

SERVICE BRAKES

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GROUP 35A BASIC BRAKE SYSTEM

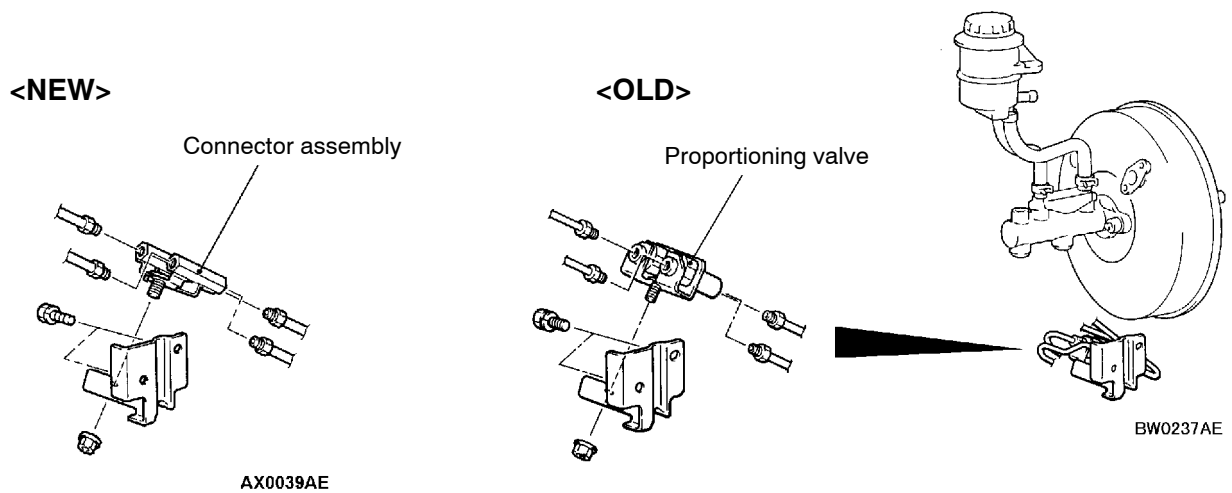
GENERAL

OUTLINE OF CHANGES

The proportioning valve has been abolished and a connector assembly has been added to correspond to the adoption of EBD* (Electronic Brake force Distribution) control carried out by the ABS-ECU. <Vehicles with ABS>

NOTE

*: Refer to GROUP 35B for an explanation of EBD operation.



ANTI-SKID BRAKING SYSTEM (ABS) <2WD>

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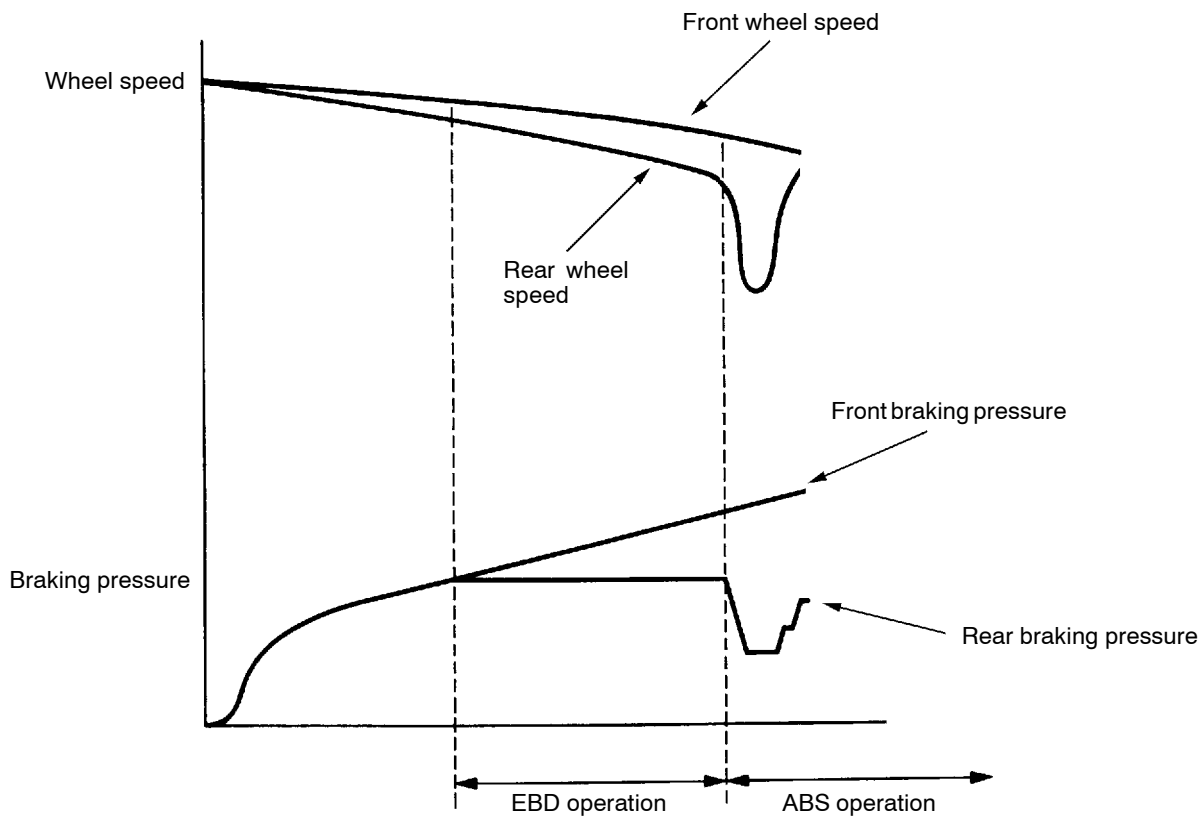
GENERAL

