# FUEL

## CONTENTS

# MULTIPOINT FUEL INJECTION (MPI)

## CONTENTS

# 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 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 idle speed control 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 barometric 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 Motor 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 | 60 |
| | Throttle position sensor | Variable resistor type |
| | Idle speed control servo | Stepper motor type<br>(Stepper motor type by-pass air control system with the air volume limiter) |
| Engine-ECU | Identification No. | E6T34874 |
| 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 |
| | 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 | Engine control relay type | Contact switch type |
| | Fuel pump relay type | Contact switch type |
| | Injector type and number | Electromagnetic type, 4 |
| | Injector identification mark | MDL560 |
| | EGR control solenoid valve | Duty cycle type solenoid valve |
| | Purge control solenoid valve | Duty cycle type solenoid valve |
| | Fuel pressure control solenoid valve | ON/OFF type solenoid valve |
| | Waste gate solenoid valve | Duty cycle type solenoid valve |
| | Secondary air control solenoid valve | ON/OFF type solenoid valve |
| Fuel pressure regulator | Regulator pressure kPa | 294 |

## MULTI-POINT FUEL INJECTION SYSTEM DIAGRAM

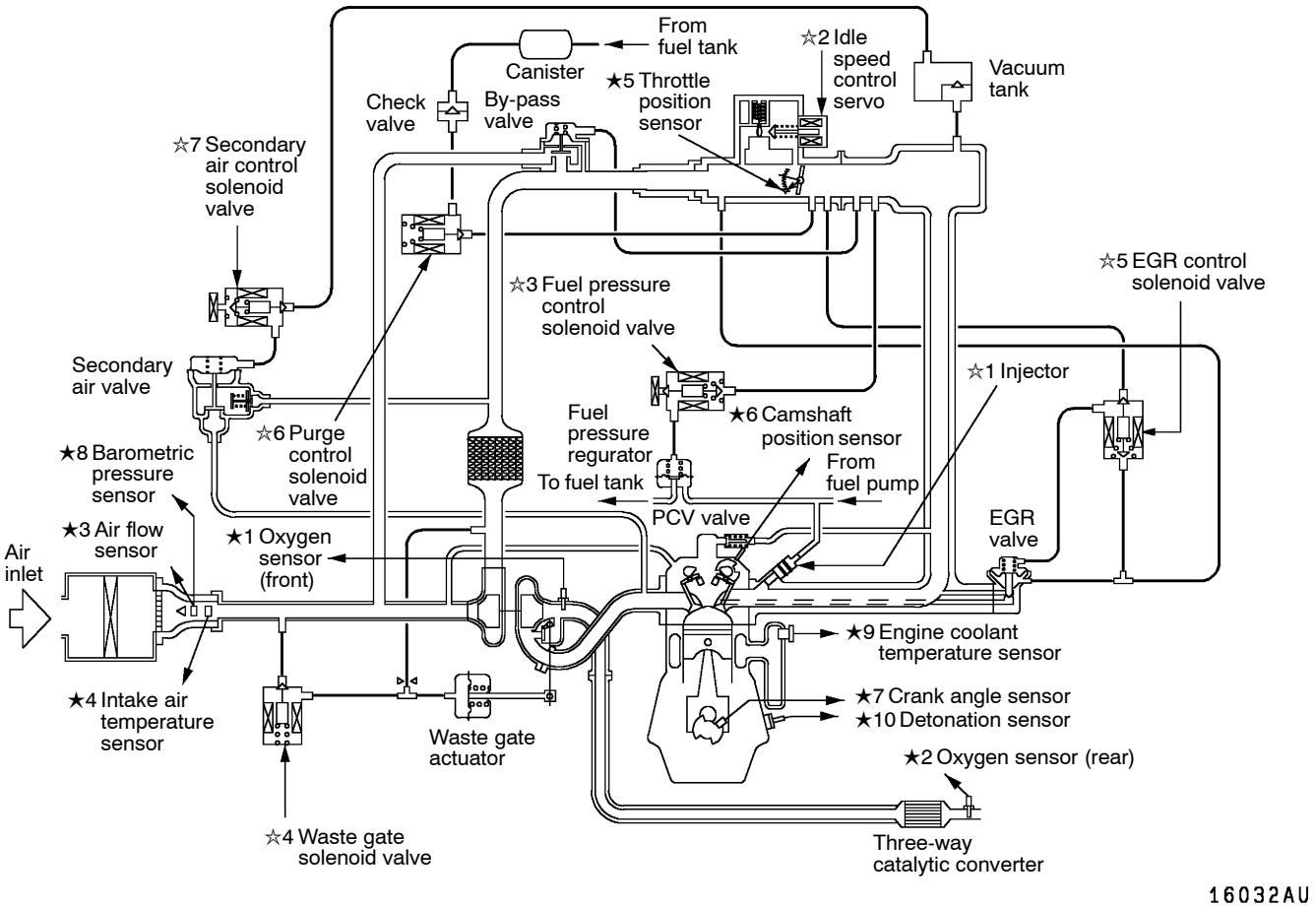
★1 Oxygen sensor (front)
★2 Oxygen sensor (rear)
★3 Air flow sensor
★4 Intake air temperature sensor
★5 Throttle position sensor
★6 Camshaft position sensor
★7 Crank angle sensor
★8 Barometric pressure sensor
★9 Engine coolant temperature sensor
★10 Detonation sensor

- Power supply
- Ignition switch IG
- Ignition switch ST
- Vehicle speed sensor
- A/C switch
- A/C load signal
- Tachometer
- Power steering fluid pressure switch
- Alternator FR terminal
- Diagnosis control terminal
- Intercooler water spray switch (automatic)
- Intercooler water spray switch (manual)

→ Engine-ECU →

☆1 Injector
☆2 Idle speed control servo
☆3 Fuel pressure control solenoid valve
☆4 Waste gate solenoid valve
☆5 EGR control solenoid valve
☆6 Purge control solenoid valve
☆7 Secondary air control solenoid valve

- Engine control relay
- Fuel pump relay 2, 3
- A/C relay
- Ignition coil
- Fan controller
- Condenser fan relay (HI)
- Condenser fan relay (LOW)
- Engine warning lamp
- Diagnosis output
- Alternator G terminal
- Intercooler water spray relay
- Intercooler water spray lamp

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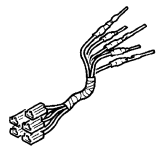
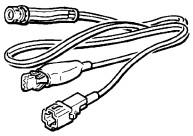
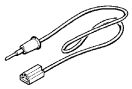
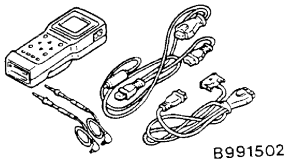
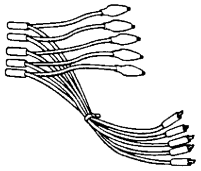
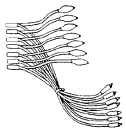
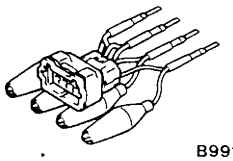
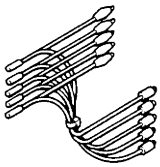
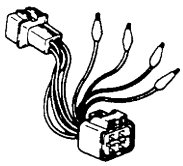
# SERVICE SPECIFICATIONS

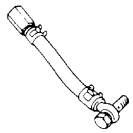
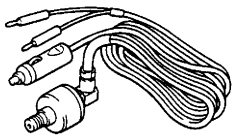
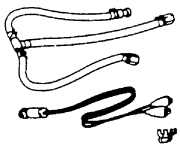
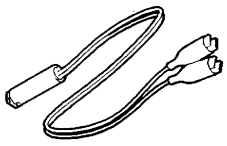
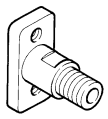
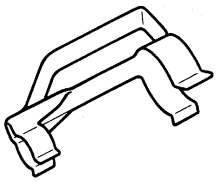
| Items | | Specifications |
|---|---|---|
| Basic idle speed r/min | | 850 ± 100 |
| Throttle position sensor adjusting voltage mV | | 535 - 735 |
| Throttle position sensor resistance kΩ | | 3.5 - 6.5 |
| Idle speed control servo coil resistance (at 20°C) Ω | | 28 - 33 |
| Intake air temperature sensor resistance kΩ | -20°C | 13 - 17 |
| | 0°C | 5.7 - 6.7 |
| | 20°C | 2.3 - 3.0 |
| | 40°C | 1.0 - 1.5 |
| | 60°C | 0.56 -0.76 |
| | 80°C | 0.30 - 0.42 |
| Engine coolant temperature sensor resistance kΩ | -20°C | 14 - 17 |
| | 0°C | 5.1 - 6.5 |
| | 20°C | 2.1 - 2.7 |
| | 40°C | 0.9 - 1.3 |
| | 60°C | 0.48 - 0.68 |
| | 80°C | 0.26 - 0.36 |
| Oxygen sensor heater resistance (at 20°C) Ω | Front | 4.5 - 8.0 |
| | Rear | 11 - 18 |
| Oxygen sensor output voltage (at racing) V | | 0.6 - 1.0 |
| Fuel pressure kPa | Vacuum hose disconnection | 289 - 309 at curb idle |
| | Vacuum hose connection | Approximately 230 at curb idle |
| Fuel pressure control solenoid valve resistance (at 20°C) Ω | | 28 - 36 |
| Fuel pump resistor resistance Ω | | 0.45 - 0.65 |
| Injector coil resistance (at 20°C) Ω | | 2 - 3 |
| Injector fuel leakage rate Drop/minute | | 1 or less |
| Resistor (for injector) resistance (at 20°C) Ω | | 5.8 - 6.2 |

# SEALANT

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

# SPECIAL TOOLS

| Tool | Number | Name | Use |
|---|---|---|---|
| A<br>  <br>B<br>  <br>C<br>  <br>D<br>  <br>C991223 | MB991223<br>A: MB991219<br>B: MB991220<br>C: MB991221<br>D: MB991222 | Harness set<br>A: Test harness<br>B: LED harness<br>C: LED harness adapter<br>D: Probe | • Check at the ECU terminals<br>A: Connector pin contact pressure inspection<br>B: Power circuit inspection<br>C: Power circuit inspection<br>D: Commercial tester connection |
|  <br>B991502 | MB991502 | MUT-II sub assembly | • Reading diagnosis code<br>• MPI system inspection |
|  | MB991348 | Test harness set | • Inspection using an analyzer |
|  <br>MB991709 | MB991709 | Test harness | • Measurement of voltage during trouble-shooting<br>• Inspection using an analyzer<br>• Idle speed control servo (stepper motor) check |
|  <br>B991536 | MB991536 | Check harness for TPS adjustment | • Adjustment of throttle position sensor<br>• Measurement of voltage during trouble-shooting |
|  <br>B991658 | MB991658 | Test harness | • Measurement of voltage during trouble-shooting<br>• Inspection using an analyzer |
|  | MD998464 | Test harness (4 pin, square) | • Measurement of voltage during trouble-shooting<br>• Oxygen sensor (front) check |

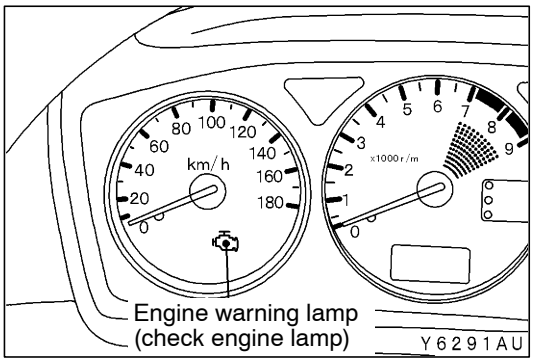
| Tool | Number | Name | Use |
|---|---|---|---|
|  | MD998478 | Test harness (3-pin, triangle) | • Measurement of voltage during trouble-shooting<br>• Inspection using an analyzer |
|  | MD998709 | Adaptor hose | Measurement of fuel pressure |
|  | MD998742 | Hose adaptor | |
|  <br>B991637 | MB991637 | Fuel pressure gauge set | |
|  | MD998706 | Injector test set | Checking the spray condition of injectors |
|  <br>MB991607 | MB991607 | Injector test harness | |
|  <br>MD998741 | MD998741 | Injector test adaptor | |
|  | MB991608 | Clip | |

# TROUBLESHOOTING

### DIAGNOSIS TROUBLESHOOTING FLOW

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

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




## DIAGNOSIS FUNCTION

### ENGINE WARNING LAMP (CHECK ENGINE LAMP)

If an abnormality occurs in any of the following items related to the MPI system, the engine warning lamp will illuminate or flash. If the lamp remains illuminated or if the lamp illuminates while the engine is running, check the diagnosis code output.
However, the warning lamp will illuminate as bulb check for 5 seconds whenever the ignition switch is turned to the ON position.

**Engine warning lamp inspection items**

| Code No. | Diagnosis item |
|---|---|
| - | Engine-ECU |
| P0100 | Air flow sensor system |
| P0105 | Barometric pressure sensor system |
| P0110 | Intake air temprature sensor system |
| P0115 | Engine coolant temperature sensor system |
| P0120 | Throttle position sensor system |
| P0130 | Oxygen sensor (front) system |
| P0135 | Oxygen sensor heater (front) system |
| P0136 | Oxygen sensor (rear) system |
| P0141 | Oxygen sensor heater (rear) system |
| P0201 | No.1 injector system |
| P0202 | No.2 injector system |
| P0203 | No.3 injector system |
| P0204 | No.4 injector system |
| P0325 | Detonation sensor system |
| P0335 | Crank angle sensor system |
| P0340 | Camshaft position sensor system |
| P0403 | EGR control solenoid valve system |

| Code No. | Diagnosis item |
|---|---|
| P0443 | Purge control solenoid valve system |
| P0500 | Vehicle speed sensor system |
| P0505 | Idle speed control system |
| P0551 | Power steering fluid pressure switch |
| P1104 | Waste gate solenoid valve system |
| P1105 | Fuel pressure control solenoid valve system |

NOTE
If the engine warning lamp illuminates because of a malfunction of the engine-ECU, communication between MUT-II and the engine-ECU is impossible. In this case, the diagnosis code cannot be read.

**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, and then start the engine again and carry out a road test to confirm that the problem has disappeared.

## CONFIRMING FREEZE FRAME DATA

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

NOTE
If mulfunctions have been detected in multiple systems, engine-ECU stores one malfunction only, which has been detected first.

| Item No. | Data item | Unit/State | Item No. | Data item | Unit/State |
|---|---|---|---|---|---|
| 21 | Engine coolant temperature sensor | °C | 81 | Learn value | % |
| 22 | Crank angle sensor | r/min | 82 | Feedback | % |
| 24 | Vehicle speed | km/h | 87 | Engine load | % |

## FAIL-SAFE FUNCTION REFERENCE TABLE

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

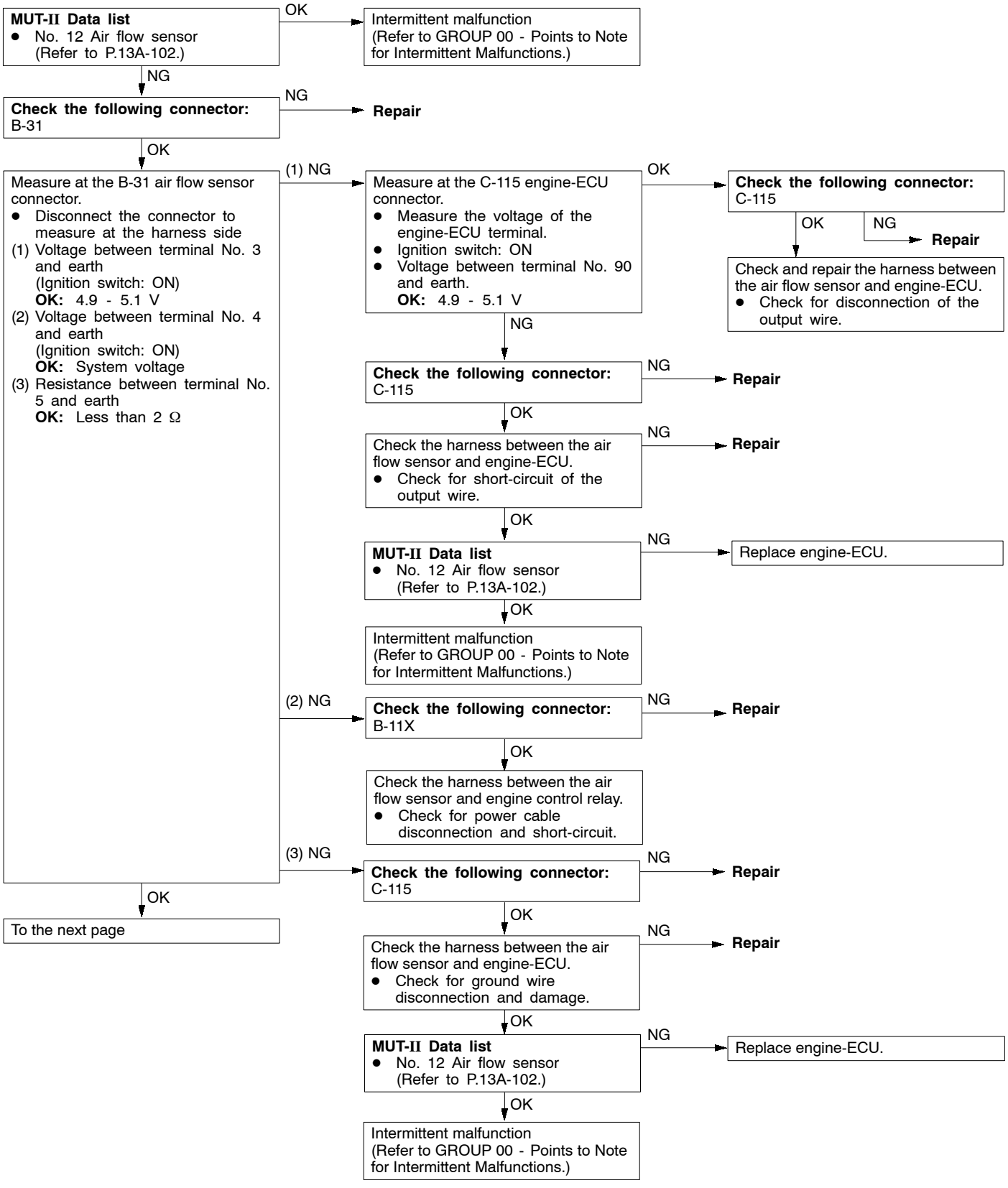
| Malfunctioning item | Control contents during malfunction |
|---|---|
| Air flow sensor | 1. Uses the throttle position sensor signal and engine speed signal (crank angle sensor signal) to take reading of the basic injector drive time and basic ignition timing from the pre-set mapping.<br>2. Fixes the idle speed control 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 | No increase in fuel injection amount during acceleration due to the throttle position sensor signal. |
| Engine coolant temperature sensor | 1. Controls as if the engine coolant temperature is 80°C. (Even after sensor signal is correctly recovered, continues until the ignition switch is set to the “LOCK” (OFF) position.)<br>2. Rotates radiator fan and condenser fan at high speed. |
| Camshaft position sensor | 1. Inject all fuel cylinders simultaneously. (However, when the No.1 cylinder top dead centre is not detected at all after the ignition switch is turned to “ON” position.)<br>2. Shuts off fuel supply after 4 seconds have passed since a failure was detected. (However, when the No.1 cylinder top dead centre is not detected at all after the ignition switch is turned to “ON” position.) |
| 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. |
| Alternator FR terminal | Does not control the output of the alternator according to an electrical load. (works as a normal alternator) |

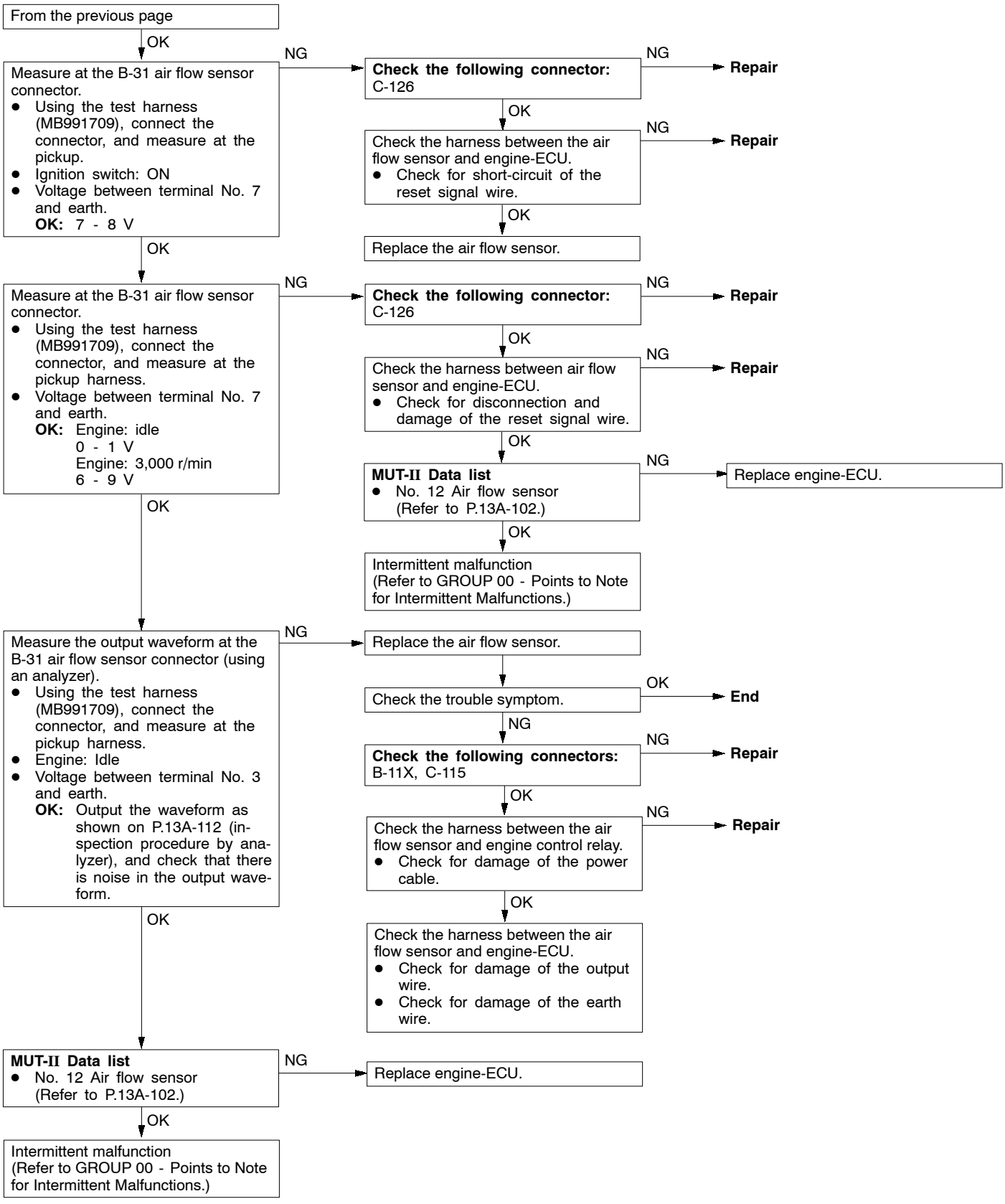
## INSPECTION CHART FOR DIAGNOSIS CODES

| Code No. | Diagnosis item | Reference page |
|---|---|---|
| P0100 | Air flow sensor system | 13A-13 |
| P0105 | Barometric pressure sensor system | 13A-15 |
| P0110 | Intake air temprature sensor system | 13A-16 |
| P0115 | Engine coolant temperature sensor system | 13A-19 |
| P0120 | Throttle position sensor system | 13A-21 |
| P0130 | Oxygen sensor (front) system | 13A-24 |
| P0135 | Oxygen sensor heater (front) system | 13A-26 |
| P0136 | Oxygen sensor (rear) system | 13A-27 |
| P0141 | Oxygen sensor heater (rear) system | 13A-29 |
| P0201 | No.1 injector system | 13A-30 |
| P0202 | No.2 injector system | 13A-31 |
| P0203 | No.3 injector system | 13A-32 |
| P0204 | No.4 injector system | 13A-33 |
| P0325 | Detonation sensor system | 13A-34 |
| P0335 | Crank angle sensor system | 13A-35 |
| P0340 | Camshaft position sensor system | 13A-37 |
| P0403 | EGR control solenoid valve system | 13A-39 |
| P0443 | Purge control solenoid valve system | 13A-41 |
| P0500 | Vehicle speed sensor system | 13A-43 |
| P0505 | Idle speed control system | 13A-44 |
| P0551 | Power steering fluid pressure switch system | 13A-46 |
| P1104 | Waste gate solenoid valve system | 13A-47 |
| P1105 | Fuel pressure control valve system | 13A-48 |
| P1500 | Alternator FR terminal system | 13A-49 |
| P1603 | Battery backup line malfunction | 13A-50 |
| P1610 | Immobilizer system | 13A-51 |

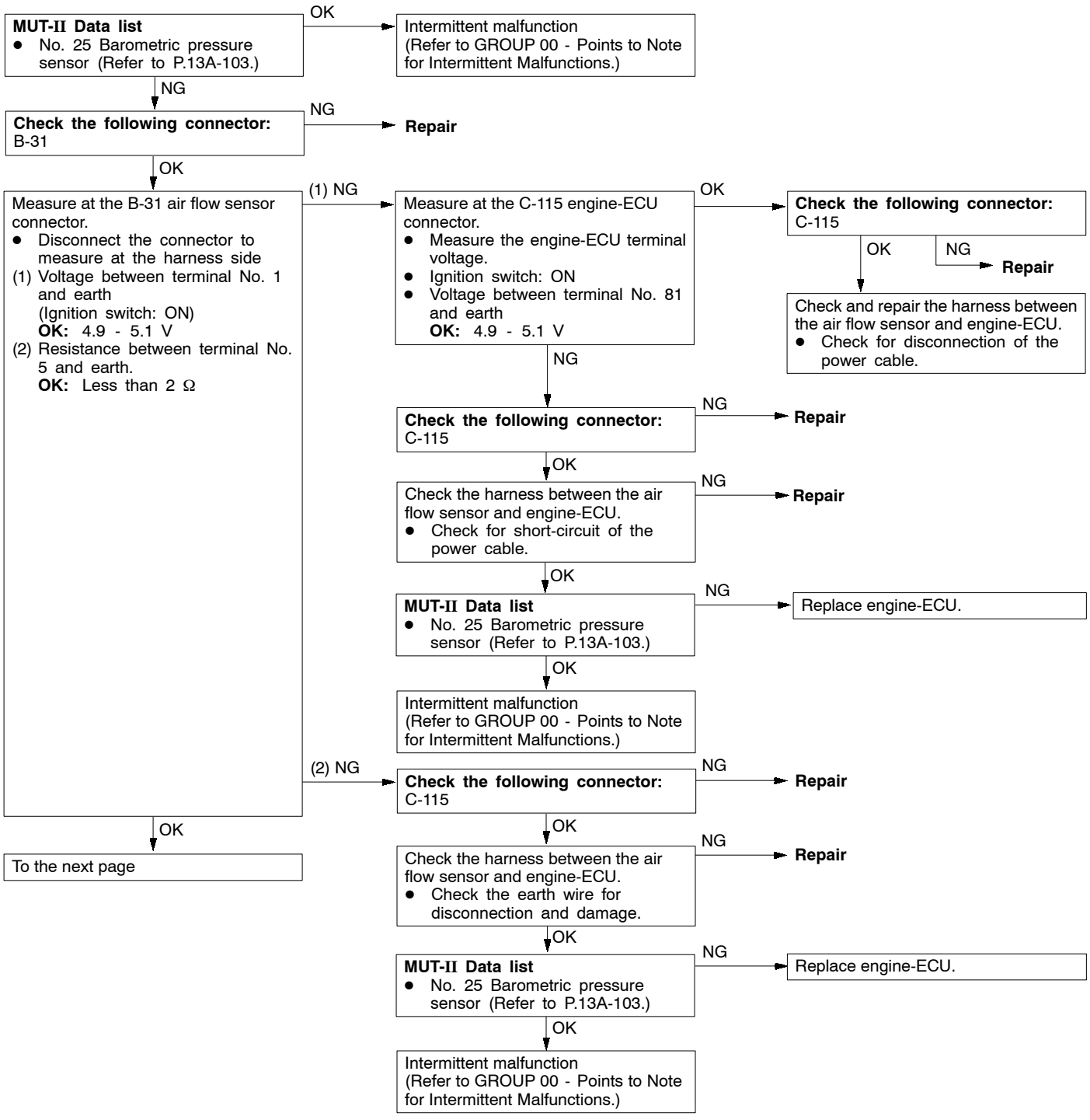
# DIAGNOSTIC TROUBLE CODE INSPECTION PROCEDURE

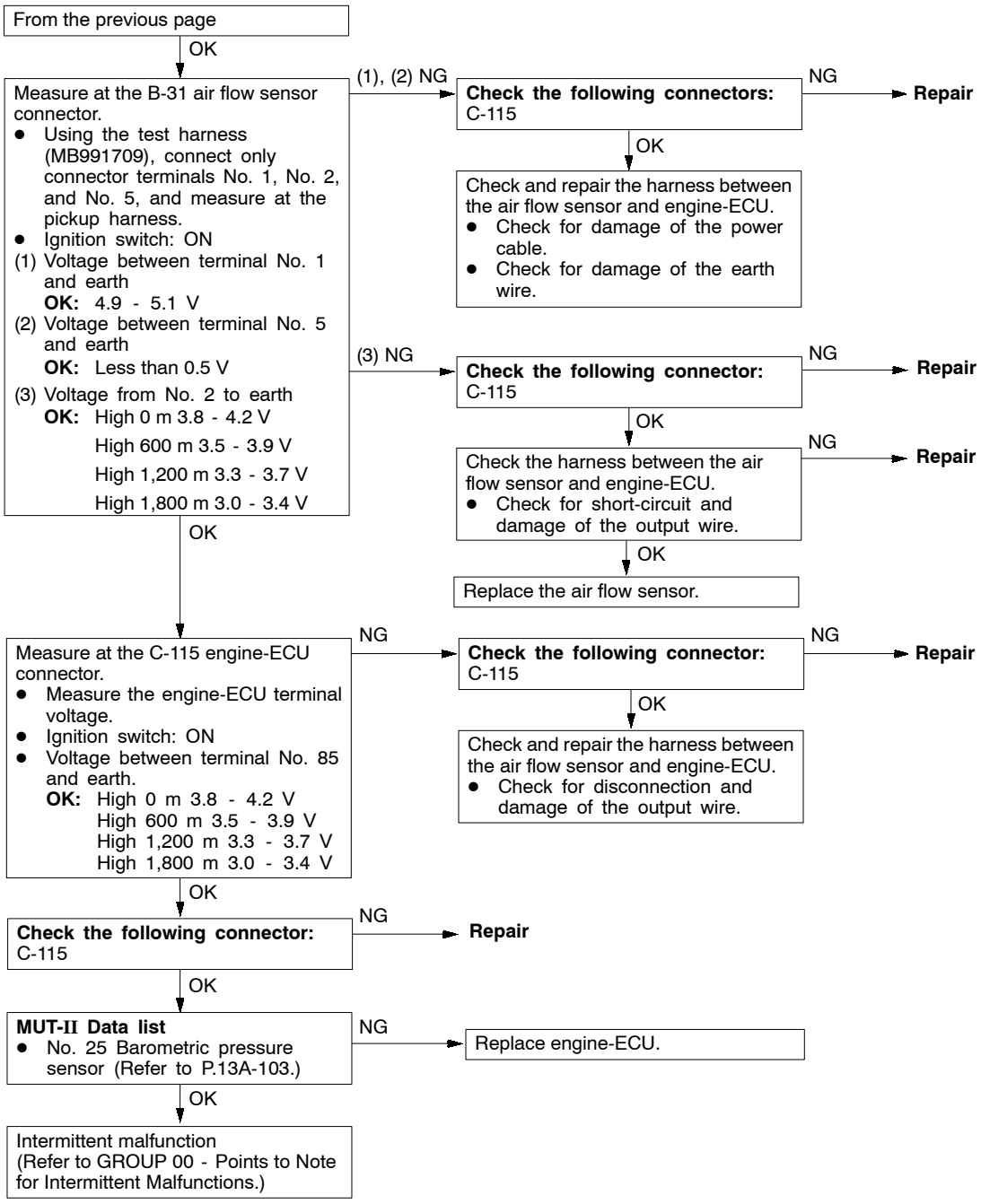
| Code No. P0100 Air flow sensor system | Probable cause |
|---|---|
| Inspection Range<br>● Engine speed: More than 500 r/min<br>Evaluation Conditions<br>● The sensor output frequency is less than 3 Hz for 4 seconds. | ● Air flow sensor malfunction<br>● Air flow sensor circuit disconnection, short-circuit, or connector contact defect<br>● Engine-ECU malfunction |



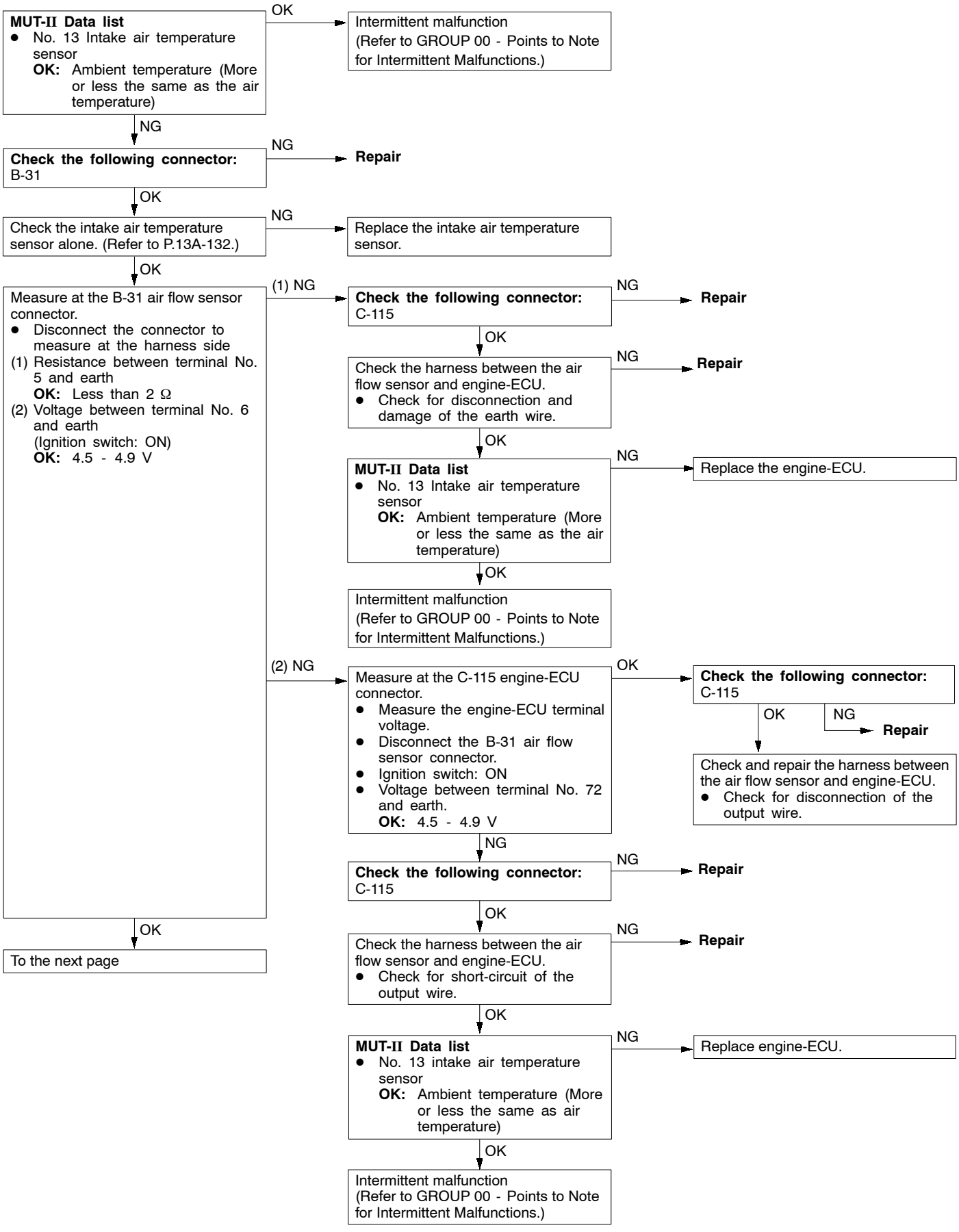

From the previous page
OK
Measure at the B-31 air flow sensor connector.
● Using the test harness (MB991709), connect the connector, and measure at the pickup.
● Ignition switch: ON
● Voltage between terminal No. 7 and earth.
OK: 7 - 8 V
NG
Check the following connector: C-126
NG
Repair
OK
Check the harness between the air flow sensor and engine-ECU.
● Check for short-circuit of the reset signal wire.
NG
Repair
OK
Replace the air flow sensor.
OK
Measure at the B-31 air flow sensor connector.
● Using the test harness (MB991709), connect the connector, and measure at the pickup harness.
● Voltage between terminal No. 7 and earth.
OK: Engine: idle
0 - 1 V
Engine: 3,000 r/min
6 - 9 V
NG
Check the following connector: C-126
NG
Repair
OK
Check the harness between air flow sensor and engine-ECU.
● Check for disconnection and damage of the reset signal wire.
NG
Repair
OK
MUT-II Data list
● No. 12 Air flow sensor (Refer to P.13A-102.)
NG
Replace engine-ECU.
OK
Intermittent malfunction (Refer to GROUP 00 - Points to Note for Intermittent Malfunctions.)
OK
Measure the output waveform at the B-31 air flow sensor connector (using an analyzer).
● Using the test harness (MB991709), connect the connector, and measure at the pickup harness.
● Engine: Idle
● Voltage between terminal No. 3 and earth.
OK: Output the waveform as shown on P.13A-112 (inspection procedure by analyzer), and check that there is noise in the output waveform.
NG
Replace the air flow sensor.
OK
Check the trouble symptom.
OK
End
NG
Check the following connectors: B-11X, C-115
NG
Repair
OK
Check the harness between the air flow sensor and engine control relay.
● Check for damage of the power cable.
NG
Repair
OK
Check the harness between the air flow sensor and engine-ECU.
● Check for damage of the output wire.
● Check for damage of the earth wire.
OK
MUT-II Data list
● No. 12 Air flow sensor (Refer to P.13A-102.)
NG
Replace engine-ECU.
OK
Intermittent malfunction (Refer to GROUP 00 - Points to Note for Intermittent Malfunctions.)

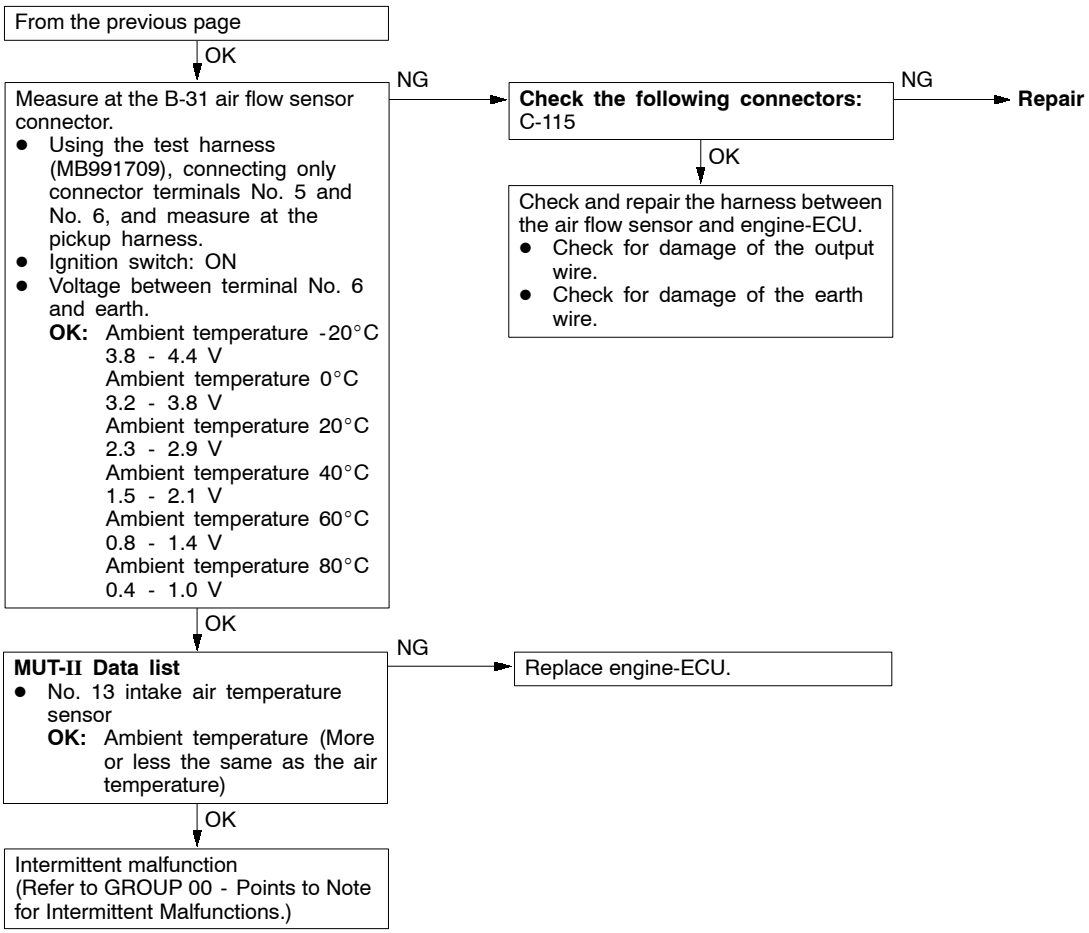
| Code No. P0105 Barometric pressure sensor system | Probable cause |
|---|---|
| Inspection Range<br>● 2 seconds after the ignition switch is set to the "ON" position, or after the completion of start of engine.<br>Evaluation Conditions<br>● The sensor output voltage is more than 4.5 V for 4 seconds (Equivalent to air pressure of more than 114 kPa)<br>or<br>● The sensor output voltage is less than 0.2 V for 4 seconds (Equivalent to air pressure of less than 5 kPa) | ● Barometric pressure sensor malfunction<br>● Barometric pressure sensor circuit disconnection, short-circuit, or connector contact defect<br>● Engine-ECU malfunction |






| Code No. P0110 Intake air temperature sensor system | Probable cause |
|---|---|
| Inspection Range<br>● After setting the ignition switch to the "ON" position, or after 2 seconds from completion of start.<br>Evaluation Conditions<br>● The sensor output voltage is more than 4.6 V for 4 seconds (Equivalent to intake air temperature less than -40°C)<br>or<br>● The sensor output voltage is less than 0.2 V for 4 seconds (Equivalent to intake air temperature of more than 120°C) | ● Intake air temperature sensor malfunction<br>● Intake air temperature sensor circuit disconnection, short-circuit, or connector contact defect<br>● Engine-ECU malfunction |


MUT-II Data list
● No. 13 Intake air temperature sensor
OK: Ambient temperature (More or less the same as the air temperature)
OK
Intermittent malfunction
(Refer to GROUP 00 - Points to Note for Intermittent Malfunctions.)
NG
Check the following connector:
B-31
NG
Repair
OK
Check the intake air temperature sensor alone. (Refer to P.13A-132.)
NG
Replace the intake air temperature sensor.
OK
Measure at the B-31 air flow sensor connector.
● Disconnect the connector to measure at the harness side
(1) Resistance between terminal No. 5 and earth
OK: Less than 2 Ω
(2) Voltage between terminal No. 6 and earth
(Ignition switch: ON)
OK: 4.5 - 4.9 V
(1) NG
Check the following connector:
C-115
NG
Repair
OK
Check the harness between the air flow sensor and engine-ECU.
● Check for disconnection and damage of the earth wire.
NG
Repair
OK
MUT-II Data list
● No. 13 Intake air temperature sensor
OK: Ambient temperature (More or less the same as the air temperature)
NG
Replace the engine-ECU.
OK
Intermittent malfunction
(Refer to GROUP 00 - Points to Note for Intermittent Malfunctions.)
(2) NG
Measure at the C-115 engine-ECU connector.
● Measure the engine-ECU terminal voltage.
● Disconnect the B-31 air flow sensor connector.
● Ignition switch: ON
● Voltage between terminal No. 72 and earth.
OK: 4.5 - 4.9 V
OK
Check the following connector:
C-115
OK
NG
Repair
Check and repair the harness between the air flow sensor and engine-ECU.
● Check for disconnection of the output wire.
NG
Check the following connector:
C-115
NG
Repair
OK
Check the harness between the air flow sensor and engine-ECU.
● Check for short-circuit of the output wire.
NG
Repair
OK
MUT-II Data list
● No. 13 intake air temperature sensor
OK: Ambient temperature (More or less the same as air temperature)
NG
Replace engine-ECU.
OK
Intermittent malfunction
(Refer to GROUP 00 - Points to Note for Intermittent Malfunctions.)
OK
To the next page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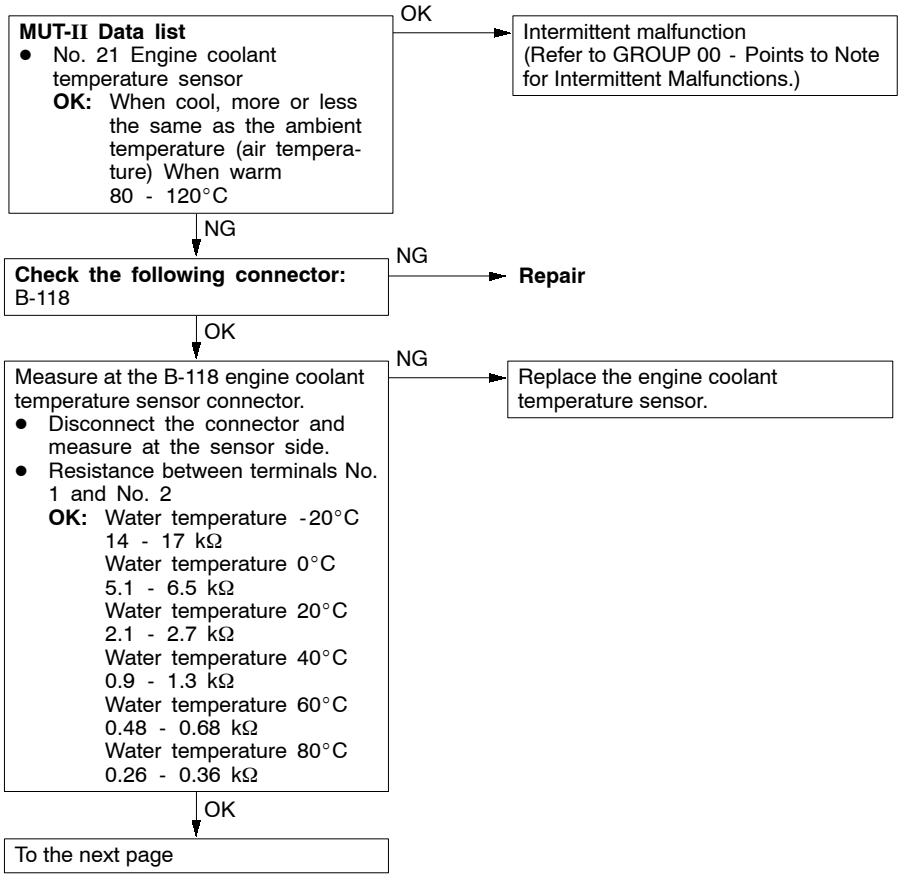
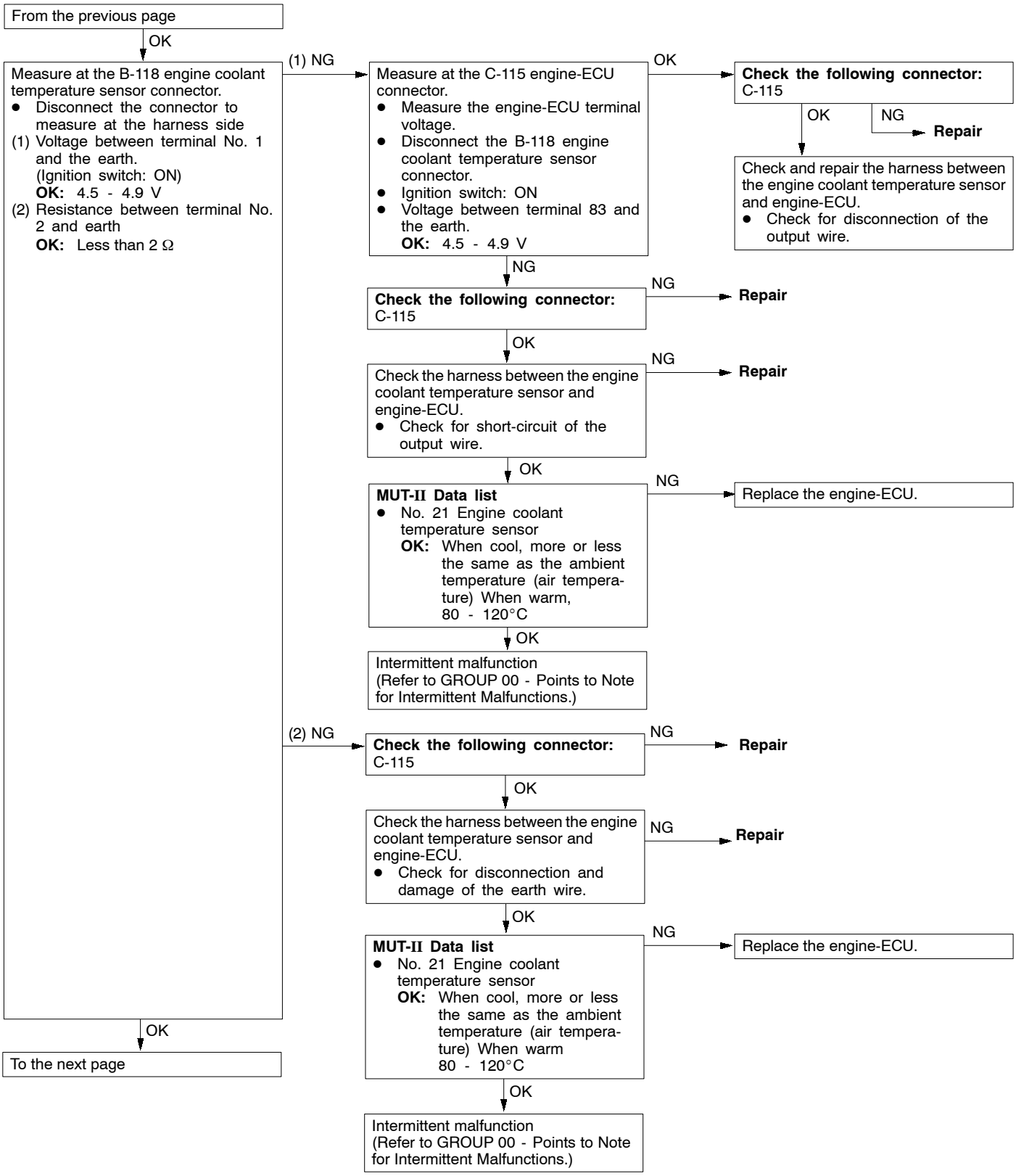
OK
Measure at the B-31 air flow sensor connector.
● Using the test harness (MB991709), connecting only connector terminals No. 5 and No. 6, and measure at the pickup harness.
● Ignition switch: ON
● Voltage between terminal No. 6 and earth.
OK: Ambient temperature -20°C 3.8 - 4.4 V
Ambient temperature 0°C 3.2 - 3.8 V
Ambient temperature 20°C 2.3 - 2.9 V
Ambient temperature 40°C 1.5 - 2.1 V
Ambient temperature 60°C 0.8 - 1.4 V
Ambient temperature 80°C 0.4 - 1.0 V
NG
Check the following connectors: C-115
NG
Repair
OK
Check and repair the harness between the air flow sensor and engine-ECU.
● Check for damage of the output wire.
● Check for damage of the earth wire.
OK
MUT-II Data list
● No. 13 intake air temperature sensor
OK: Ambient temperature (More or less the same as the air temperature)
NG
Replace engine-ECU.
OK
Intermittent malfunction
(Refer to GROUP 00 - Points to Note for Intermittent Malfunctions.)

| Code No. P0115 Engine coolant temperature sensor system | Probable cause |
|---|---|
| Inspection Range<br>● After setting the ignition switch to the "ON" position, or 2 seconds after completion of engine start.<br>Evaluation Conditions<br>● When the sensor output voltage is more than 4.6 V for 4 seconds (Equivalent to water temperature of less than -45°C)<br>or<br>● When the sensor output voltage is less than 0.1 V for 4 seconds (Equivalent to water temperature of more than 140°C) | ● Engine coolant temperature sensor malfunction<br>● Engine coolant temperature sensor circuit disconnection and short-circuit or connector contact defect<br>● Engine-ECU malfunction |
| Inspection Range<br>● Ignition switch: ON<br>● The engine speed is approximately 50 r/min or more.<br>Evaluation Conditions<br>● From less than 1.6 V (Equivalent to water temperature of more than 40°C), the sensor output voltage rises to more than 1.6 V (Equivalent to water temperature of less than 40°C)<br>● The sensor output voltage is more than 1.6 V for 5 minutes | |

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OK
Measure at the B-118 engine coolant temperature sensor connector.
● Disconnect the connector to measure at the harness side
(1) Voltage between terminal No. 1 and the earth.
(Ignition switch: ON)
OK: 4.5 - 4.9 V
(2) Resistance between terminal No. 2 and earth
OK: Less than 2 Ω
OK
To the next page
(1) NG
Measure at the C-115 engine-ECU connector.
● Measure the engine-ECU terminal voltage.
● Disconnect the B-118 engine coolant temperature sensor connector.
● Ignition switch: ON
● Voltage between terminal 83 and the earth.
OK: 4.5 - 4.9 V
OK
Check the following connector: C-115
OK
NG
Repair
Check and repair the harness between the engine coolant temperature sensor and engine-ECU.
● Check for disconnection of the output wire.
NG
Check the following connector: C-115
NG
Repair
OK
Check the harness between the engine coolant temperature sensor and engine-ECU.
● Check for short-circuit of the output wire.
NG
Repair
OK
MUT-II Data list
● No. 21 Engine coolant temperature sensor
OK: When cool, more or less the same as the ambient temperature (air temperature) When warm, 80 - 120°C
NG
Replace the engine-ECU.
OK
Intermittent malfunction
(Refer to GROUP 00 - Points to Note for Intermittent Malfunctions.)
(2) NG
Check the following connector: C-115
NG
Repair
OK
Check the harness between the engine coolant temperature sensor and engine-ECU.
● Check for disconnection and damage of the earth wire.
NG
Repair
OK
MUT-II Data list
● No. 21 Engine coolant temperature sensor
OK: When cool, more or less the same as the ambient temperature (air temperature) When warm
80 - 120°C
NG
Replace the engine-ECU.
OK
Intermittent malfunction
(Refer to GROUP 00 - Points to Note for Intermittent Malfunctions.)

From the previous page

OK

Measure at the B-118 engine coolant temperature sensor connector.
- Using the test harness (MB991658), connect the connector, and measure at the pickup harness.
- Ignition switch: ON
- Voltage between terminal No. 1 and the earth.

**OK:** Water temperature -20°C
3.9 - 4.5 V
Water temperature 0°C
3.2 - 3.8 V
Water temperature 20°C
2.3 - 2.9 V
Water temperature 40°C
1.3 - 1.9 V
Water temperature 60°C
0.7 - 1.3 V
Water temperature 80°C
0.3 - 0.9 V

NG → **Check the following connector:** C-115

NG → **Repair**

OK → Check and repair the harness between the engine coolant temperature sensor and engine-ECU.
- Check for damage of the output wire.
- Check for damage of the earth wire.

OK

**MUT-II Data list**
- No. 21 Engine coolant temperature sensor

**OK:** When cool, more or less the same as the ambient temperature (air temperature) When warm, 80 - 120°C

NG → Replace the engine-ECU.

OK

Intermittent malfunction
(Refer to GROUP 00 - Points to Note for Intermittent Malfunctions.)

| Code No. P0120 Throttle position sensor system | Probable cause |
|---|---|
| Inspection Range<br>● Ignition switch: ON<br>● Excluding for two seconds after ignition switch is set to "ON" position or two seconds after engine start is completed.<br>Evaluation Conditions<br>● The sensor output voltage is 0.2 V or less for 2 seconds. | ● Throttle position sensor malfunction<br>● Throttle position sensor circuit disconnection, short-circuit, or connector contact defect<br>● Engine-ECU malfunction |
| Inspection Range<br>● The engine speed is 1,000 r/min or less.<br>● The volumetric efficiency is 60 % or less.<br>Evaluation Conditions<br>● The sensor output voltage is 2.0 V or less for 2 seconds. | |

**MUT-II Data list**
- No. 14 Throttle position sensor (Refer to P.13A-103.)

OK → Intermittent malfunction
(Refer to GROUP 00 - Points to Note for Intermittent Malfunctions.)

NG

**Check the following connector:** B-02

NG → **Repair**

OK

Check the throttle position sensor. (Refer to P.13A-134.)

NG → Replace the throttle position sensor.

