valve system
Immobilizer system
Engine-ECU

METHOD OF READING AND ERASING DIAGNOSIS CODES

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

INSPECTION USING MUT-II DATA LIST AND ACTUATOR TESTING

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

FAIL-SAFE/BACKUP FUNCTION TABLE

13300390020

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
Accelerator pedal position sensor	Carries out control as if the accelerator opening angle is at a specified angle (0 %/approx. 10%) on the basis of idle position switch inputs (ON/OFF).
Boost sensor	Carries out control as if the intake air pressure is at a specified value (101 kPa).
Diesel fuel temperature sensor	Carries out control as if the fuel temperature is 50 °C.
Engine coolant temperature sensor	Carries out control as if the engine coolant temperature is at a specified value (80°C).
Intake air temperature sensor	Carries out control as if the intake air temperature is at a specified value (25°C).
Vehicle speed sensor	Carries out control as if the vehicle is moving.
Pump operation sensor	Controls the injection rate according to the speed reported by the crank angle sensor.
Crank angle sensor	• Reduces the fuel injection rate. • Fixes the injection timing at a specified value.
Ignition switch-ST	Carries out control as if ignition switch ST is OFF.
Timing control solenoid valve	Reduces the fuel injection rate.
Solenoid-type spill valve	Solenoid-type spill valve relay is turned off (engine stops).
Correction resistors (injection timing and injection rate)	Carries out control as if the correction resistance are at specified values.

INSPECTION CHART FOR DIAGNOSIS CODES

13300400044

Caution
Check that the engine-ECU earth circuit is normal before checking for the cause of the problem.

Code No.	Diagnosis item	Reference page
11	Accelerator pedal position sensor system	13E-9
12	Boost sensor system	13E-10
13	Barometric pressure sensor system	13E-11
14	Diesel fuel temperature sensor system	13E-11
15	Engine coolant temperature sensor system	13E-12
16	Intake air temperature sensor system	13E-12
17	Vehicle speed sensor system	13E-13
18	Pump operation sensor system (open circuit)	13E-14
19	Pump operation sensor system (intermittent fault)	13E-14
21	Crank angle sensor system	13E-15
22	Ignition switch-ST signal system	13E-16
23	Idle position switch 1 system	13E-16
24	Idle position switch 2 system	13E-17
41	Throttle solenoid valve system	13E-18
43	Timing control solenoid valve system	13E-19
44	Solenoid-type spill valve system	13E-20
45	Injection timing correction resistor system	13E-21
46	Injection rare correction resistor system	13E-21
47	Immobilizer system	13E-22

INSPECTION PROCEDURE FOR DIAGNOSIS CODES

Code No.11 Accelerator pedal position sensor system	Probable cause
Range of Check, Set Conditions ● Open or short circuit is detected in accelerator pedal position sensor circuit. or ● Mechanical problem is detected in accelerator pedal position sensor.	● Malfunction of the accelerator pedal position sensor ● Open or short circuit in accelerator pedal position sensor circuit or poor connector contact ● Malfunction of the engine-ECU
Range of Check ● Idle position switch 1: ON ● Idle position switch 2: ON Set Conditions ● Accelerator pedal position sensor signal output is 1.2 V or higher	

Check the accelerator pedal position sensor. (Refer to P.13E-57.)

- NG → **Replace**
- OK ↓

Measure at the accelerator pedal position sensor connector B-41.
- Disconnect the connector and measure at the harness side connector.
- Voltage between 1 and earth (Ignition switch: ON)
  OK: 4.5 - 5.5 V
- Continuity between 4 and earth
  OK: Continuity

NG → **Check the following connector:**
C-54
- NG → **Repair**
- OK ↓

Check trouble symptom.
- NG ↓

Check the harness wire between the engine-ECU and the accelerator pedal position sensor connector.
- NG → **Repair**
- OK ↓

Repair the engine-ECU.

OK ↓

Check the following connector:
B-41
- NG → **Repair**
- OK ↓

Check trouble symptom.
- NG ↓

Replace the engine-ECU.

Code No.12 Boost sensor system	Probable cause
Range of Check, Set Conditions • Open or short circuit is detected in boost sensor circuit for 1 second.	• Malfunction of the boost sensor • Open or short circuit in boost sensor circuit or poor connector contact • Malfunction of the engine-ECU

Measure at the boost sensor connector B-50.
- Connect the connector.
  (Use the test harness: MB991348)
- Voltage between 1 and earth
  (Ignition switch: ON)
  OK: 2.0 - 2.6 V (Altitude: 0 m)
  1.7 - 2.3 V (Altitude: 1200 m)

NG → Measure at the boost sensor connector B-50.
- Disconnect the connector and measure at the harness side connector.
- Voltage between 3 and earth
  (Ignition switch: ON)
  OK: 4.8 - 5.2 V
- Continuity between 2 and earth
  OK: Continuity

NG → **Check the following connector:**
C-54

OK → Check trouble symptom. / NG → **Repair**

NG → Check the harness wire between the engine-ECU and the boost sensor connector.

OK → Replace the engine-ECU. / NG → **Repair**

OK → **Check the following connector:**
B-50

OK → Check trouble symptom. / NG → **Repair**

NG → Check the harness wire between the engine-ECU and the boost sensor connector.

OK → Check the vacuum hose between the boost sensor and the intake manifold. / NG → **Repair**

OK → Replace the boost sensor. / NG → **Repair**

OK → Measure at the engine-ECU connector C-54.
- Connect the connector.
- Voltage between 37 and earth
  (Ignition switch: ON)
  OK: 2.0 - 2.6 V (Altitude: 0 m)
  1.7 - 2.3 V (Altitude: 1200 m)

NG → Check the harness wire between the engine-ECU and the boost sensor connector, and repair if necessary.

OK → **Check the following connectors:**
B-50, C-54

OK → Check trouble symptom. / NG → **Repair**

NG → Replace the engine-ECU.

Code No.13 Barometric pressure sensor system	Probable cause
Range of Check, Set Conditions ● An abnormal signal being output from the barometric pressure sensor is detected for 3 seconds.	● Malfunction of the engine-ECU

MUT-II Data list
03 Barometric pressure sensor

OK → **INTERMITTENT MALFUNCTIONS**

NG ↓

Replace the engine-ECU.

Code No.14 Diesel fuel temperature sensor system	Probable cause
Range of Check ● Open or short circuit is detected in diesel fuel temperature sensor circuit for 4 seconds.	● Malfunction of the diesel fuel temperature sensor ● Open or short circuit in diesel fuel temperature sensor circuit or poor connector contact ● Malfunction of the engine-ECU

Check the diesel fuel temperature sensor. (Refer to P.13E-59.)

NG → Replace the injection pump.

OK ↓

Measure at the diesel fuel temperature sensor connector B-62.
- Disconnect the connector and measure at the harness side connector.
- Voltage between 1 and earth (Ignition switch: ON)
  OK: 4.5 - 5.5 V
- Continuity between 2 and earth
  OK: Continuity

NG → **Check the following connector:**
C-54

NG → **Repair**

OK ↓

Check trouble symptom.

NG ↓

Check the harness wire between the engine-ECU and the diesel fuel temperature sensor connector.

NG → **Repair**

OK ↓

Replace the engine-ECU.

OK ↓ (from the measurement at connector B-62)

Check the following connector:
B-62

NG → **Repair**

OK ↓

Check trouble symptom.

NG ↓

Replace the engine-ECU.

Code No.15 Engine coolant temperature sensor system	Probable cause
Range of Check, Set Conditions ● Open or short circuit is detected in engine coolant temperature sensor circuit for 1 second.	● Malfunction of the engine coolant temperature sensor ● Open or short circuit in engine coolant temperature sensor circuit or poor connector contact ● Malfunction of engine-ECU

Check the engine coolant temperature sensor. (Refer to P.13E-57.)
- NG → **Replace**
- OK ↓

Measure at the engine coolant temperature sensor connector B-33.
- Disconnect the connector and measure at the harness side connector.
- Voltage between 2 and earth (Ignition switch: ON)
  OK: 4.5 - 5.5 V
- Continuity between 1 and earth
  OK: Continuity

OK ↓

Check the following connector:
B-33
- NG → **Repair**
- OK ↓

Check trouble symptom.

NG ↓

Replace the engine-ECU.

NG (from measurement at B-33) →

Check the following connector:
C-54
- NG → **Repair**
- OK ↓

Check trouble symptom.

NG ↓

Check the harness wire between the engine-ECU and the engine coolant temperature sensor connector.
- NG → **Repair**
- OK ↓

Replace the engine-ECU.

Code No.16 Intake air temperature sensor system	Probable cause
Range of Check, Set Conditions ● Open or short circuit is detected in intake air temperature sensor circuit for 3 seconds.	● Malfunction of the intake air temperature sensor ● Open or short circuit in intake air temperature sensor circuit or poor connector contact ● Malfunction of the engine-ECU

Check the intake air temperature sensor. (Refer to P.13E-56.)
- NG → **Replace**
- OK ↓

Measure at the intake air temperature sensor connector B-45.
- Disconnect the connector and measure at the harness side connector.
- Voltage between 1 and earth (Ignition switch: ON)
  OK: 4.5 - 5.5 V
- Continuity between 2 and earth
  OK: Continuity

OK ↓

Check the following connector:
B-45
- NG → **Repair**
- OK ↓

Check trouble symptom.

NG ↓

Replace the engine-ECU.

NG (from measurement at B-45) →

Check the following connector:
C-54
- NG → **Repair**
- OK ↓

Check trouble symptom.

NG ↓

Check the harness wire between the engine-ECU and the intake air temperature sensor connector.
- NG → **Repair**
- OK ↓

Replace the engine-ECU.

Code No.17 Vehicle speed sensor system	Probable cause
Range of Check ● Engine speed: 2,400 r/min or more ● Accelerator pedal opening amount: 50 % or more ● Engine coolant temperature: 60 °C or higher Set Conditions ● Vehicle speed signal is 0 km/h for 10 seconds or more.	● Malfunction of the vehicle speed sensor ● Open or short circuit in vehicle speed sensor circuit or poor connector contact ● Malfunction of the engine-ECU

Check the vehicle speed sensor. (Refer to GROUP 54 - Combination Meters.)
- NG → **Replace**
- OK ↓

Measure at the vehicle speed sensor connector B-66.
- Disconnect the connector, and measure at the harness side.

1. Voltage between 1 and earth (Ignition switch: ON)
   OK: System voltage
2. Voltage between 3 and earth (Ignition switch: ON)
   OK: 4.8 - 5.2 V
3. Continuity between 2 and earth
   OK: Continuity

OK ↓

Check the following connectors:
B-66, C-53
- NG → **Repair**
- OK ↓

Check trouble symptom.
- NG ↓

Check the harness wire between the engine-ECU and the vehicle speed sensor connector.
- NG → **Repair**
- OK ↓

Replace the engine-ECU.

1. NG →

Check the following connectors:
B-65, C-90, C-135, C-131
- NG → **Repair**
- OK ↓

Check trouble symptom.
- NG ↓

Check the harness wire between the vehicle speed sensor and ignition switch connector.
- NG → **Repair**
- OK ↓

Check the ignition switch. (Refer to GROUP 54 - Ignition Switch.)

2. NG →

Check the following connectors:
B-65, C-56, C-53
- NG → **Repair**
- OK ↓

Check trouble symptom.
- NG ↓

Check the harness wire between the engine-ECU and the vehicle speed sensor connector.
- NG → **Repair**
- OK ↓

Replace the engine-ECU.

3. NG →

Check the following connector:
B-65
- NG → **Repair**
- OK ↓

Check trouble symptom.
- NG ↓

Check the harness wire between the vehicle speed sensor and the earth, and repair if necessary.

Code No.18 Pump operation sensor system (open circuit)	Probable cause
Range of Check ● The injection pump operation speed computed from the crank angle sensor signal is 80 r/min or more. Set Conditions ● No injection pump operation signal (pump operation sensor signal) is not during six successive crank angle sensor pulse signal inputs.	● Malfunction of the pump operation sensor ● Open or short circuit in pump operation sensor circuit or poor connector contact ● Malfunction of the engine-ECU

Check the pump operation sensor. (Refer to P.13E-60.)
- NG → Replace the injection pump.
- OK ↓

Measure at the engine-ECU connector C-53.
- Connect the connector.
- Voltage between 10 and 23 (AC range)
  OK: 0.2 - 1.0 V (Engine: idling)
  1.2 - 2.2 V (Engine: 2500 r/min)
- NG → **Check the following connectors:** C-53, B-63
  - NG → **Repair**
  - OK ↓ Check trouble symptom.
    - NG ↓ Check the harness wire between the engine-ECU and the pomp operation sensor connector, and repair if necessary.
- OK ↓

Replace the engine-ECU.

Code No.19 Pump operation sensor system (intermittent fault)	Probable cause
Range of Check ● No open circuit in pump operation sensor ● Injection pump speed: 650 r/min or more ● Ignition switch-ST signal: OFF Set Conditions ● Abnormal number of pump operation sensor signal pulses counted during two full engine rotations. ● Pulse count abnormality occurs 10 times or more.	● Malfunction of the pump operation sensor ● Poor contact in pump operation sensor connector or malfunction of circuit ● Malfunction of pump operation sensor circuit shielding ● Malfunction of the engine-ECU

Check the following connectors:
C-53, B-63
- NG → **Repair**
- OK ↓

Check trouble symptom.
- NG ↓

Check the harness wire between the engine-ECU and the pump operation sensor connector.
- NG → **Repair**
- OK ↓

Replace the engine-ECU.

Code No.21 Crank angle sensor system	Probable cause
Range of Check ● Injection pump speed: 500 r/min or more Set Conditions ● No crank angle sensor signal pulses input during two full engine rotations.	● Malfunction of the crank angle sensor ● Open or short circuit in crank angle sensor circuit or poor connector contact ● Malfunction of the engine-ECU

Measure at the crank angle sensor connector B-77.
- Connect the connector. (Use the test harness: MD998478)
- Voltage between 2 and earth (Engine: cranking)
  OK: 0.4 - 4.0 V
- Voltage between 2 and earth (Engine: idling)
  OK: 2.5 - 4.5 V

OK → Replace the engine-ECU.

NG ↓

Measure at the crank angle sensor connector B-77.
- Disconnect the connector and measure at the harness side connector.

1. Voltage between 3 and earth (Ignition switch: ON)
   OK: System voltage
2. Voltage between 2 and earth (Ignition switch: ON)
   OK: 4.8 - 5.2 V
3. Continuity between 1 and earth
   OK: Continuity

1.NG → Check the harness wire between the crank angle sensor and the control relay connector, and repair if necessary.

2.NG → **Check the following connector:**
C-53

- NG → **Repair**
- OK ↓ Check trouble symptom.
- NG ↓ Check the harness wire between the engine-ECU and the crank angle sensor connector.
  - NG → **Repair**
  - OK ↓ Replace the engine-ECU.

3.NG → Check the harness wire between the crank angle sensor and the earth, and repair if necessary.

OK ↓

Check the following connector:
B-77

- NG → **Repair**
- OK ↓ Check trouble symptom.
- NG ↓ Replace the crank angle sensor.

Code No.22 Ignition switch-ST signal system	Probable cause
Range of Check ● Ignition switch: ON ● Injection pump speed: 1,200 r/min or more Set Conditions ● Ignition switch-ST signal (high) is input for 10 seconds or more.	● Malfunction of the starter relay ● Malfunction of starter relay-related circuit ● Malfunction of the engine-ECU

Measure at the engine-ECU connector C-55.
- Disconnect the connector and measure at the harness side connector.
- Voltage between 51 and earth (Ignition switch: ST)
  OK: 8 V or higher

NG → **Check the following connectors:**
B-30, A-10
- OK → Check trouble symptom.
  - NG → Check the harness wire between the engine-ECU and the starter relay connector.
    - OK → Replace the starter relay.
    - NG → **Repair**
- NG → **Repair**

OK → **Check the following connector:**
C-55
- OK → Check trouble symptom.
  - NG → Replace the engine-ECU.
- NG → **Repair**

Code No.23 Idle position switch 1 system	Probable cause
Range of Check ● Accelerator pedal position sensor signal output is 1.2 V or higher. ● Idle position switch 2: OFF Set Conditions ● Idle position switch 1 on signal is input for 1 second or more.	● Malfunction of the idle position switch 1 ● Open or short circuit in idle position switch 1 circuit or poor connector contact ● Malfunction of the engine-ECU
Range of Check ● Accelerator pedal position sensor signal output is 0.58 V or lower. ● Idle position switch 2: ON Set Conditions ● Idle position switch 1 off signal is input for 1 second or more.	

Check the idle position switch 1. (Refer to P.13E-58.)

NG → Replace the accelerator pedal position sensor.

OK → Measure at the accelerator pedal position sensor connector B-41.
- Disconnect the connector and measure at the harness side connector.
- Voltage between 3 and earth (Ignition switch: ON)
  OK: 4 V or higher
- Continuity between 4 and earth
  OK: Continuity

NG → **Check the following connector:**
C-54
- OK → Check trouble symptom.
  - NG → Check the harness wire between the engine-ECU and the accelerator pedal position sensor connector.
    - OK → Replace the engine-ECU.
    - NG → **Repair**
- NG → **Repair**

OK → **Check the following connector:**
B-41
- OK → Check trouble symptom.
  - NG → Replace the engine-ECU.
- NG → **Repair**

Code No.24 Idle position switch 2 system	Probable cause
Range of Check ● Accelerator pedal position sensor signal output is 1.2 V or higher. ● Idle position switch 1: OFF Set Conditions ● Idle position switch 2 on signal is input for 1 second or more.	● Malfunction of the idle position switch 2 ● Open or short circuit in idle position switch 2 circuit or poor connector contact ● Malfunction of the engine-ECU
Range of Check ● Accelerator pedal position sensor signal output is 0.48 V or lower. ● Idle position switch 1: ON Set Conditions ● Idle position switch 2 off signal is input for 1 second or more.	

Check the idle position switch 2. (Refer to P.13E-58.)

NG → **Replace**

OK ↓

Measure at the idle position switch 2 connector B-47 <L.H. drive vehicles>, B-48 <R.H. drive vehicles>.

- Disconnect the connector and measure at the harness side connector.
- Voltage between 1 and earth (Ignition switch: ON)
  OK: 4 V or higher

OK ↓

Check the following connector:
B-47

NG → **Repair**

OK ↓

Check trouble symptom.

NG ↓

Replace the engine-ECU.

(From "Measure at the idle position switch 2 connector": NG →)

Check the following connector:
C-53

NG → **Repair**

OK ↓

Check trouble symptom.

NG ↓

Check the harness wire between the engine-ECU and the idle position switch 2 connector.

NG → **Repair**

OK ↓

Replace the engine-ECU.

Code No.41 Throttle solenoid valve system	Probable cause
Range of Check From the following condition, the ignition switch is turned to OFF. ● 2.2 seconds or more have passed since idle position switch turned on and ignition switch-ST turned off ● Accelerator pedal opening amount: Approx. 0 % ● Vehicle speed: 0 km/h ● Injection pump speed: Between 700 r/min and 1,500 r/min Set Conditions ● The difference between the boost sensor signal output before and after the engine stops is 50 mmHg or less for 10 times in succession (ignition switch transition to off counted as one time).	● Malfunction of the throttle solenoid valve ● Open or short circuit in throttle solenoid valve circuit or poor connector contact ● Incorrect vacuum hose routing ● Malfunction of the throttle actuator

Check the throttle solenoid valve. (Refer to P.13E-60.)
- NG → **Replace**
- OK ↓

Check the throttle actuator. (Refer to P.13E-61.)
- NG → **Replace**
- OK ↓

Measure at the throttle solenoid valve connector B-49.
- Disconnect the connector and measure at the harness side connector.
- Voltage between 2 and earth (Ignition switch: ON)
  OK: System voltage

- NG → Check the harness wire between the control relay and the throttle solenoid valve connector, and repair if necessary.
- OK ↓

Measure at the engine-ECU connector C-53.
- Disconnect the connector and measure at the harness side connector.
- Voltage between 4 and earth (Ignition switch: ON)
  OK: System voltage

- NG → **Check the following connector:** B-49
  - NG → **Repair**
  - OK → Check trouble symptom.
    - NG → Check the harness wire between the engine-ECU and the throttle solenoid valve connector, and repair if necessary.
- OK ↓

Check the following connector:
C-53
- NG → **Repair**
- OK ↓

Check the vacuum hose routing.
- NG ↓

Check the vacuum hose routing.
- NG → **Repair**
- OK ↓

Replace the engine-ECU.

Code No.43 Timing control solenoid valve system	Probable cause
Range of Check ● Ignition switch-ST: OFF ● Engine speed: 400 r/min or more ● Engine coolant temperature: 60 °C or higher Set Conditions ● Target advance value differs from actual advance value by 7° or more for a continuous period of 10 seconds or more.	● Malfunction of the timing control solenoid valve ● Open or short circuit in timing control solenoid valve circuit or poor connector contact ● Incorrect ignition timing adjustment ● Malfunction of the injection pomp ● Malfunction of the engine-ECU

Check the timing control solenoid valve. (Refer to P.13E-59.)

- NG → Replace the injection pump.
- OK ↓

Measure at the timing control solenoid valve connector B-56 <L.H. drive vehicles>, B-57 <R.H. drive vehicles>.
- Disconnect the connector and measure at the harness side connector
- Voltage between 2 and earth (Ignition switch: ON)
  OK: System voltage

- NG → Check the harness wire between the control relay and the timing control solenoid valve connector, and repair if necessary.
- OK ↓

Measure at the engine-ECU connector C-53.
- Disconnect the connector and measure at the harness side connector.
- Voltage between 2 and earth (Ignition switch: ON)
  OK: System voltage

- NG → **Check the following connector:**
  B-56
  - NG → **Repair**
  - OK → Check trouble symptom.
    - NG → Check the harness wire between the engine-ECU and the timing control solenoid valve connector, and repair if necessary.
- OK ↓

Check the following connector:
C-53

- NG → **Repair**
- OK ↓

Check trouble symptom.

- NG ↓

MUT-II Actuator test
11 Timing control solenoid valve
OK: Sound of operation can be heard.

- NG → Replace the injection pump.
- OK ↓

Replace the engine-ECU.

Code No.44 Solenoid-type spill valve system	Probable cause
Range of Check ● Ignition switch-ST: OFF ● Injection pump speed: 750 r/min or more ● Solenoid-type spill valve relay: ON Set Conditions ● Solenoid-type spill valve does not turn off.	● Malfunction of the solenoid-type spill valve ● Open or short circuit in solenoid-type spill valve circuit or poor connector contact ● Malfunction of the injection pump ● Malfunction of the engine-ECU
Range of Check, Set Conditions ● Injection pump speed is 5,400 r/min or more for a continuous period of 2 seconds or more.	

Check the solenoid-type spill valve. (Refer to P.13E-59.)
- NG → Replace the injection pump.
- OK ↓

Measure at the solenoid-type spill valve connector B-61.
- Disconnect the connector and measure at the harness side connector.
- Voltage between 1 and earth (Ignition switch: ON)
  OK: System voltage

- NG → Check the harness wire between the solenoid-type spill valve relay and the solenoid-type spill valve connector, and repair if necessary.
- OK ↓

Measure at the engine-ECU connector C-53.
- Disconnect the connector and measure at the harness side connector.
- Voltage between 3 and earth (Ignition switch: ON)
  OK: System voltage

- NG → **Check the following connector:** B-61
  - NG → **Repair**
  - OK → Check trouble symptom.
    - NG → Check the harness wire between the engine-ECU and the solenoid-type spill valve connector, and repair if necessary.
- OK ↓

Check the following connector: C-53
- NG → **Repair**
- OK ↓

Check trouble symptom.
- NG ↓

MUT-II Actuator test
01 Solenoid-type spill valve
OK: Sound of operation can be heard.

- NG → Replace the injection pump.
- OK ↓

Replace the engine-ECU.

Code No.45 Injection timing correction resistor system	Probable cause
Range of Check, Set Conditions ● Open or short circuit is detected in injection timing correction resistor circuit.	● Malfunction of the injection timing correction resistor ● Open or short circuit in injection timing correction resistor circuit of poor connector contact ● Malfunction of the engine-ECU

Check the injection timing correction resistor. (Refer to P.13E-60.)
- NG → Replace the injection pump.
- OK ↓

Measure at the injection timing correction resistor connector B-60.
- Disconnect the connector and measure at the harness side connector.
- Voltage between 1 and earth (Ignition switch: ON)
  OK: 4.5 - 5.5 V
- Continuity between 2 and earth
  OK: Continuity

NG → **Check the following connector:**
C-54
- NG → **Repair**
- OK ↓

Check trouble symptom.
- NG ↓

Check the harness wire between the engine-ECU and the injection timing correction resistor connector.
- NG → **Repair**
- OK ↓

Replace the engine-ECU.

OK ↓ (from measurement)

Check the following connector:
B-60
- NG → **Repair**
- OK ↓

Check trouble symptom.
- NG ↓

Replace the engine-ECU.

