
MULTIPOINT FUEL INJECTION (MPI)

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MULTIPOINT FUEL INJECTION (MPI) <4G1>

GENERAL

OUTLINE OF CHANGE

- The engine-ECU has been modified

GENERAL INFORMATION

GENERAL SPECIFICATIONS

Items		Specifications
Engine-ECU	Identification No.	E2T69282

MULTIPOINT FUEL INJECTION (MPI) <4G9>

GENERAL

OUTLINE OF CHANGE

- The following items have been changed to correspond to specification changes to the 4G92 engine without vehicles for MVV.
 - (1) The engine-ECU has been modified
 - (2) The shape of the air flow sensor connector has been changed.
 - (3) The fixed SAS has been abolished to correspond to changes in the throttle body. In addition, the shape of the stepper motor connector has been changed.
 - (4) The idle position switch has been abolished.

GENERAL INFORMATION

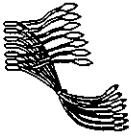
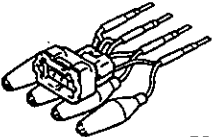
GENERAL SPECIFICATIONS

Items		Specifications
Engine-ECU	Identification No.	E2T73774

SERVICE SPECIFICATIONS

Items	Specifications
Throttle position sensor adjusting voltage mV	535 – 735

SPECIAL TOOLS

Tool	Number	Name	Use
 MB991709	MB991709	Test harness	• Measurement of voltage during trouble shooting • Inspection using an analyzer • Inspection of idle speed control servo
 B991536	MB991536	Check harness for PS adjustment	• Adjusting the throttle position sensor

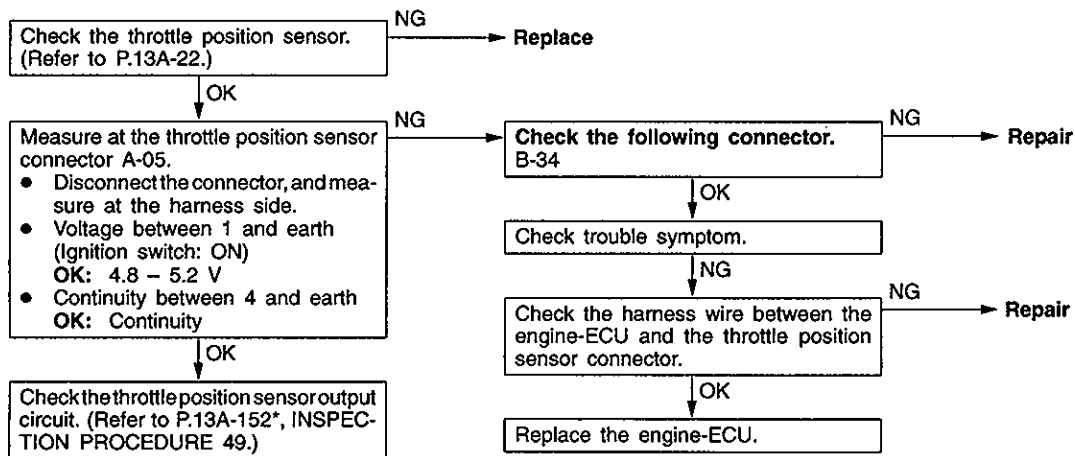
TROUBLESHOOTING

INSPECTION CHART FOR DIAGNOSIS CODES

Code No.	Diagnosis item	Reference page
14	Throttle position sensor system	13A-4

INSPECTION PROCEDURE FOR DIAGNOSIS CODES

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 - Engine speed is 3,000 r/min or less, and volumetric efficiency is 30% or less, TPS output voltage is 4.6 V or more for 4 seconds. or - Engine speed is 2,000 r/min or more, and volumetric efficiency is 60% or more, TPS output voltage is 0.8 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 - Malfunction of the engine-ECU



NOTE

*: Refer to the '96 COLT/LANCER Workshop Manual (Pub No. PWME9511).

INSPECTION CHART FOR TROUBLE SYMPTOMS

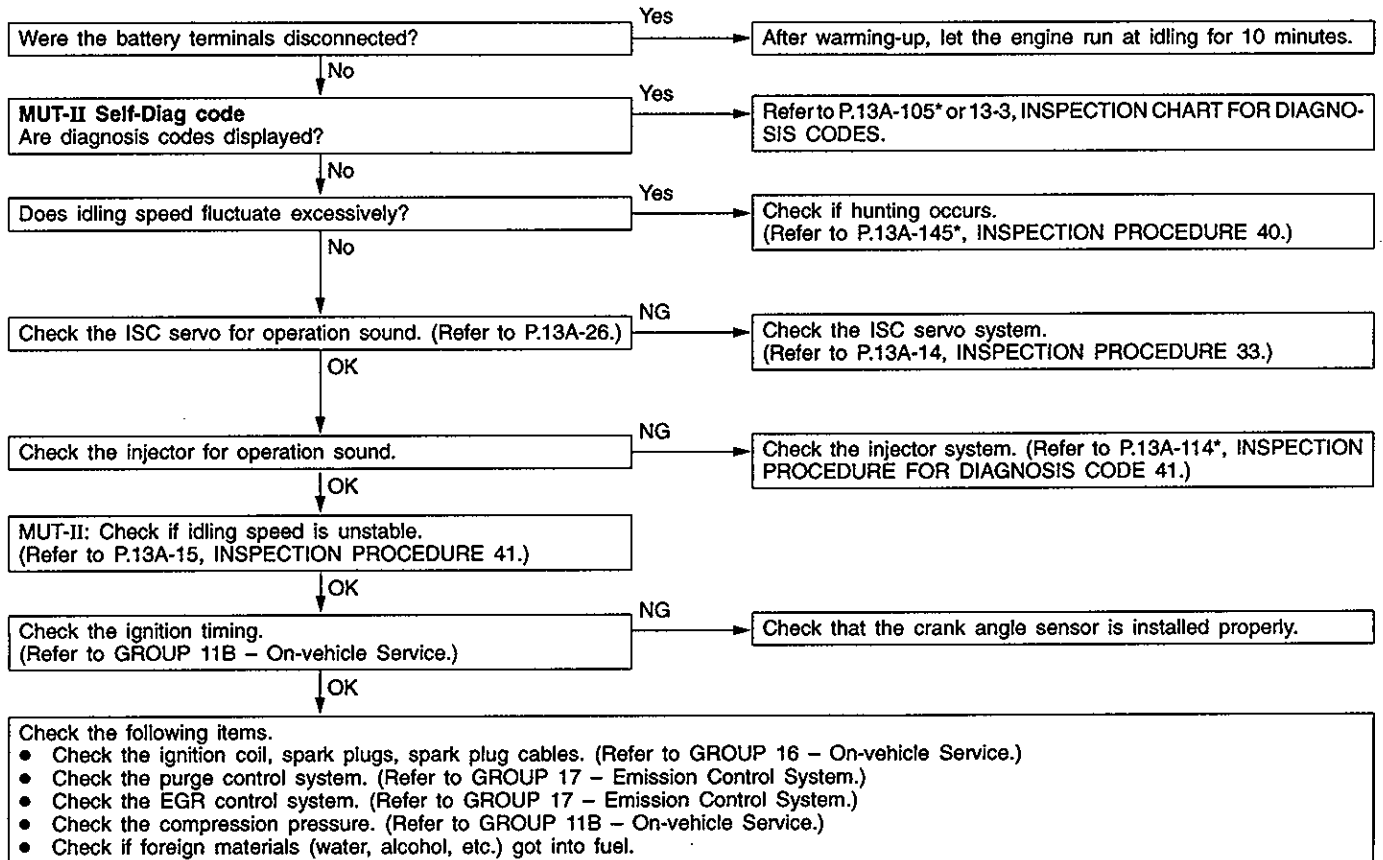
Trouble symptom		Inspection procedure No.	Reference page
Communication with MUT-II is impossible.	Communication with all systems is not possible.	1	13A-119*
	Communication with engine-ECU only is not possible.	2	13A-120*
Engine warning lamp and related parts	The engine warning lamp does not illuminate right after the ignition switch is turned to the ON position.	3	13A-121*
	The engine warning lamp remains illuminating and never goes out.	4	13A-121*
Starting	No initial combustion (starting impossible)	5	13A-122*
	Initial combustion but no complete combustion (starting impossible)	6	13A-123*
	Long time to start (improper starting)	7	13A-124*
Idling stability (Improper idling)	Unstable idling (Rough idling, hunting)	8	13A-6
	Idling speed is high. (Improper idling speed)	9	13A-7
	Idling speed is low. (Improper idling speed)	10	13A-7
Idling stability (Engine stalls)	When the engine is cold, it stalls at idling. (Die out)	11	13A-8
	When the engine becomes hot, it stalls at idling. (Die out)	12	13A-129*
	The engine stalls when starting the car. (Pass out)	13	13A-130*
	The engine stalls when decelerating.	14	13A-9
Driving	Hesitation, sag or stumble	15	13A-10
	The feeling of impact or vibration when accelerating	16	13A-131*
	The feeling of impact or vibration when decelerating	17	13A-11
	Poor acceleration	18	13A-132*
	Surge	19	13A-12
	Knocking	20	13A-133*
Dieseling		21	13A-133*
Too high CO and HC concentration when idling		22	13A-13
Low alternator output voltage (approx. 12.3 V)		23	13A-135*

NOTE

*: Refer to the '96 COLT/LANCER Workshop Manual (Pub No. PWME9511).

