
SERVICE BRAKES

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35109000180

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ANTI-SKID BRAKING SYSTEM (ABS) <2WD>	35B
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BASIC BRAKE SYSTEM

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GENERAL INFORMATION

35100010120

The brake system has high reliability and durability which maintains excellent braking performance and braking feeling. The main features are as follows.

- A dual type master cylinder is equipped in all models.
- Both a single type and a tandem type brake booster have been adopted.
- The following type of brake have been adopted.
Front: Floating caliper, 2-piston, ventilated disc brakes (V4-W43, V5-W43) or floating caliper, 1-piston, ventilated disc brakes (V4-S60, V5-S60)
Rear: Leading-trailing type drum brake.

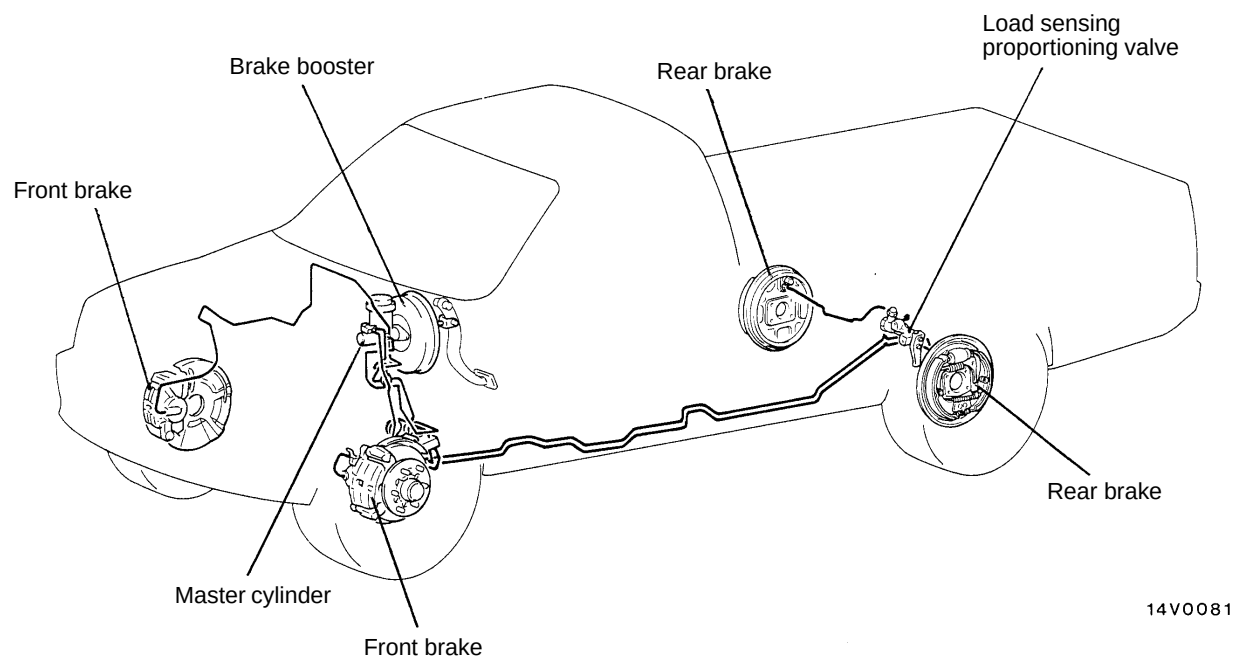
Items	2WD <Petrol-powered vehicles>	2WD <Diesel-powered vehicles>	4WD <Petrol-powered vehicles>	4WD <Diesel-powered vehicles>
Master cylinder I.D. mm	23.8	23.8	23.8	23.8
Brake booster effective dia. of power cylinder mm	230 205 + 230*	230 180 + 205*	205 + 230	180 + 205
Brake booster boosting ratio	5.0	5.0	7.0	7.0
Load sensing proportioning valve decompression ratio	0.15	0.15	0.15	0.15
Front brake disc effective dia. mm	200	200	222 228*	222 228*
Front brake wheel cylinder I.D. mm	60.3 42.9*	60.3 42.9*	60.3 42.9*	60.3 42.9*
Rear drum brake drum I.D. mm	254	254	270	270
Rear drum brake wheel cylinder I.D. mm	23.8	23.8	23.8	23.8
Rear drum brake lining thickness mm	4.7	4.7	4.7	4.7

NOTE

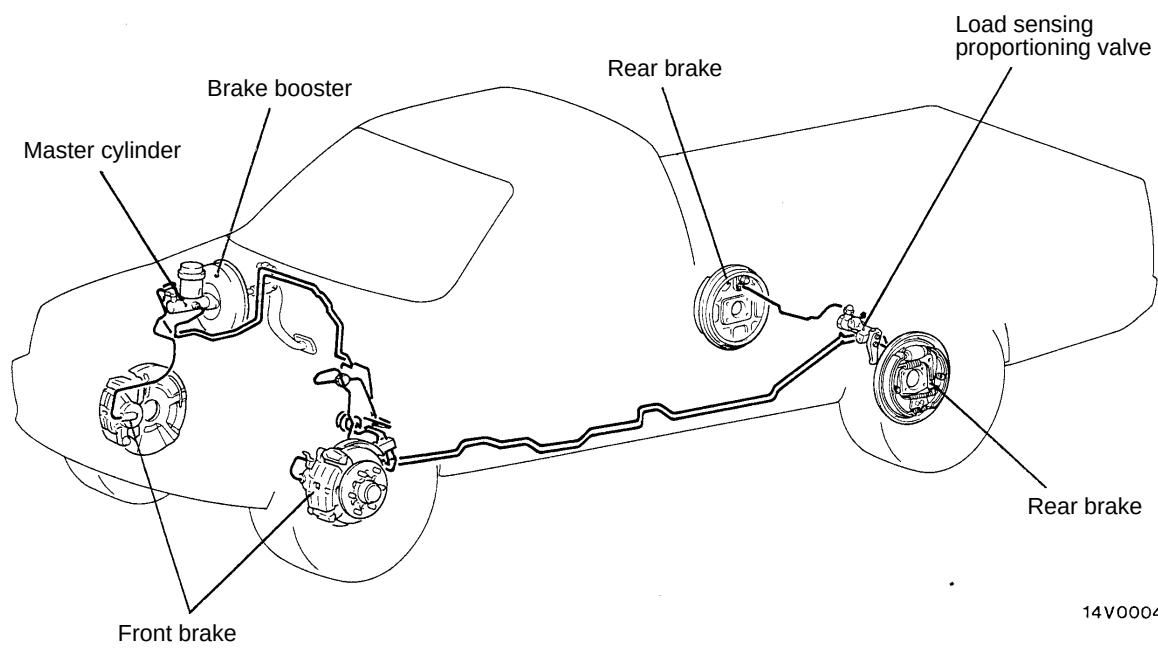
*: Vehicles with ABS.

CONFIGURATION DIAGRAM

<L.H. drive vehicles>



<R.H. drive vehicles>



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SERVICE SPECIFICATIONS

35100030119

Items			Standard value	Limit
Brake pedal height mm			176 – 181	–
Brake pedal free play mm			3 – 8	–
Brake pedal to floor board clearance mm			95 or more	–
Load sensing proportioning valve output pressure kPa (Input pressure kPa)	2WD	When load sensing spring length is 190 mm (when unladen)	3,625 (5,884)	–
			5,390 (17,652)	–
		When load sensing spring length is 215 mm (when laden)	14,393 (17,652)	–
	4WD	When load sensing spring length is 190 mm (when unladen)	4,309 (5,884)	–
			6,074 (17,652)	–
		When load sensing spring length is 215 mm (when laden)	16,310 (17,652)	–
Load sensing spring length mm			189 – 193	–
Booster push rod to master cylinder piston clearance mm	Single brake booster	Petrol-powered vehicles	0.65 – 1.05	–
		Diesel-powered vehicles	1.00 – 1.40	–
	Tandem brake booster	Vehicle which brake booster of power cylinder is 180 mm and 205 mm in effective diameter	0.90 – 1.30	–
		Vehicle which brake booster of power cylinder is 205 mm and 230 mm in effective diameter	0.70 – 1.10	–
Front disc brake pad thickness mm			10	2.0
Front brake disc thickness mm			24	22.4
Front brake disc run-out mm		2WD	–	0.08
		4WD	–	0,06
Front disc brake drag force (tangential force of wheel mounting bolts) N			69 or less	–
Rear drum brake lining thickness mm			4.7	1.0
Rear drum inside diameter mm		2WD	254.0	256.0
		4WD	270.0	272.0
Front hub end play mm			0.05	–

LUBRICANTS

35100040105

Items	Specified lubricant
Brake fluid	DOT3 or DOT4
Brake piston seal	Repair kit grease
Guide pin boot inner surface	
Lock pin boot inner surface	
Piston boot mounting grooves	
Brake piston boot inner surface	
Lock pin bush inner surface	
Piston cup surface	
Rear brake shoe and backing plate contact surface	Brake grease SAE J310, NLGI No.1
Auto adjuster assembly	

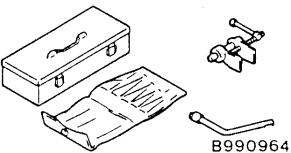
SEALANTS

35100050108

Items	Specified sealant	Remarks
Vacuum switch	3M ATD Part No.8661 or equivalent	Semi-drying sealant
Shoe hold-down pin	3M ATD Part No.8513 or equivalent	Drying sealant

SPECIAL TOOLS

35100060095

Tool	Number	Name	Use
	MB990964 MB990520 MB990623	Brake tool set	Pushing-in of the disc brake piston Installation of drum brake wheel cylinder piston cup

TROUBLESHOOTING

35100070081

Symptom	Probable cause	Remedy
Vehicle pulls to one side when brakes are applied	Grease or oil on pad or lining surface	Replace
	Inadequate contact of pad or lining	Correct
	Auto adjuster malfunction	Adjust
	Drum eccentricity or uneven wear	Repair or replace as necessary
Insufficient braking power	Low or deteriorated brake fluid	Refill or change
	Air in brake system	Bleed air
	Overheated brake rotor due to dragging of pad or lining	Correct
	Inadequate contact of pad or lining	
	Brake booster malfunction	
	Clogged brake line	
	Grease or oil on pad or lining surface	Replace
	Load sensing proportioning valve malfunction	
	Auto adjuster malfunction	Adjust
Increased pedal stroke (Reduced pedal to floor board clearance)	Air in brake system	Bleed air
	Worn lining or pad	Replace
	Broken vacuum hose	
	Faulty master cylinder	
	Brake fluid leaks	Correct
	Auto adjuster malfunction	Adjust
	Excessive push rod to master cylinder clearance	
Brake drag	Incomplete release of parking brake	Correct
	Clogged master cylinder return port	
	Incorrect parking brake adjustment	Adjust
	Improper push rod to master cylinder clearance	
	Faulty master cylinder piston return spring	Replace
	Worn brake pedal return spring	
	Broken rear drum brake shoe to shoe spring	
	Lack of lubrication in sliding parts	Lubricate

Symptom	Probable cause	Remedy
Insufficient parking brake function	Worn brake lining or pad	Replace
	Grease or oil on lining or pad surface	
	Parking brake cable sticking	
	Stuck wheel cylinder or caliper piston	
	Excessive parking brake lever stroke	Adjust the parking brake lever stroke or check the parking brake cable routing
	Auto adjuster malfunction	Adjust
Scraping or grinding noise when brakes are applied	Worn brake lining or pad	Replace
	Caliper to wheel interference	Correct or replace
	Dust cover to disc interference	
	Bent brake backing plate	
	Cracked drums or brake disc	
Squealing, groaning or chattering noise when brakes are applied	Disc brakes – Missing or damaged brake pad anti-squeak shim	Replace
	Brake drums and linings, discs and pads worn or scored	Correct or replace
	Improper lining parts	
	Disc brake – Burred or rusted calipers	Correct or deburr
	Dirty, greased, contaminated or glazed linings	Clean or replace
	Drum brakes – Weak, damaged or incorrect shoe hold-down springs, loose or damaged shoe hold-down pins and springs	Correct or replace
	Incorrect brake pedal or booster push rod	Adjust

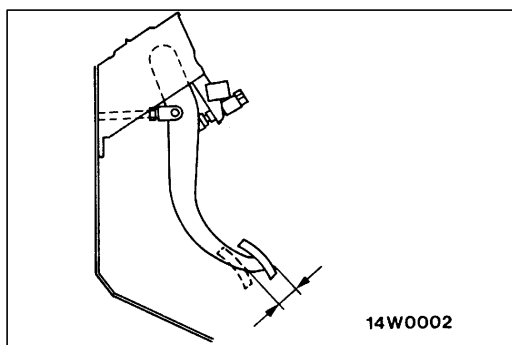
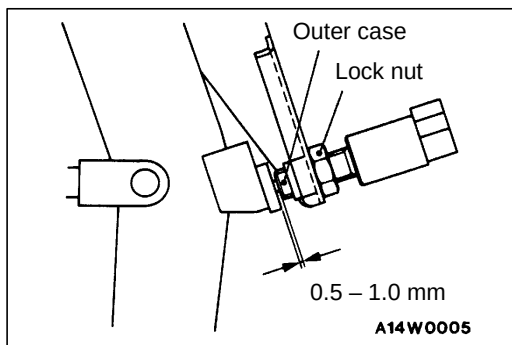
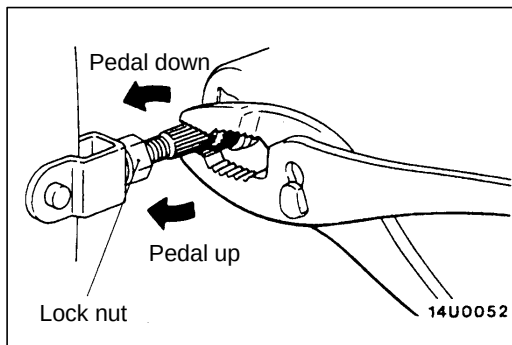
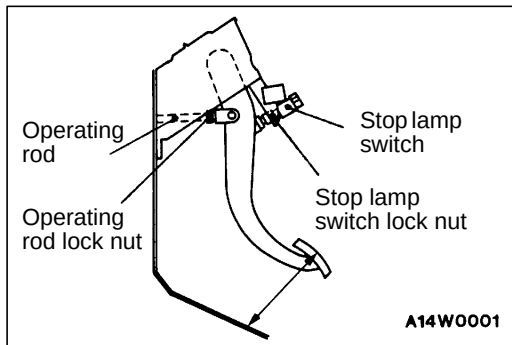
Symptom	Probable cause	Remedy
Squealing noise when brakes are not applied	Bent or warped backing plate causing interference with drum	Replace
	Drum brakes – Weak, damaged or incorrect shoe-to-shoe spring	
	Poor return of brake booster, master cylinder or wheel cylinder	
	Loose or extra parts in brakes	Retighten
	Improper positioning of pads in caliper	Correct
	Improper installation of support mounting to caliper body	
	Improper machining of drum causing interference with backing plate or shoe	Replace drum
	Disc brakes – Rusted, stuck	Lubricate or replace
	Worn, damaged or insufficiently lubricated wheel bearings	
	Incorrect brake pedal or booster push rod	Adjust
Groaning, clicking or rattling noise when brakes are not applied	Stones or foreign material trapped inside wheel covers	Remove stones, etc.
	Loose wheel nuts	Retighten
	Disc brakes – Loose installation bolts	
	Worn, damaged or dry wheel bearings	Lubricate or replace
	Disc brakes – Failure of shim	Replace
	Disc brakes – Wear on sleeve	
	Incorrect brake pedal or booster push rod	Adjust

ON-VEHICLE SERVICE**BRAKE PEDAL CHECK AND ADJUSTMENT****BRAKE PEDAL HEIGHT**

1. Turn back the carpet etc. under the brake pedal.
2. Measure the brake pedal height as illustrated. If it is not within the standard value, adjust as follows.

Standard value: 176 – 181 mm (From the surface of melting seat to the face of pedal pad)

- (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).
 - (3) Screw in the stop lamp switch until it contacts the brake pedal stopper (just before brake pedal is caused to move), return the stop lamp switch 1/2 to 1 turn and secure with 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 released.
3. Return the carpet etc.

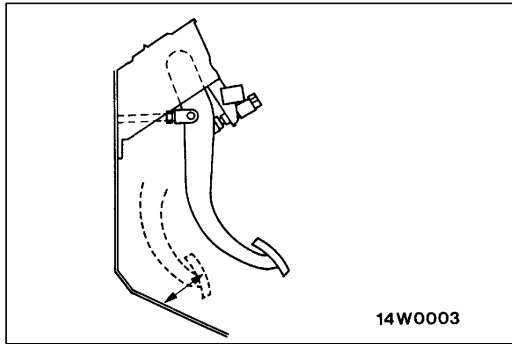
**BRAKE PEDAL FREE PLAY**

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

Standard value: 3 – 8 mm

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.



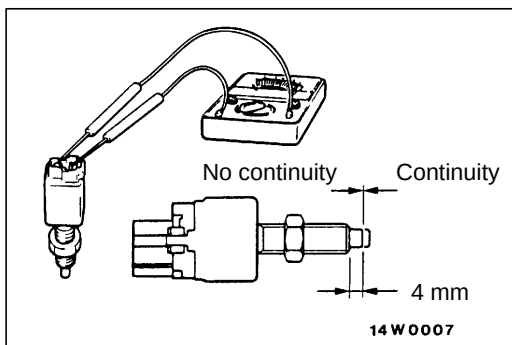
CREARANCE BETWEEN BRAKE PEDAL AND FLOOR BOARD

1. Turn back the carpet etc. under the brake pedal.
2. Start the engine, depress the brake pedal with approximately 490 N of force, and measure the clearance between the brake pedal and the floorboard.

Standard value:

95 mm or more (From the surface of melting seat to the face of pedal pad)

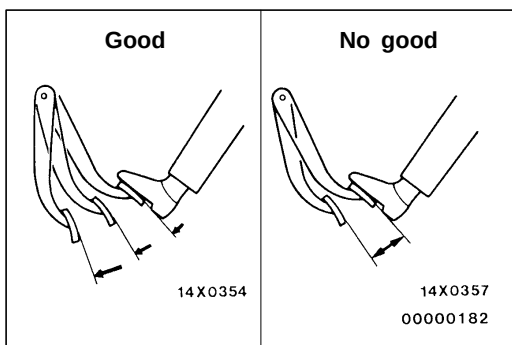
3. If the clearance is outside the standard value, check for air trapped in the brake line, clearance between the lining and the drum and dragging in the parking brake. Adjust and replace defective parts as required.
4. Return the carpet etc.



STOP LAMP SWITCH CHECK

35100890090

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 from the outer case edge surface, and if there is continuity when it is released.

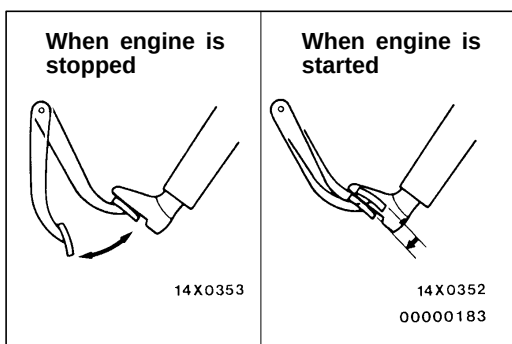


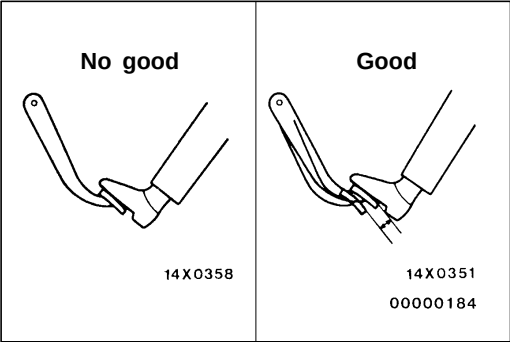
BRAKE BOOSTER OPERATING TEST

35100100087

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.





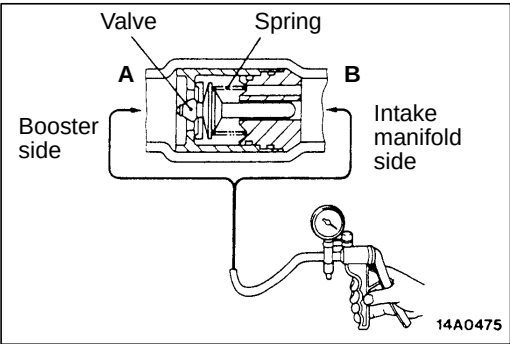
3. With the engine running, step on the brake pedal and then stop the engine. Hold the pedal depressed for 30 seconds. If the pedal height does not change, the booster is in good condition, if the pedal rises, the booster is defective. If the above three tests are okay, the booster performance can be 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

35100900113

1. Remove the vacuum hose. (Refer to P.35A-20.)

Caution
The check valve should not be removed from 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 (A)	A negative pressure (vacuum) is created and held.
Connection at the intake manifold side (B)	A negative pressure (vacuum) is not created.

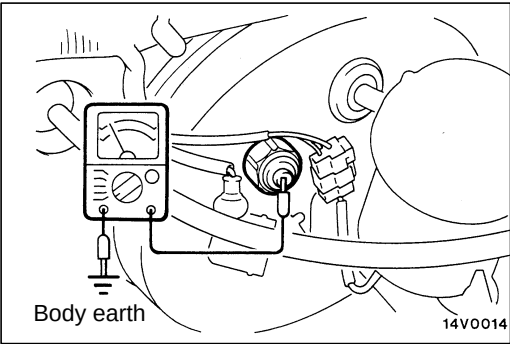
Caution
If the check valve is defective, replace it as an assembly unit together with the vacuum hose.

BRAKE BOOSTER VACUUM SWITCH CHECK

<DIESEL-POWERED VEHICLES>

35100920034

1. Connect an ohmmeter to the connector of the vacuum switch.
2. Start the engine and check for continuity when the vacuum hose is connected, and when it is disconnected. The vacuum switch is in good condition if there is no continuity when the vacuum hose is connected, and if there is continuity when it is disconnected.

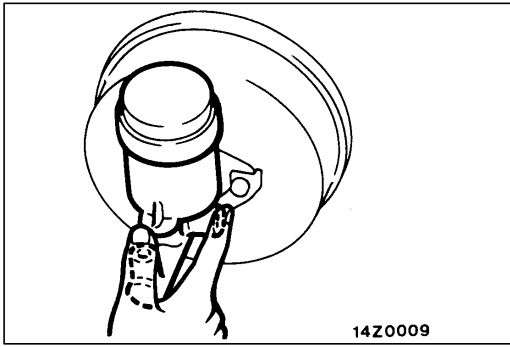


BLEEDING

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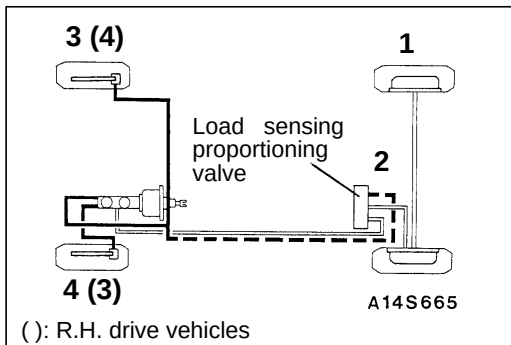
Caution
Use the specified brake fluid. Avoid using a mixture of the specified brake fluid and other fluid.