Code No.46 Injection rate correction resistor system	Probable cause
Range of Check, Set Conditions ● Open or short circuit is detected in injection rate correction resistor circuit.	● Malfunction of the injection rate correction resistor ● Open or short circuit in injection rate correction resistor circuit or poor connector contact ● Malfunction of the engine-ECU

Check the injection rate correction resistor. (Refer to P.13E-60.)
- NG → Replace the injection pump.
- OK ↓

Measure at the injection rate correction resistor connector B-58 <L.H. drive vehicles>, B-59 <R.H. drive vehicles>.
- Disconnect the connector and measure at the harness side connector.
- Voltage between 1 and earth (Ignition switch: ON)
  OK: 4.5 - 5.5 V
- Continuity between 2 and earth
  OK: Continuity

NG → **Check the following connector:**
C-54
- NG → **Repair**
- OK ↓

Check trouble symptom.
- NG ↓

Check the harness wire between the engine-ECU and the injection rate correction resistor connector.
- NG → **Repair**
- OK ↓

Replace the engine-ECU.

OK ↓ (from measurement)

Check the following connector:
B-58 <L.H. drive vehicles>, B-59 <R.H. drive vehicles>
- NG → **Repair**
- OK ↓

Check trouble symptom.
- NG ↓

Replace the engine-ECU.

Code No.47 Immobilizer system	Probable cause
Range of Check ● Ignition switch: ON Set Conditions ● Communication problem between the engine-ECU and the immobilizer-ECU. NOTE If the engine is started while several ignition keys are present nearly, signal mixing may occur, which will cause this diagnosis code to be generated. This code may also be generated when registering the key ID codes.	● Radio interference of ID codes ● Incorrect ID code ● Malfunction of harness or connector ● Malfunction of the immobilizer-ECU ● Malfunction of the engine-ECU

Is there another ignition key near the ignition key that is inserted in the ignition switch?

- Yes → Remove the extra ignition key. → Check trouble symptom. → NG → (go to next step)
- No ↓

Is a diagnosis code output from the immobilizer-ECU.

- Yes → Check the immobilizer system. (Refer to GROUP 54 - Ignition Switch and Immobilizer System.)
- No ↓

Check the following connectors:
C-54, C-81, C-66

- NG → **Repair**
- OK ↓

Check trouble symptom.

- NG ↓

Check the harness wire between the engine-ECU and the immobilizer-ECU.

- OK → Replace the immobilizer-ECU. → NG → Check trouble symptom. → NG → Replace the engine-ECU.
- NG → **Repair**

INSPECTION CHART FOR TROUBLE SYMPTOM

13300410023

Caution
Check that the engine-ECU earth circuit is normal before checking for the cause of the problem.

Trouble symptoms		Inspection procedure No.	Reference page
Communication with MUT-II is impossible.	MUT-II communication with all systems is impossible.	1	13E-24
	MUT-II communication with engine-ECU only is impossible.	2	13E-24
Engine warning lamp and related parts	The engine warning lamp does not illuminate right after the ignition switch is turned to the ON position.	3	13E-25
	The engine warning lamp remains illuminating and never goes out.	4	13E-25
Starting	No initial combustion (Starting not possible)	5	13E-26
	Poor startability when engine is cold (Poor starting)	6	13E-26
	Poor startability when engine is cold or warm (Poor starting)	7	13E-27
Idling stability (Improper idling)	Idling speed is low when engine is cold (Improper idling speed)	8	13E-27
	Idling speed is high (Improper idling speed)	9	13E-28
	Idling speed is low (Improper idling speed)	10	13E-28
	Idling speed is unstable (Rough idling, hunting)	11	13E-29
Idling stability (Engine stalls)	Engine stops soon after starting	12	13E-29
	Engine stops during idling	13	13E-30
Driving	Engine output is too low	14	13E-30
	Abnormal engine knocking occurs	15	13E-31
	Abnormally black smoke	16	13E-31
	Abnormally white smoke	17	13E-32
	Hunting occurs while driving	18	13E-32
Idling speed is improper when A/C is operating		19	13E-33
Fans (radiator fan and A/C condenser fan) are imoperative		20	13E-33

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

INSPECTION PROCEDURE 1

Communication with MUT-II is impossible. (MUT-II communication with all systems is impossible.)	Probable cause
The cause is probably a defect in the power supply system (including earth) for the diagnosis line.	• Malfunction of the connector • Malfunction of the harness wire

Measure at the diagnosis connector C-20.
- Voltage between 16 and earth
  OK: System voltage

NG → **Check the following connectors:** C-66, C-63, (C-132, C-141) <L.H. drive vehicles>, (C-62, C-14) <R.H. drive vehicles>

NG → **Repair**

OK → Check trouble symptom.

NG → Check the harness wire between the power supply and the diagnosis connector, and repair if necessary.

OK → Measure at the diagnosis connector C-20.
- Continuity between 4 and earth
- Continuity between 5 and earth
  OK: Continuity

NG → Check the harness wire between the diagnosis connector and the earth, and repair if necessary.

OK → Replace the MUT-II.

INSPECTION PROCEDURE 2

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

Is communication possible between the MUT-II and the immobilizer-ECU.

No → Check the diagnosis line between the immobilizer-ECU and the MUT-II, and repair if necessary. (Refer to GROUP 54 - Ignition Switch and Immobilizer System.)

Yes → **Check the following connectors:**
C-54, C-81, C-68, C-66, C-56 <R.H. drive vehicles>, C-83, C-20

NG → **Repair**

OK → Check trouble symptom.

NG → Check the harness wire between the engine-ECU and the diagnosis connector.

NG → **Repair**

OK → Check the harness wire between the engine-ECU and the immobilizer-ECU.

NG → **Repair**

OK → Check the harness wire between the engine-ECU and the earth

NG → **Repair**

OK → Check the engine-ECU power supply and earth circuit. (Refer to P.13E-34, INSPECTION PROCEDURE 21.)

INSPECTION PROCEDURE 3

The engine warning lamp does not illuminate right after the ignition switch is turned to the ON position.	Probable cause
Because there is a burn-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.	• Burn-out bulb • Defective warning lamp circuit • Malfunction of the engine-ECU

MUT-II Data list
11 Battery voltage (Refer to 13E-39.)

- NG → Check the engine-ECU power supply and earth circuit. (Refer to P.13E-34, INSPECTION PROCEDURE 21.)
- OK ↓

Measure at the engine-ECU connector C-55.
- Disconnect the connector and measure at the harness side connector.
- Earth the terminal No.57.
  OK: The engine warning lamp illuminates.

- OK → **Check the following connector:** C-55
  - NG → **Repair**
  - OK → Check trouble symptom.
    - NG → Replace the engine-ECU.
- NG ↓

Check a burn-out bulb.

- NG → **Replace**
- OK ↓

Measure at the combination meter connector D-03.
- Disconnect the connector and measure at the harness side connector.
- Voltage between 4 and earth (Ignition switch: ON)
  OK: System voltage

- NG → **Check the following connectors:** C-135, C-131
  - NG → **Repair**
  - OK → Check trouble symptom.
    - NG → Check the harness wire between the engine warning lamp and the ignition switch connector, and repair if necessary.
- OK ↓

Check the following connectors:
D-03, C-90

- NG → **Repair**
- OK ↓

Check trouble symptom.

- NG → Check the harness wire between the combination meter and the engine-ECU connector, and repair if necessary.

INSPECTION PROCEDURE 4

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

MUT-II Self-Diagnosis code
Are diagnosis codes output?

- Yes → Refer to P.13E-8, INSPECTION CHART FOR DIAGNOSIS CODES.
- No ↓

Measure at the combination meter connector D-03.
- Disconnect the connector and measure at the harness side connector.
- Continuity between 16 and earth
  OK: No continuity

- NG → Check the harness wire between the combination meter and the engine-ECU connector, and repair if necessary.
- OK ↓

Replace the engine-ECU.

INSPECTION PROCEDURE 5

No initial combustion (Starting not possible)	Probable cause
The cause is probably a malfunction of the control system, injection nozzles, injection pump, glow system or power supply.	• Malfunction of the control system • Malfunction of the injection nozzles • Malfunction of the injection pump • Malfunction of the glow system • Malfunction of the immobilizer system • Malfunction of the engine-ECU

Is immobilizer-ECU diagnosis code output?

- Yes → Check the immobilizer system. (Refer to GROUP 54 - Ignition Switch and Immobilizer System.)
- No ↓

MUT-II Self-Diagnosis code
Are diagnosis codes output?

- Yes ↓ Refer to P.13E-8, INSPECTION CHART FOR DIAGNOSIS CODES.
- No → Carry out MUT-II Data list check and Actuator test. (Refer to P.13E-38, 42.)
  - NG → **Repair**
  - OK ↓

Check the following items:
- Glow plug, glow plug relay
- Battery
- Fuel cut solenoid valve
- Injection nozzle
- Compression pressure
- Injection pump
- Contamination (water, kerosene, etc.) in fuel
- Immobilizer system

INSPECTION PROCEDURE 6

Poor startability when engine is cold (Poor starting)	Probable cause
The cause is probably a malfunction of the control system, injection pump, fuel system, air intake system or glow system.	• Malfunction of the control system • Malfunction of the injection pump • Malfunction of the fuel system • Malfunction of the air intake system • Malfunction of the glow system • Malfunction of the engine-ECU

MUT-II Self-Diagnosis code
Are diagnosis codes output?

- Yes ↓ Refer to P.13E-8, INSPECTION CHART FOR DIAGNOSIS CODES.
- No → Carry out MUT-II Data list check and Actuator test. (Refer to P.13E-38, 42.)
  - NG → **Repair**
  - OK ↓

Check the following items:
- Glow plug, glow plug relay
- Injection nozzle, fuel filter
- Throttle body assembly
- Starter switch input signal
- Engine oil viscosity
- Injection pump
- Contamination (water, kerosene, etc.) in fuel

INSPECTION PROCEDURE 7

Poor startability when engine is cold or warm (Poor starting)	Probable cause
The cause is probably a malfunction of the control system, injection pump, fuel system or air intake system.	● Malfunction of the control system ● Malfunction of the injection pump ● Malfunction of the fuel system ● Malfunction of the air intake system ● Malfunction of the engine-ECU

MUT-II Self-Diagnosis code
Are diagnosis codes output?

Yes → Refer to P.13E-8, INSPECTION CHART FOR DIAGNOSIS CODES.

No → Carry out MUT-II Data list check and Actuator test. (Refer to P.13E-38, 42.)

NG → **Repair**

OK → Check the following items:
- Injection nozzle, fuel filter
- Throttle body assembly
- Compression pressure
- Injection pump
- Contamination (water, kerosene, etc.) in fuel

INSPECTION PROCEDURES 8

Idling speed is low when engine is cold (Improper idling speed)	Probable cause
The cause is probably a malfunction of the control system, injection pump or fuel system.	● Malfunction of the control system ● Malfunction of the injection pump ● Malfunction of the fuel system ● Malfunction of the engine-ECU

MUT-II Self-Diagnosis code
Are diagnosis codes output?

Yes → Refer to P.13E-8, INSPECTION CHART FOR DIAGNOSIS CODES.

No → Carry out MUT-II Data list check and Actuator test. (Refer to P.13E-38, 42.)

NG → **Repair**

OK → Check the following items:
- Injection nozzle
- Injection pump
- Fuel filter

INSPECTION PROCEDURE 9

Idling speed is high (Improper idling speed)	Probable cause
The cause is probably a malfunction of the control system, injection nozzles or injection pump.	● Malfunction of the control system ● Malfunction of the injection nozzles ● Malfunction of the injection pump ● Malfunction of the engine-ECU

MUT-II Self-Diagnosis code
Are diagnosis codes output?

- Yes → Refer to P.13E-8, INSPECTION CHART FOR DIAGNOSIS CODES.
- No → Carry out MUT-II Data list check and Actuator test. (Refer to P.13E-38, 42.)
  - NG → **Repair**
  - OK → Check the following items:
    - Injection nozzle
    - Injection pump
    - Starter switch input signal

INSPECTION PROCEDURE 10

Idling speed is low (Improper idling speed)	Probable cause
The cause is probably a malfunction of the control system, injection pump or fuel system.	● Malfunction of the control system ● Malfunction of the injection pump ● Malfunction of the fuel system ● Malfunction of the engine-ECU

MUT-II Self-Diagnosis code
Are diagnosis codes output?

- Yes → Refer to P.13E-8, INSPECTION CHART FOR DIAGNOSIS CODES.
- No → Carry out MUT-II Data list check and Actuator test. (Refer to P.13E-38, 42.)
  - NG → **Repair**
  - OK → Check the following items:
    - Injection pump
    - Injection nozzle

INSPECTION PROCEDURE 11

Idling speed is unstable (Rough idling, hunting)	Probable cause
The cause is probably a malfunction of the control system, injection pump, fuel system, air intake system or glow system.	● Malfunction of the control system ● Malfunction of the injection pump ● Malfunction of the fuel system ● Malfunction of the air intake system ● malfunction of the glow system ● Malfunction of the EGR system ● Malfunction of the engine-ECU

MUT-II Self-Diagnosis code
Are diagnosis codes output?

Yes → Refer to P.13E-8, INSPECTION CHART FOR DIAGNOSIS CODES.

No → Carry out MUT-II Data list check and Actuator test. (Refer to P.13E-38, 42.)

NG → **Repair**

OK → Check the following items:

- Glow plug, glow plug relay
- EGR system
- Injection nozzle
- Compression pressure
- Valve clearance
- Throttle body assembly
- Injection timing
- Air in fuel line
- Injection pump

INSPECTION PROCEDURE 12

Engine stops soon after starting	Probable cause
The cause is probably a malfunction of the control system, injection pump, fuel system or air intake system.	● Malfunction of the control system ● Malfunction of the injection pump ● Malfunction of the fuel system ● Malfunction of the air intake system ● Malfunction of the engine-ECU

MUT-II Self-Diagnosis code
Are diagnosis codes output?

Yes → Refer to P.13E-8, INSPECTION CHART FOR DIAGNOSIS CODES.

No → Carry out MUT-II Data list check and Actuator test. (Refer to P.13E-38, 42.)

NG → **Repair**

OK → Check the following items:

- Throttle body assembly
- Injection nozzle, fuel filter
- Injection pump

INSPECTION PROCEDURE 13

Engine stops during idling	Probable cause
The cause is probably a malfunction of the control system, injection pump, air intake system or power supply system.	• Malfunction of the control system • Malfunction of the injection pump • Malfunction of the EGR system • Malfunction of the air intake system • Malfunction of the engine-ECU

MUT-II Self-Diagnosis code
Are diagnosis codes output?

- Yes → Refer to P.13E-8, INSPECTION CHART FOR DIAGNOSIS CODES.
- No → Carry out MUT-II Data list check and Actuator test. (Refer to P.13E-38, 42.)
  - NG → **Repair**
  - OK → Check the following items:
    - Power supply system
    - Throttle body assembly
    - EGR system
    - Injection pump

INSPECTION PROCEDURE 14

Engine output is too low	Probable cause
The cause is probably a malfunction of the control system, injection pump, fuel system, air intake system or EGR system.	• Malfunction of the control system • Malfunction of the injection pump • Malfunction of the fuel system • Malfunction of the air intake system • Malfunction of the EGR system • Malfunction of the engine-ECU

MUT-II Self-Diagnosis code
Are diagnosis codes output?

- Yes → Refer to P.13E-8, INSPECTION CHART FOR DIAGNOSIS CODES.
- No → Carry out MUT-II Data list check and Actuator test. (Refer to P.13E-38, 42.)
  - NG → **Repair**
  - OK → Check the following items:
    - Injection nozzle, fuel filter
    - Throttle body assembly
    - EGR system
    - Turbocharger
    - Compression pressure
    - Injection timing
    - Injection pump
    - Contamination (water, kerosene, etc.) in fuel

INSPECTION PROCEDURE 15

Abnormal engine knocking occurs	Probable cause
The cause is probably a malfunction of the control system, injection pump or fuel system.	● Malfunction of the control system ● Malfunction of the injection pump ● Malfunction of the fuel system ● Malfunction of the engine-ECU

MUT-II Self-Diagnosis code
Are diagnosis codes output?

- Yes → Refer to P.13E-8, INSPECTION CHART FOR DIAGNOSIS CODES.
- No → Carry out MUT-II Data list check and Actuator test. (Refer to P.13E-38, 42)
  - NG → **Repair**
  - OK → Check the following items:
    - Injection nozzle
    - Injection timing
    - Injection pump

INSPECTION PROCEDURE 16

Abnormally black smoke	Probable cause
The cause is probably a malfunction of the control system, injection pump, fuel system, air intake system or EGR system.	● Malfunction of the control system ● Malfunction of the injection pump ● Malfunction of the fuel system ● Malfunction of the air intake system ● Malfunction of the EGR system ● Malfunction of the engine-ECU

MUT-II Self-Diagnosis code
Are diagnosis codes output?

- Yes → Refer to P.13E-8, INSPECTION CHART FOR DIAGNOSIS CODES.
- No → Carry out MUT-II Data list check and Actuator test. (Refer to P.13E-38, 42.)
  - NG → **Repair**
  - OK → Check the following items:
    - Air cleaner
    - Injection nozzle
    - Throttle body assembly
    - EGR system
    - Turbocharger
    - Injection pump
    - Injection timing

INSPECTION PROCEDURE 17

Abnormally white smoke	Probable cause
The cause is probably a malfunction of the control system, injection pump, fuel system, air intake system, EGR system or glow system.	● Malfunction of the control system ● Malfunction of the injection pump ● Malfunction of the fuel system ● Malfunction of the air intake system ● Malfunction of the EGR system ● Malfunction of the glow system ● Malfunction of the engine-ECU

MUT-II Self-Diagnosis code
Are diagnosis codes output?

Yes → Refer to P.13E-8, INSPECTION CHART FOR DIAGNOSIS CODES.

No → Carry out MUT-II Data list check and Actuator test. (Refer to P.13E-38, 42.)

NG → **Repair**

OK → Check the following items:
- Glow plug, glow plug relay
- Injection nozzle
- Throttle body assembly
- EGR system
- Turbocharger
- Injection pump
- Injection timing

INSPECTION PROCEDURE 18

Hunting occurs while driving	Probable cause
The cause is probably a malfunction of the control system, injection pump, fuel system or EGR system.	● Malfunction of the control system ● Malfunction of the injection pump ● Malfunction of the fuel system ● Malfunction of the EGR system ● Malfunction of the engine-ECU

MUT-II Self-Diagnosis code
Are diagnosis codes output?

Yes → Refer to P.13E-8, INSPECTION CHART FOR DIAGNOSIS CODES.

No → Carry out MUT-II Data list check and Actuator test. (Refer to P.13E-38, 42.)

NG → **Repair**

OK → Check the following items:
- Injection nozzle, fuel filter
- EGR system
- Injection pump

INSPECTION PROCEDURE 19

Idling speed is improper when A/C is operating

Measure at the engine-ECU connector C-54.
- Connect the connector.
- Voltage between 39 and earth (Engine: Idling, Outside air temperature: 25 °C or higher)
  OK: 0 - 3 V [When A/C is MAX. COOL condition (when the load by A/C is high)]
  System voltage [(When A/C is MAX. HOT condition (When the load by A/C is low)]

NG → Check the A/C system. (Refer to GROUP 55 - On-vehicle Service.)

OK → **Check the following connector:**
C-54

NG → **Repair**

OK → Check trouble symptom.

NG → Replace the engine-ECU.

INSPECTION PROCEDURE 20

Fans (radiator fan and A/C condenser fan) are imoperative

Measure at the engine-ECU connector C-53.
- Disconnect the connector and measure at the harness side connector.
- Voltage between 18 and earth (Ignition switch: ON)
  OK: 4.8 - 5.2 V (Fan rotates at high speed.)
- Short circuit between 18 and earth (Ignition switch: ON)
  OK: Fan stops.

NG → Check the harness wire between the engine-ECU and the fan controller connector.

NG → **Repair**

OK → Check the radiator fan and the condenser fan circuit. (Refer to GROUP 14 - Troubleshooting.)

OK → **Check the following connector:**
C-53

NG → **Repair**

OK → Check trouble symptoms.

NG → Replace the engine-ECU.

INSPECTION PROCEDURE 21

Check the engine-ECU power supply and earth circuit

Check the control relay. (Refer to P.13E-56.)

NG → **Replace**

OK ↓

Measure at the control relay connector C-31.
- Disconnect the connector and measure at the harness side connector.

1. Voltage between 2, 3 and earth
   OK: System voltage

NG → **Check the following connector:**
B-30

- NG → **Repair**
- OK ↓

Check trouble symptoms.

NG ↓

Check the harness wire between the battery and control relay connector, and repair if necessary.

OK ↓

Measure at the engine-ECU connector C-53, C-55.
- Disconnect the connector and measure at the harness side connector.

1. Voltage between 25 and earth (Ignition switch: ON)
   OK: System voltage
2. Voltage between 59 and earth
   OK: System voltage
3. Voltage between 72 and earth
   OK: System voltage (When the terminal 59 is earthed)
4. Continuity between 1, 14, 26 and earth
   OK: Continuity
5. Voltage between 61 and earth
   OK: System voltage

1.NG → **Check the following connector:**
C-92, C-131

- NG → **Repair**
- OK ↓

Check trouble symptoms.

NG ↓

Check the harness wire between the engine-ECU and ignition switch connector.

- NG → **Repair**
- OK ↓

Check the ignition switch. (Refer to GROUP 54 - Ignition Switch.)

2,3 NG → Check the harness wire between the engine-ECU and control relay connector, and repair if necessary.

4.NG → Check the harness wire between the engine-ECU and earth, and repair if necessary.

5.NG → **Check the following connectors:**
C-83, C-66, (C-63, C-132, C-141) <L.H. drive vehicles>, (C-62, C-14) <R.H. drive vehicles>

- NG → **Repair**
- OK ↓

Check trouble symptoms.

NG ↓

Check the harness wire between the battery and engine-ECU connector, and repair if necessary.

OK ↓

Check the following connectors:
C-53, C-55

- NG → **Repair**
- OK ↓

Check trouble symptoms.

NG ↓

Replace the engine-ECU.

INSPECTION PROCEDURE 22

Check the solenoid-type spill valve relay circuit.

Check the solenoid-type spill valve relay. (Refer to P.13E-56.)

NG → **Replace**

OK ↓

Measure at solenoid-type spill valve relay connector C-52.
- Disconnect the connector and measure at the harness side connector.
- Voltage between 2, 3 and earth (Ignition switch: ON)
  OK: System voltage

NG → Check the harness wire between the control relay and solenoid-type spill valve relay connectors, and repair if necessary.

OK ↓

Measure at the engine-ECU connector C-55.
- Disconnect the connector and measure at the harness side connector.
- Voltage between 71 and earth
  OK: System voltage (When the terminal 3 is earthed)

NG → **Check the following connector:**
C-52

- NG → **Repair**
- OK ↓

Check trouble symptoms.

NG ↓

Check the harness wire between the solenoid-type spill valve relay and engine-ECU connectors, and repair if necessary.

OK ↓

Check the following connector:
C-55

- NG → **Repair**
- OK ↓

Check trouble symptoms.

NG ↓

Replace the engine-ECU.

INSPECTION PROCEDURE 23

Check the fuel cut solenoid valve circuit.

Check the fuel cut solenoid valve. (Refer to P.13E-60.)

NG → **Replace**

OK ↓

Measure at the fuel cut solenoid valve connector B-55.
- Disconnect the connector and measure at the harness side connector.
- Voltage between 1 and earth (Ignition switch: ON)
  OK: System voltage

NG → **Check the following connector:**
C-52

NG → **Repair**

OK ↓

Check trouble symptoms.

NG ↓

Check the harness wire between the fuel cut solenoid valve and solenoid-type spill valve relay connectors, and repair if necessary.

OK ↓ (from measurement at B-55)

Check the connector B-55, and repair if necessary.

INSPECTION PROCEDURE 24

Check the EGR solenoid valve circuit.

Check the EGR solenoid valve.
(Refer to GROUP 17 - Emission Control System.)

NG → **Replace**

OK ↓

Measure at the EGR solenoid valve connector B-06.
- Disconnect the connector and measure at the harness side connector.
- Voltage between 1 and earth (Ignition switch: ON)
  OK: System voltage

NG → Check the harness wire between the control relay and EGR solenoid valve connector, and repair if necessary.

OK ↓

Measure at the engine-ECU connector C-53.
- Disconnect the connector and measure at the harness side connector.
- Voltage between 16 and earth (Ignition switch: ON)
  OK: System voltage

NG → **Check the following connector:**
B-06

NG → **Repair**

OK ↓

Check trouble symptoms.

NG ↓

Check the harness wire between the engine-ECU and EGR solenoid valve connector, and repair if necessary.

OK ↓ (from measurement at C-53)

Check the following connector:
C-53

NG → **Repair**

OK ↓

Check trouble symptoms.

NG → Replace the engine-ECU.

INSPECTION PROCEDURE 25

Check the glow plug relay circuit

Check the glow plug relay. (Refer to GROUP 16 - Glow System.)
- NG → **Replace**
- OK ↓

Measure at the glow plug relay connector B-52.
- Disconnect the connector and measure at the harness side connector.
- Voltage between 1 and earth (Ignition switch: ON)(Engine coolant temperature: 40 °C or lower)
  OK: System voltage (Between approx. 4 - 8 seconds)

- OK ↓ **Check the following connector, and repair if necessary.** B-52
- NG → **Check the following connector:** C-55
  - NG → **Repair**
  - OK ↓

Check trouble symptoms.
- NG ↓

Check the harness wire between the engine-ECU and glow plug relay connector.
- NG → **Repair**
- OK ↓

Check the glow control system.
(Refer to GROUP 16 - Glow System.)
- NG → **Repair**
- OK ↓

Replace the engine-ECU.