OK

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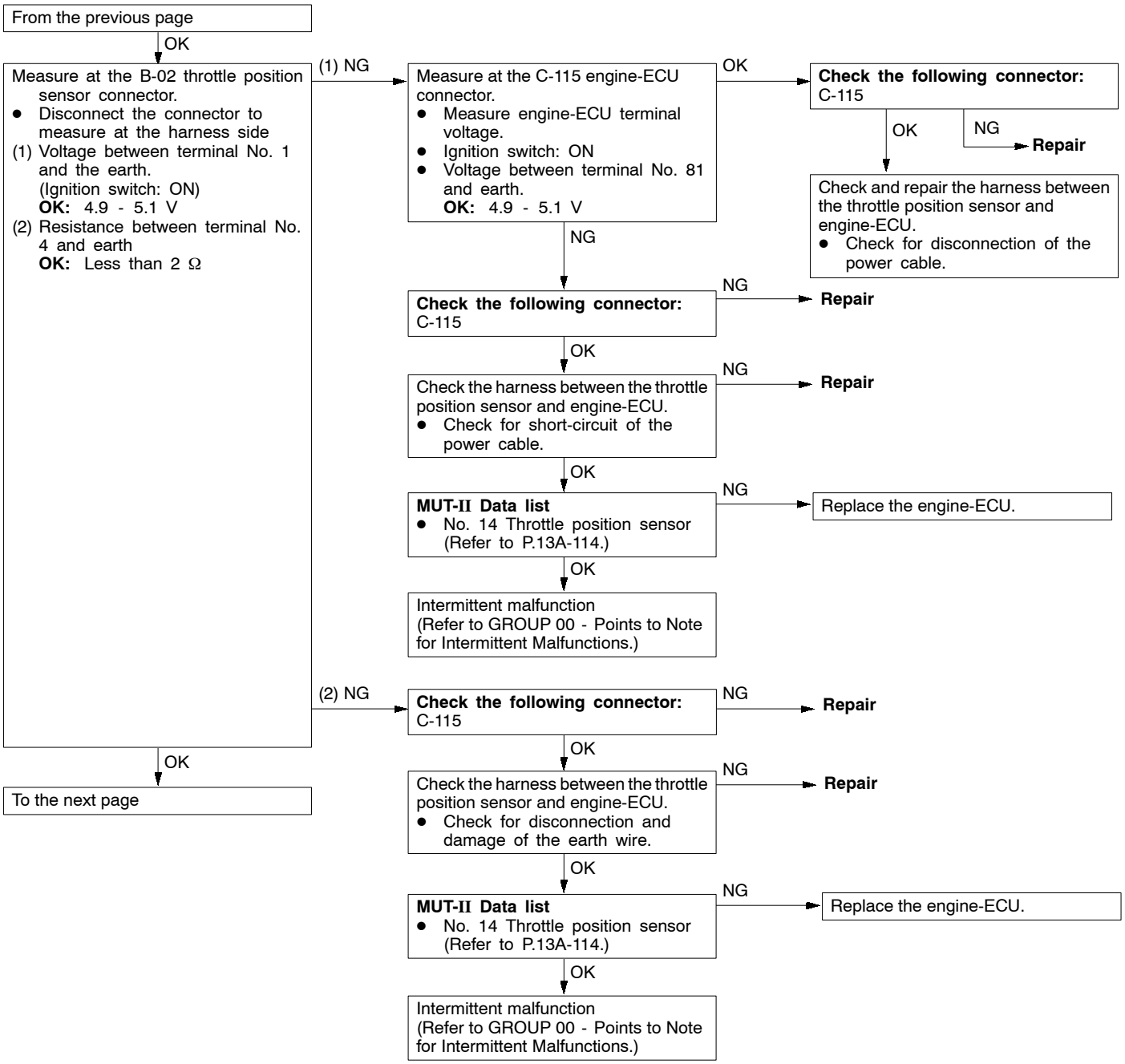
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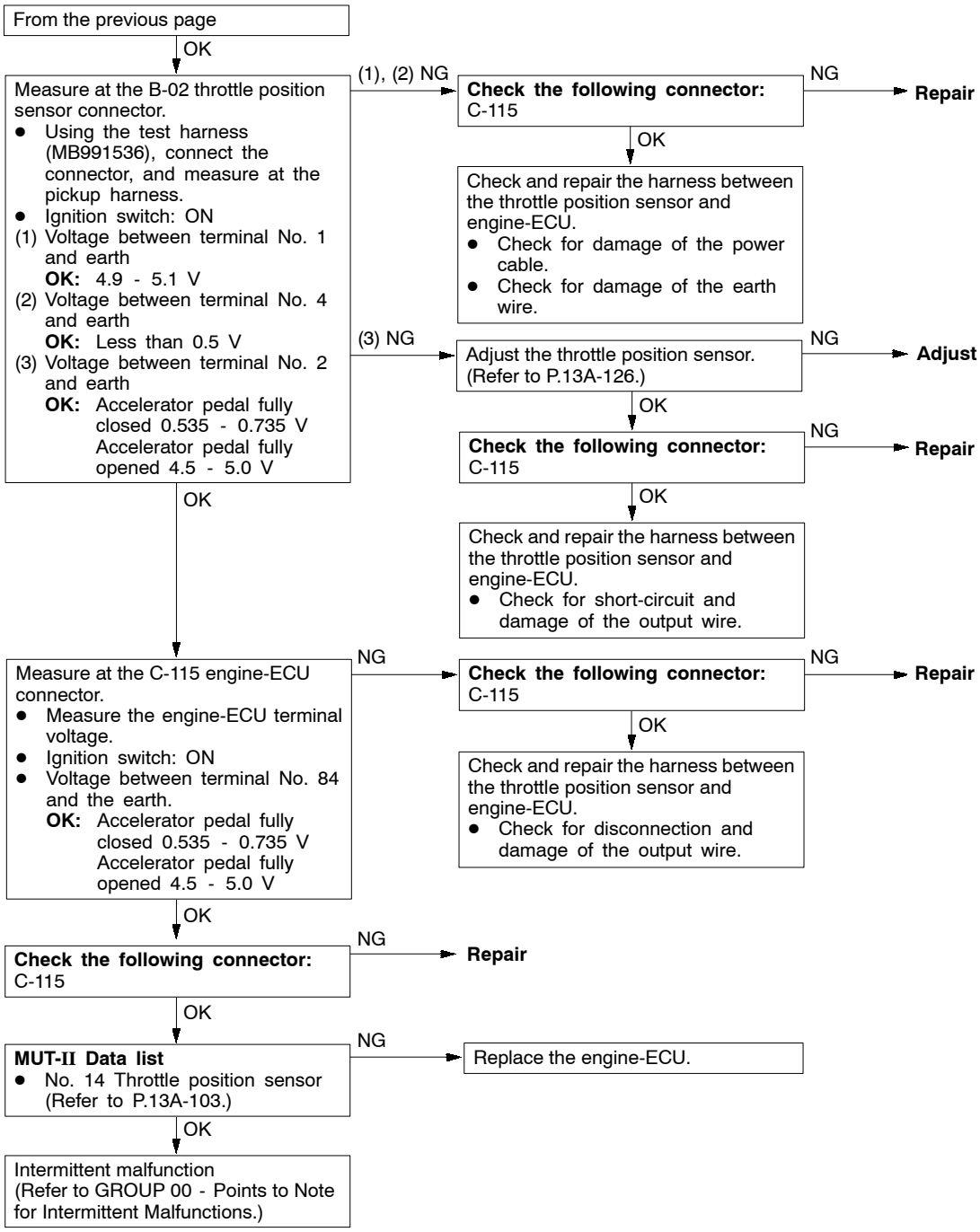
OK
Measure at the B-02 throttle position sensor connector.
● Disconnect the connector to measure at the harness side
(1) Voltage between terminal No. 1 and the earth. (Ignition switch: ON)
OK: 4.9 - 5.1 V
(2) Resistance between terminal No. 4 and earth
OK: Less than 2 Ω
(1) NG
Measure at the C-115 engine-ECU connector.
● Measure engine-ECU terminal voltage.
● Ignition switch: ON
● Voltage between terminal No. 81 and earth.
OK: 4.9 - 5.1 V
OK
Check the following connector: C-115
OK
NG
Repair
Check and repair the harness between the throttle position sensor and engine-ECU.
● Check for disconnection of the power cable.
NG
Check the following connector: C-115
NG
Repair
OK
Check the harness between the throttle position sensor and engine-ECU.
● Check for short-circuit of the power cable.
NG
Repair
OK
MUT-II Data list
● No. 14 Throttle position sensor (Refer to P.13A-114.)
NG
Replace the engine-ECU.
OK
Intermittent malfunction (Refer to GROUP 00 - Points to Note for Intermittent Malfunctions.)
(2) NG
Check the following connector: C-115
NG
Repair
OK
Check the harness between the throttle position sensor and engine-ECU.
● Check for disconnection and damage of the earth wire.
NG
Repair
OK
MUT-II Data list
● No. 14 Throttle position sensor (Refer to P.13A-114.)
NG
Replace the engine-ECU.
OK
Intermittent malfunction (Refer to GROUP 00 - Points to Note for Intermittent Malfunctions.)
OK
To the next page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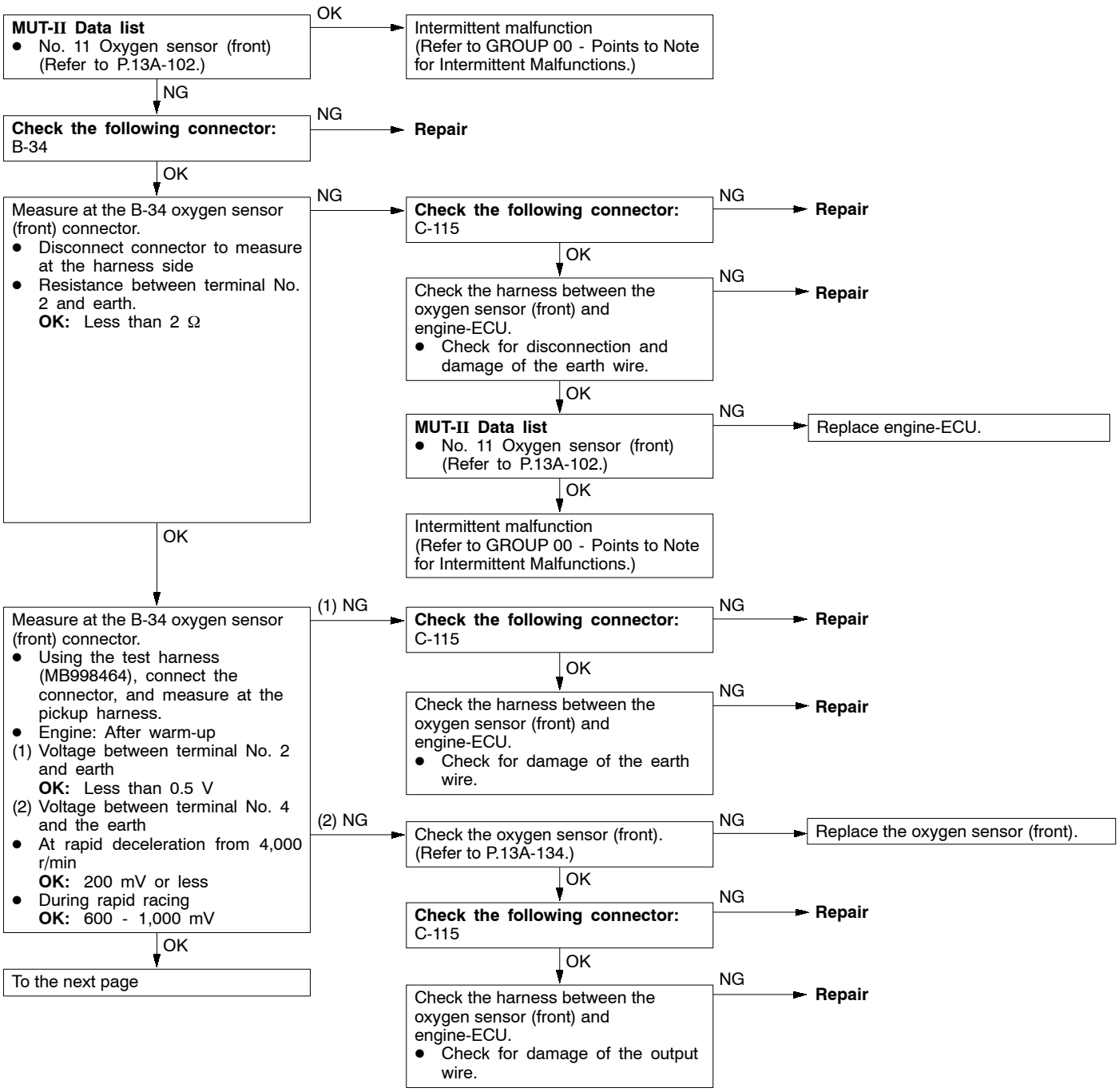
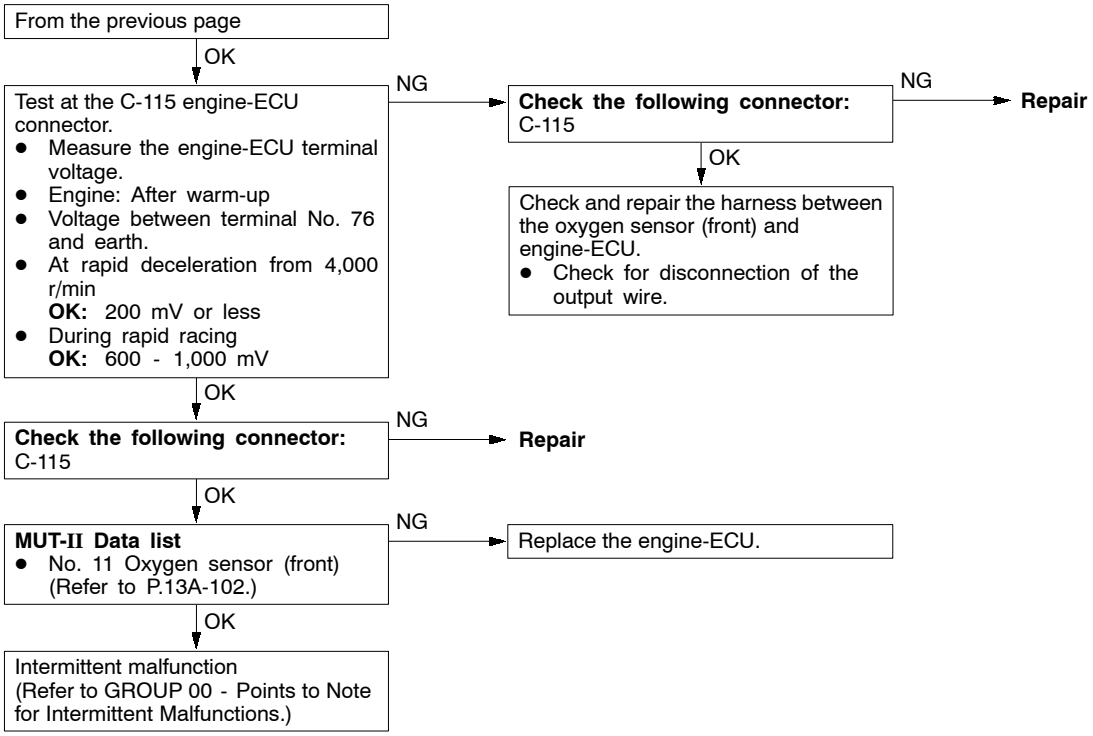
OK
Measure at the B-02 throttle position sensor connector.
● Using the test harness (MB991536), connect the connector, and measure at the pickup harness.
● Ignition switch: ON
(1) Voltage between terminal No. 1 and earth
OK: 4.9 - 5.1 V
(2) Voltage between terminal No. 4 and earth
OK: Less than 0.5 V
(3) Voltage between terminal No. 2 and earth
OK: Accelerator pedal fully closed 0.535 - 0.735 V
Accelerator pedal fully opened 4.5 - 5.0 V
(1), (2) NG
Check the following connector: C-115
NG
Repair
OK
Check and repair the harness between the throttle position sensor and engine-ECU.
● Check for damage of the power cable.
● Check for damage of the earth wire.
(3) NG
Adjust the throttle position sensor. (Refer to P.13A-126.)
NG
Adjust
OK
Check the following connector: C-115
NG
Repair
OK
Check and repair the harness between the throttle position sensor and engine-ECU.
● Check for short-circuit and damage of the output wire.
OK
Measure at the C-115 engine-ECU connector.
● Measure the engine-ECU terminal voltage.
● Ignition switch: ON
● Voltage between terminal No. 84 and the earth.
OK: Accelerator pedal fully closed 0.535 - 0.735 V
Accelerator pedal fully opened 4.5 - 5.0 V
NG
Check the following connector: C-115
NG
Repair
OK
Check and repair the harness between the throttle position sensor and engine-ECU.
● Check for disconnection and damage of the output wire.
OK
Check the following connector: C-115
NG
Repair
OK
MUT-II Data list
● No. 14 Throttle position sensor (Refer to P.13A-103.)
NG
Replace the engine-ECU.
OK
Intermittent malfunction (Refer to GROUP 00 - Points to Note for Intermittent Malfunctions.)

| Code No. P0130 Oxygen sensor (front) system | Probable cause |
|---|---|
| Inspection Range<br>● More than 3 minutes passed after completion of start of engine<br>● The engine coolant temperature is approximately more than 80°C.<br>● The engine speed is more than 1,200 r/min.<br>● The volumetric efficiency is 25% or more.<br>Evaluation Conditions<br>● When 5 V is applied to oxygen sensor (front) in engine-ECU while oxygen sensor (front) output voltage is 0.2 V or less, the sensor output voltage is 4.5 V or more. | ● Oxygen sensor (front) malfunction<br>● Oxygen sensor (front) circuit disconnection, short-circuit, or connector contact defect.<br>● Engine-ECU malfunction |

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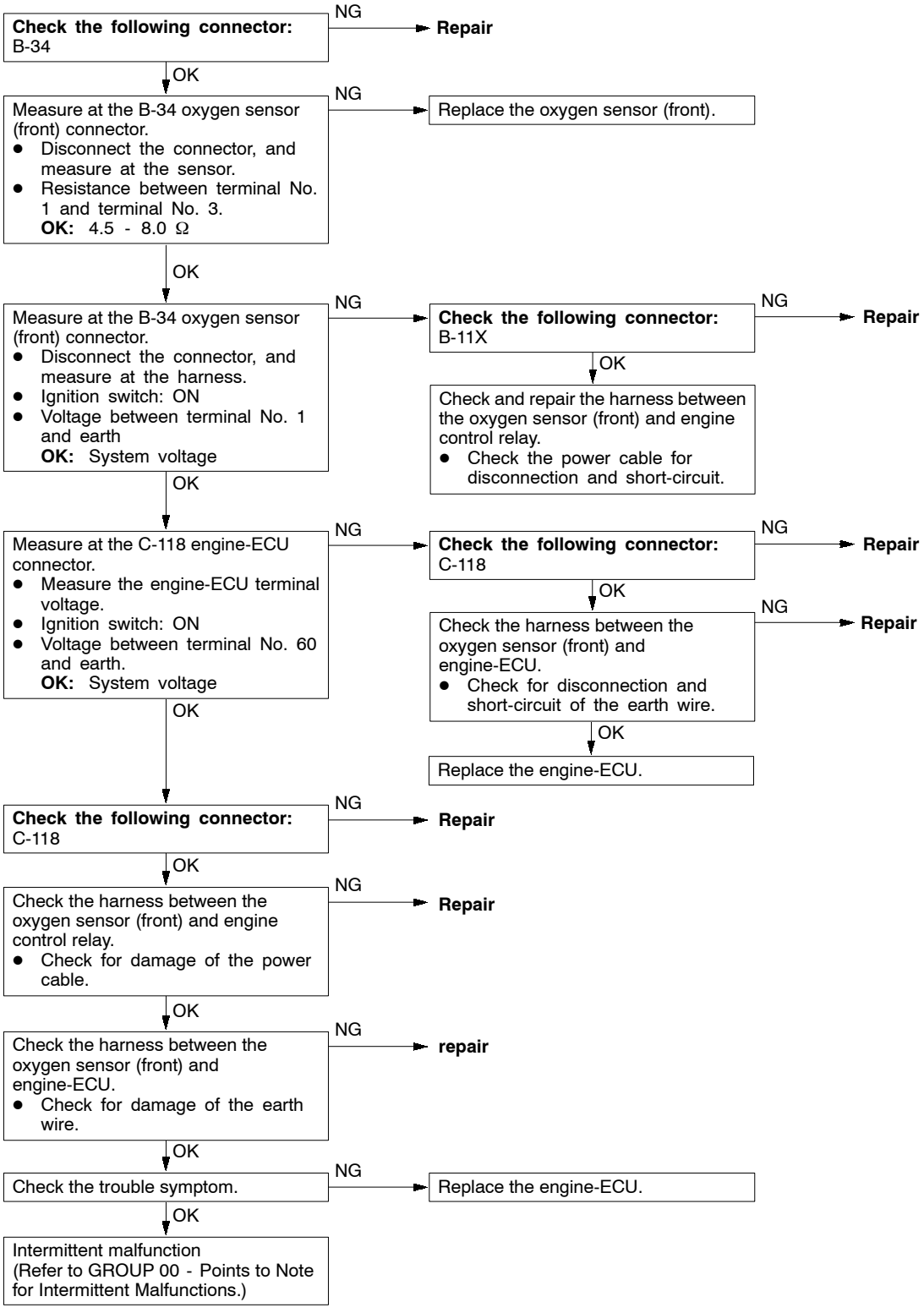
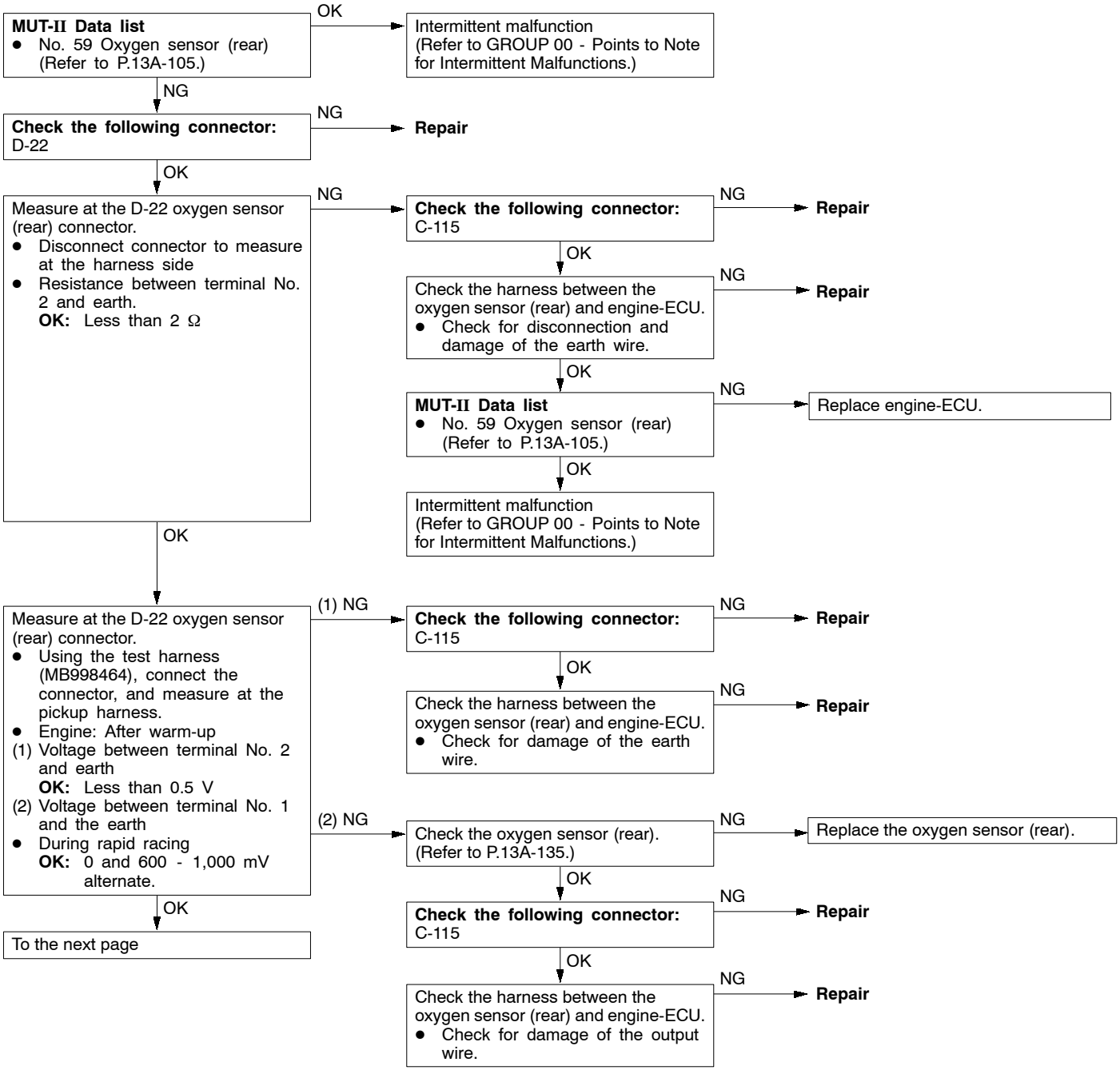
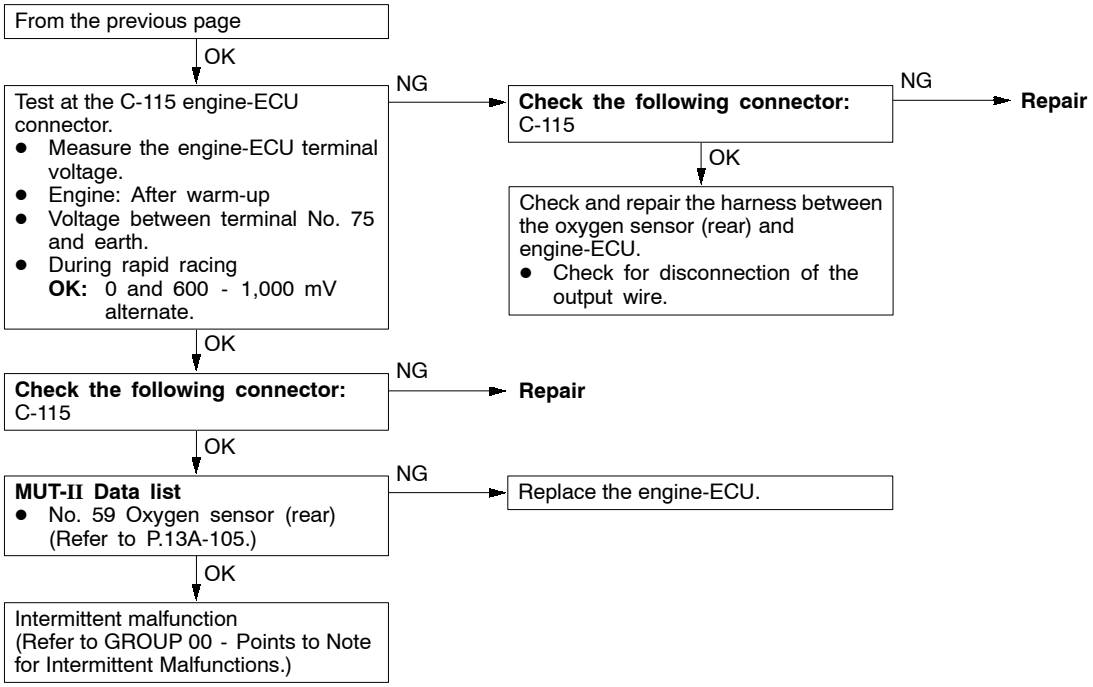
OK
Test at the C-115 engine-ECU connector.
● Measure the engine-ECU terminal voltage.
● Engine: After warm-up
● Voltage between terminal No. 76 and earth.
● At rapid deceleration from 4,000 r/min
OK: 200 mV or less
● During rapid racing
OK: 600 - 1,000 mV
NG
Check the following connector: C-115
NG
Repair
OK
Check and repair the harness between the oxygen sensor (front) and engine-ECU.
● Check for disconnection of the output wire.
OK
Check the following connector: C-115
NG
Repair
OK
MUT-II Data list
● No. 11 Oxygen sensor (front) (Refer to P.13A-102.)
NG
Replace the engine-ECU.
OK
Intermittent malfunction
(Refer to GROUP 00 - Points to Note for Intermittent Malfunctions.)

| Code No. P0135 Oxygen sensor heater (front) system | Probable cause |
|---|---|
| Inspection Range<br>● The engine coolant temperature is approximately more than 20°C.<br>● The oxygen sensor heater (front) is ON.<br>● The engine speed is more than 50 r/min.<br>● A/C relay: OFF, radiator fan: OFF<br>● The battery voltage is 11 - 16 V.<br>Evaluation Conditions<br>● The oxygen sensor heater (front) current is less than 0.2 A or more than 3.5 A for 4 seconds. | ● Oxygen sensor heater (front) malfunction<br>● Oxygen sensor heater (front) circuit disconnection, short-circuit, or connector contact defect<br>● Engine-ECU malfunction |



| Code No. P0136 Oxygen sensor (rear) system | Probable cause |
|---|---|
| Inspection Range<br>● More than 3 minutes passed after completion of start of engine<br>● The engine coolant temperature is approximately more than 80°C.<br>● The engine speed is more than 1,200 r/min.<br>● The volumetric efficiency is 25% or more.<br>Evaluation Conditions<br>● When 5 V is applied to the oxygen sensor (rear), the output voltage is more than 4.5 V. | ● Oxygen sensor (rear) malfunction<br>● Oxygen sensor (rear) circuit disconnection, short-circuit, or connector contact defect.<br>● Engine-ECU malfunction |

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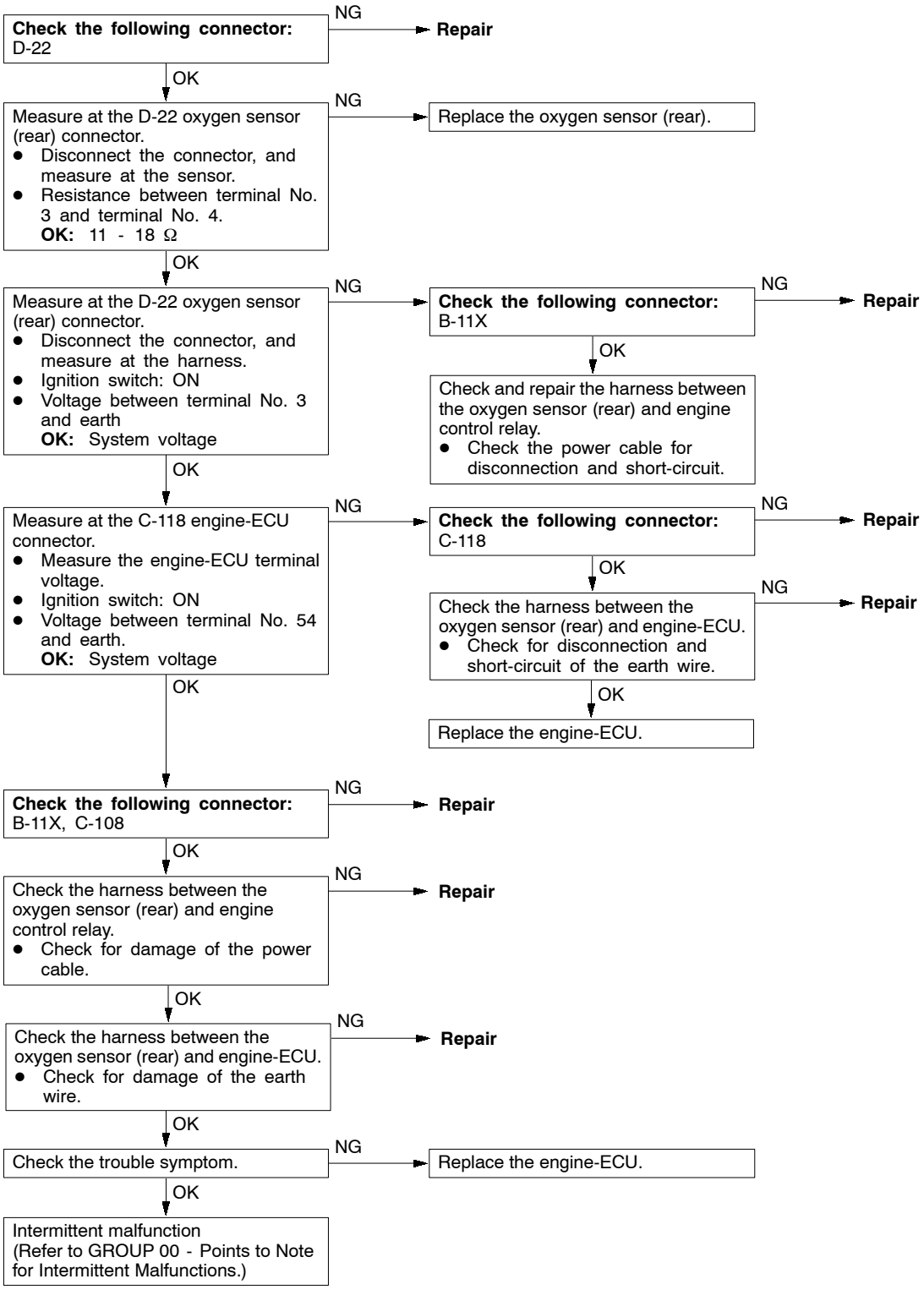
OK
Test at the C-115 engine-ECU connector.
● Measure the engine-ECU terminal voltage.
● Engine: After warm-up
● Voltage between terminal No. 75 and earth.
● During rapid racing
OK: 0 and 600 - 1,000 mV alternate.
NG
Check the following connector: C-115
NG
Repair
OK
Check and repair the harness between the oxygen sensor (rear) and engine-ECU.
● Check for disconnection of the output wire.
OK
Check the following connector: C-115
NG
Repair
OK
MUT-II Data list
● No. 59 Oxygen sensor (rear) (Refer to P.13A-105.)
NG
Replace the engine-ECU.
OK
Intermittent malfunction
(Refer to GROUP 00 - Points to Note for Intermittent Malfunctions.)

| Code No. P0141 Oxygen sensor heater (rear) system | Probable cause |
|---|---|
| Inspection Range<br>● The engine coolant water temperature is approximately more than 20°C.<br>● The oxygen sensor heater (rear) is ON.<br>● The engine speed is more than 50 r/min.<br>● A/C relay: OFF, radiator fan: OFF<br>● The battery voltage is 11 - 16 V.<br>Evaluation Conditions<br>● The oxygen sensor heater (rear) current is less than 0.2 A or more than 3.5 A for 4 seconds. | ● Oxygen sensor heater (rear) malfunction<br>● Oxygen sensor heater (rear) circuit disconnection, short-circuit, or connector contact defect<br>● Engine-ECU malfunction |



| Code No. P0201 No. 1 injector system | Probable cause |
|---|---|
| Inspection Range<br>● The engine speed is 50 - 1,000 r/min.<br>● The throttle position sensor output voltage is 1.15 V or less.<br>● MUT-II forced drive (actuator test) is not being carried out.<br>Evaluation Conditions<br>● Surge voltage at injector coil is not detected for 2 seconds. | ● No. 1 injector malfunction<br>● No. 1 injector circuit disconnection, short-circuit, or connector contact defect<br>● Engine-ECU malfunction |

**MUT-II Actuator test**
● No. 01: No. 1 injector
**OK:** The idling state changes.
→ OK: Intermittent malfunction (Refer to GROUP 00 - Points to Note for Intermittent Malfunctions.)
↓ NG

**Check the following connector:** B-27
→ NG: **Repair**
↓ OK

Measure at the B-27 No. 1 injector connector.
● Disconnect the connector to measure at the injector side.
● Resistance between terminal No. 1 and terminal No. 2
**OK:** 2 - 3 Ω
→ NG: Replace the No. 1 injector.
↓ OK

Measure at the B-27 No. 1 injector connector.
● Disconnect the connector to measure at the harness side.
● Ignition switch: ON
● Voltage between terminal No. 1 and earth
**OK:** System voltage
→ NG: **Check the following connectors:** B-11X, B-138, C-108
→ NG: **Repair**
→ OK: Check the resistor. (Refer to P.13A-138.)
→ OK: Check the harness between the No. 1 injector and resistor (for injector).
● Check for disconnection and short-circuit of the power cable.
→ NG: **Repair**
→ OK: Check and repair the harness between the resistor (for injector) and engine control relay.
● Check for disconnection and short-circuit of the power cable.
↓ OK

Check the harness between the No. 1 injector and resistor (for injector).
● Check for damage of the power cable.
→ NG: **Repair**
↓ OK

Check the harness between the resistor (for injector) and engine control relay.
● Check for damage of the power cable.
→ NG: **Repair**
↓ OK

**Check the following connector:** C-126
→ NG: **Repair**
↓ OK

Check the harness between the No. 1 injector and engine-ECU.
● Check for disconnection, short-circuit and damage of the output cable.
→ NG: **Repair**
↓ OK

Measure the signal waveform at the C-126 engine-ECU connector (using an analyzer).
● Engine: Idling
● Voltage between terminal No. 1 and earth
**OK:** The waveform shown on P.13A-119 (Inspection Procedure Using Analyzer) should be output.
→ NG: Replace the engine-ECU.
→ OK: Intermittent malfunction (Refer to GROUP 00 - Points to Note for Intermittent Malfunctions.)

| Code No. P0202 No. 2 injector system | Probable cause |
|---|---|
| Inspection Range<br>● The engine speed is 50 - 1,000 r/min.<br>● The throttle position sensor output voltage is 1.15 V or less.<br>● MUT-II forced drive (actuator test) is not being carried out.<br>Evaluation Conditions<br>● Surge voltage at injector coil is not detected for 2 seconds. | ● No. 2 injector malfunction<br>● No. 2 injector circuit disconnection, short-circuit, or connector contact defect<br>● Engine-ECU malfunction |

**MUT-II Actuator test**
● No. 02: No. 2 injector
**OK:** The idling state changes.
OK → Intermittent malfunction (Refer to GROUP 00 - Points to Note for Intermittent Malfunctions.)
NG ↓

**Check the following connector:** B-26
NG → **Repair**
OK ↓

Measure at the B-26 No. 2 injector connector.
● Disconnect the connector to measure at the injector side.
● Resistance between terminal No. 1 and terminal No. 2
**OK:** 2 - 3 Ω
NG → Replace the No. 2 injector.
OK ↓

Measure at the B-26 No. 2 injector connector.
● Disconnect the connector to measure at the harness side.
● Ignition switch: ON
● Voltage between terminal No. 1 and earth
**OK:** System voltage
NG → **Check the following connectors:** B-11X, B-138, C-108
NG → **Repair**
OK ↓

Check the resistor. (Refer to P.13A-138.)
NG → **Repair**
OK ↓

Check the harness between the No. 2 injector and resistor (for injector).
● Check for disconnection and short-circuit of the power cable.
NG → **Repair**
OK ↓

Check and repair the harness between the resistor (for injector) and engine control relay.
● Check for disconnection and short-circuit of the power cable.

Check the harness between the No. 2 injector and resistor (for injector).
● Check for damage of the power cable.
NG → **Repair**
OK ↓

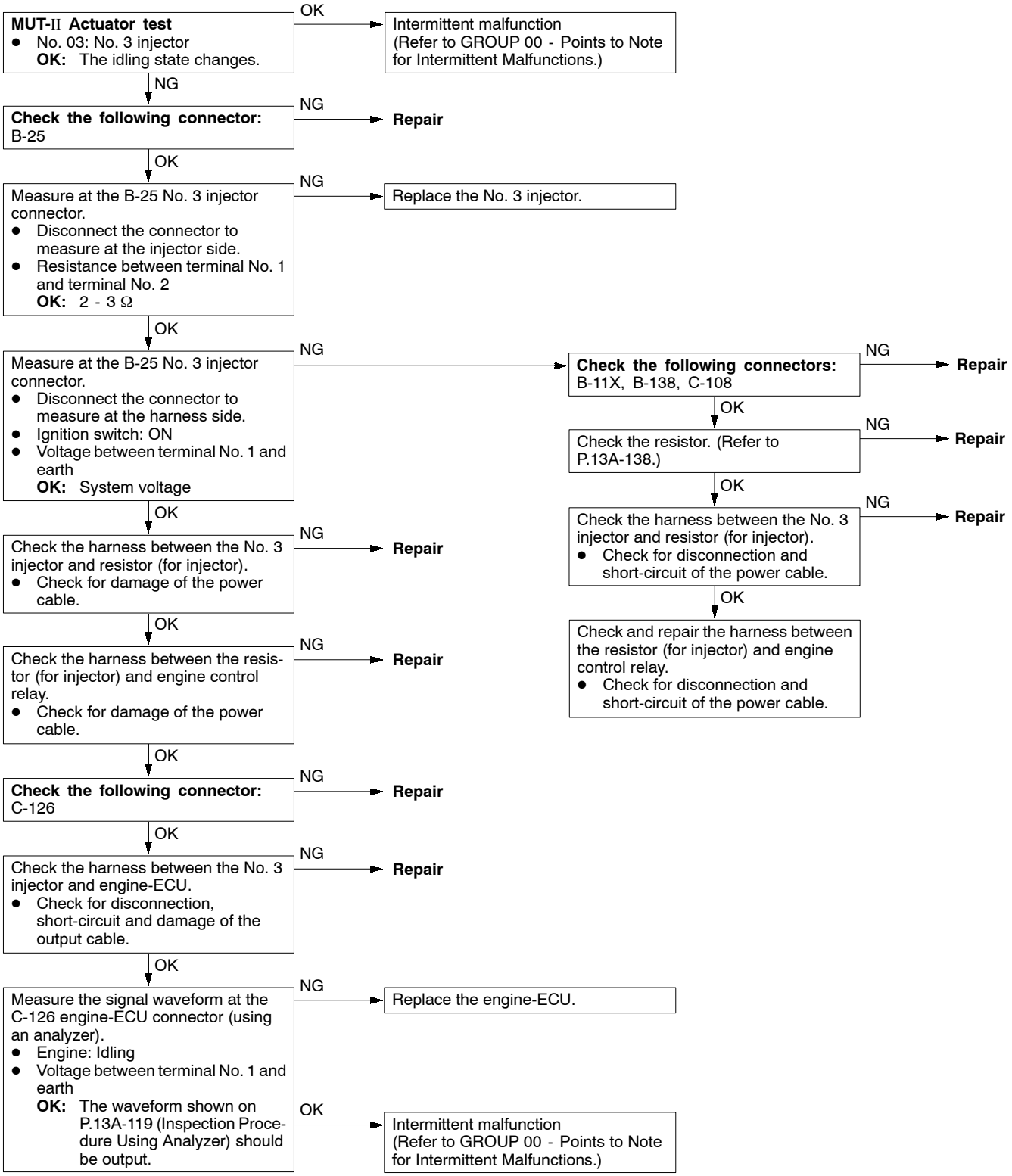
Check the harness between the resistor (for injector) and engine control relay.
● Check for damage of the power cable.
NG → **Repair**
OK ↓

**Check the following connector:** C-126
NG → **Repair**
OK ↓

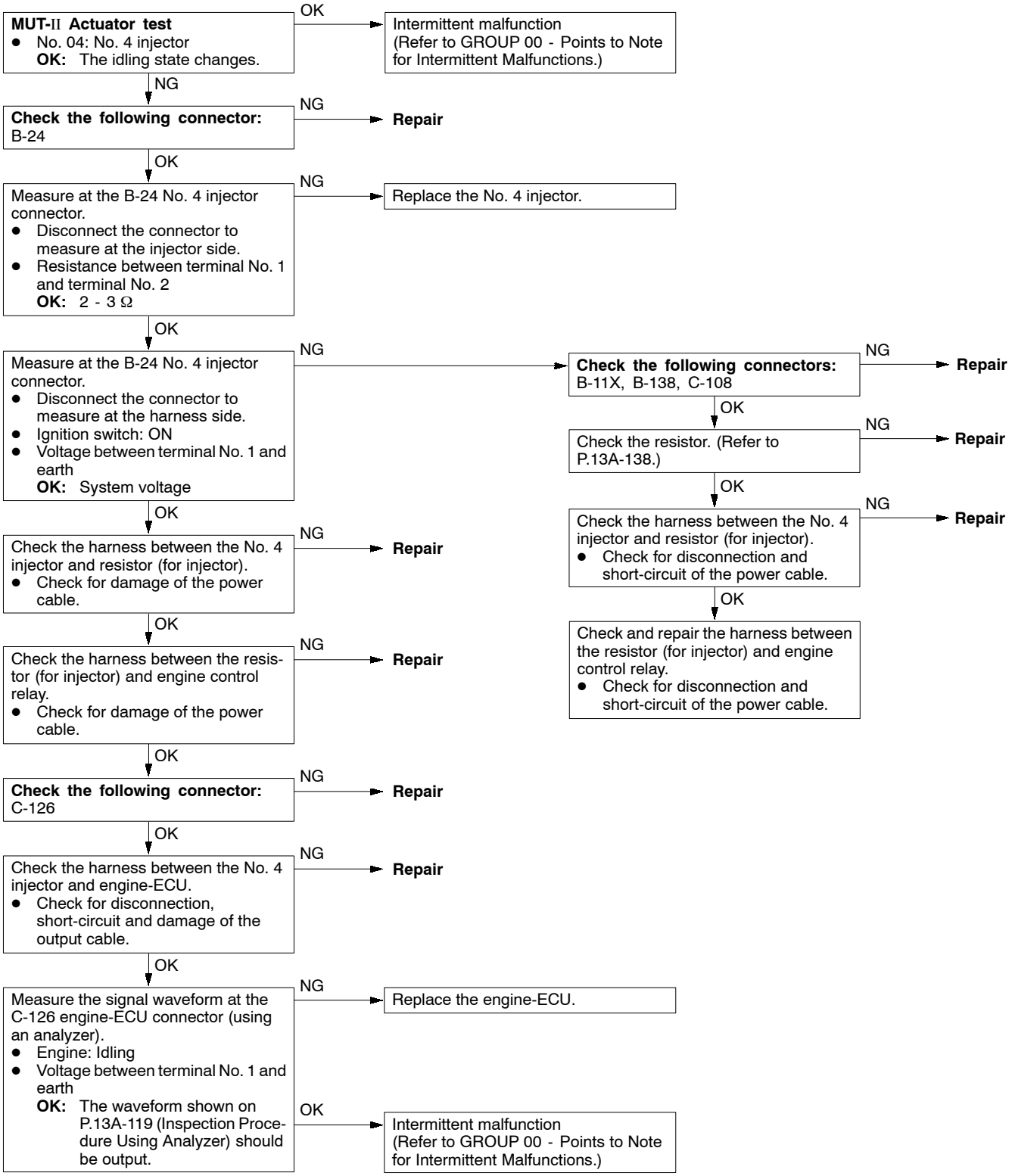
Check the harness between the No. 2 injector and engine-ECU.
● Check for disconnection, short-circuit and damage of the output cable.
NG → **Repair**
OK ↓

Measure the signal waveform at the C-126 engine-ECU connector (using an analyzer).
● Engine: Idling
● Voltage between terminal No. 1 and earth
**OK:** The waveform shown on P.13A-119 (Inspection Procedure Using Analyzer) should be output.
NG → Replace the engine-ECU.
OK → Intermittent malfunction (Refer to GROUP 00 - Points to Note for Intermittent Malfunctions.)

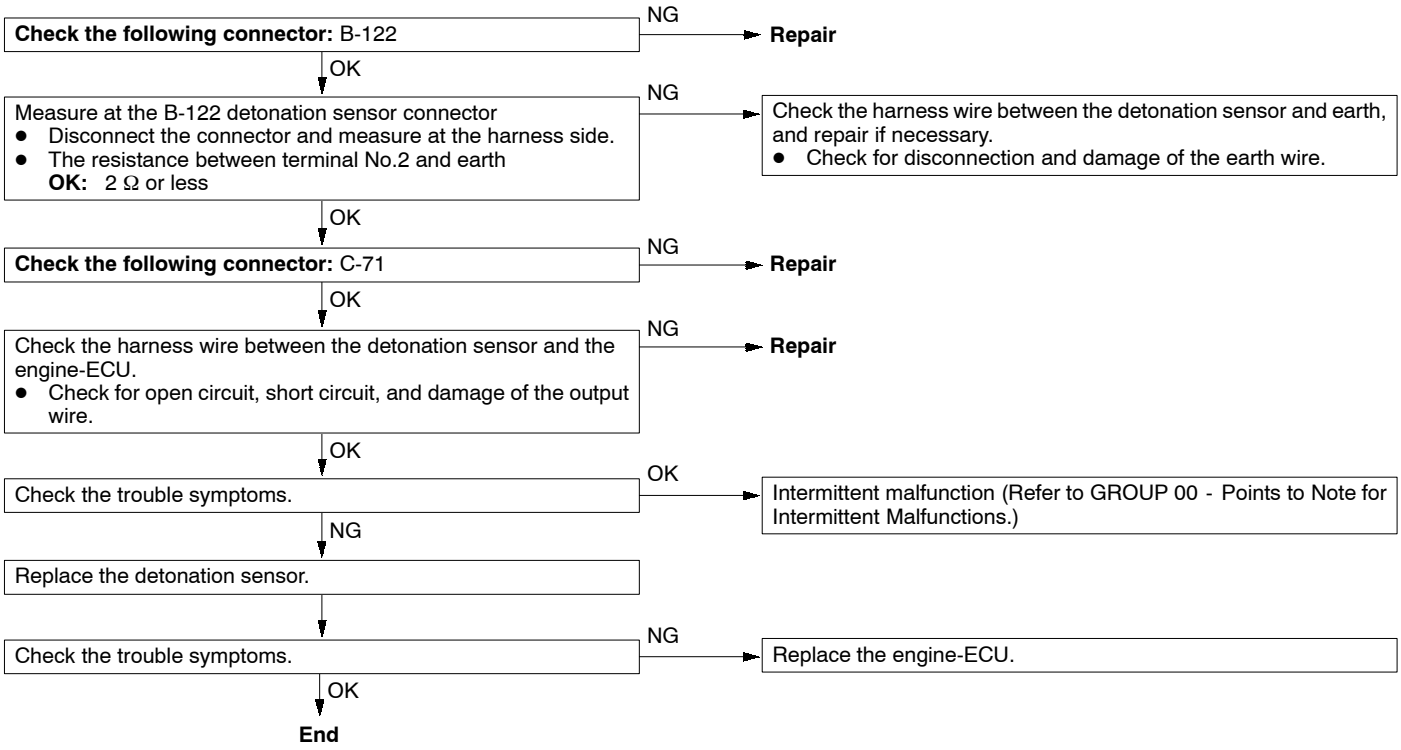
| Code No. P0203 No. 3 injector system | Probable cause |
|---|---|
| Inspection Range<br>● The engine speed is 50 - 1,000 r/min.<br>● The throttle position sensor output voltage is 1.15 V or less.<br>● MUT-II forced drive (actuator test) is not being carried out.<br>Evaluation Conditions<br>● Surge voltage at injector coil is not detected for 2 seconds. | ● No. 3 injector malfunction<br>● No. 3 injector circuit disconnection, short-circuit, or connector contact defect<br>● Engine-ECU malfunction |



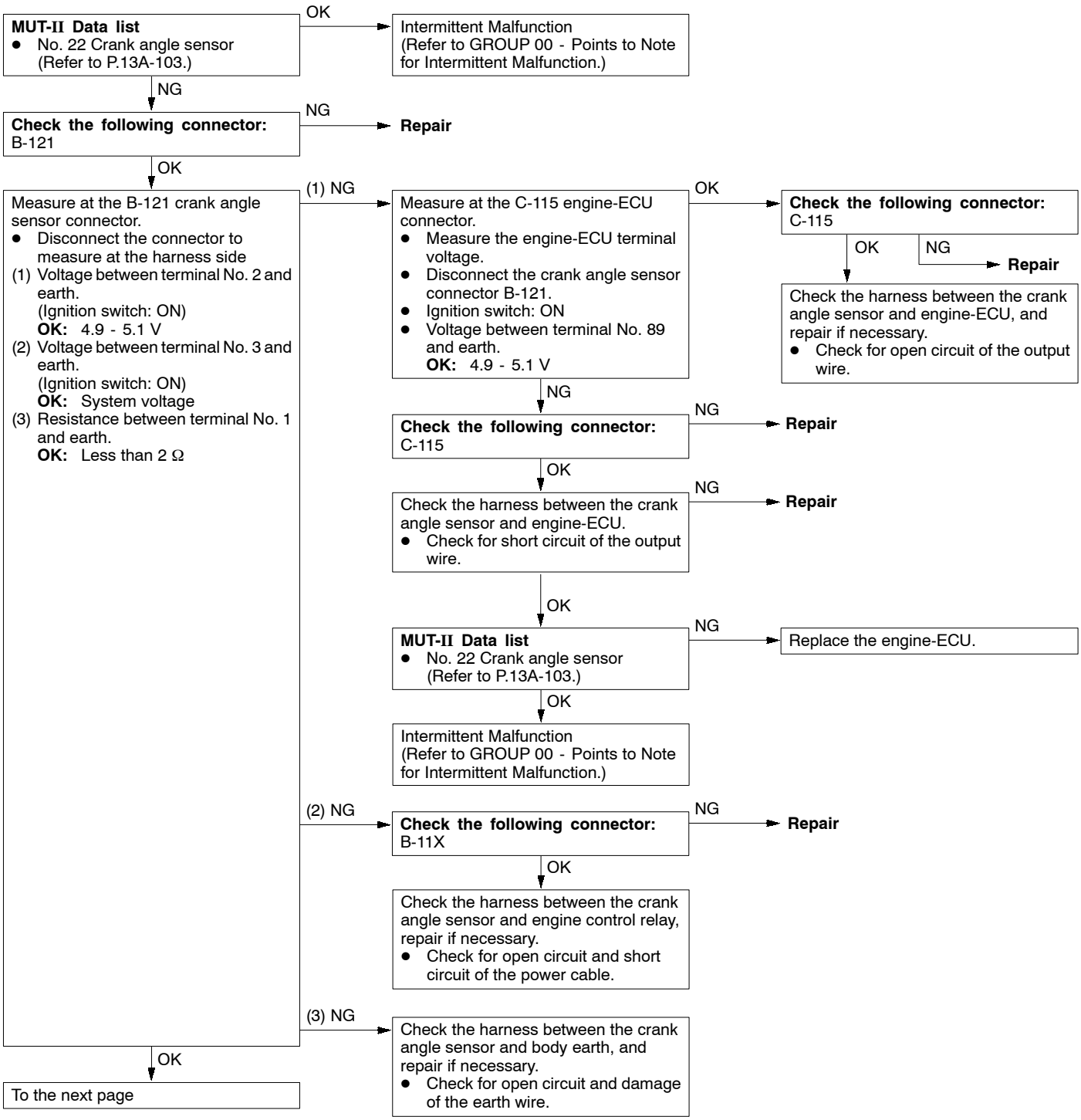
| Code No. P0204 No. 4 injector system | Probable cause |
|---|---|
| Inspection Range<br>● The engine speed is 50 - 1,000 r/min.<br>● The throttle position sensor output voltage is 1.15 V or less.<br>● MUT-II forced drive (actuator test) is not being carried out.<br>Evaluation Conditions<br>● Surge voltage at injector coil is not detected for 2 seconds. | ● No. 4 injector malfunction<br>● No. 4 injector circuit disconnection, short-circuit, or connector contact defect<br>● Engine-ECU malfunction |

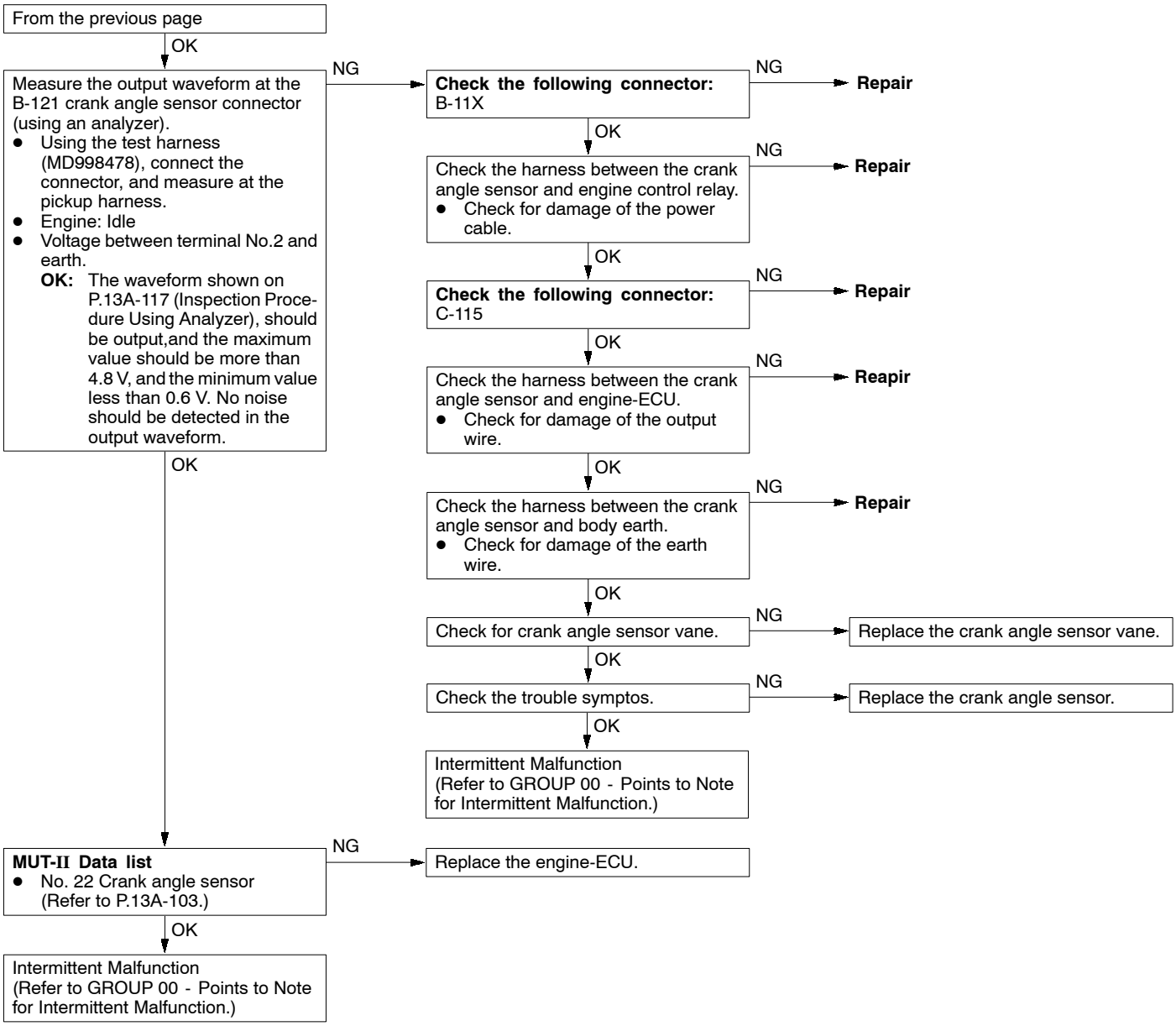


| Code No. P0325 Detonation sensor system | Probable cause |
|---|---|
| Inspection Range<br>● Ignition switch: ON<br>● Excluding for 2 seconds after ignition switch is set to “ON” position or 2 seconds after engine start is completed.<br>● The engine speed is approximately 2,000 r/min or more.<br>● The volumetric efficiency is 30% or more.<br>Set Conditions<br>● Changes in sensor output voltage (detonation sensor peak voltage per 1/2 crankshaft rotation) in 200 consecutive cycles are 0.06 V or less. | ● Malfunction of the detonation sensor<br>● Detonation sensor circuit disconnection, short-circuit, or connector contact defect<br>● Malfunction of engine-ECU |

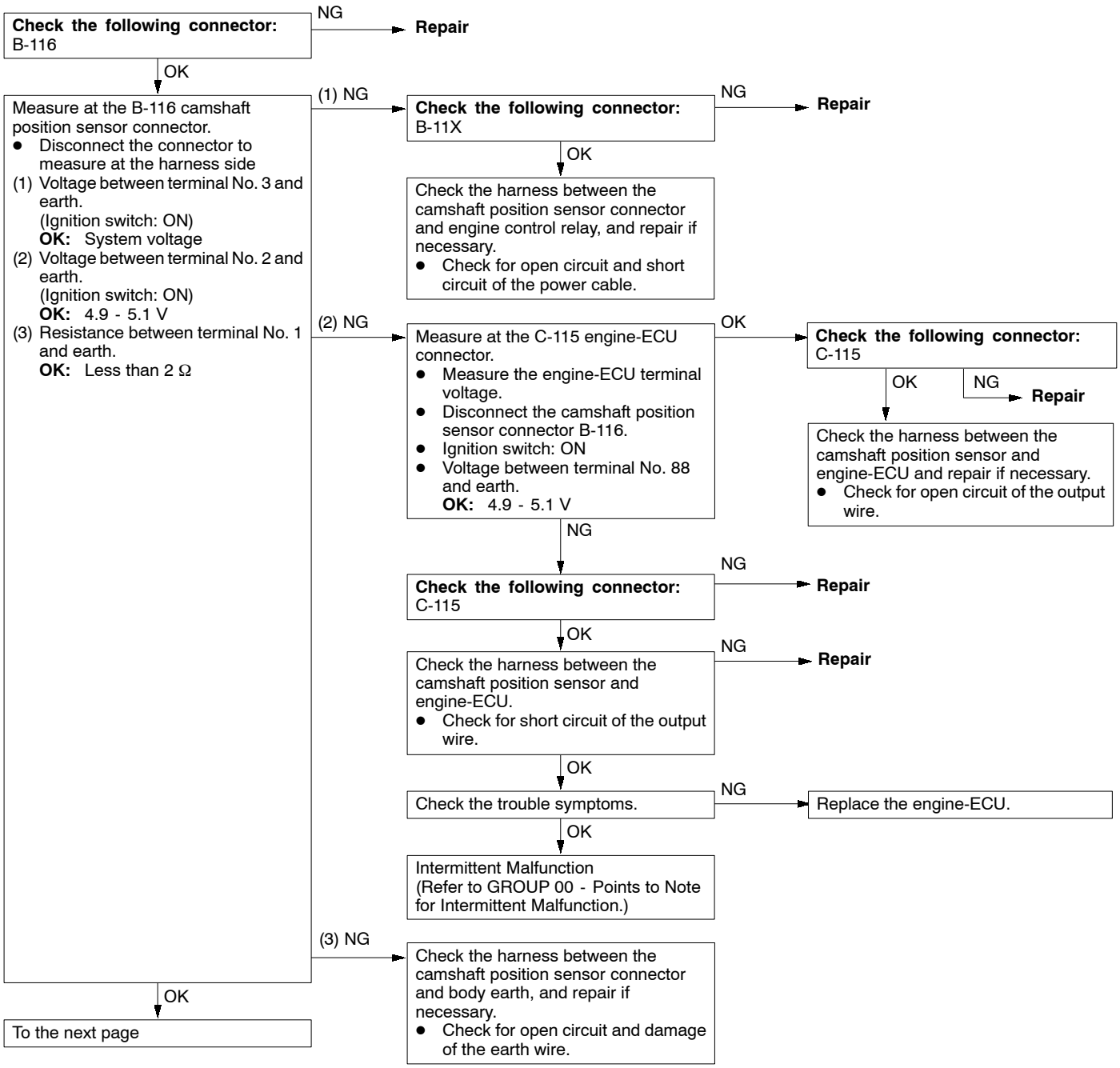


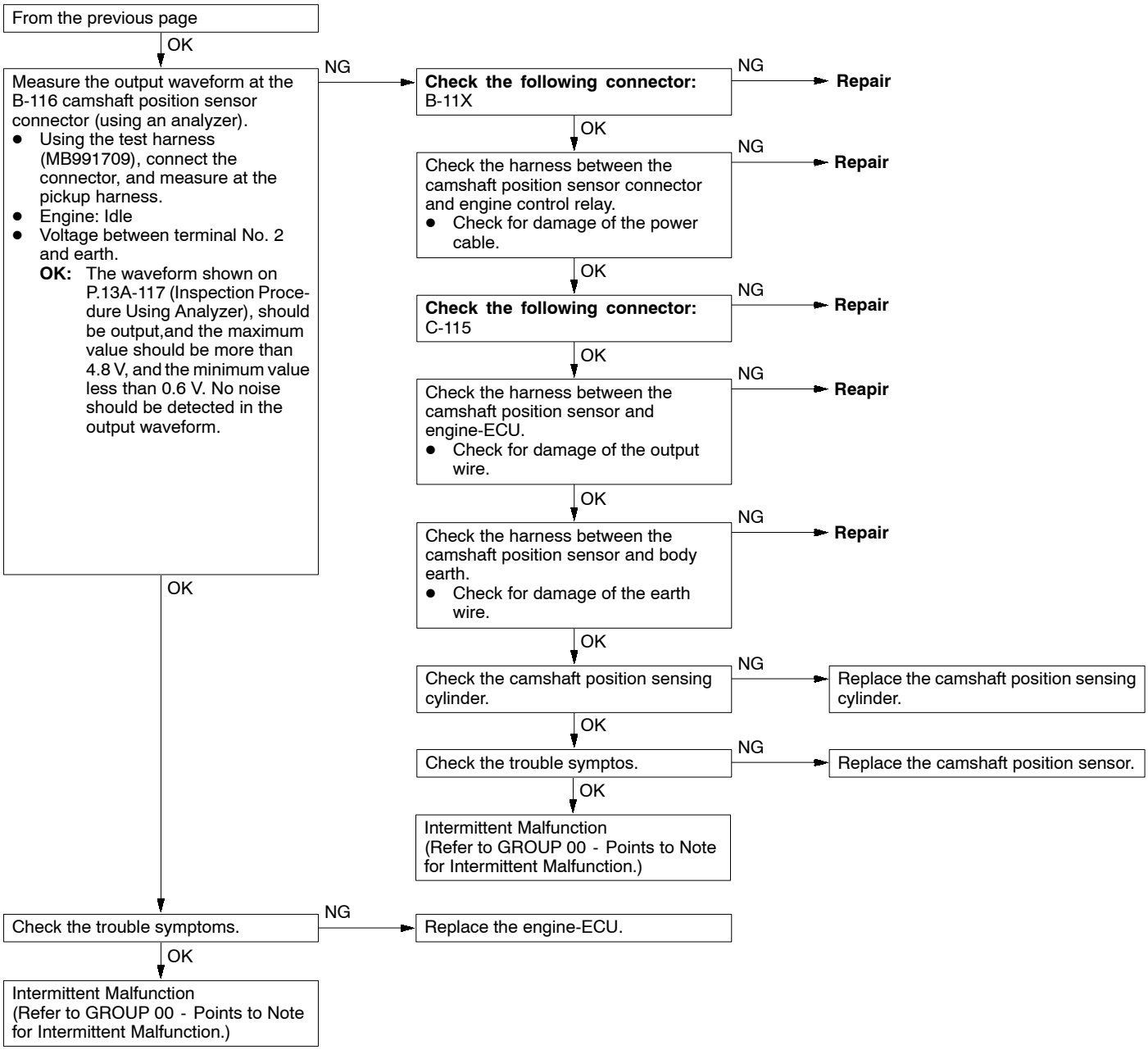
| Code No. P0335 Crank angle sensor system | Probable cause |
|---|---|
| Inspection Range<br>● Engine: During cranking<br>Evaluation Conditions<br>● The sensor output voltage does not change for 2 seconds (no pulse signal output) | ● Malfunction of crank angle sensor<br>● Open or short circuit in the crank angle sensor circuit or loose connector contact<br>● Malfunction of engine-ECU |



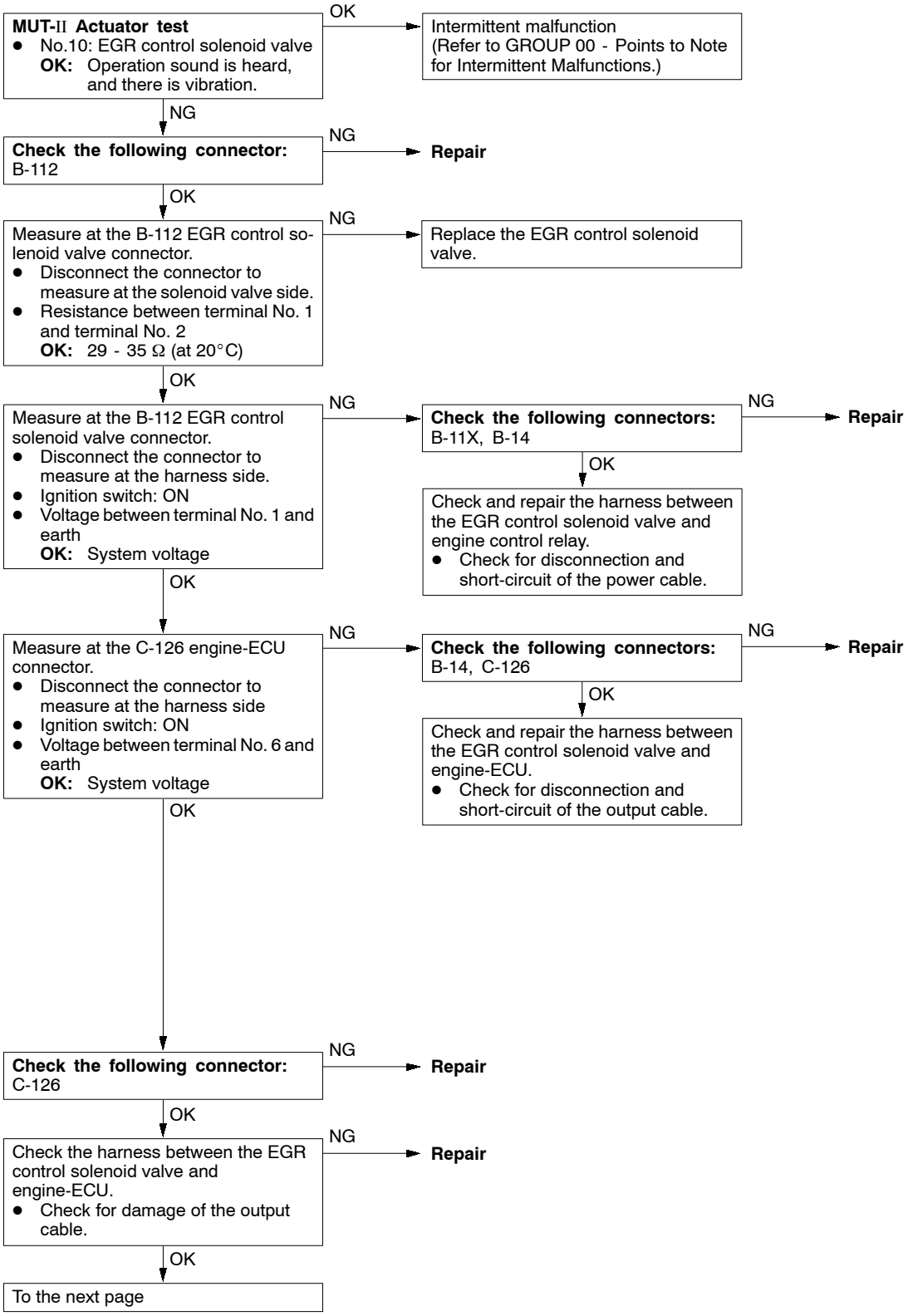

From the previous page
OK
Measure the output waveform at the B-121 crank angle sensor connector (using an analyzer).
● Using the test harness (MD998478), connect the connector, and measure at the pickup harness.
● Engine: Idle
● Voltage between terminal No.2 and earth.
OK: The waveform shown on P.13A-117 (Inspection Procedure Using Analyzer), should be output,and the maximum value should be more than 4.8 V, and the minimum value less than 0.6 V. No noise should be detected in the output waveform.
NG
Check the following connector: B-11X
NG
Repair
OK
Check the harness between the crank angle sensor and engine control relay.
● Check for damage of the power cable.
NG
Repair
OK
Check the following connector: C-115
NG
Repair
OK
Check the harness between the crank angle sensor and engine-ECU.
● Check for damage of the output wire.
NG
Reapir
OK
Check the harness between the crank angle sensor and body earth.
● Check for damage of the earth wire.
NG
Repair
OK
Check for crank angle sensor vane.
NG
Replace the crank angle sensor vane.
OK
Check the trouble symptos.
NG
Replace the crank angle sensor.
OK
Intermittent Malfunction
(Refer to GROUP 00 - Points to Note for Intermittent Malfunction.)
OK
MUT-II Data list
● No. 22 Crank angle sensor (Refer to P.13A-103.)
NG
Replace the engine-ECU.
OK
Intermittent Malfunction
(Refer to GROUP 00 - Points to Note for Intermittent Malfunction.)

