MULTIPOINT FUEL INJECTION (MPI)

CONTENTS

GENERAL INFORMATION

OUTLINE OF CHANGES

Maintenance procedure have been established according to the following changes.

- The terminal arrangement of the engine-ECU has been changed from 64 pins connector to 76 pins connector.
- The sequential fuel injection has been adopted.
- The oxygen sensor (rear) has been added for vehicles for Germany.

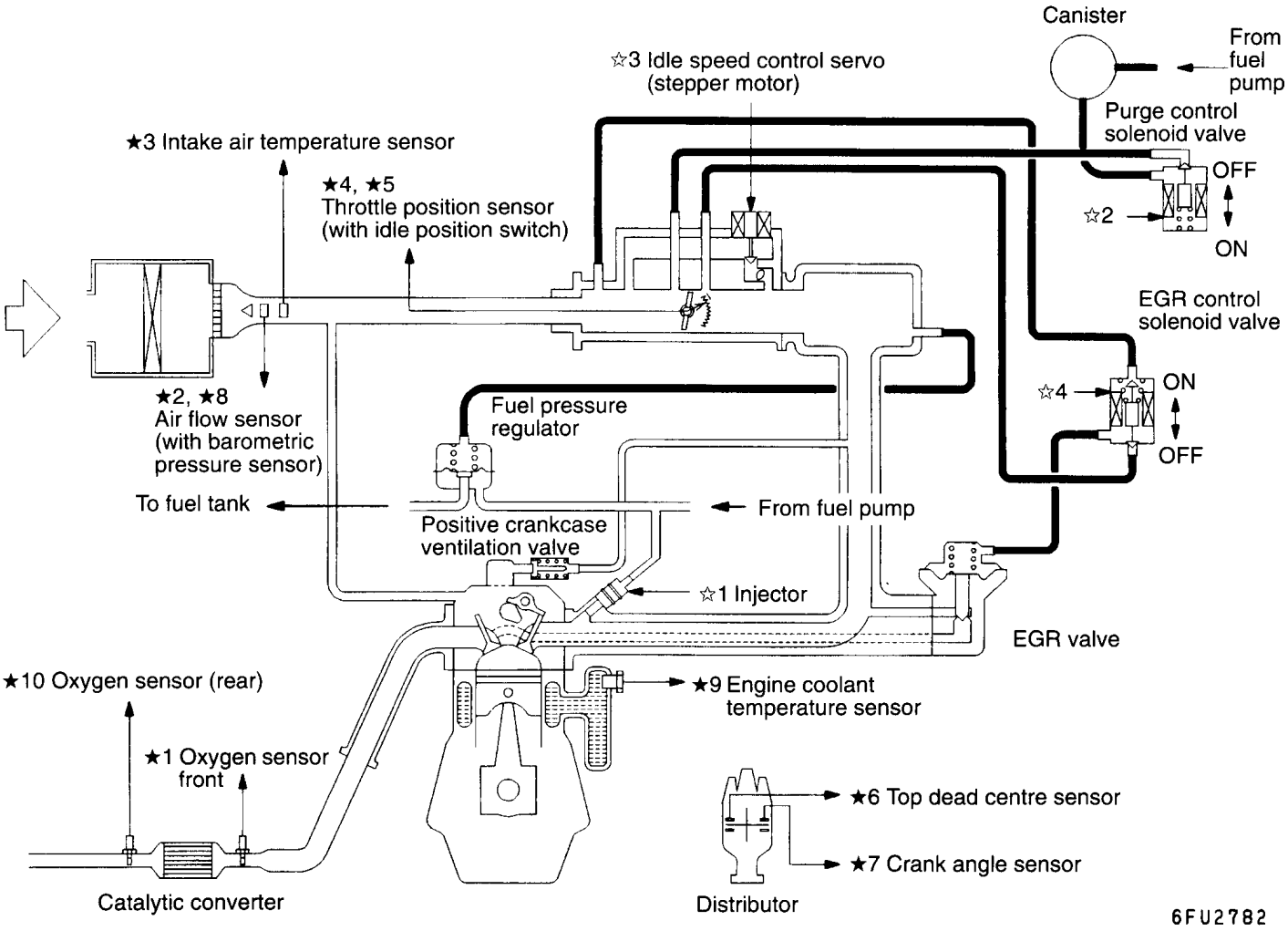
GENERAL SPECIFICATIONS

Items				Specifications
Engine-ECU	Identification model No.	Vehicles without immobilizer system	4G63-Panel van and window van	E2T69783 <Right-hand vehicles> E2T69788 <Left-hand vehicles>
			4G63-Wagon	E2T69785
			4G64	E2T69781 <Right-hand vehicles> E2T69784 <Left-hand vehicles>
		Vehicles with immobilizer system	4G63-Panel van and window van	E2T69778 <Vehicles for Germany> E2T69789 <Vehicles except for Germany>
			4G63-Wagon	E2T69787
			4G64	E2T69780 <Vehicles for Germany> E2T69782 <Right-hand vehicles> E2T69786 <Left-hand vehicles except for Germany>

MULTI POINT FUEL INJECTION SYSTEM DIAGRAM

<Vehicles for Germany>

★1 Oxygen sensor (front) ★2 Air flow sensor ★3 Intake air temperature sensor ★4 Throttle position sensor ★5 Idle position switch ★6 Top dead centre sensor ★7 Crank angle sensor ★8 Barometric pressure sensor ★9 Engine coolant temperature sensor ★10 Oxygen sensor (rear)	• Power supply • Vehicle speed sensor • A/C switch • Inhibitor switch • Power steering fluid pressure switch • Ignition switch-ST • Ignition switch-IG	⇨ Engine-ECU ⇨	☆1 Injector ☆2 Purge control solenoid valve ☆3 Idle speed control servo ☆4 EGR control solenoid valve	• Fuel pump relay • Control relay • A/C power relay • Engine warning lamp • Diagnosis signal • Ignition coil, power transistor	



SERVICE SPECIFICATIONS

Items	Specifications
Injector coil resistance Ω	13 – 16 (at 20°C)

TROUBLESHOOTING

13100870214

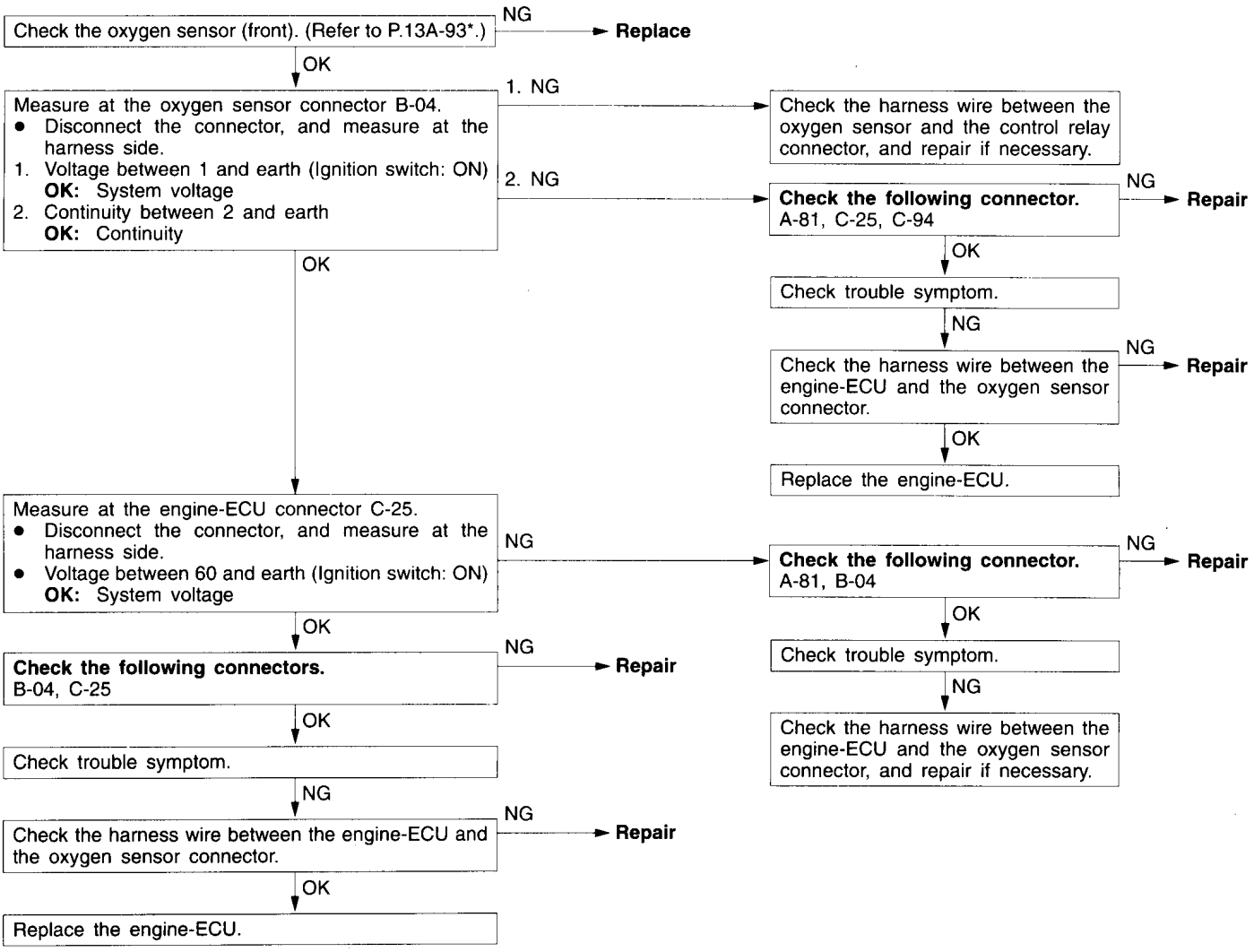
INSPECTION CHART FOR DIAGNOSIS CODES

Code No.	Diagnosis item	Reference page
11	Oxygen sensor (front) system	13A-5
12	Air flow sensor system	13A-6
13	Intake air temperature sensor system	13A-6
14	Throttle position sensor system	13A-7
21	Engine coolant temperature sensor system	13A-8
22	Crank angle sensor system	13A-9
23	Top dead center sensor system	13A-10
24	Vehicle speed sensor system	13A-11
25	Barometric pressure sensor system	13A-12
36*	Ignition timing adjustment signal system	13A-13
41	Injector system	13A-13
54	Immobilizer system	13A-14
59	Oxygen sensor (rear) system <Vehicles for Germany>	13A-15

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

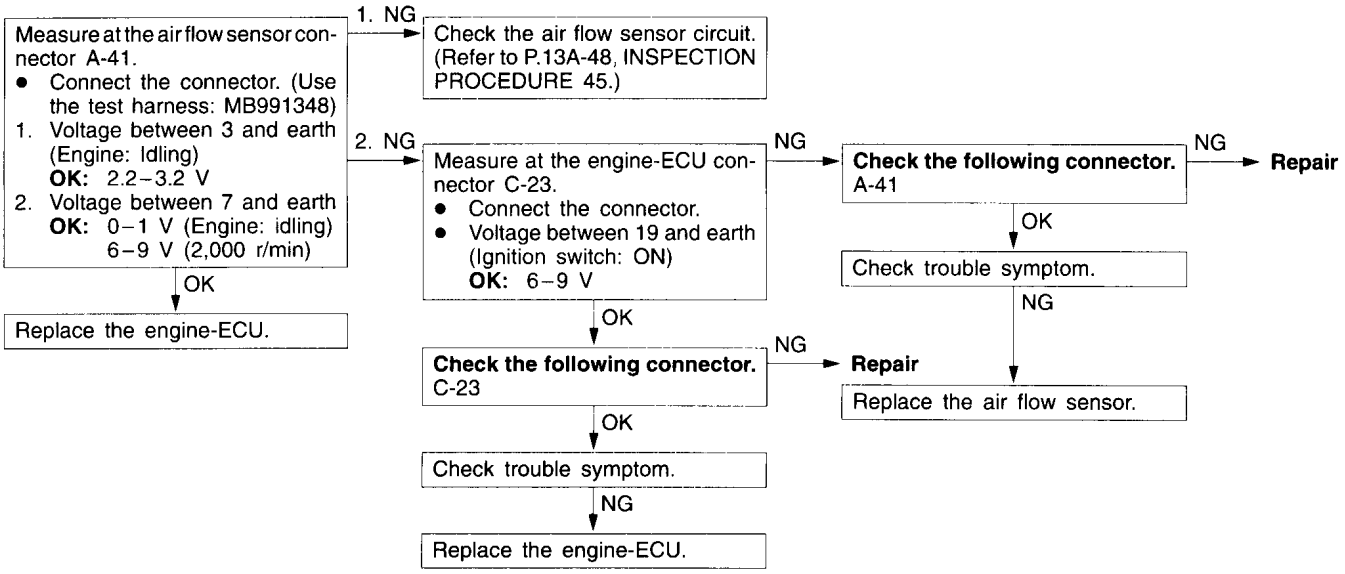
INSPECTION PROCEDURE FOR DIAGNOSIS CODES

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

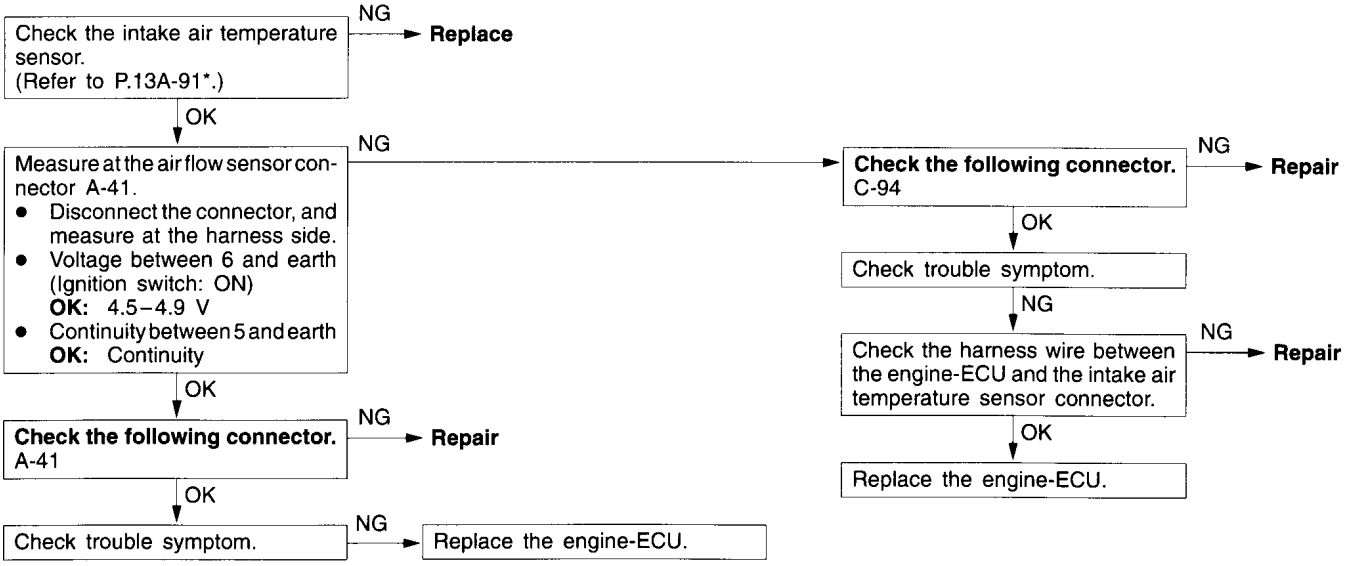


*: Refer to L400 Workshop Manual (Pub. No. PWWE9410)

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

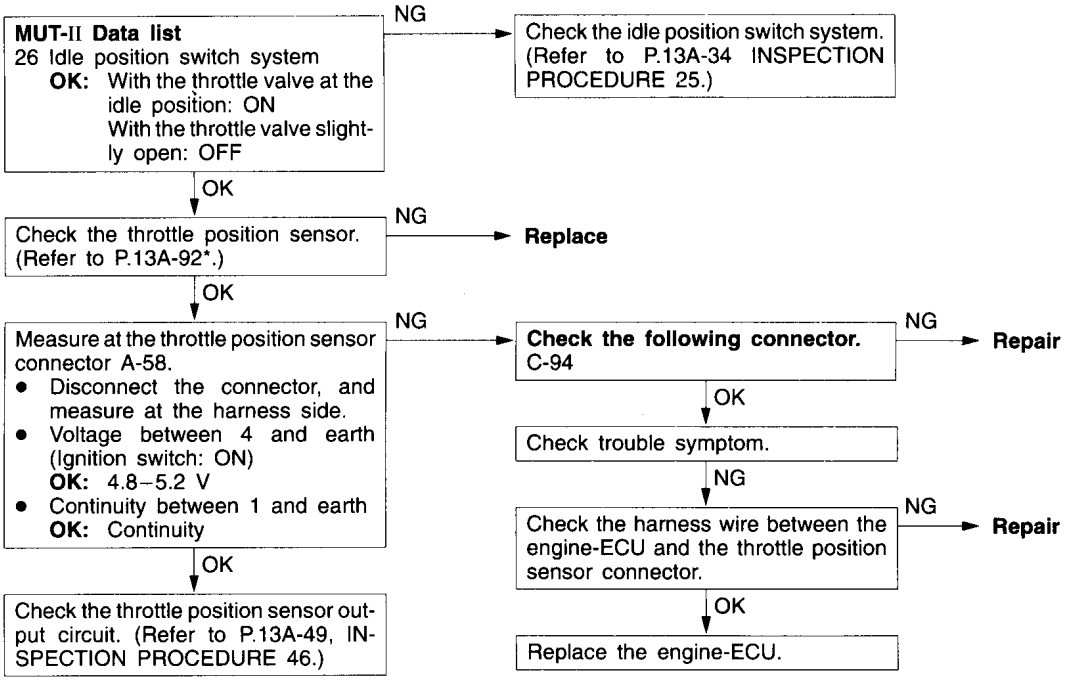


Code No. 13 Intake air temperature sensor system	Probable cause
Range of Check • Ignition switch: ON • Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts. Set conditions • Sensor output voltage is 4.6 V or more (corresponding to an intake air temperature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



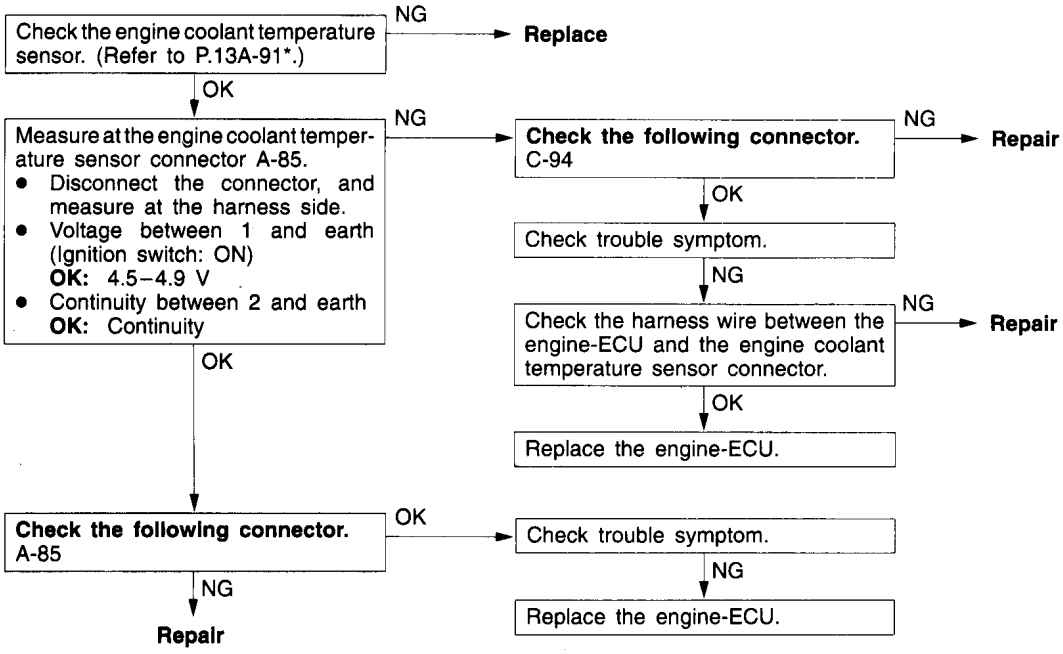
*: Refer to L400 Workshop Manual (Pub. No. PWWE9410)

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



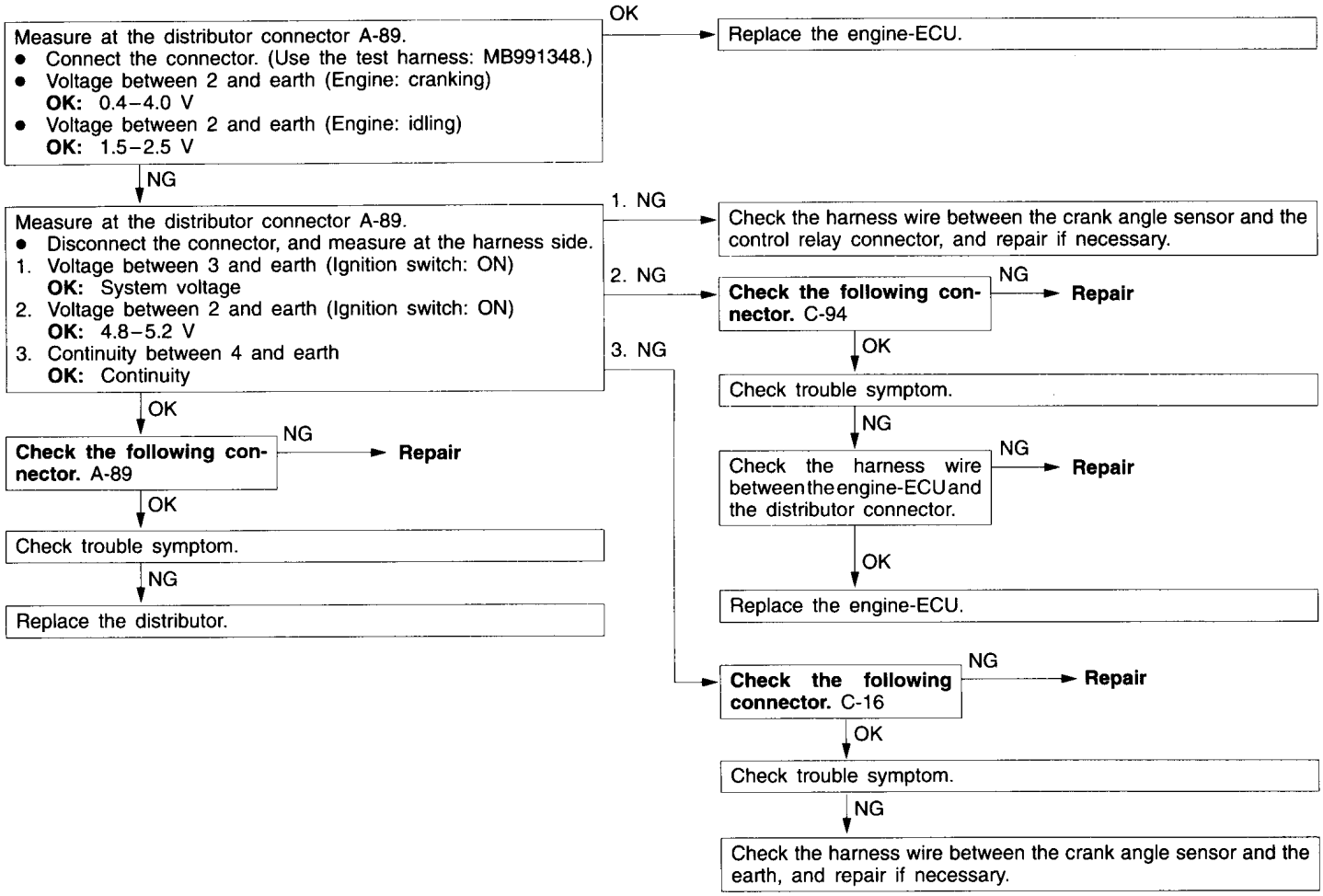
*: Refer to L400 Workshop Manual (Pub. No. PWWE9410)