OUTLINE OF CHANGE

- The following service procedures have been established to correspond to the addition of an EBD (Electronic Brake force Distribution) function to the ABS-ECU.

EBD (Electronic Brake force Distribution)

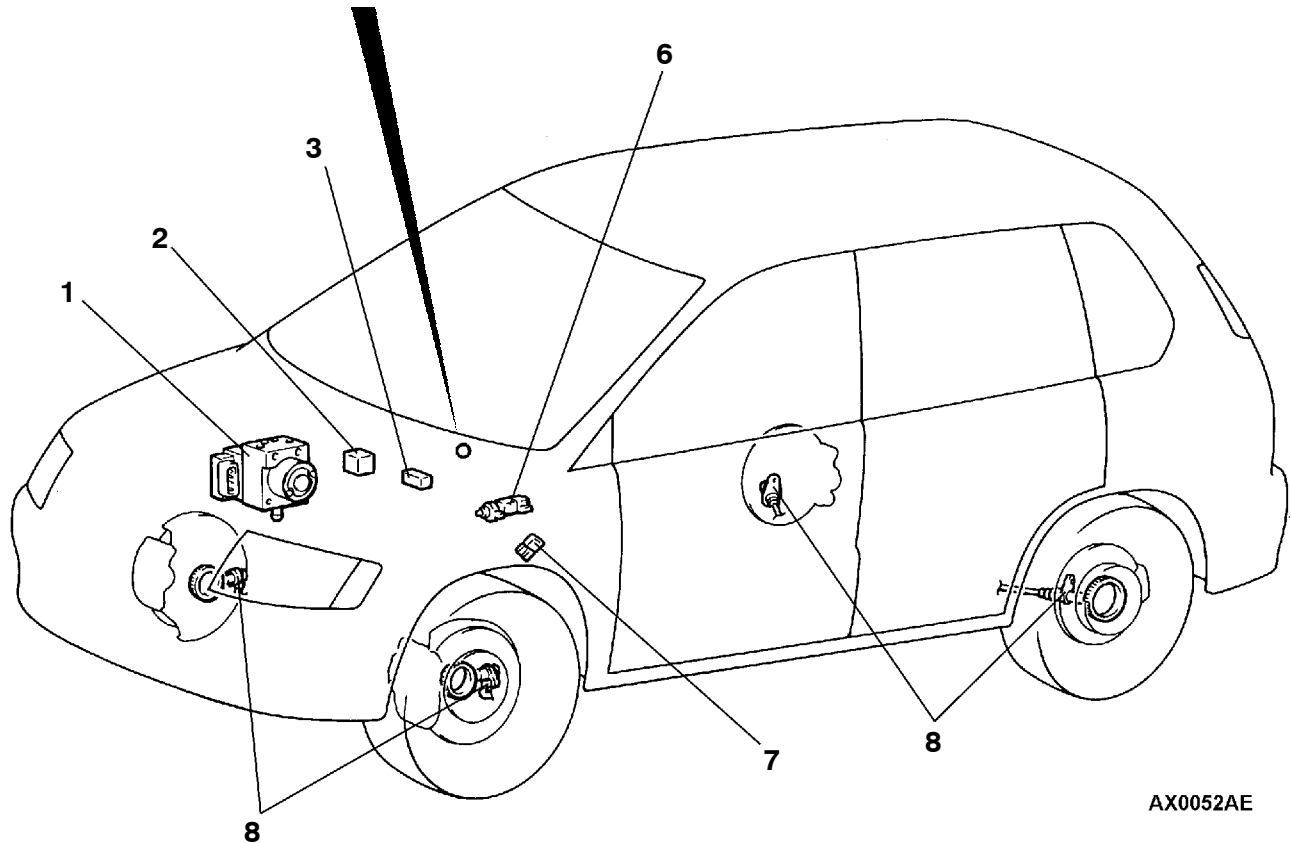
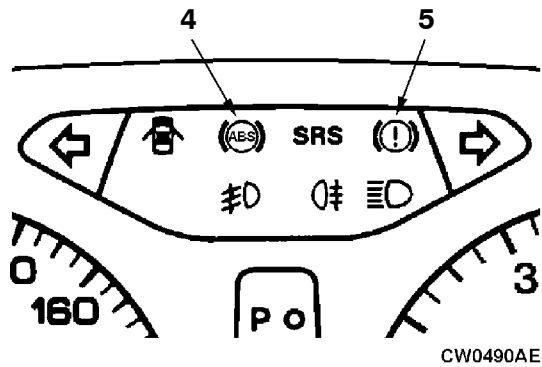
The EBD operates during braking within the range where the slip ratio is relatively low and the ABS does not normally operate. The input signals from the vehicle speed sensors are used to detect the amount of slip in the rear wheels. This is then used to control the solenoid valves in the ABS hydraulic unit so as to limit the rear wheel hydraulic pressure in order to prevent the rear wheels from locking. Because the amount of slip in the rear wheels is directly monitored by the ABS-ECU, it allows the braking force to be optimised in accordance with the road conditions (such as road surface μ and gradient) and the laden condition of the vehicle, and also makes it possible to shorten braking distances by improving the braking performance even when the brake pad μ is low.