INSPECTION PROCEDURE 26

Check the A/C switch and A/C relay circuit

Check the A/C compressor relay.
(Refer to GROUP 55 - On-vehicle Service.)
- NG → **Replace**
- OK ↓

Check the A/C variable capacity relay.
(Refer to GROUP 55 - On-vehicle Service.)
- NG → **Replace**
- OK ↓

Measure at the engine-ECU connector C-55.
- Disconnect the connector and measure at the harness side connector.
- Voltage between 52 and earth, and between 53 and earth (Ignition switch: ON)
  OK: 0 - 3 V (A/C switch: OFF)
  System voltage (A/C switch: ON)
- Short circuit between 53 and earth
  (Ignition switch: ON, A/C switch: ON)
  OK: A/C compressor clutch turns on.

- NG → Check the A/C system. (Refer to GROUP 55 - Troubleshooting.)
- OK → **Check the following connector:** C-55
  - NG → **Repair**
  - OK ↓

Check trouble symptoms.
- NG ↓

Replace the engine-ECU.

DATA LIST REFERENCE TABLE

13300420026

Caution
Driving tests always need another personnel.

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
01	Intake air temperature sensor	Ignition switch: ON or with engine running	Intake air temperature is -20 °C	-20 °C	Code No.16	13E-12
			Intake air temperature is 0 °C	0 °C		
			Intake air temperature is 20 °C	20 °C		
			Intake air temperature is 40 °C	40 °C		
			Intake air temperature is 80 °C	80 °C		
02	Engine coolant temperature sensor	Ignition switch: ON or with engine running	Engine coolant temperature is -20 °C	-20 °C	Code No.15	13E-12
			Engine coolant temperature is 0 °C	0 °C		
			Engine coolant temperature is 20 °C	20 °C		
			Engine coolant temperature is 40 °C	40 °C		
			Engine coolant temperature is 80 °C	80 °C		
03	Barometric pressure sensor	Ignition switch: ON	At altitude of 0 m	101 kPa	Code No.13	13E-11
			At altitude of 600 m	95 kPa		
			At altitude of 1,200 m	88 kPa		
			At altitude of 1,800 m	81 kPa		
04	Boost sensor	• Engine coolant temperature: 80 - 95 °C • Lamps, electric cooling fan and all accessories: OFF • Transmission: Neutral • Ignition switch: ON	At altitude of 0 m	101 kPa	Code No.12	13E-10
			At altitude of 600 m	95 kPa		
			At altitude of 1,200 m	88 kPa		
			At altitude of 1,800 m	81 kPa		
			When the engine is suddenly raced	Increases		

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
05	Diesel fuel temperature sensor	Ignition switch: ON or with engine running	Fuel temperature is -20 °C	-20 °C	Code No.14	13E-11
			Fuel temperature is 0 °C	0 °C		
			Fuel temperature is 20 °C	20 °C		
			Fuel temperature is 40 °C	40 °C		
			Fuel temperature is 80 °C	80 °C		
06	Vehicle speed sensor	When vehicle is moving	Compare the speeds displayed on the speedometer and the MUT-II.	Identical	Code No.17	13E-13
07	Pump operation sensor (high speed)	Engine: Idling	Compare the engine speeds displayed on the tachometer and MUT-II.	The same engine speed is displayed.	Code No.18, 19	13E-14
08	Pump operation sensor (low speed)	Engine: Idling	Compare the engine speeds displayed on the tachometer and the MUT-II.	The same engine speed is displayed.	Code No.18, 19	13E-14
09	Accelerator pedal position sensor	Ignition switch: ON	Accelerator pedal is released	480 - 570 mV	Code No.11	13E-9
			Accelerator pedal is fully depressed	4000 - 4690 mV		
10	Accelerator pedal position sensor (Accelerator opening angle)	Ignition switch: ON	Throttle lever: Idle position	0 %	Code No.11	13E-9
			Throttle lever: Fully open position	100 %		
11	Battery voltage	Ignition switch: ON		System voltage	-	-
12	Solenoid-type spill valve	Engine: After having warmed up	Engine: Idling	51.5 - 66.5 deg	Code No.44	13E-20
			A/C switch OFF → ON	Advances slightly		
13	Timing control solenoid valve duty ratio	Engine: After having warmed up	When engine is suddenly decelerated from 3,000 r/min.	Momentarily increases slightly	Code No.43	13E-19

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
14	EGR command value	Engine: Idle		44.8 %	Procedure No.24	13E-36
		Engine: After having warmed up	When engine is suddenly raced	0 %		
15	Injection rate correction resistance value	Ignition switch: ON		0.2 - 4.5 V	Code No.46	13E-21
16	Injection timing correction resistance value	Ignition switch: ON		0.2 - 4.5 V	Code No.45	13E-21
17	Fuel injection rate command value	Engine: After having warmed up	Engine: Idling	3.5 - 12.5 m^3/st	-	-
			A/C switch: OFF → ON	Increases slightly		
18	Actual injection timing	Engine: After having warmed up		The same value as the injection timing command value is displayed.	Code No.43	13E-19
19	Injection timing command value	Engine: After having warmed up	Engine: Idling	12.6 - 14.6 deg	-	-
			Engine: Racing to 3500 r/min or more	Advances slightly		
20	Radiator fan, A/C condenser fan duty ratio	Engine: Idling	When radiator fan and condenser fan are not operating	0 %	Procedure No.26	13E-20
			When radiator fan and condenser fan are operating	5 % or more (varies in accordance with fan operating speed)		

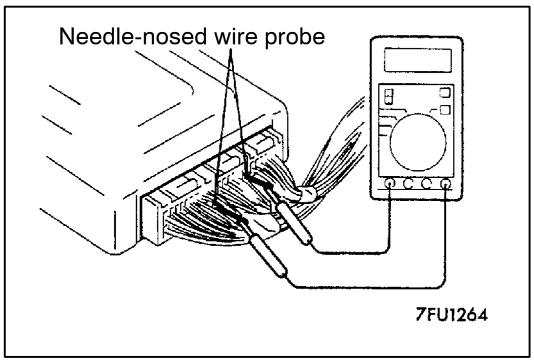
Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
41	Idle position switch 1 (Built into accelerator pedal position sensor)	Ignition switch: ON	Accelerator pedal is released	ON	Code No.23	13E-16
			Accelerator pedal is slightly depressed	OFF		
42	Idle position switch 2	Ignition switch: ON	Accelerator pedal is released	ON	Code No.24	13E-17
			Accelerator pedal is slightly depressed	OFF		
43	A/C switch	Engine: Idling (When the A/C switch is on, the A/C compressor should be driven.)	A/C switch: ON	ON	Procedure No.26	13E-37
			A/C switch: OFF	OFF		
44	Ignition switch: ST	Ignition switch: ON	Engine: Stopped	OFF	Code No.22	13E-16
			Engine: Cranking	ON		
45	Ignition switch-IG	Ignition switch: ON		ON	-	-
46	Control relay	Ignition switch: ON		ON	Procedure No.21	13E-34
47	A/C relay	Engine: Idling after having warmed up	A/C switch: ON	ON	Procedure No.26	13E-37
			A/C switch: OFF	OFF		
49	Solenoid-type spill valve relay	Ignition switch: ON		ON	Code No.44	13E-20
52	Glow plug relay	MUT-II Actuator test: Glow plug relay (item No.2) is driven		ON (for approx. 6 seconds)	Procedure No.25	13E-37
53	Throttle solenoid valve	Engine: After having warmed up	Engine: Idling	ON	Code No.41	13E-18
			Gently racing	OFF		
55	Engine warning lamp	MUT-II Actuator test: Engine warning lamp (item No.16) is driven		ON (For approx. 6 seconds)	-	-
56	Glow indicator lamp	MUT-II Actuator test: Glow indicator lamp (item No.15) is driven		ON (for approx. 6 seconds)	-	-

ACTUATOR TEST REFERENCE TABLE

13300440022

Item No.	Inspection item	Drive contents	Inspection contents	Normal condition	Inspection procedure No.	Reference page
01	Solenoid-type spill valve relay	Turns relay from OFF to ON and from ON to OFF	Ignition switch: ON	Operation sound can be heard.	-	-
02	Glow plug relay	Turns relay from OFF to ON and from ON to OFF.	Ignition switch: ON	Battery voltage is applied to glow plug when glow plug relay is ON.	Procedure No.25	13E-37
03	A/C compressor relay	Turns relay from OFF to ON and from ON to OFF.	• Ignition switch: ON • A/C switch: ON	A/C compressor clutch operation sound can be heard.	Procedure No.26	13E-37
08	Throttle solenoid valve	Turns throttle solenoid valve ON.	Engine: 1500 r/min	Throttle valve opens half way.	Code No.41	13E-18
09		Turns throttle solenoid valve OFF.	Engine: Idling	Throttle valve opens fully.	Code No.41	13E-18
11	Timing control solenoid valve	Drives timing control solenoid valve at 94 % duty.	Ignition switch: ON	Operation sound can be heard.	Code No.43	13E-19
13	Solenoid-type spill valve	Turns solenoid-type spill valve from OFF to ON and from ON to OFF.	Ignition switch: ON	Operation sound can be heard.	Code No.44	13E-20
14	EGR solenoid valve	Turns EGR solenoid valve OFF.	Engine: Idling	EGR valve closes.	Procedure No.24	13E-36
15	Glow indicator lamp	Turns glow indicator lamp ON and OFF.	Ignition switch: ON	Glow indicator lamp illuminates and switches OFF.	-	-
16	Engine warning lamp	Turns engine warning lamp ON and OFF.	Ignition switch: ON	Engine warning lamp illuminates and switches OFF.	-	-

Item No.	Inspection item	Drive contents	Inspection contents	Normal condition	Inspection procedure No.	Reference page
17	Radiator fan, A/C condens-er fan	Drives radiator fan and A/C condenser fan at 0 % duty	Ignition switch: ON	Fans stop.	Procedure No.20	13E-33
18		Drives radiator fan and A/C condenser fan at 50 % duty	Ignition switch: ON	Fans operate at medium speed.		
19		Drives radiator fan and A/C condenser fan at 100 % duty	Ignition switch: ON	Fans operate at high speed.		



CHECK AT THE ENGINE-ECU TERMINALS

13300450025

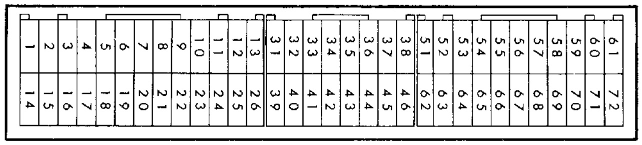
TERMINAL VOLTAGE CHECK CHART

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



9FU0101

Terminal No.	Check item	Check condition (Engine condition)		Normal condition
2	Timing control solenoid valve	Ignition switch: ON		11 - 13 V
		Engine: Idling		3.5 - 7.5 V
		Engine: 2,500 r/min		5 - 9 V
3	Solenoid-type spill valve	Ignition switch: ON		11 - 13 V
		When engine is suddenly decelerated from 3000 r/min		0 ↔ 12.5 V (varies repeatedly) and momentarily increases
4	Throttle solenoid valve	Ignition switch: ON		0 - 3 V
		Engine: Idling	Engine coolant temperature is 40 °C or lower	12 - 15 V
			Engine coolant temperature is 80 °C or higher	0 - 3 V
9	Crank angle sensor	Engine: Cranking		0.4 - 4.0 V
		Engine: Idling		2.5 - 4.5 V
Between terminals 10 and 23	Pump operation sensor	Engine: Idling		0.2 - 1.0 V (AC range)
		Engine: 2,500 r/min		1.2 - 2.2 V (AC range)
16	EGR solenoid valve	Ignition switch: OFF → ON		11 - 13 V
		When idling after having warmed up, engine is suddenly raced.		Momentarily increases
18	Fan controller	When radiator fan and A/C condenser fan are not operating		0 - 0.3 V
		When radiator fan and A/C condenser fan are operating		0.7 V or more
19	Idle position switch 2	Ignition switch: ON	Accelerator pedal is released	0 - 1 V
			Accelerator pedal is slightly depressed	4 V or higher

Terminal No.	Check item	Check condition (Engine condition)		Normal condition
21	Vehicle speed sensor	• Ignition switch: ON • Vehicle is moving forward slowly		0 ↔ 5 V (Varies repeatedly)
25	Ignition switch-IG	Ignition switch: ON		11 - 13 V
31	A/C switch 2	• Engine: Idling • Outside air temperature: 25 °C or more	When A/C is MAX. COOL condition (When the load by A/C is high)	0 - 3 V
			When A/C is MAX. HOT condition (When the load by A/C is low)	System voltage
33	Fuel injection rate correction resistor	Ignition switch: ON		0.2 - 4.5 V
34	Diesel fuel temperature sensor	Ignition switch: ON (when cranking at cold engine)		0.5 - 3.4 V
35	Engine coolant temperature sensor	Ignition switch: ON	Engine coolant temperature is 0 °C	3.2 - 3.8 V
			Engine coolant temperature is 20 °C	2.3 - 2.9 V
			Engine coolant temperature is 40 °C	1.3 - 1.9 V
			Engine coolant temperature is 80 °C	0.3 - 0.9 V
36	Intake air temperature sensor	Ignition switch: ON	Intake air temperature is 0 °C	3.2 - 3.8 V
			Intake air temperature is 20 °C	2.3 - 2.9 V
			Intake air temperature is 40 °C	1.5 - 2.1 V
			Intake air temperature is 80 °C	0.4 - 1.0 V
37	Boost sensor	Ignition switch: ON	Altitude is 0 m	2.0 - 2.6 V
			Altitude is 1,200 m	1.7 - 2.3 V
38	Sensor applied voltage	Ignition switch: ON		4.5 - 5.5 V
41	Fuel injection timing correction resistor	Ignition switch: ON		0.2 - 4.5 V
43	Idle position switch 1	Ignition switch: ON	Accelerator pedal is released	0 - 1 V
			Accelerator pedal is depressed	4 V or higher

Terminal No.	Check item	Check condition (Engine condition)		Normal condition
44	Accelerator pedal position sensor	Ignition switch: ON	Accelerator pedal is released	0.3 - 0.8 V
			Accelerator pedal is fully depressed	4.2 - 4.5 V
51	Ignition switch-ST	Engine: Cranking		8 V or higher
52	A/C switch 1	Engine: Idling	A/C switch is off	0 - 3 V
			A/C switch is on (A/C compressor is operating)	13 - 15 V
53	A/C relay	● Engine: Idling ● A/C switch: OFF → ON (A/C compressor is operating)		13 - 15 V or momentarily 6 V or more → 0 - 3 V
55	Glow indicator lamp	● Ignition switch: OFF → ON ● Engine coolant temperature is 40 °C or less		0 - 1 V; after approx. 1 second → 11 - 13 V (at engine coolant temperature of 20 °C)
57	Engine warning lamp	Ignition switch: OFF → ON		0 - 3 V → (after several seconds) 9 - 13 V
59	Control relay	Ignition switch: OFF		11 - 13 V
		Ignition switch: ON		0 - 3 V
60	Glow plug relay (pre-heat time control)	● Ignition switch: OFF → ON ● Engine coolant temperature is 40 °C or less (Pre-glow function check)		9 - 12 V; after approx. 8 seconds → 0 - 0.5 V (at engine coolant temperature of 20 °C)
61	Backup power supply	Ignition switch: OFF		11 - 13 V
66	A/C variable capacity relay	● Engine: Idling ● A/C switch: ON	Engine coolant temperature is 5 °C or less	0 - 3 V
			Engine coolant temperature is 5 °C or more	13 - 15 V
71	Solenoid-type spill valve	Ignition switch: ON → OFF		0.39 V → (after approx. 3 seconds) 0 V
72	Power supply	Ignition switch: ON		11 - 13 V

CHECK CHART FOR RESISTANCE AND CONTINUITY BETWEEN TERMINALS

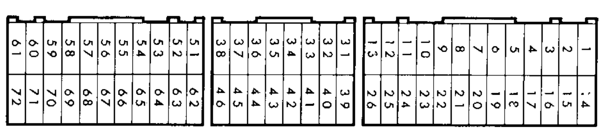
1. Turn the ignition switch to OFF.
2. Disconnect the engine-ECU connector.
3. Measure the resistance and check for continuity between the terminals of the engine-ECU harness-side connector while referring to the check chart.

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

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

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

Engine-ECU Connector Terminal Arrangement



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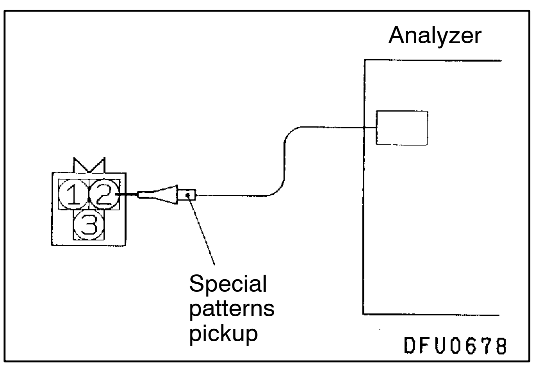
Terminal No.	Check item	Normal condition (Check condition)
2 - 72	Timing control valve	8 - 12 Ω (At 20 °C)
4 - 72	Throttle solenoid valve	36 - 44 Ω (At 20 °C)
10 - 23	Pump operation sensor	215 - 245 Ω (At 20 °C)
16 - 72	EGR solenoid valve	11 - 14 Ω (At 20 °C)
19 - Body earth	Idle position switch 2	Continuity (When accelerator lever is at idle position)
		No continuity (When accelerator lever is at slightly open)

Terminal No.	Check item	Normal condition (Check condition)
26 - Body earth	Engine-ECU earth	Continuity (0 Ω)
33 - 46	Injection rate correction resistor	0.1 - 2.5 kΩ (At 20 °C)
34 - 46	Diesel fuel temperature sensor	2.2 - 2.7 kΩ
35 - 46	Engine coolant temperature sensor	5.1 - 6.5 kΩ (When engine coolant temperature is 0 °C)
		2.1 - 2.7 kΩ (When engine coolant temperature is 20 °C)
		0.9 - 1.3 kΩ (When engine coolant temperature is 40 °C)
		0.26 - 0.36 kΩ (When engine coolant temperature is 80 °C)
36 - 46	Intake air temperature sensor	5.3 - 6.7 kΩ (When intake air temperature is 0 °C)
		2.3 - 3.0 kΩ (When intake air temperature is 20 °C)
		1.0 - 1.5 kΩ (When intake air temperature is 40 °C)
		0.30 - 0.42 kΩ (When intake air temperature is 80 °C)
41 - 46	Injection timing correction resistor	0.1 - 2.5 kΩ (At 20 °C)
43 - 46	Idle position switch 1	Continuity (When accelerator lever is at idle position)
		No continuity (When accelerator lever is at slightly open)



INSPECTION PROCEDURE USING AN ANALYZER

13300460028

CRANK ANGLE SENSOR

Measurement Method

1. Disconnect the crank angle sensor connector and connect the special tool (test harness: MD998478) in between.
2. Connect the analyzer special patterns pickup to crank angle sensor connector terminal (2) (black clip of special tool).

Alternate Method (Test harness not available)

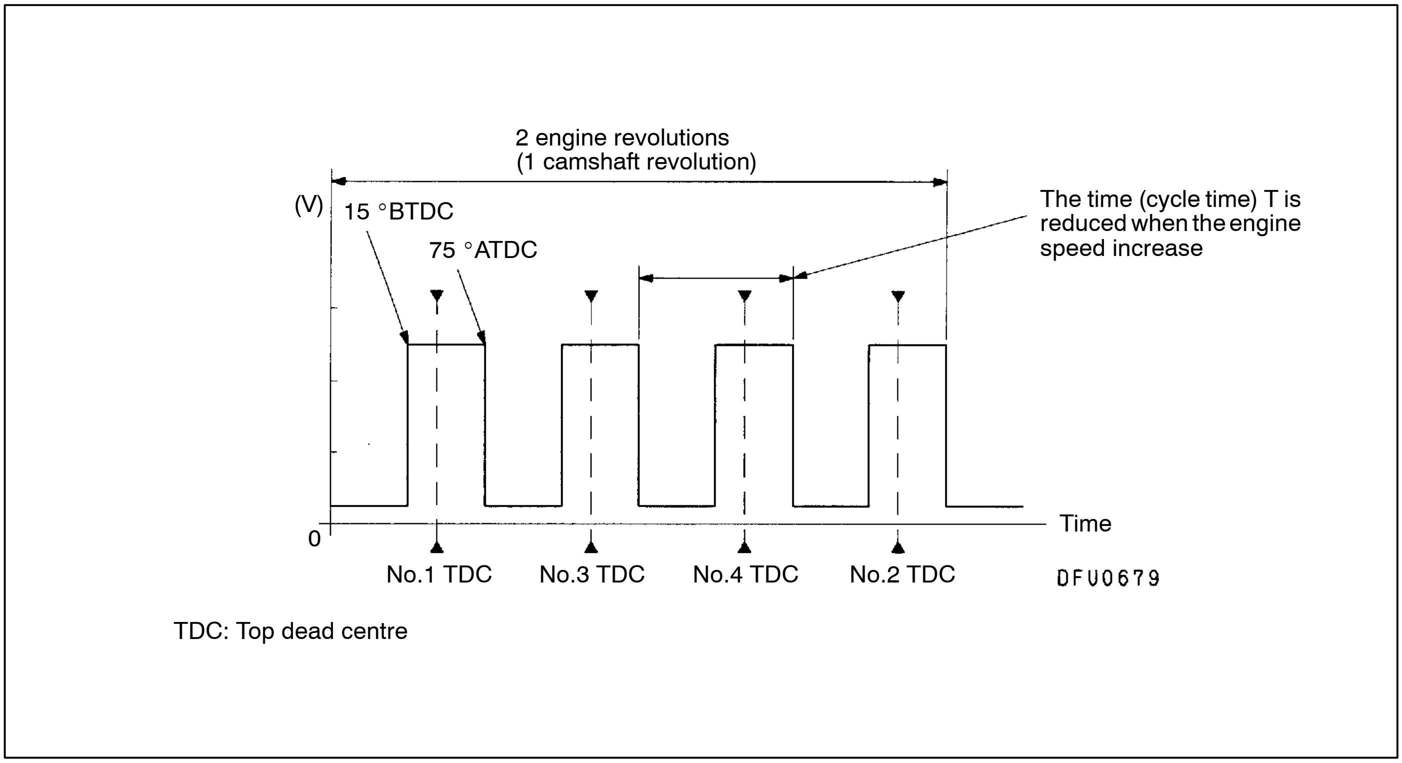
Connect the analyzer special patterns pickup to engine-ECU terminal 9.

Standard Wave pattern

Observation conditions

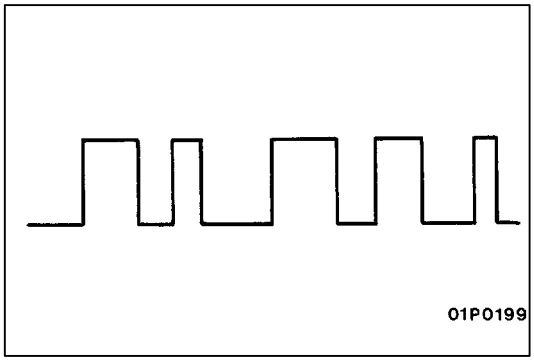
Function	Special patterns
Pattern height	Low
Pattern selector	Display
Engine r/min	Idle speed

Standard wave pattern



Wave Pattern Observation Points

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



Examples of Abnormal Wave Patterns

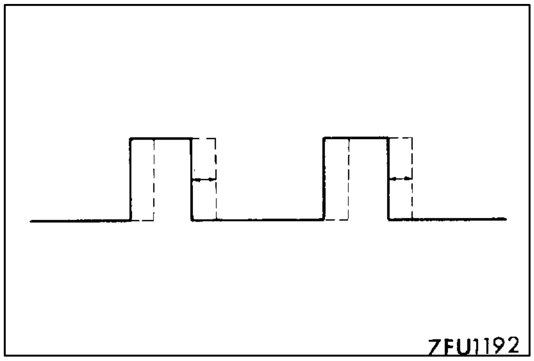
- Example 1

  Cause of problem

  Sensor interface malfunction

  Wave pattern characteristics

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



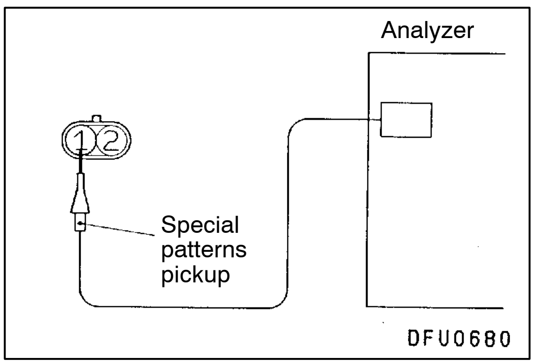
- Example 2

  Cause of problem

  Loose timing belt
  Abnormality in sensor disk

  Wave pattern characteristics

  Wave pattern is displaced to the left or right.



PUMP OPERATION SENSOR

Measurement Method

1. Disconnect the pump operation 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 pump operation sensor connector terminal (1).