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

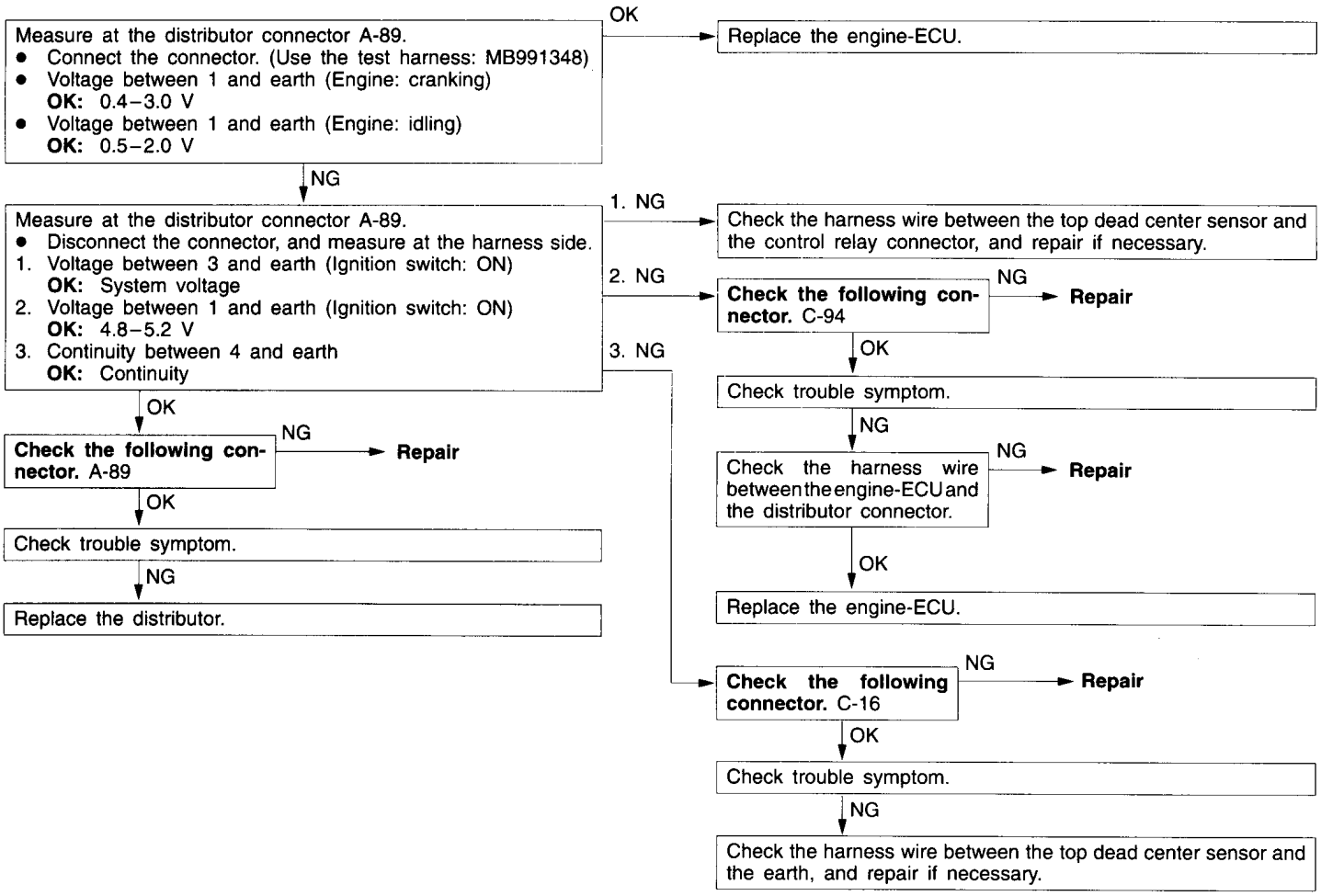


*: Refer to L400 Workshop Manual (Pub. No. PWWE9410)

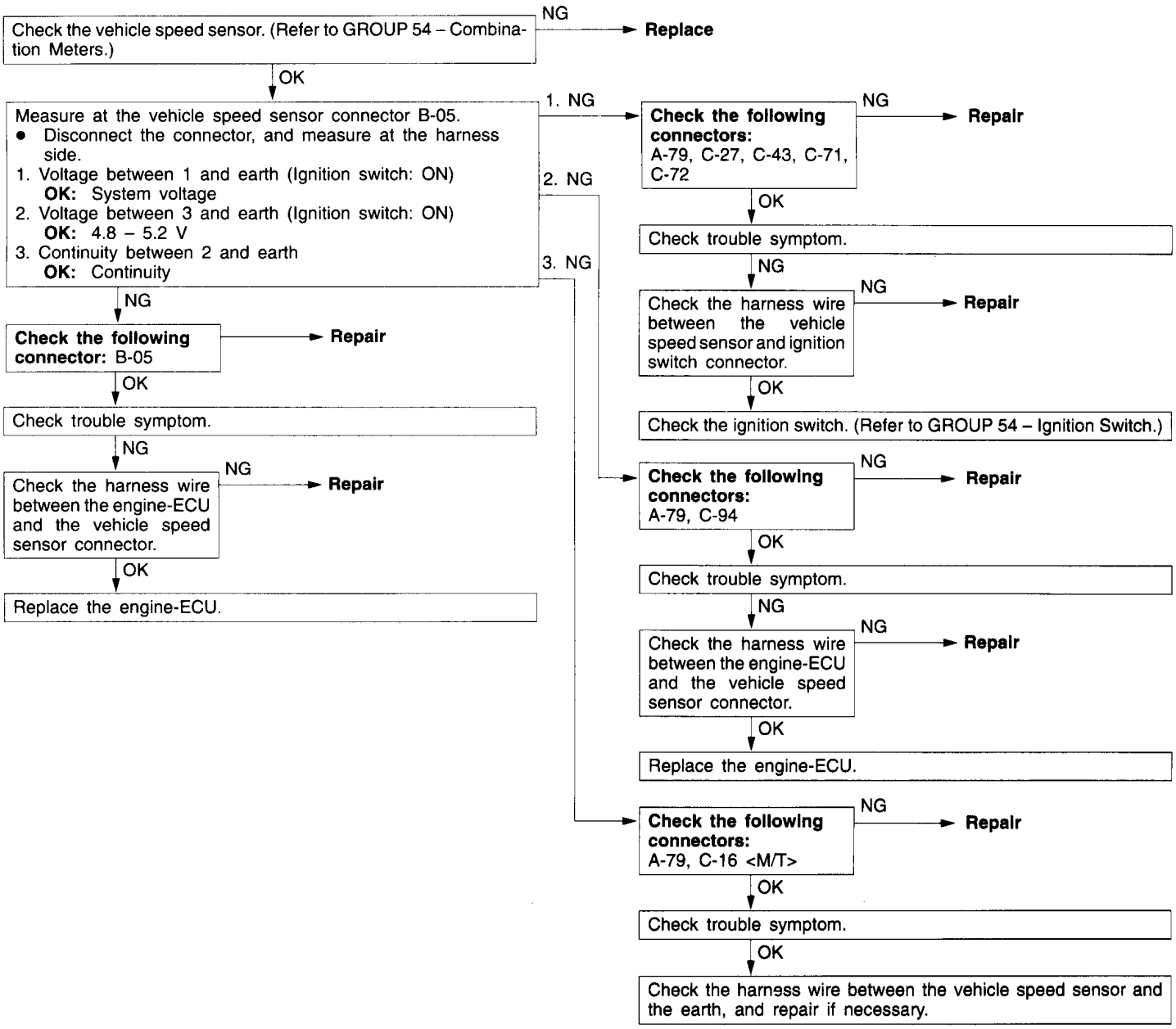
Code No. 22 Crank angle sensor system	Probable cause
Range of Check • Engine is cranking. Set conditions • Sensor output voltage does not change for 4 seconds (no pulse signal input.)	• Malfunction of the crank angle sensor • Improper connector contact, open circuit or short-circuited harness wire of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



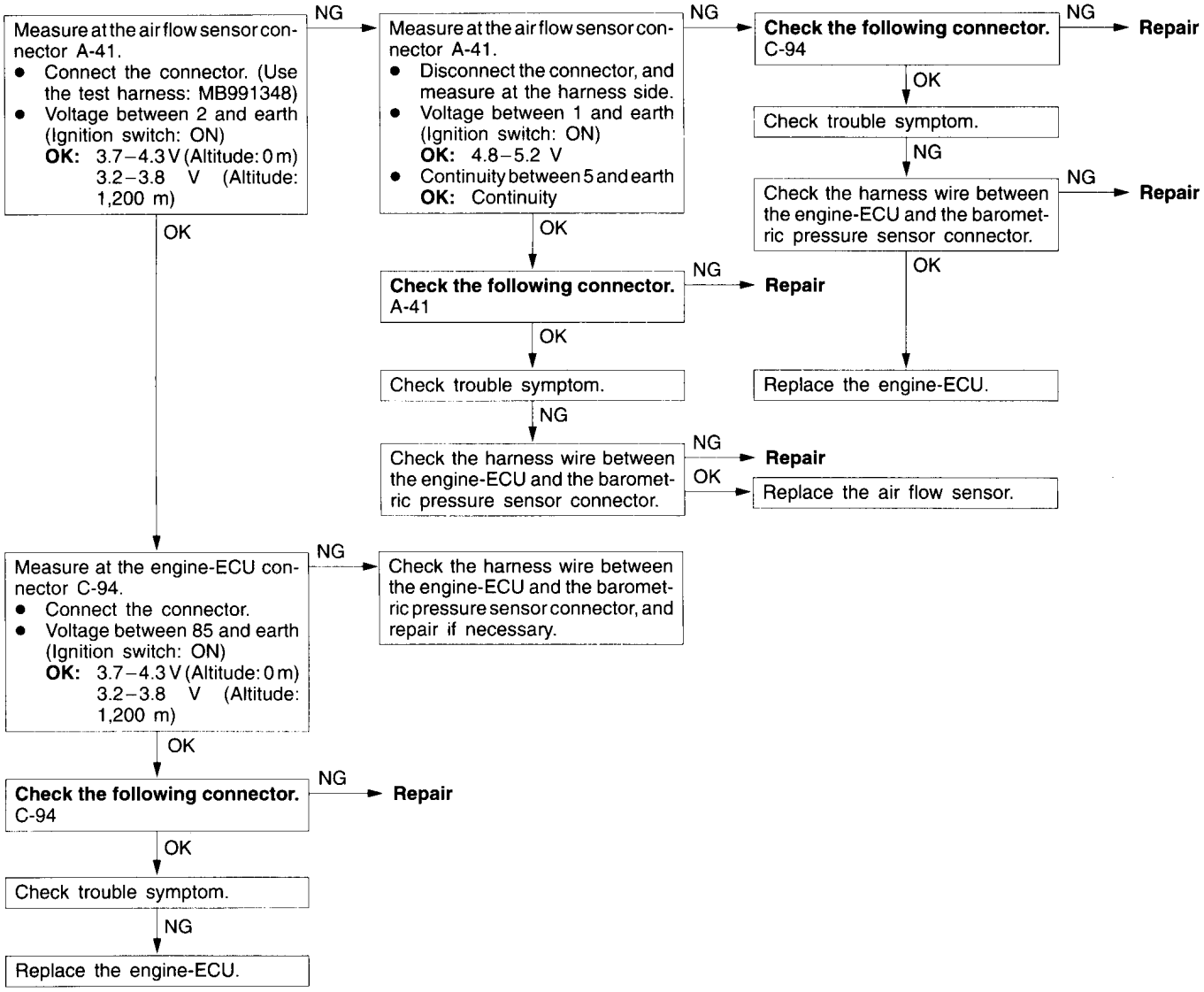
Code No. 23 Top dead center sensor system	Probable cause
Range of Check • Ignition switch: ON • Engine speed is approx. 50 r/min or more. Set conditions • Sensor output voltage does not change for 4 seconds (no pulse signal input.)	• Malfunction of the camshaft position sensor • Improper connector contact,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



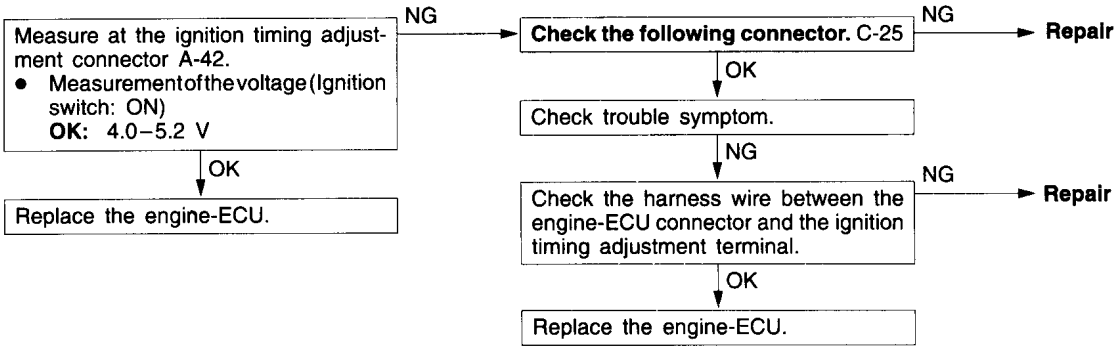
Code No. 24 Vehicle speed sensor system	Probable cause
Range of check • Ignition switch: ON • Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts. • Idle position switch: OFF • Engine speed is 3,000 r/min or more. • Driving under high engine load conditions.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



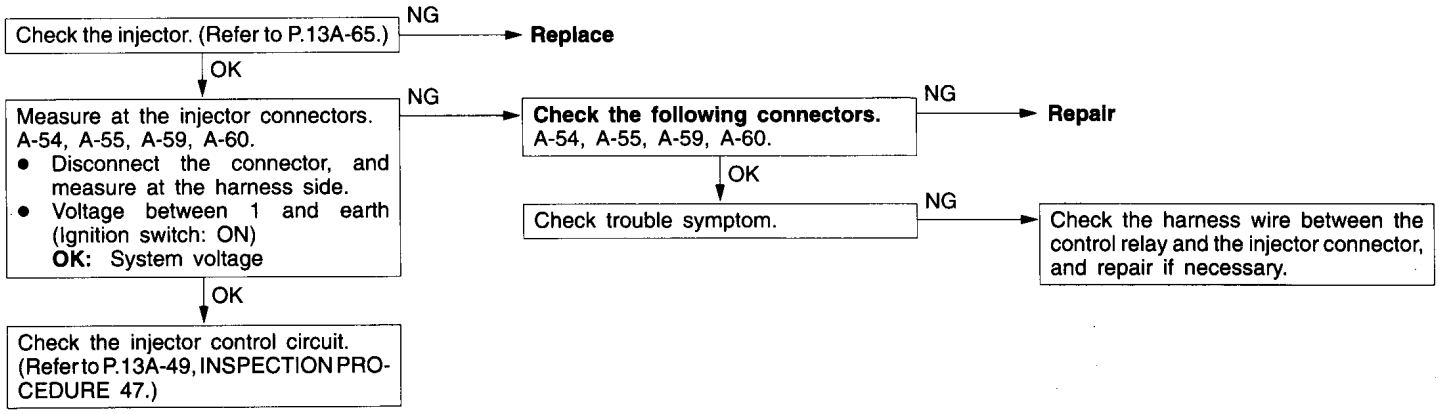
Code No. 25 Barometric pressure sensor system	Probable cause
Range of Check • Ignition switch: ON • Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts. • Battery voltage is 8 V or more. Set conditions • Sensor output voltage is 4.5 V or more (corresponding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



Code No. 36 Ignition timing adjustment signal system	Probable cause
Range of Check • Ignition switch: ON Set conditions • The ignition timing adjusting signal wire is shorted to the earth.	• Short circuit to earth of the ignition timing adjustment signal line • Malfunction of the engine-ECU

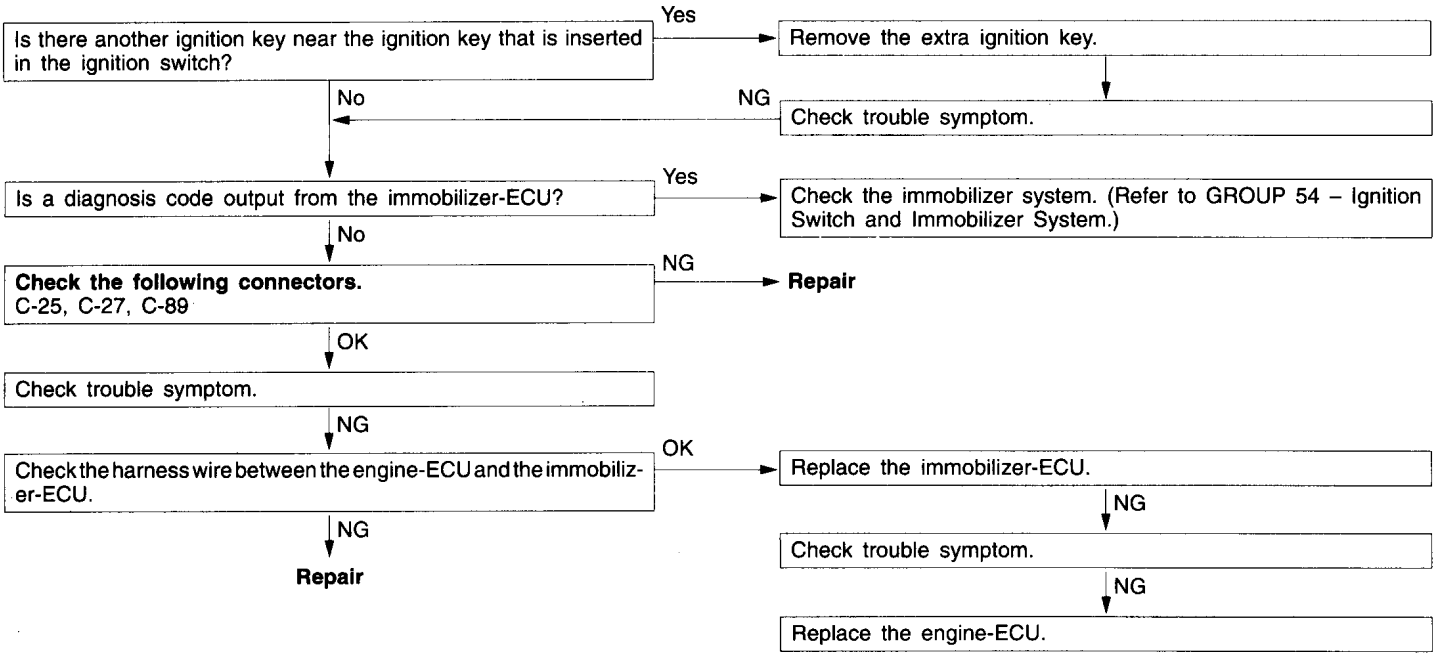


Code No. 41 Injector system	Probable cause
Range of Check • Engine speed is approx. 50–1,000 r/min • The throttle position sensor output voltage is 1.15 V or less. • Actuator test by MUT-II is not carried out. Set conditions • Surge voltage of injector coil is not detected for 4 seconds.	• Malfunction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

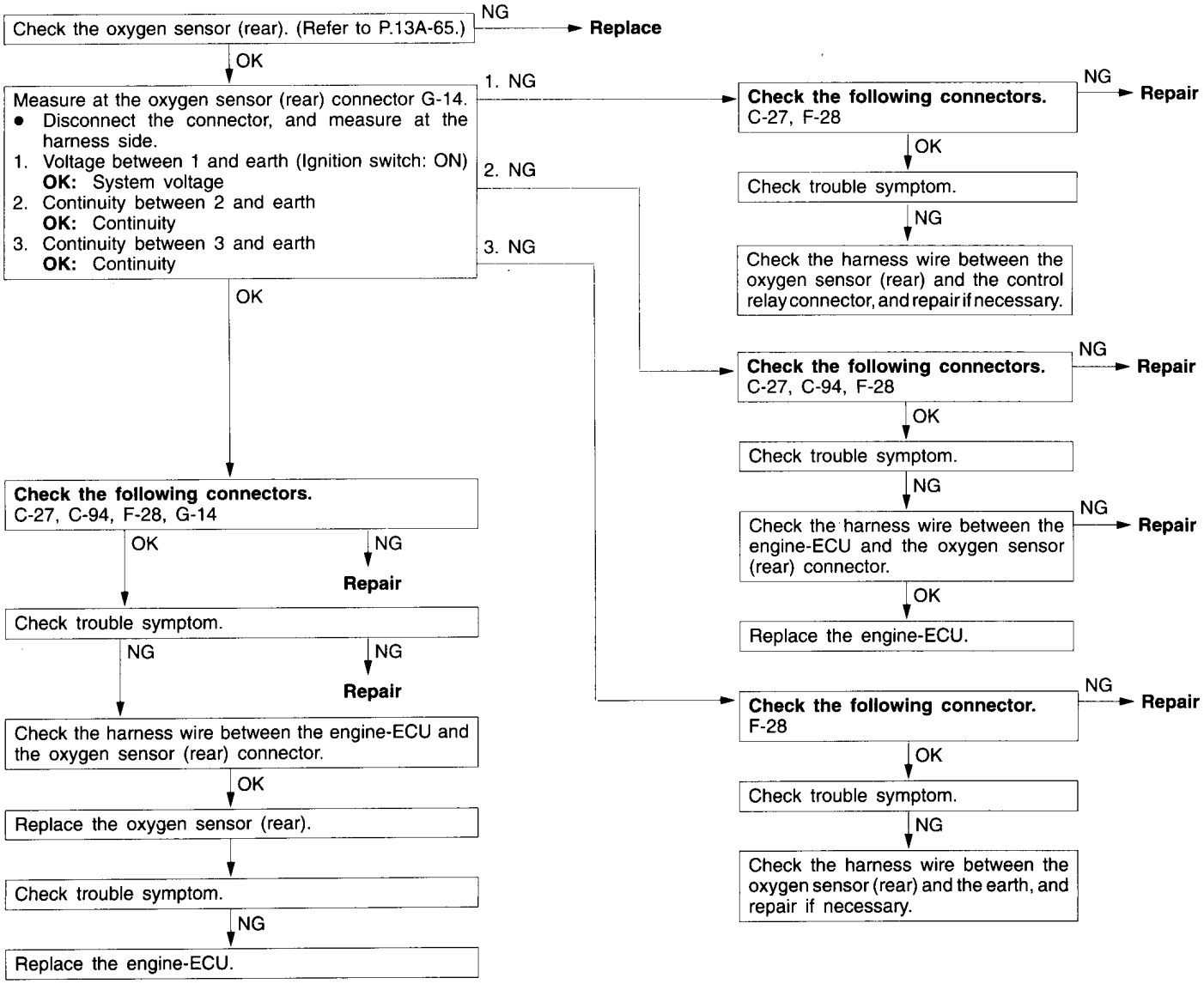


Code No. 54 Immobilizer system	Probable cause
Range of Check • Ignition switch: ON Set Conditions • Improper communication between the engine-ECU and immobilizer-ECU	• Radio interference of ID codes • Incorrect ID code • Malfunction of harness or connector • Malfunction of immobilizer-ECU • Malfunction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