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

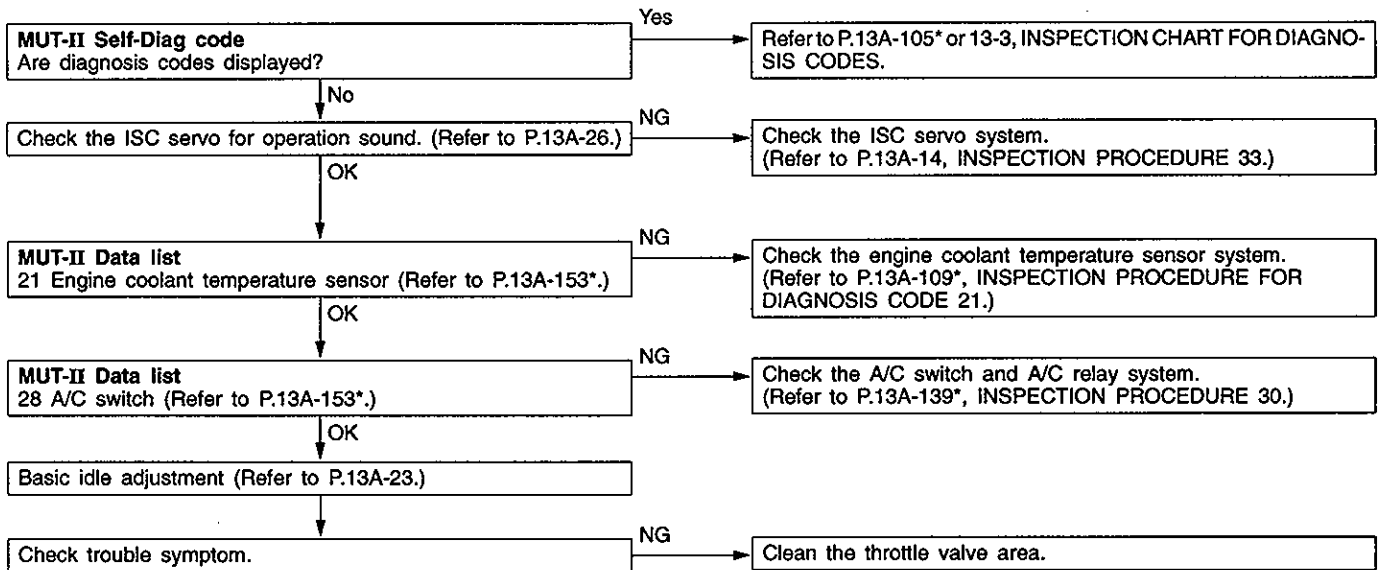


NOTE

*: Refer to the '96 COLT/LANCER Workshop Manual (Pub No. PWME9511).

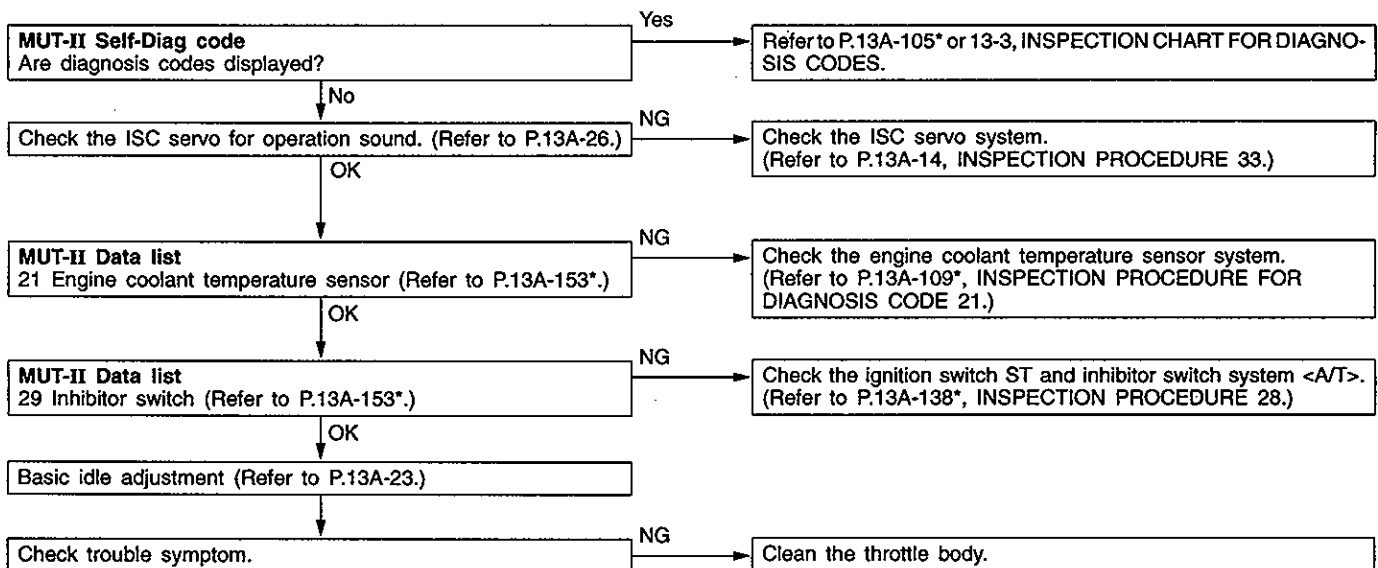
INSPECTION PROCEDURE 9

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



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

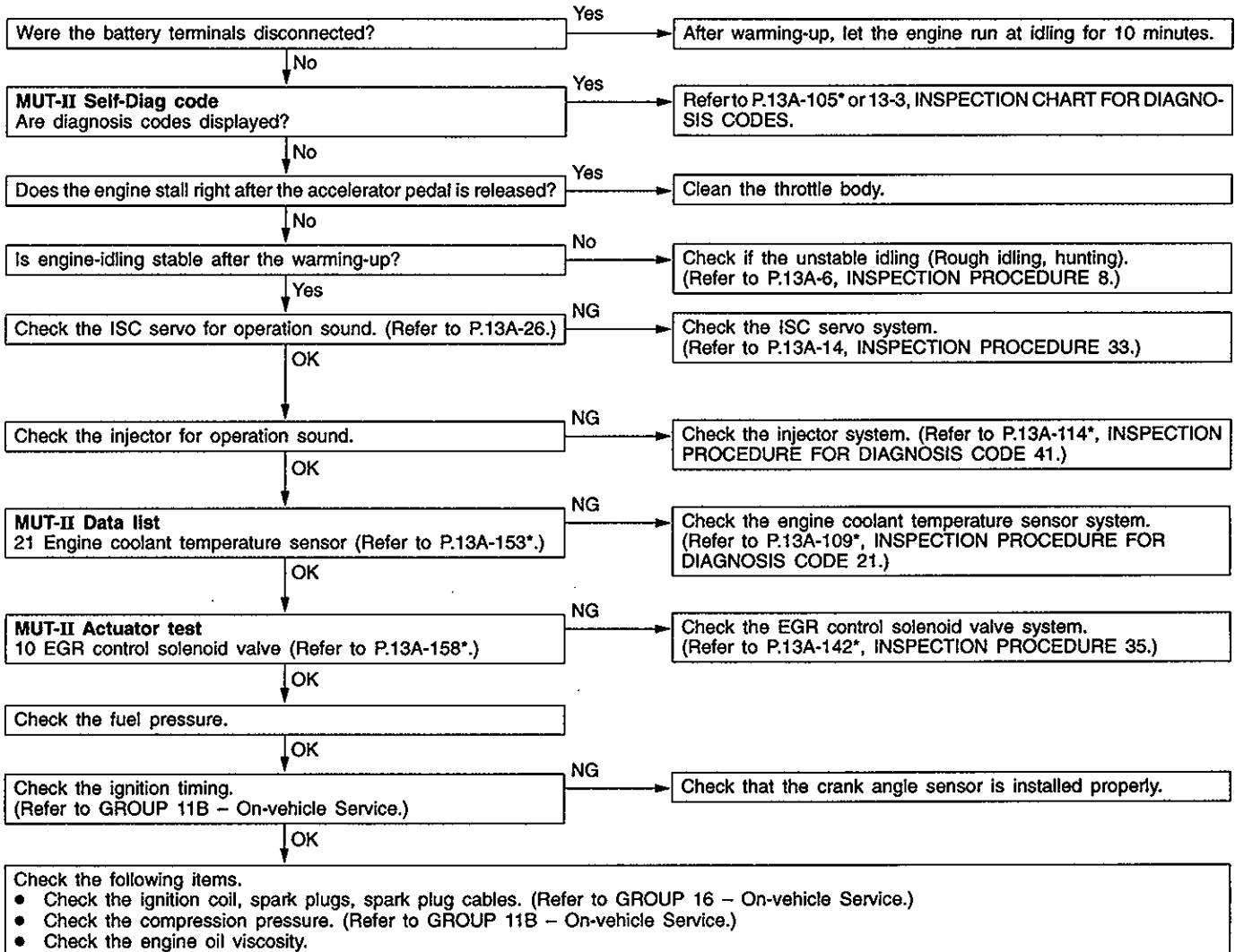


NOTE

*: Refer to the '96 COLT/LANCER Workshop Manual (Pub No. PWME9511).

