SERVICE BRAKES

CONTENTS

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WARNING REGARDING SERVICING OF SUPPLEMENTAL RESTRAINT SYSTEM (SRS) EQUIPPED VEHICLES

WARNING!
(1) Improper service or maintenance of any component of the SRS, or any SRS-related component, can lead to personal injury or death to service personnel (from inadvertent firing of the air bag) or to the driver (from rendering the SRS inoperative).
(2) Service or maintenance of any SRS component or SRS-related component must be performed only at an authorized MITSUBISHI dealer.
(3) MITSUBISHI dealer personnel must thoroughly review this manual, and especially its GROUP 52B – Supplemental Restraint System (SRS), before beginning any service or maintenance of any component of the SRS or any SRS-related component.

NOTE
The SRS includes the following components: SRS diagnosis unit, SRS warning lamp, air bag module, clock spring, and interconnecting wiring. Other SRS-related components (that may have to be removed/installed in connection with SRS service or maintenance) are indicated in the table of contents by as asterisk (*).

NOTES

SPECIFICATIONS

GENERAL SPECIFICATIONS

E35CA--

COLT, LANCER–Sedan

Items	2WD			4WD
	1300	1600, 2000D	1800	1600
Master cylinder				
Type	Tandem type, (without level sensor)	Tandem type, (without level sensor)	Tandem type, (without level sensor)	Tandem type, (without level sensor)
I.D. mm (in.)	20.6 (13/16)	20.6 (13/16) 23.8 (15/16)*	22.2 (7/8) 23.8 (15/16)*	22.2 (7/8) 23.8 (15/16)*
Brake booster				
Type	Vacuum type, single	Vacuum type, single Vacuum type, tandem*	Vacuum type, single Vacuum type, tandem*	Vacuum type, single Vacuum type, tandem*
Effective dia. of power cylinder mm (in.)	205 (8)	205 (8) 180 + 205 (7 + 8)*	230 (9) 180 + 205 (7 + 8)*	230 (9) 180 + 205 (7 + 8)*
Boosting ratio	4.5	4.5, 6.0*	5.0, 6.0*	5.0, 6.0*
Proportioning valve				
Split point Mpa (kg/cm^2, psi.)	2.5 (25, 356)	2.5 (25, 356) 3.0 (30, 427)*	3.0 (30, 427)	2.5 (25, 356) 3.5 (35, 498)*
Decompression ratio	0.25	0.25	0.25	0.25 0.37*
Front brakes				
Type	Floating caliper, single piston, solid disc (M-R31S)	Floating caliper, single piston, ventilated disc (M-R34V)	Floating caliper, single piston, ventilated disc (M-R44V)	Floating caliper, single piston, ventilated disc (M-R34V)
Disc effective dia. × thickness mm (in.)	184 × 13 (7.24 × 0.51)	184 × 18 (7.24 × 0.71)	204 × 24 (8.03 × 0.94)	184 × 18 (7.24 × 0.71)
Wheel cylinder I.D. mm (in.)	51.1 (2 1/64)	53.9 (2 1/8)	53.9 (2 1/8)	53.9 (2 1/8)
Pad thickness mm (in.)	10.0 (0.39)	10.0 (0.39)	10.0 (0.39)	10.0 (0.39)
Clearance adjustment	Automatic	Automatic	Automatic	Automatic

NOTE
*: Vehicles with ABS

Items	2WD			4WD
	1300	1600, 2000D	1800	1600
Rear drum brakes				
Type	Leading trailing	Leading trailing	–	Leading trailing
Drum I.D. mm (in.)	180 (7)	203 (8)		228 (9)
Wheel cylinder I.D. mm (in.)	19.0 (3/4)	17.4 (11/16)		17.4 (11/16)
Lining thickness mm (in.)	4.3 (0.17)	4.4 (0.17)		4.9 (0.19)
Clearance adjustment	Automatic	Automatic		Automatic
Rear disc brakes				
Type	–	Floating caliper,* single piston, ventilated disc (M-R33S-P)*	Floating caliper, dual pistons, ventilated disc (M-R43S-P)	Floating caliper,* single piston, ventilated disc (M-R33S-P)*
Disc effective dia. x thickness mm (in.)		200 x 10 (7.87 x 0.39)	224 x 10 (8.82 x 0.39)	200 x 10 (7.87 x 0.39)
Wheel cylinder I.D. mm (in.)		30.1 (3/16)	30.1 (3/16)	30.1 (3/16)
Pad thickness mm (in.)		9.5 (0.37)	9.5 (0.37)	9.5 (0.37)
Clearance adjustment		Automatic	Automatic	Automatic
ABS*				
Rotor teeth				
Front	–	43	43	43
Rear		43	43	43
Speed sensor type		Magnet coil type	Magnet coil type	Magnet coil type

NOTE
*: Vehicles with ABS

LANCER – Wagon

Items	2WD		4WD
	1600	2000D	1600
Master cylinder			
Type	Tandem type, (without level sensor)	Tandem type, (without level sensor)	Tandem type, (without level sensor)
I.D. mm (in.)	22.2 (7/8)	22.2 (7/8)	22.2 (7/8)
	23.8 (15/16)*	23.8 (15/16)*	23.8 (15/16)*
Brake booster			
Type	Vacuum type, single	Vacuum type, single	Vacuum type, single
	Vacuum type, tandem*	Vacuum type, tandem*	Vacuum type, tandem*
Effective dia. of power cylinder mm (in.)	230 (9)	205 (8)	230 (9)
	180 + 205 (7 + 8)*	180 + 205 (7 + 8)*	180 + 205 (7 + 8)*
Boosting ratio	5.0, 6.0*	4.5, 6.0*	5.0, 6.0*
Proportioning valve			
Split point MPa (kg/cm², psi.)	—	—	3.5 (35–498)
Decompression ratio	—	—	0.37
Load sensing proportioning valve			
Split point MPa (kg/cm², psi.)			
When spring length is 90.1 mm (3.55 in.)	2.00–2.50 (20.0–25.0, 284.5–355.6)	2.00–2.50 (20.0–25.0, 284.5–355.6)	—
Front brakes			
Type	Floating caliper, single piston, ventilated disc (M-R34V)	Floating caliper, single piston, ventilated disc (M-R34V)	Floating caliper, single piston, ventilated disc (M-R44V)
Disc effective dia. x thickness mm (in.)	184 x 18 (7.24 x 0.71)	184 x 18 (7.24 x 0.71)	204 x 24 (8.03 x 0.94)
Wheel cylinder I.D. mm (in.)	53.9 (2 1/8)	53.9 (2 1/8)	53.9 (2 1/8)
Pad thickness mm (in.)	10.0 (0.39)	10.0 (0.39)	10.0 (0.39)
Clearance adjustment	Automatic	Automatic	Automatic

NOTE
* : Vehicles with ABS

Items		2WD		4WD
		1600	2000D	1600
Rear drum brakes				
Type		Leading trailing	Leading trailing	Leading trailing
Drum I.D.	mm (in.)	203 (8)	203 (8)	228 (9)
Wheel cylinder I.D.	mm (in.)	19.0 (3/4)	19.0 (3/4)	19.0 (3/4)
Lining thickness	mm (in.)	4.4 (0.17)	4.4 (0.17)	4.9 (0.19)
Clearance adjustment		Automatic	Automatic	Automatic
Rear disc brakes				
Type		Floating caliper, single piston, ventilated disc (M-R35S-P)*	Floating caliper, dual pistons, ventilated disc (M-R35S-P)*	—
Disc effective dia. x thickness	mm (in.)	200 x 10 (7.87 x 0.39)	200 x 10 (7.87 x 0.39)	—
Wheel cylinder I.D.	mm (in.)	34.9 (1 3/8)	34.9 (1 3/8)	—
Pad thickness	mm (in.)	9.5 (0.37)	9.5 (0.37)	—
Clearance adjustment		Automatic	Automatic	—
ABS*				
Rotor teeth				
Front		43	43	43
Rear		43	43	43
Speed sensor type		Magnet coil type	Magnet coil type	Magnet coil type

NOTE
* : Vehicles with ABS

SERVICE SPECIFICATIONS

E35CB-

Items		Specifications
Standard value		
Brake pedal height	mm (in.)	162–165 (6.4–6.5)
Brake pedal free play	mm (in.)	3–8 (0.12–0.31)
Brake pedal to floorboard clearance	mm (in.)	80 (3.1) or more
Output pressure of proportioning valve	MPa (kg/cm², psi)	
<Split point>		
Vehicles without ABS		
2WD		
Except 1800		2.5 (25, 356)
1800		3.0 (30, 427)
4WD		3.5 (35, 498)
Vehicles with ABS		
2WD		3.0 (30, 427)
4WD		3.5 (35, 498)
<Input fluid pressure set in the following>		
Vehicles without ABS		
2WD		
Except 1800: 6.5 MPa (65 kg/cm², 925 psi)		3.75 (37.5, 533)
1800: 7.0 MPa (70 kg/cm², 996 psi)		4.25 (42.5, 604)
4WD: 7.5 MPa (75 kg/cm², 1066 psi)		5.23 (52.3, 744)
Vehicles with ABS		
2WD: 7.0 MPa (70 kg/cm², 996 psi)		4.25 (42.5, 604)
4WD: 7.5 MPa (75 kg/cm², 1066 psi)		5.23 (52.3, 744)
Load sensing proportioning valve spring length	mm (in.)	89.3–91.3 (3.52–3.59)
Output pressure of load sensing proportioning valve	MPa (kg/cm², psi)	
<Sprit point>		
When spring length is 90.1 mm (3.55 in.):		2.00–2.50 (20.0–25.0, 284.5–355.6)
When spring length is 108.2 mm (4.26 in.):		6.82–8.82 (68.2–88.2, 970.0–1254.5)
<Input fluid pressure set in the following>		
When spring length is 90.1 mm (3.55 in.):		
14 MPa (140 kg/cm², 1991.3 psi)		5.38–6.18 (53.8–61.8, 765.2–878.9)
When spring length is 108.2 mm (4.26 in.):		
14 MPa (140 kg/cm², 1991.3 psi)		8.82–10.52 (88.2–105.2, 1254.5–1496.3)
Front disc brake pad thickness	mm (in.)	10 (0.39)
Front disc brake drag force (tangential force of wheel mounting bolts)	N (kg, lbs.)	
13-inch disc brake		20 (2, 4.4) or less
14-inch disc brake		40 (4, 8.8) or less
Front brake disc thickness	mm (in.)	
13-inch disc brake		
Solid type		13 (0.51)
Ventilated type		18 (0.71)
14-inch disc brake		24 (0.94)

Items		Specifications
Rear disc brake pad thickness	mm (in.)	9.5 (0.37)
Rear disc brake drag force (tangential force of wheel mounting bolts)	N (kg, lbs.)	20 (2, 4.4) or less
Rear brake disc thickness	mm (in.)	10 (0.39)
Booster push rod to master cylinder piston clearance	mm (in.)	
8 inch brake booster		0.45–0.65 (0.018–0.026)
9 inch brake booster		0.6–0.8 (0.024–0.031)
7 + 8 inch brake booster		0.4–0.6 (0.016–0.024)
Resistance between speed sensor terminals	kΩ	
2WD		1.4–2.2
4WD		0.8–1.2
Resistance between terminals and the body of the speed sensor	kΩ	100 or more
Clearance between rear speed sensor pole piece and rotor	mm (in.)	0.3–0.9 (0.012–0.035)
Limit		
Left/right proportioning valve output pressure difference	MPa (kg/cm², psi)	0.4 (4, 57)
Load sensing proportioning valve left and right difference of output fluid pressure	MPa (kg/cm², psi)	
<Sprit point>		
When spring length is 90.1 mm (3.55 in.):		0.25 (2.5, 35.6)
When spring length is 108.2 mm (4.26 in.):		1.0 (10, 142.2)
<Input fluid pressure set in the following>		
When spring length is 90.1 mm (3.55 in.):		
14 MPa (140 kg/cm², 1991.3 psi)		0.4 (4, 56.9)
When spring length is 108.2 mm (4.26 in.):		
14 MPa (140 kg/cm², 1991.3 psi)		0.85 (8.5, 120.9)
Pad thickness	mm (in.)	2.0 (0.08)
Front brake disc thickness	mm (in.)	
13-inch disc brake		
Solid type		11.4 (0.45)
Ventilated type		16.4 (0.65)
14-inch disc brake		22.4 (0.88)
Front brake disc runout	mm (in.)	0.07 (0.0028) or less
Front hub end play	mm (in.)	0.05 (0.0020)
Rear brake disc thickness	mm (in.)	8.4 (0.33)
Rear brake disc runout	mm (in.)	0.08 (0.0031) or less
Rear brake lining thickness	mm (in.)	1.0 (0.04)
Rear drum inside diameter	mm (in.)	
7-inch drum brake		182 (7.2)
8-inch drum brake		205 (8.1)
9-inch drum brake		230.6 (9.1)

LUBRICANTS

E35CD--

Items	Specified lubricant
Brake fluid	DOT3 or DOT4
Brake piston seal Slide pin boot and slide pin bush inner surfaces Brake piston boot inner surfaces Lock pin boot inner surfaces Guide pin boot inner surfaces Pad assembly and shim contact surface Lock pin sleeve Piston boot mounting grooves	Repair kit grease (orange)
Rear brake shoe and backing plate contact surfaces Shoe assembly and auto adjuster assembly contact surfaces Shoe and lever assembly and auto adjuster assembly contact surfaces	Brake grease SAE J310, NLGI No. 1

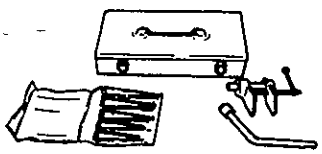
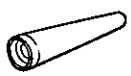
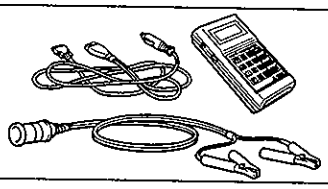
SEALANT AND ADHESIVES

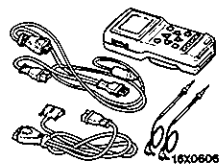
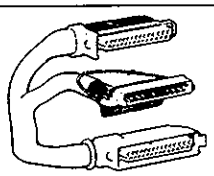
E35CE--

Items	Specified sealant	Remarks
Thread part fitting	3M ATD Part No. 8661 or equivalent	Semi-drying sealant
Drum brake wheel cylinder	3M ATD Part No. 8513 or equivalent	Drying sealant

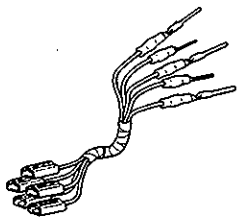
SPECIAL TOOLS

E35DA--

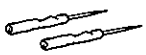
Tool	Number	Name	Use
	MB990964 MB990520 MB990773 (E) <COLT, LANCER-Sedan (1600, 2000D)>	Brake tool set	Pushing-in of the front disc brake piston Installation of drum brake wheel cylinder piston cup.
	MB991008 (F) <1300, LANCER-Wagon>	Piston cup installer	
	MB991341	Multi-use tester assembly	Up to 1993 models For checking of A.B.S.
	[For the number, refer to GROUP 00 – Precautions Before Service]	ROM pack	

Tool	Number	Name	Use
	MB991502	MUT-II sub assembly	All models For checking of A.B.S.
 16X0607		ROM pack	
	MB991377	Adapter harness	For checking of ABS <ABS-4WD>
	MB991356	ABS check harness	Measurement of the ABS control unit terminal voltages <ABS-4WD>
	MB991223	Test harness set	Inspection of connector engagement <ABS> Inspection of ABS-ECU <ABS>

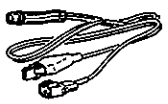
• Test harness MB991219
(Connector pin contact pressure inspection)



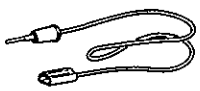
• Probe MB991222
(Market tester connection)

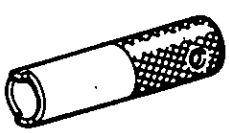
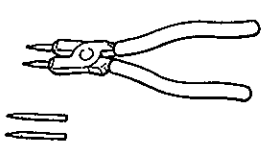


• LED harness MB991220
(Power circuit inspection)



[LED harness adapter MB991221]

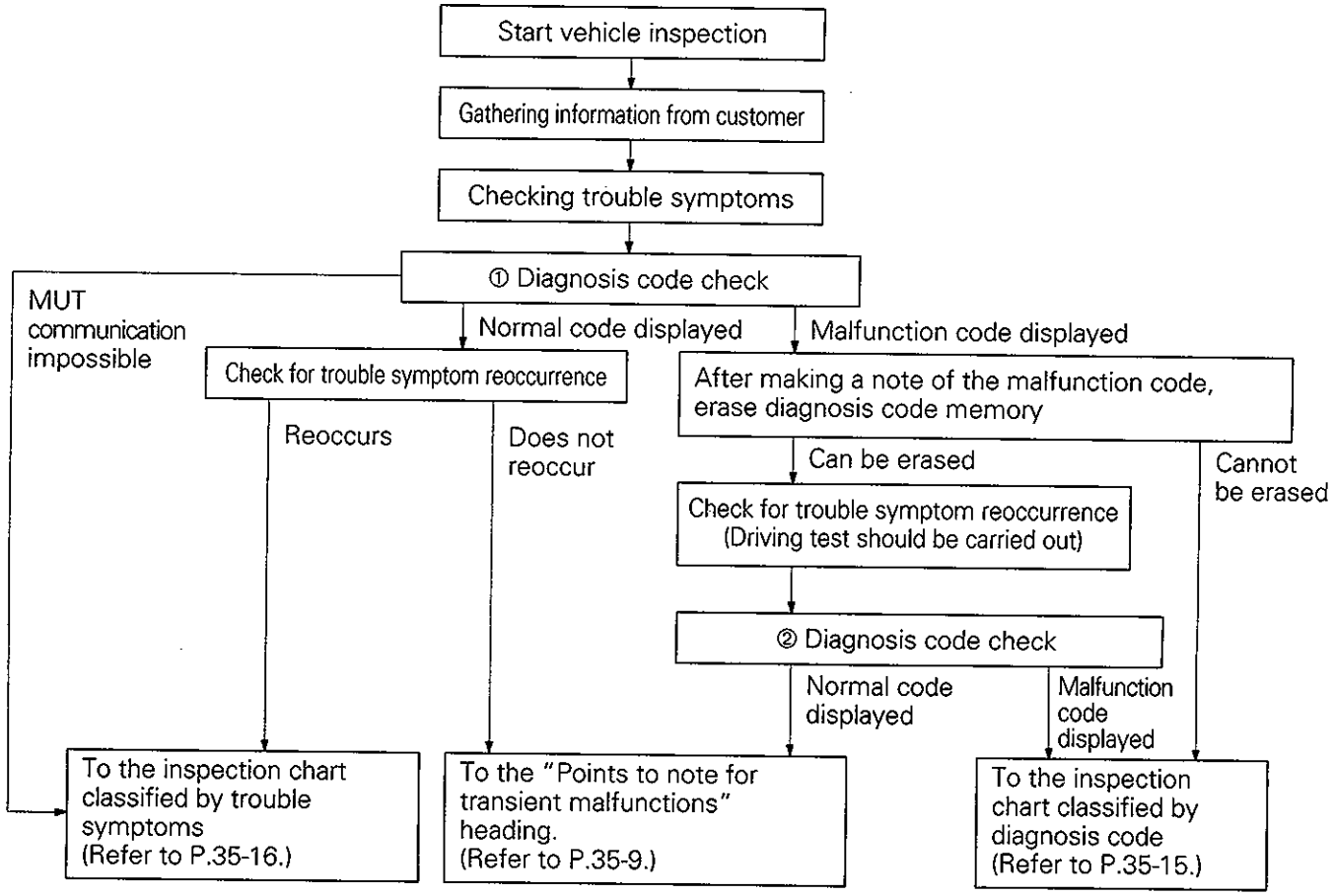


	MB990652	Rear disc brake piston driver	Pressing of the rear disc brake pistons
	MB991041 MB991042	Snap ring pliers Claws for snap ring pliers	Removal of the rear disc brake circlips

TROUBLESHOOTING <ANTI-LOCK BRAKE SYSTEM>

E35EC--

1. FLOW CHART FOR PROBLEM DIAGNOSIS



NOTE

If a normal code is displayed in the diagnosis code check in ②, the problem may be only transient. However, in this case the related connector for the malfunction code displayed in the diagnosis code check in ① should be checked first.

Caution

The driving test should be performed at 30km/h (18.6mph) or more for 30 seconds.

2. CAUTIONS WITH REGARD TO DIAGNOSIS

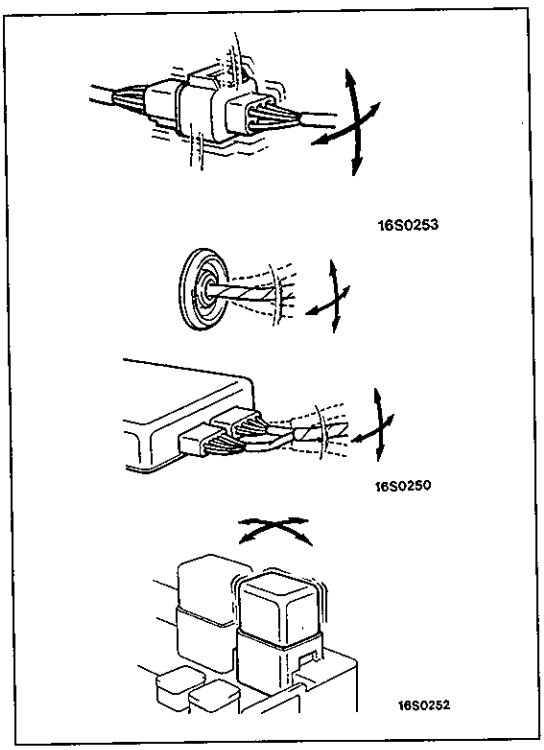
The ABS system controls braking by means of electronic control. Accordingly, the phenomena listed in the table below may occur, but these are generated when the ABS is operating normally, and are not abnormal.

Phenomenon	Explanation of phenomenon
System check sound	When starting the engine, a thudding sound can sometimes be heard coming from inside the engine compartment, but this because the system operation check is being performed, and is not an abnormality.
ABS operation sound	① Sound of the motor inside the ABS hydraulic unit operating (whine) ② Sound is generated along with vibration of the brake pedal. (scraping) ③ When ABS operates, sound is generated from the vehicle chassis due to repeated brake application and release. (Thump: suspension; squeak: tires)
ABS operation (Long braking distance)	For road surfaces such as snow-covered roads and gravel roads, the braking distance for vehicles with ABS can sometimes be longer than that for other vehicles. Accordingly, advise the customer to drive safely on such roads by lowering the vehicle speed and not being too overconfident.

3. POINTS TO NOTE FOR TRANSIENT MALFUNCTIONS

In electronic control systems, momentary problems can occur in electronic circuits and input and output signals, and this can result in temporary trouble symptoms or a diagnosis code being recorded by means of ECU self-diagnosis. If the cause of the problem is continuous, the location of the abnormality can be discovered by checking according to the troubleshooting chart classified by trouble symptoms. However, the symptoms of some transient problems may return to normal by themselves, so there is a possibility that the cause of the problem will be unclear.

The causes of problems in vehicles which are malfunctioning "temporarily" (when trouble symptoms do not reoccur) are mainly vibration, heat and excess electrical resistance. By carrying out inspection according to the simulation method given below, the trouble symptom can be made to reoccur.

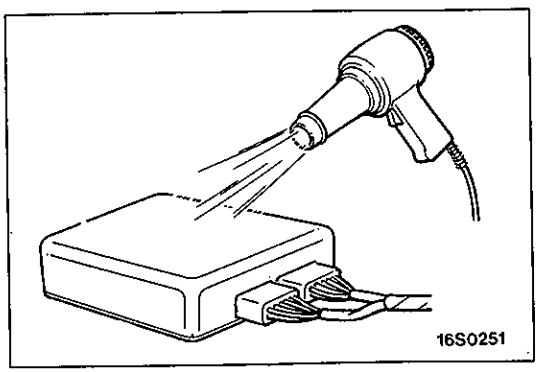


3-1. SIMULATION METHOD

Test by the following method to check if the problem reoccurs.

(1) When the main cause is probably vibration
- Gently shake the connector up, down and to the left and right.
- Gently shake the wiring harness up, down and to the left and right.
- Gently rock each sensor by hand.
- Gently shake other moving parts.

NOTE
If any wires are bent or are pulled a little bit too hard and break, the re-connection should be made with new ones. The vehicle speed sensors in particular are subject to temporary defective contacts due to the movement of the suspension while driving, and therefore it is desirable that a driving test be conducted while monitoring the sensor signals.
(Refer to P.35-75.)



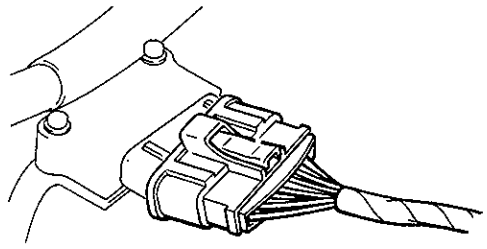
(2) When the main cause is probably heat
- Use a hair dryer to heat the part that you believe is malfunctioning.

Caution
Do not heat the part above 80°C.

(3) When the main cause is probably excess electrical resistance
- Turn all electrical switches, including the headlamp and rear defogger switches, to ON.

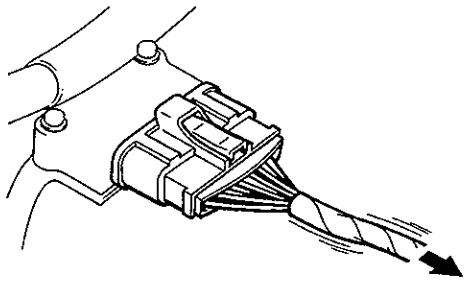
If the trouble symptom does not reoccur even after carrying out the above inspections, the problem should be left for a while.

Connector disconnected or improperly connected



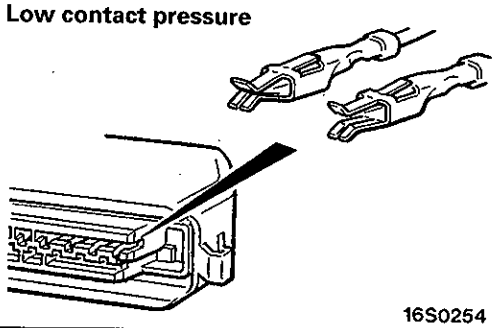
16S0256

Defective connector contact



16S0255

Low contact pressure



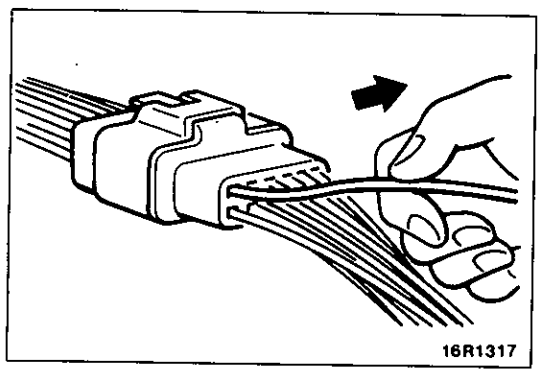
16S0254

4. CONNECTOR INSPECTION

Problems with the electronic control system may be caused by connector abnormalities.
Causes of such abnormalities are recorded below, so inspect and then make repairs if necessary.

NOTE
While inspecting the system, the trouble symptom may be erased by repeatedly disconnecting and connecting the connectors.

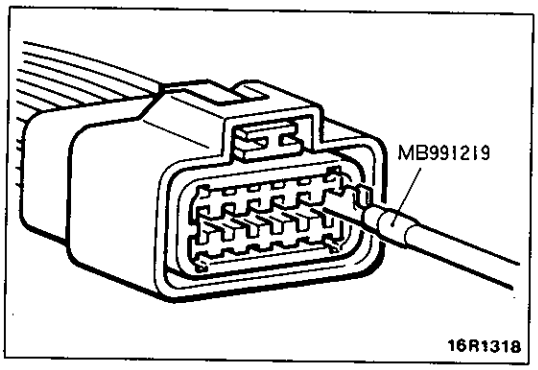
(1) Connector is disconnected
(2) Connector is improperly connected
(3) Connector pins are pulled out
(4) Defective connector contact due to harness tension
(5) Low connection pressure due to rusted terminals
(6) Foreign matter lodged in terminals
(7) Low contact pressure between male and female terminals



16R1317

4-1. CONNECTOR PIN INSPECTION

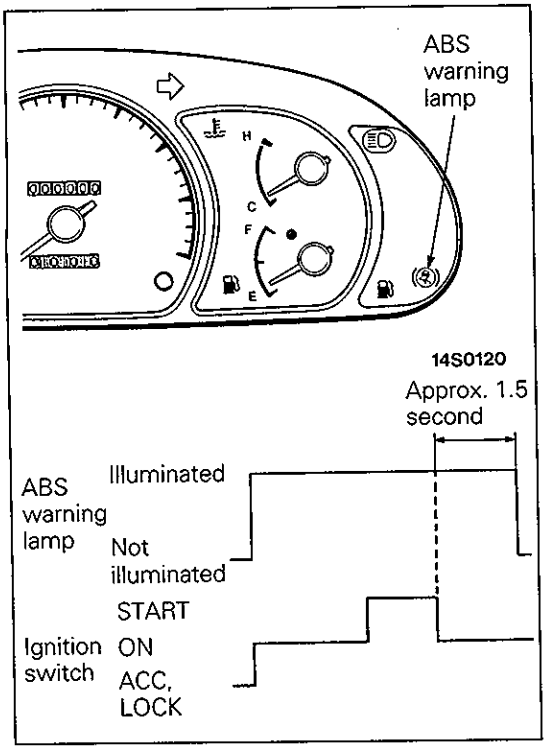
If the connector pin stopper is damaged, the terminal connections (male and female pins) will not be perfect even if the connector body is connected, and the pins may pull out of the reverse side of the connector. Therefore, gently pull the harnesses one by one to make sure that no pins pull out of the connector.



16R1318

4-2. CONNECTOR ENGAGEMENT INSPECTION

When inspecting the connectors, inspect by the following procedure.
Use the special tool (connector pin connection pressure inspection harness of the inspection harness set) to inspect the engagement of the male pins and female pins.
(Pin drawing force: 100g or more)

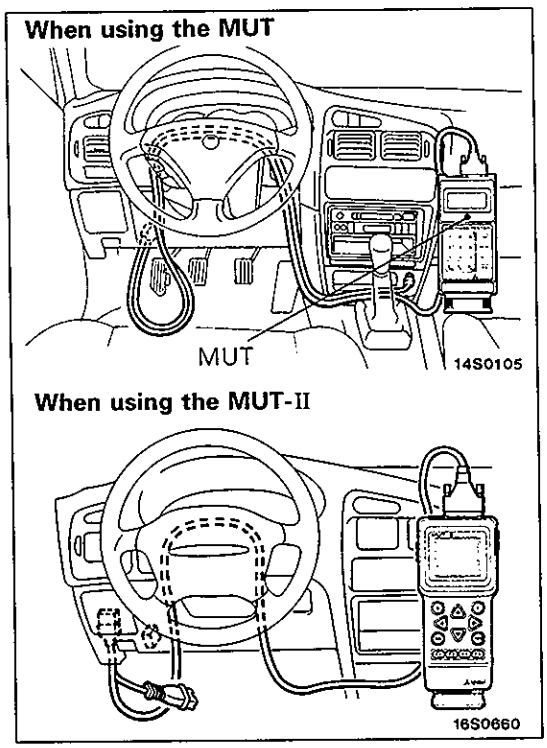


ABS-2WD

1. INSPECTION OF ABS WARNING LAMP

Check that the ABS warning lamp illuminates as follows.

(1) When the ignition switch is turned to "ON", the ABS warning lamp illuminate.
(2) When the ignition switch is turned to "START" to start the engine, the ABS warning lamp switch off after approx. 1.5 second.
(3) If the illumination is other than the above, check the diagnosis codes.



2. INSPECTION BY SELF-DIAGNOSIS

Caution
Connection and disconnection of the MUT or MUT-II should always be made with the ignition switch in the OFF position.

(1) With the ignition switch OFF, connect the MUT or MUT-II, turn the ignition to "ON" and select the ABS system. (The ABS warning lamp lights up, it goes into the MUT or MUT-II mode. In the MUT or MUT-II mode, ABS does not function.)
If it does not go into the MUT or MUT-II mode, check the ECU power circuit and the harness between the ECU and diagnosis check terminals.
(2) Read and make a note of the diagnosis output codes.
(3) Momentarily erase the diagnosis code memory. (Refer to P.35-12.)
If the memory cannot be erased, the function is being stopped by a problem that is currently displaying a problem code. If the memory can be erased, then the problem was only temporary, or it is a problem that can only be detected while driving.
(4) If the malfunction code is not erased, or if the ABS function is stopped by a repeated driving test and a malfunction code is output, inspect according to the diagnosis code inspection charts.

(5) After the inspection, turn the ignition switch to "OFF" and disconnect the MUT or MUT-II.

NOTE
The codes below are output as diagnosis codes according to the vehicle's condition, even when the ABS system is normal. These codes are output only for a current problem, and if the vehicle's condition returns to normal, then the codes will become normal.

Code No.	Vehicle Condition
16	Battery is dead
35	Engine is stopped

3. METHOD OF ERASING THE DIAGNOSIS CODE MEMORY

Caution
When repairs are completed, the diagnosis code memory should be erased. When the ABS-ECU function is stopped, the malfunction code memory cannot be erased.

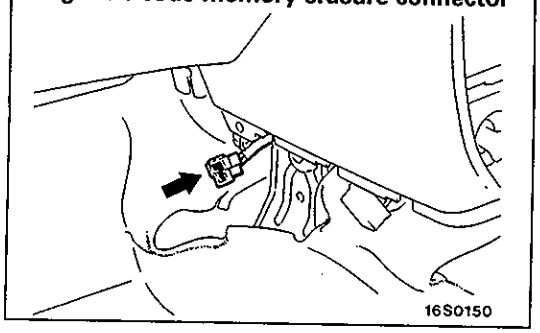
WHEN USING THE MUT OR MUT-II

(1) Erase the memory with the MUT or MUT-II.
(For details, refer to the MUT or MUT-II instruction manual.)

NOTE
After erasing the memory, a command cannot be received from the MUT or MUT-II. When checking diagnosis codes, momentarily stop and restart the engine, and then reactivate the MUT or MUT-II.

(2) Check the diagnosis codes to check that the memory has been erased.

Diagnosis code memory erasure connector



WHEN NOT USING THE MUT OR MUT-II

(1) After connecting the diagnosis code memory erasure connector two terminals (left diagram), turn the ignition key to ON.
At this time, the valve relay will turn OFF, and the ABS warning lamp will illuminate.
(2) After approximately 7 seconds or more has passed, turn the ignition key to OFF.
(3) Disconnect the diagnosis code memory erasure connector two terminals and turn the ignition key back to ON.
At this point in time, the erasure of one malfunction code has been completed.

4. DIAGNOSIS CODE DISPLAY METHOD

The codes are displayed as follows depending on the system problem.

System problem		Displayed code
No current problem	No previous problem	Normal code
	Previous problem	Previous code is displayed.
Current problem	No previous problem	Current problem code is displayed.
	Previous problem	Current code and previous code are displayed.

NOTE

1. If diagnosis code No. 15 appears after a problem is detected in a wheel speed sensor that can specify the wheel position (nos. 11-14 or nos. 21-24), then it cannot be written into memory.
2. Diagnosis codes No. 16 and 35 (low voltage), and No. 63 (ECU faulty) are only displayed when there is a current problem. (Past occurences are not recorded in memory.)
3. Even if identical codes are output continuously, the code is only memorized when it is first displayed.

5. SERVICE DATA INSPECTION TABLE

The following items can be read by the MUT or MUT-II from the ABS-ECU input data.

(1) WHEN THE SYSTEM IS NORMAL

Service data item		Display units	Service data item		Display units
No.	Item		No.	Item	
11	Front right wheel speed	km/H (mph)	16	ECU power voltage	HIGH/LOW
12	Front left wheel speed	km/H (mph)	35	Alternator L terminal voltage	HIGH/LOW
13	Rear right wheel speed	km/H (mph)	36	ON/OFF condition of stop lamp switch	ON/OFF
14	Rear left wheel speed	km/H (mph)			

(2) WHEN SYSTEM IS ISOLATED BY THE ABS-ECU

When the ABS-ECU function is being stopped by the self-diagnosis function, the above code nos. 11-14 for each wheel speed are not displayed. The normal MUT or MUT-II display data is "0.0 km/h (0.0 mph).".

6. ACTUATOR TEST FUNCTION

By using the MUT or MUT-II, the following force-activation of the actuator can be performed.
By using this function, function checking of the hydraulic unit can be done without the need for special devices such as a hydraulic unit checker (MB991131).

NOTE
When the ABS-ECU function is stopped, actuator testing can not be carried out.

ACTUATOR TEST SPECIFICATIONS

No.	Drive condition	Drive object	Drive specifications
01	A and B	Front right solenoid valve	Hydraulic pressure increase → hydraulic pressure decrease (2 sec) → hydraulic pressure increase (The motor turns ON at the same time as hydraulic pressure reduction, and then turns OFF 0.85 seconds after hydraulic pressure reduction is completed.)
02		Front left solenoid valve	
03		Rear right solenoid valve	
04		Rear left solenoid valve	
05	A	Valve relay and ABS warning lamp	Relay OFF signal is output for 2 seconds. For a six second period including 2 seconds before and after this, the ABS-ECU outputs an ABS warning lamp OFF signal. This checks the operation by illuminating the warning lamp when the relay is OFF.
06	A	Motor relay	Motor ON signal is output for 2 seconds.

Drive conditions:
- Condition A: Highest wheel speed is less than 10 km/h (6 mph).
- Condition B: Wheel speed of both front wheels or both rear wheels is 0 km/h (0 mph).

7. TROUBLESHOOTING QUICK-REFERENCE CHART

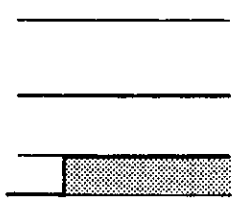
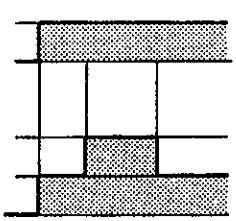
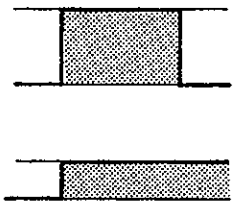
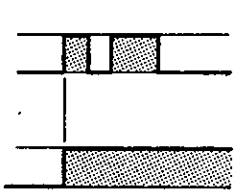
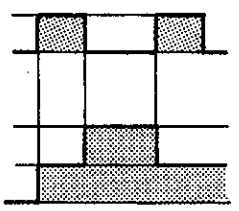
7-1. INSPECTION CHART CLASSIFIED BY DIAGNOSIS CODE

Inspect according to the inspection chart that is appropriate for the malfunction code.

Diagnosis code No.	Inspection item	Diagnosis content	Inspection chart No.	Reference page
11	Front right wheel speed sensor	Open circuit	2	P. 35–20
12	Front left wheel speed sensor			
13	Rear right wheel speed sensor			
14	Rear left wheel speed sensor			
15	Open circuit in sensor	Open circuit in sensor	1	P. 35–20
16	Drop of battery voltage	Drop of ABS operation voltage	6	P. 35–24
21	Front right wheel speed sensor	Short circuit	3	P. 35–21
22	Front left wheel speed sensor			
23	Rear right wheel speed sensor			
24	Rear left wheel speed sensor			
25	Both rear wheel speed sensors	Open circuit in both rear wheel speed sensors, short circuit	4	P. 35–22
31	Rotor of front right wheel speed sensor	Chipped tooth of rotor	5	P. 35–23
32	Rotor of front left wheel speed sensor			
33	Rotor of rear right wheel speed sensor			
34	Rotor of rear left wheel speed sensor			
35	Alternator	Drop of alternator output voltage	7	P. 35–24
41	Front right solenoid valve	No response to solenoid valve drive signal	8	P. 35–25
42	Front left solenoid valve			
43	Rear right solenoid valve			
44	Rear left solenoid valve			
51	Valve relay 1	Detection impossible in OFF condition	9	P. 35–26
52	Valve relay 2	Detection impossible in ON condition	10	P. 35–26
53	Motor relay, motor 1	ON impossible	11	P. 35–28
54	Motor relay, motor 2	OFF impossible	12	P. 35–29
55	Sticking of motor	Motor operation impossible	13	P. 35–30
62	Malfunction inside hydraulic unit	Hydraulic pressure reduction impossible	14	P. 35–31
63	Malfunction inside ABS-ECU	Irregular program, etc.	Replace ABS-ECU	P. 35–116

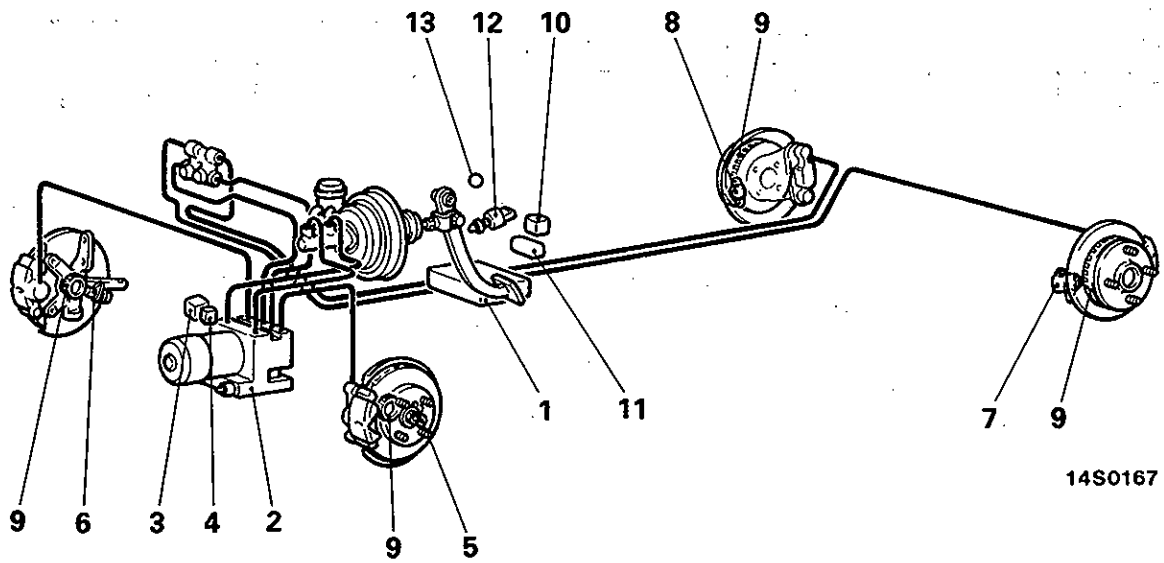
7-2. INSPECTION CHART CLASSIFIED BY TROUBLE SYMPTOMS

Get an understanding of the trouble symptoms and check according to the inspection chart.

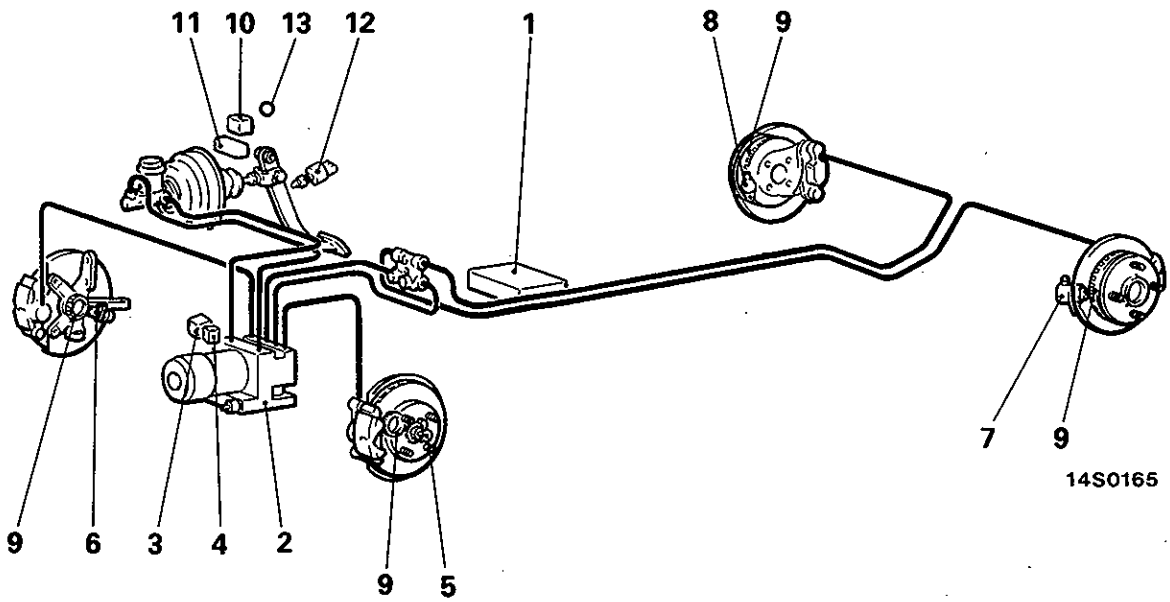
Trouble symptom	Inspection chart No.	Reference page
When the ignition key is turned to "ON" (engine stopped), the ABS warning lamp does not illuminate. ABS warning lamp: Illuminated / Not illuminated Ignition key: ON / ACC, LOCK  14N0167	1	P. 35–32
After the engine starts, the lamp remains illuminated. ABS warning lamp: Illuminated / Not illuminated Ignition key: START / ON / ACC, LOCK  14N0172	2	P. 35–33
The ABS warning lamp switches off approximately 1.5 second after the ignition key is turned to "ON". ABS warning lamp: Illuminated / Not illuminated Ignition key: ON / ACC, LOCK  14N0168	3	P. 35–33
After the ignition key is turned to "ON", the ABS warning lamp illuminates twice, but after that it remains switched off. ABS warning lamp: Illuminated / Not illuminated Ignition key: ON / ACC, LOCK  14N0169	4	P. 35–34
When the ignition key is turned to "START", the ABS warning lamp switches off. ABS warning lamp: Illuminated / Not illuminated Ignition key: START / ON / ACC, LOCK  14N0171	5	P. 35–34
Faulty ABS operation: Unequal braking power on both sides	6	P. 35–35
Faulty ABS operation: Insufficient braking power	6	P. 35–35
Faulty ABS operation: ABS operates under normal braking conditions	6	P. 35–35
Faulty ABS operation: ABS operates before vehicle stops under normal braking conditions	6	P. 35–35
Faulty ABS operation: Large brake pedal vibration when ABS operates	6	P. 35–35
Faulty ABS operation: Large amount of skidding when ABS operates (ABS does not operate properly)	7	P. 35–36
No diagnosis output (no communication with MUT)	8	P. 35–37

8. COMPONENTS

L.H. drive vehicles



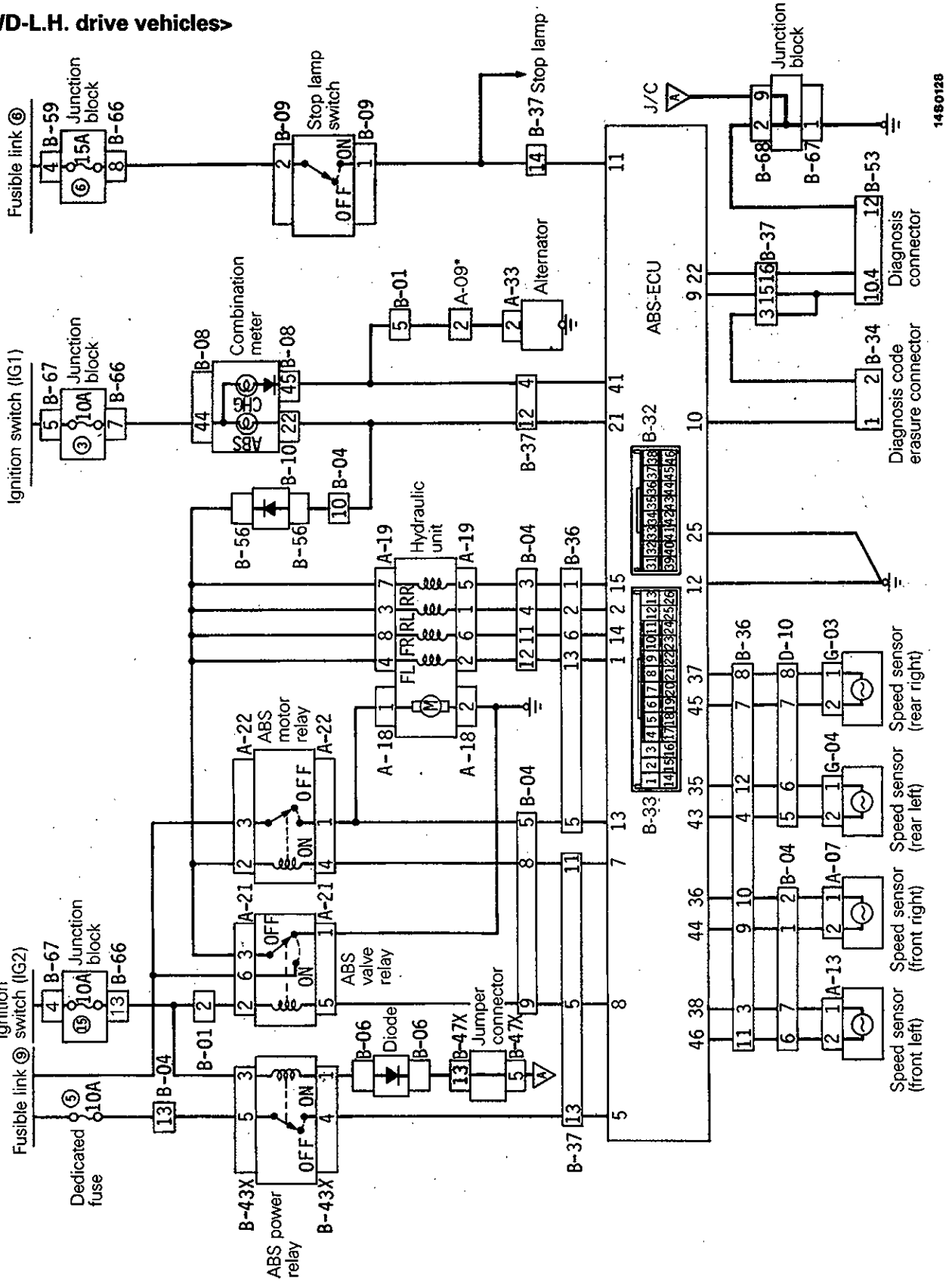
R.H. drive vehicles



1. ABS-ECU
2. Hydraulic unit
3. ABS valve relay
4. ABS motor relay
5. Wheel speed sensor (front left)
6. Wheel speed sensor (front right)
7. Wheel speed sensor (rear left)
8. Wheel speed sensor (rear right)
9. Rotor
10. ABS power relay
11. Diagnosis connector
12. Stop lamp switch
13. ABS warning lamp

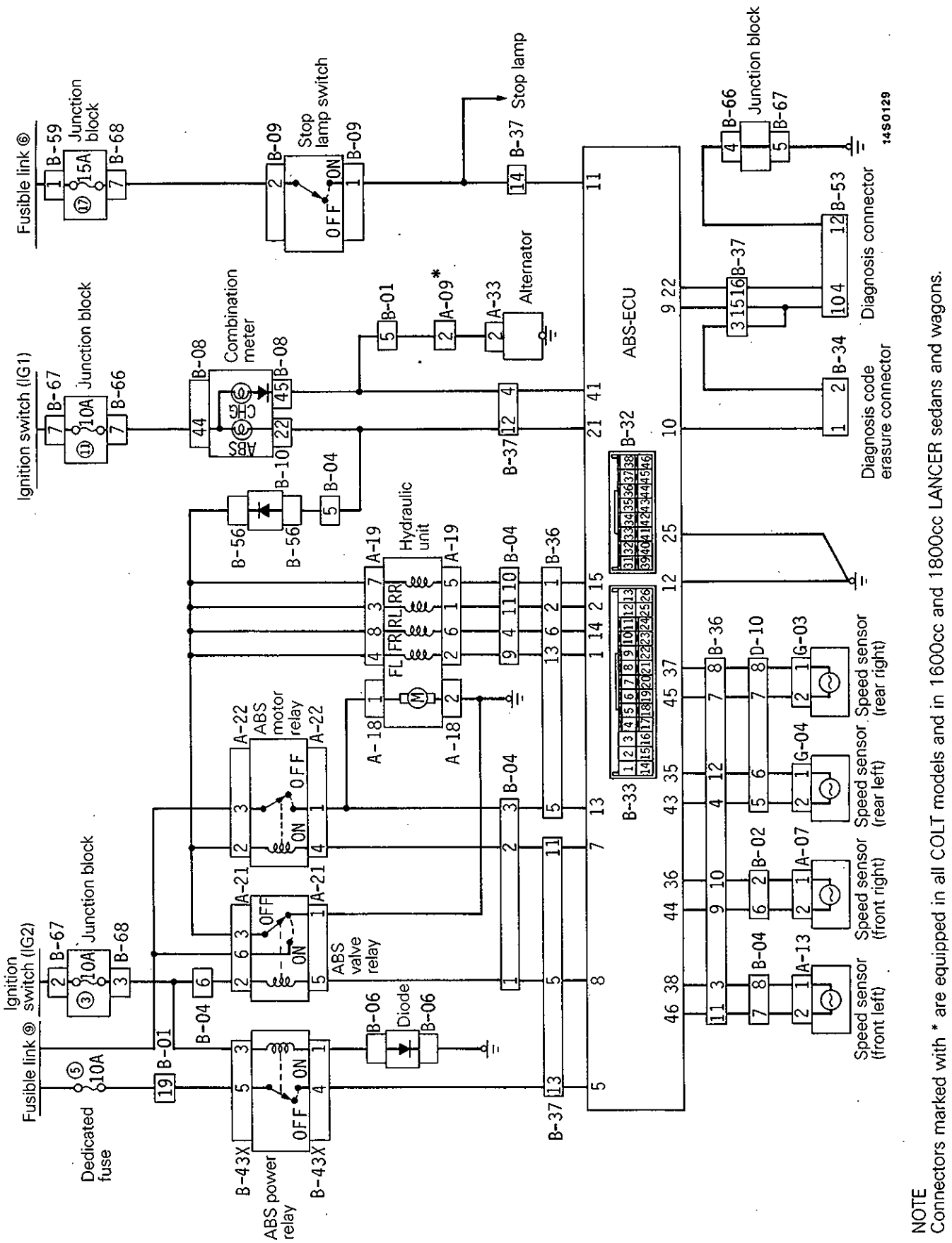
9. CIRCUIT DIAGRAM

<2WD-L.H. drive vehicles>



NOTE
Connectors marked with * are equipped in all COLT models and in 1600cc and 1800cc LANCER sedans and wagons.