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



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



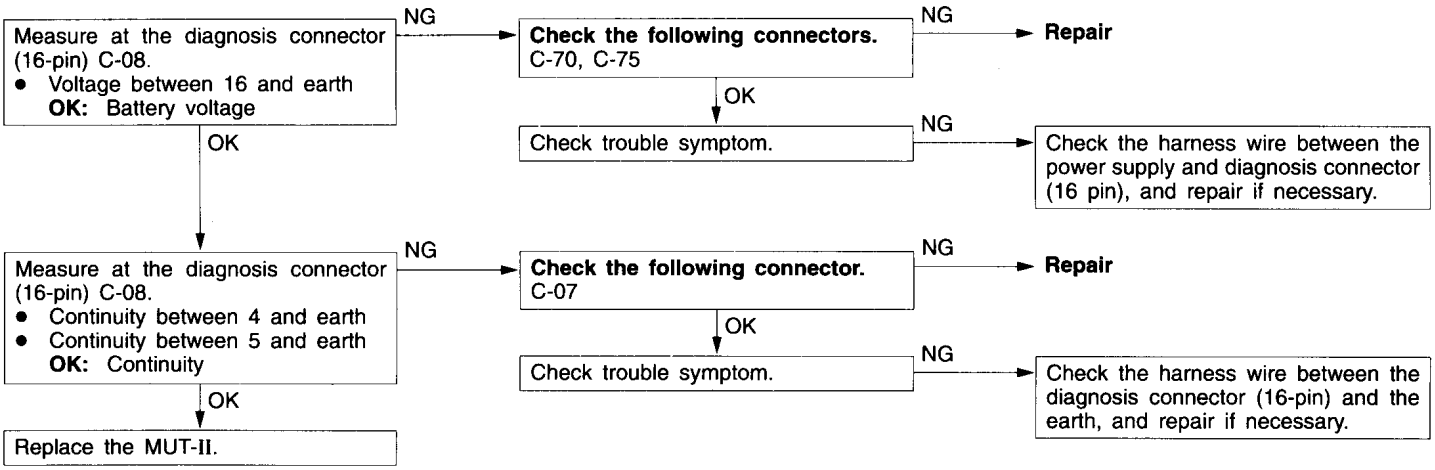
INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom		Inspection procedure No.	Reference page
Communication with MUT-II is impossible.	Communication with all systems is not possible.	1	13A-17
	Communication with engine-ECU only is not possible.	2	13A-18
Engine warning lamp and related parts	The engine warning lamp does not illuminate right after the ignition switch is turned to the ON position.	3	13A-19
	The engine warning lamp remains illuminating and never goes out.	4	13A-19
Starting	No initial combustion (starting impossible)	5	13A-20
	Initial combustion but no complete combustion (starting impossible)	6	13A-21
	Long time to start (improper starting)	7	13A-22
Idling stability (Improper idling)	Unstable idling (Rough idling, hunting)	8	13A-23
	Idling speed is high. (Improper idling speed)	9	13A-24
	Idling speed is low. (Improper idling speed)	10	13A-25
Idling stability (Engine stalls)	When the engine is cold, it stalls at idling. (Die out)	11	13A-26
	When the engine becomes hot, it stalls at idling. (Die out)	12	13A-27
	The engine stalls when starting the car. (Pass out)	13	13A-28
	The engine stalls when decelerating.	14	13A-28
Driving	Hesitation, sag or stumble	15	13A-29
	The feeling of impact or vibration when accelerating	16	13A-29
	The feeling of impact or vibration when decelerating	17	13A-30
	Poor acceleration	18	13A-30
	Surge	19	13A-31
	Knocking	20	13A-31
Dieseling		21	13A-31
Too high CO and HC concentration when idling		22	13A-32

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

INSPECTION PROCEDURE 1

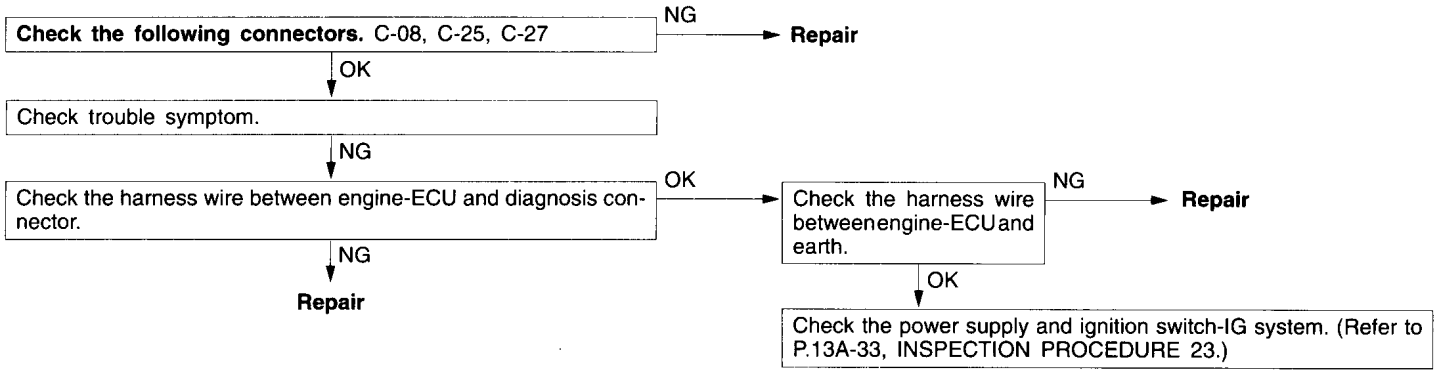
Communication with MUT-II is not possible. (Communication with all systems is not possible.)	**Probable cause**
The cause is probably a defect in the power supply system (including earth) for the diagnosis line.	• Malfunction of the connector • Malfunction of the harness wire



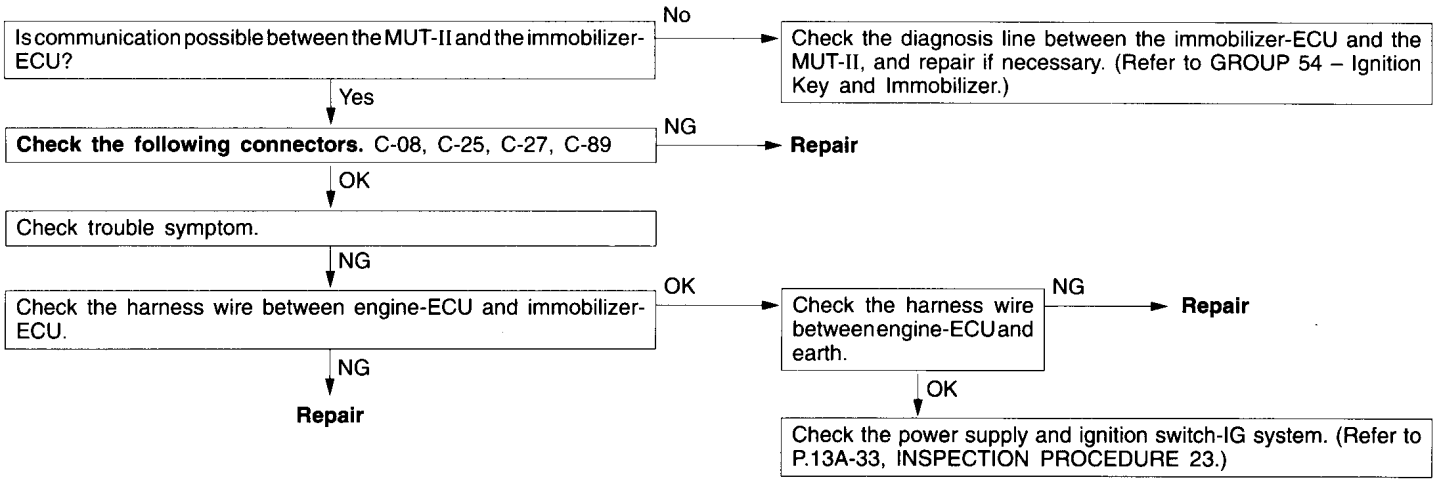
INSPECTION PROCEDURE 2

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

<Vehicles without immobilizer system>

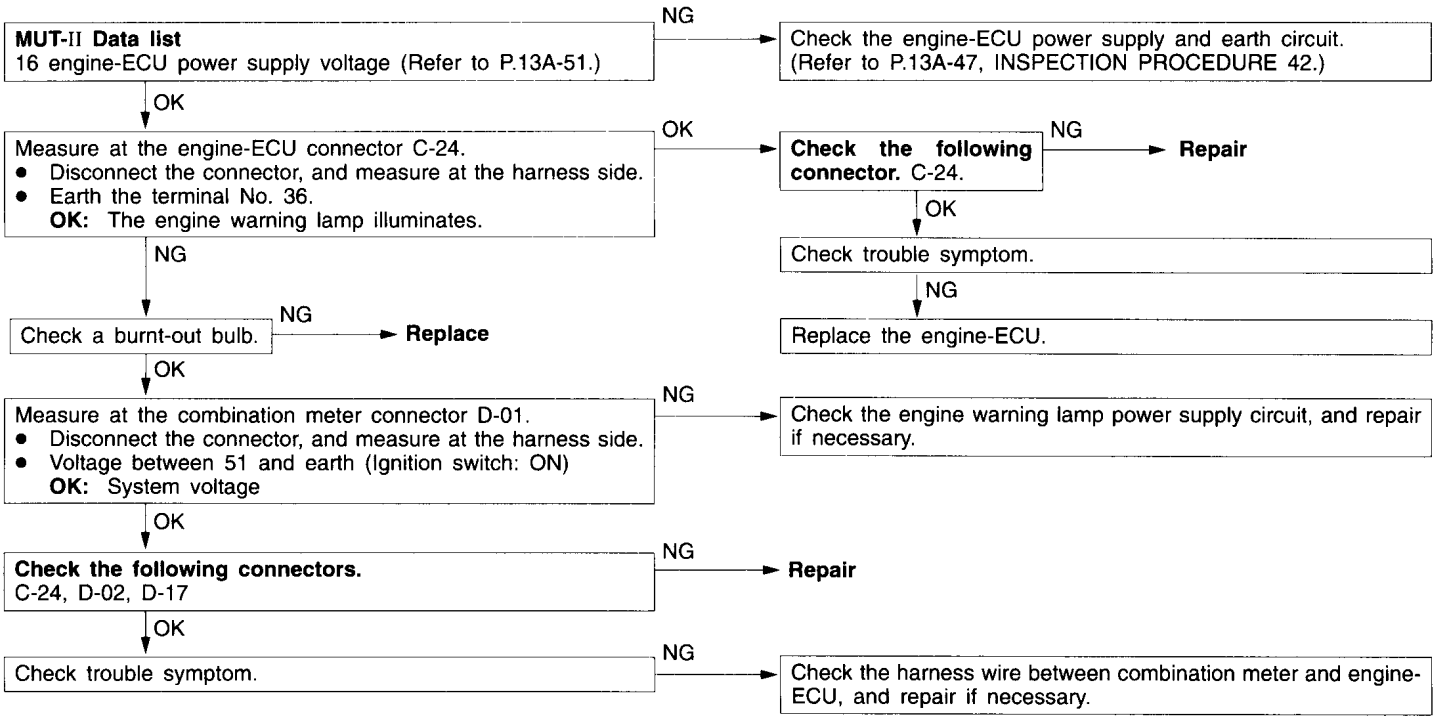


<Vehicles with immobilizer system>



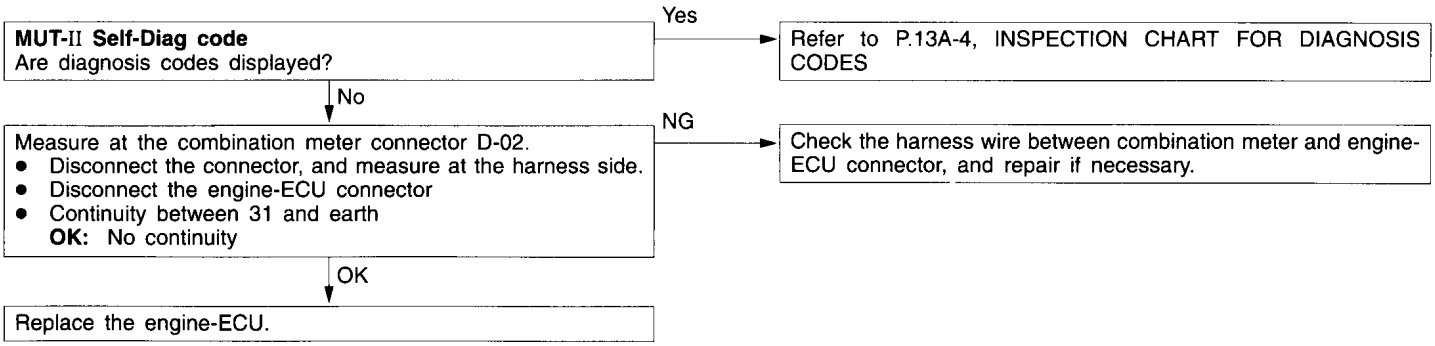
INSPECTION PROCEDURE 3

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



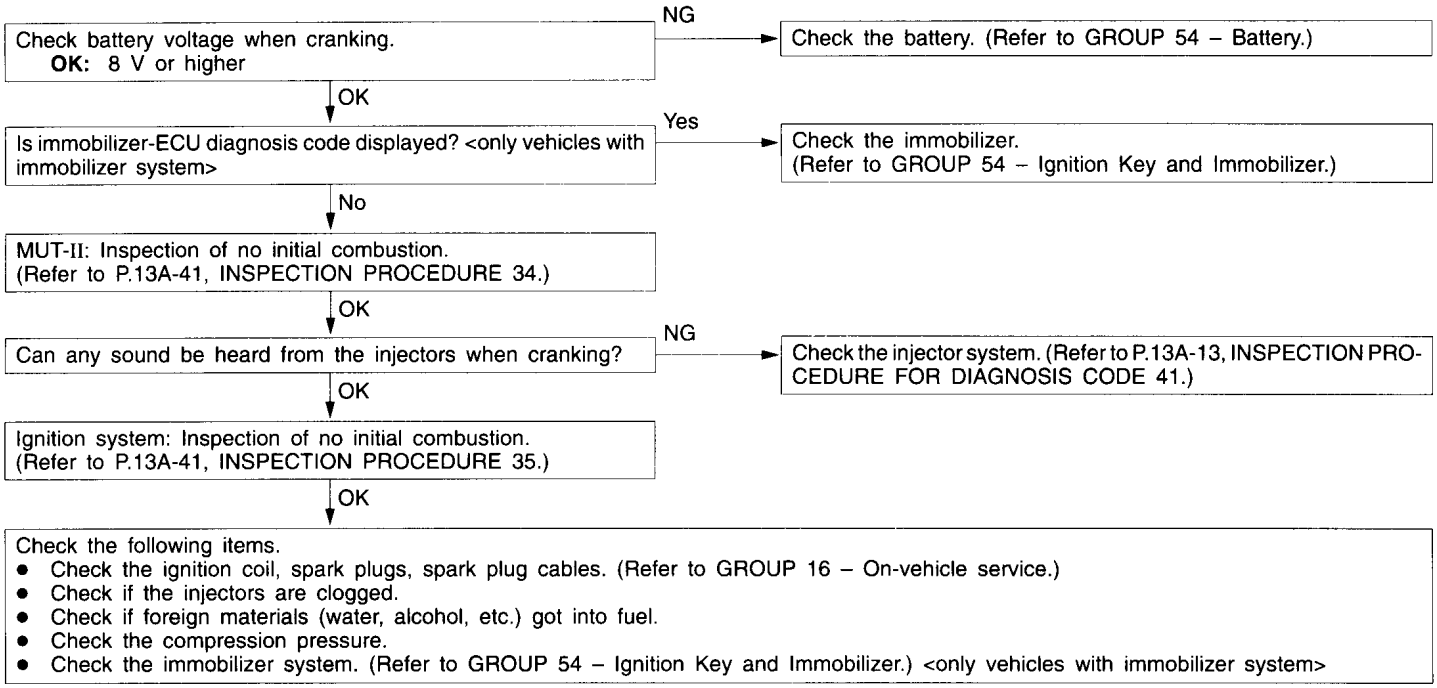
INSPECTION PROCEDURE 4

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



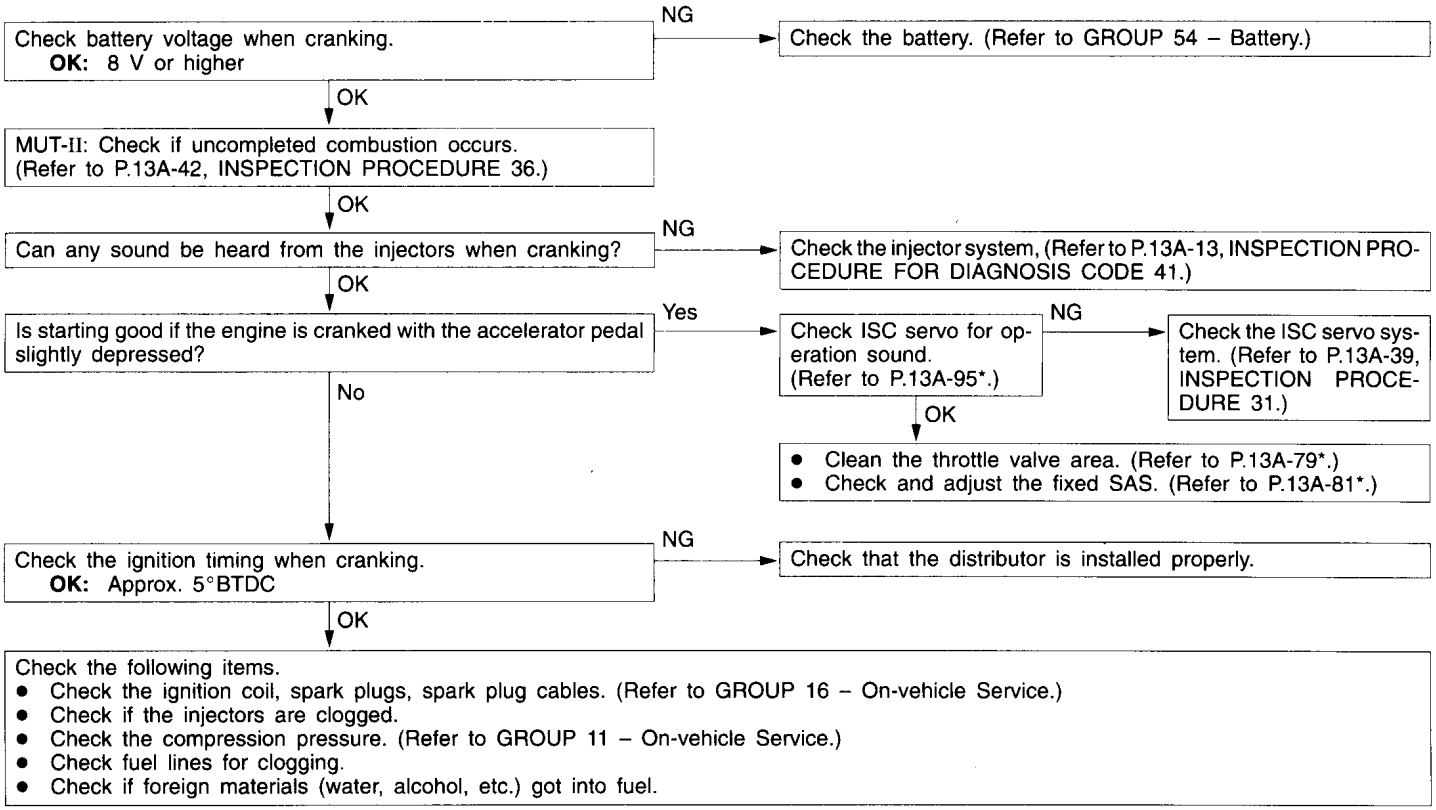
INSPECTION PROCEDURE 5

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



INSPECTION PROCEDURE 6

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



*: Refer to L400 Workshop Manual (Pub. No. PWWE9410)

INSPECTION PROCEDURE 7

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

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

MUT-II: Check if uncomplete combustion occurs.
(Refer to P.13A-42, INSPECTION PROCEDURE 36.)
↓ OK

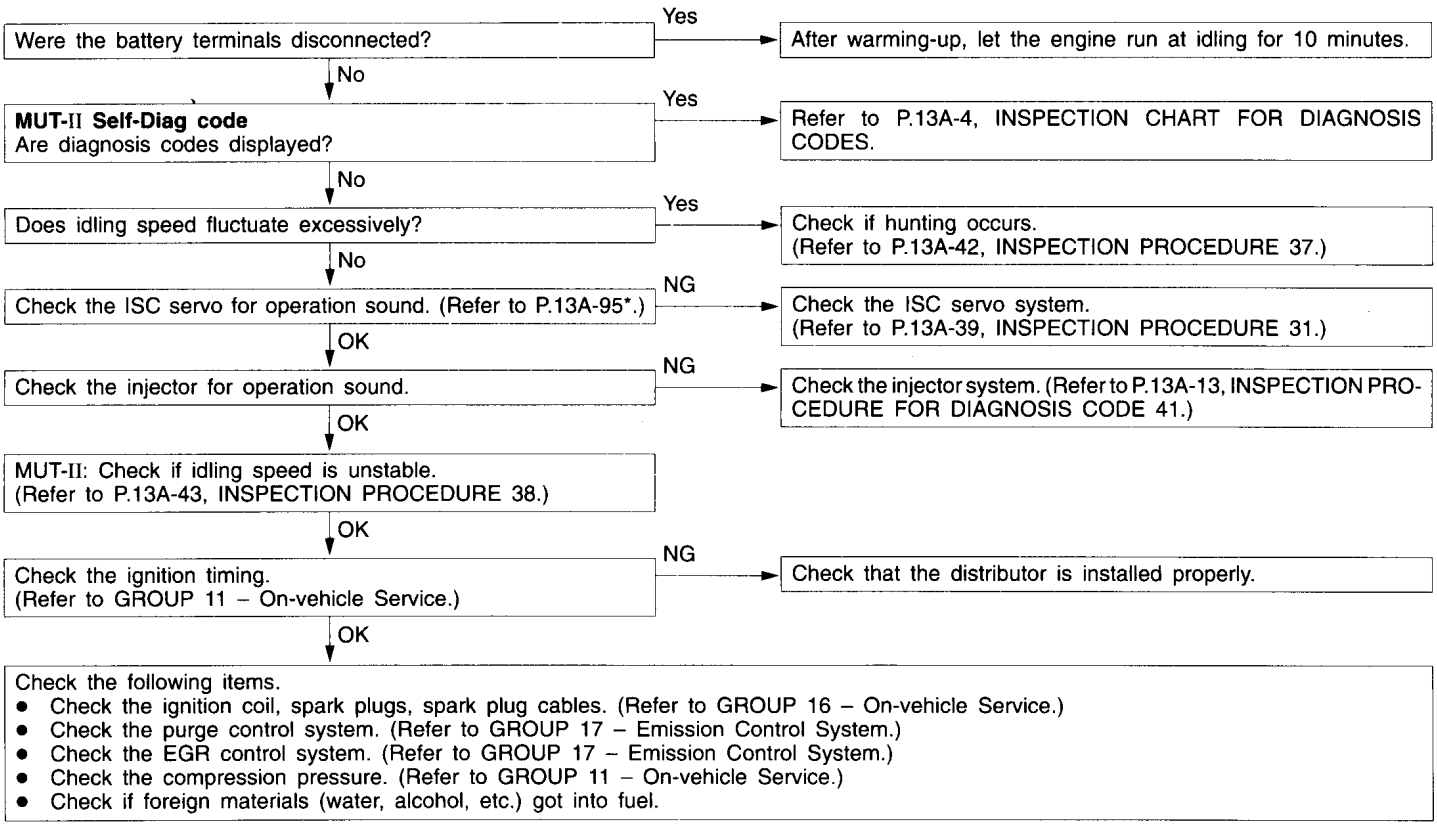
Can any sound be heard from the injectors when cranking?
→ NG → Check the injector system. (Refer to P.13A-13, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 41.)
↓ OK

Check the ignition timing when cranking.
OK: Approx. 5°BTDC
→ NG → Check that the distributor is installed properly.
↓ OK

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle Service.)
- Check if the injectors are clogged.
- Check the compression pressure. (Refer to GROUP 11 – On-vehicle Service.)
- Check if foreign materials (water, alcohol, etc.) got into fuel.