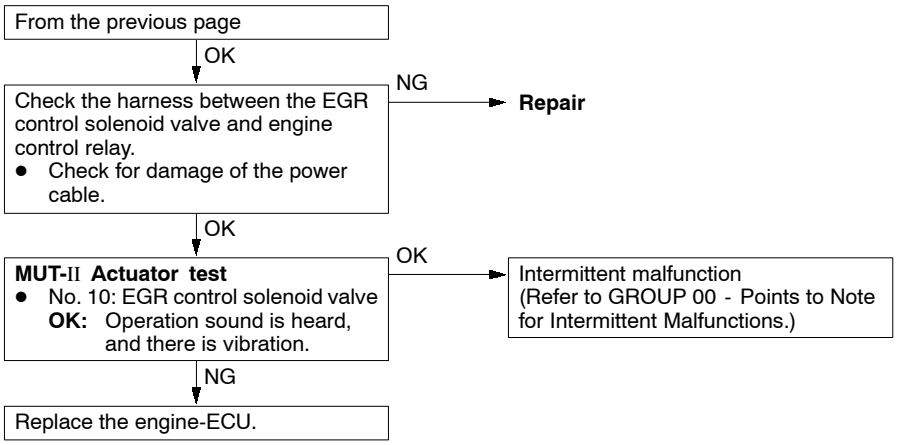
| Code No. P0340 Camshaft position sensor system | Probable cause |
|---|---|
| Inspection Range<br>● Ignition switch: ON<br>● The engine speed is approximately 50 r/min or more.<br>Evaluation Conditions<br>● The sensor output voltage does not change for 2 seconds (no pulse signal output) | ● Malfunction of camshaft position sensor<br>● Open or short circuit in the camshaft position sensor or loose connector contact<br>● Malfunction of engine-ECU |




From the previous page
OK
Measure the output waveform at the B-116 camshaft position sensor connector (using an analyzer).
● Using the test harness (MB991709), connect the connector, and measure at the pickup harness.
● Engine: Idle
● Voltage between terminal No. 2 and earth.
OK: The waveform shown on P.13A-117 (Inspection Procedure Using Analyzer), should be output,and the maximum value should be more than 4.8 V, and the minimum value less than 0.6 V. No noise should be detected in the output waveform.
NG
Check the following connector: B-11X
NG
Repair
OK
Check the harness between the camshaft position sensor connector and engine control relay.
● Check for damage of the power cable.
NG
Repair
OK
Check the following connector: C-115
NG
Repair
OK
Check the harness between the camshaft position sensor and engine-ECU.
● Check for damage of the output wire.
NG
Reapir
OK
Check the harness between the camshaft position sensor and body earth.
● Check for damage of the earth wire.
NG
Repair
OK
Check the camshaft position sensing cylinder.
NG
Replace the camshaft position sensing cylinder.
OK
Check the trouble symptos.
NG
Replace the camshaft position sensor.
OK
Intermittent Malfunction
(Refer to GROUP 00 - Points to Note for Intermittent Malfunction.)
OK
Check the trouble symptoms.
NG
Replace the engine-ECU.
OK
Intermittent Malfunction
(Refer to GROUP 00 - Points to Note for Intermittent Malfunction.)

| Code No. P0403 EGR control solenoid valve system | Probable cause |
|---|---|
| Inspection Range<br>● The battery voltage is 10 V or more.<br>Evaluation Conditions<br>● Solenoid coil's surge voltage (battery voltage +2 V) is not detected when EGR control solenoid valve is turned OFF from ON. | ● EGR control solenoid valve malfunction<br>● EGR control solenoid valve circuit disconnection, short-circuit, or connector contact defect<br>● Engine-ECU malfunction |

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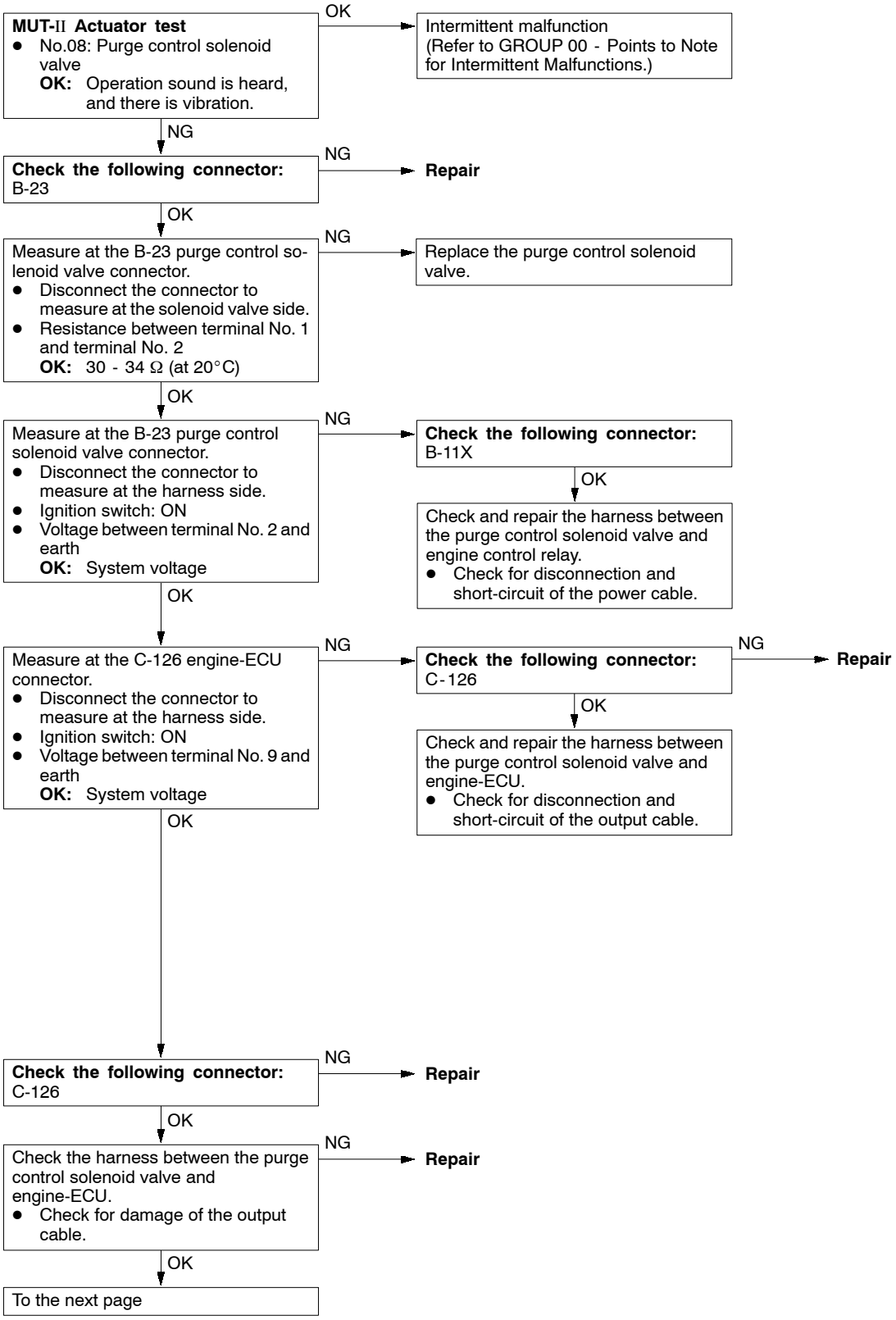
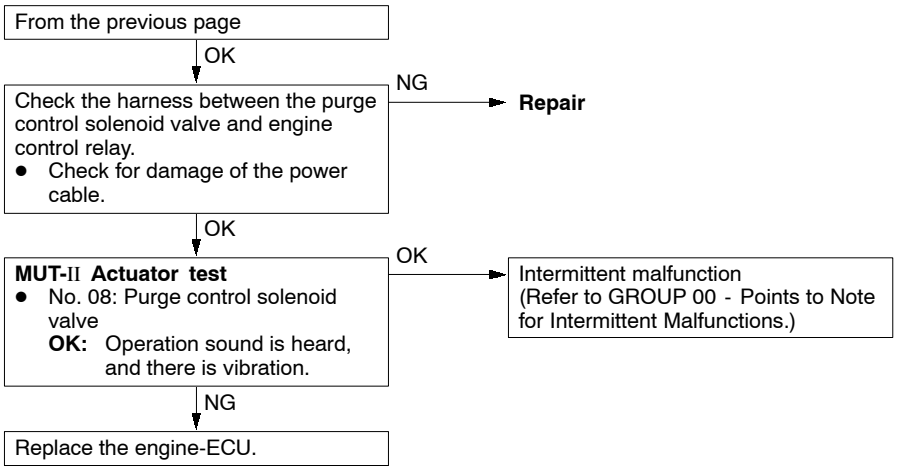
OK
Check the harness between the EGR control solenoid valve and engine control relay.
● Check for damage of the power cable.
NG
Repair
OK
MUT-II Actuator test
● No. 10: EGR control solenoid valve
OK: Operation sound is heard, and there is vibration.
OK
Intermittent malfunction
(Refer to GROUP 00 - Points to Note for Intermittent Malfunctions.)
NG
Replace the engine-ECU.

| Code No. P0443 Purge control solenoid valve system | Probable cause |
|---|---|
| Range of check<br>● Ignition switch: ON<br>● Battery voltage is 10 V or more.<br>Set Conditions<br>● The solenoid coil surge voltage (battery voltage +2 V) is not detected when the purge control solenoid valve is turned from ON to OFF. | ● Malfunction of the purge control solenoid valve<br>● Open or short circuit in the purge control solenoid valve circuit or loose connector contact.<br>● Malfunction of Engine-ECU |

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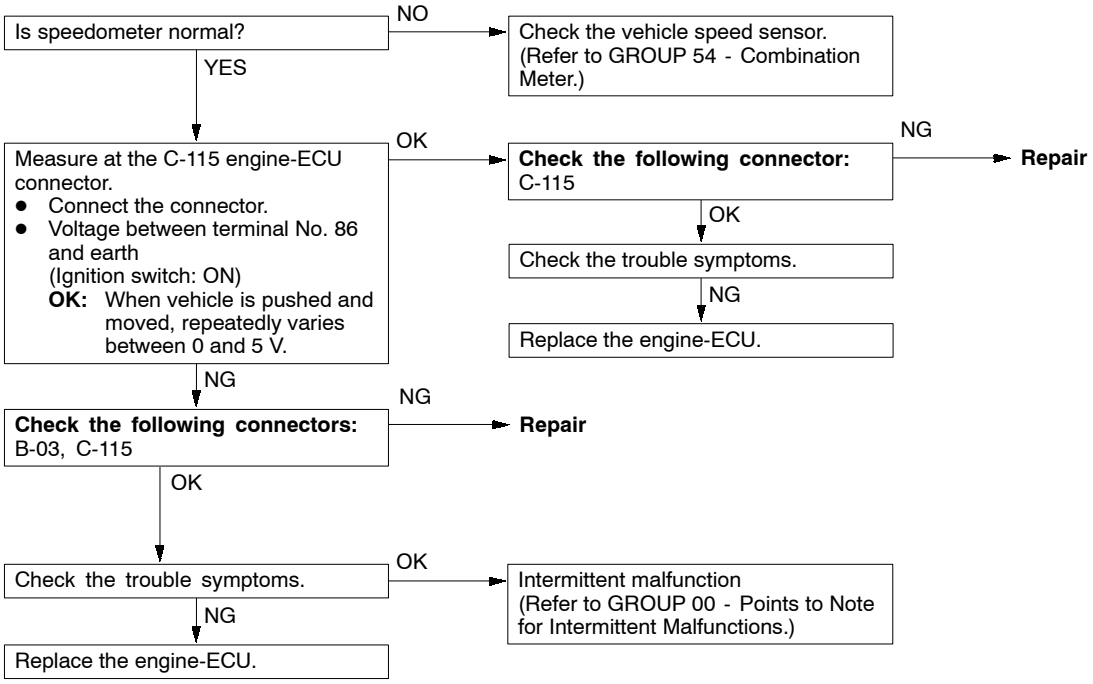
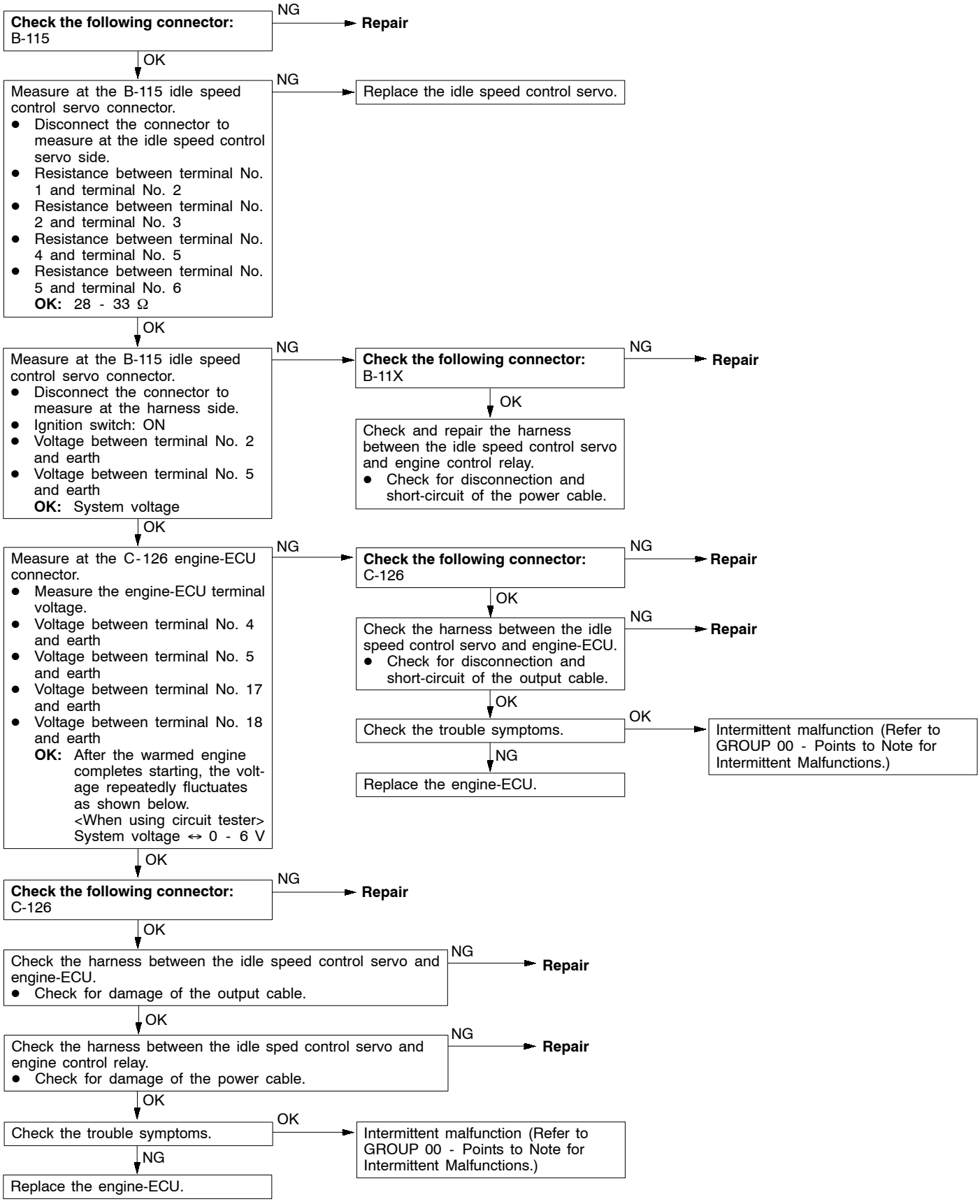
OK
Check the harness between the purge control solenoid valve and engine control relay.
● Check for damage of the power cable.
NG
Repair
OK
MUT-II Actuator test
● No. 08: Purge control solenoid valve
OK: Operation sound is heard, and there is vibration.
OK
Intermittent malfunction
(Refer to GROUP 00 - Points to Note for Intermittent Malfunctions.)
NG
Replace the engine-ECU.

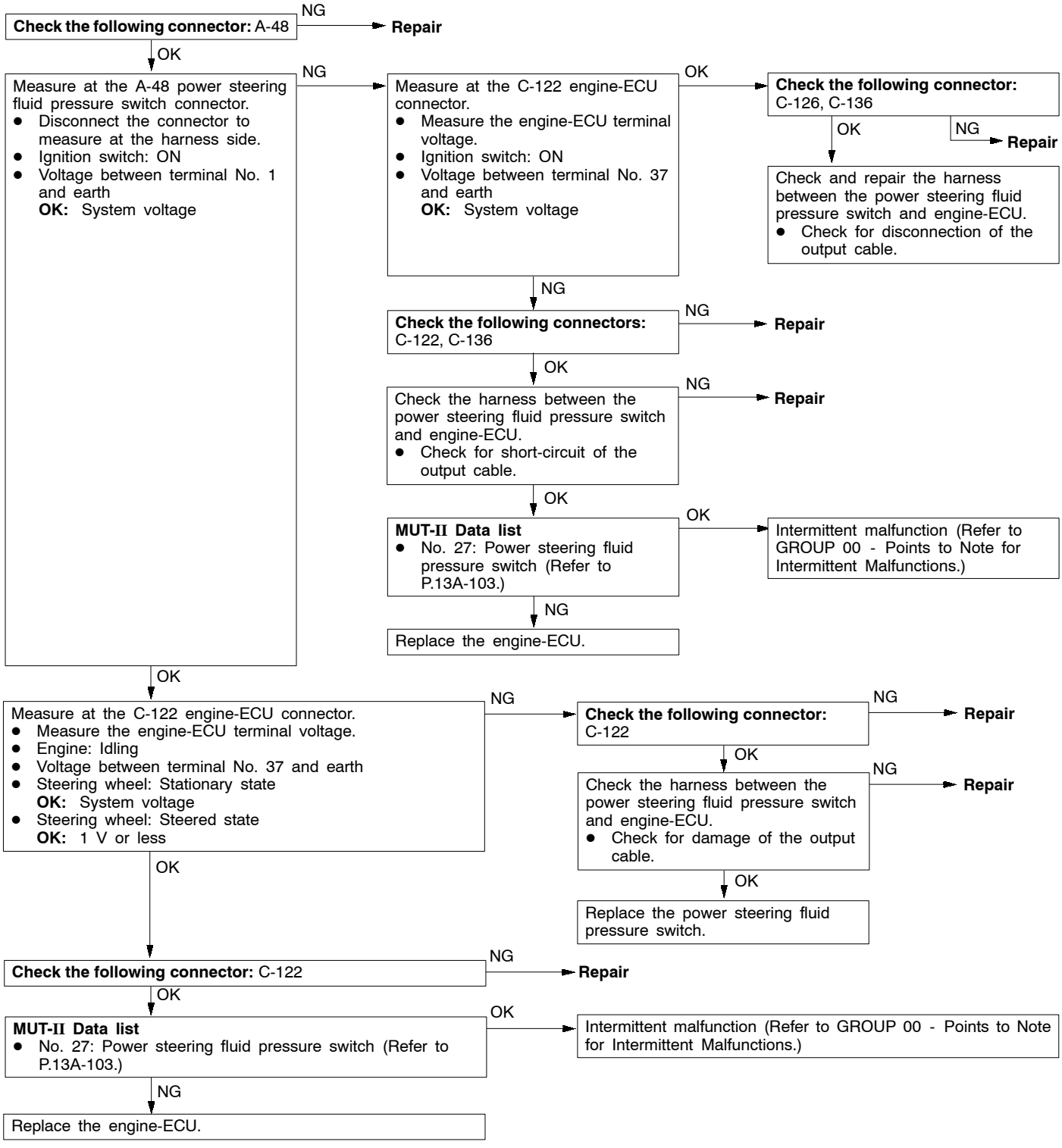
| Code No. P0500 Vehicle speed sensor system | Probable cause |
|---|---|
| Inspection Range<br>● Ignition switch: ON<br>● After 2 seconds from setting ignition switch to ON position or completion of engine starting<br>● The engine speed is approximately 2,000 - 4,000 r/min or more.<br>● The volumetric efficiency is 60 - 80%.<br>Evaluation Conditions<br>● Vehicle speed signal does not change for 2 seconds. (Pulse signal is not input.) | ● Vehicle speed sensor malfunction<br>● Vehicle speed sensor circuit disconnection, short-circuit, or connector contact defect<br>● Engine-ECU malfunction |



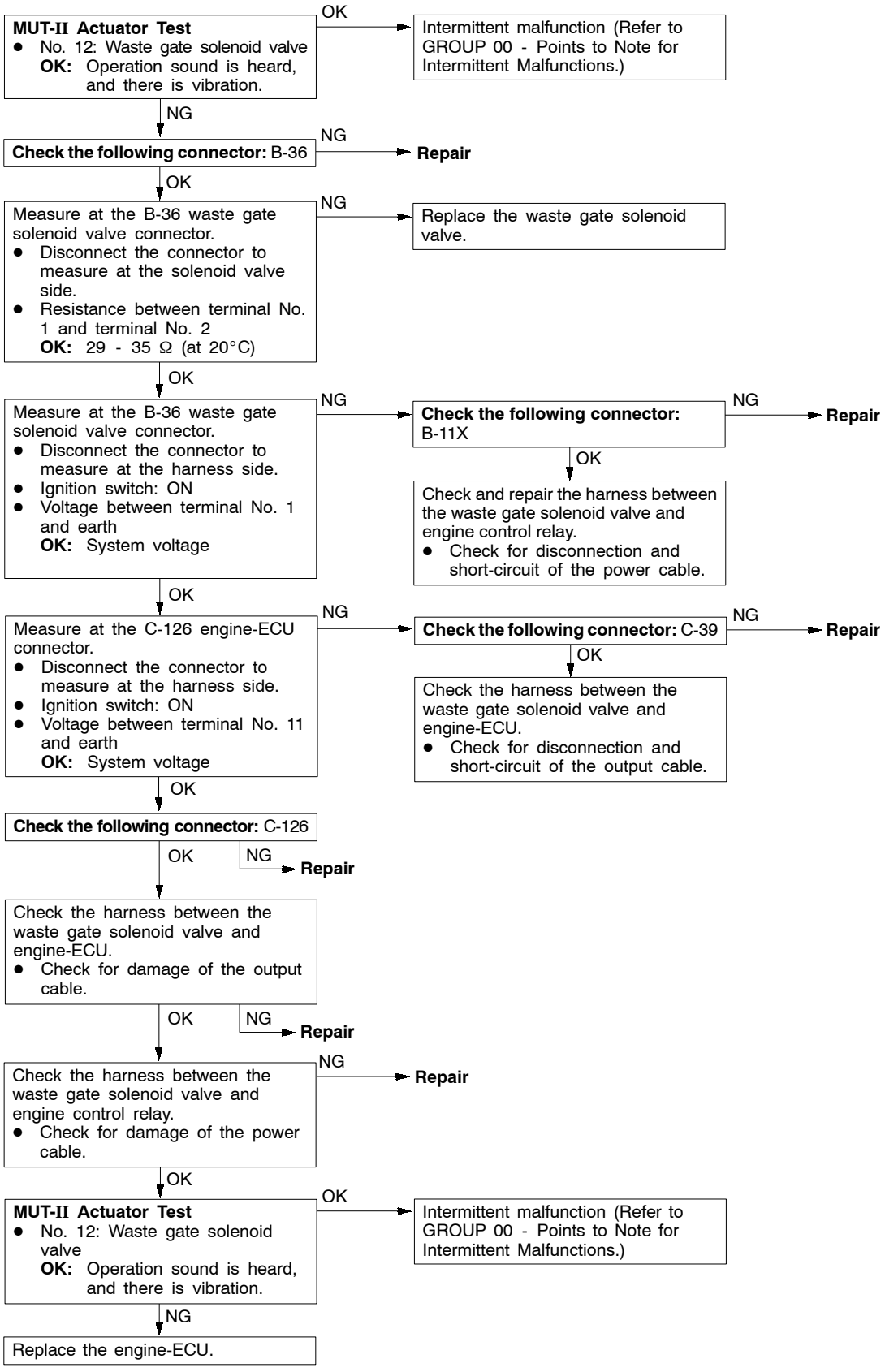
| Code No. P0505 Idle speed control system | Probable cause |
|---|---|
| Range of Check<br>● Vehicle speed has reached 1.5 Km/h at least once.<br>● Under the closed loop idle speed control.<br>Set Conditions<br>● Actual idle speed has continued to be higher than the target idle speed by 300 r/min or more for 10 seconds.<br>Range fo Check<br>● Vehicle speed has reached 1.5 km/h at least once.<br>● During idle speed closed loop control.<br>● The highest temperature at the last drive is 45°C or less.<br>● Engine coolant temperature is approximately 80°C or more.<br>● Battery voltage is 10 V or more.<br>● Barometric pressure is 76 kPa or higher.<br>● Intake air temperature is -10°C or more.<br>Set Conitions<br>● Actual idle speed has been minimum 200 r/min higher than the target idle speed for 10 seconds.<br>Range of Check<br>● During idle speed closed loop control.<br>● Engine coolant temperature is approximately 80°C or higher.<br>● Battery voltage is 10 V or higher.<br>● Power steering switch is off.<br>● Volumetric efficiency is 40 % or lower.<br>● Barometric pressure is 76 kPa or higher.<br>● Intake air temperature is -10°C or more.<br>Set Conitions<br>● Actual idle speed has been minimum 100 r/min higher than the target idle speed for 10 seconds. | ● Malfunction of idle speed control servo<br>● Open or short circuit in the idle speed control servo circuit or loose connector contact<br>● Malfunction of engine-ECU |


Check the following connector: B-115
NG
Repair
OK
Measure at the B-115 idle speed control servo connector.
● Disconnect the connector to measure at the idle speed control servo side.
● Resistance between terminal No. 1 and terminal No. 2
● Resistance between terminal No. 2 and terminal No. 3
● Resistance between terminal No. 4 and terminal No. 5
● Resistance between terminal No. 5 and terminal No. 6
OK: 28 - 33 Ω
NG
Replace the idle speed control servo.
OK
Measure at the B-115 idle speed control servo connector.
● Disconnect the connector to measure at the harness side.
● Ignition switch: ON
● Voltage between terminal No. 2 and earth
● Voltage between terminal No. 5 and earth
OK: System voltage
NG
Check the following connector: B-11X
NG
Repair
OK
Check and repair the harness between the idle speed control servo and engine control relay.
● Check for disconnection and short-circuit of the power cable.
OK
Measure at the C-126 engine-ECU connector.
● Measure the engine-ECU terminal voltage.
● Voltage between terminal No. 4 and earth
● Voltage between terminal No. 5 and earth
● Voltage between terminal No. 17 and earth
● Voltage between terminal No. 18 and earth
OK: After the warmed engine completes starting, the voltage repeatedly fluctuates as shown below.
<When using circuit tester>
System voltage ↔ 0 - 6 V
NG
Check the following connector: C-126
NG
Repair
OK
Check the harness between the idle speed control servo and engine-ECU.
● Check for disconnection and short-circuit of the output cable.
NG
Repair
OK
Check the trouble symptoms.
OK
Intermittent malfunction (Refer to GROUP 00 - Points to Note for Intermittent Malfunctions.)
NG
Replace the engine-ECU.
OK
Check the following connector: C-126
NG
Repair
OK
Check the harness between the idle speed control servo and engine-ECU.
● Check for damage of the output cable.
NG
Repair
OK
Check the harness between the idle sped control servo and engine control relay.
● Check for damage of the power cable.
NG
Repair
OK
Check the trouble symptoms.
OK
Intermittent malfunction (Refer to GROUP 00 - Points to Note for Intermittent Malfunctions.)
NG
Replace the engine-ECU.

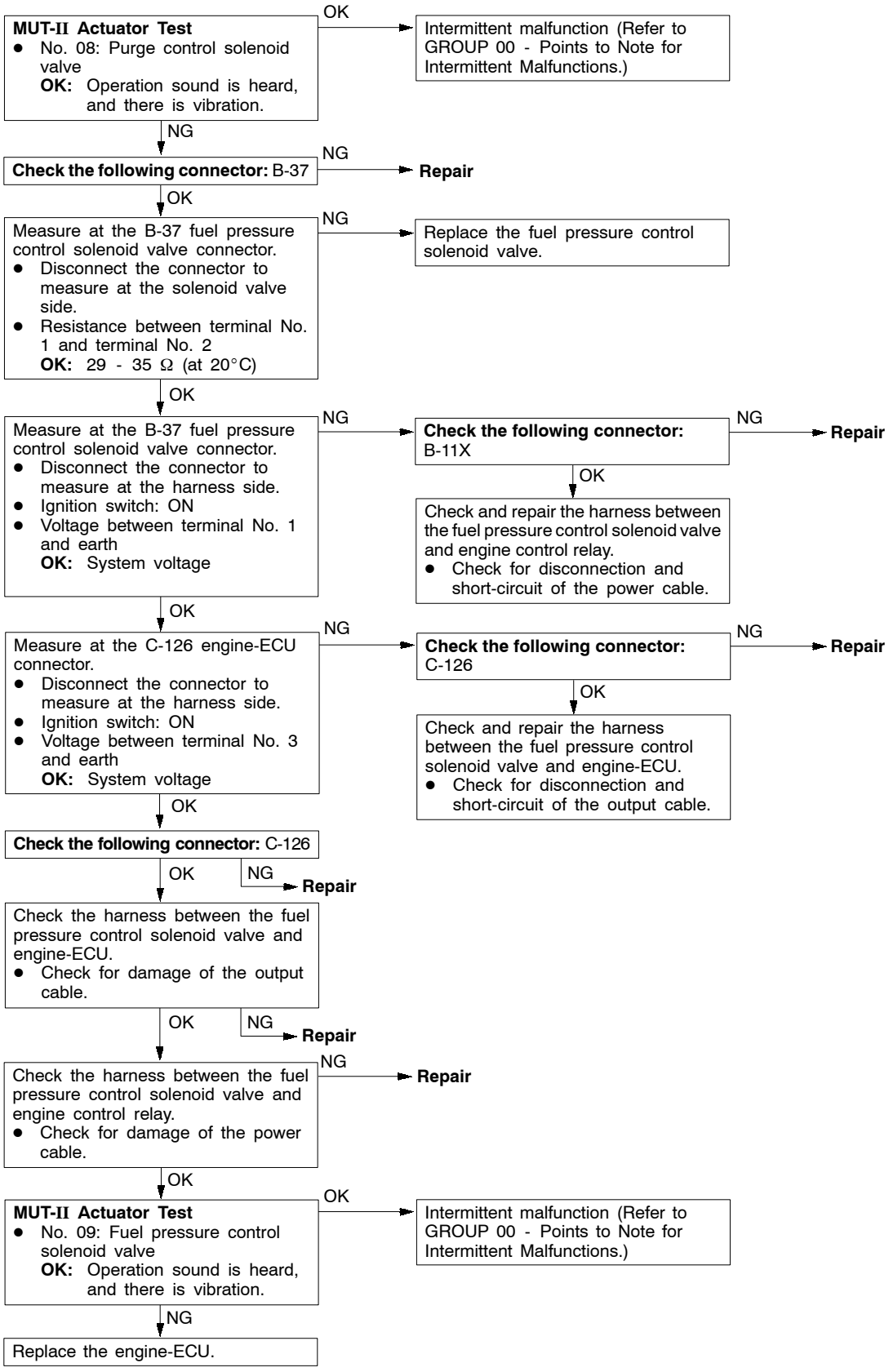
| Code No. P0551 Power steering fluid pressure switch system | Probable cause |
|---|---|
| Range of Check<br>● Intake air temperature is -10°C or higher.<br>● Barometric pressure is 76 kPa or more.<br>● Engine coolant temperature is 30°C or more.<br>● Repeat the *1 drive and *2 stop ten times or more.<br>*1: Engine speed is 2500 r/min or higher, volumetric efficiency is 55 % or higher and vehicle speed is 5 km/h or higher for 4 seconds or more.<br>*2: Vehicle speed is 1.5 km/h or lower.<br>Set Conditions<br>● Power steering fluid pressure switch remains on. | ● Power steering fliud pressure switch failed<br>● Open or short circuit in the power steering fluid pressure switch circuit or loose conector contact<br>● Mulfunction of engine-ECU |



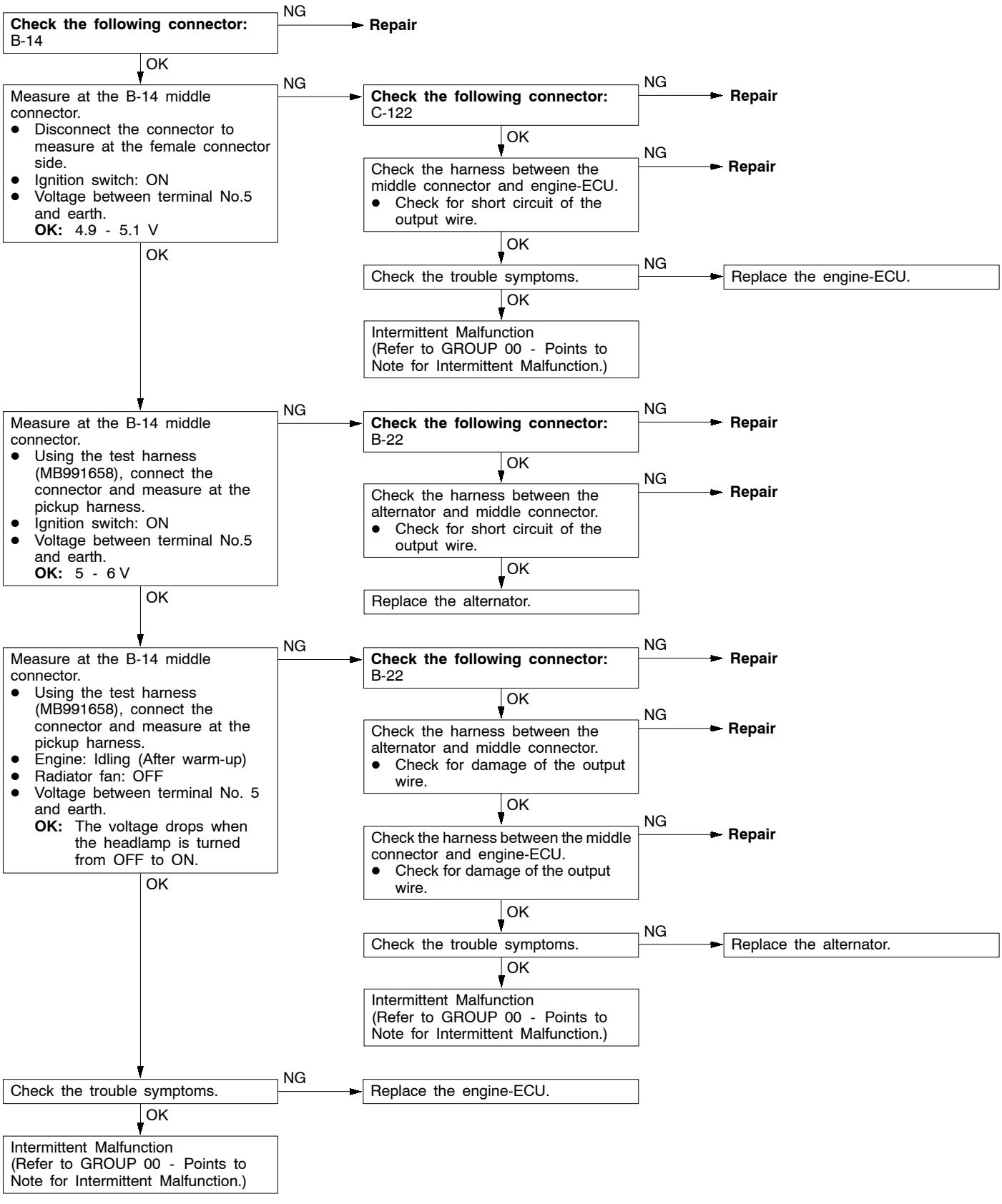
| Code No. P1104 Waste gate solenoid valve system | Probable cause |
|---|---|
| Inspection Range<br>● Battery voltage is more than 10 V.<br>Evaluation Conditions<br>● Solenoid coil's surge voltage (battery voltage +2 V) is not detected when the waste gate solenoid valve turned from ON to OFF. | ● Waste gate solenoid valve malfunction<br>● Engine-ECU malfunction |



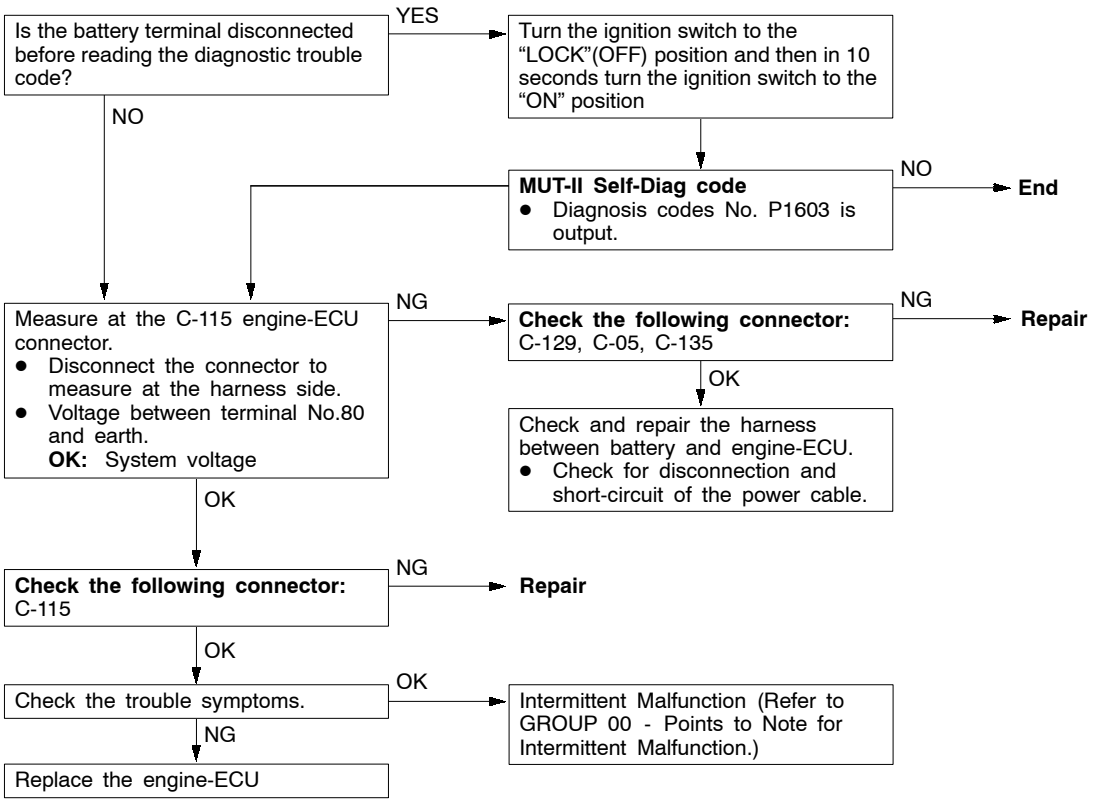
| Code No. P1105 Fuel pressure control solenoid valve system | Probable cause |
|---|---|
| Inspection Range<br>● Battery voltage is more than 10 V.<br>Evaluation Conditions<br>● Solenoid coil's surge voltage (battery voltage +2 V) is not detected when the fuel pressure control solenoid valve turned from ON to OFF. | ● Fuel pressure control solenoid valve malfunction<br>● Engine-ECU malfunction |



| Code No. P1500 Alternator FR terminal system | Probable cause |
|---|---|
| Inspection Range<br>● Engine speed: More than 50 r/min<br>Evaluation Conditions<br>● The input voltage from the alternator FR terminal is between 4.8 V and 5.2 V or is the battery voltage for 20 seconds. | ● Open circuit in the alternator FR terminal circuit<br>● Malfunction of engine-ECU |

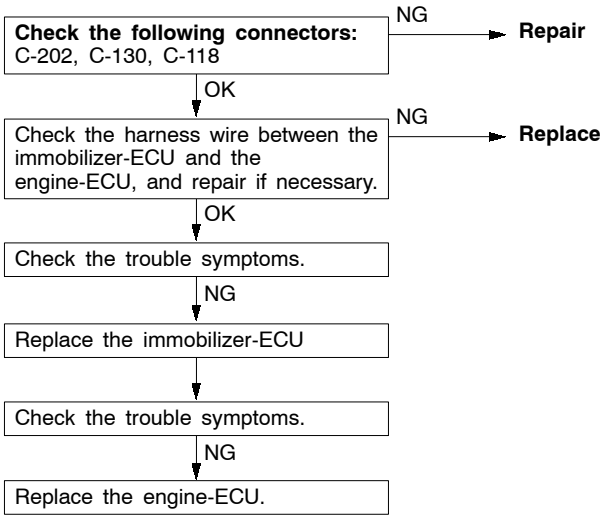


| Code No. P1603 Battery backup line malfunction | Probable cause |
|---|---|
| Inspection Range<br>● Ignition switch: ON<br>Evaluation Conditions<br>● The backup RAM information set at the last time when the ignition switch was turned to the OFF position is not memorized. | ● Battery backup line disconnection, short circuit or connector contact defect<br>● Engine-ECU malfunction |



| Code No.P1610 Immobilizer system <Europe and General Export-spec. models> | Probable cause |
|---|---|
| Inspection Range<br>● Ignition switch: ON<br>Set Conditions<br>● Improper communication between the engine-ECU and the immobilizer-ECU | ● Open or short circuit, or loose connector contact<br>● Malfunction of the immobilizer-ECU<br>● Malfunction of the engine-ECU |

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



## INSPECTION CHART FOR TROUBLE SYMPTOMS

| Inspection procedure | Check items | Reference page |
|---|---|---|
| 1 | Communication between MUT-II and entire system is not possible. | 13A-54 |
| 2 | Only communication between MUT-II and engine-ECU is not possible. | 13A-55 |
| 3 | Engine warning lamp does not illuminate immediately after ignition switch is set to ON position. | 13A-56 |
| 4 | Engine warning lamp stays illuminated and does not turn OFF. | 13A-57 |
| 5 | Starting disabled (Starter does not rotate.) | 13A-58 |
| 6 | Starting disabled (Starter rotates but initial combustion does not occur.) | 13A-59 |
| 7 | Starting disabled (Initial combustion occurs but is incomplete.) | 13A-61 |
| | Improper starting (Starting time is long.) | |
| 8 | Unstable idling (Rough idling, hunting) | 13A-63 |
| | Inappropriate idling speed (High or low idling speed) | |
| | Engine stalls (Die out) during idling | |
| 9 | Engine stalls when starting travel. (Pass out) | 13A-66 |
| 10 | Engine stalls during deceleration | 13A-67 |
| 11 | Pulsation (Hesitation, sag) | 13A-68 |
| | Poor acceleration | |
| | Stumbling | |
| | Surging | |
| 12 | Shock during acceleration | 13A-70 |
| 13 | Shock during deceleration | 13A-71 |
| 14 | Knocking | 13A-72 |
| 15 | Deviation of ignition interval | 13A-73 |
| 16 | Run on (Dieseling) | 13A-74 |
| 17 | Abnormal odor, white smoke, black smoke, high CO or HC concentration when idling | 13A-75 |
| 18 | Battery dies | 13A-77 |
| 19 | Overheating | 13A-79 |
| 20 | Abnormal radiator fan motor rotation | 13A-80 |
| 21 | A/C ineffective | 13A-81 |
| 22 | Engine-ECU power supply, engine control relay, ignition switch-IG1 system | 13A-82 |
| 23 | Fuel pump system | 13A-85 |
| 24 | Radiator fan control relay system | 13A-87 |
| 25 | Condenser fan relay system | 13A-89 |
| 26 | A/C switch system | 13A-92 |
| 27 | A/C compressor relay system | 13A-93 |
| 28 | A/C load signal system | 13A-95 |
| 29 | Secondary air control solenoid valve system | 13A-96 |
| 30 | Intercooler water spray circuit system | 13A-97 |
| 31 | Intercooler water spray lamp system | 13A-99 |
| 32 | Ignition coil (integrated power transistor) system | 13A-100 |

## 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.<br>Serious hesitation is called "sag". (Refer to Fig. 1) |
| | Poor acceleration | Poor acceleration is inability to obtain an acceleration corresponding to the degree of throttle opening, even though acceleration is smooth, or the inability to reach maximum speed. |
| | Stumble | Engine speed increase is delayed when the accelerator pedal is initially depressed for acceleration. (Refer to Fig. 2) |
| | Shock | The feeling of a comparatively large impact or vibration when the engine is accelerated or decelerated. |
| | Surge | This is repeated surging ahead during constant speed travel or during variable speed travel. |
| | Knocking | A sharp sound like a hammer striking the cylinder walls during driving and which adversely affects driving. |
| Stopping | Run on ("Dieseling") | The condition in which the engine continues to run after the ignition switch is turned to "LOCK" (OFF) position. Also called "Dieseling". |

**Fig. 1**

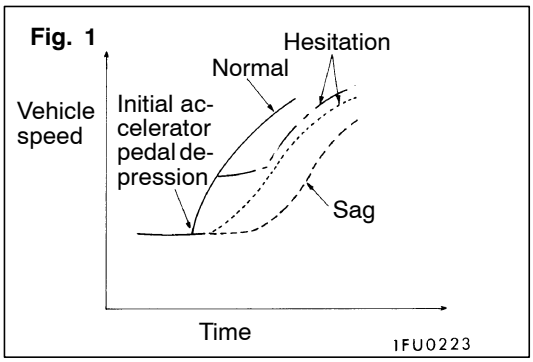
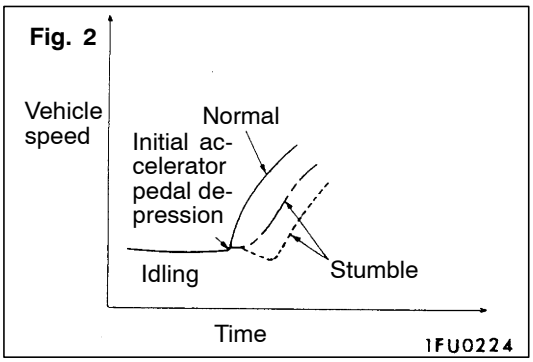


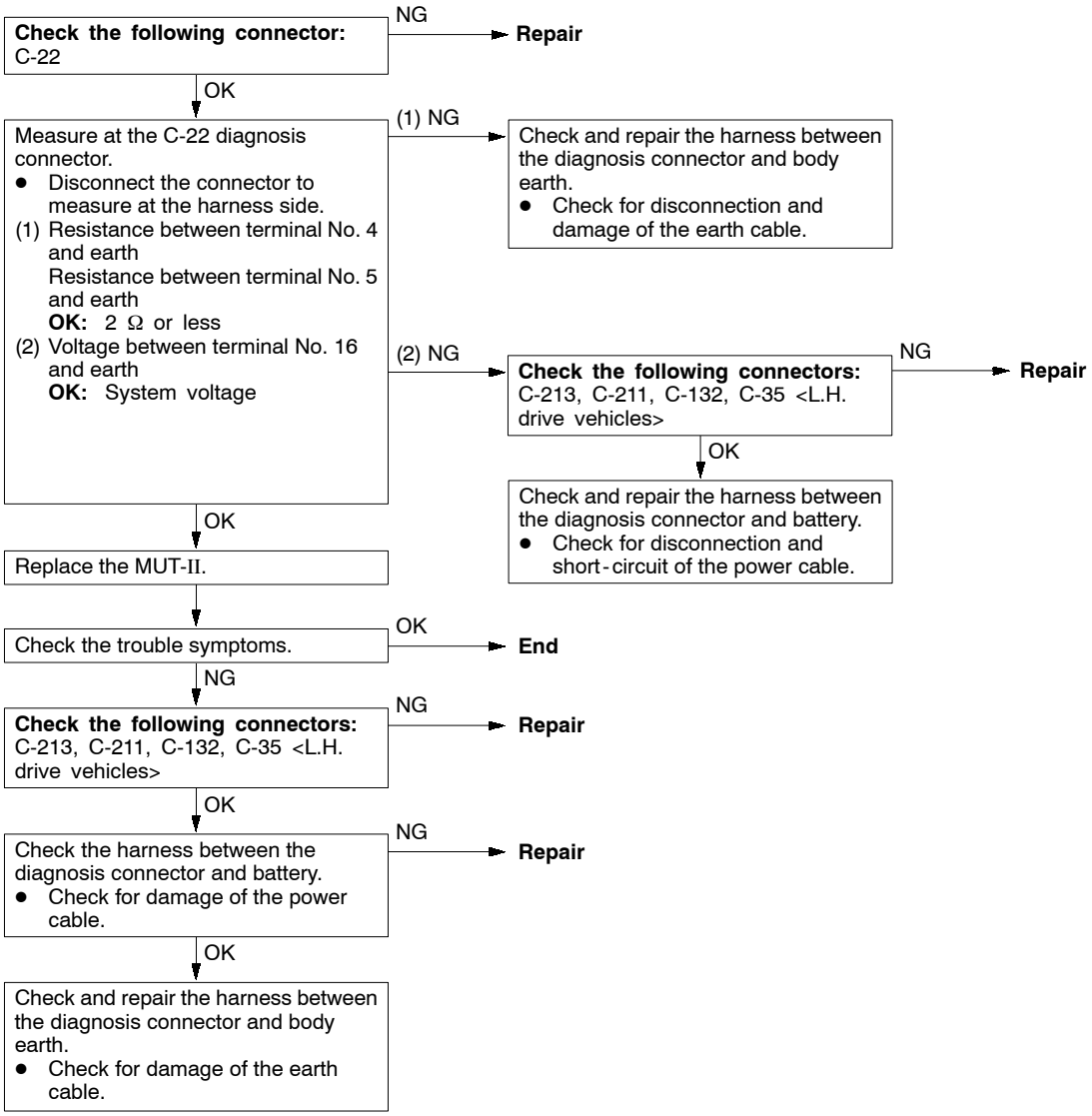

**Fig. 2**



# INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

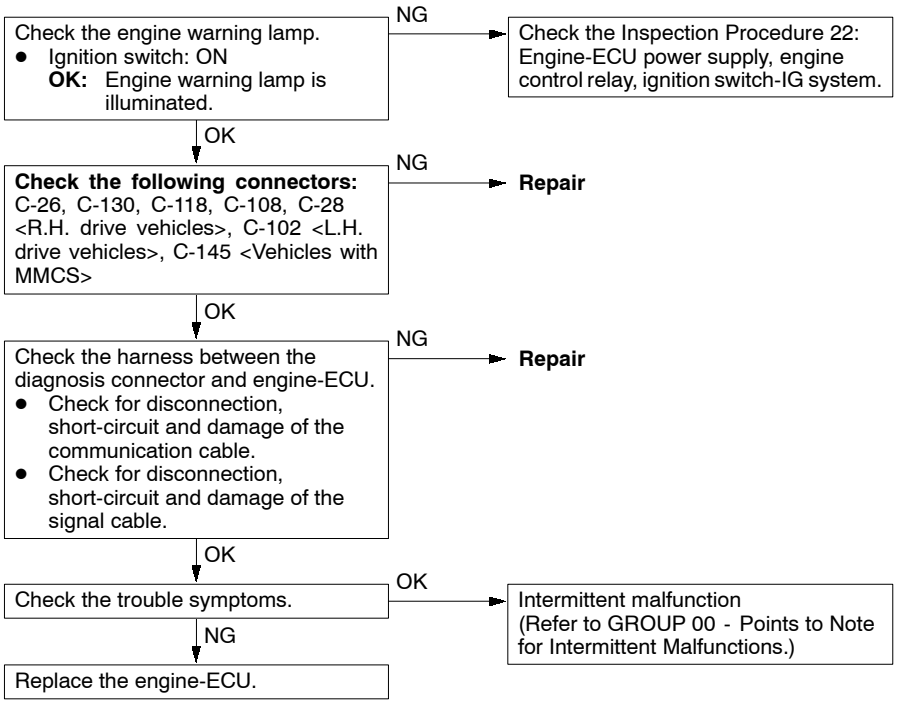
## Inspection Procedure 1

| Communication between MUT-II and entire system is not possible. | Probable cause |
|---|---|
| Causes shown on right are suspected. | • Diagnosis connector malfunction<br>• MUT-II malfunction |



## Inspection Procedure 2

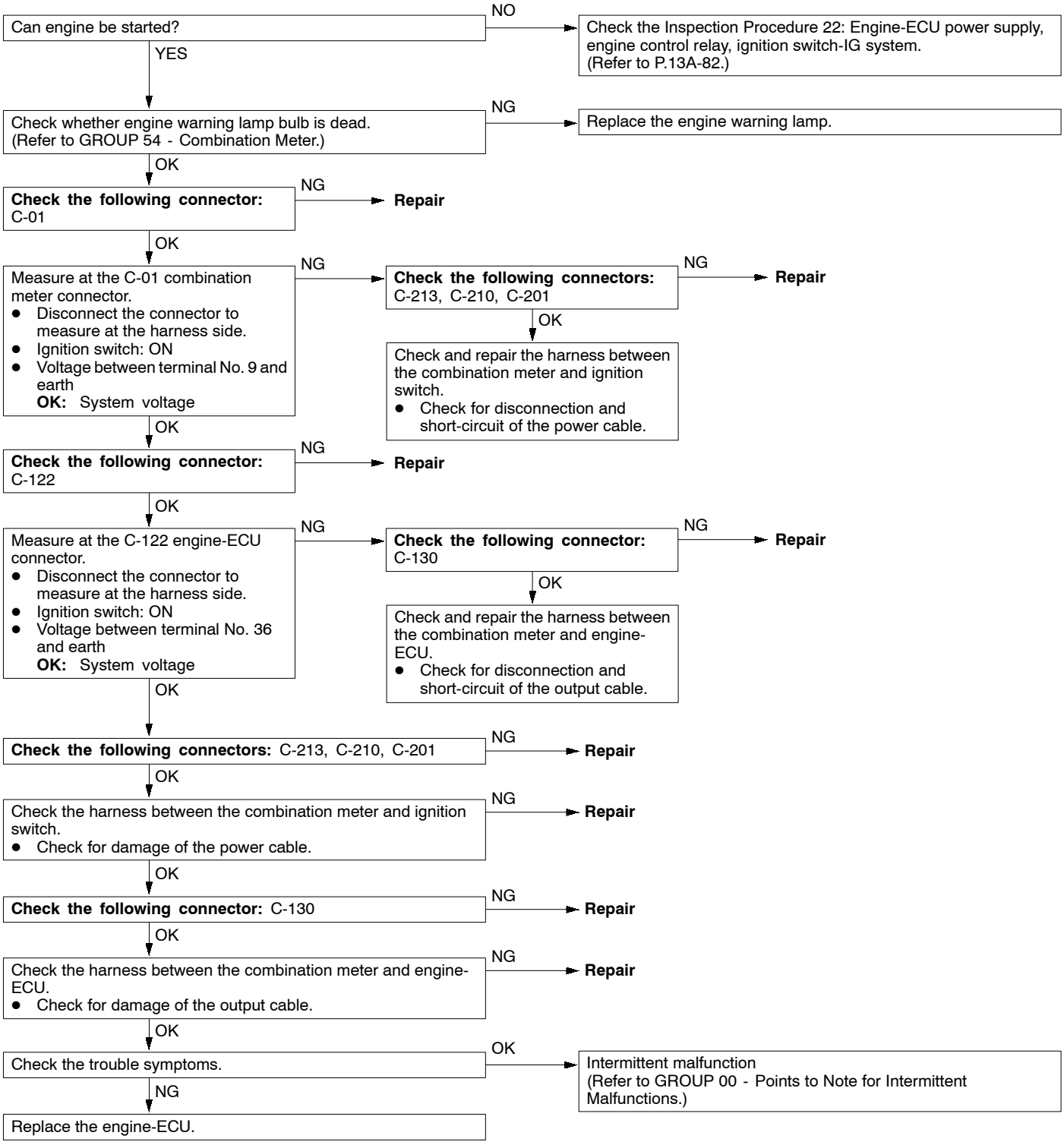
| Only communication between MUT-II and engine-ECU is not possible. | Probable cause |
|---|---|
| Causes shown on right are suspected. | • Ignition switch malfunction<br>• Engine control relay malfunction<br>• Engine-ECU malfunction |




NOTE
If the problem symptom does not disappear in the vehicle with MMCS after carrying out the above-mentioned inspection procedure, there may be a malfunction in the multi-center display.

