

# SERVICE BRAKES

## CONTENTS

<b>BASIC BRAKE SYSTEM .....</b>	<b>35A</b>
<b>ANTI-SKID BRAKING SYSTEM (ABS) .....</b>	<b>35B</b>
<b>TRACTION CONTROL SYSTEM (TCL) .....</b>	<b>35C</b>

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# BASIC BRAKE SYSTEM

## CONTENTS

<b>GENERAL</b> .....	<b>3</b>	Disc Brake Pad Check and Replacement .....	<b>5</b>
Outline of Changes .....	3	Brake Disc Thickness Check .....	6
<b>SERVICE SPECIFICATIONS</b> .....	<b>4</b>	Brake Disc Run-out Check .....	6
<b>LUBRICANT</b> .....	<b>4</b>	Brake Disc Run-out Correction .....	7
<b>ON-VEHICLE SERVICE</b> .....	<b>5</b>	<b>MASTER CYLINDER AND BRAKE BOOSTER</b> .....	<b>8</b>
Proportioning Valve Function Test .....	5	<b>DISC BRAKE</b> .....	<b>9</b>

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## GENERAL

### OUTLINE OF CHANGES

- The size of the front brake discs for 1600 and 1900 has been changed from 13 inch to 14 inch. The service procedures have been established as the 15-inch ventilated front brake disc has been used for 1800.
- The service procedures have been established as 14-inch ventilated rear brake disc has been used for 1800.
- The service procedures have been established due to the change in the proportioning valve.
- The service procedures have been established due to the change in the brake booster.

Items		1800 - SPORT	Except 1800 - SPORT
Master cylinder	Type	Tandem type	Tandem type
	I.D. mm	23.81	23.81
Brake booster	Type	Vacuum type, tandem	Vacuum type, tandem
	Effective dia. of power cylinder mm	190 + 217	190 + 217
	Boosting ratio	6.5	6.5
Proportioning valve	Type	Dual type	Dual type
	Decompression ratio	0.37	0.25, 0.37*
Front disc brakes	Type	Floating caliper, 1-piston, ventilated disc	Floating caliper, 1-piston, ventilated disc
	Disc effective dia. × thickness mm	232 × 24	211 × 24, 232 × 24*
	Wheel cylinder I.D. mm	53.97	53.97
	Pad thickness mm	12.0	10.0, 12.0*
	Clearance adjustment	Automatic	Automatic
Rear disc brakes	Type	Floating caliper, 1-piston, ventilated disc	Floating caliper, 1-piston, ventilated disc*
	Disc effective dia. × thickness mm	211.6 × 10	211.6 × 10*
	Wheel cylinder I.D. mm	35.00	35.00*
	Pad thickness mm	9.0	9.0*
	Clearance adjustment	Automatic	Automatic*
Rear drum brakes	Type	–	Leading trailing
	Drum I.D. mm	–	203
	Wheel cylinder I.D. mm	–	19.05
	Lining thickness mm	–	4.4
	Clearance adjustment	–	Automatic
Brake fluid		DOT3 or DOT4	DOT3 or DOT4

#### NOTE

\* : Vehicles with rear disc brake (option) or traction control (option).

## SERVICE SPECIFICATIONS

Items				Standard value	Limit	
Proportioning valve	Split point fluid pressure MPa	Hatchback	Vehicles with rear drum brake	3.68 – 4.17	–	
			Vehicles with rear disc brake	3.19 – 3.68	–	
		Sedan	Vehicles with rear drum brake	3.19 – 3.68	–	
			Vehicles with rear disc brake	2.70 – 3.19	–	
	Output fluid pressure MPa (Input fluid pressure: 13.7 MPa)	Hatchback	Vehicles with rear drum brake	4.66 – 5.15	–	
			Vehicles with rear disc brake	4.64 – 5.13	–	
		Sedan	Vehicles with rear drum brake	4.17 – 4.66	–	
			Vehicles with rear disc brake	4.15 – 4.64	–	
	Output fluid pressure difference between left and right MPa				–	0.39
	Front disc brake	Pad thickness mm		14 inch disc brake	10.0	2.0
15 inch disc brake				12.0	2.0	
Disc thickness mm			24.0	22.4		
Disc runout mm			–	0.06 or less		
Drag force N			40 or less	–		
Rear disc brake	Pad thickness mm			9.0	2.0	
	Disc thickness mm			10.0	8.4	
	Disc runout mm			–	0.08 or less	
	Drag force N			20 or less	–	
Hub end play mm				–	0.05	
Brake booster push rod to master cylinder piston clearance mm				0.4 – 0.6	–	

## LUBRICANT

Item	Specified Lubricant
Guide pin and boot	Repair kit grease

## ON-VEHICLE SERVICE

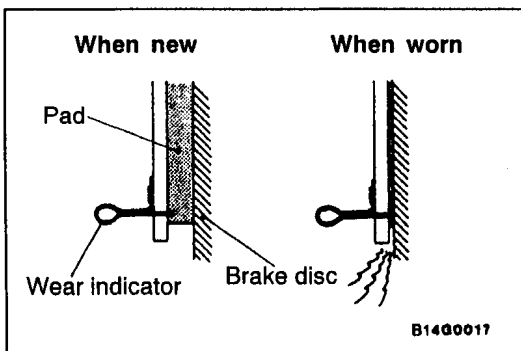
### PROPORTIONING VALVE FUNCTION TEST

Standard values have been set as follows. The inspection procedure is the same as before.

**Standard value:**

Items	Hatchback		Sedan	
	Vehicles with rear drum brake	Vehicles with rear disc brake	Vehicles with rear drum brake	Vehicles with rear disc brake
Split point fluid pressure MPa	3.68 – 4.17	3.19 – 3.68	3.19 – 3.68	2.70 – 3.19
Output fluid pressure MPa (Input fluid pressure: 13.7 MPa)	4.66 – 5.15	4.64 – 5.13	4.17 – 4.66	4.15 – 4.64

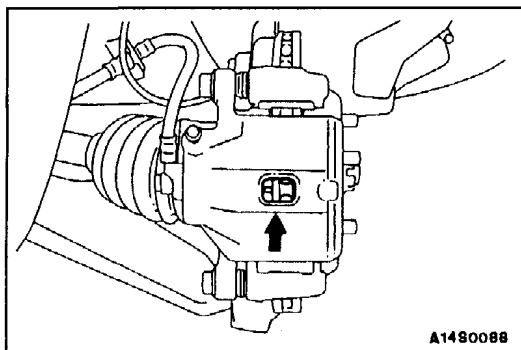
**Limit (Output fluid pressure difference between left and right) : 0.39 MPa**



### DISC BRAKE PAD CHECK AND REPLACEMENT

**NOTE**

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



1. Check brake pad thickness through caliper body check port.

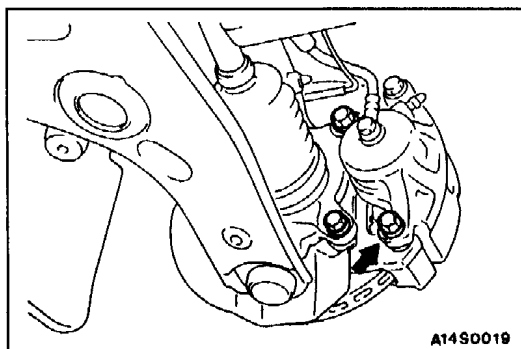
**Standard value:**

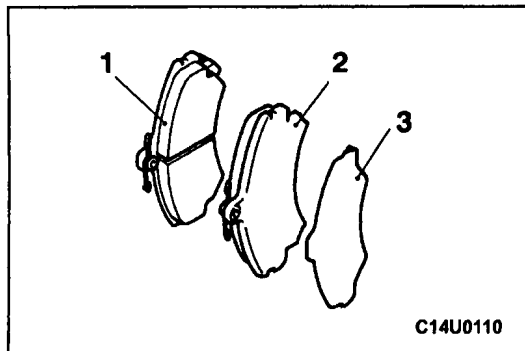
- <Front 14 inch disc brake> 10.0 mm
- <Front 15 inch disc brake> 12.0 mm
- <Rear 14 inch disc brake> 9.0 mm

**Limit: 2.0 mm**

**Caution**

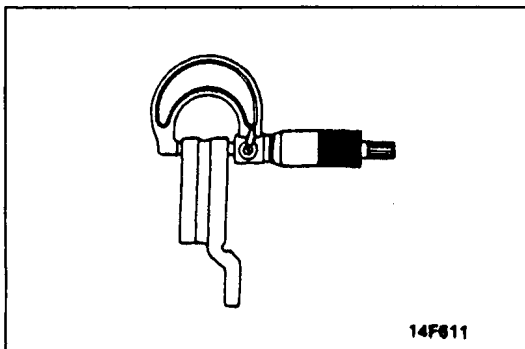
- (1) When the limit is exceeded, replace the pads at both sides, and also the brake pads for the wheels on the opposite side at the same time.
  - (2) If there is a significant difference in the thickness of the pads on the left and right sides, check the sliding condition of the piston, lock pin and guide pin.
  - (3) Do not wipe off the special grease that is on the lock pin or allow it to contaminate the lock pin.
2. Remove the caliper lower bolt, and then tilt the caliper body upwards to support it with a wire.





3. Remove the following parts from caliper support.
  1. Pad & wear indicator assembly
  2. Pad assembly
  3. Outer shim <Front 14 inch disc brake>

4. In order to measure the brake drag torque after pad installation, measure the rotary-sliding resistance of the hub with the pads removed. (Refer to P.35A-10.)
5. Install the pads and the caliper assembly, and then check the brake drag torque. (Refer to P.35A-10.)



### BRAKE DISC THICKNESS CHECK

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

#### Brake disc thickness

##### Standard value:

<Front> 24.0 mm

<Rear> 10.0 mm

##### Limit:

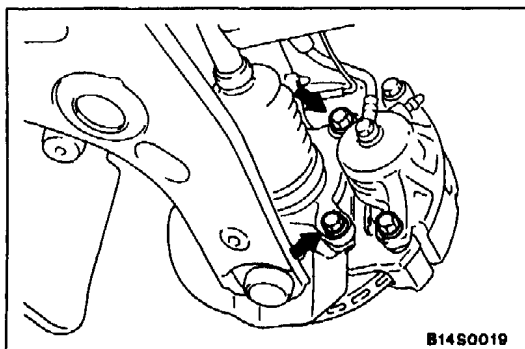
<Front> 22.4 mm

<Rear> 8.4 mm

Thickness variation (at least 8 positions)

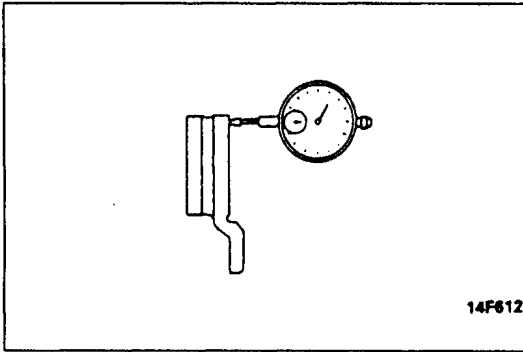
The difference between any thickness measurements should not be more than 0.015 mm.

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 brake disc or turn rotor with on-the-car type brake lathe ("MAD, DL-8700PF" or equivalent).



### BRAKE DISC RUN-OUT CHECK

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 from the outer circumference of the brake disc, and measure the run-out of the disc.