Specified brake fluid: DOT3 or DOT4

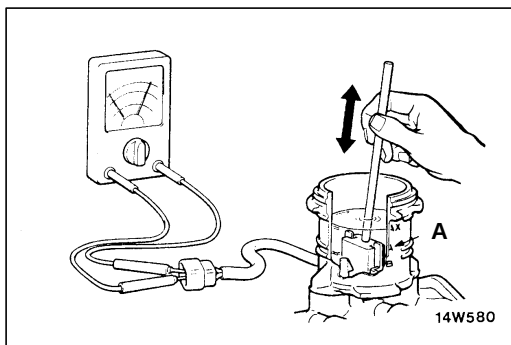
**MASTER CYLINDER BLEEDING**

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.

**BRAKE PIPE LINE BLEEDING**

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

**BRAKE FLUID LEVEL SENSOR CHECK**

35100910086

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

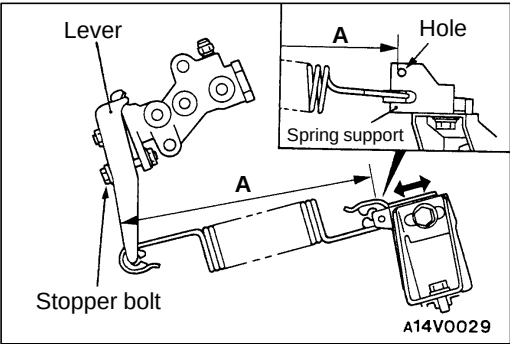
LOAD SENSING SPRING LENGTH CHECK AND ADJUSTMENT

35100120021

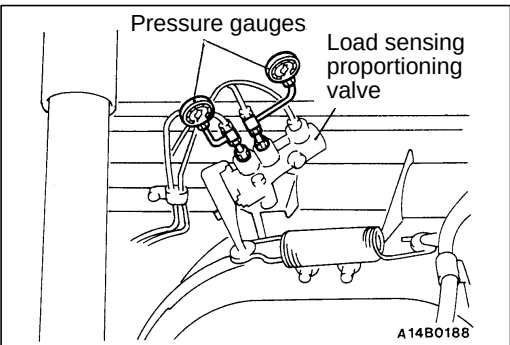
1. Park the vehicle on a level ground. The vehicle should be unloaded and supported only by wheels.

Caution

Never support the vehicle with jacks or other similar means.



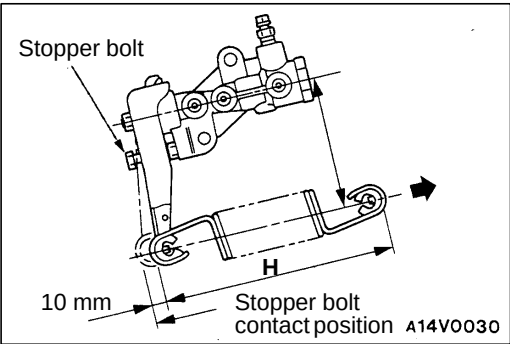
2. While the lever of the load sensing proportioning valve is touching the stopper bolt, install the spring support so that the distance (A) from the edge of the spring mounting section of the lever to the place on the spring support shown in the illustration is at the standard value.
Standard value (A): 189 – 193 mm
3. If the spring length is not within the standard value, loosen the bolt attaching the support and adjust the distance by moving the support.



LOAD SENSING PROPORTIONING VALVE FUNCTION TEST

35100130024

1. Connect pressure gauges to the input and output ports of the load sensing proportioning valve.
2. Bleed the system. (Refer to P.35-12, GROUP 35B – On-vehicle Service.)



3. Disconnect the spring at the support side.
4. Place the spring so that it is in parallel with the load sensing proportioning valve, and pull in the direction indicated by the arrow so that its length H shown in the figure (the length between its ends) is as noted below.

NOTE

At this time the lever is pressed all the way to the load sensing proportioning valve.

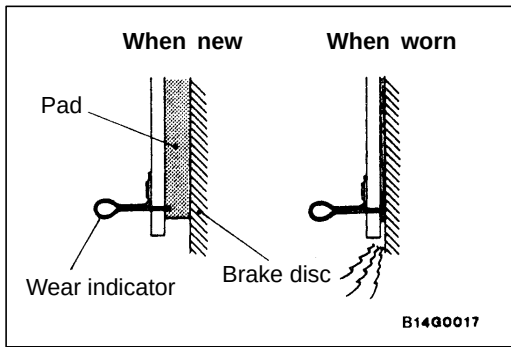
Standard value:

Items	Spring length H mm	Input fluid pressure kPa	Output fluid pressure kPa
2WD	190* ¹	5,884	3,625
		17,652	5,390
	215* ²	17,652	14,393
4WD	190* ¹	5,884	4,309
		17,652	6,074
	215* ²	17,652	16,310

NOTE

*¹ and *² indicate the applicable lengths for unladen and laden vehicles respectively.

5. After making the check, install the spring. Disconnect the pressure gauges from the load sensing proportioning valve and bleed the air. (Refer to P.35A-12, GROUP 35B – On-vehicle Service.)

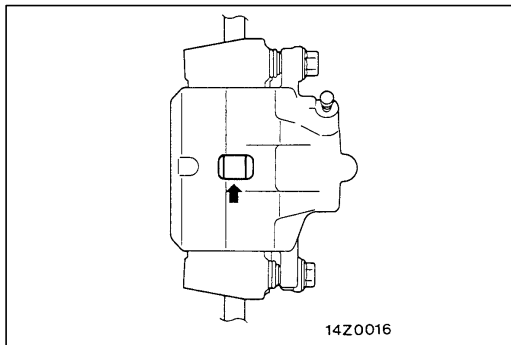


DISC BRAKE PAD CHECK AND REPLACEMENT

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NOTE

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



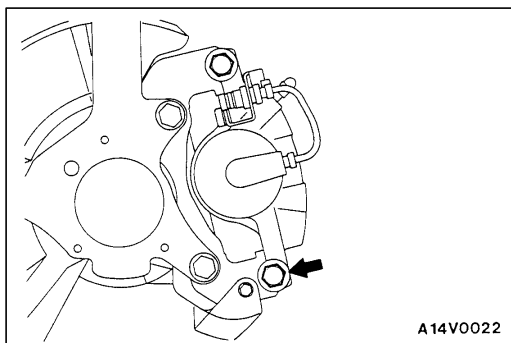
1. Check brake pad thickness through caliper body check port.

Standard value: 10 mm

Limit: 2.0 mm

Caution

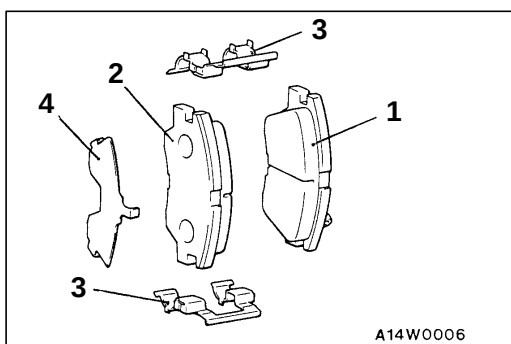
1. When the limit is exceeded, replace the pads at both sides, and also the brake pads for the wheels on the opposite side at the same time.
2. If there is a significant difference in the thicknesses of the pads on the left and right sides, check the sliding condition of the piston, lock pin and guide pin.



2. Remove the guide pin <2WD> or lock pin <4WD>. Lift the caliper assembly and retain with wire.

Caution

Do not wipe the special grease from the guide pin <2WD> or lock pin <4WD>. Do not contaminate the guide pin <2WD> or lock pin <4WD>.



3. Remove the following parts from caliper support.
 - (1) Pad & wear indicator assembly
 - (2) Pad assembly
 - (3) Clip
 - (4) Outer shim
4. Measure hub torque with pad removed to measure brake drag torque after pad installation. (Refer to P.35A-25.)
5. Install the pad and caliper assembly, and check the brake drag force. (Refer to P.35A-25.)

FRONT DISC BRAKE ROTOR CHECK

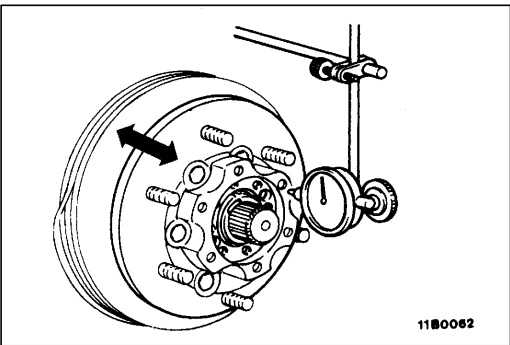
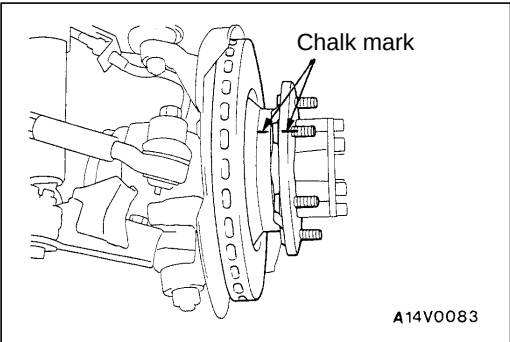
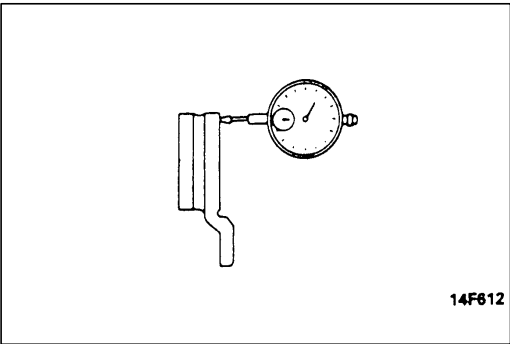
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CAUTION

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 or 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.



RUN-OUT CHECK AND CORRECTION

35100940016

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:

<2WD> 0.08 mm

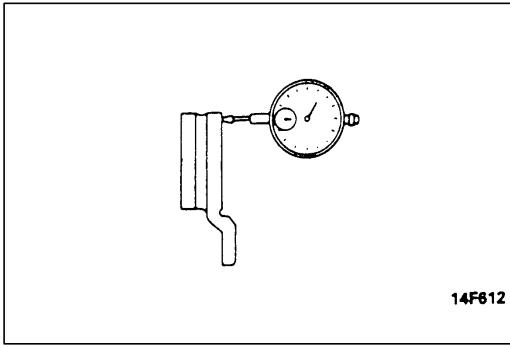
<4WD> 0.06 mm

4. 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) For 4WD, place a dial gauge as show in the illustration, and then move the hub in the axial direction and measure the play.

Standard value: 0.05 mm

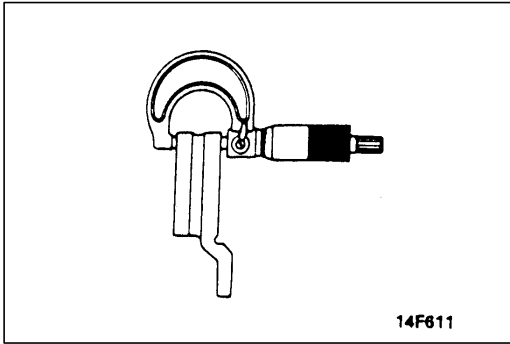
If the play is equal to or exceeds the standard value, adjust the wheel bearing preload. (Refer to GROUP 26 – Front Hub Assembly <4WD>.)



14F612

(3) If the play does not exceed the standard value 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.

5. 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).



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THICKNESS CHECK

35100160108

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

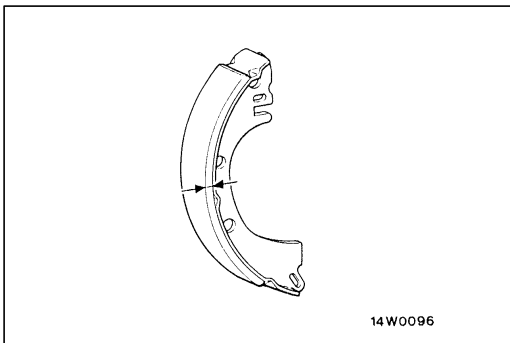
Standard value: 24 mm

Limit: 22.4 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).



14W0096

BRAKE LINING THICKNESS CHECK

35100300135

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

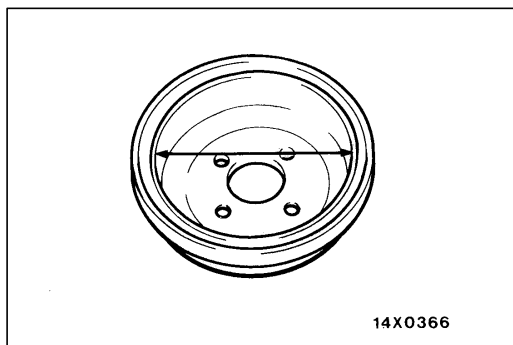
Standard value: 4.7 mm

Limit: 1.0 mm

Replace the shoe and lining assembly if brake lining thickness is less than the limit or if it is not worn evenly. For information concerning the procedures for installation of the shoe and lining assembly, refer to P.35A-30.

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 thickness of the shoe and lining assemblies on the left and right sides, check the sliding condition of the piston.

**BRAKE DRUM INSIDE DIAMETER CHECK**

35100320124

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

Standard value:

<2WD> 254.0 mm

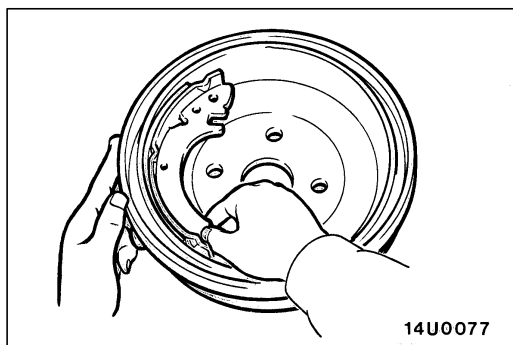
<4WD> 270.0 mm

Limit:

<2WD> 256.0 mm

<4WD> 272.0 mm

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

**BRAKE LINING AND BRAKE DRUM CONNECTION CHECK**

35100310138

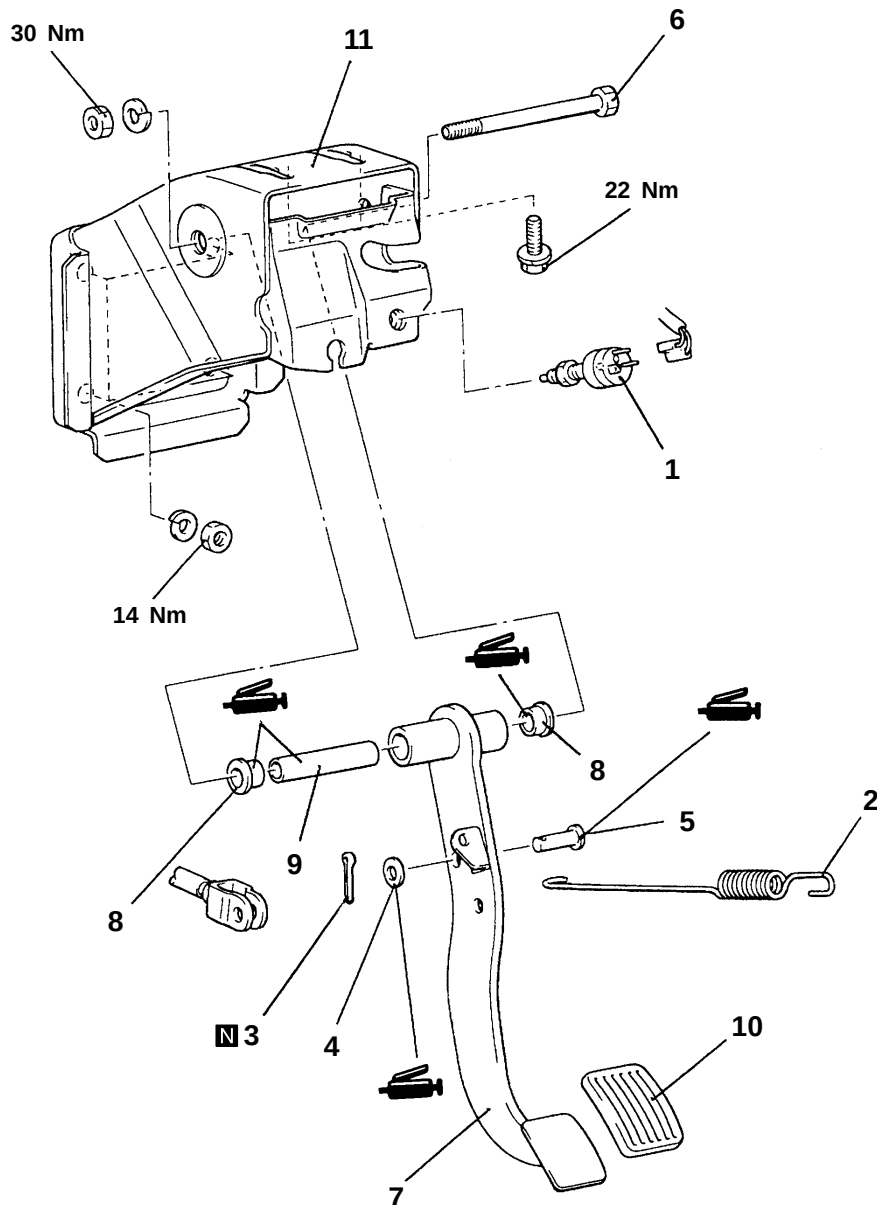
1. Remove the brake drum.
2. Remove the shoe and lining assembly.
(Refer to P.35A-30.)
3. Chalk inner surface of brake drum and rub with shoe and lining assembly.
4. Replace shoe and lining assembly or brake drums if there are any irregular contact area.

NOTE

Clean off chalk after check.

BRAKE PEDAL**REMOVAL AND INSTALLATION****Post-installation Operation**

- Brake Pedal Adjustment (Refer to P.35A-10.)



A14V0008

Removal steps

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

MASTER CYLINDER AND BRAKE BOOSTER

35100370150

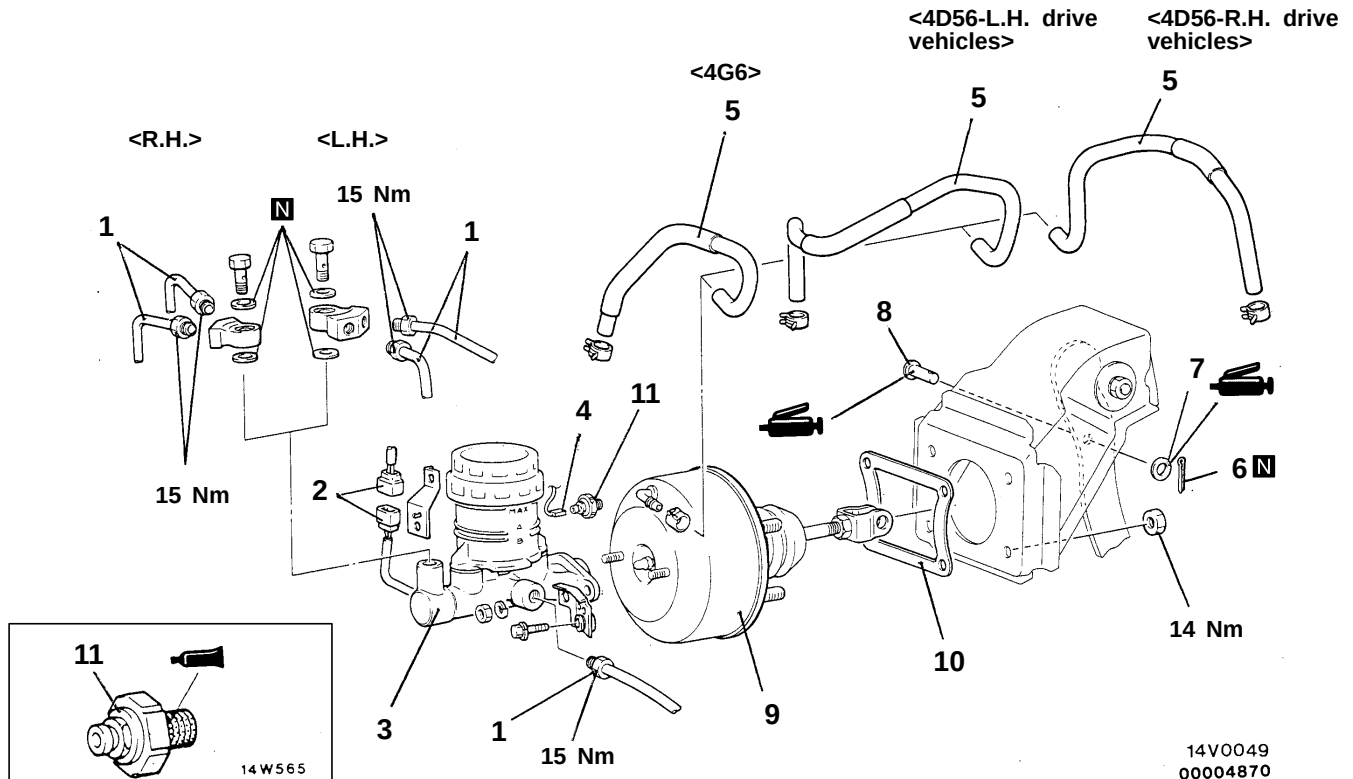
REMOVAL AND INSTALLATION

Pre-removal Operation

- Brake Fluid Draining

Post-installation Operation

- Brake Fluid Supplying
- Brake Line Bleeding (Refer to P.35A-12.)
- Brake Pedal Adjustment (Refer to P.35A-10.)



14V0049
00004870

Sealant: 3M ATD Part No.8661 or equivalent

Removal steps

1. Brake tube connection
2. Brake fluid level sensor connector
3. Master cylinder assembly
- ▶B◀ • Adjustment of clearance between brake booster push rod and primary piston
- ▶A◀ 4. Vacuum switch connector <4D56>
5. Vacuum hose (with built-in check valve)
6. Split pin

7. Washer
8. Clevis pin
9. Brake booster
10. Sealer
11. Vacuum switch <4D56>

Caution

Do not remove the check valve from the vacuum hose. If the check valve is defective, replace it together with the vacuum hose.

INSTALLATION SERVICE POINTS

►A◄ VACUUM HOSE CONNECTION

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.