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

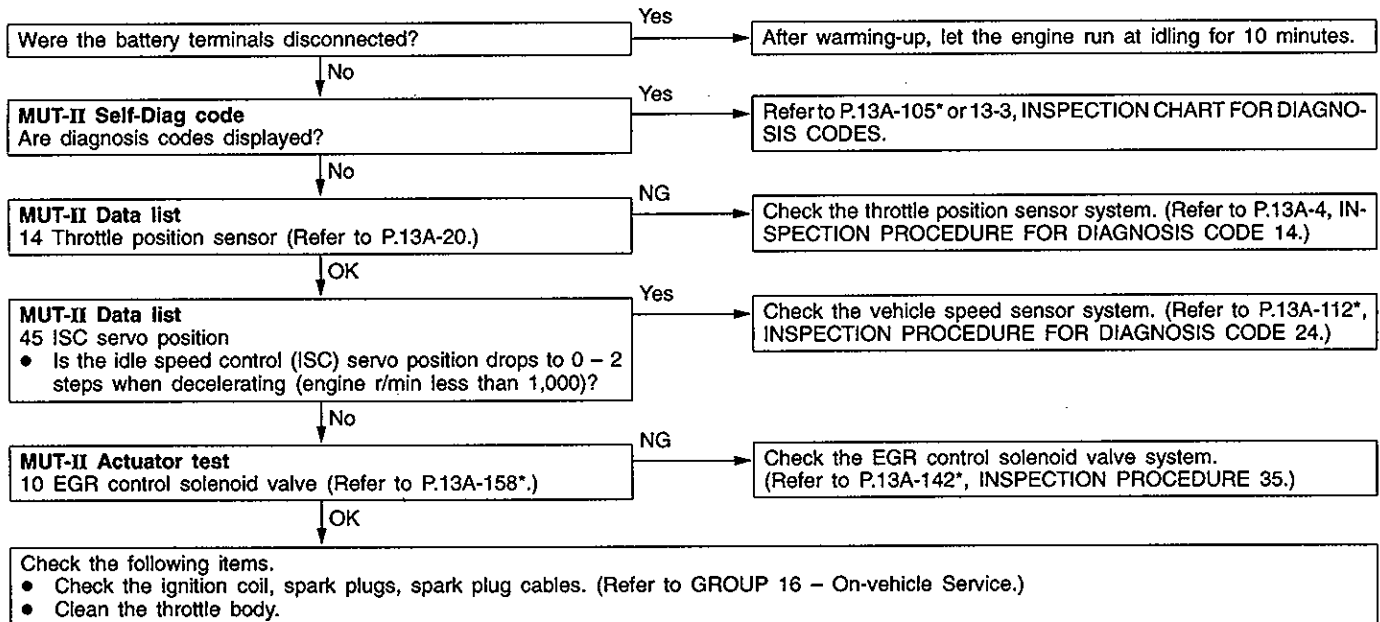


NOTE

*: Refer to the '96 COLT/LANCER Workshop Manual (Pub No. PWME9511).

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

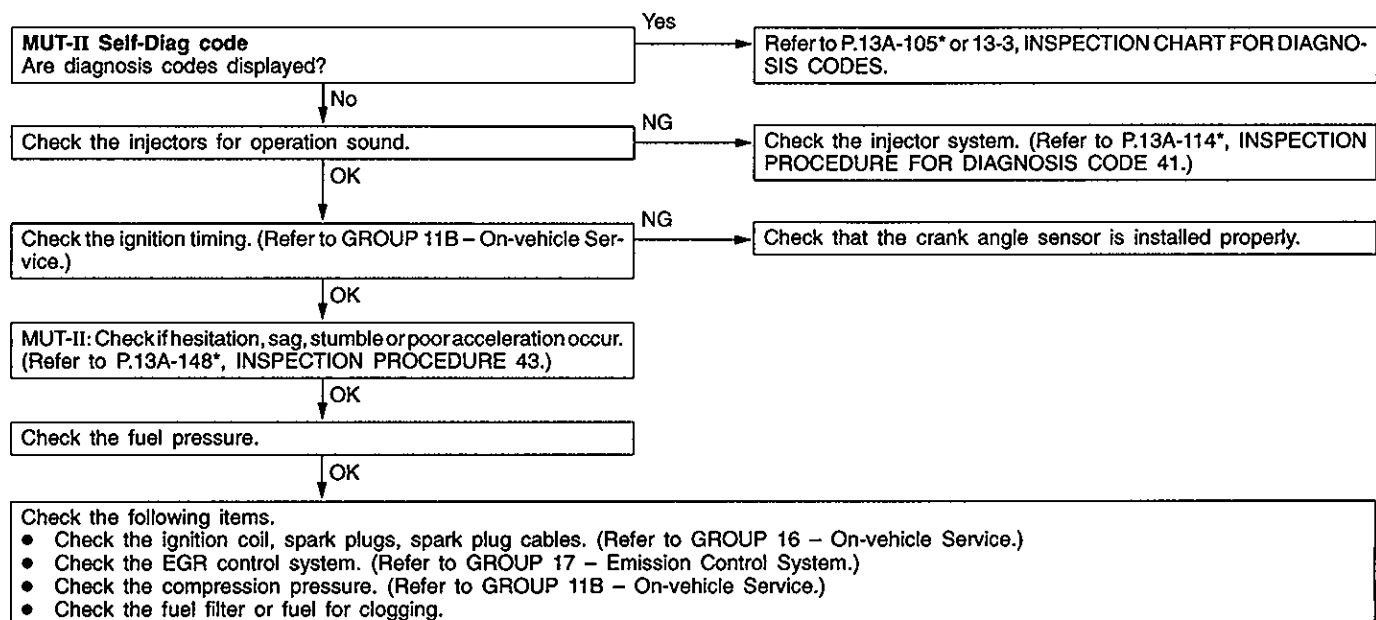


NOTE

*: Refer to the '96 COLT/LANCER Workshop Manual (Pub No. PWME9511).

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

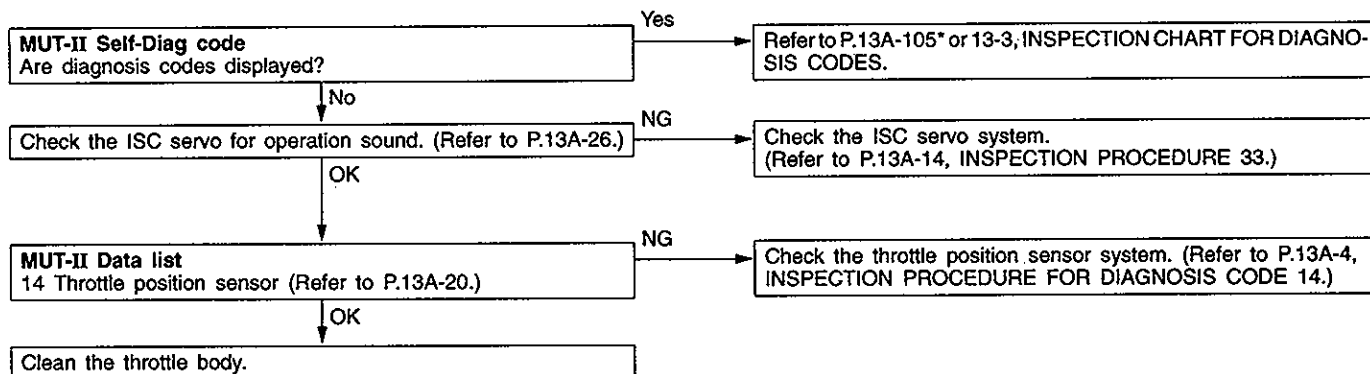


NOTE

*: Refer to the '96 COLT/LANCER Workshop Manual (Pub No. PWME9511).