INSPECTION PROCEDURE 8

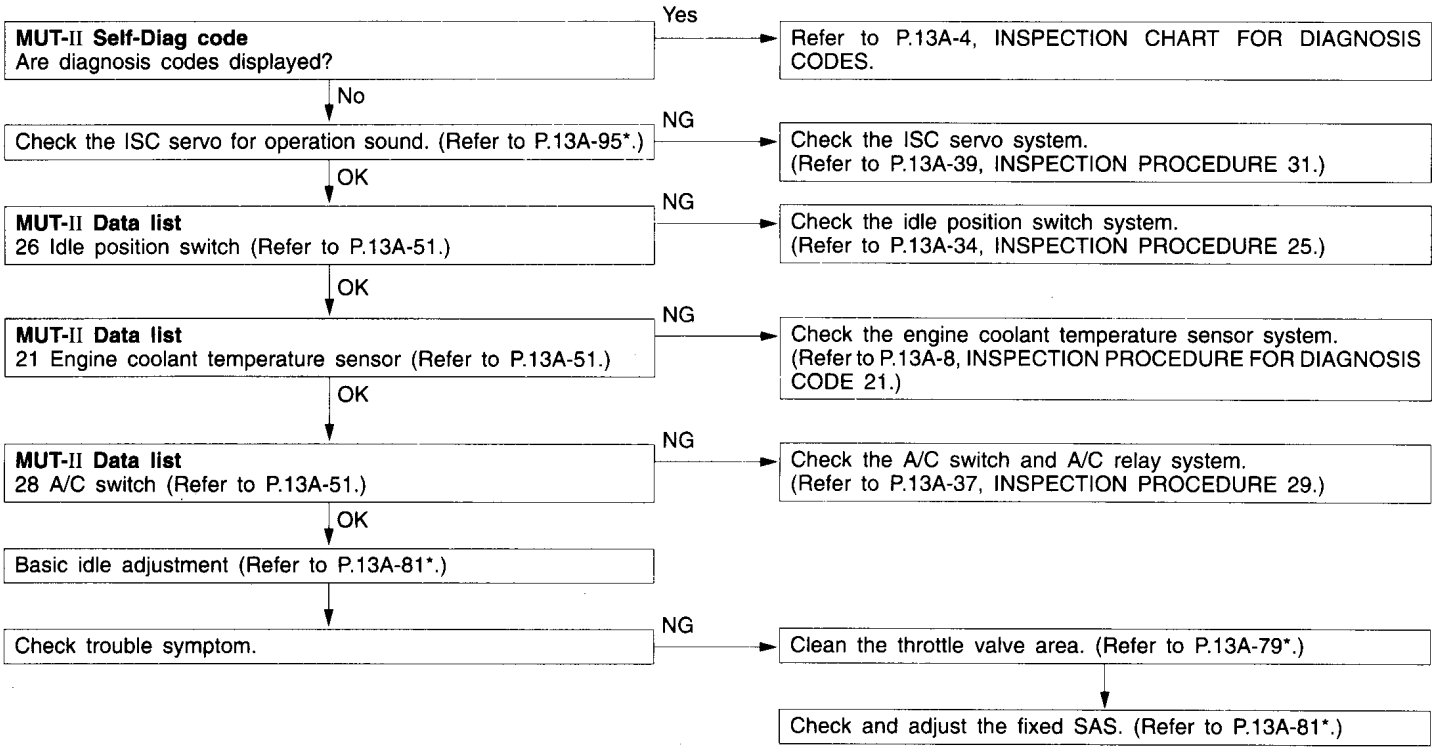
Unstable idling (Rough idling, hunting)	Probable cause
In cases as the above, the cause is probably that the ignition system, air/fuel mixture, idle speed control (ISC) or compression pressure is defective. Because the range of possible causes is broad, inspection is narrowed down to simple items.	•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



*: Refer to L400 Workshop Manual (Pub. No. PWWE9410)

INSPECTION PROCEDURE 9

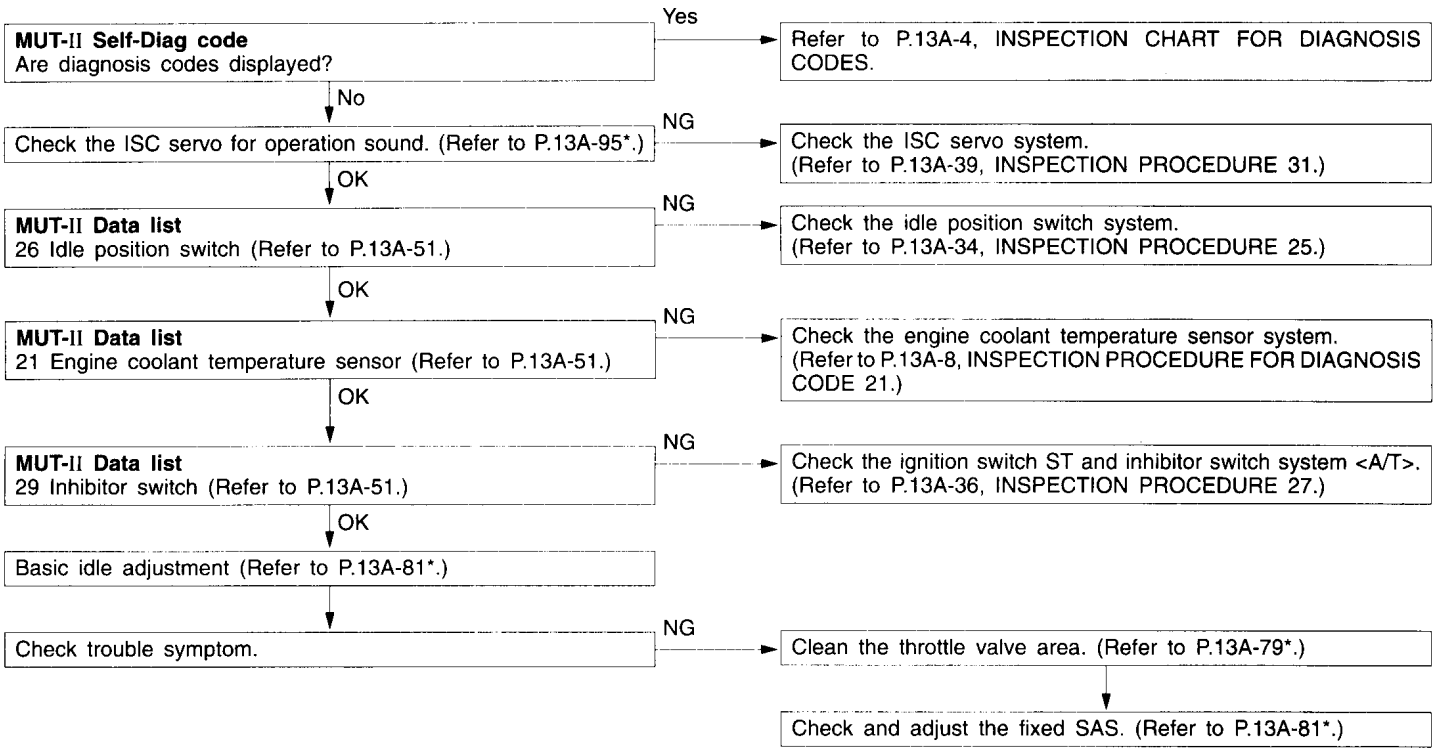
Idling speed is high. (Improper idling speed)	Probable cause
In such cases as the above, the cause is probably that the intake air volume during idling is too great.	• Malfunction of the ISC servo system • Malfunction of the throttle body



*: Refer to L400 Workshop Manual (Pub. No. PWWE9410)

INSPECTION PROCEDURE 10

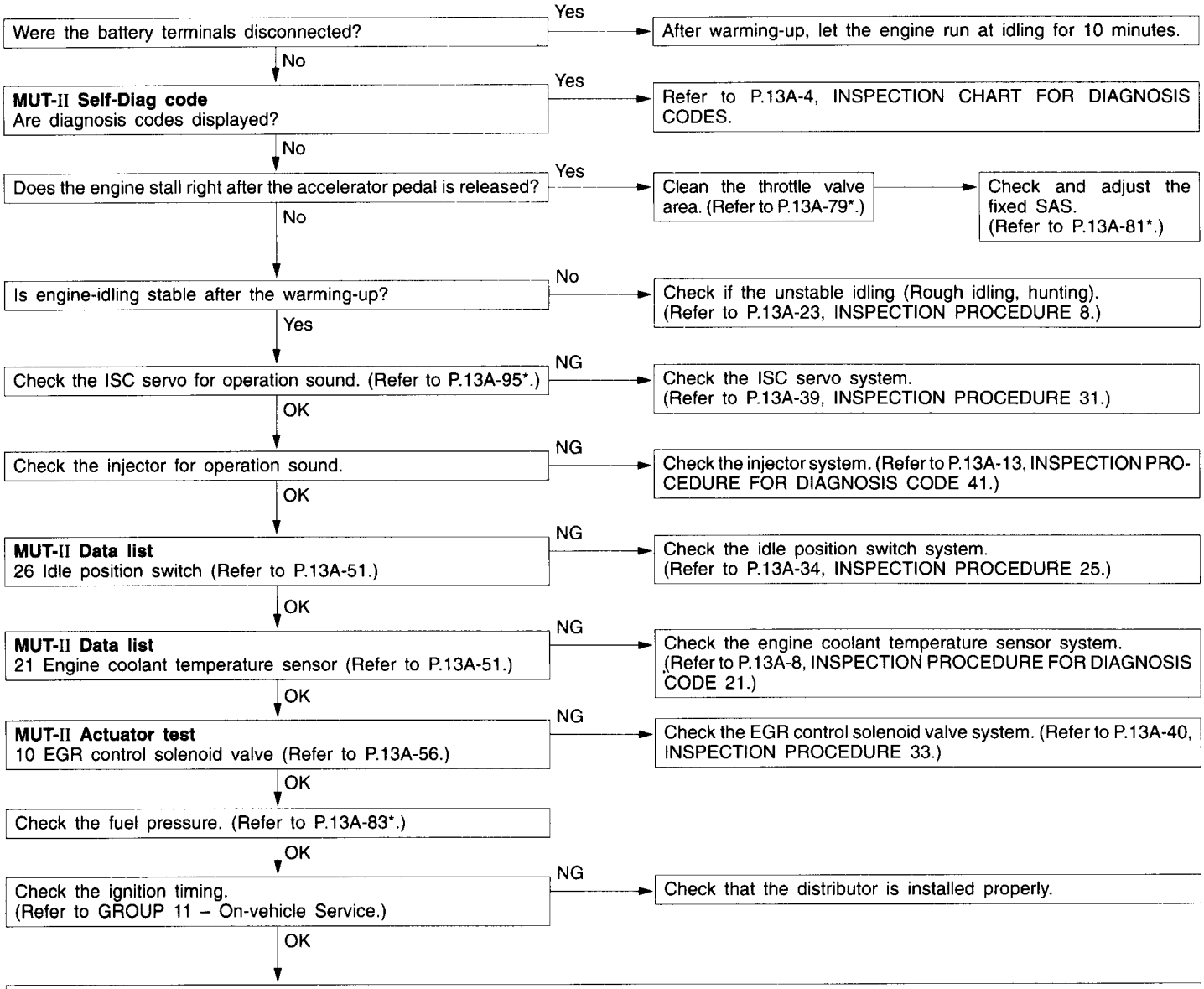
Idling speed is low. (Improper idling speed)	Probable cause
In cases such as the above, the cause is probably that the intake air volume during idling is too small.	• Malfunction of the ISC servo system • Malfunction of the throttle body



*: Refer to L400 Workshop Manual (Pub. No. PWWE9410)

INSPECTION PROCEDURE 11

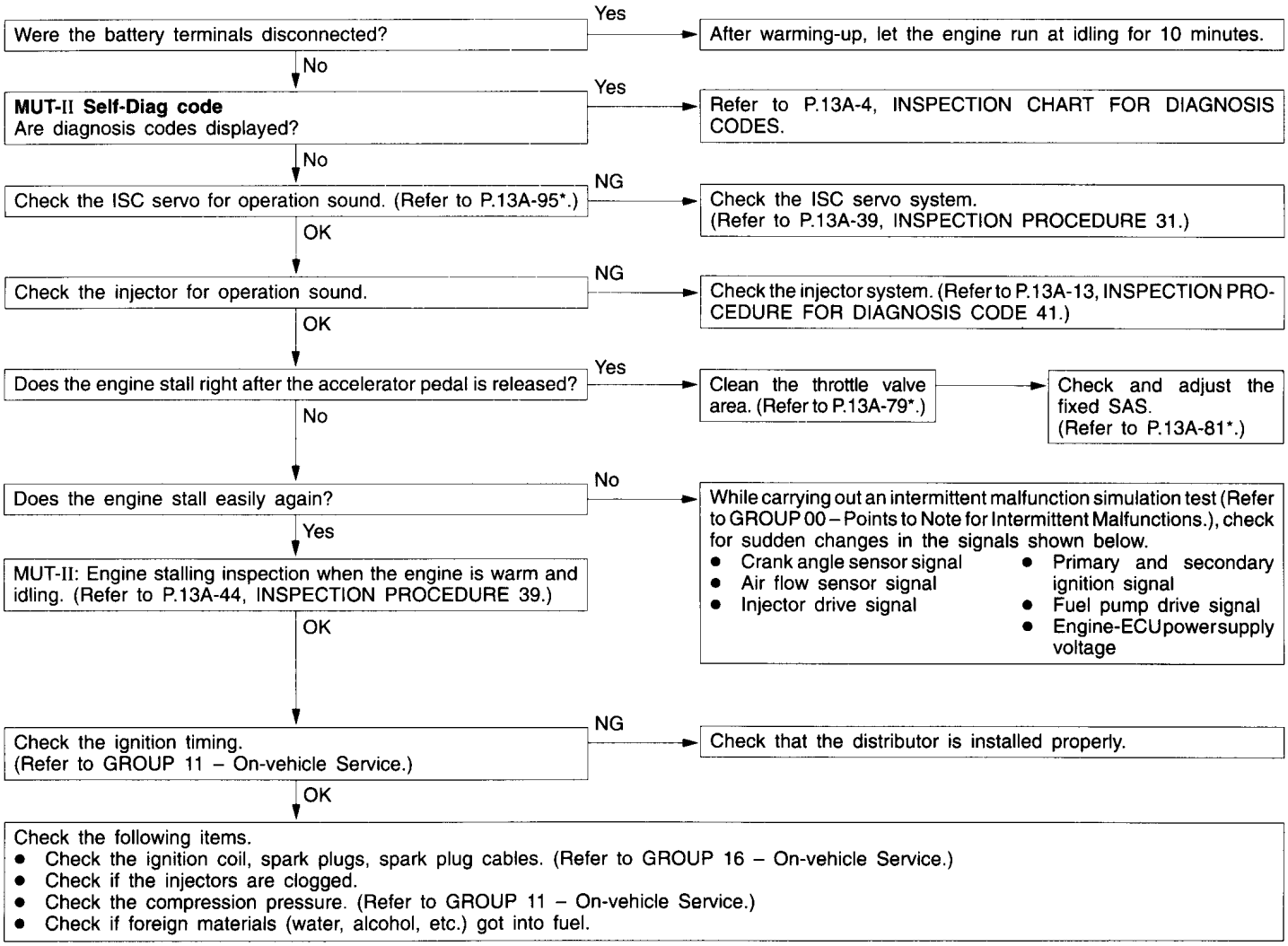
When the engine is cold, it stalls at idling. (Die out)	Probable cause
In such cases as the above, the cause is probably that the air/fuel mixture is inappropriate when the engine is cold, or that the intake air volume is insufficient.	• Malfunction of the ISC servo system • Malfunction of the throttle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



*: Refer to L400 Workshop Manual (Pub. No. PWWE9410)

INSPECTION PROCEDURE 12

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



*: Refer to L400 Workshop Manual (Pub. No. PWWE9410)

INSPECTION PROCEDURE 13

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

MUT-II Self-Diag code
Are diagnosis codes displayed?
Yes → Refer to P.13A-4, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13A-56.)
NG → Check the EGR control solenoid valve system. (Refer to P.13A-40, INSPECTION PROCEDURE 33.)
OK ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle Service.)
- Check if air was drawn into the intake system.
  - Broken intake manifold gasket
  - Broken or disconnected vacuum hose
  - Improper operation of the PCV valve
  - Broken air intake hose

INSPECTION PROCEDURE 14

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

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

MUT-II Self-Diag code
Are diagnosis codes displayed?
Yes → Refer to P.13A-4, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

MUT-II Data list
26 Idle position switch (Refer to P.13A-51.)
NG → Check the idle position switch system. (Refer to P.13A-34, INSPECTION PROCEDURE 25.)
OK ↓

MUT-II Data list
14 Throttle position sensor (Refer to P.13A-51.)
NG → Check the throttle position sensor system. (Refer to P.13A-7, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 14.)
OK ↓

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

Yes → Check the vehicle speed sensor system. (Refer to P.13A-11, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 24.)
No ↓

MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13A-56.)
NG → Check the EGR control solenoid valve system. (Refer to P.13A-40, INSPECTION PROCEDURE 33.)
OK ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle Service.)
- Check the throttle valve area. (Refer to P.13A-79*.)
- Check and adjust the fixed SAS. (Refer to P.13A-81*.)

*: Refer to L400 Workshop Manual (Pub. No. PWWE9410)

INSPECTION PROCEDURE 15

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

MUT-II Self-Diag code
Are diagnosis codes displayed?
Yes → Refer to P.13A-4, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

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

Check the ignition timing.
(Refer to GROUP 11 – On-vehicle Service.)
NG → Check that the distributor is installed properly.
OK ↓

MUT-II: Check if hesitation, sag, stumble or poor acceleration occur.
(Refer to P.13A-45, INSPECTION PROCEDURE 40.)
OK ↓

Check the fuel pressure. (Refer to P.13A-83*.)
OK ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle Service.)
- Check the EGR control system. (Refer to GROUP 17 – Emission Control System.)
- Check the compression pressure. (Refer to GROUP 11 – On-vehicle Service.)
- Check the fuel filter or fuel line for clogging.

*: Refer to L400 Workshop Manual (Pub. No. PWWE9410)

INSPECTION PROCEDURE 16

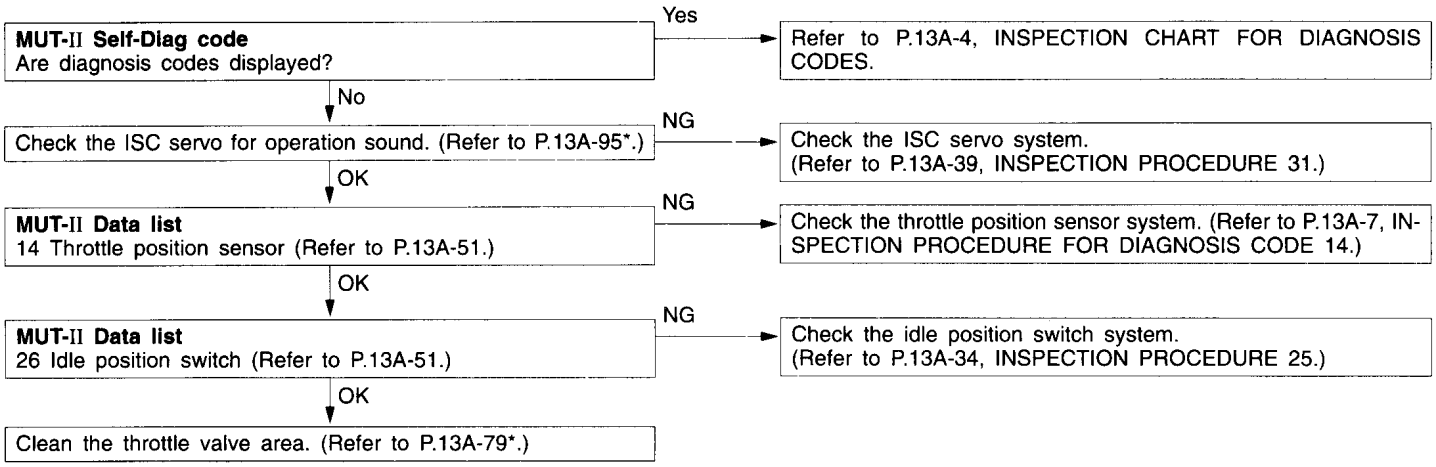
The feeling of impact or vibration when accelerating	Probable cause
In cases such as the above, the cause is probably that there is an ignition leak accompanying the increase in the spark plug demand voltage during acceleration.	• Malfunction of the ignition system

MUT-II Self-Diag code
Are diagnosis codes displayed?
Yes → Refer to P.13A-4, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle Service.)
- Check for occurrence of ignition leak.

INSPECTION PROCEDURE 17

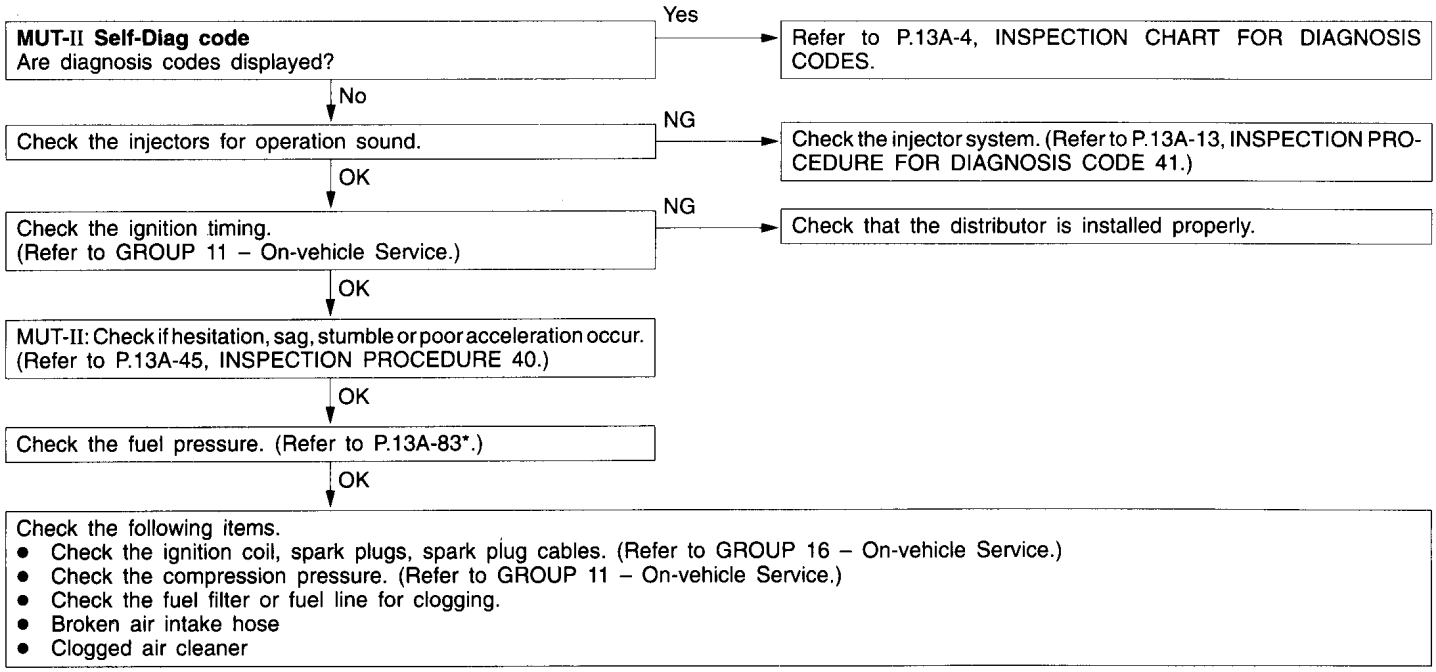
The feeling of impact or vibration when decelerating.	Probable cause
Malfunction of the ISC system is suspected.	• Malfunction of the ISC system



*: Refer to L400 Workshop Manual (Pub. No. PWWE9410)

INSPECTION PROCEDURE 18

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



*: Refer to L400 Workshop Manual (Pub. No. PWWE9410)

INSPECTION PROCEDURE 19

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

MUT-II Self-Diag code
Are diagnosis codes displayed?
→ Yes → Refer to P.13A-4, INSPECTION CHART FOR DIAGNOSIS CODES.
↓ No

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

Check the ignition timing.
(Refer to GROUP 11 – On-vehicle Service.)
→ NG → Check that the distributor is installed properly.
↓ OK

MUT-II: Check if surge occurs.
(Refer to P.13-46, INSPECTION PROCEDURE 41.)
↓ OK

Check the fuel pressure. (Refer to P.13A-83*.)
↓ OK

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle Service.)
- Check the EGR control system. (Refer to GROUP 17 – Emission Control System.)