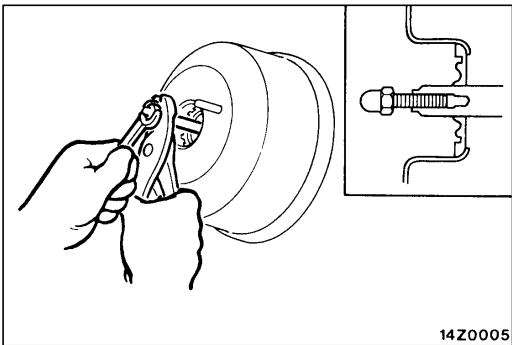
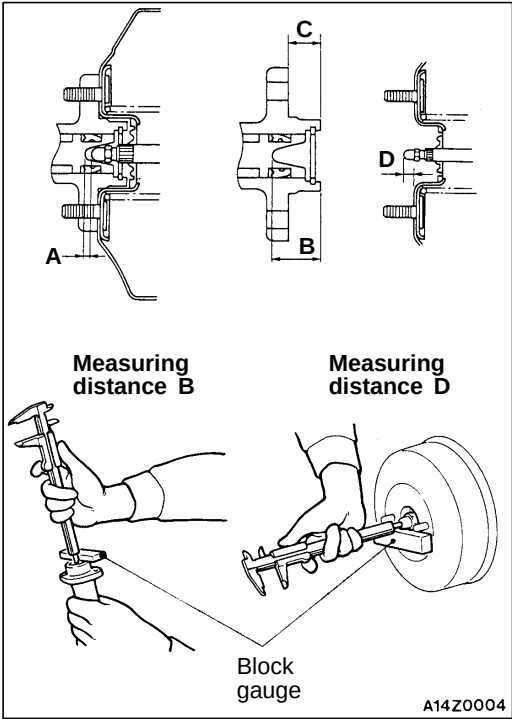
►B◄ CLEARANCE ADJUSTMENT BETWEEN BRAKE BOOSTER PUSH ROD AND PRIMARY PISTON

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

Standard value:

Brake booster size		Clearance A standard valve mm
Single brake booster	Petrol-powered vehicles	0.65 – 1.05
	Diesel-powered vehicles	1.00 – 1.40
Tanden brake booster	Vehicle which brake booster of power cylinder is 180 mm and 205 mm in effective diameter	0.90 – 1.30
	Vehicle which brake booster of power cylinder is 205 mm and 230 mm in effective diameter	0.70 – 1.10

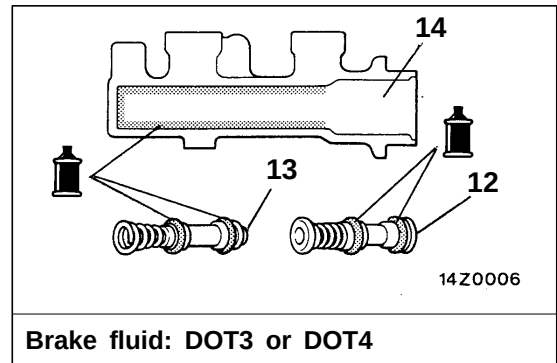
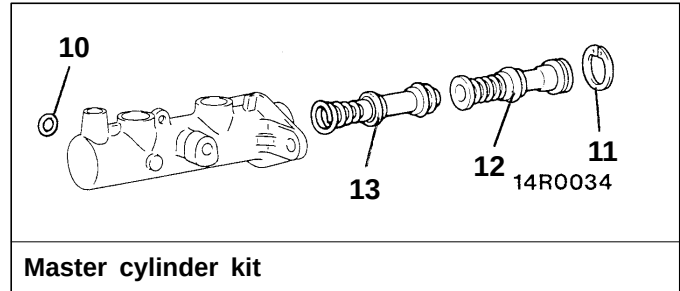
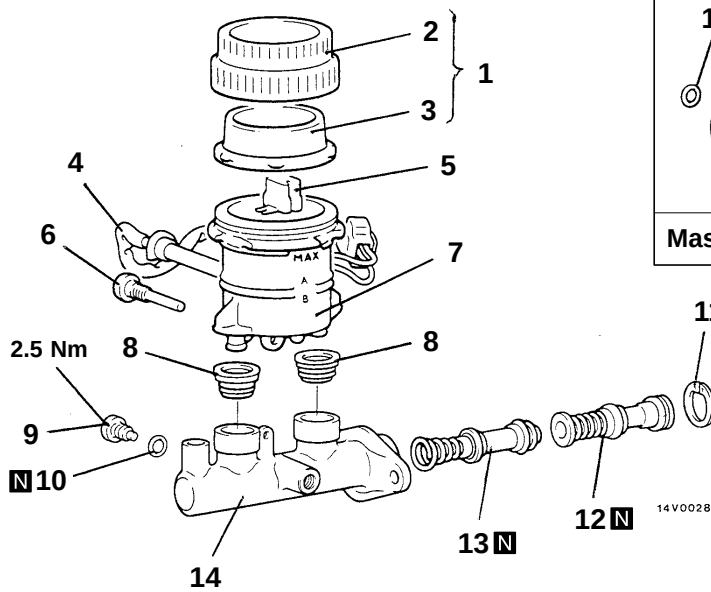
NOTE
When brake booster negative pressure (petrol-powered vehicles: –66.7 kPa, diesel-powered vehicles: –93.3 kPa) is applied, clearance value will become 0.10 – 0.50 mm.



If the clearance is not 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

35100420114



00004871

Disassembly steps

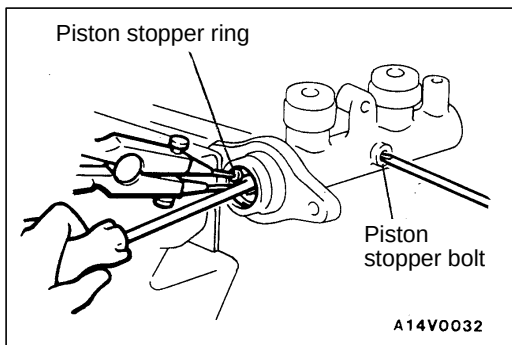
1. Reservoir cap assembly
2. Reservoir cap
3. Diaphragm
4. Brake fluid level sensor
5. Float
6. Reservoir stopper bolt
7. Reservoir tank
8. Reservoir seal
9. Piston stopper bolt



10. Gasket
11. Piston stopper ring
12. Primary piston assembly
13. Secondary piston assembly
14. Master cylinder body

Caution

Do not disassemble the primary piston and secondary piston assembly.



DISASSEMBLY SERVICE POINT

◀A▶ PISTON STOPPER BOLT/PISTON STOPPER RING DISASSEMBLY

Remove the piston stopper bolt and piston stopper ring while depressing the piston.

INSPECTION

35100430056

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

LOAD SENSING PROPORTIONING VALVE

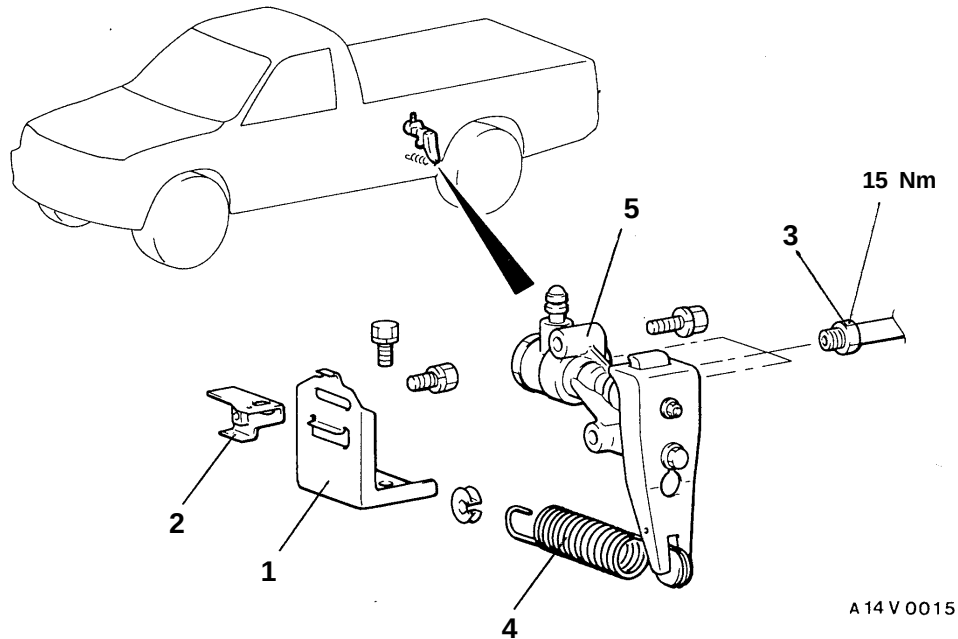
REMOVAL AND INSTALLATION

Pre-removal Operation

- Brake Fluid Draining

Post-installation Operation

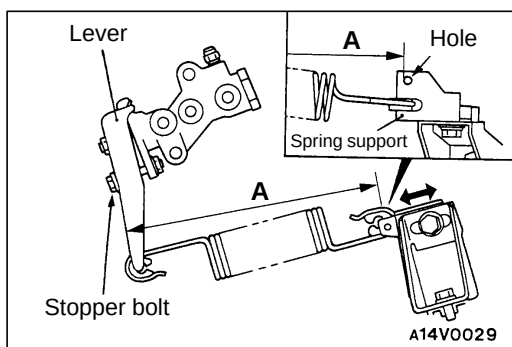
- Brake Fluid Supplying
- Brake Line Bleeding (Refer to P.35A-12.)

**Removal steps**

1. Spring holder
2. Spring support
3. Brake tube connection
4. Load sensing spring
5. Load sensing proportioning valve

Caution

Do not disassemble the load sensing proportioning valve.

**INSTALLATION SERVICE POINT****►A◄ SPRING SUPPORT INSTALLATION**

While the lever of the load sensing proportioning valve is touching the stopper bolt, install the spring support so that the distance (A) from the edge of the spring mounting section of the lever to the place on the spring support shown in the illustration is within the standard value.

Standard value (A): 189 – 193 mm

FRONT DISC BRAKE

35100600112

REMOVAL AND INSTALLATION

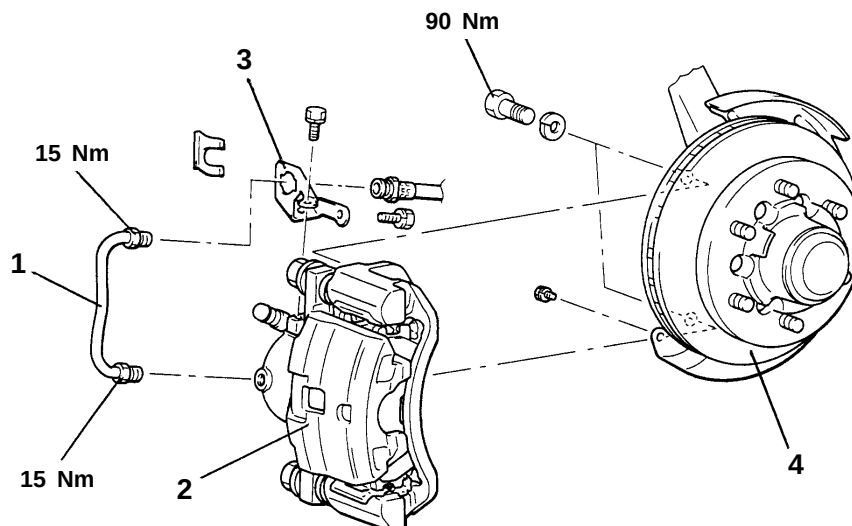
Pre-removal Operation

- Brake Fluid Draining

Post-installation Operation

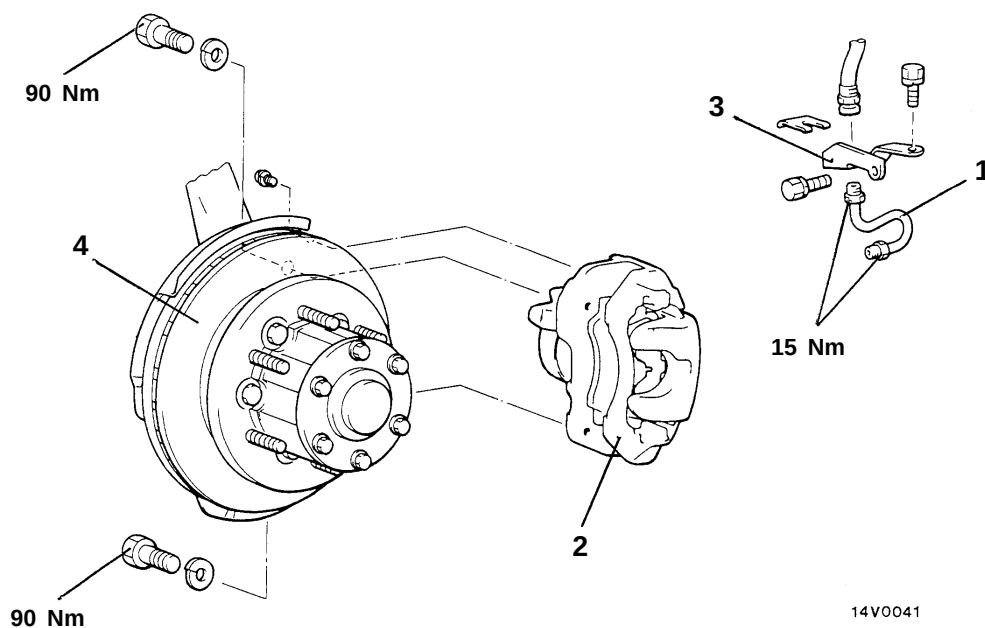
- Brake Fluid Supplying
- Brake Line Bleeding (Refer to P.35A-12.)

<2WD>



14 V 0016

<4WD>

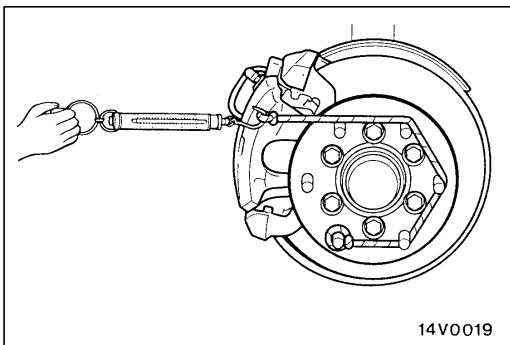
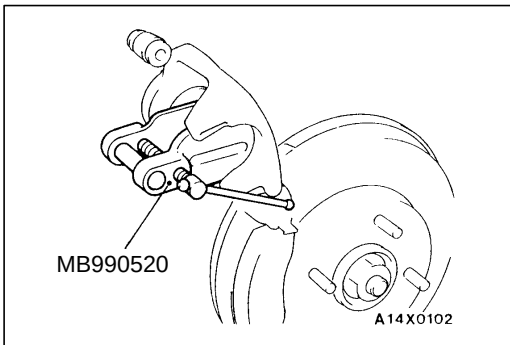
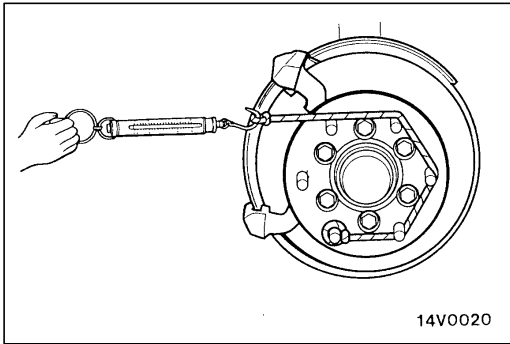


14V0041

00004872

Removal steps

1. Brake tube
2. Front brake assembly
3. Brake hose bracket
4. Brake disc (Refer to GROUP 26 – Front Hub Assembly.)



INSTALLATION SERVICE POINT

►A◄ FRONT BRAKE ASSEMBLY INSTALLATION

1. Measure hub torque (A) with pad removed to measure brake drag torque after pad installation.
2. Securely attach the pad clip to the caliper support.

Caution

For the vehicles with 4WD, engage 2WD before measurement.

3. Clean the 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 install the lock pin.
5. Check brake drag torque as follows.
 - (1) Start engine and hold brake pedal down for 5 seconds. (Pedal depression force: approx. 196 N)
 - (2) Stop engine.
 - (3) Turn brake disc forward 10 times.
 - (4) Check hub torque (B) with spring balance.
 - (5) Calculate drag torque of the disc brake [difference between hub torque (B) and hub torque (A)].

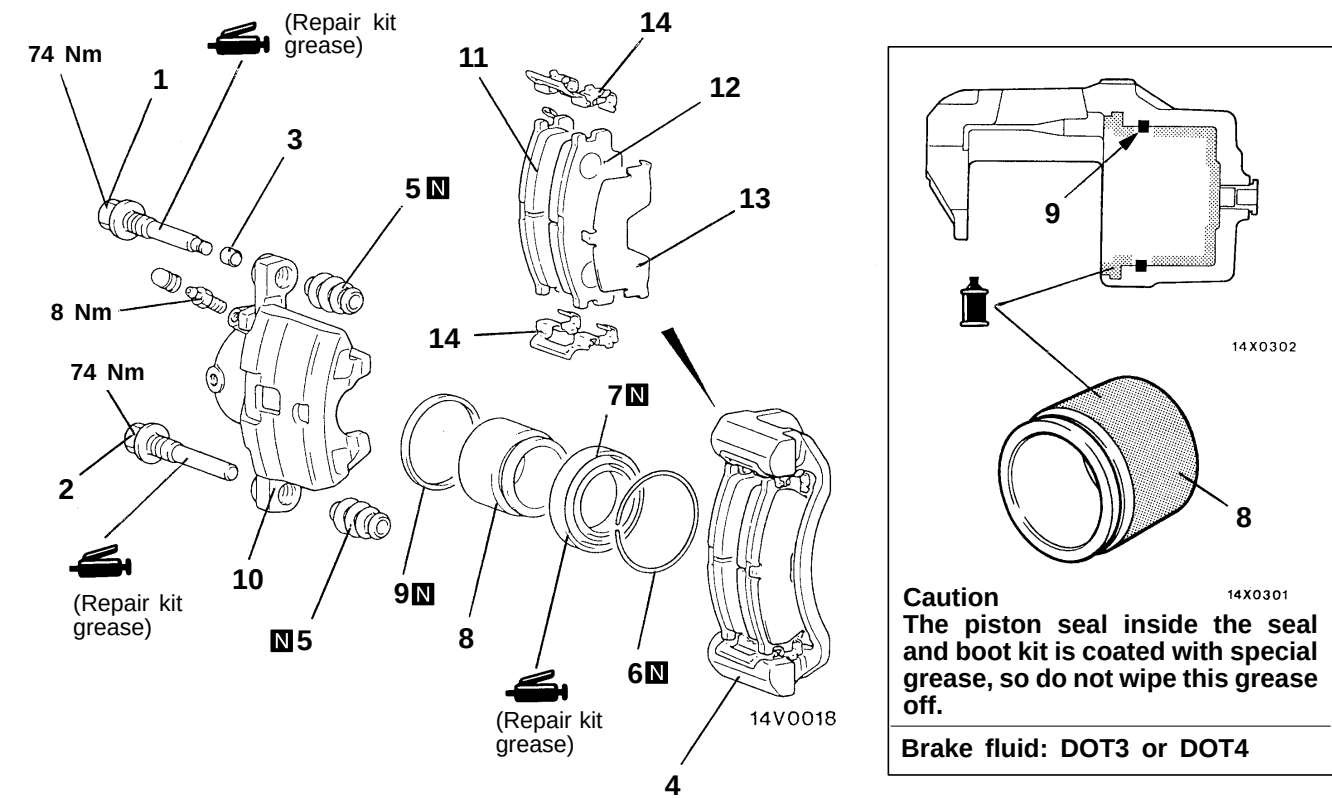
Standard value: 69 N or less

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

DISASSEMBLY AND REASSEMBLY

35100620132

<2WD>



Brake caliper kit	Pad repair kit	Seal and boots repair kit

00004873

Caliper assembly disassembly steps



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

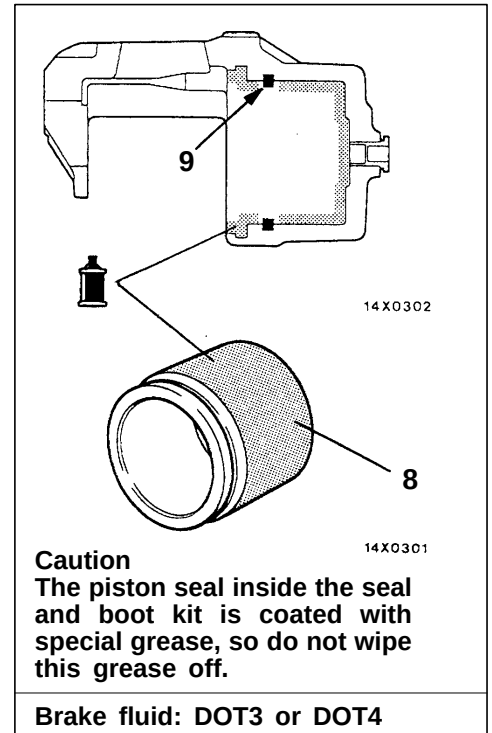
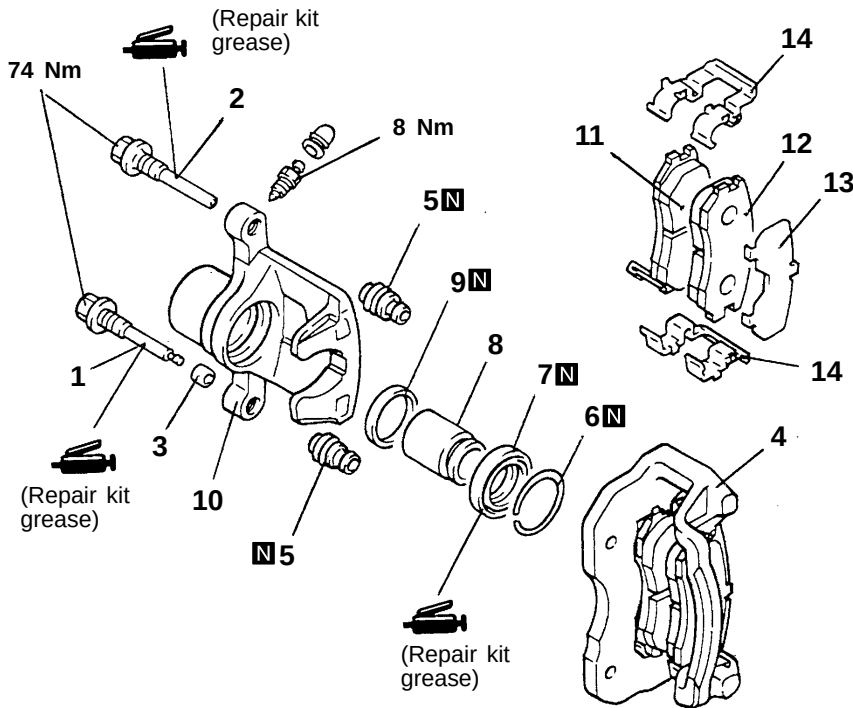


Pad assembly disassembly steps



1. Lock pin
2. Guide pin
3. Bushing
4. Caliper support (pad, clip and shim)
11. Pad and wear indicator assembly
12. Pad assembly
13. Outer shim
14. Clip

<4WD>



Brake caliper kit	Pad repair kit	Seal and boot repair kit

00004874

Caliper assembly disassembly steps



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

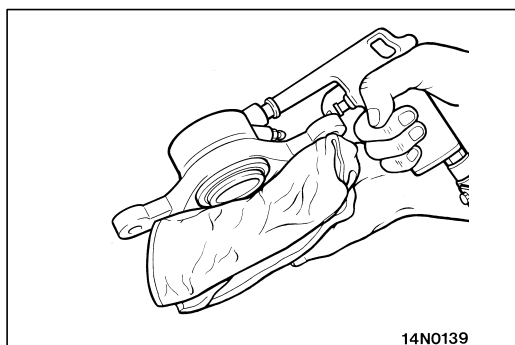
Pad assembly disassembly steps



1. Lock pin
2. Guide pin
3. Bushing
4. Caliper support (pad, clip and shim)
11. Pad and wear indicator assembly
12. Pad assembly
13. Outer shim
14. Clip

DISASSEMBLY SERVICE POINTS

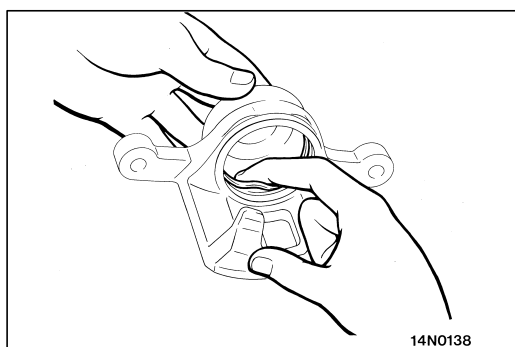
When disassembling the front disc brakes, disassemble both sides (left and right) as a set.