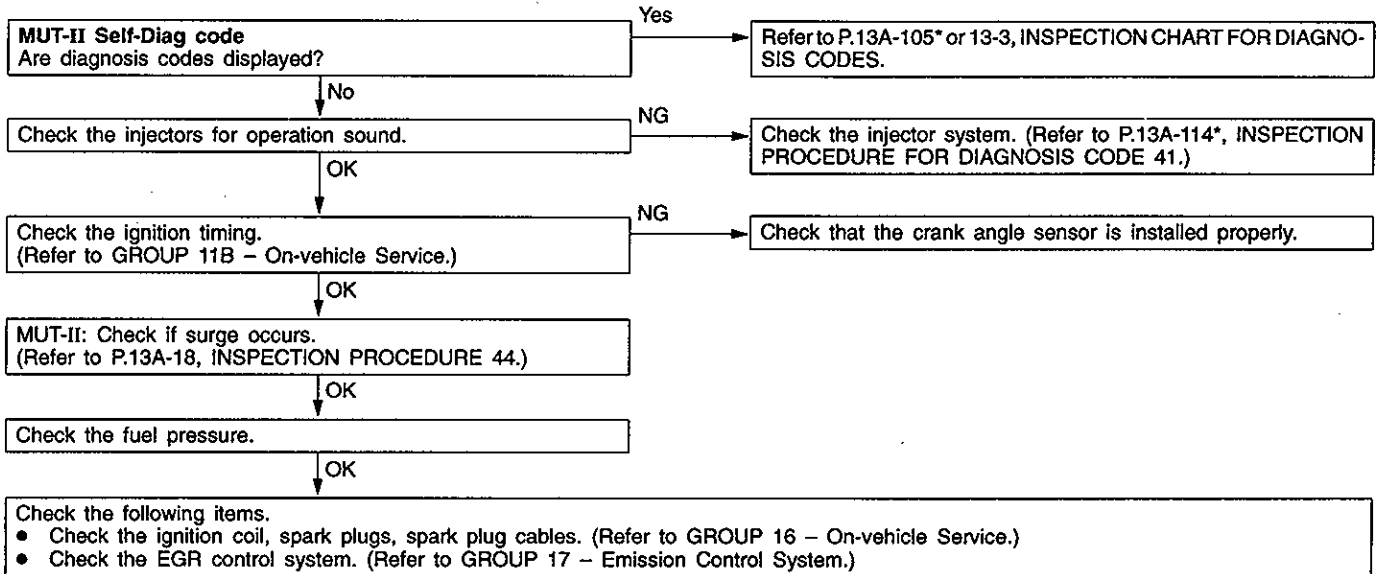
INSPECTION PROCEDURE 17

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



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

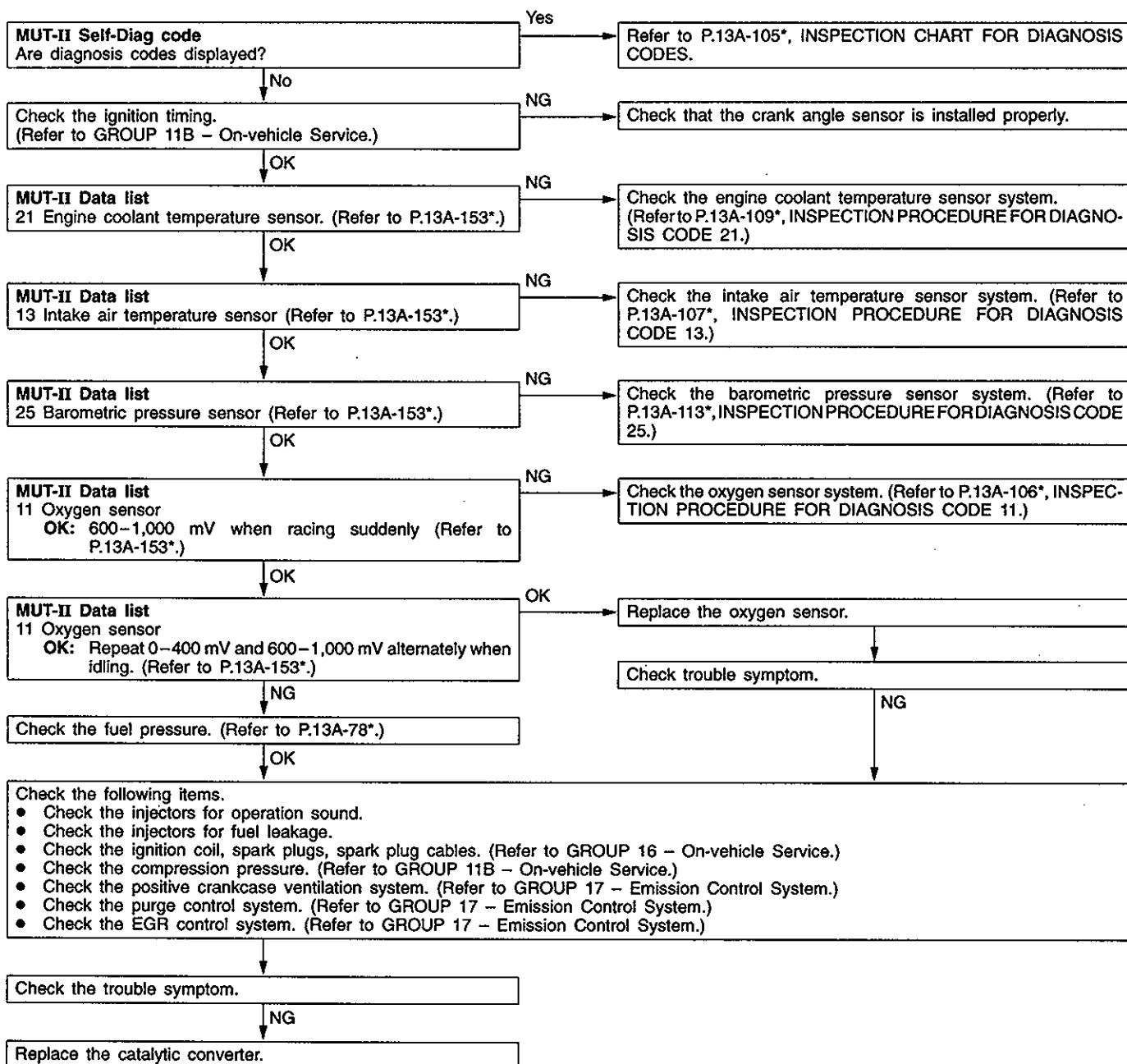


NOTE

*: Refer to the '96 COLT/LANCER Workshop Manual (Pub No. PWME9511).

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

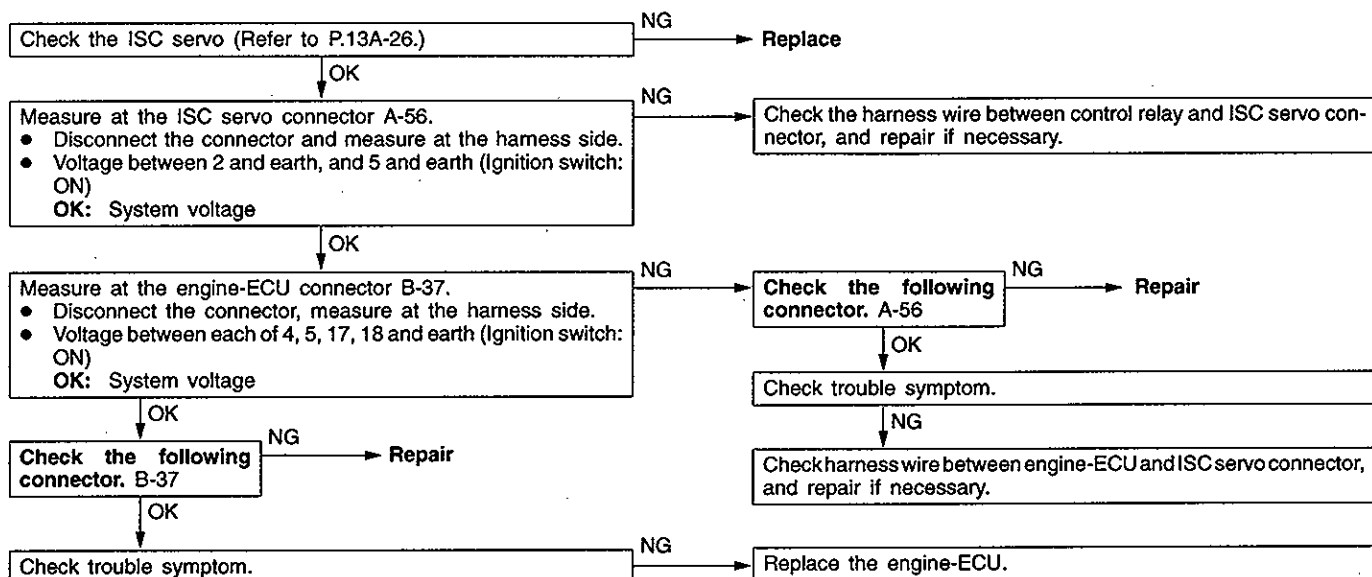


NOTE

*: Refer to the '96 COLT/LANCER Workshop Manual (Pub No. PWME9511).