<2WD-R.H. drive vehicles>



NOTE
Connectors marked with * are equipped in all COLT models and in 1600cc and 1800cc LANCER sedans and wagons.

10. INSPECTION CHART CLASSIFIED BY DIAGNOSIS CODE

1 **When diagnosis code No. 15 is displayed**

[Comment] There is a broken + wire or – wire in one or more of the four wheel speed sensors detected by a open circuit inspection by the ABS-ECU hardware circuit.
In this case, if a driving test is carried out at 10km/h (6.2mph) or more, the malfunction code (No. 11 - 14) for the abnormal wheel will be displayed. Also, if the malfunction code for the abnormal wheel is not displayed, the problem is transient.

[Hint] When using the MUT or MUT-II, previous malfunction codes are displayed. When this code (No. 15) appears, and a malfunction code for a specific wheel (nos. 11-14) is also displayed, it is likely that there is a open circuit in the wheel speed sensor indicated by these codes.

Probable cause
- Open circuit in wheel speed sensor

When a driving test is carried out at 10km/h (6.2mph) or more, is the malfunction code (No. 11 – 14) displayed?
- No → Refer to "Points to note for transient malfunctions" (P.35-9).
- Yes → Refer to the inspection chart No. 2.

2 **When diagnosis code No. 11, No. 12, No. 13 or No. 14 are displayed**

[Comment] These codes are displayed when the sensor with the open circuit can be distinguished.

Probable cause
- Open circuit in wheel speed sensor
- Broken wiring harness, disconnected connector
- Malfunction of ABS-ECU

Inspection of individual part
- Wheel speed sensor (Refer to P.35-114.)

OK ↓

1. ABS-ECU connector B-32: Disconnected
Is the resistance value between the following terminals of the ABS-ECU harness side connector standard value?
Standard value: 1.4–2.2 kΩ
At this time, the resistance should be inspected while moving the sensor harness and connector.
Front side
- No.46–No.38
- No.44–No.36

Rear side
- No.43–No.35
- No.45–No.37

B–32

No → Check the following connectors. Refer to P.35-10.)
- Wheel speed sensor connectors A-13, A-07, G-04 and G-03
- ABS-ECU connector B-33
- Intermediate connectors B-36, B-04, B-02 (R.H. drive vehicles) and D-10

NG → Repair the connector.

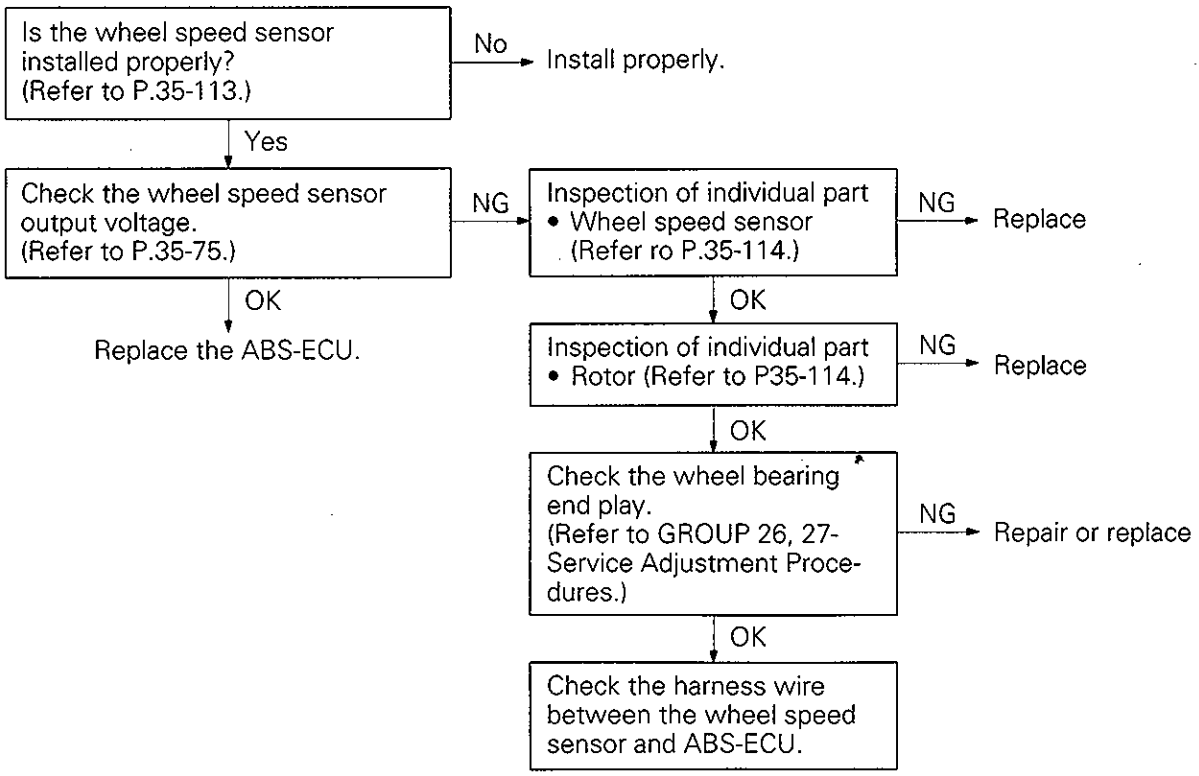
OK ↓

Does the problem reoccur?
- No → Refer to "Points to note for transient malfunctions" (P.35-9).
- Yes → Check the harness wire between each wheel speed sensor and ABS-ECU.

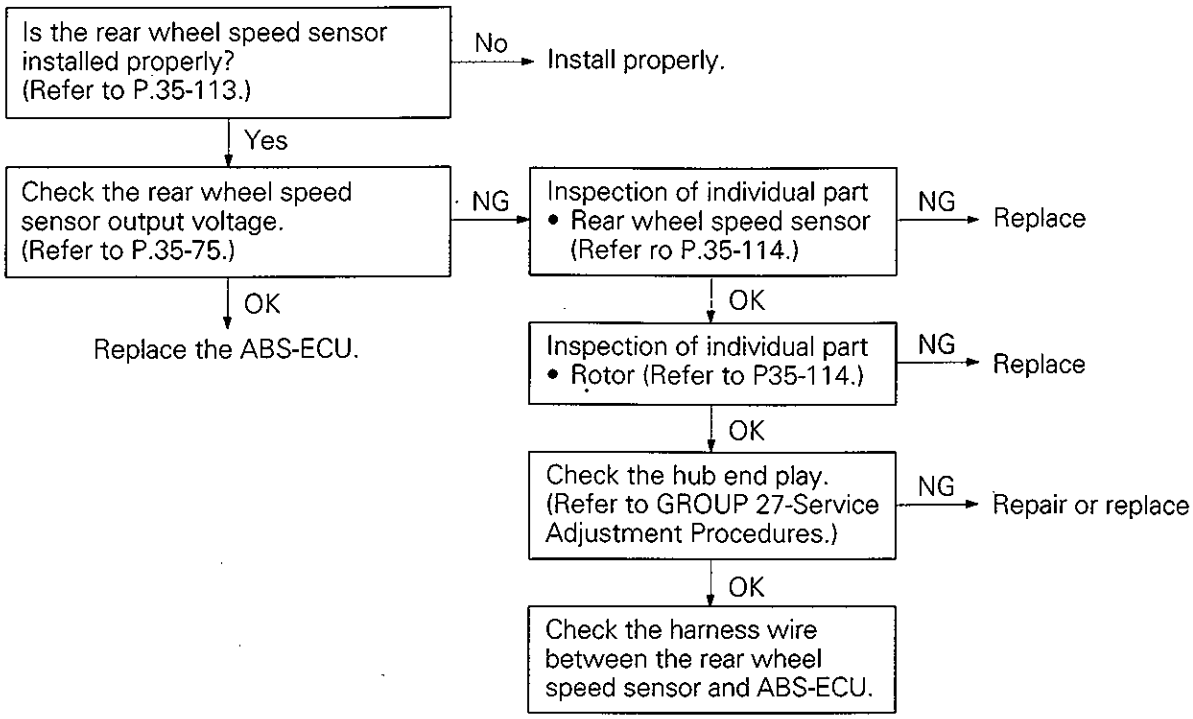
Yes ↓

Replace the ABS-ECU.

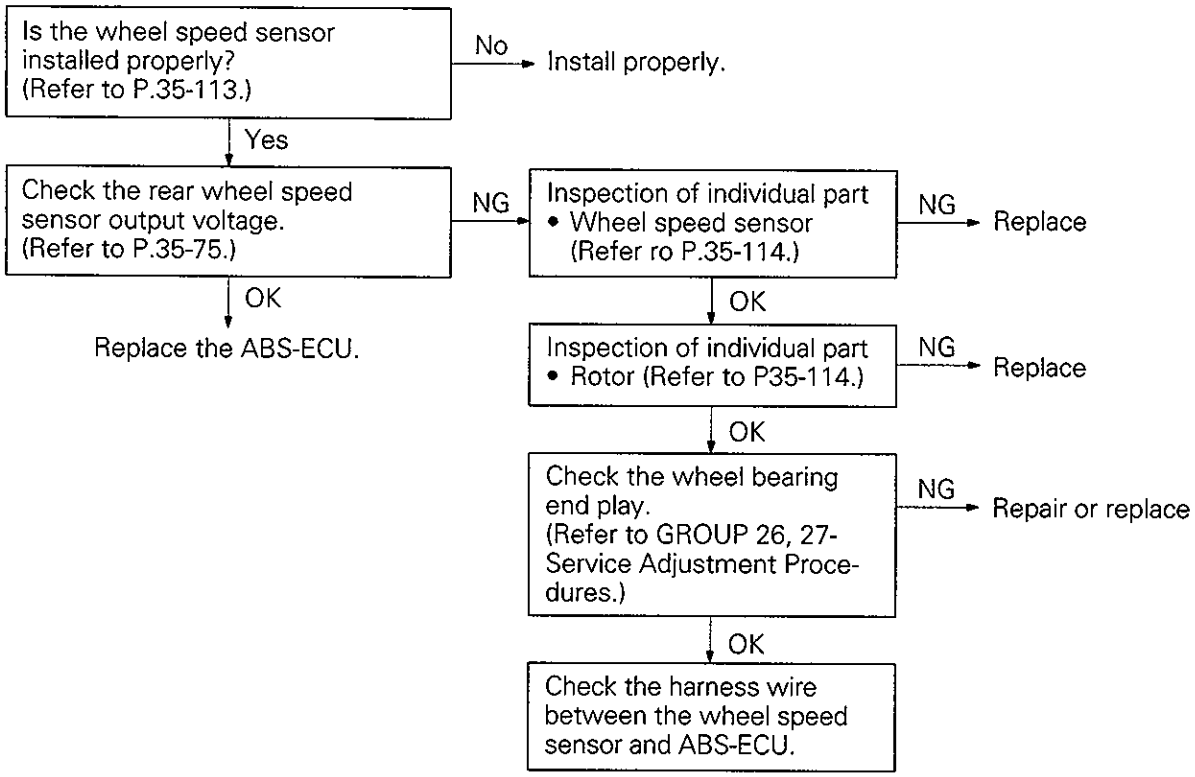
3	When diagnosis code No.21, No. 22, No. 23 or No. 24 are displayed	Probable cause
	[Comment] These malfunction codes are displayed when a open circuit cannot be verified, but when the vehicle speed reaches 10 km/h (6 mph) or more, no pulses are input. [Hint] The cause is likely to be either a short between the sensor harnesses, a short in the sensor + wire with the body, or an excessive sensor gap.	• Improper installation of wheel speed sensor • Malfunction of wheel speed sensor • Malfunction of rotor • Malfunction of wheel bearing • Shortcircuited harness wire • Malfunction of ABS-ECU



4 When diagnosis code No. 25 is displayed	Probable cause
[Comment] A problem in both rear wheel sensors is diagnosed when the signal from either of the front wheel speed sensors is diagnosed as normal, and the wheel speed of both rear wheels is 0 km/h (0 mph) for a continuous 20 second period, even if the wheel speed of the front wheels is 11 km/h (7 mph) or more. [Hint] This code is displayed when there is a short in the sensor harnesses of both rear wheels, or if there is low output from both rear wheel sensors. NOTE If the vehicle is raised up, or if the wheels are stuck and only the front wheels are moving, after approximately 20 seconds the ABS warning lamp will illuminate, and the system will be isolated. Thus, this code can be output even when the system is normal, so it is only output during a current problem, and is not kept in memory from a previous problem. Accordingly, before turning the ignition switch to OFF, the malfunction code should be read and written down.	• Improper installation of rear wheel speed sensor • Malfunction of rear wheel speed sensor system • Malfunction of rotor • Malfunction of wheel bearing • Shortcircuited harness wire • Malfunction of ABS-ECU



5	When diagnosis code No. 31 or No. 32 are displayed	Probable cause
	[Comment] These codes are displayed when a chipped rotor tooth or a jammed rotor (one tooth) is detected, or if sensor output is low due to a defective sensor and warped rotor and continuous anti-lock braking occurs. Also, they show that there is a request of brake fluid pressure control with the stop lamp switch OFF from when the vehicle is stationary until the vehicle speed exceeds approximately 15 km/h (9.3 mph). If the vehicle repeats start and stop and the condition above is detected five times, the ABS warning lamp will illuminate. [Hint] There is a strong chance that the wheel speed sensor output is low due to a bent rotor tooth or excessive sensor gap. Low sensor output could also be caused by a rare short in the sensor coil.	• Improper installation of wheel speed sensor • Malfunction of wheel speed sensor • Malfunction of rotor • Malfunction of wheel bearing • Shortcircuited harness wire • Malfunction of ABS-ECU



6	When diagnosis code No. 16 is displayed	Probable cause
	[Comment] This indicates that the ABS-ECU power voltage is lower than the standard value. If the voltage returns to standard voltage or above, this malfunction code will not be output.	• Disconnected connector. • Malfunction of battery or alternator • Malfunction of ABS-ECU

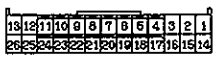
Caution
If the battery voltage drops during inspection, this code will be output as a current problem, and correct diagnosis of the problem cannot be made.

Before carrying out the following inspection, check the battery level, and refill it if necessary.

1. ABS-ECU connector B-33: Disconnected
2. Engine: Start

Between the connector terminal terminal No. 5 and the earth: 10V or more.

B – 33



OK → Replace the ABS-ECU.

NG → Check the following connectors (Refer to P.35-10.)
- Relay connector B-43X
- ABS-ECU connector B-33
- Intermediate connectors B-01 and B-37

NG → Repair the connector.

OK → Does the problem reoccur?

No → Refer to "Points to note for transient malfunctions" (P.35-9).

Yes → Check the battery or the alternator.

7	When diagnosis code No. 35 is displayed	Probable cause
	[Comment] This indicates that the output voltage of the alternator L terminal is low when the ignition key is turned to "ON" and the engine is stopped, or when the engine is running. If the voltage returns to standard voltage or above, this problem code will not be output. [Hint] When the output voltage of the alternator L terminal is low, the charge warning lamp will illuminate. This code also appears when there is a short in the alternator L terminal monitor circuit, but not if there is a open circuit in that circuit. If the MUT or MUT-II service data displays No. 35, this malfunction code is output.	• Incorrectly connected connector, shortcircuited harness wire. • Malfunction of alternator • Malfunction of ABS-ECU

NOTE
If the engine is stopped, this code will be output, even if the situation is normal, so the following inspection should only be carried out if the code is output while the engine is running.

1. ABS-ECU connector B-32: Disconnected
2. Engine: Start

Between the connector terminal No. 41 and the earth: 7V or more.

B – 32

OK → Replace the ABS-ECU.

NG → Check the following connectors (Refer to P.35-10.)
- ABS-ECU connector B-32
- Alternator connector A-33
- Intermediate connectors B-37, B-01 and A-33

NG → Repair the connector.

OK → Does the problem reoccur?

No → Refer to "Points to note for transient malfunctions" (P.35-9).

Yes → Check the alternator and the harness wire between ABS-ECU and alternator.

8	When diagnosis codes No. 41, No. 42, No. 43 or No. 44 are displayed	Probable cause
	[Comment] The ABS-ECU normally monitors the solenoid valve drive circuit. If there is no current flowing to the solenoid even when the solenoid is ON, or the current continues to flow to the solenoid even when the solenoid is OFF, the ABS-ECU diagnoses a open circuit or short in the solenoid coil or a open circuit or short in the harness, and this malfunction code is output.	• Malfunction of hydraulic unit • Broken wire, disconnected connector • Shortcircuited harness wire • Malfunction of ABS-ECU

1. Hydraulic unit connector A-19: Disconnected

Is the resistance value between the following terminals of the hydraulic unit side connector standard value?

Standrad value: 3.10–3.34 Ω

- No. 7 – No. 5
- No. 3 – No. 1
- No. 8 – No. 6
- No. 4 – No. 2

A – 19

No → Replace the hydraulic uinit.

Yes ↓

1. Hydraulic unit connector A-19: Disconnected
2. ABS-ECU connector B-33: Disconnected

Is the resistance value between the terminals of the hydraulic unit side connector and ABS-ECU harness side connector standard value?

Standrad value: 3.10–3.34 Ω

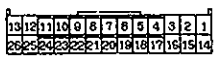
Hydraulic unit side – ABS-ECU side

- No. 7 – No. 15
- No. 3 – No. 2
- No. 8 – No. 14
- No. 4 – No. 1

Hydraulic unit side

A – 19

ABS-ECU side



B – 33

NG → Check the following connectors. (Refer to P.35-10.)
- Hydraulic unit connector A-19
- ABS-ECU connector B-33
- Intermediate connectors B-04 and B-36

NG → Repair the connector.

OK ↓

Does the problem reoccur?

No → Refer to "Points to note for transient malfunctions" (P.35-9).

Yes ↓

Check the harness wire between hydraulic unit and ABS-ECU.

Yes ↓

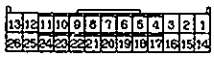
Replace the ABS-ECU.

9	When diagnosis code No. 51 is displayed	Probable cause
	[Comment] During the initial check when the ignition switch is turned to "ON", if power is being supplied to the solenoid when the valve relay is OFF, the ABS-ECU diagnoses a melted relay contact or a short in the valve relay drive circuit, and this malfunction code is output.	• Malfunction of ABS valve relay • Shortcircuited harness wire • Malfunction of ABS-ECU

Inspection of individual part
• ABS valve relay
(Refer to P.35-111.)
NG → Replace

OK ↓

1. ABS-ECU connector
B-33: Disconnected
Between the harness side connector terminal No. 8 and the earth:
No continuity.

B–33 

NG → Check the harness wire between ABS valve relay and ABS-ECU.

OK ↓

Replace the ABS-ECU.

10 When diagnosis code No. 52 is displayed

[Comment] During the initial check when the ignition switch is turned to "ON", if power is not being supplied to the solenoid when the valve relay is ON, the ABS-ECU diagnoses an OFF problem in the valve relay (not turned ON), and outputs this malfunction code.

Probable cause

- Malfunction of ABS valve relay
- Broken wire, disconnected connector
- Malfunction of ABS-ECU

Inspection of individual part
- ABS valve relay (Refer to P.35-111.)

NG → Replace

OK ↓

1. ABS valve relay connector: Disconnected

Between the harness side connector terminal No. 6 and the earth: Battery voltage

A – 21 

NG → Check the harness wire between fusible link No. 9 and ABS valve relay.

OK ↓

1. ABS-ECU connector B-33: Disconnected
2. Ignition switch: ON

Between the harness side connector terminal No. 8 and the earth: Battery voltage

B – 33 

NG → Check the following connectors. (Refer to P.35-10.)
- Junction block connectors B-67 and B-66 (L.H. drive vehicles) and B-68 (R.H. drive vehicles)
- Relay connector A-21
- ABS-ECU connector B-33
- Intermediate connectors B-04 and B-37

NG → Repair the connector.

OK ↓

Does the problem reoccur?

No → Refer to "Points to note for transient malfunctions" (P.35-9).

Yes ↓

Check the harness wire between fuse No. 15 (L.H. drive vehicles) or fuse No. 3 (R.H. drive vehicles)

OK ↓

1. Hydraulic unit connector A-19: Disconnected
2. Ignition switch: ON

Is battery voltage displayed between the harness side connector terminal No. 4, 8, 3 or 7 and the earth?

A – 19 

No → Check the harness wire between ABS valve relay and hydraulic unit.

Yes ↓

Check the following connectors. (Refer to P.35-10.)
- Hydraulic unit connector A-19

NG → Repair the connector.

OK ↓

Does the problem reoccur?

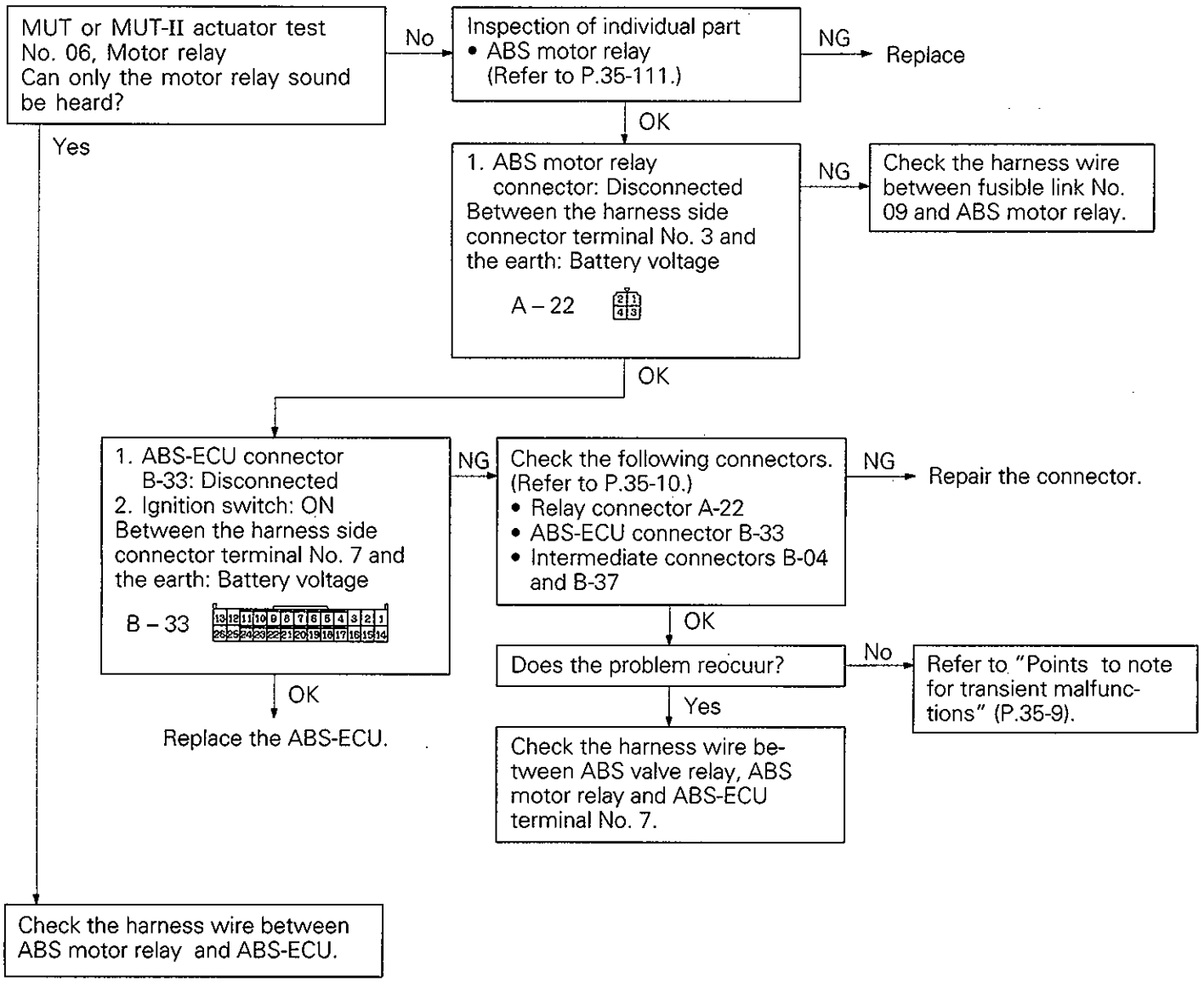
No → Refer to "Points to note for transient malfunctions" (P.35-9).

Yes ↓

Check the harness wire between hydraulic unit and ABS-ECU.

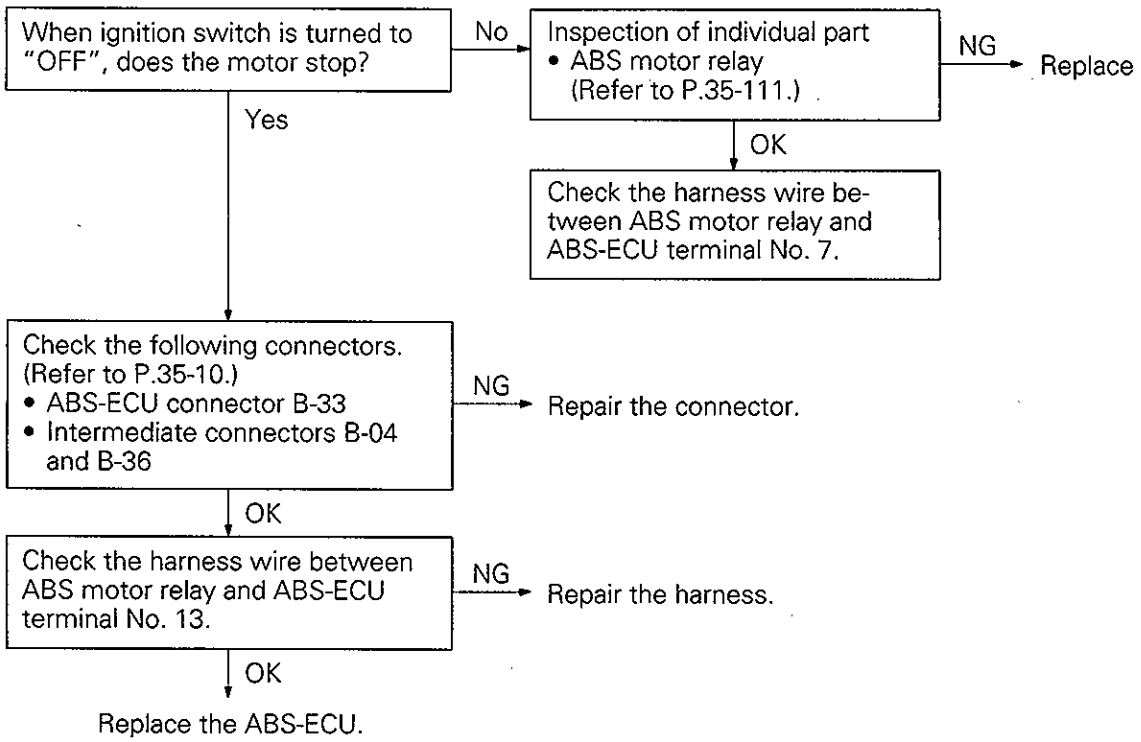
11	When diagnosis code No. 53 is displayed	Probable cause
[Comment]	When the motor pump receives a signal to turn ON and voltage at the motor monitor is LOW, the ABS-ECU outputs this malfunction code.	• Malfunction of ABS motor relay • Defective harness wire, disconnected connector • Malfunction of ABS-ECU
[Hint]	If the sound of the motor relay operation can be heard when the No. 6 motor relay is driven by a MUT or MUT-II actuator test, there is probably a short in the motor monitor wire.	

Caution
In the case of actuator test No. 06, the engine should be started left running for a while after the test is completed to prevent the battery from being drained.



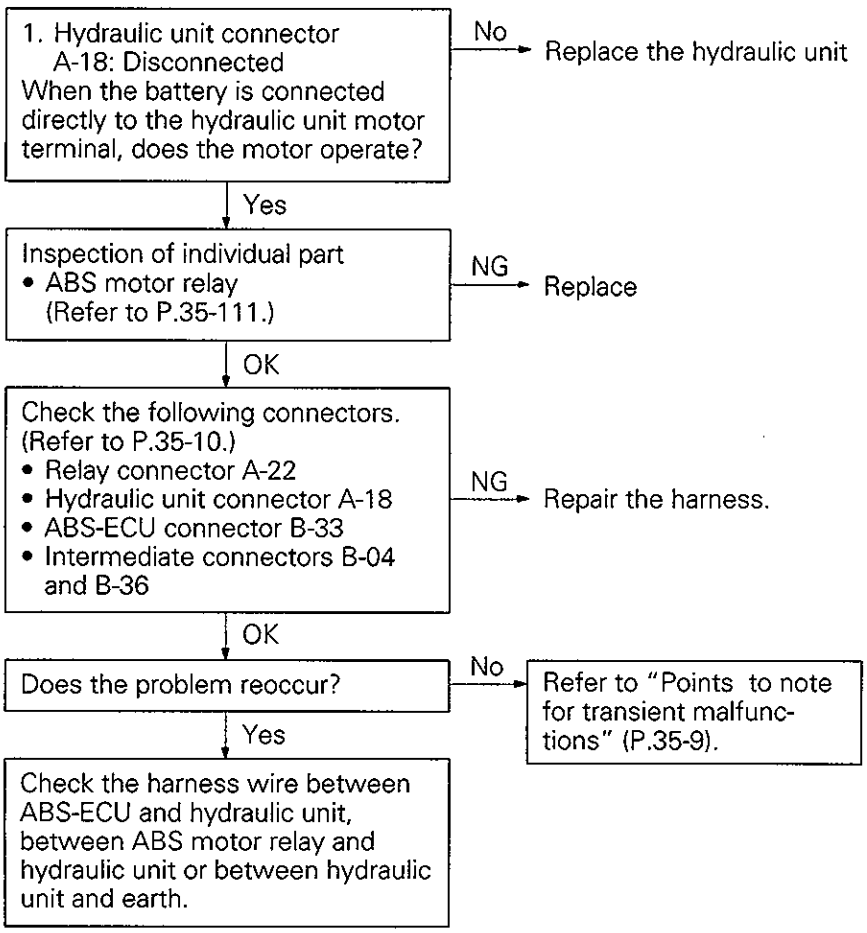
12	When diagnosis code No. 54 is displayed	Probable cause
[Comment]	When the pump motor receives a signal to turn OFF and the motor monitor is ON, if a melted contact, etc. is diagnosed in the motor relay, the ABS-ECU outputs this malfunction code.	• Malfunction of ABS motor relay • Malfunction of hydraulic unit • Broken wire, disconnected connector • Malfunction of ABS-ECU
[Hint]	Because the motor monitor wire is pulled up into the ABS-ECU by the IG power, this malfunction code is output if there is a open circuit in the harness, even if the motor relay and the motor are normal.	

Caution
If there is a melted contact in the motor relay, the motor will keep turning, even if the ignition switch is turned to OFF. In such a case, immediately remove the fusible link (60A) or disconnect the hydraulic unit A-18 connector. Excessive running of the motor will consume a battery.



13	When diagnosis code No. 55 is displayed	Probable cause
[Comment]	The ABS-ECU drives the motor after the initial check, and if the motor is diagnosed as not running normally, the motor is driven again when the vehicle speed is 10km/h (6.2mph). If the motor operation is diagnosed as not normal at this time also, this malfunction code is output.	• Malfunction of hydraulic unit • Bad contact of connector • Defective harness wire
[Hint]	It is possible for this malfunction code to be output when there is an abnormality in the motor relay or motor harnesses. If the noise from the motor is not heard after starting the engine without depressing the brake pedal, the rotating shaft of the motor is probably stuck. When the No. 06 motor relay is driven by a MUT or MUT-II actuator test and the motor doesn't operate, the same judgement is possible.	

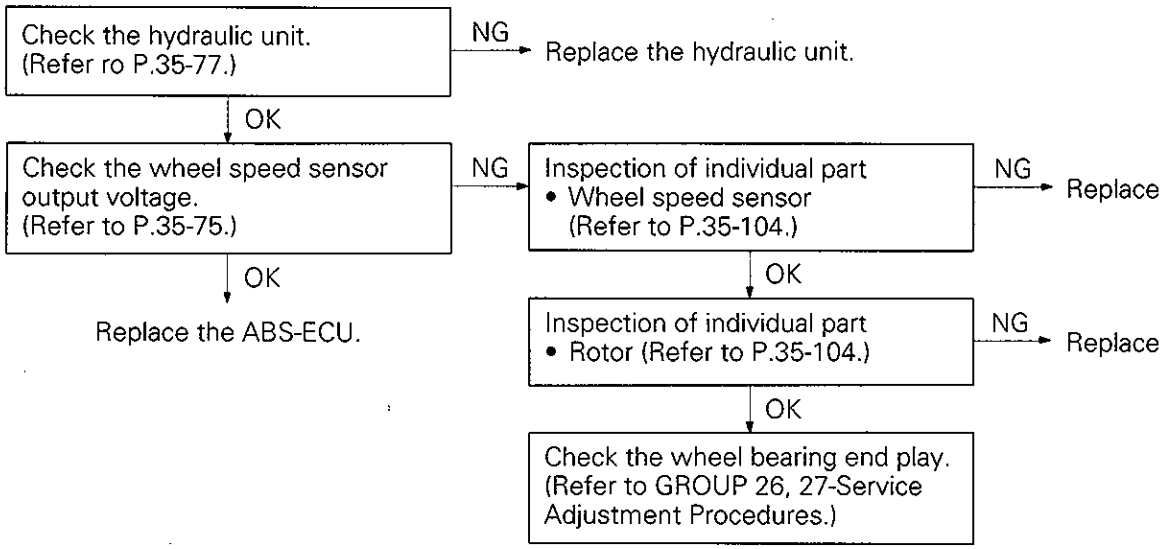
Caution
If the battery is depleted or if the alternator L terminal voltage is low, the motor will not be driven, so when carrying out the motor drive check, check to be sure that these things are normal.
Carry out the motor drive check while the vehicle is stationary.



14 When diagnosis code No. 62 is displayed	Probable cause
[Comment] Diagnosis code No. 62 is a malfunction code that is output when the ABS is unable to operate for a long period of time. However, it is possible that the problem could be caused not only by a faulty hydraulic unit, but also by a malfunctioning wheel speed sensor.	• Malfunction of hydraulic unit • Malfunction of wheel speed sensor • Malfunction of rotor • Foreign material adhered to wheel speed sensor • Malfunction of wheel bearing

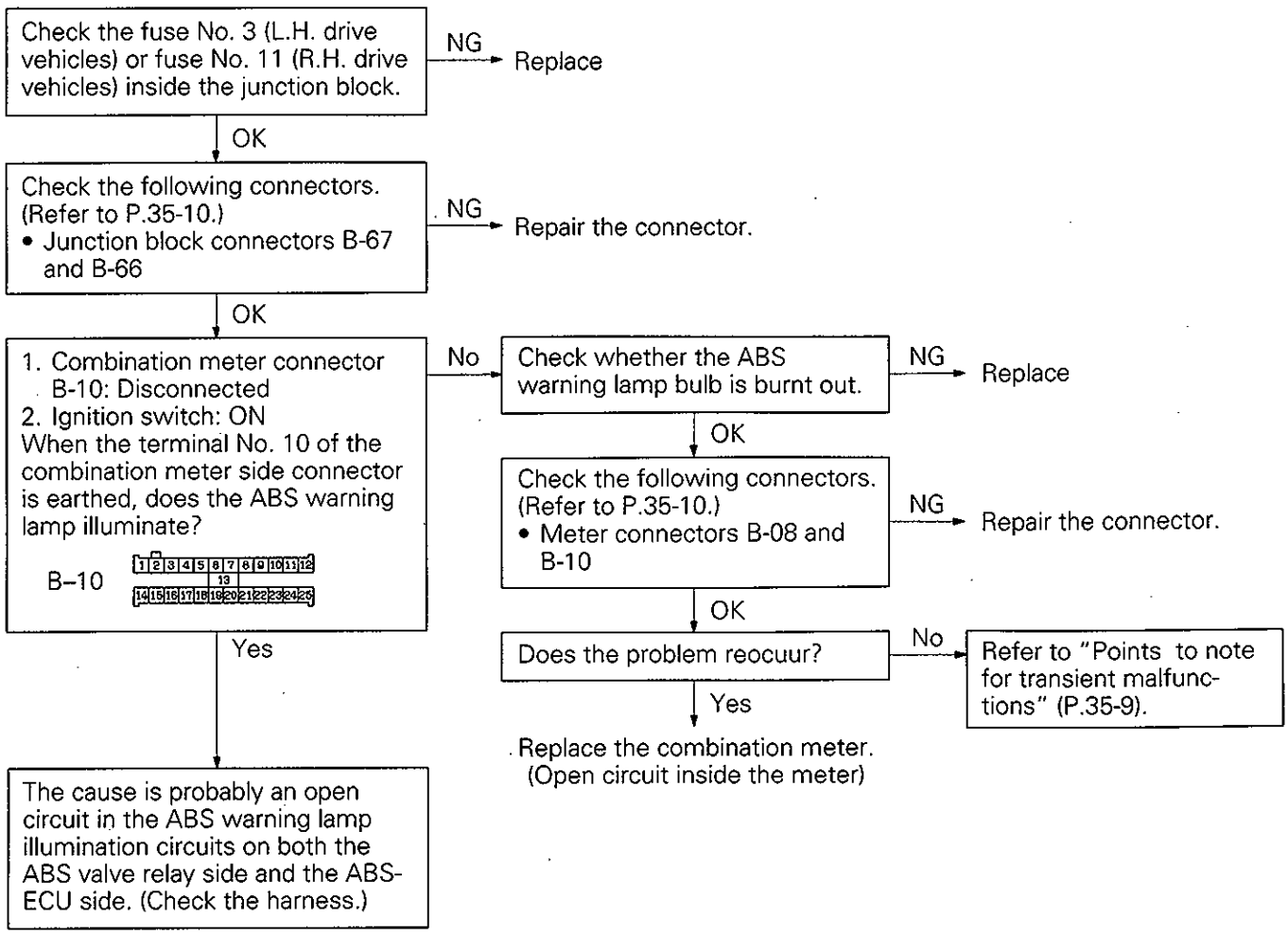
Caution
The malfunction code No. 62 is detected in the following cases, even if the ABS system is normal. To be sure, the user should be questioned to check if the appropriate driving is not being carried out.

- **If the parking brake is not fully released, or if the brakes are dragging while driving on snow or ice.**
- **When driving with left and right tyres of different sizes (difference in tyre diameter or uneven wear).**
- **When driving for a long period of time on roads with low friction coefficients, such as ice-covered roads.**



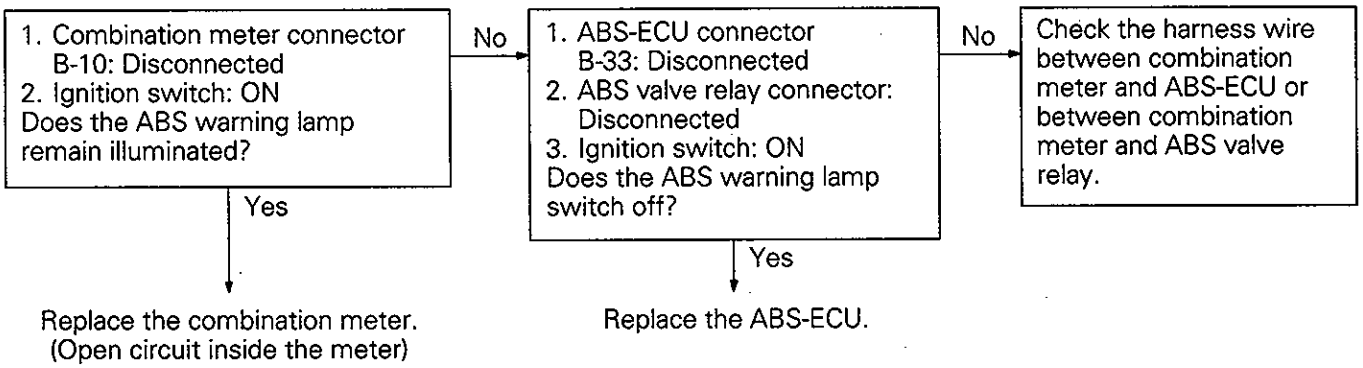
11. INSPECTION CHART CLASSIFIED BY TROUBLE SYMPTOMS

1	When ignition key is turned to "ON" (engine stopped), ABS warning lamp does not illuminate	Probable cause
	[Comment] When power is supplied to the ABS-ECU, the valve relay changes from OFF to ON→OFF→ON by the initial check, and thus even if there is a problem with the circuit between ABS warning lamp and ABS-ECU, the lamp will illuminate twice when the valve relay is OFF. Accordingly, the cause of the lamp not illuminating is probably an open circuit in the lamp power circuit, a blown lamp bulb, or an open circuit in both the circuit between the ABS warning lamp and the ABS-ECU and the circuit between the ABS warning lamp and the ABS valve relay. [Hint] When other warning lamps also do not illuminate, the cause is probably a blown fuse.	• Blown fuse • Burnt out ABS warning lamp bulb • Broken wire, disconnected connector

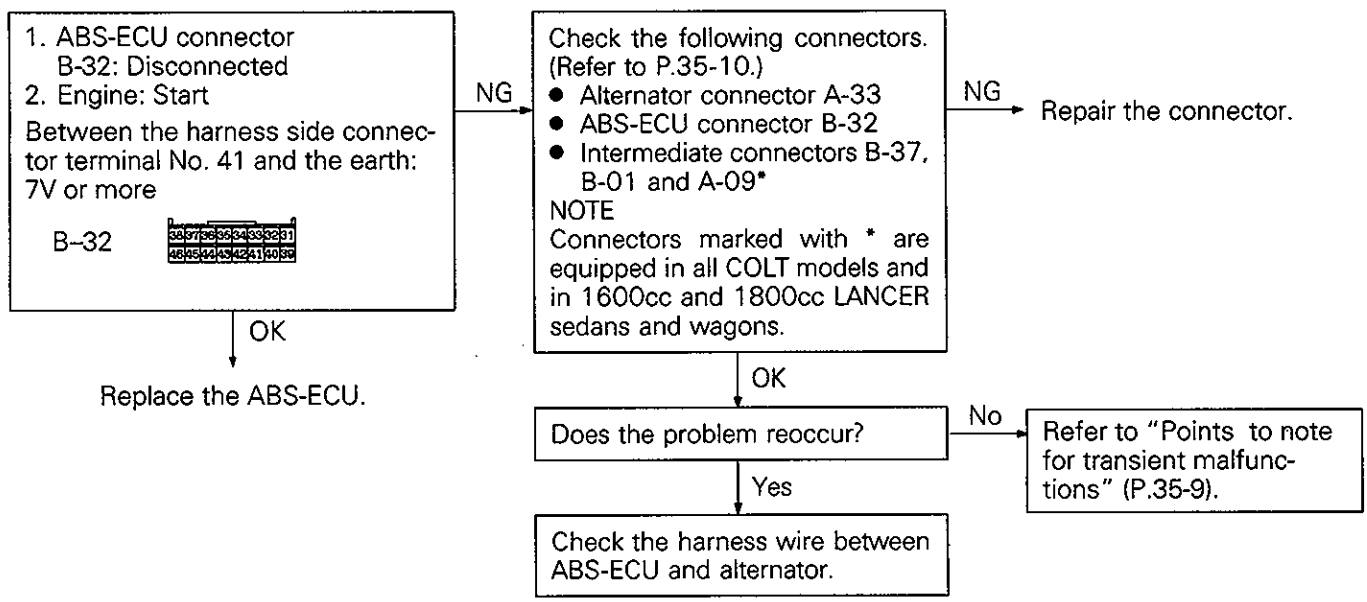


2	Even after the engine is started, the ABS warning lamp remains illuminated	Probable cause
	[Comment] There is probably a short in the ABS warning lamp illumination circuit.	• Malfunction of combination meter • Malfunction of ABS-ECU • Shortcircuited harness wire

NOTE
This trouble symptom is limited to cases where communication with the MUT is possible (ABS-ECU power supply is normal) and the diagnosis code is a normal diagnosis code.



3	The ABS warning lamp switches OFF approximately 1.5 second after the ignition key is turned to "ON"	Probable cause
	[Comment] The ABS-ECU monitors the voltage of the alternator L terminal, and when the engine is not running, the voltage of the L terminal is low, and thus the ABS warning lamp illuminates. Accordingly, when the ignition key is turned to "ON", if the lamp turns off after the initial check (which takes about 1.5 second), there is a problem in the ABS warning lamp illumination function resulting from the alternator L terminal monitor.	• Broken wire, disconnected connector • Malfunction of ABS-ECU



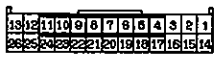
4 The ABS warning lamp illuminates twice after the ignition key is turned to "ON", but after that it remains switched off

[Comment] The ABS-ECU causes the ABS warning lamp to illuminate during the initial check. The valve relay changes from OFF to ON→OFF→ON by the initial check, and if there is a open circuit in the lamp drive circuit from the ABS-ECU, the lamp will illuminate when the valve relay is OFF. Accordingly, if the ignition key is "ON", and the lamp illuminates twice and then switches off, there is a problem in the ABS-ECU drive circuit.

Probable cause
- Broken wire, disconnected connector
- Malfunction of ABS-ECU

1. ABS valve relay connector: Disconnected
2. ABS-ECU connector B-33: Disconnected
3. Ignition switch: ON

Between the harness side connector terminal No. 21 of the ABS-ECU and the earth: 7V or more

B–33 

NG → Check the following connectors. (Refer to P.35-10.)
- ABS-ECU connector B-33
- Intermediate connectors B-37

NG → Repair the connector.

OK → Does the problem reoccur?

No → Refer to "Points to note for transient malfunctions" (P.35-9).

Yes → Check the harness wire between combination meter and ABS-ECU.

OK → Replace the ABS-ECU.

5 When ignition key is turned to "START", ABS warning lamp switches off

[Comment] The ABS-ECU uses the power to the IG2 which is cut when the ignition switch is turned to "START". The ABS warning lamp uses IG1 power which is not cut even when the ignition switch is turned to "START". Accordingly, because the power to the ABS-ECU is stopped in "START" position, if the warning lamp switches off at this time, the cause is a problem in the lamp illumination circuit in the valve relay.

Probable cause
- Malfunction of ABS valve relay
- Broken wire, disconnected connector

Inspection of individual part
- ABS valve relay (Refer to P.35-111.)

NG → Replace

OK →

1. ABS-ECU connector B-33: Disconnected
2. ABS valve relay connector: Disconnected
3. Ignition switch: ON

Between the harness side connector terminal No. 3 of the ABS valve relay and the earth: Battery voltage

A–21 

NG → Check the following connectors and diode. (Refer to P.35-10.)
- Relay connector A-21
- Intermediate connector B-04
- Diode B-56

NG → Repair the connector or the diode

OK → Does the problem reoccur?

No → Refer to "Points to note for transient malfunctions" (P.35-7).

Yes → Check the harness wire between combination meter and ABS valve relay.

OK → Check the harness wire between ABS valve relay and earth.