CONSTRUCTION DIAGRAM

The following two parts have been added to the ABS component parts to correspond to the addition of an EBD function.

- Brake warning lamp (used as an EBD warning lamp)
- Brake warning lamp relay



1. Hydraulic unit assembly (integrated with the ABS-ECU)
2. Brake warning lamp relay
3. Diagnosis connector
4. ABS warning lamp

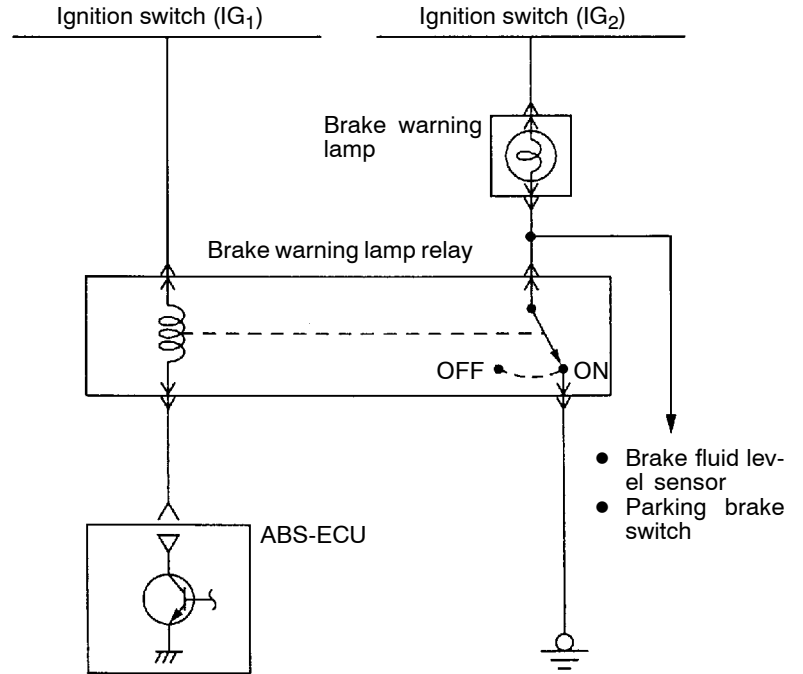
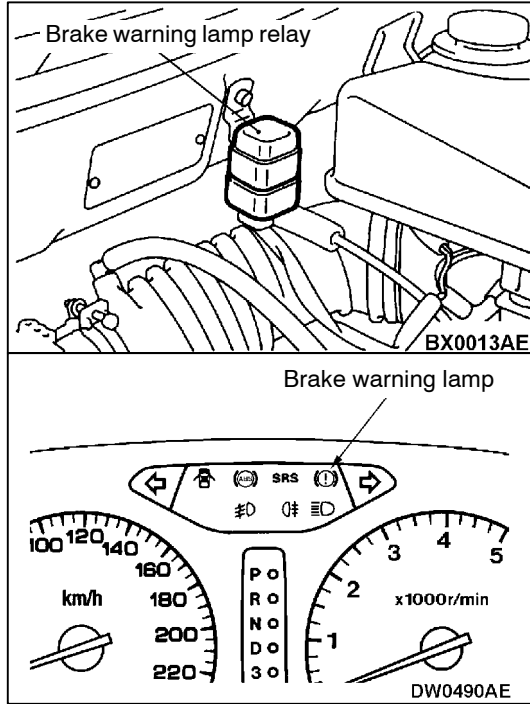
5. Brake warning lamp
6. Stop lamp switch
7. ABS warning lamp relay
8. Wheel speed sensor