**Limit:**

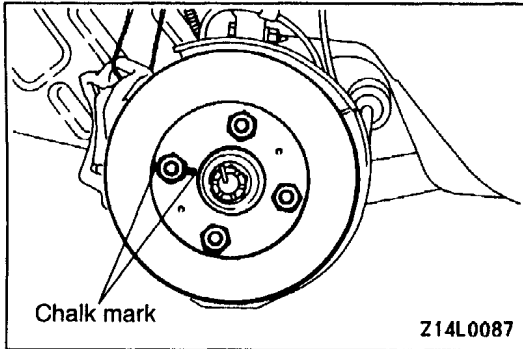
<Front> 0.06 mm or less

<Rear> 0.08 mm or less

**NOTE**

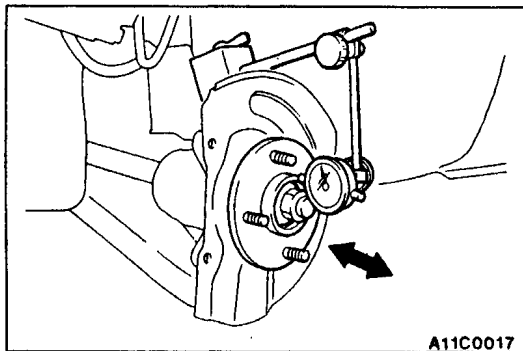
Tighten the nuts in order to secure the disc to the hub.

**BRAKE DISC RUN-OUT CORRECTION**



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.

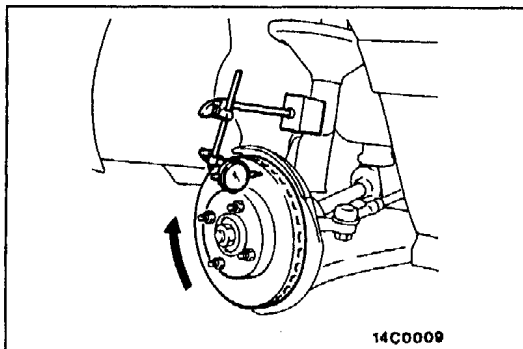
- (1) Before removing the brake disc, chalk both sides of the wheel stud on the side at which run-out is greatest.



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

**Limit: 0.05 mm**

If the play is equivalent to or exceeds the limit, disassemble the hub knuckle 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).

## **MASTER CYLINDER AND BRAKE BOOSTER**

### **REMOVAL AND INSTALLATION**

The procedure is the same as before.

### **INSTALLATION SERVICE POINT**

#### **CLEARANCE ADJUSTMENT BETWEEN BRAKE BOOSTER PUSH ROD AND PRIMARY PISTON**

The following standard value has been revised. The procedure is the same as before.

**Standard value: 0.4 – 0.6 mm**

### **INSPECTION**

#### **VACUUM SENSOR CHECK**

Refer to GROUP 13 – Troubleshooting.

#### **NOTE**

The engine-ECU monitors the vacuum sensor. If it is defective, a diagnosis code will be displayed on the MUT-II.



# DISC BRAKE

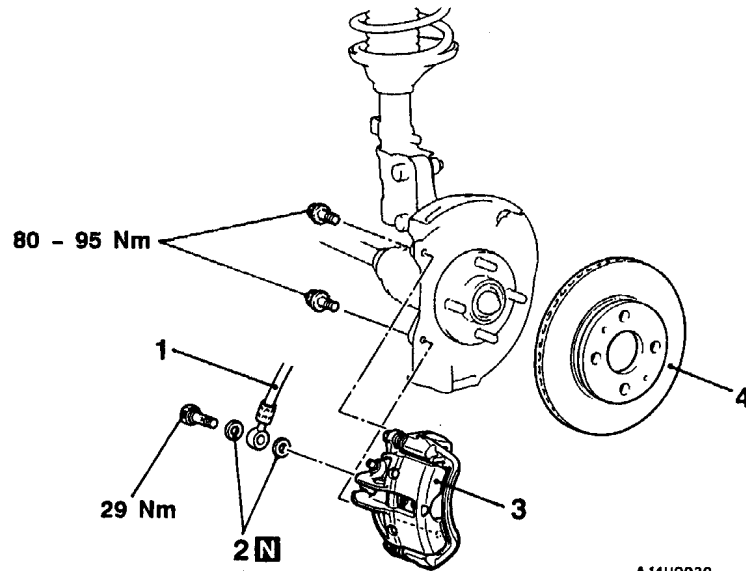
## REMOVAL AND INSTALLATION

**Pre-removal Operation**  
 Brake Fluid Draining

**Post-Installation Operation**

- Brake Fluid Supplying
- Brake Line Bleeding (Refer to P.35A-9.)

<Front>

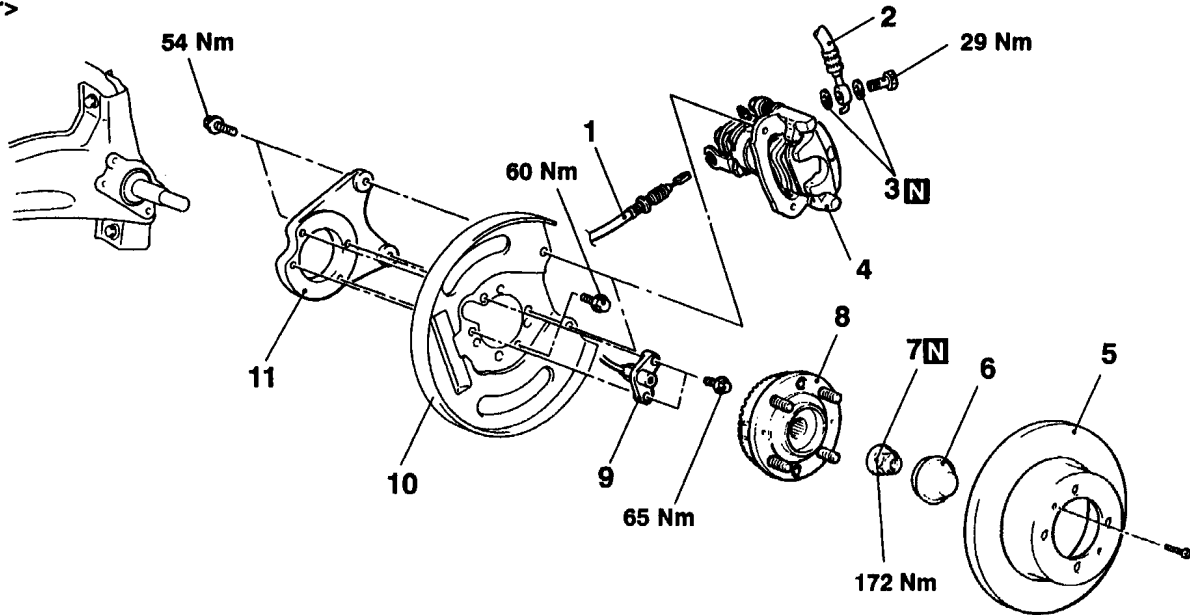


### Removal steps

1. Brake hose connection
2. Gasket
3. Disc brake assembly
4. Brake disc



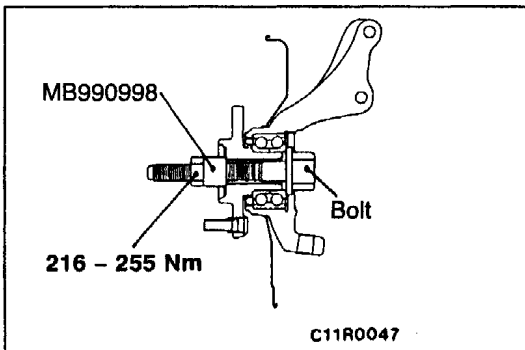
<Rear>



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**Removal steps**

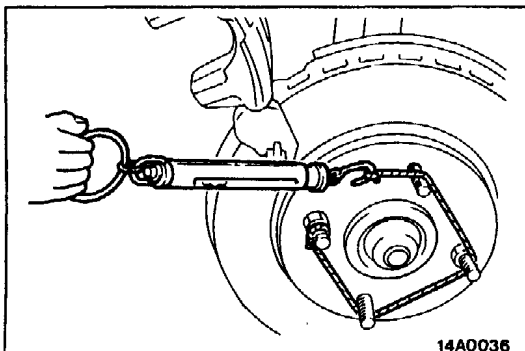
- |  |   |
|--|---|
| <p>►A◄</p> <ol style="list-style-type: none"> <li>1. Parking brake cable connection</li> <li>2. Brake hose connection</li> <li>3. Gasket</li> <li>4. Disc brake assembly</li> <li>5. Brake disc</li> <li>6. Hub cap</li> </ol> | <p>►B◄</p> <ol style="list-style-type: none"> <li>7. Self locking nut</li> <li>8. Rear hub and rotor assembly</li> <li>9. Rear speed sensor</li> <li>10. Dust shield</li> <li>11. Disc brake adapter</li> </ol> |
|--|---|

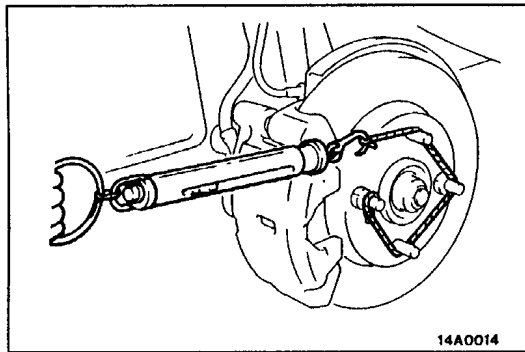
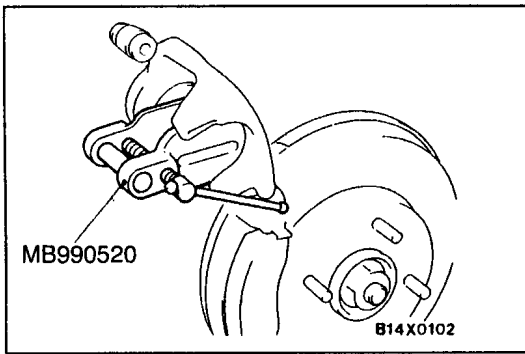


**INSTALLATION SERVICE POINT**

►A◄ **DISC BRAKE ASSEMBLY INSTALLATION**

1. In order to measure the brake drag torque after pad installation, measure the rotary-sliding resistance of the hub by the following procedure with the pads removed.
  - (1) Remove the drive shaft. (Refer to GROUP 26.)<Front>
  - (2) Attach the special tool to the front hub assembly as shown in the illustration, and tighten it to the specified torque.<Front>
  - (3) Use a spring balance to measure the rotary-sliding resistance of the hub in the forward direction.





2. Install the caliper support, and then install the brake pad to the caliper support.

**Caution**

**Do not let any oil, grease or other contamination get onto the friction surfaces of the pads and brake discs.**

3. Clean piston and insert into cylinder with special tool.
4. Be careful that the piston boot does not become caught, when lowering the caliper assembly, and then tighten the bolt to the specified torque.

**Tightening torque: 27 Nm**

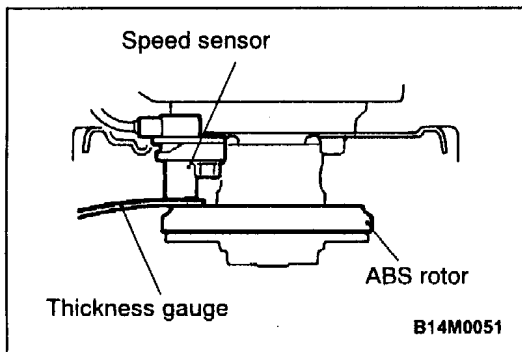
5. Start the engine and then depress the brake pedal 2-3 times.
6. Stop engine.
7. Turn brake disc forward 10 times.
8. Use a spring balance to measure the rotation sliding resistance of the hub in the forward direction.
9. Calculate the drag force of the disc brake (difference between of values measured in item 8 and item 1.)