**◀A▶ PISTON BOOT/PISTON REMOVAL**

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

Caution

Blow compressed air gently.

**◀B▶ PISTON SEAL REMOVAL**

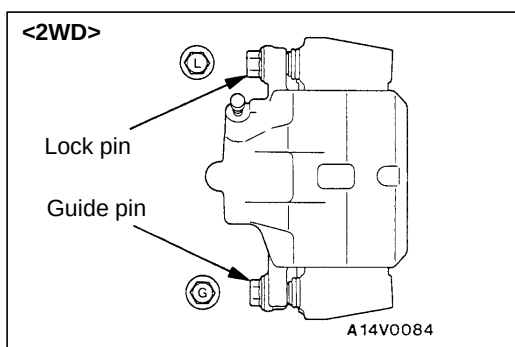
- (1) Remove piston seal with finger tip.

Caution

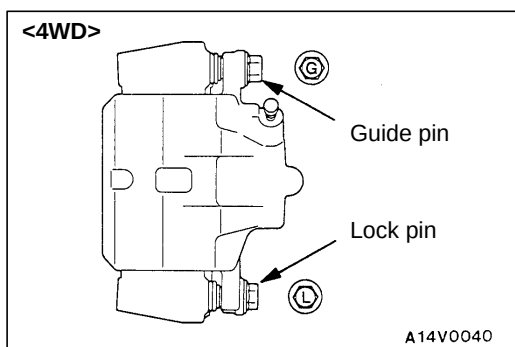
Do not use a flat-tipped screwdriver or other tool to prevent damage to inner cylinder.

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

Specified brake fluid: DOT3 or DOT4

**REASSEMBLY SERVICE POINT****▶A◀ LOCK PIN/GUIDE PIN INSTALLATION**

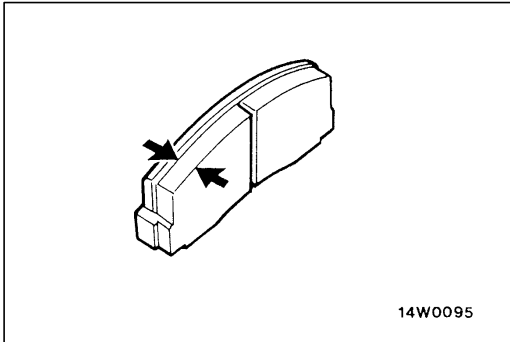
Install the lock pin and guide pin to the caliper body as shown in the illustration.



INSPECTION

35100630104

- 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.

**PAD WEAR CHECK**

Measure the thickness at the thinnest and worn area of the pad.

Replace the pad assembly if pad thickness is less than the limit value.

Standard value: 10 mm

Limit: 2.0 mm

Caution

1. Replace the pads always at both sides, and also the brake pads for the wheels on the opposite side at the same time.
2. If there is 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.

REAR DRUM BRAKE

35100750091

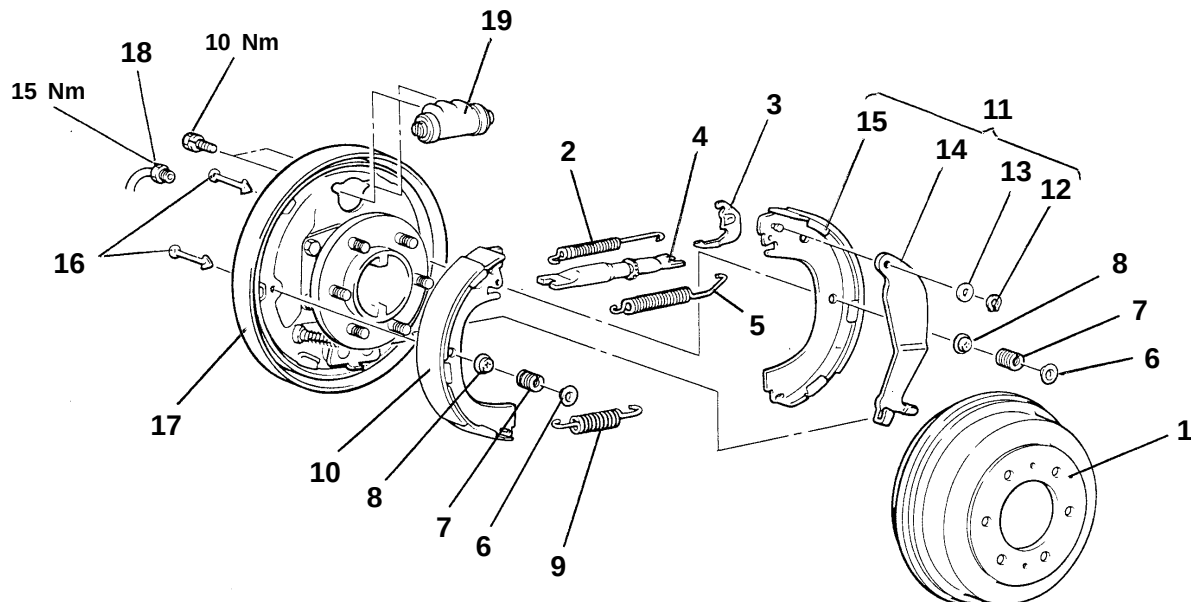
REMOVAL AND INSTALLATION

Pre-removal Operation

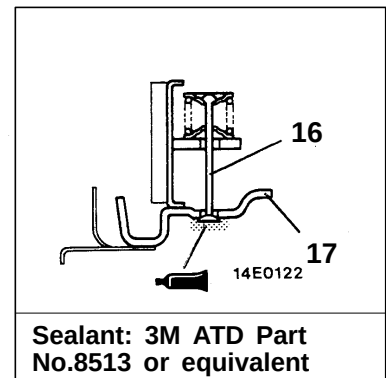
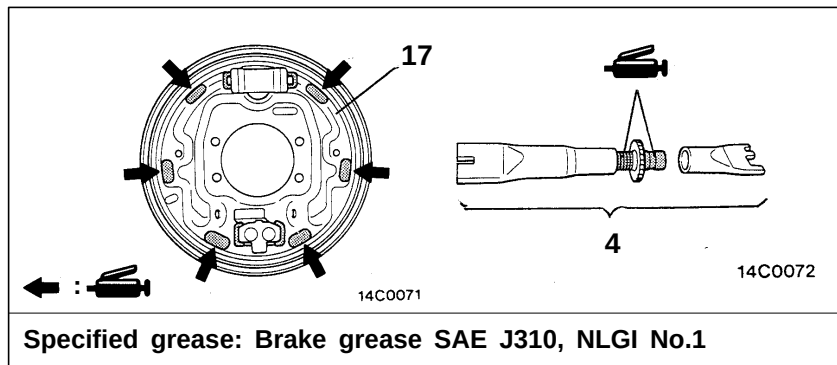
- Loosening the Parking Brake Cable Adjusting Nut.
- Brake Fluid Draining

Post-installation Operation

- Brake Fluid Filling and Air Bleeding (Refer to P.35A-12 or GROUP 35B – On-vehicle Service.)
- Parking Brake Lever Stroke Adjustment (Refer to GROUP 36 – On-vehicle Service.)



14V0027



00004875

Rear drum brake removal steps

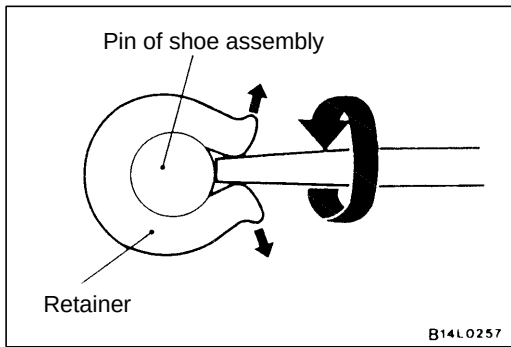
1. Brake drum
2. Shoe-to-lever spring
3. Adjuster lever
4. Auto adjuster assembly
5. Retainer spring
6. Shoe hold-down cup
7. Shoe hold-down spring
8. Shoe hold-down cup
9. Shoe-to-shoe spring
10. Shoe and lining assembly
11. Shoe and lever assembly
12. Retainer

13. Wave washer
14. Parking lever
15. Shoe and lining assembly
16. Shoe hold-down pin
17. Backing plate (Refer to GROUP 27 – Rear Axle Shaft.)

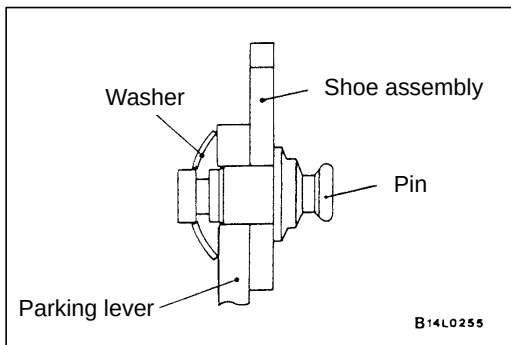
Wheel cylinder removal steps

1. Brake drum
18. Brake tube connection
19. Wheel cylinder

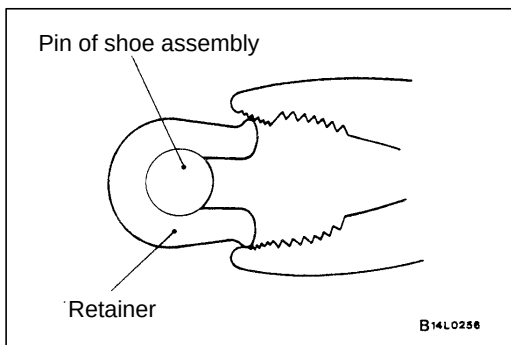
◀A▶ ▶B▶

**REMOVAL SERVICE POINT****◀A▶ RETAINER REMOVAL**

Use a flat-tipped screwdriver or the like to open up the retainer joint, and remove retainer.

**INSTALLATION SERVICE POINTS****▶A◀ WAVE WASHER INSTALLATION**

Install the washer in the direction shown in the illustration.

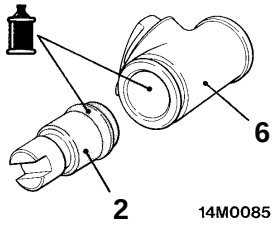
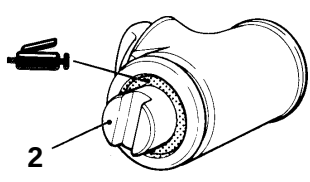
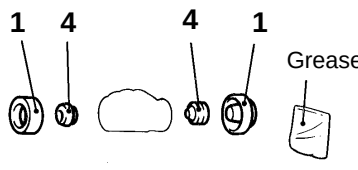
**▶B◀ RETAINER INSTALLATION**

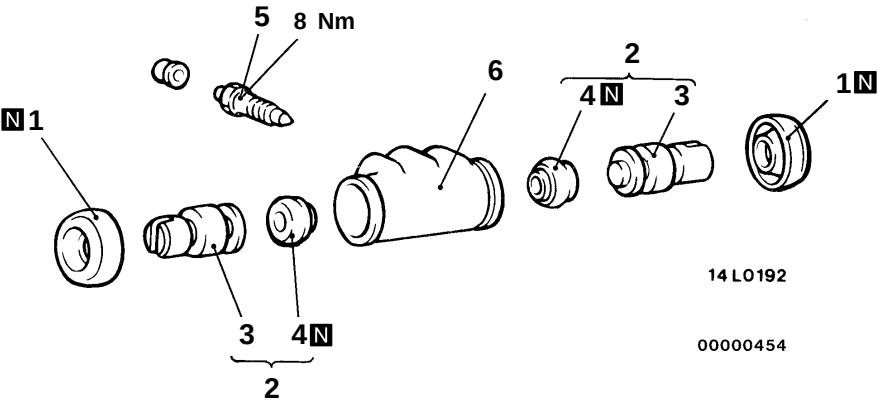
Use pliers or the like to install the retainer or the pin positively.

WHEEL CYLINDER

DISASSEMBLY AND REASSEMBLY

35100770080

 14M0085	 14V554	 14B0053
Brake fluid: DOT3 or DOT4	Grease: Repair kit grease	Wheel cylinder repair kit



- Disassembly steps
- ▶A▶A

1. Boots

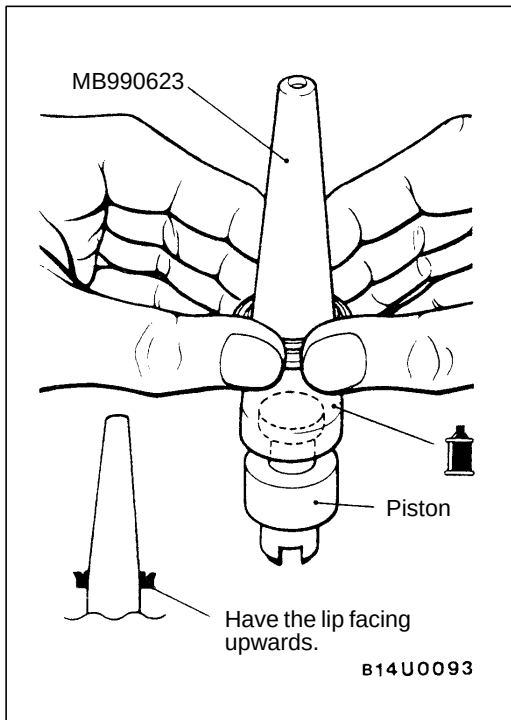
2. Piston assembly

3. Pistons

4. Piston cups

5. Bleeder screw

6. Wheel cylinder body

**REASSEMBLY SERVICE POINT****▶◀ PISTON CUP/PISTON REASSEMBLY**

- (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.

INSPECTION

35100780069

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

NOTES

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

CONTENTS

35209000121

GENERAL INFORMATION	3	ON-VEHICLE SERVICE	23
SERVICE SPECIFICATIONS	4	Brake Pedal Check and Adjustment	 Refer to GROUP 35A
LUBRICANTS	4	Stop Lamp Switch Check	 Refer to GROUP 35A
SEALANTS	4	Brake Booster Operating Test	 Refer to GROUP 35A
SPECIAL TOOLS	4	Check valve Operation Check	 Refer to GROUP 35A
TROUBLESHOOTING	5	Brake Booster Vacuum Switch Check	 Refer to GROUP 35A

CONTINUED ON NEXT PAGE

WARNINGS 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: impact sensors, 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 an asterisk (*).

Bleeding	23	Motor Relay and Valve Relay Continuity Check	28
Brake Fluid Level Sensor Check	Refer to GROUP 35A	Remedy for a Flat Battery	28
Load Sensing Spring Length Check and Adjustment	Refer to GROUP 35A	BRAKE PEDAL	Refer to GROUP 35A
Load Sensing Proportioning Valve Function Test	Refer to GROUP 35A	MASTER CYLINDER AND BRAKE BOOSTER	29
Disc Brake Pad Check and Replacement	23	LOAD SENSING PROPORTIONING VALVE	Refer to GROUP 35A
Front Disc Brake Rotor Check	Refer to GROUP 35A	FRONT DISC BRAKE	32
Brake Lining Thickness Check	Refer to GROUP 35A	REAR DRUM BRAKE	Refer to GROUP 35A
Brake Drum Inside Diameter Check	Refer to GROUP 35A	HYDRAULIC UNIT	37
Brake Lining and Brake Drum Connection Check	Refer to GROUP 35A	WHEEL SPEED SENSOR	39
Wheel Speed Sensor Output Voltage Check	24	ABS-ECU	41
Hydraulic Unit Check	26		
Solenoid Valve Check	27		
Motor Operation Check	27		

GENERAL INFORMATION

35200010123

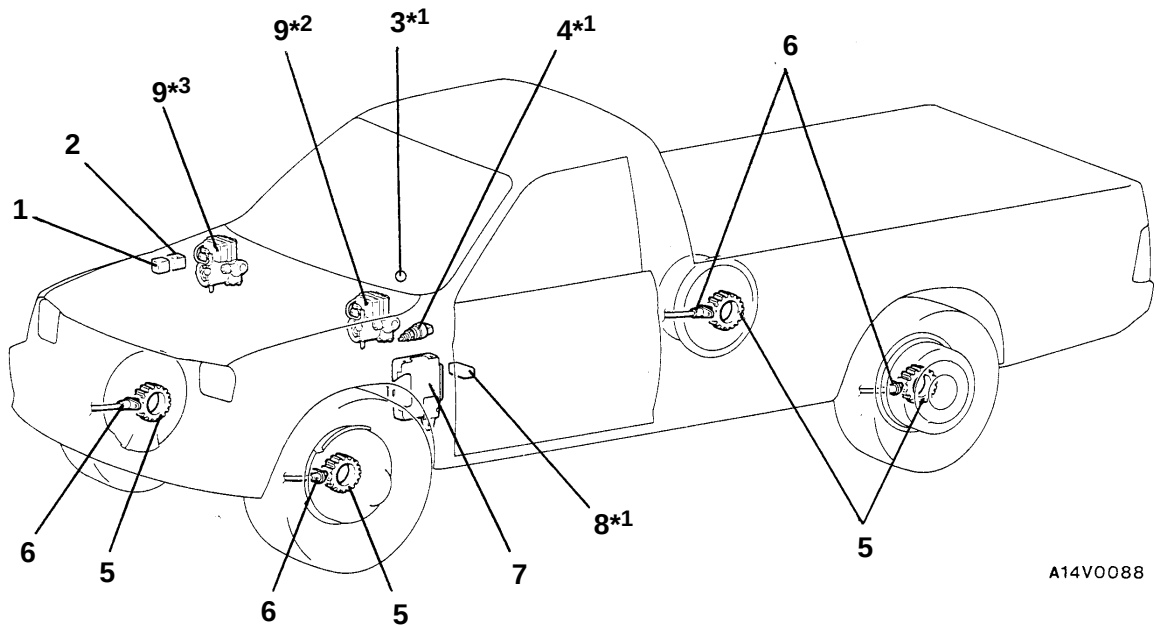
The ABS consists of wheel speed sensors, stop lamp switch hydraulic unit and the ABS-ECU. If a problem occurs in the system, the malfunctioning system can be identified by means of the diagnosis function, and the trouble symptom memory will not be erased even if the ignition switch is turned to

OFF. (However, it will be erased if the battery is disconnected.)

In addition, reading of diagnosis codes and data list and actuator testing are possible using the MUT-II.

Items	Specifications
Speed sensor	Magnet coil type
Front rotor teeth	47
Rear rotor teeth	47

CONSTRUCTION DIAGRAM



A14V0088

NOTE

*1: For R.H. drive vehicles, those parts are installed at the right side.

*2: Diesel-powered vehicles-L.H. drive vehicles.

*3: Except diesel-powered vehicles-L.H. drive vehicles.

- 1. ABS motor relay
- 2. ABS valve relay
- 3. ABS warning lamp
- 4. Stop lamp switch
- 5. Rotor

- 6. Wheel speed sensor
- 7. ABS-ECU
- 8. Diagnosis connector
- 9. Hydraulic unit

SERVICE SPECIFICATIONS

35200030136

Items		Standard value	Limit
Booster push rod to master cylinder piston clearance mm	Diesel-powered vehicles	0.70 – 1.10	–
	Petrol-powered vehicles	0.90 – 1.30	–
Front disc brake pad thickness mm		10	2.0
Hydraulic unit solenoid valve internal resistance Ω	OUT	2.2	–
	IN	5.0	–
Speed sensor's internal resistance k Ω		1.2 – 1.4	–
Speed sensor insulation resistance k Ω		100 or more	–

LUBRICANTS

35200040023

Items	Specified lubricant
Brake fluid	DOT3 or DOT4
Brake piston seal	Repair kit grease
Guide pin boot inner surfaces	
Lock pin boot inner surfaces	
Piston boot mounting grooves	
Brake piston boot inner surfaces	
Lock pin bush inner surfaces	
Piston cup surface	

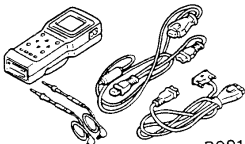
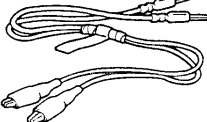
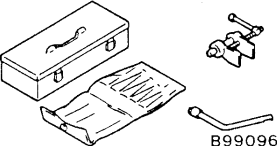
SEALANTS

35200050057

Items	Specified sealant	Remarks
Vacuum switch	3M ATD Part No. 8661 or equivalent	Semi-drying sealant

SPECIAL TOOLS

35200060135

Tool	Number	Name	Use
 B991502	MB991502	MUT-II sub assembly	For checking of ABS (Diagnosis code display when using the MUT-II)
 B991529	MB991529	Diagnosis code check harness	For checking of ABS (Diagnosis code display when using the ABS warning lamp)
 B990964	MB990964 MB990520	Brake tool set	Pushing-in of the disc brake piston

TROUBLESHOOTING

35201110143

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING

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

NOTES WITH REGARD TO DIAGNOSIS

The phenomena listed in the following table 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 is 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 operation. (whine) 2. Sound is the 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: tyres)
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.
Shock during system operation check	Shock may be felt when the brake pedal is depressed slightly at a low driving speed. This occurs due to ABS operation check (initial check at a vehicle speed of 8 km/h), and does not indicate any malfunction.