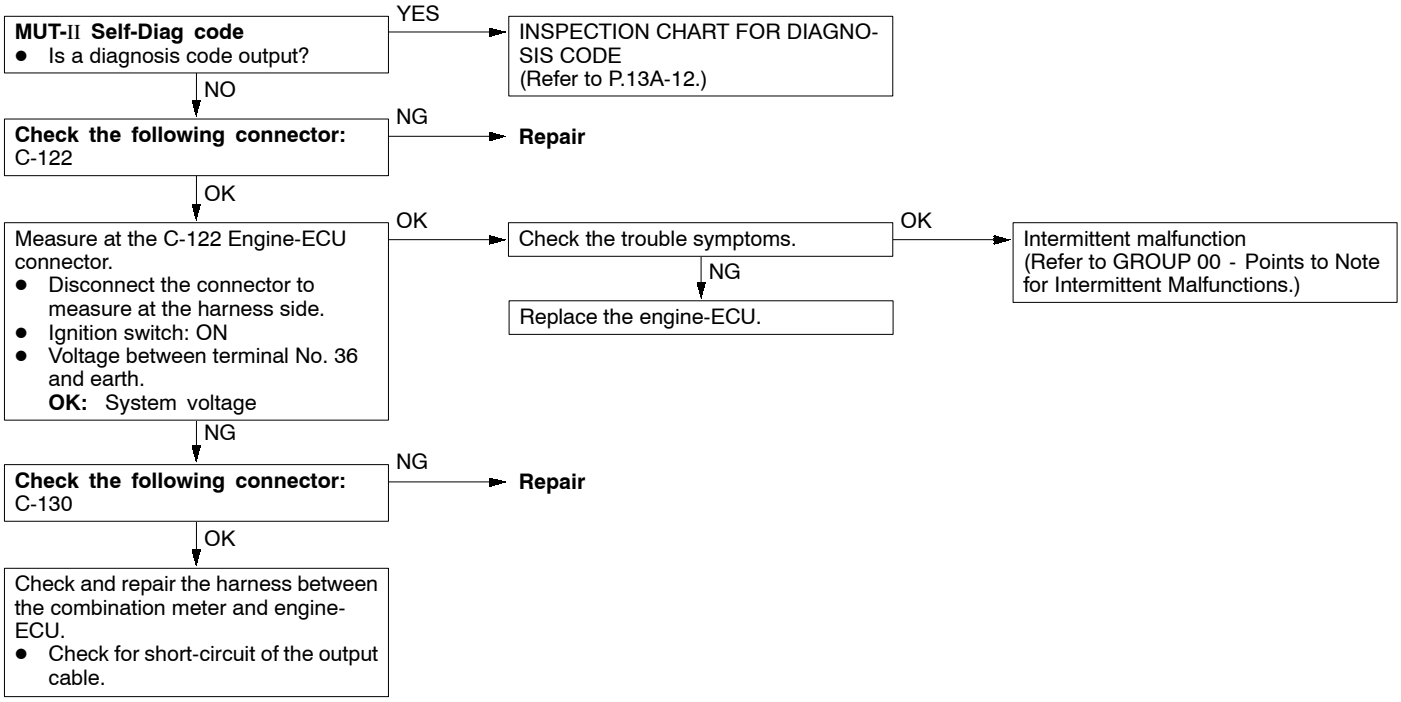
## Inspection Procedure 3

| Engine warning lamp does not illuminate immediately after ignition switch is set to ON position. | Probable cause |
|---|---|
| The engine-ECU illuminates the engine warning lamp for 5 seconds immediately after ignition switch is set to "ON" position to check whether the engine warning lamp bulb is dead. | • Engine warning lamp bulb dead<br>• Ignition switch malfunction<br>• Engine control relay malfunction<br>• Engine-ECU malfunction |



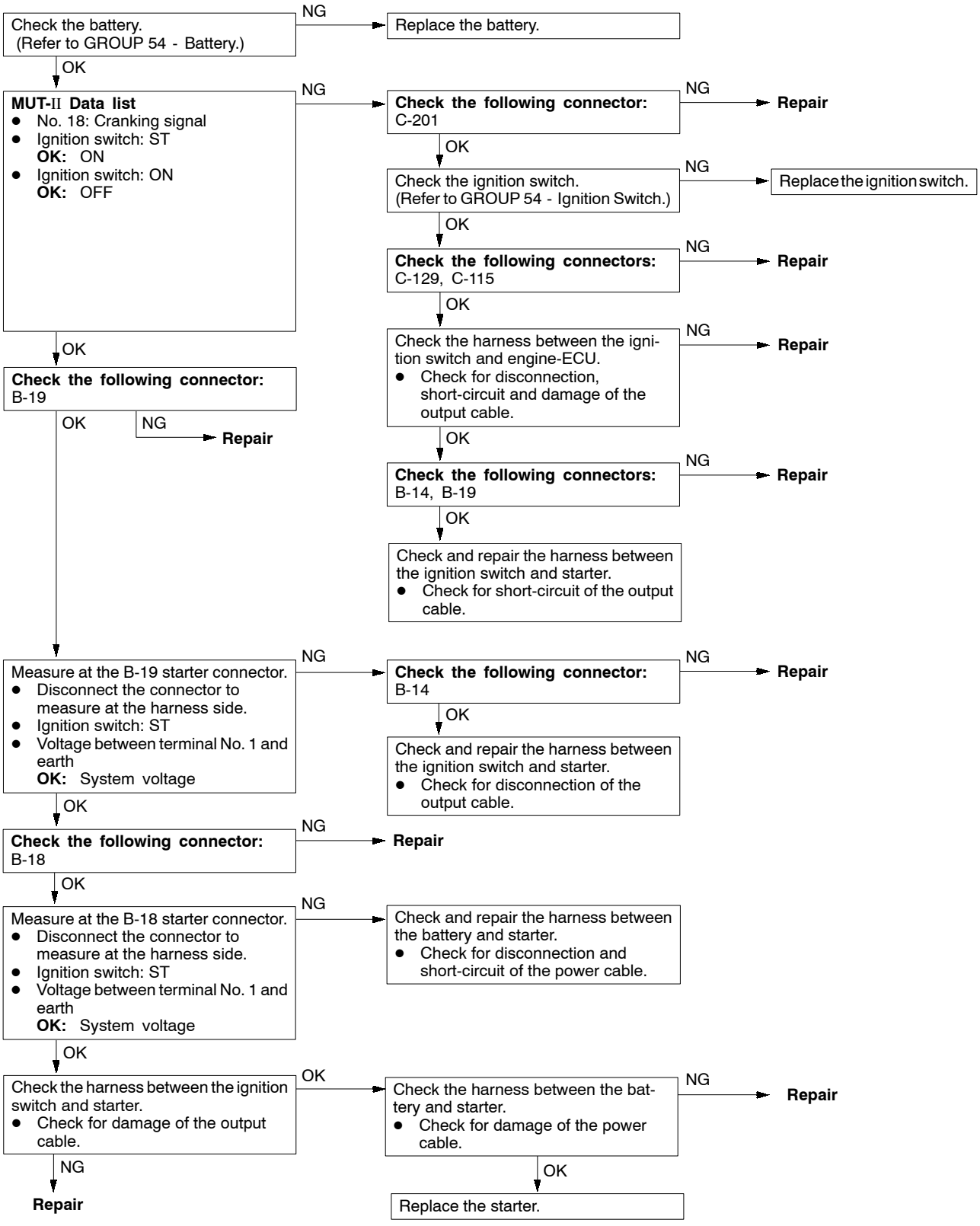
## Inspection Procedure 4

| Engine warning lamp stays illuminated and does not turn OFF. | Probable cause |
|---|---|
| The engine-ECU illuminates the engine warning lamp when the occurrence of a diagnosis code is recorded. | • Engine-ECU malfunction |



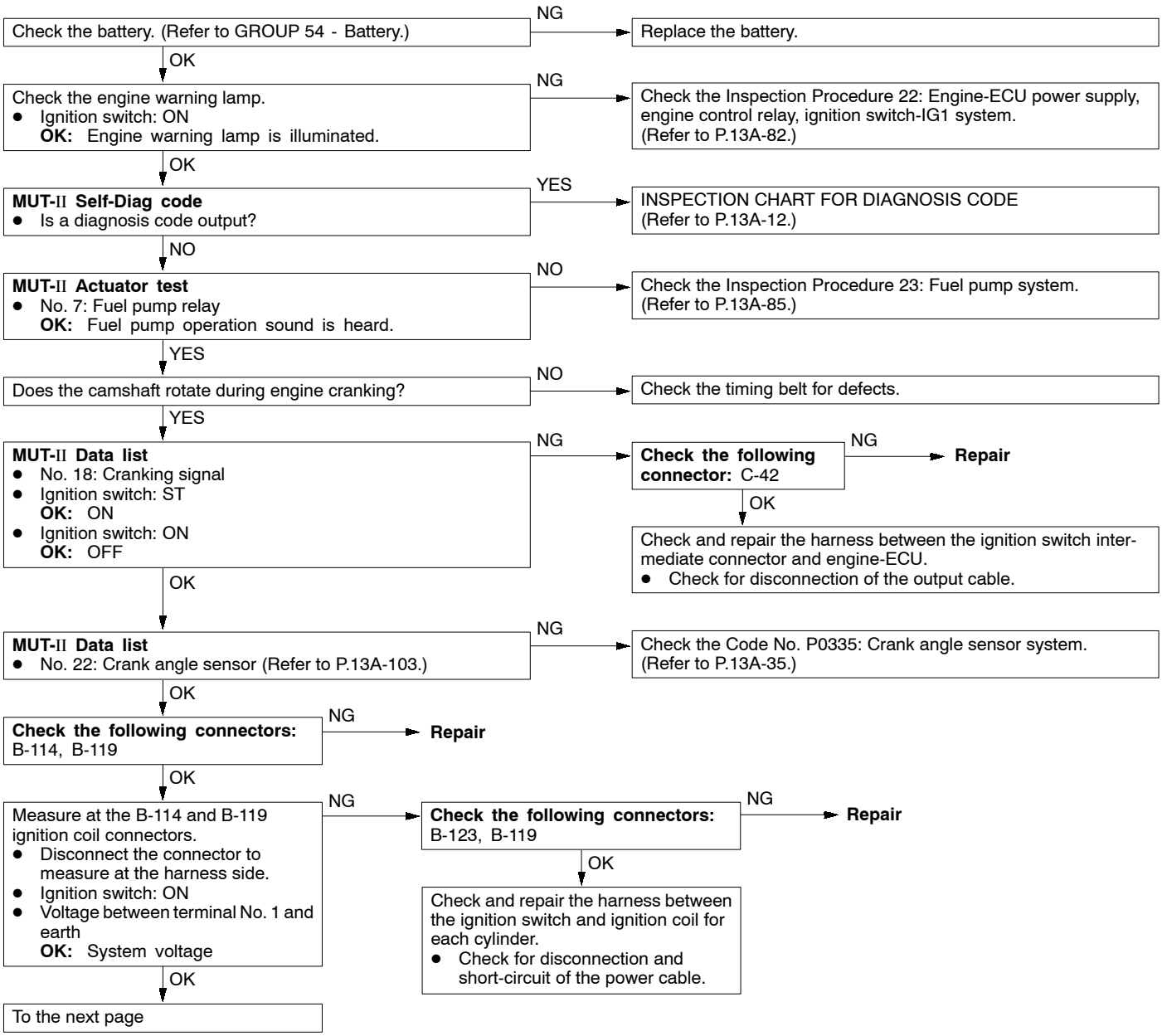
## Inspection Procedure 5

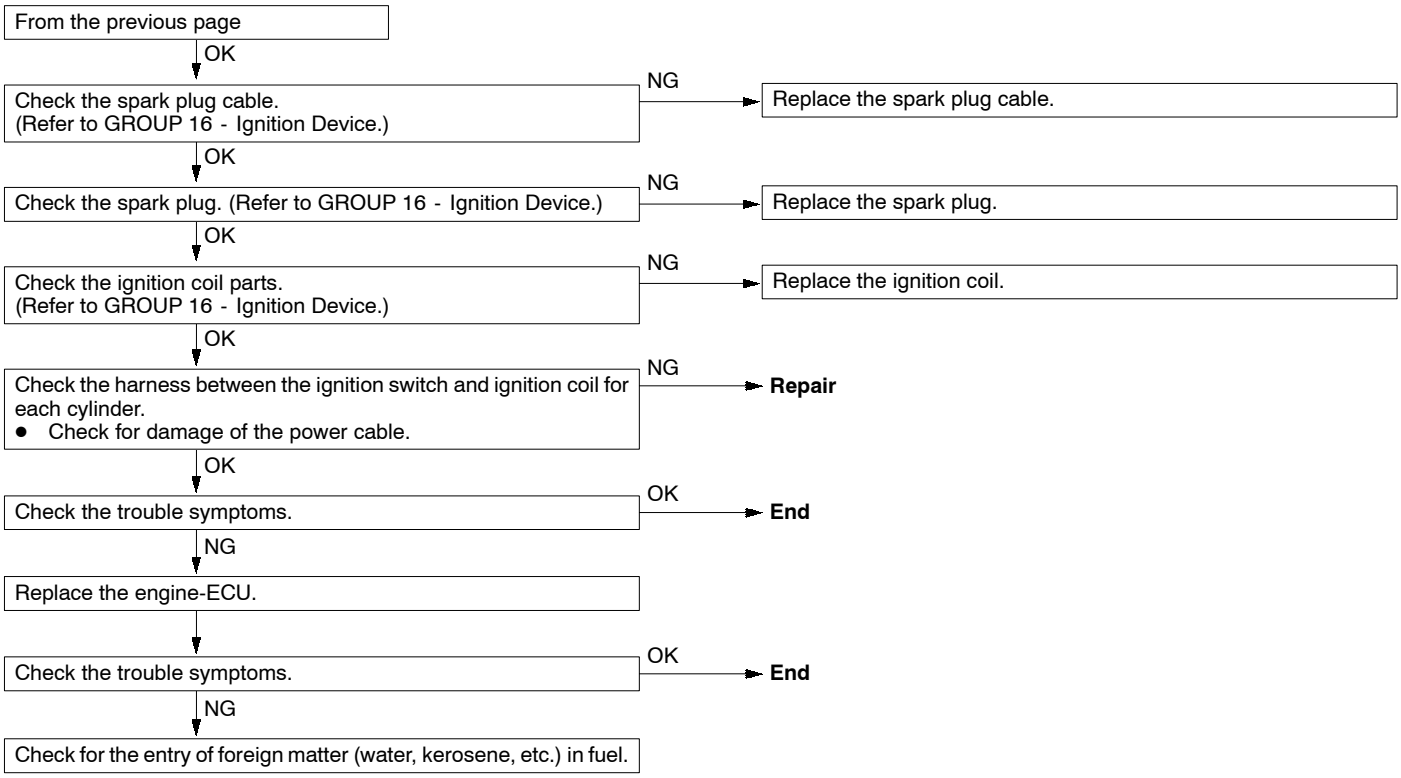
| Starting disabled (Starter does not rotate.) | Probable cause |
|---|---|
| Causes shown on right are suspected. | • Battery malfunction<br>• Ignition switch malfunction<br>• Starter malfunction |



## Inspection Procedure 6

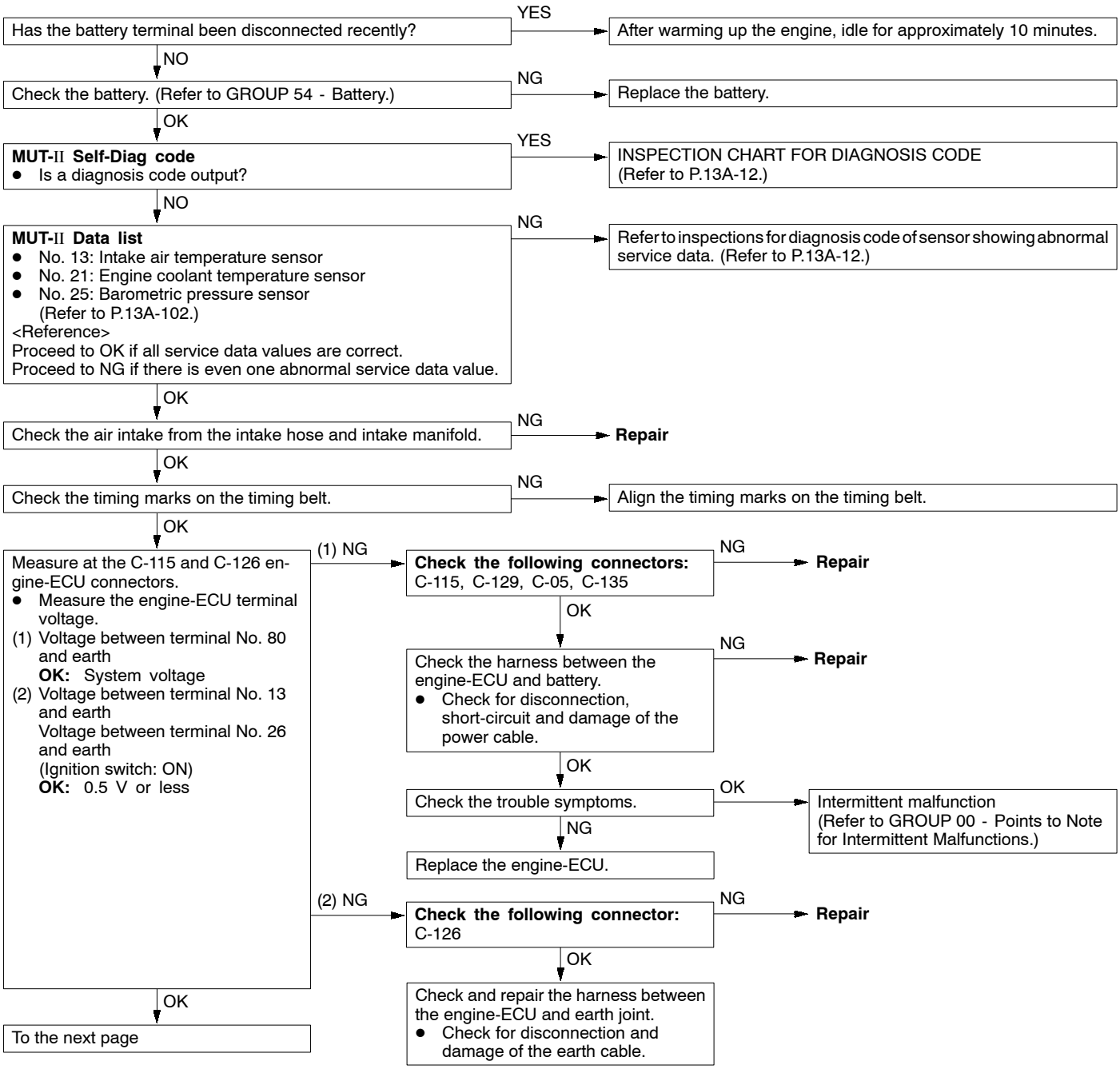
| Starting disabled (Starter rotates but initial combustion does not occur.) | Probable cause |
|---|---|
| Causes shown on right are suspected. | • Battery malfunction<br>• Ignition switch malfunction<br>• Ignition system malfunction<br>• Fuel system malfunction<br>• Throttle valve malfunction<br>• Timing belt malfunction<br>• Engine-ECU malfunction- |

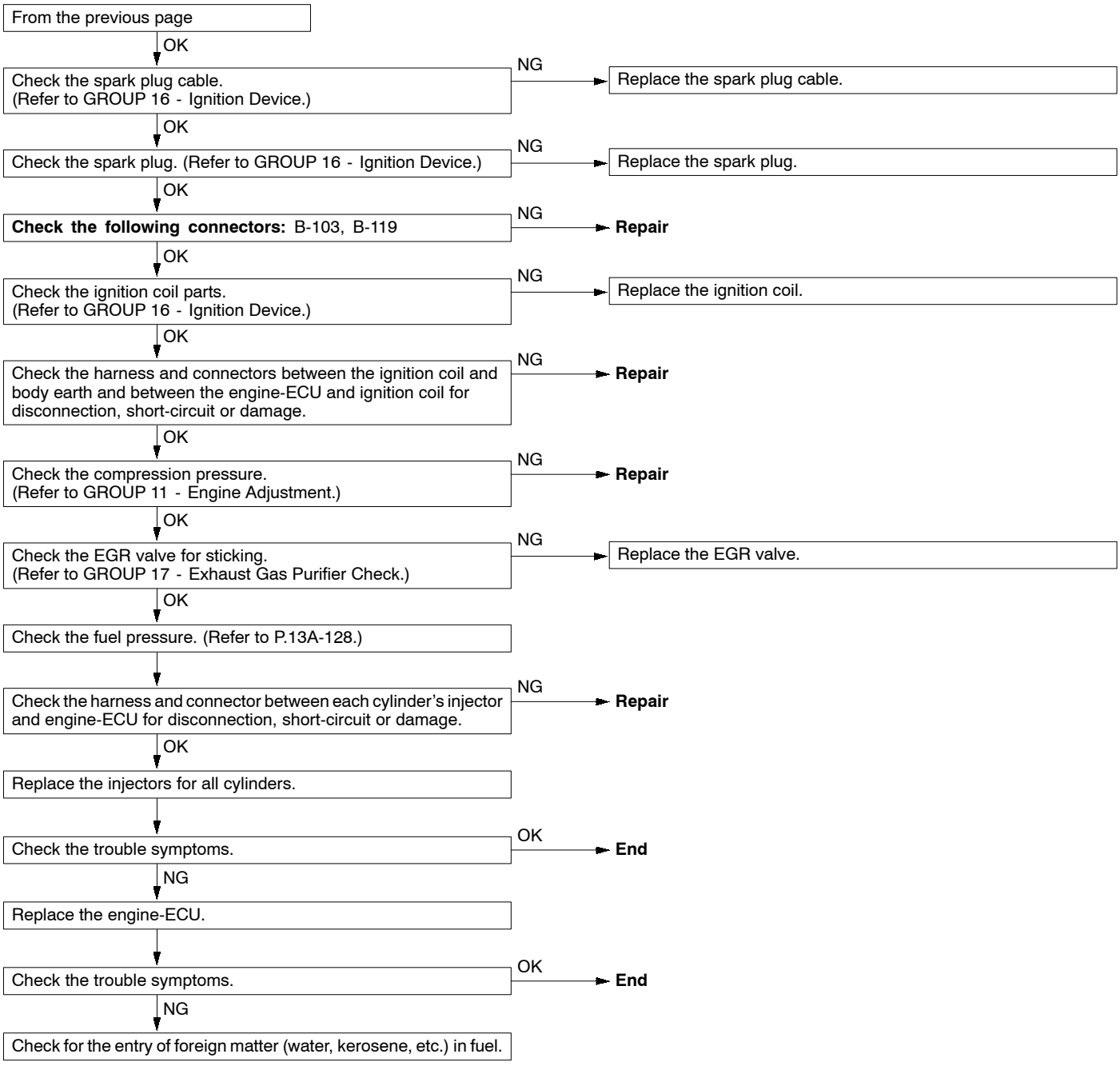



From the previous page
OK
Check the spark plug cable.
(Refer to GROUP 16 - Ignition Device.)
NG
Replace the spark plug cable.
OK
Check the spark plug. (Refer to GROUP 16 - Ignition Device.)
NG
Replace the spark plug.
OK
Check the ignition coil parts.
(Refer to GROUP 16 - Ignition Device.)
NG
Replace the ignition coil.
OK
Check the harness between the ignition switch and ignition coil for each cylinder.
● Check for damage of the power cable.
NG
Repair
OK
Check the trouble symptoms.
OK
End
NG
Replace the engine-ECU.
Check the trouble symptoms.
OK
End
NG
Check for the entry of foreign matter (water, kerosene, etc.) in fuel.

## Inspection Procedure 7

| Starting disabled (Initial combustion occurs but is incomplete.), improper starting (Starting time is long.) | Probable cause |
|---|---|
| Causes shown on right are suspected. | • Battery malfunction<br>• Ignition system malfunction<br>• Fuel system malfunction<br>• Intake system malfunction<br>• EGR valve malfunction<br>• Timing belt malfunction<br>• Improper compression pressure<br>• Engine-ECU malfunction |




From the previous page
OK
Check the spark plug cable. (Refer to GROUP 16 - Ignition Device.)
NG
Replace the spark plug cable.
OK
Check the spark plug. (Refer to GROUP 16 - Ignition Device.)
NG
Replace the spark plug.
OK
Check the following connectors: B-103, B-119
NG
Repair
OK
Check the ignition coil parts. (Refer to GROUP 16 - Ignition Device.)
NG
Replace the ignition coil.
OK
Check the harness and connectors between the ignition coil and body earth and between the engine-ECU and ignition coil for disconnection, short-circuit or damage.
NG
Repair
OK
Check the compression pressure. (Refer to GROUP 11 - Engine Adjustment.)
NG
Repair
OK
Check the EGR valve for sticking. (Refer to GROUP 17 - Exhaust Gas Purifier Check.)
NG
Replace the EGR valve.
OK
Check the fuel pressure. (Refer to P.13A-128.)
Check the harness and connector between each cylinder's injector and engine-ECU for disconnection, short-circuit or damage.
NG
Repair
OK
Replace the injectors for all cylinders.
Check the trouble symptoms.
OK
End
NG
Replace the engine-ECU.
Check the trouble symptoms.
OK
End
NG
Check for the entry of foreign matter (water, kerosene, etc.) in fuel.

## Inspection Procedure 8

| Unstable idling (Rough idling, hunting), inappropriate idling speed (High or low idling speed), engine stalls (Die out) during idling | Probable cause |
|---|---|
| Causes shown on right are suspected. | • Idle speed control system malfunction<br>• Air/fuel ratio control system malfunction<br>• Ignition system malfunction<br>• Fuel system malfunction<br>• Intake and exhaust system malfunction<br>• Exhaust gas purifier system malfunction<br>• Throttle valve malfunction<br>• Timing belt malfunction<br>• Improper compression pressure<br>• Engine-ECU malfunction |

Has the battery terminal been disconnected recently?
- YES → After warming up the engine, idle for approximately 10 minutes.
- NO ↓

**MUT-II Self-Diag code**
- Is a diagnosis code output?
- YES → INSPECTION CHART FOR DIAGNOSIS CODE (Refer to P.13A-12.)
- NO ↓

**MUT-II Data list**
- No. 12: Air flow sensor
- No. 13: Intake air temperature sensor
- No. 14: Throttle position sensor
- No. 21: Engine coolant temperature sensor
- No. 25: Barometric pressure sensor (Refer to P.13A-102.)

<Reference>
Proceed to OK if all service data values are correct.
Proceed to NG if there is even one abnormal service data value.
- NG → Refer to inspections for diagnosis code of sensor showing abnormal service data. (Refer to P.13A-12.)
- OK ↓

**MUT-II Data list**
- No. 45: Idle speed control servo position (Refer to P.13A-105.)
- NG → Check the Idle speed control servo (stepper motor) system. (Refer to P.13A-49 PROCEDURE FOR DIAGNOSIS CODE P0505)
- OK ↓

**MUT-II Data list**
- No. 27: Power steering fluid pressure switch (Refer to P.13A-103.)
- NG → Check the Power steering fluid pressure switch system. (Refer to P.13A-51, PROCEDURE FOR DAIGNOSIS CODE P0551)
- OK ↓

Check the timing marks on the timing belt.
- NG → Align the timing marks on the timing belt.
- OK ↓

Check the air intake from the intake hose and intake manifold.
- NG → **Repair**
- OK ↓

Check the throttle body (throttle valve section) for contamination.
- NG → Clean the throttle body (throttle valve section). (Refer to P.13A-126.)
- OK ↓

**MUT-II Data list**
- No. 11: Oxygen sensor (front) (Refer to P.13A-102.)
- NG → Check the Code No. P0130: Oxygen sensor (front) system. (Refer to P.13A-24.)
- OK ↓

To the next page

From the previous page

OK

**MUT-II Data list**
- No. 59: Oxygen sensor (rear) (Refer to P.13A-105.)

NG → Check the Code No. P0136: Oxygen sensor (rear) system. (Refer to P.13A-27.)

OK

Measure at the C-115 and C-126 engine-ECU connectors.
- Measure the engine-ECU terminal voltage.

(1) Voltage between terminal No. 80 and earth
**OK:** System voltage

(2) Voltage between terminal No. 13 and earth
Voltage between terminal No. 26 and earth
(Ignition switch: ON)
**OK:** 0.5 V or less

(1) NG → **Check the following connectors:** C-115, C-129, C-05, C-135
NG → **Repair**

OK → Check the harness between the engine-ECU and battery.
- Check for disconnection, short-circuit and damage of the power cable.

NG → **Repair**

OK → Check the trouble symptoms.

OK → Intermittent malfunction (Refer to GROUP 00 - Points to Note for Intermittent Malfunctions.)

NG → Replace the engine-ECU.

(2) NG → **Check the following connector:** C-39
NG → **Repair**

OK → Check the harness between the engine-ECU and earth joint.
- Check for disconnection and damage of the earth cable.

OK

Measure at the C-40 engine-ECU connector.
- Measure the engine-ECU terminal voltage.
- Engine: Idling (after warm-up)
- Radiator fan: Stopped
- Voltage between terminal No. 33 and earth
  **OK:** Voltage rises 0.2 to 3.5 V when headlamp is turned OFF and ON.
- Voltage between terminal No. 41 and earth
  **OK:** Voltage drops when headlamp is turned OFF and ON.

NG → **Check the following connectors:** C-40, B-21, B-03
NG → **Repair**

OK → Check the harness between the alternator and engine-ECU.
- Check for disconnection, short-circuit and damage of the output cable.

NG → **Repair**

OK → Check the trouble symptoms.

OK → Intermittent malfunction (Refer to GROUP 00 - Points to Note for Intermittent Malfunctions.)

NG → Replace the alternator.

OK

Measure at the C-39 engine-ECU connector.
- Measure the engine-ECU terminal voltage.
- Engine: Idling
- A/C switch: ON (A/C compressor driven state)
- Voltage between terminal No .24 and earth
  (A/C setting temperature: Minimum temperature)
  (Air volume: Maximum)
  **OK:** 1 V or less
  (A/C setting temperature: indoor temperature)
  (Air volume: Minimum)
  **OK:** System voltage

NG → Check the Inspection Procedure 28: A/C load signal system. (Refer to P.13A-95.)

OK

To the next page

From the previous page

OK

Check the spark plug cable.
(Refer to GROUP 16 - Ignition Device.)
NG → Replace the spark plug cable.

OK

Check the spark plug. (Refer to GROUP 16 - Ignition Device.)
NG → Replace the spark plug.

OK

**Check the following connectors:** B-114, B-119
NG → **Repair**

OK

Check the ignition coil parts.
(Refer to GROUP 16 - Ignition Device.)
NG → Replace the ignition coil.

OK

Check the harness and connector between each cylinder's ignition coil and body earth and between engine-ECU and ignition coil for disconnection, short-circuit or damage.
NG → **Repair**

OK

Check the compression pressure.
(Refer to GROUP 11 - Engine Adjustment.)
NG → **Repair**

OK

Check the purge control solenoid valve.
(Refer to GROUP 17 - Exhaust Gas Purifier Check.)
NG → Replace the purge control solenoid valve.

OK

Check the EGR control solenoid valve.
(Refer to GROUP 17 - Exhaust Gas Purifier Check.)
NG → Replace the EGR control solenoid valve.

OK

Check the EGR valve for sticking.
(Refer to GROUP 17 - Exhaust Gas Purifier Check.)
NG → Replace the EGR valve.

OK

Check the fuel pressure. (Refer to P.13A-118.)

OK

Check the harness and connector between each cylinder's injector and engine-ECU for disconnection, short-circuit or damage.
NG → **Repair**

OK

Replace the injector for each cylinder.

Check the trouble symptoms.
OK → **End**

NG

Replace the engine-ECU.

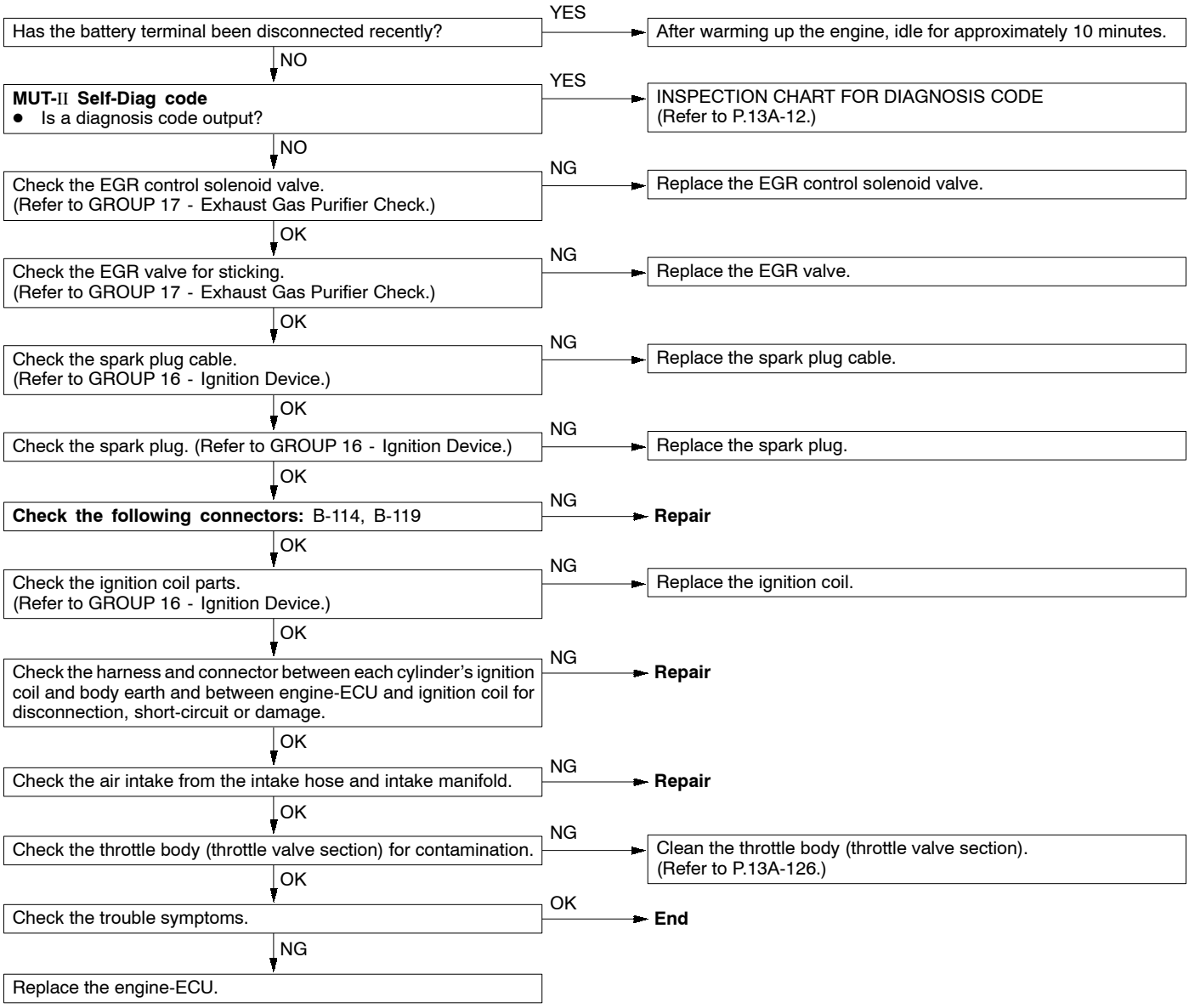
Check the trouble symptoms.
OK → **End**

NG

Check for the entry of foreign matter (water, kerosene, etc.) in fuel.

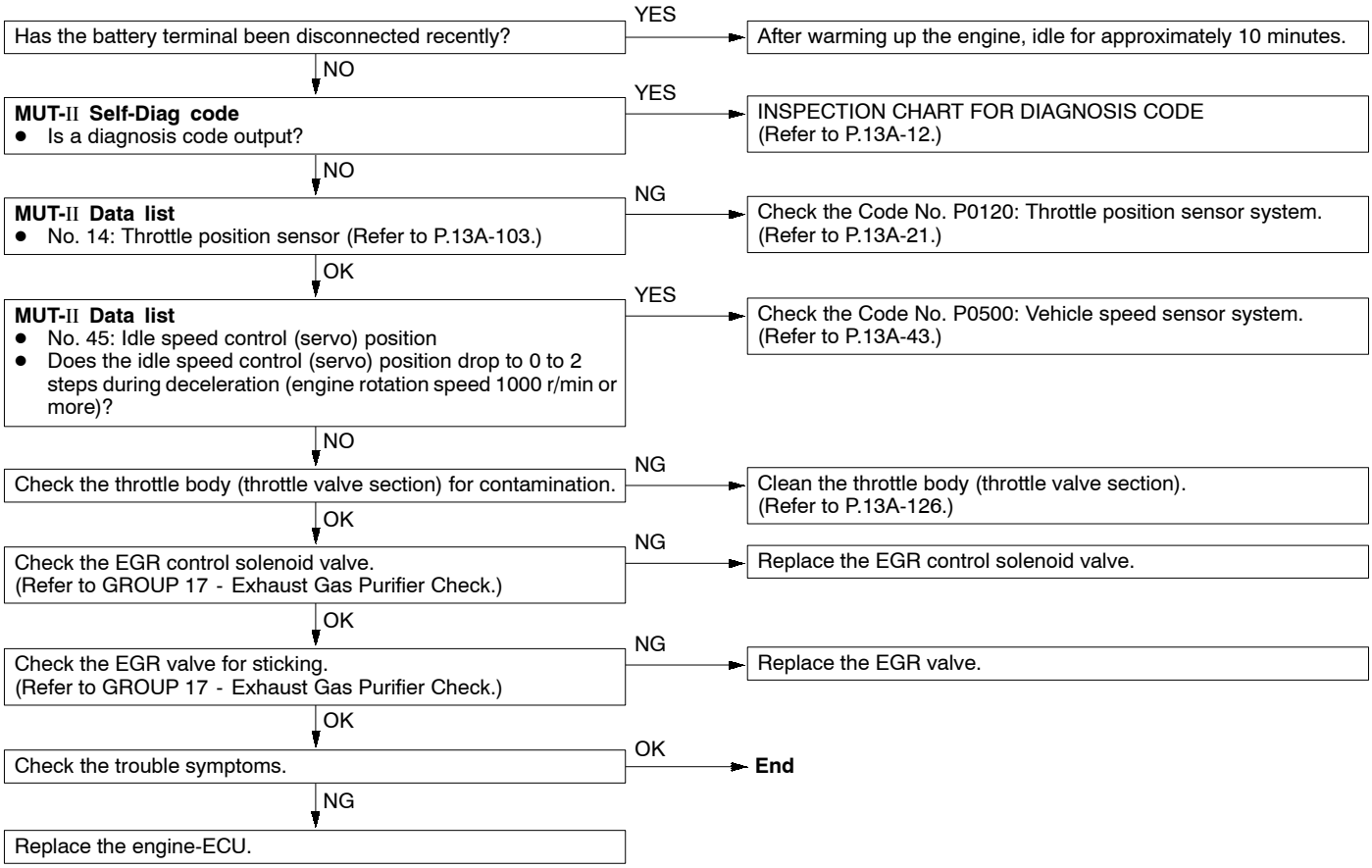
## Inspection Procedure 9

| Engine stalls when starting travel. (Pass out) | Probable cause |
|---|---|
| Causes shown on right are suspected. | • Ignition system malfunction<br>• Intake system malfunction<br>• Exhaust gas purifier system malfunction<br>• Throttle body malfunction<br>• Engine-ECU malfunction |



## Inspection Procedure 10

| Engine stalls during deceleration | Probable cause |
|---|---|
| Causes shown on right are suspected. | • Idle speed control system malfunction<br>• Exhaust gas purifier system malfunction<br>• Throttle valve malfunction<br>• Engine-ECU malfunction |



## Inspection Procedure 11

| Pulsation (Hesitation, sag), poor acceleration, stumbling, surging | Probable cause |
|---|---|
| Causes shown on right are suspected. | • Air/fuel ratio control system malfunction<br>• Ignition system malfunction<br>• Fuel system malfunction<br>• Intake and exhaust system malfunction<br>• Exhaust gas purifier system malfunction<br>• Improper compression pressure<br>• Turbocharger system malfunction |

**MUT-II Self-Diag code**
- Is a diagnosis code output?

YES → INSPECTION CHART FOR DIAGNOSIS CODE (Refer to P.13A-12.)

NO ↓

Check the ignition timing. (Refer to GROUP 11 - Engine Adjustment.)

NG → Check mounting state of crank angle sensor and timing belt cover.

OK ↓

Check the injector operation sound. (Use sound scope.)

NG → Check the Code No. P0201 - 204: Injector system for faulty cylinder.

OK ↓

**MUT-II Data list**
- No. 13: Intake air temperature sensor
- No. 14: Throttle position sensor
- No. 21: Engine coolant temperature sensor
- No. 25: Barometric pressure sensor
  (Refer to P.13A-102.)

<Reference>
Proceed to OK if all service data values are correct.
Proceed to NG if there is even one abnormal service data value.

NG → Refer to inspections for diagnosis code of sensor showing abnormal service data. (Refer to P.13A-12.)

OK ↓

Check the purge control solenoid valve. (Refer to GROUP 17 - Exhaust Gas Purifier Check.)

NG → Replace the purge control solenoid valve.

OK ↓

Check the EGR control solenoid valve. (Refer to GROUP 17 - Exhaust Gas Purifier Check.)

NG → Replace the EGR control solenoid valve.

OK ↓

Check the EGR valve for sticking. (Refer to GROUP 17 - Exhaust Gas Purifier Check.)

NG → Replace the EGR valve.

OK ↓

**MUT-II Data list**
- No. 11: Oxygen sensor (front) (Refer to P.13A-102.)

NG → Check the Code No. P0130: Oxygen sensor (front) system. (Refer to P.13A-24.)

OK ↓

**MUT-II Data list**
- No. 59: Oxygen sensor (rear) (Refer to P.13A-105.) <Europe and General Export-spec. models>

NG → Check the Code No. P0136: Oxygen sensor (rear) system. (Refer to P.13A-27.)

OK ↓

To the next page

From the previous page

OK

Check the spark plug cable.
(Refer to GROUP 16 - Ignition Device.)
NG → Replace the spark plug cable.

OK

Check the spark plug. (Refer to GROUP 16 - Ignition Device.)
NG → Replace the spark plug.

OK

**Check the following connectors:** B-123, B-119
NG → **Repair**

OK

Check the ignition coil parts.
(Refer to GROUP 16 - Ignition Device.)
NG → Replace the ignition coil.

OK

Check the harness and connector between each cylinder's ignition coil and body earth and between engine-ECU and ignition coil for disconnection, short-circuit or damage.
NG → **Repair**

OK

**MUT-II Actuator test**
- No. 12: Waste gate solenoid valve (Refer to P.13A-107.)

NG → Check the waste gate solenoid valve system.
(Refer to P.13A-12, INSPECTION PROCEDURE FOR DIAGNOSIS CODE No. P1104)

OK

Check the turbocharger supercharging pressure.
(Refer to GROUP 15 - Intake Exhaust, On-vehicle Service.)
NG → **Repair**

OK

Check the supercharging pressure control system.
(Refer to GROUP 15 - Intake Exhaust, On-vehicle Service.)
NG → **Repair**

OK

**MUT-II Actuator test**
- No. 09: Fuel pressure control solenoid valve (Refer to P.13A-107.)

NG → Check the Fuel pressure control solenoid valve system.
(Refer to P.13A-12, INSPECTION PROCEDURE FOR DIAGNOSIS CODE No. P1105)

OK

Check the fuel pressure. (Refer to P.13A-128.)
NG → **Repair**

OK

Check the trouble symptoms.
OK → **End**

NG

Check the compression pressure.
(Refer to GROUP 11 - Engine Adjustment.)
NG → **Repair**

OK

Check the trouble symptoms.
OK → **End**

NG

Check and repair the intake hose and manifold damage and air intake.

## Inspection Procedure 12

| Shock during acceleration | Probable cause |
|---|---|
| The occurrence of ignition leaks, etc., due to the rise in voltage required for the spark plugs during acceleration is a probable cause. | • Ignition system malfunction |

**MUT-II Self-Diag code**
- Is a diagnosis code output?

YES → INSPECTION CHART FOR DIAGNOSIS CODE (Refer to P.13A-12.)

NO ↓

Check the spark plug cable. (Refer to GROUP 16 - Ignition Device.)

NG → Replace the spark plug cable.

OK ↓

Check the spark plug. (Refer to GROUP 16 - Ignition Device.)

NG → Replace the spark plug.

OK ↓

**Check the following connectors:** B-114, B-119

NG → **Repair**

OK ↓

Check the ignition coil parts. (Refer to GROUP 16 - Ignition Device.)

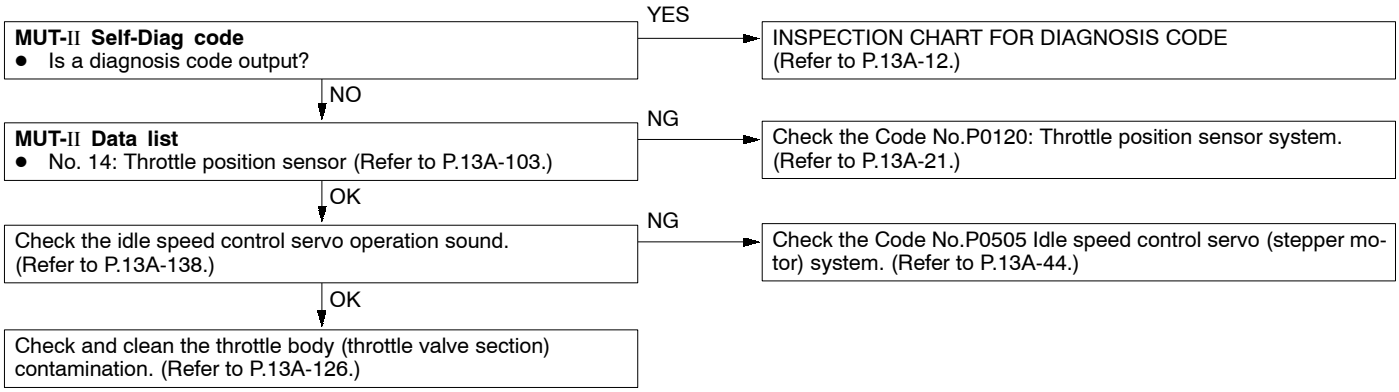
NG → Replace the ignition coil.

OK ↓

Check and repair the harness and connector between each cylinder's ignition coil and body earth and between the engine-ECU and ignition coil for disconnection, short-circuit and damage.

## Inspection Procedure 13

| Shock during deceleration | Probable cause |
|---|---|
| The idle speed control may be incorrect. | • Idle speed control system malfunction |



## Inspection Procedure 14

| Knocking | Probable cause |
|---|---|
| Causes shown on right are suspected. | • Detonation sensor malfunction<br>• Knocking control system malfunction<br>• Spark plug malfunction<br>• Ignition system malfunction<br>• Engine-ECU malfunction |

**MUT-II Self-Diag code**
- Is a diagnosis code output?

YES → INSPECTION CHART FOR DIAGNOSIS CODE (Refer to P.13A-12.)

NO ↓

Check the spark plug cable. (Refer to GROUP 16 - Ignition Device.)

NG → Replace the spark plug cable.

OK ↓

Check the spark plug. (Refer to GROUP 16 - Ignition Device.)

NG → Replace the spark plug.

OK ↓

**Check the following connectors:** B-114, B-119

NG → **Repair**

OK ↓

Check the ignition coil parts. (Refer to GROUP 16 - Ignition Device.)

NG → Replace the ignition coil.

OK ↓

Check the harness and connector between each cylinder's ignition coil and body earth and between engine-ECU and ignition coil for disconnection, short-circuit or damage.

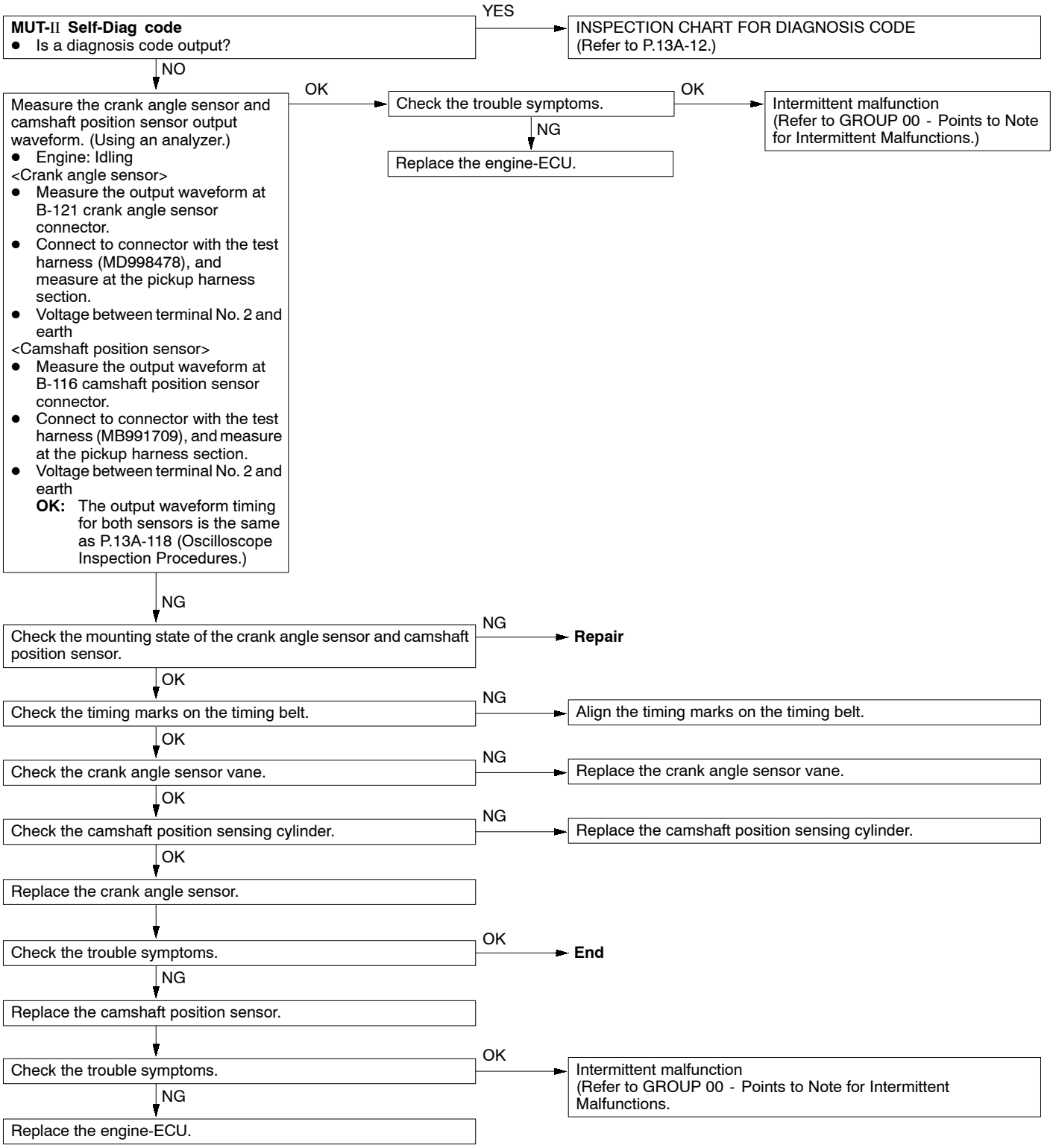
NG → **Repair**

OK ↓

Check the Code No. P0325: Detonation sensor system. (Refer to P.13A-34.)

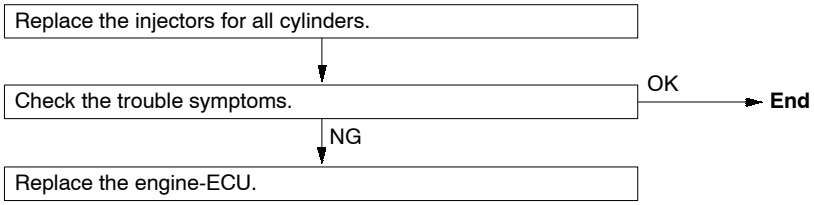
## Inspection Procedure 15

| Deviation of ignition interval | Probable cause |
|---|---|
| Causes shown on right are suspected. | • Crank angle sensor malfunction<br>• Camshaft position sensor malfunction<br>• Timing belt malfunction<br>• Engine-ECU malfunction |



## Inspection Procedure 16

| Run on (Dieseling) | Probable cause |
|---|---|
| Causes shown on right are suspected. | • Injector malfunction<br>• Engine-ECU malfunction |



## Inspection Procedure 17

| Abnormal odor, white smoke, black smoke, high CO or HC concentration when idling | Probable cause |
|---|---|
| Causes shown on right are suspected. | • Air/fuel ratio control system malfunction<br>• Ignition system malfunction<br>• Fuel system malfunction<br>• Intake and exhaust system malfunction<br>• Exhaust gas purifier system malfunction<br>• Improper compression pressure<br>• Catalyst defect<br>• Engine-ECU malfunction |

**MUT-II Self-Diag code**
- Is a diagnosis code output?

YES → INSPECTION CHART FOR DIAGNOSIS CODE (Refer to P.13A-12.)

NO ↓

**MUT-II Actuator test**
- No. 01: No. 1 injector
- No. 02: No. 2 injector
- No. 03: No. 3 injector
- No. 04: No. 4 injector

**OK:** The idling state changes.

- Proceed to NG if the cylinder (NG cylinder) for which the idling state did not change when injector was stopped is pinpointed.
- Proceed to OK if all cylinders are OK, or if the NG cylinder cannot be pinpointed.

NG → Check the Code No. P0201: No. 1 injector system, P0202: No. 2 injector system, P0203: No. 3 injector system and P0204: No. 4 injector system. (Refer to P.13A-30, 31, 32, 33.)

OK ↓

Check the ignition timing. (Refer to GROUP 11 - Engine Adjustment.)

NG → Check the Inspection Procedure 15: Deviation of ignition interval (Refer to P.13A-73.)

OK ↓

**MUT-II Data list**
- No. 12: Air flow sensor
- No. 13: Intake air temperature sensor
- No. 21: Engien coolant temperature sensor
- No. 25: Barometric pressure sensor (Refer to P.13A-102.)

<Reference>
Proceed to OK if all service data values are correct.
Proceed to NG if there is even one abnormal service data value.

NG → Refer to inspections for diagnosis code of sensor showing abnormal service data. (Refer to P.13A-102.)

OK ↓

Check the air intake from the intake hose and intake manifold.

NG → **Repair**

OK ↓

Check for exhaust gas leaks from exhaust manifold.

NG → **Repair**

OK ↓

**MUT-II Data list**
- No. 11: Oxygen sensor (front) (Refer to P.13A-102.)

NG → Check the Code No. P0130: Oxygen sensor (front) system. (Refer to P.13A-24.)

OK ↓

**MUT-II Data list**
- No. 59: Oxygen sensor (rear) (Refer to P.13A-105.)

NG → Check the Code No. P0136: Oxygen sensor (rear) system. (Refer to P.13A-27.)

OK ↓

Check the fuel pressure. (Refer to P.13A-128.)