*: Refer to L400 Workshop Manual (Pub. No. PWWE9410)

INSPECTION PROCEDURE 20

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

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

INSPECTION PROCEDURE 21

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

Check the injectors for fuel leakage.

INSPECTION PROCEDURE 22

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

MUT-II Self-Diag code
Are diagnosis codes displayed?
Yes → Refer to P.13A-4, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

Check the ignition timing.
(Refer to GROUP 11 – On-vehicle Service.)
NG → Check that the distributor is installed properly.
OK ↓

MUT-II Data list
21 Engine coolant temperature sensor. (Refer to P.13A-51.)
NG → Check the engine coolant temperature sensor system. (Refer to P.13A-8, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 21.)
OK ↓

MUT-II Data list
13 Intake air temperature sensor (Refer to P.13A-51.)
NG → Check the intake air temperature sensor system. (Refer to P.13A-6, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 13.)
OK ↓

MUT-II Data list
25 Barometric pressure sensor (Refer to P.13A-51.)
NG → Check the barometric pressure sensor system. (Refer to P.13A-12, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 25.)
OK ↓

MUT-II Data list <Vehicles for Germany>
59 Oxygen sensor (rear) (Refer to P.13A-51)
- Transmission: 2nd gear <M/T>, L range <A/T>
- Driving with throttle widely open

OK: 600 – 1,000 mV
NG → Check the oxygen sensor (rear) system. (Refer to P.13A-15, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 59.)
OK ↓

MUT-II Data list
11 Oxygen sensor (front)
OK: 600–1,000 mV when racing suddenly (Refer to P.13A-51.)
NG → Check the oxygen sensor system. (Refer to P.13A-5, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 11.)
OK ↓

MUT-II Data list
11 Oxygen sensor (front)
OK: Repeat 0–400 mV and 600–1,000 mV alternately when idling. (Refer to P.13A-51.)
OK → Replace the oxygen sensor (front).
NG ↓

Check the fuel pressure. (Refer to P.13A-83*.)
OK ↓

Check trouble symptom.
NG ↓

Check the following items.
- Check the injectors for operation sound.
- Check the injectors for fuel leakage.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle Service.)
- Check the compression pressure. (Refer to GROUP 11 – On-vehicle Service.)
- Check the positive crankcase ventilation system. (Refer to GROUP 17 – Emission Control System.)
- Check the purge control system. (Refer to GROUP 17 – Emission Control System.)
- Check the EGR control system. (Refer to GROUP 17 – Emission Control System.)

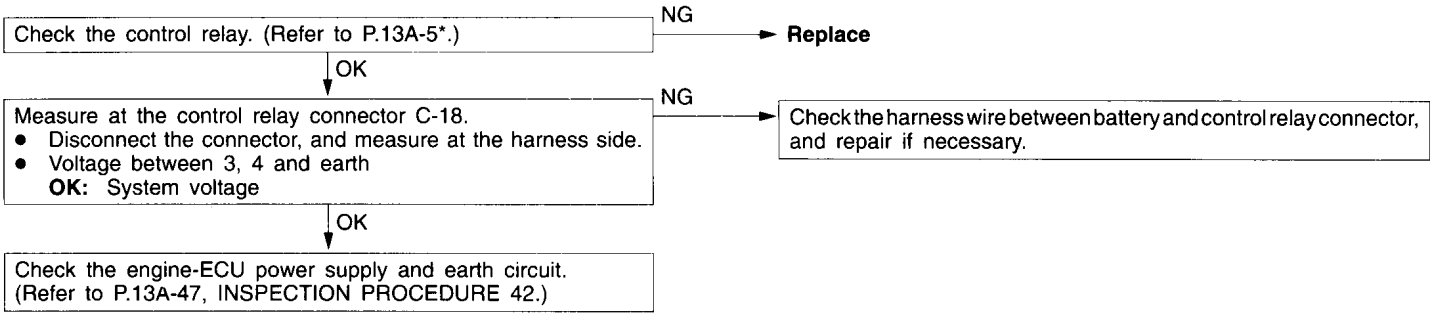
Check the trouble symptom.
NG ↓

Replace the catalytic converter.

*: Refer to L400 Workshop Manual (Pub. No. PWWE9410)

INSPECTION PROCEDURE 23

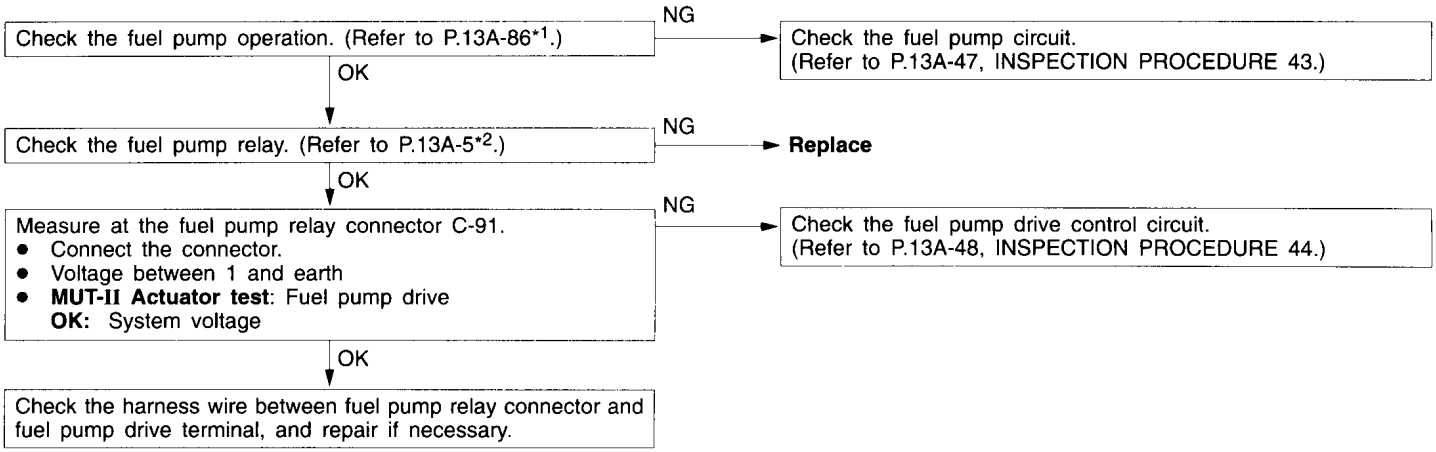
Power supply system and ignition switch-IG system	Probable cause
When an ignition switch ON signal is input to the engine-ECU, the engine-ECU turns the control relay ON. This causes battery voltage to be supplied to the engine-ECU, injectors and air flow sensor.	• Malfunction of the ignition switch •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



*: Refer to L400 Workshop Manual (Pub. No. PWWE9410-B)

INSPECTION PROCEDURE 24

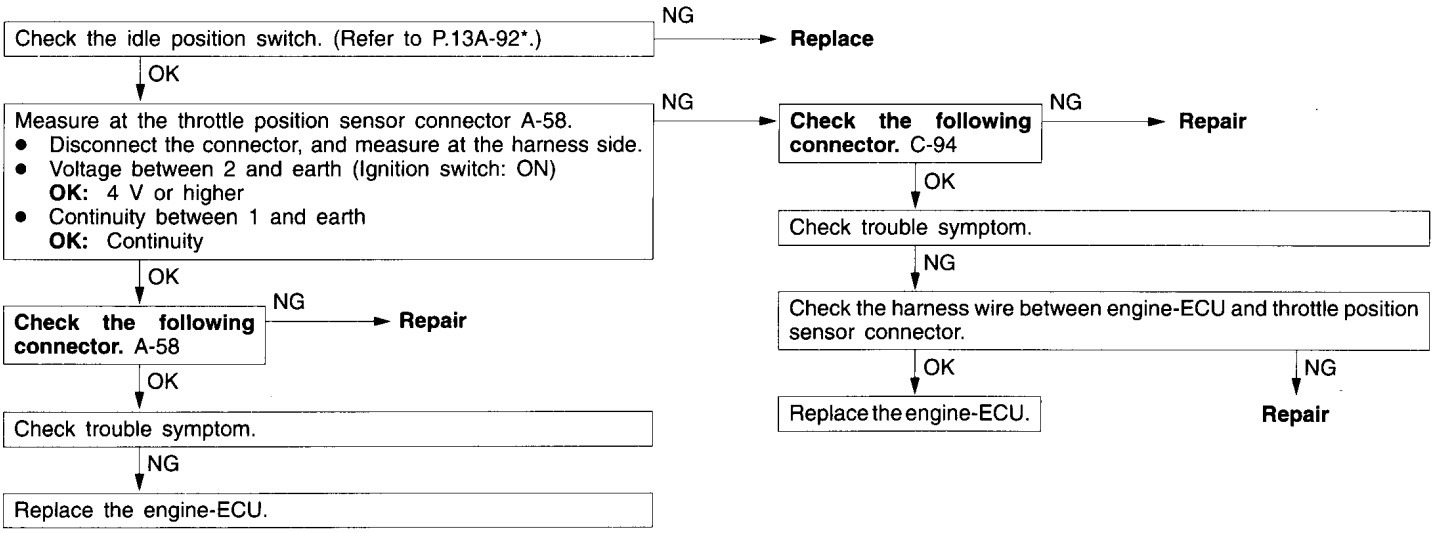
Fuel pump system	Probable cause
The engine-ECU turns the control relay ON when the engine is cranking or running, and this supplies power to drive the fuel pump.	• Malfunction of the fuel pump relay • Malfunction of the fuel pump • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the engine-ECU



*1: Refer to L400 Workshop Manual (Pub. No. PWWE9410)
*2: Refer to L400 Workshop Manual (Pub. No. PWWE9410-B)

INSPECTION PROCEDURE 25

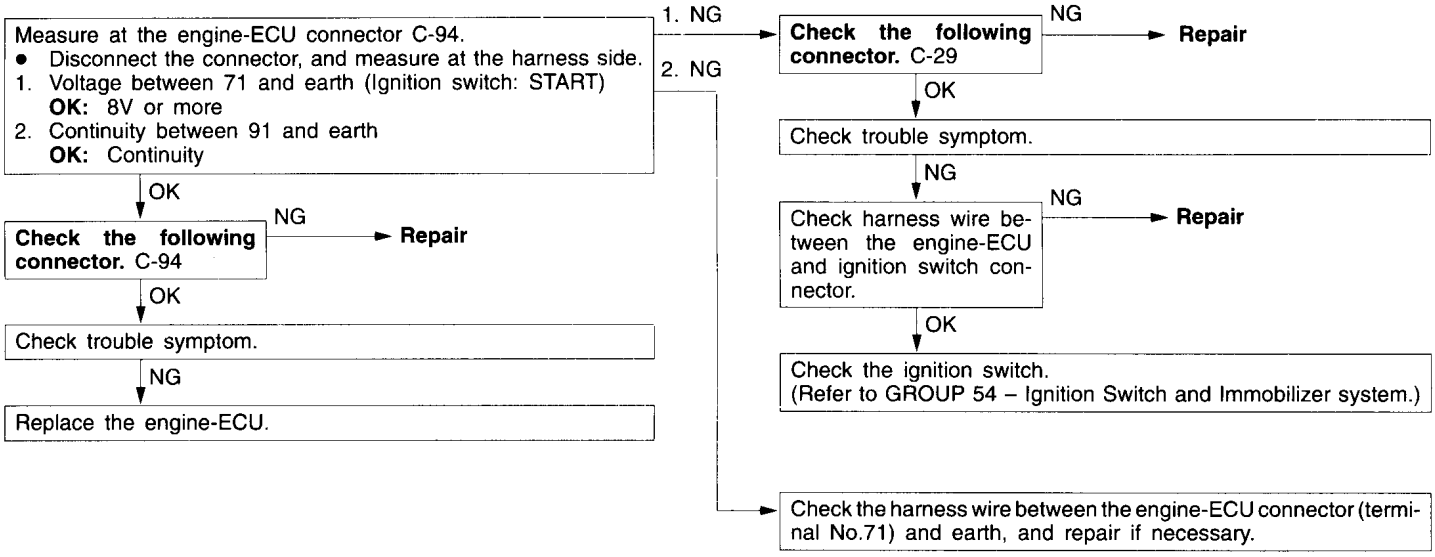
Idle position switch system	Probable cause
The idle position switch inputs the condition of the accelerator pedal, i.e. whether it is depressed or released (HIGH/LOW), to the engine-ECU. The engine-ECU controls the idle speed control servo based on this input.	• Maladjustment of the accelerator pedal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



*: Refer to L400 Workshop Manual (Pub. No. PWWE9410)