Diagnosis detection condition can vary depending on the diagnosis code.

Make sure that checking requirements listed in the “Comment” are satisfied when checking the trouble symptom again.

DIAGNOSIS FUNCTION

35201120108

DIAGNOSIS CODES CHECK

Read a diagnosis code by the MUT-II or ABS warning lamp.
(Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points.)

ERASING DIAGNOSIS CODES

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

INSPECTION CHART FOR DIAGNOSIS CODES

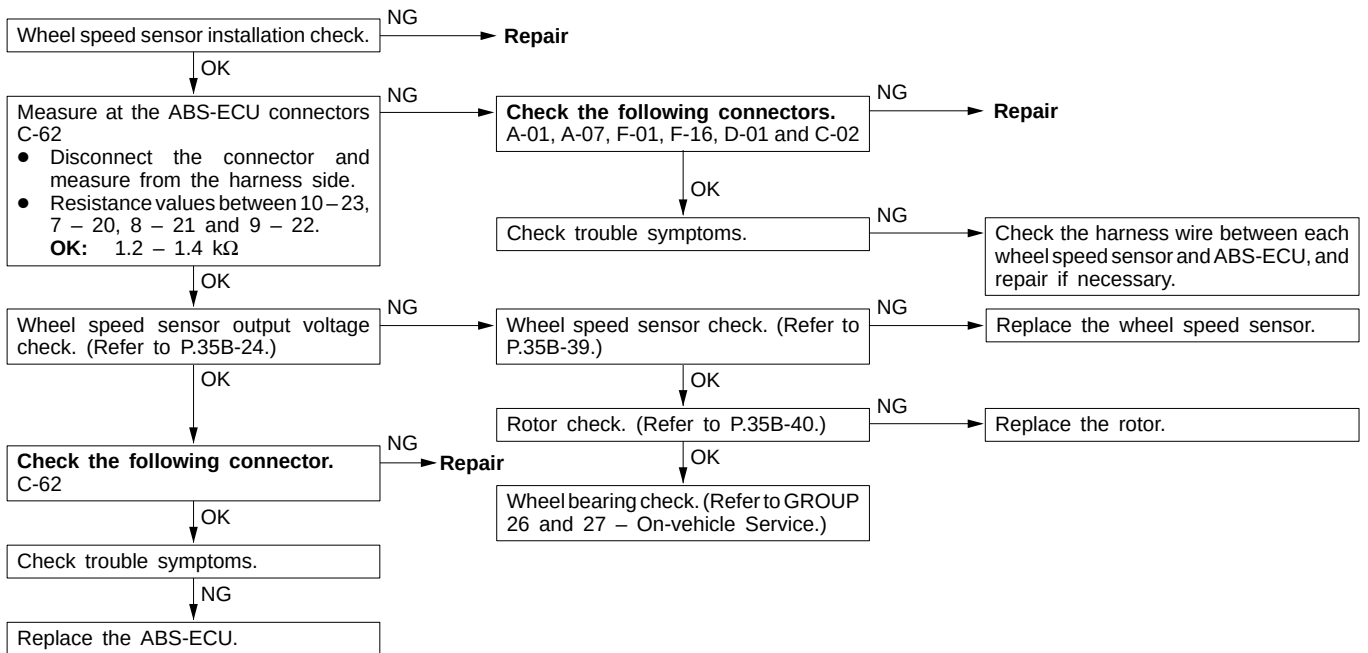
35201130156

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

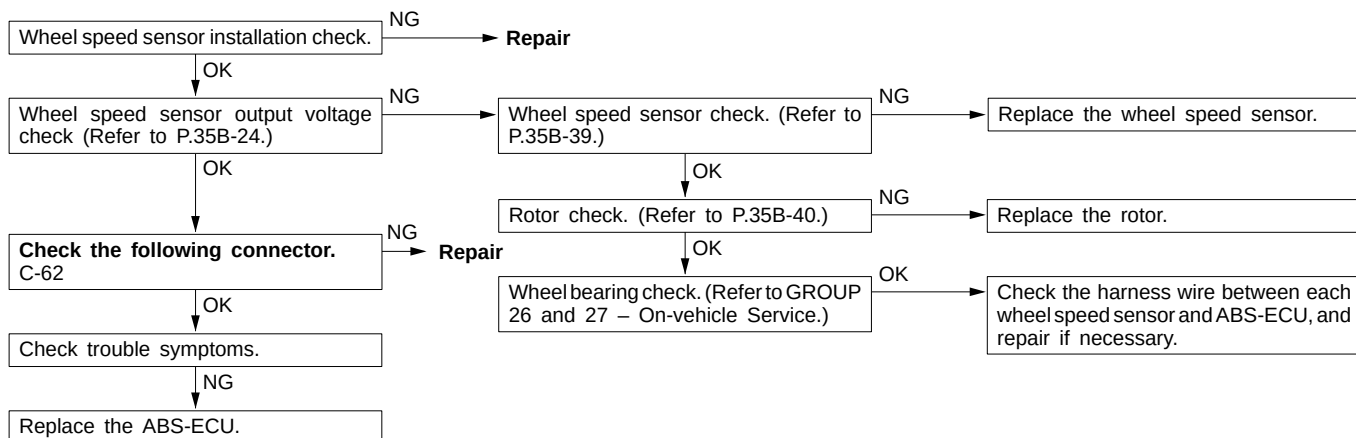
Diagnosis code No.	Inspection item	Diagnosis content	Reference page
11	Front right wheel speed sensor	Open or short circuit	35B-7
12	Front left wheel speed sensor		
13	Rear right wheel speed sensor		
14	Rear left wheel speed sensor		
15	Wheel speed sensor	Abnormal output signal	35B-8
16	Power supply system		35B-8
21	Front right wheel speed sensor	Abnormal	35B-7
22	Front left wheel speed sensor		
23	Rear right wheel speed sensor		
24	Rear left wheel speed sensor		
33	Stop lamp switch system		35B-9
41	Front right solenoid valve		35B-10
42	Front left solenoid valve		
43	Rear solenoid valve		
51	Valve relay		35B-11
53	Motor relay, motor		35B-12
63	ABS-ECU		35B-41 (Replace the ABS-ECU)
64			

INSPECTION PROCEDURE FOR DIAGNOSIS CODES

Code No. 11, 12, 13, 14 Wheel speed sensor open circuit or short circuit	Probable cause
Code No. 21, 22, 23, 24 Wheel speed sensor abnormal	
The ABS-ECU determines that an open circuit or short circuit occurs in more than one line of wheel speed sensors.	• Malfunction of wheel speed sensor • Malfunction of wiring harness or connector • Malfunction of ABS-ECU
These codes are output at the following times: • When an open circuit cannot be found, but more than one wheel speed sensor does not output any signal during driving at 8 km/h or higher. • When a chipped or plugged-up rotor tooth, etc. is detected. • When the sensor output drops and anti-lock control is continuously carried out due to a defective sensor or a warped rotor.	• Malfunction of wheel speed sensor • Malfunction of rotor • Malfunction of wheel bearing • Malfunction of wiring harness or connector • Malfunction of ABS-ECU



Code No. 15 Wheel speed sensor (Abnormal output signal)	Probable cause
A wheel speed sensor outputs an abnormal signal (other than an open or short-circuit).	• Improper installation of wheel speed sensor • Malfunction of wheel speed sensor • Malfunction of rotor • Malfunction of wheel bearing • Malfunction of wiring harness or connector • Malfunction of ABS-ECU

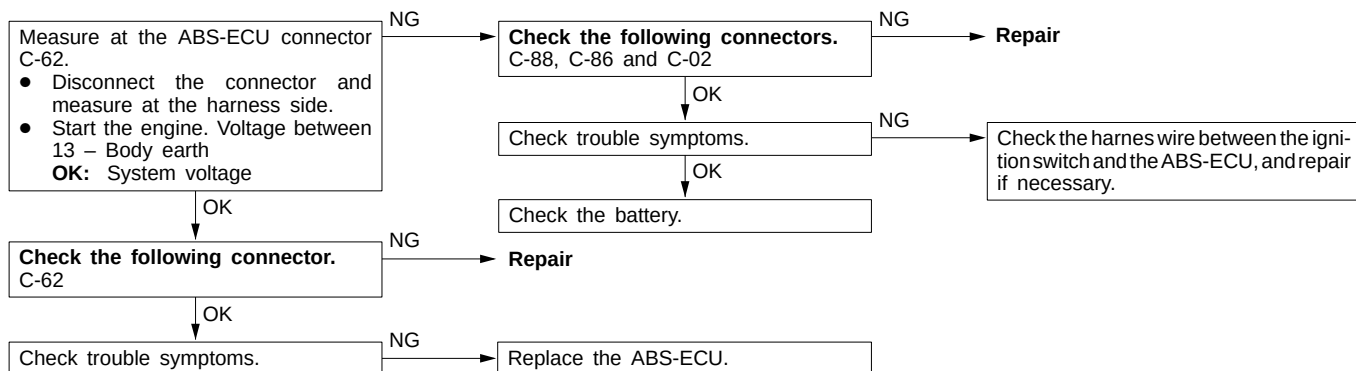


Code No. 16 Power supply system	Probable cause
The voltage of the ABS-ECU power supply drops lower or rises higher than the specified value. If the voltage returns to the specified value, this code is no longer output.	• Malfunction of wiring harness or connector. • Malfunction of ABS-ECU

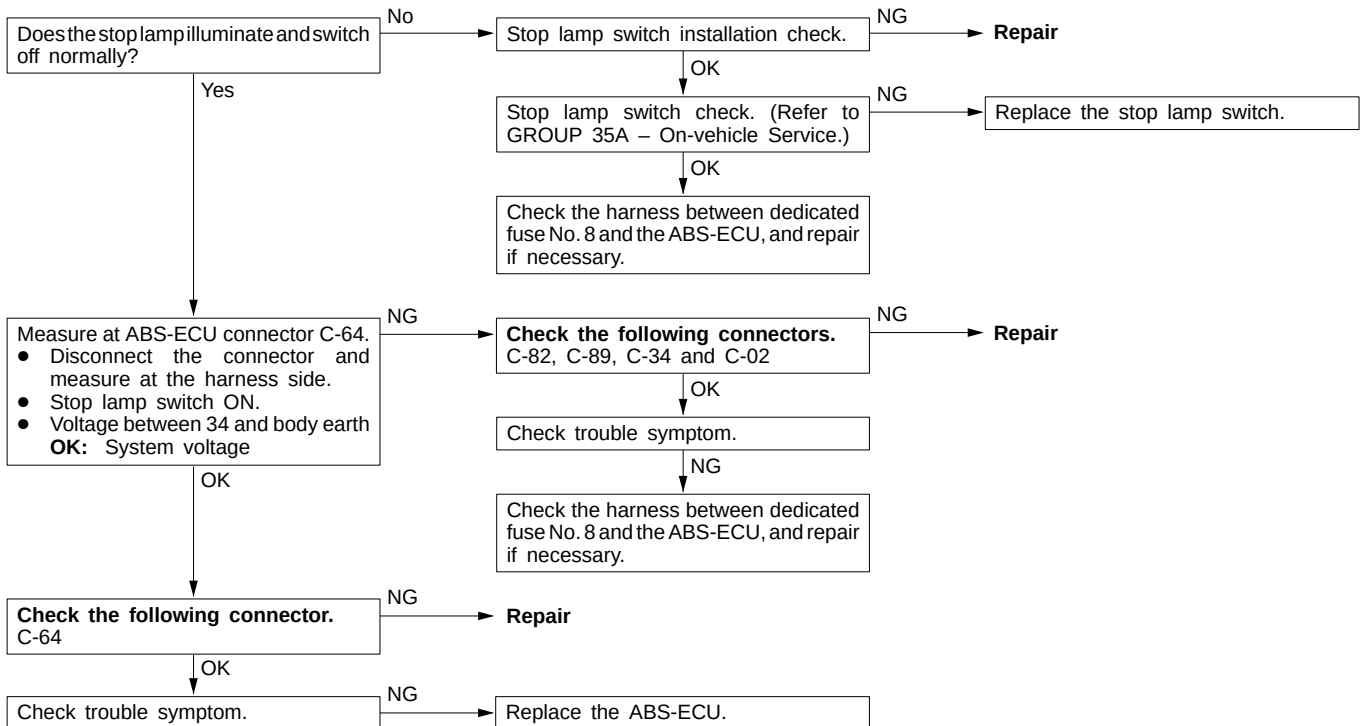
Caution

If battery voltage drops or rises during inspection, this code will be output as well. If the voltage returns to standard value, this code is no longer output.

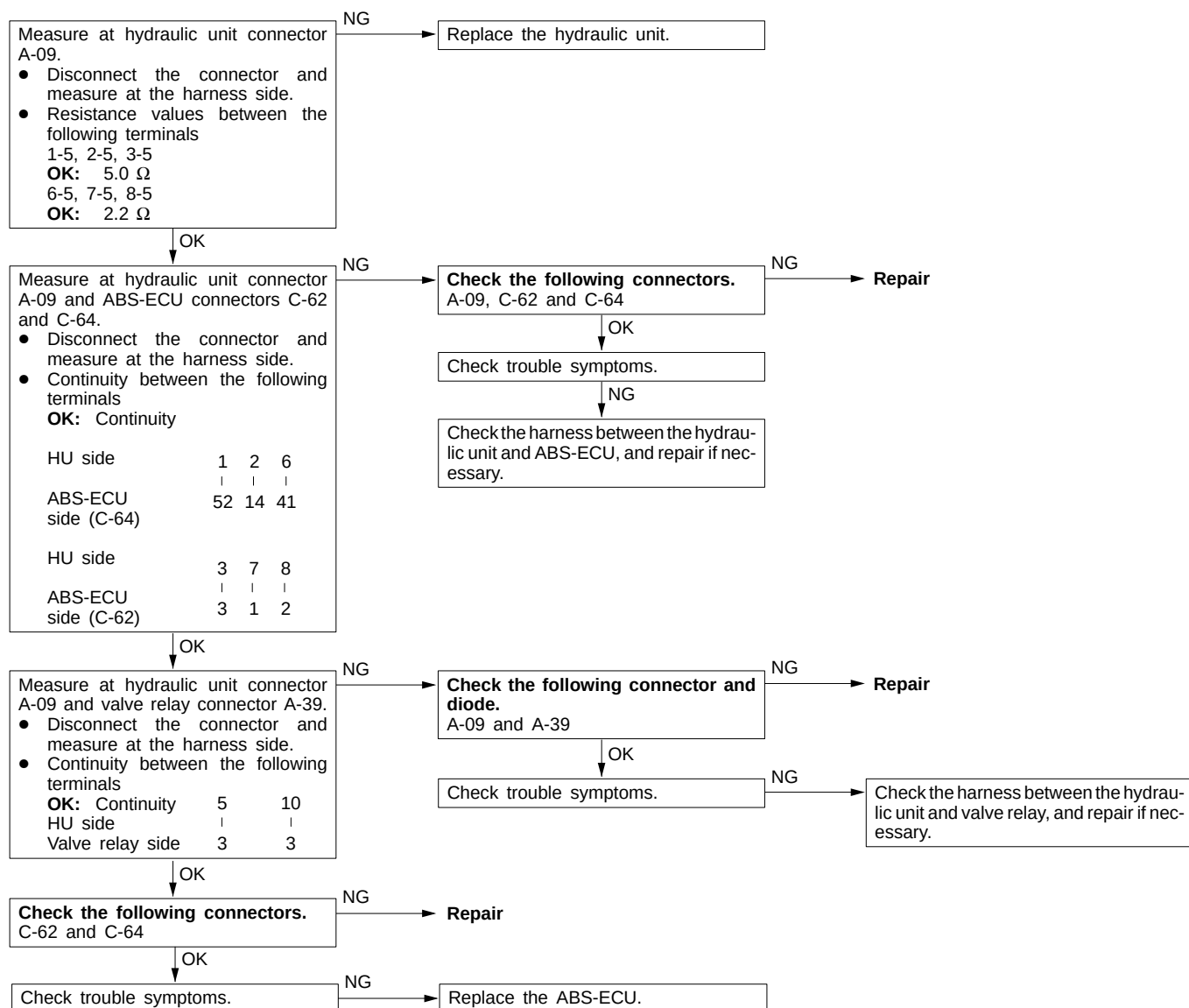
Before carrying out the following inspection, check the battery level, and refill distilled water if necessary.



Code No. 33 Stop lamp switch system	Probable cause
These codes are output at the following times: • When the stop lamp switch is not be turned off (when the stop lamp switch stays on for 15 minutes or more although the ABS is not operating) • When the ABS-ECU determines that there is an open circuit in harness of the stop lamp switch system.	• Malfunction of stop lamp switch • Malfunction of harness or connector • Malfunction of ABS-ECU



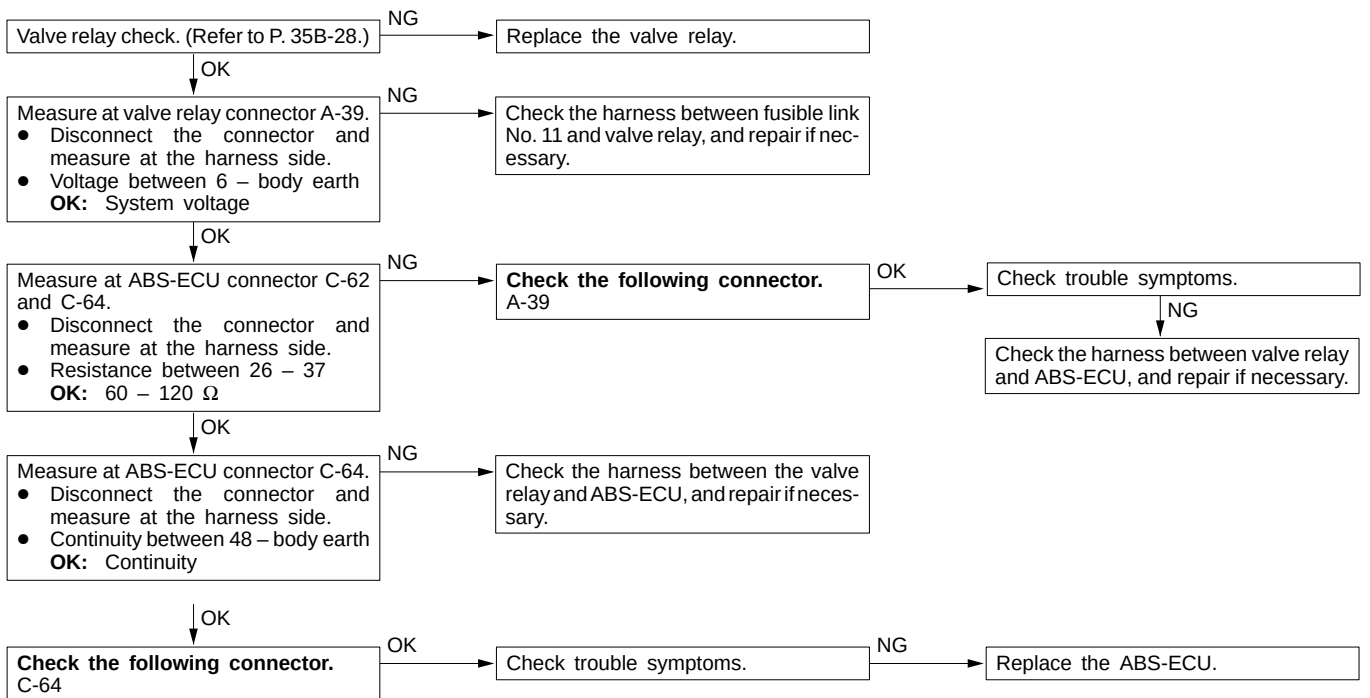
Code No. 41, 42, 43 Solenoid valve	Probable cause
The ABS-ECU always monitors the solenoid valve drive circuit. It determines that there is an open or short-circuit in the solenoid coil or in a harness: When no current flows in the solenoid even though the ABS-ECU turns on it, and vice versa.	• Malfunction of wiring harness • Malfunction of hydraulic unit • Malfunction of ABS-ECU



Code No. 51 Valve relay	Probable cause
When the ignition switch is turned to ON, the ABS-ECU switches the valve relay off and on during the initial check. In that way, the ABS-ECU compares the signals sent to the valve relay with the voltage in the valve power monitor line. That is how to check if the valve relay is operating normally. The ABS-ECU always checks if current flows in the valve power monitor line, too. It determines that there is an open circuit when no current flows. If no current flows in the valve power monitor line, this diagnosis code is output.	• Malfunction of valve relay • Malfunction of wiring harness or connector • Malfunction of ABS-ECU • Malfunction of hydraulic unit

NOTE

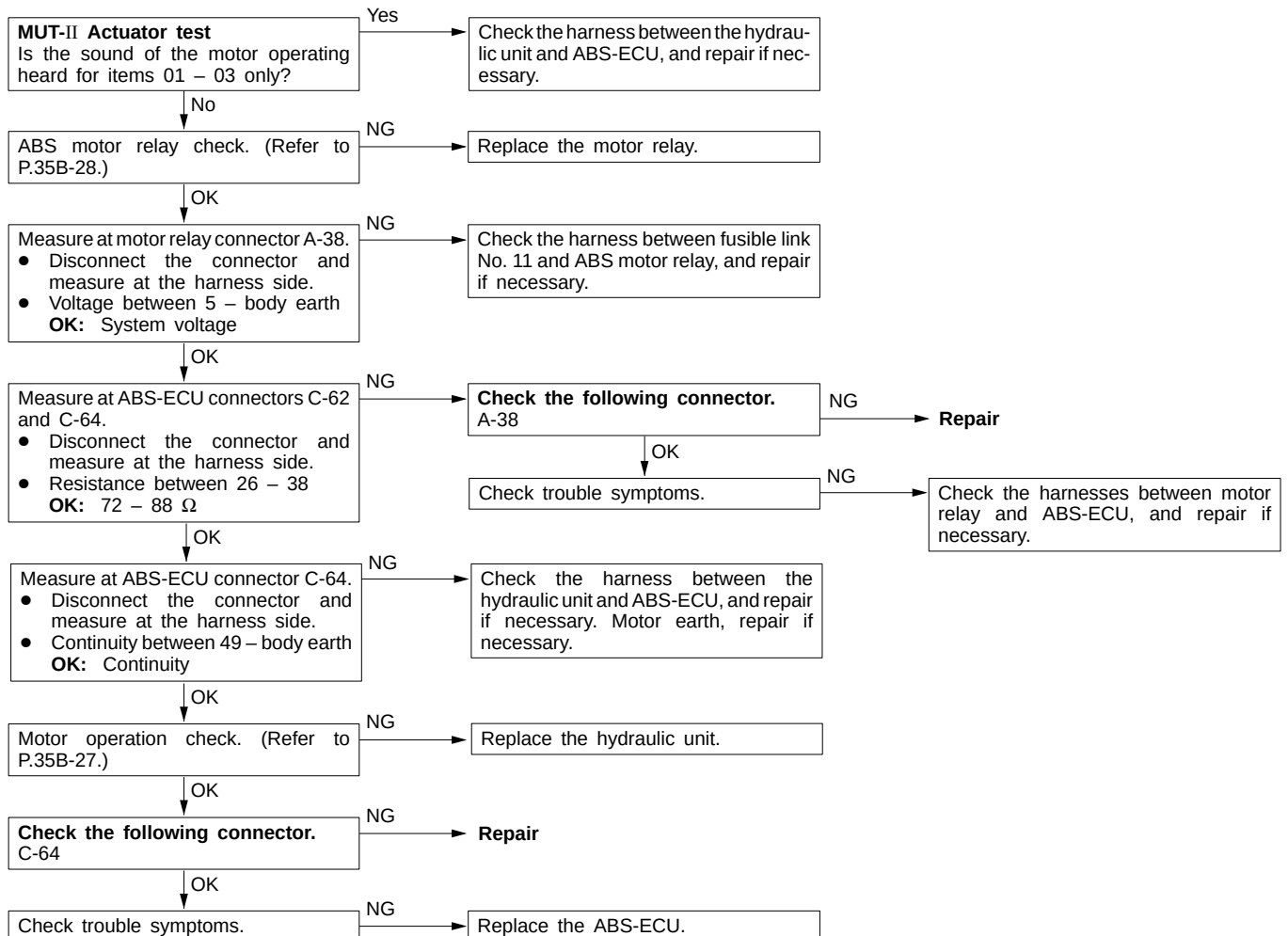
Whenever reading the diagnosis codes using the ABS warning lamp (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points), this diagnosis code will be output. That is not a malfunction but because the valve relay connector is disconnected. After repairing all other malfunctions, connect the valve relay connector again to check the valve relay. Then check that the ABS warning lamp does not illuminate. If it illuminates, the valve relay may be defective. So carry out the following procedure.