BRAKE WARNING LAMP AND BRAKE WARNING LAMP RELAY

The brake warning lamp relay is a normally-closed type of relay which is controlled by the ABS-ECU. When the transistor inside the ABS-ECU turns off, the brake warning lamp relay turns on and causes the brake warning lamp to illuminate.

The ABS-ECU controls the brake warning lamp relay to cause the brake warning lamp to illuminate at the following times.

- (1) During the initial check when the ignition switch is turned to ON (approximately 3 seconds)
- (2) When there is a malfunction in the system (refer to P.35B-5.)
- (3) If the ABS-ECU connector is not connected properly



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ABS-ECU

The ABS-ECU has a fail-safe function which controls the EBD in the following way if an abnormality occurs in the ABS system.

Fail-Safe Function

Problem location	Brake warning lamp	ABS warning lamp	EBD control
Front wheel speed sensor 1 abnormality	OFF	ON	Normal control is carried out.
ABS solenoid valve (front) abnormality			
ABS solenoid valve (front) abnormality			
Stop lamp switch abnormality			
Front wheel speed sensor 2 abnormality	OFF	ON	Hydraulic pressure increases to the rear wheels are limited. (Control gives priority to preventing the rear wheels from locking.)
Motor abnormality (OFF problem)			
Motor abnormality (ON problem)	ON	ON	Control is prohibited.
Rear wheel speed sensor 2 abnormality			
ABS solenoid valve (rear) abnormality			
ABS-ECU abnormality			
ABS-ECU power supply voltage abnormality			
ABS-ECU connector disconnected			

TROUBLESHOOTING

Items other than those given below are the same as before.