Alternate Method (Test harness not available)

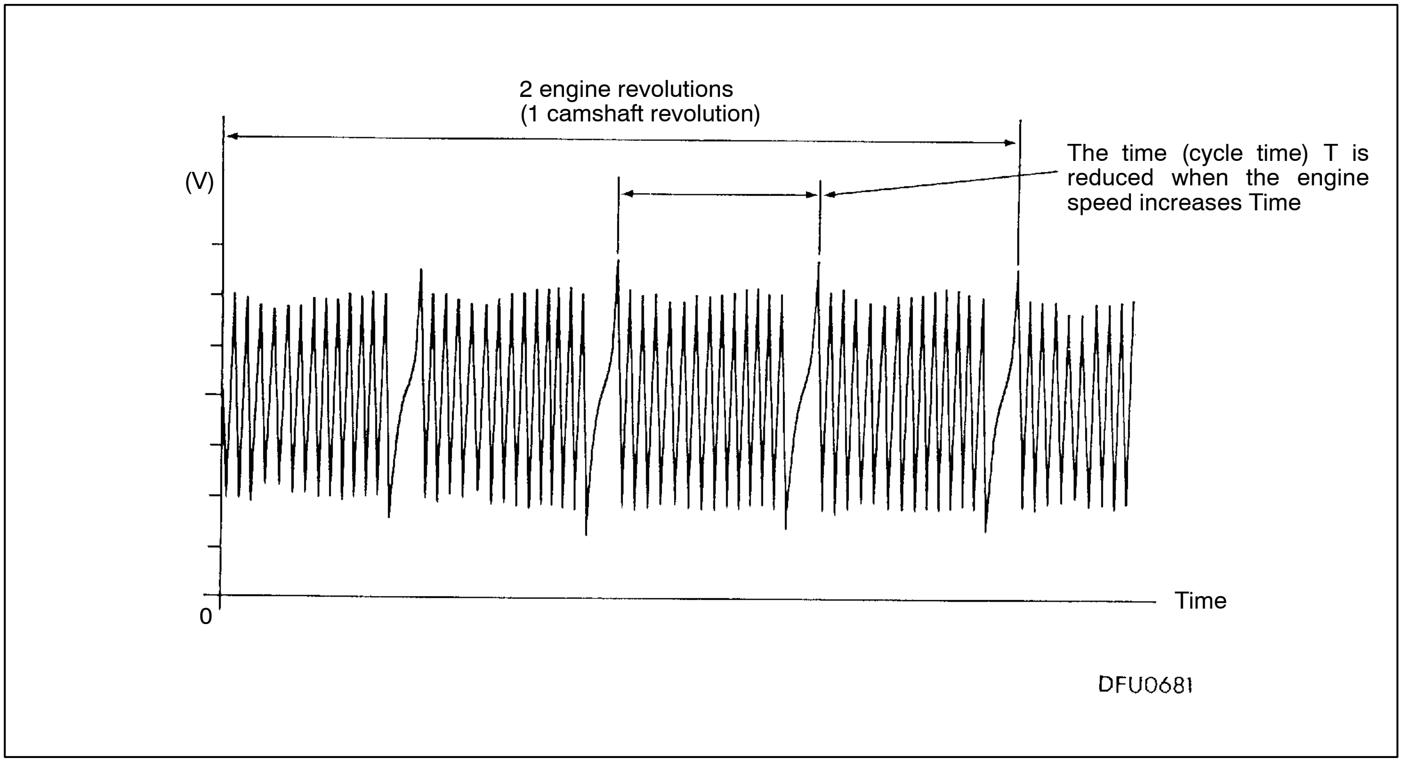
Connect the analyzer special patterns pickup to engine-ECU terminal 10.

Standard Wave Pattern

Observation conditions

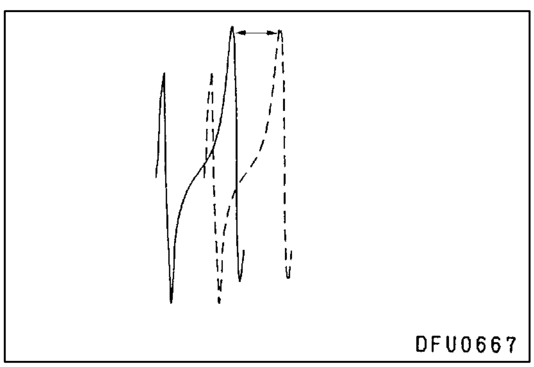
Function	Special patterns
Pattern height	Low
Pattern selector	Display
Engine r/min	Idle speed

Standard wave pattern



Wave Pattern Observation Points

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



Examples of Abnormal Wave Patterns

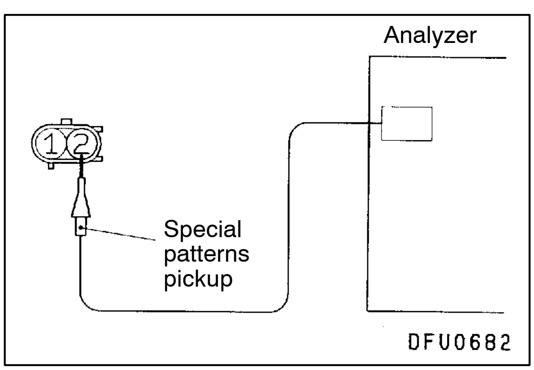
- Example

  Cause of problem

  Loose timing belt
  Incorrect installation of injection pump or pump operation sensor

  Wave pattern characteristics

  Wave pattern is displaced to the left or right.



SOLENOID-TYPE SPILL VALVE

Measurement Method

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

Alternate Method (Test harness not available)

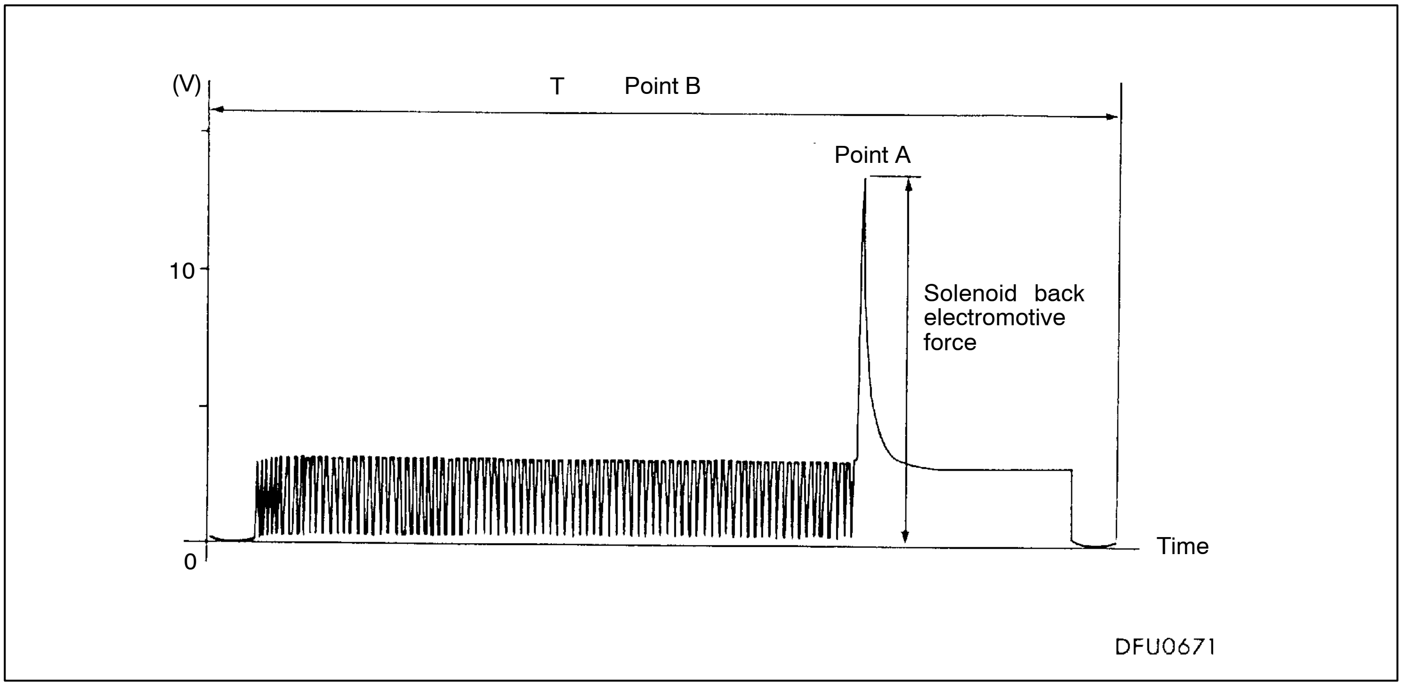
Connect the analyzer special patterns pickup to engine-ECU terminal 3.

Standard Wave Pattern

Observation conditions

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

Standard wave pattern



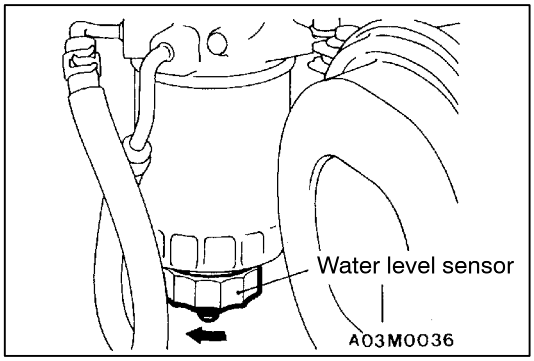
Wave Pattern Observation Points

Point A: Height of solenoid back electromotive force

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

Point B: Solenoid-type spill valve drive cycle

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



ON-VEHICLE SERVICE

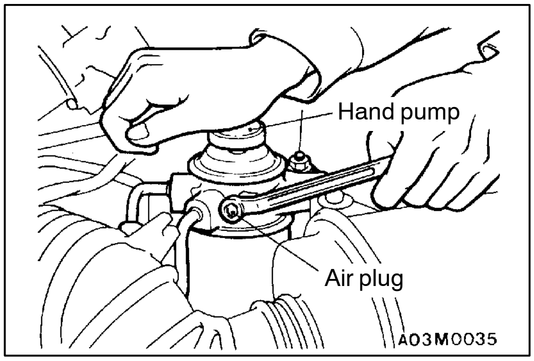
13300120056

EVACUATION OF WATER FROM FUEL FILTER

Water is in the filter when fuel filter warning lamp lights. Evacuate water by the following procedures.

1. Loosen the water level sensor.
2. Operate the hand pump to drain the water, and then tighten the water level sensor to the specified torque.

   Tightening torque: 13 Nm



EVACUATION OF AIR FROM FUEL LINE

13300130059

Bleed the air from the fuel line after refilling the fuel.

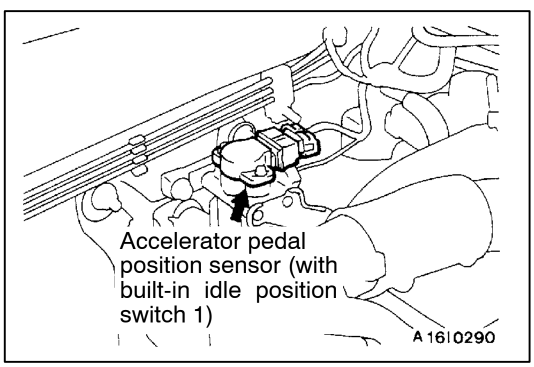
- When fuel is drained for service.
- When fuel filter is replaced.
- When main fuel line is removed.

1. Loosen fuel filter air plug.
2. Place rags around air plug hole. Operate hand pump repeatedly until no bubbles come from plug hole. Tighten air plug.
3. Repeat until hand pump operation becomes stiff.

FUEL FILTER CARTRIDGE REPLACEMENT

13300320036

Refer to GROUP 13F.



ACCELERATOR PEDAL POSITION SENSOR AND IDLE POSITION SWITCH 1 ADJUSTMENT

13300600017

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

   Standard value: 530 - 570 mV

4. If the output voltage is outside the standard value range, loosen the accelerator pedal position sensor mounting bolt and turn the accelerator pedal position sensor body to adjust. After adjusting, securely tighten the mounting bolt.
5. Check the voltage at the point where idle position switch 1 turns from on to off.

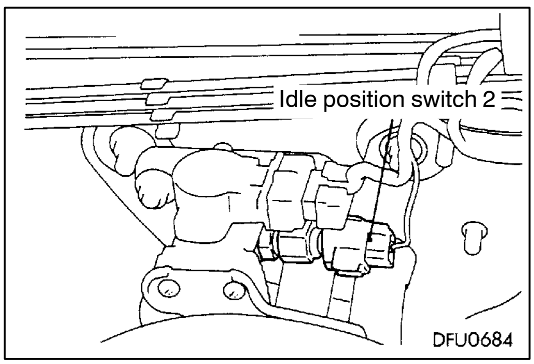
   Standard value: 650 - 1,150 mV

6. If the voltage is outside the standard value range, replace the accelerator pedal position sensor assembly.

7. Check the accelerator pedal position sensor output voltage when the accelerator pedal is fully depressed.

   Standard value: 4,000 - 4,690 mV

   NOTE
   If the voltage is outside the standard value range, check whether there are any marks which show that idle position switch 2 has been moved. If such marks can be found, adjust the idle position switch 2.
   If no such marks can be found, re-adjust the output voltage of the accelerator pedal position sensor.
8. Turn the ignition switch to OFF.
9. Disconnect the MUT-II.



IDLE POSITION SWITCH 2 ADJUSTMENT

13300610010

NOTE
(1) The idle position switch 2 should not be moved unnecessarily; it has been precisely adjusted by the manufacturer.
(2) If the adjustment is disturbed for any reason, re-adjust as follows.

1. Loosen the tension of the accelerator cable sufficiently.
2. Connect the MUT-II to the diagnosis connector.
3. Turn the ignition switch to ON. (but do not start the engine.)
4. Check the accelerator pedal position sensor output voltage when the accelerator pedal is fully depressed.

   Standard value: 4,000 - 4,690 mV
5. If the output voltage is outside the standard value range, loosen the accelerator pedal position sensor mounting bolt and turn the accelerator pedal position sensor body to adjust.

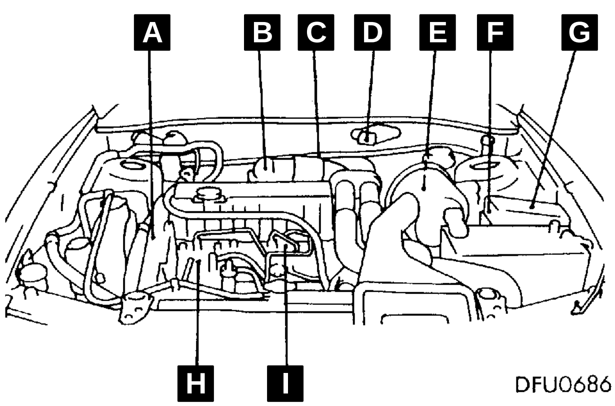
   Standard value: 4,350 mV
6. Tighten securely the accelerator pedal position sensor mounting bolt.
7. Back out the idle position switch 2 lock nut.
8. Adjust the idle position switch 2 so that the accelerator pedal position sensor output voltage is within the standard value range when the accelerator pedal is released.

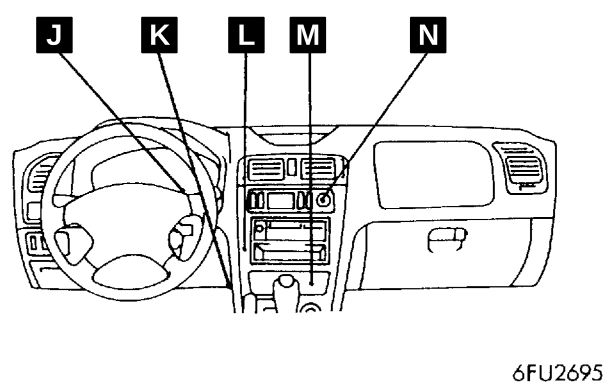
   Standard value: 530 - 570 mV
9. While holding the idle position switch 2 so that it doesn't move, tighten the lock nut securely.
10. Turn the ignition switch to OFF.
11. Disconnect the MUT-II.
12. Adjust the tension of the accelerator cable.

COMPONENT LOCATION

13300470021

Name	Symbol	Name	Symbol
A/C relay	G	Engine coolant temperature sensor	I
A/C switch	N	Engine-ECU	M
Accelerator pedal position sensor (with built-in idle position switch 1)	C	Engine warning lamp (check engine lamp)	J
Boost sensor	D	Glow indicator lamp	J
Control relay	L	Glow plug relay	F
Crank angle sensor	A	Idle position switch 2	C
Diagnosis connector	K	Intake air temperature sensor	B
Diesel fuel temperature sensor	H	Pump operation sensor	H
EGR solenoid valve	D	Throttle solenoid valve	D
Solenoid-type spill valve	H	Timing control solenoid valve	H
Solenoid-type spill valve relay	L	Vehicle speed sensor	E





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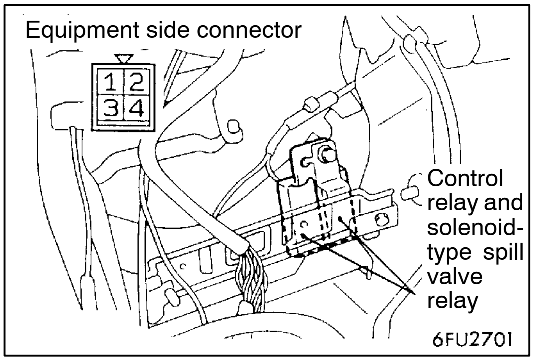
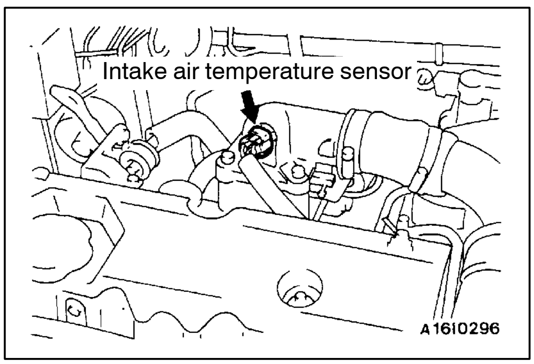


CONTROL RELAY AND SOLENOID-TYPE SPILL VALVE RELAY CONTINUITY CHECK

13300620013

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



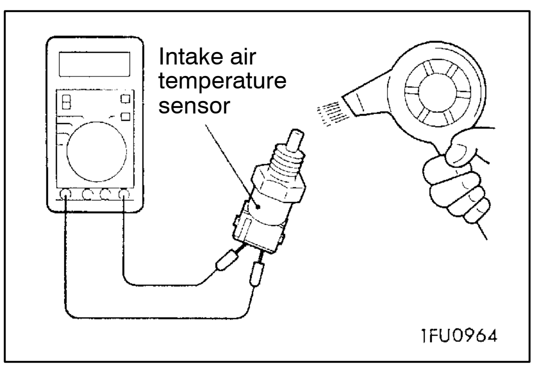
INTAKE AIR TEMPERATURE SENSOR CHECK

13300490027

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

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

3. Remove the intake air temperature sensor.



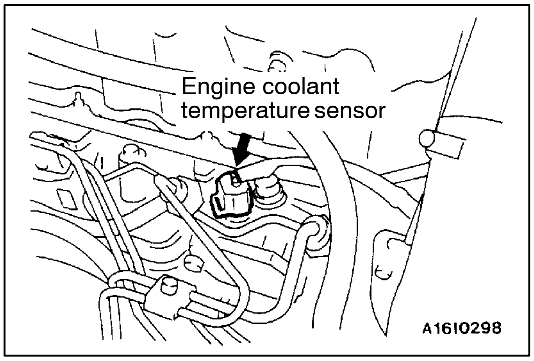
4. Measure resistance while heating the sensor using a hair drier.

   Normal condition:

Temperature (°C)	Resistance (kΩ)
Higher	Smaller

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

   Tightening torque: 12 - 15 Nm

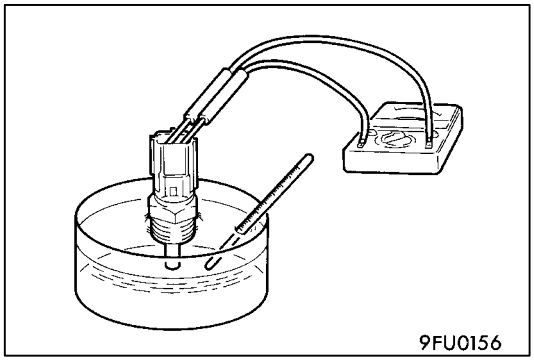


ENGINE COOLANT TEMPERATURE SENSOR CHECK

13300500027

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

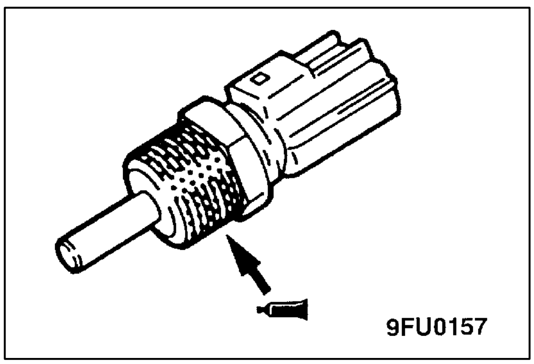
1. Remove the engine coolant temperature sensor.



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

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

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

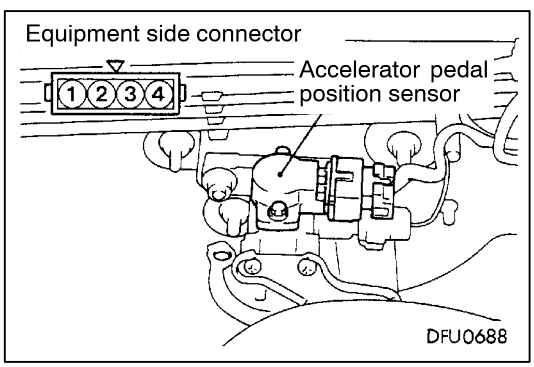


4. Apply sealant to threaded portion.

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

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

   Tightening torque: 29 Nm



ACCELERATOR PEDAL POSITION SENSOR CHECK

13300630016

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

   Standard value: 3.5 - 6.5 kΩ

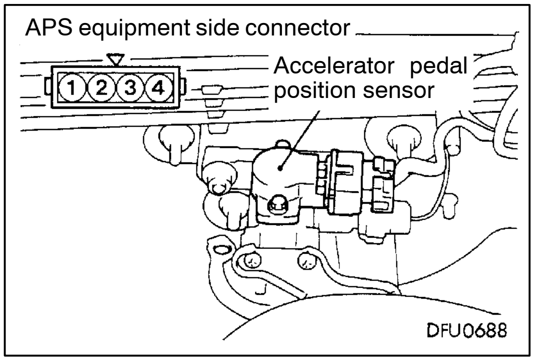
3. Measure the resistance between the accelerator pedal position sensor side connector terminal 2 and terminal 4.

   Normal condition:

Depress the accelerator pedal slowly until fully depressed position from the idle position.	Changes smoothly in proportion to the opening angle of the throttle valve.

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

NOTE
For the accelerator pedal position sensor adjustment procedure, refer to P.13E-53.



IDLE POSITION SWITCH 1 CHECK 13300640019

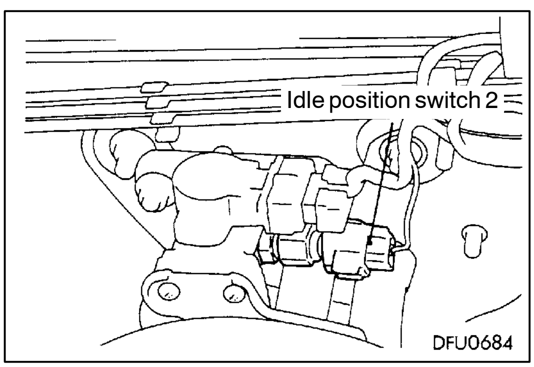
1. Disconnect the accelerator pedal position sensor connector.
2. Check the continuity between the accelerator pedal position sensor connector side terminal 3 and terminal 4.

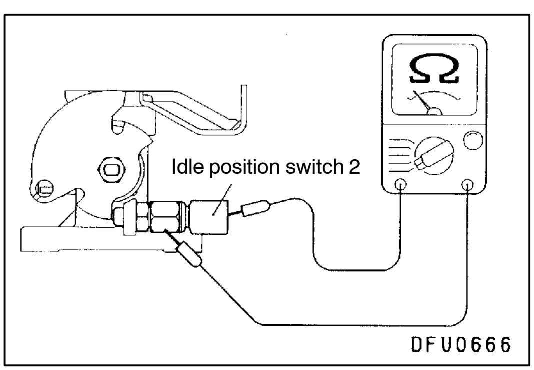
Normal condition:

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

3. If out of specification, replace the idle position switch 1.

NOTE
After replacement, the accelerator pedal position sensor should be adjusted. (Refer to P.13E-53.)





IDLE POSITION SWITCH 2 CHECK 13300650012

1. Disconnect the idle position switch 2 connector.
2. Check the continuity between the idle position switch 2 terminal and body earth.