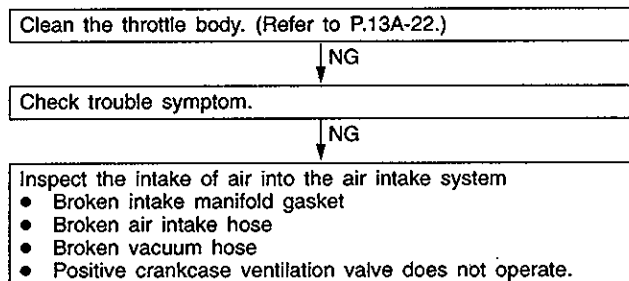
INSPECTION PROCEDURE 33

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

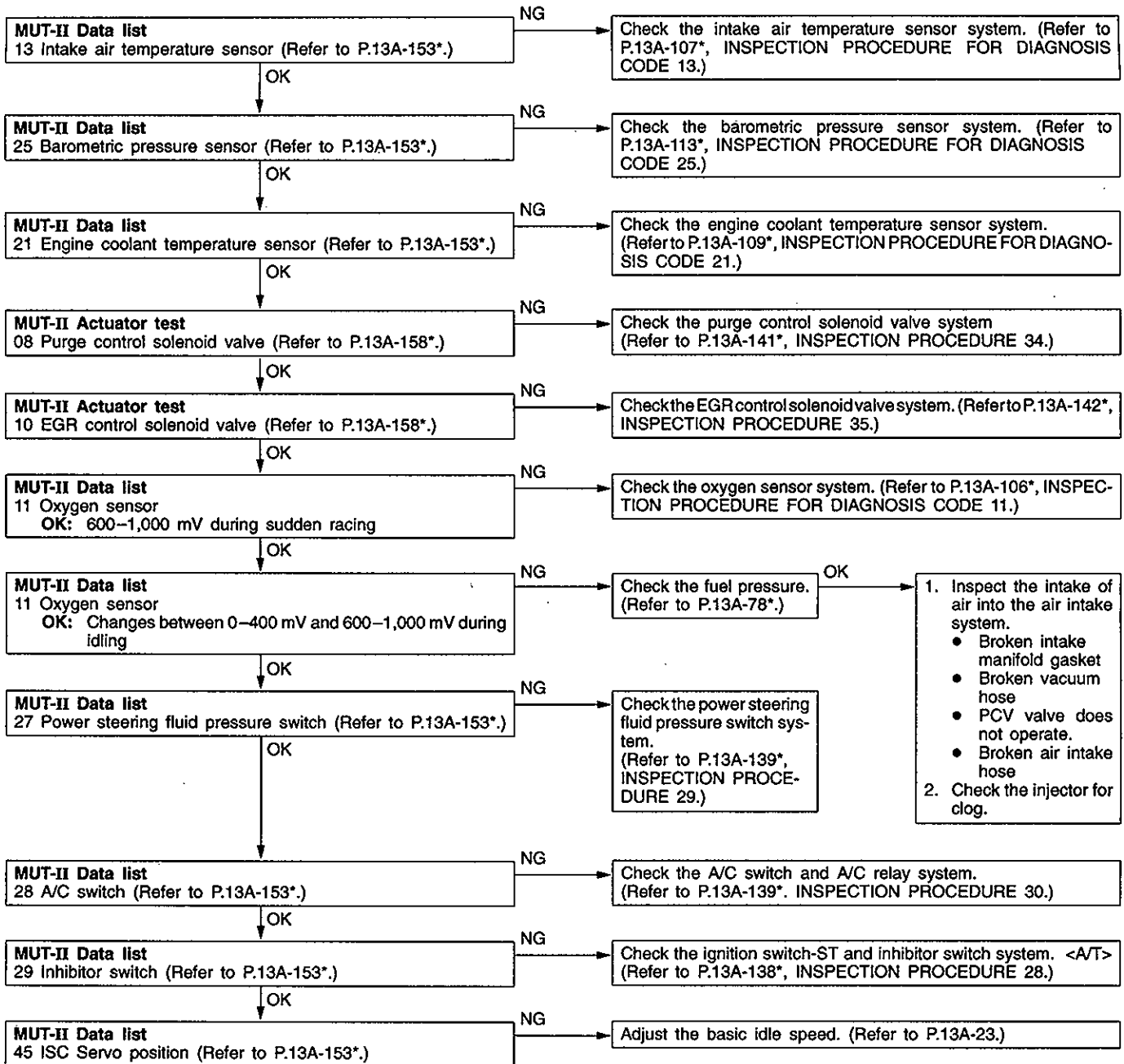


INSPECTION PROCEDURE 40

Check if hunting occurs.



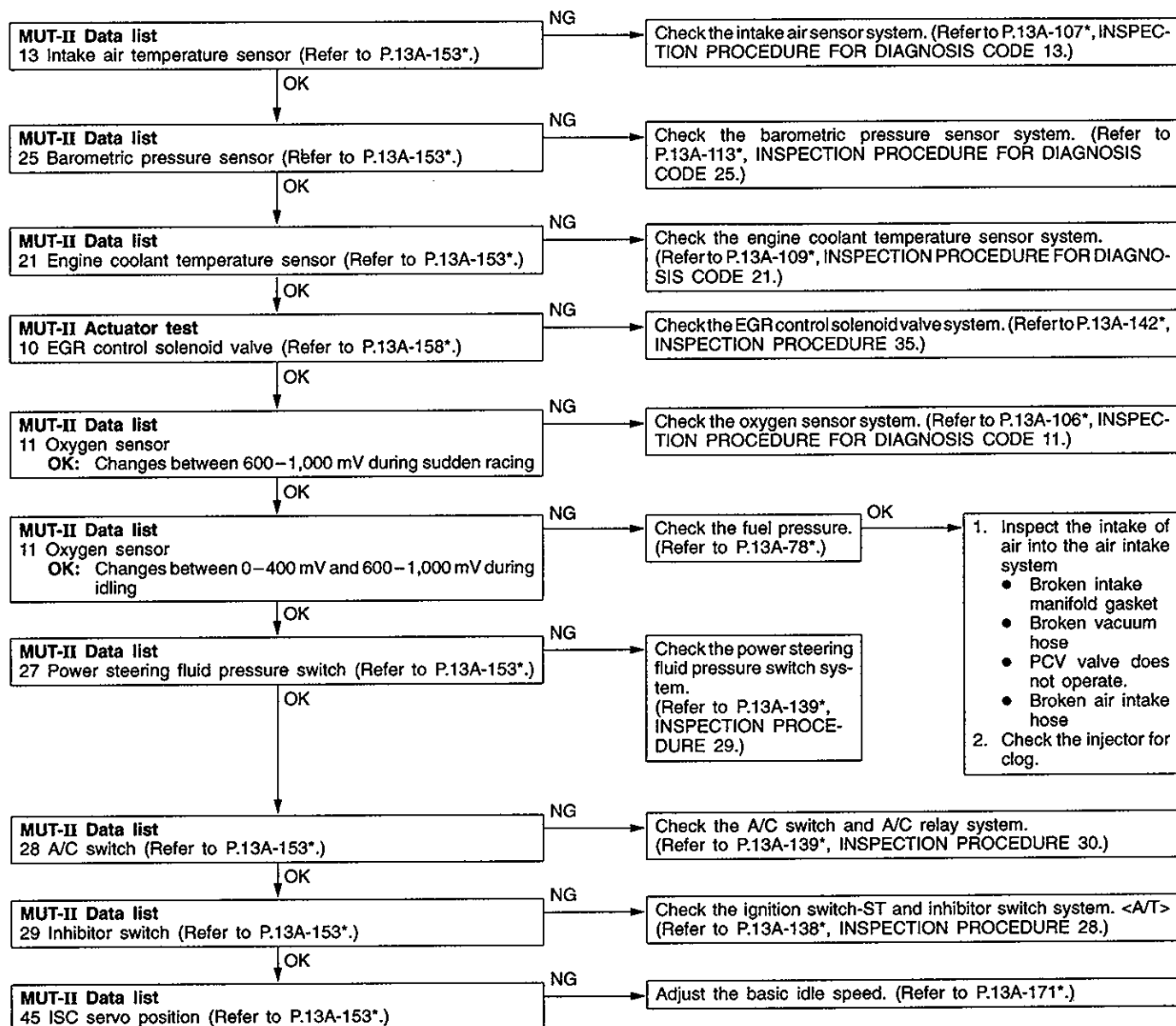
INSPECTION PROCEDURE 41

MUT-II: Check if idling speed is unstable.

NOTE

*: Refer to the '96 COLT/LANCER Workshop Manual (Pub No. PWME9511).