Code No. 53 Motor relay, motor	Probable cause
These codes are output at the following times: When the motor relay is on but no signal is input to the motor monitor line (motor is not operating, etc.) When the motor relay is off but a signal is input to the motor monitor line for 5 seconds or more (motor continues operating, etc.) When the motor relay does not operate	• Malfunction of motor relay • Malfunction of wiring harness or connector • Malfunction of hydraulic unit • Malfunction of ABS-ECU

Caution

Because force-driving of the motor by means of the actuator test will drain the battery, the engine should be started and left to run for a while after testing is completed.



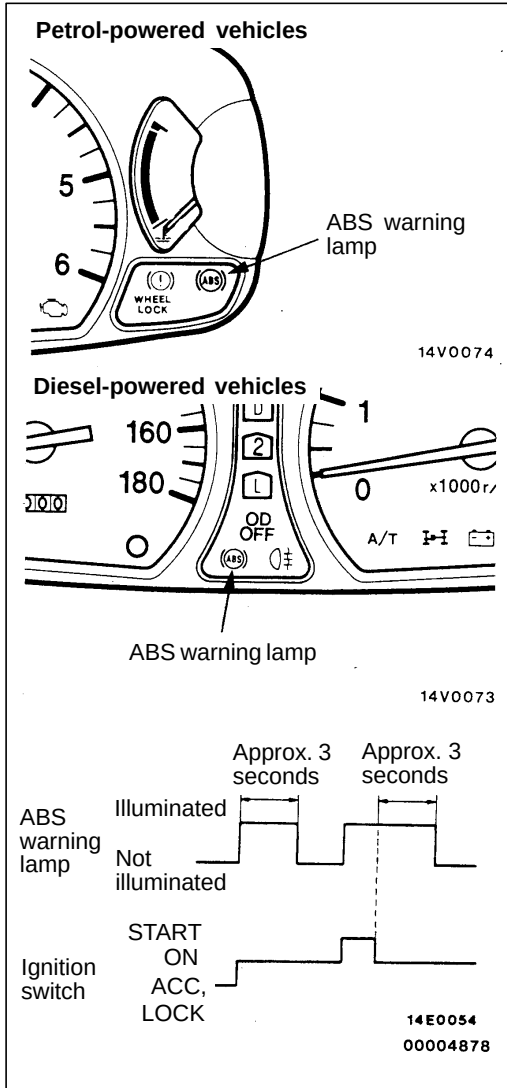
35201200079

ABS WARNING LAMP INSPECTION**Check that the ABS warning lamp illuminates as follows.**

1. When the ignition key is turned to "ON", the ABS warning lamp illuminates for approximately 3 seconds* and then switches off.
2. When the ignition key is turned to "START", the ABS warning lamp remains illuminated.
3. When the ignition key is turned from "START" back to "ON", the ABS warning lamp illuminates for approximately 3 seconds* and then switches off.
4. If the illumination is other than the above, check the diagnosis codes.

NOTE

*: The warning lamp may continue to illuminate until the vehicle speed reaches 8 km/h after the ignition switch is turned on. If the ABS-ECU has stored one of the diagnosis codes Nos.21 to 24 or No.53 as a former malfunction, the ECU attempts to detect the malfunction at 8 km/h. Until the speed reaches 8 km/h, the ABS-ECU illuminates the warning lamp.



INSPECTION CHART FOR TROUBLE SYMPTOMS

35201140142

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	35B-15
	Communication with ABS only is not possible.	2	35B-15
When the ignition key is turned to "ON" (engine stopped), the ABS warning lamp does not illuminate.		3	35B-16
After the engine starts, the ABS warning lamp remains illuminated.		4	35B-16
When the ignition key is turned to "START", the ABS warning lamp does not illuminate.		5	35B-17
After the ignition key is turned to "ON", the ABS warning lamp blinks twice, and when turned to "START", it illuminates. When returned to "ON", the lamp flashes once, and then switches off.		6	35B-17
Faulty ABS operation	Unequal braking power on both sides	7	35B-18
	Insufficient braking power		
	ABS operates under normal braking conditions		
	ABS operates before vehicle stops under normal braking conditions		
	Large brake pedal vibration (Caution 2.)	—	—

Caution

1. If steering movements are made when driving at high speed, or when driving on road surfaces with low frictional resistance, or when passing over bumps, the ABS 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.
2. During ABS operation, the brake pedal may vibrate or may not be able to be depressed. Such phenomena are due to intermittent changes in hydraulic pressure inside the brake line to prevent the wheels from locking and is not an abnormality.

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

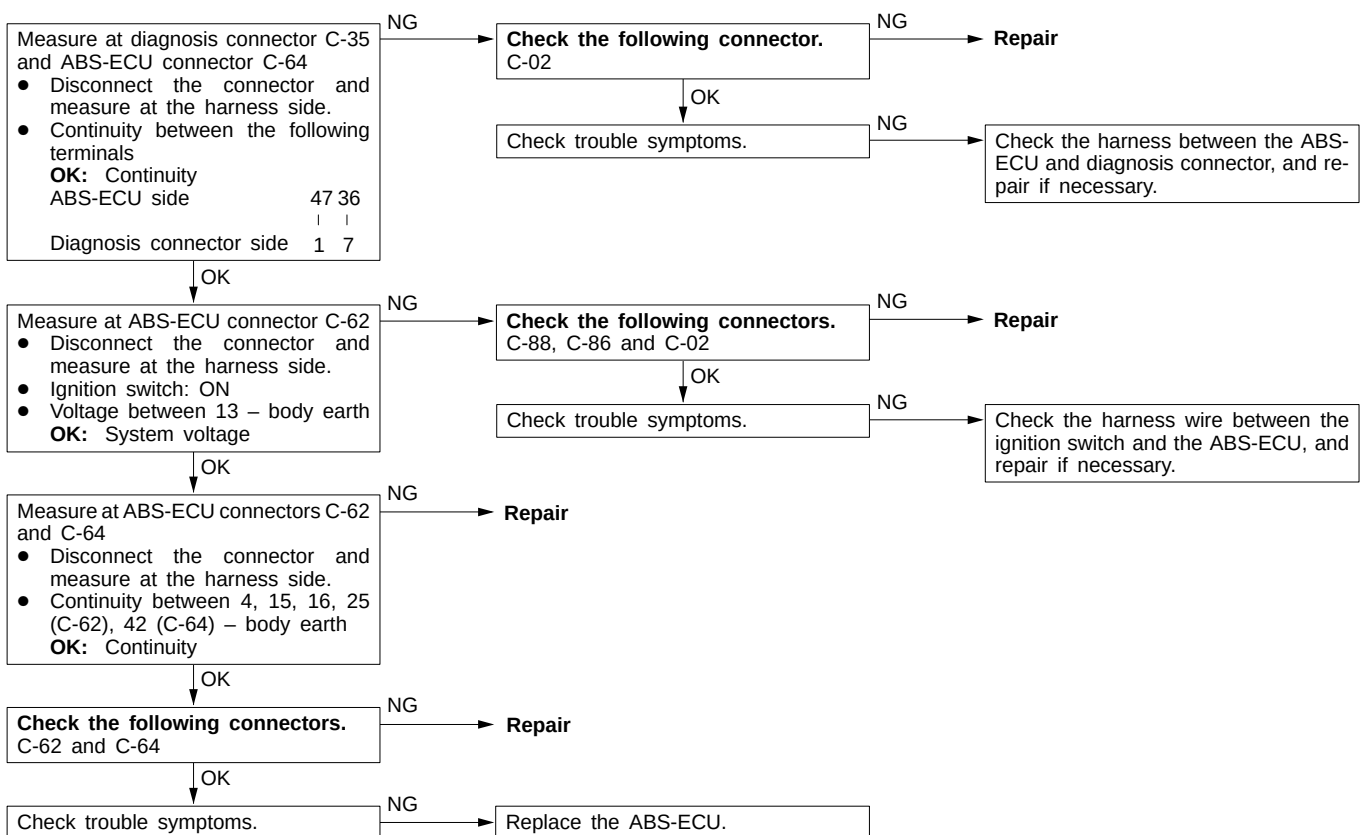
Inspection Procedure 1

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

Referto GROUP 13A – Troubleshooting.

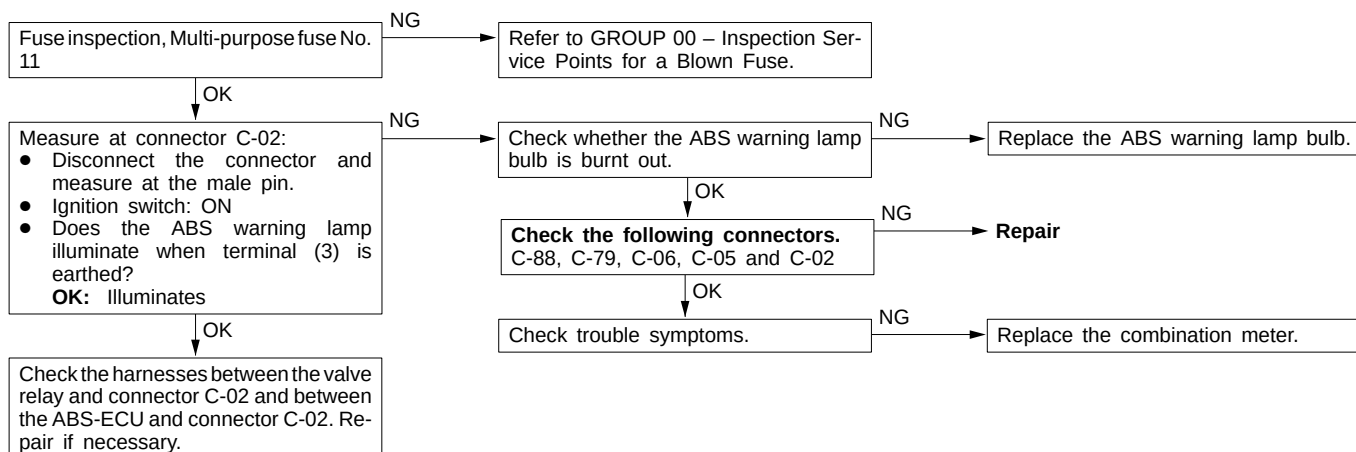
Inspection Procedure 2

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.	• Blown fuse • Malfunction of wiring harness or connector • Malfunction of ABS-ECU



Inspection Procedure 3

When ignition key is turned to "ON" (engine stopped), ABS warning lamp does not illuminate.	Probable cause
When current flows in the ABS-ECU, the valve relay turns from off to on, off and back to on again as the initial check. So the ABS warning lamp will illuminate twice when the valve relay is off even if there is a problem with the circuit between the ABS warning lamp and the ABS-ECU. Therefore, if the lamp does not illuminate, 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 ABS warning lamp and the ABS-ECU and in the circuit between the ABS warning lamp and the valve relay.	• Blown fuse • Burnt out ABS warning lamp bulb • Malfunction of wiring harness or connector

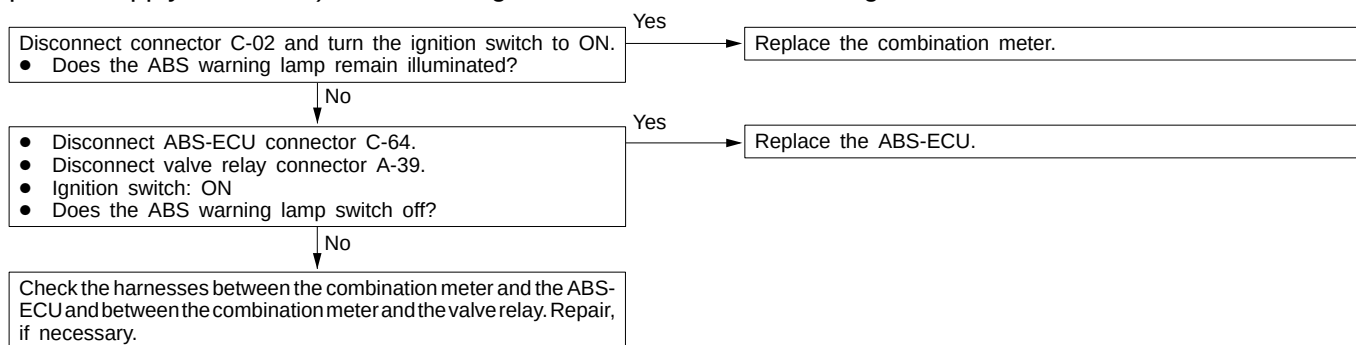


Inspection Procedure 4

Even after the engine is started, the ABS warning lamp remains illuminated.	Probable cause
The cause is probably a short-circuit in the ABS warning lamp illumination circuit.	• Malfunction of combination meter • Malfunction of ABS-ECU • Malfunction of wiring harness

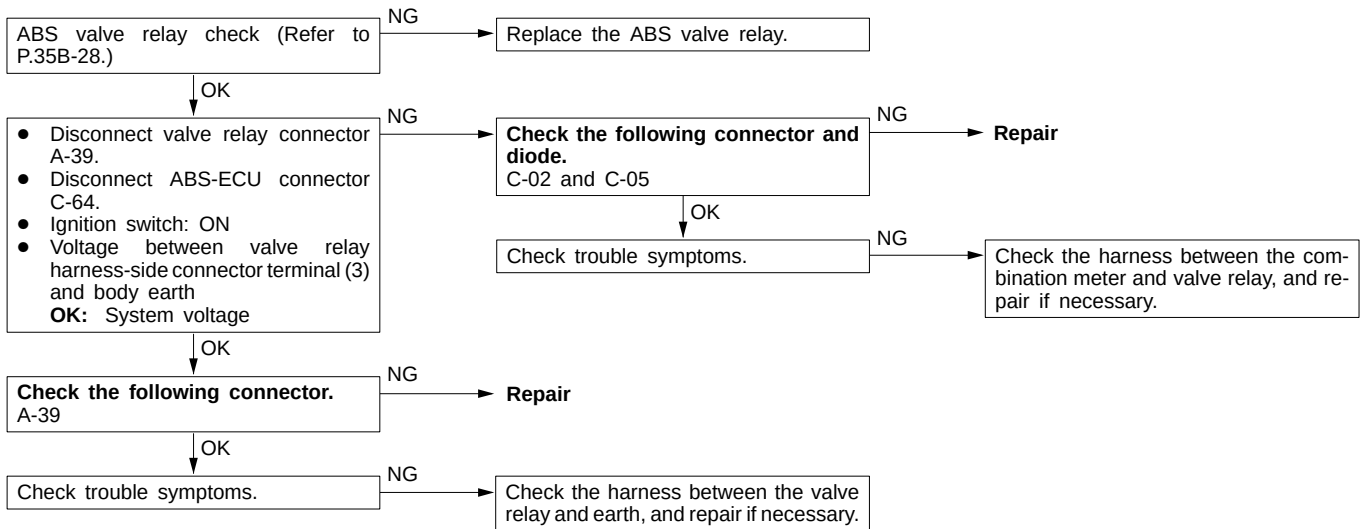
NOTE

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.



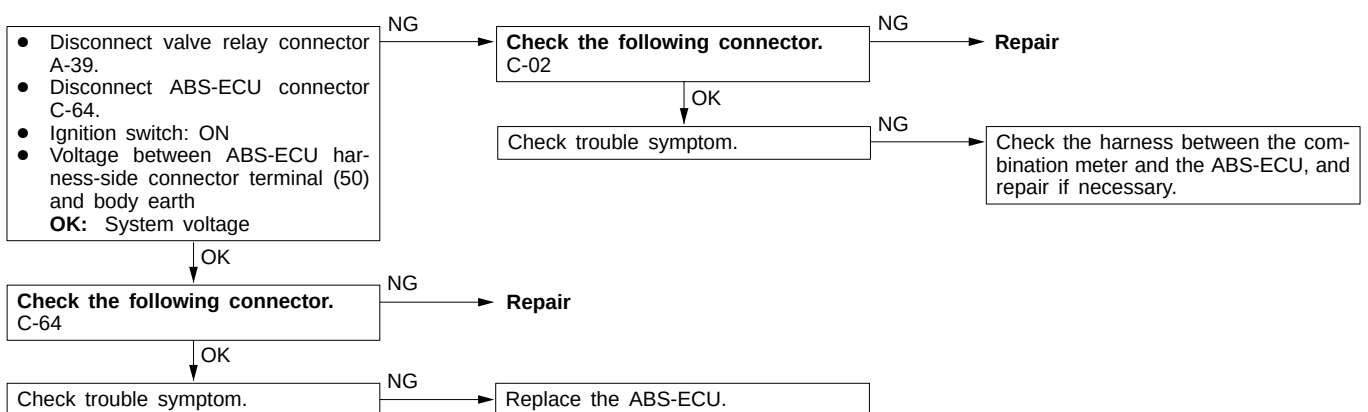
Inspection Procedure 5

When ignition key is turned to "START", ABS warning lamp does not illuminate.	Probable cause
Current does not flow in the ABS-ECU when the ignition switch is turned to START. Current flows in the ABS warning lamp even when the ignition switch is turned to START. Therefore, the valve relay, which current is supplied through the ABS-ECU, turns off when the ignition switch is at START. However, the warning lamp circuit of the valve relay must turn on in turn. So the cause must be a defective circuit on valve relay side.	• Malfunction of wiring harness or connector • Malfunction of ABS-ECU



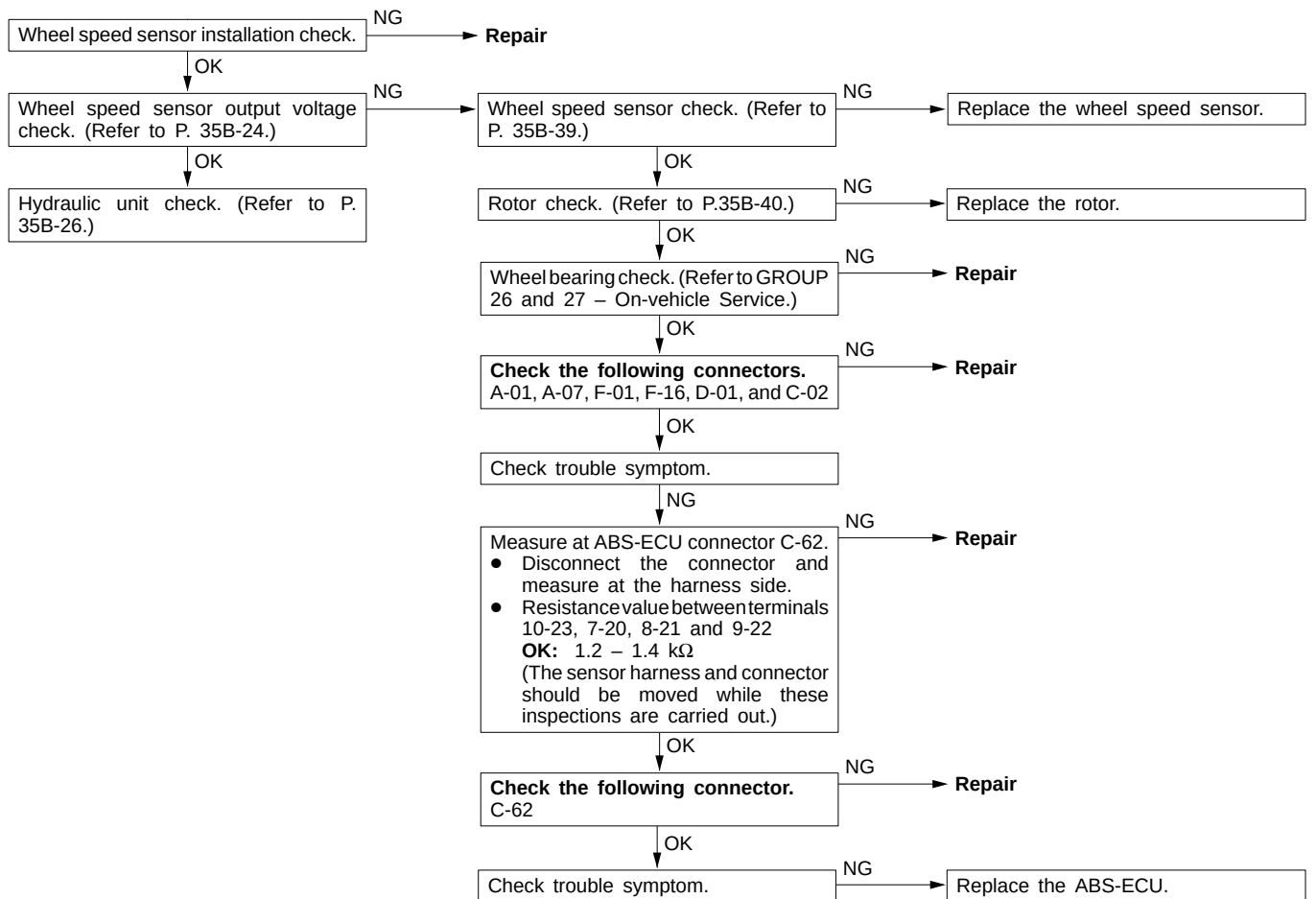
Inspection Procedure 6

The ABS warning lamp flashes twice 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.	Probable cause
The ABS-ECU causes the ABS warning lamp to illuminate during the initial check (approx. 3 seconds). During the initial check, the valve relay turns from off to on, off and back to on again. If there is an open circuit in the harness between the ABS-ECU and the ABS warning lamp, the lamp will illuminate only when the valve relay is OFF during valve relay test, etc.	• Malfunction of wiring harness or connector • Malfunction of ABS-ECU



Inspection Procedure 7

Brake operation is abnormal.	Probable cause
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 • Incorrect sensor harness contact • Foreign material adhering to wheel speed sensor • Malfunction of wheel speed sensor • Malfunction of rotor • Malfunction of wheel bearing • Malfunction of hydraulic unit • Malfunction of ABS-ECU



DATA LIST REFERENCE TABLE

35201150091

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
33	Stop lamp switch	Depress the brake pedal.	ON
		Release the brake pedal.	OFF

2. When the ABS-ECU shut off ABS operation.

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

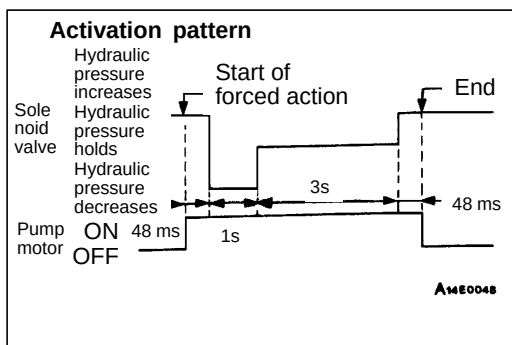
ACTUATOR TEST REFERENCE TABLE

35201160049

The MUT-II activates the following actuators for testing.