**Standard value:**

**<Front> 40 N or less**

**<Rear> 20 N or less**

10. If the drag force of the disc brake 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.



**►B◀ REAR SPEED SENSOR INSTALLATION**

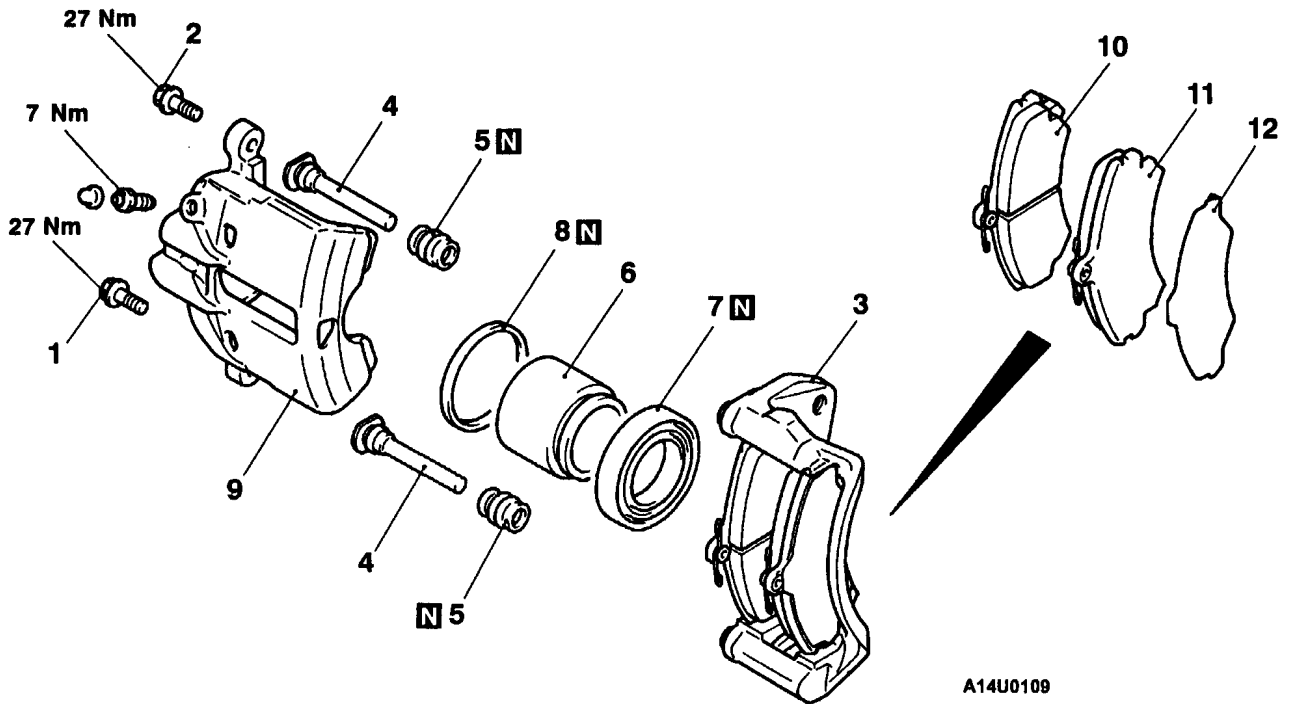
**Caution**

**Be sure not to damage the pole piece at the tip of the speed sensor by striking against other parts.**

Insert a thickness gauge into the space between the speed sensor's pole piece and the ABS rotor's toothed surface, and check the clearance is the standard value all around.

**Standard value: 0.1 - 1.9 mm**

DISASSEMBLY AND REASSEMBLY <FRONT DISC BRAKE>



A14U0109

<p>A14U0108</p>	<p>A14U0110</p>	<p>B14U0110</p>	<p>A14U0111</p>
<p>Brake callper kit</p>	<p>Pad set</p>	<p>Shim set</p>	<p>Seal and boots kit</p>

**Caliper assembly disassembly steps**

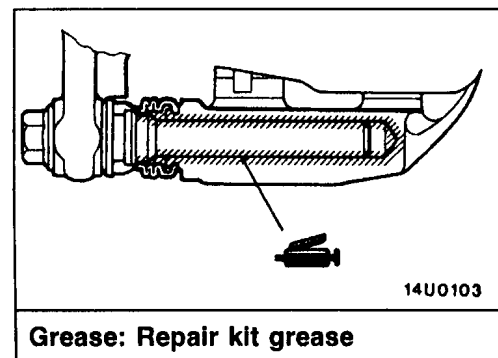
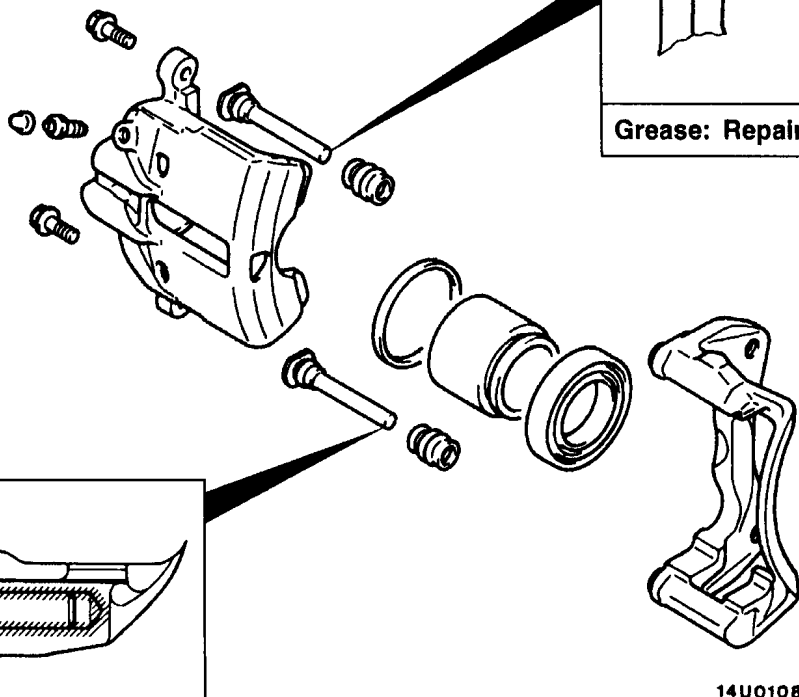
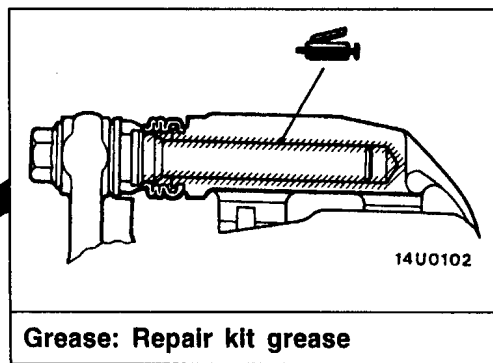
1. Bolt
2. Bolt
3. Caliper support
4. Guide pin
5. Boot
6. Piston
7. Piston boot
8. Piston seal
9. Caliper body

**Pad assembly disassembly steps**

1. Bolt
10. Pad and wear indicator assembly
11. Pad assembly
12. Outer shim <14 inch disc brake>

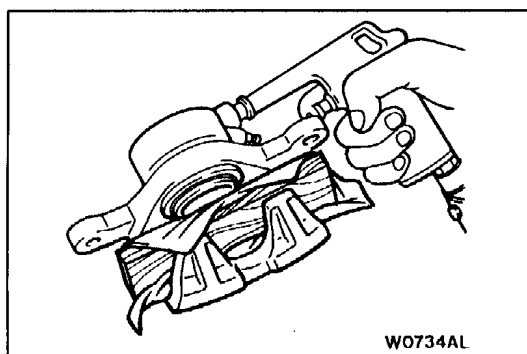


LUBRICATION POINTS



14U0108

00005953



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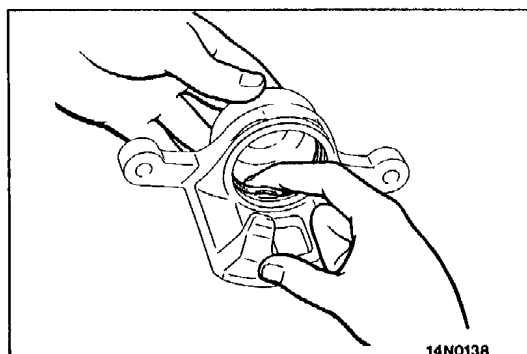
**DISASSEMBLY SERVICE POINTS**

**◀A▶ PISTON BOOT/PISTON REMOVAL**

Use a piece of wood to protect the caliper body outer side, and then apply compressed air through the brake hose connection hole to withdraw the piston and piston boot.

**Caution**

If air is blown into the caliper body suddenly, the piston will pop out, causing damage to the caliper body. Be sure to apply compressed air gradually.



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**◀B▶ PISTON SEAL REMOVAL**

1. Remove piston seal with finger tip.

**Caution**

Do not use a flat-tipped 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**

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

**PAD WEAR CHECK**

Measure thickness at the thinnest and worn area of the pad. Replace pad assembly if pad thickness is less than the limit value.

**Standard value:**

<14 inch disc brake> 10.0 mm

<15 inch disc brake> 12.0 mm

**Limit: 2.0 mm**

**Caution**

1. Always replace the right and left brake pads as a set.
2. If an excessive difference is found in the thickness between the right and left brake pads, check moving parts.

# ANTI-SKID BRAKING SYSTEM (ABS)

## CONTENTS

<b>GENERAL</b> .....	<b>2</b>	<b>TROUBLESHOOTING</b> .....	<b>2</b>
Outline of Changes .....	2	<b>REAR WHEEL SPEED SENSOR</b> .....	<b>4</b>



**GENERAL****OUTLINE OF CHANGES**

- Troubleshootings have been revised for the modification of the anti-skid braking system (ABS) circuit.
- The removal and installation procedures for the rear wheel speed sensor have been changed due to the change on the sensor.

**TROUBLESHOOTING****INSPECTION CHART FOR TROUBLE SYMPTOMS**

Get an understanding of the trouble symptoms and check according to the inspection procedure chart. The other procedures than the revision below are the same as before.

Trouble symptoms		Inspection procedure No.	Reference page
Communication with MUT-II is not possible.	Communication with all systems is not possible.	1	*
	Communication with ABS only is not possible.	2	35B-3