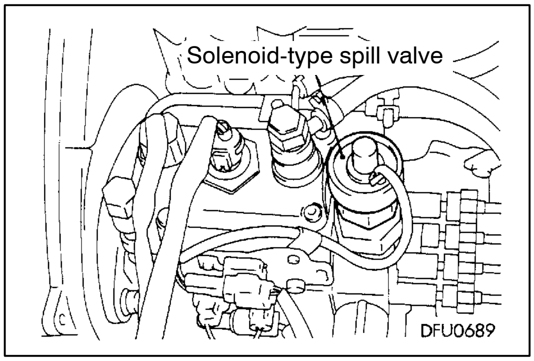
Normal condition:

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

3. If out of specification, replace the idle position switch 2.

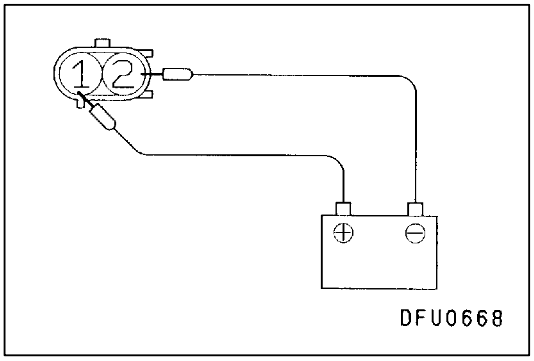
NOTE
After replacement, the accelerator pedal position sensor should be adjusted. (Refer to P.13E-53.)

SOLENOID-TYPE SPILL VALVE CHECK 13300660015



1. Disconnect the solenoid-type spill valve connector.
2. Measure the resistance between terminals 1 and 2.

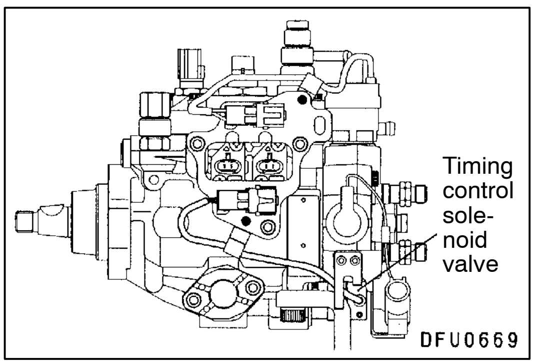
Standard value: 1 - 2 Ω (at 20°C)



3. Check that the sound of the solenoid valve operating can be heard when battery voltage is applied momentarily (for 2 - 3 seconds) between the solenoid-type spill valve terminals.

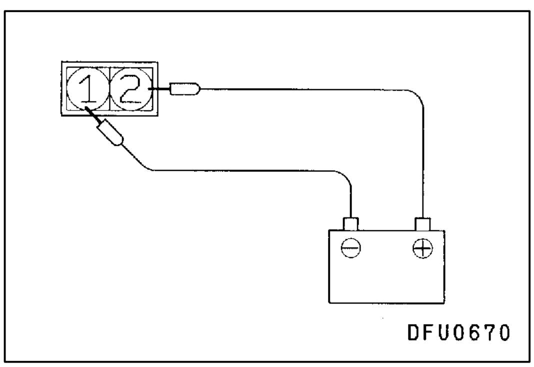
Caution
Because the solenoid-type spill valve is current-controlled, it should not be left for a long time with the voltage applied.

TIMING CONTROL SOLENOID VALVE CHECK 13300560025



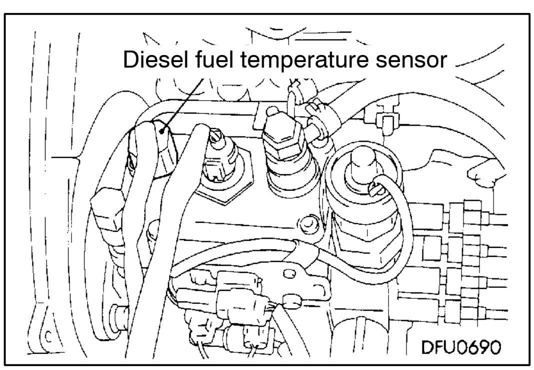
1. Disconnect the timing control solenoid valve connector.
2. Measure the resistance between terminals 1 and 2.

Standard value: 8 - 12 Ω (at 20°C)



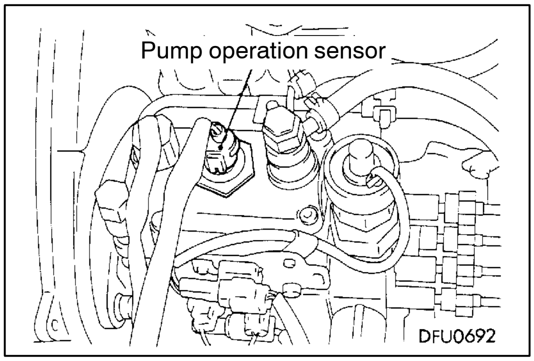
3. Check that the sound of the solenoid valve operating can be heard when battery voltage is applied between the timing control solenoid valve terminals.

DIESEL FUEL TEMPERATURE SENSOR CHECK 13300680011



1. Disconnect the diesel fuel temperature sensor connector.
2. Measure the resistance between terminals 1 and 2.

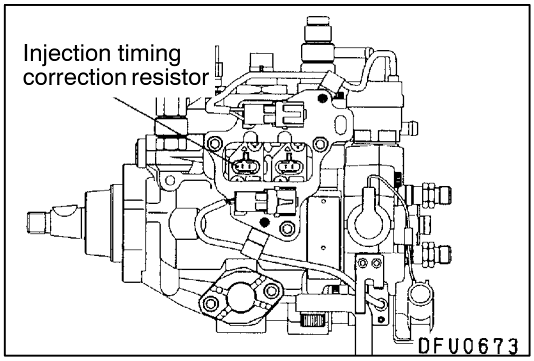
Standard value: 2.2 - 2.7 kΩ (at 20°C)



PUMP OPERATION SENSOR CHECK 13300690014

1. Disconnect the pump operation sensor connector.
2. Measure the resistance between terminals 1 and 2.

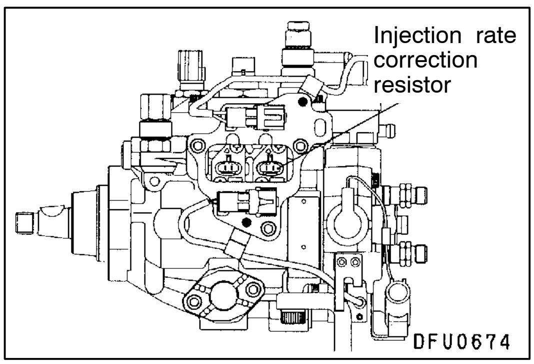
Standard value: 215 - 245 Ω (at 20°C)



INJECTION TIMING CORRECTION RESISTOR CHECK 13300700014

1. Disconnect the injection timing correction resistor connector.
2. Measure the resistance between terminals 1 and 2.

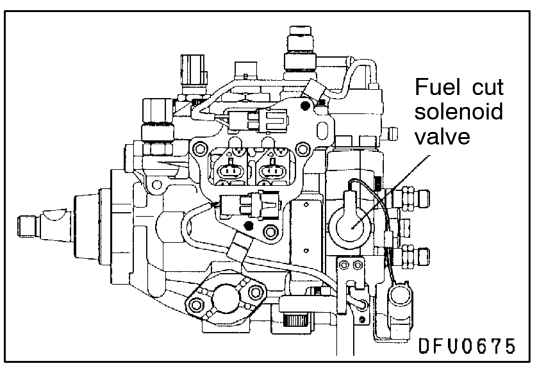
Standard value: 0.1 - 2.5 kΩ (at 20°C)



INJECTION RATE CORRECTION RESISTOR CHECK 13300710017

1. Disconnect the injection rate correction resistor connector.
2. Measure the resistance between terminals 1 and 2.

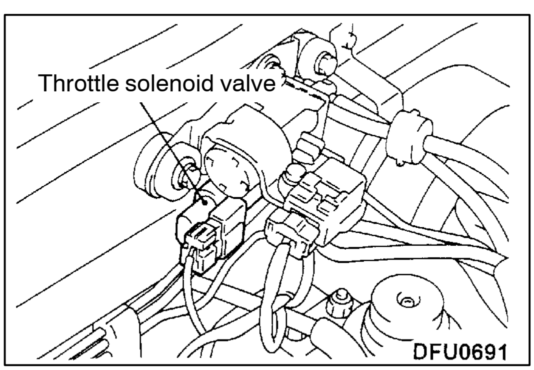
Standard value: 0.1 - 2.5 kΩ (at 20°C)



FUEL CUT SOLENOID VALVE CHECK 13300720010

1. When a sound scope is held against the fuel cut solenoid valve and the ignition switch is turned to ON, check that the sound of the valve operating can be heard.
2. Disconnect the fuel cut solenoid valve connector.
3. Measure the resistance between fuel cut solenoid valve terminal and the injection pump body.

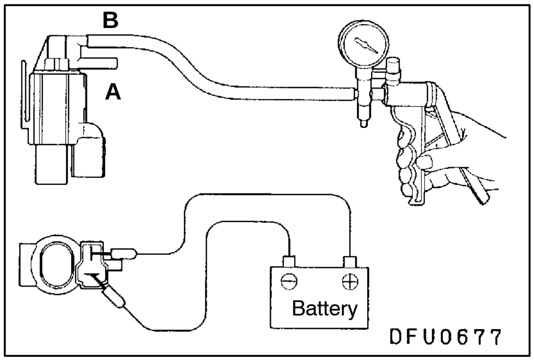
Standard value: 8 - 10 Ω



THROTTLE SOLENOID VALVE CHECK 13300730013

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

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



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

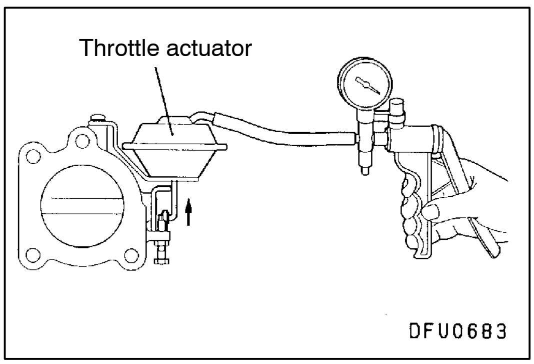
Normal condition:

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

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

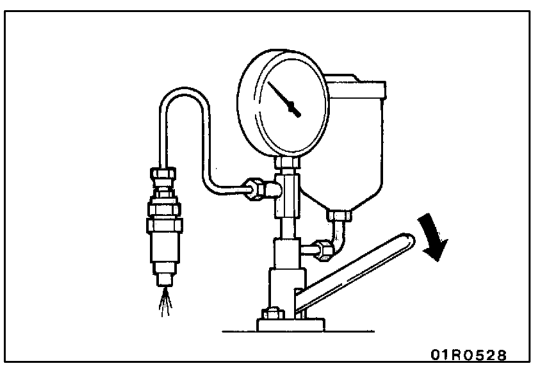
Standard value: 36 - 44 Ω (at 20°C)

THROTTLE ACTUATOR CHECK 13300740016



1. Remove the vacuum hose (red stripe) from the throttle actuator and connect a hand vacuum pump to the throttle actuator nipple.
2. Check that the actuator rod moves smoothly when applying vacuum gradually.
   Also, check that the vacuum is maintained when applying 53 kPa of vacuum.

INJECTION NOZZLE CHECK AND ADJUSTMENT 13300170020



Caution
Never touch the injection spray that is injected from the nozzle.

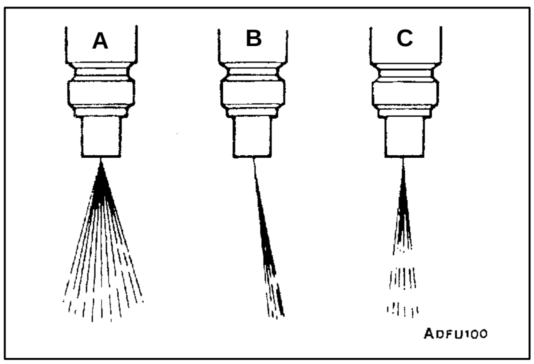
FUEL INJECTION INITIAL PRESSURE CHECK

1. Install the injection nozzle to a nozzle tester.
2. Move the lever of the nozzle tester 2 - 3 times to inject fuel and to bleed the air.
3. Gently press down the lever of the nozzle tester, and take a reading of the indication value on the pressure gauge at the point where the needle slowly rises and then suddenly drops.

Standard value: 14,710 - 15,690 kPa

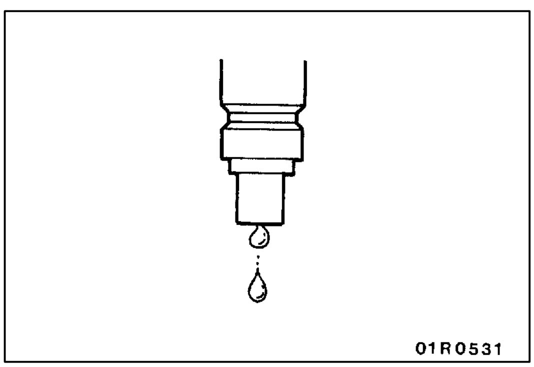
4. If the fuel injection initial pressure is outside the standard value, disassemble the nozzle holder to clean it, and then change the thickness of the shim to adjust the fuel injection initial pressure.

   NOTE
   (1) For disassembly, reassembly and adjustment of the nozzle holder, refer to P.13E-66.
   (2) There are 10 shims for adjustment, with thicknesses in the range of 0.10 - 0.80 mm.
   (3) When the shim thickness is increased by 0.1 mm, the fuel injection initial pressure increases by 2,350 kPa.

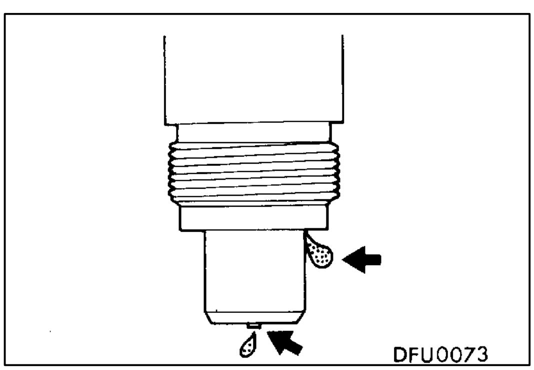


INJECTION SPRAY CONDITION CHECK 13300180023

1. Move the lever of the nozzle tester rapidly (4 - 6 times per second) to eject the fuel continuously. Check to be sure that the injection spray comes out evenly in a cone shape (injection spray angle is 10°). The injection spray patterns shown in the illustration at left are wrong.
   A. Injection angle is too large
   B. Bias
   C. Intermittent fuel injection



2. Check to be sure that no fuel drips after injection is completed.
3. If there are any drips, disassemble the nozzle, clean it and re-inspect, or replace the nozzle.



NOZZLE FUEL-TIGHT CHECK 13300190026

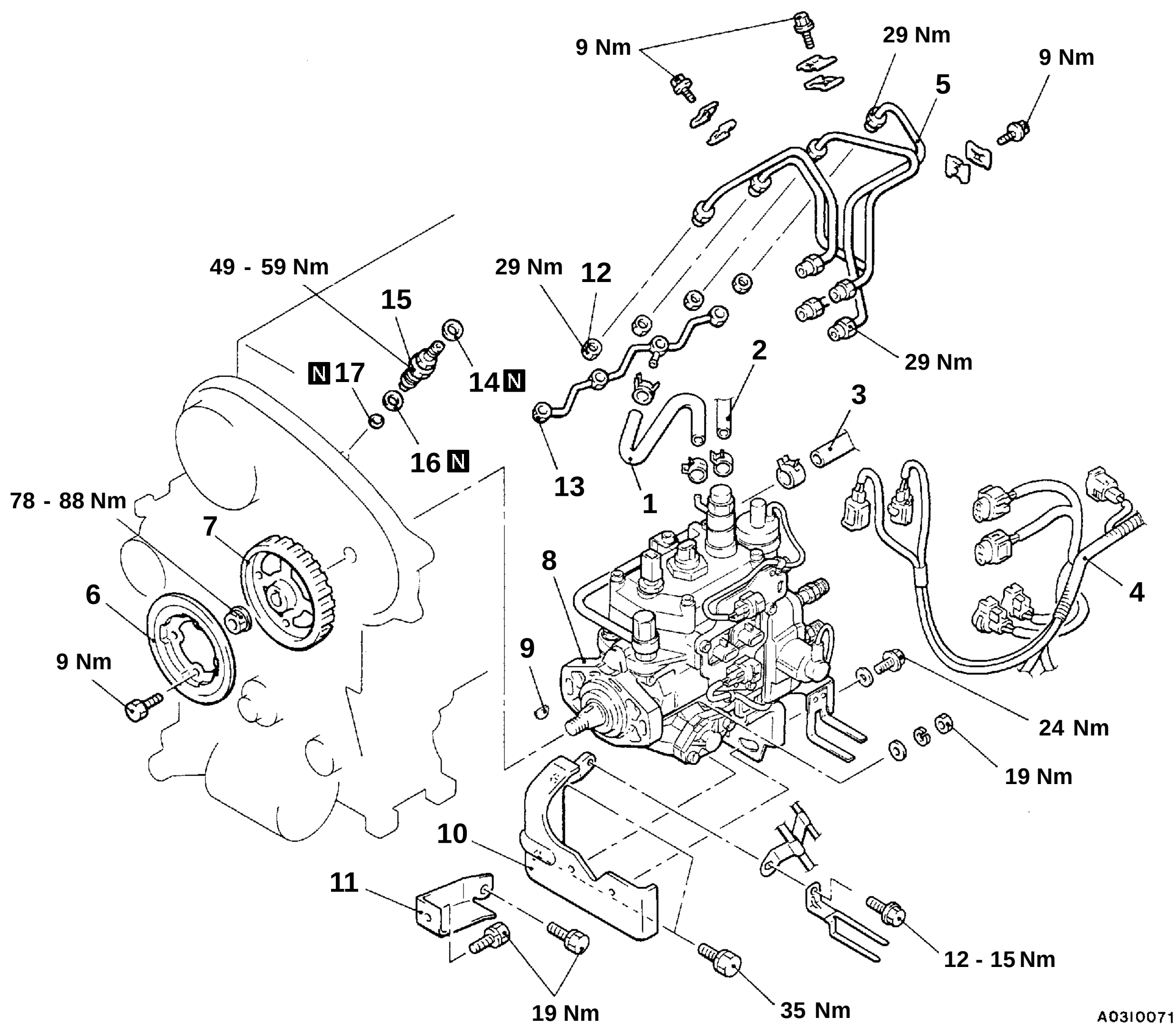
1. Gently raise the lever of the nozzle tester until the pressure inside the nozzle (value displayed on pressure gauge) becomes 12,750 - 13,730 kPa, and after holding this pressure for approximately 10 seconds, check to be sure that there are no fuel leaks from the nozzle.
2. If there are any leaks, disassemble the nozzle, clean it and re-inspect, or replace the nozzle.

INJECTION PUMP AND NOZZLE

13300210036

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Glow Plug Removal and Installation (Refer to GROUP 16.)
- Timing Belt Removal and Installation (Refer to GROUP 11C.)



Fuel injection pump removal steps

1. Fuel return hose connection
2. Fuel return hose connection
3. Fuel main hose connection
4. Control wiring harness connection

◀A▶ ▶D◀ 5. Fuel injection pipe

6. Flange

◀B▶ 7. Fuel injection pump sprocket

◀B▶ 8. Fuel injection pump

9. Key
10. Injection pump stay
11. Injection pump bracket stay

Fuel injection nozzle removal steps

1. Fuel return hose connection

◀A▶ ▶D◀ 5. Fuel injection pipe

◀C▶ ▶C◀ 12. Nut

◀C▶ ▶C◀ 13. Fuel return pipe

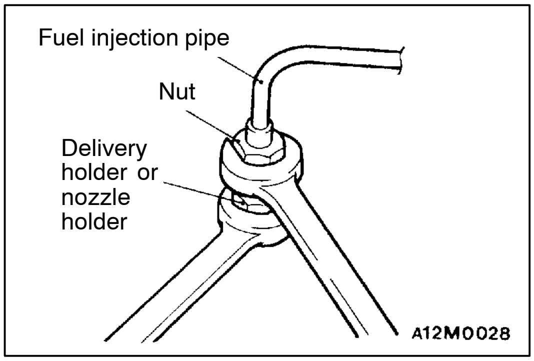
14. Fuel return pipe gasket

◀D▶ ▶B◀ 15. Fuel injection nozzle and holder assembly

▶A◀ 16. Holder gasket

▶A◀ 17. Nozzle gasket

REMOVAL SERVICE POINTS

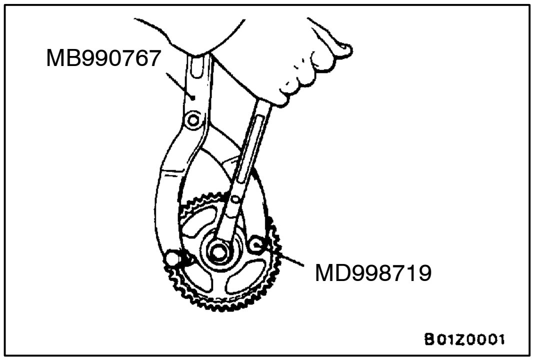


◀A▶ FUEL INJECTION PIPE REMOVAL

When loosening nuts at both ends of injection pipe, hold the delivery holder (for pump side) an the injection nozzle holder (for nozzle side) with wrench and loosen nut.

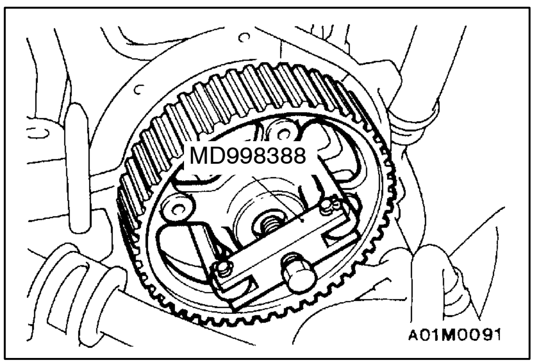
Caution

After disconnecting the injection pipe, be sure to use a plug so that foreign material, etc. does not get into the pump.



◀B▶ FUEL INJECTION PUMP SPROCKET/ FUEL INJECTION PUMP REMOVAL

1. Use the special tool to hold the injection pump sprocket, and then remove the injection pump sprocket fixing nut.

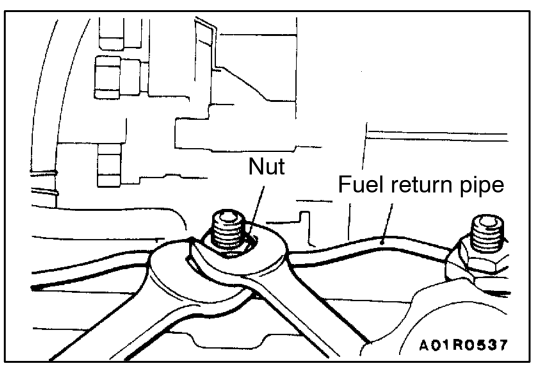


2. After removing the nut, install the special tool to the injection pump sprocket.
3. Pull the injection pump sprocket off from the pump drive shaft.

   Caution

   (1) When removing the sprocket, care must be taken not to subject the pump drive shaft to an impact.

   (2) After removal, the crankshaft should not be turned.
4. Remove the fuel injection pump.

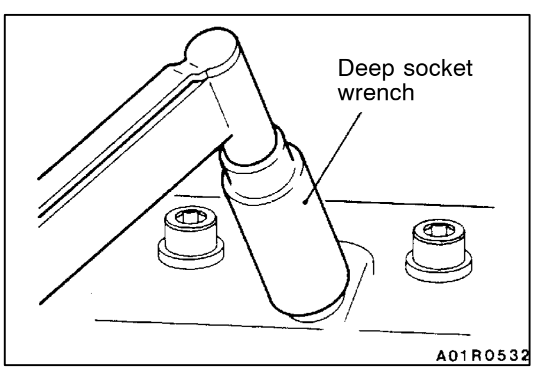


◀C▶ NUT/FUEL RETURN PIPE REMOVAL

1. While using a spanner or similar tool to hold the hexagonal nut of the fuel return pipe, remove the nut.

   Caution

   If an attempt is made to loosen the nut without first holding the fuel return pipe, the pipe may be broken or otherwise damaged.
2. Disconnect the fuel return pipe.



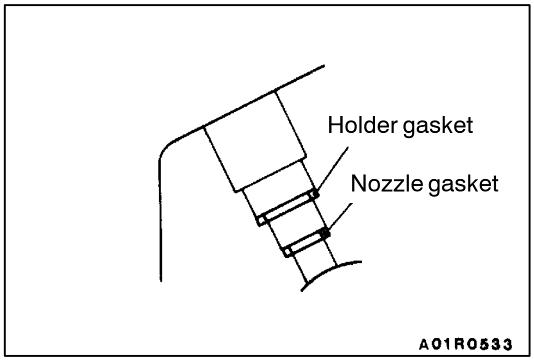
◀D▶ FUEL INJECTION NOZZLE AND HOLDER ASSEMBLY REMOVAL

Using a deep socket wrench, remove the fuel injection nozzle and holder assembly.