NOTE

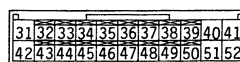
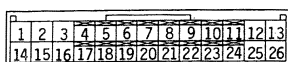
1. If the ABS-ECU runs down, actuator testing cannot be carried out.
2. Actuator testing is only possible when the vehicle is stationary. If the vehicle speed during actuator testing exceeds 10 km/h, forced actuation will be canceled.
3. During the actuator test, the ABS warning lamp will illuminate and the anti-skid control will be cancelled.

**ACTUATOR TEST SPECIFICATIONS**

No.	Item	
01	Solenoid valve for front-left wheel	Solenoid valves and pump motors in the hydraulic unit (simple inspection mode)
02	Solenoid valve for front-right wheel	
03	Solenoid valve for rear wheel	

CHECK AT ABS-ECU**TERMINAL VOLTAGE CHECK CHART**

1. Measure the voltages between terminals (15), (16), (25) and (42) (earth terminals) and each respective terminal.
2. The terminal layouts are shown in the illustrations below.



14W0043

Connector terminal No.	Signal	Checking requirements		Normal condition
1	Output to front-left hydraulic unit solenoid valve (OUT side)	Ignition switch: ON (When solenoid valve is off approximately 1 second after engine is started)		System voltage
2	Output to rear hydraulic unit solenoid valve (OUT side)			
3	Output to rear hydraulic unit solenoid valve (IN side)			
13	ABS-ECU power supply	Ignition switch: ON		System voltage
		Ignition switch: START		0 V
14	Output to front-left hydraulic unit solenoid valve (IN side)	Ignition switch: ON (When solenoid valve is off approximately 1 second after engine is started)		System voltage
26	Output to relay power supply	Ignition switch: ON		System voltage
32	Memory power supply	Always		System voltage
34	Input from stop lamp switch	Ignition switch: ON	Stop lamp switch: ON	System voltage
			Stop lamp switch: OFF	1 V or less
36	MUT-II	Connect the MUT-II.		Serial communication with MUT-II.
		Do not connect the MUT-II.		1 V or less
37	Output to valve relay	Ignition switch: ON	Approximately 1 second after engine is started, the relay is on.	2 V or less
			The system runs down. The relay is off.	System voltage
38	Output to motor relay	Ignition switch: ON Approximately 1 second after engine is started	Motor is on.	2 V or less
			Motor is off.	System voltage
39	Idle-up solenoid valve (+)	Ignition switch: ON (The motor is on approximately 1 second after engine is started.)		System voltage
41	Output to front-right hydraulic unit solenoid valve (OUT side)	Ignition switch: ON (When solenoid valve is off approximately 1 second after engine is started.)		System voltage

Connector terminal No.	Signal	Checking requirements		Normal condition
43	Idle-up solenoid valve (–)	Ignition switch: ON (The motor is on approximately 1 second after engine is started.)		2 V or less
46	Ignition switch	Ignition switch: ON		System voltage
		Ignition switch: START		0 V
47	Input from diagnosis indication selection	Connect the MUT-II.		0 V
		Do not connect the MUT-II.		Approx. 12 V
48	Input from valve relay monitor	Ignition switch: ON		System voltage
49	Motor monitor	Ignition switch: ON Approximately 1 second after engine is started	Motor is on.	System voltage
			Motor is off.	0.5 V or less
50	Output to ABS warning lamp	Ignition switch: ON	The lamp is switched off.	System voltage
			The lamp is illuminated.	0 – 2 V
52	Output to front-right hydraulic unit solenoid valve (IN side)	Ignition switch: ON (When solenoid valve is off approximately 1 second after engine is started.)		System voltage

RESISTANCE AND CONTINUITY BETWEEN HARNESS-SIDE CONNECTOR TERMINALS

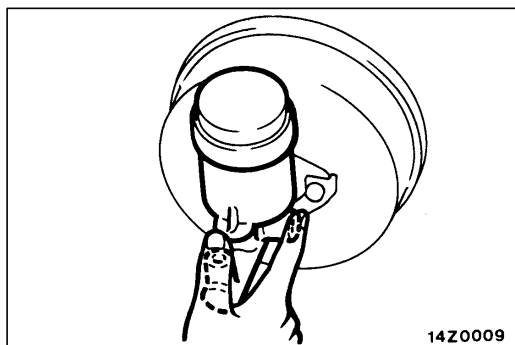
1. Turn the ignition switch off and disconnect the ABS-ECU connectors before checking resistance and continuity.
2. Check them between the terminals indicated in the table below.
3. The terminal layouts are shown in the illustrations below.

41	40	39	38	37	36	35	34	33	32	31
52	51	50	49	48	47	46	45	44	43	42

13	12	11	10	9	8	7	6	5	4	3	2	1
26	25	24	23	22	21	20	19	18	17	16	15	14

14W0042

Connector terminal No.	Signal	Normal condition
1 – Body earth	Front-left solenoid valve (OUT side)	2.2 Ω
2 – Body earth	Rear solenoid valve (OUT side)	2.2 Ω
3 – Body earth	Rear solenoid valve (IN side)	5.0 Ω
7 – 20	Front-left wheel speed sensor (+ wire)	1.2 – 1.4 kΩ
8 – 21	Rear-right wheel speed sensor (+ wire)	1.2 – 1.4 kΩ
9 – 22	Rear-left wheel speed sensor (+ wire)	1.2 – 1.4 kΩ
10 – 23	Front-right wheel speed sensor (+ wire)	1.2 – 1.4 kΩ
14 – Body earth	Front-left solenoid valve (IN side)	5.0 Ω
15 – Body earth	ABS-ECU earth	Continuity
16 – Body earth		
25 – Body earth		
39 – 43	Idle-up solenoid valve	37 – 44 Ω
41 – Body earth	Front-right solenoid valve (OUT side)	2.2 Ω
42 – Body earth	ABS-ECU earth	Continuity
48 – Body earth	Valve relay monitor input	Continuity
49 – Body earth	Motor monitor	Continuity
52 – Body earth	Front-right solenoid valve (IN side)	5.0 Ω



ON-VEHICLE SERVICE

35200150108

BLEEDING

Caution

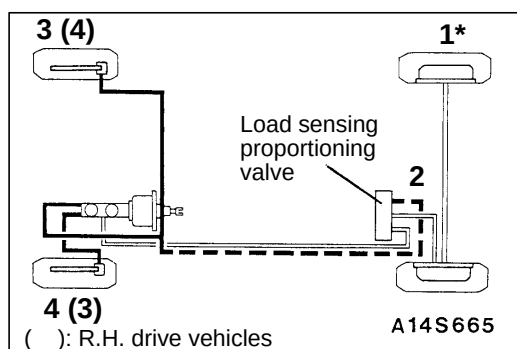
Use the specified brake fluid. Avoid using a mixture of the specified brake fluid and other fluid.

Specified brake fluid: DOT3 or DOT4

MASTER CYLINDER BLEEDING

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.

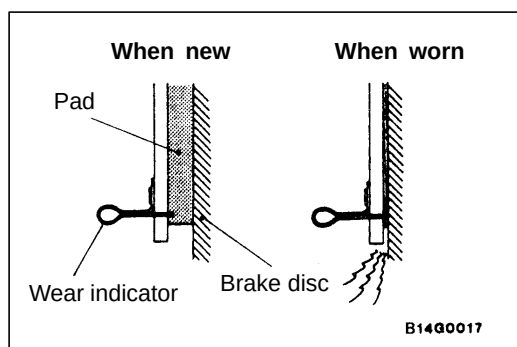


BRAKE PIPE LINE BLEEDING

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

Caution

Be sure to install a filter to the master cylinder reservoir tank when supplying brake fluid.



DISC BRAKE PAD CHECK AND REPLACEMENT

35200280012

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.

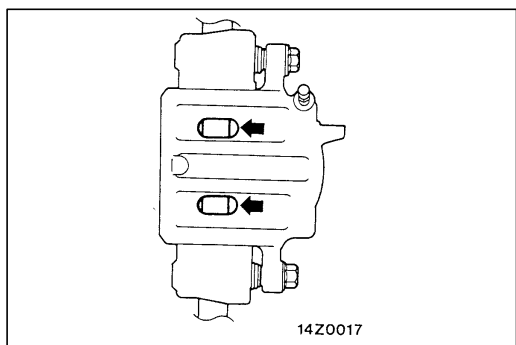
1. Check brake pad thickness through caliper body check port.

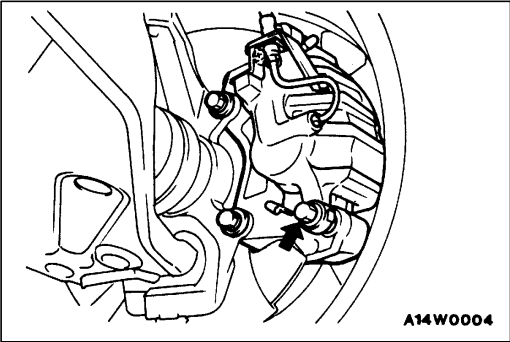
Standard value: 10 mm

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 thicknesses of the pads on the left and right sides, check the sliding condition of the piston, lock pin and guide pin.

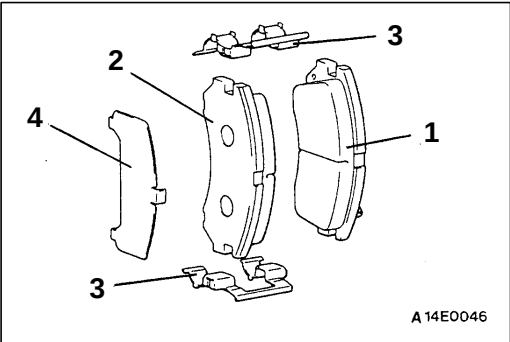




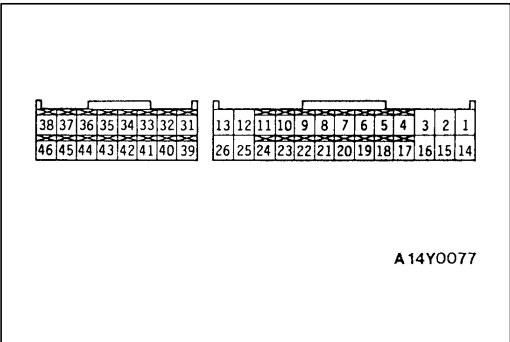
2. Remove guide pin. Lift caliper assembly and retain with wires.

Caution

Do not wipe off the special grease that is on the lock pin or allow it to contaminate the guide pin.



3. Remove the following parts from caliper support.
(1) Pad and wear indicator assembly
(2) Pad assembly
(3) Clip
(4) Outer shim
4. Measure hub torque with pad removed to measure brake drag torque after pad installation. (Refer to P. 35B-33.)
5. Install the pad and caliper assembly, and check the brake drag force. (Refer to P. 35B-33.)



WHEEL SPEED SENSOR OUTPUT VOLTAGE CHECK

35200160156

1. Lift up the vehicle and release the parking brake.
2. Disconnect the ABS-ECU connector, and then use the special tool (inspection harness for connector pin contact pressure) to measure the output voltage at the harness-side connector.

3. 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.

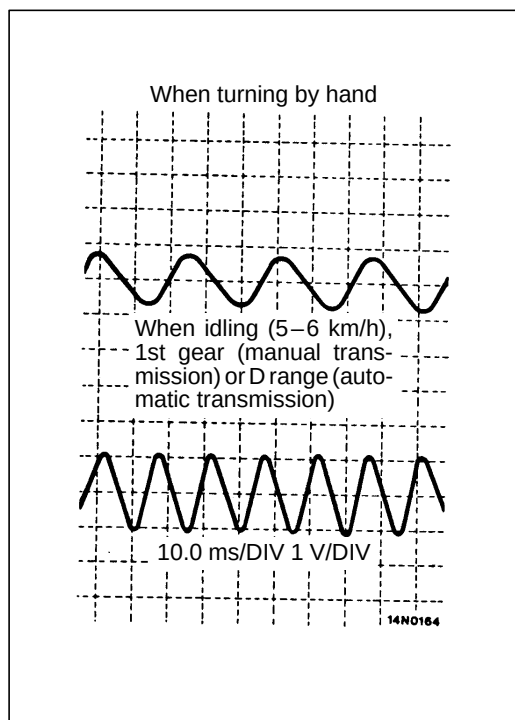
Wheel speed sensor	Front left	Front right	Rear left	Rear right
Terminal No.	7	10	9	8
	20	23	22	21

Output voltage

When measuring with a circuit tester:
50 mV or more

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

4. If the output voltage is lower than the above values, the reason could be as follow:
- Faulty wheel speed sensor.
- So replace the wheel speed sensor.



Inspecting Waveforms With An Oscilloscope

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

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

NOTE

- Check the connection of the sensor harness and connector before using the oscilloscope.
- The waveform measurements can also be taken while the vehicle is actually moving.
- 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
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.

HYDRAULIC UNIT CHECK

35200170166

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

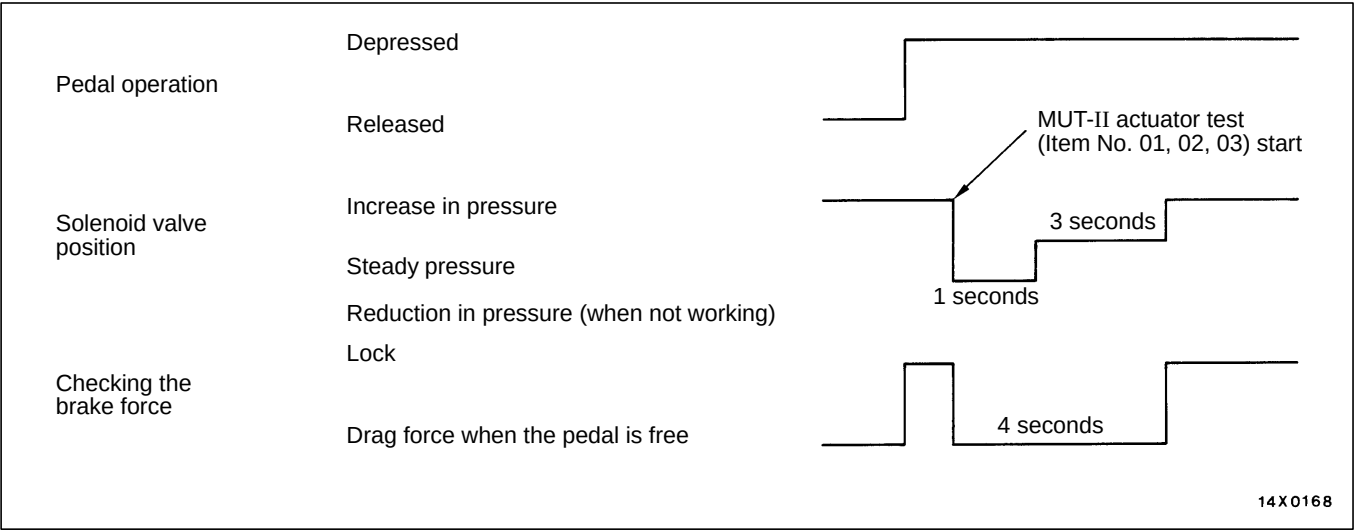
- 1. The roller of the braking force tester and the tyre should be dry during testing.
 - 2. When testing the front brakes, apply the parking brake, and when testing the rear brakes, stop the front wheels by chocking them.
- 2. Release the parking brake, and feel the drag force (drag torque) on each 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.
- 5. Use the MUT-II to force-drive the actuator.

NOTE

- 1. During the actuator test, the ABS warning lamp will illuminate and the anti-skid control will be cancelled.
 - 2. When the ABS has been interrupted by the fail-safe function, the MUT-II actuator testing cannot be used.
- 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 that the braking force decreases when the actuator is force-driven.

Front wheel	785–981 N
Rear wheel	294–490 N

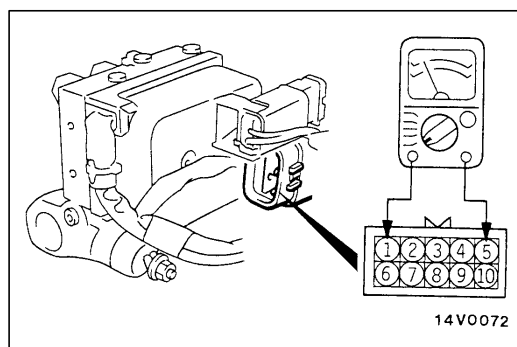
The result should be as shown in the following diagram.



- 7. If the result of inspection is abnormal, correct according to the “Diagnosis Table” (Refer to P.35B-27).
- 8. After inspection, disconnect the MUT-II immediately after turning the ignition switch to OFF.

Diagnosis Table

No.	Operation	Judgement – Normal	Judgement – Abnormal	Probable cause	Remedy
01	(1) Depress brake pedal to lock wheel. (2) Using the 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 4 seconds after locking.	Wheel does not lock when brake pedal is depressed.	Clogged brake line other than hydraulic unit	Check and clean brake line
02				Clogged hydraulic circuit in hydraulic unit	Replace hydraulic unit assembly
03			Brake force is not released	Incorrect hydraulic unit brake tube connection	Connect correctly
				Hydraulic unit solenoid valve not functioning correctly	Replace hydraulic unit assembly



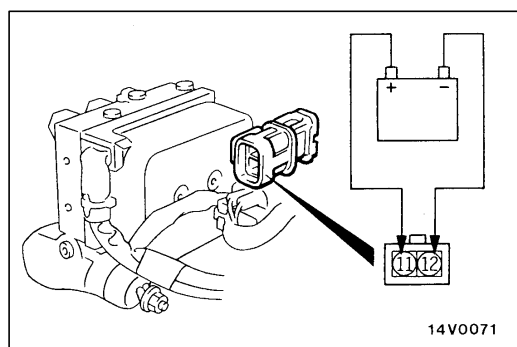
SOLENOID VALVE CHECK

35201070120

Measure the resistance between terminals.

Standard value:

Solenoid valve	Measurement terminals	Resistance between terminals.
Front IN (right side)	1 – 5 or 10	5.0 Ω
Front IN (left side)	2 – 5 or 10	
Rear IN	3 – 5 or 10	
Front OUT (right side)	6 – 5 or 10	2.2 Ω
Front OUT (left side)	7 – 5 or 10	
Rear OUT	8 – 5 or 10	

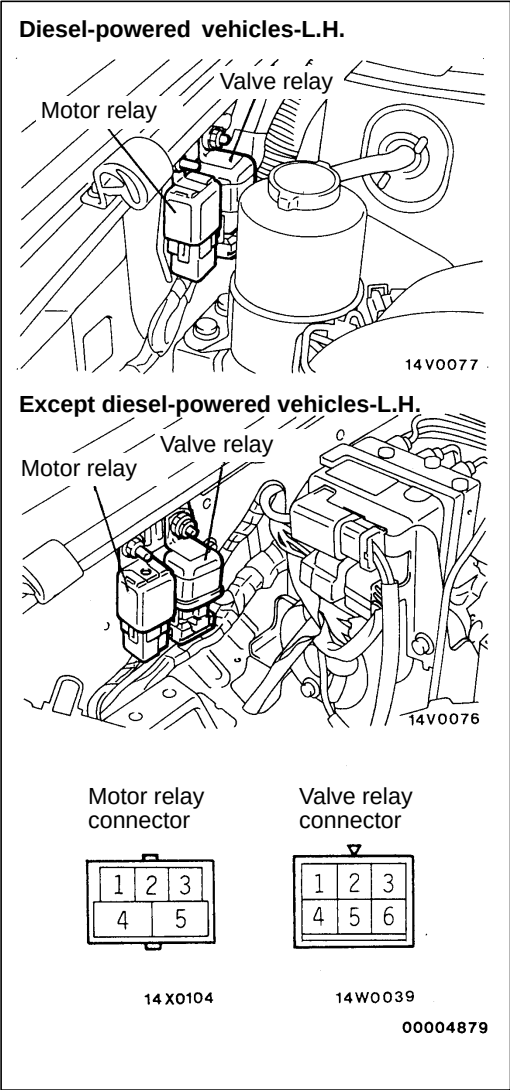


MOTOR OPERATION CHECK

35200180121

Connect the battery and check to be sure that the sound of the hydraulic unit motor operating can be heard.

Caution**The battery power should not be applied for more than 1 second.**



**MOTOR RELAY AND VALVE RELAY
CONTINUITY CHECK**

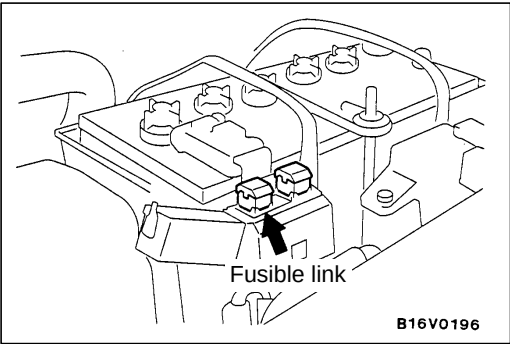
35201090133

Motor relay

Battery voltage	Terminal No.			
	1	3	4	5
Power is not supplied	○	○		
Power is supplied	⊕	⊖	○	○

Valve relay

Battery voltage	Terminal No.				
	1	2	3	5	6
Power is not supplied	○	○	○	○	
Power is supplied		⊕	○	⊖	○



REMEDY FOR A FLAT BATTERY

35200350126

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 ABS 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 ABS circuit, thus disabling the anti-skid brake system. The ABS warning lamp will illuminate when the fusible link (for ABS) is removed.