6	Brake operation is abnormal	Probable cause
	[Comment] This varies depending on the driving conditions and the road surface conditions, so problem diagnosis is difficult. However, if a normal diagnosis code is displayed, carry out the following inspection.	• Improper installation of wheel speed sensor • Bad contact of wheel speed sensor harness connector • Malfunction of wheel speed sensor • Malfunction of rotor • Foreign material adhered to wheel speed sensor • Malfunction of wheel bearing • Malfunction of hydraulic unit • Malfunction of ABS-ECU

Is the wheel speed sensor installed properly? (Refer to P.35-113.)
- No → Install properly.
- Yes ↓

Check the wheel speed sensor output voltage. (Refer to P.35-75.)
- NG → Inspection of individual part
  - Wheel speed sensor (Refer to P.35-104.)
    - NG → Replace.
    - OK ↓
  - Rotor (Refer to P.35-104.)
    - NG → Replace.
    - OK ↓
- OK ↓

Check the hydraulic unit. (Refer to P.35-77.) ↓

Check the wheel bearing end play. (Refer to GROUP 26, 27- Service Adjustment Procedures.)
- NG → Repair or replace.
- OK ↓

Check the following connectors. (Refer to P.35-10.)
- Wheel speed sensor connectors A-13, A-07, G-04 and G-03
- ABS-ECU connector B-33
- Intermediate connectors B-36, B-04, B-02 (R.H. drive vehicles) and D-10

NG → Repair the connector.
OK ↓

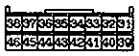
Does the problem reoccur?
- No → Refer to "Points to note for transient malfunctions" (P.35-9).
- Yes ↓

1. ABS-ECU connector B-32: Disconnected

Is the resistance value between the following terminals of the ABS-ECU harness side connector standard value?
Standard value: 1.4–2.2 kΩ
At this time, the resistance should be inspected while moving the sensor harness and connector.
Front side
- No. 46–No. 38
- No. 44–No. 36

Rear side
- No. 43– No. 35
- No. 45 –No. 37

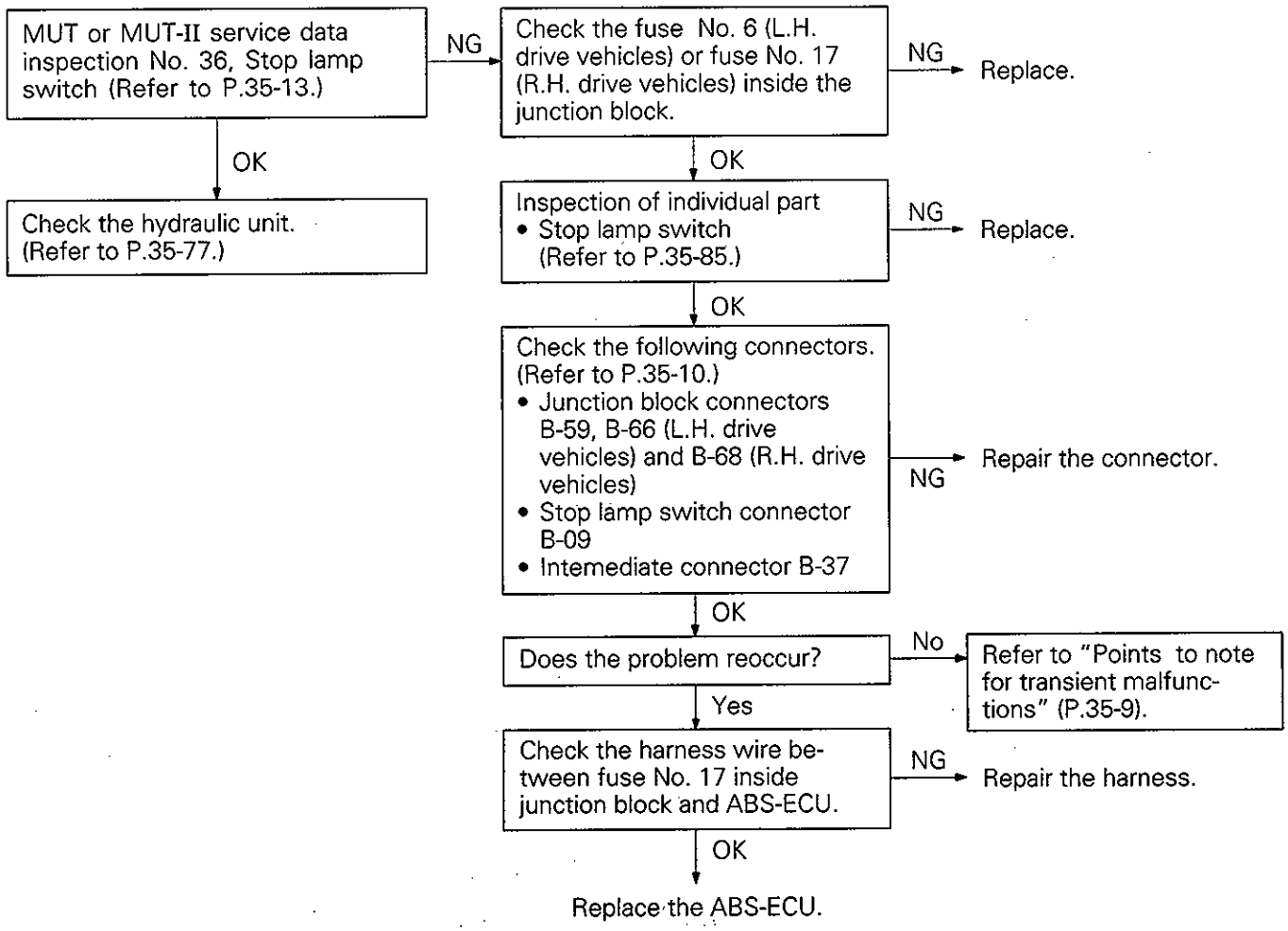
B–32



- No → Repair the harness.
- Yes ↓

Replace the ABS-ECU.

7	ABS function does not easily operate	Probable cause
	[Comment] If the stop lamp switch ON signal is not input to the ABS-ECU even once after the engine has been started, the ABS control starting vehicle speed becomes 15km/h (9.3mph) or more. [If the signal is input even once, control is possible at a vehicle speed of 6km/h (3.7mph) or more.] This symptom occurs when there is an open circuit in the stop lamp switch. [Hint] When the illumination and switching off of the stop lamp switch is normal and MUT or MUT-II service data No. 36 displays "OFF" even though the brake pedal is depressed, there is an open circuit in the stop lamp switch input circuit, or the ABS-ECU interface circuit is defective.	• Blown fuse • Malfunction of stop lamp switch • Malfunction of hydraulic unit • Broken wire, disconnected connector • Malfunction of ABS-ECU



8 No diagnosis output (Communication with MUT or MUT-II not possible)

[Comment] When communication with the MUT or MUT-II is not possible, the cause is probably an open circuit in the ABS-ECU power circuit or an open circuit in the diagnosis output circuit.

Probable cause

- Blown fuse
- Malfunction ABS power relay
- Broken wire, disconnected connector
- Malfunction of ABS-ECU

Can communication be made between other electronic control systems and the MUT or MUT-II?

No → Defect in the MUT or MUT-II mechanism. Repair the MUT or MUT-II and reinspect.

Yes ↓

Check the special fuse No. 5.

NG → Replace.

OK ↓

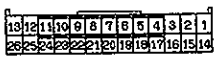
Inspection of individual part
- ABS power relay (Refer to P.35-81.)

NG → Replace.

OK ↓

1. ABS-ECU connector B-33: Disconnected
2. Ignition switch: ON

Between the harness side connector terminal No. 5 and the earth: Battery voltage

B–33 

NG → Check the following connectors. (Refer to P.35-10.)
- Relay connector B-43
- ABS-ECU connector B-33
- Intermediate connectors B-01 and B-37

NG → Repair the connector.

OK ↓

Does the problem reoccur?

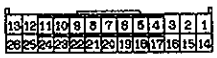
No → Refer to "Points to note for transient malfunctions" (P.35-9).

Yes ↓

Check the harness wire between special fuse No. 5 and ABS-ECU.

OK ↓

1. ABS-ECU connector B-33: Disconnected
(1) Between the harness side connector terminal No. 12 and the earth: Continuity
(2) Between the harness side connector terminal No. 25 and the earth: Continuity

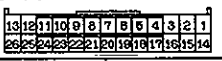
B–33 

NG → Repair the harness or the earth.

OK ↓

1. ABS-ECU connector B-33: Disconnected
(1) Between the harness side connector terminal No. 22 of the ABS-ECU and the diagnosis connector terminal No. 4 <Vehicles built up to September 1993>, No. 8 <Vehicles built from October 1993>: Continuity
(2) Between the harness side connector terminal No. 9 of the ABS-ECU and the diagnosis connector terminal No. 10: Continuity

ABS-ECU connector

B–33 

NG → Check the following connectors. (Refer to P.35-10.)
- Intermediate connector B-33
- ABS-ECU connector B-37

NG → Repair the connector.

OK ↓

Does the problem reoccur?

No → Refer to "Points to note for transient malfunctions" (P.35-9).

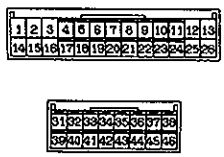
Yes ↓

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

OK ↓

Replace the ABS-ECU.

ABS-ECU connector terminal arrangement



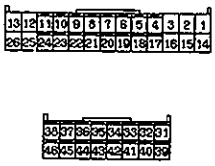
12. INSPECTION OF ABS-ECU

(1) Check that the battery voltage is normal.
(2) With the connector connected, insert the test bar attached to the special tool (MB991222) into the reverse side of the connector and check the voltage and continuity between each terminal and the body earth when the ignition switch is "ON".

Terminal No.	Signal	Input or output	Item	Check condition		Diagnosis standard	Main abnormal location
1	Front left solenoid	Output	Voltage	Ignition switch: ON (When solenoid is OFF approx. 1 second after engine is started.)		Battery voltage	• ABS valve relay • Hydraulic unit
2	Rear left solenoid	Output	Voltage	Ignition switch: ON (When solenoid is OFF approx. 1 second after engine is started.)		Battery voltage	• ABS valve relay • Hydraulic unit
5	Ignition switch	Input	Voltage	Ignition switch: ON		Battery voltage	• ABS power relay
				Ignition switch: START		0 V	
7	Motor relay coil	Output	Voltage	Ignition switch: ON (Approx. 1 second after engine is started.)	Motor: ON	Battery voltage	• ABS motor relay • ABS-ECU
					Motor: OFF	0 – 2 V	
8	Valve relay coil	Output	Voltage	Ignition switch: ON	When idling	0 – 2 V	• ABS valve relay • ABS-ECU
					When system abnormality is detected	Battery voltage	
9	Service data and actuator test	Input	Voltage	MUT or MUT-II: Disconnected		Approx. 12V	• Harness
				MUT or MUT-II: Connected		0 V	
10	Diagnosis code	Output	Voltage	MUT or MUT-II: Disconnected		0 ↔ 12 V (Displayed in intervals of 0.5 sec.)	
11	Stop lamp switch	Input	Voltage	Ignition switch: ON (Stop lamp switch: ON)		8 V or more	• Stop lamp switch
				Ignition switch: ON (Stop lamp switch: OFF)		1.5 V or less	
12	Earth	Input	Continuity	At any time		Continuity	• Body earth

Terminal No.	Signal	Input or output	Item	Check condition		Diagnosis standard	Main abnormal location
13	Motor monitor	Input	Voltage	Ignition switch: ON (Approx. 1 second after engine is started.)	Motor: ON	Battery voltage	• ABS motor relay • ABS-ECU • Hydraulic unit
					Motor: OFF	0 – 2 V	
14	Front right solenoid	Output	Voltage	Ignition switch: ON (When solenoid is OFF approx. 1 second after engine is started.)		Battery voltage	• ABS valve relay • Hydraulic unit
15	Rear right solenoid						
21	ABS warning lamp	Output	Voltage	Ignition switch: ON	When lamp switches off	Battery voltage	• ABS warning lamp
					When lamp illuminates	0 – 2 V	
2	MUT	Output/ Input	Voltage	MUT or MUT-II: Connected		Serial communication with MUT or MUT-II	• Harness
				MUT or MUT-II: Disconnected		1 V or less	
25	Earth	Input	Continuity	At any time		Continuity	• Body earth
35	Rear left wheel speed sensor (– wire)	Input	Continuity	At any time		Continuity	• Rear left wheel speed sensor • ABS-ECU
36	Front right wheel speed sensor (– wire)	Input	Continuity	At any time		Continuity	• Front right wheel speed sensor • ABS-ECU
37	Rear right wheel speed sensor (– wire)	Input	Continuity	At any time		Continuity	• Rear right wheel speed sensor • ABS-ECU
38	Front left wheel speed sensor (– wire)	Input	Continuity	At any time		Continuity	• Front left wheel speed sensor • ABS-ECU
41	Alternator	Input	Voltage	Ignition switch: ON (During engine stopped)		2 – 5 V	• Alternator
				Ignition switch: ON (During engine running)		Approx. 12V	

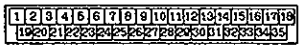
ABS-ECU harness side connector terminal arrangement



(3) Disconnect the connector from the ABS-ECU and inspect the resistance and continuity between each of the terminals on the harness-side connector.

Terminal No.	Signal	Item	Check terminal	Check condition	Diagnosis standard	Main abnormal location
1	Front left solenoid	Resistance	Between terminal No. 1 and body earth	Ignition switch: OFF	3.10–3.34 Ω	• Hydraulic unit • ABS valve relay
2	Rear left solenoid	Resistance	Between terminal No. 2 and body earth	Ignition switch: OFF	3.10–3.34 Ω	• Hydraulic unit • ABS valve relay
13	Motor monitor	Continuity	Between terminal No. 13 and body earth	Ignition switch: OFF	Continuity	• Hydraulic unit
14	Front right solenoid	Resistance	Between terminal No. 14 and body earth	Ignition switch: OFF	3.10–3.34 Ω	• Hydraulic unit • ABS valve relay
15	Rear right solenoid	Resistance	Between terminal No. 15 and body earth	Ignition switch: OFF	3.10–3.34 Ω	• Hydraulic unit • ABS valve relay
43	Rear left wheel speed sensor (+wire)	Resistance	Between terminals No. 35 and No. 43	Ignition switch: OFF	1.4–2.2 kΩ	• Rear left wheel speed sensor
44	Front right wheel speed sensor (+ wire)	Resistance	Between terminals No. 36 and No. 44	Ignition switch: OFF	1.4–2.2 kΩ	• Front right wheel speed sensor
45	Rear right wheel speed sensor (+ wire)	Resistance	Between terminals No. 37 and No. 45	Ignition switch: OFF	1.4–2.2 kΩ	• Rear right wheel speed sensor
46	Front left wheel speed sensor (+ wire)	Resistance	Between terminals No. 38 and No. 46	Ignition switch: OFF	1.4–2.2 kΩ	• Front left wheel speed sensor

Connector terminal arrangement for troubleshooting



Terminal arrangement shown on the special tool connector

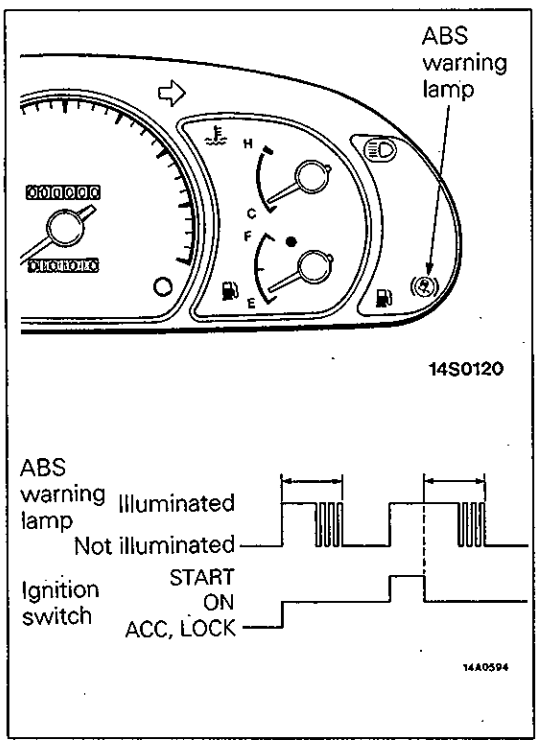
ABS – 4WD

Caution

1. **When carrying out inspection of the ABS-ECU terminal voltage and resistance, the special tool (MB991356) should be used.**
2. **Because the ABS-ECU connector terminal arrangement for troubleshooting is different from the terminal arrangement shown on the special tool connector, when using the special tool for inspecting, take the readings from the terminal numbers of the special tool.**

Example

ABS-ECU connector terminal number for troubleshooting	Terminal number shown on the special tool connector
18	1

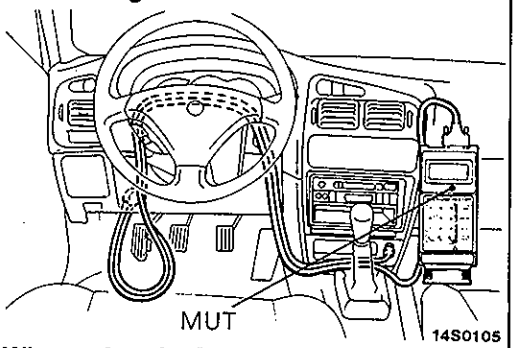


1. INSPECTION OF ABS WARNING LAMP

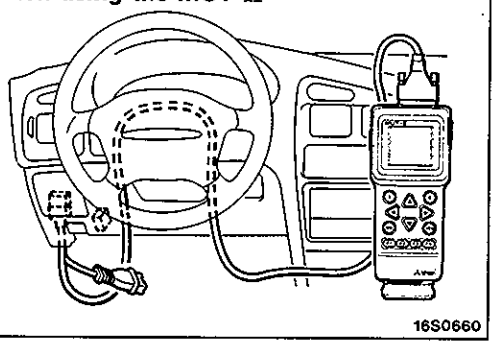
Check that the ABS warning lamp illuminates as follows.

(1) When the ignition switch is turned to "ON", the ABS warning lamp flashes 4 times during a 1.5 second period and then the lamp switches off.
(2) When the ignition switch is turned to "START", the ABS warning lamp remains illuminated.
(3) When the ignition switch is turned back to the "ON", the ABS warning lamp flashes 4 times and then the lamp stays switched off.
(4) If the illumination is other than the above, check the diagnosis codes.

When using the MUT



When using the MUT-II



2. INSPECTION BY SELF-DIAGNOSIS [WHEN USING THE MULTI-USE TESTER (MUT) <Up to 1993 models> OR THE MUT-II <All models>]

Caution
Connection and disconnection of the MUT or MUT-II should always be made with the ignition switch in the OFF position.

(1) With the ignition switch OFF, connect the MUT or MUT-II through the adapter harness (MB991377) <Up to 1993 models> or the adapter harness included in the MUT-II sub assembly <All models>, turn the ignition ON and select the ABS system. (The ABS warning lamp lights up, it goes into the MUT or MUT-II mode. In the MUT or MUT-II mode, ABS does not function.)
If it does not go into the MUT or MUT-II mode, check the ECU power circuit and the harness between the ECU and diagnosis check terminals.
(2) Read and make a note of the diagnosis output codes.
(3) Momentarily erase the diagnosis code memory (See below.)
(4) Check whether the ABS warning lamp will switch off when the engine is restarted. If the lamp switches off, the problem is only temporary, or it is a problem that can only be detected while driving.
(5) If the ABS warning lamp does not switch off, or if the ABS function is stopped by a repeated driving test and a malfunction code is output, inspect according to the diagnosis code inspection charts.
(6) After the inspection, turn the ignition switch to "OFF" and disconnect the MUT or MUT-II.

3. METHOD OF ERASING THE DIAGNOSIS CODE MEMORY WHEN USING THE MULTI-USE TESTER (MUT) <Up to 1993 models> OR THE MUT-II <All models>

Caution
When repairs are completed, the diagnosis code memory should be erased. When the ABS-ECU function is stopped, the malfunction code memory cannot be erased.

(1) Erase the memory with the MUT or MUT-II.

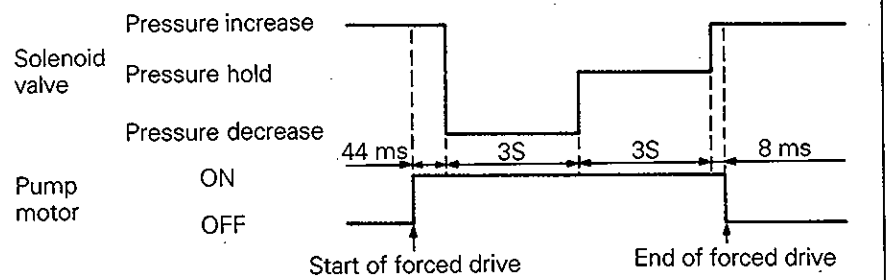
NOTE
After erasing the memory, a command cannot be received from the MUT or MUT-II. When checking diagnosis codes, momentarily stop and restart the engine, and then reactivate the MUT or MUT-II.

(2) Check the diagnosis codes to check that the memory has been erased.

4. ACTUATOR TEST FUNCTION

The actuator can be force-driven using the MUT or MUT-II, enabling easy operation checking to be performed.

NOTE
1. When the ECU is cancelling the function, actuator testing cannot be carried out.
2. Actuator testing is only possible when the vehicle is stationary. When force-driving the actuator, if the vehicle speed reaches 10 km/h (6 mph), forced-driving is cancelled.
3. The item Nos. in the table below indicate the numbers input to the MUT or MUT-II when actuator testing is carried out.

Item No.	Drive object	Drive pattern
04	Front right solenoid valve and pump motor	
05	Front light solenoid valve and pump motor	

5. TROUBLESHOOTING QUICK-REFERENCE CHART

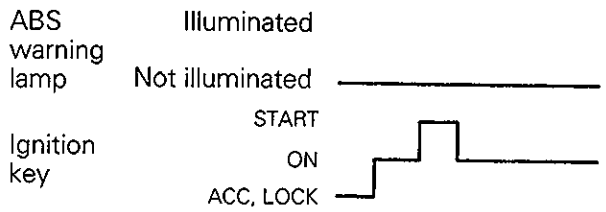
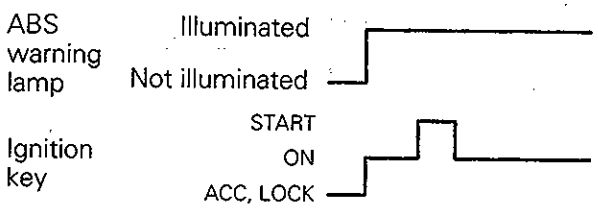
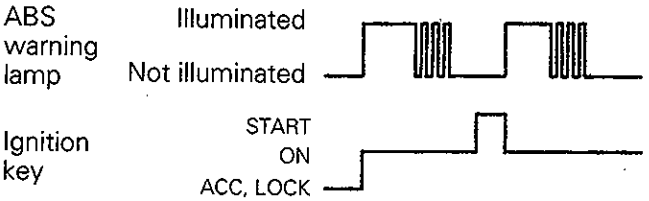
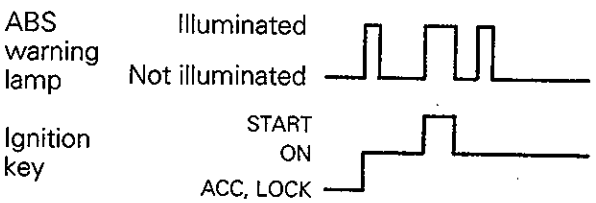
5-1. INSPECTION CHART CLASSIFIED BY DIAGNOSIS CODE

Inspect according to the inspection chart that is appropriate for the malfunction code.

Diagnosis code No.	Inspection item	Diagnosis content	Inspection chart No.	Reference page
11	Front left wheel speed sensor	Open circuit or short in + wire	1	P.35-48
12	Front right wheel speed sensor			
13	Rear right wheel speed sensor			
14	Rear left wheel speed sensor			
15	Vehicle speed sensor	Abnormal output signal	2	P.35-49
21	G sensor	Open circuit or OFF malfunction	3	P.35-50
22	Stop lamp switch	Open circuit or ON malfunction	4	P.35-51
41	Front left solenoid valve	No response to solenoid valve drive signal	5	P.35-52
42	Front right solenoid valve			
43	Solenoid valve drift	Current value in both valves is different when in same mode		
51	Valve relay	No response in valve relay to solenoid valve drive signal	6	P.35-53
52	Motor relay, motor	No response in motor relay and motor to motor drive signal	7	P.35-54
55	ABS-ECU	Malfunction inside the ABS-ECU	Replace ABS-ECU.	P.35-116

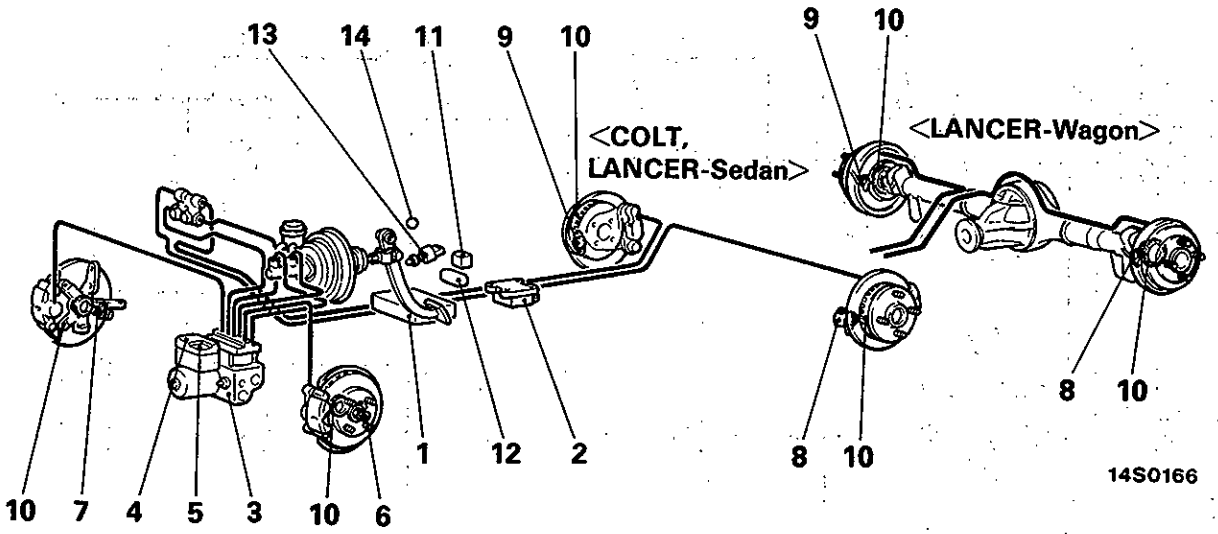
5-2. INSPECTION CHART CLASSIFIED BY TROUBLE SYMPTOMS

Get an understanding of the trouble symptoms and check according to the inspection chart.

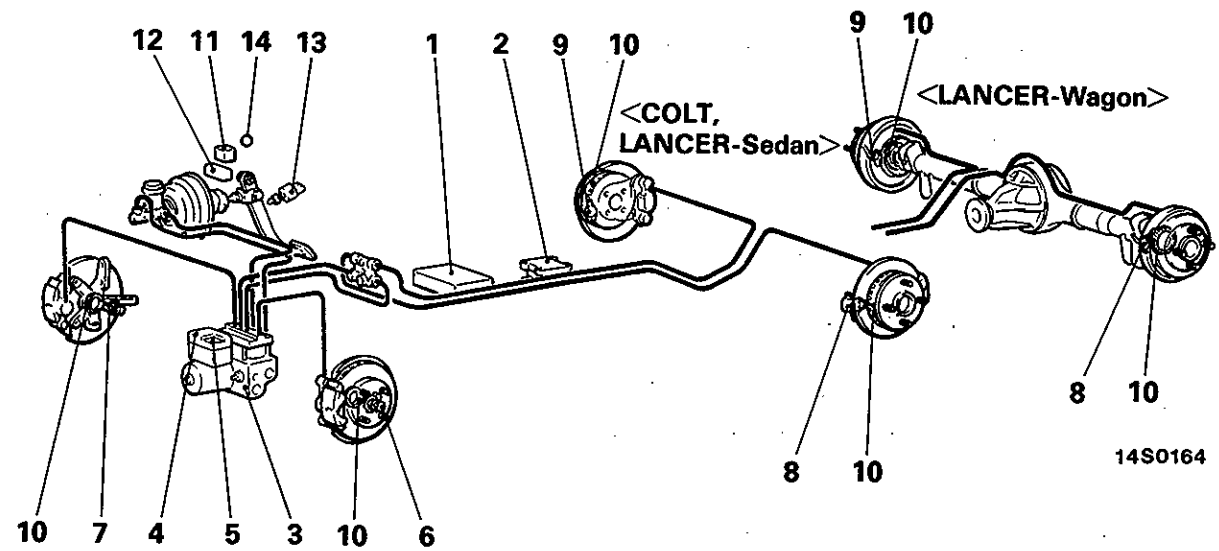
Trouble symptom	Inspection chart No.	Reference page
When the ignition key is turned to "ON" (engine stopped), the ABS warning lamp does not illuminate. ABS warning lamp: Illuminated / Not illuminated Ignition key: START / ON / ACC, LOCK  14A0590	1	P. 35–55
After the engine starts, the lamp remains illuminated. ABS warning lamp: Illuminated / Not illuminated Ignition key: START / ON / ACC, LOCK  14A0591	2	P. 35–56
When the ignition key is turned to "START", the ABS warning lamp does not illuminate. ABS warning lamp: Illuminated / Not illuminated Ignition key: START / ON / ACC, LOCK  14A0595	3	P. 35–56
After the ignition key is turned to "ON", the ABS warning lamp blinks once, and when turned to "START", it illuminates. When returned to "ON", the lamp flashes once, and then switches off. ABS warning lamp: Illuminated / Not illuminated Ignition key: START / ON / ACC, LOCK  14A0593	4	P. 35–57
Faulty ABS operation: Unequal braking power on both sides	5	P. 35–57
Faulty ABS operation: Insufficient braking power		
Faulty ABS operation: ABS operates under normal braking conditions		
Faulty ABS operation: ABS operates before vehicle stops under normal braking conditions		
Faulty ABS operation: Large brake pedal vibration when ABS operates		
No diagnosis output (no communication with MUT or MUT-II)	6	P. 35–59

6. COMPONENTS

L.H. drive vehicles



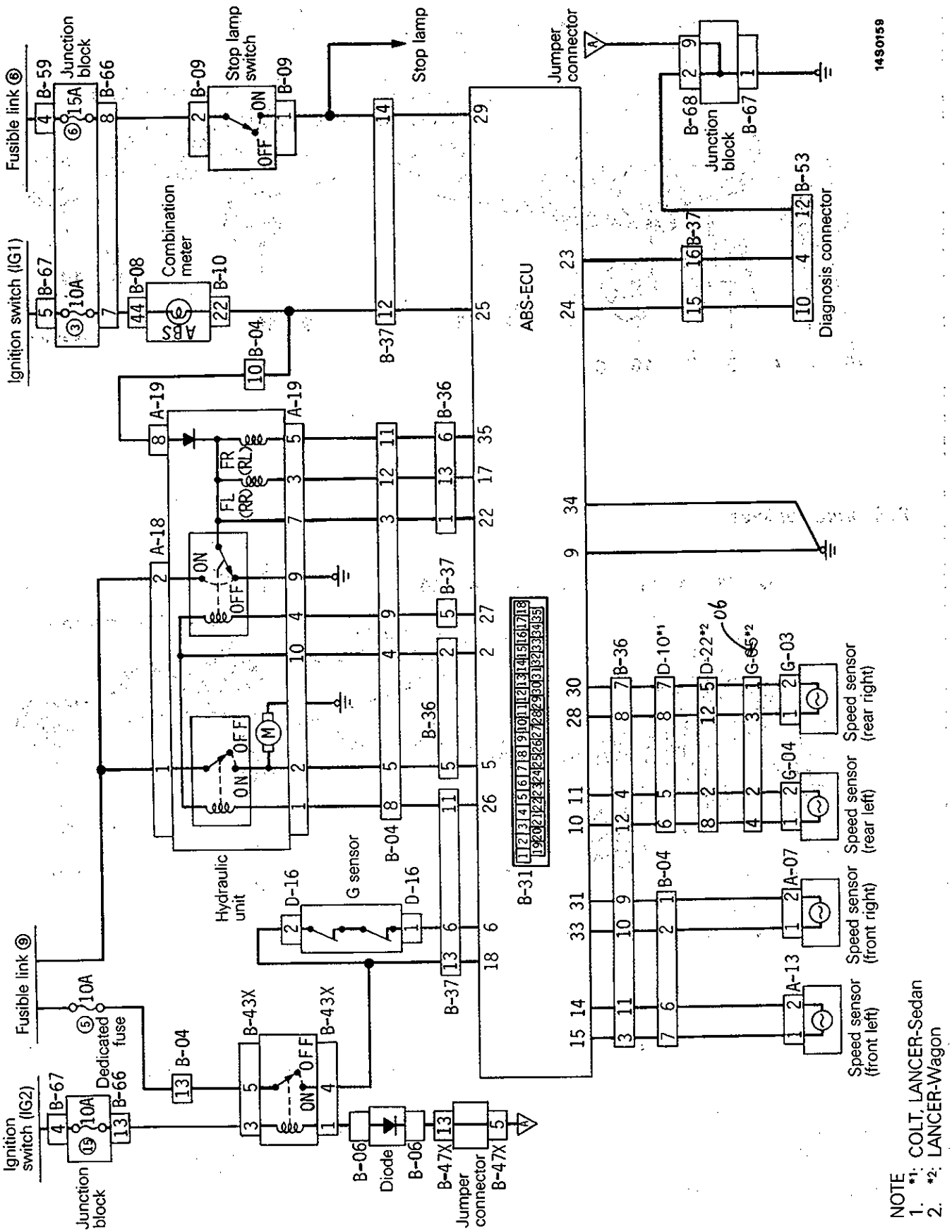
R.H. drive vehicles



1. ABS-ECU
2. G sensor
3. Hydraulic unit
4. ABS valve relay
5. ABS motor relay
6. Wheel speed sensor (front left)
7. Wheel speed sensor (front right)
8. Wheel speed sensor (rear left)
9. Wheel speed sensor (rear right)
10. Rotor
11. ABS power relay
12. Diagnosis connector
13. Stop lamp switch
14. ABS warning lamp

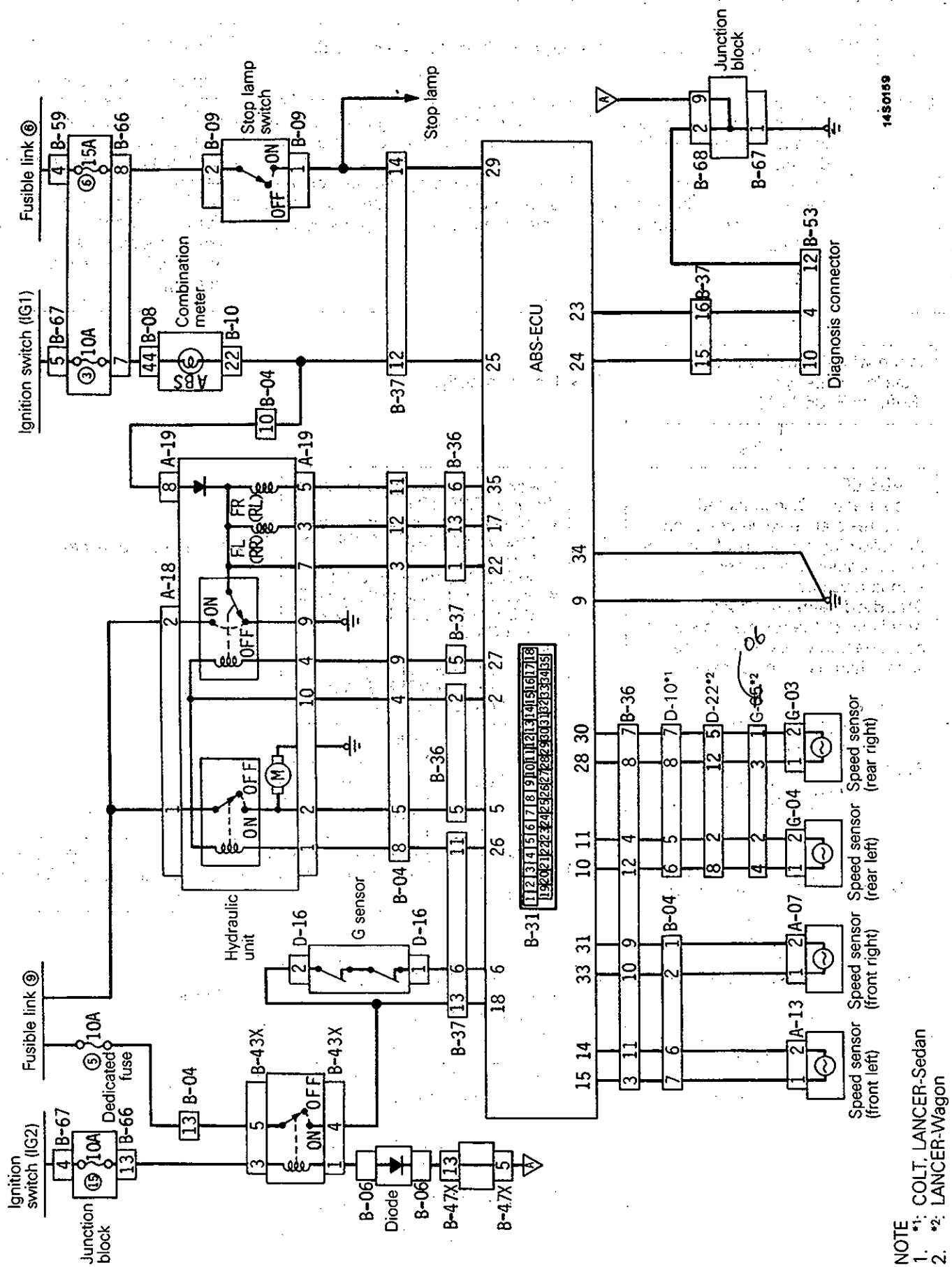
7. CIRCUIT DIAGRAM

<4WD-L.H. drive vehicles>



NOTE
1. *1: COLT, LANCER-Sedan
2. *2: LANCER-Wagon

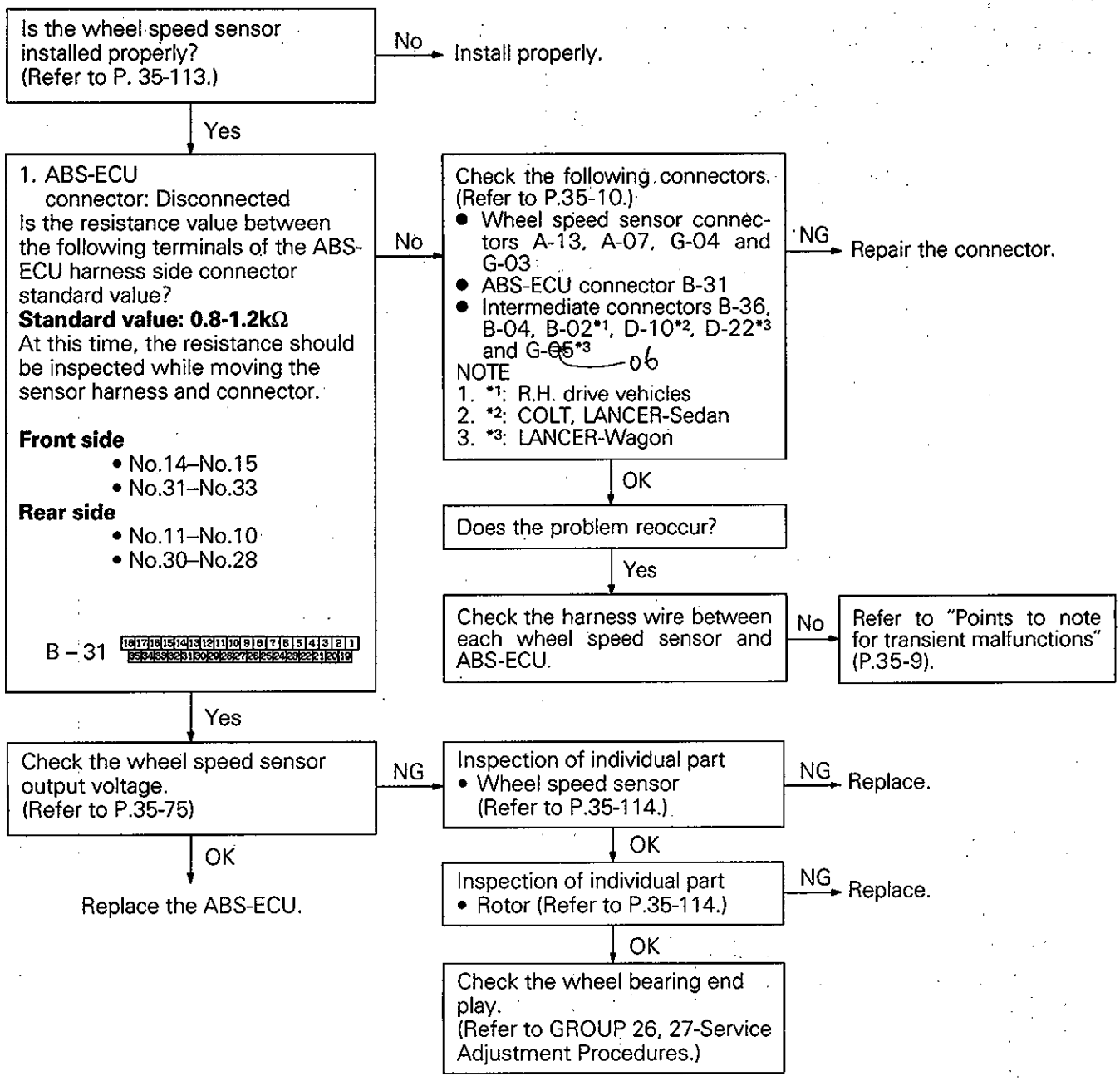
<4WD-R.H. drive vehicles>



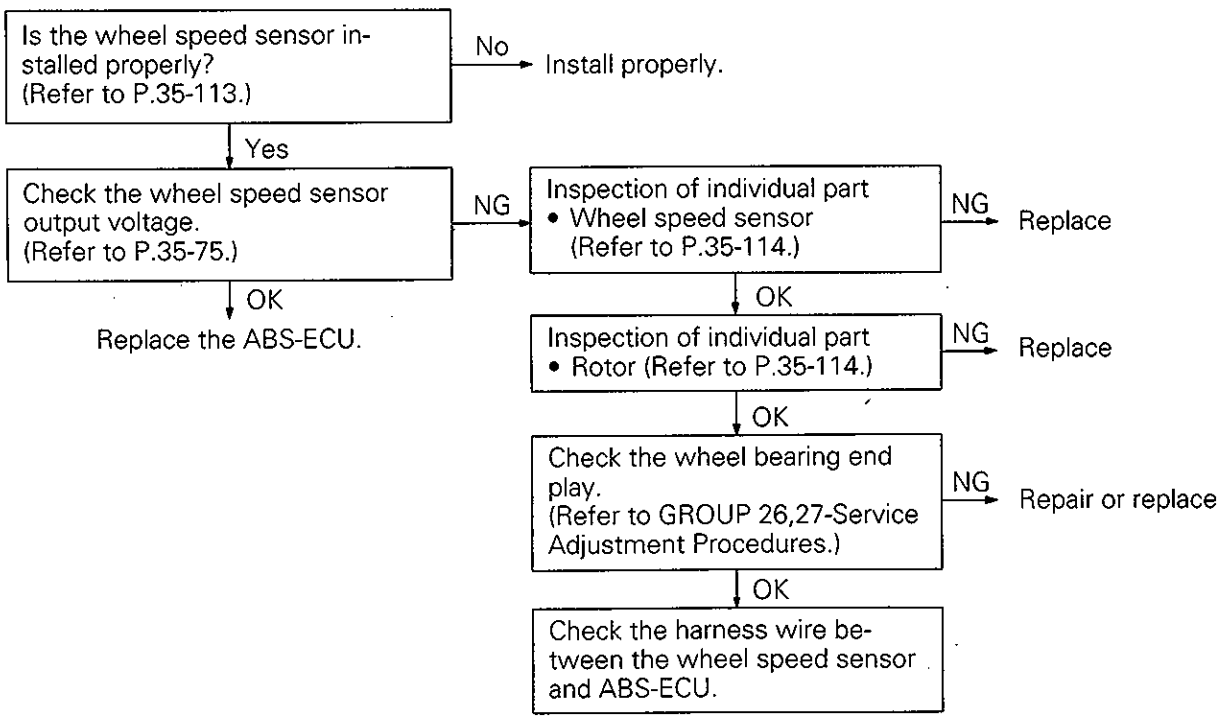
NOTE
1. *1: COLT, LANCER-Sedan
2. *2: LANCER-Wagon

8. INSPECTION CHART CLASSIFIED BY DIAGNOSIS CODE

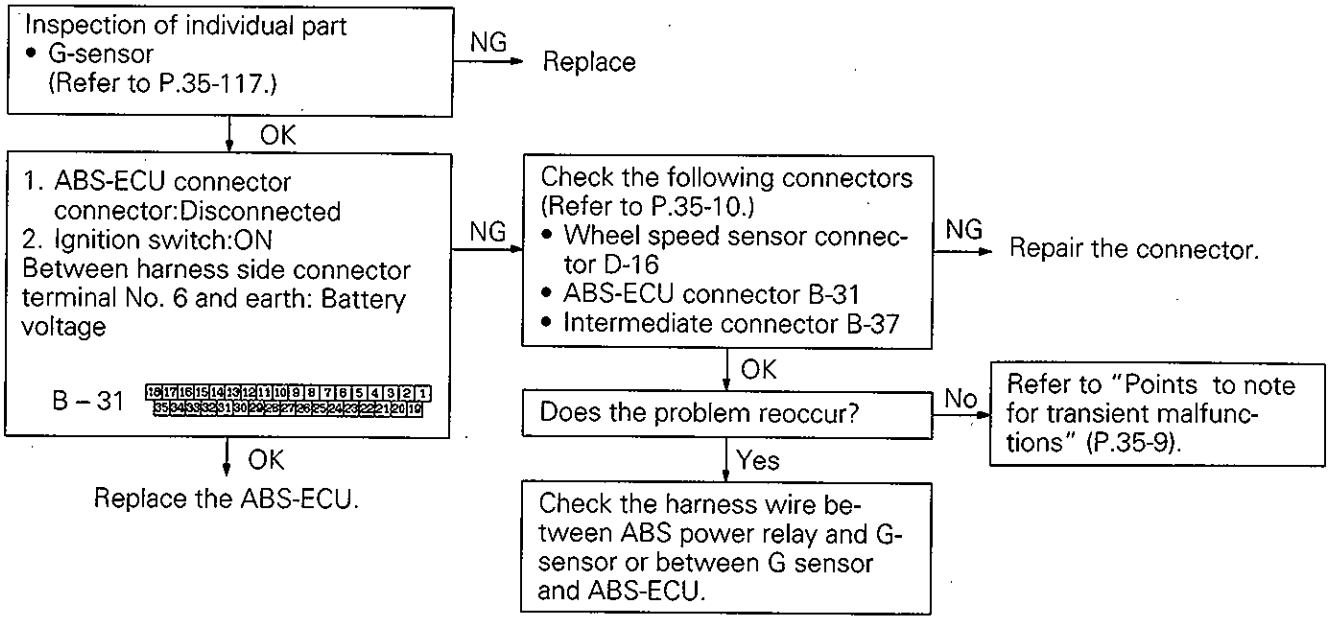
1	When diagnosis code No. 11, No. 12, No. 13 or No. 14 are displayed	Probable cause
	[Comment] The ABS-ECU detects breaks in the wheel speed sensor wire. This malfunction code is output if the wheel speed sensor signal is not input (or short circuited) or if its output is low when starting to drive or while driving. [Hint] In addition to an open or short circuit in the wheel speed sensor, also check whether the sensor gap is too large, sensor harness wire is broken, or sensor harness and body connector are not properly connected.	• Improper installation of wheel speed sensor • Bad contact of sensor harness connector • Malfunction of wheel speed sensor • Malfunction of rotor • Foreign material adhered to wheel speed sensor • Malfunction of wheel bearing



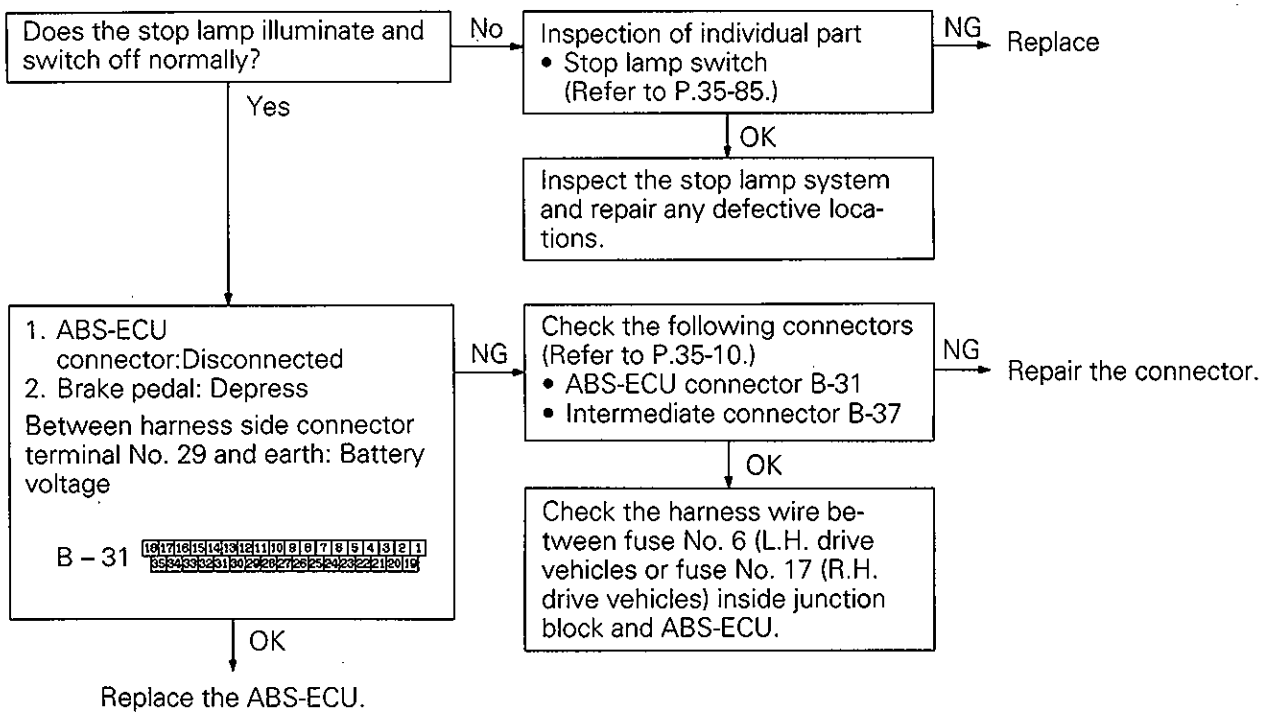
2	When diagnosis code No. 15 is displayed	Probable cause
	[Comment] This malfunction code is output when there is an abnormality (other than broken wire or short circuit) in any of the wheel speed sensor output signals while driving. [Hint] The following can be considered as the cause of the wheel speed sensor output abnormality. • Distortion of rotor, teeth missing • Low frequency noise interference when sensor harness wire is broken • Noise interference in sensor signal • Sensor output signal is below the standard value or amplitude modulation is over the standard value. Using an oscilloscope to measure the wave shape of the wheel speed sensor output signal is very effective. • Broken sensor harness • Poor connection of connector	• Improper installation of wheel speed sensor • Malfunction of wheel speed sensor • Malfunction of rotor • Malfunction of wheel bearing • Shortcircuited harness wire • Malfunction of ABS-ECU



3	When diagnosis code No. 21 is displayed	Probable cause
	[Comment] The ABS-ECU outputs this malfunction code in the following cases. • G-sensor OFF trouble (It is judged when the G-sensor continues to be OFF for more than approximately 13 seconds except when the vehicle is stopped or when there is stop lamp switch input.) • When there is an open or short circuit in the harness for the G-sensor system.	• Malfunction of G-sensor • Defective harness, disconnected connector • Malfunction of ABS-ECU



4	When diagnosis code No. 22 is displayed	Probable cause
	[Comment] The ABS-ECU outputs this malfunction code in the following cases. • Stop lamp switch remains on for more than 15 minutes while the ABS is not functioning. • The harness wire for the stop lamp switch may be open. [Hint] If the stop lamp operates normally, there is an open circuit in the harness for the stop lamp switch input circuit is broken or there is a malfunction in the ABS-ECU.	• Malfunction of stop lamp switch • Broken wire, disconnected connector • Malfunction of ABS-ECU



5	When diagnosis code No. 41, No. 42 or No. 43 are displayed	Probable cause
	[Comment] The ABS-ECU normally monitors the solenoid valve drive circuit. If no current flows in the solenoid even if the ECU turns the solenoid ON or if it continues to flow even when turned OFF, the ECU determines the solenoid coil wire is broken/short-circuited or the harness is broken/short-circuited, and then these malfunction codes are output.	• Malfunction of hydraulic unit • Broken wire, disconnected connector • Shortcircuited harness wire • Malfunction of ABS-ECU

1. Hydraulic unit connector A-19:Disconnected

Is the resistance value between the following terminals of the hydraulic unit side connector standard value?

Standard value:1.0-1.3Ω

- No.7–No.3
- No.7–No.5

A – 19 

No → Replace the hydraulic unit.

Yes ↓

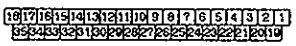
1. Hydraulic unit connector A-19:Disconnected
2. ABS-ECU connector:Disconnected

Is the resistance value between the terminals of the hydraulic unit side connector and ABS-ECU harness side connector standard value?