**NOTE**

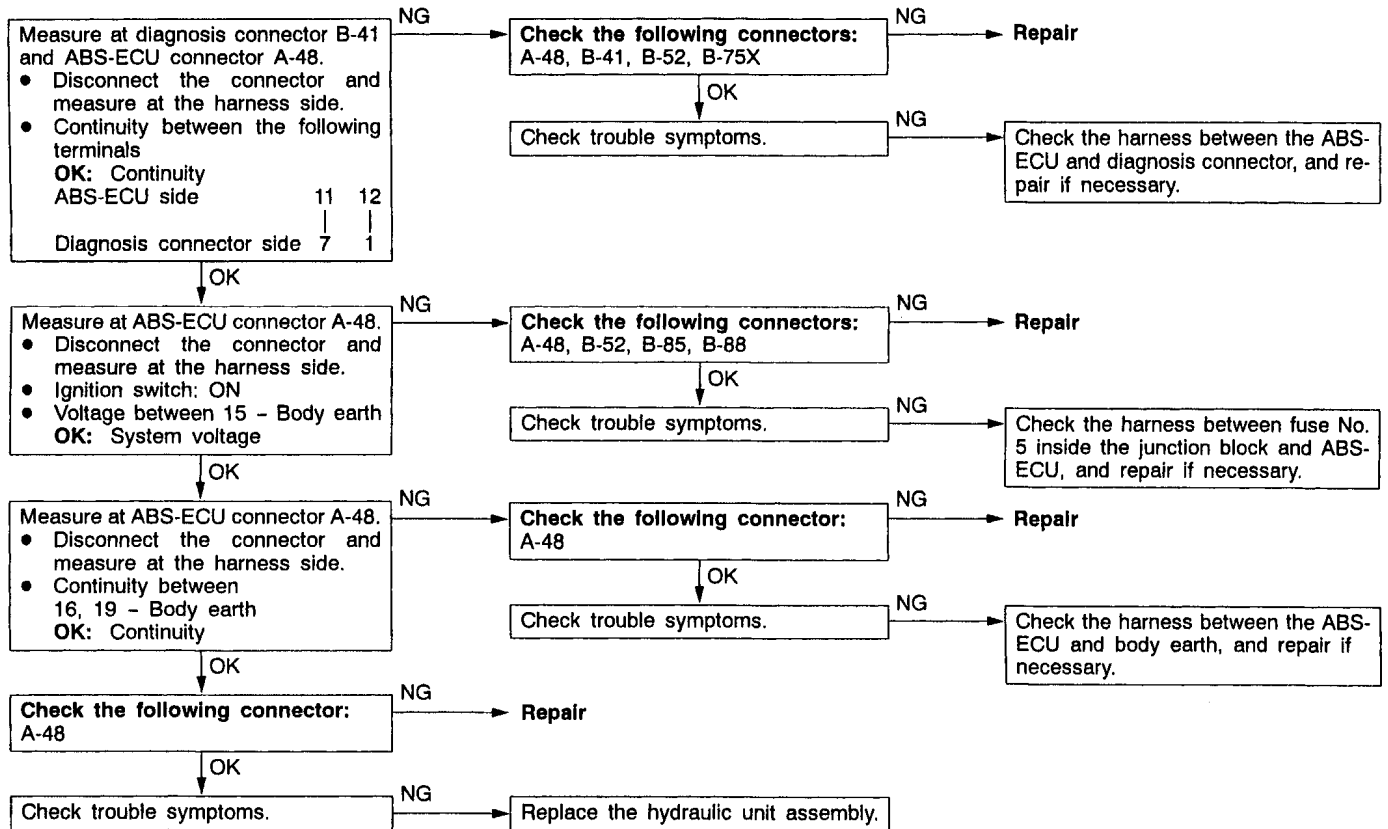
\*: Refer to '96 CARISMA Workshop Manual (Pub. No.PWDE9502).



**INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS**

**Inspection Procedure 2**

Communication with MUT-II is not possible. (Communication with ABS only is not possible.)	Probable cause
When communication with the 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.	<ul style="list-style-type: none"> <li>● Blown fuse</li> <li>● Malfunction of wiring harness or connector</li> <li>● Malfunction of ABS-ECU</li> </ul>

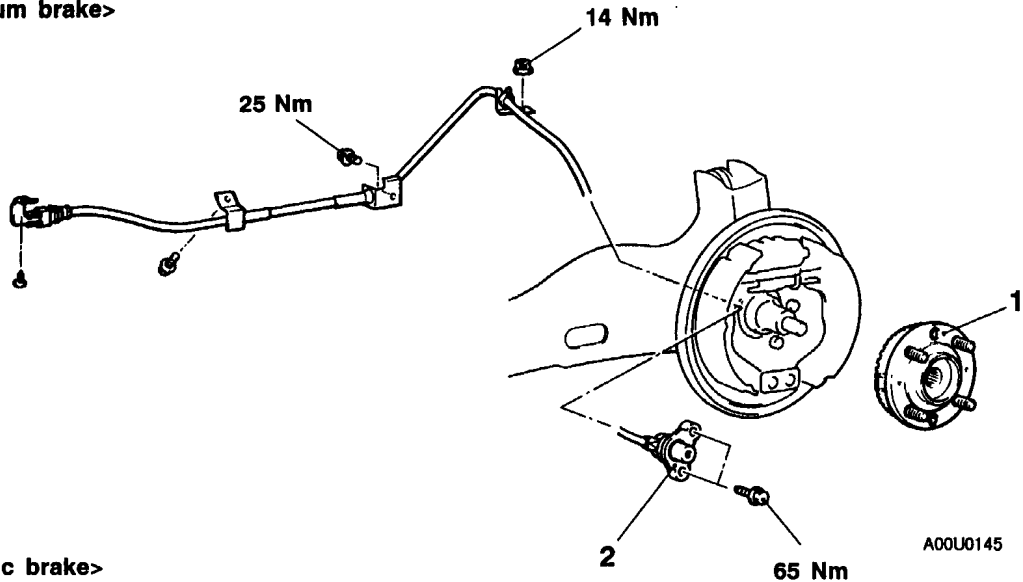


# REAR WHEEL SPEED SENSOR

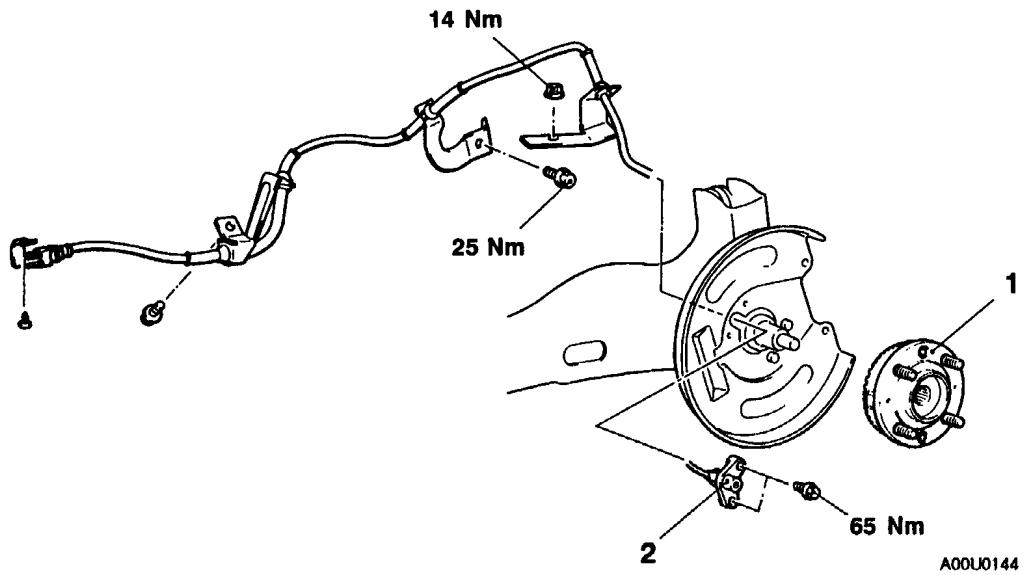
## REMOVAL AND INSTALLATION

**Post-Installation Operation**  
 Wheel Speed Sensor Output Voltage Check

<Vehicles with drum brake>



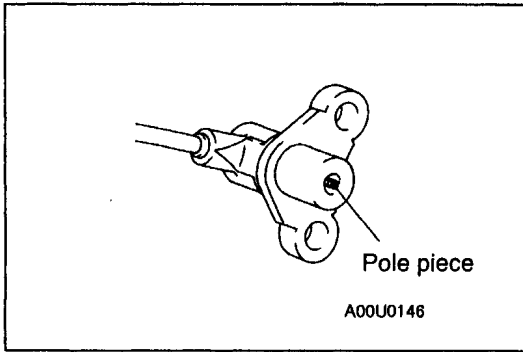
<Vehicles with disc brake>



**Removal steps**

1. Rear ABS rotor  
 (Refer to GROUP 27 - Rear Axle Hub.)
2. Rear speed sensor



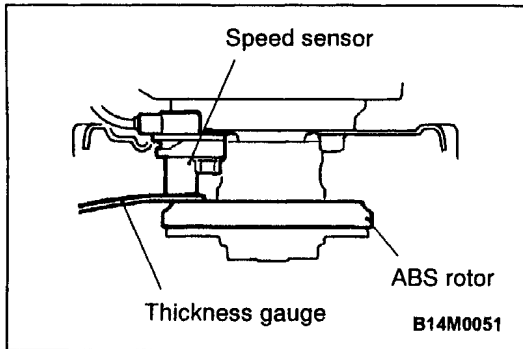


**REMOVAL SERVICE POINT**

**◀A▶ REAR SPEED SENSOR REMOVAL**

**Caution**

Be sure not to damage the pole piece at the tip of the speed sensor by striking against other parts.



**INSTALLATION SERVICE POINT**

**▶A◀ REAR SPEED SENSOR INSTALLATION**

**Caution**

Be sure not to damage the pole piece at the tip the speed sensor by striking against other parts.

Insert a thickness gauge into the space between the speed sensor's pole piece and the ABS rotor's toothed surface, and check the clearance is the standard value all around.

**Standard value: 0.1 – 1.9 mm**

**INSPECTION**

The inspections are the same as before.

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# TRACTION CONTROL SYSTEM (TCL)

## CONTENTS

<b>GENERAL</b> .....	<b>2</b>	<b>ON-VEHICLE SERVICE</b> .....	<b>17</b>
Outline of Change .....	2	Stop Lamp Switch Check .....	17
<b>GENERAL INFORMATION</b> .....	<b>2</b>	Wheel Speed Sensor Output Voltage Check .....	17
<b>SPECIAL TOOLS</b> .....	<b>8</b>	Wheel Speed Sensor Check .....	17
<b>TROUBLESHOOTING</b> .....	<b>8</b>	Hydraulic Unit (HC) Check .....	18
		<b>HYDRAULIC UNIT</b> .....	<b>18</b>

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## GENERAL

### OUTLINE OF CHANGE

- The following service procedures have been added to the use of the brake-controlled TCL.

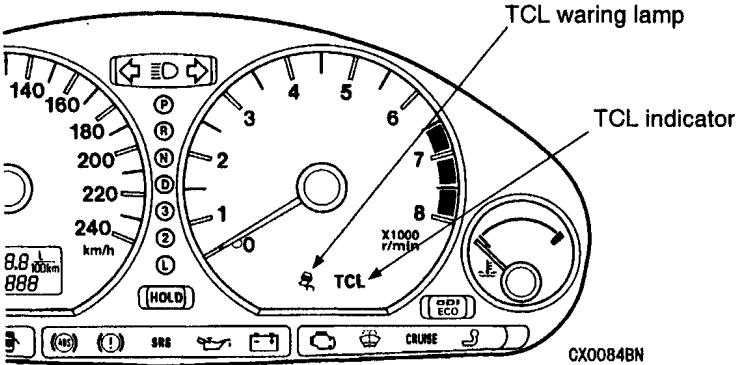
### GENERAL INFORMATION

If a throttle valve is opened excessively widely when a vehicle is started or accelerated, driving wheels may slip due to excessive driving torque, thus adversely affecting startability, accelerating ability or controllability. In order to ensure startability, accelerating ability and controllability, this TCL system will prevent the wheel slips by controlling (applying) the brake fluid pressure to the driving wheels and thus adjust the driving torque according to road conditions.