Caution

(1) Make a mark on the removed injection nozzle assembly (the cylinder No.).

(2) Use a cap to prevent foreign material, etc. from entering the injection nozzle hole.



INSTALLATION SERVICE POINTS

▶A◀ NOZZLE GASKET/HOLDER GASKET INSTALLATION

Clean the cylinder head's injection nozzle hole, and insert a new gasket.

▶B◀ FUEL INJECTION NOZZLE AND HOLDER ASSEMBLY INSTALLATION

Use a deep socket wrench in the same way as during removal to tighten to the specified torque.

Tightening torque: 49 - 59 Nm

▶C◀ FUEL RETURN PIPE/NUT INSTALLATION

While holding the hexagonal nut on the fuel return pipe with a spanner in the same way as during removal, tighten the nut to the specified torque.

Tightening torque: 29 Nm

Caution
If an attempt is made to tighten the nut without first holding the fuel return pipe, the pipe may be broken or otherwise damaged.

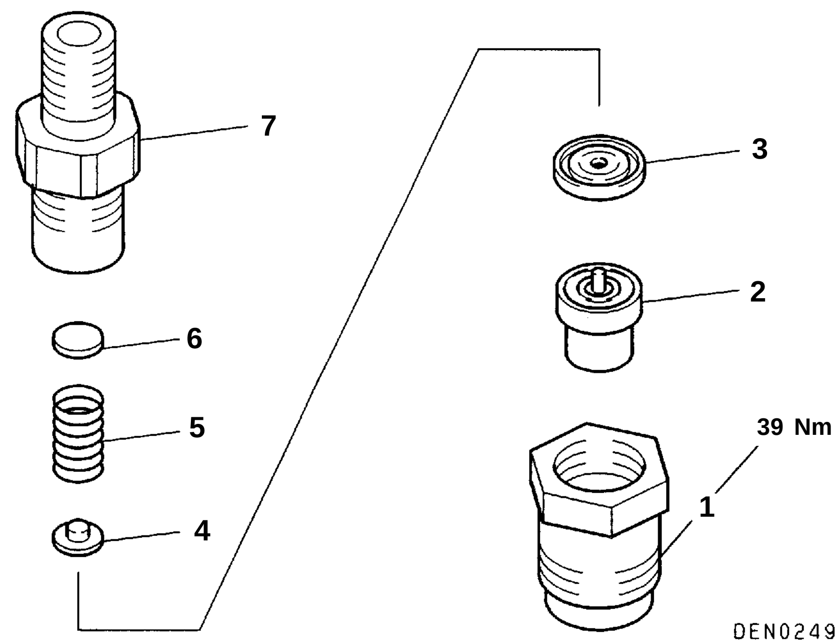
▶D◀ FUEL INJECTION PIPE INSTALLATION

When tightening the nuts at both ends of the fuel injection pipe, hold the delivery holder (for pump side) an the injection nozzle holder (for nozzle side) with wrench in the same way as during removal, and then tighten the nuts to the specified torque.

Tightening torque: 29 Nm

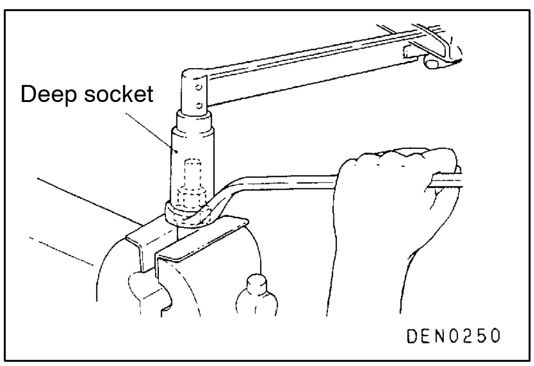
DISASSEMBLY AND REASSEMBLY

13300350035



Disassembly steps

◀A▶ ▶A◀ 1. Retaining nut
2. Nozzle tip
3. Distance piece
4. Retaining pin
5. Pressure spring
6. Shim
7. Nozzle holder body



DISASSEMBLY SERVICE POINT

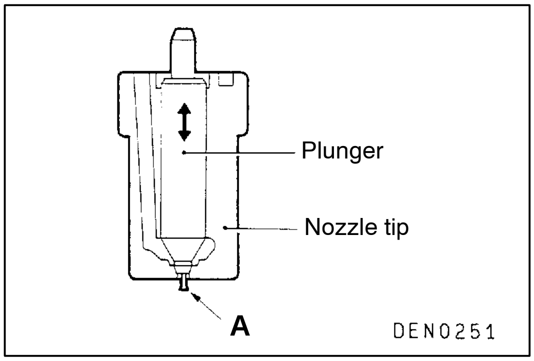
◀A▶ RETAINING NUT REMOVAL

1. Lightly clamp the retaining nut in a vise with soft jaws.
2. Hold the retaining nut with a box wrench, and loosen the nozzle holder body using a deep socket.

REASSEMBLY SERVICE POINT

▶A◀ RETAINING NUT INSTALLATION

1. Finger-tighten the nozzle holder body.
2. Lightly clamp the retaining nut in a vise with soft jaws.
3. While holding the retaining nut with a box wrench in the same way as during removal, use a deep socket wrench to tighten the nozzle holder body to the specified torque.



INSPECTION

13300360038

NOZZLE TIP

1. Check the nozzle tip for carbon deposits. Scape off carbon deposits with a piece of wood and clean each part with petrol. After cleaning, keep parts submerged in diesel fuel. Take particular care to protect the nozzle tip needle valve from damage.
2. While the nozzle tip is submerged in diesel fuel, check that the needle valve slides smoothly.
   If the needle valve does not slide smoothly, replace the nozzle tip.
   When replacing the nozzle tip, completely wash off the anticorrosive oil from the new nozzle tip with clean diesel fuel before using it.
3. Check plunger tip “A” for deformation and breakage. If “A” is damaged or broken, replace it.

DISTANCE PIECE

Check the surface in contact with the nozzle holder body by using minium.

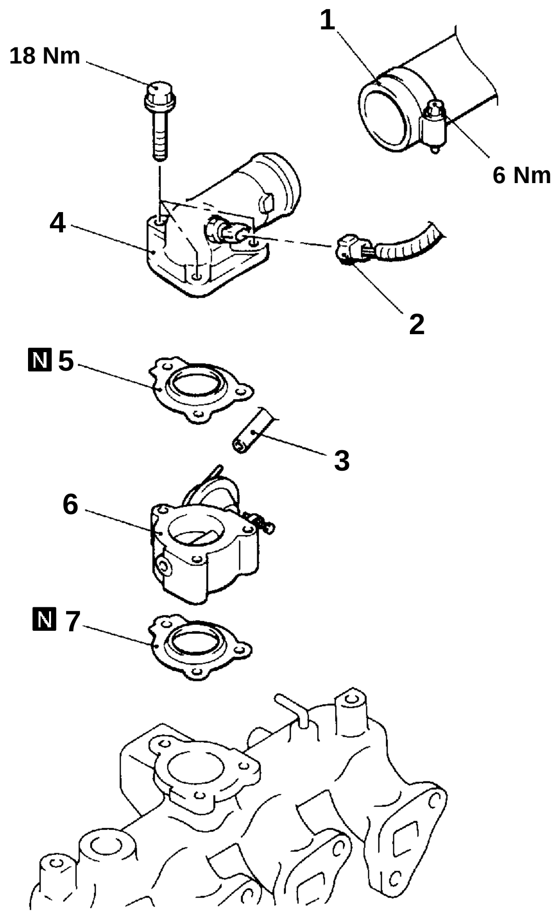
PRESSURE SPRING

Check spring for weakness and breakage.

THROTTLE BODY

13300760012

REMOVAL AND INSTALLATION



Removal steps

1. Air hose connection
2. Intake air temperature sensor connector
3. Vacuum hose connection
4. Air intake fitting
5. Intake fitting gasket
6. Throttle body assembly
7. Intake fitting gasket

FUEL SUPPLY

CONTENTS

13509000197

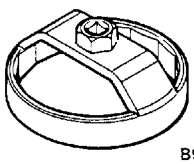
GENERAL INFORMATION

13500010120

- The steel fuel tank is located under the floor of the rear seats to provide increased safety and increase the amount of luggage compartment space.
- The fuel tank has been equipped with a valve assembly which incorporates a fuel cut-off valve to prevent fuel from leaking out in the event of a collision and a two-way valve for adjusting the pressure inside the fuel tank.
- A plastic snap-fitting hose (high-pressure fuel hose) has been adopted between the fuel pump assembly and the fuel filter assembly in petrol-powered vehicles in order to improve ease of maintenance.

SPECIAL TOOL

13500060088

Tool	Number	Name	Use
 B991610	MB991610	Oil filter wrench	Fuel filter cartridge replacement <Diesel-powered vehicles>

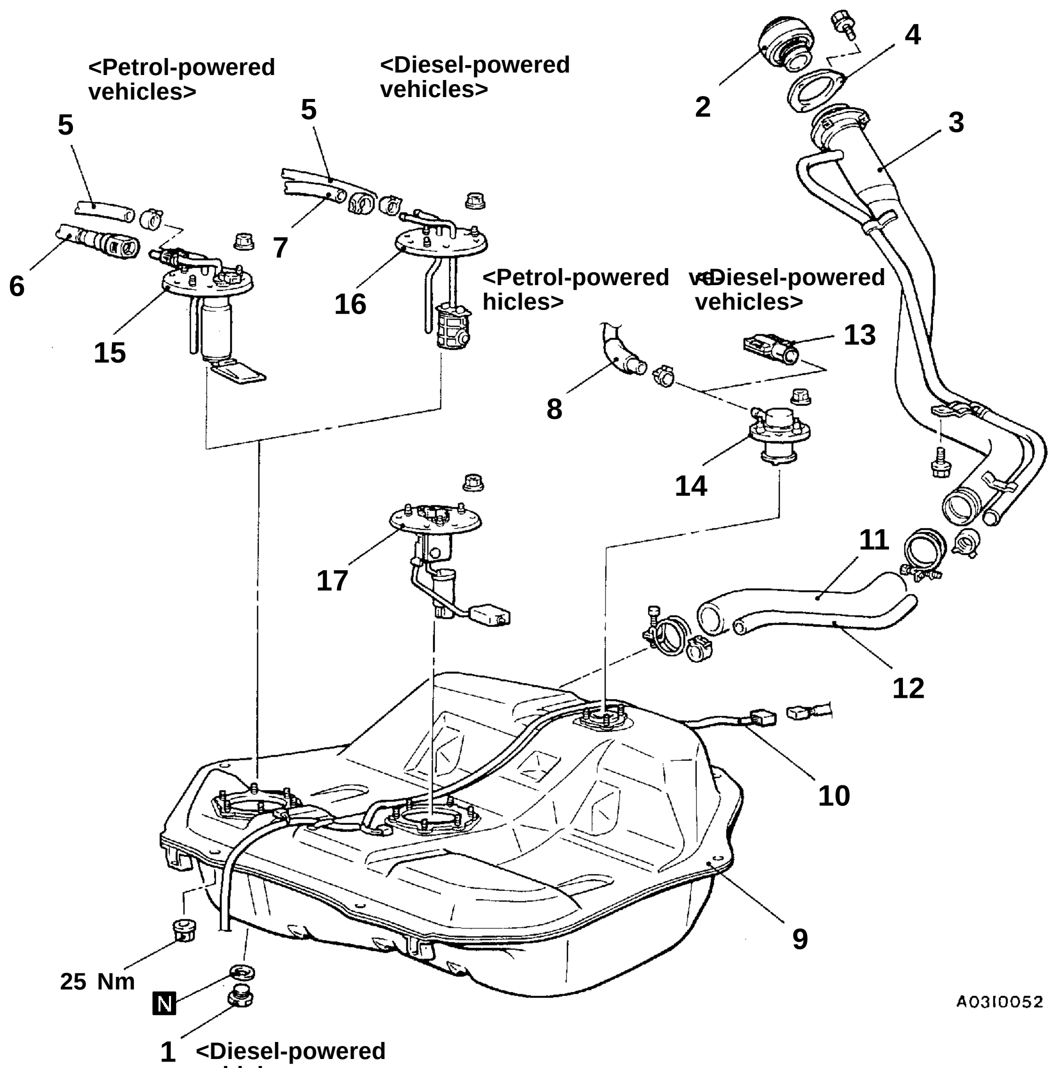
FUEL TANK

13500190244

REMOVAL AND INSTALLATION

Pre-removal Operation
- Draining Fuel
- Reduce the Inner Pressure of Fuel Line and Hose <Petrol-powered Vehicles> (Refer to GROUP 13A - On-vehicle Service.)

Post-installation Operation
- Refilling Fuel.
- Checking for Fuel Leaks



Removal steps

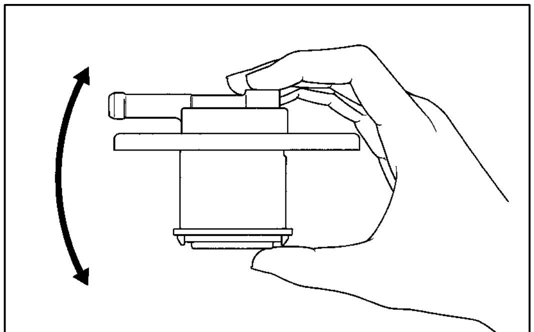
1. Drain plug
2. Fuel filler cap
3. Fuel filler neck assembly
4. Packing
- Parking brake cable connection (Refer to GROUP 36)
- Rear seat cushion (Refer to GROUP 52A)

5. Return hose
▶A◀ 6. High-pressure fuel hose
7. Main hose
8. Vapour hose
9. Fuel tank assembly
10. Fuel wiring harness
11. Filler hose
12. Vapour hose
13. Vapour cap
14. Valve assembly
15. Fuel pump assembly
16. Fuel pipe assembly
17. Fuel gauge unit assembly

INSTALLATION SERVICE POINT

▶A◀ HIGH-PRESSURE FUEL HOSE INSTALLATION

Caution
After connecting the high-pressure fuel hose, pull it gently in the direction of removal to check that the hose is firmly connected.



03T0038

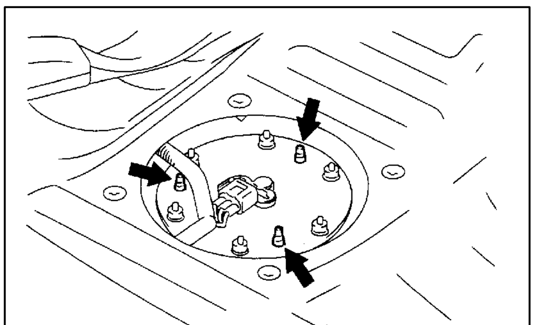
INSPECTION 13500300104

VALVE CHECK

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

FUEL GAUGE UNIT CHECK

Refer to GROUP 54 - Combination Meter.



A03I0024

FUEL GAUGE UNIT REPLACEMENT 13500140065

1. Remove the rear seat cushion. (Refer to GROUP 52A.)
2. Remove the protector, and then disconnect the connector from the fuel gauge unit.
3. Remove the mounting nut, and then remove the fuel gauge unit.
4. Install the new fuel gauge unit, align the projections on the packing (indicated by arrows in the illustration) with the holes in the fuel gauge unit, and then tighten the mounting nut to the standard torque.
5. Connect the connector, and then install the protector.
6. Install the rear seat cushion. (Refer to GROUP 52A.)

FUEL FILTER

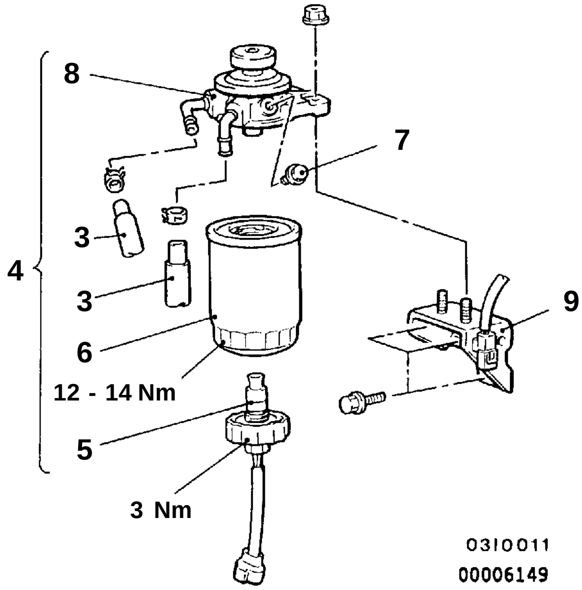
13500280101

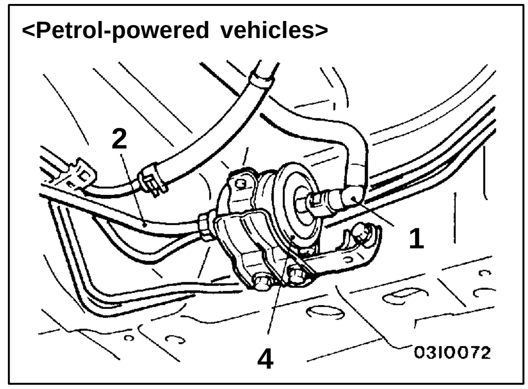
REMOVAL AND INSTALLATION

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

Post-installation Operation
- Checking for Fuel Leaks

<Diesel-powered vehicles>





Removal steps

◀A▶ ▶B◀ 1. High-pressure fuel hose connection
2. Main pipe connection
▶A◀ 3. Main hose connection
4. Fuel filter assembly
5. Water level sensor
6. Fuel filter cartridge
7. Breather screw
8. Fuel filter pump body
9. Fuel filter bracket

REMOVAL SERVICE POINT

◀A▶ HIGH-PRESSURE FUEL HOSE DISCONNECTION

Caution
As there will be some pressure remaining in the fuel pipe line, cover it with a rag to prevent fuel from spraying out.

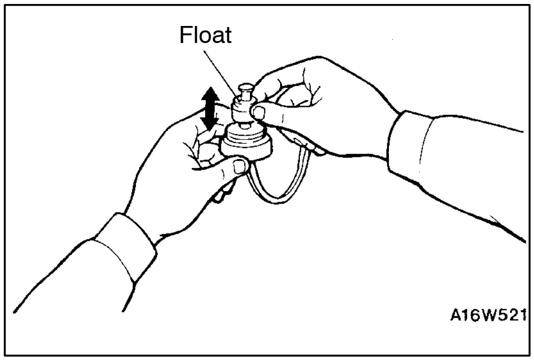
INSTALLATION SERVICE POINTS

▶A◀ MAIN HOSE CONNECTION

Insert the main hose as far as the stepped section of the pipe.

▶B◀ HIGH-PRESSURE FUEL HOSE CONNECTION

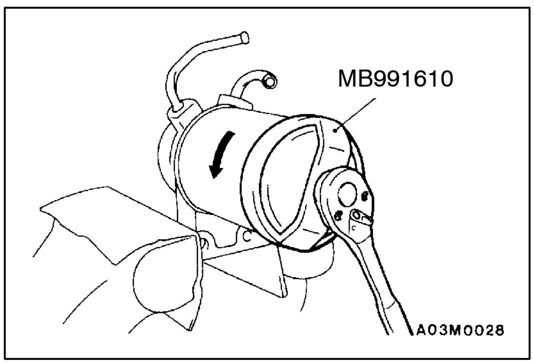
Caution
After connecting the high-pressure fuel hose, pull it gently in the direction of removal to check that the hose is firmly connected.



INSPECTION 13500290043

WATER LEVEL SENSOR CHECK <DIESEL-POWERED VEHICLES>

1. Connect the circuit tester to the water level sensor connector.
2. The water level sensor is operating correctly if there is continuity when the float is raised, and no continuity when it is lowered.



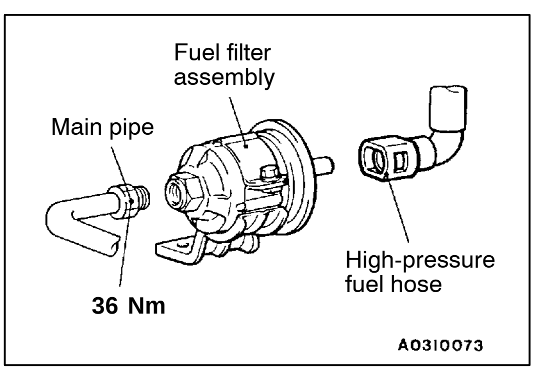
FUEL FILTER CARTRIDGE REPLACEMENT 13500130147

<DIESEL-POWERED VEHICLES>

1. Remove the fuel tank cap to release the pressure inside the fuel tank.
2. Disconnect the connector and the main hose, and then remove the fuel filter assembly from the bracket.
3. Remove the water level sensor.
4. Use an oil filter wrench to remove the fuel filler cartridge from the fuel filter pump body.

   Caution
   Cover the cartridge with a rag to prevent fuel from spraying out.

5. Install a new filter, and bleed the air from fuel line. (Refer to GROUP 13E - On-vehicle Service.)
6. Start the engine, and check that there are no fuel leakage.



FUEL FILTER ASSEMBLY REPLACEMENT <PETROL-POWERED VEHICLES> 13500130130

1. Bleed the residual pressure from inside the fuel line. (Refer to GROUP 13A - On-vehicle Service.)
2. Remove the parking brake cable clamp.
3. Disconnect the high-pressure fuel hose.

   Caution
   As there will be some pressure remaining in the fuel pipe line, cover it with a rag to prevent fuel from spraying out.

4. Hold the fuel filter with a spanner and loosen the flare nut. Then disconnect the main pipe connection.
5. Remove the fuel filter.
6. After installing the new fuel filter, tighten the main pipe flare nut to the specified torque.
7. Connect the high-pressure fuel hose.

   Caution
   After connecting the high-pressure fuel hose, pull it gently in the direction of removal to check that the hose is firmly connected.

8. After installation, check that there are no fuel leaks.
   (1) Apply battery voltage to the fuel pump drive terminal to operate the fuel pump. (Refer to GROUP 13A - On-vehicle Service.)
   (2) Check for leaks when fuel pressure is applied.

NOTES

TRACTION CONTROL SYSTEM (TCL)

CONTENTS

13609000039

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

WARNING!

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

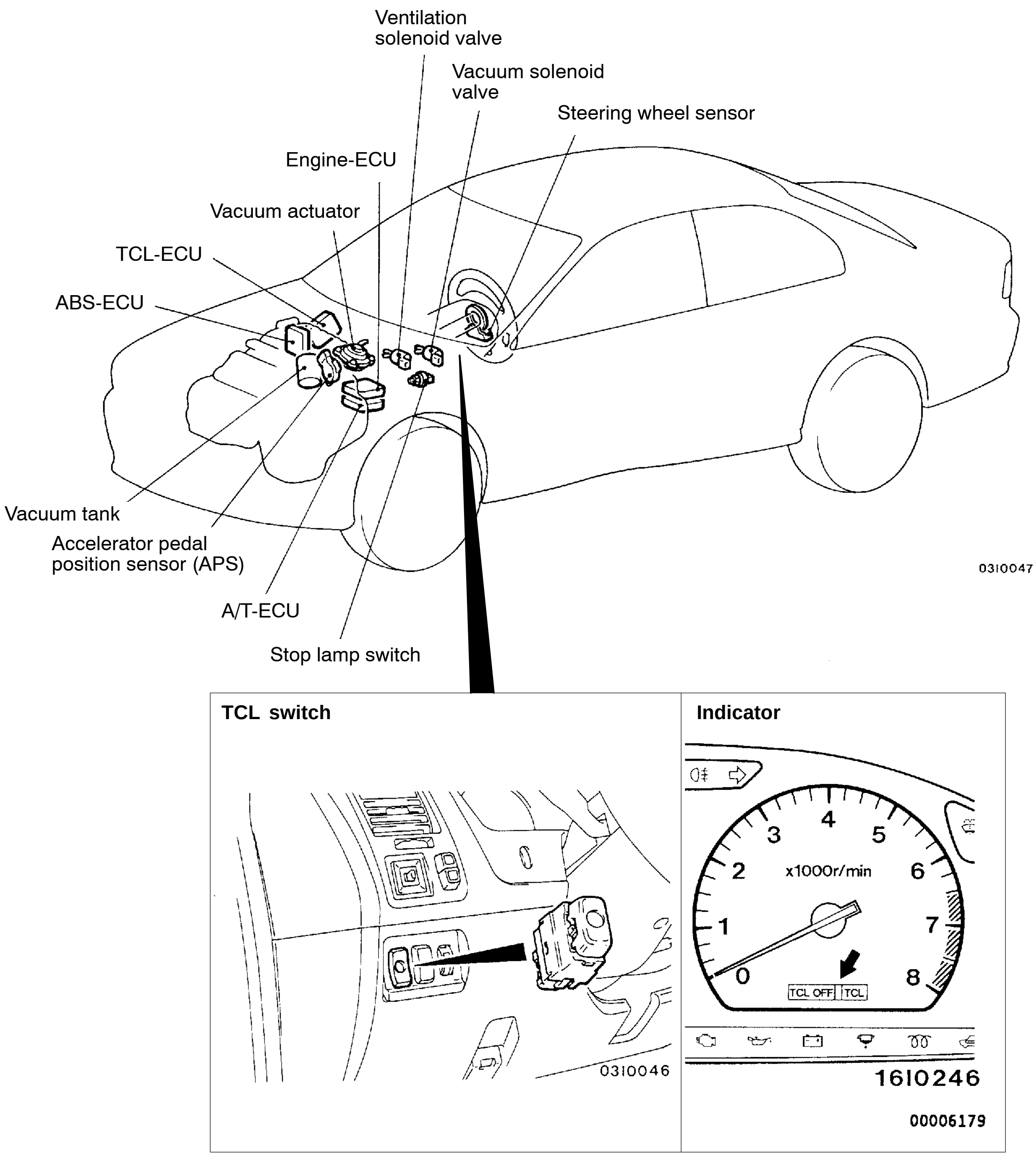
NOTE

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

GENERAL INFORMATION

13600010031

For vehicles with 6A13 engine, the TCL system (slip control and trace control) is available as an option. This system facilitates starting, accelerating, and cornering on slippery roads such as snowy roads. In addition, this system improves driveability while cornering on normal roads and contributes to easier driving.