Standard value:1.0–1.3Ω

Hydraulic unit side		ABS-ECU side
• No.7	–	No.17
• No.7	–	No.35

Hydraulic unit side A–19 

ABS-ECU side B – 31 

NG → Check the following connectors. (Refer to P.35-10.)
- Hydraulic unit connector A-19
- ABS-ECU connector B-31
- Intermediate connectors B-04 and B-36

NG → Repair the connector.

OK ↓

Does the problem reoccur?

No → Refer to "Points to note for transient malfunctions" (P.35-9).

Yes ↓

Check the harness wire between hydraulic unit and ABS-ECU

OK ↓

Replace the ABS-ECU.

6 When diagnosis code No. 51 is displayed

[Comment] When the ignition switch is turned ON, the ABS-ECU switches the valve relay OFF and ON for an initial check, compares the voltage of the signal to the valve relay and valve power monitor line voltage to check whether the valve relay operation is normal. In addition, normally it monitors whether or not there is power in the valve power monitor line since the valve relay is normally ON. If the supply of power to the valve power monitor line is interrupted, this malfunction code will be output.

Probable cause

- Malfunction of ABS valve relay
- Malfunction of hydraulic unit
- Broken wire, disconnected connector
- Malfunction of ABS-ECU

Inspection of individual part
- ABS valve relay
(Refer to P.35-111.)

NG → Replace.

OK ↓

1. Hydraulic unit connector A-18: Disconnected

Between the harness side connector terminal No.2 and the earth: Battery voltage

A – 18

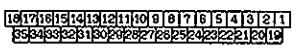
NG → Check the harness wire between fusible link No. 9 and hydraulic unit.

OK ↓

1. ABS-ECU connector:Disconnected

Resistance between the harness side connector terminals No.2 and No.27:60-120Ω

B – 31



NG → Check the following connectors.
(Refer to P.35-10.)
- Hydraulic unit connector A-19
- ABS-ECU connector B-31
- Intermediate connectors B-04,B-36 and B-37

NG → Repair the connector.

OK ↓

Does the problem reoccur?

No → Refer to "Points to note for transient malfunctions" (P.35-9).

Yes ↓

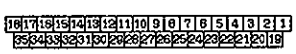
Check the harness wire between hydraulic unit and ABS-ECU.

OK ↓

1. ABS-ECU connector:Disconnected
2. Ignition switch:ON

Between the harness side connector terminal No.22 and the earth: Battery voltage

B – 31



NG → Check the harness wire between hydraulic unit and ABS-ECU.

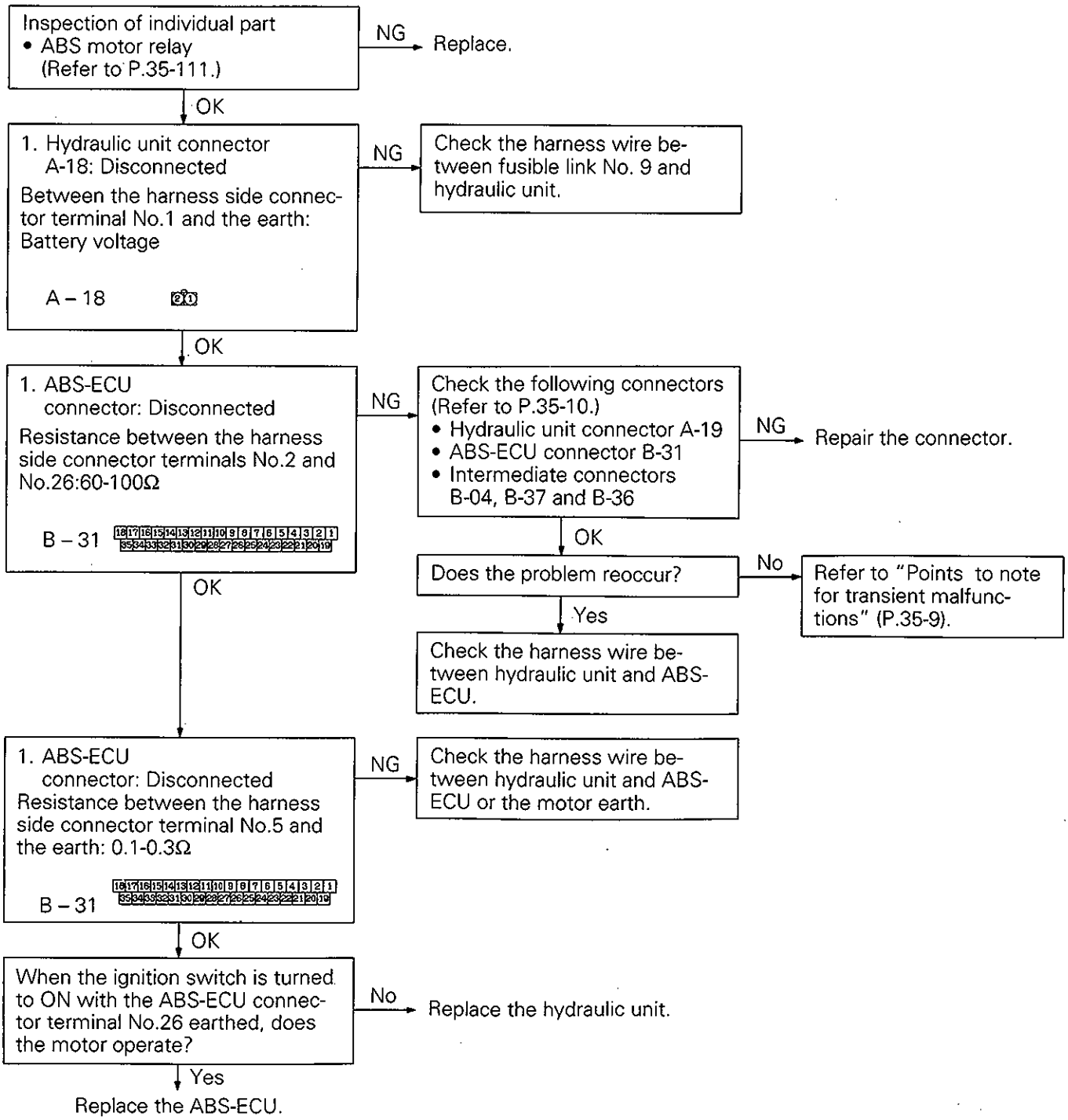
OK ↓

Replace the ABS-ECU.

7 When diagnosis code No. 52 is displayed

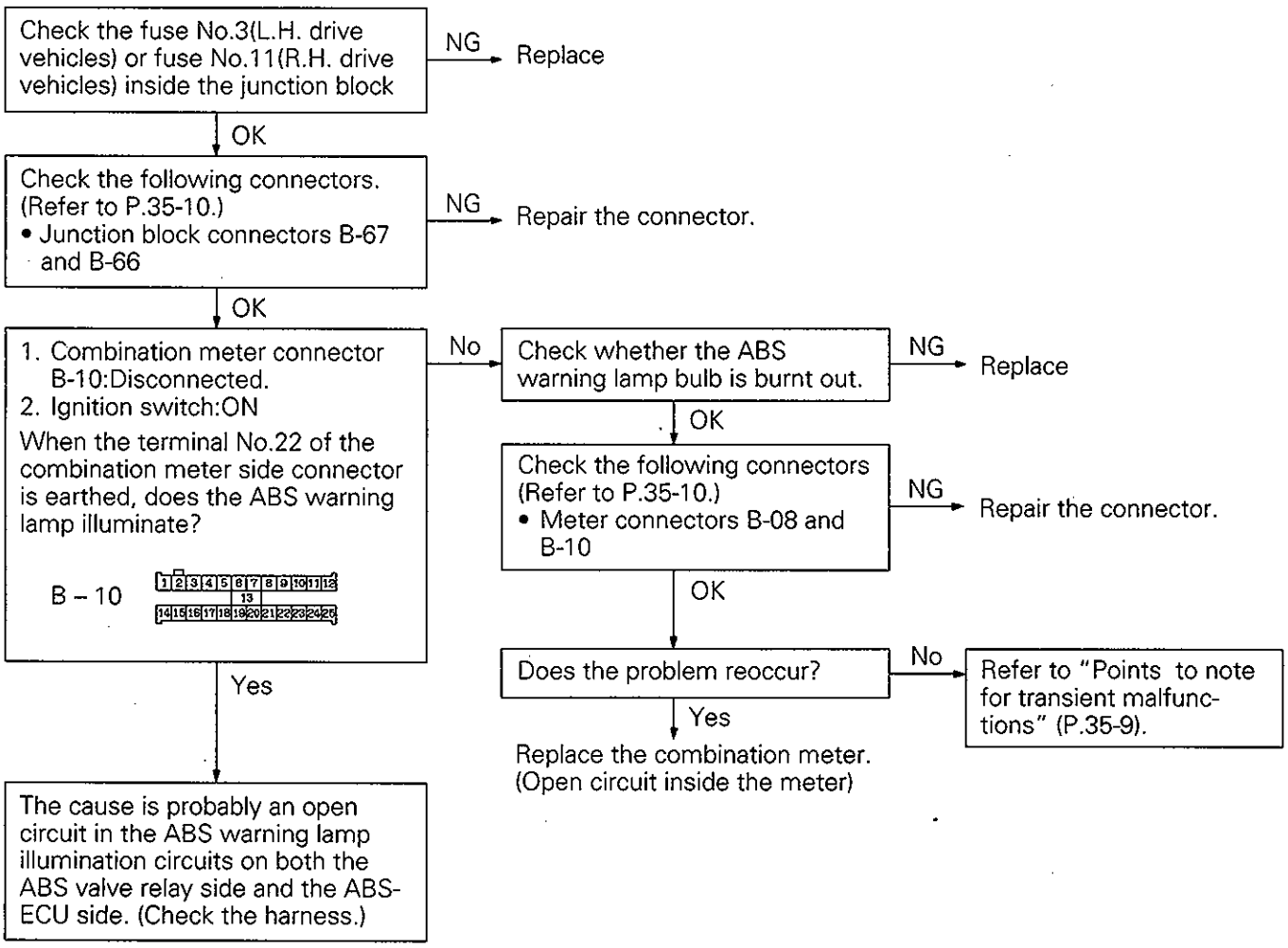
[Comment] The ABS-ECU outputs this malfunction code for the motor relay and motor in the following cases.
- When motor relay is ON and no signal is input to the motor monitor line (when motor is not operating, etc.)
- When motor relay is OFF and signal is input to the motor monitor line for approximately 5 seconds or more (when motor continues operating, etc.)
- When the motor relay does not function

Probable cause
- Malfunction of ABS motor relay
- Malfunction of hydraulic unit
- Broken wire, disconnected connector
- Malfunction of ABS-ECU



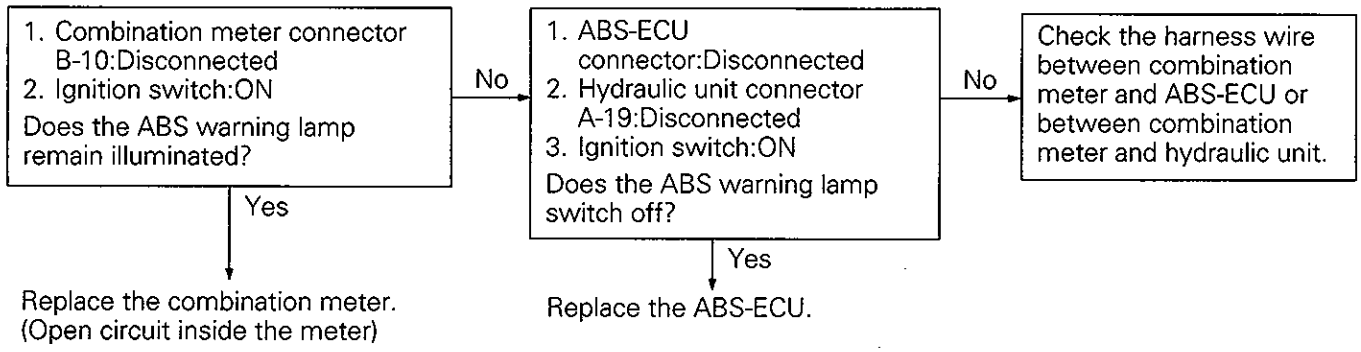
9. INSPECTION CHART CLASSIFIED BY TROUBLE SYMPTOMS

1	When ignition key is turned to "ON" (engine stopped), ABS warning lamp does not illuminate	Probable cause
	[Comment] When power is supplied to the ABS-ECU, the valve relay changes from ON to OFF→ON by the initial check, and thus even if there is a problem with the circuit between ABS warning lamp and ABS-ECU, the lamp will illuminate once when the valve relay is OFF. Accordingly, the cause of the lamp not illuminating is probably an open circuit in the lamp power circuit, a blown lamp bulb, or an open circuit in both the circuit between the ABS warning lamp and the ABS-ECU and the circuit between the ABS warning lamp and the ABS valve relay.	• Blown fuse • Burnt out ABS warning lamp bulb • Broken wire, disconnected connector
	[Hint] When other warning lamps also do not illuminate, the cause is probably a blown fuse.	

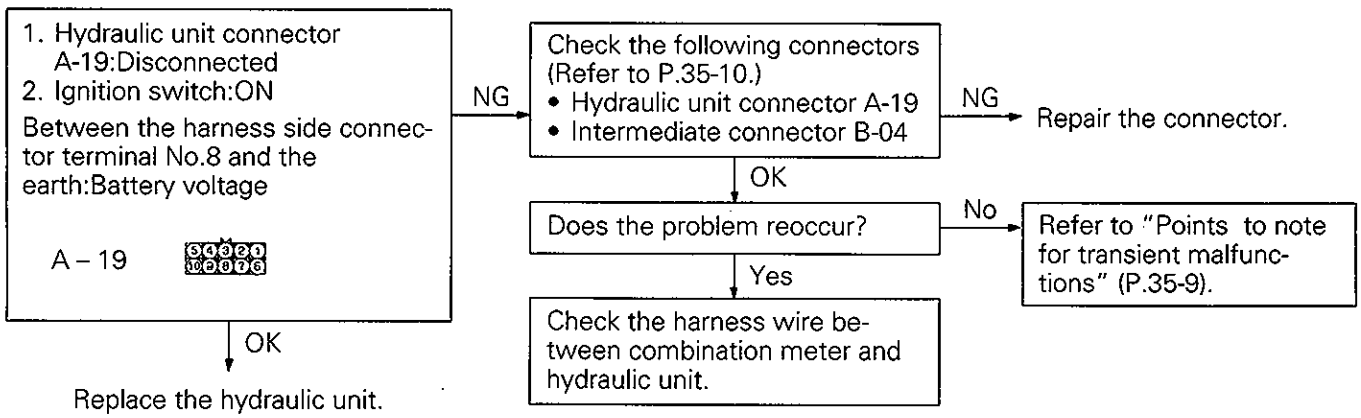


2	**Even after the engine is started, the ABS warning lamp remains illuminated.**	Probable cause
	[Comment] There is probably a short in the ABS warning lamp illumination circuit.	• Malfunction of combination meter • Malfunction of ABS-ECU • Shortcircuited harness wire

NOTE
This trouble symptom is limited to cases where communication with the MUT or MUT-II is possible (ABS-ECU power supply is normal) and the diagnosis code is a normal diagnosis code.



3	**When ignition key is turned to "START", ABS warning lamp does not illuminate.**	Probable cause
	[Comment] The ABS-ECU uses the power to the IG2 which is cut when the ignition switch is turned to "START". The ABS warning lamp uses IG1 power which is not cut even when the ignition switch is turned to "START". Accordingly, because the power to the ABS-ECU is stopped in "START" position, if the warning lamp does not illuminate at this time, the cause is a problem in the lamp illumination circuit in the valve relay.	• Malfunction of hydraulic unit • Broken wire, disconnected connector



4 The ABS warning lamp flashes once after the ignition key is turned to "ON". The lamp illuminates when the ignition key is turned to "START", and when the key is returned to "ON", it flashes once.

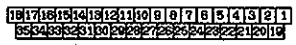
[Comment] When power flows, the ABS-ECU turns on the warning lamp for approximately 1 second while it performs a valve relay test. If there is a break in the harness between the ECU and the warning lamp the lamp illuminates only when the valve relay is off in the valve relay test, etc.

Probable cause

- Broken wire, disconnected connector
- Malfunction of ABS-ECU

1. ABS-ECU connector:Disconnected
2. Ignition switch:ON

Between the harness side connector terminal No.25 and the earth:Battery voltage

B – 31 

NG → Check the following connectors (Refer to P.35-10.)
- ABS-ECU connector B-31
- Intermediate connector B-37

NG → Repair the connector.

OK → Does the problem reoccur?

No → Refer to "Points to note for transient malfunctions" (P.35-9).

Yes → Check the harness wire between combination meter and ABS-ECU.

OK → Replace the ABS-ECU.

5 Break operation is abnormal

[Comment] This varies depending on the driving conditions and the road surface conditions, so problem diagnosis is difficult. However, if a normal diagnosis code is displayed, carry out the following inspection.

Probable cause

- Improper installation of wheel speed sensor
- Bad contact of wheel speed sensor harness connector
- Malfunction of wheel speed sensor
- Malfunction of rotor
- Foreign material adhered to wheel speed sensor
- Malfunction of wheel bearing
- Malfunction of hydraulic unit
- Malfunction of ABS-ECU

Is the wheel speed sensor installed properly? (Refer to P.35-113.)

No → Install properly.

Yes → Check the wheel speed sensor output voltage. (Refer to P.35-75.)

NG → Inspection of individual part
- Wheel speed sensor (Refer to P.35-114.)

NG → Replace.

OK → Inspection of individual part
- Rotor (Refer to P.35-114.)

NG → Replace.

OK → Check the wheel bearing end play. (Refer to GROUP 26,27-Service Adjustment Procedures.)

NG → Repair or replace.

OK → Check the hydraulic unit. (Refer to P.35-77.)

OK → To next page

From previous page

Check the following connectors. (Refer to P.35-10.)
- Wheel speed sensor connectors A-13, A-07, G-04 and G-03
- ABS-ECU connector B-31
- Intermediate connectors B-36, B-04, B-02*1, D-10*2, D-22*3 and G-05*3

NOTE
1. *1: R.H. drive vehicles
2. *2: COLT, LANCER-Sedan
3. *3: LANCER-Wagon

NG → Repair the connector.

OK

Does the problem reoccur?

No → Refer to "Points to note for transient malfunctions" (P.35-9).

Yes

1. ABS-ECU connector:Disconnected

Is the resistance value between the following terminals of the ABS-ECU harness side connector standard value?

Standard value:0.8-1.2kΩ

At this time, the resistance should be inspected while moving the sensor harness and connector.

Front side
- No.14–No.15
- No.31–No.33

Rear side
- No.11–No.10
- No.30–No.28

No → Repair the harness.

B-31

Yes

Replace the ABS-ECU.

6 No diagnosis output (Communication with MUT or MUT-II not possible)

[Comment] When communication with the MUT or MUT-II is not possible, the cause is probably an open circuit in the ABS-ECU power circuit or an open circuit in the diagnosis output circuit.

Probable cause
• Blown fuse • Malfunction of ABS power relay • Broken wire, disconnected connector • Malfunction of ABS-ECU

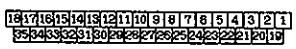
Can communication be made between other electronic control systems and the MUT or MUT-II?
- No → Defect in the MUT or MUT-II mechanism. Repair the MUT or MUT-II and reinspect.
- Yes ↓

Check the special fuse No.5.
- NG → Replace.
- OK ↓

Inspection of individual part
- ABS power relay (Refer to P.35-81.)
- NG → Replace.
- OK ↓

1. ABS-ECU connector:Disconnected
2. Ignition switch:ON

Between the harness side connector terminal No.18 and the earth:Battery voltage

B – 31 

- NG → Check the following connectors. (Refer to P.35-10.)
  - Relay connector B-43X
  - ABS-ECU connector B-31
  - Intermediate connectors B-04 (L.H. drive vehicles), B-01 (R.H. drive vehicles) and B-37
  - NG → Repair the connector.
  - OK ↓

Does the problem reoccur?
- Yes ↓

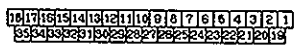
Check the harness wire between special fuse No.5 and ABS-ECU.
- No → Refer to "Points to note for transient malfunctions" (P.35-9).

- OK ↓

1. ABS-ECU connector:Disconnected

(1) Between the harness side connector terminal No.34 and the earth:Continuity

(2) Between the harness side connector terminal No.9 and the earth:Continuity

B – 31 

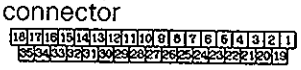
- NG → Repair the harness or the earth.
- OK ↓

1. ABS-ECU connector:Disconnected

(1) Between the harness side connector terminal No.23 of the ABS-ECU and the diagnosis connector terminal No.4 <Vehicles built up to September 1993>, No.8 <Vehicles built from October 1993>: Continuity

(2) Between the harness side connector terminal No.24 of the ABS-ECU and the diagnosis connector terminal No.10:Continuity

ABS-ECU connector

B – 31 

- NG → Check the following connectors. (Refer to P.35-10.)
  - Intermediate connector B-31
  - ABS-ECU connector B-37
  - NG → Repair the connector.
  - OK ↓

Does the problem reoccur?
- No → Refer to "Points to note for transient malfunctions" (P.35-9).
- Yes ↓

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

- OK ↓

Replace the ABS-ECU.

ABS-ECU connector terminal arrangement

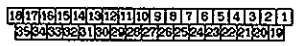
10. INSPECTION OF ABS-ECU

(1) Check that the battery voltage is normal.
(2) With the connector connected, insert the test bar attached to the special tool and check the voltage and continuity between each terminal and the body earth when the ignition switch is "ON".

Terminal No.	Signal	Input or output	Item	Check condition	Diagnosis standard	Main abnormal location
2	Relay power supply	Output	Continuity	Ignition switch:OFF	Continuity	• ABS-ECU
			Voltage	Ignition switch:ON	Battery voltage	
6	G sensor	Input	Voltage	Ignition switch:ON (Vehicle is level)	Battery voltage	• G-sensor • ABS-ECU
9	Earth	Input	Continuity	At any time	Continuity	• Body earth
10	Rear left wheel speed sensor (– wire)	Input	Continuity	At any time	Continuity	• Rear left wheel speed sensor • ABS-ECU
15	Front left wheel speed sensor (– wire)	Input	Continuity	At any time	Continuity	• Front left wheel speed sensor • ABS-ECU
17	Front left (rear right) solenoid	Output	Continuity	Ignition switch:OFF	Continuity	• ABS valve relay
			Voltage	Ignition switch:ON	Battery voltage	• Hydraulic unit
18	Ignition switch	Input	Voltage	Ignition switch:ON	Battery voltage	• ABS power relay
				Ignition switch:START	0 V	
22	Valve relay monitor	Input	Continuity	Ignition switch:OFF	Continuity	• ABS valve relay
			Voltage	Ignition switch:ON	Battery voltage	• Hydraulic unit
23	Diagnosis communication	Input/ Output	Voltage	MUT or MUT-II: Connected	Serial communication with MUT or MUT-II	• Harness
				MUT or MUT-II: Disconnected	1V or less	
24	Diagnosis selection	Input	Voltage	MUT or MUT-II: Connected	0V	• Harness
				MUT or MUT-II: Disconnected	Approx. 12V	
25	ABS warning lamp	Output	Voltage	Ignition switch:ON	Battery voltage	• ABS warning lamp
28	Rear right wheel speed sensor (– wire)	Input	Continuity	At any time	Continuity	• Rear right wheel speed sensor • ABS-ECU

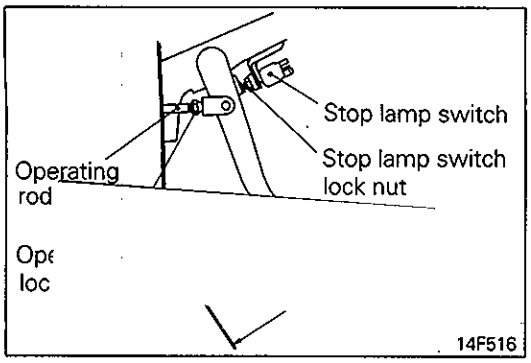
Terminal No.	Signal	Input or output	Item	Check condition	Diagnosis standard	Main abnormal location
29	Stop lamp switch	Input	Voltage	Ignition switch:ON (Stop lamp switch:ON)	8V or more	• Stop lamp switch
				Ignition switch:ON (Stop lamp switch:OFF)	1.5V or less	
33	Front right wheel speed sensor (– wire)	Input	Continuity	At any time	Continuity	• Front right wheel speed sensor • ABS-ECU
34	Earth	Input	Continuity	At any time	Continuity	• Body earth
35	Front right (rear right) solenoid	Output	Continuity	Ignition switch:OFF	Continuity	• ABS valve relay
			Voltage	Ignition switch:ON	Battery voltage	• Hydraulic unit

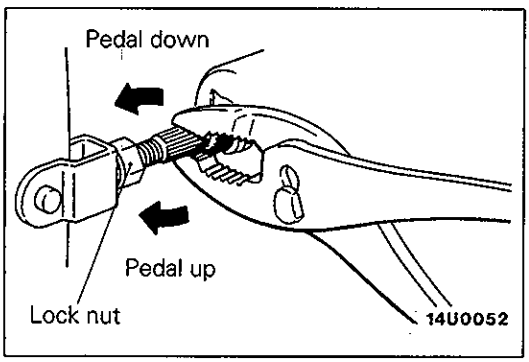
ABS-ECU harness side connector terminal arrangement

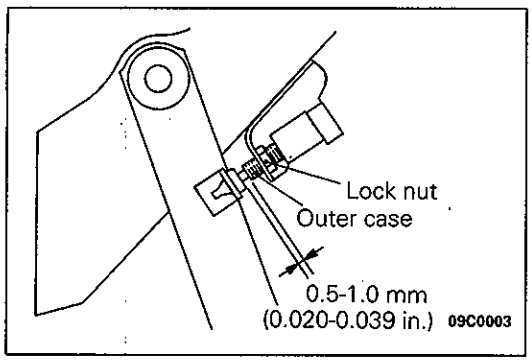


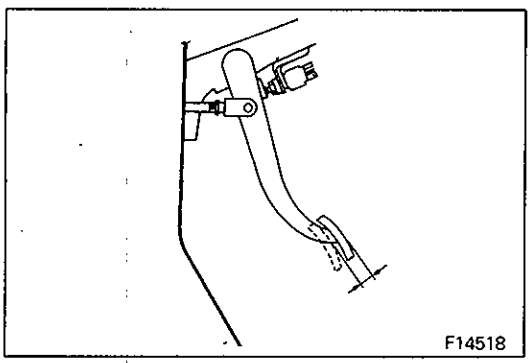
(3) Disconnect the connector from the ABS-ECU and use the special tool to inspect the resistance and continuity between each of the terminals on the harness-side connector.

Terminal No.	Signal	Item	Check terminal	Check condition	Diagnosis standard	Main abnormal location
5	Motor monitor	Continuity	Between terminal No.5 and body earth	Ignition swtich: OFF	Continuity	• Hydraulic unit
11	Rear left wheel speed sensor (+ wire)	Resistance	Between terminals No.11 and No. 10	Ignition swtich: OFF	0.8 – 1.2kΩ	• Rear left wheel speed sensor
14	Front left wheel speed sensor (+ wire)	Resistance	Between terminals No.14 and No. 15	Ignition swtich: OFF	0.8 – 1.2kΩ	• Front left wheel speed sensor
17	Front left (rear right) solenoid	Resistance	Between terminal No. 17 and body earth	Ignition swtich: OFF	1.0 – 1.3Ω	• Hydraulic unit • ABS valve relay
26	Motor relay	Resistance	Between terminals No. 26 and No.2	Ignition swtich: OFF	60 – 100Ω	• ABS motor relay
27	Valve relay	Resistance	Between terminals No. 27 and No.2	Ignition swtich: OFF	60 – 120kΩ	• ABS valve relay
30	Rear right wheel speed sensor (+ wire)	Resistance	Between terminals No. 30 and No. 28	Ignition swtich: OFF	0.8 – 1.2kΩ	• Rear right wheel speed sensor
31	Front right wheel speed sensor (+ wire)	Resistance	Between terminals No. 31 and No. 33	Ignition swtich: OFF	0.8 – 1.2kΩ	• Front right wheel speed sensor
35	Front right (rear left) solenoid	Resistance	Between terminal No. 35 and body earth	Ignition swtich: OFF	1.0 – 1.3Ω	• Hydraulic unit • ABS valve relay









SERVICE ADJUSTMENT PROCEDURES

BRAKE PEDAL INSPECTION AND ADJUSTMENT

E35FAAJ

1. Measure the brake pedal height as illustrated. If the brake pedal height is not within the standard value, adjust as follows.

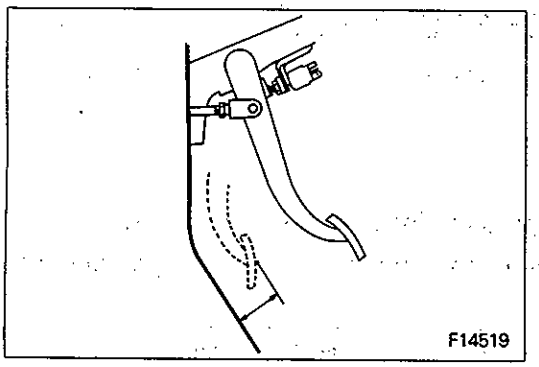
   Standard value: 162-165 mm (6.4-6.5 in.)

   (1) Disconnect the stop lamp switch connector, loosen the lock nut, and move the stop lamp switch to a position where it does not contact the brake pedal arm.
   (2) Adjust the brake pedal height by turning the operating rod with pliers (with the operating rod lock nut loosened), until the correct brake pedal height is obtained.
   (3) After screwing in the stop lamp switch until it contacts the brake pedal stopper (just before the brake pedal is caused to move), return the stop lamp switch 1/2 to 1 turn and secure by tightening the lock nut.
   (4) Connect the connector of the stop lamp switch.
   (5) Check to be sure that the stop lamp is not illuminated with the brake pedal unpressed.

2. With the engine stopped, depress the brake pedal two or three times. After eliminating the vacuum in the power brake booster, press the pedal down by hand, and confirm that the amount of movement before resistance is met (the free play) is within the standard value range.

   Standard value: 3-8 mm (0.12-0.31 in.)

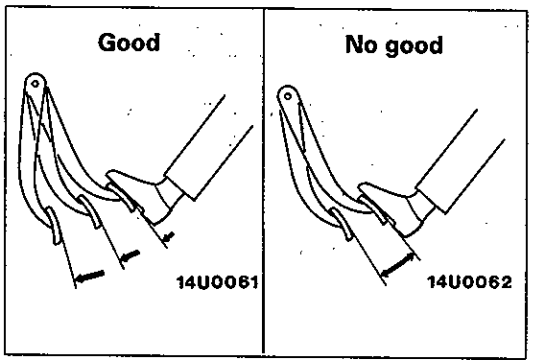
   If the free play exceeds the standard value, it is probably due to excessive play between the clevis pin and brake pedal arm. Check for excessive clearance and replace faulty parts as required.



3. Start the engine, depress the brake pedal with approximately 500 N (50 kg, 110 lbs.) of force, and measure the clearance between the brake pedal and the floorboard.

   Standard value: 80 mm (3.1 in.) or more

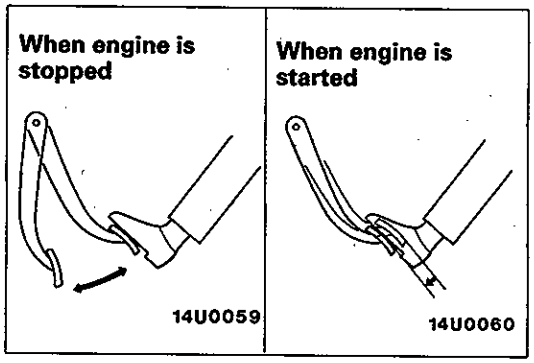
   If the clearance is outside the standard value, check for air trapped in the brake line, clearance between the lining and the drum and dragging in the parking brake.
   Adjust and replace defective parts as required.



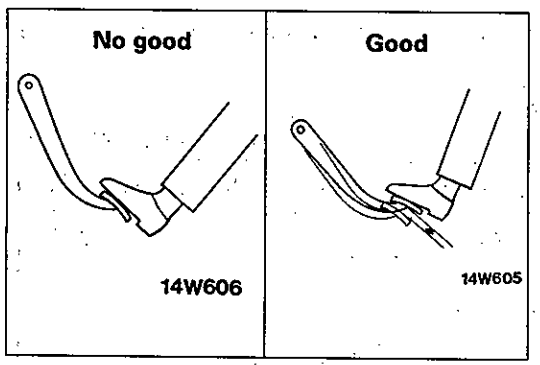
BRAKE BOOSTER OPERATING TEST E35FCAAa

For simple checking of the brake booster operation, carry out the following tests:

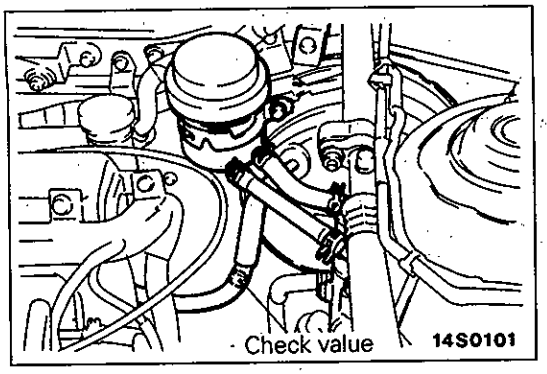
1. Run the engine for one or two minutes, and then stop it.
   If the pedal depresses fully the first time but gradually becomes higher when depressed succeeding times, the booster is operating properly, if the pedal height remains unchanged, the booster is defective.



2. With the engine stopped, step on the brake pedal several times.
   Then step on the brake pedal and start the engine.
   If the pedal moves downward slightly, the booster is in good condition. If there is no change, the booster is defective.



3. With the engine running, step on the brake pedal and then stop the engine.
   Hold the pedal depressed for 30 seconds. If the pedal height does not change, the booster is in good condition, if the pedal rises, the booster is defective.
   If the above three tests are okay, the booster performance can be determined as good.
   If one of the above three tests is not okay at last, the check valve, vacuum hose, or booster will be defective.



CHECK VALVE OPERATION CHECK E35FEAI

When checking the check valve, keep the check valve fit in the vacuum hose.

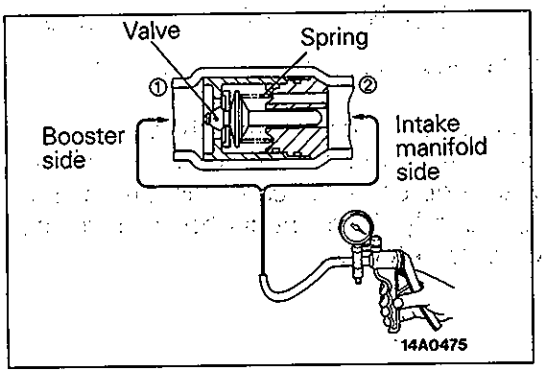
1. Remove the vacuum hose.

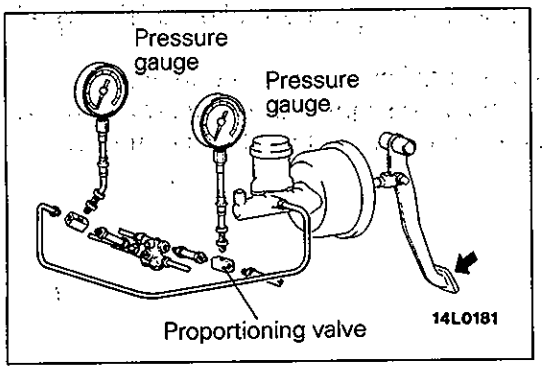
   NOTE
   The check valve is press-fit inside the vacuum hose.

2. Check the operation of the check valve by using a vacuum pump.

Vacuum pump connection	Accept/reject criteria
Connection at the brake booster side ①	A negative pressure (vacuum) is created and held.
Connection at the intake manifold side ②	A negative pressure (vacuum) is not created.

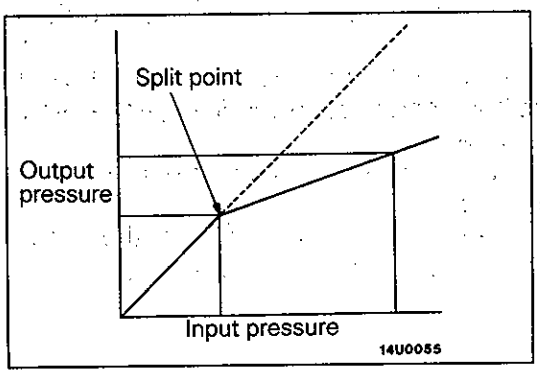
Caution
If the check valve is defective, replace it as an assembly unit together with the vacuum hose.





PROPORTIONING VALVE FUNCTION TEST E35FKCK

1. Connect two pressure gauges, one each to the input side and output side of the proportioning valve, as shown.
2. Air bleed the brake line and the pressure gauge.
3. While gradually depressing the brake pedal, make the following measurements and check to be sure that the measured values are within the allowable range.



(1) Output pressure begins to drop relative to input pressure (split point).

Standard value:

MPa (kg/cm², psi)

	Vehicles without ABS			Vehicles with ABS	
	2WD		4WD	2WD	4WD
	Except 1800	1800			
Split point	2.5 (25, 356)	3.0 (30, 427)	3.5 (35, 498)	3.0 (30, 427)	3.5 (35, 498)

(2) Check to be sure that the output fluid pressure is at the standard value when the pedal depression force is increased so that the input fluid pressure is at the values shown in the table below.

Standard value:

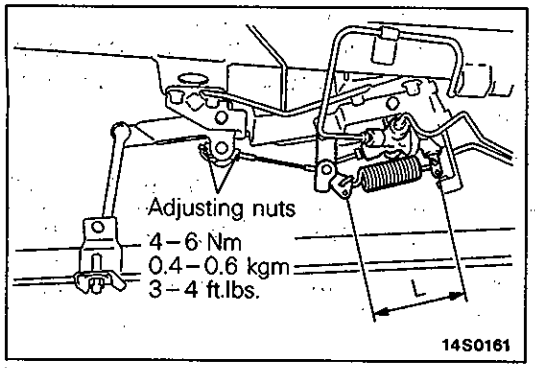
MPa (kg/cm², psi)

	Vehicles without ABS			Vehicles with ABS	
	2WD		4WD	2WD	4WD
	Except 1800	1800			
Input fluid pressure	6.5 (65, 925)	7.0 (70, 996)	7.5 (75, 1066)	7.0 (70, 996)	7.5 (75, 1066)
Output fluid pressure	3.75 (37.5, 533)	4.25 (42.5, 604)	5.23 (52.3, 744)	4.25 (42.5, 604)	5.23 (52.3, 744)

(3) Output pressure difference between left and right brake lines

Limit: 0.4 MPa (4 kg/cm², 57 psi)

4. If the measured pressures are not within the permissible ranges, replace the proportioning valve.



LOAD SENSING PROPORTIONING VALVE SPRING LENGTH ADJUSTMENT

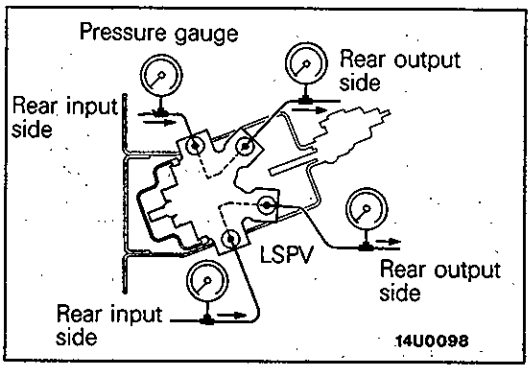
E35FHAL

1. Park the vehicle on a level surface.

   Caution
   Do not use a jack or similar device in order to keep the vehicle level.

2. Unload the vehicle and adjust the spring end position, utilizing the adjusting nuts so that the dimension "L" in the illustration will be as specified.

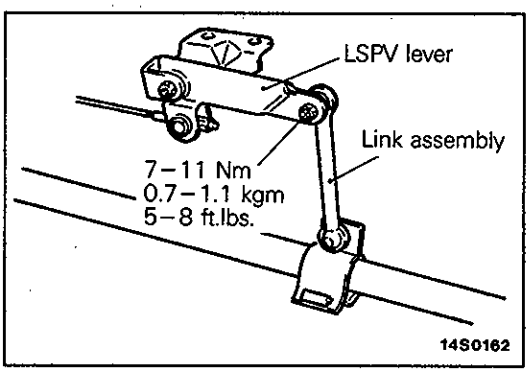
   Standard value: 89.3–91.3 mm (3.52–3.59 in.)



LOAD SENSING PROPORTIONING VALVE FUNCTION TEST

E35FKAM

1. Connect pressure gauges to the input and output ports of the load sensing proportioning valve. Bleed the system.



2. Check the output fluid pressure of the LSPV by the following method.
   (1) Remove the connection between the link assembly and the LSPV lever.
   (2) Move the LSPV lever up and down to secure it in the position where the spring length is at the dimensions (L) in the table below.
   (3) Slowly depress the brake pedal and check the point where the amount of increase in the output fluid pressure starts to drop (split point) with respect to the input fluid pressure.
   Then, increase the pedal depression force and check the output fluid pressure when the input fluid pressure is 14 MPa (140 kg/cm², 1991 psi.).

   Standard value:

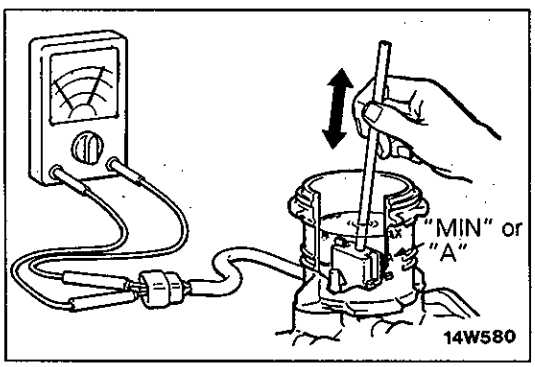
Spring length L mm (in.)	Input fluid pressure MPa (kg/cm², psi)	Output fluid pressure MPa (kg/cm², psi)
90.1 (3.55)	2.25 (22.5, 320.0) Split point	2.00–2.50 (20.0–25.0, 284.5–355.6)
	14 (140, 1991.3)	5.38–6.18 (53.8–61.8, 765.2–878.9)
108.2 (4.26)	7.82 (78.2, 1112.2) Split point	6.82–8.82 (68.2–88.2, 970.0–1254.5)
	14 (140, 1991.3)	8.82–10.52 (88.2–105.2, 1254.5–1496.3)

(4) At the same time, check the left and right difference between each measured value of the output fluid pressure.

Limit:

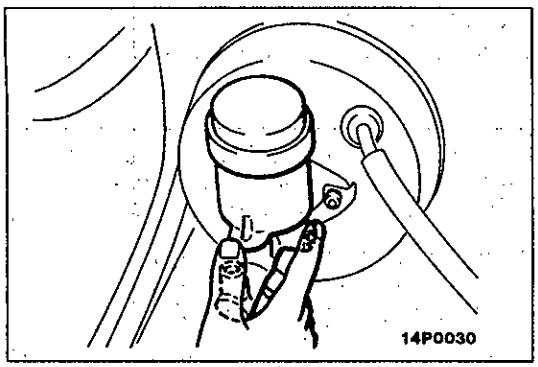
Spring length H mm (in.)	Input fluid pressure MPa (kg/cm², psi)	Left/right difference of output fluid pressure MPa (kg/cm², psi)
90.1 (3.55)	2.25 (22.3, 320.0)	0.25 (2.5, 35.6)
	14 (140, 1991.3)	0.4 (4, 56.9)
108.2 (4.26)	7.82 (78.2, 1112.2)	1.0 (10, 142.2)
	14 (140, 1991.3)	0.85 (8.5, 120.9)

3. Install the LSPV lever and the link assembly, and check to be sure that the LSPV spring length is at the standard value.
4. Disconnect the pressure gauge from the load-sensing proportioning valve and bleed the air.



BAKE FLUID LEVEL SENSOR CHECK E35FBAF

The brake fluid level sensor is in good condition if there is no continuity when the float surface is above "MIN" or "A" and if there is continuity when the float surface is below "MIN" or "A".



BLEEDING

E35FYAJ

Caution

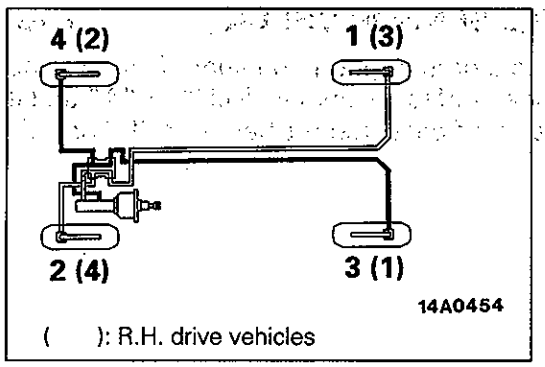
Use the specified brake fluid. Avoid using a mixture of the specified brake fluid and other fluid.

Specified brake fluid: DOT3 or DOT4

BLEEDING OF MASTER CYLINDER

The master cylinder used has no check valve, so if bleeding is carried out by the following procedure, bleeding of air from the brake pipeline will become easier. (When brake fluid is not contained in the master cylinder.)

(1) Fill the reserve tank with brake fluid.
(2) Keep the brake pedal depressed.
(3) Have another person cover the master cylinder outlet with a finger.
(4) With the outlet still closed, release the brake pedal.
(5) Repeat steps 2. – 4. three or four times to fill the inside of the master cylinder with brake fluid.

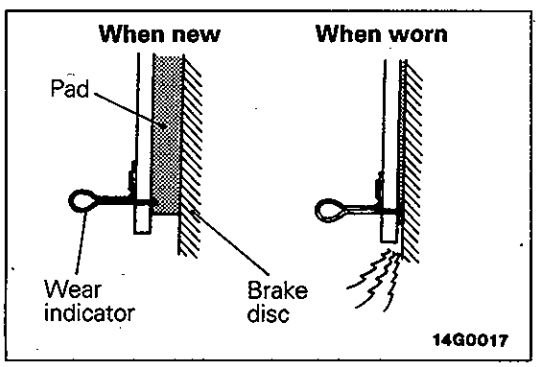


BLEEDING OF BRAKE PIPE LINE

Start the engine and bleed the air in the sequence shown in the figure.

Caution

For vehicles with ABS, be sure to install a filter to the master cylinder reservoir tank when supplying brake fluid.

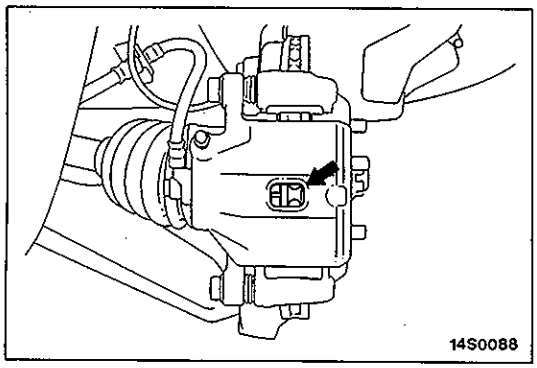


FRONT DISC BRAKE PAD CHECK AND REPLACEMENT

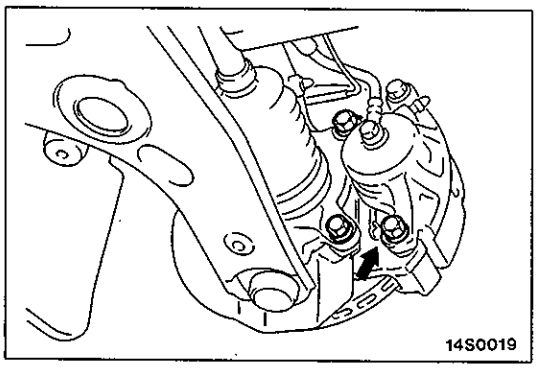
E35FQAM

NOTE

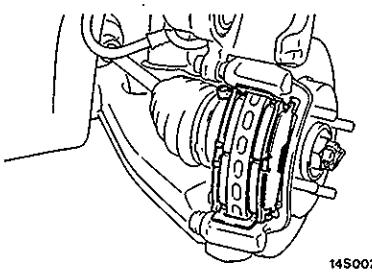
The brake pads have wear indicators that contact the brake disc when the brake pad thickness becomes 2 mm (0.08 in.), and emit a squealing sound to warn the driver.



1. Check brake pad thickness through caliper body check port.
   Standard value: 10.0 mm (0.39 in.)
   Limit: 2.0 mm (0.08 in.)
   Caution:
   1. **When the limit is exceeded, replace the pads at both sides, and also the brake pads for the wheels on the opposite side at the same time.**
   2. **If there is a significant difference in the thicknesses of the pads on the left and right sides, check the sliding condition of the piston, lock pin and guide pin.**

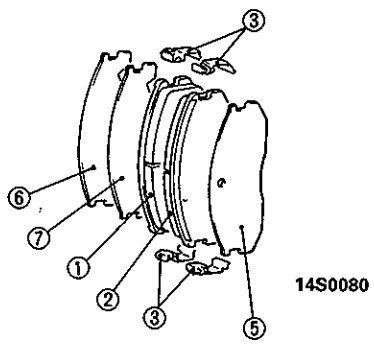


2. Remove guide pin. Lift caliper assembly and retain with wires.
   Caution
   Do not wipe off the special grease that is on the guide pin or allow it to contaminate the lock pin.

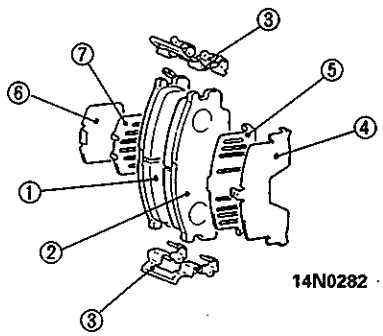


3. Remove the following parts from caliper support.
   ① Pad & wear indicator assembly
   ② Pad assembly
   ③ Clip
   ④ Outer shim (stainless)
   ⑤ Outer shim (coated with rubber)
   ⑥ Inner shim (stainless)
   ⑦ Inner shim (coated with rubber)

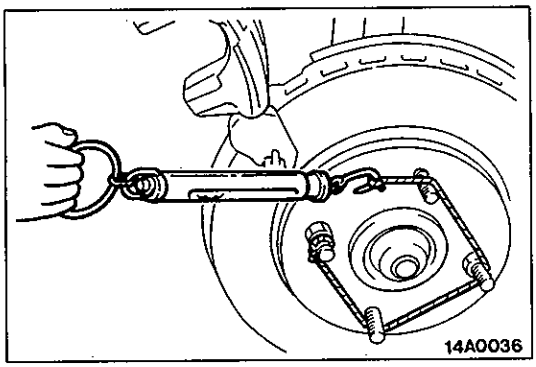
Vehicles with 13-inch disc brake



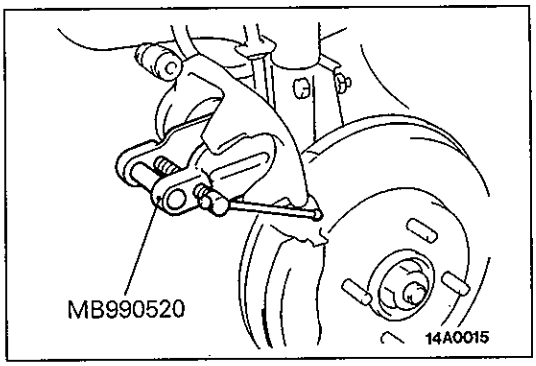
Vehicles with 14-inch disc brake



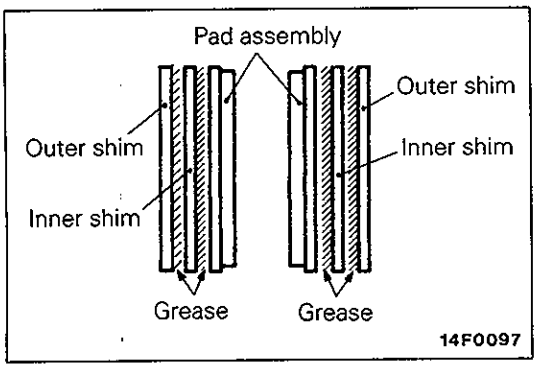
4. For vehicles with VCU type front differential and vehicles with 4WD, take out the drive shaft.
(Refer to GROUP 26 – Drive Shaft.)