INSPECTION PROCEDURE 42

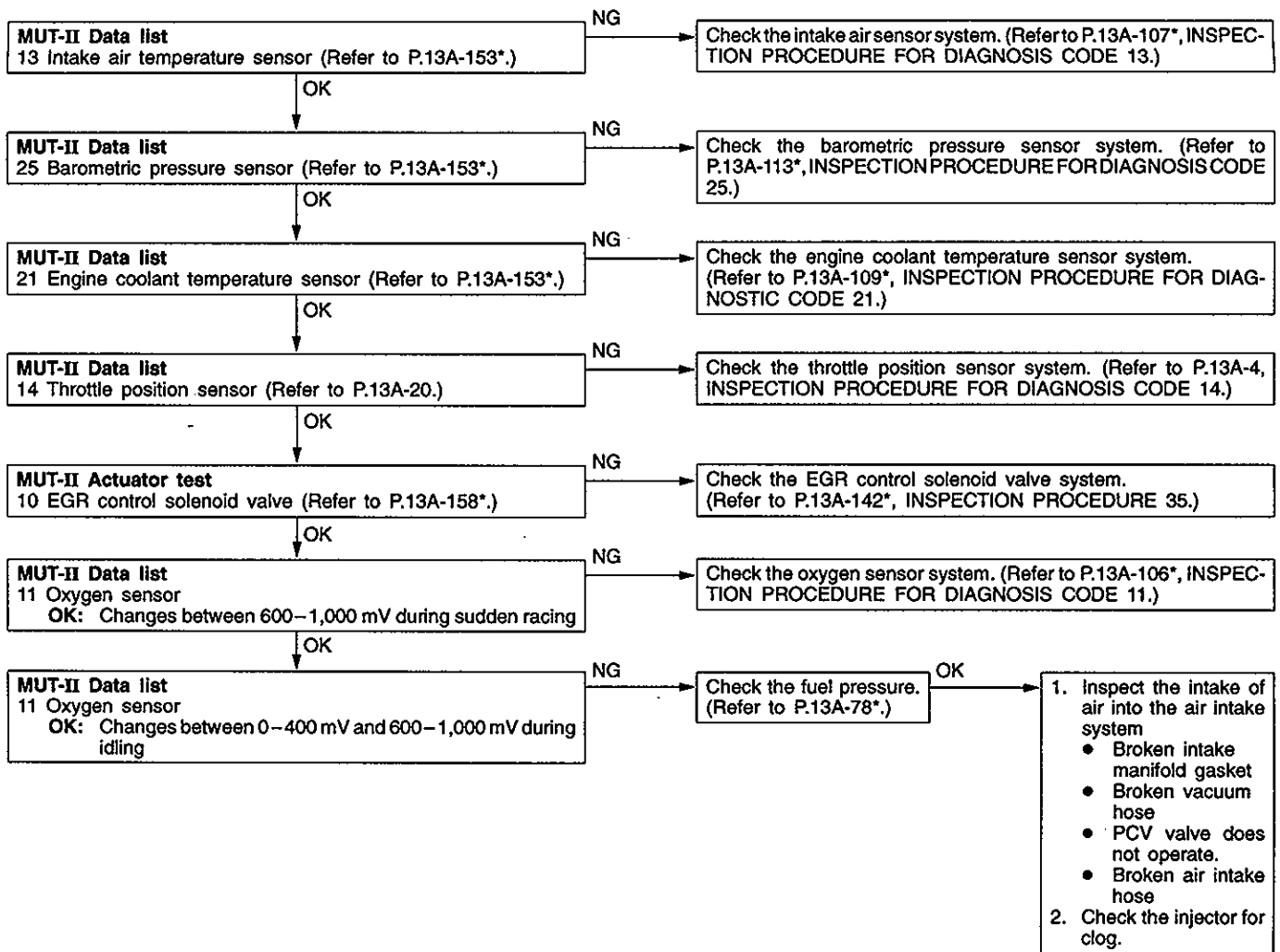
MUT-II: Engine stalling inspection when the engine is warmed up and idling.

NOTE

*: Refer to the '96 COLT/LANCER Workshop Manual (Pub No. PWME9511).

INSPECTION PROCEDURE 43

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

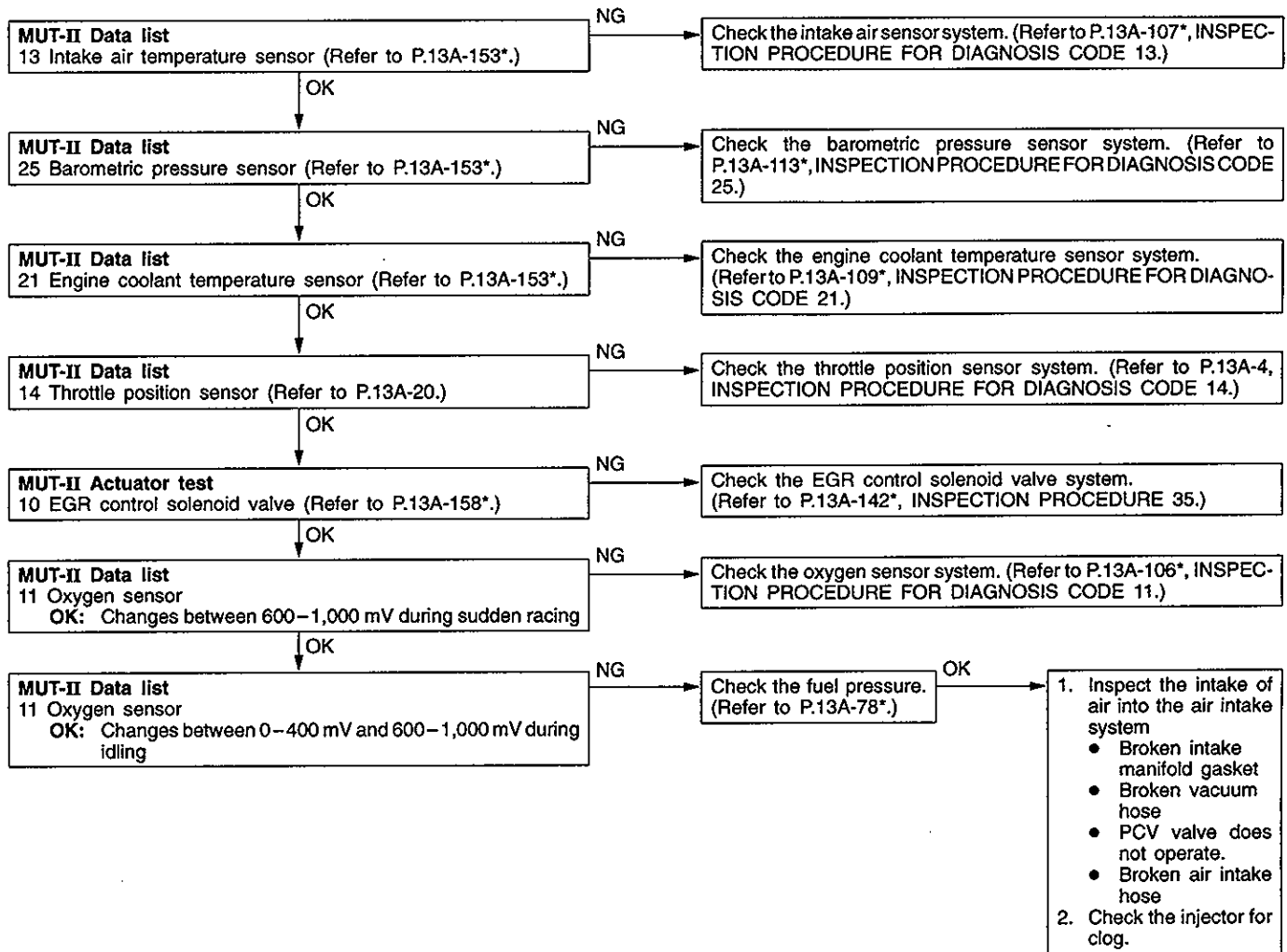


NOTE

*: Refer to the '96 COLT/LANCER Workshop Manual (Pub No. PWME9511).

INSPECTION PROCEDURE 44

MUT-II: Check if surge occurs.

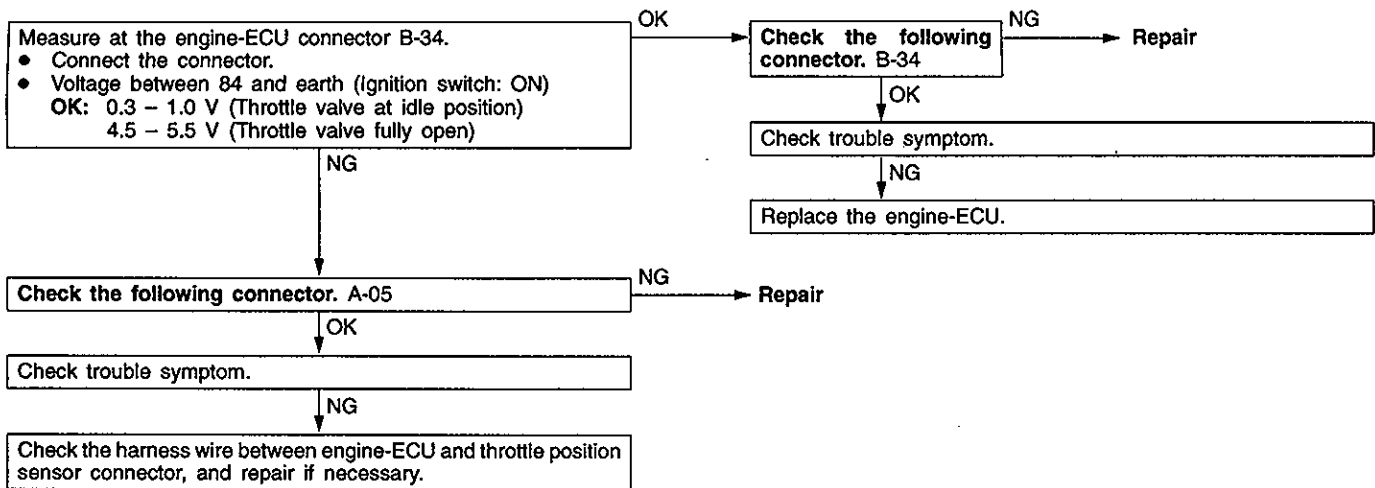


NOTE

*: Refer to the '96 COLT/LANCER Workshop Manual (Pub No. PWME9511).