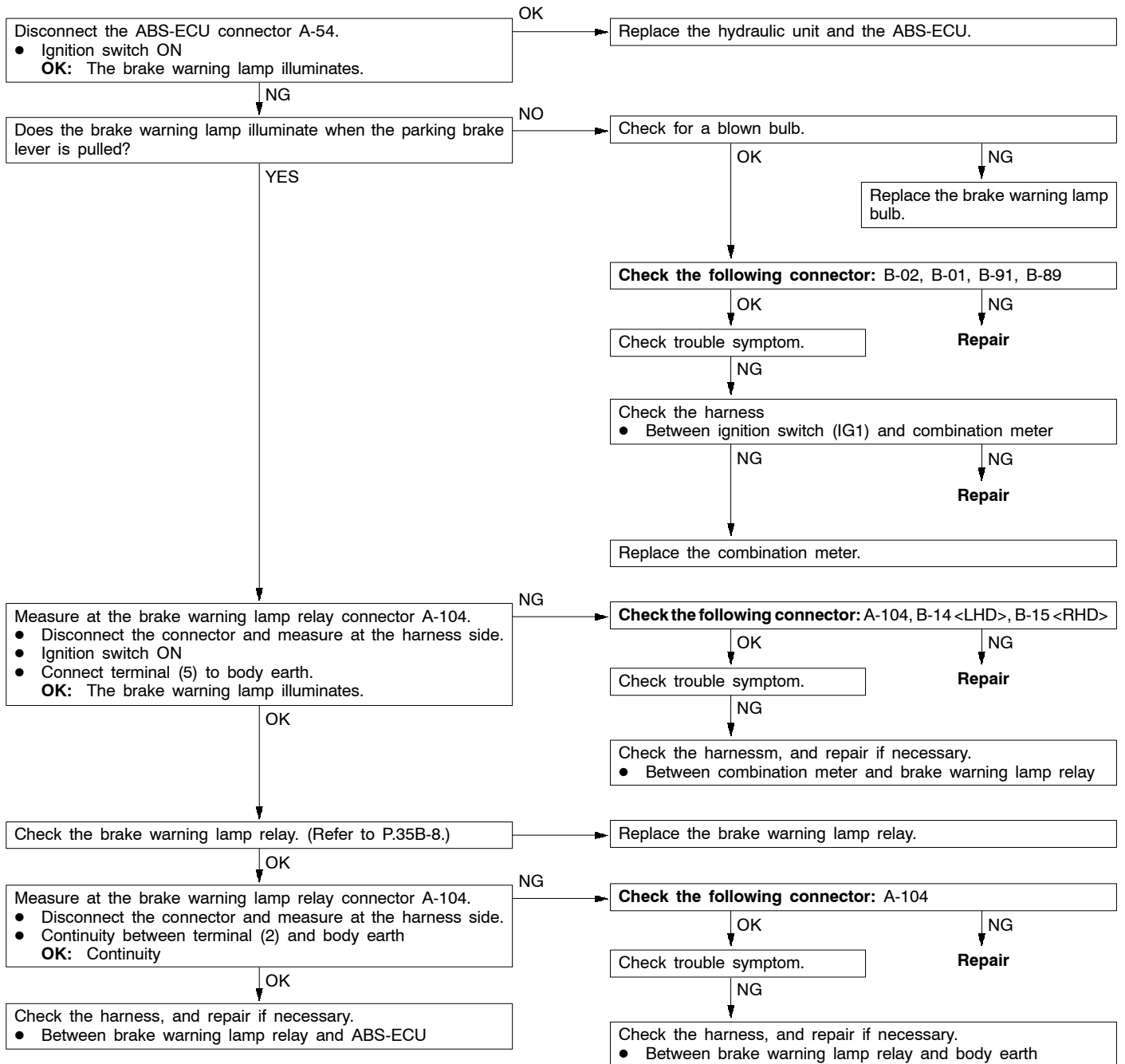
INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptoms	Inspection procedure No.	Reference page
When the ignition key is turned to "ON" (engine stopped), the brake warning lamp does not illuminate.	1	35B-6
Even after the engine is started, the brake warning lamp does not switch off. (However, the parking brake is released and the brake fluid level, brake fluid sensor and parking brake switch are all normal.)	2	35B-7