5. With the pad removed, use a spring balance to measure the rotation sliding resistance of the hub in the forward direction.
NOTE
Tighten the nuts in order to secure the disc to the hub.
6. Securely attach the pad clip to the caliper support.



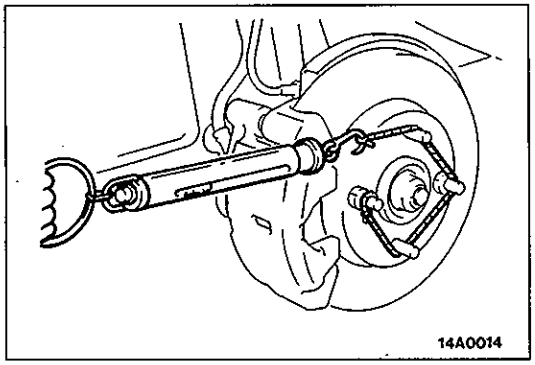
7. Clean piston and insert into cylinder with special tool.



8. <Vehicles with 14-inch disc brake>
Apply repair kit grease to the attaching faces of pad and inner shim and to the attaching faces of inner and outer shims. Apply so as not to spread it out from the edge of shim.

Caution
Do not deposit grease or other dirt on pad or brake disc friction surfaces.

9. Be careful that the piston boot does not become caught, when lowering the caliper assembly and install the guide pin.
10. Check brake drag force as follows.
(1) Start engine and hold brake pedal down for 5 seconds. (Pedal depression force approx. 200 N [20 kg, 44 lbs.])
(2) Stop engine.
(3) Turn brake disc forward 10 times.



(4) Use a spring balance to measure the rotation sliding resistance of the hub in the forward direction.

11. Calculate the drag torque of the disc brake (difference of values measured in item 10 and item 5).

Standard value: 13-inch disc brake
20 N (2 kg, 4.4 lbs.) or less
14-inch disc brake
40 N (4 kg, 8.8 lbs.) or less

12. If the brake drag torque exceeds the standard value, disassemble piston and clean the piston. Check for corrosion or worn piston seal, and check the sliding condition of the lock pin and guide pin.

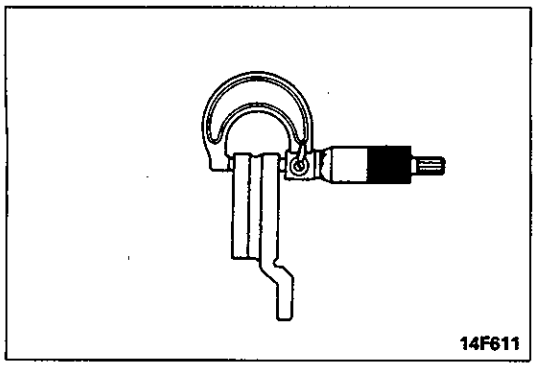
FRONT DISC BRAKE ROTOR INSPECTION

CAUTION

When servicing disc brakes, it is necessary to exercise caution to keep the disc brakes within the allowable service values in order to maintain normal brake operation.

Before re-finishing or re-processing the brake disc surface, the following conditions should be checked.

Inspection items	Remarks
Scratches, rust, saturated lining materials and wear	• If the vehicle is not driven for a certain period, the sections of the discs that are not in contact with lining will become rusty, causing noise and shuddering. • If grooves resulting from excessive disc wear and scratches are not removed prior to installing a new pad assembly, there will momentarily be inappropriate contact between the disc and the lining (pad).
Run-out of drift	Excessive run-out or drift of the discs will increase the pedal depression resistance due to piston knock-back.
Change in thickness (parallelism)	If the thickness of the disc changes, this will cause pedal pulsation, shuddering and surging.
Inset or warping (flatness)	Overheating and improper handling while servicing will cause inset or warping.



THICKNESS CHECK

E35FRAD

1. Using a micrometer, measure disc thickness at eight positions, approximately 45° C apart and 10 mm (0.39 in.) from the outer edge of the disc.

Standard value:

13-inch disc brake	
Solid type	**13 mm (0.51 in.)**
Ventilated type	**18 mm (0.71 in.)**
14-inch disc brake	**24 mm (0.94 in.)**

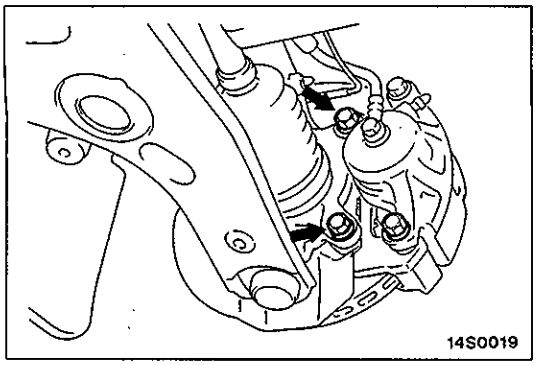
Limit:

13-inch disc brake	
Solid type	**11.4 mm (0.45 in.)**
Ventilated type	**16.4 mm (0.65 in.)**
14-inch disc brake	**22.4 mm (0.88 in.)**

NOTE
Thickness variation (At least 8 positions)
The difference between any thickness measurements should not be more than 0.015 mm (0.0006 in.).

2. If the disc is beyond the limits for thickness remove it and install a new one.
If thickness variation exceeds the specification, replace the disc or turn rotor with on the car type brake lathe ("MAD, DL-8700PF " or equivalent).

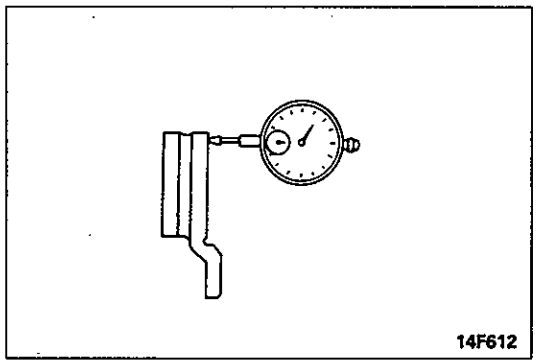
NOTES



RUN-OUT CHECK

E35FSAG

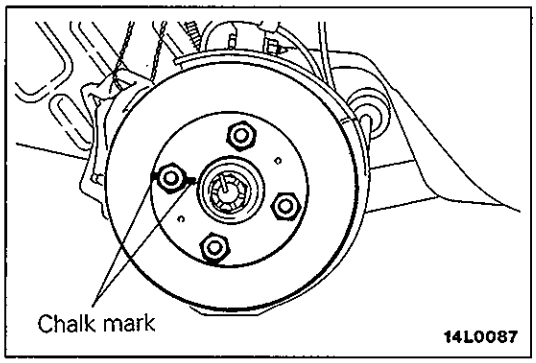
1. Remove the caliper support; then raise the caliper assembly upward and secure by using wire.
2. Inspect the disc surface for grooves, cracks and rust. Clean the disc thoroughly and remove all rust.



3. Place a dial gauge approximately 5 mm (0.2 in.) from the outer circumference of the brake disc, and measure the run-out of the disc.

   Limit: 0.07 mm (0.0028 in.) or less

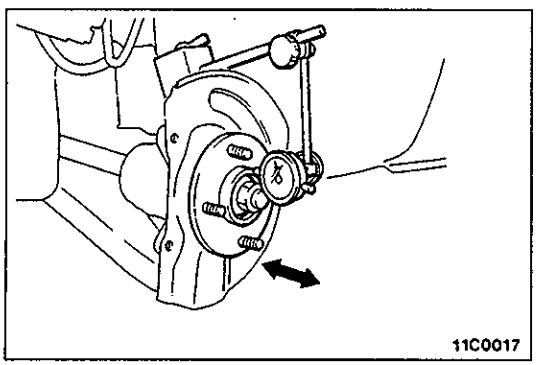
   NOTE
   Tighten the nuts in order to secure the disc to the hub.



RUN-OUT CORRECTION

E35FTAD

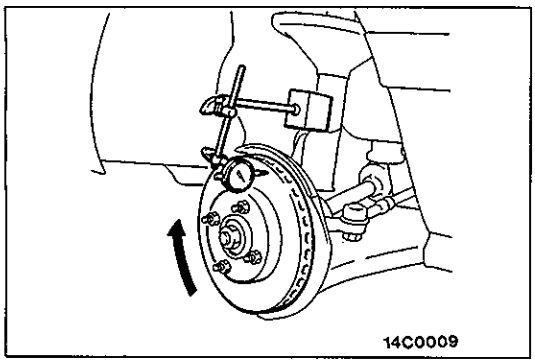
1. If the run-out of the brake disc is equivalent to or exceeds the limit specification, change the phase of the disc and hub, and then measure the run-out again.
   (1) Before removing the brake disc, chalk both sides of the wheel stud on the side at which run-out is greatest.



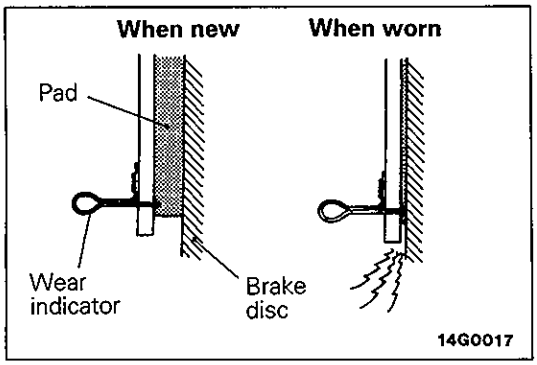
   (2) Remove the brake disc, and then place a dial gauge as shown in the illustration; then move the hub in the axial diretion and measure the play.

   Limit: 0.05 mm (0.0020 in.)

   If the play is equivalent to or exceeds the limit, disassemble the hub knukle and check each part.



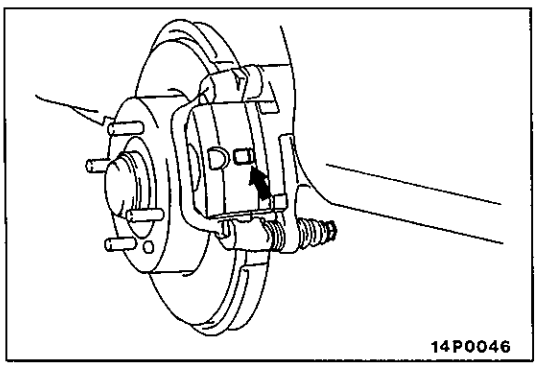
   (3) If the play does not exceed the limit specification, install the brake disc at a position 180° away from the chalk mark, and then check the run-out of the brake disc once again.
2. If the run-out cannot be corrected by changing the phase of the brake disc, replace the disc or turn rotor with on the car type brake lathe ("MAD, DL-8700PF or equivalent).



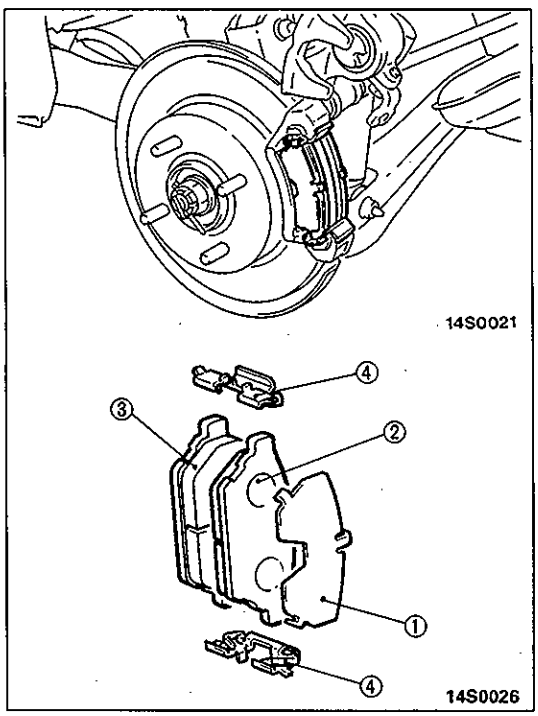
REAR DISC BRAKE PAD CHECK AND REPLACEMENT

E35FUAH

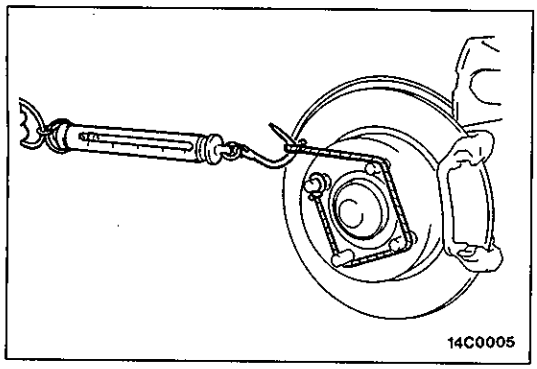
NOTE
The brake pads have wear indicators that contact the brake disc when the brake pad thickness becomes 2 mm (0.08 in.), and emit a squealing sound to warn the driver.



1. Check brake pad thickness through caliper body check port.
   Standard value: 9.5 mm (0.37 in.)
   Limit: 2.0 mm (0.08 in.)
   Caution
   1. **When the limit is exceeded, replace the pads at both sides, and also the brake pads for the wheels on the opposite side at the same time.**
   2. **If there is a significant difference in the thicknesses of the pads on the left and right sides, check the sliding condition of the piston, lock pin sleeve and guide pin sleeve.**
2. Remove guide pin. Lift caliper assembly and retain with wires.
   Caution
   Do not wipe off the special grease that is on the guide pin or allow it to contaminate the guide pin.
3. Remove the following parts from caliper support.
   ① Outer shim
   ② Pad assembly
   ③ Pad & wear indicator assembly
   ④ Clip



4. For vehicles with 4WD, remove the drive shaft from the lower arm. (Refer to GROUP 27 – Drive Shaft.)

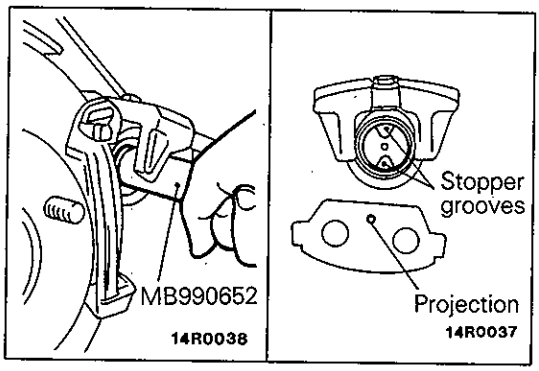


5. With the pad removed, use a spring balance to measure the rotation sliding resistance of the hub in the forward direction.

   NOTE
   To secure the disc to the hub, tighten the nuts.

6. Securely attach the pad clip to the caliper support.

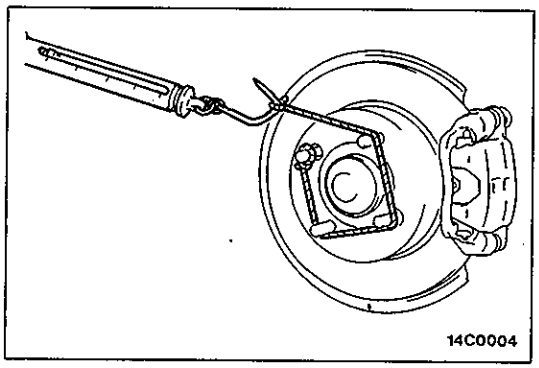
   Caution
   Do not deposit grease or other dirt on pad or brake disc friction surfaces.



7. Push the piston into the caliper with special tool.

   NOTE
   Align the grooves as illustrated.

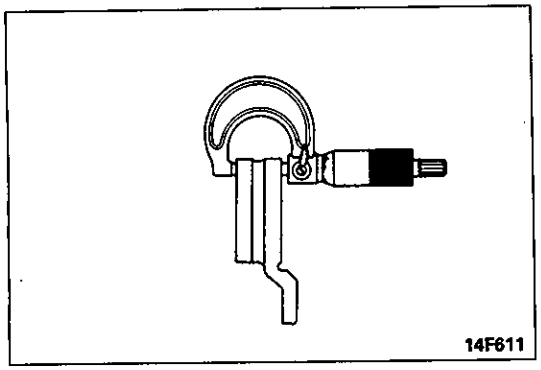
8. The pins on the back side of the brake pad must be placed in the grooves in the position.
9. Be careful that the piston boot does not become caught, when lowering the caliper assembly and install the guide pin.



10. Check brake drag force as follows.
    (1) Start engine and hold brake pedal down for 5 seconds. (Pedal depression force approx. 200 N [20 kg, 44 lbs.])
    (2) Stop engine.
    (3) Turn brake disc forward 10 times.
    (4) Use a spring balance to measure the rotation sliding resistance of the hub in the forward direction.
11. Calculate the drag torque of the disc brake (difference between of values measured in item 10 and item 5).

    Standard value: 20 N (2 kg, 4.4 lbs.) or less

12. If the difference between brake drag torque and hub torque exceeds the standard value, disassemble piston and clean piston. Check for corrosion or worn piston seal, and check the sliding condition of the lock pin and guide pin.

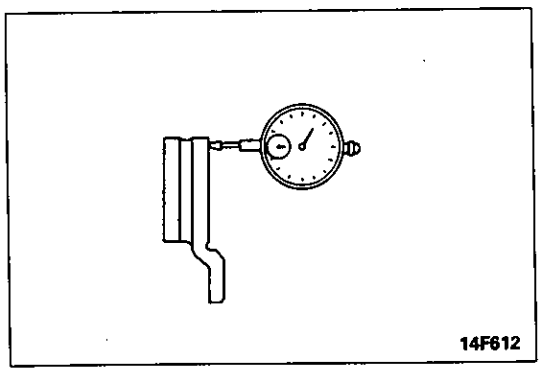

14F611

REAR BRAKE DISC THICKNESS CHECK E35FVAB

1. Remove dirt and rust from brake disc surface.
2. Measure disc thickness at 4 locations or more.

   Standard value: 10 mm (0.39 in.)
   Limit: 8.4 mm (0.33 in.)

   Replace the discs and pad assembly for both sides left and right of the vehicle if they are worn beyond the specified limit.


14F612

REAR BRAKE DISC RUN-OUT CHECK E35FWAB

1. Remove the caliper support, raise the caliper assembly, and secure it by using a wire, etc.
2. Place a dial gauge approximately 5 mm (0.2 in.) from the outer circumference of the brake disc, and measure the run-out of the disc.

   Limit: 0.08 mm (0.0031 in.) or less

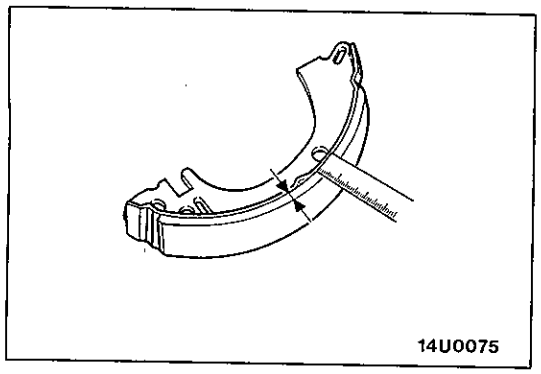
   NOTE
   To secure the disc to the hub, tighten the nuts.

REAR BRAKE DISC RUN-OUT CORRECTION E35FLAAa

1. If the run-out of the brake disc is equivalent to or exceeds the limit specification, change the phase of the disc and hub, and then measure the run-out again.

   NOTE
   The procedures for checking by changing the installation phase of the disc are the same as those for the front brake discs. (Refer to P. 35-70.)

2. If the problem cannot be corrected by changing the phase of the brake disc, replace the disc.


14U0075

BRAKE LINING THICKNESS CHECK E35FFAA

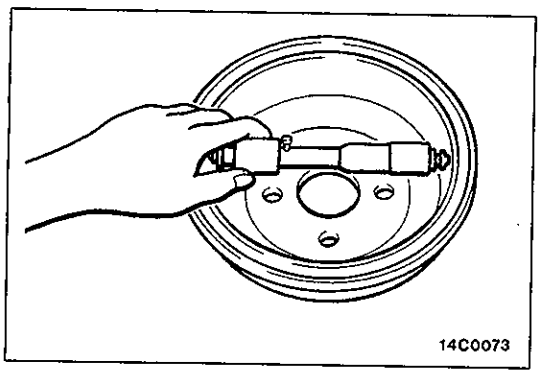
1. Remove the brake drum.
2. Measure the wear of the brake lining at the place worn the most.

   Limit: 1.0 mm (0.04 in.)

   Replace the shoe and lining assembly if brake lining thickness is less than the limit if it is not worn evenly. For information concerning the procedures for installation of the shoe and lining assembly, refer to P. 35 - 99.

Caution

1. **Whenever the shoe and lining assembly is replaced, replace both RH and LH assemblies as a set to prevent car from pulling to one side when braking.**
2. **If there is a significant difference in the thicknesses of the shoe and lining assemblies on the left and right sides, check the sliding condition of the piston.**

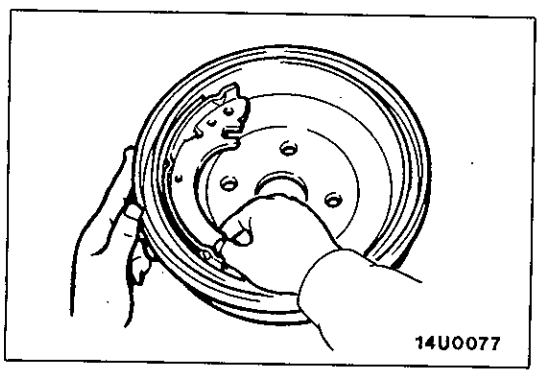

14C0073

BRAKE DRUM INSIDE DIAMETER CHECK E35FGAA

1. Remove the brake drum.
2. Measure the inside diameter of the hub and drum at two or more locations.

   Limit: 7-inch drum brake 182 mm (7.2 in.)
   8-inch drum brake 205 mm (8.1 in.)
   9-inch drum brake 230.6 mm (9.1 in.)

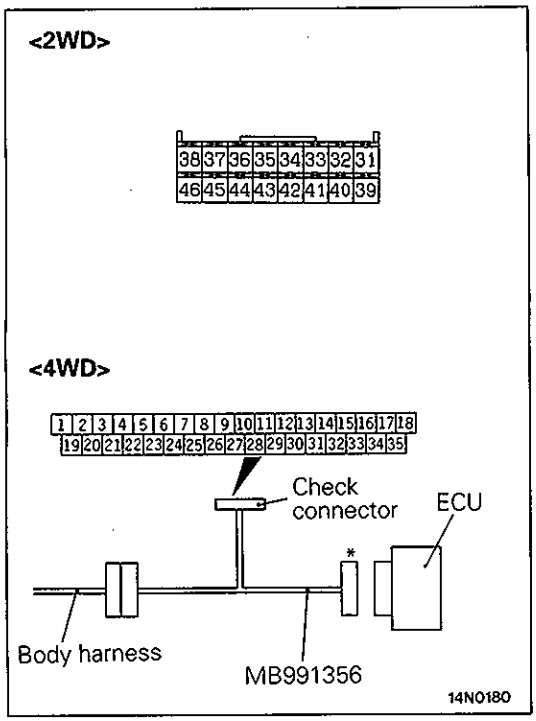
3. Replace brake drums, shoe and lining assembly when wear exceeds the limit value or is badly imbalanced.


14U0077

BRAKE LINING AND BRAKE DRUM CONNECTION CHECK E35FIAD

1. Remove the brake drum.
2. Remove the shoe and lining assembly. (Refer to P. 35-99.)
3. Chalk inner surface of brake drum and rub with shoe and lining assembly.
4. Replace shoe and lining assembly or brake drums if very irregular contact area.

   NOTE
   Clean off chalk after check.



CHECKING OPERATION OF THE ABS (ANTI-LOCK BRAKE SYSTEM) E35FPBB

WHEEL SPEED SENSOR OUTPUT VOLTAGE CHECK

1. Check that the clearance between the wheel speed sensor and the rotor are within the standard values.
2. Lift up the vehicle and release the parking brake.
3. Disconnect the ECU harness connector and measure from the harness side connector.

Caution

1. **For 2WD, be sure to remove the connector double lock and insert the probe into the harness side. Inserting it into the terminal side will result in a bad connection.**
2. **For 4WD vehicles, set the special tool and use the inspection connector to inspect. Do not connect the connector (Special Tool) marked with "*" except when recording the waveform on a driving test. In such a case, connect the connector to the ECU.**

4. Rotate the wheel to be measured at approximately 1/2 - 1 rotation per second, and check the output voltage using a circuit tester or an oscilloscope.

	2WD				4WD			
	Front left	Front right	Rear left	Rear right	Front left	Front right	Rear left	Rear right
Terminal No.	38	36	35	37	4	21	8	24
	46	44	43	45	5	23	9	26

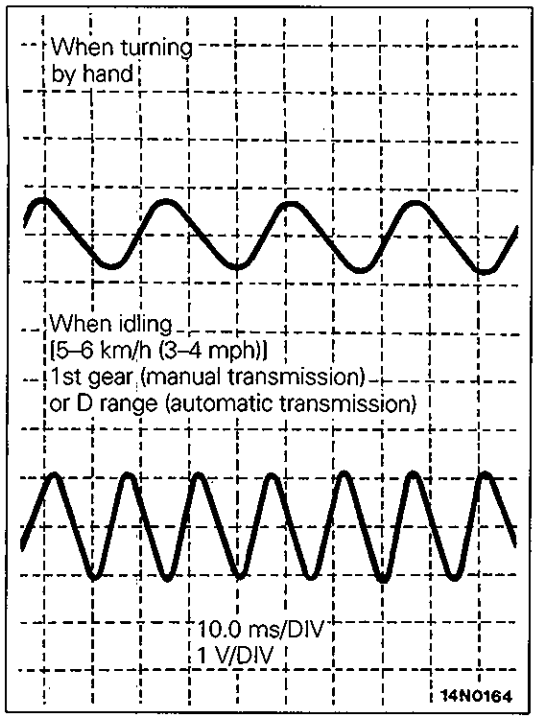
Output voltage

When measuring with a circuit tester:
70 mV or more

When measuring with an oscilloscope:
200 mV p-p or more

5. If the output voltage is lower than the above values, the reason could be as follows:
   - Excessive clearance between the wheel speed sensor pole piece and the rotor.
   - Faulty wheel speed sensor.

   so adjust the wheel speed sensor or replace it.



Inspecting Wave Forms With An Oscilloscope

Use the following method to observe the output voltage wave form from each wheel sensor with an oscilloscope.

<2WD>

Start the engine, and rotate the front wheels by engaging 1st gear (vehicles with manual transmission) or D range (vehicles with automatic transmission). Turn the rear wheels manually so that they rotate at a constant speed.

<4WD>

Start the engine, and engage 1st gear (vehicles with manual transmission) or D range (vehicles with automatic transmission).

NOTE

1. Check the connection of the sensor harness and connector before using the oscilloscope.
2. The wave form measurements can also be taken while the vehicle is actually moving.
3. The output voltage will be small when the wheel speed is low, and similarly it will be large when the wheel speed is high.

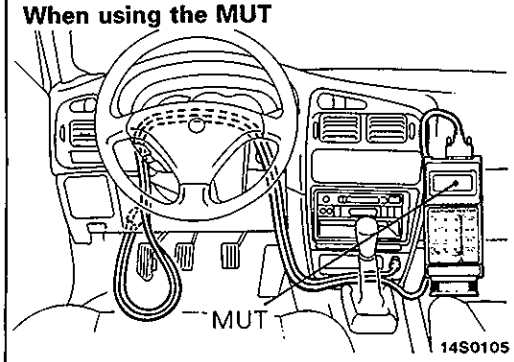
Points In Waveform Measurement

Symptom	Probable causes	Remedy
Too small or zero waveform amplitude	Faulty wheel speed sensor	Replace sensor
	Incorrect pole piece-to-rotor clearance	Adjust clearance
Waveform amplitude fluctuates excessively (this is no problem if the minimum amplitude is 100 mV or more)	Axle hub eccentric or with large runout	Replace hub
Noisy or disturbed waveform	Open circuit in sensor	Replace sensor
	Open circuit in harness	Correct harness
	Incorrectly mounted wheel speed sensor	Mount correctly
	Rotor with missing or damaged teeth	Replace rotor

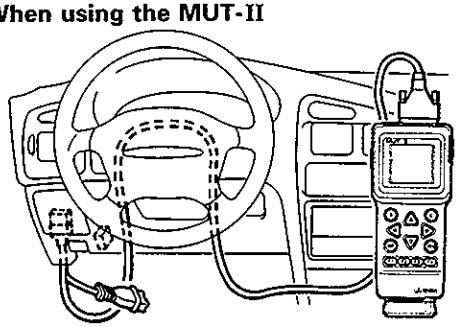
NOTE

The wheel speed sensor cable moves following motion of the front or rear suspension. Therefore, it is likely that it has an open circuit only when driving on rough roads and it functions normally on ordinary roads. It is, therefore, recommended to observe sensor output voltage waveform also under special conditions, such as rough road driving.

When using the MUT



When using the MUT-II



INSPECTION OF HYDRAULIC UNIT (HU)

<2WD> E35FPCB

Caution

Connection and disconnection of the MUT or MUT-II should always be made with the ignition switch in the OFF position.

1. Jack up the vehicle and support the vehicle with rigid racks placed at the specified jack-up points or place the wheels which are checked on the rollers of the braking force tester.

   Caution

   1. The roller of the braking force tester and the tyre should be dry during testing.

   2. When testing the front brakes, apply the parking brake, and when testing the rear brakes, stop the front wheels by chocking them.

2. Release the parking brake, and feel the drag force (drag torque) on each road wheel.
   When using the braking force tester, take a reading of the brake drag force.
3. Turn the ignition key to the OFF position and set the MUT or MUT-II as shown in the figure.
4. After checking that the shift lever <M/T> or the selector lever <A/T> is in neutral, start the engine.

   NOTE

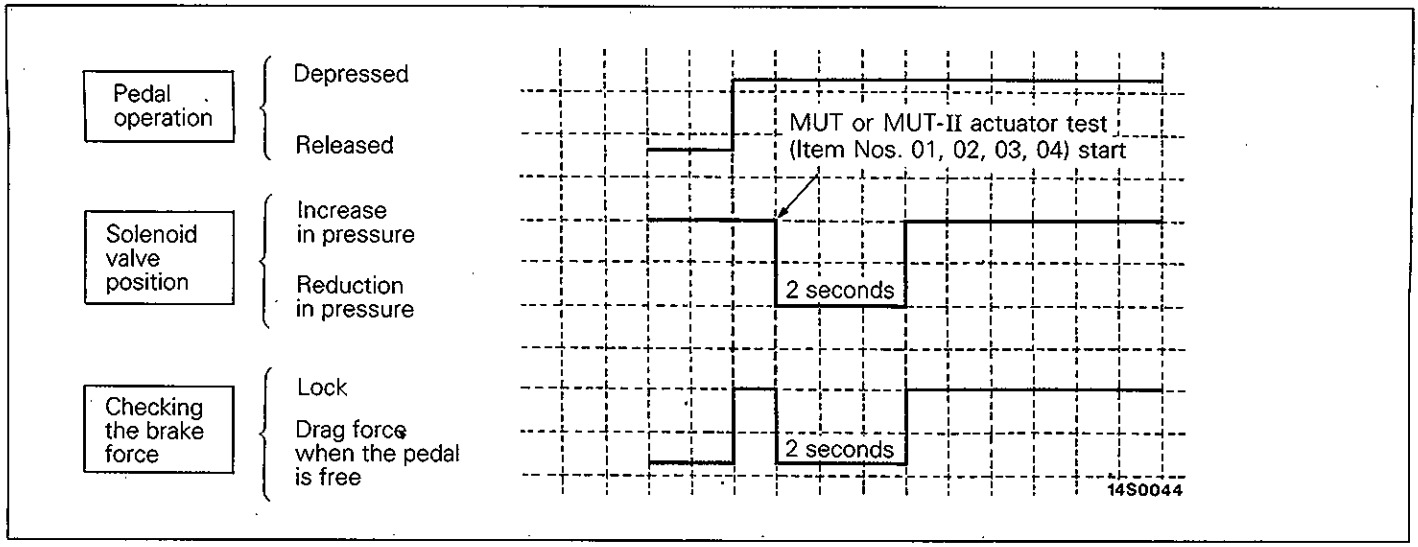
   1. At this time, the ABS system will switch to the MUT or MUT-II mode and the ABS warning lamp will illuminate.
   2. When the ABS has been interrupted by the fail-safe function, the MUT or MUT-II actuator testing cannot be used.

5. Use the MUT or MUT-II to force-drive the actuator.
6. Turn the wheel by hand and check the change in braking force when the brake pedal is depressed.
   When using the braking force tester, depress the brake pedal until the braking force is at the following values, and check to be sure that the braking force changes to the brake drag force inspected in step 2 when the actuator is force-driven.

N (kg, lbs.)

Front wheel	1,800 (180, 397)
Rear wheel	650 (65, 143)

The result should be as shown in the following diagram.



7. If the result of inspection is abnormal, correct according to the "Diagnosis Table."

Diagnosis Table

No.	MUT or MUT-II display	Operation	Judgement		Probable cause	Remedy
			Normal	Abnormal		
01	FR VALVE M	(1) Depress brake pedal to lock wheel. (2) Using the MUT or MUT-II, select the wheel to be checked and force the actuator to operate. (3) Turn the selected wheel manually to check the change of brake force.	Brake force released for 2 seconds after locking.	Wheel does not lock when brake pedal is depressed.	Clogged brake line other than HU	Check and clean brake line
02	FL VALVE M				Clogged hydraulic circuit in HU	Replace HU assembly
03	RR VALVE M			Brake force is not released.	Incorrect HU brake tube connection	Connect correctly
04	RL VALVE M				HU solenoid valve not functioning correctly	Replace HU assembly

8. After inspection, disconnect the MUT or MUT-II immediately after turning the ignition switch to OFF.

<4WD>

Caution
Connection and disconnection of the MUT or MUT-II should always be made with the ignition switch in the OFF position.

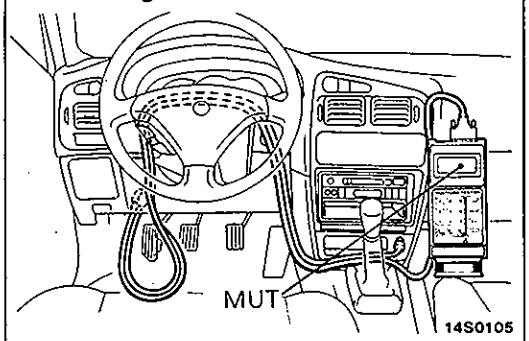
If the MUT or MUT-II is disconnected while the ignition switch is ON, the ABS diagnosis codes will be memorized and the ABS warning lamp may illuminate.

1. Jack up the vehicle and support the vehicle with rigid racks placed at the specified jack-up points or place the wheels which are checked on the rollers of the braking force tester.

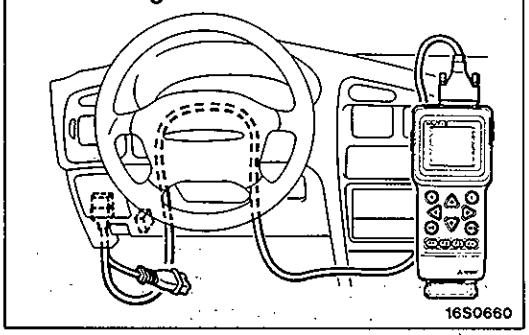
Caution
1. **The roller of the braking force tester and the tyre should be dry during testing.**
2. **When testing the front brakes, apply the parking brake, and when testing the rear brakes, stop the front wheels by chocking them.**

Release the parking brake, and feel the drag force (drag torque) on each road wheel.
When using the braking force tester, take a reading of the brake drag force.

When using the MUT



When using the MUT-II



3. Turn the ignition key to the OFF position and set the MUT or MUT-II through the adapter harness (MB991377) <Up to 1993 models> or the adapter harness included in the MUT-II sub assembly <All models>, as illustrated.
4. After checking that the shift lever <M/T> or the selector lever <A/T> is in neutral, start the engine.

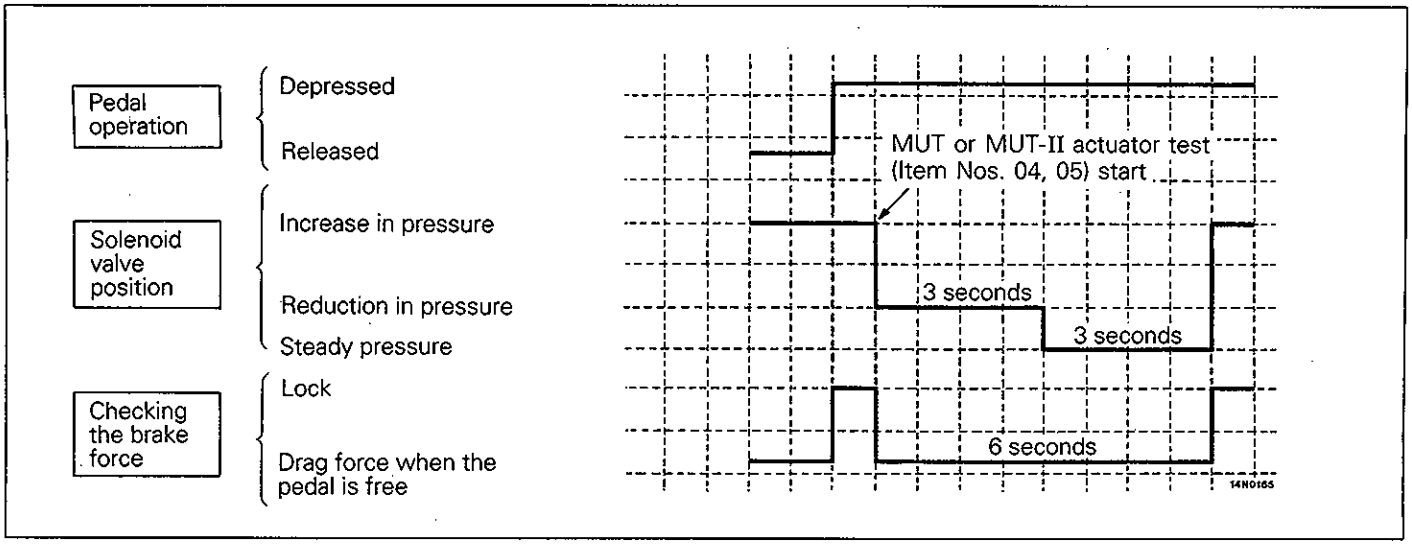
NOTE
1. At this time, the ABS system will switch to the MUT or MUT-II mode and the ABS warning lamp will illuminate.
2. When the ABS has been interrupted by the fail-safe function, the MUT or MUT-II actuator testing cannot be used.

5. Use the MUT or MUT-II to force-drive the actuator.
6. Turn the wheel by hand and check the change in braking force when the brake pedal is depressed.
When using the braking force tester, depress the brake pedal until the braking force is at the following values, and check to be sure that the braking force changes to the brake drag force inspected in step 2 when the actuator is force-driven.

N (kg, lbs.)

Front wheel	1,800 (180, 397)
Rear wheel	650 (65, 143)

The result should be as shown in the following diagram.

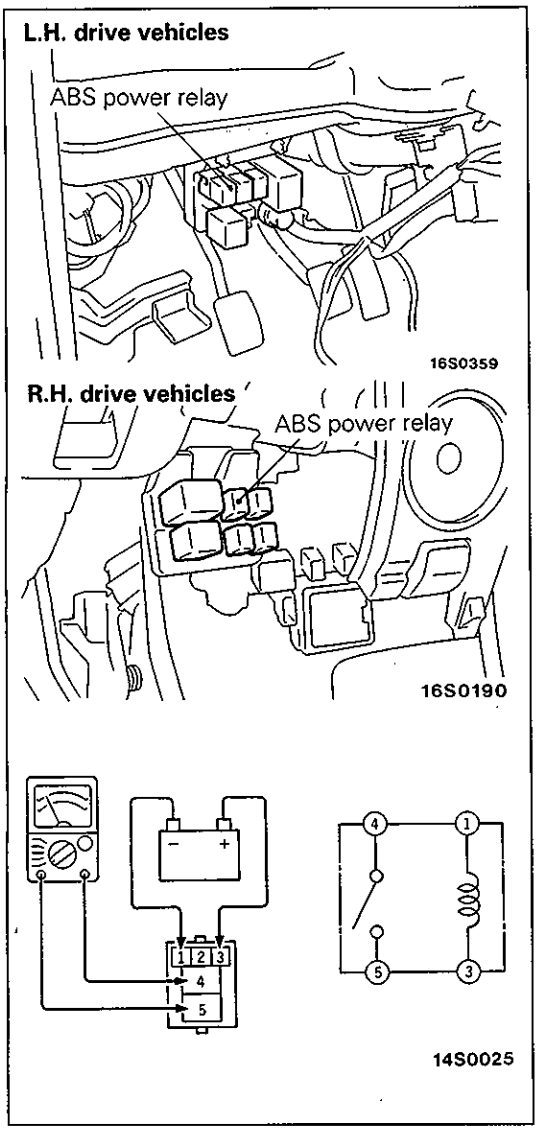


7. If the result of inspection is abnormal, correct according to the "Diagnosis Table."

Diagnosis Table

No.	MUT or MUT-II display	Operation	Judgement		Probable cause	Remedy
			Normal	Abnormal		
04	FR VALVE M	(1) Depress brake pedal to lock wheel. (2) Using the MUT or MUT-II, select the wheel to be checked and force the actuator to operate. (3) Turn the selected wheel manually to check the change of brake force.	Brake force released for 6 seconds after locking.	Wheel does not lock when brake pedal is depressed.	Clogged brake line other than HU	Check and clean brake line
					Clogged hydraulic circuit in HU	Replace HU assembly
05	FL VALVE M			Brake force is not released.	Incorrect HU brake tube connection	Connect correctly
					HU solenoid valve not functioning correctly	Replace HU assembly

8. After inspection, disconnect the MUT or MUT-II immediately after turning the ignition switch to OFF.

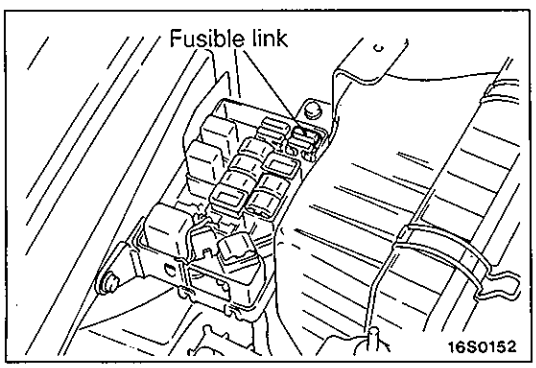


INSPECTION OF POWER RELAY E35FPDA

Remove the instrument under cover and remove the power relay.

Terminal / Battery voltage	1	2	3	5
Continuity no voltage		○		○
Continuity with voltage	○	⊕	○	⊖

NOTE
(1) ○—○ indicates that there is continuity between the terminals.
(2) ⊕---⊖ indicates connection of battery voltage.



REMEDY FOR A FLAT BATTERY E35FPEA

When booster cables are used to start the engine when the battery is completely flat and then the vehicle is immediately driven without waiting for the battery to recharge itself to some extent, the engine may misfire, and driving might not be possible. This happens because A.B.S. consumes a great amount of current for its self-check function; the remedy is to either allow the battery to recharge sufficiently, or to remove the fusible link for A.B.S. circuit, thus disabling the anti-skid brake system.
The A.B.S. warning lamp will illuminate when the fusible link (for A.B.S.) is removes.
After the battery has sufficiently charged, install the fusible link (for A.B.S.) and restart the engine; then check to be sure the A.B.S. warning lamp is not illuminated.

BRAKE PEDAL <M/T>

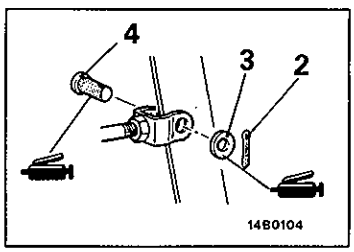
E35GA-A

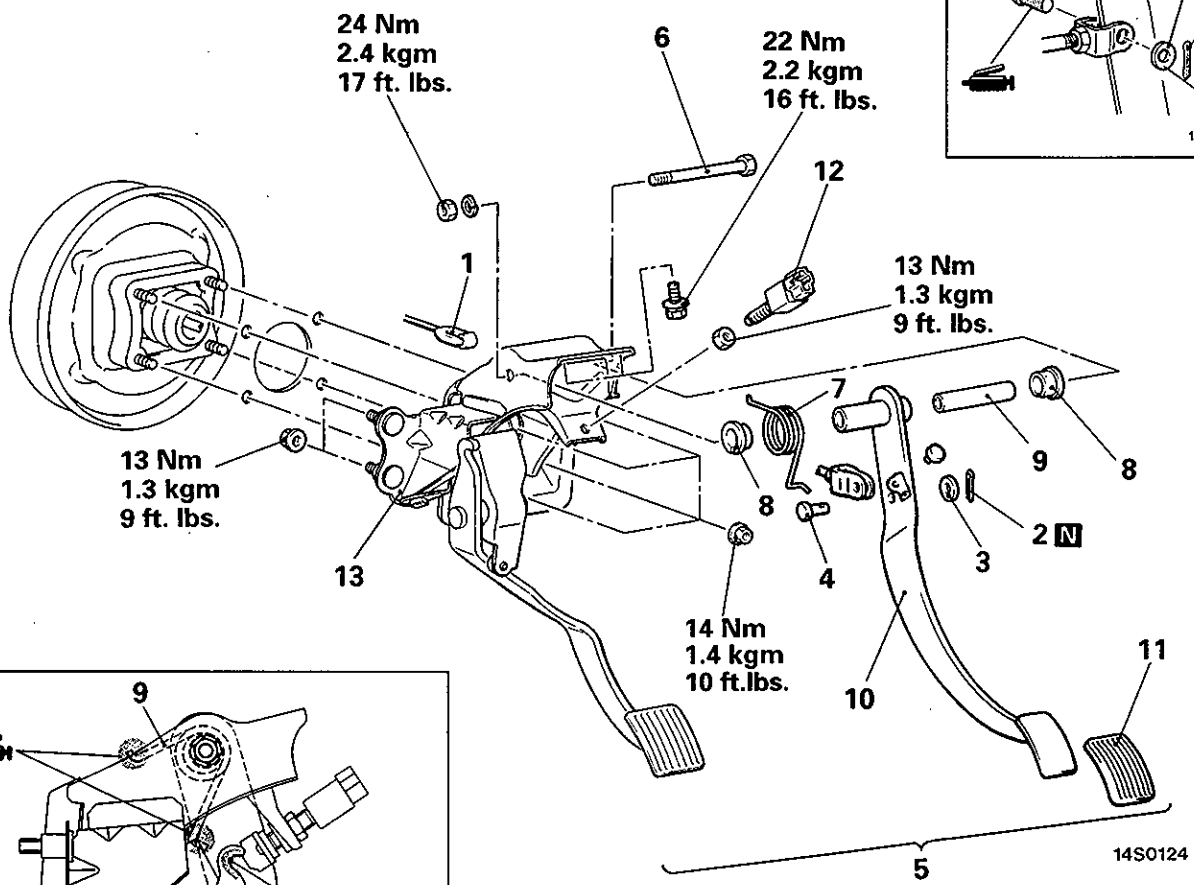
REMOVAL AND INSTALLATION

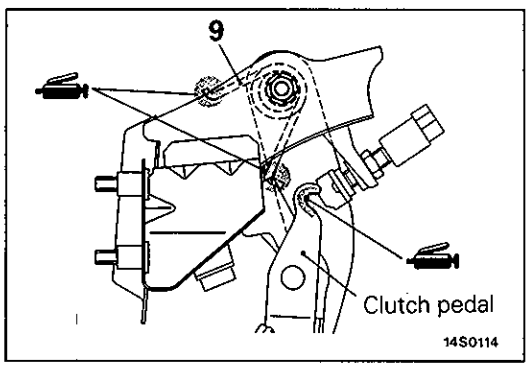
Pre-removal Operation
- Removal of Instrument lower panel (Refer to GROUP 52A – Instrument Panel.)

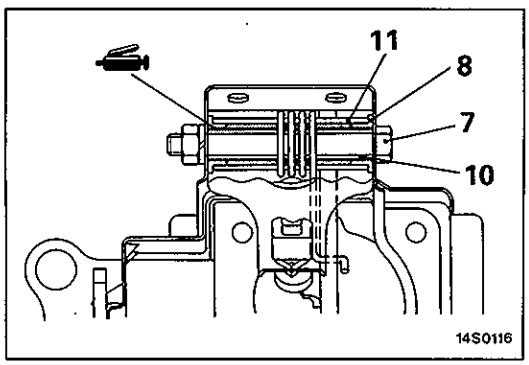
Post-installation Operation
- Installation of Instrument lower panel (Refer to GROUP 52A – Instrument Panel.)
- Adjustment of Clutch Pedal (Refer to GROUP 21 – Service Adjustment Procedures.)
- Adjustment of Brake Pedal (Refer to P. 35-62.)