OK ↓

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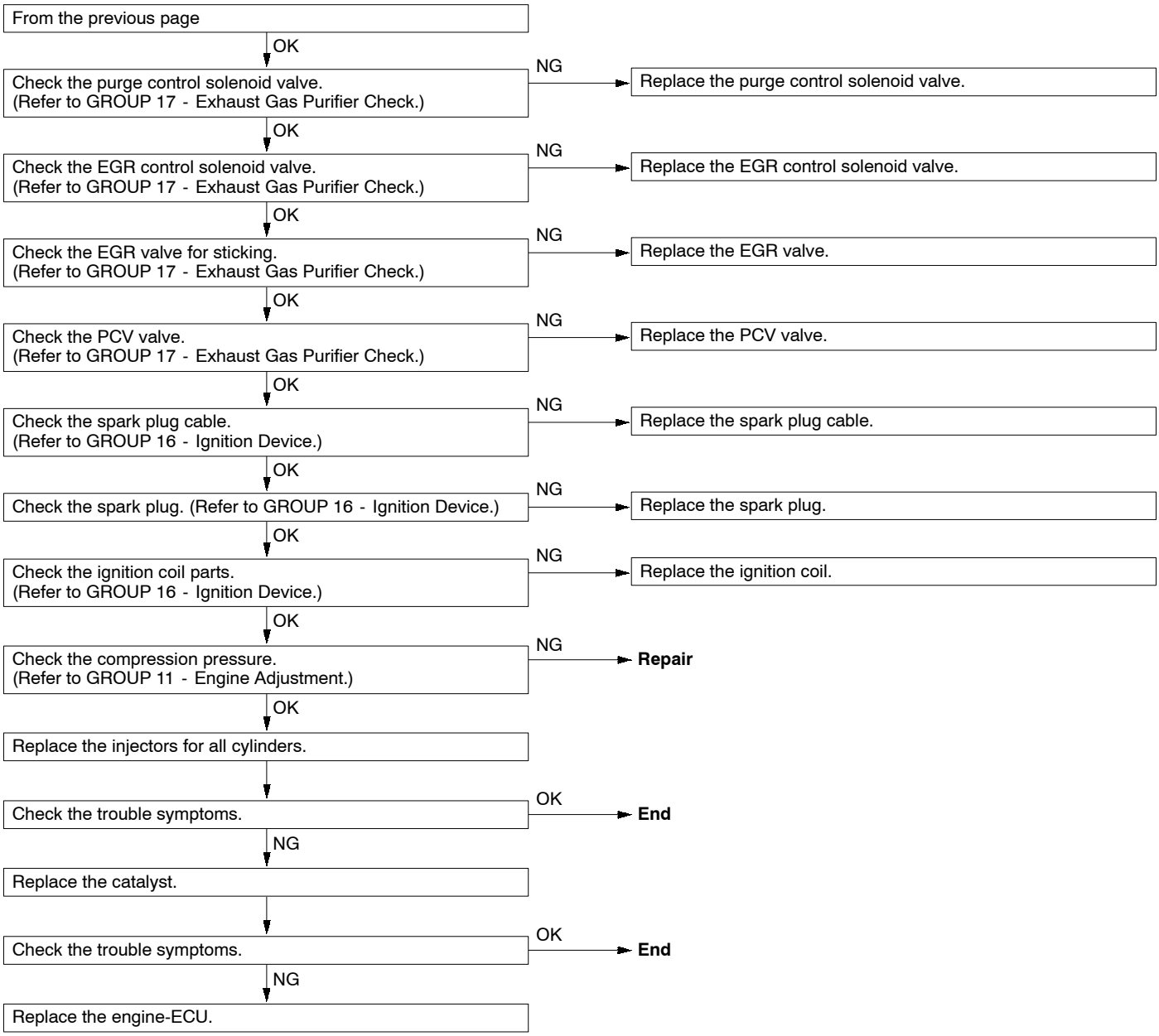
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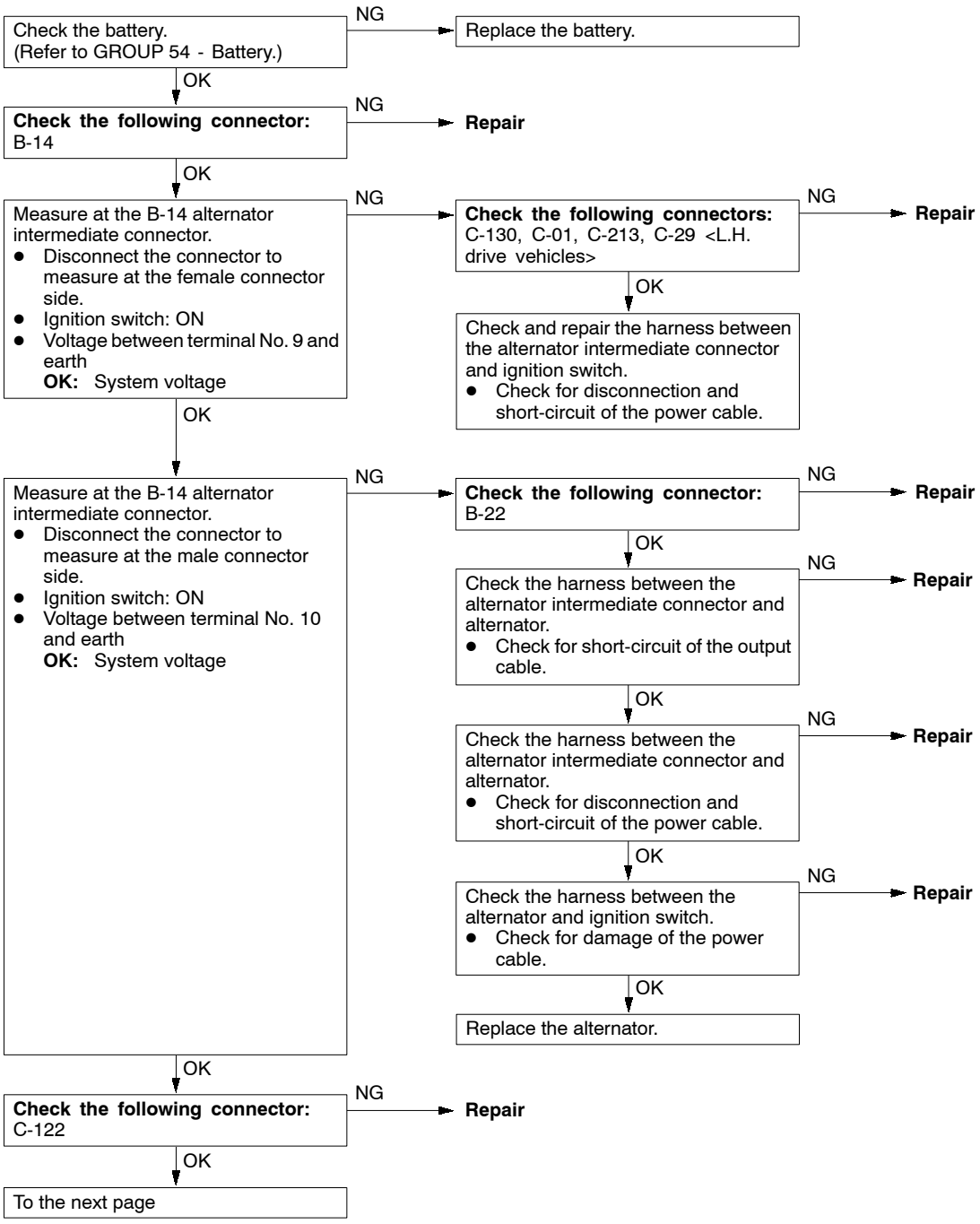
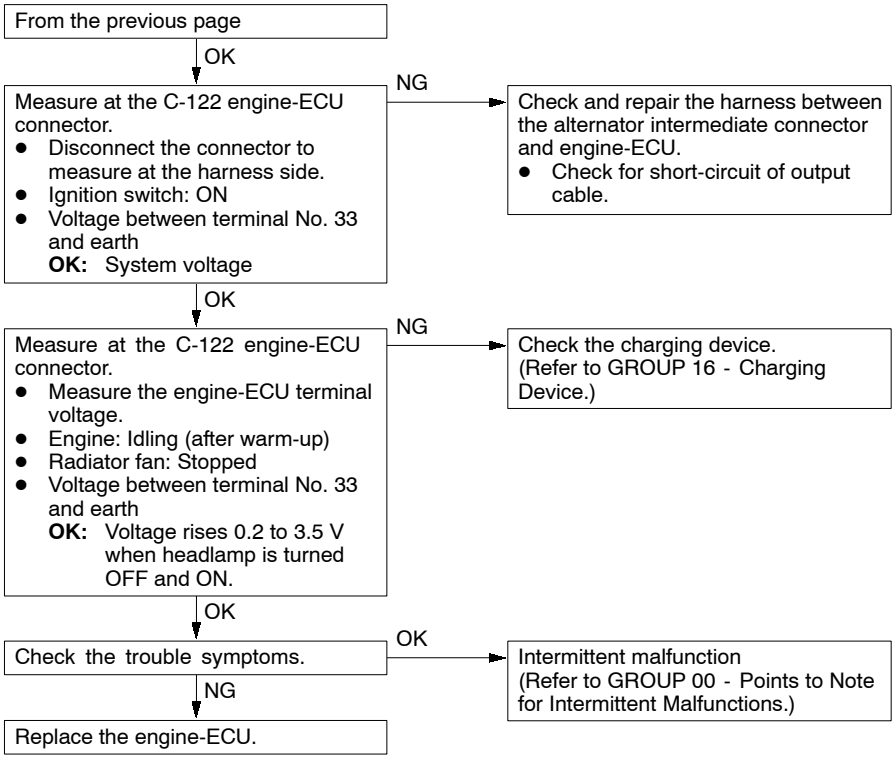
OK
Check the purge control solenoid valve. (Refer to GROUP 17 - Exhaust Gas Purifier Check.)
NG
Replace the purge control solenoid valve.
OK
Check the EGR control solenoid valve. (Refer to GROUP 17 - Exhaust Gas Purifier Check.)
NG
Replace the EGR control solenoid valve.
OK
Check the EGR valve for sticking. (Refer to GROUP 17 - Exhaust Gas Purifier Check.)
NG
Replace the EGR valve.
OK
Check the PCV valve. (Refer to GROUP 17 - Exhaust Gas Purifier Check.)
NG
Replace the PCV valve.
OK
Check the spark plug cable. (Refer to GROUP 16 - Ignition Device.)
NG
Replace the spark plug cable.
OK
Check the spark plug. (Refer to GROUP 16 - Ignition Device.)
NG
Replace the spark plug.
OK
Check the ignition coil parts. (Refer to GROUP 16 - Ignition Device.)
NG
Replace the ignition coil.
OK
Check the compression pressure. (Refer to GROUP 11 - Engine Adjustment.)
NG
Repair
OK
Replace the injectors for all cylinders.
Check the trouble symptoms.
OK
End
NG
Replace the catalyst.
Check the trouble symptoms.
OK
End
NG
Replace the engine-ECU.

## Inspection Procedure 18

| Battery dies | Probable cause |
|---|---|
| Causes shown on right are suspected. | • Battery malfunction<br>• G terminal short-circuit<br>• Alternator malfunction<br>• Engine-ECU malfunction |

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OK
Measure at the C-122 engine-ECU connector.
● Disconnect the connector to measure at the harness side.
● Ignition switch: ON
● Voltage between terminal No. 33 and earth
OK: System voltage
NG
Check and repair the harness between the alternator intermediate connector and engine-ECU.
● Check for short-circuit of output cable.
OK
Measure at the C-122 engine-ECU connector.
● Measure the engine-ECU terminal voltage.
● Engine: Idling (after warm-up)
● Radiator fan: Stopped
● Voltage between terminal No. 33 and earth
OK: Voltage rises 0.2 to 3.5 V when headlamp is turned OFF and ON.
NG
Check the charging device.
(Refer to GROUP 16 - Charging Device.)
OK
Check the trouble symptoms.
OK
Intermittent malfunction
(Refer to GROUP 00 - Points to Note for Intermittent Malfunctions.)
NG
Replace the engine-ECU.

## Inspection Procedure 19

| Overheating | Probable cause |
|---|---|
| Causes shown on right are suspected. | • Engine coolant insufficient or deteriorated<br>• Fan controller malfunction<br>• Engine coolant temperature sensor malfunction<br>• Thermostat malfunction<br>• Water pump malfunction<br>• Condenser fan relay malfunction<br>• Radiator core malfunction<br>• Engine-ECU malfunction |

**MUT-II Self-Diag Code**
Is a diagnosis code output?
YES → INSPECTION CHART FOR DIAGNOSIS CODE (Refer to P.13A-12.)
NO ↓

Check the engine coolant.
(Refer to GROUP 14 - On-vehicle Service.)
<Note>
If the engine coolant level is low, check whether the engine coolant has leaked, and repair if required.
NG → Replace or replenish the engine coolant.
OK ↓

**MUT-II Actuator Test**
- No. 21: Fan controller
- Ignition switch: ON

**OK:** Radiator fan rotates.
NG → Check the Inspection Procedure 24: Radiator fan control relay system. (Refer to P.13A-87.)
OK ↓

**MUT-II Actuator Test**
- No. 37: Condenser fan (HI)
- No. 38: Condenser fan (LOW)
- Ignition switch: ON

**OK:** Condenser fan rotates (low speed).
**OK:** Condenser fan rotates (high speed).
NG → Check the Inspection Procedure 25: Condenser fan control relay system. (Refer to P.13A-89.)
OK ↓

**MUT-II Data list**
- No. 21: Engine coolant temperaure sensor

**OK:** Approximately the same as the ambient temperature when cooled.
Between 80 - 120°C when hot.
NG → Check the Code No. P0115: Engine coolant temperature sensor system. (Refer to P.13A-19.)
OK ↓

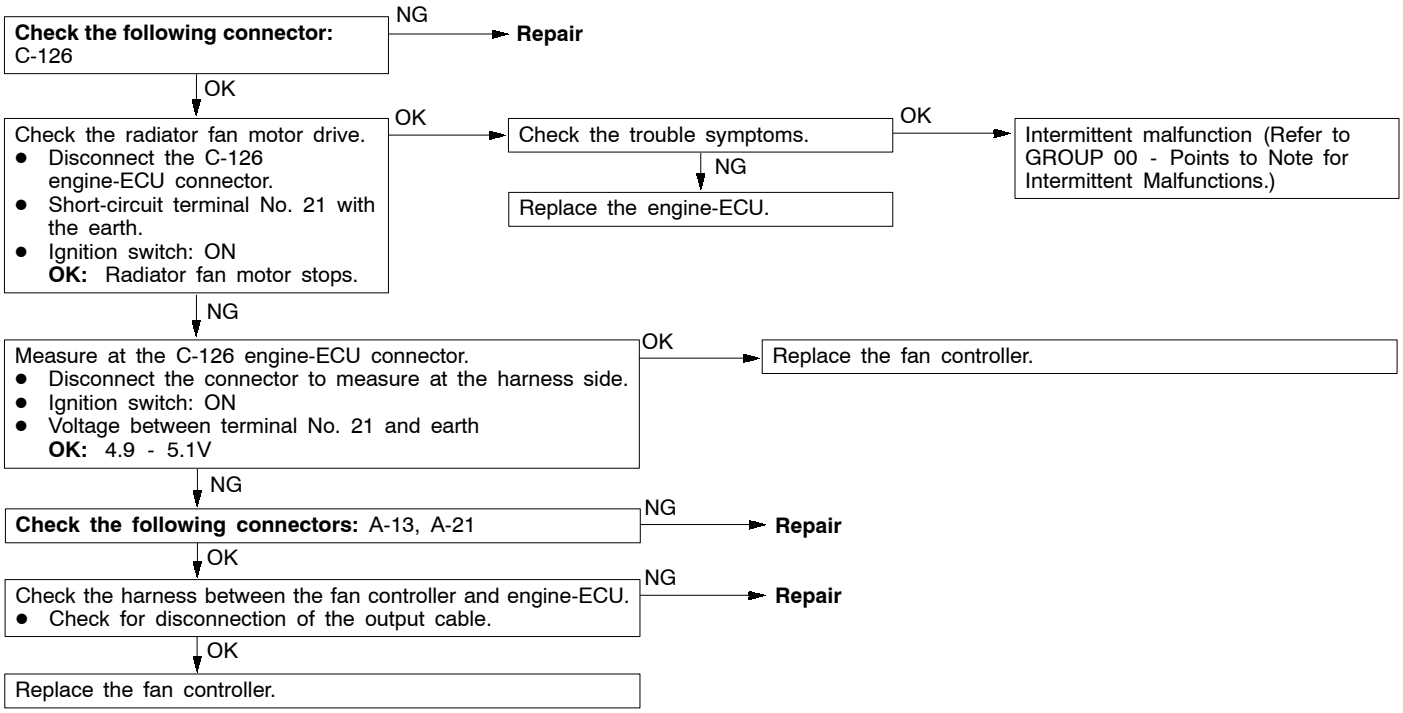
Check the thermostat. (Refer to GROUP 14 - Thermostat.)
NG → Replace the thermostat.
OK ↓

Check the water pump. (Refer to GROUP 14 - Water pump.)
NG → Replace the water pump.
OK ↓

Replace the radiator core.

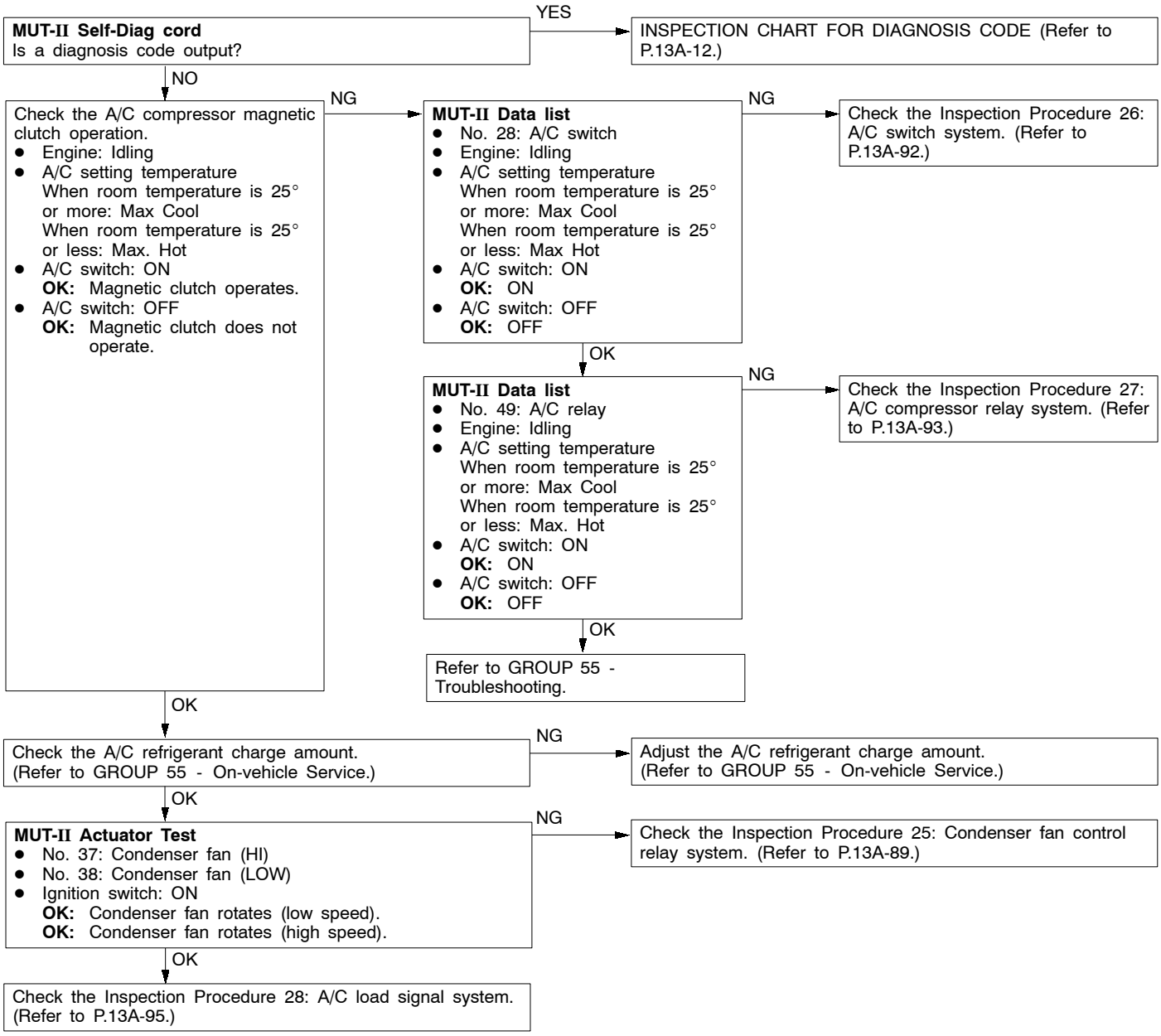
## Inspection Procedure 20

| Abnormal radiator fan motor rotation | Probable cause |
|---|---|
| Causes shown on right are suspected. | • Fan controller malfunction<br>• Engine-ECU malfunction |



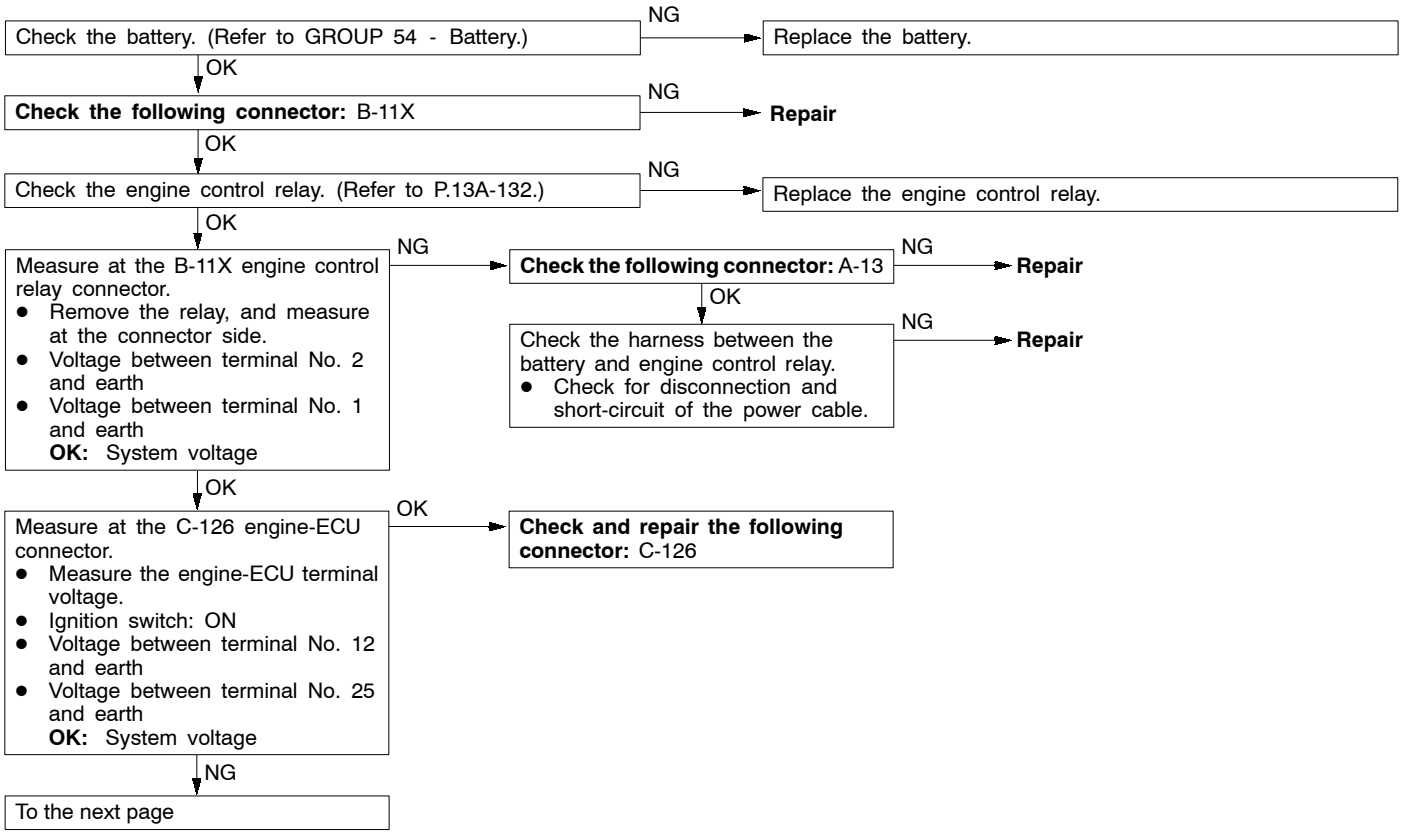
## Inspection Procedure 21

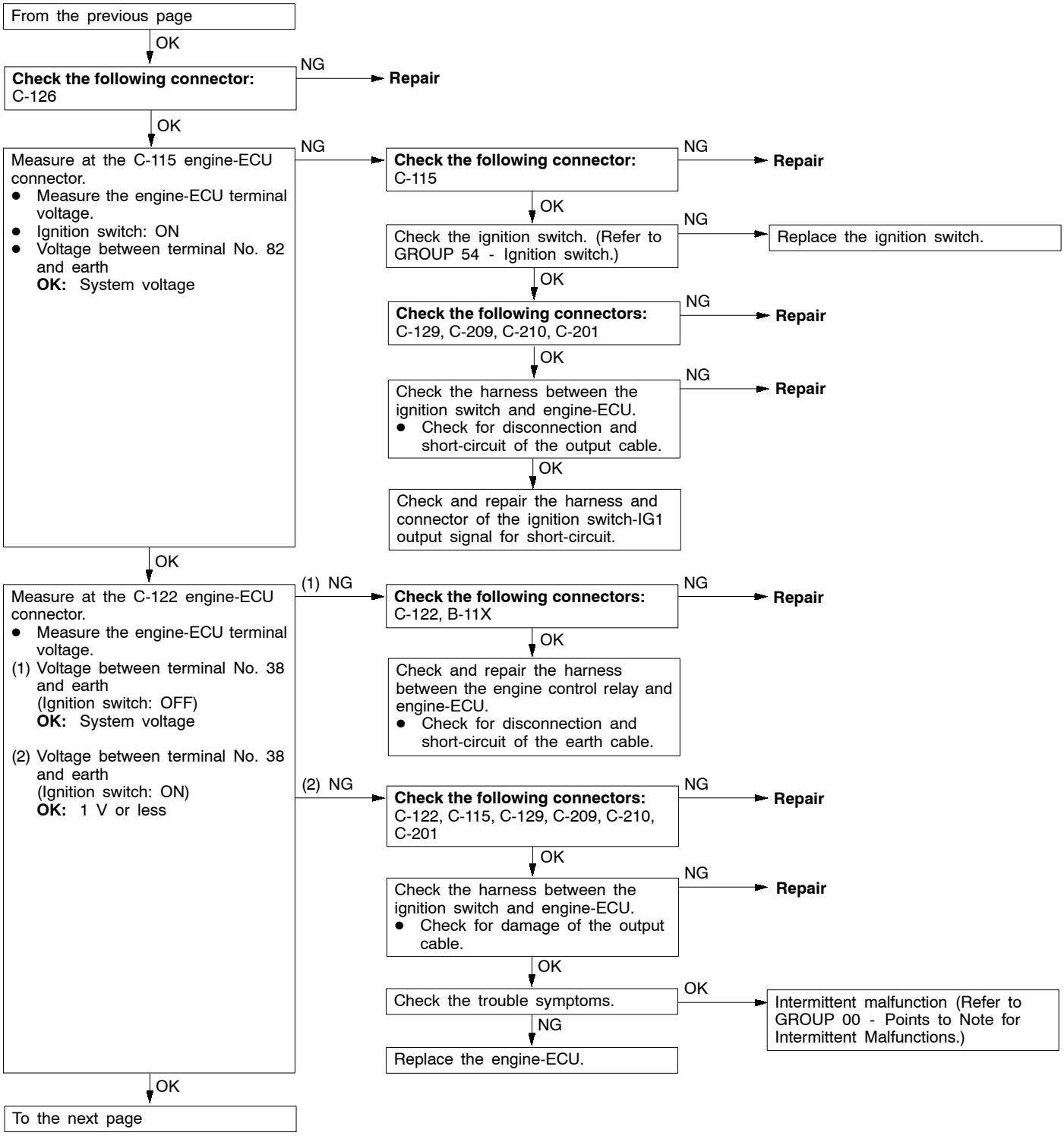
| A/C ineffective | Probable cause |
|---|---|
| Causes shown on right are suspected. | • A/C refrigerant insufficient or over-charged<br>• A/C compressor relay malfunction<br>• Condenser fan system malfunction<br>• A/C-ECU malfunction<br>• Engine-ECU malfunction |



## Inspection Procedure 22

| Engine-ECU power supply, engine control relay, ignition switch-IG1 system | Probable cause |
|---|---|
| When the ignition switch ON signal is input to the engine-ECU, the engine-ECU turns the engine control relay ON.<br>This starts the supply of the battery voltage to the engine-ECU, sensor and actuator. | • Ignition switch malfunction<br>• Engine control relay malfunction<br>• Engine-ECU malfunction |

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OK
Check the following connector: C-126
NG
Repair
OK
Measure at the C-115 engine-ECU connector.
● Measure the engine-ECU terminal voltage.
● Ignition switch: ON
● Voltage between terminal No. 82 and earth
OK: System voltage
NG
Check the following connector: C-115
NG
Repair
OK
Check the ignition switch. (Refer to GROUP 54 - Ignition switch.)
NG
Replace the ignition switch.
OK
Check the following connectors: C-129, C-209, C-210, C-201
NG
Repair
OK
Check the harness between the ignition switch and engine-ECU.
● Check for disconnection and short-circuit of the output cable.
NG
Repair
OK
Check and repair the harness and connector of the ignition switch-IG1 output signal for short-circuit.
OK
Measure at the C-122 engine-ECU connector.
● Measure the engine-ECU terminal voltage.
(1) Voltage between terminal No. 38 and earth
(Ignition switch: OFF)
OK: System voltage
(2) Voltage between terminal No. 38 and earth
(Ignition switch: ON)
OK: 1 V or less
(1) NG
Check the following connectors: C-122, B-11X
NG
Repair
OK
Check and repair the harness between the engine control relay and engine-ECU.
● Check for disconnection and short-circuit of the earth cable.
(2) NG
Check the following connectors: C-122, C-115, C-129, C-209, C-210, C-201
NG
Repair
OK
Check the harness between the ignition switch and engine-ECU.
● Check for damage of the output cable.
NG
Repair
OK
Check the trouble symptoms.
OK
Intermittent malfunction (Refer to GROUP 00 - Points to Note for Intermittent Malfunctions.)
NG
Replace the engine-ECU.
OK
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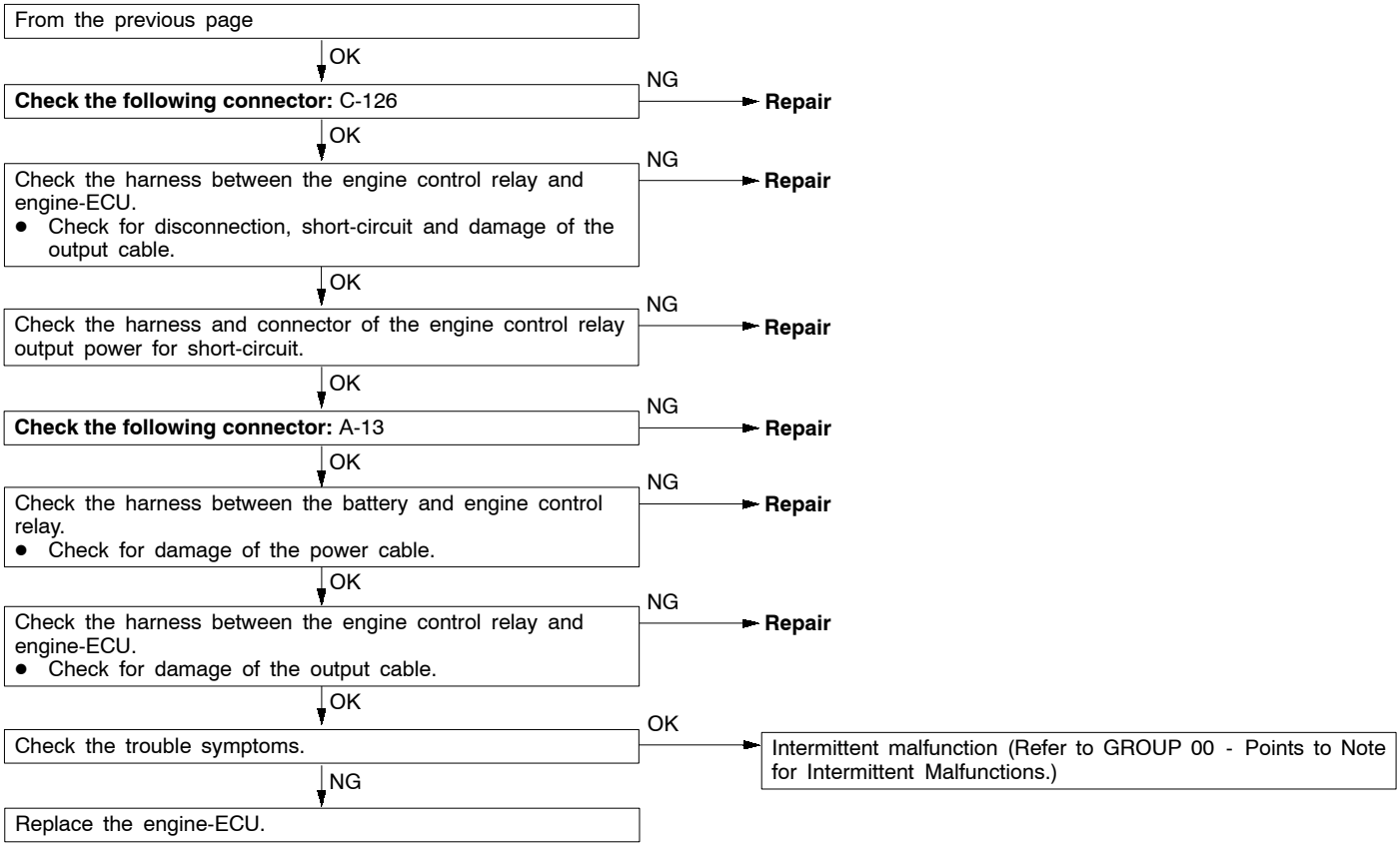
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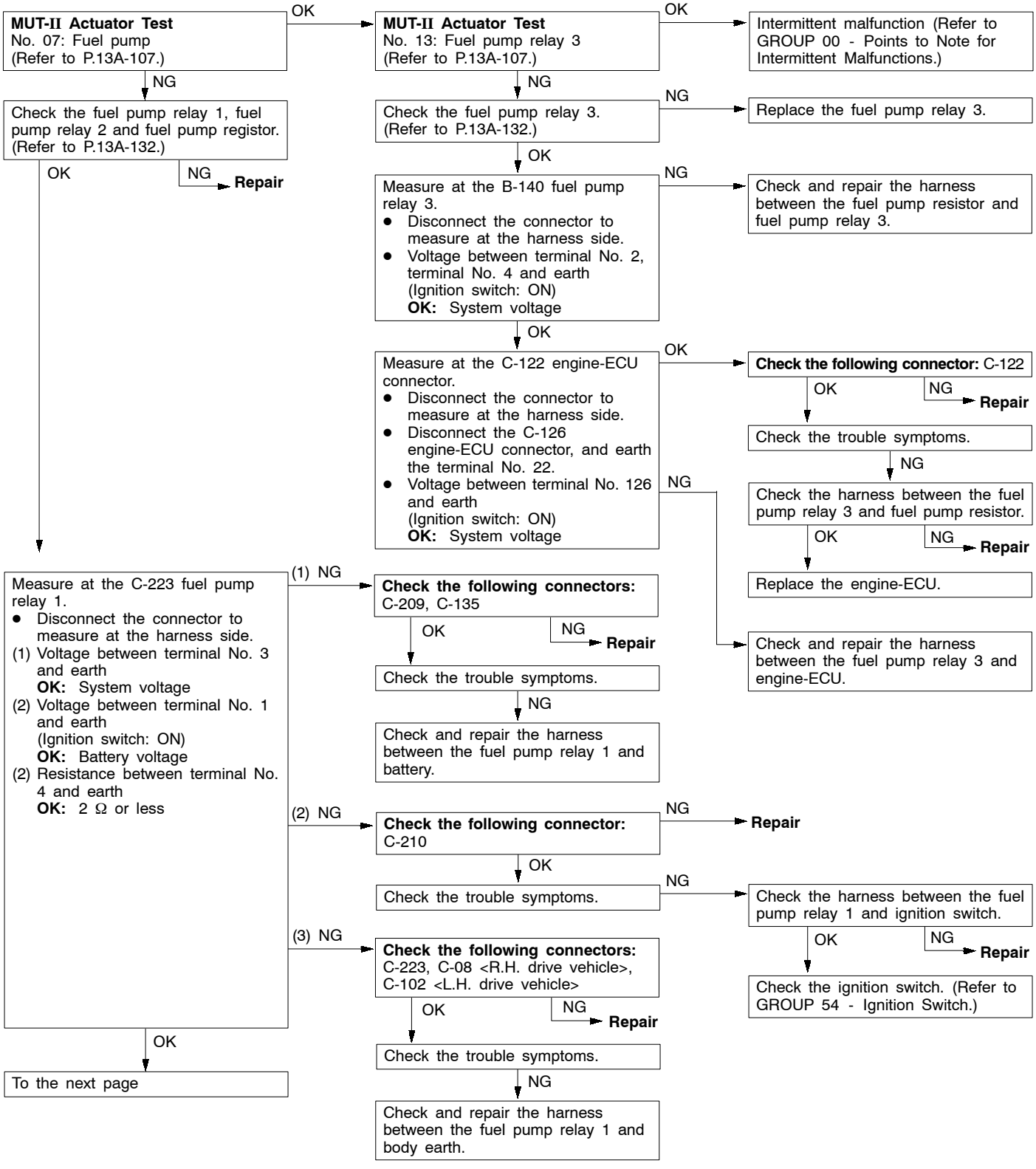
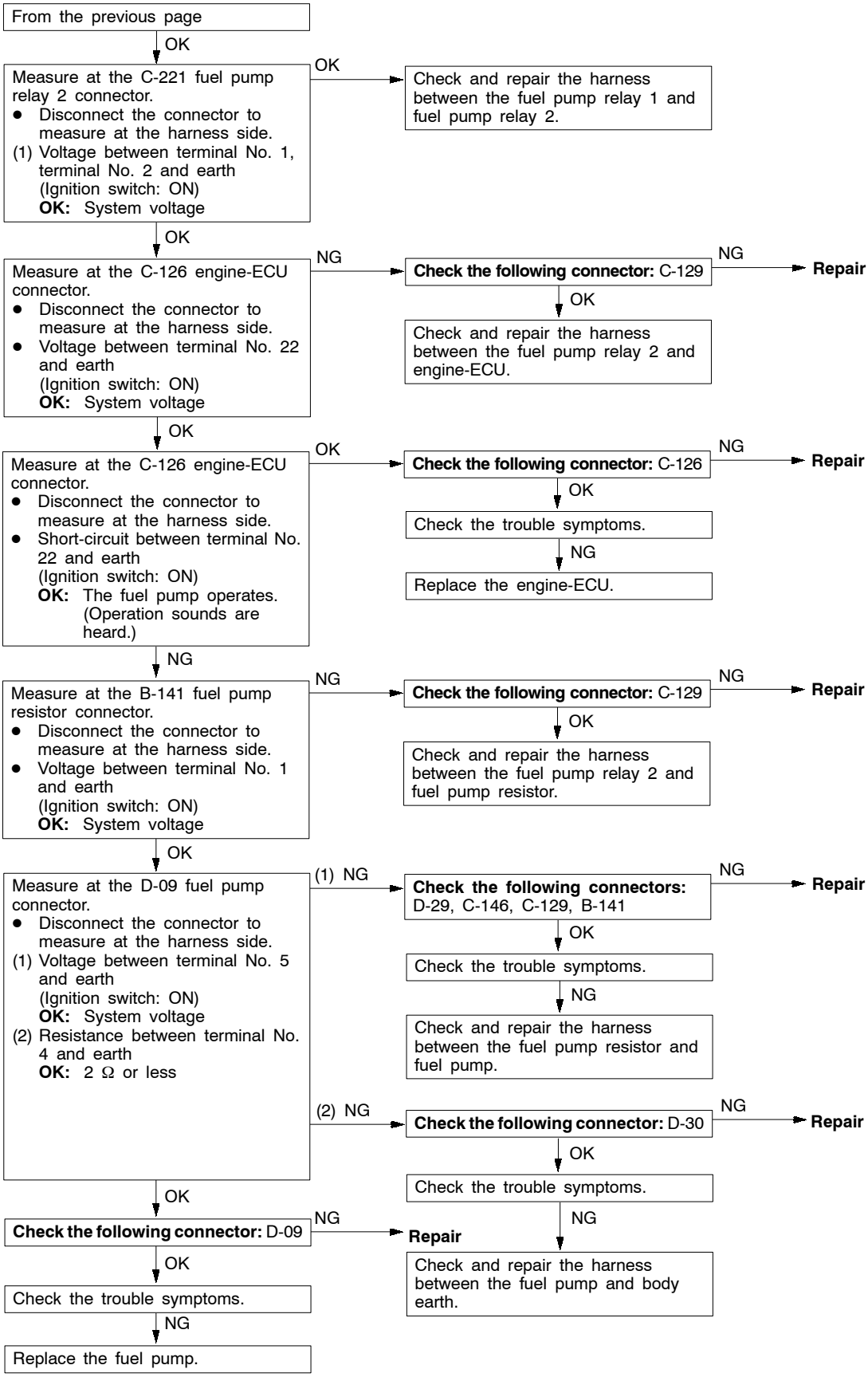
OK
Check the following connector: C-126
NG
Repair
OK
Check the harness between the engine control relay and engine-ECU.
● Check for disconnection, short-circuit and damage of the output cable.
NG
Repair
OK
Check the harness and connector of the engine control relay output power for short-circuit.
NG
Repair
OK
Check the following connector: A-13
NG
Repair
OK
Check the harness between the battery and engine control relay.
● Check for damage of the power cable.
NG
Repair
OK
Check the harness between the engine control relay and engine-ECU.
● Check for damage of the output cable.
NG
Repair
OK
Check the trouble symptoms.
OK
Intermittent malfunction (Refer to GROUP 00 - Points to Note for Intermittent Malfunctions.)
NG
Replace the engine-ECU.

## Inspection Procedure 23

| Fuel pump system | Probable cause |
|---|---|
| • The engine-ECU turns the fuel pump relay ON during cranking and engine operation, and supplies the drive power to the fuel pump.<br>• When operating with a low load, the engine-ECU supplies power to the fuel pump via the resistor. When operating with a high load, power is directly supplied and the fuel pump fuel discharge amount is increased. | • Fuel pump relay 1 malfunction<br>• Fuel pump relay 2 malfunction<br>• Fuel pump relay 3 malfunction<br>• Fuel pump resistor malfunction<br>• Fuel pump malfunction<br>• Fuel pump circuit disconnection, short-circuit, or connector contact defect<br>• Engine-ECU malfunction |

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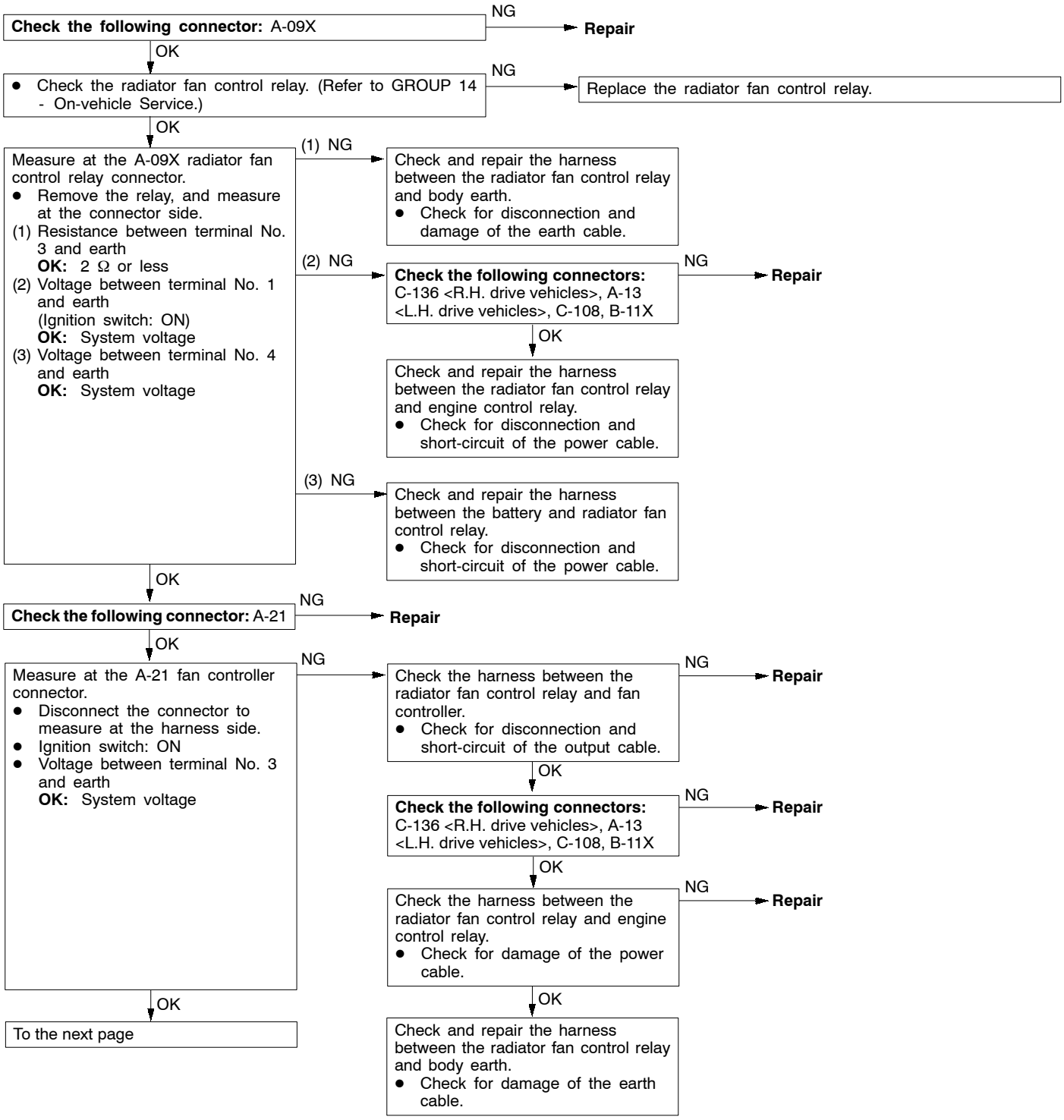
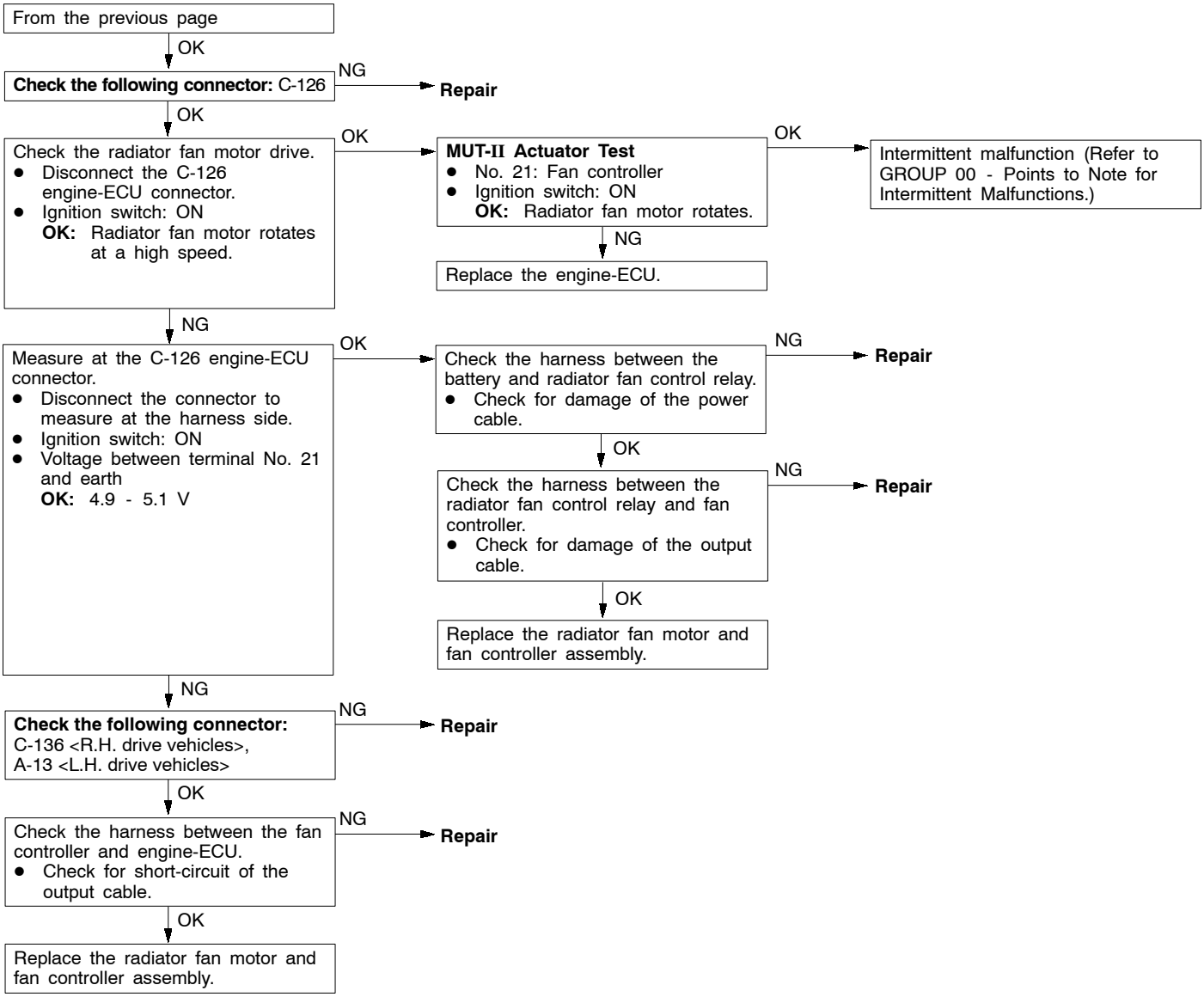
OK
Measure at the C-221 fuel pump relay 2 connector.
● Disconnect the connector to measure at the harness side.
(1) Voltage between terminal No. 1, terminal No. 2 and earth (Ignition switch: ON)
OK: System voltage
OK
Check and repair the harness between the fuel pump relay 1 and fuel pump relay 2.
OK
Measure at the C-126 engine-ECU connector.
● Disconnect the connector to measure at the harness side.
● Voltage between terminal No. 22 and earth (Ignition switch: ON)
OK: System voltage
NG
Check the following connector: C-129
NG
Repair
OK
Check and repair the harness between the fuel pump relay 2 and engine-ECU.
OK
Measure at the C-126 engine-ECU connector.
● Disconnect the connector to measure at the harness side.
● Short-circuit between terminal No. 22 and earth (Ignition switch: ON)
OK: The fuel pump operates. (Operation sounds are heard.)
OK
Check the following connector: C-126
NG
Repair
OK
Check the trouble symptoms.
NG
Replace the engine-ECU.
NG
Measure at the B-141 fuel pump resistor connector.
● Disconnect the connector to measure at the harness side.
● Voltage between terminal No. 1 and earth (Ignition switch: ON)
OK: System voltage
NG
Check the following connector: C-129
NG
Repair
OK
Check and repair the harness between the fuel pump relay 2 and fuel pump resistor.
OK
Measure at the D-09 fuel pump connector.
● Disconnect the connector to measure at the harness side.
(1) Voltage between terminal No. 5 and earth (Ignition switch: ON)
OK: System voltage
(2) Resistance between terminal No. 4 and earth
OK: 2 Ω or less
(1) NG
Check the following connectors: D-29, C-146, C-129, B-141
NG
Repair
OK
Check the trouble symptoms.
NG
Check and repair the harness between the fuel pump resistor and fuel pump.
(2) NG
Check the following connector: D-30
NG
Repair
OK
Check the trouble symptoms.
NG
Check and repair the harness between the fuel pump and body earth.
OK
Check the following connector: D-09
NG
Repair
OK
Check the trouble symptoms.
NG
Replace the fuel pump.

## Inspection Procedure 24

| Radiator fan control relay system | Probable cause |
|---|---|
| When the engine control relay turns ON, the radiator fan control relay turns ON simultaneously, and power is supplied to the fan controller.<br>The radiator fan motor is driven when the fan motor drive signal is input to the fan controller from the engine-ECU. | • Radiator fan control relay malfunction<br>• Fan controller malfunction<br>• Radiator fan motor malfunction<br>• Engine-ECU malfunction |

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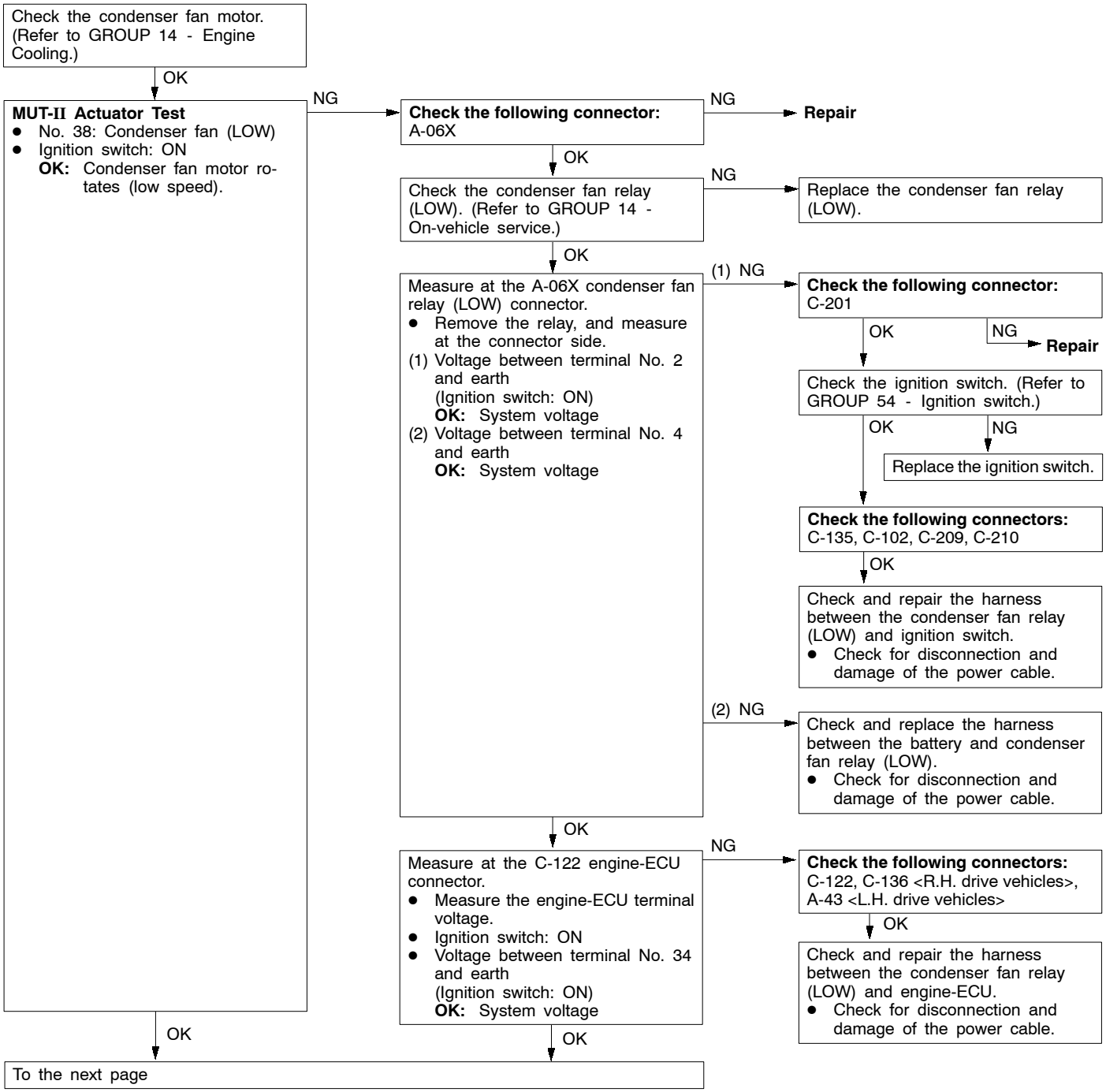
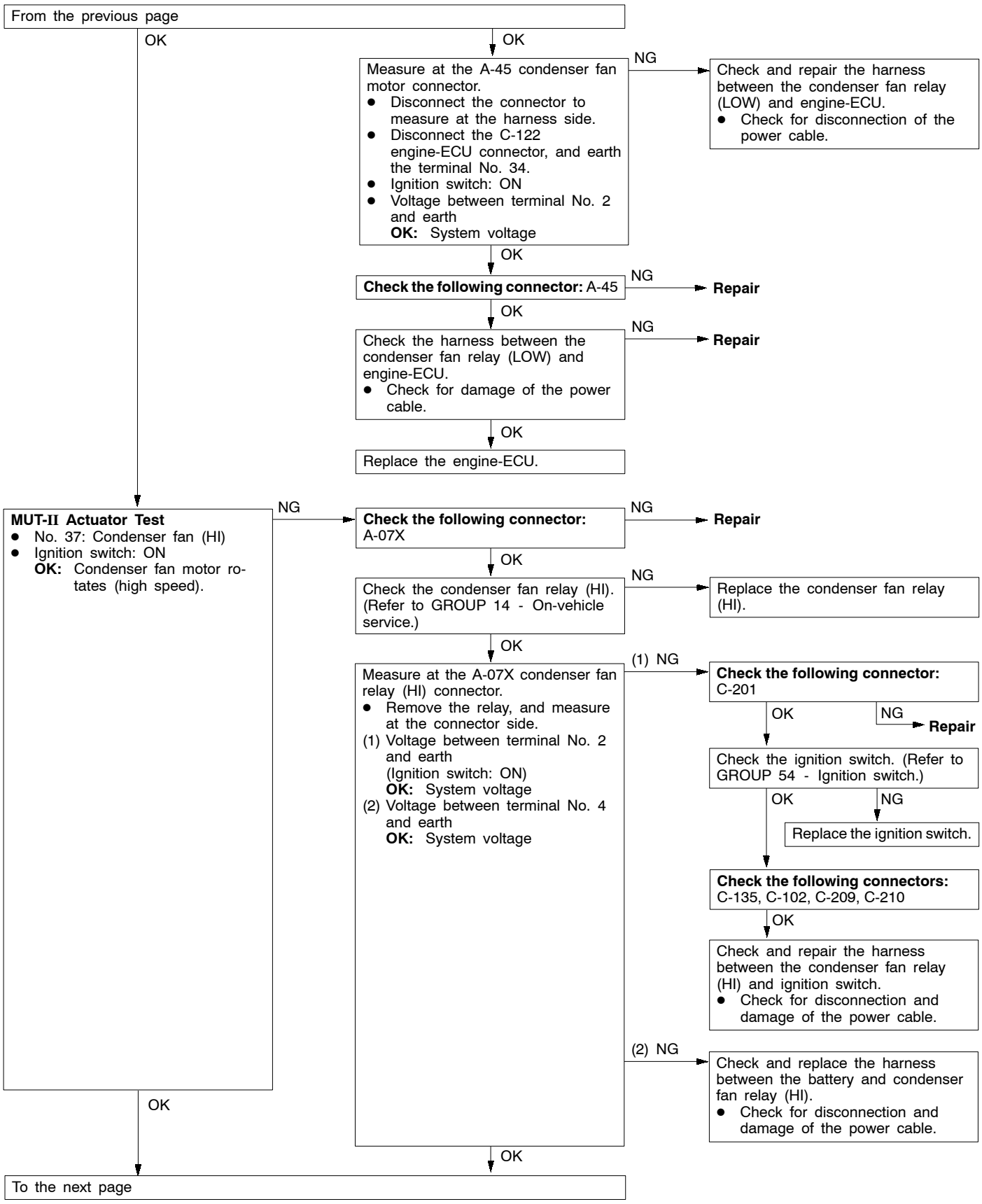
OK
Check the following connector: C-126
NG
Repair
OK
Check the radiator fan motor drive.
● Disconnect the C-126 engine-ECU connector.
● Ignition switch: ON
OK: Radiator fan motor rotates at a high speed.
OK
MUT-II Actuator Test
● No. 21: Fan controller
● Ignition switch: ON
OK: Radiator fan motor rotates.
OK
Intermittent malfunction (Refer to GROUP 00 - Points to Note for Intermittent Malfunctions.)
NG
Replace the engine-ECU.
NG
Measure at the C-126 engine-ECU connector.
● Disconnect the connector to measure at the harness side.
● Ignition switch: ON
● Voltage between terminal No. 21 and earth
OK: 4.9 - 5.1 V
OK
Check the harness between the battery and radiator fan control relay.
● Check for damage of the power cable.
NG
Repair
OK
Check the harness between the radiator fan control relay and fan controller.
● Check for damage of the output cable.
NG
Repair
OK
Replace the radiator fan motor and fan controller assembly.
NG
Check the following connector:
C-136 <R.H. drive vehicles>,
A-13 <L.H. drive vehicles>
NG
Repair
OK
Check the harness between the fan controller and engine-ECU.
● Check for short-circuit of the output cable.
NG
Repair
OK
Replace the radiator fan motor and fan controller assembly.