INSPECTION PROCEDURE 49

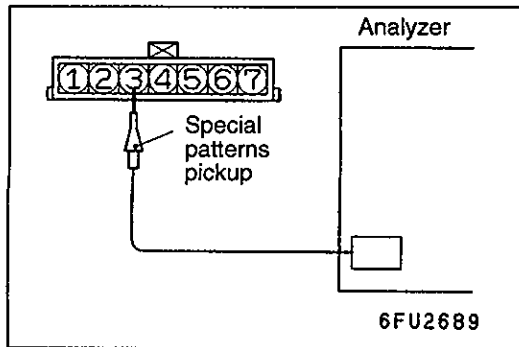
Check throttle position sensor (TPS) output circuit.



DATA LIST REFERENCE TABLE**Caution**

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

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. 14	13A-4
			Gradually open	Increases in proportion to throttle opening angle		
			Open fully	4,500 – 5,500 mV		



INSPECTION PROCEDURE USING AN ANALYZER

AIR FLOW SENSOR (AFS)

- The shape of the air processor connector has been changed.
Procedures other than the measurement method are the same as before.

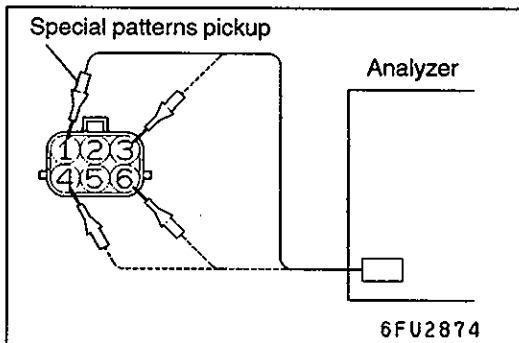
Measurement Method

- Disconnect the air flow sensor connector, and connect the special tool (test harness: MB991709) in between. (All terminals should be connected.)
- Connect the analyzer special patterns pickup to air flow sensor connector terminal 3.

Alternate Method

(Test harness not available)

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



STEPPER MOTOR

- The shape of the stepper motor connector has been changed to correspond to changes to the throttle body. Procedures other than the measurement method are the same as before.

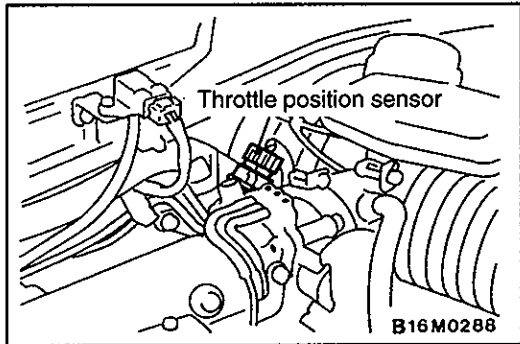
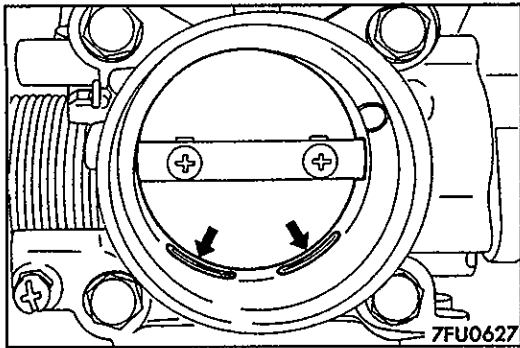
Measurement Method

- Disconnect the stepper motor connector, and connect the special tool (test harness: MB991709) in between. (All terminals should be connected.)
- Connect the analyzer special patterns pickup to the stepper motor-side connector terminal 1, terminal 3, terminal 4 and terminal 6 respectively.

Alternate Method

(Test harness not available)

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



ON-VEHICLE SERVICE

- The following service procedures have been established to correspond to changes in the throttle body. Other procedures are the same as before.

THROTTLE BODY (THROTTLE VALVE AREA) CLEANING

- Start the engine and warm it up until the coolant is heated to 80°C or higher and then stop the engine.
- Remove the air intake hose from the throttle body.
- Plug the bypass passage inlet of the throttle body.

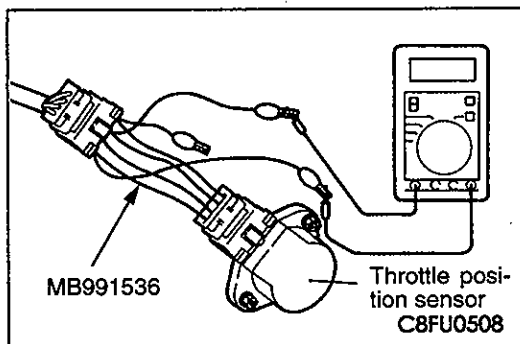
Caution

Do not allow cleaning solvent to enter the bypass passage.

- Spray cleaning solvent into the valve through the throttle body intake port and leave it for about 5 minutes.
- Start the engine, race it several times and idle it for about 1 minute. If the idling speed becomes unstable (or if the engine stalls) due to the bypass passage being plugged, slightly open the throttle valve to keep the engine running.
- If the throttle valve deposits are not removed, repeat steps 4 and 5.
- Unplug the bypass passage inlet.
- Attach the air intake hose.
- Use the MUT-II to erase the self-diagnosis code.
- Adjust the basic idle speed. (Refer to P.13A-23.)

NOTE

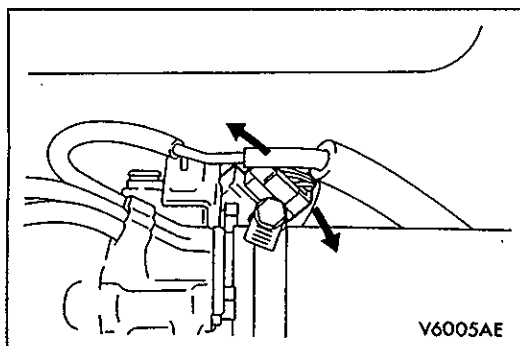
If the engine hunts while idling after adjustment of the basic idle speed, disconnect the (–) cable from the battery for 10 seconds or more, and then reconnect it and run the engine at idle for about 10 minutes.



THROTTLE POSITION SENSOR ADJUSTMENT

- Connect the MUT-II to the diagnosis connector. Carry out the following procedure if not using the MUT-II.
 - Disconnect the throttle position sensor connector and connect the special tool (MB991536 test harness) between the disconnected connectors. (Be careful not to mistake the terminal numbers.)
 - Connect a digital-type voltage meter between terminal (3) (sensor output: yellow clip of the special tool) and terminal (1) (sensor earth: red clip of special tool) of the throttle position sensor connector.
- Turn the ignition switch to ON. (Do not start the engine.)
- Check the throttle position sensor output voltage.

Standard value: 535 – 735 mV



4. If the voltage is outside the standard value range, loosen the throttle position sensor mounting bolt and turn the throttle position sensor body to adjust.
5. Turn the ignition switch to OFF.
6. Disconnect the MUT-II. If not using the MUT-II, remove the special tool and re-connect the throttle position sensor connector.
7. If a diagnosis trouble code has been output, use the MUT-II to erase the diagnosis codes, or disconnect the (-) terminal of the battery for 10 seconds or more and then reconnect it. Then run the engine at idle for about 10 minutes.

BASIC IDLE SPEED ADJUSTMENT

NOTE

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

NOTE

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

3. Start the engine and run at idle.

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

NOTE

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

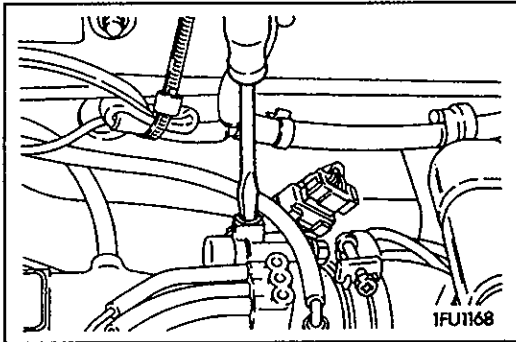
5. Check the idle speed.

Standard value:

750 ± 50 r/min

NOTE

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



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

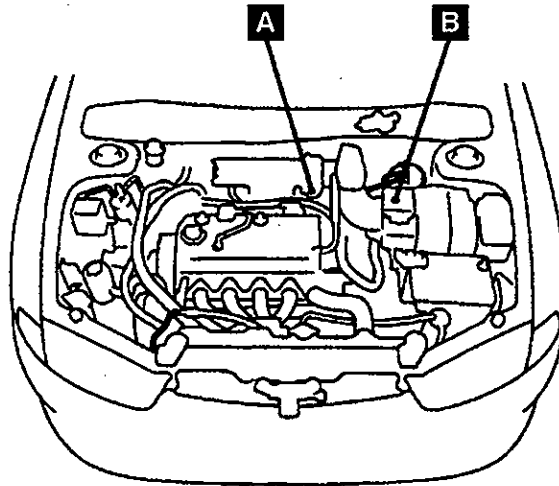
NOTE

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

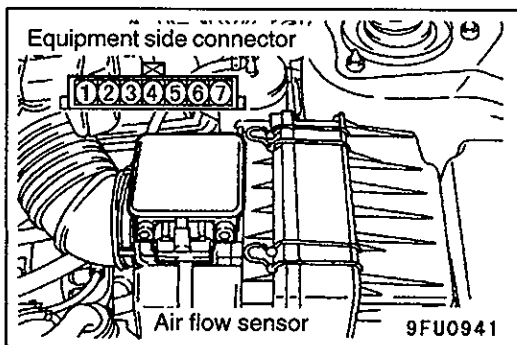
8. Switch OFF the ignition switch.
9. Disconnect the MUT-II.
10. Start the engine again and let it run at idle speed for about 10 minutes; check that the idling conditions is normal.