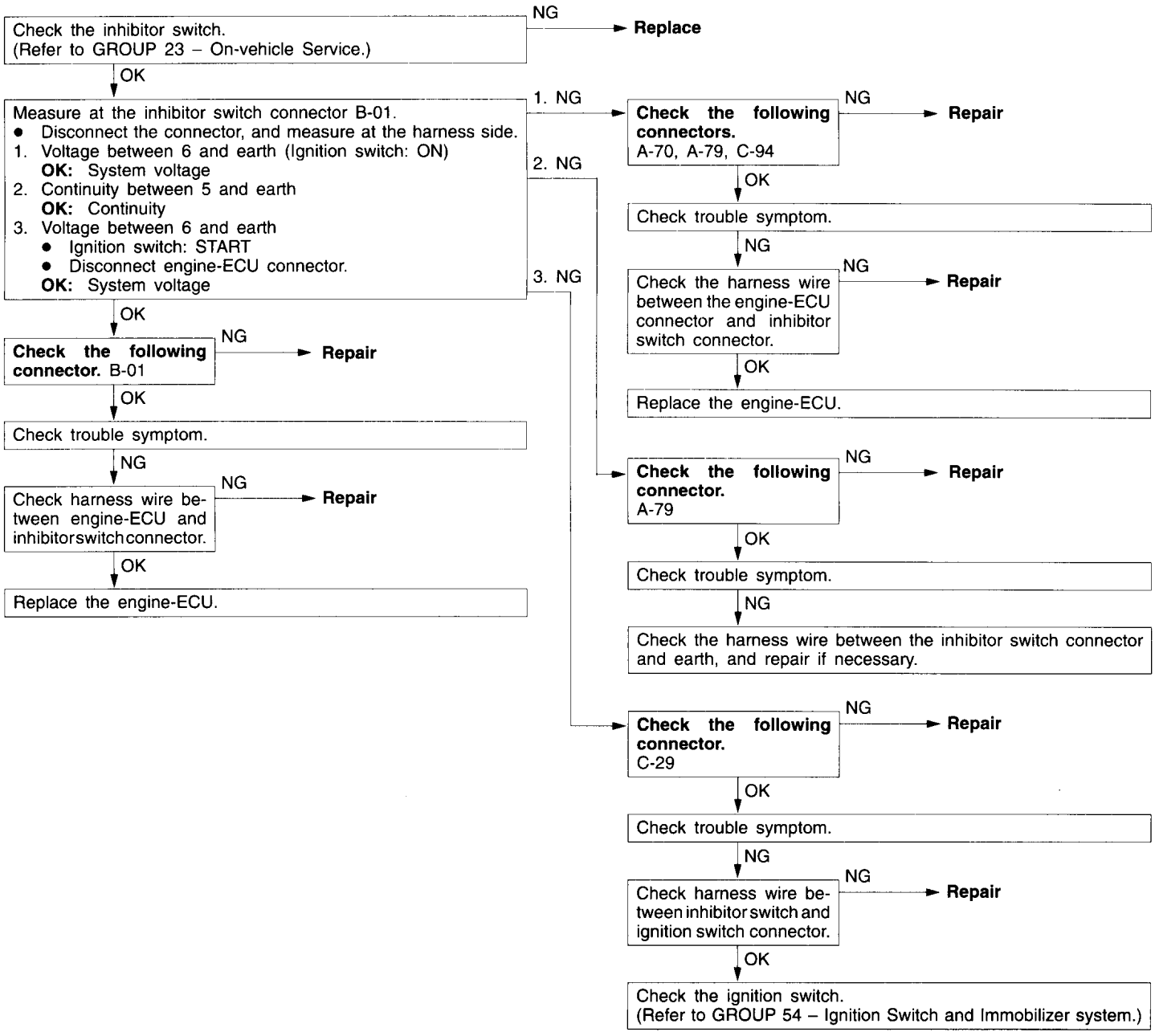
INSPECTION PROCEDURE 26

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



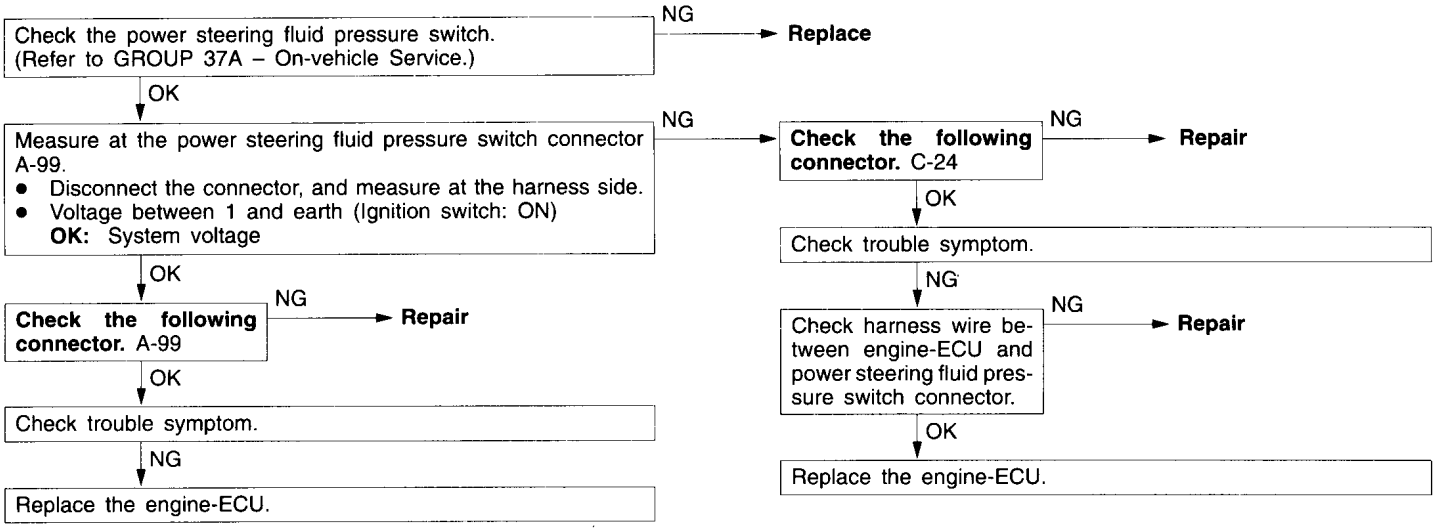
INSPECTION PROCEDURE 27

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



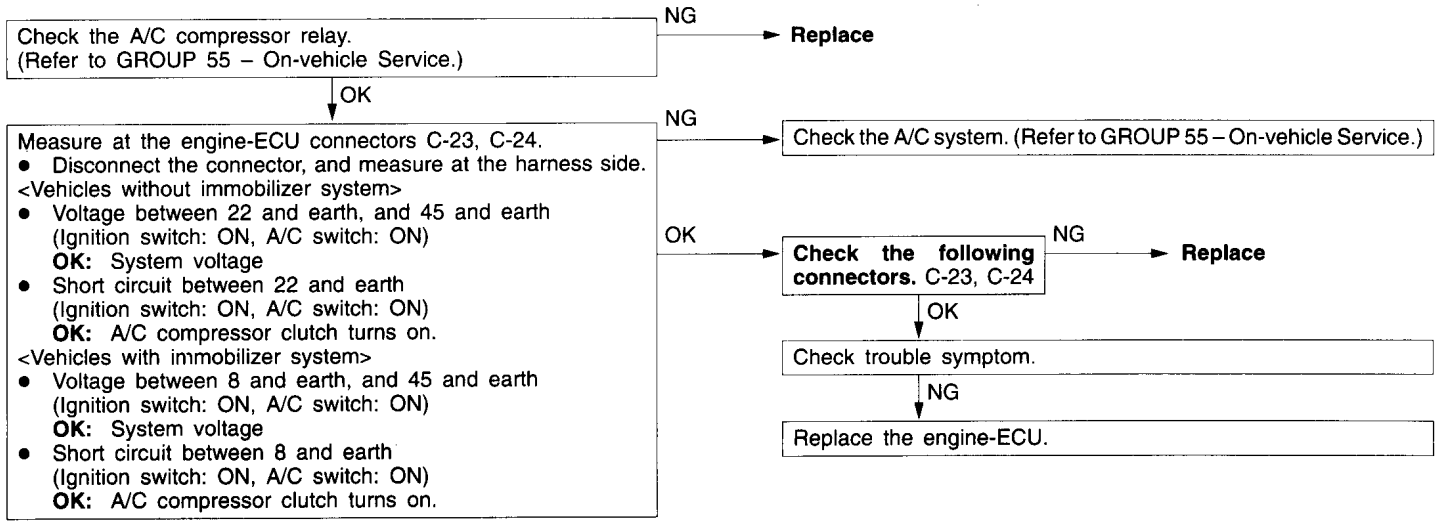
INSPECTION PROCEDURE 28

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



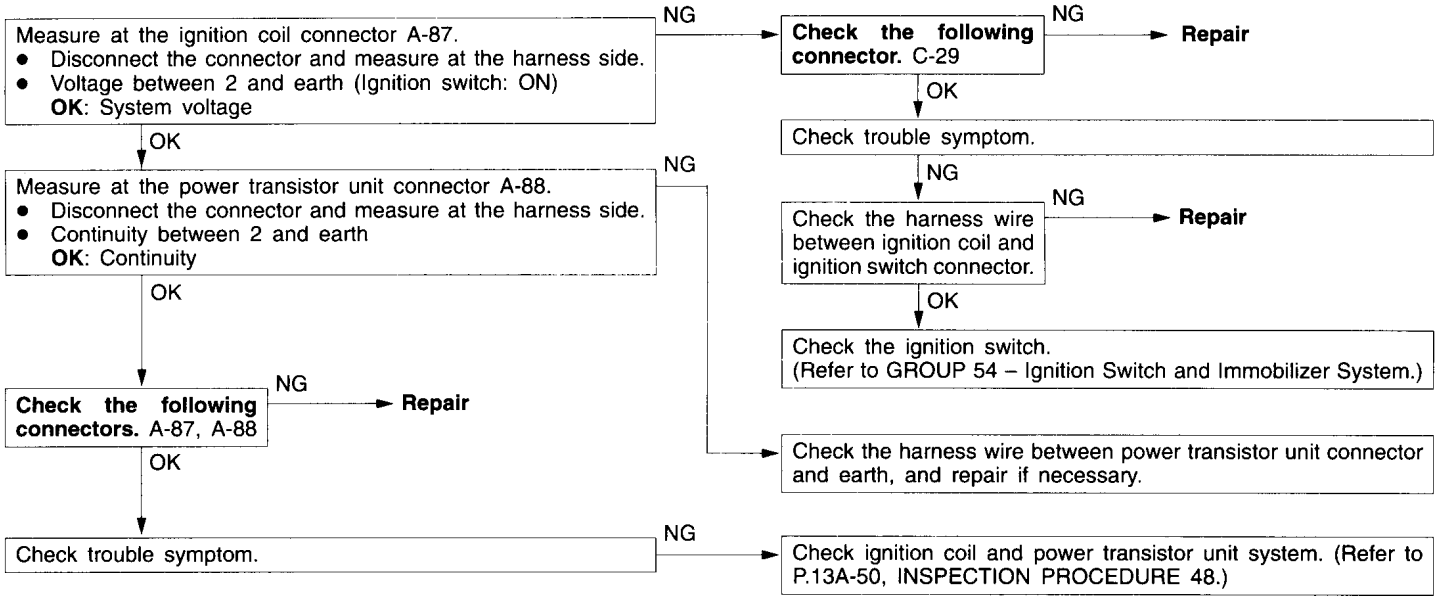
INSPECTION PROCEDURE 29

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



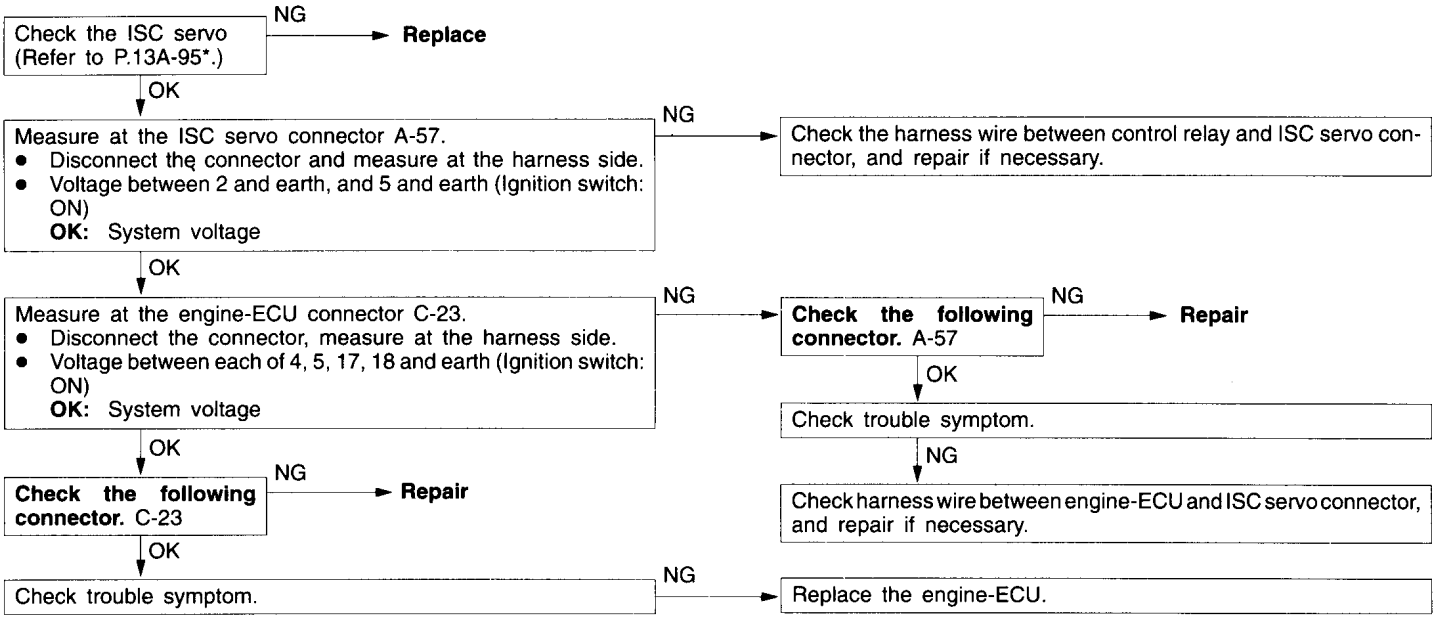
INSPECTION PROCEDURE 30

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



INSPECTION PROCEDURE 31

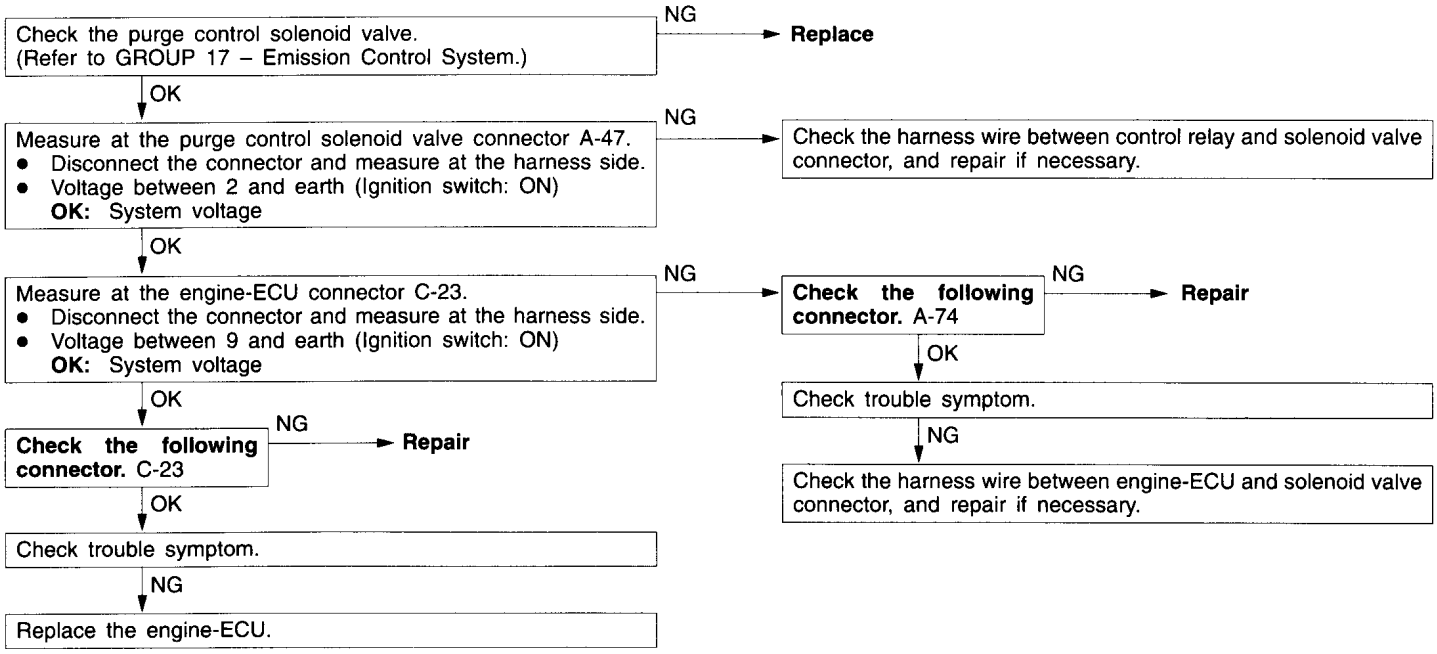
Idle speed control (ISC) servo (Stepper motor) system	Probable cause
The engine-ECU controls the intake air volume during idling by opening and closing the servo valve located in the bypass air passage.	• Malfunction of ISC servo • Improper connector contact, open circuit or short-circuited harness wire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



*: Refer to L400 Workshop Manual (Pub. No. PWWE9410)

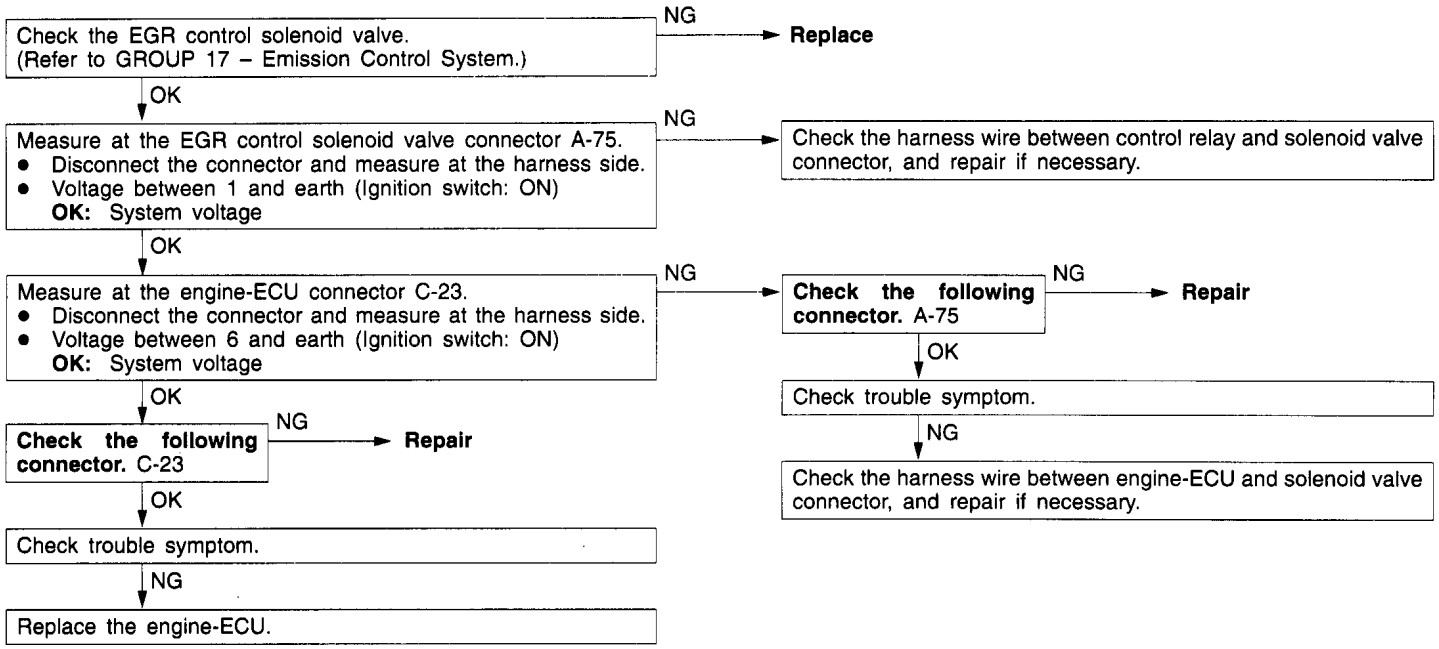
INSPECTION PROCEDURE 32

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



INSPECTION PROCEDURE 33

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



INSPECTION PROCEDURE 34

MUT-II: Inspection of no initial combustion

MUT-II Data list
16 Voltage of engine-ECU power source (Refer to P.13A-51.)
NG → Check the power supply and ignition switch-IG system. (Refer to P.13A-33, INSPECTION PROCEDURE 23.)
OK ↓

Does the camshaft rotate at the engine cranking? (When oil filler cap is removed.)
No → Check timing belt for breakage.
Yes ↓

MUT-II Self-Diag code
Are diagnosis codes displayed?
Yes → Refer to P.13A-4, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

MUT-II Data list
22 Crank angle sensor
OK: Cranking speed is displayed.
No → Check the crank angle sensor system. (Refer to P.13A-9, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 22.)
OK ↓

MUT-II Actuator test
07 Fuel pump (Refer to P.13A-56.)
NG → Check the fuel pump system. (Refer to P.13A-34, INSPECTION PROCEDURE 24.)
OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13A-51.)
NG → Check the engine coolant temperature sensor system. (Refer to P.13A-8, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 21.)

INSPECTION PROCEDURE 35

Ignition system: Inspection of no initial combustion.

Does the engine tachometer display the cranking speed?
- Set the tachometer of primary voltage detection type.

NG → Check ignition circuit system. (Refer to P.13A-38, INSPECTION PROCEDURE 30.)
OK ↓

Check the ignition timing when cranking.
OK: Approx. 5°BTDC
NG → Check that the crank angle sensor is installed properly.

INSPECTION PROCEDURE 36

MUT-II: Check if uncomplete combustion occurs.

MUT-II Self-Diag code
Are diagnosis codes displayed?
→ Yes → Refer to P.13A-4, INSPECTION CHART FOR DIAGNOSIS CODE
↓ No

MUT-II Actuator test
07 Fuel pump (Refer to P.13A-56.)
→ NG → Check the fuel pump system. (Refer to P.13A-34, INSPECTION PROCEDURE 24.)
↓ OK

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13A-51.)
→ NG → Check the engine coolant temperature sensor system. (Refer to P.13A-8, INSPECTION PROCEDURES FOR DIAGNOSIS CODE 21.)
↓ OK

MUT-II Data list
18 Ignition switch-ST (Refer to P.13A-51.)
→ NG → Check the ignition switch-ST system <M/T>. (Refer to P.13A-35, INSPECTION PROCEDURE 26.)

INSPECTION PROCEDURE 37

Check if hunting occurs.

Clean the throttle body. (Refer to P.13A-79*.)
↓
Check and adjust the fixed SAS. (Refer to P.13A-81*.)
↓
Check trouble symptom.
↓ NG
Inspect the intake of air into the air intake system
- Broken intake manifold gasket
- Broken air intake hose
- Broken vacuum hose
- Positive crankcase ventilation valve does not operate.

*: Refer to L400 Workshop Manual (Pub. No. PWWE9410)

INSPECTION PROCEDURE 38

MUT-II: Check if idling speed is unstable.

MUT-II Data list
26 Idle position switch (Refer to P.13A-51.)
NG → Check the idle position switch system. (Refer to P.13A-34, INSPECTION PROCEDURE 25.)
OK ↓

MUT-II Data list
13 Intake air temperature sensor (Refer to P.13A-51.)
NG → Check the intake air temperature sensor system. (Refer to P.13A-6, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 13.)
OK ↓

MUT-II Data list
25 Barometric pressure sensor (Refer to P.13A-51.)
NG → Check the barometric pressure sensor system. (Refer to P.13A-12, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 25.)
OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13A-51.)
NG → Check the engine coolant temperature sensor system. (Refer to P.13A-8, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 21.)
OK ↓

MUT-II Actuator test
08 Purge control solenoid valve (Refer to P.13A-56.)
NG → Check the purge control solenoid valve system (Refer to P.13A-39, INSPECTION PROCEDURE 32.)
OK ↓

MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13A-56.)
NG → Check the EGR control solenoid valve system. (Refer to P.13A-40, INSPECTION PROCEDURE 33.)
OK ↓

MUT-II Data list <Vehicles for Germany>
59 Oxygen sensor (rear) (Refer to P.13A-51)
- Transmission: 2nd gear <M/T>, L range <A/T>
- Driving with throttle widely open

OK: 600 – 1,000 mV
NG → Check the oxygen sensor (rear) system. (Refer to P.13A-15, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 59.)
OK ↓

MUT-II Data list
11 Oxygen sensor (front)
OK: 600–1,000 mV during sudden racing
NG → Check the oxygen sensor (front) system. (Refer to P.13A-5, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 11.)
OK ↓

MUT-II Data list
11 Oxygen sensor (front)
OK: Changes between 0–400 mV and 600–1,000 mV during idling
NG → Check the fuel pressure. (Refer to P.13A-83*.)
OK → 1. Inspect the intake of air into the air intake system.
- Broken intake manifold gasket
- Broken vacuum hose
- PCV valve does not operate.
- Broken air intake hose

2. Check the injector for clog.

OK ↓

MUT-II Data list
27 Power steering fluid pressure switch (Refer to P.13A-51.)
NG → Check the power steering fluid pressure switch system. (Refer to P.13A-37, INSPECTION PROCEDURE 28.)
OK ↓

MUT-II Data list
28 A/C switch (Refer to P.13A-51.)
NG → Check the A/C switch and A/C relay system. (Refer to P.13A-37. INSPECTION PROCEDURE 29.)
OK ↓

MUT-II Data list
29 Inhibitor switch (Refer to P.13A-51.)
NG → Check the ignition switch-ST and inhibitor switch system. <A/T> (Refer to P.13A-36, INSPECTION PROCEDURE 27.)
OK ↓

MUT-II Data list
45 ISC Servo position (Refer to P.13A-51.)
NG → Adjust the basic idle speed. (Refer to P.13A-83*.)

*: Refer to L400 Workshop Manual (Pub. No. PWWE9410)

INSPECTION PROCEDURE 39

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

MUT-II Data list
26 Idle position switch (Refer to P.13A-51.)
NG → Check the idle position switch system. (Refer to P.13A-34, INSPECTION PROCEDURE 25.)
OK ↓

MUT-II Data list
13 Intake air temperature sensor (Refer to P.13A-51.)
NG → Check the intake air sensor system. (Refer to P.13A-6, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 13.)
OK ↓

MUT-II Data list
25 Barometric pressure sensor (Refer to P.13A-51.)
NG → Check the barometric pressure sensor system. (Refer to P.13A-12, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 25.)
OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13A-51.)
NG → Check the engine coolant temperature sensor system. (Refer to P.13A-8, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 21.)
OK ↓

MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13A-56.)
NG → Check the EGR control solenoid valve system. (Refer to P.13A-40, INSPECTION PROCEDURE 33.)
OK ↓

MUT-II Data list <Vehicles for Germany>
59 Oxygen sensor (rear) (Refer to P.13A-51)
- Transmission: 2nd gear <M/T>, L range <A/T>
- Driving with throttle widely open

OK: 600 – 1,000 mV
NG → Check the oxygen sensor (rear) system. (Refer to P.13A-15, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 59.)
OK ↓

MUT-II Data list
11 Oxygen sensor (front)
OK: Changes between 600 – 1,000 mV during sudden racing
NG → Check the oxygen sensor (front) system. (Refer to P.13A-5, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 11.)
OK ↓

MUT-II Data list
11 Oxygen sensor (front)
OK: Changes between 0 – 400 mV and 600 – 1,000 mV during idling
NG → Check the fuel pressure. (Refer to P.13A-83*.)
OK → 1. Inspect the intake of air into the air intake system
- Broken intake manifold gasket
- Broken vacuum hose
- PCV valve does not operate.
- Broken air intake hose

2. Check the injector for clog.

OK ↓

MUT-II Data list
27 Power steering fluid pressure switch (Refer to P.13A-51.)
NG → Check the power steering fluid pressure switch system. (Refer to P.13A-37, INSPECTION PROCEDURE 28.)
OK ↓

MUT-II Data list
28 A/C switch (Refer to P.13A-51.)
NG → Check the A/C switch and A/C relay system. (Refer to P.13A-37, INSPECTION PROCEDURE 29.)
OK ↓

MUT-II Data list
29 Inhibitor switch (Refer to P.13A-51.)
NG → Check the ignition switch-ST and inhibitor switch system. <A/T> (Refer to P.13A-36, INSPECTION PROCEDURE 27.)
OK ↓

MUT-II Data list
45 ISC servo position (Refer to P.13A-51.)
NG → Adjust the basic idle speed. (Refer to P.13A-81*.)

*: Refer to L400 Workshop Manual (Pub. No. PWWE9410)

INSPECTION PROCEDURE 40

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

MUT-II Data list
26 Idle position switch (Refer to P.13A-51.)
NG → Check the idle position switch system. (Refer to P.13A-34, INSPECTION PROCEDURE 25.)
OK ↓

MUT-II Data list
13 Intake air temperature sensor (Refer to P.13A-51.)
NG → Check the intake air sensor system. (Refer to P.13A-6, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 13.)
OK ↓

MUT-II Data list
25 Barometric pressure sensor (Refer to P.13A-51.)
NG → Check the barometric pressure sensor system. (Refer to P.13A-12, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 25.)
OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13A-51.)
NG → Check the engine coolant temperature sensor system. (Refer to P.13A-8, INSPECTION PROCEDURE FOR DIAGNOSTIC CODE 21.)
OK ↓

MUT-II Data list
14 Throttle position sensor (Refer to P.13A-51.)
NG → Check the throttle position sensor system. (Refer to P.13A-7, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 14.)
OK ↓

MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13A-56.)
NG → Check the EGR control solenoid valve system. (Refer to P.13A-40, INSPECTION PROCEDURE 33.)
OK ↓

MUT-II Data list <Vehicles for Germany>
59 Oxygen sensor (rear) (Refer to P.13A-51)
- Transmission: 2nd gear <M/T>, L range <A/T>
- Driving with throttle widely open

OK: 600 – 1,000 mV
NG → Check the oxygen sensor (rear) system. (Refer to P.13A-15, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 59.)
OK ↓

MUT-II Data list
11 Oxygen sensor (front)
OK: Changes between 600 – 1,000 mV during sudden racing
NG → Check the oxygen sensor (front) system. (Refer to P.13A-5, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 11.)
OK ↓

MUT-II Data list
11 Oxygen sensor (front)
OK: Changes between 0 – 400 mV and 600 – 1,000 mV during idling
NG → Check the fuel pressure. (Refer to P.13A-83*.)
OK → 1. Inspect the intake of air into the air intake system
- Broken intake manifold gasket
- Broken vacuum hose
- PCV valve does not operate.
- Broken air intake hose

2. Check the injector for clog.

*: Refer to L400 Workshop Manual (Pub. No. PWWE9410)

INSPECTION PROCEDURE 41

MUT-II: Check if surge occurs.