## Inspection Procedure 25

| Condenser fan relay system | Probable cause |
|---|---|
| The condenser fan relay turns ON with the signal from the engine-ECU, and power is supplied to the condenser fan motor. | • Condenser fan relay (HI) malfunction<br>• Condenser fan relay (LOW) malfunction<br>• Condenser fan motor malfunction<br>• Condenser fan circuit disconnection, short-circuit, or connector contact defect<br>• Engine-ECU malfunction |

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OK
OK
Measure at the A-45 condenser fan motor connector.
● Disconnect the connector to measure at the harness side.
● Disconnect the C-122 engine-ECU connector, and earth the terminal No. 34.
● Ignition switch: ON
● Voltage between terminal No. 2 and earth
OK: System voltage
NG
Check and repair the harness between the condenser fan relay (LOW) and engine-ECU.
● Check for disconnection of the power cable.
OK
Check the following connector: A-45
NG
Repair
OK
Check the harness between the condenser fan relay (LOW) and engine-ECU.
● Check for damage of the power cable.
NG
Repair
OK
Replace the engine-ECU.
MUT-II Actuator Test
● No. 37: Condenser fan (HI)
● Ignition switch: ON
OK: Condenser fan motor rotates (high speed).
NG
Check the following connector: A-07X
NG
Repair
OK
Check the condenser fan relay (HI). (Refer to GROUP 14 - On-vehicle service.)
NG
Replace the condenser fan relay (HI).
OK
Measure at the A-07X condenser fan relay (HI) connector.
● Remove the relay, and measure at the connector side.
(1) Voltage between terminal No. 2 and earth
(Ignition switch: ON)
OK: System voltage
(2) Voltage between terminal No. 4 and earth
OK: System voltage
(1) NG
Check the following connector: C-201
OK
NG
Repair
Check the ignition switch. (Refer to GROUP 54 - Ignition switch.)
OK
NG
Replace the ignition switch.
Check the following connectors: C-135, C-102, C-209, C-210
OK
Check and repair the harness between the condenser fan relay (HI) and ignition switch.
● Check for disconnection and damage of the power cable.
(2) NG
Check and replace the harness between the battery and condenser fan relay (HI).
● Check for disconnection and damage of the power cable.
OK
OK
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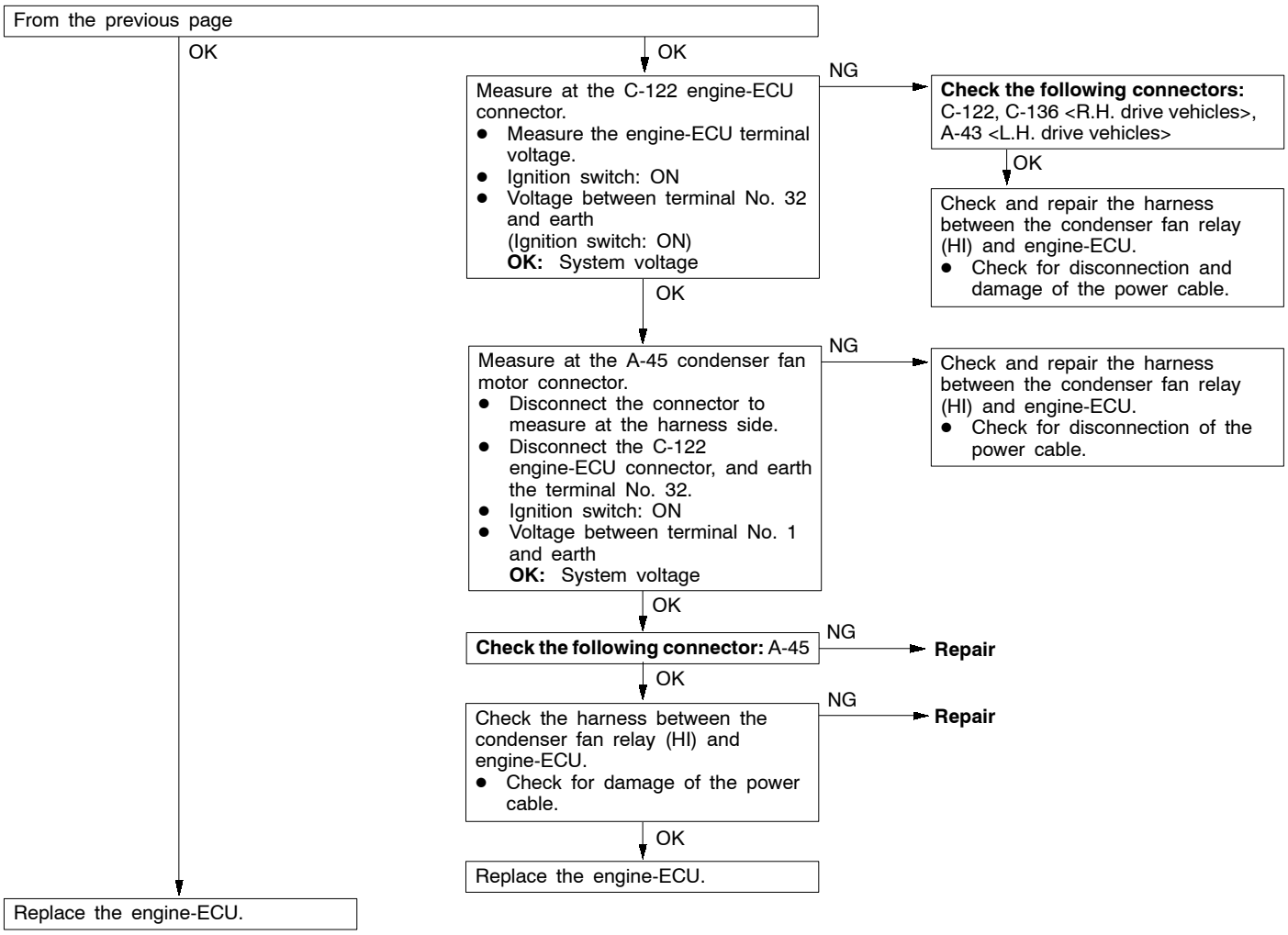
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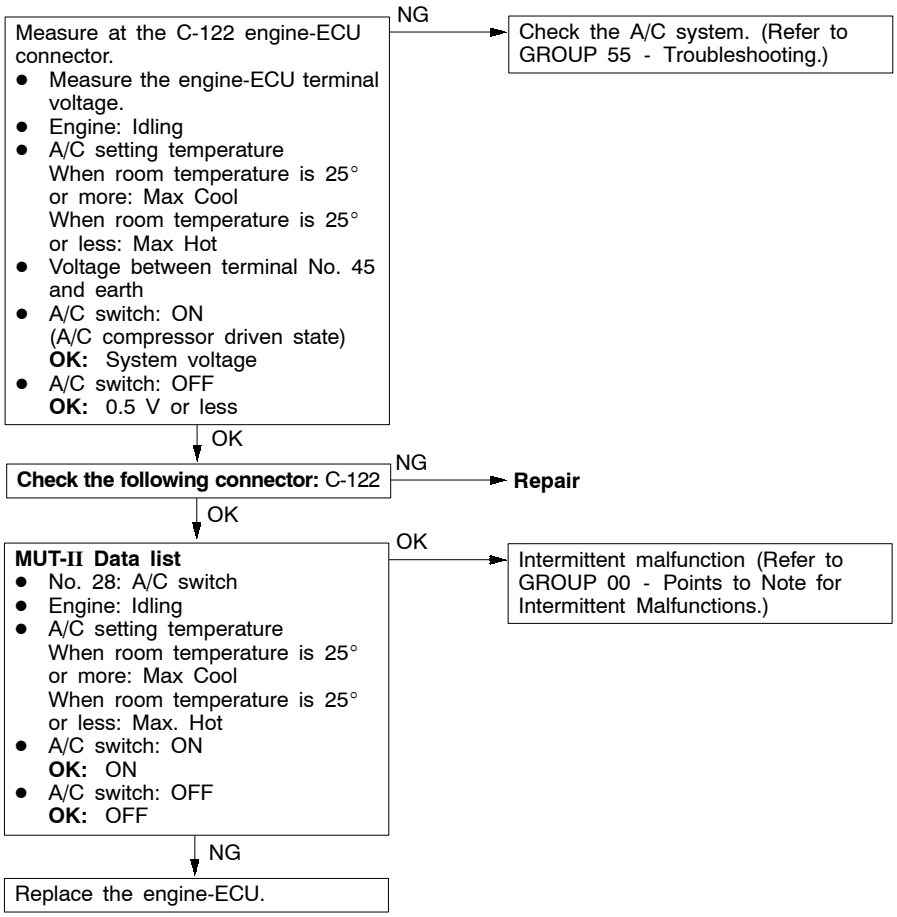
OK
OK
Measure at the C-122 engine-ECU connector.
● Measure the engine-ECU terminal voltage.
● Ignition switch: ON
● Voltage between terminal No. 32 and earth (Ignition switch: ON)
OK: System voltage
NG
Check the following connectors: C-122, C-136 <R.H. drive vehicles>, A-43 <L.H. drive vehicles>
OK
Check and repair the harness between the condenser fan relay (HI) and engine-ECU.
● Check for disconnection and damage of the power cable.
OK
Measure at the A-45 condenser fan motor connector.
● Disconnect the connector to measure at the harness side.
● Disconnect the C-122 engine-ECU connector, and earth the terminal No. 32.
● Ignition switch: ON
● Voltage between terminal No. 1 and earth
OK: System voltage
NG
Check and repair the harness between the condenser fan relay (HI) and engine-ECU.
● Check for disconnection of the power cable.
OK
Check the following connector: A-45
NG
Repair
OK
Check the harness between the condenser fan relay (HI) and engine-ECU.
● Check for damage of the power cable.
NG
Repair
OK
Replace the engine-ECU.
Replace the engine-ECU.

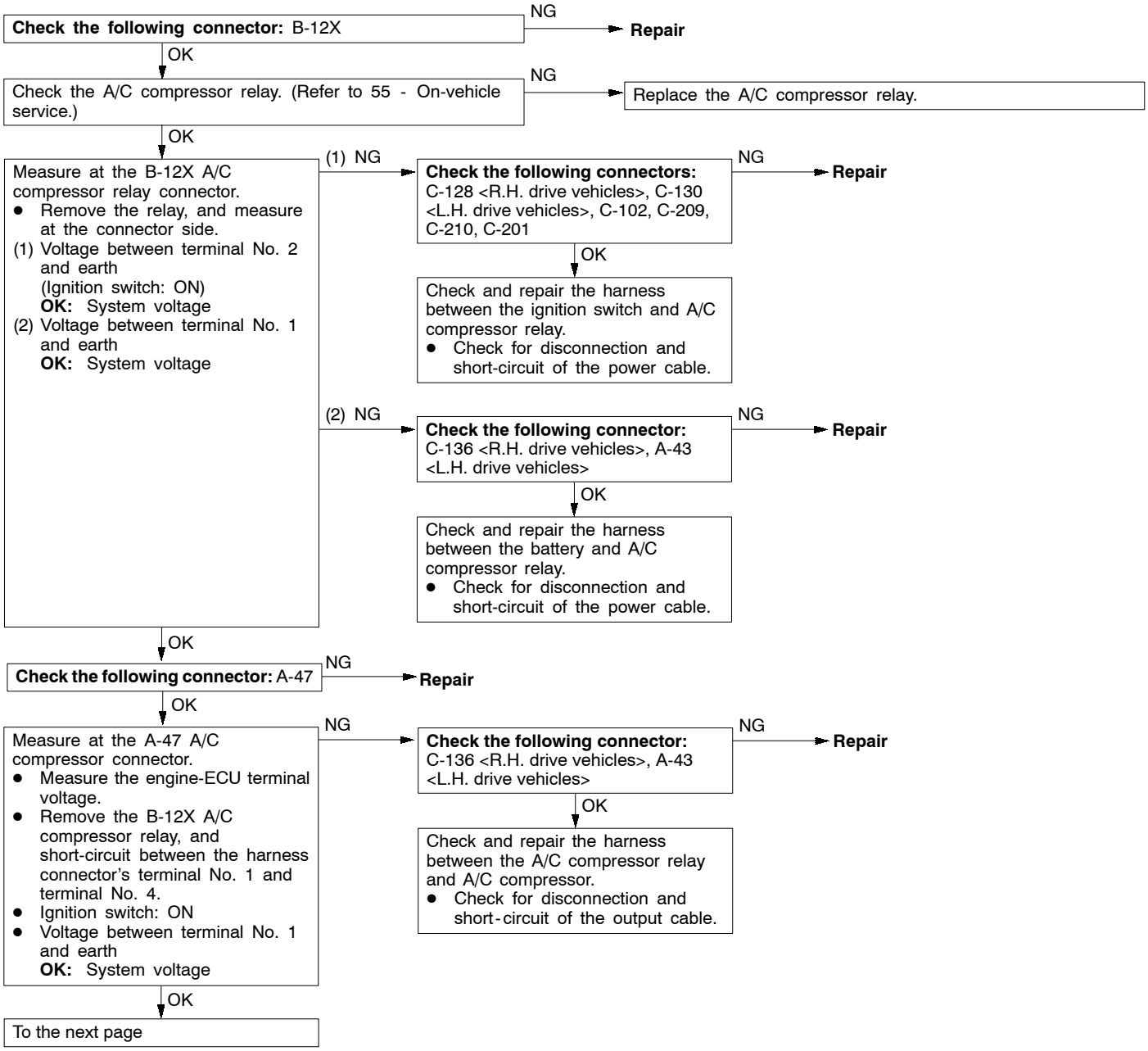
## Inspection Procedure 26

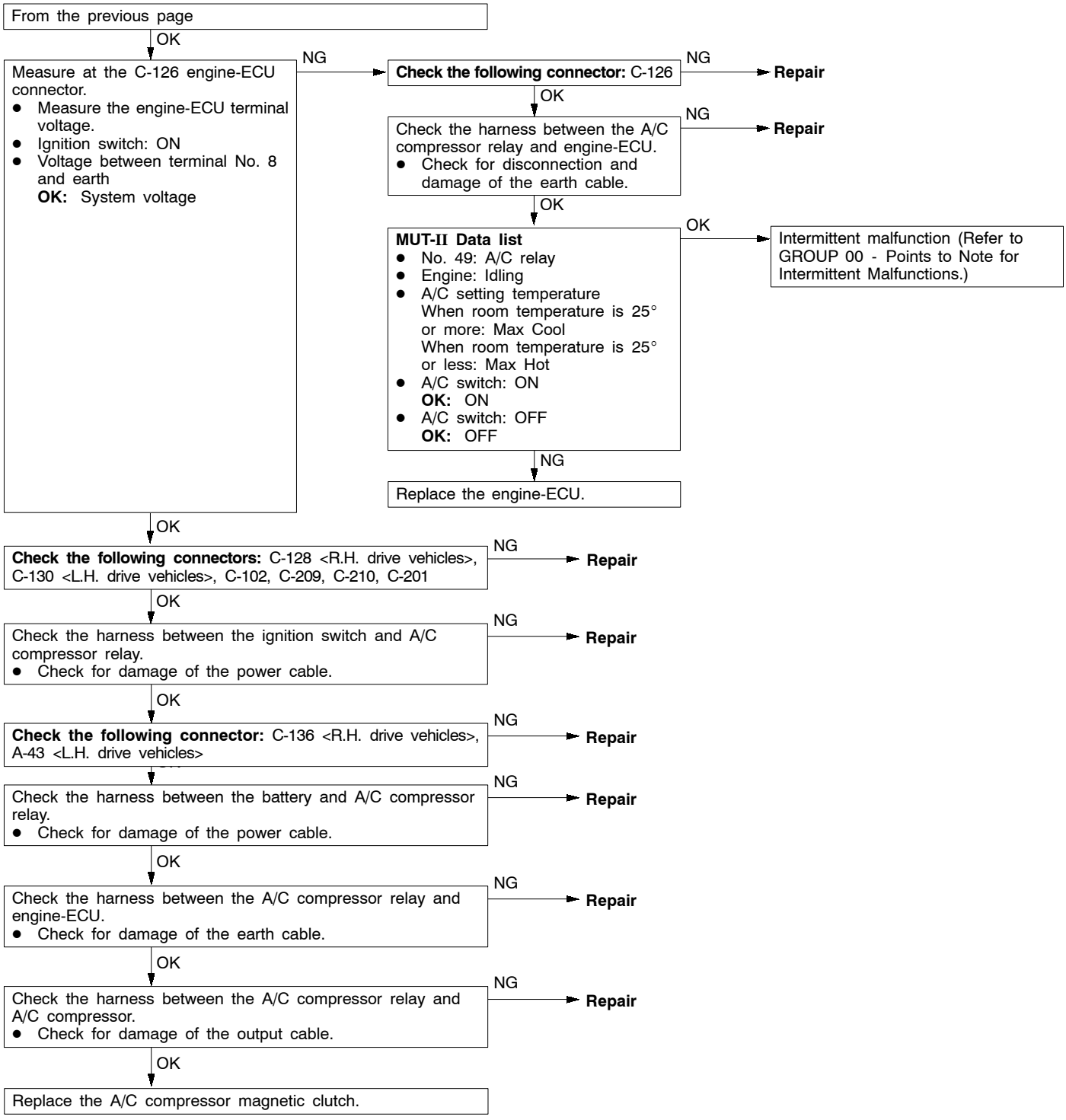
| A/C switch system | Probable cause |
|---|---|
| When the A/C switch on the control panel is turned ON, the A/C switch ON signal is input to the engine-ECU. After receiving this signal, the engine-ECU turns the A/C compressor ON. | • Control panel A/C switch malfunction<br>• A/C system malfunction<br>• Engine-ECU malfunction |



## Inspection Procedure 27

| A/C compressor relay system | Probable cause |
|---|---|
| When the A/C switch ON signal is input to the engine-ECU, the engine-ECU turns the A/C compressor relay ON.<br>The A/C compressor magnetic clutch starts with this. | • A/C compressor relay malfunction<br>• A/C compressor magnetic clutch malfunction<br>• Engine-ECU malfunction |

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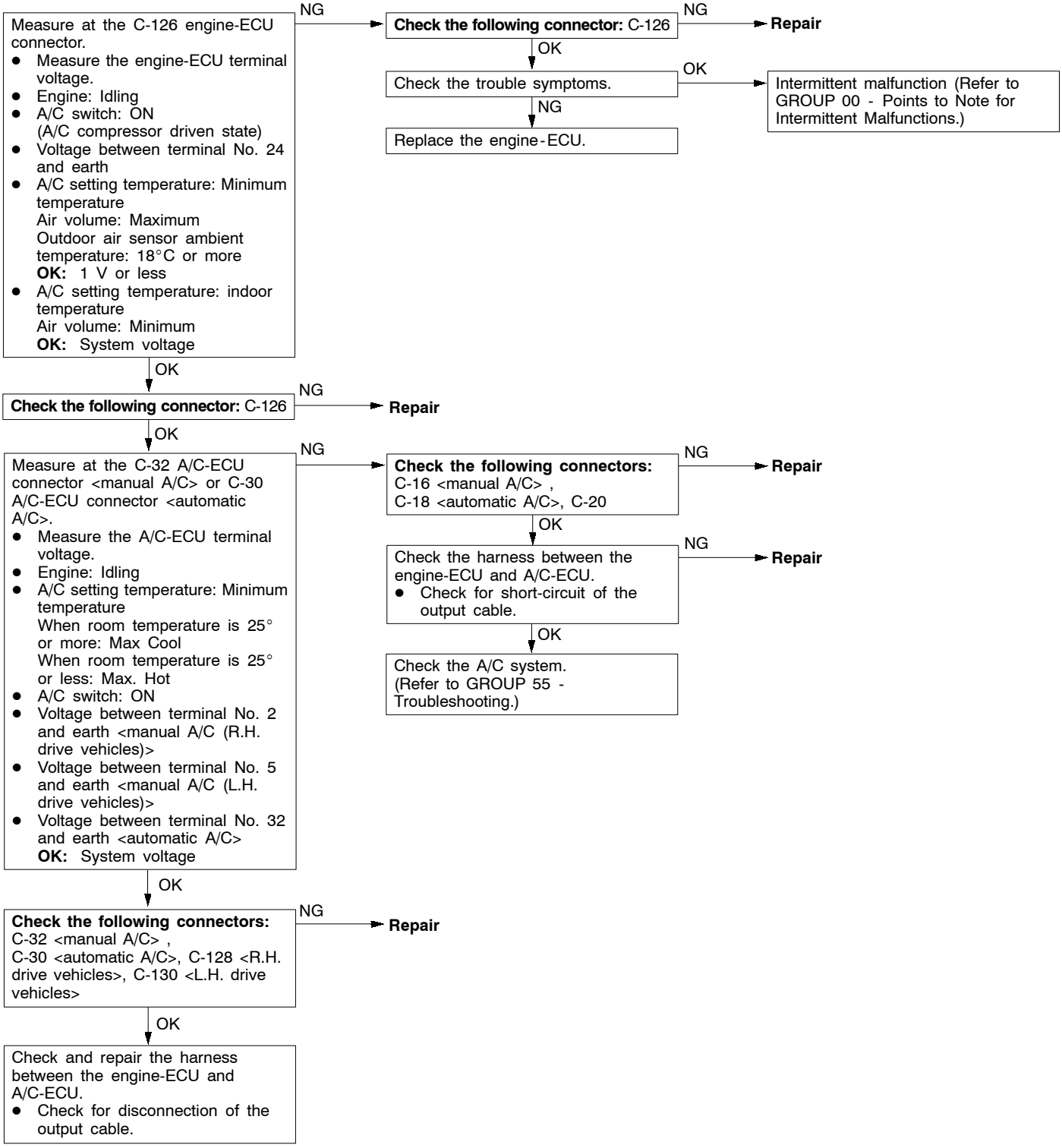
OK
Measure at the C-126 engine-ECU connector.
● Measure the engine-ECU terminal voltage.
● Ignition switch: ON
● Voltage between terminal No. 8 and earth
OK: System voltage
NG
Check the following connector: C-126
NG
Repair
OK
Check the harness between the A/C compressor relay and engine-ECU.
● Check for disconnection and damage of the earth cable.
NG
Repair
OK
MUT-II Data list
● No. 49: A/C relay
● Engine: Idling
● A/C setting temperature
When room temperature is 25° or more: Max Cool
When room temperature is 25° or less: Max Hot
● A/C switch: ON
OK: ON
● A/C switch: OFF
OK: OFF
OK
Intermittent malfunction (Refer to GROUP 00 - Points to Note for Intermittent Malfunctions.)
NG
Replace the engine-ECU.
OK
Check the following connectors: C-128 <R.H. drive vehicles>, C-130 <L.H. drive vehicles>, C-102, C-209, C-210, C-201
NG
Repair
OK
Check the harness between the ignition switch and A/C compressor relay.
● Check for damage of the power cable.
NG
Repair
OK
Check the following connector: C-136 <R.H. drive vehicles>, A-43 <L.H. drive vehicles>
NG
Repair
Check the harness between the battery and A/C compressor relay.
● Check for damage of the power cable.
NG
Repair
OK
Check the harness between the A/C compressor relay and engine-ECU.
● Check for damage of the earth cable.
NG
Repair
OK
Check the harness between the A/C compressor relay and A/C compressor.
● Check for damage of the output cable.
NG
Repair
OK
Replace the A/C compressor magnetic clutch.

## Inspection Procedure 28

| A/C load signal system | Probable cause |
|---|---|
| The size of the A/C compressor load is detected according to the difference in set temperature. When the A/C large load signal is input to the engine-ECU, the engine-ECU judges that the A/C compressor load is large, and controls the throttle valve control servo so that the idling speed increases. | • A/C-ECU malfunction<br>• Engine-ECU malfunction |



## Inspection Procedure 29

| Secondary air control solenoid valve system | Probable cause |
|---|---|
| The secondary air control solenoid valve switches the pressure led into the secondary air valve between the intake manifold and the atmospheric pressure. | • Secondary air control solenoid valve malfunction<br>• Engine-ECU malfunction |

**MUT-II Actuator Test**
- No. 36: Secondary air control solenoid valve
  **OK:** Operation sound is heard, and there is vibration.

OK → Intermittent malfunction (Refer to GROUP 00 - Points to Note for Intermittent Malfunctions.)

NG ↓

**Check the following connector:** B-142

NG → **Repair**

OK ↓

Measure at the B-142 secondary air control solenoid valve connector.
- Disconnect the connector to measure at the solenoid valve side.
- Resistance between terminal No. 1 and terminal No. 2
  **OK:** 29 - 35 Ω (at 20°C)

NG → Replace the secondary air control solenoid valve.

OK ↓

Measure at the B-142 secondary air control solenoid valve connector.
- Disconnect the connector to measure at the harness side.
- Ignition switch: ON
- Voltage between terminal No. 1 and earth
  **OK:** System voltage

NG → **Check the following connectors:** B-14, B-11X

NG → **Repair**

OK ↓

Check and repair the harness between the secondary air control solenoid valve and engine control relay.
- Check for disconnection and short-circuit of the power cable.

OK ↓

Measure at the C-118 engine-ECU connector.
- Disconnect the connector to measure at the haness side.
- Ignition switch: ON
- Voltage between terminal No. 53 and earth
  **OK:** System voltage

NG → **Check the following connectors:** B-14, B-11X

NG → **Repair**

OK ↓

Check and repair the harness between the secondary air control solenoid valve and engine-ECU.
- Check for disconnection and short-circuit of the output cable.

OK ↓

**Check the following connector:** C-118

OK ↓ / NG → **Repair**

Check the harness between the secondary air control solenoid valve and engine-ECU.
- Check for damage of the output cable.

OK ↓ / NG → **Repair**

Check the harness between the secondary air control solenoid valve and engine control relay.
- Check for damage of the power cable.

NG → **Repair**

OK ↓

**MUT-II Actuator Test**
- No. 36: Secondary air control solenoid valve
  **OK:** Operation sound is heard, and there is vibration.

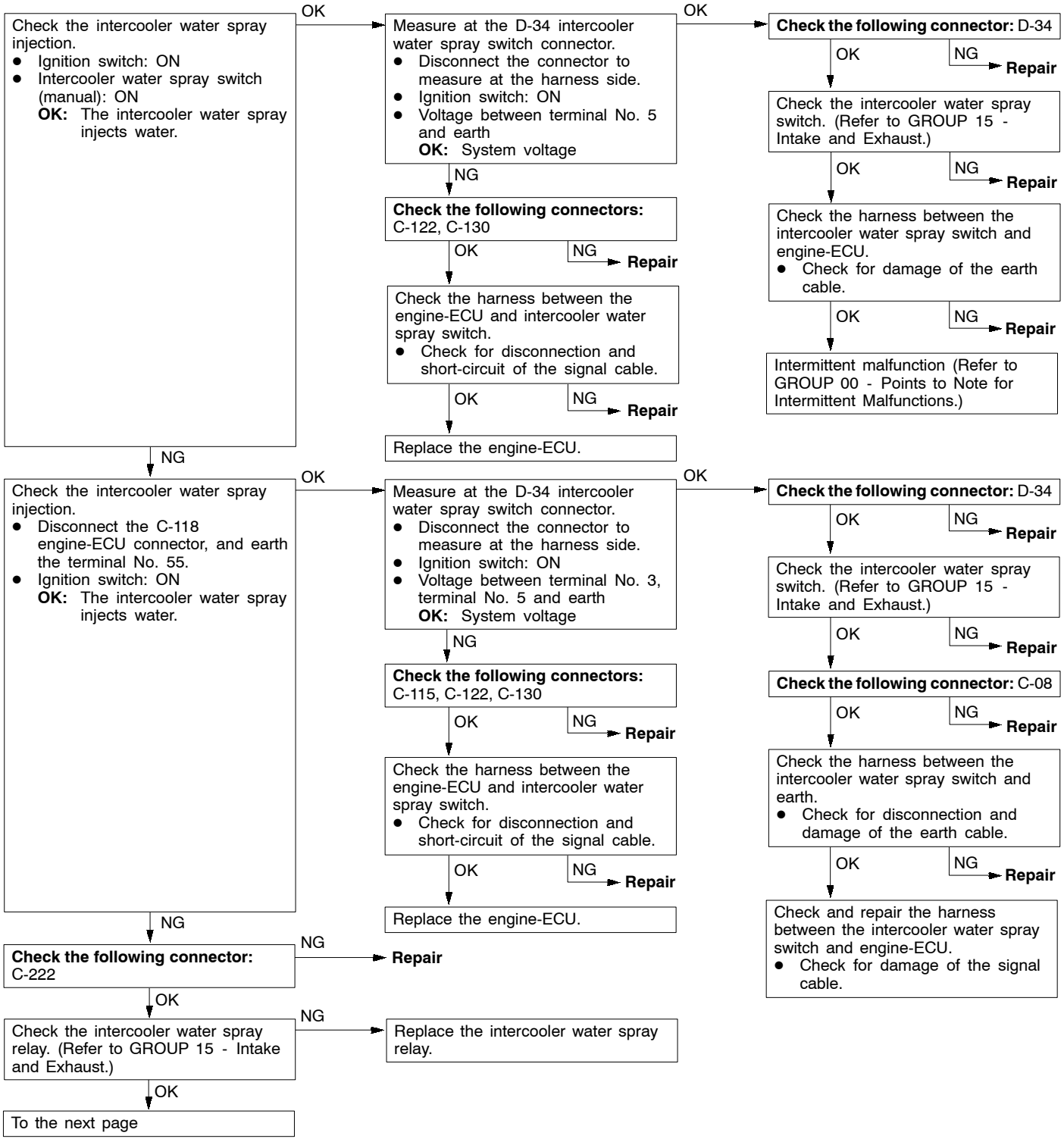
OK → Intermittent malfunction (Refer to GROUP 00 - Points to Note for Intermittent Malfunctions.)

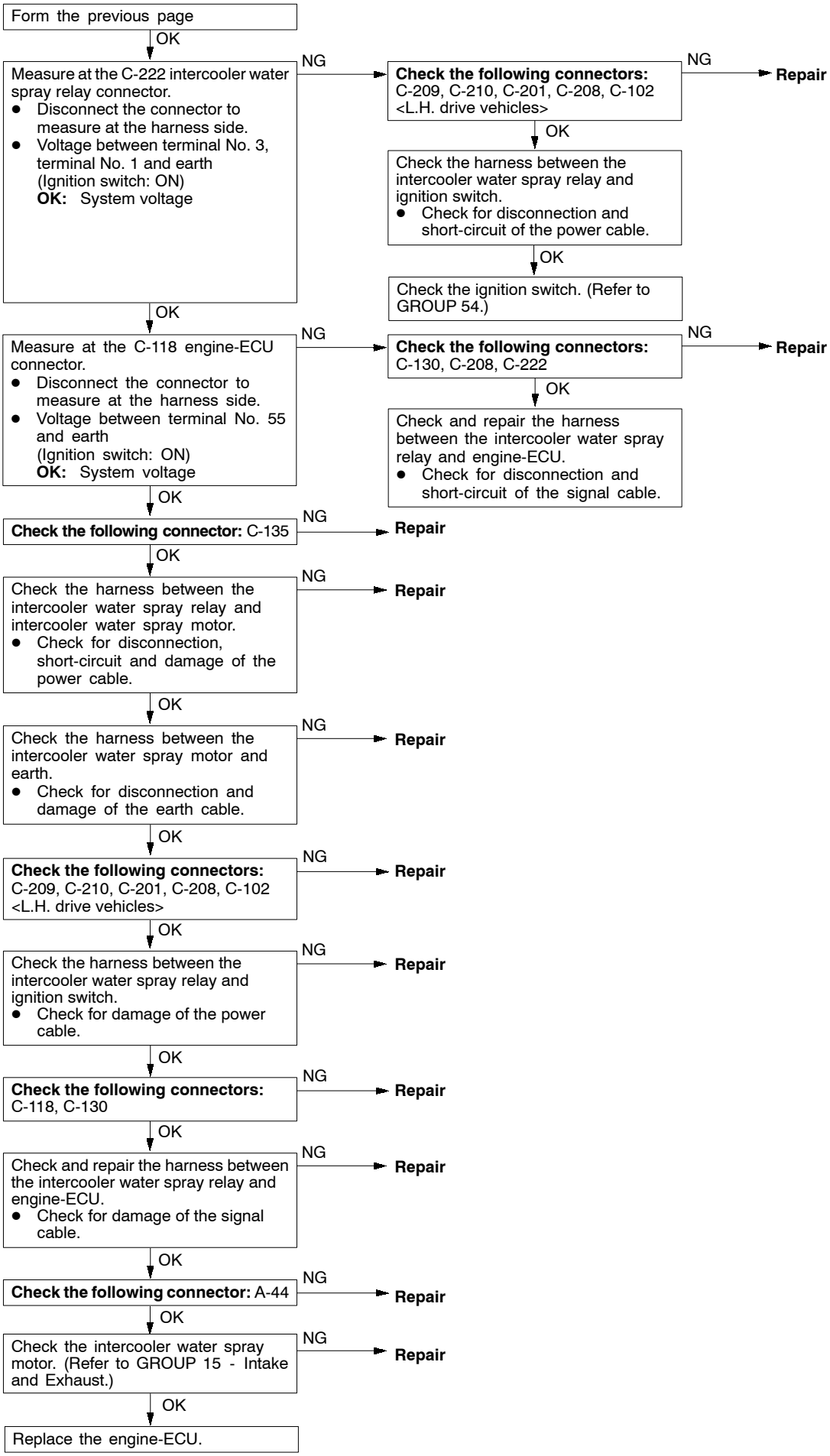
NG ↓

Replace the engine-ECU.

## Inspection Procedure 30

| Intercooler water spray circuit system | Probable cause |
|---|---|
| • When the intercooler water spray switch (manual) turns ON, the intercooler water spray manual ON signal is input to the engine-ECU. After receiving this signal, the engine-ECU turns the intercooler water spray relay ON. The intercooler water spray motor is driven to inject the water for air cooling into the intercooler and increase the filling performance.<br>• When the intercooler water spray switch (automatic) turns ON, the intercooler water spray automatic ON signal is input to the engine-ECU. After receiving this signal, the engine-ECU turns the intercooler water spray relay ON intermittently during high-load operation. The intercooler water spray motor is driven to inject the water for air cooling into the intercooler and increase the filling performance. | • Intercooler water spray switch malfunction<br>• Intercooler water spray relay malfunction<br>• Intercooler water spray motor malfunction<br>• Intercooler water spray relay circuit disconnection, short-circuit, or connector contact defect<br>• Intercooler water spray switch circuit disconnection, short-circuit, or connector contact defect<br>• Ignition switch malfunction<br>• Engine-ECU malfunction |

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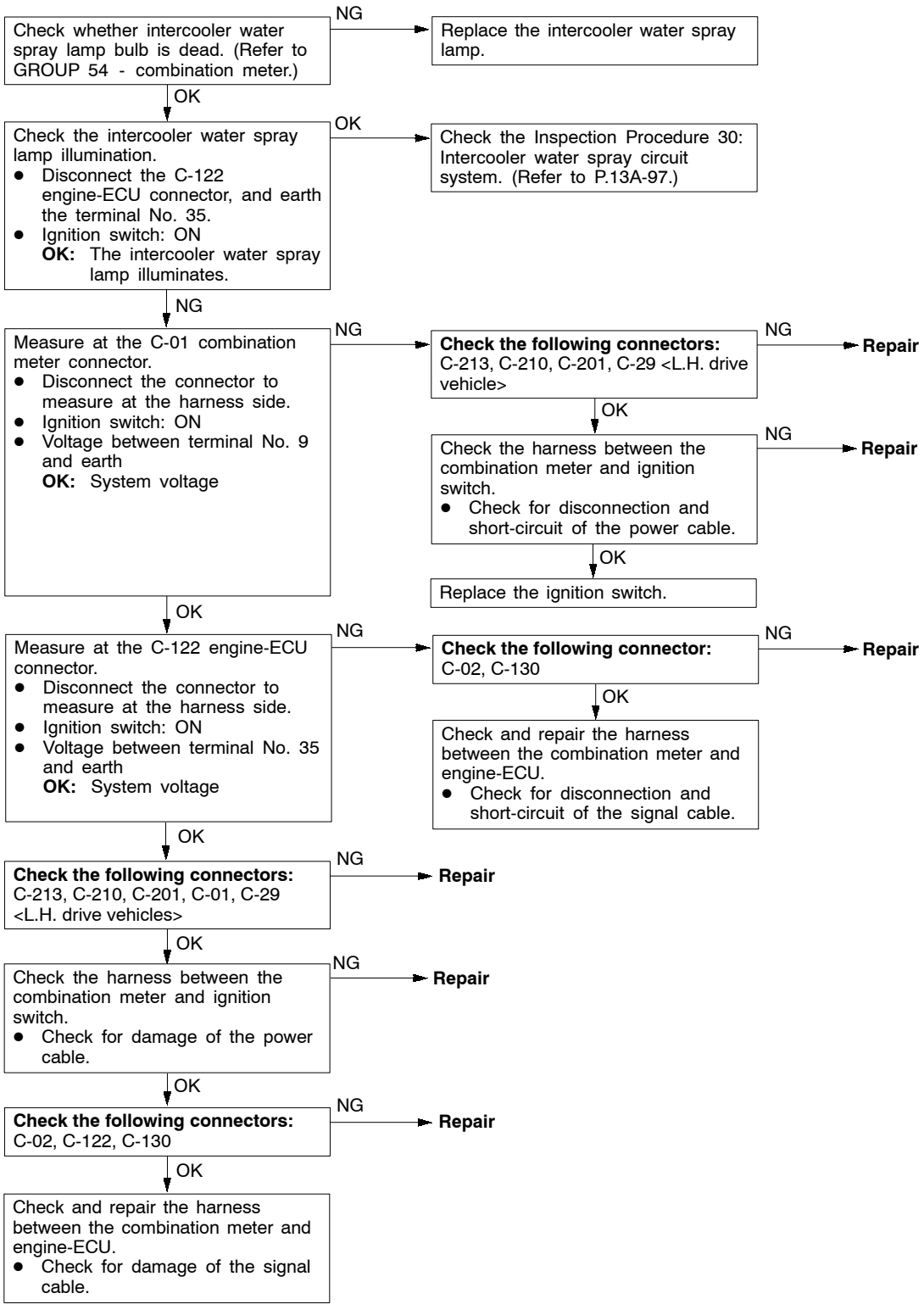
OK
Measure at the C-222 intercooler water spray relay connector.
● Disconnect the connector to measure at the harness side.
● Voltage between terminal No. 3, terminal No. 1 and earth (Ignition switch: ON)
OK: System voltage
NG
Check the following connectors: C-209, C-210, C-201, C-208, C-102 <L.H. drive vehicles>
NG
Repair
OK
Check the harness between the intercooler water spray relay and ignition switch.
● Check for disconnection and short-circuit of the power cable.
OK
Check the ignition switch. (Refer to GROUP 54.)
OK
Measure at the C-118 engine-ECU connector.
● Disconnect the connector to measure at the harness side.
● Voltage between terminal No. 55 and earth (Ignition switch: ON)
OK: System voltage
NG
Check the following connectors: C-130, C-208, C-222
NG
Repair
OK
Check and repair the harness between the intercooler water spray relay and engine-ECU.
● Check for disconnection and short-circuit of the signal cable.
OK
Check the following connector: C-135
NG
Repair
OK
Check the harness between the intercooler water spray relay and intercooler water spray motor.
● Check for disconnection, short-circuit and damage of the power cable.
NG
Repair
OK
Check the harness between the intercooler water spray motor and earth.
● Check for disconnection and damage of the earth cable.
NG
Repair
OK
Check the following connectors: C-209, C-210, C-201, C-208, C-102 <L.H. drive vehicles>
NG
Repair
OK
Check the harness between the intercooler water spray relay and ignition switch.
● Check for damage of the power cable.
NG
Repair
OK
Check the following connectors: C-118, C-130
NG
Repair
OK
Check and repair the harness between the intercooler water spray relay and engine-ECU.
● Check for damage of the signal cable.
NG
Repair
OK
Check the following connector: A-44
NG
Repair
OK
Check the intercooler water spray motor. (Refer to GROUP 15 - Intake and Exhaust.)
NG
Repair
OK
Replace the engine-ECU.

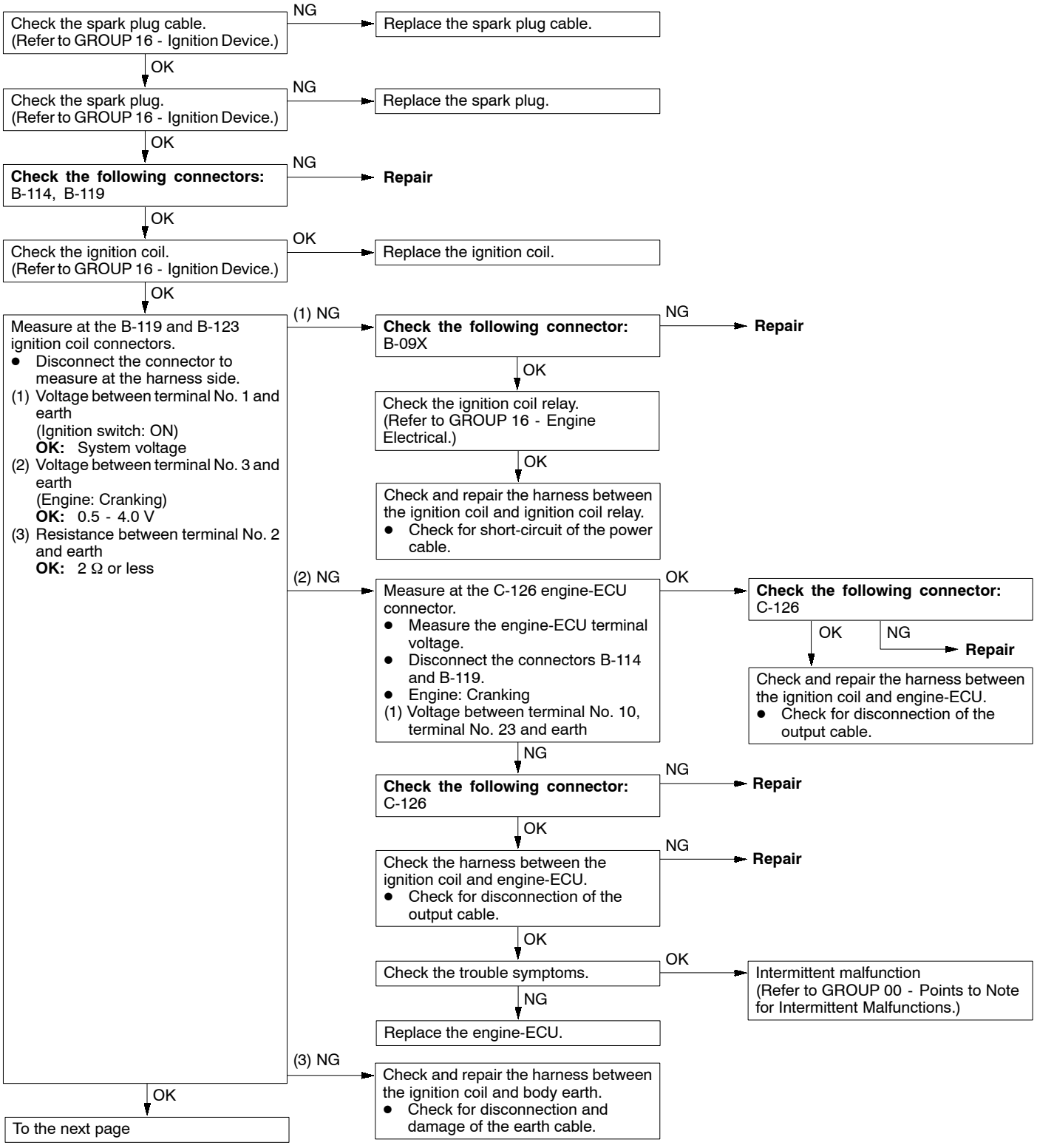
## Inspection Procedure 31

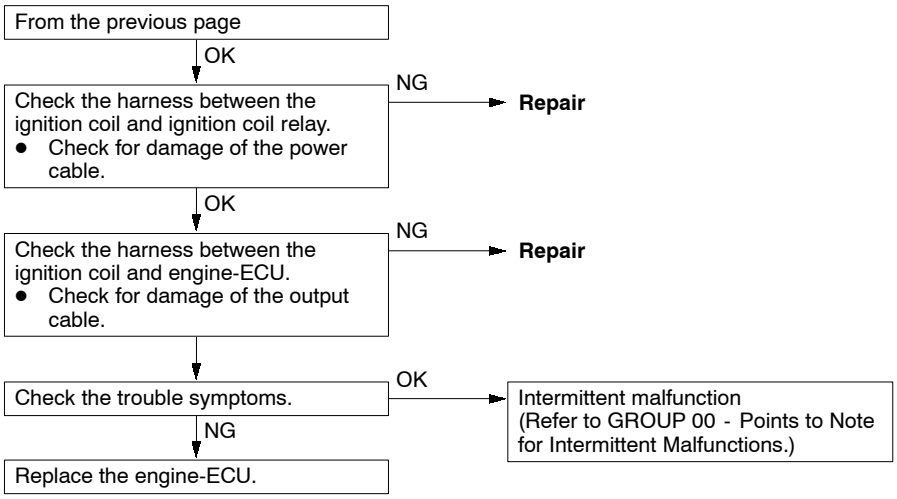
| Intercooler water spray lamp system | Probable cause |
|---|---|
| The engine-ECU illuminates the intercooler water spray lamp when the intercooler water spray switch (automatic) is ON. | • Intercooler water spray lamp bulb dead<br>• Ignition switch malfunction<br>• Intercooler water spray lamp circuit disconnection, short-circuit, or connector contact defect<br>• Intercooler water spray switch circuit disconnection, short-circuit, or connector contact defect<br>• Engine-ECU malfunction |



## Inspection Procedure 32

| Ignition coil (integrated power transistor) system | Probable cause |
|---|---|
| The engine-ECU allows the ignition coil primary current to flow intermittently by turning the power transistor in the unit OFF and ON. | • Ignition coil malfunction<br>• Spark plug malfunction<br>• Spark plug cable malfunction<br>• Ignition primary circuit disconnection, short-circuit, or connector contact defect<br>• Engine-ECU malfunction |

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OK
Check the harness between the ignition coil and ignition coil relay.
● Check for damage of the power cable.
NG
Repair
OK
Check the harness between the ignition coil and engine-ECU.
● Check for damage of the output cable.
NG
Repair
Check the trouble symptoms.
OK
Intermittent malfunction
(Refer to GROUP 00 - Points to Note for Intermittent Malfunctions.)
NG
Replace the engine-ECU.

## DATA LIST REFERENCE TABLE

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

| Item No. | Inspection item | Inspection contents | | Normal condition | Inspection procedure No. | Reference page |
|---|---|---|---|---|---|---|
| 11 | Oxygen sensor (front) | Engine: After having warmed up (Air/fuel mixuture is made leaner when decelerating, and is made richer when racing.) | When at 4,000 r/min, engine is suddenly decelerated | 200 mV or less | Code No. P0130 | 13A-24 |
| | | | When engine is suddenly raced | 600 - 1,000 mV | | |
| | | Engine: After having warmed up (The oxygen sensor (front) signal is used to check the air/fuel mixture ratio, and control condition is also checked by the engine-ECU.) | Engine is idling | 400 mV or less ↔ 600 - 1,000 mV (Varies) | | |
| | | | 2,500 r/min | | | |
| 12 | Air flow sensor*1 | ● Engine coolant temperature: 80 - 95°C<br>● Lightning and all accessories: OFF<br>● Transmission: Neutral | Idle operation | 17 - 43 Hz | - | - |
| | | | 2,500 r/min | 40 - 100 Hz | | |
| | | | Acceleration | According to acceleration, frequency is amplified. | | |
| 13 | Intake air temperature sensor | Ignition switch: "ON" or engine running | When intake air temperature is -20°C | -20°C | Code No. P0110 | 13A-13 |
| | | | 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 | 535 - 735 mV | Code No. P0120 | 13A-21 |
| | | | Gradually open | Increases in proportion to throttle opening angle | | |
| | | | Open fully | 4,500 - 5,000 mV | | |
| 16 | Battery voltage | Ignition switch: “ON” | | System voltage | Procedure No. 22 | 13A-82 |
| 18 | Cranking signal (ignition switch-ST) | Ignition switch: “ON” | Engine: Stopped | OFF | Procedure No.22 | 13A-82 |
| | | | Engine: Cranking | ON | | |
| 21 | Engine coolant temperature sensor | Ignition switch: “ON” or engine running | When engine coolant temperature is -20°C | -20°C | Code No. P0115 | 13A-19 |
| | | | When engine coolant temperature is 0°C | 0°C | | |
| | | | When engine coolant temperature is 20°C | 20°C | | |
| | | | When engine coolant temperature is 40°C | 40°C | | |
| | | | When engine coolant temperature is 80°C | 80°C | | |
| 22 | Crank angle sensor | ● Engine: Cranking<br>● Tachometer: Connected | Compare the engine speed readings on the tachometer and the MUT-II. | Accord | - | - |
| | | ● Engine: Idle operation | When engine coolant temperature is -20°C | 1,300 - 1,500 r/min | | |
| | | | When engine coolant temperature is 0°C | 1,300 - 1,500 r/min | | |
| | | | When engine coolant temperature is 20°C | 1,300 - 1,500 r/min | | |
| | | | When engine coolant temperature is 40°C | 1,150 - 1,350 r/min | | |
| | | | When engine coolant temperature is 80°C | 600 - 900 r/min | | |
| 24★ | Vehicle speed sensor | Drive at 40 km/h | | Approximately 40 km/h | Code No. P0500 | 13A-43 |

| Item No. | Inspection item | Inspection contents | | Normal condition | Inspection procedure No. | Reference page |
|---|---|---|---|---|---|---|
| 25 | Barometric pressure sensor | Ignition switch: ON | Altitude: 0 m | 101 kPa | Code No. P0105 | 13A-15 |
| | | | Altitude: 0 m | 95 kPa | | |
| | | | Altitude: 0 m | 88 kPa | | |
| | | | Altitude: 0 m | 81 kPa | | |
| 27 | Power steering fluid pressure switch | Engine: Idle operation | Steering wheel stationary | OFF | Code No. P0551 | 13A-46 |
| | | | Steering wheel turning | ON | | |
| 28 | A/C switch | Engine: Idle operation (When A/C switch is ON, A/C compressor should be operating.) | A/C switch: OFF | OFF | Procedure No. 26 | 13A-92 |
| | | | A/C switch: ON | ON | | |
| 34 | Air flow sensor reset signal | Engine: After warm-up | Idle operation | ON | Code No. P0100 | 13A-13 |
| | | | 3,000 r/min | OFF | | |
| 37 | Volumetric efficiency | • Engine coolant temperature: 85 - 95°C<br>• Lightning and accessories: OFF | Idle operation | 15 - 35% | - | - |
| | | | 2,500 r/min | 15 - 35% | | |
| | | | Excessive accelleration | According to acceleration, volumetric efficiency is increased. | | |
| 41 | Injectors*1 | Engine: Cranking | When engine coolant temperature is 0°C (injection is carried out for all cylinders simultaneously) | 25 - 37 ms | - | - |
| | | | When engine coolant temperature is 20°C | 15 - 22 ms | | |
| | | | When engine coolant temperature is 80°C | 4.2 - 6.3 ms | | |
| | Injectors*2 | • Engine coolant temperature: 80 – 95°C<br>• Lamps, electric cooling fan and all accessories: OFF<br>• Transmission: Neutral | Engine: Idle operation | 1.5 - 2.7 ms | - | - |
| | | | 2,500 r/min | 1.2 - 2.4 ms | | |
| | | | When engine is suddenly raced | Increases | | |

| Item No. | Inspection item | Inspection contents | | Normal condition | Inspection procedure No. | Reference page |
|---|---|---|---|---|---|---|
| 44 | Ignition advance | • Engine: After having warmed up<br>• Timing lamp is set. (The timing lamp is set in order to check actual ignition timing.) | Engine: Idle operation | 0 - 13°BTDC | - | - |
| | | | 2,500 r/min | 20 - 40°BTDC | | |
| 45 | Idle speed control (stepper) motor position*3 | • Engine coolant temperature: 80 - 90°C<br>• Lamps, electric cooling fan and all accessories: OFF<br>• Transmission: Neutral<br>• Engine: Idle operation<br>• When A/C switch is ON, A/C compressor should be operating | A/C switch: OFF | 2 - 25 STEP | - | - |
| | | | A/C switch: OFF → ON | Increases by 10 - 70 steps | | |
| 49 | A/C relay | Engine: After having warmed up/Engine is idling | A/C switch: OFF | OFF (Compressor clutch is not operating) | Procedure No. 27 | 13A-92 |
| | | | A/C switch: ON | ON (Compressor clutch is operating) | | |
| 59 | Oxygen sensor (rear) | Engine: After having warmed-up | When engine is suddenly raced | 0 and 600 - 1,000 mV alternate. | Code No. P0136 | 13A-27 |
| 81★ | Learned value | Engine: After having warmed up, running with no load at 2,500 r/min. (During air/fuel ratio feedback control) | | -12.5 - 12.5% | - | - |
| 82★ | Feedback | Engine: After having warmed up, running with no load at 2,500 r/min. (During air/fuel ratio feedback control) | | -20 - 20% | - | - |
| 87★ | Engine load | Engine: After having warmed up | Idle operation | 15 - 35% | - | - |
| | | | 2,500 r/min | 15 - 35% | - | - |

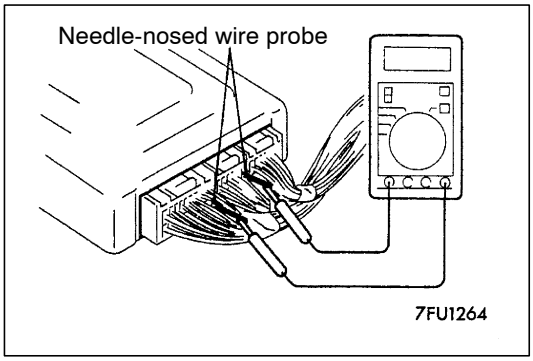
| Item No. | Inspection item | Inspection contents | | Normal condition | Inspection procedure No. | Reference page |
|---|---|---|---|---|---|---|
| A1★ | Oxygen sensor (front) | Engine: After having warmed up (Air/fuel mixture is made leaner when decelerating, and is made richer when racing.) | When at 4,000 r/min, engine is suddenly decelerated | 200 mV or less | Code No. P0130 | 13A-24 |
| | | | When engine is suddenly raced | 600 - 1,000 mV | | |
| | | Engine: After having warmed up (By using oxygen sensor, check air/fuel mixture as well as control status by engine-ECU) | Idle operation | 400 mV or less ↔ 600 - 1,000 mV (altered) | | |
| | | | 2,500 r/min | | | |
| A2★ | Oxygen sensor (rear) | Engine: After having warmed up | When engine is suddenly raced | 0 and 600 - 1,000 mV alternate. | Code No. P0136 | 13A-27 |
| 8A★ | Throttle position sensor (Throttle position opening angle) | • Engine: After having warmed up<br>• Ignition switch: "ON" (Engine stopped) | Release the accelerator pedal. | 8 - 16% | Code No. P0120 | 13A-21 |
| | | | Depress the accelerator pedal gradually. | Increase in response to the pedal depression stroke. | | |
| | | | Depress the accelerator pedal fully. | 80 - 100% | | |

NOTE
Items marked by ★ will not displayed if service data is selected on the check mode.

## ACTUATOR TEST REFERENCE TABLE

| Item No. | Inspection item | Drive contents | Inspection contents | | Normal condition | Inspection procedure No. | Reference page |
|---|---|---|---|---|---|---|---|
| 01 | Injectors | Cut fuel to No. 1 injector | Engine: After having warmed up/Engine is idling (Cut the fuel supply to each injector in turn and check cylinders which don't affect idling.) | | Idling condition becomes different (becomes unstable). | Code No. P0201 | 13A-30 |
| 02 | | Cut fuel to No. 2 injector | | | | Code No. P0202 | 13A-31 |
| 03 | | Cut fuel to No. 3 injector | | | | Code No. P0203 | 13A-32 |
| 04 | | Cut fuel to No. 4 injector | | | | Code No. P0204 | 13A-33 |
| 07 | Fuel pump | Fuel pump operates and fuel is recirculated. | • Engine: Cranking<br>• Fuel pump: Forced driving<br>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. 23 | 13A-85 |
| | | | | Listen near the fuel tank for the sound of fuel pump operation. | Sound of operation is heard. | | |
| 08 | Purge control solenoid valve | Solenoid valve turns from OFF to ON. | Ignition switch: "ON" | | Sound of operation can be heard when solenoid valve is driven. | Code No. P0443 | 13A-41 |
| 09 | Fuel pressure control solenoid valve | Solenoid valve turns from OFF to ON. | Ignition switch: "ON" | | Sound of operation can be heard when solenoid valve is driven. | Code No. P1105 | 13A-48 |
| 10 | EGR control solenoid valve | Solenoid valve turns from OFF to ON. | Ignition switch: "ON" | | Sound of operation can be heard when solenoid valve is driven. | Code No. P0403 | 13A-39 |
| 12 | Waste gate solenoid valve | Solenoid valve turns from OFF to ON. | Ignition switch: "ON" | | Sound of operation can be heard when solenoid valve is driven. | Code No. P1104 | 13A-47 |
| 13 | Fuel pump relay 3 | Fuel pump relay 3 turns from OFF to ON. | • Ignition switch: "ON"<br>• Listen near the fuel tank for the sound of fuel pump operation. | | Sound of operation is heard. | Procedure No. 23 | 13A-85 |
| 17 | Basic ignition timing | Set to ignition timing adjustment mode | Engine: Idling<br>Timing light is set | | 5°BTDC | - | - |

| Item No. | Inspection item | Drive contents | Inspection contents | Normal condition | Inspection procedure No. | Reference page |
|---|---|---|---|---|---|---|
| 21 | Fan controller | Radiator fan motor is driven. | Ignition switch: “ON” | Fan motor rotates at high speed. | Procedure No. 24 | 13A-87 |
| 36 | Secondary air 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. 29 | 13A-96 |
| 37 | Condenser fan (HI) | Condensor fan motor is driven. | Ignition switch: “ON” | Fan motor rotates at high speed. | Procedure No. 25 | 13A-89 |
| 38 | Condenser fan (LOW) | Second air control solenoid valve | Ignition switch: “ON” | Fan motor rotates at low speed. | | |




## CHECK AT THE ENGINE-ECU TERMINALS

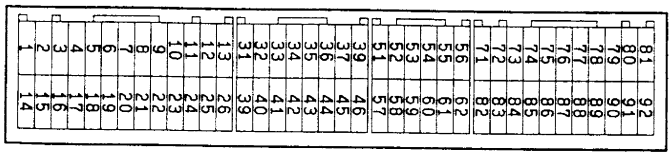
### TERMINAL VOLTAGE CHECK CHART

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

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

   **Caution**
   **Short-circuiting the positive (+) probe between a connector terminal and earth could damage the vehicle wiring, the sensor, engine-ECU or all of them. Be careful to prevent this!**
3. If voltmeter shows any division from standard value, check the corresponding sensor, actuator and related electrical wiring, then repair or replace.
4. After repair or replacement, recheck with the voltmeter to confirm that the repair has corrected the problem.