<Vehicles with cable-type clutch>





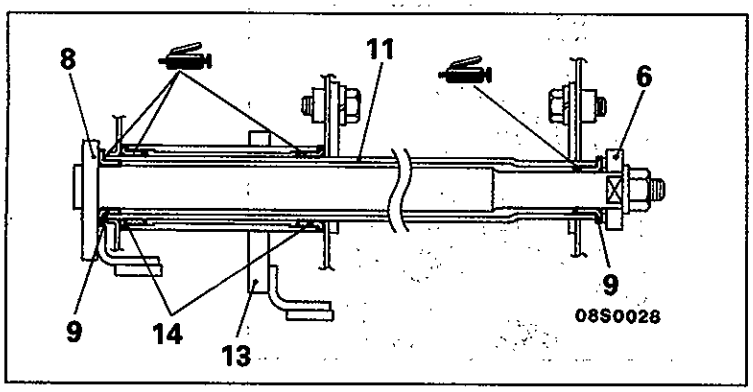


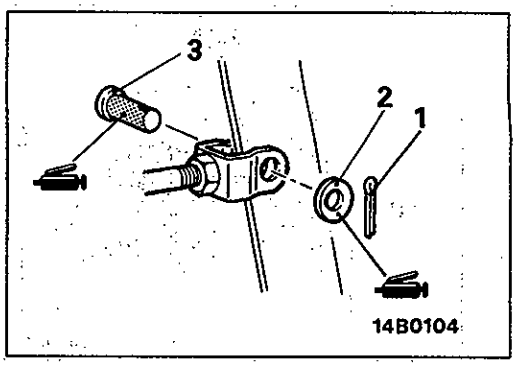


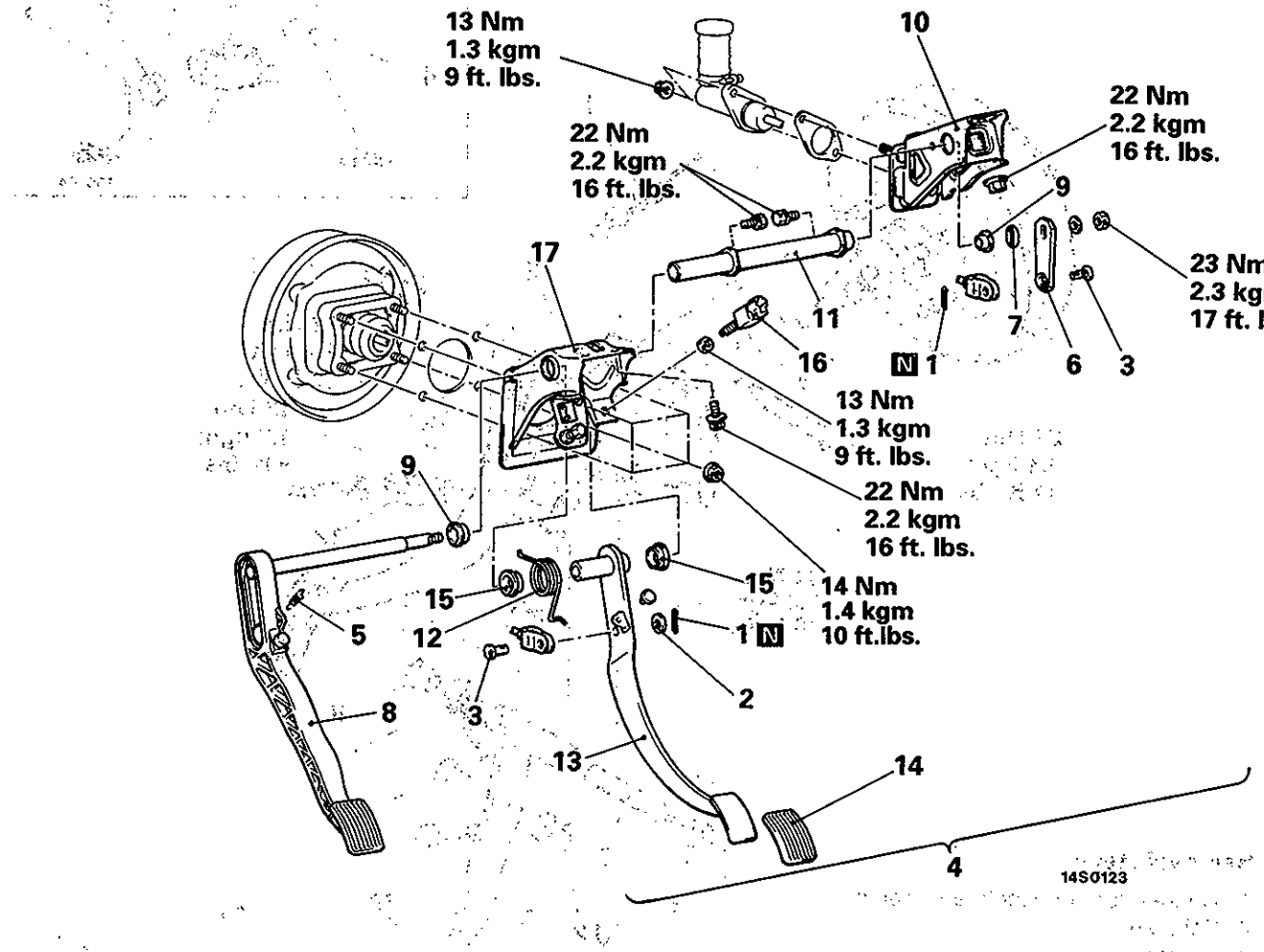
Removal steps

◆◆ 1. Connection for clutch cable
2. Split pin
3. Washer
4. Clevis pin
5. Pedal assembly
6. Brake pedal shaft bolt
7. Brake pedal return spring
8. Bushing
9. Spacer
10. Brake pedal
11. Pedal pad
12. Stop lamp switch
13. Pedal support member

<Vehicles with hydraulic-type clutch – L. H. drive vehicles>



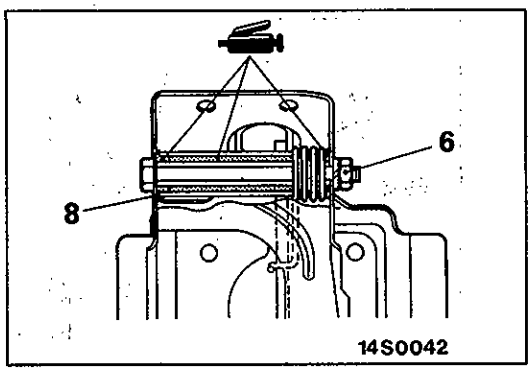


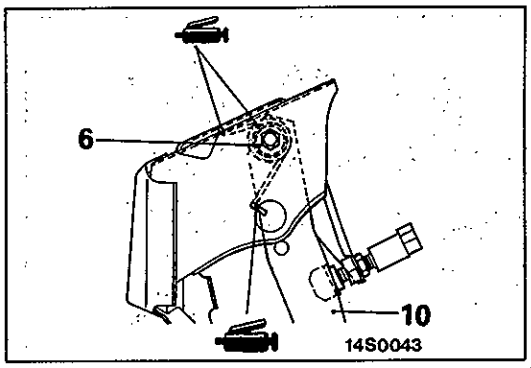


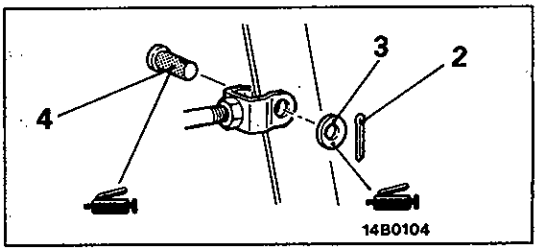
Removal steps

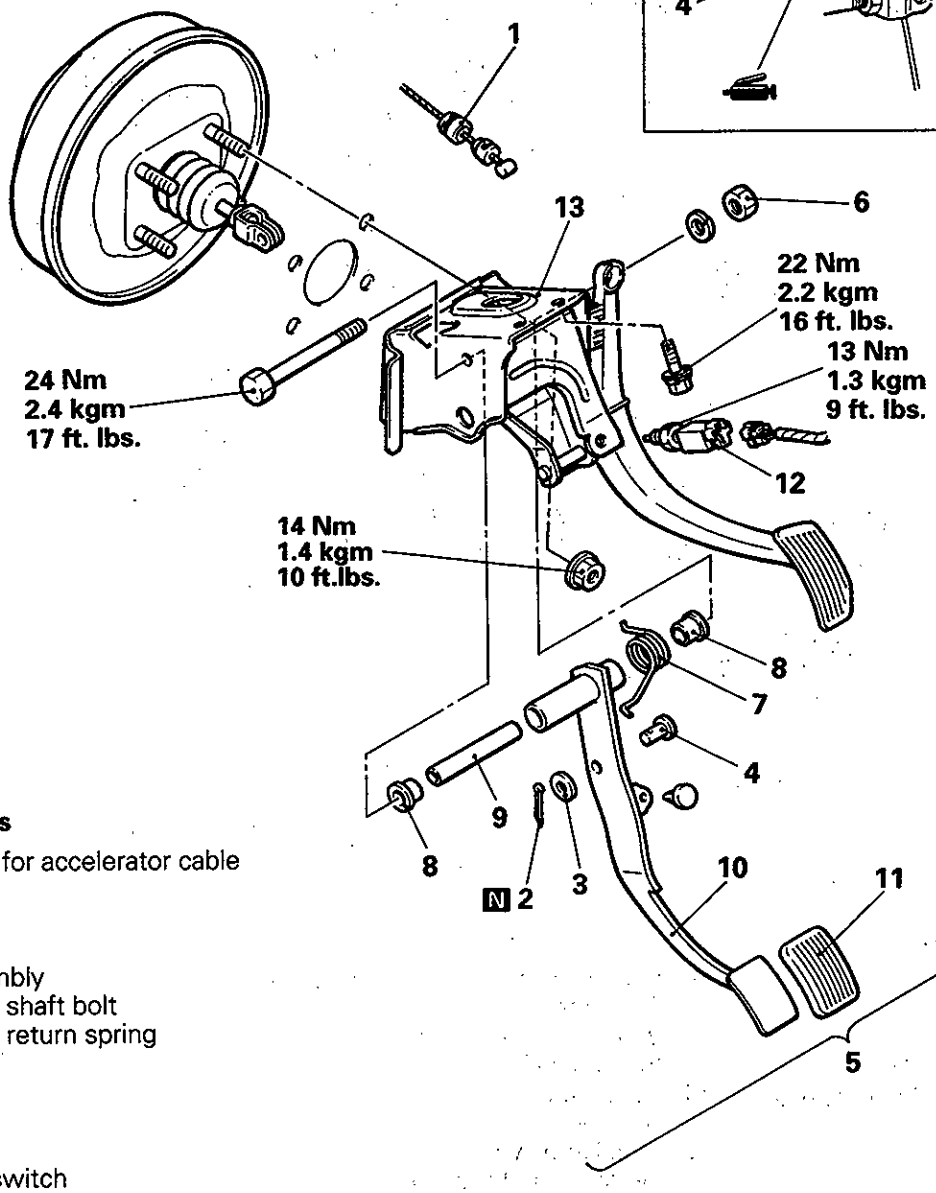
1. Split pin
2. Washer
3. Clevis pin
4. Pedal assembly
5. Clutch pedal return spring
6. Clutch lever
7. Washer
8. Clutch pedal
9. Bushing
10. Master cylinder member assembly
11. Pedal rod
12. Brake pedal return spring
13. Brake pedal
14. Pedal pad
15. Bushing
16. Stop lamp switch
17. Pedal support member

<Vehicles with hydraulic-type clutch – R.H. drive vehicles>



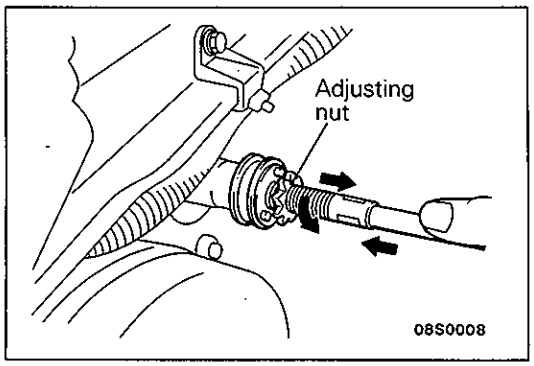






Removal steps

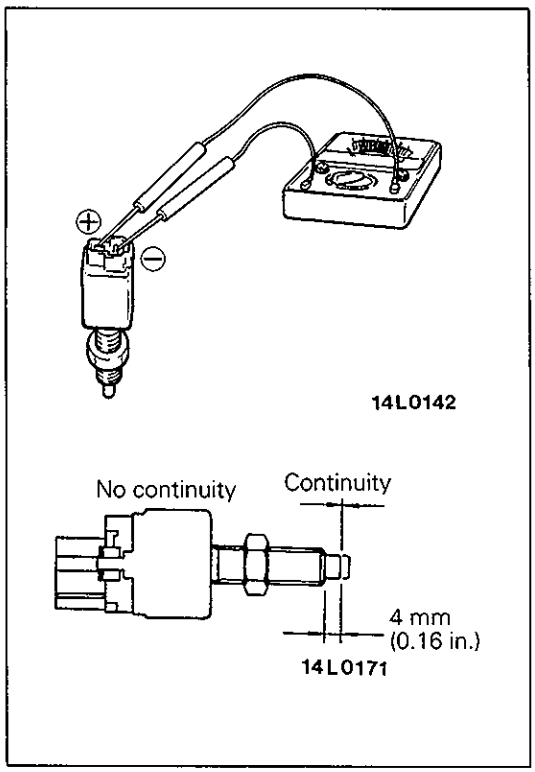
1. Connection for accelerator cable
2. Split pin
3. Washer
4. Clevis pin
5. Pedal assembly
6. Brake pedal shaft bolt
7. Brake pedal return spring
8. Bushing
9. Spacer
10. Brake pedal
11. Pedal pad
12. Stop lamp switch
13. Pedal support member



SERVICE POINT OR REMOVAL E35GBBI

1. DISCONNECTION OF CLUTCH CABLE <Vehicles with cable-type clutch>

(1) Pull out the cable and turn the adjusting nut counterclockwise to increase the cable play.
(2) Disconnect the cable from the clutch lever.



INSPECTION E35GCAD

- Check the bushing for wear.
- Check the brake pedal for bend or twisting.
- Check the brake pedal return spring for damage.

Stop lamp switch

Connect a circuit tester to the stop lamp switch, and check whether or not there is continuity when the plunger of the stop lamp switch is pushed in and when it is released.

The stop lamp switch is in good condition if there is no continuity when the plunger is pushed in to a depth of within 4 mm (0.16 in.) from the outer case edge surface, and if there is continuity when it is released.

BRAKE PEDAL <A/T>

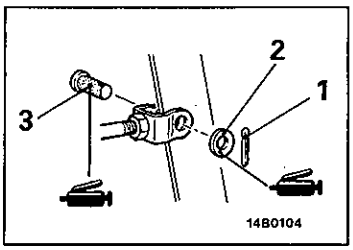
E35GA-B

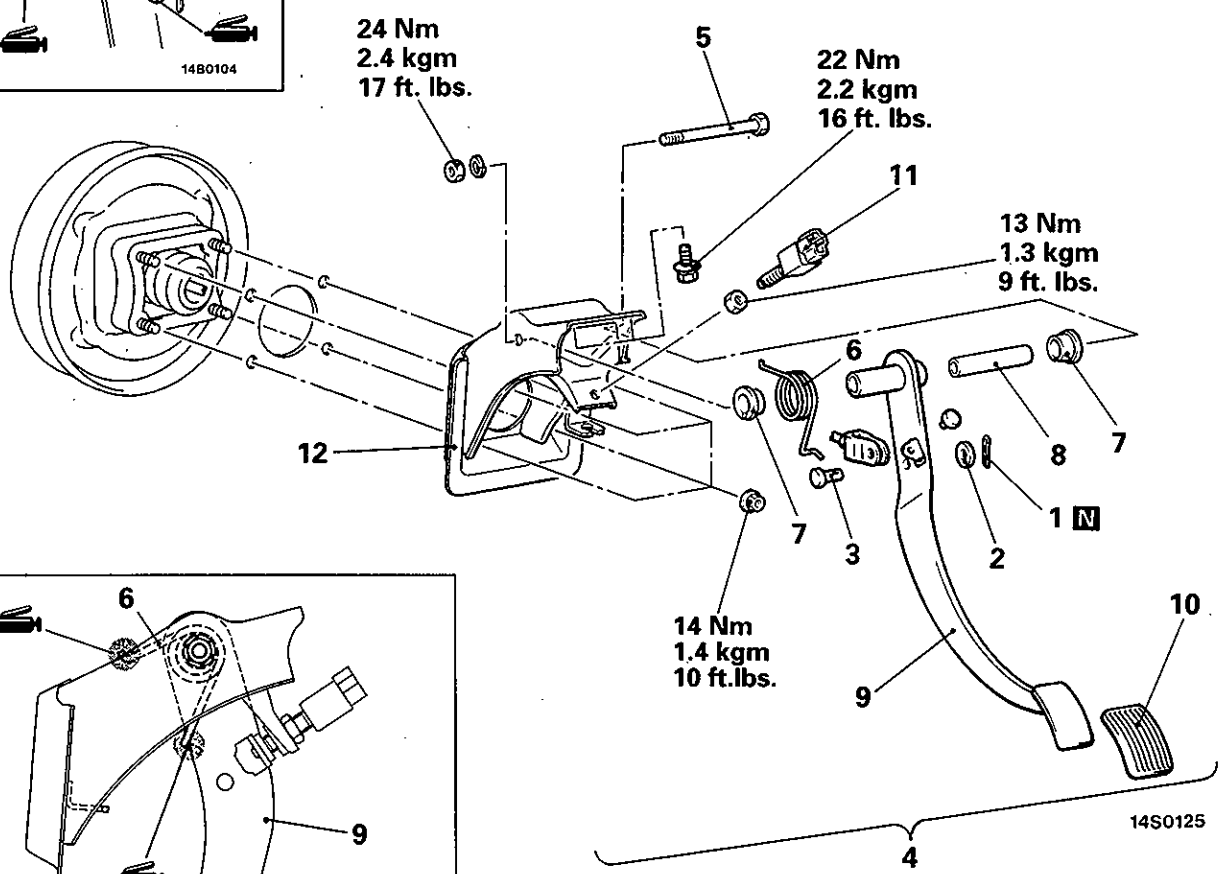
REMOVAL AND INSTALLATION

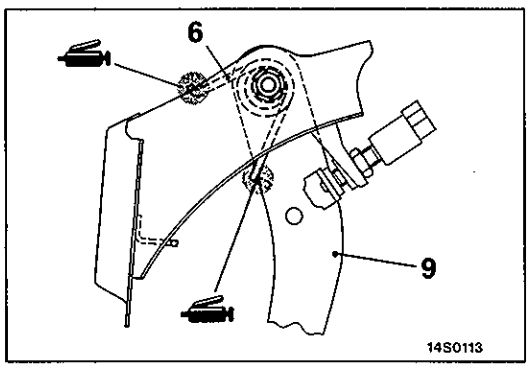
Pre-removal Operation
- Removal of Instrument lower panel (Refer to GROUP 52A – Instrument Panel.)

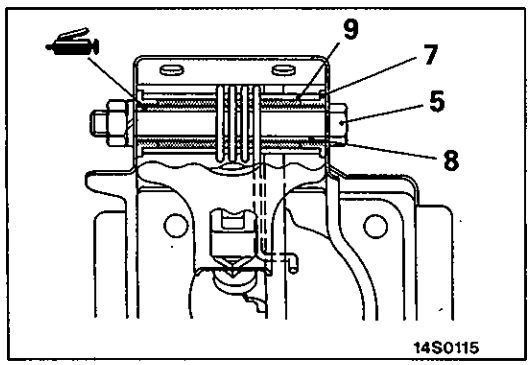
Post-installation Operation
- Installation of Instrument lower panel (Refer to GROUP 52A – Instrument Panel.)
- Adjustment of Brake Pedal (Refer to P. 35-62.)

<L. H. drive vehicles>





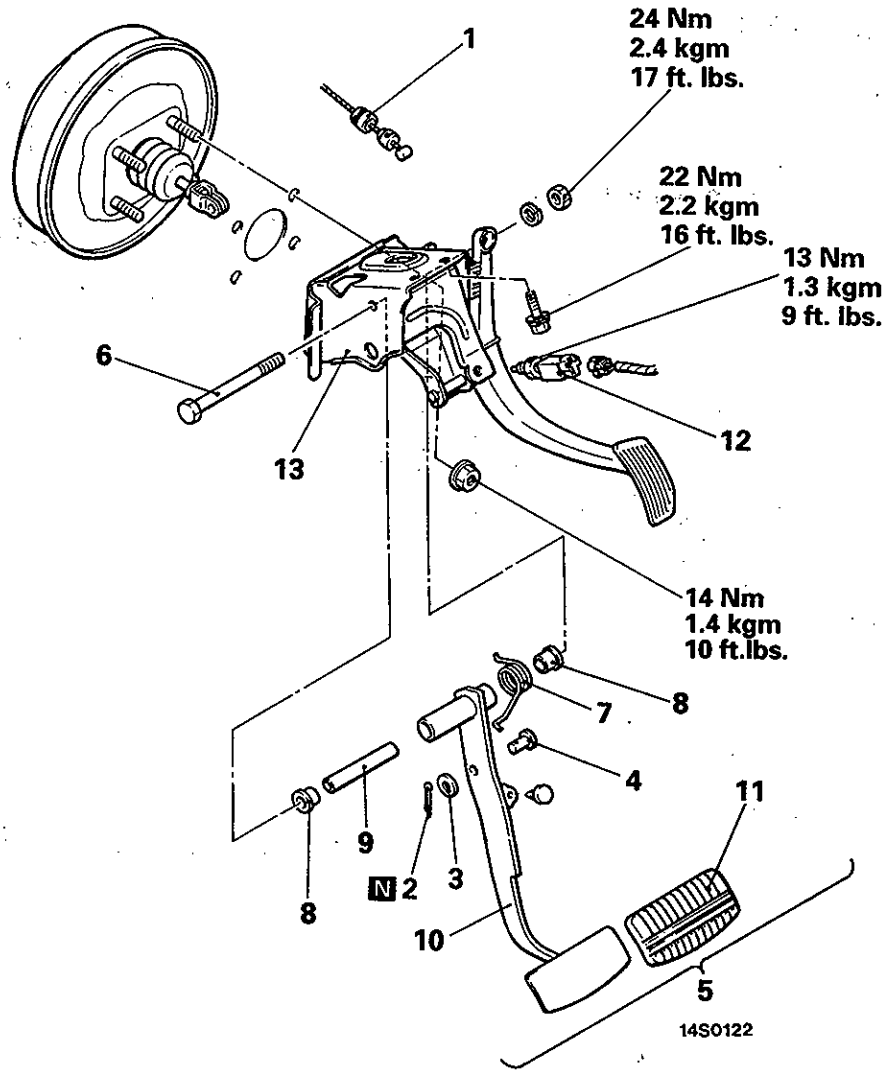


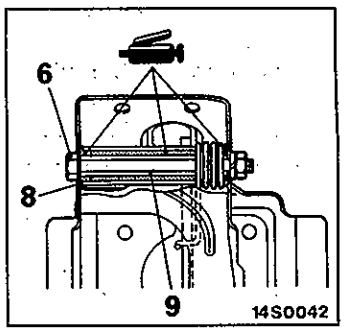


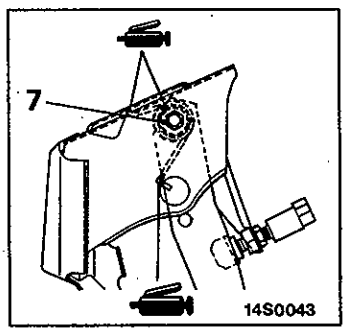
Removal steps

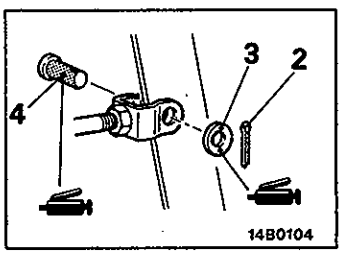
1. Split pin
2. Washer
3. Clevis pin
4. Pedal assembly
5. Brake pedal shaft bolt
6. Brake pedal return spring
7. Bushing
8. Spacer
9. Brake pedal
10. Pedal pad
11. Stop lamp switch
12. Pedal support member

<R. H. drive vehicles>









Removal steps

1. Connection for accelerator cable
2. Split pin
3. Washer
4. Clevis pin
5. Pedal assembly
6. Brake pedal shaft bolt
7. Brake pedal return spring
8. Bushing
9. Spacer
10. Brake pedal
11. Pedal pad
12. Stop lamp switch
13. Pedal support member

INSPECTION

E35GCAJ

Refer to P. 35-85.

MASTER CYLINDER AND BRAKE BOOSTER

E35IA–

REMOVAL AND INSTALLATION

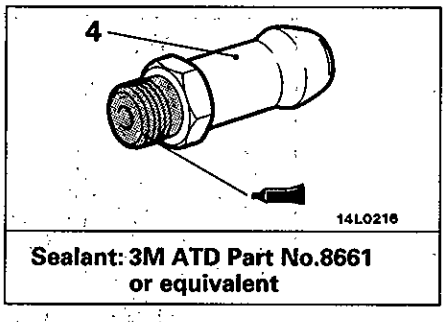
Pre-removal Operation
- Draining of Brake Fluid

Post-installation Operation
- Supplying Brake Fluid
- Bleeding Brake Lines (Refer to P. 35-66.)
- Adjustment of Brake Pedal (Refer to P. 35-62.)

Flared brake line nuts
15 Nm
1.5 kgm
11 ft.lbs.

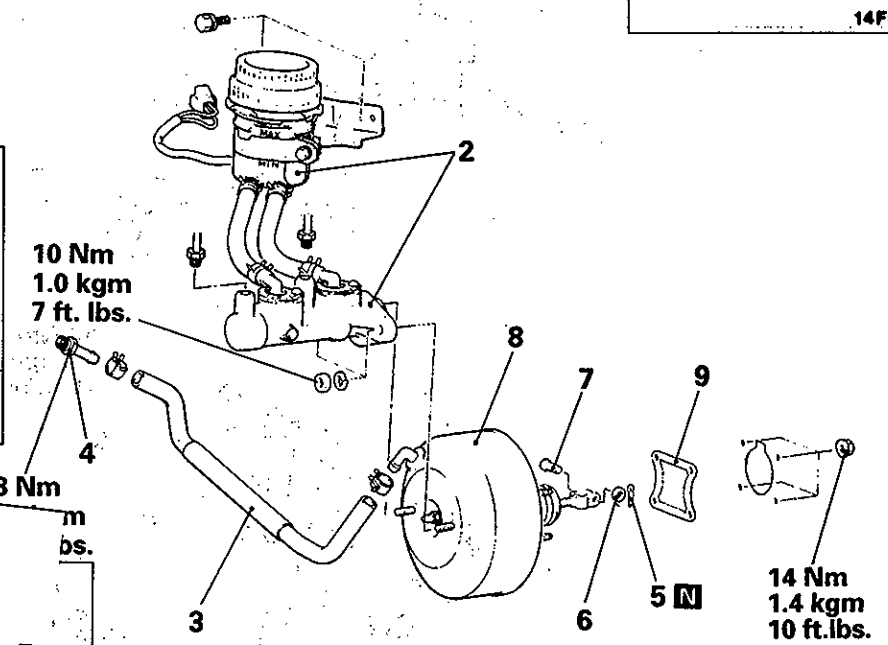
14F038

<L. H. drive vehicles>

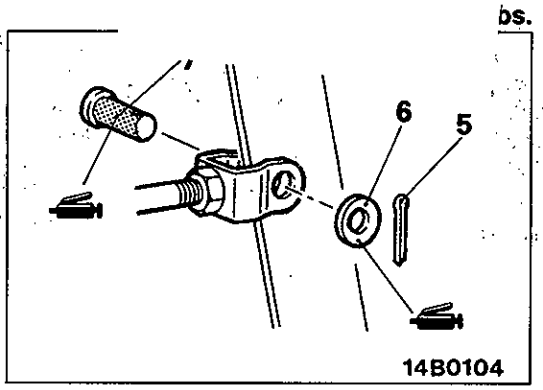


14L0216

Sealant: 3M ATD Part No.8661 or equivalent

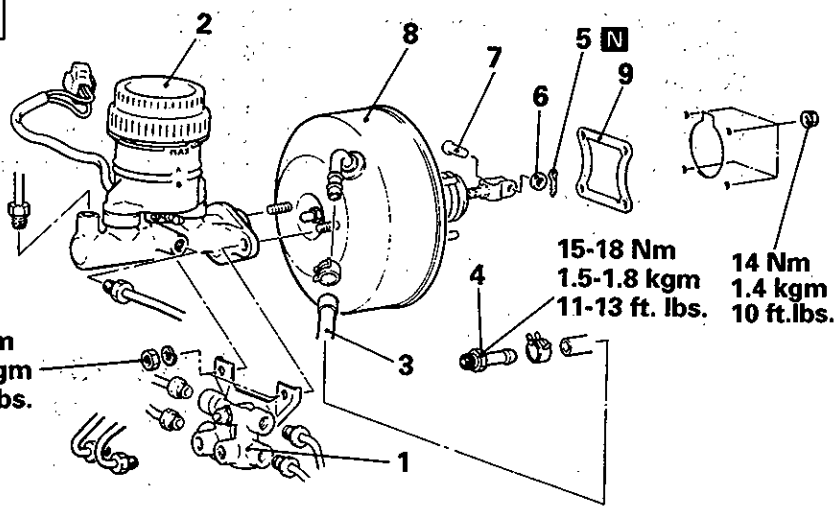


14S0110



14B0104

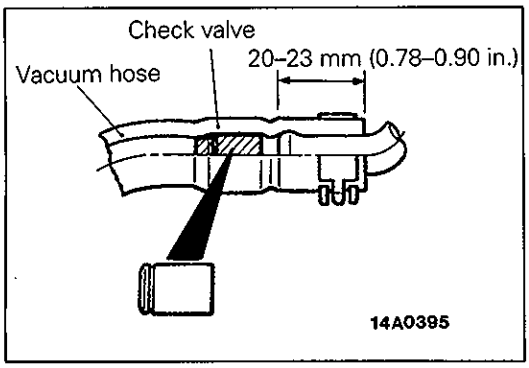
<R. H. drive vehicles>

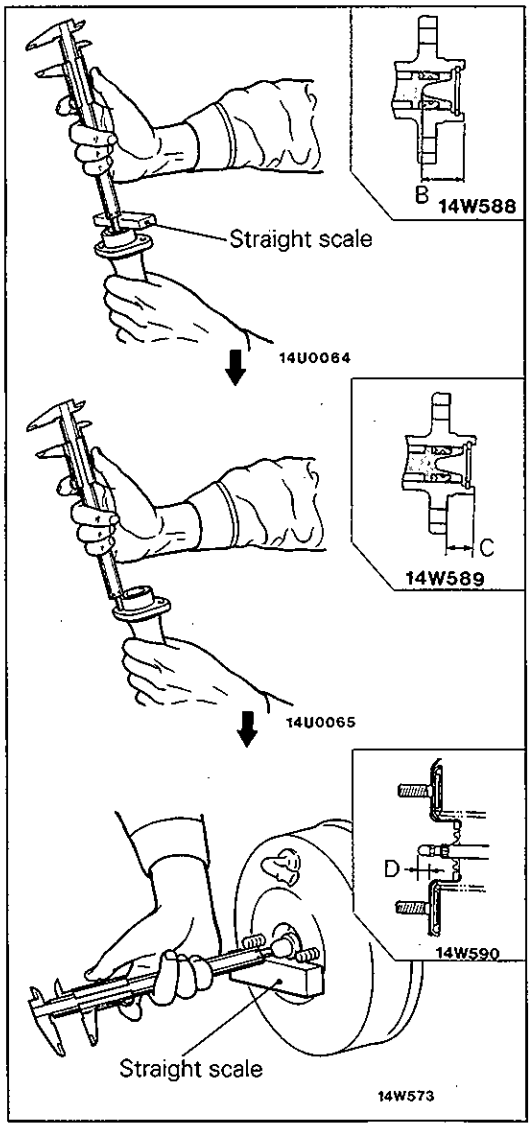


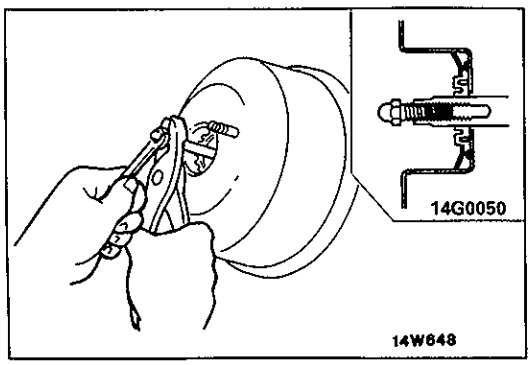
14S0112

Removal steps
1. Proportioning valve <Vehicles without A.B.S.>
2. Master cylinder assembly
   - Adjustment of clearance between brake booster push rod and primary piston
3. Vacuum hose
4. Fitting
5. Split pin
6. Washer
7. Clevis pin
8. Brake booster
9. Sealer

Caution
The check valve should not be removed from the vacuum hose. If the check valve is defective, replace it together with the vacuum hose.







SERVICE POINTS OF INSTALLATION E35IDAG

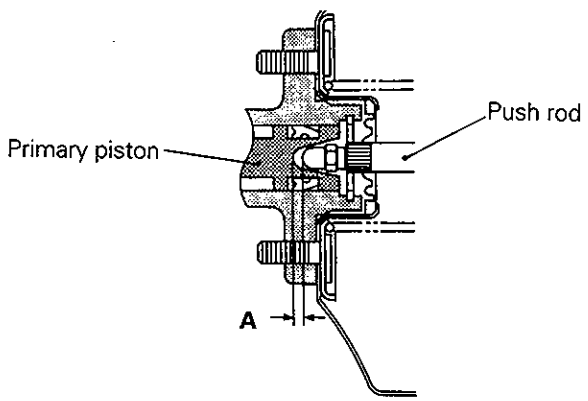
3. CONNECTION OF THE VACUUM HOSE

(1) Install to the pipe part of the brake booster so that the amount of insertion of the vacuum hose is as shown in the figure.

Caution
The check valve and the pipe part of the brake booster must not contact each other.

(2) Insert securely and completely until the vacuum hose at the engine side contacts the edge of the hexagonal part of the fitting, and then secure by using the hose clip.

● ADJUSTMENT OF CLEARANCE BETWEEN BRAKE BOOSTER PUSH ROD AND PRIMARY PISTON



Calculate clearance A from the B, C and D measurements.

A = B–C–D

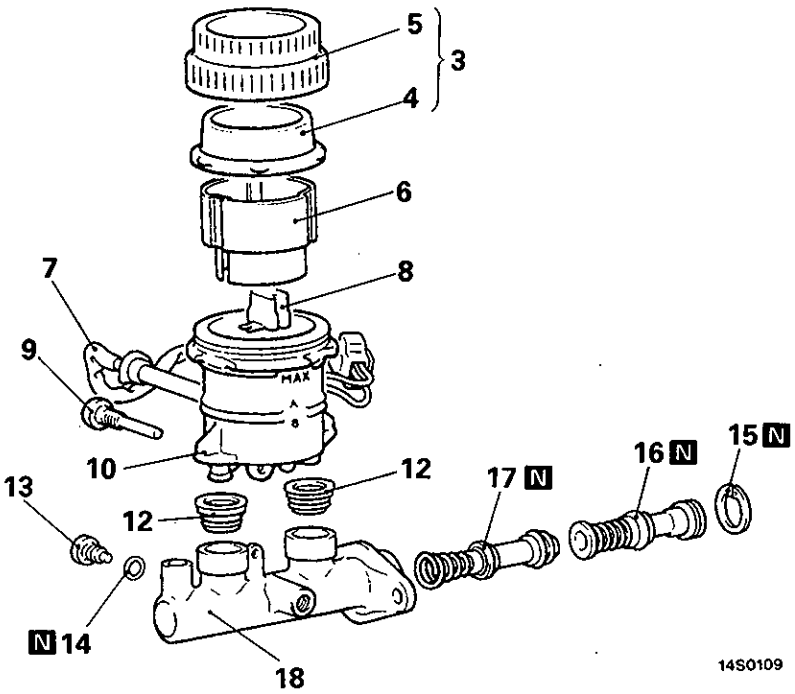
Standard value (A): 8 inch brake booster
0.45 – 0.65 mm (0.018 – 0.026 in.)
9 inch brake booster
0.6 – 0.8 mm (0.024 – 0.031 in.)
7 + 8 inch brake booster
0.4 – 0.6 mm (0.016 – 0.024 in.)

If the clearance is no within the standard value range, adjust by changing the push rod length by turning the screw of the push rod.

MASTER CYLINDER
DISASSEMBLY AND REASSEMBLY

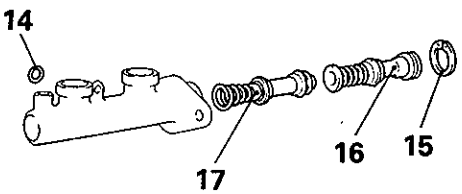
E35IE–

<R. H. drive vehicles>

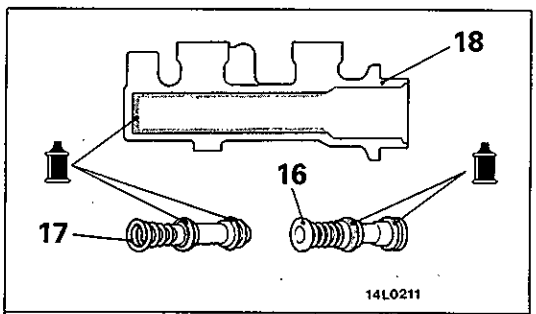


14S0109

Master cylinder kit



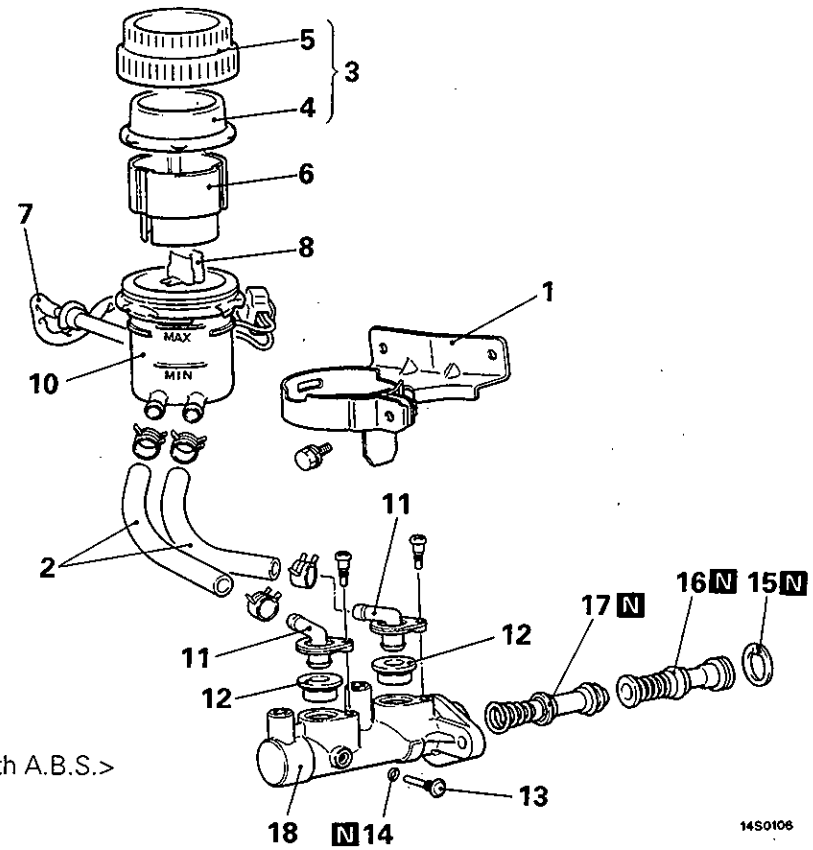
14S0104



14L0211

Brake fluid: DOT3 or DOT4

<L. H. drive vehicles>

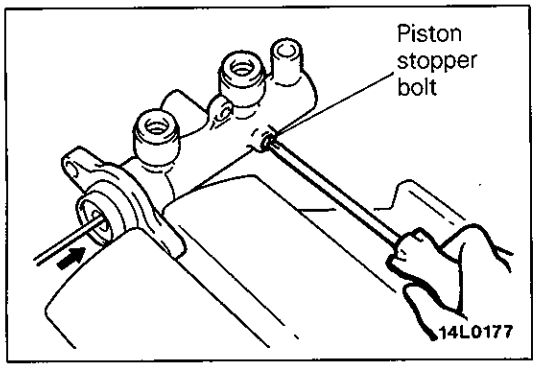


14S0106

Disassembly steps

1. Reservoir bracket
2. Reservoir hose
3. Reservoir cap assembly
4. Diaphragm
5. Reservoir cap
6. Filter <Vehicles with A.B.S.>
7. Brake fluid level sensor
8. Float
9. Reservoir stopper bolt
10. Reservoir tank
11. Nipple
12. Reservoir seal
13. Piston stopper bolt ◆◆ } <Vehicles with A.B.S.>
14. Gasket ◆◆ }
15. Piston stopper ring ◆◆
16. Primary piston assembly
17. Secondary piston assembly
18. Master cylinder body

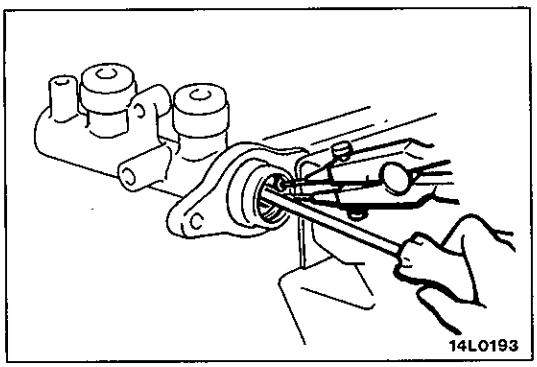
Caution
Do not disassemble the primary and secondary piston assembly.



SERVICE POINTS OF DISASSEMBLY E35IFAE

13. DISASSEMBLY OF PISTON STOPPER BOLT

Remove the piston stopper bolt, while depressing the piston.



15. DISASSEMBLY OF PISTON STOPPER RING

Remove the piston stopper ring, while depressing the piston.

INSPECTION E35IGAF

- Check the inner surface of master cylinder body for rust or pitting.
- Check the primary and secondary pistons for rust, scoring, wear, damage or wear.
- Check the diaphragm for cracks and wear.

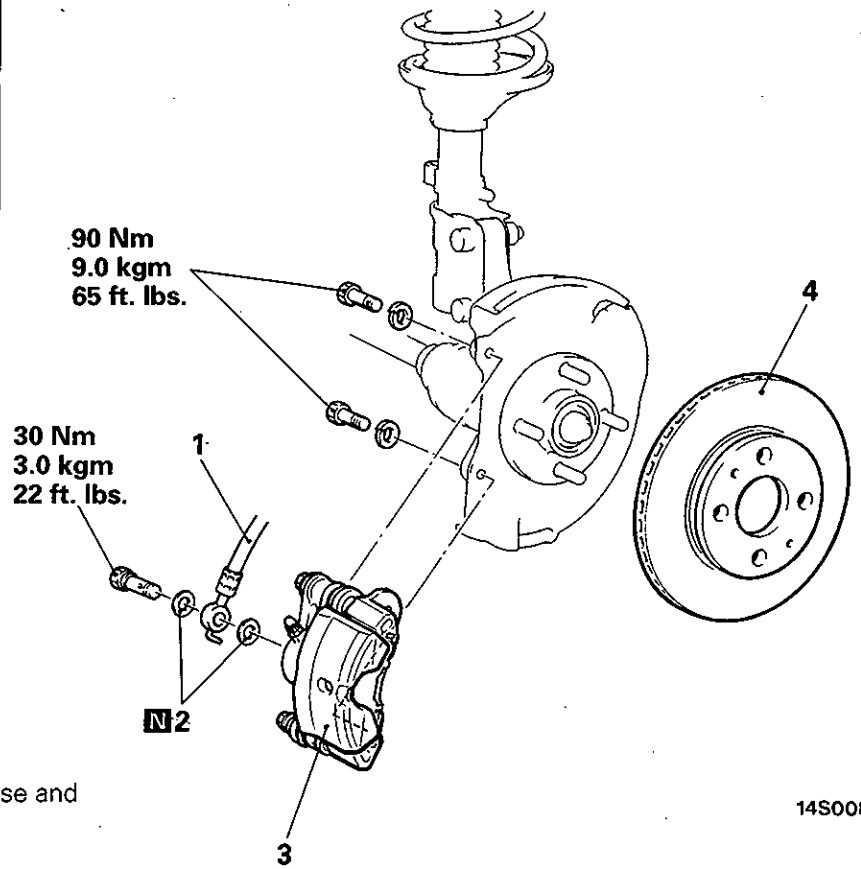
FRONT DISC BRAKE

E35LA-

REMOVAL AND INSTALLATION

Pre-removal Operation
- Draining of Brake Fluid

Post-installation Operation
- Supplying Brake Fluid
- Bleeding Brake Lines (Refer to P. 35-66.)



Removal steps
1. Connection for the brake hose and the brake assembly
2. Gasket
3. Front brake assembly
4. Brake disc

INSPECTION

E35LCAC

- Check the brake disc for damage.

SERVICE POINTS OF INSTALLATION

E35LDAI

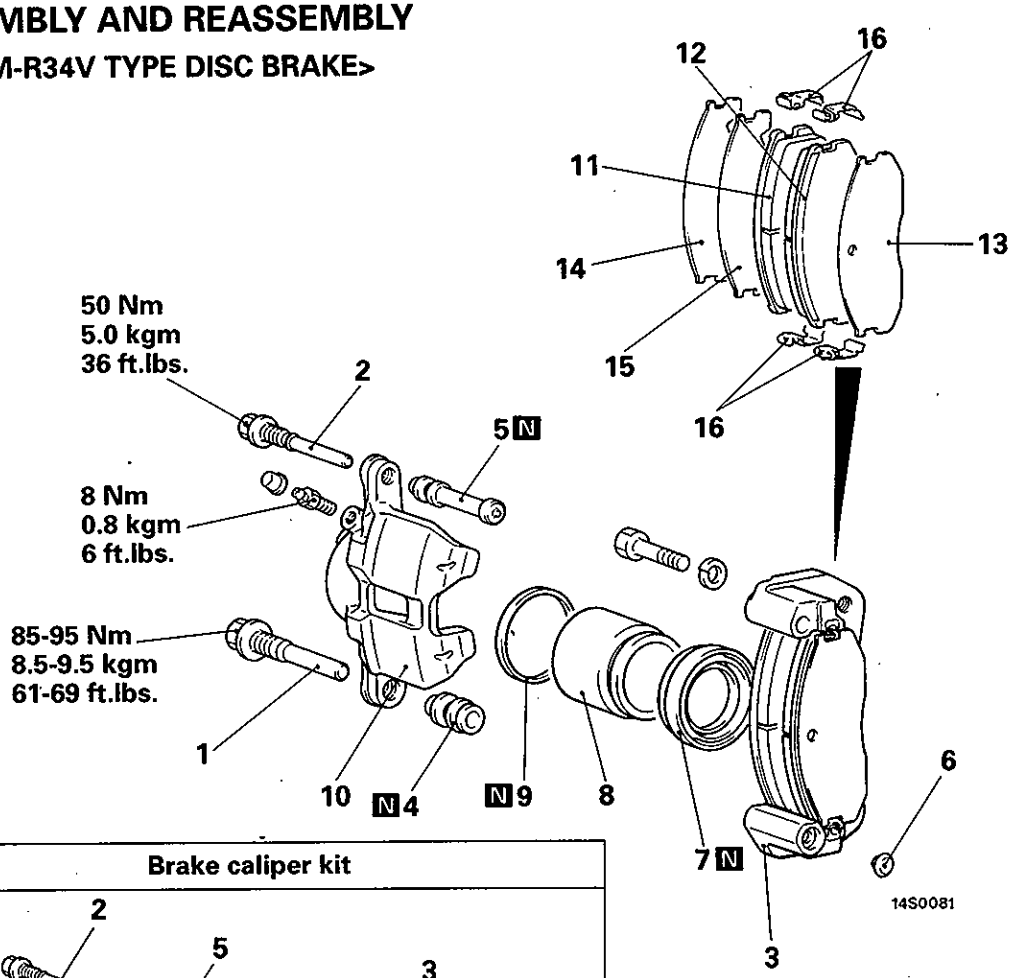
3. INSTALLATION OF FRONT BRAKE ASSEMBLY

Install the front brake assembly and measure the disc brake drag torque. (Refer to P. 35-66.)

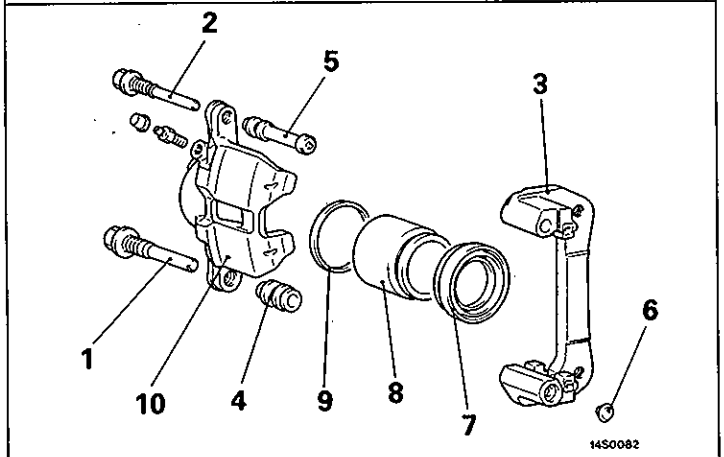
DISASSEMBLY AND REASSEMBLY

E35LF-A

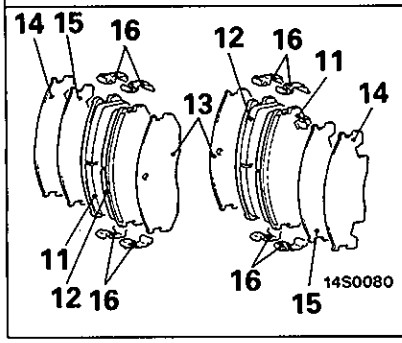
<M-R31S, M-R34V TYPE DISC BRAKE>



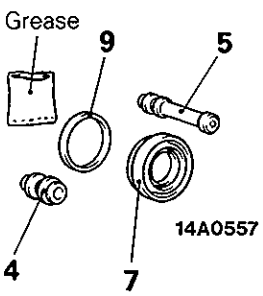
Brake caliper kit



Pad repair kit



Seal and boots repair kit



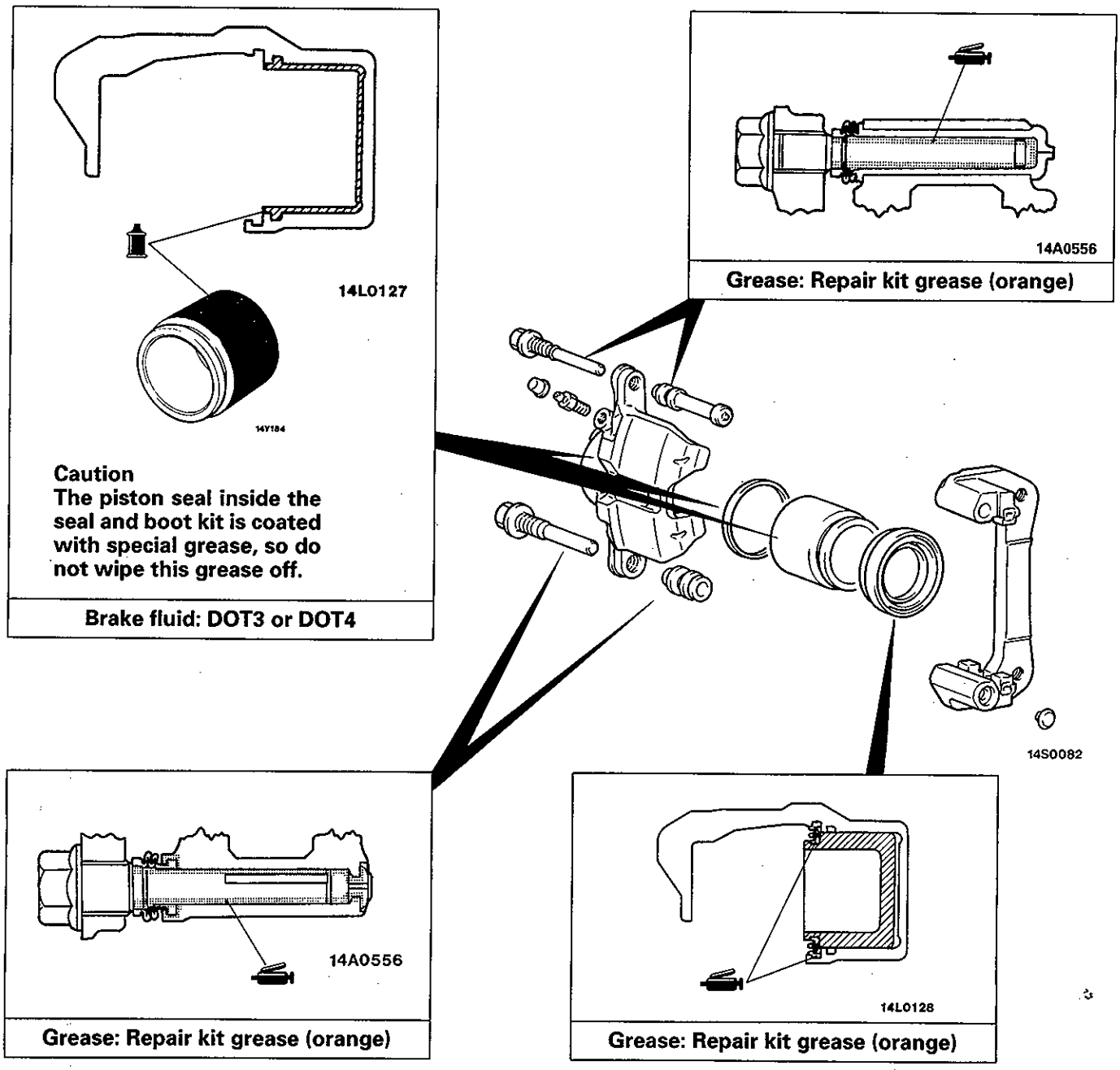
Caliper assembly disassembly steps

1. Slide pin (M14)
2. Slide pin (M10)
3. Torque member (pad, pad liner, shim)
4. Boot
5. Bush
6. Plug
7. Piston boot ◆◆
8. Piston ◆◆
9. Piston seal ◆◆
10. Caliper body

Pad assembly disassembly steps

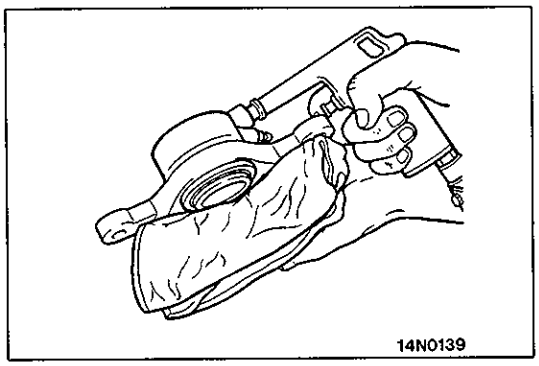
1. Slide pin (M14)
2. Slide pin (M10)
3. Torque member (pad, pad liner, shim)
11. Pad and wear indicator assembly
12. Pad assembly
13. Outer shim (coated with rubber)
14. Inner shim (stainless)
15. Inner shim (coated with rubber)
16. Pad liner

LUBRICATION POINTS



SERVICE POINTS OF DISASSEMBLY E35LGAJ1

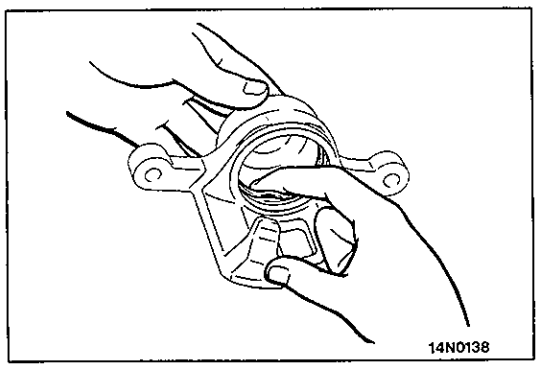
When disassembling the front disc brakes, disassemble both sides (left and right) as a set.