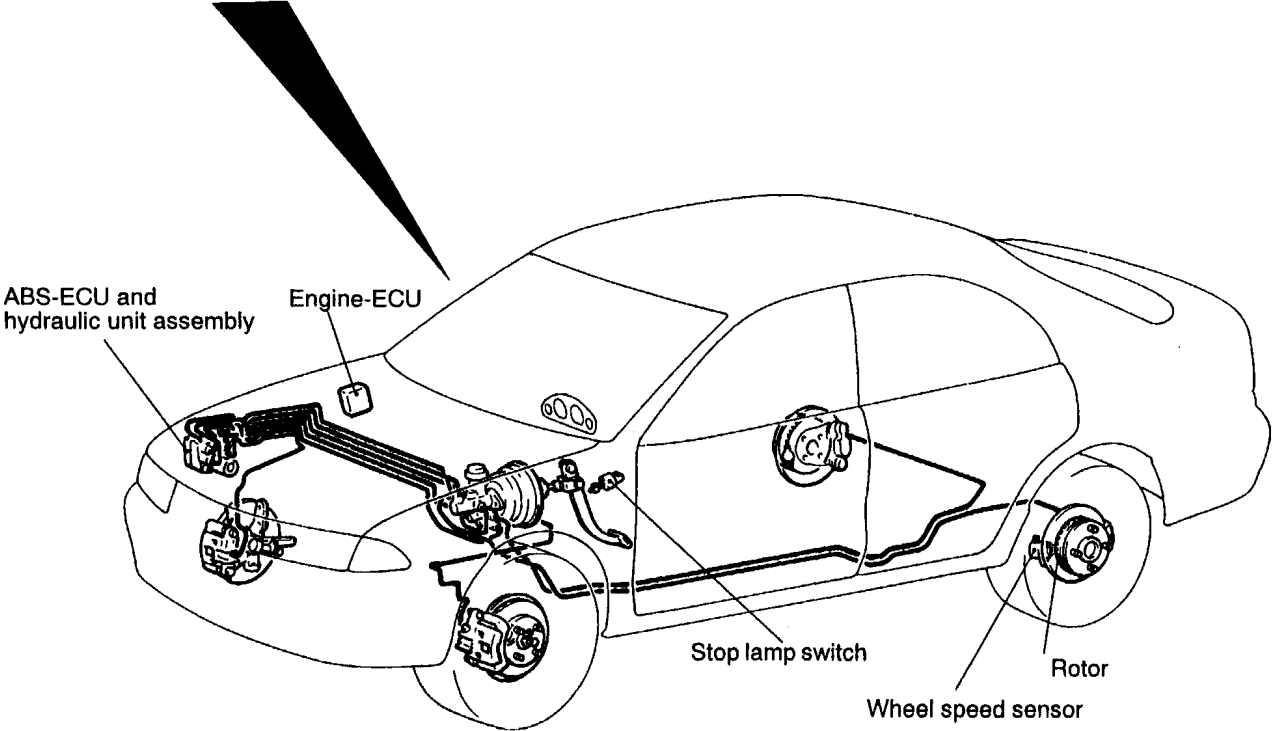
Each wheel-speed sensor detects wheel speed and convert it to electric signal. The ABS-ECU determines which wheel almost slips according to that signal. If the ABS-ECU determines the wheel slip, it activates the solenoid valves and the pump inside the hydraulic unit to prevent the wheel slip by applying brake, thus ensuring controllability. Furthermore, this TCL system is controlled by the ABS-ECU, and the TCL components are shared by the ABS system.

System operation	TCL indicator	TCL warning lamp	ABS lamp warning	TCL control function
TCL: ON	On	Off	Off	Enable
TCL: OFF	Off	Off	Off	
Fail-safe: activated	Off	On	On	Disable

CONSTRUCTION DIAGRAM



CX0084BN



AX0087BN

**SYSTEM OPERATION**

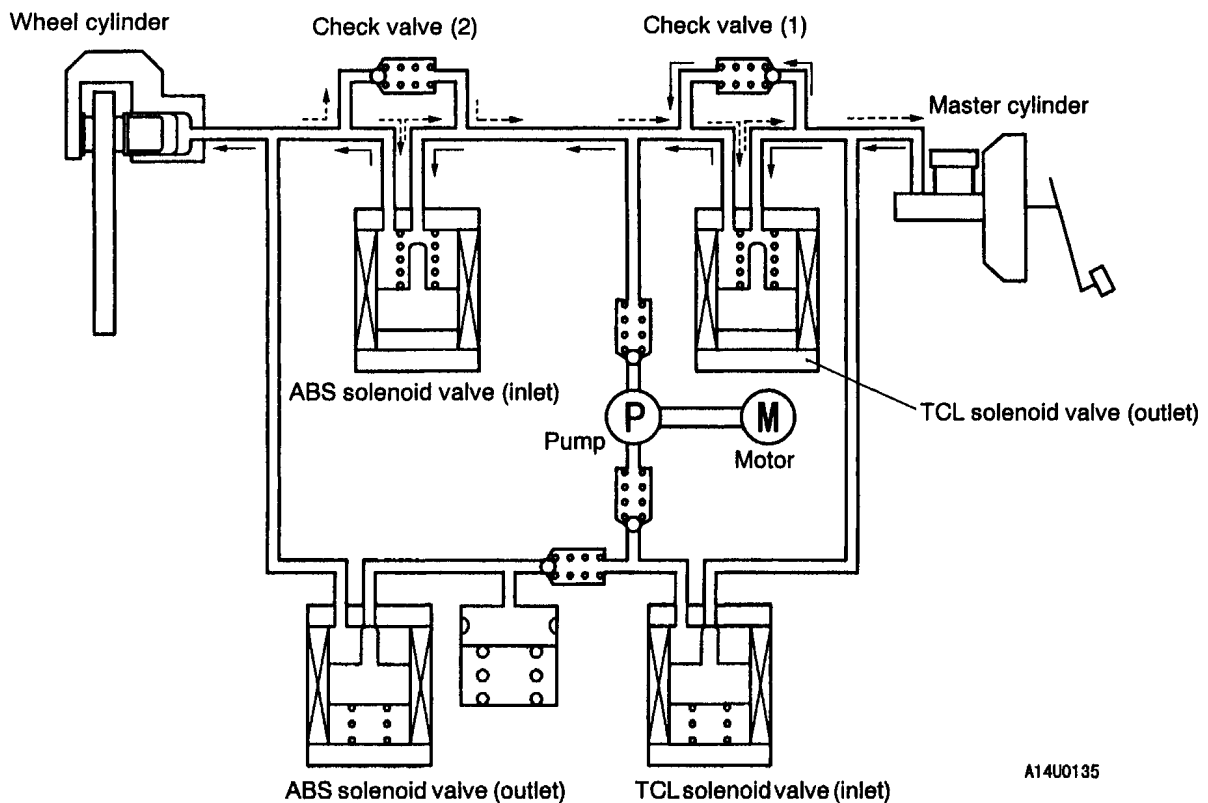
The hydraulic unit contains eight ABS solenoid valves and four TCL solenoid valves. Two ABS solenoid valves (inlet and outlet valves) are mounted in each road wheels, and two TCL solenoid valves (inlet and outlet valves) are mounted in each front driving wheel. The following description explains one front driving wheel.

**1. When the TCL Is off**

The TCL solenoid valve (outlet) and the ABS solenoid valve (inlet) are opened while the TCL solenoid valve (inlet) and the ABS solenoid valve (outlet) is closed. If the brake pedal is depressed, the brake fluid flows through the TCL solenoid valve (outlet) and check valve (1) and the ABS solenoid valve (inlet) to the wheel cylinder, thus applying brake.

Next, if the brake pedal is released, the brake fluid returns through the ABS solenoid valve (inlet), check valve (2) and the TCL solenoid valve (outlet) to the master cylinder, thus releasing brake.

Name		Energisation	Open/Close	Name		Energisation	Open/Close
ABS solenoid valve	IN	OFF	Open	TCL solenoid valve	IN	OFF	Close
	OUT	OFF	Close		OUT	OFF	Open



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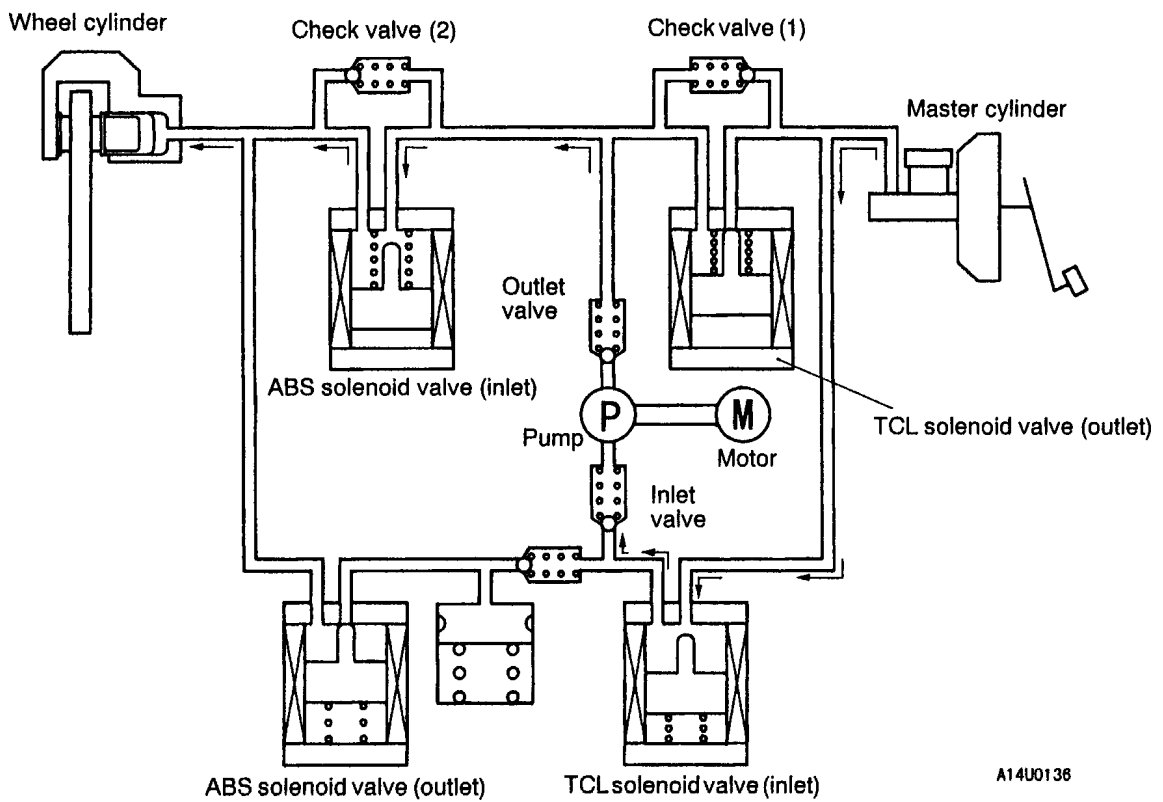
← When brake pedal is depressed  
 ← - - - When brake pedal is released

2. When the TCL Is on

(1) When the brake fluid pressure is increased

When the ABS-ECU determines wheel slip due to sudden acceleration or others, the ABS-ECU closes the TCL solenoid valve (outlet), opens the TCL solenoid valve (inlet), and energises the motor to activate the plunger pump. Then the brake fluid is pumped from the master cylinder through the TCL solenoid valve (inlet) and the inlet valve. The pressurised brake fluid flows through the ABS solenoid valve (inlet) to the wheel cylinder, thus increasing the brake fluid pressure.