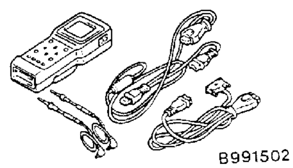
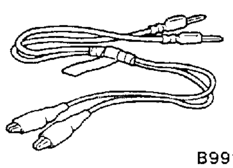
SERVICE SPECIFICATION

13600030013

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

SPECIAL TOOLS

13600060029

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

TROUBLESHOOTING

13600070039

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING

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

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

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

DIAGNOSTIC FUNCTION

METHOD OF READING THE DIAGNOSIS CODES

Use the MUT-II or the warning lamp to read the diagnosis codes.
(Refer to GROUP 00 - How to Use Troubleshooting/Inspection Service Points.)

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

METHOD OF ERASING THE DIAGNOSIS CODES

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

INSPECTION CHART FOR DIAGNOSIS CODES

13600330014

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

INSPECTION PROCEDURES FOR DIAGNOSIS CODES

Code No. 11 APS circuit system	Probable cause
This diagnosis code is output if the APS output voltage is less than 0.2 V due to an open circuit or other malfunction in the APS circuit. The APS power supply and earth are supplied from the engine-ECU, and the output signal is used by the A/T-ECU and auto-cruise control-ECU as well as by the TCL-ECU.	● Malfunction of APS ● Malfunction of TCL-ECU ● Malfunction of engine-ECU ● Malfunction of harness or connector

MUT-II Data list
11 APS output Open and close the throttle lever.
OK: Changes smoothly between 300 mV - 5,500 mV

- OK → **Check the following connectors:** C-10, B-41, C-39
  - NG → **Repair**
  - OK → Check trouble symptom.
    - NG → Replace the TCL-ECU.
- NG → Measure the voltage at APS connector B-41.
  - ● Ignition switch: ON
  - ● Disconnect the APS connector and measure at harness side.
  - ● Measure at the harness side.
  - ● Between terminal (1) and body earth

  OK: 4.8 - 5.2 V

  - NG → **Check the following connectors:** B-41, C-39
    - NG → **Repair**
    - OK → Check trouble symptom.
      - NG → Check the harness between the APS and the engine-ECU, and repair if necessary.
        - NG → **Repair**
        - OK → Replace the engine-ECU.
  - OK → Check the APS. (Refer to P.13H-27.)
    - NG → **Replace**
    - OK → Measure the voltage at TCL-ECU connector C-10.
      - ● Ignition switch: ON
      - ● Disconnect the TCL-ECU connector and measure at the harness side.
      - ● Between terminal (19) and body earth

      OK: 0.3 V or more

      - NG → **Check the following connectors:** C-10, C-51, B-41
        - NG → **Repair**
        - OK → Check trouble symptom.
          - NG → Check the harness between the APS and the TCL-ECU, and repair if necessary.
      - OK → **Check the following connector:** C-10
        - NG → **Repair**
        - OK → Check trouble symptom.
          - NG → Replace the TCL-ECU.

Code No. 12 APS or TPS circuit system	Probable cause
This diagnosis code is output if the APS opening angle is 20° or greater than the TPS opening angle because of a short in the APS, an open circuit in the TPS or sticking of the vacuum actuator. As this detection condition can be applicable during throttle control, trouble diagnosis is invalid at this time.	• Malfunciton of APS • Malfunction of TPS • Malfunction of TCL-ECU • Malfunction of engine-ECU • Malfunction of harness or connector • Malfunction of vacuum actuator

- **MUT-II Data list**
  13 TPS output Open and close the throttle lever.
  OK: Changes smoothly between 300 mV - 5,500 mV
  - OK → Check the APS. (Refer to P.13H-27.)
    - NG → **Replace**
    - OK → **Check the following connectors:** C-10, C-51, B-41
      - NG → **Repair**
      - OK → Check trouble symptom.
        - NG → Check the harness between the APS and the TCL-ECU, and repair if necessary.
          - NG → **Repair**
          - OK → Replace the TCL-ECU
  - NG → Vacuum actuator operation inspection (Refer to GROUP 13A - On-vehicle Service.)
    - NG → **Replace**
    - OK → Measure the voltage at TPS connector B-07.
      - Ignition switch: ON
      - Disconnect the TPS connector and measure at the harness side.
      - Between terminal (4) and body earth

      OK: 4.8 - 5.2 V
      - NG → **Check the following connectors:** B-07, C-39
        - NG → **Repair**
        - OK → Check trouble symptom.
          - NG → Check the harness between the TPS and the engine-ECU, and repair if necessary.
            - NG → **Repair**
            - OK → Replace the engine-ECU.
      - OK → Check the TPS. (Refer to GROUP 13A - On-vehicle Service.)
        - NG → **Replace**
        - OK → Measure the voltage at engine-ECU connector C-39.
          - Ignition switch: ON
          - Connect the engine-ECU connector.
          - Between terminal (84) and body earth.

          Move the accelerator lever
          OK: 0.3 - 1.0 V (Set to idle position)
          4.5 - 5.5 V (Fully open)
          - NG → **Check the following connectors:** B-07, C-39
            - NG → **Repair**
            - OK → Check trouble symptom.
              - NG → Check the harness between the TPS and the engine-ECU, and repair if necessary.
          - OK → **Check the following connector:** C-39
            - NG → **Repair**
            - OK → Check trouble symptom.
              - NG → Replace the engine-ECU.

Code No.13 TPS circuit system	Probable cause
This diagnosis code is output if the TPS opening angle is 20° or greater than the APS opening angle because of a short in the TPS or an open circuit in the APS. If there is an open circuit in the APS, diagnosis code No. 11 is output at the same time. Accordingly, if only diagnosis code No. 11 is output, the cause is probably an abnormality in the TPS circuit system.	• Malfunction of APS • Malfunction of TPS • Malfunction of harness or connector • Malfunction of engine-ECU

MUT-II Self-Diag code
Is TCL diagnosis code No. 11 output?

- Yes → Code No. 11 APS circuit system (Refer to P.13H-5.)
- No ↓

Check the TPS.
(Refer to GROUP 13A - On-vehicle Service.)

- NG → **Replace**
- OK ↓

Measure the voltage at engine-ECU connector C-39.
- Ignition switch: ON
- Connect the engine-ECU connector.
- Between terminals (84) and body earth
- Move the accelerator lever.

OK: 0.3 - 1.0 V (Set to idle position)
4.5 - 5.5 V (Fully open)

- NG → **Check the following connectors:** B-07, C-39
  - NG → **Repair**
  - OK ↓ Check trouble symptom.
  - NG ↓ Check the harness between the TPS and the engine-ECU, and repair if necessary.
- OK ↓

Check the following connector:
C-39

- OK → Check trouble symptom.
  - NG ↓ Replace the engine-ECU.
- NG ↓ **Repair**

Code No. 23 Stop lamp switch circuit system	Probable cause
This diagnosis code is output if the stop lamp switch remains ON for a continuous period of 15 minutes or more, or for a continuous period of 1 minute or more when driving at a speed of 10 km/h or more, because of a short circuit or defective adjustment of the stop lamp switch. This diagnosis code No. may also occur while driving in traffic jams or if the foot is resting on the brake pedal with driving.	• Malfunction of stop lamp switch • Malfunction of harness or connector • Malfunction of TCL-ECU

Measure the continuity at the stop lamp switch connector C-02.
- Disconnect the connector and measure at the switch side.
- Between terminals (1) - (2)

OK: Continuity when the brake pedal is depressed
No continuity when the brake pedal is released

- OK → **Check the following connectors:** C-02, C-65, C-75, C-11
  - NG → **Repair**
  - OK ↓ Check trouble symptom.
  - NG ↓ Inspect the harness between stop lamp switch and the TCL-ECU.
    - NG → **Repair**
    - OK ↓ Replace the TCL-ECU.
- NG ↓

Stop lamp switch installation check (Refer to GROUP 35A - On-vehicle Service.)

- OK → Replace the stop lamp switch.
- NG ↓

Stop lamp switch adjustment (Refer to GROUP 35A - On-vehicle Service.)

Code No. 24 TCL switch circuit system	Probable cause
This diagnosis code is output if signals are input simultaneously from both the TCL-OFF and TCL-ON positions because of a short circuit in the TCL switch circuit.	● Malfunction of the TCL switch ● Malfunction of harness or connector ● Malfunction of TCL-ECU

Measure the continuity at TCL switch connector C-98.
- Disconnect the connector and measure at the switch side.
- Between terminals (2) - (3) and (3) - (6)

OK: No continuity

- NG → Replace the TCL switch.
- OK ↓

Check the following connectors:
C-98, C-75, C-11

- NG → **Repair**
- OK ↓

Check trouble symptom.

- NG ↓

Inspect the harness between the TCL switch and the TCL-ECU.

- NG → **Repair**
- OK ↓

Replace the TCL-ECU.

Code No. 26 Ignition switch (IG2) circuit system	Probable cause
This diagnosis code is output if the IG2 power supply is not distributed, even though the engine speed is 450 r/min or more.	● Malfunction of harness or connector ● Malfunction of TCL-ECU

Measure the voltage at TCL-ECU connector C-11.
- Ignition switch : ON
- Disconnect the TCL-ECU connector and measure at the harness side.
- Between terminal (35) and body earth

  OK: System voltage

- OK → **Check the following connector:** C-11
  - NG → **Repair**
  - OK ↓

  Check trouble symptom.
  - NG ↓

  Replace the TCL-ECU.
- NG ↓

Check the following connectors:
C-131, C-134, C-66, C-75, C-11

- NG → **Repair**
- OK ↓

Check trouble symptom.

- NG ↓

Check the harness between the ignition switch and the TCL-ECU, and repair if necessary.

Code No. 27 TCL-ECU power supply voltage circuit (engine control relay circuit) system	Probable cause
This diagnosis code is output if the TCL-ECU power supply voltage (engine control relay supply voltage) is lower than the specified value. If the voltage returns to the specified value or greater, the diagnosis code is erased.	• Malfunction of control relay • Malfunction of harness or connector • Malfunction of TCL-ECU

Measure the voltage at TCL-ECU connector C-10.
- Engine: idling
- Disconnect the TCL-ECU connector and measure at the harness side.
- Between terminal (25) and body earth

OK: 10 V or more

OK → **Check the following connector:**
C-10

OK → Check trouble symptom.

NG → Replace the TCL-ECU.

NG → **Check the following connectors:**
C-31, C-47, C-51, C-10

NG → **Repair**

OK → Check trouble symptom.

NG → Inspect the harness between the control relay and the TCL-ECU.

NG → **Repair**

OK → Engine control relay inspection (Refer to GROUP 13A - On-vehicle Service.)

Code No. 31 Front right wheel speed sensor circuit system Code No. 32 Front left wheel speed sensor circuit system	Probable cause
These diagnosis codes are output if a pulse (from the front wheels) indicates that the difference between the front wheels and the rear wheels is 8km/h or more because of an open or short circuit in a wheel speed sensor or a malfunction of sensor.	● Malfunction of front wheel speed sensor ● Malfunction of harness or connector ● Malfunction of TCL-ECU ● Malfunction of ABS-ECU

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

Is the ABS warning lamp illuminated, or is an ABS diagnosis code output?

- Yes → Carry out ABS troubleshooting (Refer to GROUP 35B - Troubleshooting.)
- No ↓

Measure at ABS-ECU connector A-04.
- Ignition switch: ON
- Measure at the ECU side with the connector connected.
- Voltage between terminal (17) and body earth
- Voltage between terminal (21) and body earth

OK: 4.8 - 5.2 V

- NG → Replace the TCL-ECU.
- OK ↓

Check the following connectors:
A-04, C-10

- NG → **Repair**
- OK ↓

Check trouble symptom.

- NG ↓

Check the harness connectors between the ABS-ECU and the TCL-ECU, and repair if necessary.

Code No. 33 Rear right wheel speed sensor circuit system Code No. 34 Rear left wheel speed sensor circuit system	Probable cause
These diagnosis codes are output if a pulse (from the wheels on one side of rear) indicates that the difference between the left wheel and the right wheel is 8km/h or more because of an open or short circuit in a wheel speed sensor or a defective sensor.	● Malfunction of rear wheel speed sensor ● Malfunction of harness or connector ● Malfunction of TCL-ECU ● Malfunction of ABS-ECU

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

Is the ABS warning lamp illuminated, or is an ABS diagnosis code output?

- Yes → Carry out ABS troubleshooting (Refer to GROUP 35B - Troubleshooting.)
- No ↓

Measure at ABS-ECU connector A-04.
- Ignition switch : ON
- Measure at the ECU side with the connector connected.
- Voltage between terminal (3) and body earth
- Voltage between terminal (10) and body earth

OK: 4.8-5.2 V

- NG → Replace the TCL-ECU.
- OK ↓

Check the following connectors:
A-04, C-10

- NG → **Repair**
- OK ↓

Check trouble symptom.

- NG → Check the harness connectors between the ABS-ECU and the TCL-ECU, and repair if necessary.

Code No. 35 Rear wheel speed sensor circuit system (1) Code No. 36 Rear wheel speed sensor circuit system (2)	Probable cause
Diagnosis code No. 35 is output if the pulse signal from a rear wheel sensor is momentarily interrupted (0.02 sec.) because of a transient open circuit in a rear wheel speed sensor. Diagnosis code No. 36 is output if a rear wheel speed sensor abnormality is judged when the turning speed of both rear wheels is 0 km/h for 20 seconds or more while TCL is operating.	● Malfunction of rear wheel speed sensor ● Malfunction of harness or connector ● Malfunction of ABS-ECU ● Malfunction of TCL-ECU

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

Is a diagnosis code output from the ABS-ECU?

- Yes → Carry out ABS troubleshooting (Refer to GROUP 35B - Trouble-shooting.)
- No ↓

MUT-II Data list
33, 34 Wheel speed sensor
Accelerate from a stationary position.
OK: Vehicle speeds displayed on the speedometer and MUT-II are identical.

- OK → Replace the TCL-ECU.
- NG ↓

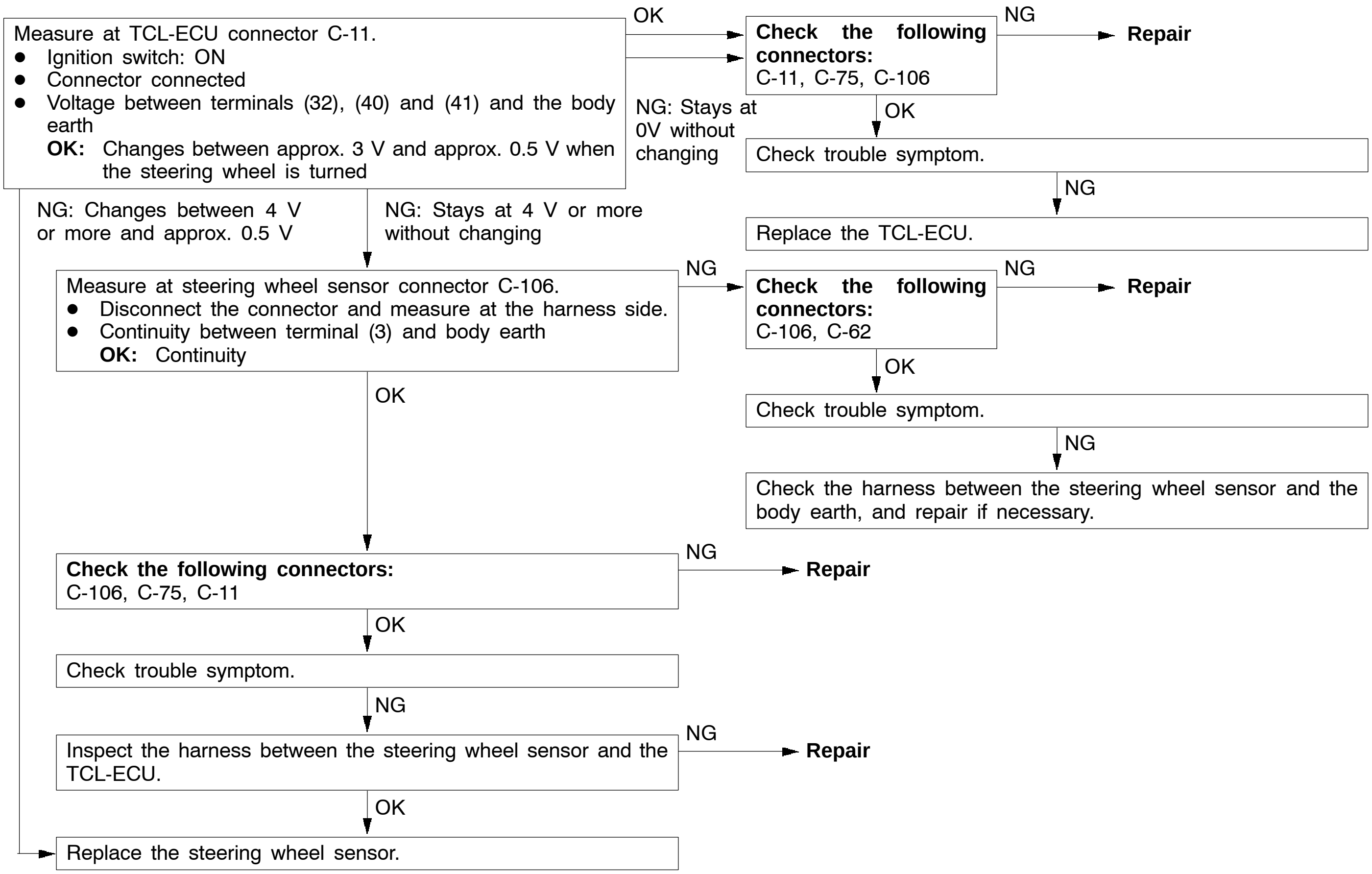
Check the following connectors:
A-04, C-10

- OK → **Repair**
- NG ↓

Check trouble symptom.

- NG → Check the harness connectors between the ABS-ECU and the TCL-ECU, and repair if necessary.

Code No.	Probable cause
Code No. 41 Steering wheel sensor (ST-1) circuit system (open circuit)	
Code No. 42 Steering wheel sensor (ST-2) circuit system (open circuit)	
Code No. 43 Steering wheel sensor (ST-N) circuit system (open circuit)	
These diagnosis codes are output if there is an open circuit in the output wire of the steering wheel sensor circuit.	● Malfunction of harness or connector ● Malfunction of steering wheel sensor ● Malfunction of TCL-ECU



Code No. 44 Steering wheel sensor circuit system (short circuit)	Probable cause
This diagnosis code is output when no steering angle signal is output because there is a short-circuit in either steering wheel sensor ST-1 or steering wheel sensor ST-2 when the speed averages output by the left and right rear wheel speed sensors are 15 km/h or more.	• Malfunction of harness or connector • Malfunction of steering wheel sensor • Malfunction of TCL-ECU

Measure at TCL-ECU connector C-11.
- Ignition switch: ON
- Connector connected
- Voltage between terminals (40) and (41) and the body earth
  OK: Changes between approx. 3 V and approx. 0.5 V when the steering wheel is turned

OK → **Check the following connector:** C-11

NG → **Repair**

OK → Check trouble symptom.

NG → Replace the TCL-ECU.

NG → **Check the following connectors:** C-11, C-75, C-106

NG → **Repair**

OK → Inspect the harness between the steering wheel sensor and the TCL-ECU.

NG → **Repair**

OK → Measure at steering wheel sensor connector C-106.
- Ignition switch: ON
- Disconnect the connector and measure at the harness side.
- Continuity between terminal (2) and body earth
  OK: System voltage

NG → **Check the following connectors:** C-131, C-132, C-61, C-106

NG → **Repair**

OK → Check trouble symptom.

NG → Check the harness between the steering wheel sensor and the ignition switch, and repair if necessary.

OK → **Check the following connector:** C-106

NG → **Repair**

OK → Replace the steering wheel sensor.

Code No. 45 Steering wheel sensor (ST-N) circuit system (short circuit)	Probable cause
This diagnosis code is output if it is considered that there is an abnormality in the steering wheel sensor (ST-N) circuit system when the straight-ahead position is continuously detected even though the steering wheel is turned 20° or more.	• Malfunction of steering wheel sensor • Malfunction of harness or connector • Malfunction of TCL-ECU

Measure at TCL-ECU connector C-11.
- Connector connected
- Voltage between terminals (32) and the body earth
  OK: Changes between approx. 3V and approx. 0.5 V when the steering wheel is turned

OK → **Check the following connector:** C-11

NG → **Repair**

OK → Check trouble symptom.

NG → Replace the TCL-ECU.

NG → **Check the following connectors:** C-11, C-75, C-106

NG → **Repair**

OK → Inspect the harness between the steering wheel sensor and the TCL-ECU.

NG → **Repair**

OK → Replace the steering wheel sensor.

Code No. 71 Engine-ECU communication circuit system	Probable cause
This diagnosis code is output if an error is detected in the communication contents because of an open or short circuit in the serial communication circuit between the TCL-ECU and the engine-ECU, a malfunction of ECU and a defective shielding of the shield wire.	• Malfunction of harness or connector • Malfunction of TCL-ECU • Malfunction of engine-ECU

Check the following connectors:
C-10, C-51, C-37
— NG → **Repair**

↓ OK

Check trouble symptom.

↓ NG

Inspect the harness between the TCL-ECU and the engine-ECU.
— NG → **Repair**

↓ OK

Is a diagnosis code output from the engine-ECU?
— Yes → Carry out engine-ECU troubleshooting (Refer to GROUP 13A - Troubleshooting.)

↓ No

Replace the TCL-ECU.

↓

Check trouble symptom.
— NG → Replace the engine-ECU.

Code No. 74 A/T-ECU communication circuit system	Probable cause
This diagnosis code is output if an error is detected in the communication contents because of an open or short circuit in the serial communication circuit between the TCL-ECU and the A/T-ECU, a malfunction of ECU and a defective shielding of the shield wire.	• Malfunction of harness or connector • Malfunction of TCL-ECU • Malfunction of A/T-ECU

Check the following connectors:
C-10, C-51, C-49, C-29, C-30
— NG → **Repair**

↓ OK

Check trouble symptom.

↓ NG

Inspect the harness between the TCL-ECU and the A/T-ECU.
— NG → **Repair**

↓ OK

Is a diagnosis code output from the A/T-ECU?
— Yes → Carry out A/T-ECU troubleshooting (Refer to GROUP 23 - Troubleshooting.)

↓ No

Replace the TCL-ECU.

↓

Check trouble symptom.
— NG → Replace the A/T-ECU.

Code No. 76 ABS circuit system	Probable cause
This diagnosis code is output if the ABS-ECU detects the system abnormality (when ABS warning lamp illumination is controlled).	• Malfunction of harness or connector • Malfunction of TCL-ECU • Malfunction of ABS-ECU

Is the ABS warning lamp illuminated, or is an ABS diagnosis code output?

Yes → Carry out ABS troubleshooting. (Refer to GROUP 35B - Troubleshooting.)

No ↓

Check the following connectors:
A-04, C-10

NG → **Repair**

OK ↓

Check trouble symptom.

NG ↓

Inspect the harness between the ABS-ECU and the TCL-ECU.

NG → **Repair**

OK ↓

Replace the TCL-ECU.

↓

Check trouble symptom.

NG → Replace the ABS-ECU.

INSPECTION CHART FOR TROUBLE SYMPTOMS

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

INSPECTION PROCEDURES FOR EACH TROUBLE SYMPTOM

Inspection Procedure 1

Communication with the MUT-II is not possible. (Communication with all systems is not possible.)	Probable cause
The cause is probably a defective power supply system (including earth) for the diagnosis line.	• Malfunction of connector • Malfunction of harness

Measure at the diagnosis connector C-20.
Voltage between terminal (16) and body earth
OK: System voltage

- NG → **Check the following connectors:**
C-141, C-132, C-63, C-66, C-20
<L.H. drive vehicles>
C-14, C-62, C-66, C-20
<R.H.drive vehicles>
  - NG → **Repair**
  - OK → Check trouble symptom.
    - NG → Check the harness between the fusible link No. 2 and diagnosis connector, and repair if necessary.
- OK → Measure at the diagnosis connector C-20.
Continuity between terminal (4), (5) and body earth
OK: Continuity
  - NG → **Check the following connector:**
C-20
    - NG → **Repair**
    - OK → Check trouble symptom.
      - NG → Check the harness between the diagnosis connector and the earth, and repair if necessary.
  - OK → Check trouble symptom.
    - NG → Replace the MUT-II.