14N0139

7. REMOVAL OF PISTON BOOT/8. PISTON

Protect caliper body with cloth. Blow compressed air through brake hose to remove piston boot and piston.

Caution
Blow compressed air gently.


14N0138

9. REMOVAL OF PISTON SEAL

(1) Remove piston seal with finger tip.

Caution
Do not use (–) screwdriver or other tool to prevent damage to inner cylinder.

(2) Clean piston surface and inner cylinder with trichloroethylene, alcohol or specified brake fluid.

Specified brake fluid: DOT3 or DOT4

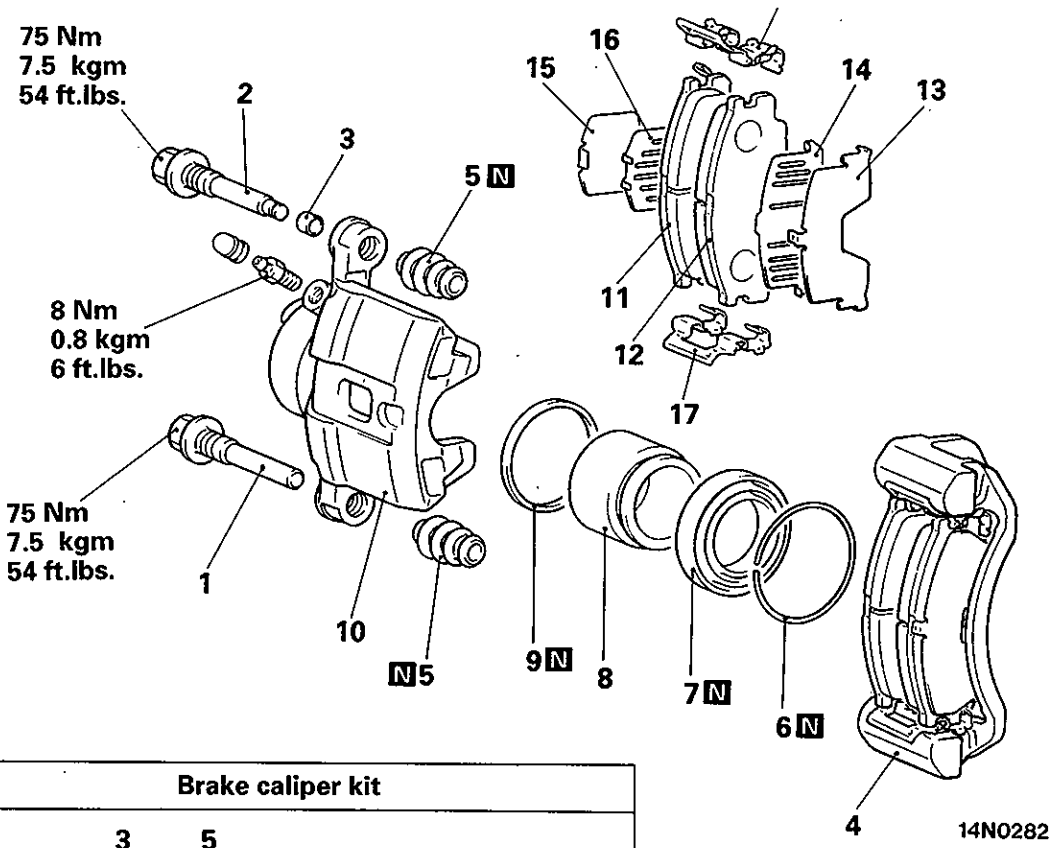
INSPECTION E35LHAD1

- Check cylinder for wear, damage or rust.
- Check piston surface for wear, damage or rust.
- Check caliper body or sleeve for wear.
- Check pad for damage or adhesion of grease, check backing metal for damage.

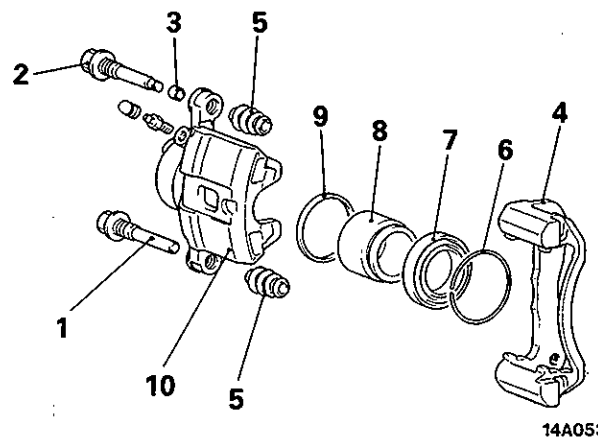
DISASSEMBLY AND REASSEMBLY

E35LF-B

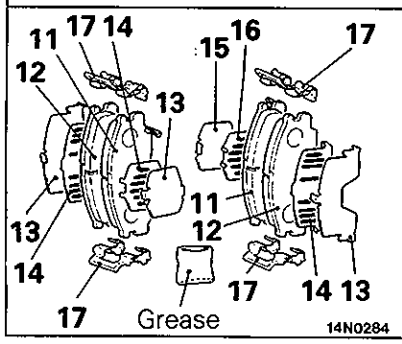
<M-R44V TYPE DISC BRAKE>



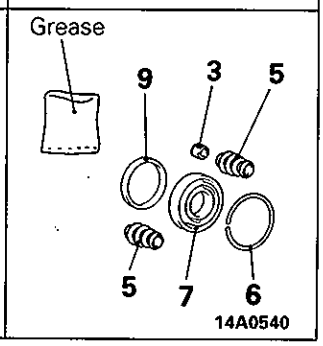
Brake caliper kit



Pad repair kit



Seal and boots repair kit



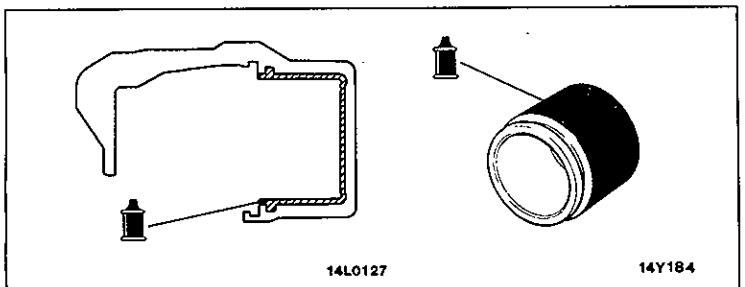
Caliper assembly disassembly steps

- ◆◆ 1. Guide pin
- ◆◆ 2. Lock pin
- 3. Bushing
- 4. Caliper support (pad, clip, shim)
- 5. Boot
- 6. Boot ring
- ◆◆ 7. Piston boot
- ◆◆ 8. Piston
- ◆◆ 9. Piston seal
- 10. Caliper body

Pad assembly disassembly steps

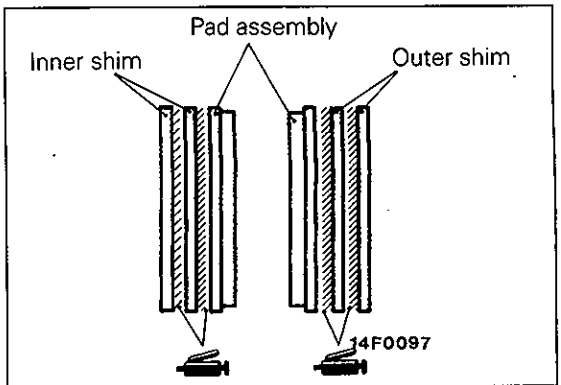
- ◆◆ 1. Guide pin
- ◆◆ 2. Lock pin
- 3. Bushing
- 4. Caliper support (pad, clip, shim)
- 11. Pad and wear indicator assembly
- 12. Pad assembly
- 13. Outer shim (stainless)
- 14. Outer shim (coated with rubber)
- 15. Inner shim (stainless)
- 16. Inner shim (coated with rubber)
- 17. Clip

LUBRICATION POINTS

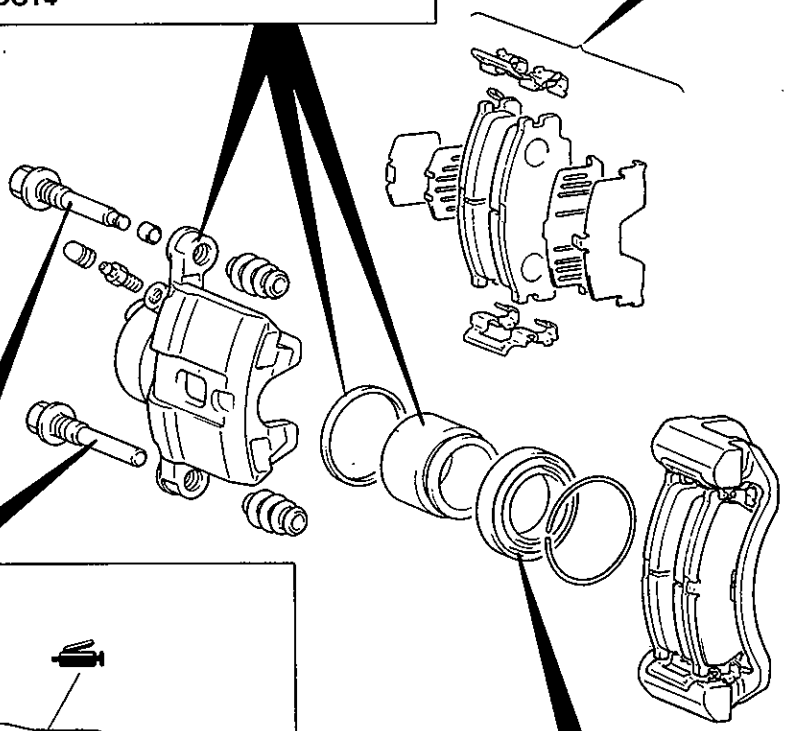


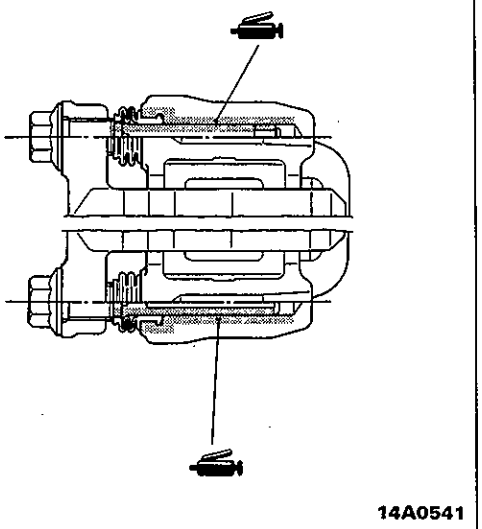
Caution
The piston seal inside the seal and boot kit is coated with special grease, so do not wipe this grease off

Brake fluid: DOT3 or DOT4

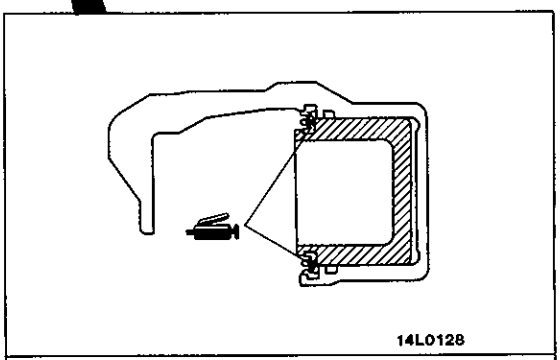


Grease: Repair kit grease (orange)





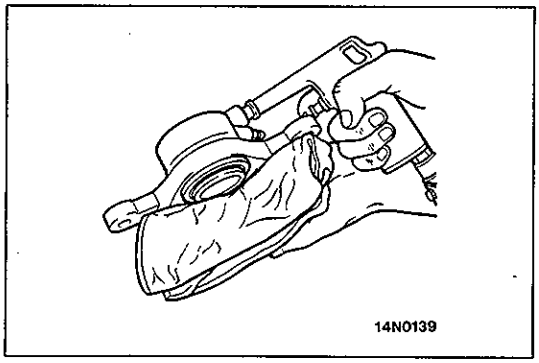
Grease: Repair kit grease (orange)



Grease: Repair kit grease (orange)

SERVICE POINTS OF DISASSEMBLY E35LGAJ2

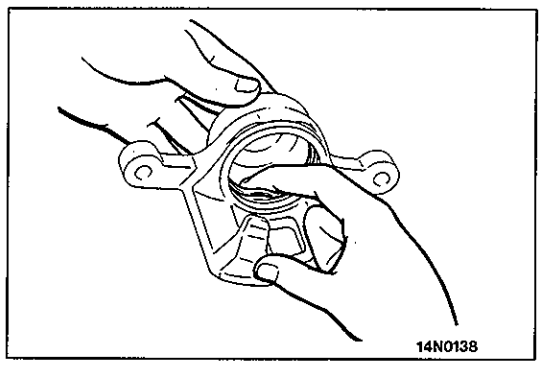
When disassembling the front disc brakes, disassemble both sides (left and right) as a set.



7. REMOVAL OF PISTON BOOT/8. PISTON

Protect caliper body with cloth. Blow compressed air through brake hose to remove piston boot and piston.

Caution
Blow compressed air gently.



9. REMOVAL OF PISTON SEAL

(1) Remove piston seal with finger tip.

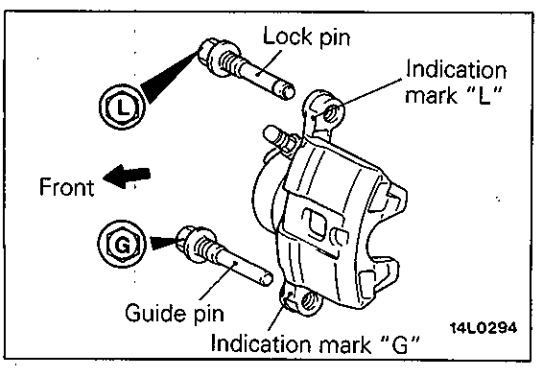
Caution
Do not use (–) screwdriver or other tool to prevent damage to inner cylinder.

(2) Clean piston surface and inner cylinder with trichloroethylene, alcohol or specified brake fluid.

Specified brake fluid: DOT3 or DOT4

INSPECTION E35LHAD2

- Check cylinder for wear, damage or rust.
- Check piston surface for wear, damamge or rust.
- Check caliper body or sleeve for wear.
- Check pad for damage or adhesion of grease, check backing metal for damage.



SERVICE POINTS OF REASSEMBLY E35LIAJ

2. INSTALLATION OF LOCK PIN/1. GUIDE PIN

Install the guide pin and lock pin as illustrated so that each head mark of the guide pin and the lock pin matches the indication mark located on the caliper body.

REAR DRUM BRAKE SHOE

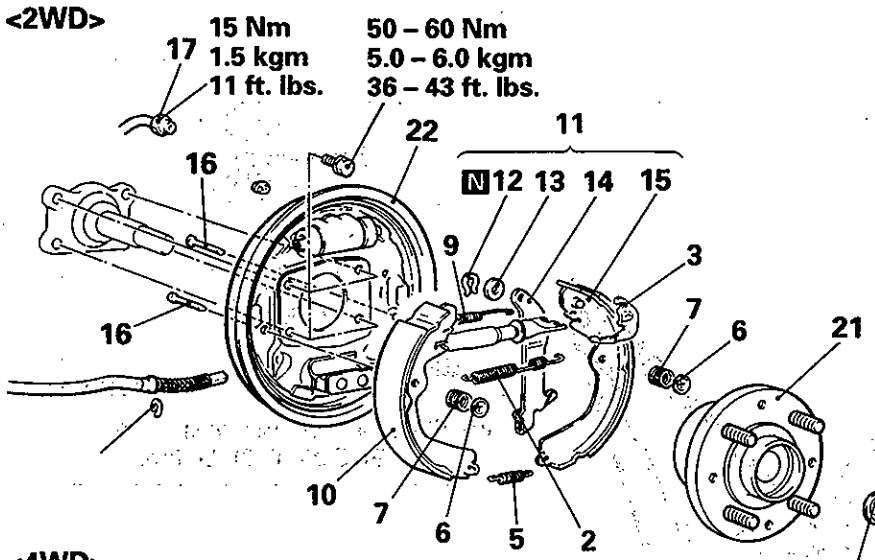
E35UA-

REMOVAL AND INSTALLATION

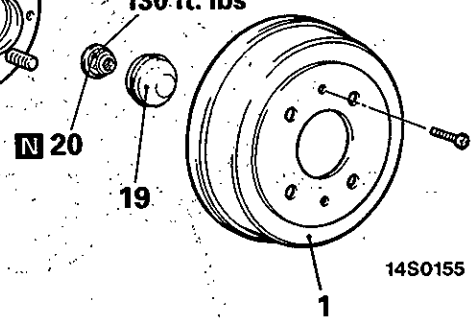
Pre-removal Operation
- Loosen the parking brake cable adjusting nut.
- Draining of Brake Fluid

Post-installation Operation
- Filling of Brake Fluid and Air Bleeding (Refer to P.35-66.)
- Adjustment of Parking Brake Lever Stroke (Refer to GROUP 36 – Service Adjustment Procedures.)

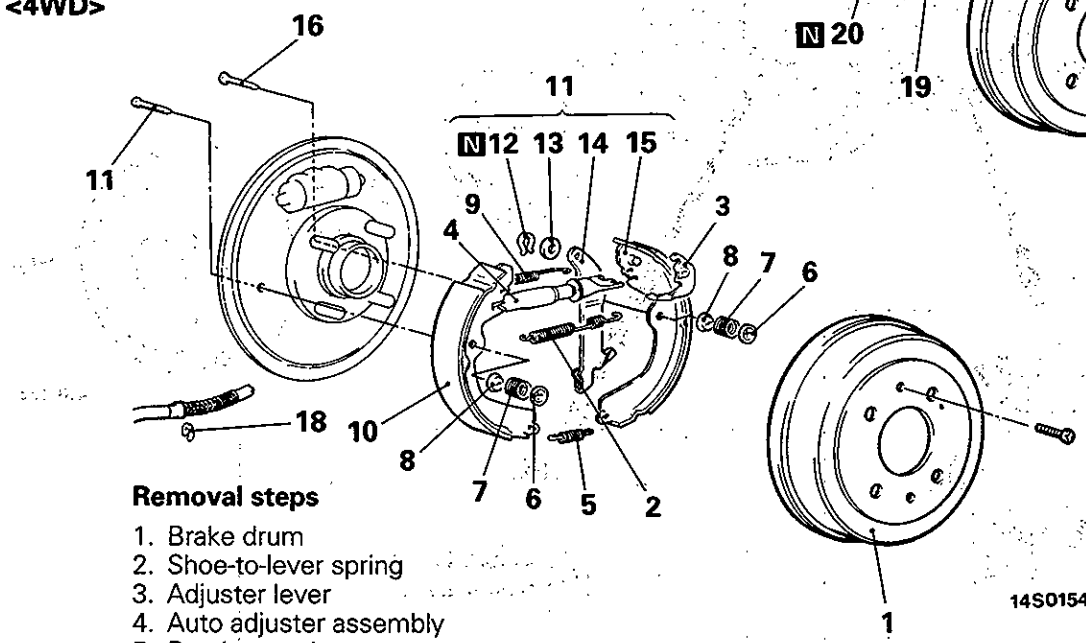
<2WD>



180 Nm
18 kgm
130 ft. lbs



<4WD>



Removal steps

1. Brake drum
2. Shoe-to-lever spring
3. Adjuster lever
4. Auto adjuster assembly
5. Retainer spring
6. Shoe hold-down cup
7. Shoe hold-down spring
8. Shoe hold-down cup
9. Shoe-to-shoe spring
10. Shoe and lining assembly
11. Shoe, lining and lever assembly

◀▶ ▶◀ 12. Retainer

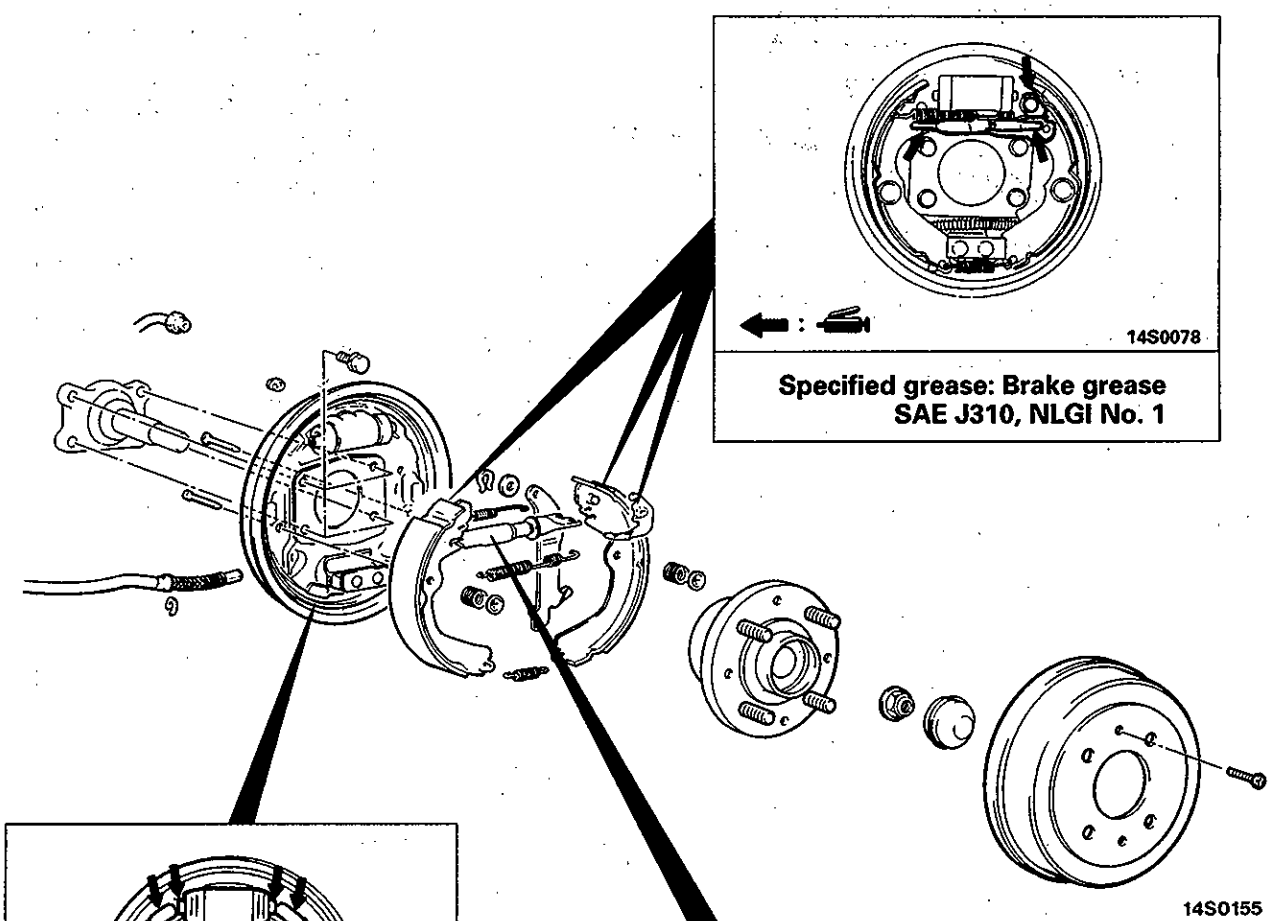
▶◀ 13. Wave washer

14. Parking lever
15. Shoe and lining assembly
16. Shoe hold-down pin
17. Connection for the brake pipe
18. Snap ring
19. Hub cap
20. Flange nut
21. Rear hub assembly
22. Backing plate

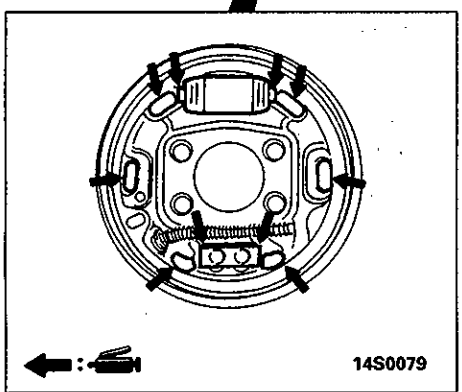
NOTE

For removal and installation of the backing plate in 4WD vehicles, refer to GROUP 27 - Rear Axle Hub.

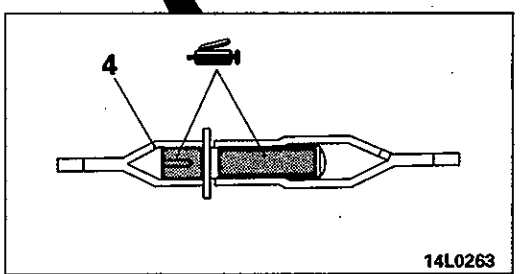
LUBRICATION AND SEALING POINTS



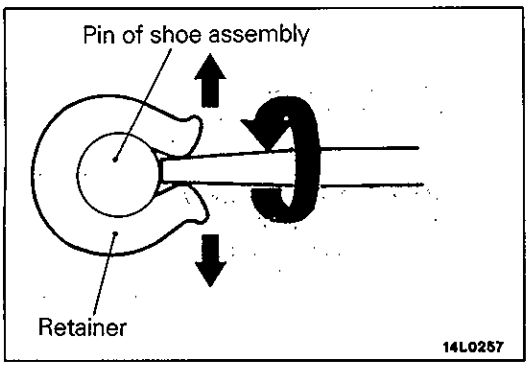
Specified grease: Brake grease
SAE J310, NLGI No. 1



Specified grease: Brake grease
SAE J310, NLGI No. 1



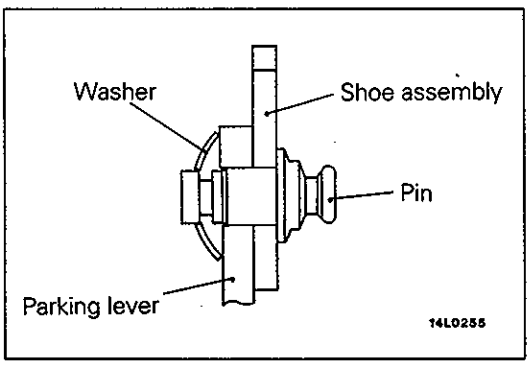
Specified grease: Brake grease
SAE J310, NLGI No. 1



SERVICE POINTS OF REMOVAL E35UBEC

12. REMOVAL OF RETAINER

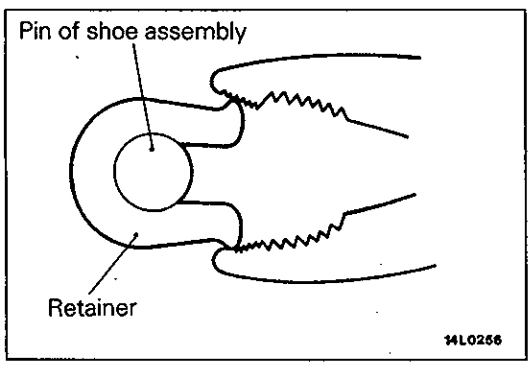
Use standard screwdriver or the like to open up the retainer joint, and remove the retainer.



SERVICE POINTS OF INSTALLATION E35UDEB

13. INSTALLATION OF WAVE WASHER

Install the washer in the direction shown in the ilustration.



12. INSTALLATION OF RETAINER

Use pliers or the like to install the retainer or the pin positively.

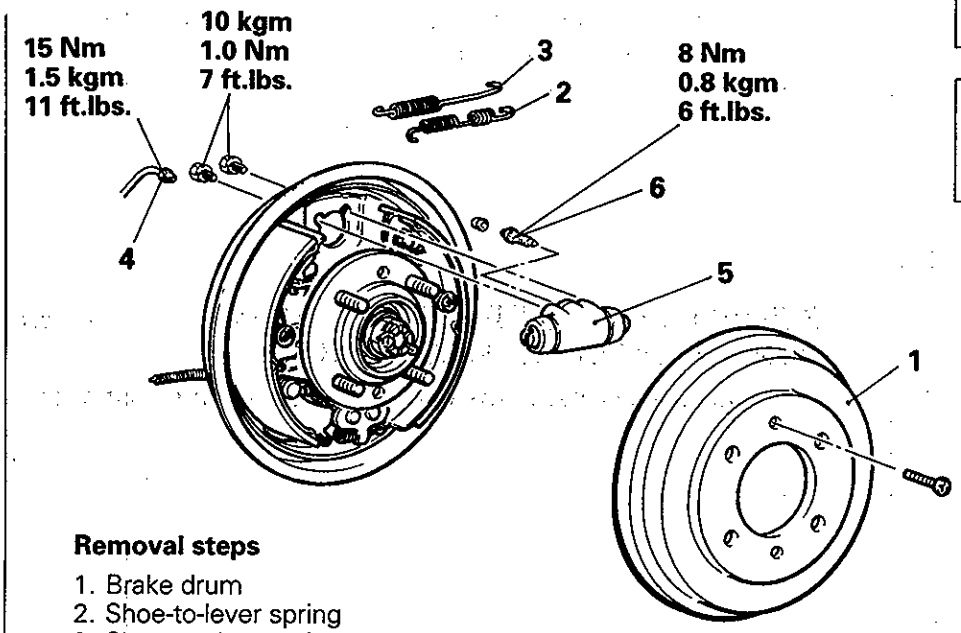
REAR DRUM BRAKE WHEEL CYLINDER

E35VA--

REMOVAL AND INSTALLATION

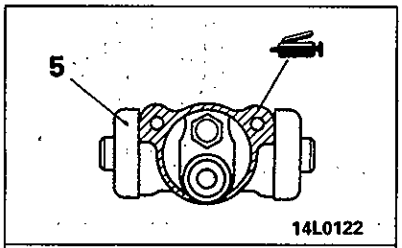
Pre-removal Operation
- Draining of Brake Fluid

Post-installation Operation
- Brake Fluid Filling
- Brake Line Bleeding (Refer to P.35-66.)



14S0018

Removal steps
1. Brake drum
2. Shoe-to-lever spring
3. Shoe-to-shoe spring
4. Conneciton for the brake pipe
5. Wheel cylinder
6. Bleeder screw

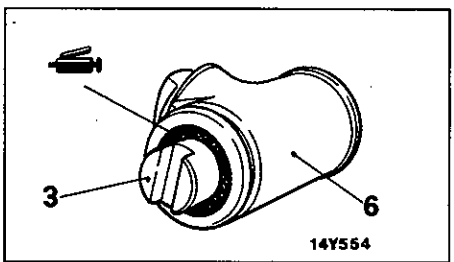


14L0122

Sealant: 3M ATD Part NO. 8513 or equivalent

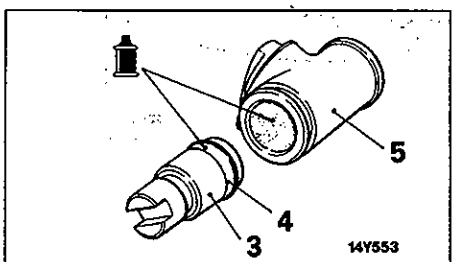
DISASSEMBLY AND REASSEMBLY

E35VE--



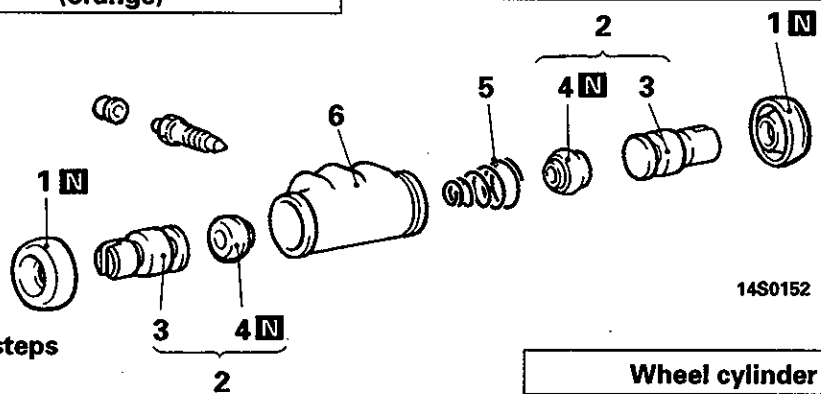
14Y554

Grease: Repair kit grease (orange)



14Y553

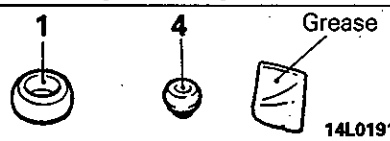
Brake fluid: DOT3 or DOT4



14S0152

Disassembly steps
1. Boots
2. Piston assembly
- ◆◆ 3. Pistons
- ◆◆ 4. Piston cups
5. Spring <2WD>
6. Wheel cylinder body

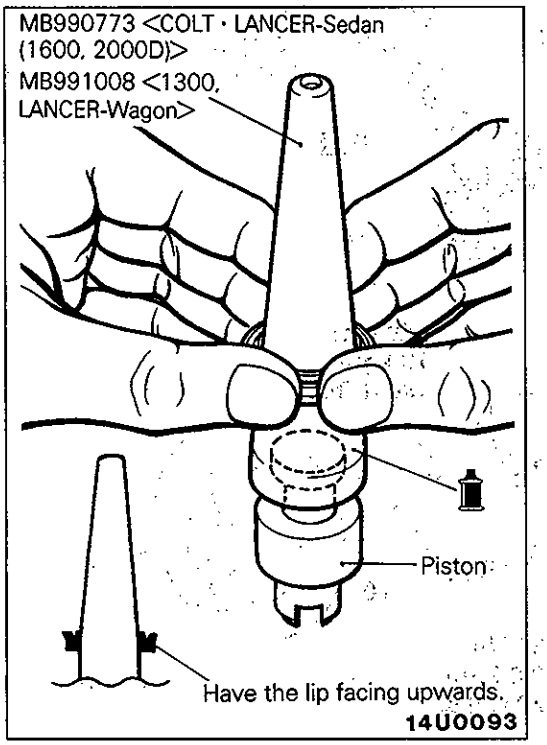
Wheel cylinder repair kit



14L0191

INSPECTION E35VGAB

Check the piston and wheel cylinder walls for rust or damage, and if there is any abnormality, replace the entire wheel cylinder assembly.



SERVICE POINTS OF REASSEMBLY E35VHAE

4. REASSEMBLY OF PISTON CUPS/3. PISTONS

(1) Use alcohol or specified brake fluid to clean the wheel cylinder and the piston.

(2) Apply the specified brake fluid to the piston cups and the special tool.

Specified brake fluid: DOT3 or DOT4

(3) Set the piston cup on the special tool with the lip of the cup facing up, fit the cup onto the special tool, and then slide it down the outside of the tool into the piston groove.

Caution
In order to keep the piston cup from becoming twisted or slanted, slide the piston cup down the tool slowly and carefully, without stopping.

REAR DISC BRAKE

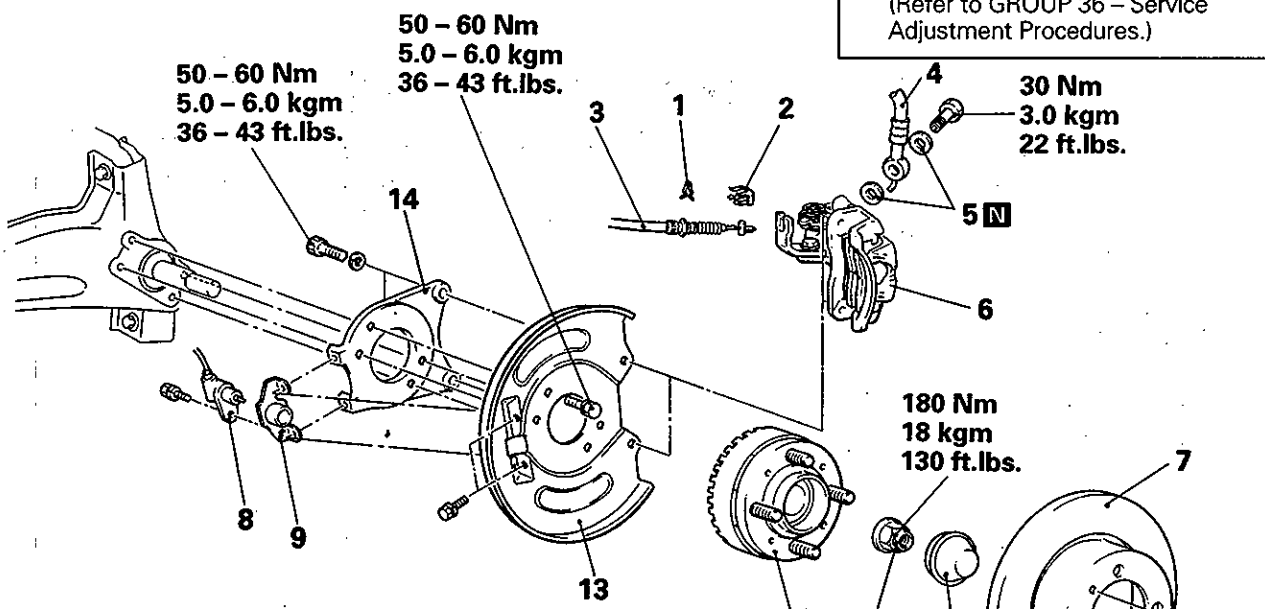
E35RA--

REMOVAL AND INSTALLATION

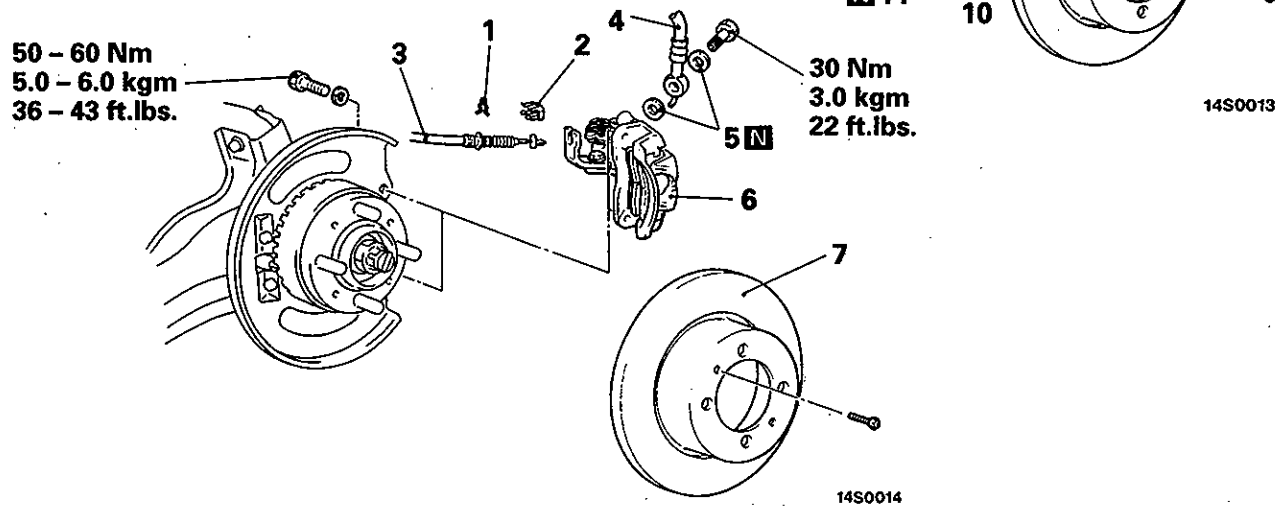
Pre-removal Operation
- Loosen the parking brake cable adjusting nut.
- Draining of Brake Fluid

Post-installation Operation
- Filling of Brake Fluid and Air Bleeding (Refer to P.35-66.)
- Adjustment of Parking Brake Lever Stroke (Refer to GROUP 36 – Service Adjustment Procedures.)

<COLT (2WD), LANCER-Sedan (2WD)>



<COLT (4WD), LANCER-Sedan (4WD)>

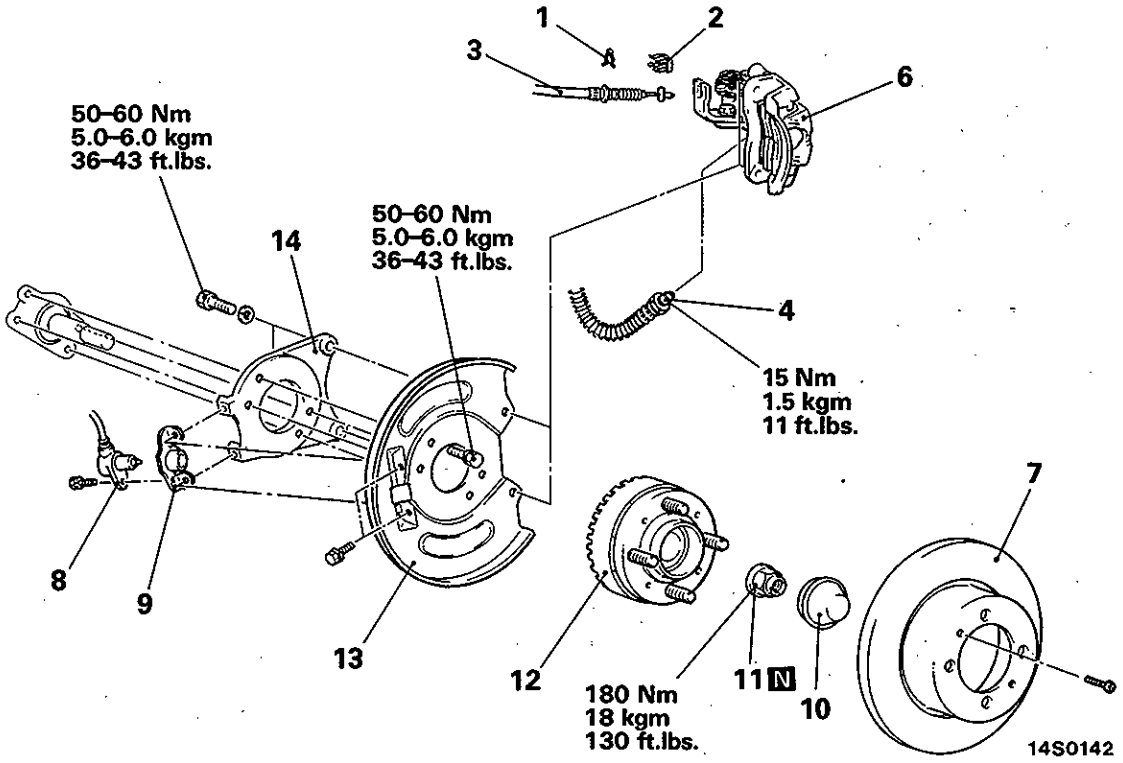


Removal steps

1. Parking clip
2. Retainer spring
3. Connection for the parking brake cable
4. Connection for the brake hose
5. Gasket
6. ◆◆ Rear brake assembly
7. Rear brake disc
8. ◆◆ Rear speed sensor } <Vehicles with A.B.S.>
9. Sensor bracket }
10. Hub cap
11. Self-locking nut
12. Rear hub assembly
13. Dust shield
14. Disc brake adapter

NOTE
For removal and installation of the dust shield and disc brake adapter in 4WD vehicles, refer to GROUP 27 - Rear Axle Hub.

<LANCER-Wagon>



Removal steps

1. Parking clip
2. Retainer spring
3. Parking brake cable connection
4. Parking hose connection
◆◆ 6. Rear brake assembly
7. Rear brake disc
◆◆ 8. Rear speed sensor <Vehicles with A.B.S.>
9. Sensor bracket <Vehicles with A.B.S.>
10. Hub cap
11. Self-locking nut
12. Rear hub assembly
13. Dust shield
14. Disc brake adapter

INSPECTION E35RCAD

- Check the brake disc for damage.
- Check the brake disc for thickness.
- Check the brake disc for run-out.

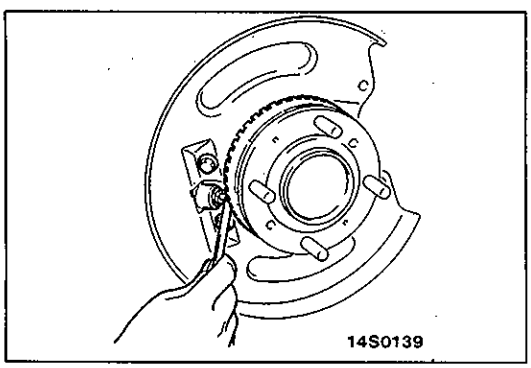
SERVICE POINTS OF INSTALLATION E35RDAI

8. INSTALLATION OF REAR SPEED SENSOR <Vehicles with A.B.S.>

Caution
Be careful that the pole piece at the end of the speed sensor and the rotor teeth do not become damaged by striking them against the metal parts.

Insert a thickness gauge into the space between the speed sensor's pole piece and the rotor's toothed surface, and then tighten the speed sensor bracket at the position where the clearance is the standard value all around.

Standard value: 0.3–0.9 mm (0.012–0.035 in.)

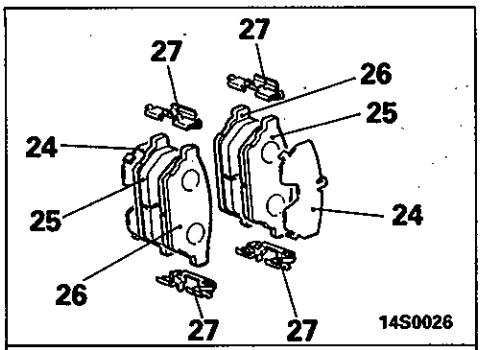


6. INSTALLATION OF REAR BRAKE ASSEMBLY

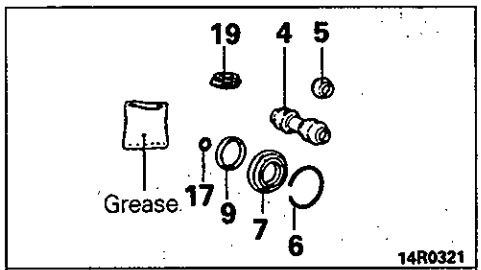
Install the rear brake assembly and measure the disc brake drag torque. (Refer to P.35-71.)