## Engine-ECU Connector Terminal Arrangement



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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 | Fuel pressure control solenoid valve | Ignition switch: “ON” | System voltage |
| | | Engine: Cranking → Idle operation (within approximately 2 minutes or less) | 1 V or less → System voltage |
| 4 | Stepper motor coil <A1> | Engine: Soon after the warmed up engine is started | System voltage ↔ 0 - 6 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 operation<br>• A/C switch: OFF → ON (A/C compressor runs) | System voltage or momentarily 6 V or more → 1 V or less |
| 9 | Purge control solenoid valve | Ignition switch: “ON” | System voltage |
| | | Engine: Idle operation | 1 V or less |
| 10 | Ignition coil - No.1, No.4 | Engine speed: 3,000 r/min | 0.3 - 3.0 V |
| 23 | Ignition coil - No.2, No.3 | | |
| 11 | Waste gate solenoid valve | Ignition switch: “ON” | System voltage |
| | | Engine: After warm-up, idle operation (When using premium gasoline) | 1 V or less |

| Terminal No. | Check item | Check condition (Engine condition) | | Normal condition |
|---|---|---|---|---|
| 12 | Power supply | Ignition switch: “ON” | | System voltage |
| 25 | | | | |
| 19 | Air flow sensor reset signal | Engine: Idle operation | | 0 - 1 V |
| | | Engine speed: 3,000 r/min | | 6 - 9 V |
| 21 | Fan controller | Radiator fan is not operating | | 0 - 0.3 V |
| | | Radiator fan is operating | | 0.7 V or more |
| 22 | Fuel pump relay 2 | Ignition switch: “ON” | | System voltage |
| | | Engine: Idle operation | | 1 V or less |
| 24 | A/C load signal | ● Engine: Idle operation<br>● A/C switch: ON (A/C compressor runs) | ● Outdoor air sensor ambient temperature: 18°C or more<br>● A/C setting temperature: Minimum temperature<br>● A/C air volume: Maximum | 1 V or less |
| | | | ● A/C setting temperature: indoor temperature<br>● A/C air volume: Minimum | System voltage |
| 32 | Condenser fan motor relay (HI) | Fan inactive state (Engine coolant temperature: 90°C or less) | | System voltage |
| | | Fan high-speed rotation state (Engine coolant temperature: 105°C or more) | | 1 V or less |
| 33 | Alternator G terminal | ● Engine: After warm-up, idle operation<br>● Radiator fan: Not operating<br>● Headlamp: OFF → ON<br>● Stop lamp: OFF → ON<br>● Rear defogger switch: OFF → ON | | Voltage increases by 0.2 - 3.5 V |
| 34 | Condenser fan motor relay (LOW) | Fan inactive state (Engine coolant temperature: 90°C or less) | | System voltage |
| | | Fan low-speed rotation state (Engine coolant temperature: 95 - 100°C or more) | | 1 V or less |
| 35 | Intercooler water spray lamp | Ignition switch: “ON” | | System voltage |
| | | Ignition switch: “LOCK” (OFF) | | 1 V or less |
| 36 | Engine warning lamp | Ignition switch: “LOCK” (OFF) → “ON” | | 1 V or less → System voltage (After several seconds have elapsed) |

| Terminal No. | Check item | Check condition (Engine condition) | | Normal condition |
|---|---|---|---|---|
| 37 | Power steering fluid pressure switch | Engine: Idling after warming up | When steering wheel is stationary | System voltage |
| | | | When steering wheel is turned | 1 V or less |
| 38 | Engine control relay | Ignition switch: “LOCK” (OFF) | | System voltage |
| | | Ignition switch: “ON” | | 1 V or less |
| 39 | Fuel pump relay 3 | While engine is idling, suddenly depress the accelerator pedal. | | Temporarily rises slightly from 1 V or less. |
| 41 | Alternator FR terminal | ● Engine: After warm-up, idle operation<br>● Radiator fan: Not operating<br>● Head lamp: OFF → ON<br>● Stop lamp: OFF → ON<br>● Rear deffogger switch: OFF → ON | | Voltage decrease |
| 44 | Intercooler water spray switch (Auto) | ● Ignition switch: “ON”<br>● Intercooler water spray switch: ON | | 1 V or less |
| | | ● Ignition switch: “ON”<br>● Intercooler water spray switch: OFF | | System voltage |
| 45 | A/C switch | Engine: Idle operation | Turn the A/C switch OFF | 0.5 V or less |
| | | | ● A/C switch: ON<br>● A/C setting temperature<br>When room temperature is 25°C or more: Max Cool<br>When room temperature is 25°C or less: Max. Hot | System voltage |
| 53 | Secondary air control solenoid valve | Ignition switch: “ON” | | System voltage |
| 54 | Oxygen sensor heater (Rear) | Engine: Idling after warming up | | 1 V or less |
| | | Engine speed: 5,000r/min | | System voltage |
| 55 | Intercooler water spray relay | Ignition switch: “ON” | | System voltage |
| | | Ignition switch: “LOCK” (OFF) | | 1 V or less |
| 58 | Tachometer signal | Engine speed: 3,000r/min | | 0.3 - 3.0 V |
| 60 | Oxygen sensor heater (front) | Engine: Idling after warming up | | 1 V or less |
| | | Engine speed: 5,000r/min | | System voltage |
| 71 | Ignition switch - ST | Engine: Cranking | | 8 V or more |

| Terminal No. | Check item | Check condition (Engine condition) | | Normal condition |
|---|---|---|---|---|
| 72 | Intake air temperature sensor | Ignition switch: “ON” | Intake air temperature: -20°C | 3.8 - 4.4 V |
| | | | Intake air temperature: 0°C | 3.2 - 3.8 V |
| | | | Intake air temperature: 20°C | 2.3 - 2.9 V |
| | | | Intake air temperature: 40°C | 1.5 - 2.1 V |
| | | | Intake air temperature: 60°C | 0.8 - 1.4 V |
| | | | Intake air temperature: 80°C | 0.4 - 1.0 V |
| 75 | Oxygen sensor (Rear) | ● Transmission: Second gear<br>● Driving with the throttle widely open<br>● Engine: 3,500 r/min or more | | 0.6 - 1.0 V |
| 76 | Oxygen sensor (front) | Engine: Running at 2,500 r/min after warmed up (Check using a digital type voltmeter) | | 0 ↔ 0.8 V<br>(Changes repeatedly) |
| 80 | Backup power supply | Ignition switch: “LOCK” (OFF) | | System voltage |
| 81 | Sensor impressed voltage | Ignition switch: “ON” | | 4.9 - 5.1 V |
| 82 | Ignition switch - IG | Ignition switch: “ON” | | System voltage |
| 83 | Engine coolant temperature sensor | Ignition switch: “ON” | Coolant temperature: -20°C | 3.9 - 4.5 V |
| | | | Coolant temperature: 0°C | 3.2 - 3.8 V |
| | | | Coolant temperature: 20°C | 2.3 - 2.9 V |
| | | | Coolant temperature: 40°C | 1.3 - 1.9 V |
| | | | Coolant temperature: 60°C | 0.7 - 1.3 V |
| | | | Coolant temperature: 80°C | 0.3 - 0.9 V |
| 84 | Throttle position sensor | Ignition switch: “ON” | Set throttle valve to idle position | 0.535 - 0.735 V |
| | | | Fully open throttle valve | 4.5 - 5.0 V |
| 85 | Barometric pressure sensor | Ignition switch: “ON” | Altitude: 0 m | 3.8 - 4.2 V |
| | | | Altitude: 600 m | 3.5 - 3.9 V |
| | | | Altitude: 1,200 m | 3.2 - 3.8 V |
| | | | Altitude: 1,800 m | 3.0 - 3.4 V |

| Terminal No. | Check item | Check condition (Engine condition) | Normal condition |
|---|---|---|---|
| 86 | Vehicle speed sensor | ● Ignition switch: "ON"<br>● Move the vehicle slowly forward | 0 ↔ 5 V<br>(Changes repeatedly) |
| 88 | Camshaft position sensor | Engine: Cranking | 0.4 - 3.0 V |
| | | Engine: Idle operation | 0.5 - 2.0 V |
| 89 | Crank angle sensor | Engine: Cranking | 0.4 - 4.0 V |
| | | Engine: Idle operation | 1.5 - 2.5 V |
| 90 | Air flow sensor | Engine: Idle operation | 2.2 - 3.2 V |
| | | Engine speed: 2,500 r/min | |
| 91 | Intercooler water spray switch (Manual) | ● Ignition switch: "ON"<br>● Intercooler water spray switch: ON | 1 V or less |
| | | ● Ignition switch: "ON"<br>● Intercooler water spray switch: OFF | System voltage |

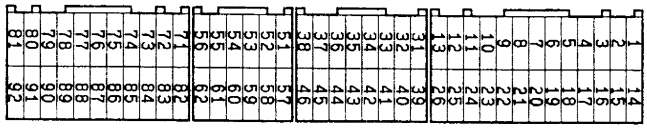
**CHECK CHART FOR RESISTANCE AND CONTINUITY BETWEEN TERMINALS**

1. Turn the ignition switch to "LOCK" (OFF) position.
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.

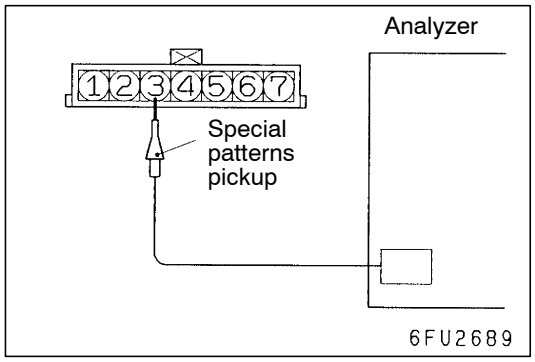
**Engine-ECU Harness Side Connector Terminal Arrangement**



9FU0392

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

| Terminal No. | Inspection item | Normal condition (Check condition) |
|---|---|---|
| 3 - 12 | Fuel pressure control solenoid valve | 28 - 36 Ω (at 20°C) |
| 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 | 22 - 26 Ω (at 20°C) |
| 11 - 12 | Waste gate solenoid valve | 62 - 74 Ω (at 20°C) |
| 13 - Body earth | ENGINE-ECU earth | Continuity (0Ω) |
| 26 - Body earth | ENGINE-ECU earth | |
| 53 - 12 | Secondary air control solenoid valve | 28 - 36 Ω (at 20°C) |
| 54 - 12 | Oxygen sensor heater (Rear) | 11 - 18 Ω (at 20°C) |
| 60 - 12 | Oxygen sensor heater (Front) | 4.5 - 8.0 Ω (at 20°C) |
| 72 - 92 | Intake air temperature sensor | 13 - 17 kΩ (When intake air temperature is -20°C) |
| | | 5.7 - 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) |
| | | 0.56 - 0.76 kΩ (When intake air temperature is 60°C) |
| | | 0.30 - 0.42 kΩ (When intake air temperature is 80°C) |
| 83 - 92 | Engine coolant temperature sensor | 14 - 17 kΩ (When coolant temperature is -20°C) |
| | | 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) |
| | | 0.48 - 0.68 kΩ (When coolant temperature is 60°C) |
| | | 0.26 - 0.36 kΩ (When coolant temperature is 80°C) |




## INSPECTION PROCEDURE USING AN ANALYZER

### AIR FLOW SENSOR

#### 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 No. 3.

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

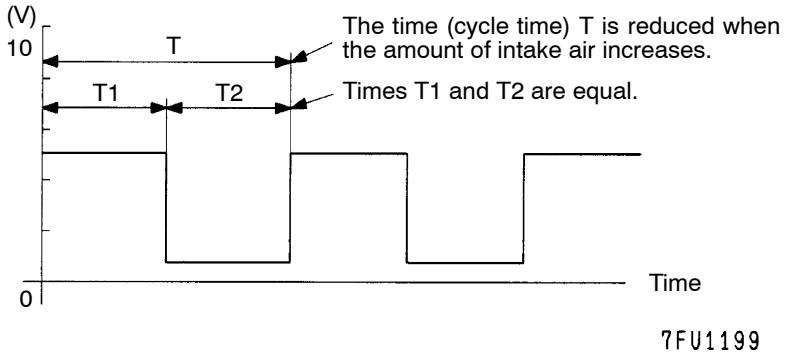
1. Connect the analyzer special patterns pickup to engine-ECU terminal No. 65.

#### Standard Wave Pattern

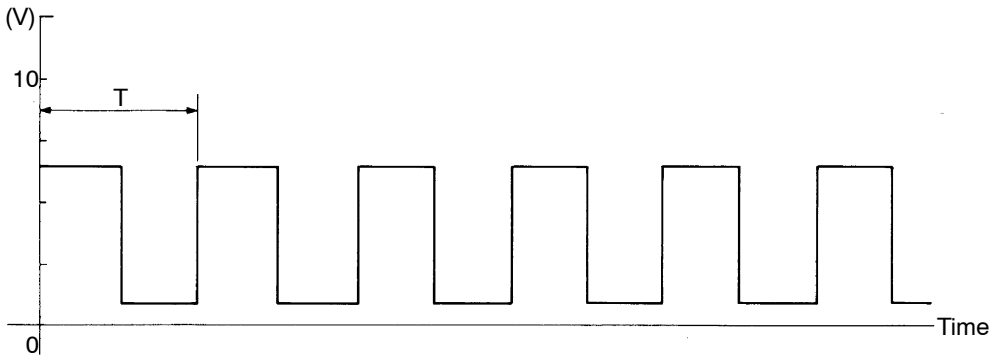
**Observation conditions**

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

**Standard wave pattern**

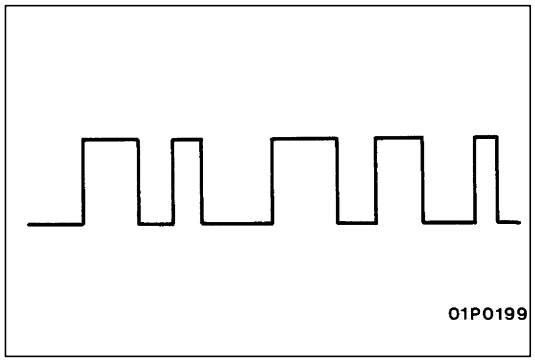



**Observation conditions (from conditions above engine speed is increased by racing.)**




#### 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.

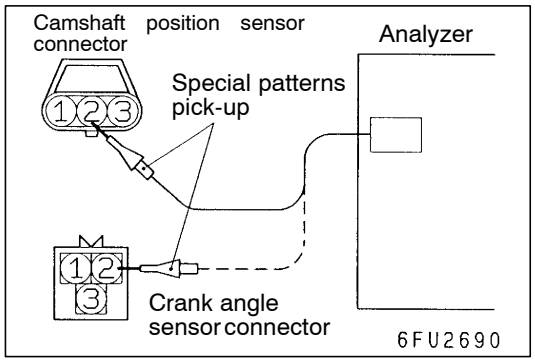
- Example 2

  **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.




**CAMSHAFT POSITION SENSOR AND CRANK ANGLE SENSOR**

**Measurement Method**

1. Disconnect the camshaft position sensor connector and connect the special tool (test harness: MB991709) in between. (All terminals should be connected.)
2. Connect the analyzer special patterns pickup to camshaft position sensor terminal No. 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 No. 2.

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

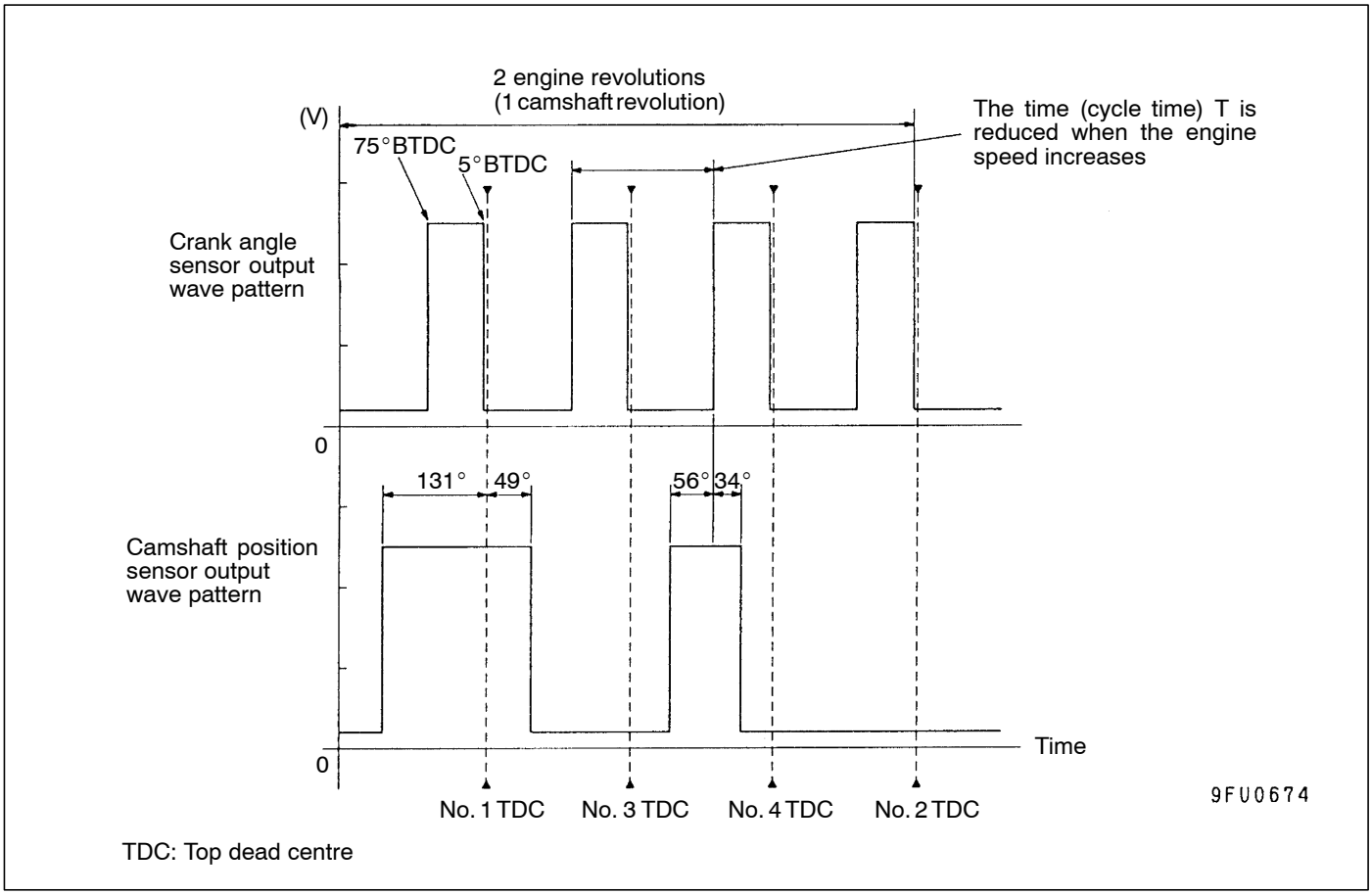
1. Connect the analyzer special patterns pickup to engine-ECU terminal No. 88. (When checking the camshaft position sensor signal wave pattern.)
2. Connect the analyzer special patterns pickup to engine-ECU terminal No. 89. (When checking the crank angle sensor signal wave pattern.)

**Standard Wave Pattern**

**Observation condition**

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

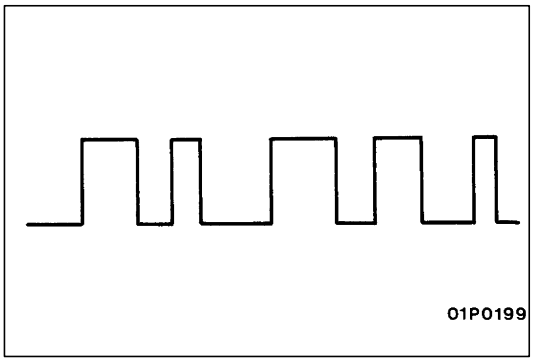
**Standard Wave Pattern**




TDC: Top dead centre

**Wave Pattern Observation Points**

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




**Examples of Abnormal Wave Patterns**

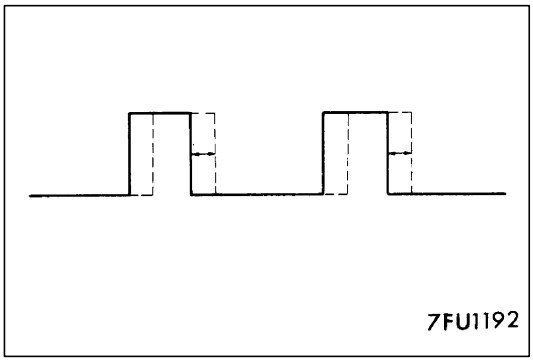
- Example 1

  **Cause of problem**

  Sensor interface malfunction

  **Wave pattern characteristics**

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



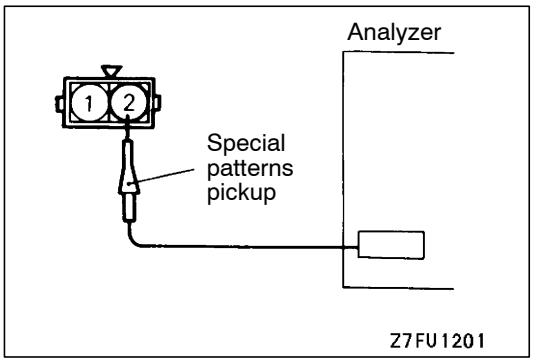

- Example 2

**Cause of problem**

Loose timing belt
Abnormality in sensor disk

**Wave pattern characteristics**

Wave pattern is displaced to the left or right.




**INJECTOR**

**Measurement Method**

1. Disconnect the injector connector, and then connect the special tool (test harness: MB991348) in between. (All terminals should be connected.)
2. Connect the analyzer special patterns pickup to terminal No. 2 of the injector connector.

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

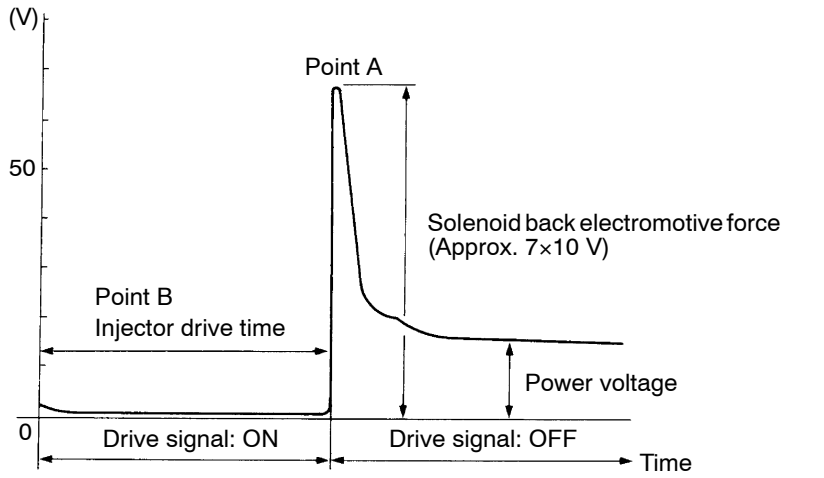
1. Connect the analyzer special patterns pickup to engine-ECU terminal No. 1. (When checking the No. 1 cylinder.)
2. Connect the analyzer special patterns pickup to engine-ECU terminal No. 14. (When checking the No. 2 cylinder.)
3. Connect the analyzer special patterns pickup to engine-ECU terminal No.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

**Standard Wave Pattern**

**Observation conditions**

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

**Standard wave pattern**

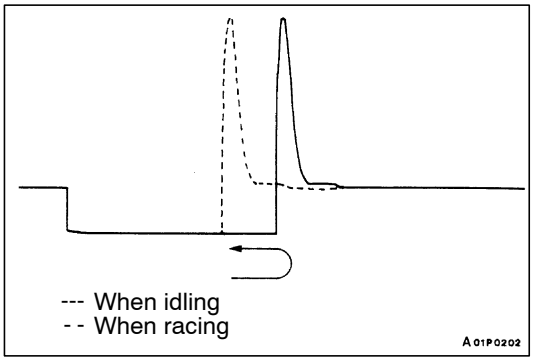



**Wave Pattern Observation Points**

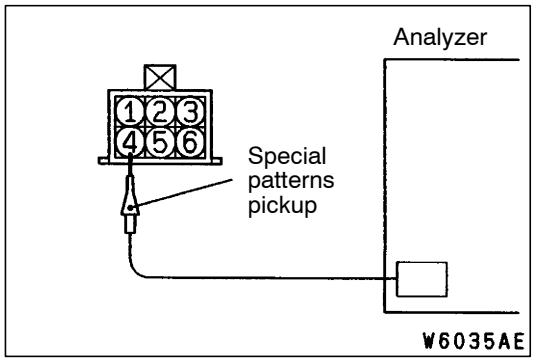
Point A: Height of solenoid back electromotive force

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

Point B: Injector drive time




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




## IDLE SPEED CONTROL SERVO (STEPPER MOTOR)

### Measurement Method

1. Disconnect the idle speed control servo connector, and connect the special tool (test harness: MB991709) in between.
2. Connect the analyzer special patterns pickup to the idle speed control servo-side connector terminal No. 1, terminal No. 3, terminal No. 4 and terminal No. 6 respectively.

### Alternate Method (Test harness not available)

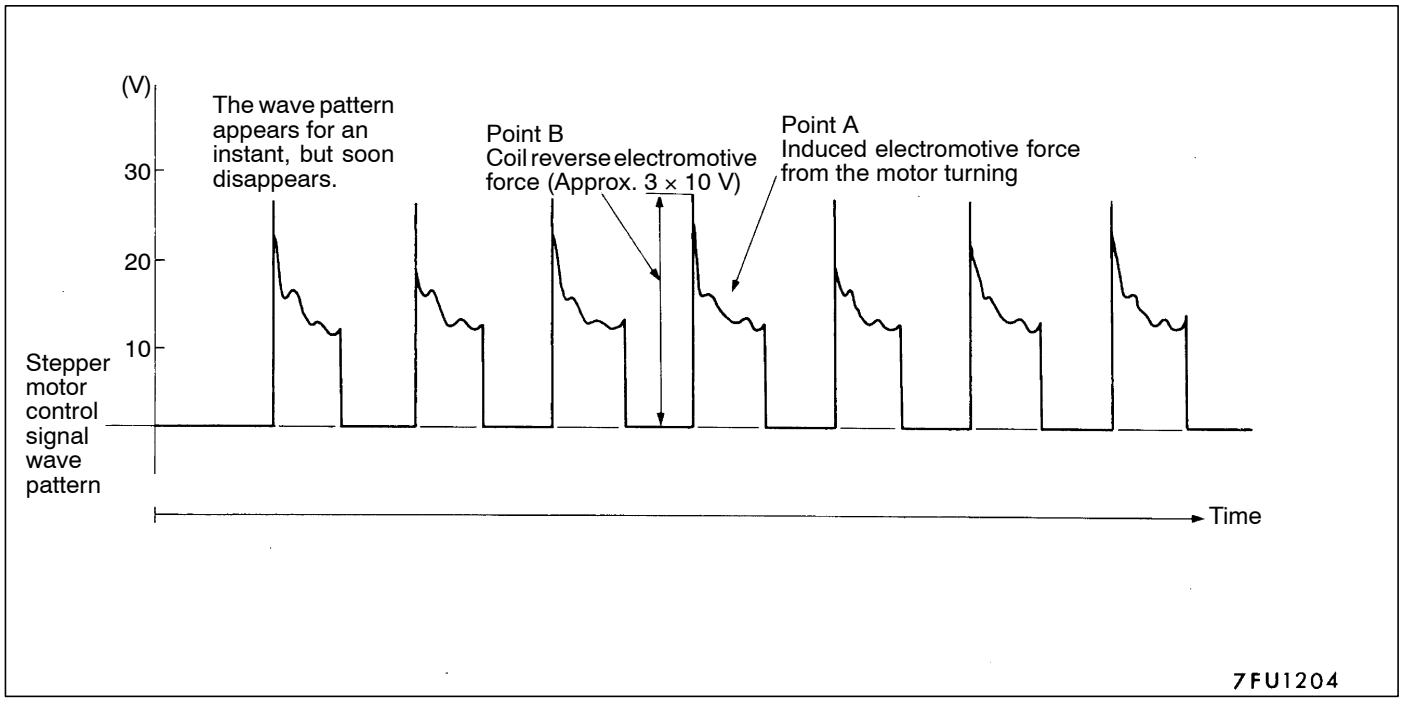
1. Connect the analyzer special patterns pickup to engine-ECU terminal No. 4, connection terminal No. 5, connection terminal No. 17, and connection terminal No. 18 respectively.

### 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 "LOCK" (OFF) position to "ON" position (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



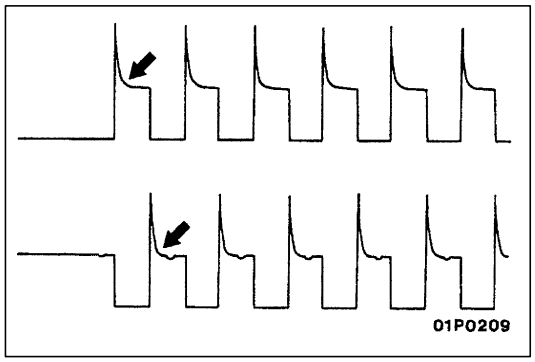
**Wave Pattern Observation Points**

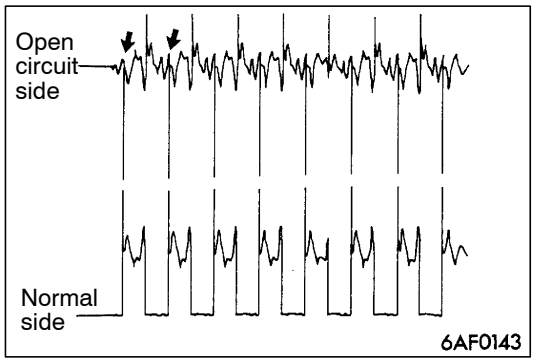
Check that the standard wave pattern appears when the stepper motor is operating.
Point A: Presence or absence of induced electromotive force from the motor turning. (Refer to the abnormal wave pattern.)

| 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.

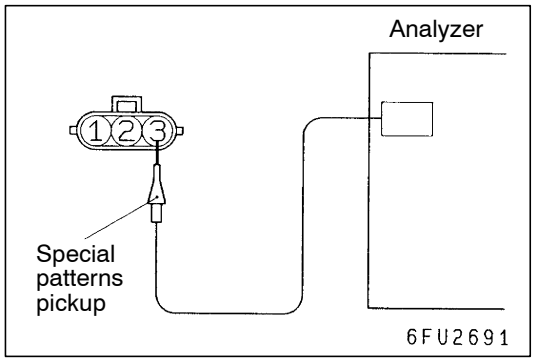
- Example 2

  **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 ignition coil connector, and connect the special tool (test harness: MB991658) in between. (All terminals should be connected.)
2. Connect the analyzer special patterns pickup to terminal No. 3 of each ignition coil connector in turn.

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

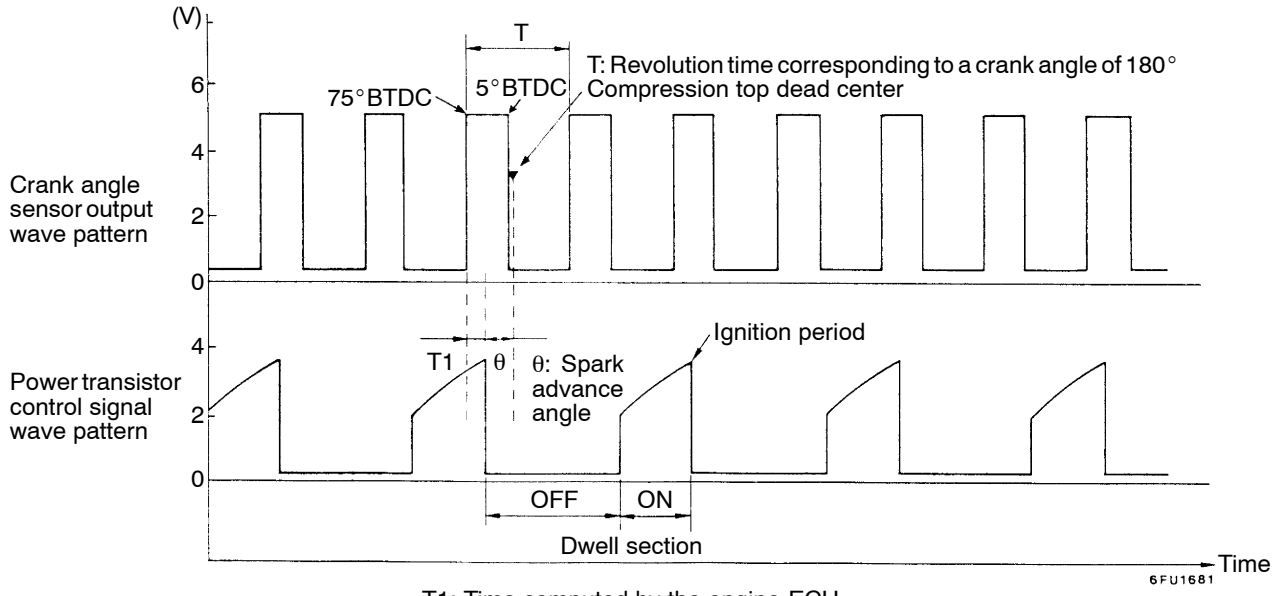
1. Connect the analyzer special patterns pickup to engine-ECU terminal No. 10 (No. 1 - No. 4), terminal No. 23 (No. 2 - No. 3) respectively.

**Standard Wave Pattern**

**Observation condition**

| | |
|---|---|
| Function | Special patterns |
| Pattern height | Low |
| Pattern selector | Display |
| Engine r/min | Approximately 1,200 r/min |

**Standard wave pattern**

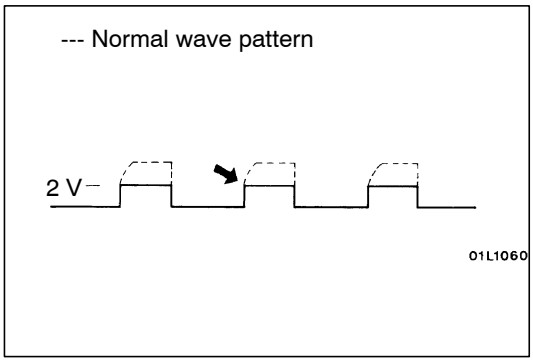


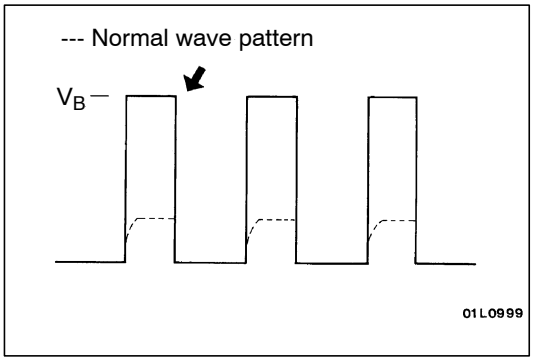

T1: Time computed by the engine-ECU

**Wave Pattern Observation Points**

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

| Condition of wave pattern build-up section and maximum voltage | Probable cause |
|---|---|
| Rises from approximately 2 V to approximately 4.5 V at the top-right | Normal |
| 2 V 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

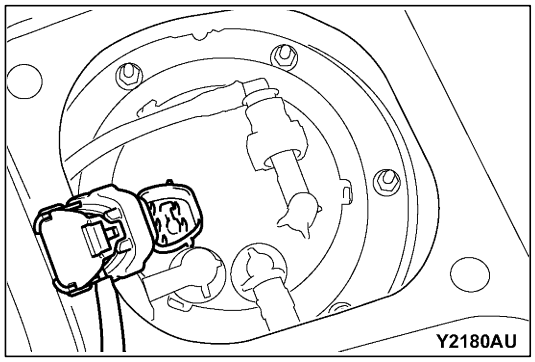
  Wave pattern during engine cranking

  **Cause of problem**

  Malfunction in power transistor

  **Wave pattern characteristics**

  Power voltage results when the power transistor is ON.




# ON-VEHICLE SERVICE

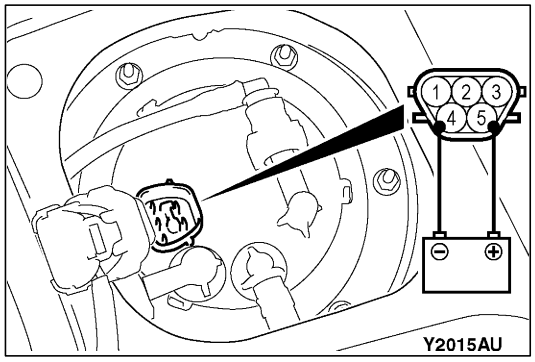
## FUEL PUMP CONNECTOR DISCONNECTION (HOW TO REDUCE THE FUEL PRESSURE)

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

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

## FUEL PUMP OPERATION CHECK

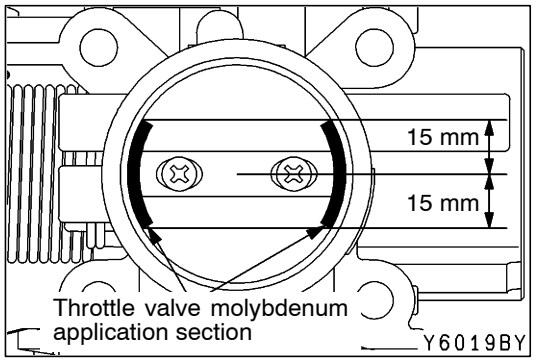
1. Check the operation of the fuel pump by using the MUT-II to force-drive the fuel pump.
2. If the fuel pump will not operate, check by using the following procedure, and if it is normal, check the drive circuit.
   (1) Turn the ignition switch to “LOOK” (OFF) position.
   (2) Remove the rear seat assembly. (Refer to GROUP 52A.)
   (3) Remove the protector.
   (4) Disconnect the fuel pump module connector.




   (5) When the fuel pump drive connector 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.

   (6) Check the fuel pressure by pinching the fuel hose with the fingertips.
   (7) Connect the fuel pump module connector.
   (8) Install the protector and rear seat assembly. (Refer to GROUP 52A.)

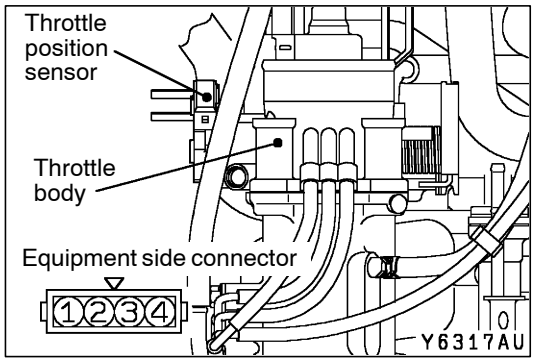



## THROTTLE BODY (THROTTLE VALVE AREA) CLEANING

1. Remove the air intake hose from the throttle body.
2. Spray cleaning fluid on a clean cloth.
3. Wipe off the dirt around the throttle valve with the cloth sprayed with cleaning fluid.

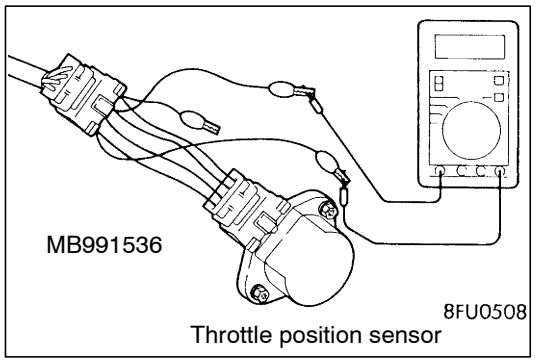
**Caution**
**(1) Do not spray the cleaning fluid directly to the throttle valve.**
**(2) Make sure the cleaning fluid does not enter the motor from the bypass line. Also make sure it does not enter the sensor through the shaft.**
**(3) Be careful not to rub off the molybden applied around the throttle valve shaft.**

4. Attach the air intake hose.
5. Adjust the basic idle speed. (Refer to P.13A-127.)




## THROTTLE POSITION SENSOR ADJUSTMENT

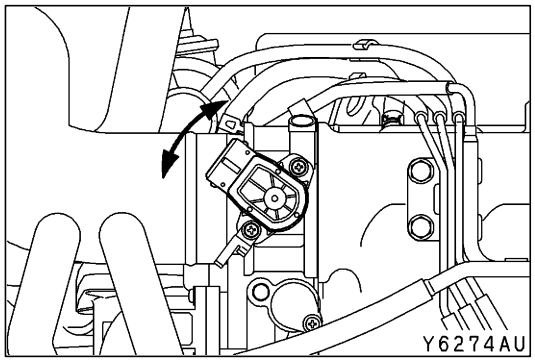
1. Connect the MUT-II to the diagnosis connector.
When not using the MUT-II, proceed as follows:




(1) Disconnect the throttle position sensor connector, and connect the special tool (test harness: MB991536) between the disconnected connector taking care not to confuse the terminal to be connected.
(2) Connect digital voltmeter between the terminal No. 2 and the terminal No. 4 of the throttle position sensor connector.

2. Turn the ignition switch to “ON” position (but do not start the engine).
3. Check the output voltage of the throttle position sensor.

**Standard value: 535 - 735 mV**




4. If not within the standard value, loosen the throttle position sensor mounting bolts. Then rotate the sensor body to adjust.
5. Turn the ignition switch to “LOCK” (OFF) position.
6. Remove the MUT-II. If the MUT-II is not used, remove the special tool, and then connect the throttle position sensor connector.
7. If a diagnosis code is displayed, erase the diagnosis code by using the MUT-II or disconnect the negative battery cable from the battery terminal and then leave it for at least ten seconds. After that, reconnect the battery cable, and then let the engine run at idle for approximately 10 minutes.

## BASIC IDLE SPEED ADJUSTMENT

NOTE
(1) The basic idling speed has been adjusted by the speed adjusting screw 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.

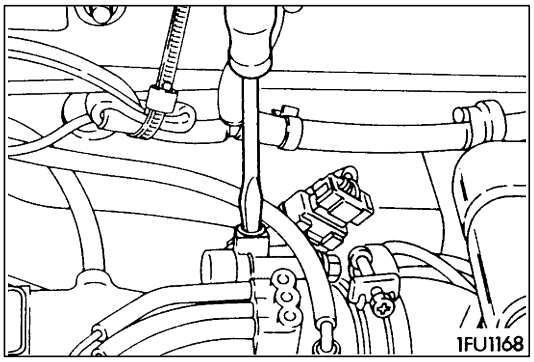
3. Start the engine and run at idle.
4. Select the item No. 30 of the MUT-II Actuator test.

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

5. Check the basic idle speed.

**Standard value: 850 ± 100 r/min**

NOTE
(1) The engine speed may be 20 to 100 r/min lower than indicated above for a new vehicle [driven approximately 500 km or less], but no adjustment is necessary.
(2) If the engine stalls or the 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-126.)



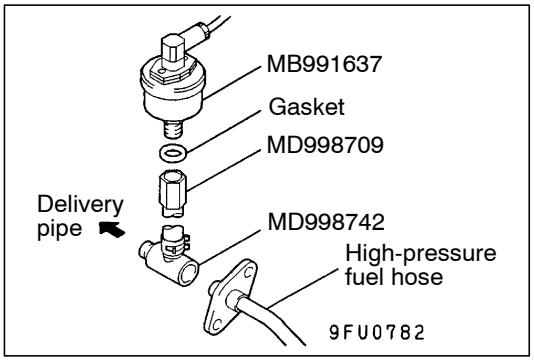

6. If not within the standard value range, turn the speed adjusting screw to make the necessary adjustment.
7. Press the MUT-II clear key, and release the idle speed control servo from the Actuator test mode.

   NOTE
   Unless the idle speed control servo is released, the Actuator test mode will continue 27 minutes.
8. Turn the ignition switch to “LOCK” (OFF) position.
9. Disconnect the MUT-II.
10. Start the engine again and let it run at idle speed for approximately 10 minutes; check that the idling condition is normal.

## FUEL PRESSURE TEST

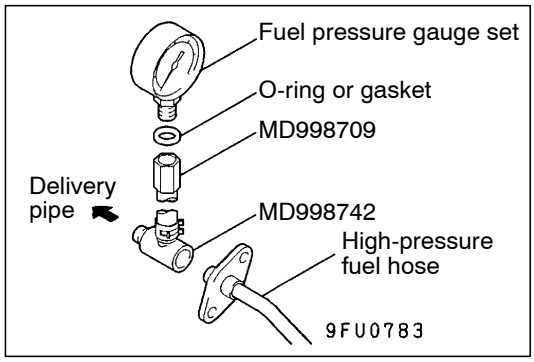
1. Release residual pressure from the fuel pipe line to prevent fuel gush out. (Refer to P.13A-125.)
2. Disconnect the high-pressure fuel hose at the delivery pipe side.

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




3. Remove the union joint and bolt from the special tool (adapter hose) and instead attach the special tool (hose adapter) to the adapter hose.
4. Install the special tool (for measuring the fuel pressure) that was set up in step 3.

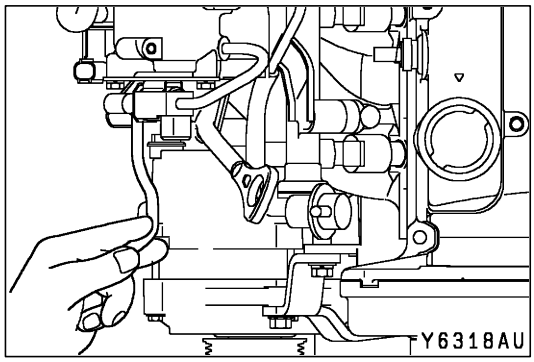
   <When using the fuel pressure gauge set (special tool)>
   (1) Install the special tool (for measuring the fuel pressure) between the high-pressure fuel hose and the delivery pipe.
   (2) Install the fuel pressure gauge set (special tool) on the special tool (for measuring the fuel pressure) putting the gasket between them.
   (3) Connect the lead wire of the fuel pressure gauge set (special tool) to the power supply (cigarette lighter socket) and to the MUT-II.




<When using the fuel pressure gauge>
(1) Install the fuel pressure gauge on the special tool (for measuring the fuel pressure) putting a suitable O-ring or gasket between them.
(2) Install the special tool which was set up in step (1) between the high-pressure fuel hose and the delivery pipe.

5. Connect the MUT-II to the diagnosis connector.
6. Turn the ignition switch to “ON” position. (But do not start the engine.)
7. Select “Item No. 07” from the MUT-II Actuator test to drive the fuel pump. Check that there are no fuel leaks from any parts.
8. Finish the actuator test or turn the ignition switch to “LOCK” (OFF) position.
9. Start the engine and run at idle.
10. Measure fuel pressure while the engine is running at idle.

**Standard value: Approximately 230 kPa at cerb idle**




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

**Standard value: 289 - 309 kPa at cerb idle**

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

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

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

| Symptom | Probable cause | Remedy |
|---|---|---|
| ● Fuel pressure too low<br>● Fuel pressure drops after racing<br>● 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 |
| | Fuel pressure control system malfunction | Check the fuel pressure control system |

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

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

16. Release residual pressure from the fuel pipe line. (Refer to P.13A-125.)
17. Remove the fuel pressure gauge and special tool from the delivery pipe.

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

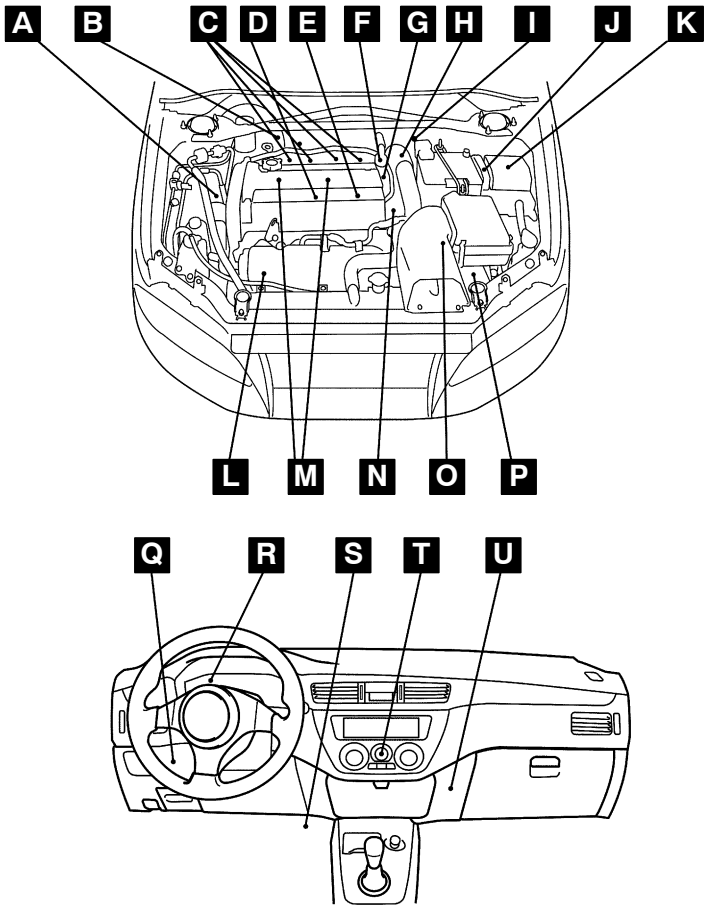
18. Replace the O-ring at the end of the fuel high pressure hose with a new one. Furthermore, apply engine oil to the new O-ring before replacement.
19. Fit the fuel high pressure hose over the delivery pipe and tighten the bolt to specified torque.

    **Tightening torque: 5.0 ± 1.0 N·m**

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

## COMPONENT LOCATION

| Name | Symbol | Name | Symbol |
|---|---|---|---|
| A/C relay | J | Fuel pump relay 1, 2 | Q |
| A/C switch | T | Fuel pump relay 3 | H |
| Air flow sensor (integrated intake air temperature sensor and barometric pressure sensor) | O | Fuel pump resistor | H |
| Camshaft position sensor | N | Idle speed control servo (stepper motor) | G |
| Crank angle sensor | K | Ignition coil (integrated power transister) | M |
| Detonation sensor | E | Injector | C |
| Diagnosis connector | S | Oxygen sensor (front) | L |
| EGR control solenoid valve | D | Oxygen sensor (rear) | X |
| Engine control relay | I | Power steering fluid pressure switch | A |
| Engine coolant temperature sensor | N | Resistor (for injector) | H |
| Engine warning lamp (check engine lamp) | R | Secondary air control solenoid valve | D |
| Engine-ECU | U | Throttle position sensor | G |
| Fan motor relay | J | Vehicle speed sensor | F |
| Fuel pressure control solenoid valve | B | Waste gate solenoid valve | P |

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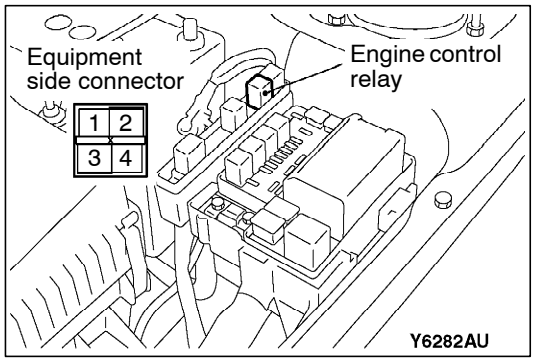
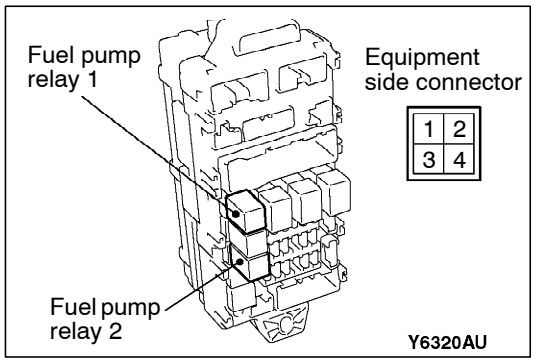


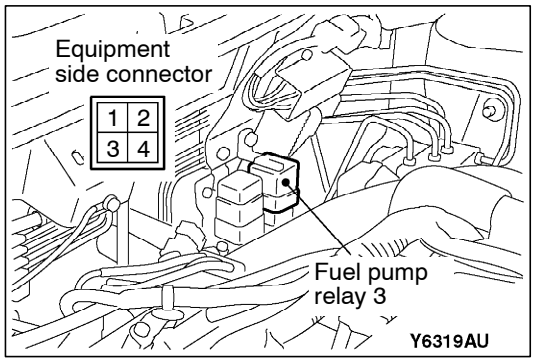

## ENGINE CONTROL RELAY CONTINUITY CHECK

| Tester connection terminal | Battery voltage | Normal state |
|---|---|---|
| 2-3 | Not energized | Continuity |
| 1-4 | Not energized | No continuity |
| | Energized [Connect terminal No. 2 to battery (+) terminal, and connect terminal No. 3 to battery (-) terminal.] | Continuity |



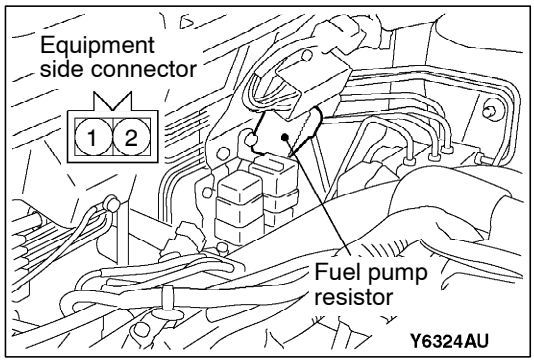

## FUEL PUMP RELAY 1, 2 CONTINUITY CHECK

| Tester connection terminal | Battery voltage | Normal state |
|---|---|---|
| 1-4 | Not energized | Continuity |
| 2-3 | Not energized | No continuity |
| | Energized [Connect terminal No. 1 to battery (+) terminal, and connect terminal No. 4 to battery (-) terminal.] | Continuity |




## FUEL PUMP RELAY 3 CONTINUITY CHECK

| Tester connection terminal | Battery voltage | Normal state |
|---|---|---|
| 3-4 | Not energized | Continuity |
| 1-2 | Not energized | Continuity |
| | Energized [Connect terminal No. 2 to battery (+) terminal, and connect terminal No. 1 to battery (-) terminal.] | No continuity |

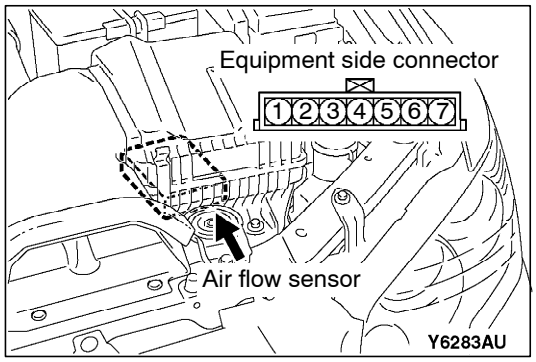



## FUEL PUMP RESISTOR CHECK

1. Disconnect the fuel pump resistor connector.
2. Measure the resistance between the terminals.

   **Standard value: 0.45 - 0.65 Ω**

3. If the value is deviated from the standard value, replace the fuel pump resistor.

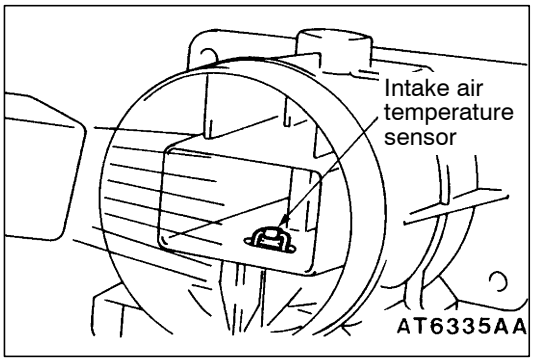



## INTAKE AIR TEMPERATURE SENSOR CHECK

1. Disconnect the air flow sensor connector.
2. Measure resistance between terminal No. 5 and terminal No. 6.

   **Standard value:**

   **13 - 17 kΩ (at -20°C)**
   **5.7 - 6.7 kΩ (at 0°C)**
   **2.3 - 3.0 kΩ (at 20°C)**
   **1.0 - 1.5 kΩ (at 40°C)**
   **0.56 - 0.76 kΩ (at 60°C)**
   **0.30 - 0.42 kΩ (at 80°C)**

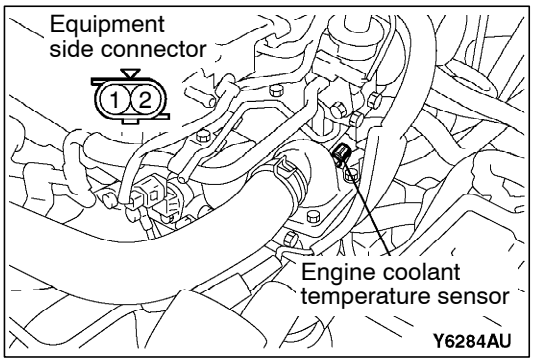



3. Measure resistance while heating the sensor using a hair drier.

**Normal condition:**

| Temperature (°C) | Resistance (kΩ) |
|---|---|
| Higher | Smaller |

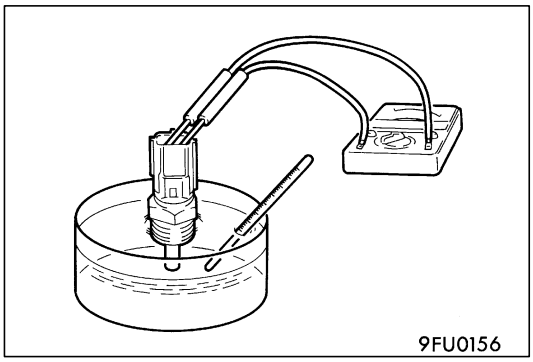
4. If the value deviates from the standard value or the resistance remains unchanged, replace the air flow sensor assembly.




## ENGINE COOLANT TEMPERATURE SENSOR CHECK

**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.

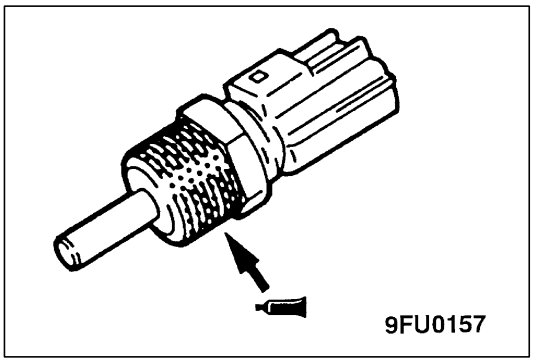
**Standard value:**
**14 - 17 kΩ (at -20°C)**
**5.1 - 6.5 kΩ (at 0°C)**
**2.1 - 2.7 kΩ (at 20°C)**
**0.9 - 1.3 kΩ (at 40°C)**
**0.48 - 0.68 kΩ (at 60°C)**
**0.26 - 0.36 kΩ (at 80°C)**

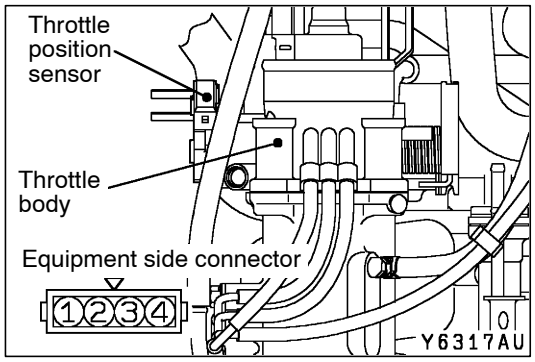
3. If the resistance deviates from the standard value greatly, replace the sensor.
4. Apply sealant to threaded portion.

**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 ± 9 N·m**






## THROTTLE POSITION SENSOR CHECK

1. Disconnect the throttle position sensor connector.
2. Measure the resistance between the throttle position sensor side connector terminal No. 1 and terminal No. 4.

   **Standard value: 3.5 - 6.5 kΩ**

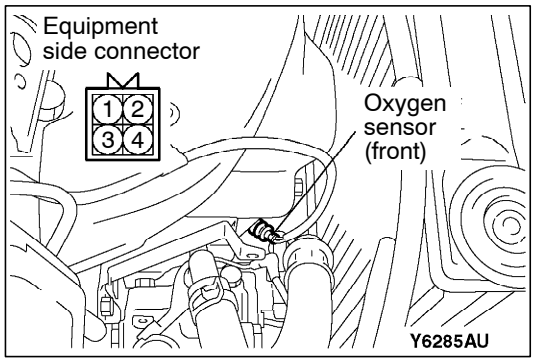
3. Measure the resistance between the throttle position sensor side connector terminal No. 2 and terminal No. 4.

   **Normal condition:**

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

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

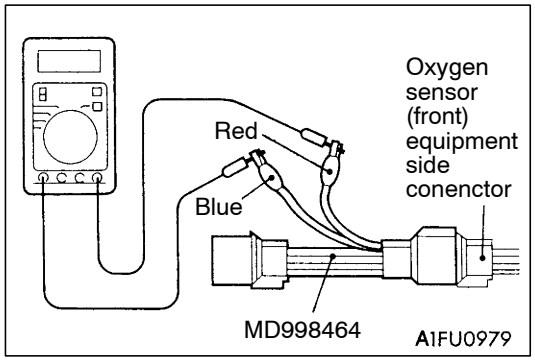
   NOTE
   For the throttle position sensor adjustment procedure, refer to P.13A-90.