MUT-II Data list
26 Idle position switch (Refer to P.13A-51.)
- NG → Check the idle position switch system. (Refer to P.13A-34, INSPECTION PROCEDURE 25.)
- OK ↓

MUT-II Data list
13 Intake air temperature sensor (Refer to P.13A-51.)
- NG → Check the intake air sensor system. (Refer to P.13A-6, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 13.)
- OK ↓

MUT-II Data list
25 Barometric pressure sensor (Refer to P.13A-51.)
- NG → Check the barometric pressure sensor system. (Refer to P.13A-12, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 25.)
- OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13A-51.)
- NG → Check the engine coolant temperature sensor system. (Refer to P.13A-8, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 21.)
- OK ↓

MUT-II Data list
14 Throttle position sensor (Refer to P.13A-51.)
- NG → Check the throttle position sensor system. (Refer to P.13A-7, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 14.)
- OK ↓

MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13A-56.)
- NG → Check the EGR control solenoid valve system. (Refer to P.13A-40, INSPECTION PROCEDURE 33.)
- OK ↓

MUT-II Data list <Vehicles for Germany>
59 Oxygen sensor (rear) (Refer to P.13A-51)
- Transmission: 2nd gear <M/T>, L range <A/T>
- Driving with throttle widely open

OK: 600 – 1,000 mV
- NG → Check the oxygen sensor (rear) system. (Refer to P.13A-15, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 59.)
- OK ↓

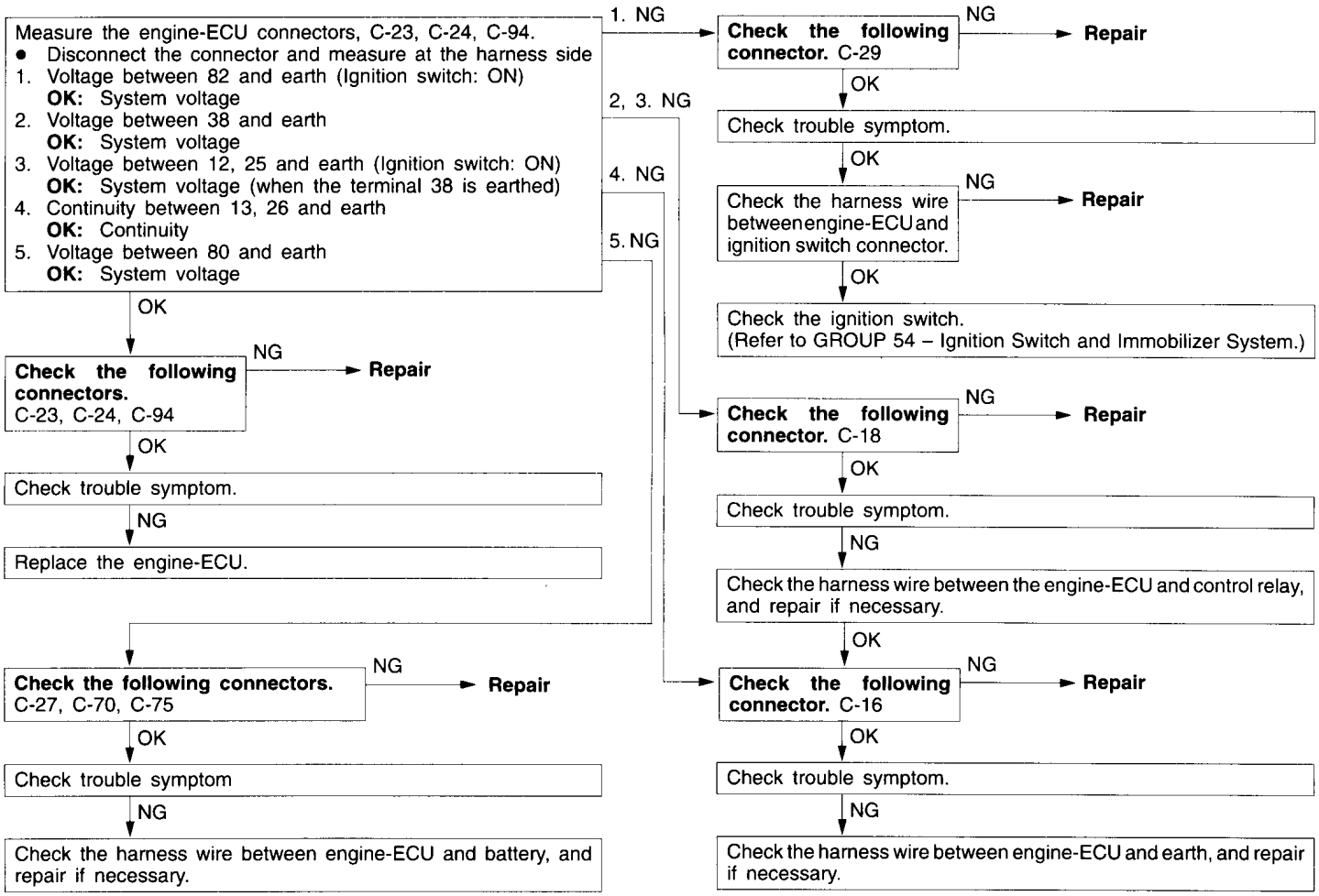
MUT-II Data list
11 Oxygen sensor (front)
OK: Changes between 600 – 1,000 mV during sudden racing
- NG → Check the oxygen sensor (front) system. (Refer to P.13A-5, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 11.)
- OK ↓

MUT-II Data list
11 Oxygen sensor (front)
OK: Changes between 0 – 400 mV and 600 – 1,000 mV during idling
- NG → Check the fuel pressure. (Refer to P.13A-83*.)
- OK → 1. Inspect the intake of air into the air intake system
  - Broken intake manifold gasket
  - Broken vacuum hose
  - PCV valve does not operate.
  - Broken air intake hose
  2. Check the injector for clog.

*: Refer to L400 Workshop Manual (Pub. No. PWWE9410)

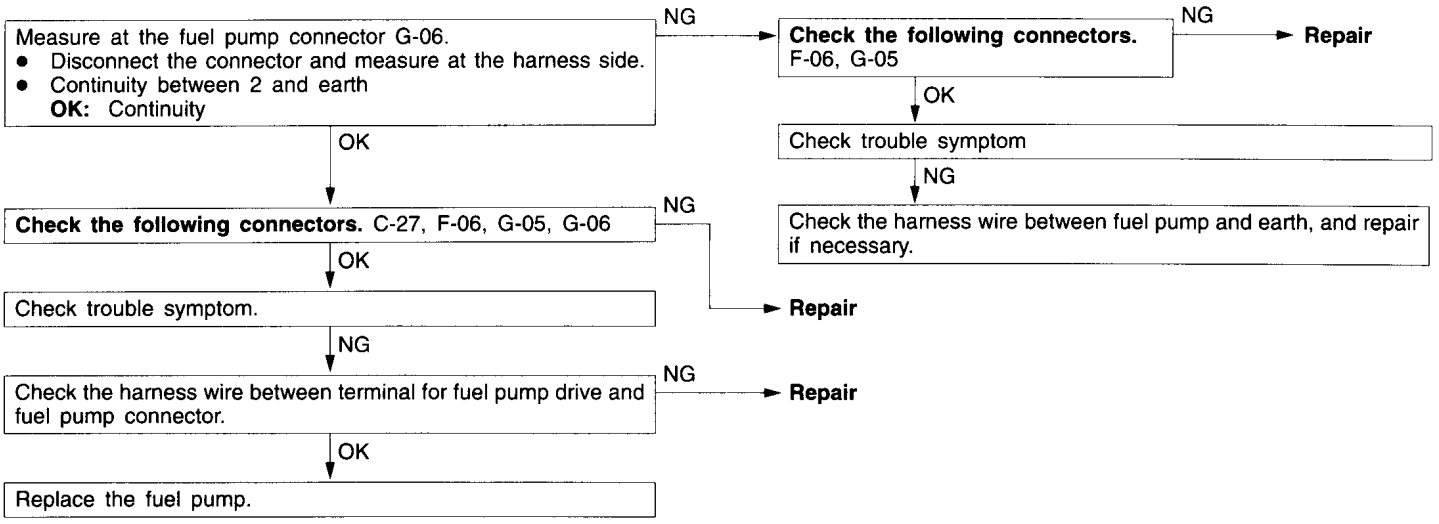
INSPECTION PROCEDURE 42

Check the engine-ECU power supply and earth circuit.



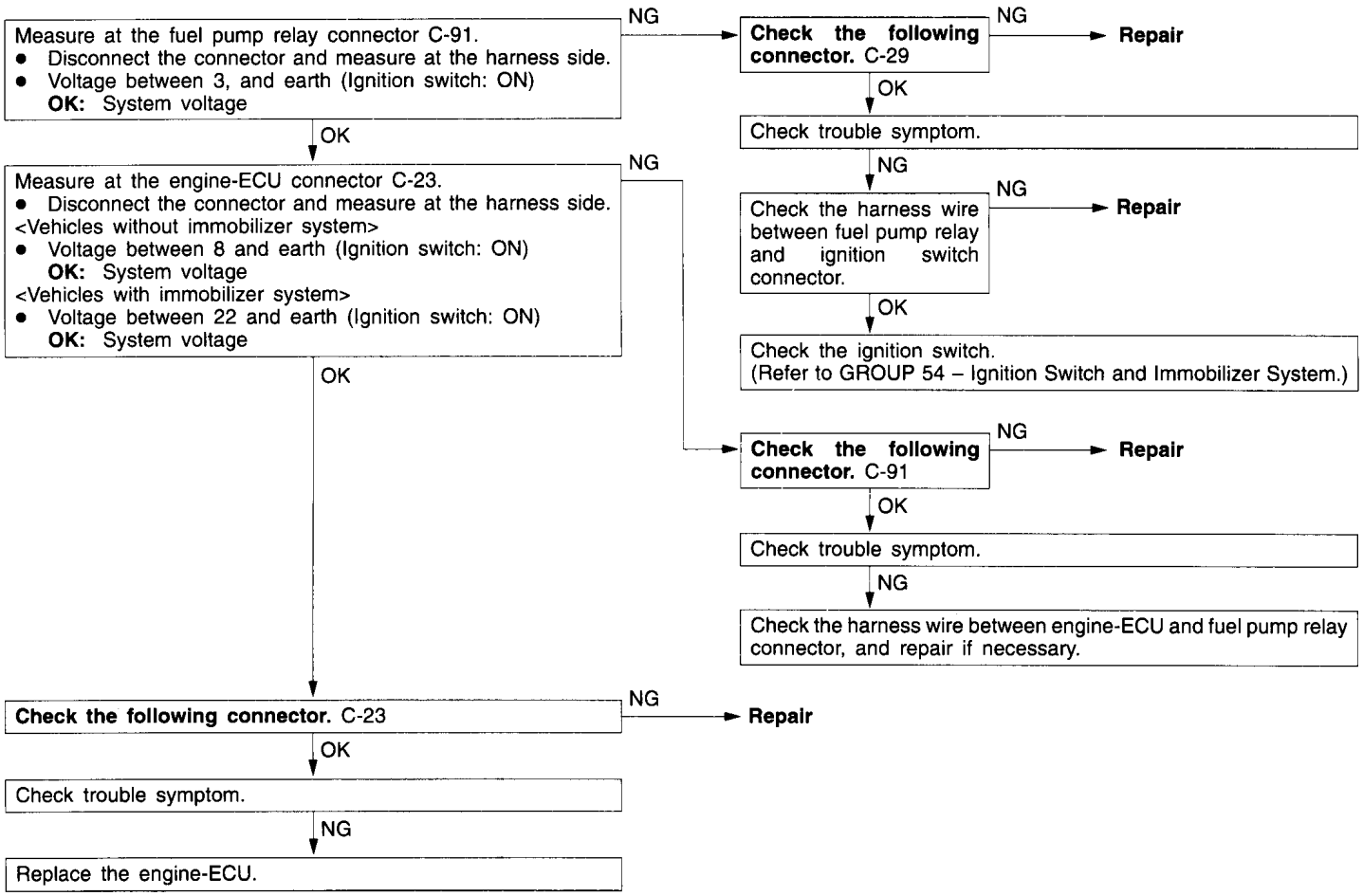
INSPECTION PROCEDURE 43

Check fuel pump circuit.



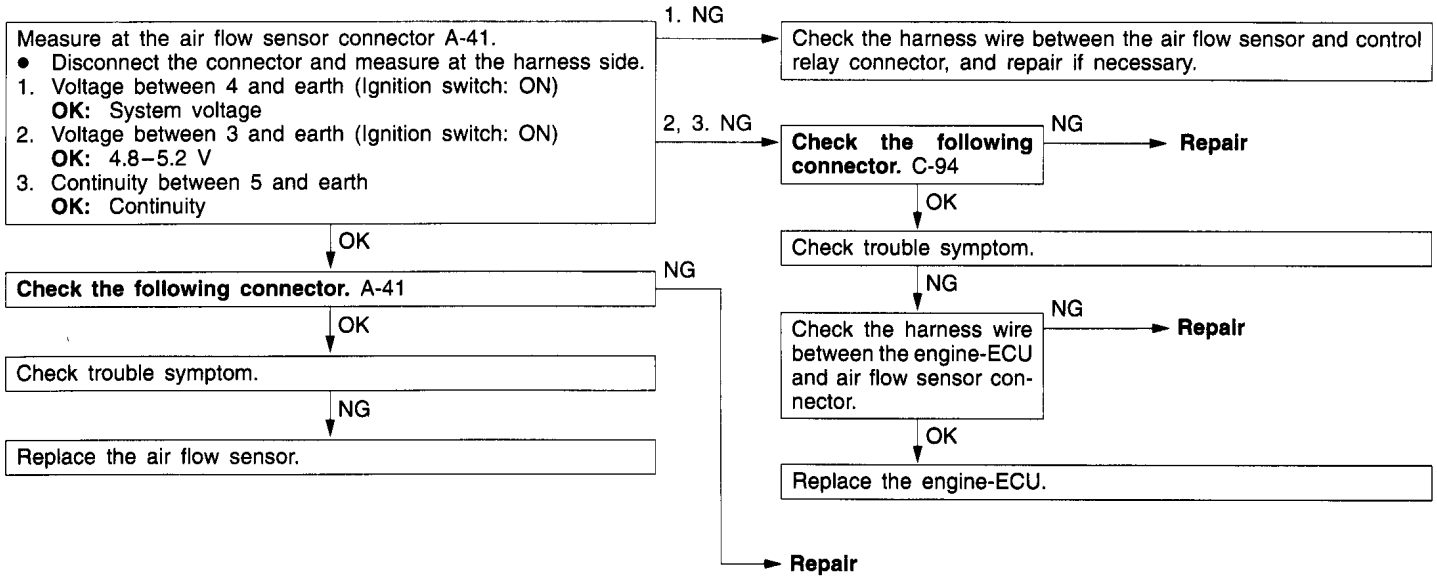
INSPECTION PROCEDURE 44

Check the fuel pump drive control circuit.



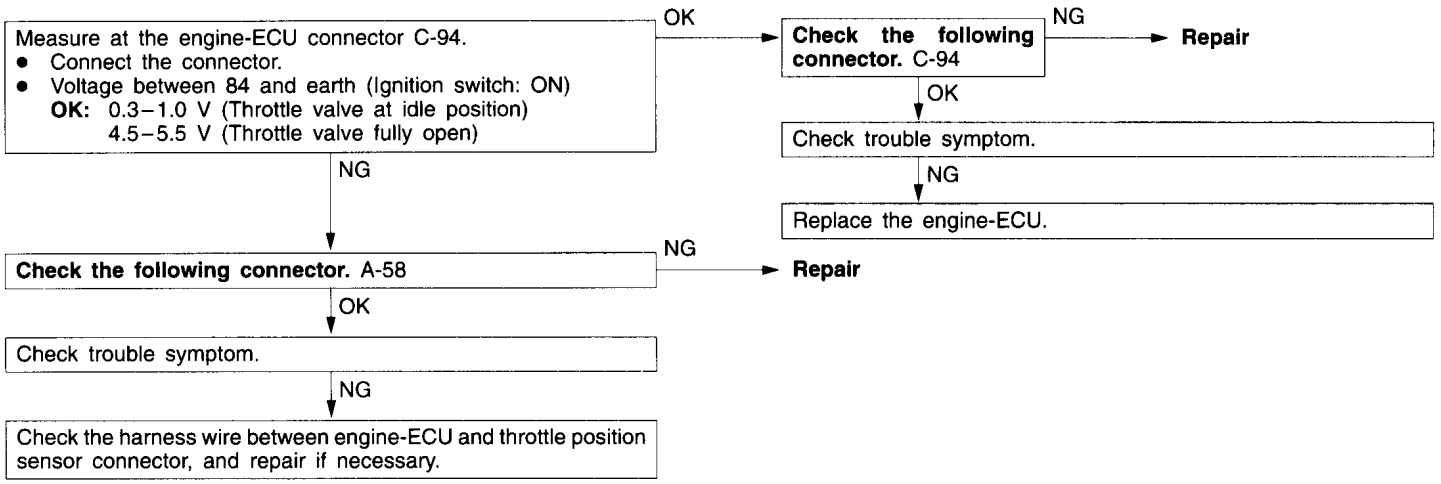
INSPECTION PROCEDURE 45

Check air flow sensor (AFS) control circuit.



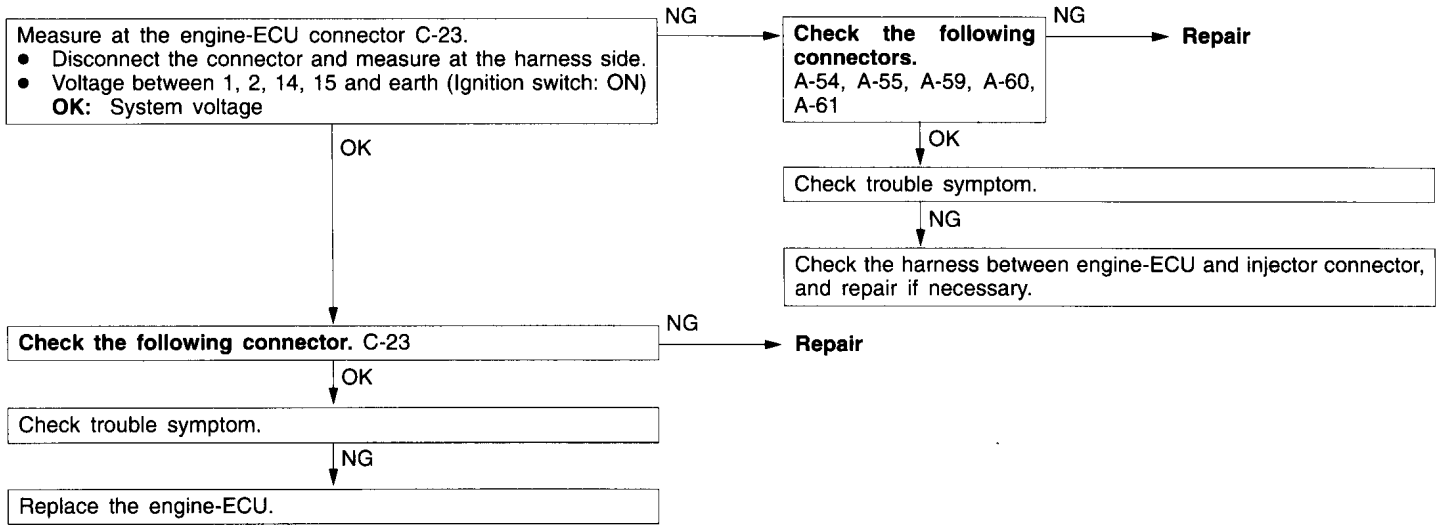
INSPECTION PROCEDURE 46

Check throttle position sensor (TPS) output circuit.



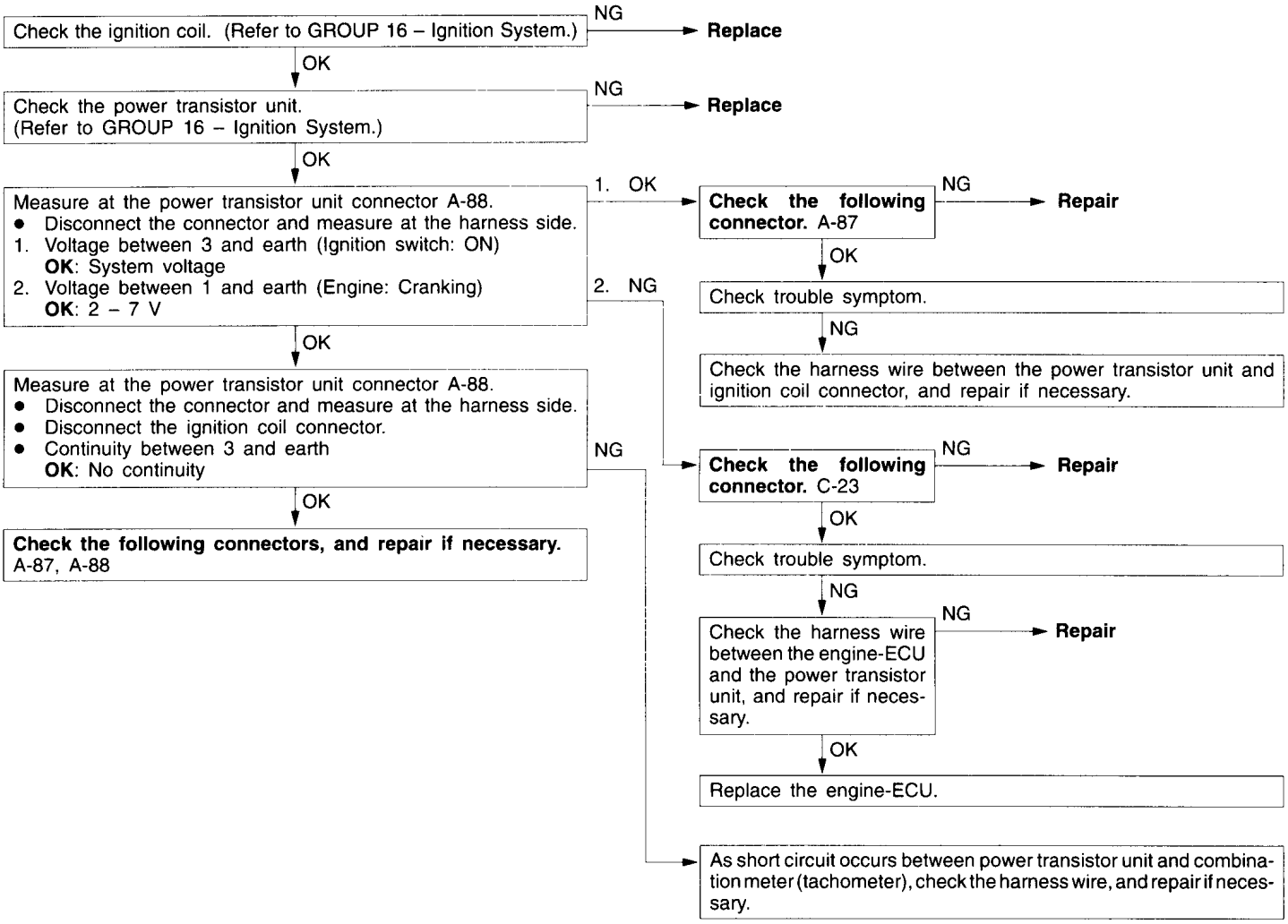
INSPECTION PROCEDURE 47

Check injector control circuit



INSPECTION PROCEDURE 48

Check ignition coil and power transistor unit circuit.