Name		Energisation	Open/Close	Name		Energisation	Open/Close
ABS solenoid valve	IN	OFF	Open	TCL solenoid valve	IN	ON	Open
	OUT	OFF	Close		OUT	ON	Close



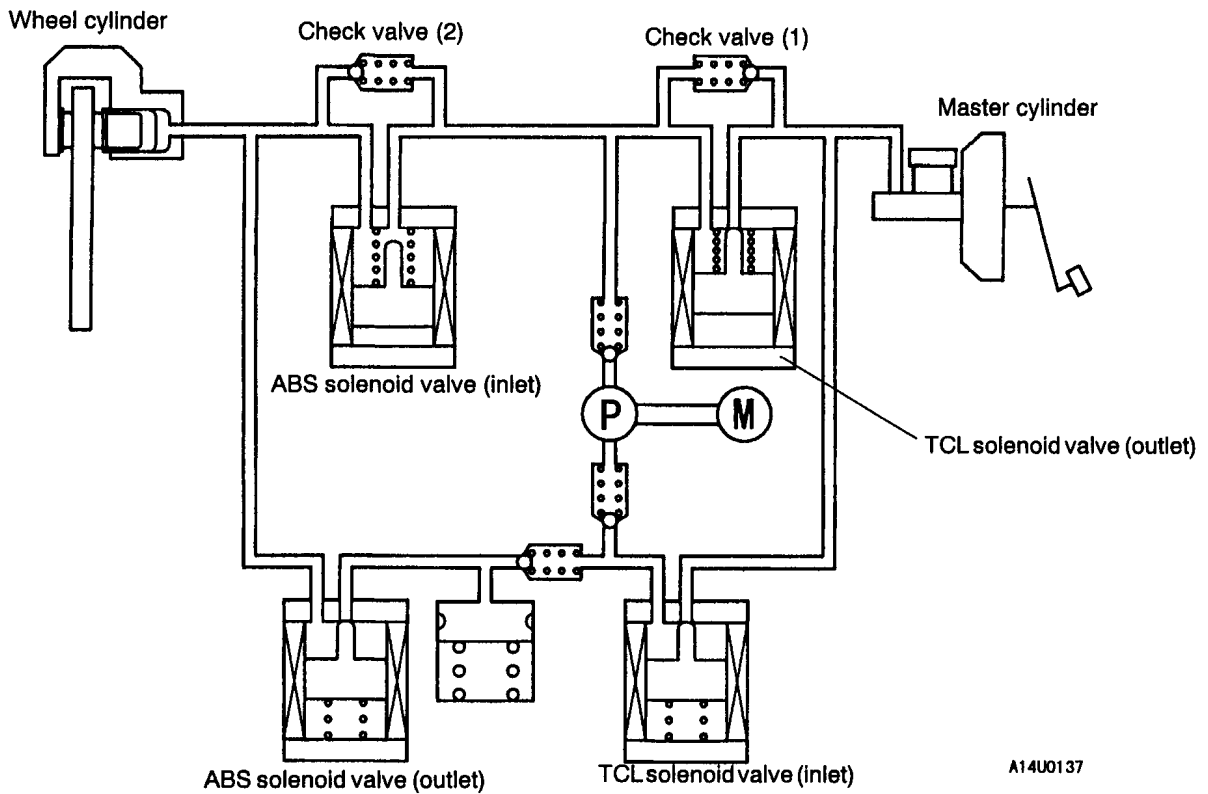
A14U0136



(2) When the brake fluid pressure is maintained

If the brake fluid pressure to the wheel cylinder reaches an optimal value, the ABS-ECU de-energises the motor and the TCL solenoid valve (inlet). Then the pump will stop, and the TCL solenoid valve (inlet) closes, thus closing the hydraulic circuit to maintain the brake fluid pressure to the wheel cylinder.

Name		Energisation	Open/Close	Name		Energisation	Open/Close
ABS solenoid valve	IN	OFF	Open	TCL solenoid valve	IN	OFF	Close
	OUT	OFF	Close		OUT	ON	Close

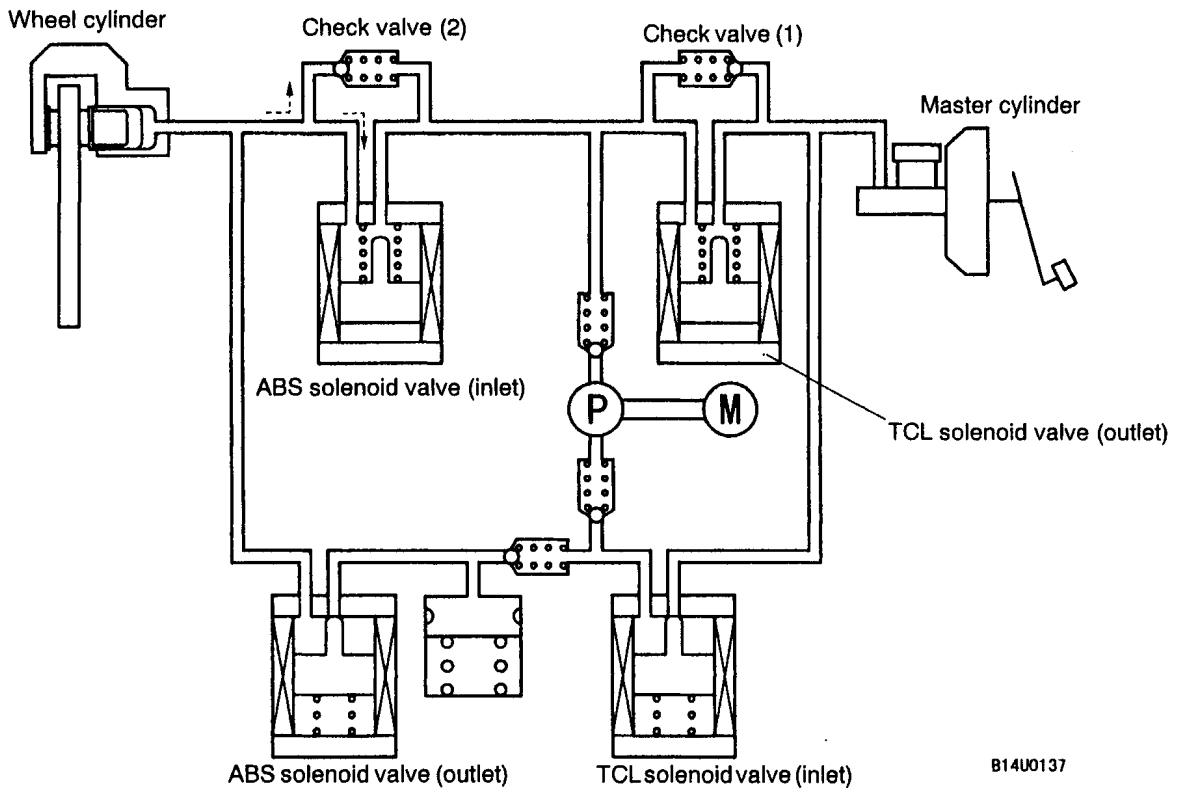


A14U0137

(3) When the brake fluid pressure is decreased


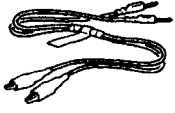
When the ABS-ECU determines no wheel slips, it opens the TCL solenoid valve (outlet). Then the brake fluid returns from the wheel cylinder through the ABS solenoid valve (inlet), check valve (2) and the TCL solenoid valve (outlet) to the master cylinder, thus decreasing the brake fluid pressure.

Name		Energisation	Open/Close	Name		Energisation	Open/Close
ABS solenoid valve	IN	OFF	Open	TCL solenoid valve	IN	OFF	Close
	OUT	OFF	Close		OUT	OFF	Open



B14U0137

**SPECIAL TOOLS**

Tool	Number	Name	Use
	MB991502	MUT-II sub assembly	For checking of TCL (Diagnosis code display when using the MUT-II)
	MB991529	Diagnosis code check harness	For checking of TCL (Diagnosis code display when using the ABS warning lamp)

**TROUBLESHOOTING****STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING**

Refer to Basic Manual GROUP 00 – How to Use Troubleshooting/Inspection Service Points.

**DIAGNOSIS FUNCTION****DIAGNOSIS CODES CHECK****With the MUT-II**

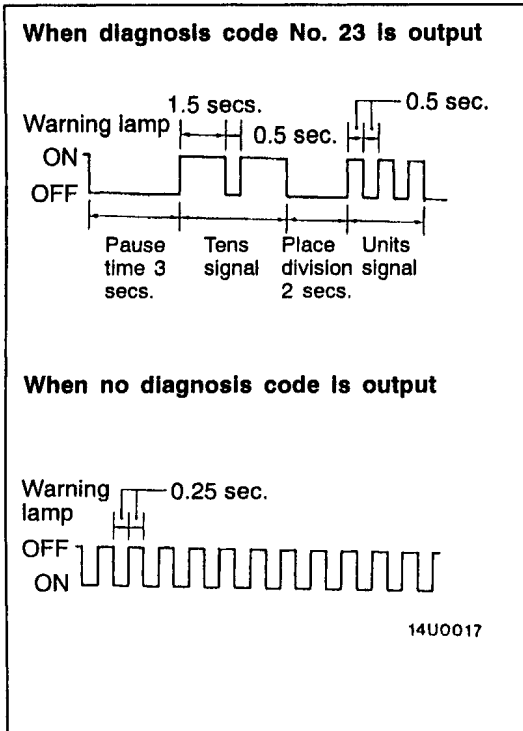
Connect the MUT-II to the diagnosis connector (16-pin), then check diagnosis codes.

**Caution**

**Turn the ignition switch off before connecting or disconnecting the MUT-II.**

**Without the MUT-II**

1. Use the special tool to earth diagnosis connector terminal No. 1.

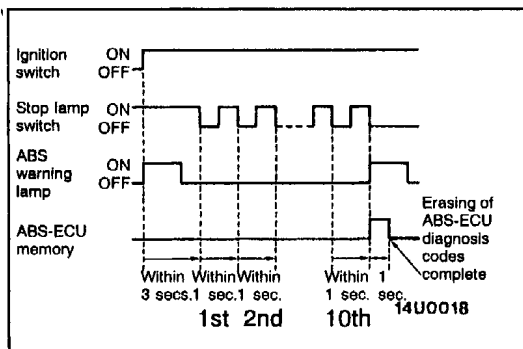


2. Turn the ignition switch to ON and then take a reading of the diagnosis codes from the flashing of the ABS warning lamp.

**ERASING DIAGNOSIS CODES**

**With the MUT-II**

Connect the MUT-II to the diagnosis connector (16-pin), then erase the diagnosis codes.



**Without the MUT-II**

The diagnosis codes can only be erased by operating the brake switch ten times according to the pattern shown in the illustration at left while the TCL is active and while driving at a speed of 10 km/h or less.

## INSPECTION CHART FOR DIAGNOSIS CODES

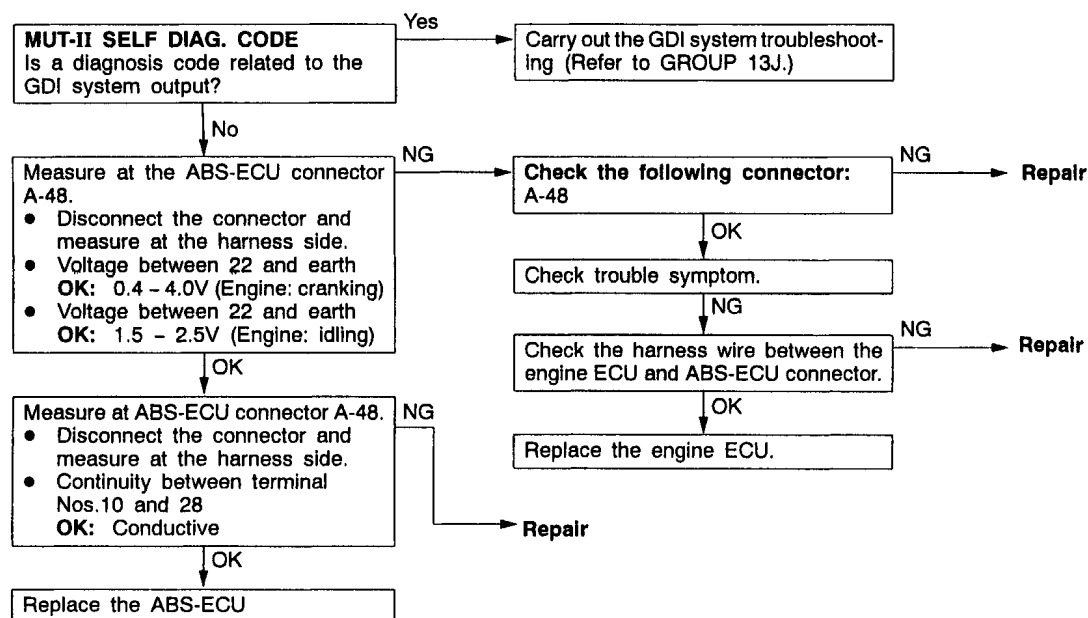
Inspect according to the inspection chart that is appropriate for the malfunction code.