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

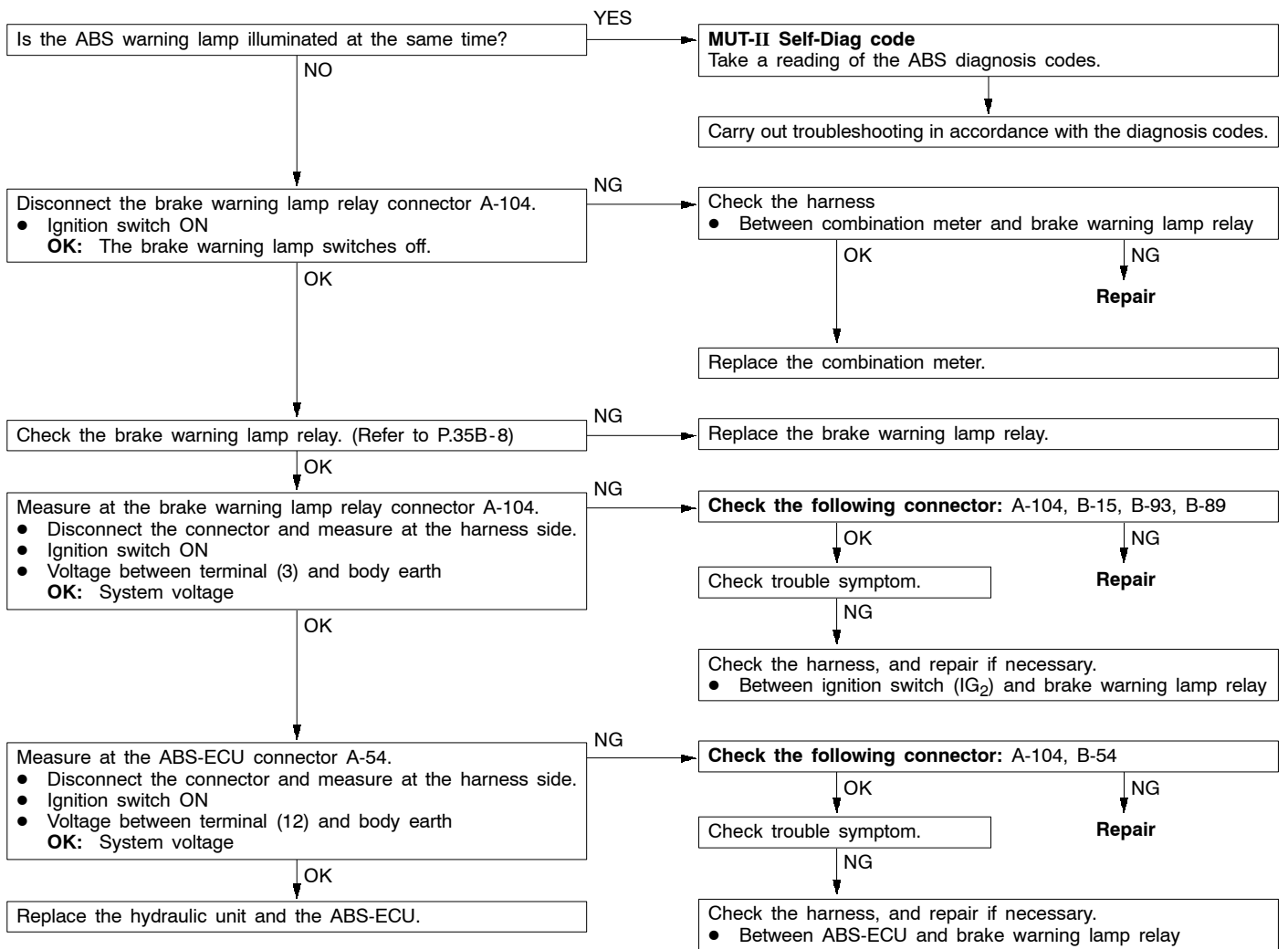
Inspection Procedure 1

When the ignition key is turned to "ON" (engine stopped), the brake warning lamp does not illuminate.	Probable cause
The cause may be an open circuit in the lamp power supply circuit, a blown lamp, a malfunction of the brake warning lamp relay or an open circuit between the brake warning lamp and earth.	<ul style="list-style-type: none"> ● Malfunction of combination meter ● Malfunction of brake warning lamp relay ● Malfunction of wiring harness or connector ● Malfunction of hydraulic unit and ABS-ECU



Inspection Procedure 2

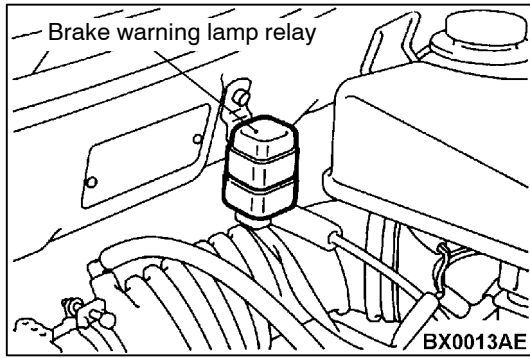
<p>Even after the engine is started, the brake warning lamp does not switch off. (However, the parking brake is released and the brake fluid level, brake fluid sensor and parking brake switch are all normal.)</p>	<p>Probable cause</p>
<p>If the ABS warning lamp is also illuminated at the same time, the cause is probably that the brake warning lamp is operating as an EBD warning lamp because of a problem in the ABS system. In addition, if the ABS warning lamp is switched off, the cause is probably a malfunction of the brake warning lamp relay or an open circuit in the brake warning lamp operating circuit.</p>	<ul style="list-style-type: none"> ● Malfunction of combination meter ● Malfunction of brake warning lamp relay ● Malfunction of wiring harness or connector ● Malfunction of hydraulic unit and ABS-ECU



CHECK AT ABS-ECU

TERMINAL VOLTAGE CHECK CHART

Connector terminal No.	Signal	Checking requirements		Normal condition
12	Output to brake warning lamp	Ignition switch: ON	When the brake warning lamp illuminates because of an ABS system abnormality	System voltage
			When the system is normal	0 - 2 V or less



ON-VEHICLE SERVICE

BRAKE WARNING LAMP RELAY CONTINUITY CHECK

Battery voltage	Terminal No.			
	1	2	3	5
Power is not supplied	○	○	○	○
Power is supplied	⊕		⊖	