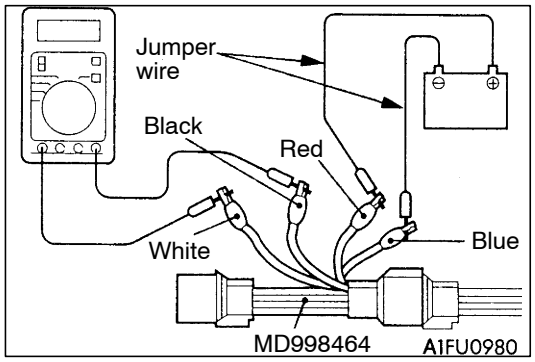

## OXYGEN SENSOR CHECK

**<Oxygen sensor (front)>**

1. Disconnect the oxygen sensor connector and connect the special tool (test harness: MB998464) to the connector on the oxygen sensor side.
2. Make sure that there is continuity (4.5 - 8.0 Ω at 20°C) between terminal No. 1 and terminal No. 3 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 No. 1 of the oxygen sensor connector to the battery (+) terminal and terminal No. 3 to the battery (-) terminal.

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

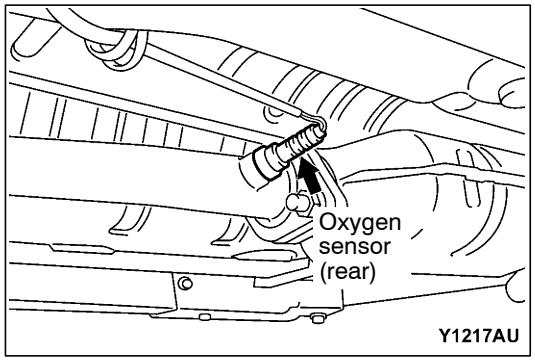
6. Connect a digital voltage meter between terminal No. 2 and terminal No. 4.
7. While repeatedly racing the engine, measure the oxygen sensor output voltage.

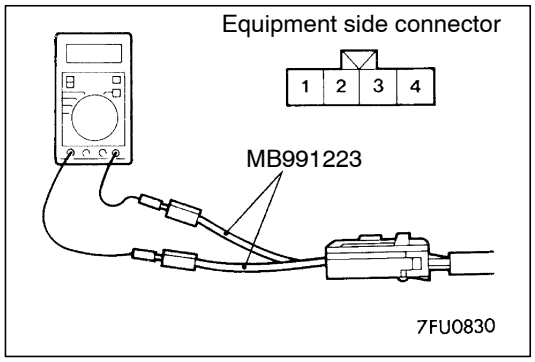
   **Standard value:**

| 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.

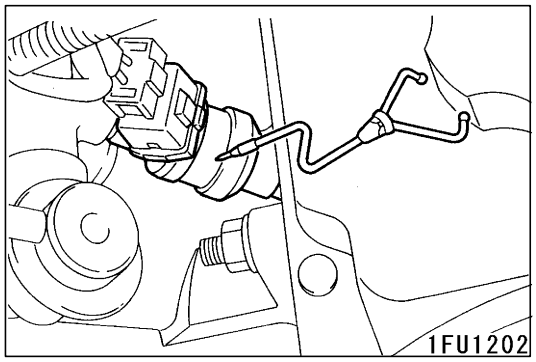



**<Oxygen sensor (rear)>**

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 No. 3 and terminal No. 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.



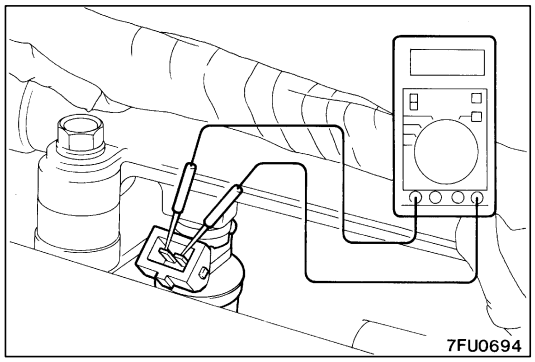

## INJECTOR CHECK

### OPERATION SOUND CHECK

Using a sound scope, check the operation sound of the injector ("chh" sound) during idling and cranking.
Check that the operation sound increases when the speed increases.

**Caution**
**The sound of other injectors operating may be heard even when the injector being checked is not operated.**

NOTE
If no operation sound is heard, check the injector drive circuit. If the circuit is normal, the injector or engine-ECU may be faulty.




**Measurement of Resistance between Terminals**

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

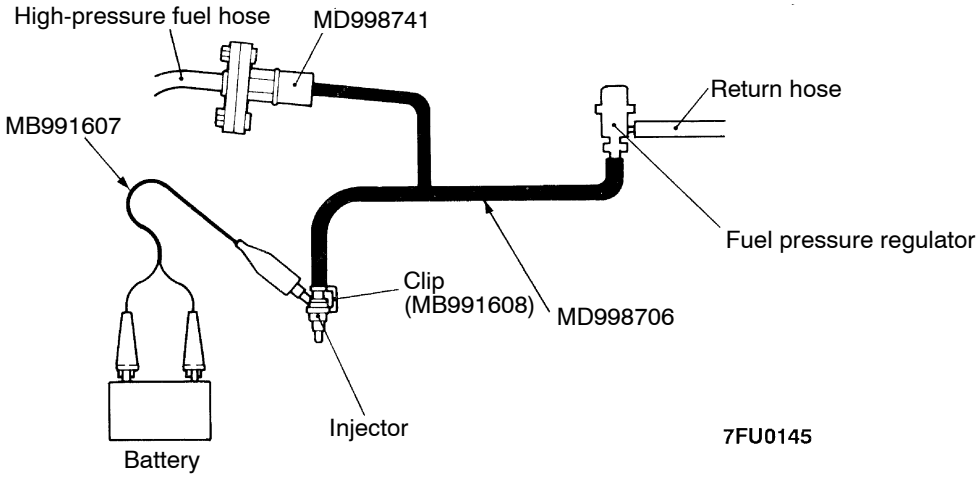
   **Standard value: 2 - 3 Ω (at 20°C)**

3. Install the injector connector.

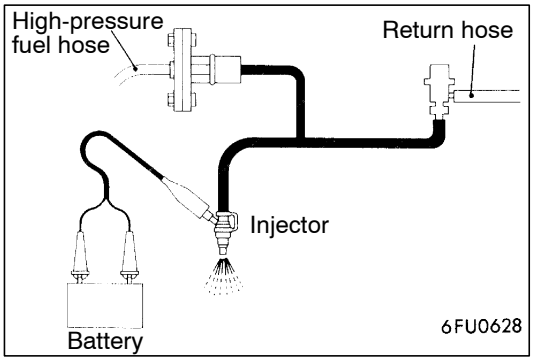
**Checking the Injection Condition**

1. Following the steps below, bleed out the residual pressure within the fuel pipe line to prevent flow of the fuel. (Refer to P.13A-96.)
2. Remove the injector.

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




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

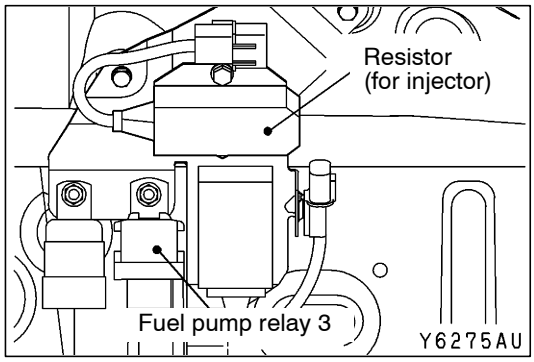


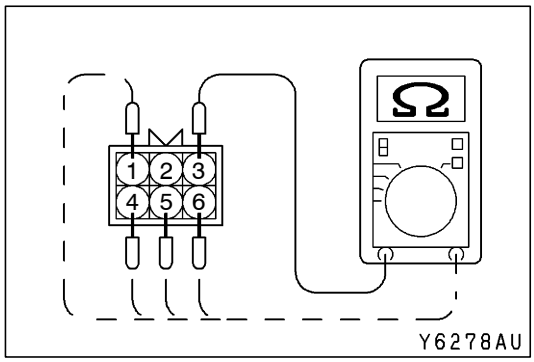

7. Activate the injector and check the atomized spray condition of the fuel.
   The condition can be considered satisfactory unless it is extremely poor.

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

   **Standard value: 1 drop or less per minute**

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



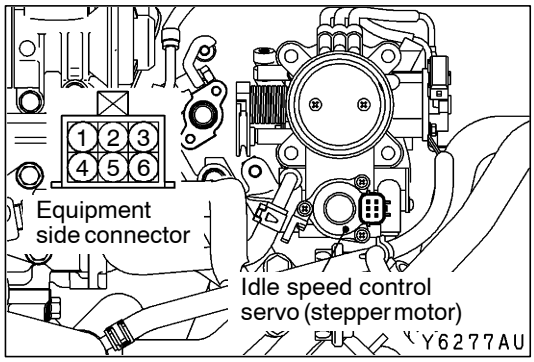




## RESISTOR (FOR INJECTOR) CHECK

1. Disconnect the resistor connector.
2. Measure the resistance between each terminal.

**Standard value:**

| Measurement terminal | Resistance Ω |
|---|---|
| 1 - 3 | 5.8 - 6.2 (at 20°C) |
| 4 - 3 | |
| 5 - 3 | |
| 6 - 3 | |

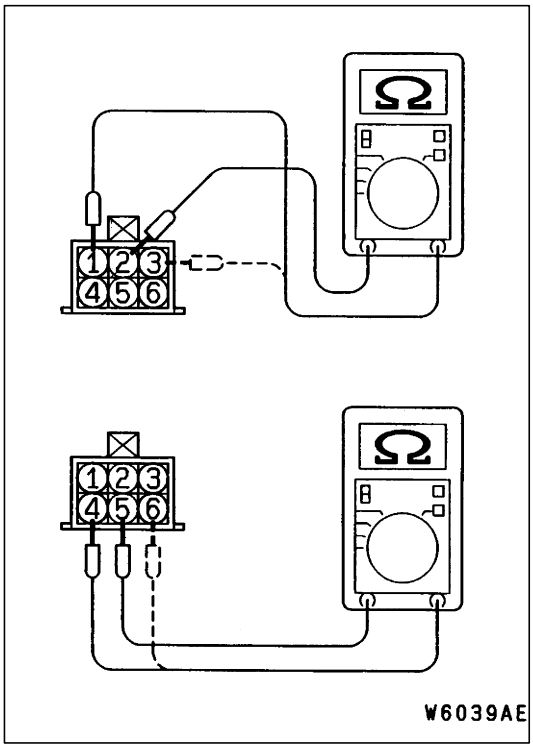



## IDLE SPEED CONTROL SERVO (STEPPER MOTOR) CHECK

### 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” position. (but without starting the engine.)
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-ECU.



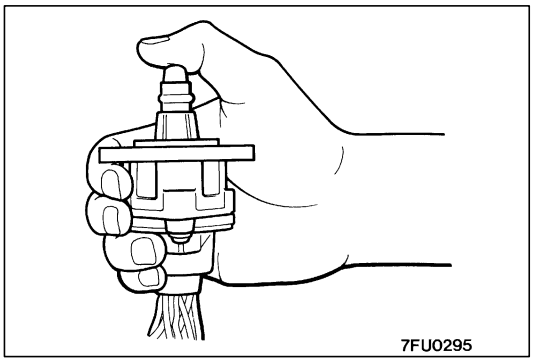

**Checking the Coil Resistance**

1. Disconnect the idle speed control servo connector.
2. Measure the resistance between terminal No. 2 and either terminal No. 1 or terminal No. 3 of the connector at the idle speed control servo side.

   **Standard value: 28 - 33 Ω (at 20°C)**

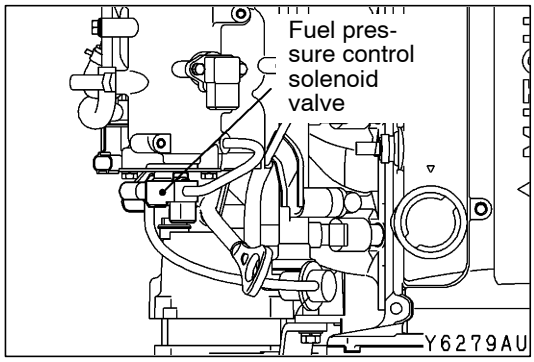
3. Measure the resistance between terminal No. 5 and either terminal No. 6 or terminal No. 4 of the connector at the idle speed control servo side.

   **Standard value: 28 - 33 Ω (at 20°C)**




**Operation Check**

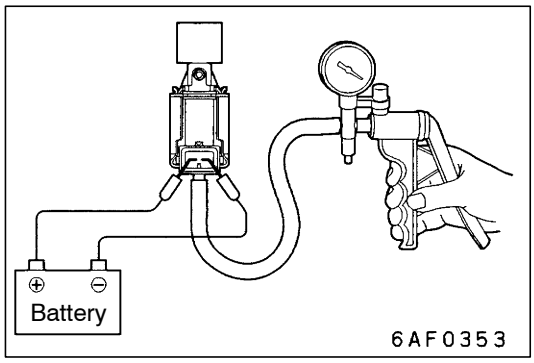
1. Remove the throttle body.
2. Remove the stepper motor.
3. Connect the special tool (test harness: MB991709) to the idle speed control servo connector.
4. Connect the positive (+) terminal of a power supply (approximately 6 V) to the terminals No. 2 and No. 5.
5. With the idle speed control servo as 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 terminals No. 1 and No. 4.
   (2) Connect the negative (-) terminal of the power supply to the terminals No. 3 and No. 4.
   (3) Connect the negative (-) terminal of the power supply to the terminals No. 3 and No. 6.
   (4) Connect the negative (-) terminal of the power supply to the terminals No. 1 and No. 6
   (5) Connect the negative (-) terminal of the power supply to the terminals No. 1 and No. 4.
   (6) Repeat the tests in sequence from (5) to (1).
6. If, as a result of these tests, vibration is detected, the stepper motor can be considered to be normal.




## FUEL PRESSURE CONTROL SOLENOID VALVE CHECK

### OPERATION CHECK

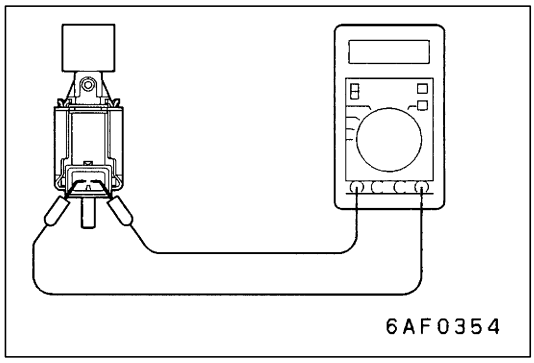
1. Disconnect the vacuum hose from the solenoid valve.
2. Separate the harness connector.




3. Connect the hand vacuum pump to the solenoid valve's A nipple.
4. Connect the solenoid valve terminal and battery terminal with a jumper wire.
5. Disconnect the jumper wire between the battery's (-) terminals, apply a negative pressure, and inspect the tightness.

**Standard value:**

| Jumper wire | State of B nipple | Normal state |
|---|---|---|
| Connected | Opened | Negative pressure leaks. |
| | Closed | Negative pressure is maintained. |
| Disconnected | Opened | Negative pressure is maintained. |




### COIL RESISTANCE CHECK

Measure the resistance between the solenoid valve terminals.

**Standard value: 28 – 36 Ω (at 20°C)**

## PURGE CONTROL SOLENOID VALVE CHECK

Refer to GROUP 17 - Emission Control System.

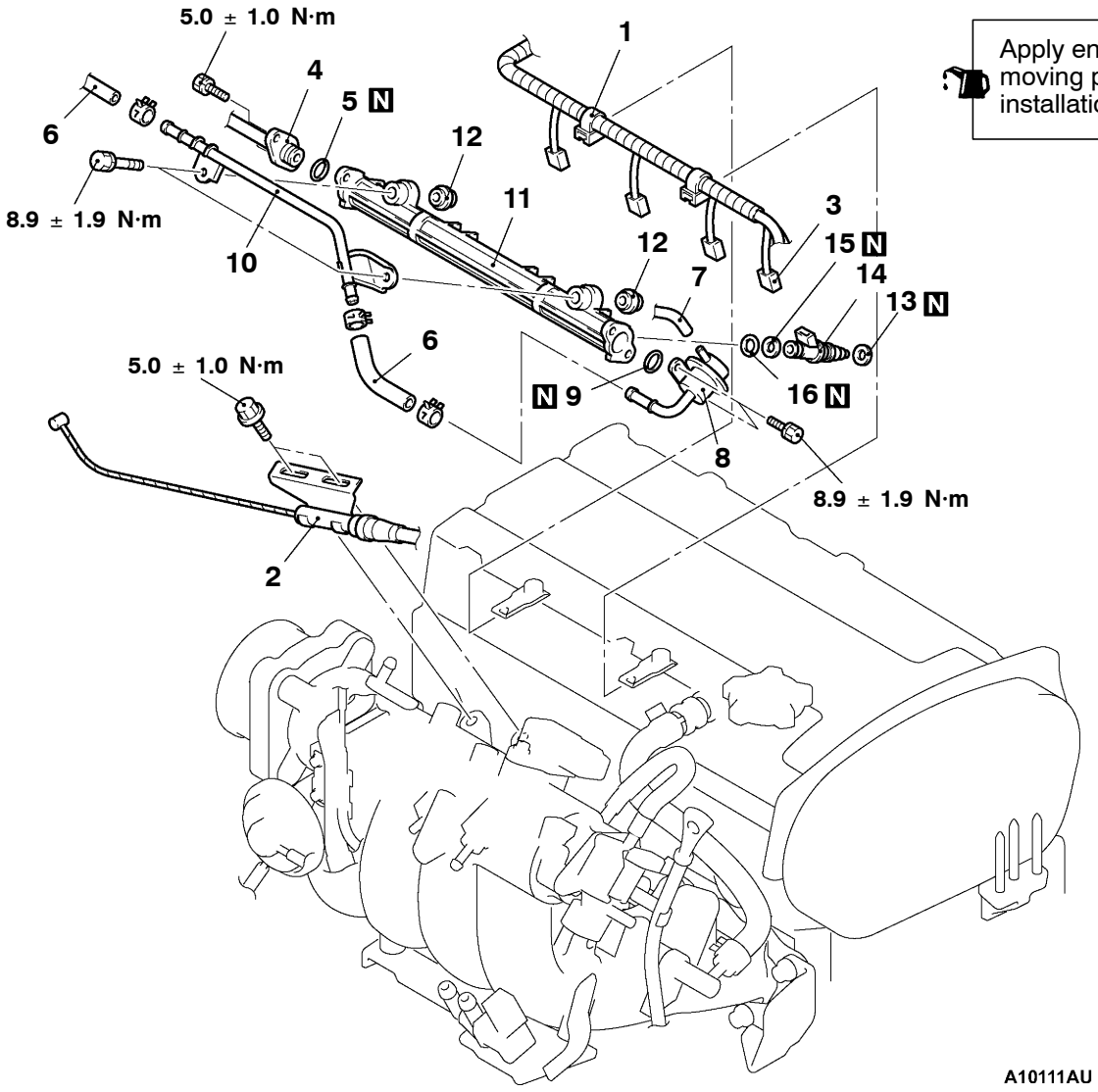
## EGR CONTROL SOLENOID VALVE CHECK

Refer to GROUP 17 - Emission Control System.

# INJECTOR

## REMOVAL AND INSTALLATION

**Pre-removal and Post-installation Operation**
- Fuel Discharge Prevention (Refer to P.13A-125.)
- Strut Tower Bar Removal and Installation (Refer to GROUP 42.)
- Air Hose E, Air By-pass Hose, Air Pipe C Removal and Installation (Refer to GROUP 15 - Intercooler.)
- Fuel Leakage Check




**Removal steps**

1. Control harness connector
2. Accelerator cable assembly connection (Throttle body side)
3. Injector harness connector
4. ▶A◀ High-pressure fuel hose connection
5. O-ring
6. Fuel return hose connection
7. Vacuum sensor connector
8. ▶A◀ Fuel pressure regulator
9. O-ring
10. Fuel return pipe
11. ◀A▶ Delivery pipe
12. Insulator
13. Insulator
14. ◀A▶ ▶A◀ Injector
15. Grommet
16. O-ring

## REMOVAL SERVICE POINT

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

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

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

## INSTALLATION SERVICE POINT

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

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

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

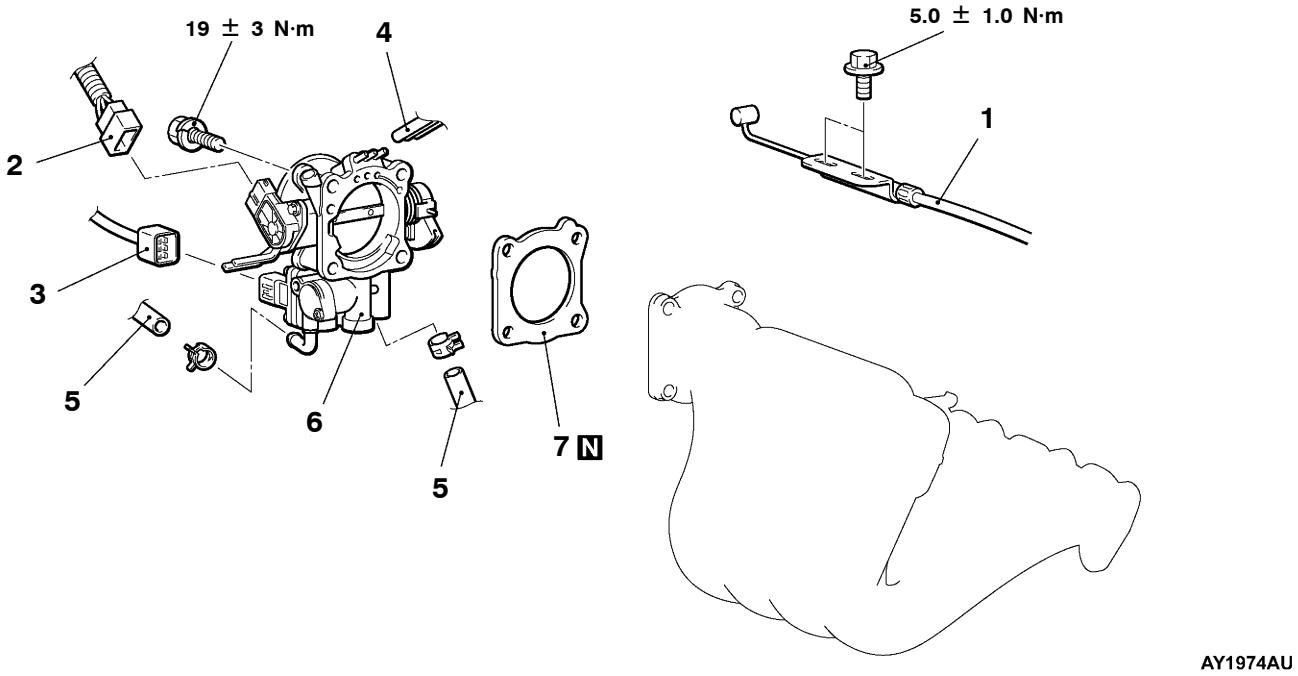
2. While turning the injector, high-pressure fuel hose and fuel pressure regulator to the right and left, install the delivery pipe, while being careful not to damage the O-ring. After installing, check that the hose turns smoothly.
3. If it does not turn smoothly, the O-ring may be trapped, remove the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

   **Tightening torque:**
   **5.0 ± 1.0 N·m (High-pressure fuel hose)**
   **8.9 ± 1.9 N·m (Fuel pressure regulator)**

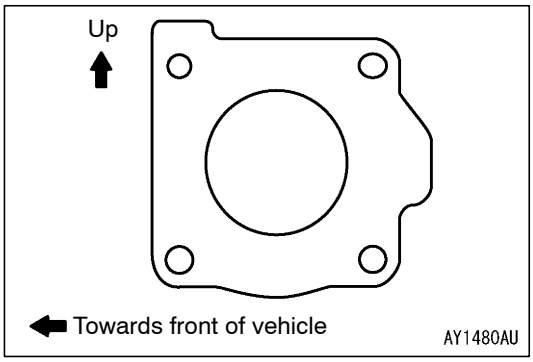
# THROTTLE BODY

## REMOVAL AND INSTALLATION

**Pre-removal and Post-installation Operation**
- Under Cover Removal and Installation (Refer to GROUP 51 - Front Bumper.)
- Engine Coolant Draining and Supplying (Refer to GROUP 14 - On-vehicle Service.)
- Strut Tower Bar Removal and Installation (Refer to GROUP 42.)
- Air Hose E, Air By-pass Hose, Air Pipe C Removal and Installation (Refer to GROUP 15 - Intercooler.)
- Accelerator Cable Adjustment (Refer to GROUP 17 - On-vehicle Service.) <Post-installation>




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

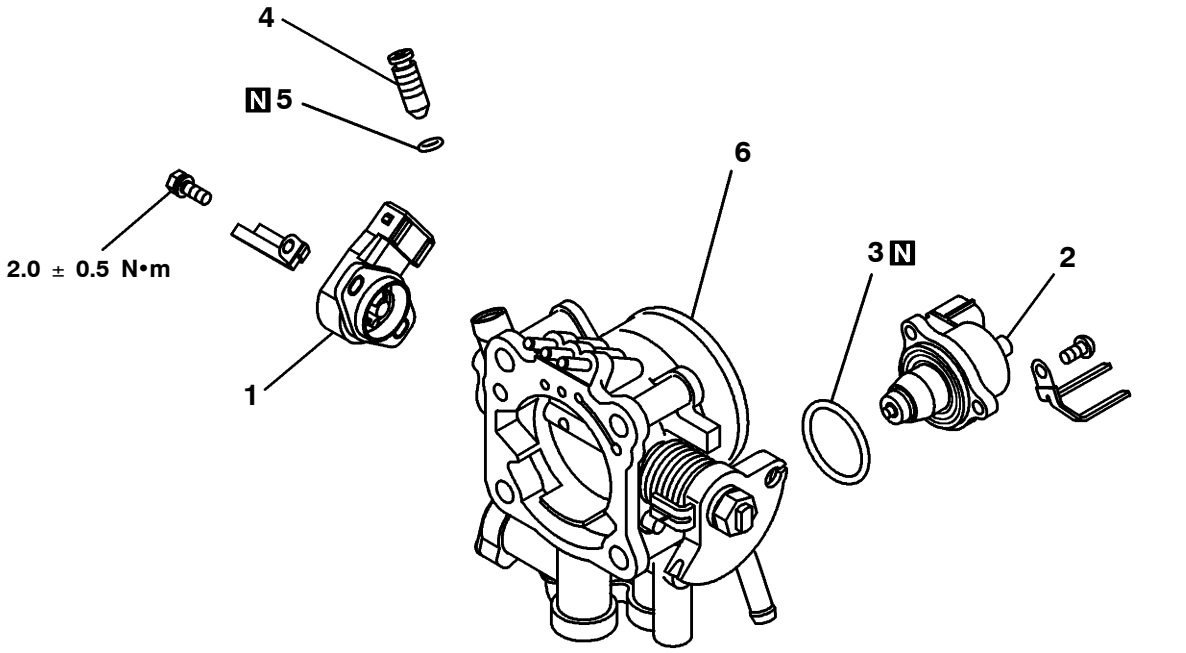



## INSTALLATION SERVICE POINT

### ▶A◀ THROTTLE BODY GASKET INSTALLATION

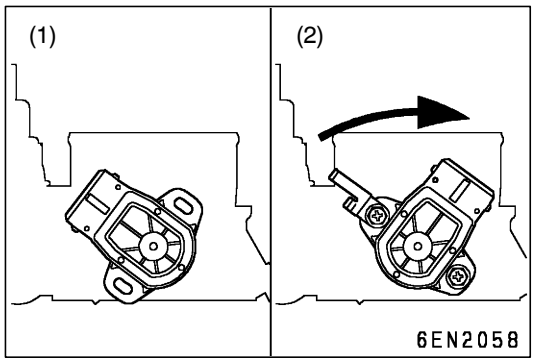
Place the gasket so that the projecting part is positioned as shown in the illustration, and then install it between the intake manifold and the throttle body.

## DISASSEMBLY AND REASSEMBLY




**Removal steps**

▶A◀ 1. Throttle position sensor
2. Idle speed control servo
3. O-ring
4. Fixed SAS
5. O-ring
6. Throttle body

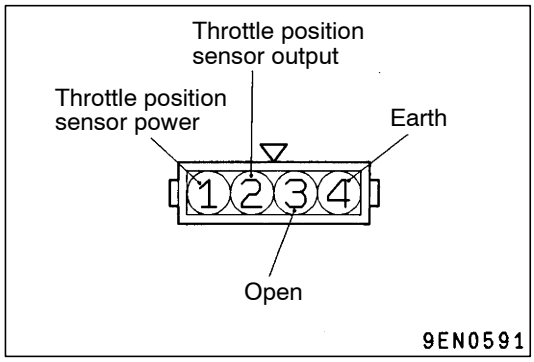



## INSTALLATION SERVICE POINT

### ▶A◀ THROTTLE POSITION SENSOR INSTALLATION

1. Set the throttle position sensor on the throttle body as shown in illustration (1).
2. Turn and set the throttle position sensor to the position shown in illustration (2), connect a circuit tester across terminal No. 2 (Throttle position sensor output) and terminal No. 4 (earth), and measure the output voltage. Tighten the throttle position sensor with a screw at the position where the output voltage is at the standard value.

   **Standard value: 0.535 - 0.735 V**

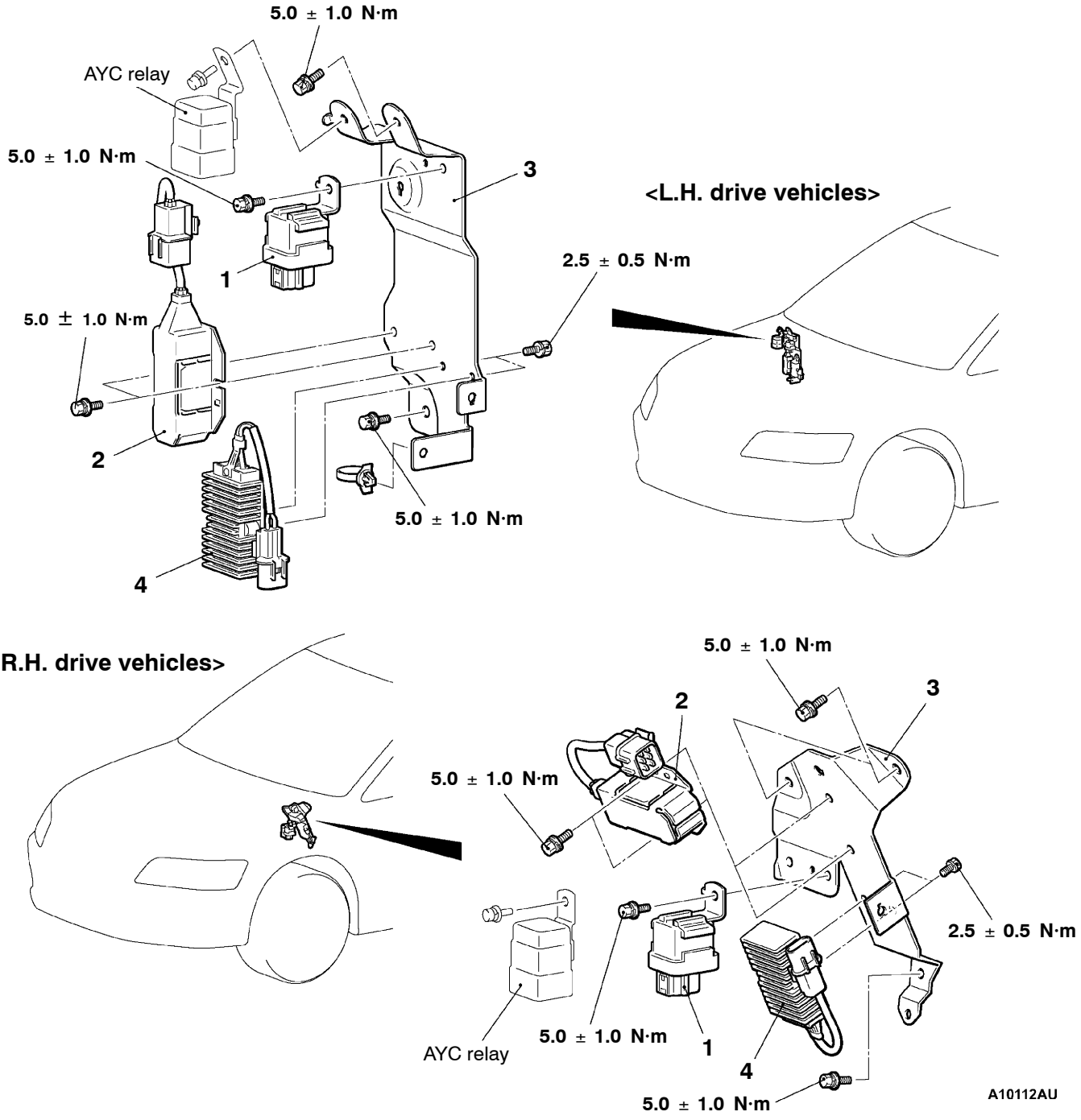



3. After installing the Throttle position sensor, check that the output voltage is at the standard value. If deviated from the standard value, loosen the screw, readjust to the standard position, and then fix. Repeat this step until the output voltage is at the standard value.
4. Connect a circuit tester across terminal No. 1 (Throttle position sensor power) and terminal No. 2 (Throttle position sensor output). Check that the resistance changes smoothly when the throttle valve is slowly moved to the fully opened position.

# ENGINE CONTROL RESISTOR, RELAY

## REMOVAL AND INSTALLATION

**Pre-removal and Post-installation Operation**
- Strut Tower Bar Removal and Installation (Refer to GROUP 42.)
- Harness Connector Connection



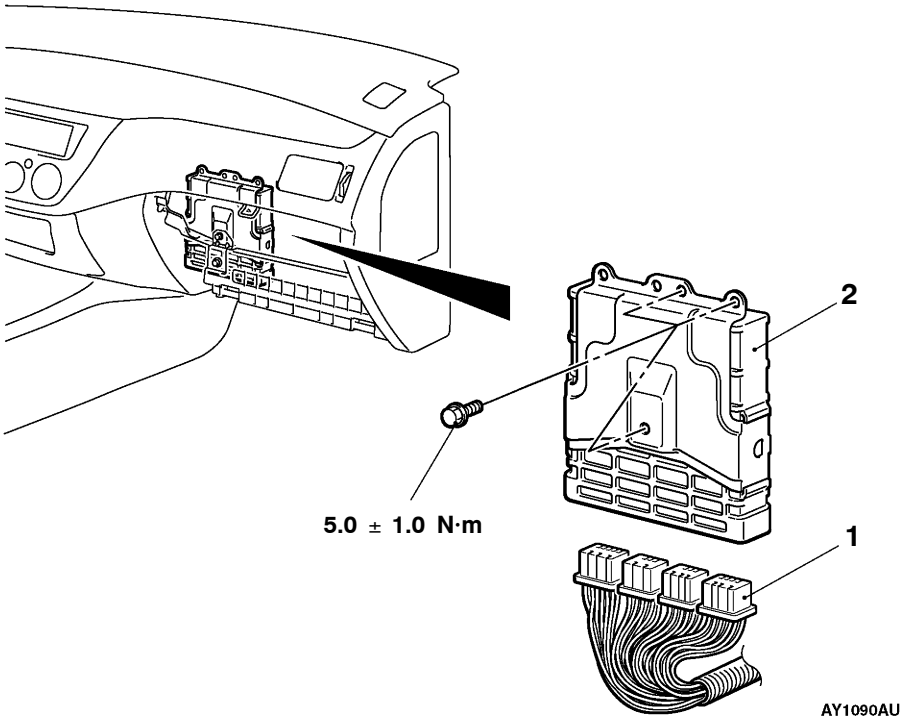

**Removal steps**
- AYC relay

1. Fuel pump relay
2. Injector resistor
3. Bracket
4. Fuel pump resistor

# ENGINE-ECU

## REMOVAL AND INSTALLATION

**Pre-removal and Post-installation Operations**
Glove Box Assembly Removal and Installation (Refer to GROUP 52A - Instrument Panel.)




**Removal steps**

1. Engine-ECU connector
2. Engine-ECU

**NOTES**

# FUEL SUPPLY

## CONTENTS

# GENERAL INFORMATION

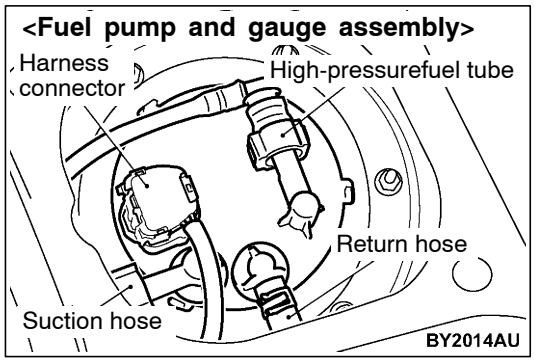
- The steel fuel tank is located under the floor of the rear seats to provide increased safety and increase the amount of luggage compartment space.
- The fuel tank has been equipped with a valve assembly which incorporates a fuel cut-off valve to prevent fuel from leaking out in the event of a collision for adjusting the pressure inside the fuel tank.
- The fuel pump module contains a fuel pump, fuel filter, and fuel pressure regulator.

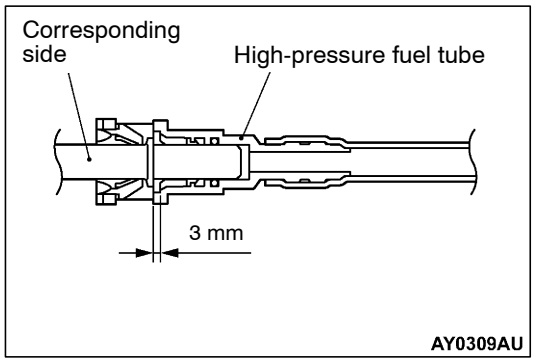
# ON-VEHICLE SERVICE

## FUEL PUMP AND GAUGE ASSEMBLY (FUEL PUMP)

### 1. FUEL PUMP OPERATION CHECK

Refer to GROUP 13A - On-vehicle service




### 2. FUEL PUMP REPLACEMENT

(1) Remove the rear seat cushion assembly. (Refer to GROUP 52A.)
(2) Remove the service hole cover.
(3) Disconnect the harness connector, high-pressure fuel tube, suction hose and return hose.
(4) Unscrew the mounting nuts to remove the fuel pump and gauge assembly.
(5) Replace the fuel pump. (Refer to P.13B-7.)
(6) Install the fuel pump and gauge assembly. Tighten the mounting nuts to the specified torque.

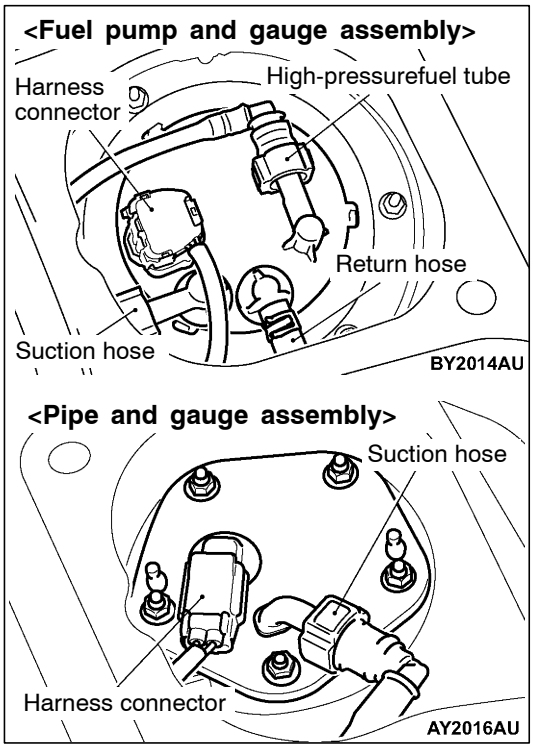
**Specified torque: 2.5 ± 0.5 N·m**

(7) Connect the harness connector, high-pressure fuel tube, suction hose, and return hose.

**Caution**

**1) Snap the high-pressure fuel hose or suction hose one-touch joint into place, then pull back slightly on the hose to assure it is securely fitted. However, the connection should have a play of approx. 3 mm.**
**2) Insert the return hose for 20 - 30 mm for connection.**

(8) Install the service hole cover.
(9) Install the rear seat cushion assembly. (Refer to GROUP 52A.)




## FUEL PUMP AND GAUGE ASSEMBLY, PIPE AND GAUGE ASSEMBLY (FUEL GAUGE UNIT)

1. Remove the rear seat cushion assembly. (Refer to GROUP 52A.)
2. Remove the service hole cover.
3. Disconnect the harness connector, high-pressure fuel tube, suction hose, and return hose.
4. Unscrew the mounting nuts to remove the fuel pump and gauge assembly or pipe and gauge assembly.
5. Fuel gauge unit check. (Refer to GROUP 54 - Combination Meter.)

   NOTE
   If the inspection shows that the basic resistance and the height of float are out of the standard value, replace the gauge unit.
   (Refer to P.13B-8.)
6. Install the fuel pump and gauge assembly or pipe and gauge assembly. Tighten the mounting nuts to the specified torque.

   **Specified torque: 2.5 ± 0.5 N·m**
7. Connect the harness connector, high-pressure fuel tube, suction hose, and return hose.

   **Caution**
   **(1) Snap the high-pressure fuel hose or suction hose one-touch joint into place, then pull back slightly on the hose to assure it is securely fitted. However, the connection should have a play of approx. 3 mm.**
   **(2) Insert the return hose for 20 - 30 mm for connection.**
8. Install the rear seat cushion assembly. (Refer to GROUP 52A.)

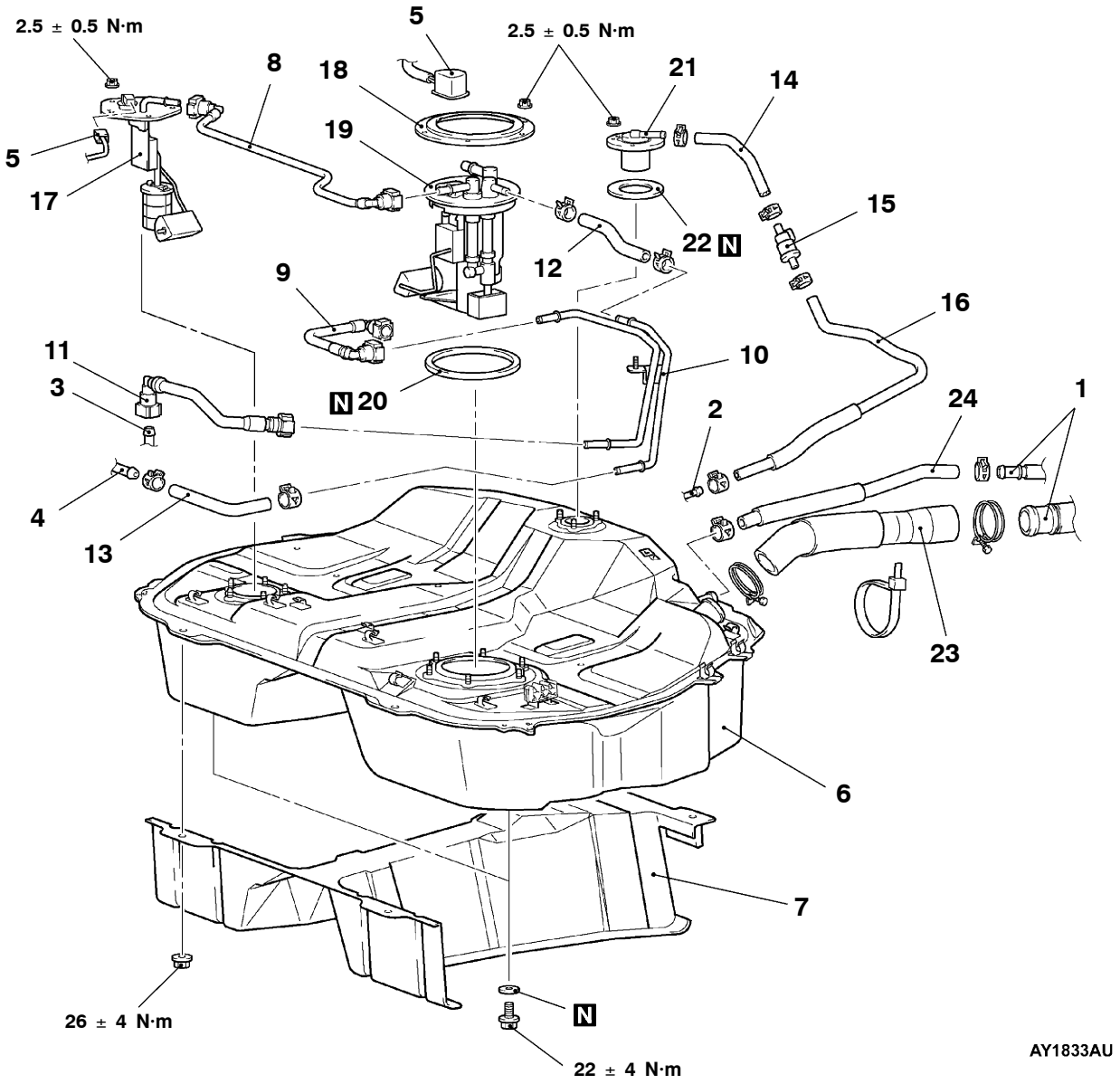
# FUEL TANK

## REMOVAL AND INSTALLATION

**Pre-removal Operation**
- Draining Fuel
- Fuel Pump Connector Disconnection (How To Reduce Fuel Pressure) (Refer to GROUP 13A - On-vehicle Service.)
- Center Exhaust Pipe Removal (Refer to GROUP 15.)

**Post-installation Operation**
- Center Exhaust Pipe Removal (Refer to GROUP 15.)
- Refilling Fuel
- Checking for Fuel Leaks

**<Fuel tank assembly>**

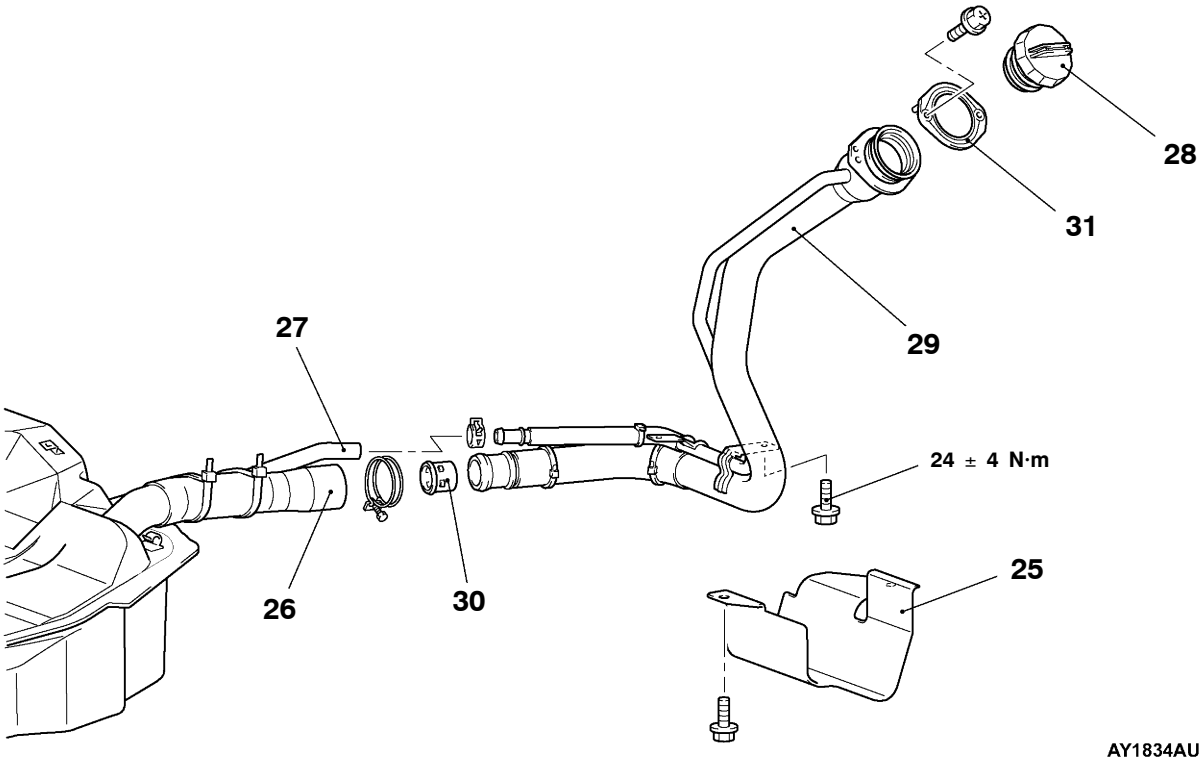



**Removal steps <Fuel tank assembly>**

1. Filler neck pipe, Filler neck vapour pipe connection
2. Vapour pipe connection
3. Main pipe connection
4. Return pipe connection
- Parking brake cable clamp (LH) connection (Refer to GROUP 36.)
- Rear wheel speed sensor (RH) connection (Refer to GROUP 35 - Wheel speed sensor.)
- Rear wheel speed sensor harness connector connection (Refer to GROUP 35 - Wheel speed sensor.)

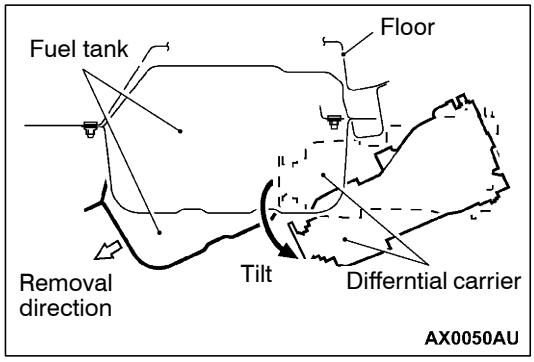
◀A▶ 5. Harness connector connection
◀A▶ 6. Fuel tank assembly
7. Fuel tank protector
▶A◀ 8. Suction hose
▶A◀ 9. High-pressure fuel hose
10. Fuel tank pipe assembly
▶A◀ 11. High-pressure fuel hose
▶B◀ 12. Fuel tank return hose
13. Return hose
14. Fuel tank vapour hose
15. Check valve
16. Vapour hose
17. Pipe and gauge assembly
18. Plate
19. Fuel pump and gauge assembly
20. Parking
21. Fuel cut off valve assembly
22. Parking
23. Filler neck hose
24. Filler neck vapour hose

**<Fuel filler neck assembly>**




**Removal steps <Filler neck assembly>**

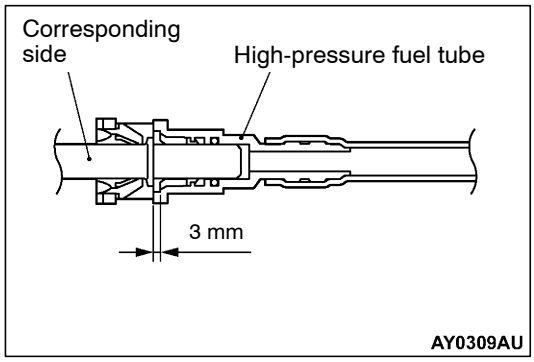
25. Filler neck protector
26. Filler neck hose connection
27. Filler neck vapour hose connection
28. Fuel filler cap
29. Fuel filler neck assembly
30. Fuel shut-off valve
31. Parking




## REMOVAL SERVICE POINT

### ◀A▶ HARNESS CONNECTOR CONNECTION/FUEL TANK ASSEMBLY DISCONNECTION

1. Remove the differential support member and tilt the differential carrier.
   (Refer to GROUP 27B.)
2. Hold the fuel tank with a transmission jack and remove the nut connected to the fuel tank.
3. Tilt the fuel tank to allow access with a hand and disconnect the harness connector.
4. Remove the fuel tank in the tilting direction to avoid contact with the differential carrier.




## INSTALLATION SERVICE POINT

**▶A◀ HIGH-PRESSURE FUEL HOSE/SUCTION HOSE INSTALLATION**

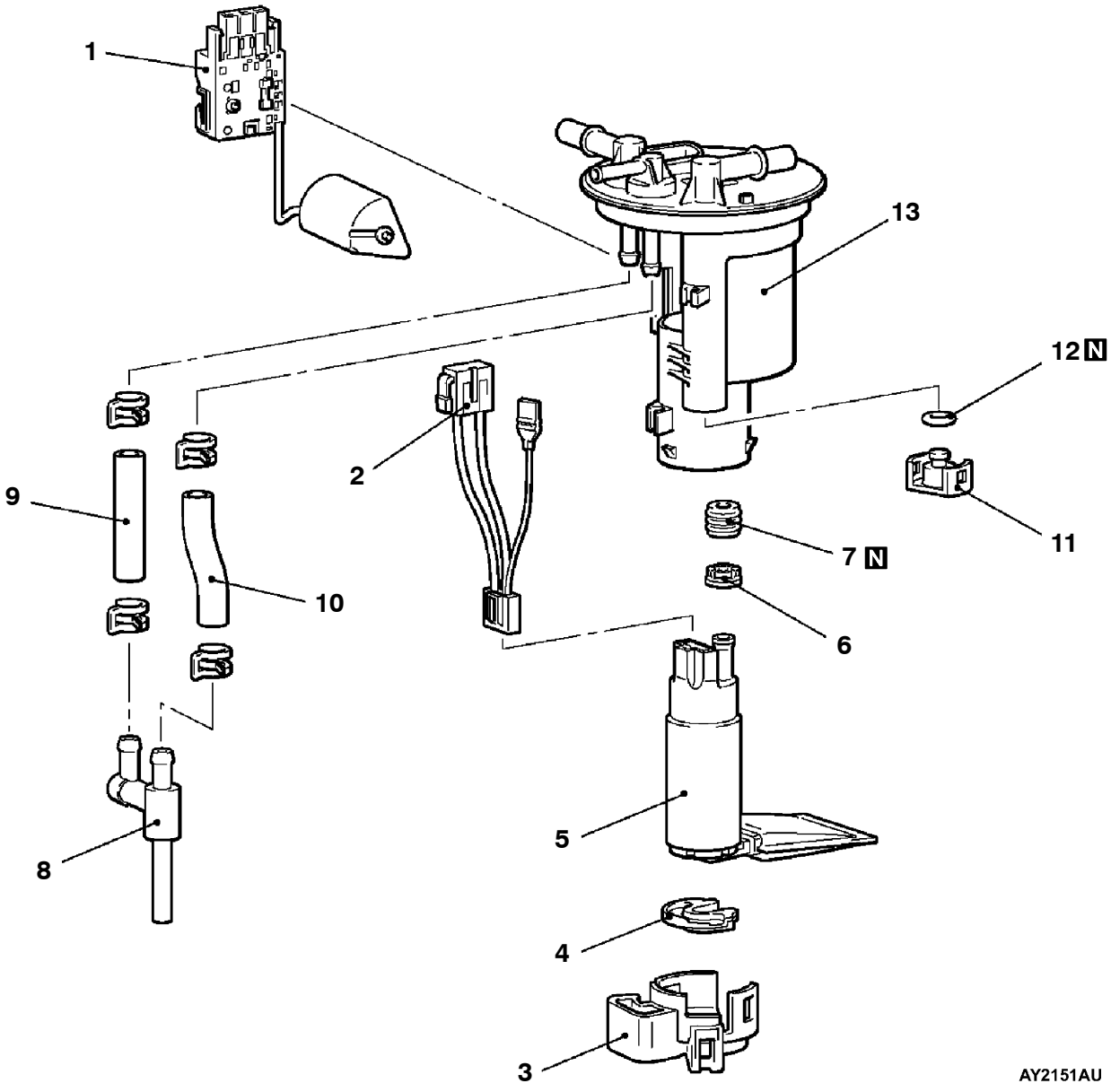
**Caution**
**Snap the high-pressure fuel hose or suction hose one-touch joint into place, then pull back slightly on the hose to assure it is securely fitted. However, the connection should have a play of approx. 3 mm.**

**▶B◀ FUEL TANK RETURN HOSE INSTALLATION**

**Caution**
**Insert the return hose for 20 - 30 mm for connection.**

## DISASSEMBLY AND REASSEMBLY

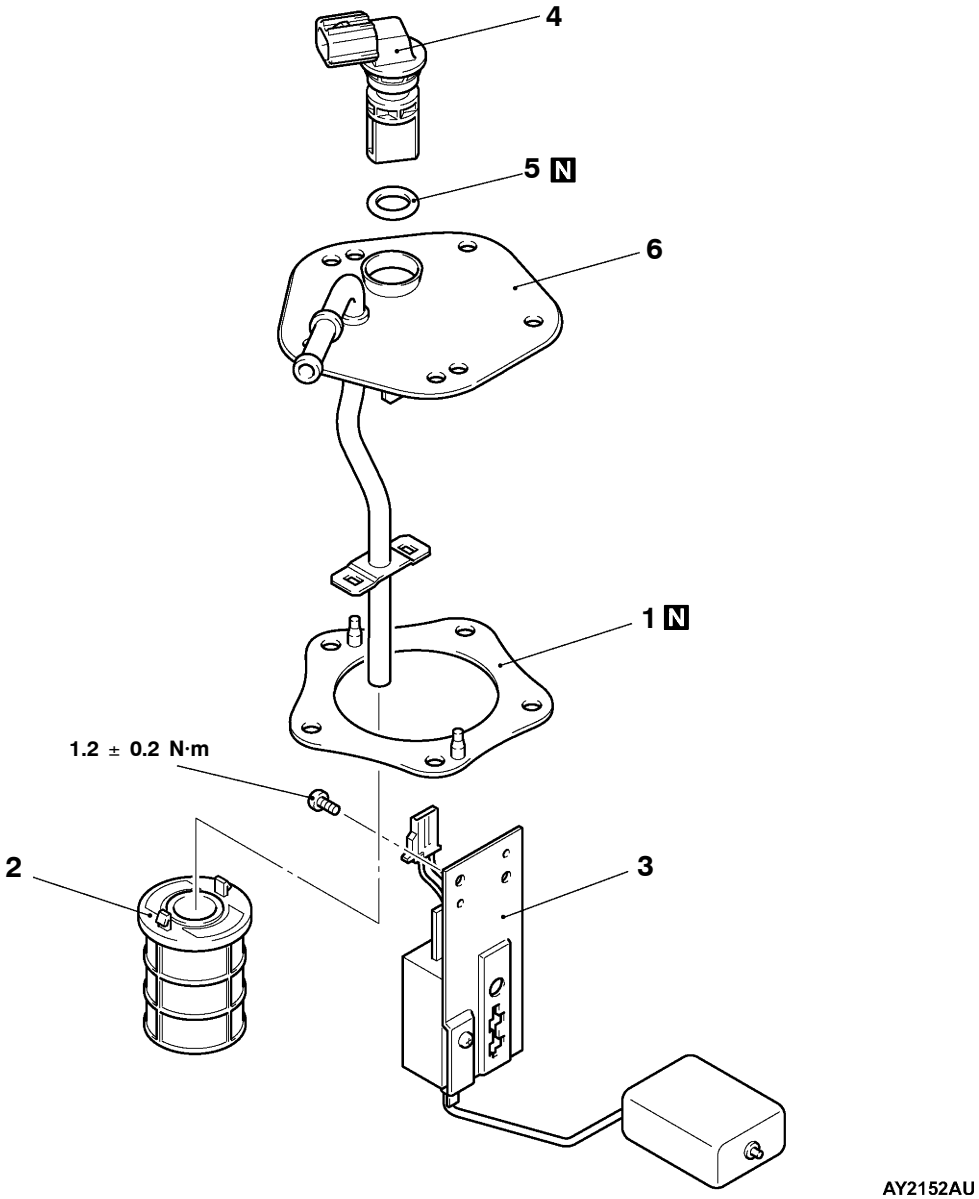
### <FUEL PUMP AND GAUGE ASSEMBLY>




**Removal steps**

1. Fuel gauge unit
2. Gauge harness
3. Bracket
4. Fuel pump cushion
5. Fuel pump
6. Spacer
▶A◀ 7. Grommet
8. Assist pump
9. Fuel suction hose
10. Fuel return hose
11. Cap
▶A◀ 12. O-ring
13. Fuel filter assembly

**<PIPE AND GAUGE ASSEMBLY>**




**Removal steps**

1. Packing
2. Filter
3. Gauge unit
4. Connector
▶A◀ 5. O-ring
6. Pipe assembly

## INSTALLATION SERVICE POINT

### ▶A◀ O-RING/GROMMET INSTALLATION

Apply a fuel to O-ring and grommet before installing them, to prevent them from being damaged or twisted.