Diagnosis code No.	Inspection item	Diagnosis content	Reference page
11	Front right wheel speed sensor	Open circuit	Refer to '98 CARISMA Workshop Manual – GROUP 35B – Troubleshooting
12	Front left wheel speed sensor		
13	Rear right wheel speed sensor		
14	Rear left wheel speed sensor		
<b>15</b> <b>&lt;Added&gt;</b>	<b>Wheel speed sensor</b>	<b>Abnormal output signal</b>	<b>Refer to '98 CARISMA Workshop Manual – GROUP 35B Troubleshooting</b>
16	Power supply system		Refer to '98 CARISMA Workshop Manual – GROUP 35B – Troubleshooting
21	Front right wheel speed sensor	Short circuit	Refer to '98 CARISMA Workshop Manual – GROUP 35B – Troubleshooting
22	Front left wheel speed sensor		
23	Rear right wheel speed sensor		
24	Rear left wheel speed sensor		
25	Engine speed		35C-10
31	TLC solenoid valve (inlet)		35C-10
32	TLC solenoid valve (outlet)		
33	TLC solenoid valve (inlet)		
34	TLC solenoid valve (outlet)		
38	Stop lamp switch system		Refer to '98 CARRISMA Workshop Manual – GROUP 35B - Troubleshooting
41	Front right inlet solenoid valve		35C-10
42	Front left inlet solenoid valve		
43	Rear right inlet solenoid valve		
44	Rear left inlet solenoid valve		
45	Front right outlet solenoid valve		
46	Front left outlet solenoid valve		
47	Rear left outlet solenoid valve		
48	Rear left outlet solenoid valve		
51	Valve power supply		35C-10
53	Pump motor		35C-10
63	ABS-ECU		Refer to '98 CARRISMA Workshop Manual – GROUP 35B – Troubleshooting (Replace the Hydraulic unit assembly)

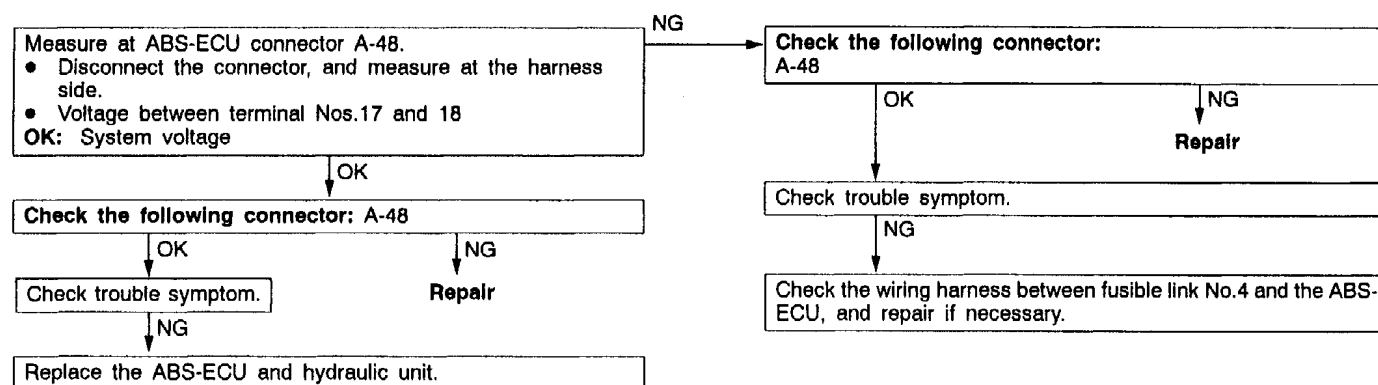
### INSPECTION PROCEDURE FOR DIAGNOSIS CODES

Refer to GROUP 35B – Troubleshooting except the following procedures.

Code No.25 Engine speed system <M/T>	Probable cause
This diagnosis code is output under the following condition: • The sensor output voltage does not change for five seconds (a pulse signal is not sent to the ABS-ECU).	<ul style="list-style-type: none"> <li>• Malfunction of wiring harness or connector</li> <li>• Malfunction of engine-ECU</li> <li>• Malfunction of ABS-ECU</li> </ul>



Code Nos.31, 32, 33, 34 TCL solenoid valve system	Probable cause
Code Nos. 41, 42, 43, 44, 45, 46, 47, 48 ABS solenoid valve system	
Code No.51 Valve relay system	
Code No.53 Pump motor system	
These diagnosis codes is output when the ABS-ECU power supply circuit (solenoid valves and motor) is short, or the hydraulic unit internal circuit is defective.	<ul style="list-style-type: none"> <li>• Malfunction of wiring harness or connector</li> <li>• Malfunction of ABS-ECU and hydraulic unit</li> </ul>



**INSPECTION CHART FOR TROUBLE SYMPTOMS**

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

Trouble symptoms		Inspection procedure No.	Reference page
Communication with MUT-II is not possible.	Communication with all systems is not possible.	1	35C-12
	Communication with TCL only is not possible.	2	35C-12
When the ignition key is turned to "ON" (engine stopped), the TCL indicator lamp does not illuminate.		3	35C-13
After the engine starts, the lamp remains illuminated.		4	35C-13
Faulty TCL operation	The TCL system does not operate.	5	35C-13
	Insufficient braking power		
	TCL operates under normal braking conditions		

**Caution**

If steering movements are made when driving on road surfaces with low frictional resistance, or when passing over bumps, the TCL may operate even though sudden braking is not being applied. Because of this, when getting information from the customer, check if the problem occurred while driving under such conditions as these.

**INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS**

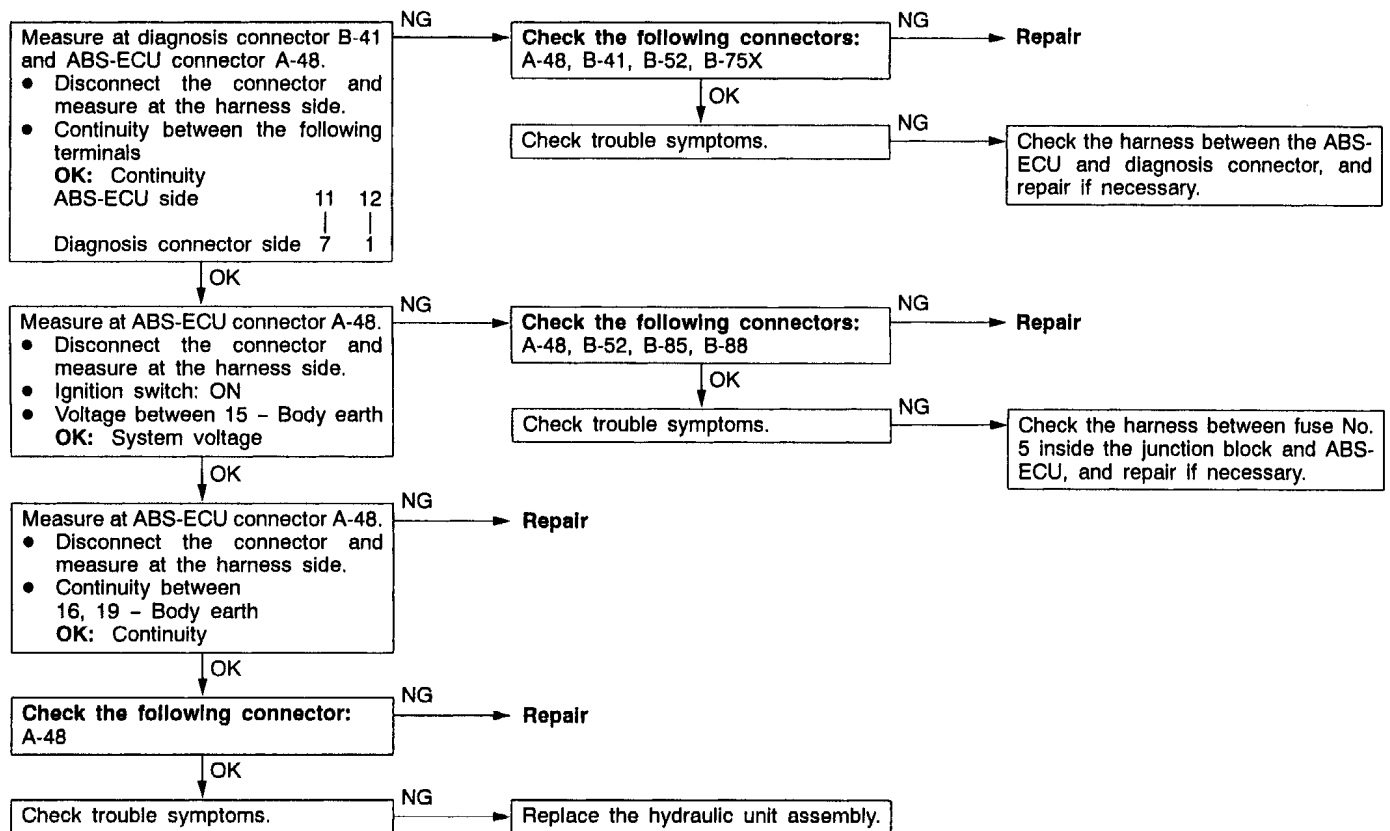
**Inspection Procedure 1**

<b>Communication with MUT-II is not possible. (Communication with all system is not possible.)</b>	<b>Probable cause</b>
The reason is probably defect in the power supply system (including earth) for the diagnosis line.	<ul style="list-style-type: none"> <li>• Malfunction of wiring harness or connector</li> </ul>

Refer to GROUP 13J – Troubleshooting.

**Inspection Procedure 2**

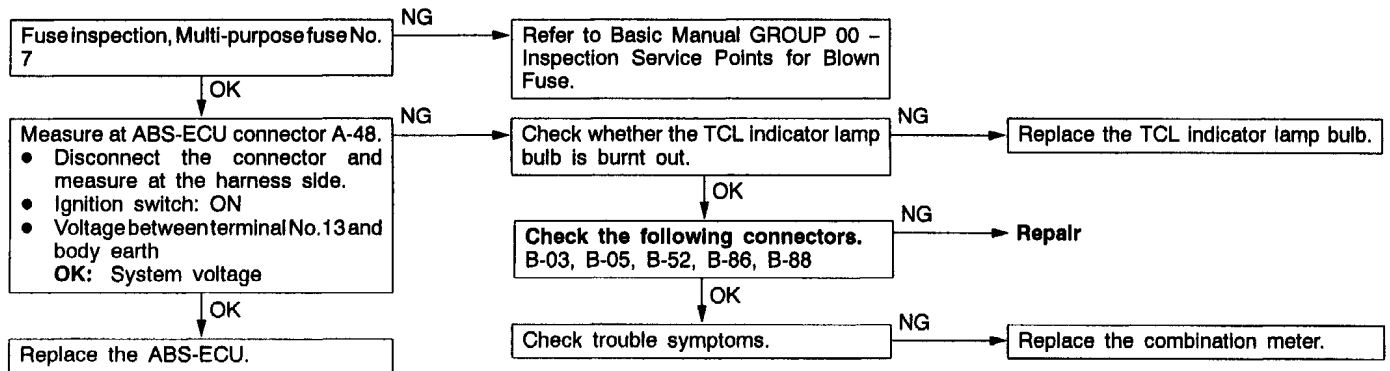
<b>Communication with MUT-II is not possible. (Communication with TCL only is not possible.)</b>	<b>Probable cause</b>
When communication with the MUT-II is not possible, the cause is probably an open circuit in the ABS-ECU power circuit or an open circuit in the diagnosis output circuit.	<ul style="list-style-type: none"> <li>• Blown fuse</li> <li>• Malfunction of wiring harness or connector</li> <li>• Malfunction of ABS-ECU</li> </ul>





**Inspection Procedure 3**

When Ignition key is turned to "ON" (engine stopped), TCL Indicator lamp does not illuminate.	Probable cause
The cause may be: an open circuit in the lamp power supply circuit, a blown lamp bulb, an open circuit in both the circuit between the TCL Indicator lamp and the ABS-ECU.	<ul style="list-style-type: none"> <li>● Blown fuse</li> <li>● Burnt out TCL Indicator lamp bulb</li> <li>● Malfunction of wiring harness or connector</li> </ul>