DISASSEMBLY AND REASSEMBLY

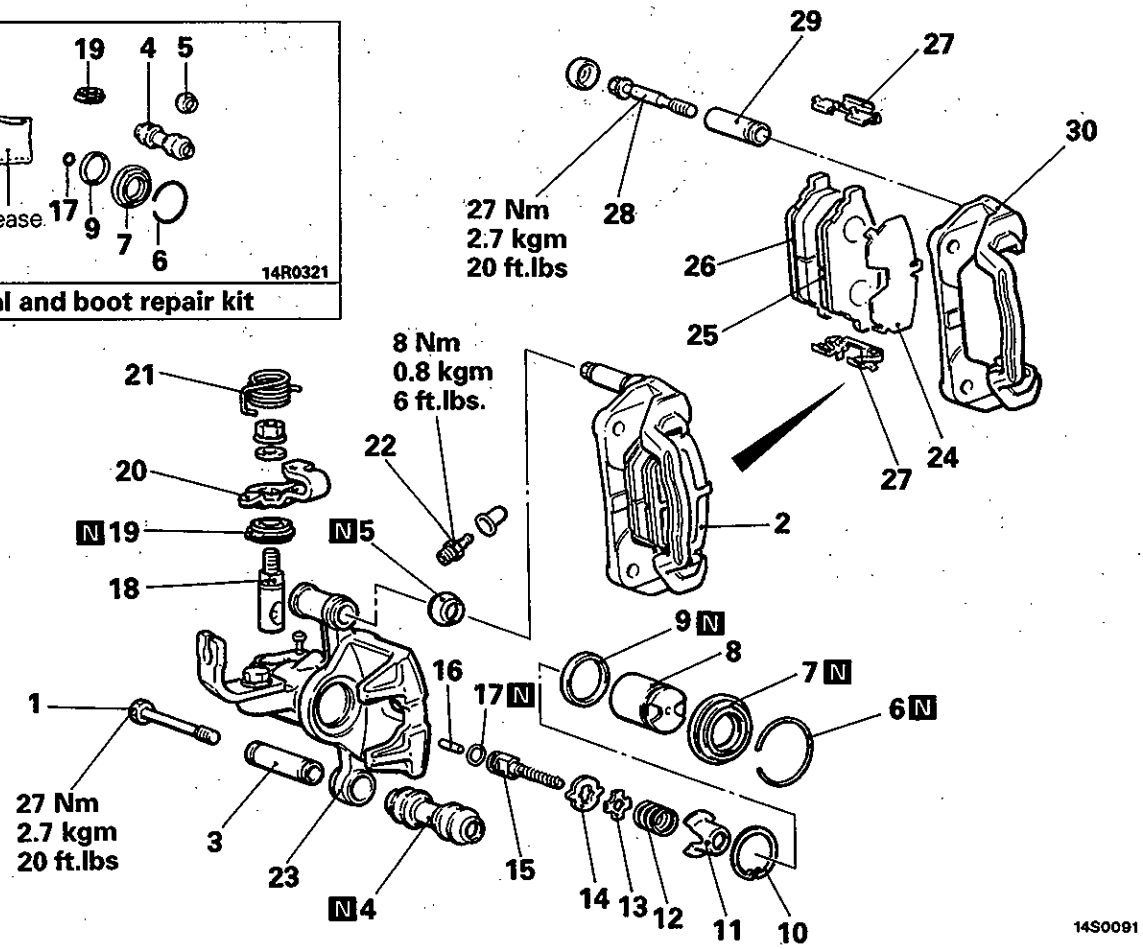
E35RF--



Pad kit



Seal and boot repair kit



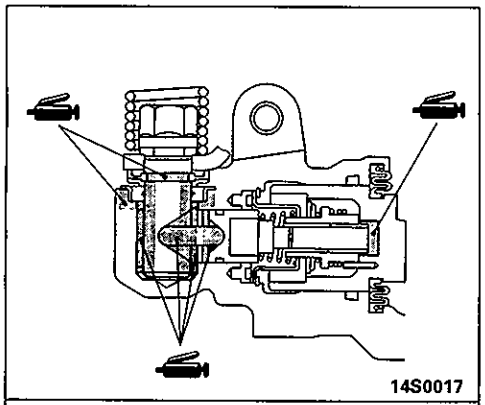
Caliper assembly disassembly steps

1. Lock pin
2. Caliper support (pad, clip, shim)
3. Lock pin sleeve
4. Lock pin boot
5. Guide pin boot
6. Boot ring
7. Piston boot
8. Piston assembly
9. Piston seal
10. Snap ring
11. Spring case
12. Return spring
13. Stopper plate
14. Stopper
15. Adjuster spindle
16. Connecting link
17. O-ring
18. Spindle lever
19. Lever boot
20. Parking brake lever
21. Return Spring
22. Bleeder screw
23. Caliper body

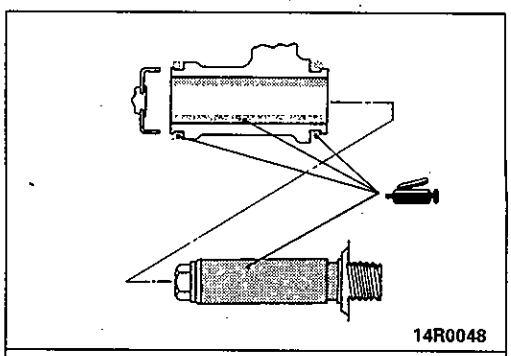
Pad assembly disassembly steps

1. Lock pin
2. Caliper support (pad, clip, shim)
24. Outer shim
25. Pad assembly
26. Pad and wear indicator assembly
27. Clip
28. Guide pin
29. Guide pin sleeve
30. Support mounting

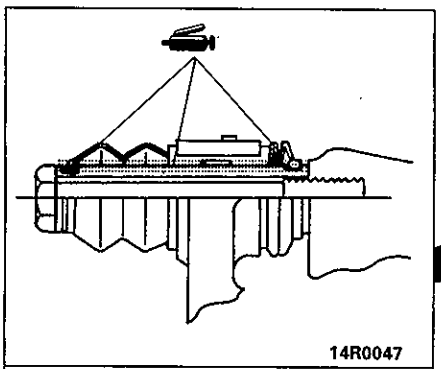
LUBRICATION POINTS



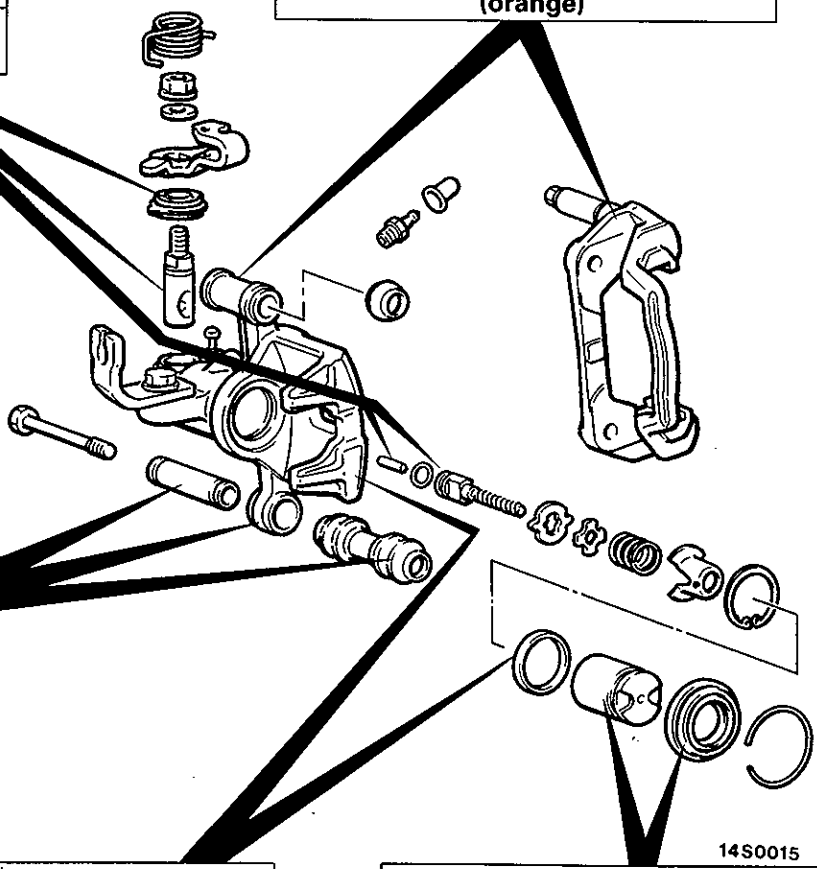
Grease: Repair kit grease (orange)

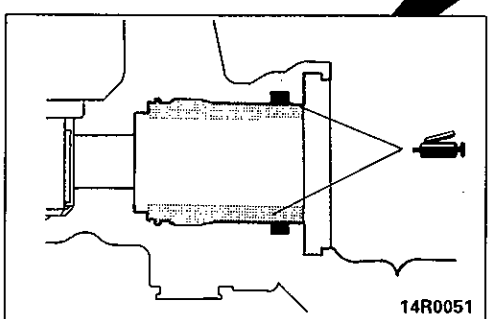


Grease: Repair kit grease (orange)



Grease: Repair kit grease (orange)

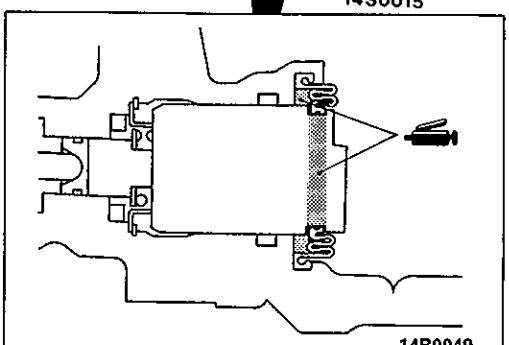




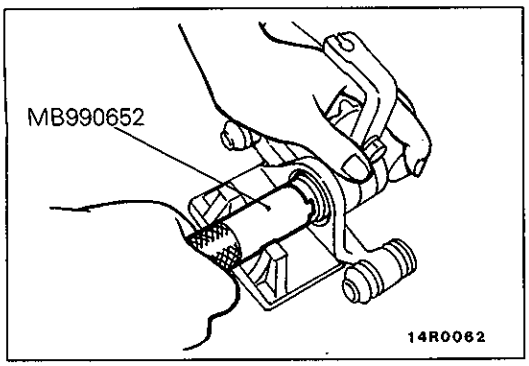
Caution

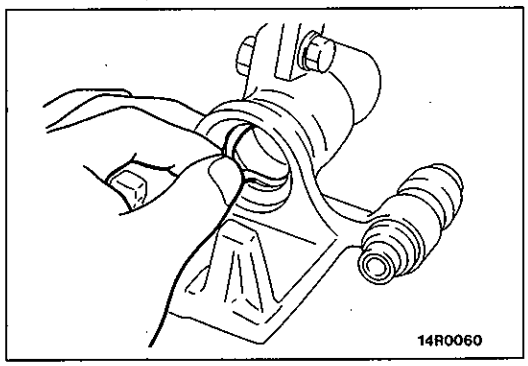
The piston seal inside the seal and boot kit is coated with special grease, so do not wipe this grease off.

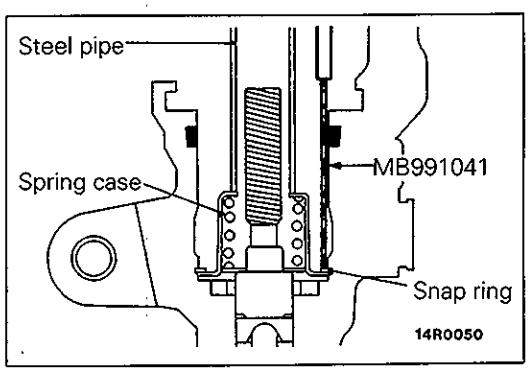
Brake fluid: DOT3 or DOT4



Grease: Repair kit grease (orange)







SERVICE POINTS OF DISASSEMBLY E35RGAG

8. DISASSEMBLY OF PISTON ASSEMBLY

Use the special tool to twist the piston out of the caliper body.

9. DISASSEMBLY OF PISTON SEAL

(1) Remove piston seal with finger tip.

Caution
Do not use (–) screwdriver or other tool to prevent damage to inner cylinder.

(2) Clean piston surface and inner cylinder with trichloroethylene, alcohol or specified brake fluid

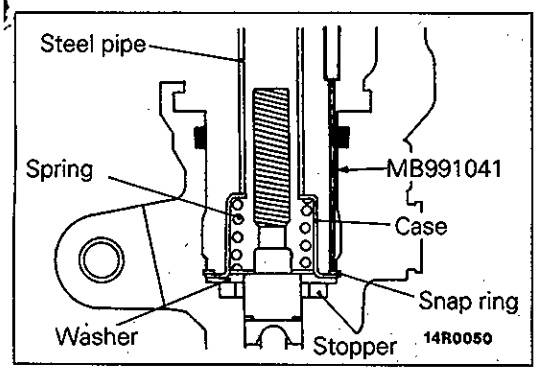
Specified brake fluid: DOT3 or DOT4

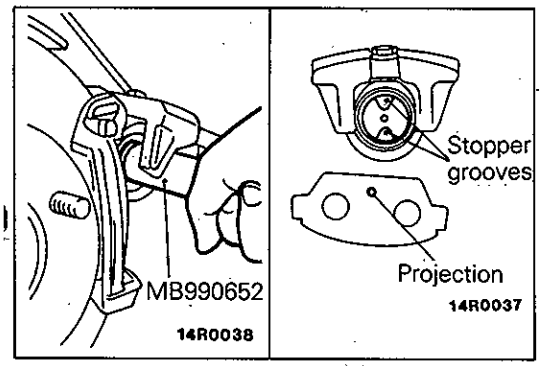
10. DISASSEMBLY OF SNAP RING

While using a 19 mm (0.75 in.) diameter steel pipe to press the spring case into the caliper body, use the special tool to remove the snap ring from the caliper body.

INSPECTION E35RHAE

- Check cylinder for wear, damage or rust.
- Check piston surface for wear, damage or rust.
- Check caliper body or sleeve for wear.
- Check pad for damage or adhesion of grease, check backing metal for damage.





SERVICE POINTS OF REASSEMBLY E35RIAG

10. REASSEMBLY OF SNAP RING

While using a 19 mm (0.75 in.) diameter steel pipe to press in the spring case, use the special tool to attach the snap ring to the caliper body.

Caution
Attach the snap ring to the caliper body with the opening facing the bleeder.

8. REASSEMBLY OF PISTON ASSEMBLY

(1) Push the piston into the caliper with special tool.

NOTE
Align the grooves as illustrated.

(2) The pins on the back side of the brake pad must be placed in the grooves in the position.

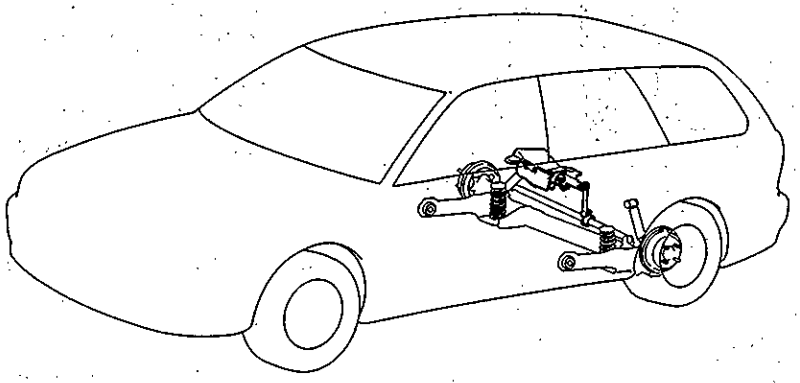
LOAD SENSING PROPORTIONING VALVE (LSPV)

E35HA--

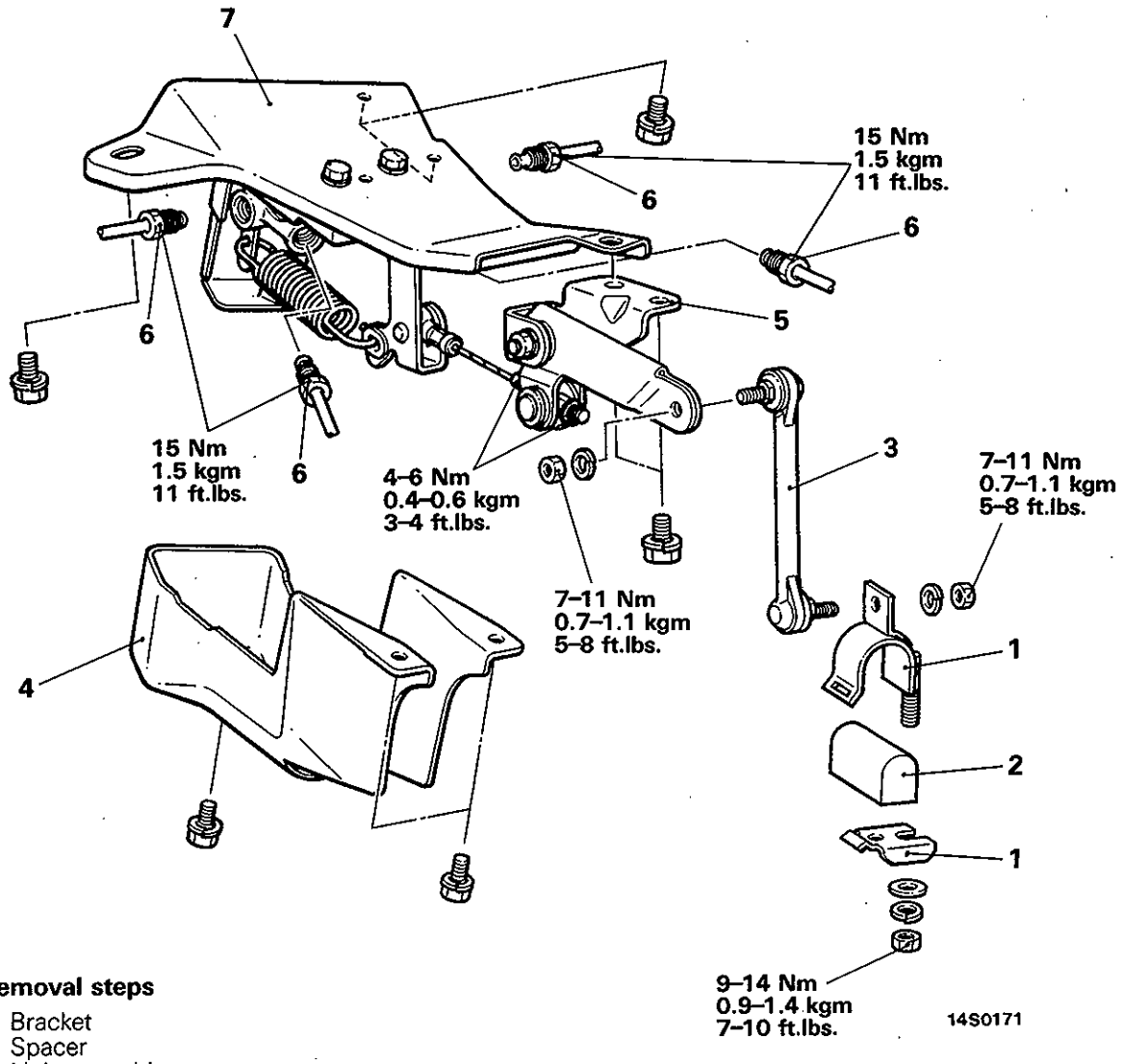
REMOVAL AND INSTALLATION

Pre-removal Operation
- Draining Brake Fluid

Post-installation Operation
- Supplying Brake Fluid
- Bleeding Brake Lines (Refer to P.35-66.)
- Adjustment of Load Sensing Proportioning Valve Spring Length (Refer to P.35-65-1.)



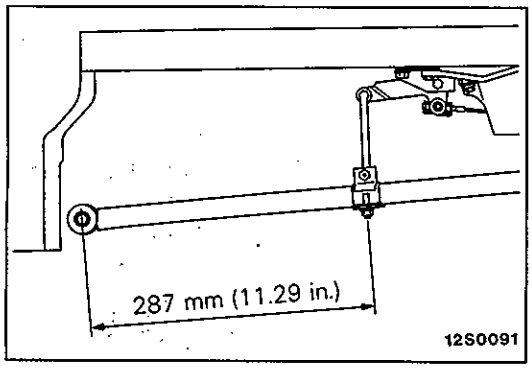
14S0169



14S0171

Removal steps

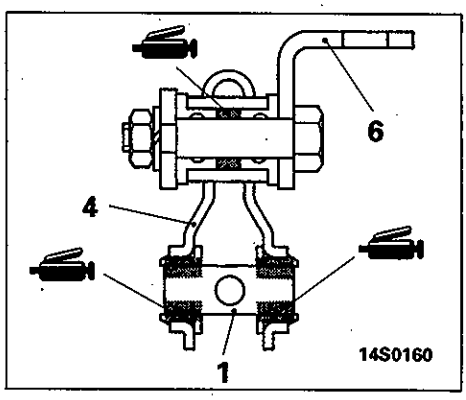
◆◆ 1. Bracket
◆◆ 2. Spacer
3. Link assembly
4. LSPV cover
5. LSPV lever assembly
6. Brake pipe
7. LSPV assembly

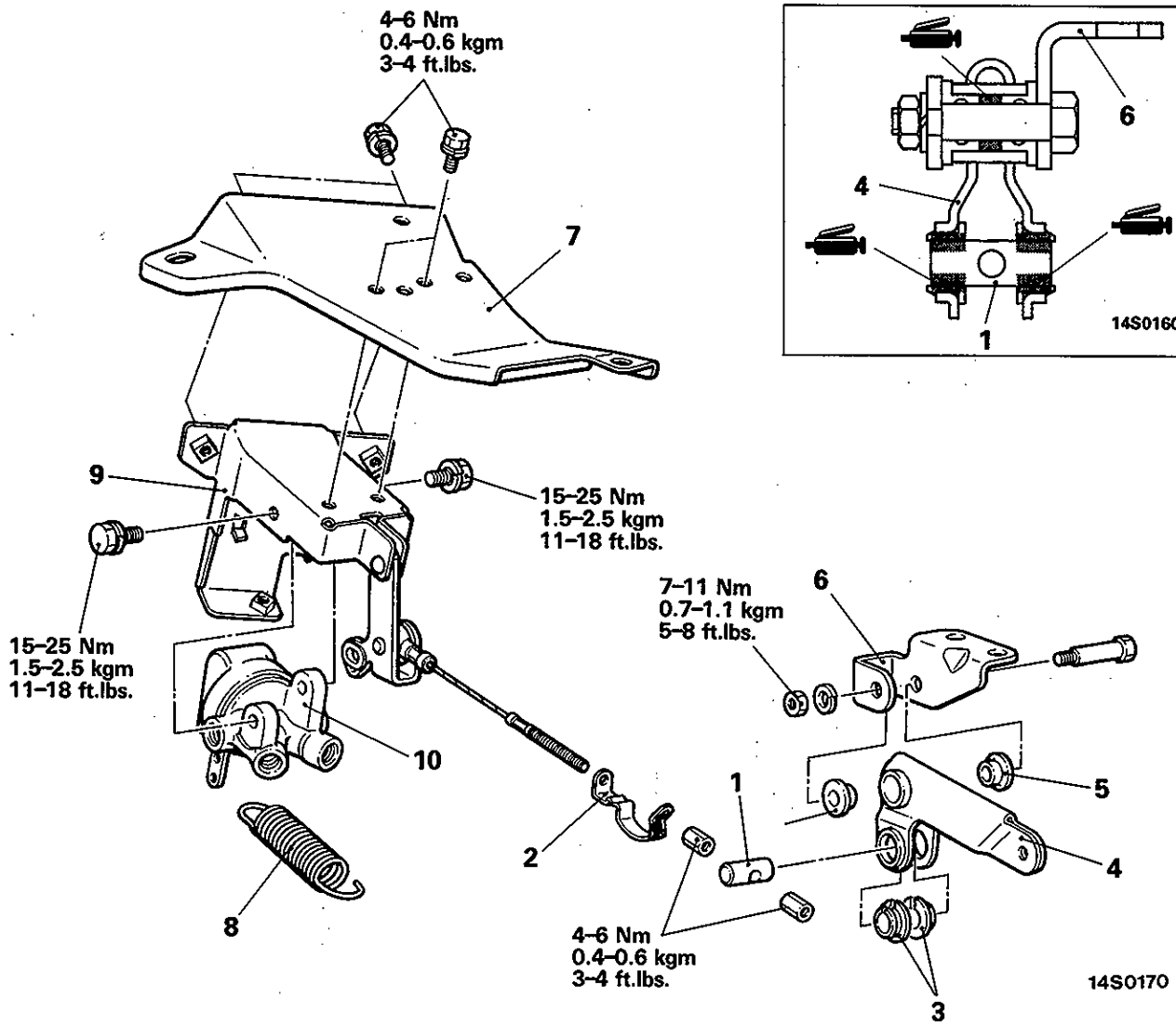


SERVICE POINTS OF INSTALLATION E35HDAB

2. INSTALLATION OF SPACER/1. BRACKET

DISASSEMBLY AND REASSEMBLY E35HEAA





Removal steps

1. Lever pin
2. Clip
3. Bushing
4. Lever
5. Bushing
6. Support
7. Valve bracket
8. Spring
9. Bracket
10. Valve assembly

HYDRAULIC UNIT <VEHICLES WITH A.B.S.>

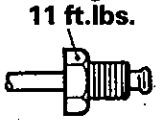
E35WA–

REMOVAL AND INSTALLATION

Pre-removal Operation
- Draining of Brake Fluid
- Removal of the Splash Shield (L.H.) (Refer to GROUP 42 – Fender.)

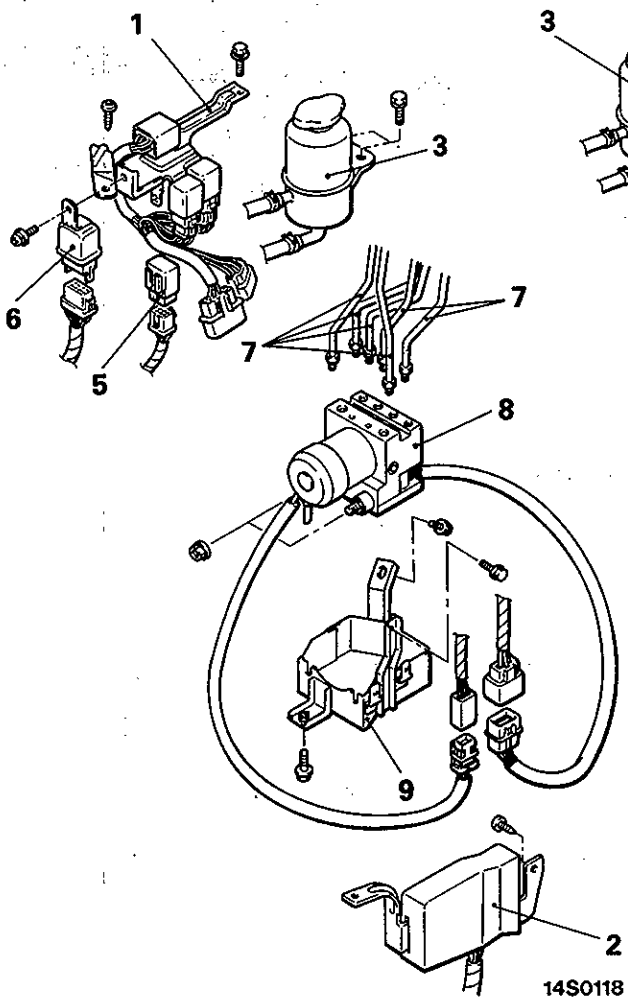
Post-installation Operation
- Installation of the Splash Shield (Refer to GROUP 42 – Fender)
- Supplying Brake Fluid
- Bleeding Brake Lines (Refer to P. 35.-66.)
- Checking of Hydraulic Unit (Refer to P.35-77.)

Flared brake line nuts
15 Nm
1.5 kgm
11 ft.lbs.



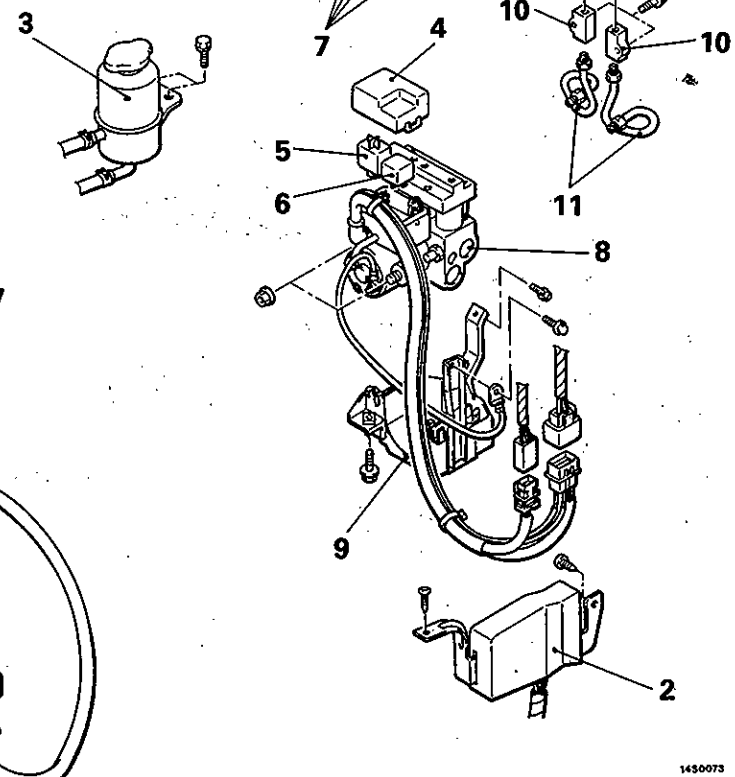
14S0035

<2WD>



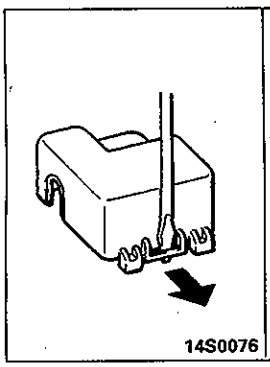
14S0118

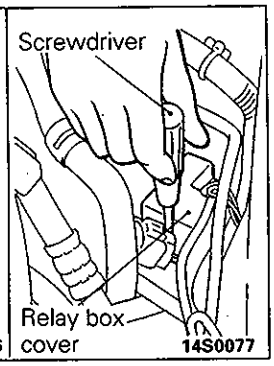
<4WD>



14S0073

Removal steps
1. D.R.L. bracket
2. A/C relay box
3. Oil reservoir
4. ◆◆ Relay box cover
5. Motor relay
6. Valve relay
7. ◆◆ Brake pipe
8. ◆◆ Hydraulic unit
9. Hydraulic unit bracket
10. 2-way connector
11. Brake pipe


14S0076



14S0077

SERVICE POINTS OF REMOVAL E35WBAI

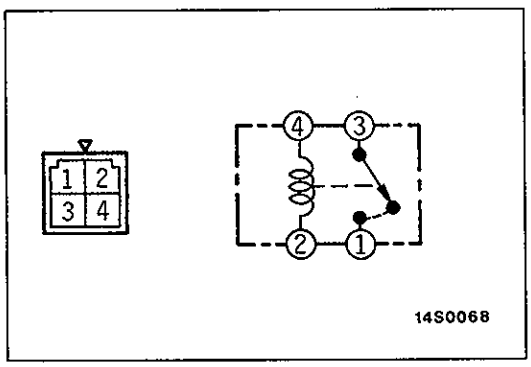
4. REMOVAL OF THE RELAY BOX COVER

Insert the tip of a screwdriver into the space between the hydraulic unit and the relay box cover and use it to open the tab at one place, and then remove the cover.

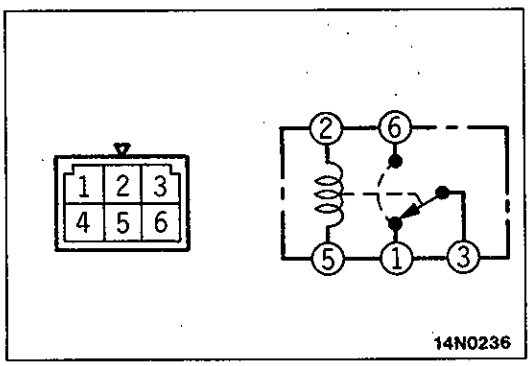
8. REMOVAL OF THE HYDRAULIC UNIT

Caution

1. **The hydraulic unit is heavy, and so care should be taken when removing it.**
2. **The hydraulic unit is not to be disassembled; its nuts and bolts should absolutely not be loosened.**
3. **The hydraulic unit must not be dropped or otherwise subjected to impact shocks.**
4. **The hydraulic unit must not be turned upside down or laid on its side.**



14S0068



14N0236

INSPECTION E35WCAF

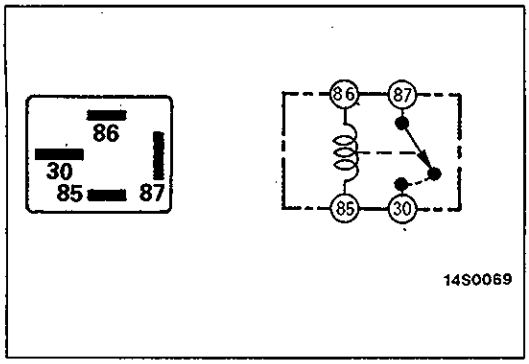
Check the continuity between the terminals when current is not flowing and when current is flowing in each of the relays.

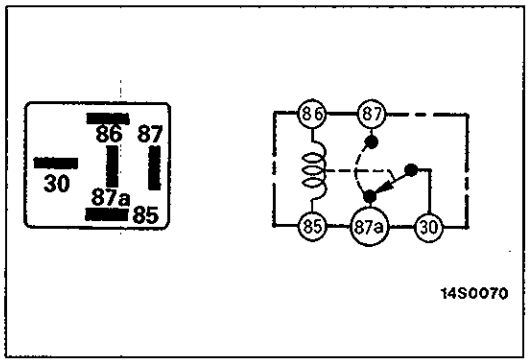
<2WD> MOTOR RELAY

When no current flows	Between terminals ② – ④	72 – 88 Ω
	Between terminals ① – ③	No continuity (∞ Ω)
When current flows between terminals ② – ④	Between terminals ① – ③	Continuity (approx. 0 Ω)

VALVE RELAY

When no current flows	Between terminals ② – ⑤	64 – 84 Ω
	Between terminals ① – ③	Continuity (approx. 0 Ω)
	Between terminals ③ – ⑥	No continuity (∞ Ω)
When current flows between terminals ② – ⑤	Between terminals ① – ③	No continuity (∞ Ω)
	Between terminals ③ – ⑥	Continuity (approx. 0 Ω)



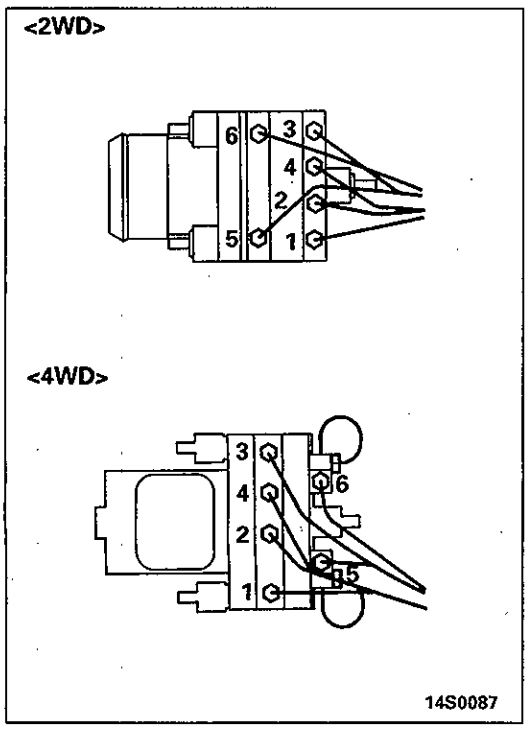


<4WD>
MOTOR RELAY

When no current flows	Between terminals (85)–(86)	72 – 88 Ω
	Between terminals (30)–(87)	No continuity (∞ Ω)
When current flows between terminals (85)–(86)	Between terminals (30)–(87)	Continuity (approx. 0 Ω)

VALVE RELAY

When no current flows	Between terminals (85)–(86)	60 – 120 Ω
	Between terminals (30)–(87a)	Continuity (approx. 0 Ω)
	Between terminals (30)–(87)	No continuity (∞ Ω)
When current flows between terminals (85)–(86)	Between terminals (30)–(87a)	No continuity (∞ Ω)
	Between terminals (30)–(87)	Continuity (approx. 0 Ω)



SERVICE POINTS OF INSTALLATION E35WDAE

7. CONNECTION OF THE BRAKE PIPE

Connect the pipes to the hydraulic unit as shown in the illustration.

1. Hydraulic unit – front brake (L.H.)
2. Hydraulic unit – rear brake (R.H.)
3. Hydraulic unit – front brake (R.H.)
4. Hydraulic unit – rear braker (L.H.)
5. Hydraulic unit – master cylinder (for left front and right rear)
6. Hydraulic unit – master cylinder (for right front and left rear)

WHEEL SPEED SENSOR <VEHICLES WITH A.B.S.>

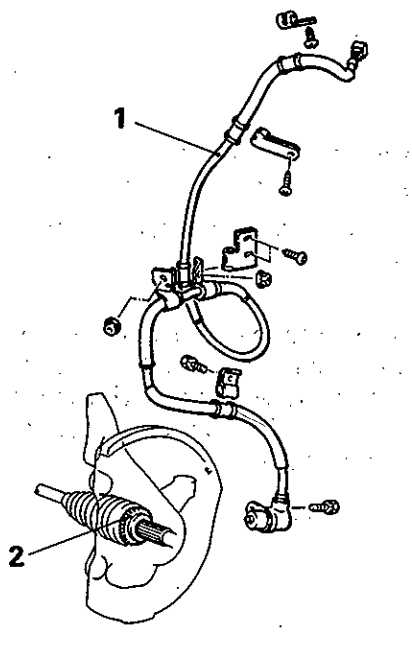
E35YA--

REMOVAL AND INSTALLATION

Pre-removal Operation
- Removal of the Splash Shield. (Refer to GROUP 42 – Fender.)

Post-installation Operation
- Checking of the Wheel Speed Sensor Output Voltage (Refer to P.35-75.)
- Installation of the Splash Shield (Refer to GROUP 42 – Fender.)

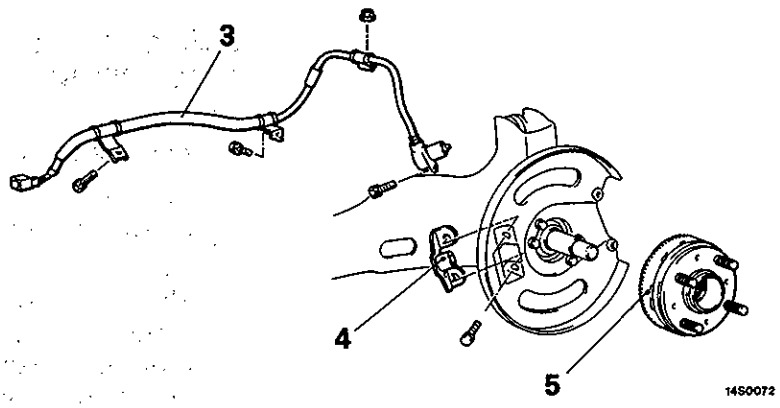
<Front>



14S0071

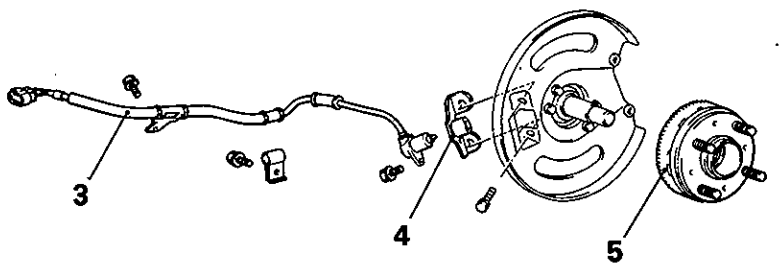
<Rear>

COLT, LANCER-Sedan



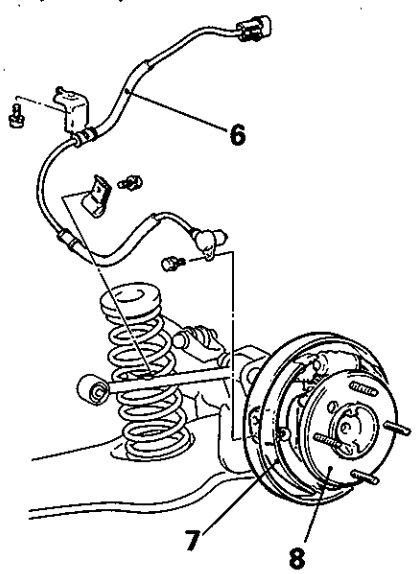
14S0072

LANCER-Wagon (2WD)



14S0156

LANCER-Wagon (4WD)



14S0157

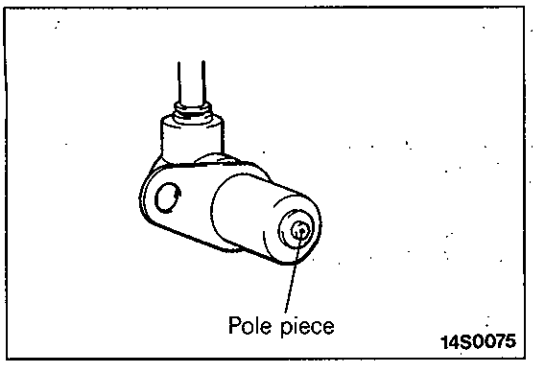
Front speed sensor removal steps

◆◆ 1. Front speed sensor
2. Front rotor (Refer to GROUP 26 – Drive shaft.)

Rear speed sensor removal steps

◆◆ ◆◆ 3. Rear speed sensor
4. Sensor bracket
5. Rear rotor (Refer to GROUP 27 – Rear Axle Hub.)
6. Rear speed sensor
7. Shoe and lining assembly
8. Axle shaft and rotor assembly (Refer to GROUP 27 – Axle Shaft.)

NOTE
The front rotor is integrated with the drive shaft and is not disassembled.



SERVICE POINTS OF REMOVAL E35YBAH

1. REMOVAL OF THE FRONT SPEED SENSOR/3. REAR SPEED SENSOR/6. REAR SPEED SENSOR

Caution
Be careful when handling the pole piece at the tip of the speed sensor and the toothed edge of the rotor so as not to damage them by striking against other parts.

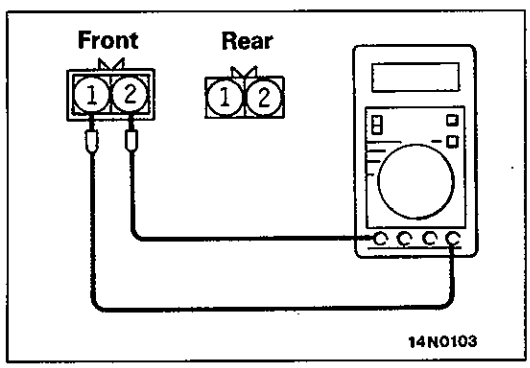
INSPECTION E35YCAAa

SPEED SENSOR

(1) Check whether any metallic foreign material has adhered to the pole piece at the speed sensor tip, and is so, remove it.

Also check whether the pole piece is damaged, and if so, replace it with a new one.

NOTE
The pole piece can become magnetized because of the magnet but into the speed sensor, with the result that metallic foreign material easily adheres to it. Moreover, the pole piece may not be able to function to correctly sense the wheel rotation speed if it is damaged.



(2) Measure the resistance between the speed sensor terminals.

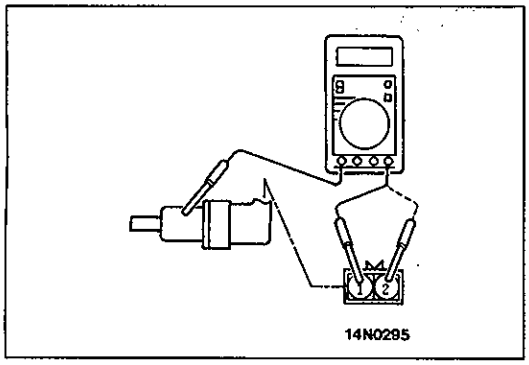
Standard value:

<2WD>	**1.4–2.2 kΩ**
<4WD>	**0.8–1.2 kΩ**

If the internal resistance of the speed sensor is not within the standard value, replace with a new speed sensor.

(3) Check the speed sensor cable for breakage, damage or disconnection; replace with a new one if a problem is found.

NOTE
When checking for cable damage, remove the cable clamp part from the body and then bend and pull the cable near the clamp to check whether or not temporary disconnection occurs.

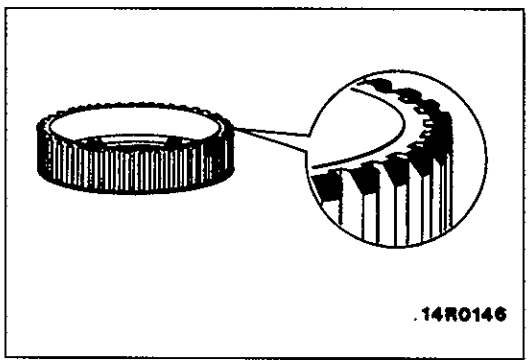


SPEED SENSOR INSULATION INSPECTION

(1) Remove all connections from the speed sensor, and then measure the resistance between terminals (1) and (2) and the body of the speed sensor.

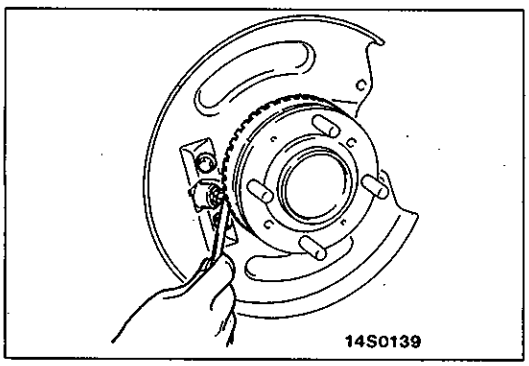
Standard value: 100 kΩ or more

(2) If the speed sensor insulation resistance is outside the standard value range, replace with a new speed sensor.



TOOTHED ROTOR

Check whether rotor teeth are broken or deformed, and, if so, replace the rotor.



SERVICE POINTS OF INSTALLATION E35YDAH

4. INSTALLATION OF REAR SPEED SENSOR

Caution

Be careful that the pole piece at the end of the speed sensor and the rotor teeth do not become damaged by striking them against the metal parts.

Insert a thickness gauge into the space between the speed sensor's pole piece and the rotor's toothed surface, and then tighten the speed sensor bracket at the position where the clearance is the standard value all around.

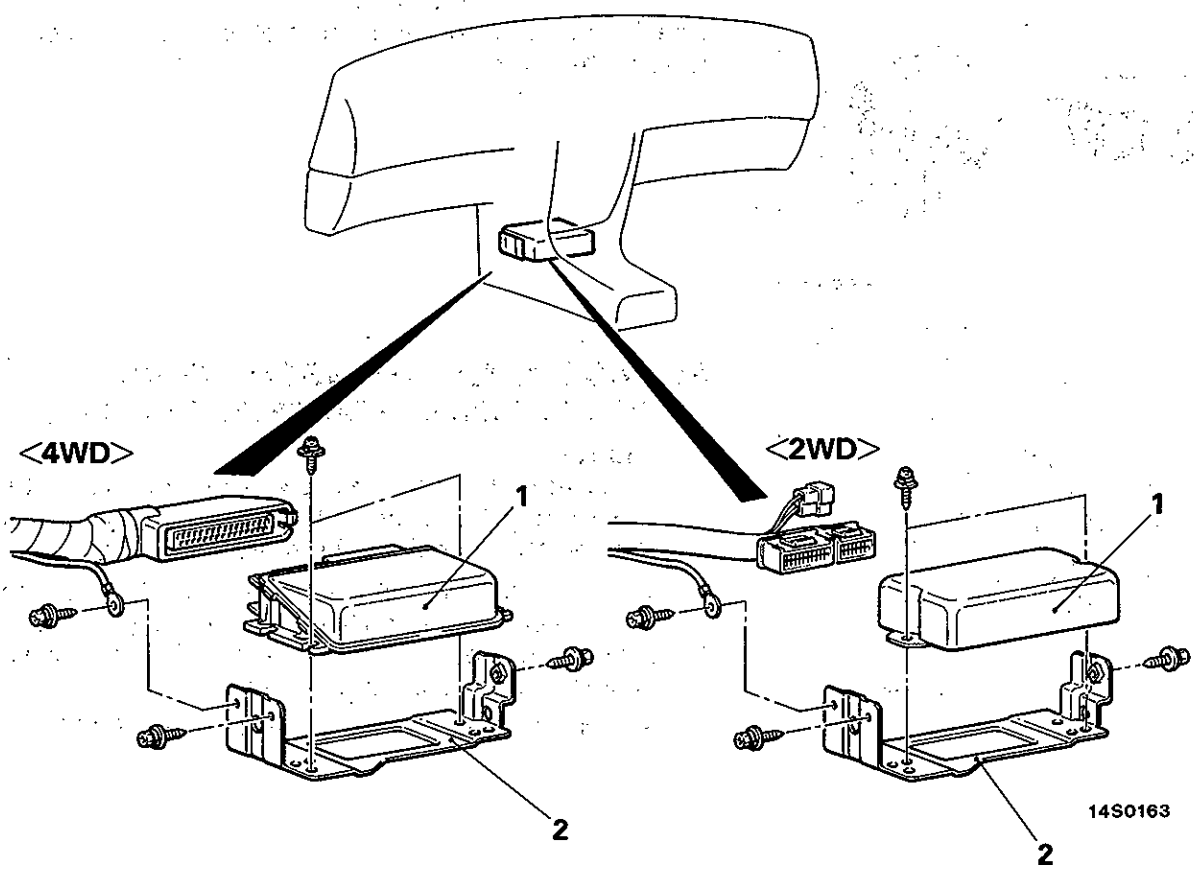
Standard value: 0.3–0.9 mm (0.012–0.035 in.)

ELECTRONIC CONTROL UNIT < VEHICLES WITH A.B.S.>

E35ZA--

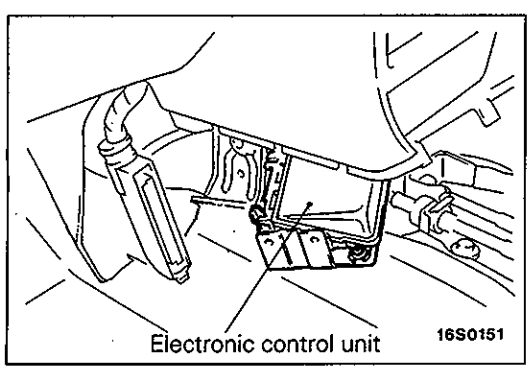
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Removal and Installation of Floor Console Assembly (Refer to GROUP 52A – Floor Console.)



Removal steps

◆◆ 1. Electronic control unit
2. Bracket



SERVICE POINTS OF REMOVAL

E35ZBAF

1. REMOVAL OF ELECTRONIC CONTROL UNIT

Remove the electronic control unit from the bottom of the center console.

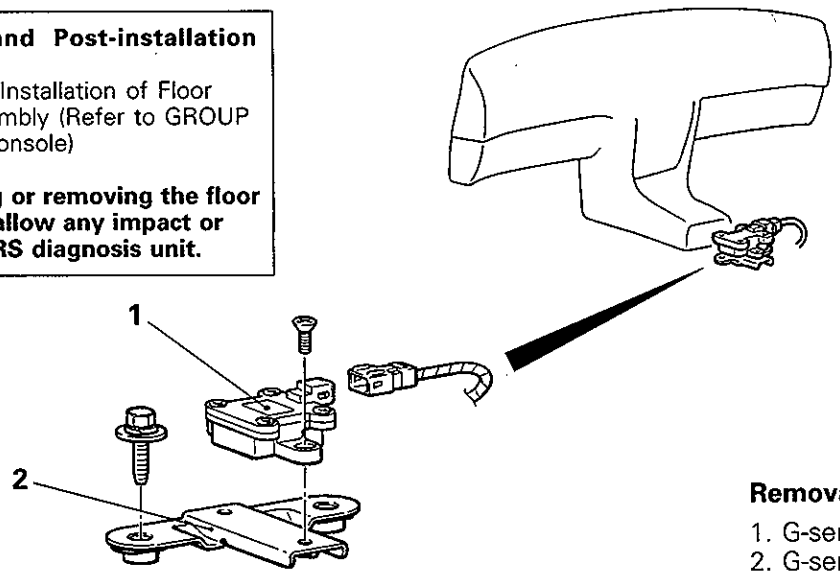
G-SENSOR < 4WD – VEHICLES WITH A.B.S.>

E35NA--

REMOVAL AND INSTALLATION

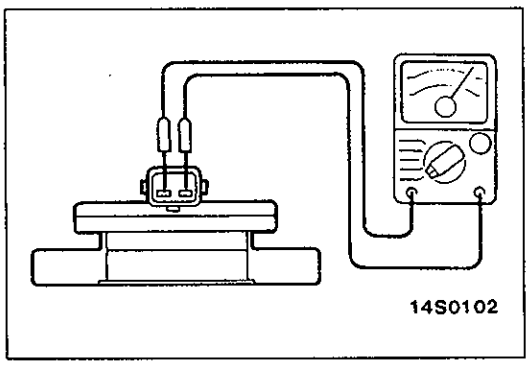
Pre-removal and Post-installation Operation
Removal and Installation of Floor Console Assembly (Refer to GROUP 52A – Floor Console)

CAUTION
When installing or removing the floor console, don't allow any impact or shock to the SRS diagnosis unit.



14S0168

Removal steps
1. G-sensor
2. G-sensor bracket

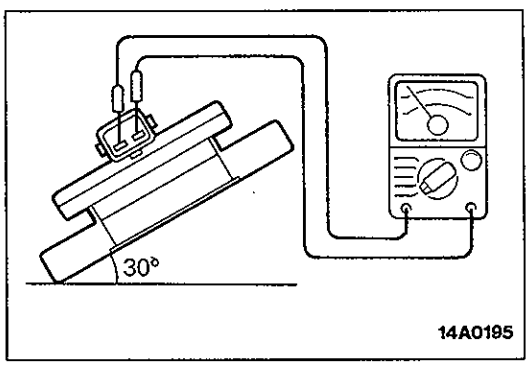


14S0102

INSPECTION

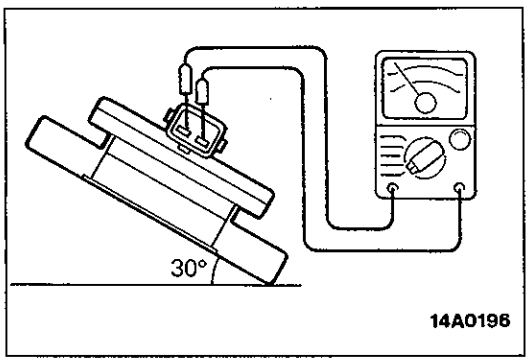
E35NCAA

(1) Place the sensor on a level surface, then check that there is conductance between the terminals.



14A0195

(2) Slowly inclining the G-sensor in the direction of forward vehicle travel, check that there is no conductance above a sensor angle of 30 degrees.



14A0196

(3) Slowly inclining the G-sensor in the direction of reverse vehicle travel, check that there is no conductance above a sensor angle of 30 degrees.

NOTES