Inspection Procedure 2

Communication with the MUT-II is not possible. (Communication with TCL-ECU only is not possible.)	Probable cause
If the MUT-II cannot communicate with the TCL-ECU only, the cause is probably an abnormality in the TCL diagnosis line or in the TCL-ECU power supply line or earth line.	• Malfunction of harness or connector • Malfunction of engine control relay • Malfunction of TCL-ECU

Measure at diagnosis connector C-20 and TCL-ECU connector C-10.
- Disconnect the connector and measure at the harness side.
- Continuity between the following terminals
  OK: Continuity
  TCL-ECU side 1 14
  | |
  Diagnosis connector side 1 7

NG → **Check the following connectors:** C-20, C-66, C-83, C-49, C-51, C-10

NG → **Repair**

OK ↓

Check trouble symptoms.

NG → Check the harness between the TCL-ECU and diagnosis connector, and repair if necessary.

OK ↓

Measure at TCL-ECU connector C-10.
- Disconnect the connector and measure at the harness side.
- Engine: idling
- Voltage between 25 - body earth
  OK: 10 V or more

NG → **Check the following connectors:** C-31, C-47, C-51, C-10

NG → **Repair**

OK ↓

Check trouble symptoms.

NG ↓

Check the harness between the engine control relay and TCL-ECU.

OK → Check the engine control relay. (Refer to GROUP 13A - On-vehicle Service.)

NG ↓

Repair

OK ↓

Measure at TCL-ECU connectors C-10 and C-11.
- Disconnect the connector and measure at the harness side.
- Continuity between 13, 26 (C-10), 31 (C-11) - body earth
  OK: Continuity

NG → Check the harness between the TCL-ECU and the earth, and repair if necessary.

OK ↓

Check the following connectors: C-10, C-11

NG → **Repair**

OK ↓

Check trouble symptoms.

NG → Replace the TCL-ECU.

Inspection Procedure 3

None of the TCL indicator lamps (TCL OFF, TCL) illuminate when the ignition switch is ON.	Probable cause
The main cause is an open circuit in the indicator circuit because of a burnt-out indicator lamp bulb.	• Malfunction of harness or connector • Malfunction of TCL-ECU • Malfunction of indicator lamp bulb

Do other warning lamps illuminate when the ignition switch is at ON position?

No → **Check the following connectors:** C-131, C-135, D-03

NG → **Repair**

OK → Check trouble symptom.

NG → Check the harness between the combination meter and the junction block, and repair if necessary.

Yes → **MUT-II Self-Diag code** Is code No.27 output?

Yes → Code No.27 TCL-ECU power supply voltage circuit system (Refer to P.13H-9.)

No → **Check the following connectors:** D-03, C-50, C-11

NG → **Repair**

OK → Check trouble symptom.

NG → Inspect the harness between the combination meter and the TCL-ECU.

NG → **Repair**

OK → Check if a TCL indicator lamp bulb is burnt out.

NG → Replace the lamp bulb.

OK → Replace the TCL-ECU.

Inspection Procedure 4

One of the TCL indicator lamps does not illuminate when the ignition switch is ON.	Probable cause
Because the TCL indicators utilise shared power supply circuits, if one of the indicator lamps is illuminated, the power supply circuit can be judged to be normal.	• Open circuit in indicator lamp power supply circuit. • Burnt-out indicator lamp bulb

Is the bulb of the non-illuminated indicator lamp normal?

No → Replace the lamp bulb.

Yes → Measure at the TCL-ECU connector C-11.

- Disconnect the connector and measure at the harness side.
- Voltage between terminal (45) and body earth
- Voltage between terminal (46) and body earth

OK: System voltage

OK → Replace the TCL-ECU.

NG → **Check the following connectors:** D-03, C-50, C-11

OK → Check trouble symptom

NG → Check the harness between the combination meter and the TCL-ECU, and repair if necessary.

Inspection Procedure 5

• TCL OFF indicator lamp remains illuminated even after the engine is started. • TCL OFF indicator lamp flashes after the engine is started.	Probable cause
The TCL-OFF indicator is also used as a system warning indicator. If there is a system abnormality, this indicator will illuminate or flash.	• Other system related to the TCL • Malfunction of harness or connector

Is the diagnosis code normal? (Is communication with the MUT-II possible?)
- No → To trouble symptom inspection procedure 1 (Refer to P.13H-16.)
- Yes ↓

Does the TCL OFF indicator lamp switch off when TCL-ECU connector C-11 is disconnected?
- Yes → Replace the TCL-ECU.
- No ↓

Check the following connectors: D-03, C-50, C-11
- OK → Check trouble symptom.
  - NG → Check the harness between the combination meter and the TCL-ECU, and repair if necessary.
- NG ↓ **Repair**

Inspection Procedure 6

TCL indicator lamp remains illuminated even after the engine is started.	Probable cause
The TCL indicator lamp only illuminates while the engine is running if the TCL is operating.	• Malfunction of TCL indicator power supply circuit • Malfunction of TCL-ECU • Malfunction of harness or connector

Does the TCL indicator remain illuminated when TCL-ECU connector C-11 is disconnected and the ignition switch is turned to ON?
- No → Replace the TCL-ECU.
- Yes ↓

Check the following connectors: D-03, C-50, C-11
- OK → Check trouble symptom.
  - NG → Check the harness between the combination meter and the TCL-ECU, and repair if necessary.
- NG ↓ **Repair**

Inspection Procedure 7

TCL OFF indicator lamp does not illuminate even if the TCL switch is continuously pressed to the OFF side while the engine is idling.	Probable cause
If the indicator lamp does not illuminate when the switch is operated, there is a malfunction in the switch, switch circuit or in the TCL-ECU.	• Malfunction of harness or connector • Malfunction of TCL switch • Malfunction of TCL-ECU

MUT-II Data list
- 25 TCL OFF switch
- Press the TCL switch continuously to the OFF side while the engine is idling.
  OK: ON is displayed

OK → Replace the TCL-ECU.

NG ↓

Check the following connectors:
C-11, C-75, C-98

NG → **Repair**

OK ↓

Check trouble symptom

NG → Inspect the harnesses between the TCL-ECU and the TCL switch, and between the TCL switch and the body earth.

OK → **Repair**

OK ↓

TCL switch component inspection (Refer to P.13H-28.)

Inspection Procedure 8

• TCL illuminates in the TCL operation range, but torque is not reduced. • Engine output is reduced in the TCL non-operation range (TCL indicator lamp does not illuminate) and starting and acceleration performance is poor.	Probable cause
In cases such as the above, the electrical system is normal, and the cause is probably an abnormality in the mechanical system (vacuum actuator).	• Malfunction of vacuum solenoid valve • Malfunction of ventilation solenoid valve • Malfunction of vacuum actuator • Incorrect vacuum hose connector • Malfunction of throttle link • Malfunction of vacuum tank • Blocked air cleaner element

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

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

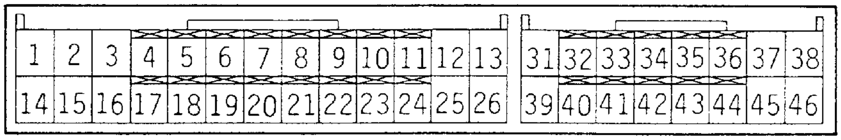
DATA LIST REFERENCE TABLE

No.	Check item	Check condition		Normal condition
11	APS	Accelerator pedal position Engine stop Selector lever position: P	Fully closed	300 - 1,000 mV
			Depressed	Gradually rises from the above value
			Fully open	4,500 - 5,500 mV
13	TPS	Accelerator pedal position Engine stop Selector lever position: P	Fully closed	300 - 1,000 mV
			Depressed	Gradually rises from the above value
			Fully open	4,500 - 5,500 mV
15*[1]	Inhibitor switch	Ignition switch: ON Engine stop	Selector lever: P position	P
			Selector lever: R position	R
			Selector lever: N position	N
			Selector lever: D position	D
			Selector lever: 3 position	3
			Selector lever: 2 position	2
			Selector lever: L position	L
16*[1]	Shift position	Shift lever position: D	Driving at constant speed of 10 km/h in 1 range	1st
			Driving at constant speed of 30 km/h in 2 range	2nd
			Driving at constant speed of 50 km/h in 3 range	3rd
			Driving at constant speed of 70 km/h in 4 range	4th
21	Idle switch	Accelerator pedal position Ignition switch: ON	Depressed	OFF
			Released	ON
22	Ignition switch	Ignition switch: ON		ON
		Ignition switch: OFF		OFF
23	Stop lamp switch	Brake pedal position Ignition switch: ON	Depressed	ON
			Released	OFF
24	TCL ON switch	TCL ON switch operation Ignition switch : ON	Pressed	ON
			Released	OFF
25	TCL OFF switch	TCL OFF switch operation Ignition switch: ON	Pressed	ON
			Released	OFF

No.	Check item	Check condition		Normal condition
27	ECU power supply voltage	Ignition switch: ON		System voltage
31	Front right wheel speed sensor	Engine running Selector lever position: D	Vehicle stopped	0 km/h
			Driving at 40 km/h	40 km/h
32	Front left wheel speed sensor	Engine running Selector lever position: D	Vehicle stopped	0 km/h
			Driving at 40 km/h	40 km/h
33	Rear right wheel speed sensor	Engine running Selector lever position: D	Vehicle stopped	0 km/h
			Driving at 40 km/h	40 km/h
34	Rear left wheel speed sensor	Engine running Selector lever position: D	Vehicle stopped	0 km/h
			Driving at 40 km/h	40 km/h
40	Engine speed	Ignition switch: ON	Engine: idling	Engine speeds displayed on the MUT-II and tachometer are identical.
44	Steering angle	Steering wheel position Ignition switch: ON	Turned 90° to the right	R 88 deg or R 92 deg
			Turned 90° to the left	L 88 deg or L 92 deg
45	Steering straight-ahead point learning	Steering wheel position Ignition switch: ON	Immediately after ignition switch is ON	OFF
			Immediately after city driving	ON
51	Slip control	TCL switch: ON Driving on low frictional resistance road	TCL indicator lamp illuminated	ON
			TCL indicator lamp switched off	OFF
52	Trace control	TCL switch: ON Driving on winding road	TCL indicator lamp illuminated	ON
			TCL indicator lamp switched off	OFF
74	Steering wheel sensor (ST-N)	Steering wheel position Engine idling	Neutral position	LOW
			Steering wheel turned 90° from neutral position	HIGH
75	Steering wheel sensor (ST-1)	Steering wheel position Ignition switch: ON	Steering wheel turned slowly to left	HIGH and LOW display alternately
76	Steering wheel sensor (ST-2)	Steering wheel position Ignition switch: ON	Steering wheel turned slowly to right	HIGH and LOW display alternately
81	Engine model	Ignition switch: ON		6A13
82	Valve type	Ignition switch: ON		SOHC
83	Aspiration type	Ignition switch: ON		N/A
84	Engine classification	Ignition switch: ON		NORMAL
85	Destination	Ignition switch: ON		EUR*2

NOTE
*1: A/T
*2: For Europe

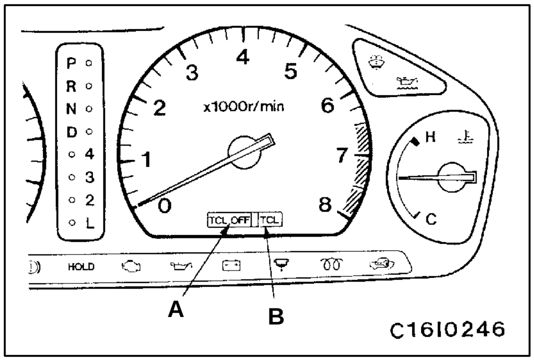
CHECK AT ECU TERMINALS



A03X0101

Terminal No.	Check item	Measurement condition	Normal condition
1	Diagnosis control	When MUT-II is not connected	Approx. 5 V
		When MUT-II is connected	0 V
13	Earth	Ignition switch: ON	0 V
14	Diagnosis data input	When MUT-II is connected	Serial communication with MUT-II
		When MUT-II is not connected	1 V or less
15	A/T-ECU data communication	Engine: Idling	Other than 0 V
16			
17	Engine-ECU data communication	Engine: Idling	Other than 0 V
18			
19	APS output	Ignition switch: ON Accelerator pedal fully depressed	4.5 - 5.5 V
		Ignition switch: ON Accelerator pedal released	0.4 - 1.0 V
20	Wheel speed sensor input (rear left wheel)	Engine: Idling, Vehicle slowly moving forward	Flashes between 0 V and approx. 5 V
21	Wheel speed sensor input (front right wheel)	Engine: Idling, Vehicle slowly moving forward	Flashes between 0 V and approx. 5 V
22	Wheel speed sensor input (front left wheel)	Engine: Idling, Vehicle slowly moving forward	Flashes between 0 V and approx. 5 V
23	Wheel speed sensor input (rear right wheel)	Engine: Idling, Vehicle slowly moving forward	Flashes between 0 V and approx. 5 V
25	ECU power supply	Ignition switch: ON	Battery voltage
26	Earth	Ignition switch: ON	0 V
31	Earth	Ignition switch: ON	0 V

Terminal No.	Check item	Measurement condition	Normal condition
32	Steering wheel sensor (ST-N) input	Engine: Idling Steering wheel in straight-ahead position	0.5 V or less
		Engine: Idling Steering wheel turned 90° from straight-ahead position	2.5 - 3.5 V
34	TCL ON switch	Ignition switch: ON TCL switch: Pressed to ON side	0 - 2 V
		Ignition switch: ON TCL switch: Released	Battery voltage
35	Ignition switch IG2	Ignition switch: ON	Battery voltage
39	ECU back-up power supply	Ignition switch: OFF	Battery voltage
40	Steering wheel sensor (ST-1) input	Ignition switch: ON Steering wheel turned slowly	Flashes between 0 V and approx. 3 V
41	Steering wheel sensor (ST-2) input	Ignition switch: ON Steering wheel turned slowly.	Flashes between 0 V and approx. 3 V
42	TCL OFF switch	Ignition switch: ON TCL switch: Pressed to OFF side	0 - 2 V
		Ignition switch: ON TCL switch: Released	Battery voltage
43	Stop lamp switch input	Ignition switch: ON Brake pedal depressed	Battery voltage
		Ignition switch: ON Brake pedal released	0 - 2 V
44	ABS fail signal	During ABS fail	0 - 2 V
		When ABS is normal	Battery voltage
45	TCL-OFF indicator	Ignition switch: ON Indicator: Extinguished	Battery voltage
		Ignition switch: ON Indicator: Illuminated	0 - 2 V
46	TCL indicator	Ignition switch: ON Indicator: Illuminated	0 - 2 V
		Ignition switch: ON Indicator: Extinguished	Battery voltage



ON-VEHICLE SERVICE

13600090035

SYSTEM CHECK USING THE TCL INDICATOR LAMPS

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

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

NOTE
O: illuminated, X: extinguished, - : not relevant

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

TCL OPERATION CHECK

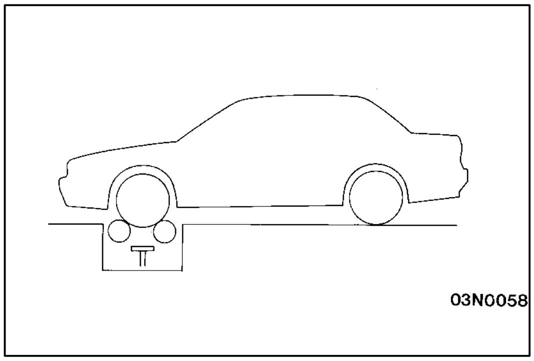
13600110038

<When using the MUT-II>

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

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

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



<When not using the MUT-II>

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

NOTE
If the following symptoms occur when the accelerator pedal is depressed, refer to “Troubleshooting.”
(1) If the TCL indicator lamp does not illuminate.
(2) If the TCL indicator lamp illuminates but the engine is not restrained.

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

STOP LAMP SWITCH CHECK 13600120024

Refer to GROUP 35A - On-vehicle Service.

WHEEL SPEED SENSOR CHECK 13600130027

Refer to GROUP 35B - On-vehicle Service.

VACUUM SOLENOID VALVE CHECK 13600390012

Refer to GROUP 13A - On-vehicle Service.

VENTILATION SOLENOID VALVE CHECK 13600400012

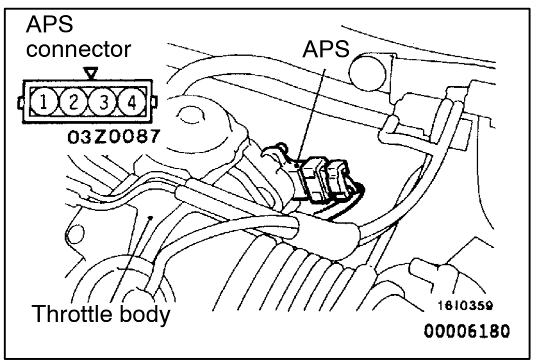
Refer to GROUP 13A - On-vehicle Service.

VACUUM TANK CHECK 13600410015

Refer to GROUP 13A - On-vehicle Service.

VACUUM ACTUATOR CHECK 13600420018

Refer to GROUP 13A - On-vehicle Service.



ACCELERATOR PEDAL POSITION SENSOR (APS) CHECK 13600430028

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

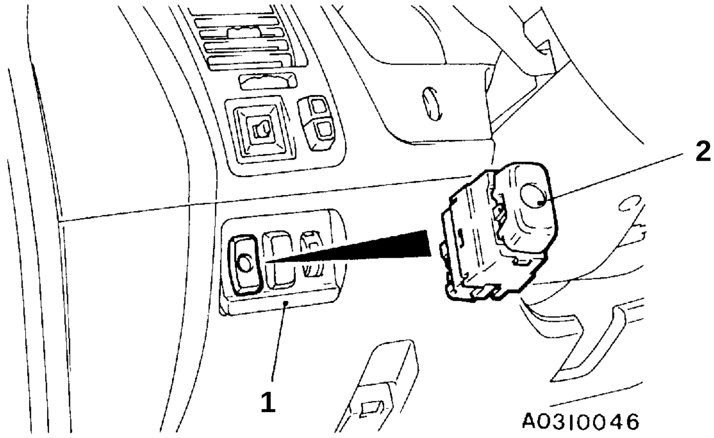
   Standard value: 3.5 - 6.5 kΩ

3. When the accelerator pedal is gradually depressed, check that the resistance between terminals (1) and (2) of the APS connector changes smoothly in proportion to the pedal opening amount.
4. If the resistance is outside the standard value, or if the resistance does not change smoothly, replace the APS. Adjust the APS after it has been replaced. (Refer to GROUP 13A - On-vehicle Service.)

TCL SWITCH

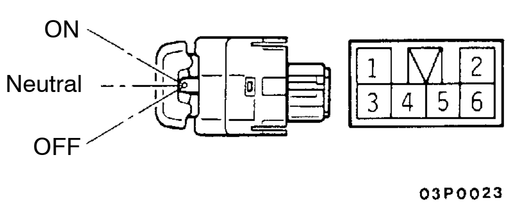
13600160033

REMOVAL AND INSTALLATION



Removal steps

1. Switch bezel
2. TCL switch



INSPECTION

13600170036

TCL SWITCH CONTINUITY CHECK

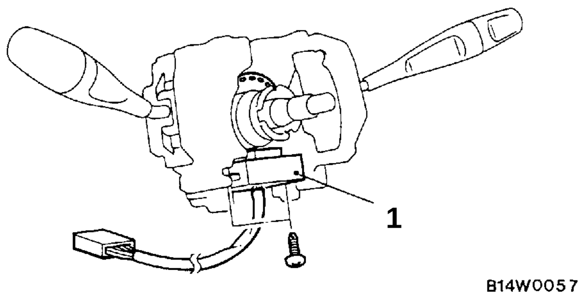
Switch position	Terminal No.						
	1	2	3	6	4	-	5
ON			○	○			
Neutral					○		○
OFF		○	○				

STEERING WHEEL SENSOR

13600220014

REMOVAL AND INSTALLATION

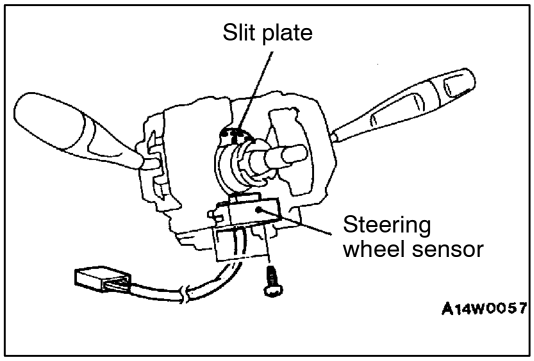
CAUTION: SRS
Before removal of air bag module and clock spring, refer to GROUP 52B - Service Precautions and Air Bag Module and Clock Spring.



Removal steps

- Steering wheel and column cover (Refer to GROUP 37A - Steering Wheel and Shaft.)

◀A▶ 1. Steering wheel sensor



REMOVAL SERVICE POINT

◀A▶ STEERING WHEEL SENSOR REMOVAL

Caution

1. **Do not adhere any dust or grease, etc. to the steering wheel sensor, which has a photo coupler in it.**
2. **Do not bend the slit plate of the column switch nor adhere any grease etc. to it.**

INSPECTION

13600230017

STEERING WHEEL SENSOR CHECK

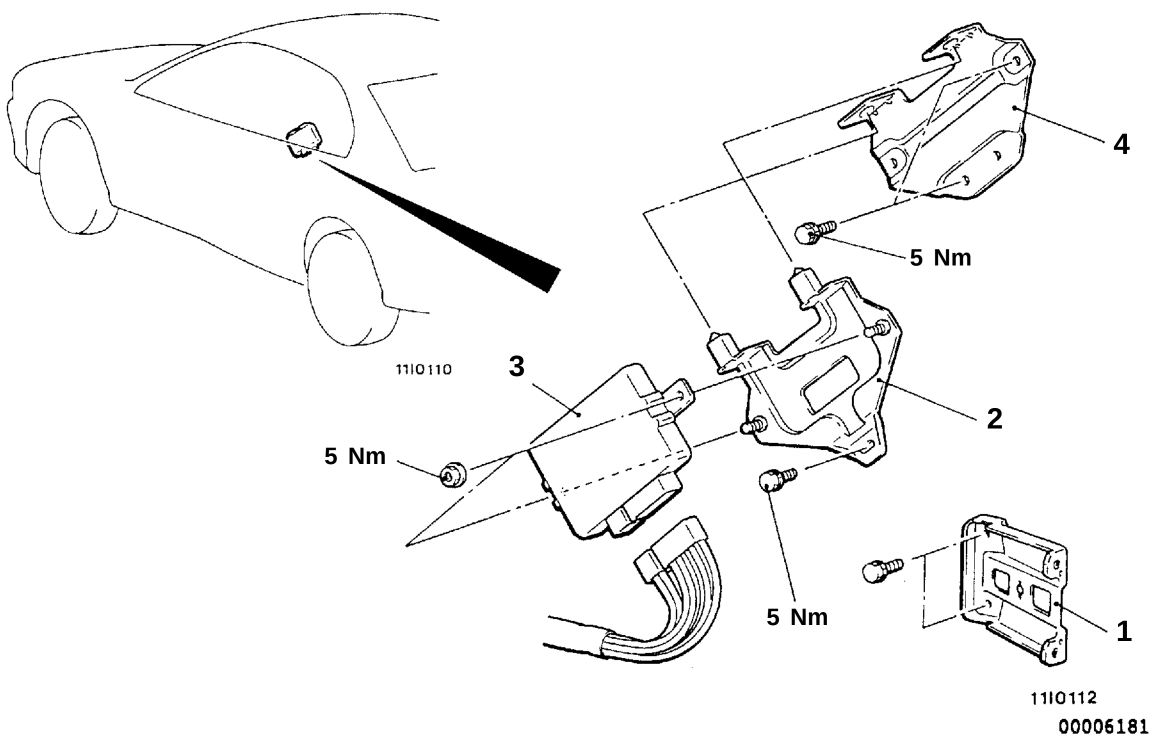
Refer to P.13H-22.

TCL-ECU

13600280036

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
Grove Box, Grove Box Frame, Side Cover and Corner Panel Removal and Installation (Refer to GROUP 52A - Instrument panel.)

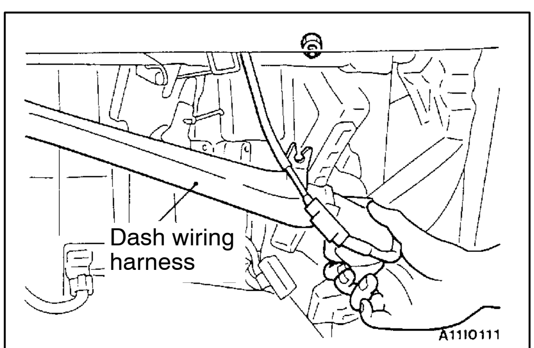


Removal steps

1. Instrument panel lower passenger side bracket

◀A▶ 2. Upper bracket

3. TCL-ECU
4. Lower bracket



REMOVAL SERVICE POINT

◀A▶ UPPER BRACKET REMOVAL

Loosen the dash wiring harness mounting nut. Lower the dash wiring harness to the position where the upper bracket can be removed, and the remove the upper bracket.

INSPECTION

13600290015

TCL-ECU CHECK

Refer to P.13H-23.