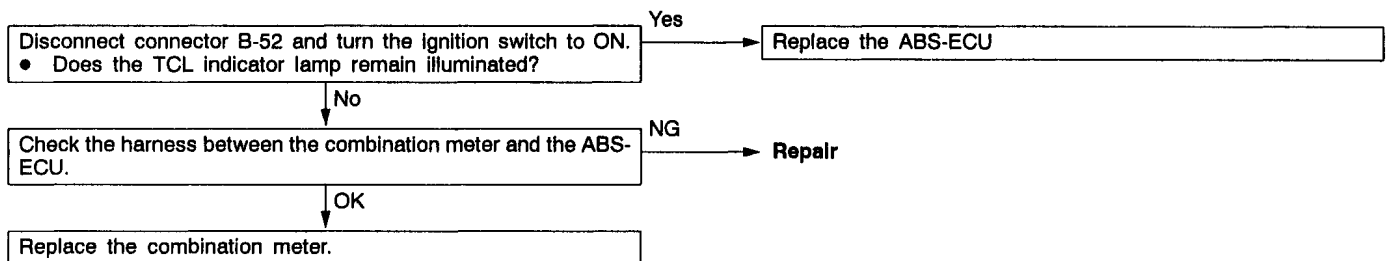


**Inspection Procedure 4**

The TCL Indicator lamp remains illuminated.	Probable cause
The cause is probably a short-circuit in the TCL indicator lamp illumination circuit.	<ul style="list-style-type: none"> <li>● Malfunction of combination meter</li> <li>● Malfunction of ABS-ECU</li> <li>● Malfunction of wiring harness</li> </ul>

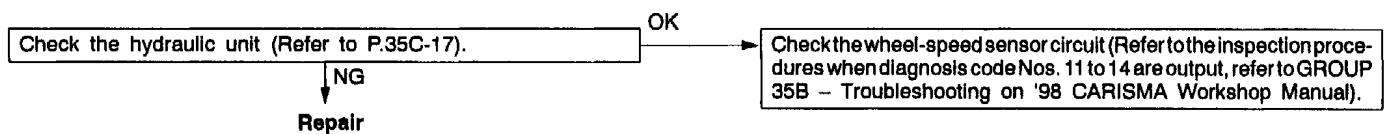
**NOTE**

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



**Inspection Procedure 5**

The TCL system does not operate.	Probable cause
The TCL system operates according to various driving and road conditions. Therefore, it is difficult to diagnose the system correctly. If the diagnosis code is not output, follow the procedure below.	<ul style="list-style-type: none"> <li>● Malfunction of the wheel-speed sensor</li> <li>● Malfunction of wiring harness or connector</li> <li>● Malfunction of rotor</li> <li>● Foreign matter attached on wheel-speed sensor</li> <li>● Malfunction of wheel bearing</li> <li>● Malfunction of hydraulic unit</li> <li>● Malfunction of ABS-ECU</li> </ul>



**SERVICE DATA REFERENCE TABLE**

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

**1. When the system is normal**

Item No.	Check item	Checking requirements	Normal value
11	Front-right wheel speed sensor	Perform a test run	Vehicle speeds displayed on the speedometer and MUT-II are identical.
12	Front-left wheel speed sensor		
13	Rear-right wheel speed sensor		
14	Rear-left wheel speed sensor		
16	ABS-ECU power supply voltage	Ignition switch power supply voltage and valve monitor voltage	9 – 16 V
38	Stop lamp switch	Depress the brake pedal.	ON
		Release the brake pedal.	OFF

**2. When the ABS-ECU shuts off ABS operation.**

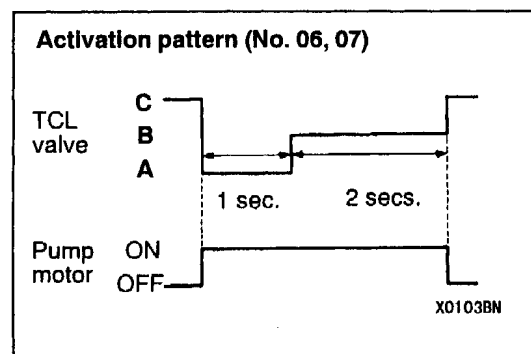
When the diagnosis system stops the ABS-ECU, the MUT-II display data will be unreliable.

**ACTUATOR TEST REFERENCE TABLE**

The MUT-II activates the following actuators for testing.

**NOTE**

1. If the ABS-ECU runs down, actuator testing cannot be carried out.
2. Actuator testing is only possible when the vehicle is stationary. If the vehicle speed during actuator testing exceeds 10 km/h, forced actuation will be canceled.



**ACTUATOR TEST SPECIFICATIONS**

No.	Item	
01	Solenoid valve for front-left wheel	Refer to CARISMA Basic Manual (Pub. No. PWDE9502) GROUP 35B – Troubleshooting
02	Solenoid valve for front-right wheel	
03	Solenoid valve for rear-left wheel	
04	Solenoid valve for rear-right wheel	
06	TCL valve for front-right wheel	TCL valves and pump motors in the hydraulic unit (simple inspection mode)
07	TCL valve for front-left wheel	
12	Pump motor	Activate the pump motor for two seconds.

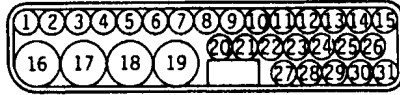
**NOTE**

- A: Hydraulic pressure increases
- B: Hydraulic pressure holds
- C: Hydraulic pressure decreases

**CHECK AT ABS-ECU**

**TERMINAL VOLTAGE CHECK CHART**

1. Measure the voltages between terminals (16) and (19) (earth terminals) and each respective terminal. <M/T>
2. Measure the voltage between terminals (16, 19) and (30) (earth terminals) and each respective terminal. <A/T>
3. The terminal layouts are shown in the illustrations below.

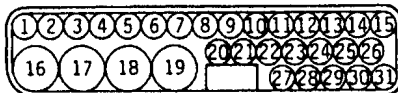


14U0122

Connector terminal No.	Signal	Checking requirements		Normal condition
11	MUT-II	Connect the MUT-II.		Serial communication with MUT-II
		Do not connect the MUT-II.		1 V or less
12	Input from diagnosis indication selection	Connect the MUT-II.		0 V
		Do not connect the MUT-II.		Approx. 12V
13	Output to TCL indicator lamp	Ignition switch: ON	The lamp is switched off.	System voltage
			The lamp is illuminated.	0 – 2 V
14	Input from stop lamp switch	Ignition switch: ON	Stop lamp switch: ON	System voltage
			Stop lamp switch: OFF	1 V or less
15	ABS-ECU power supply	Ignition switch: ON		System voltage
		Ignition switch: START		0 V
17	Pump motor power supply	Always		System voltage
18	Solenoid valve power supply	Always		System voltage
21	Output to ABS warning lamp	Ignition switch: ON	The lamp is switched off.	System voltage
			The lamp is illuminated.	0 – 2 V

**RESISTANCE AND CONTINUITY BETWEEN HARNESS-SIDE CONNECTOR TERMINALS**

1. Turn the ignition switch off and disconnect the ABS-ECU connectors before checking resistance and continuity.
2. Check them between the terminals indicated in the table below.
3. The terminal layouts are shown in the illustrations below.



14U0122

Connector terminal No.	Signal	Normal condition
1 – 3	Rear-right wheel speed sensor (+ wire)	1.28–1.92 kΩ
4 – 5	Front-right wheel speed sensor (+ wire)	1.28–1.92 kΩ
6 – 7	Front-left wheel speed sensor (+ wire)	1.28–1.92 kΩ
8 – 9	Rear-left wheel speed sensor (+ wire)	1.28–1.92 kΩ
16 – Body earth	ABS-ECU earth	Continuity
19 – Body earth		
30 – Body earth <A/T>		

**ON-VEHICLE SERVICE**

**STOP LAMP SWITCH CHECK**

Refer to Basic Manual (Pub. No. PWDE9502) GROUP 35A – On-vehicle Service.

**WHEEL SPEED SENSOR OUTPUT VOLTAGE CHECK**

Refer to Basic Manual (Pub. No. PWDE9502) GROUP 35B – On-vehicle Service.

**WHEEL SPEED SENSOR CHECK**

Refer to Basic Manual (Pub. No. PWDE9502) GROUP 35B – On-vehicle Service.

## HYDRAULIC UNIT (HU) CHECK

### Caution

Turn the ignition switch off before connecting or disconnecting the MUT-II.

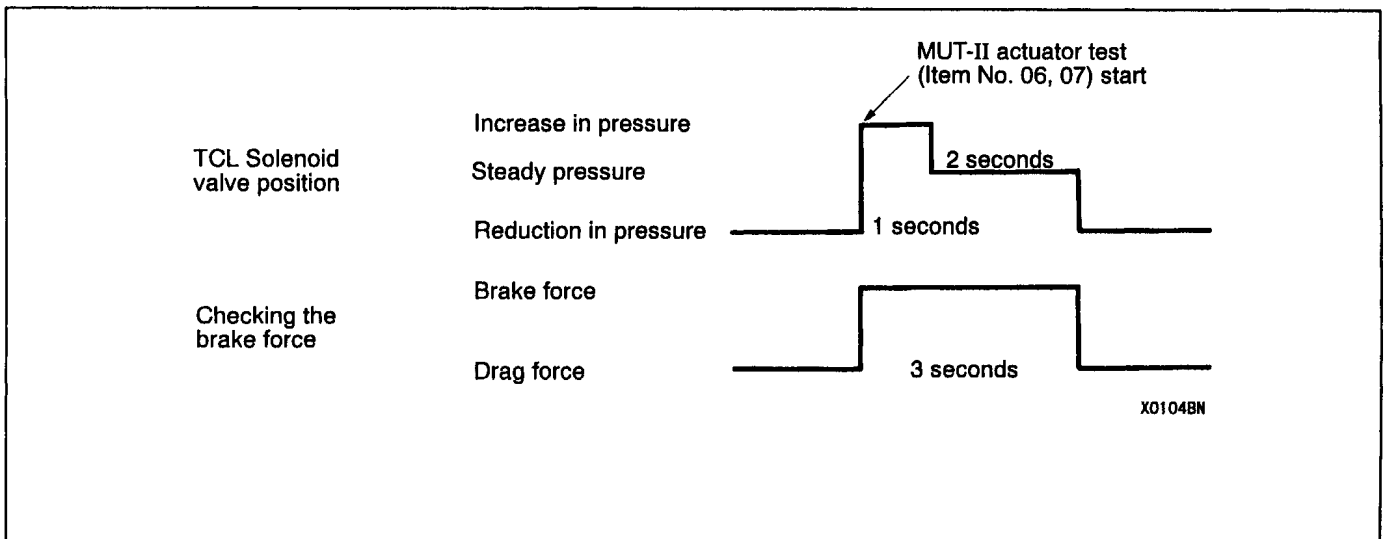
1. Jack up the vehicle and support the vehicle with rigid racks placed at the specified jack-up points or place the wheels which are checked on the rollers of the braking force tester.

### 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-II.
  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-II mode and the ABS warning lamp will illuminate.
  - (2) When the ABS has been interrupted by the fail-safe function, the MUT-II actuator testing cannot be used.
5. Use the MUT-II to force-drive the actuator.
  6. Turn the wheel by hand and check the change in braking force. When a braking force tester is used, check that the braking force changes during actuator test. The result should be as shown in the following diagram.
  7. If the result of inspection is abnormal, replace the hydraulic unit.



## HYDRAULIC UNIT

### REMOVAL AND INSTALLATION

Refer to Basic Manual (Pub. No. PWDE9502) GROUP 35B – Hydraulic unit.