DATA LIST REFERENCE TABLE

13100890180

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

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

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
11	Oxygen sensor (front)	Engine:After having warmed up Air/fuel mixture is made leaner when decelerating, and is made richer when racing.	When at 4,000 r/min, engine is suddenly decelerated	200 mV or less	Code No. 11	13A-5
			When engine is suddenly raced	600–1,000 mV		
		Engine:After having warmed up The oxygen sensor signal is used to check the air/fuel mixture ratio, and control condition by the engine-ECU.	Engine is idling	400 mV or less (Changes) 600–1,000 mV		
			2,500 r/min	400 mV or less (Changes) 600–1,000 mV		
12	Air flow sensor*1	• Engine coolant temperature: 80–95°C • Lamps and all accessories: OFF • Transmission: Neutral (A/T: P range)	Engine is idling	22 – 48 Hz <4G63> 19 – 45 Hz <4G64>	–	–
			2,500 r/min	80 – 120 Hz <4G63> 67 – 107 Hz <4G64>		
			Engine is raced	Frequency increases in response to racing		

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
13	Intake air temperature sensor	Ignition switch: ON or with engine running	When intake air temperature is –20°C	–20°C	Code No. 13	13A-6
			When intake air temperature is 0°C	0°C		
			When intake air temperature is 20°C	20°C		
			When intake air temperature is 40°C	40°C		
			When intake air temperature is 80°C	80°C		
14	Throttle position sensor	Ignition switch: ON	Set to idle position	300–1,000 mV	Code No. 14	13A-7
			Gradually open	Increases in proportion to throttle opening angle		
			Open fully	4,500–5,500 mV		
16	Power supply voltage	Ignition switch: ON		System voltage	Procedure No. 23	13A-33
18	Cranking signal (ignition switch-ST)	Ignition switch: ON	Engine: Stopped	OFF	Procedure No. 26 <M/T> Procedure No. 27 <A/T>	13A-35 <M/T> 13A-36 <A/T>
			Engine: Cranking	ON		
21	Engine coolant temperature sensor	Ignition switch: ON or with engine running	When engine coolant temperature is –20°C	–20°C	Code No. 21	13A-8
			When engine coolant temperature is 0°C	0°C		
			When engine coolant temperature is 20°C	20°C		
			When engine coolant temperature is 40°C	40°C		
			When engine coolant temperature is 80°C	80°C		

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
22	Crank angle sensor	• Engine: Cranking • Tachometer: Connected	Compare the engine speed readings on the tachometer and the MUT-II.	Accord	Code No. 22	13A-9
		• Engine: Idling • Idle position switch: ON	When engine coolant temperature is –20°C	1,275 – 1,475 r/min		
			When engine coolant temperature is 0°C	1,225 – 1,425 r/min		
			When engine coolant temperature is 20°C	1,100 – 1,300 r/min		
			When engine coolant temperature is 40°C	950 – 1,150 r/min		
			When engine coolant temperature is 80°C	650 – 850 r/min		
25	Barometric pressure sensor	Ignition switch: ON	At altitude of 0 m	101 kPa	Code No. 25	13A-12
			At altitude of 600 m	95 kPa		
			At altitude of 1,200 m	88 kPa		
			At altitude of 1,800 m	81 kPa		
26	Idle position switch	Ignition switch: ON Check by operating accelerator pedal repeatedly	Throttle valve: Set to idle position	ON	Procedure No. 25	13A-34
			Throttle valve: Slightly open	OFF*2		
27	Power steering fluid pressure switch	Engine: Idling	Steering wheel stationary	OFF	Procedure No. 28	13A-37
			Steering wheel turning	ON		

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
28	A/C switch	Engine: Idling (when A/C switch is ON, A/C compressor should be operating.)	A/C switch: OFF	OFF	Procedure No. 29	13A-37
			A/C switch: ON	ON		
29	Inhibitor switch <A/T>	Ignition switch: ON	P or N	P or N	Procedure No. 27	13A-36
			D, 2, L or R	D, 2, L or R		
41	Injectors *3	Engine: Cranking	When engine coolant temperature is 0°C	51 – 76 ms <4G63> 60 – 90 ms <4G64>	–	–
			When engine coolant temperature is 20°C	26 – 38 ms <4G63> 30 – 45 ms <4G64>		
			When engine coolant temperature is 80°C	5.7 – 8.5 ms <4G63> 6.7 – 10.1 ms <4G64>		
	Injectors*4	• Engine coolant temperature: 80–95°C • Lamps and all accessories: OFF • Transmission: Neutral (A/T : P range)	Engine is idling	1.9 – 3.1 ms <4G63> 2.2 – 3.4 ms <4G64>		
			2,500 r/min	1.8 – 3.0 ms <4G63> 1.9 – 3.1 ms <4G64>		
			When engine is suddenly raced	Increases		
44	Ignition coils and power transistors	• Engine: After having warmed up • Timing lamp is set. (The timing lamp is set in order to check actual ignition timing.)	Engine is idling	2–18°BTDC	–	–
			2,500 r/min	23 – 43° BTDC <4G63> 27 – 47° BTDC <4G64>		

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
45	ISC (stepper) motor position *5	• Engine coolant temperature: 80–95°C • Lamps and all accessories: OFF • Transmission: Neutral (A/T : P range) • Idle position switch: ON • Engine: Idling • When A/C switch is ON, A/C compressor should be operating	A/C switch: OFF	2–25 STEP	–	–
			A/C switch: OFF → ON	Increases by 10–70 steps		
			• A/C switch: OFF • Select lever: N range → D range	Increases by 5–50 steps		
49	A/C relay	Engine: After having warmed up/Engine is idling	A/C switch: OFF	OFF (Compressor clutch is not operating)	Procedure No. 29	13A-37
			A/C switch: ON	ON (Compressor clutch is operating)		
59	Oxygen sensor (rear) <Vehicles for Germany>	• Transmission: 2nd gear <M/T>, L range <A/T> • Drive with throttle widely open	3,500 r/min	600 – 1,000 mV	Code No. 59	13A-15

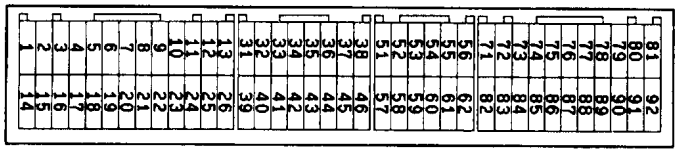
ACTUATOR TEST REFERENCE TABLE

13100900210

Item No.	Inspection item	Drive contents	Inspection contents		Normal condition	Inspection procedure No.	Reference page
01	Injectors	Cut fuel to No.1, No.3 injector	Engine: After having warmed up/Engine is idling (Cut the fuel supply to each injector in turn and check cylinders which don't affect idling.)		Idling condition becomes different (becomes unstable).	Code No. 41	13A-13
02		Cut fuel to No.2, No.4 injector					
07	Fuel pump	Fuel pump operates and fuel is recirculated.	• Engine: Cranking • Fuel pump: Forced driving Inspect according to both the above conditions.	Pinch the return hose with fingers to feel the pulse of the fuel being recirculated.	Pulse is felt.	Procedure No. 24	13A-34
				Listen near the fuel tank for the sound of fuel pump operation.	Sound of operation is heard.		
08	Purge control solenoid valve	Solenoid valve turns from OFF to ON.	Ignition switch: ON		Sound of operation can be heard when solenoid valve is driven.	Procedure No. 32	13A-39
10	EGR control solenoid valve	Solenoid valve turns from OFF to ON.	Ignition switch: ON		Sound of operation can be heard when solenoid valve is driven.	Procedure No. 33	13A-40

CHECK AT THE ENGINE-ECU TERMINALS

Engine-ECU Connector Terminal Arrangement



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NOTE
*: Vehicles with immobilizer system

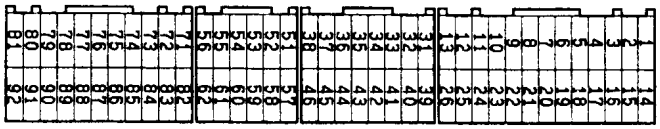
Terminal No.	Check item	Check condition (Engine condition)	Normal condition
1	No. 1 injector	While engine is idling after having warmed up, suddenly depress the accelerator pedal.	From 11 – 14 V, momentarily drops slightly
14	No. 2 injector		
2	No. 3 injector		
15	No. 4 injector		
4	Stepper motor coil <A1>	Engine: Soon after the warmed up engine is started	System voltage ↔ 0 V (Changes repeatedly)
17	Stepper motor coil <A2>		
5	Stepper motor coil <B1>		
18	Stepper motor coil <B2>		
6	EGR control solenoid valve	Ignition switch: ON	System Voltage
		While engine is idling, suddenly depress the accelerator pedal.	From system voltage, momentarily drops
8 or 22*	Fuel pump relay	Ignition switch: ON	System voltage
		Engine: Idle speed	0 – 3 V
9	Purge control solenoid valve	Ignition switch: ON	System voltage
		Running at 3,000r/min while engine is warming up after having been started.	0 – 3V
10	Power transistor unit	Engine r/min: 3,000 r/min	0.3 – 3.0V
12	Power supply	Ignition switch: ON	System voltage
25			
19	Air flow sensor reset signal	Engine: Idle speed	0 – 1V
		Engine r/min: 3,000 r/min	6 – 9V

Terminal No.	Check item	Check condition (Engine condition)		Normal condition
22 or 8*	A/C relay	• Engine: Idle speed • A/C switch: OFF → ON (A/C compressor is operating)		System voltage or momentarily 6V or more → 0 – 3V
36	Engine warning lamp	Ignition switch: OFF → ON		0 – 3V → 9 – 13V (After several seconds have elapsed)
37	Power steering fluid pressure switch	Engine: Idling after warming up	When steering wheel is stationary	System voltage
			When steering wheel is turned	0 – 3V
38	Control relay (Power supply)	Ignition switch: OFF		System voltage
		Ignition switch: ON		0 – 3V
45	A/C switch	Engine: Idle speed	Turn the A/C switch OFF	0 – 3V
			Turn the A/C switch ON (A/C compressor is operating)	System voltage
52	Ignition timing adjustment terminal	Ignition switch: ON	Earth the ignition timing adjustment terminal	0 – 1 V
			Remove the earth from the ignition timing adjustment terminal	4.0 – 5.5 V
60	Oxygen sensor heater	Engine: Idling after warming up		0 – 3V
		Engine r/min: 5,000r/min		System voltage
71	Ignition switch – ST	Engine: Cranking		8V or more
72	Intake air temperature sensor	Ignition switch: ON	When intake air temperature is 0°C	3.2 – 3.8V
			When intake air temperature is 20°C	2.3 – 2.9V
			When intake air temperature is 40°C	1.5 – 2.1V
			When intake air temperature is 80°C	0.4 – 1.0V

Terminal No.	Check item	Check condition (Engine condition)		Normal condition
75	Oxygen sensor (rear) <Vehicles for Germany>	• Transmission: 2nd gear <M/T>, L range <A/T> • Engine r/min: 3,500 r/min or more • Driving with the throttle valve widely open		0.6 – 1.0 V
76	Oxygen sensor (front)	Engine: Running at 2,500 r/min after warmed up (Check using a digital type voltmeter)		0 ↔ 0.8V (Changes repeatedly)
80	Backup power supply	Ignition switch: OFF		System voltage
81	Sensor impressed voltage	Ignition switch: ON		4.5 – 5.5V
82	Ignition switch – IG	Ignition switch: ON		System voltage
83	Engine coolant temperature sensor	Ignition switch: ON	When engine coolant temperature is 0°C	3.2 – 3.8V
			When engine coolant temperature is 20°C	2.3 – 2.9V
			When engine coolant temperature is 40°C	1.3 – 1.9V
			When engine coolant temperature is 80°C	0.3 – 0.9V
84	Throttle position sensor	Ignition switch: ON	Set throttle valve to idle position	0.3 – 1.0V
			Fully open throttle valve	4.5 – 5.5V
85	Barometric pressure sensor	Ignition switch: ON	When altitude is 0m	3.7 – 4.3V
			When altitude is 1,200m	3.2 – 3.8V
86	Vehicle speed sensor	• Ignition switch: ON • Move the vehicle slowly forward		0 ↔ 5V (Changes repeatedly)

Terminal No.	Check item	Check condition (Engine condition)		Normal condition
87	Idle position switch	Ignition switch: ON	Set throttle valve to idle position	0 – 1V
			Slightly open throttle valve	4V or more
88	Top dead center sensor	Engine: Cranking		0.4 – 3.0V
		Engine: Idle speed		0.5 – 2.0V
89	Crank angle sensor	Engine: Cranking		0.4 – 4.0V
		Engine: Idle speed		1.5 – 2.5V
90	Air flow sensor	Engine: Idle speed		2.2 – 3.2V
		Engine r/min: 2,500r/min		
91	Inhibitor switch <A/T>	Ignition switch: ON	Set selector lever to P or N	0 – 3V
			Set selector lever to Other than P or N	8 – 14V

Engine-ECU Harness Side Connector Terminal Arrangement



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Terminal No.	Inspection item	Normal condition (Check condition)
1 – 12	No. 1 injector	13 – 16 Ω (At 20°C)
14 – 12	No. 2 injector	
2 – 12	No. 3 injector	
15 – 12	No. 4 injector	
4 – 12	Stepper motor coil (A1)	28 – 33 Ω (At 20°C)
17 – 12	Stepper motor coil (A2)	
5 – 12	Stepper motor coil (B1)	
18 – 12	Stepper motor coil (B2)	
6 – 12	EGR control solenoid valve	36 – 44 Ω (At 20°C)
9 – 12	Purge control solenoid valve	36 – 44 Ω (At 20°C)
13 – Body earth	Engine-ECU earth	Continuity (0Ω)
26 – Body earth	Engine-ECU earth	
60 – 12	Oxygen sensor heater	11 – 18 Ω (At 20°C)
72 – 92	Intake air temperature sensor	5.3 – 6.7 kΩ (When intake air temperature is 0°C)
		2.3 – 3.0 kΩ (When intake air temperature is 20°C)
		1.0 – 1.5 kΩ (When intake air temperature is 40°C)
		0.30 – 0.42 kΩ (When intake air temperature is 80°C)
83 – 92	Engine coolant temperature sensor	5.1 – 6.5 kΩ (When coolant temperature is 0°C)
		2.1 – 2.7 kΩ (When coolant temperature is 20°C)
		0.9 – 1.3 kΩ (When coolant temperature is 40°C)
		0.26 – 0.36 kΩ (When coolant temperature is 80°C)
87 – 92	Idle position switch	Continuity (when throttle valve is at idle position)
		No continuity (when throttle valve is slightly open)
91 – Body earth	Inhibitor switch <A/T>	Continuity (when select lever is at P or N)
		No continuity (when select lever is at D, 2, L or R)

INSPECTION PROCEDURE USING AN ANALYZER

13100930226

AIR FLOW SENSOR (AFS)

Adjustment procedure not listed below is the same as before.

Alternate Method (Test harness not available)

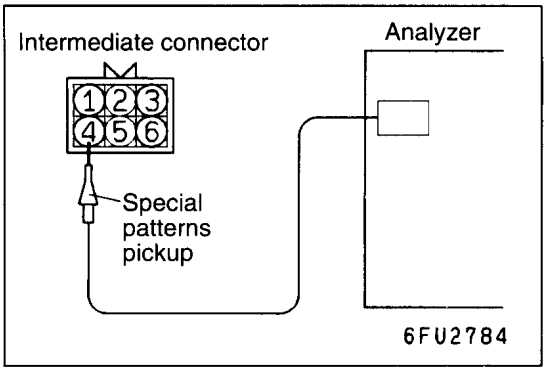
1. Connect the analyzer special patterns pickup to engine-ECU terminal 90.

TOP DEAD CENTER SENSOR AND CRANK ANGLE SENSOR

Adjustment procedure not listed below is the same as before.

Alternate Method (Test harness not available)

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



INJECTOR

Measurement Method

1. Disconnect the injector intermediate harness connector, and connect the special tool (test harness: MD998463) in between.
2. Connect the analyzer special patterns pickup to the following terminal: terminal 2 (the white clip of the special tool) when observing at the No.1 cylinder; terminal 3 (the blue clip) when observing at the No. 2 cylinder; terminal 4 (the black clip) when observing at the No. 3 cylinder; terminal 5 (the green clip) when observing at the No. 4 cylinder.

Alternate Method (Test harness not available)

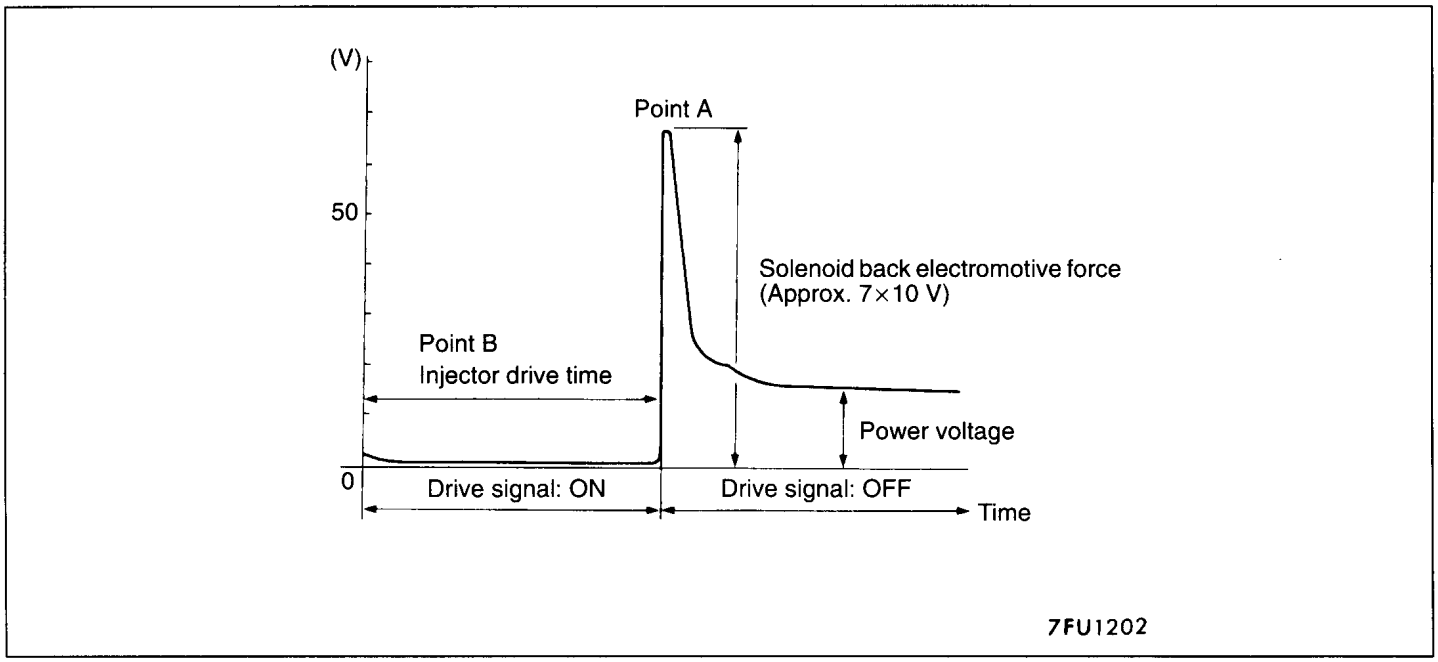
1. Connect the analyzer special patterns pickup to engine-ECU terminal 1. (When checking the No. 1 cylinder.)
2. Connect the analyzer special patterns pickup to engine-ECU terminal 14. (When checking the No. 2 cylinder.)
3. Connect the analyzer special patterns pickup to engine-ECU terminal 2. (When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

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

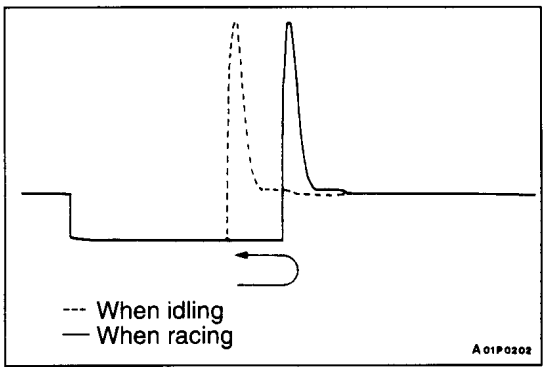


Wave Pattern Observation Points

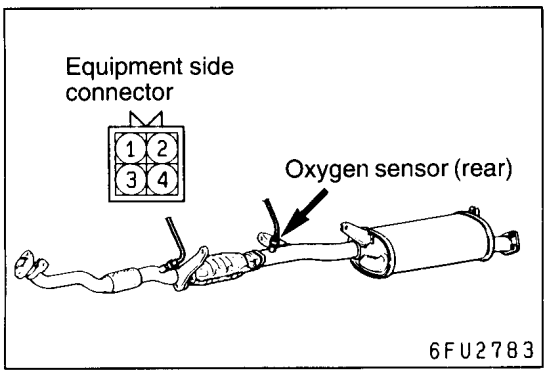
Point A: Height of solenoid back electromotive force

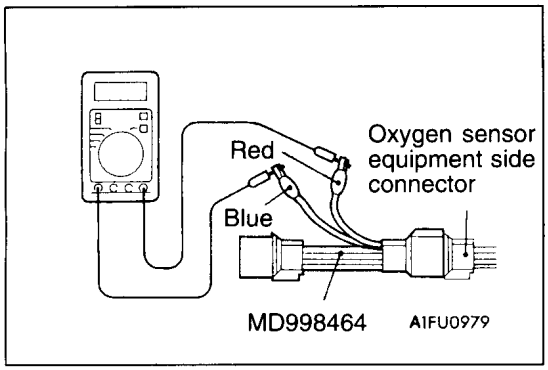
Contrast with standard wave pattern	Probable cause
Solenoid coil back electromotive force is low or doesn't appear at all.	Short in the injector solenoid

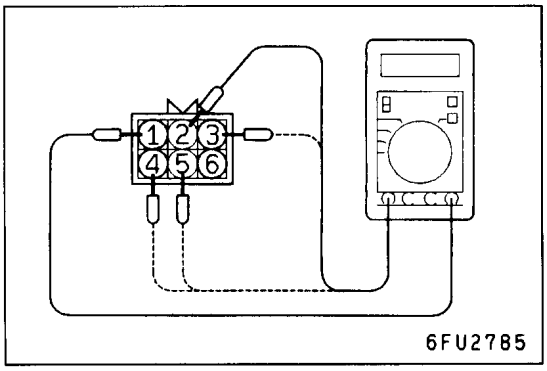
Point B: Injector drive time



- 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.







ON-VEHICLE SERVICE

OXYGEN SENSOR (REAR) CHECK <Vehicles for Germany>

1. Disconnect the oxygen sensor connector and connect the special tool (test harness) to the connector on the oxygen sensor side.
2. Make sure that there is continuity (8 – 14 Ω at 20°C) between terminal 1 (red clip of special tool) and terminal 3 (blue clip of special tool) on the oxygen sensor connector.
3. If there is no continuity, replace the oxygen sensor (rear).

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

INJECTOR CHECK

13100520294

Measurement of Resistance between Terminals

1. Disconnect the injector intermediate harness connectors.
2. Measure the resistance between terminals.

Standard value: 13 – 16 Ω (at 20°C)

Injector	Measurement probe
No.1 cylinder	1 – 2
No.2 cylinder	1 – 3
No.3 cylinder	1 – 4
No.4 cylinder	1 – 5

13F FUEL SUPPLY AND ENGINE CONTROL

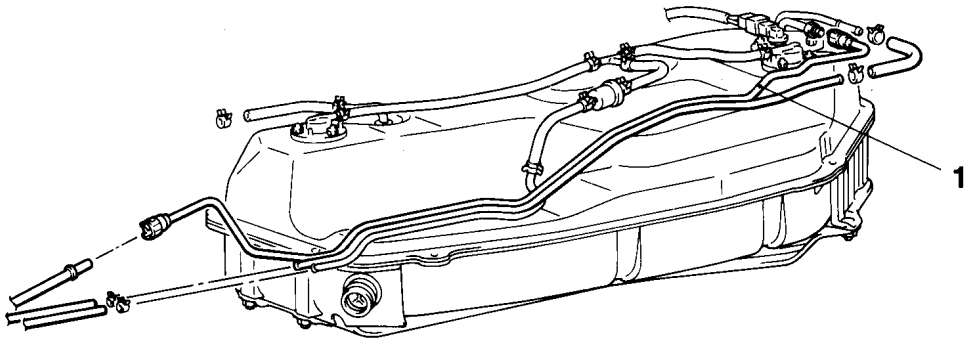
GENERAL

OUTLINE OF CHANGES

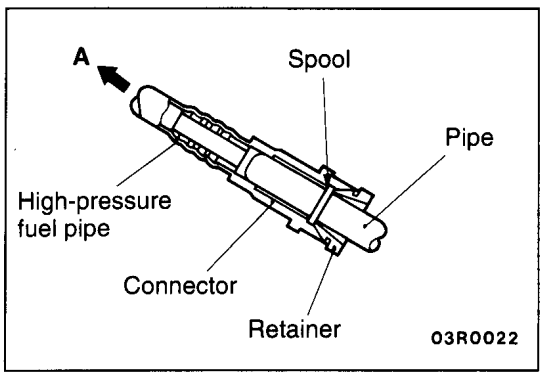
- The fuel line has been changed to correspond to the adoption of quick connector type fuel pipe. <Vehicles with MPI>

FUEL TANK

REMOVAL AND INSTALLATION



▶A◀ 1. High-pressure fuel pipe



INSTALLATION SERVICE POINT

▶A◀ HIGH-PRESSURE FUEL PIPE INSTALLATION

(1) Insert the high-pressure fuel pipe connector securely into the pipe until the retainer goes past the spool of the pipe.
(2) After inserting, gently pull the connector in the direction of A in the illustration and check that the connector does not pull out.