COMPONENT LOCATION

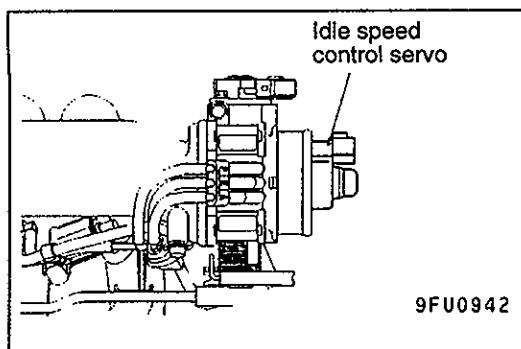
Name	Symbol
Idle speed control servo	A
Air flow sensor (with intake air temperature sensor and barometric pressure sensor)	B



X6016BL

**INTAKE AIR TEMPERATURE SENSOR CHECK**

The shape of the air flow sensor connector has been changed.
The check procedure is the same as before.



IDLE SPEED CONTROL (ISC) 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. (but without starting the motor.)
3. If the operation sound cannot be heard, check the stepper motor's activation circuit.
If the circuit is normal, it is probable that there is a malfunction of the stepper motor or of the engine control unit.

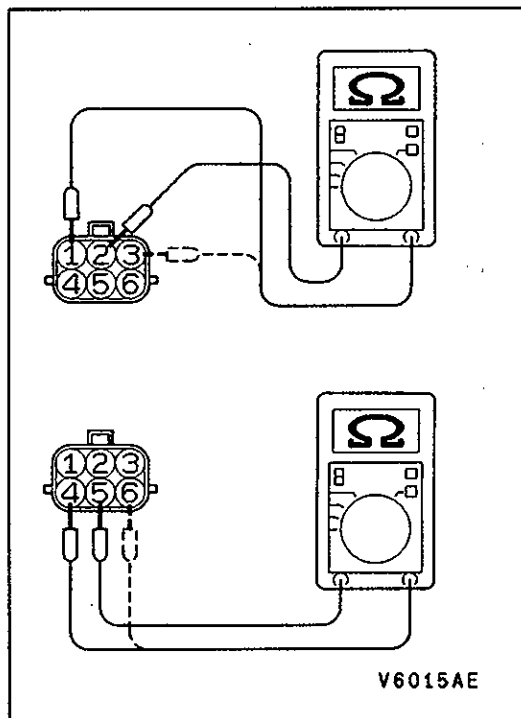
Checking the Coil Resistance

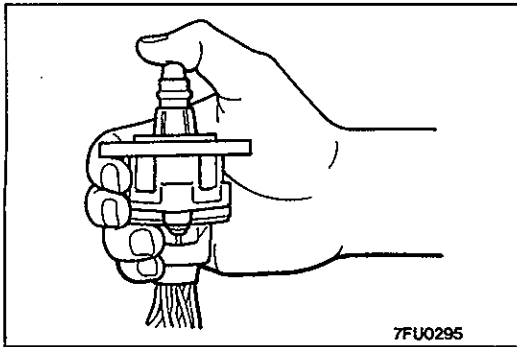
1. Disconnect the idle speed control servo connector.
2. Measure the resistance between terminal 2 and either terminal 1 or terminal 3 of the connector at the idle speed control servo side.

Standard value: 28 – 33 Ω (at 20°C)

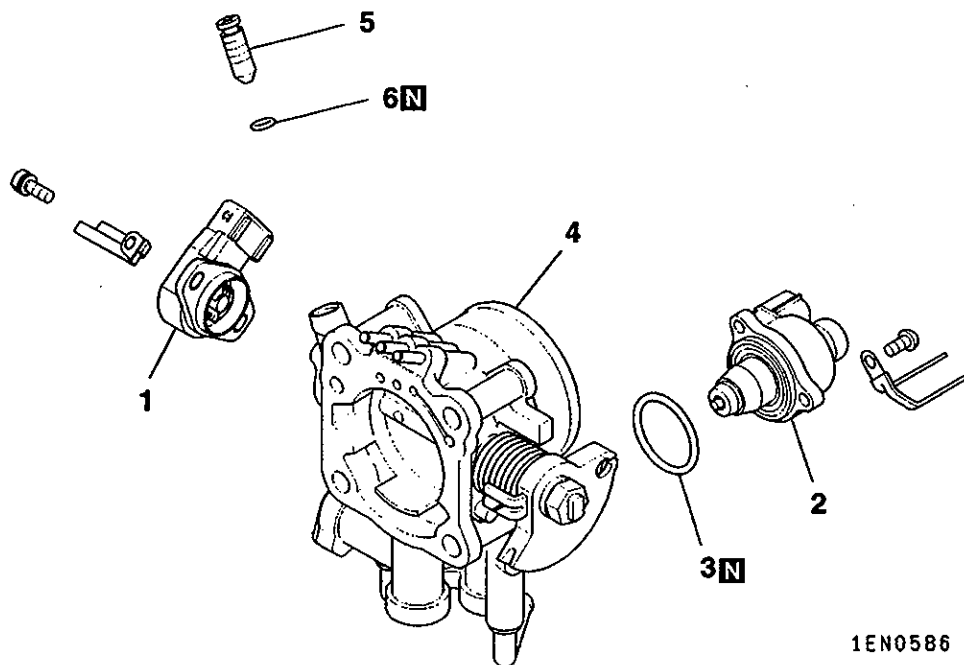
3. Measure the resistance between terminal 5 and either terminal 6 or terminal 4 of the connector at the idle speed control servo side.

Standard value: 28 – 33 Ω (at 20°C)



**Operation Check**

1. Remove the throttle body.
2. Remove the idle speed control servo.
3. Connect the special tool (test harness set: MB991709) to the idle speed control servo connector.
4. Connect the positive (+) terminal of a power supply (approx. 6 V) to the terminals No. 2 and No. 5.
5. Hold the ISC 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.

THROTTLE BODY**DISASSEMBLY AND REASSEMBLY**

1EN0586

Disassembly steps

1. Throttle position sensor
2. Idle speed control servo
3. O-ring
4. Throttle body
5. Speed adjusting screw
6. O-ring

NOTE

1. The speed adjusting screw is correctly adjusted at the factory and should not be removed.
2. If the speed adjusting screw has been removed, carry out fixed SAS adjustment.
3. If the speed adjusting screw should happen to have been removed, carry out speed adjusting screw adjustment.

CLEANING THROTTLE BODY PARTS

- (1) Clean all throttle body parts.

Do not use solvent to clean the following parts:

- Throttle position sensor
- Accelerator pedal position sensor
- Idle speed control body assembly

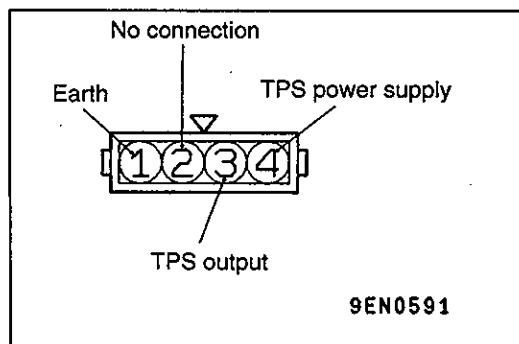
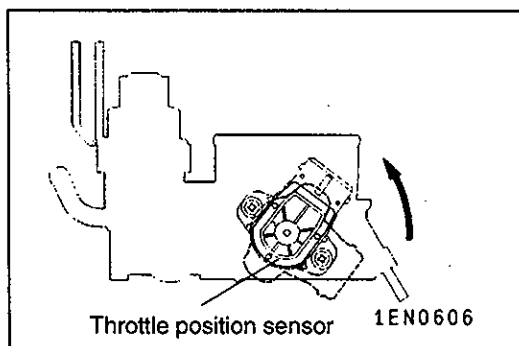
If these parts are immersed in solvent, their insulation will deteriorate.

Wipe them with cloth only.

- (2) Check if the vacuum port of passage is clogged. Use compressed air to clean the vacuum passage.

REASSEMBLY SERVICE POINTS**►A◄ THROTTLE POSITION SENSOR (TPS) INSTALLATION**

- (1) Place the throttle position sensor against the throttle body as shown by the dotted line in the illustration.
- (2) Turn the throttle position sensor to the position shown in the illustration, and then tighten the screw.



- (3) Connect a multimeter between terminal (4) (TPS power supply) and terminal (3) (TPS output) of the TPS connector, and check that the resistance increases gradually as the throttle valve is opened slowly to the fully-open position.
- (4) If there is an abnormality, replace the TPS.