After the battery has sufficiently recharged, install the fusible link (for ABS) and restart the engine; then check to be sure the ABS warning lamp is not illuminated.

MASTER CYLINDER AND BRAKE BOOSTER

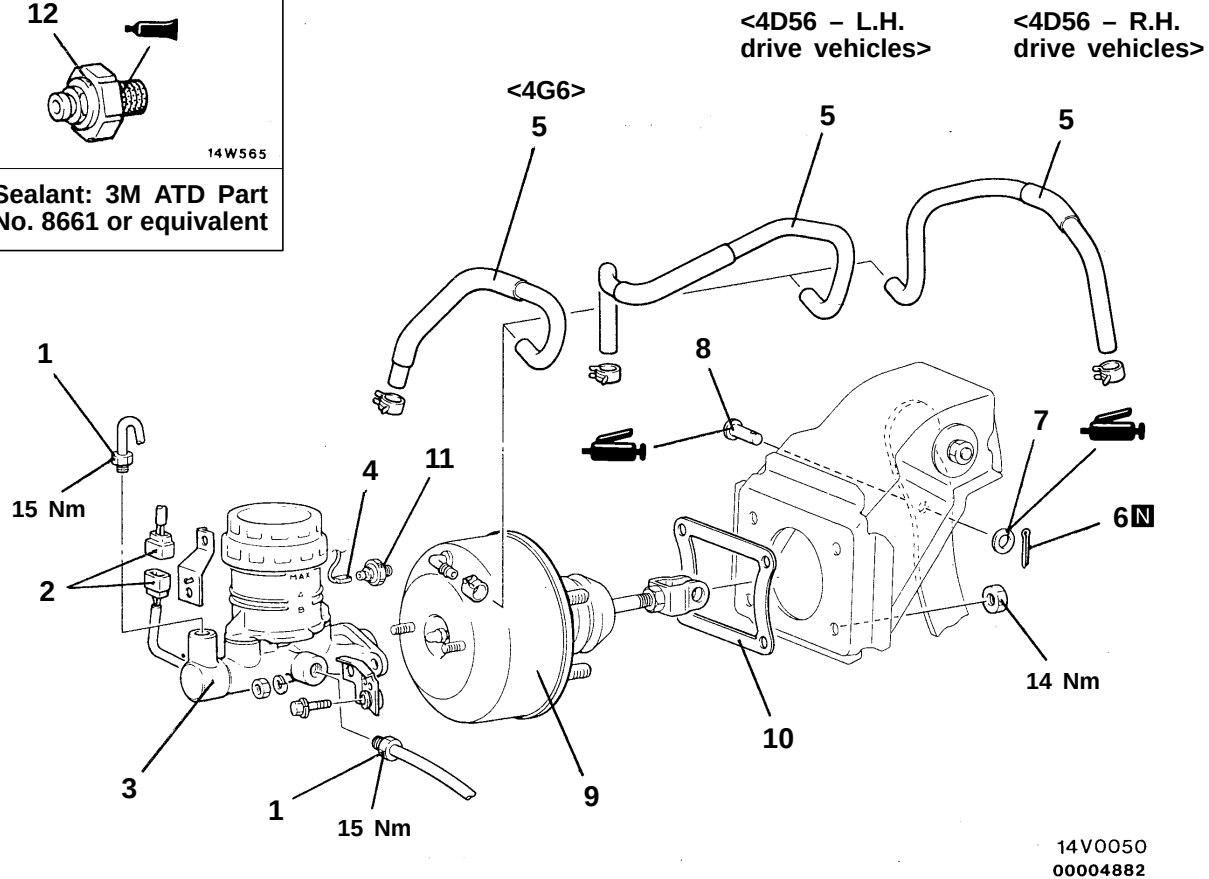
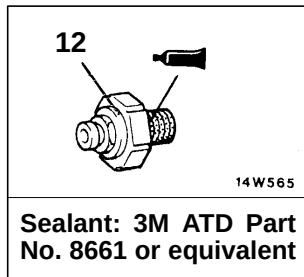
REMOVAL AND INSTALLATION

Pre-removal Operation

- Battery Removal
- Brake Fluid Draining

Post-installation Operation

- Brake Fluid Supplying
- Brake Line Bleeding (Refer to P. 35B-23.)
- Brake Pedal Adjustment (Refer to GROUP 35A – On-vehicle Service.)

**Removal steps**

1. Brake tube connection
2. Brake fluid level sensor connector
3. Master cylinder assembly
- ▶B◀ • Adjustment of clearance between brake booster push rod and primary piston
- ▶A◀ 4. Vacuum switch connector <4D56>
5. Vacuum hose (With built-in check valve)
6. Split pin

7. Washer
8. Clevis pin
9. Brake booster
10. Sealer
11. Vacuum switch <4D56>

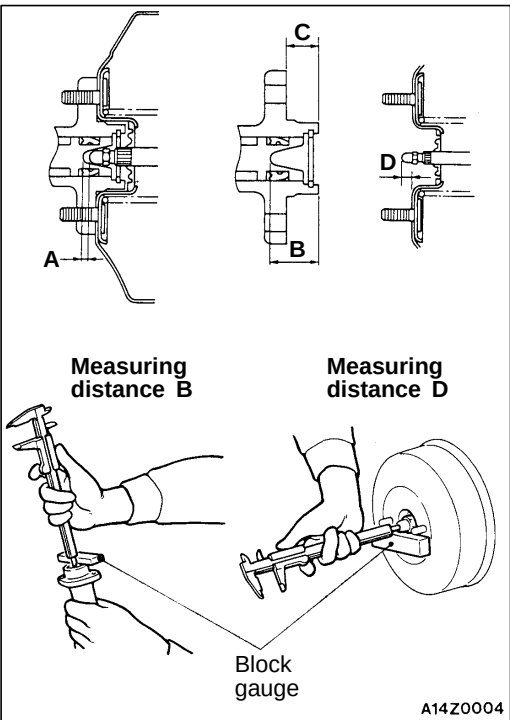
Caution

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

INSTALLATION SERVICE POINTS

►A◄ VACUUM HOSE CONNECTION

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.



►B◄ CLEARANCE ADJUSTMENT BETWEEN BRAKE BOOSTER PUSH ROD AND PRIMARY PISTON

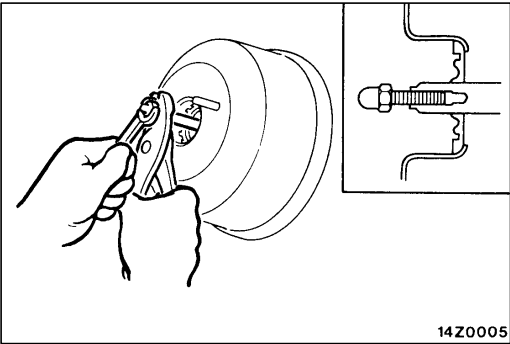
Calculate clearance A from the B, C and D measurements.
 $A = B - C - D$

Standard value:

Brake booster size	Clearance A standard value mm
Petrol-powered vehicles	0.90 – 1.30
Diesel-powered vehicles	0.70 – 1.10

NOTE

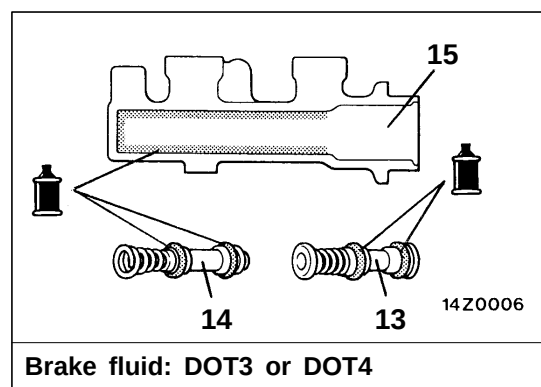
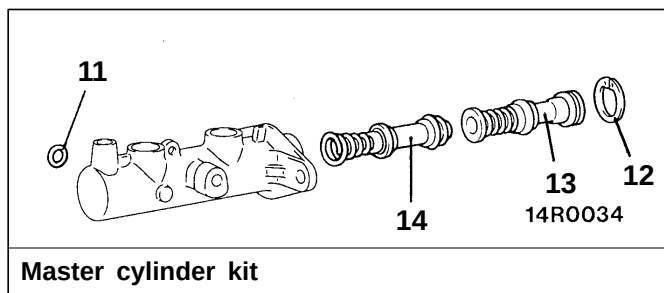
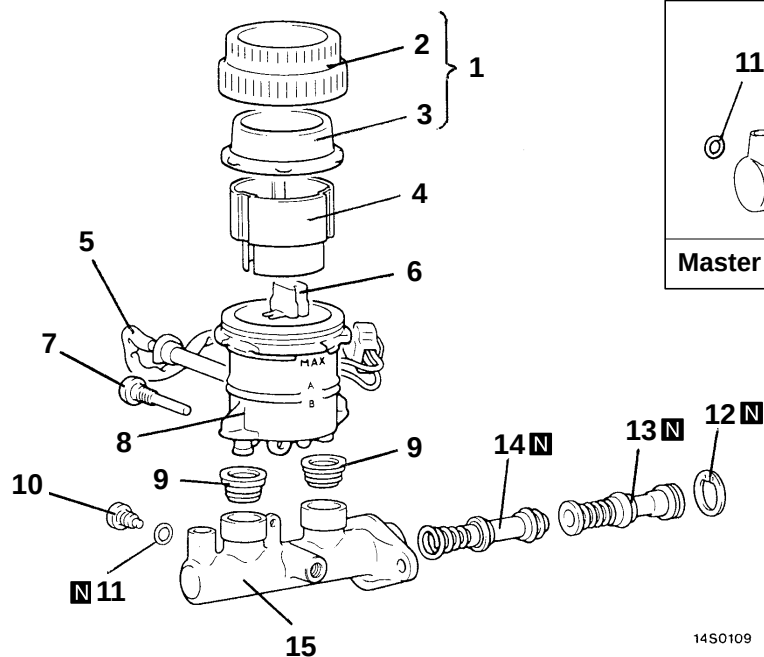
When brake booster negative pressure (petrol-powered vehicles: -66.7 kPa, diesel-powered vehicles: -93.3 kPa) is applied, clearance value will become 0.10 – 0.50 mm.



If the clearance is not 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

35200450109



00004883

Disassembly steps

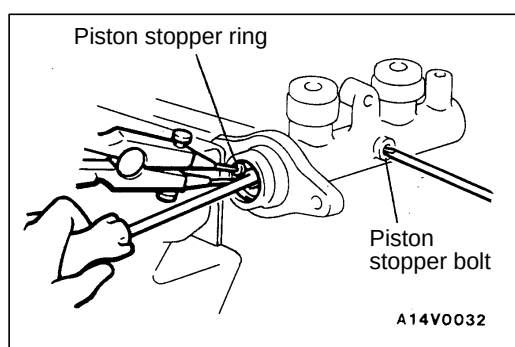
1. Reservoir cap assembly
2. Reservoir cap
3. Diaphragm
4. Filter
5. Brake fluid level sensor
6. Float
7. Reservoir stopper bolt
8. Reservoir tank
9. Reservoir seal
10. Piston stopper bolt



11. Gasket
12. Piston stopper ring
13. Primary piston assembly
14. Secondary piston assembly
15. Master cylinder body

Caution

Do not disassemble the primary and secondary piston assembly.



DISASSEMBLY SERVICE POINTS

◀A▶ PISTON STOPPER BOLT /PISTON STOPPER RING DISASSEMBLY

Remove the piston stopper bolt and piston stopper ring, while depressing the piston.

INSPECTION

35200460027

- 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

35200600016

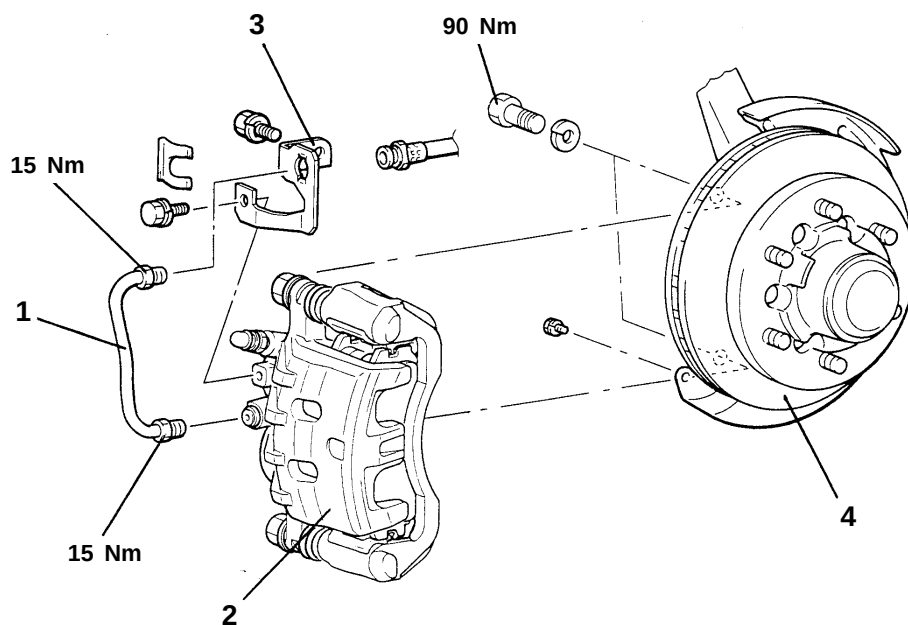
REMOVAL AND INSTALLATION

Pre-removal Operation

- Brake Fluid draining

Post-installation Operation

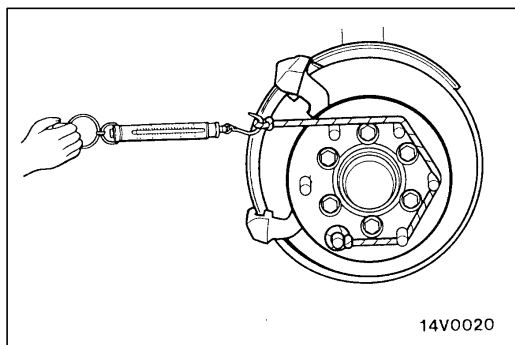
- Brake Fluid Supplying
- Brake Line Bleeding (Refer to P. 35B-23.)



A14V0048

Removal steps

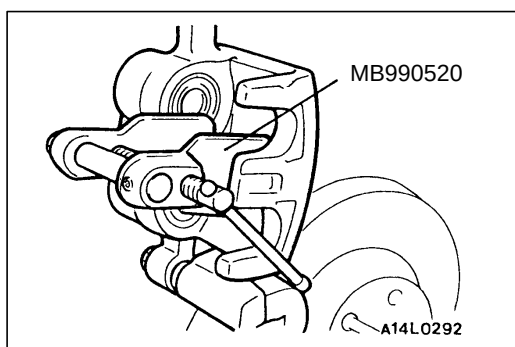
- A◄
1. Brake tube
 2. Front brake assembly
 3. Brake hose bracket
 4. Brake disc (Refer to GROUP 26 – Front Hub Assembly.)



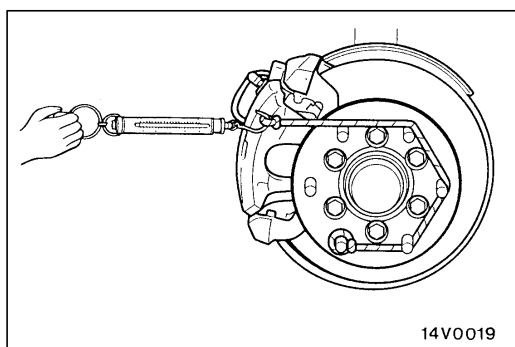
INSTALLATION SERVICE POINT

►A◄ FRONT BRAKE ASSEMBLY INSTALLATION

1. Measure hub torque (A) with pad removed to measure brake drag torque after pad installation.
2. Securely attach the pad clip to the caliper support.



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 install the lock pin.
5. Check brake drag torque as follows.
 - (1) Start engine and hold brake pedal down for 5 seconds. (Pedal depression force approx. 196 N.)
 - (2) Stop engine.
 - (3) Turn brake disc forward 10 times.



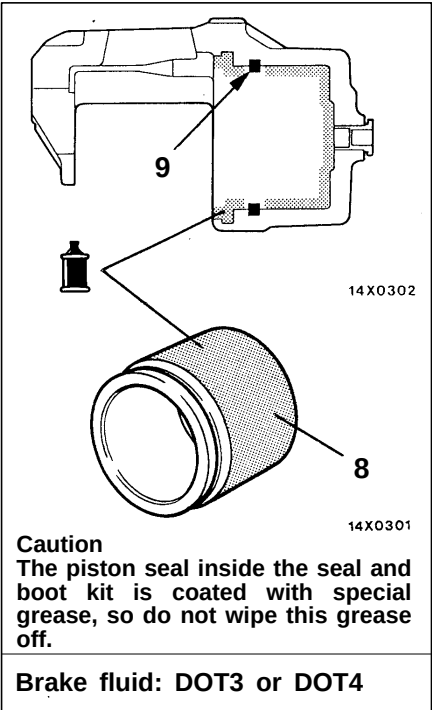
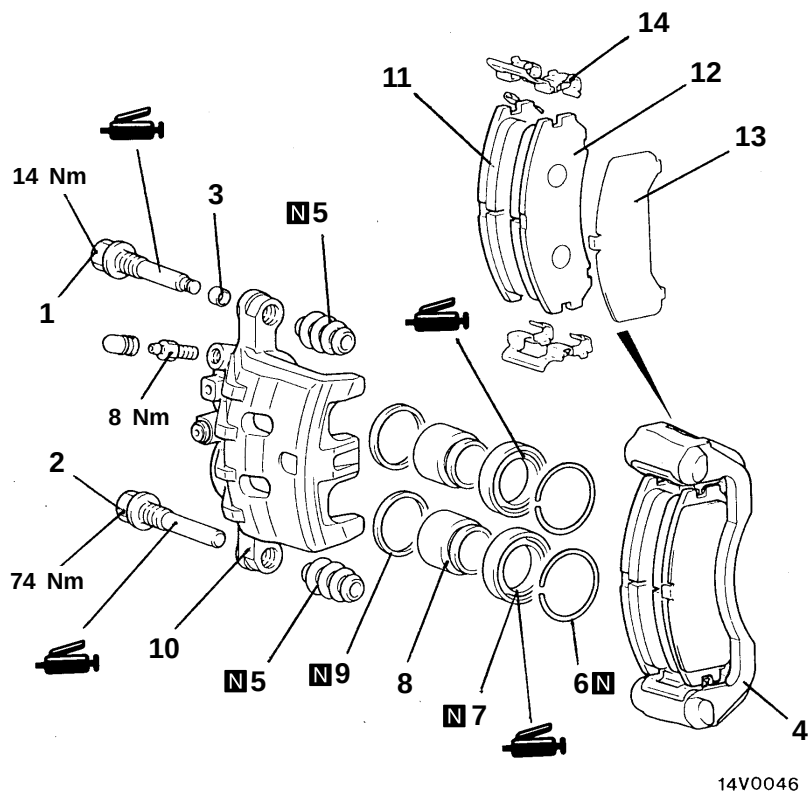
- (4) Check hub torque (B) with spring balance.
- (5) Calculate the drag torque of the disc brake [difference between hub torque (B) and hub torque (A)].

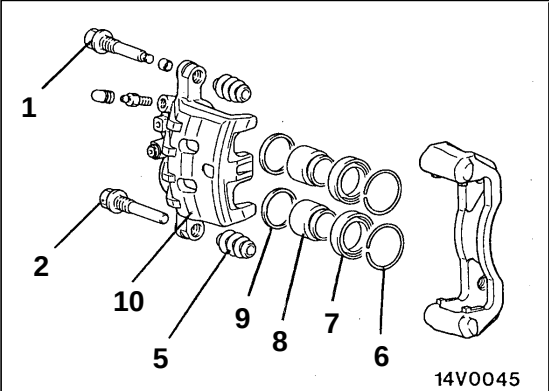
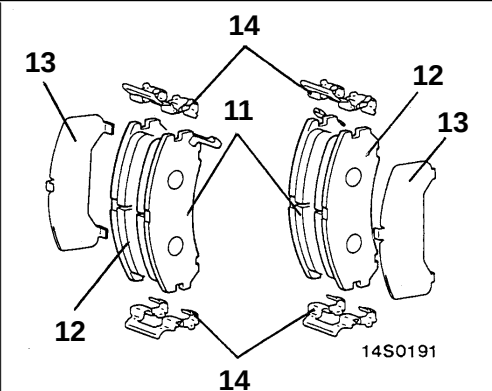
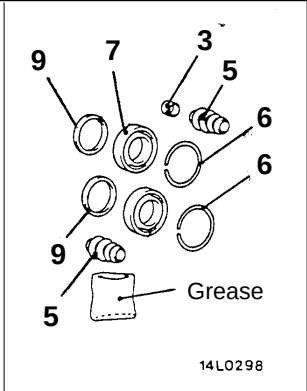
Standard value: 69 N or less

6. If the difference between brake drag torque and hub 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.

DISASSEMBLY AND REASSEMBLY

35200620012



 14V0045	 14S0191	 14L0298
Brake caliper kit	Pad kit	Seal and boot kit

00004884

Caliper assembly disassembly steps



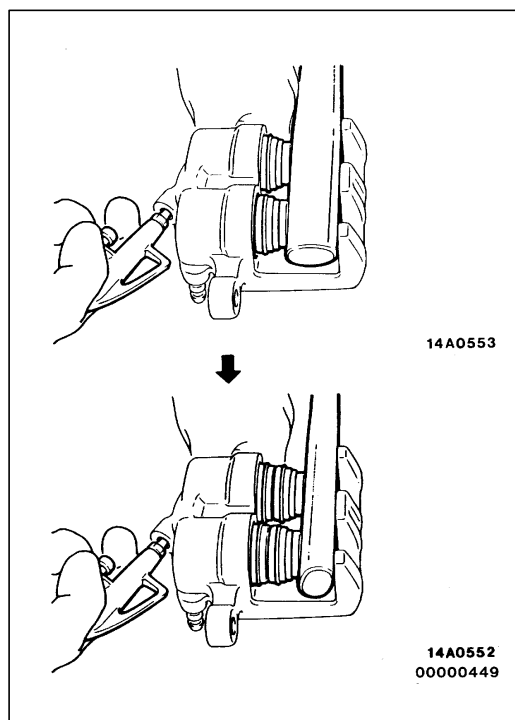
1. Lock pin
2. Guide pin
3. Bushing
4. Caliper support (Pad, clip and shim)
5. Pin boot
6. Boot ring
7. Piston boot
8. Piston
9. Piston seal
10. Caliper body



Pad assembly disassembly steps



1. Lock pin
2. Guide pin
3. Bushing
4. Caliper support (Pad, clip and shim)
11. Pad and wear indicator assembly
12. Pad assembly
13. Outer shim
14. Clip



DISASSEMBLY SERVICE POINTS

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

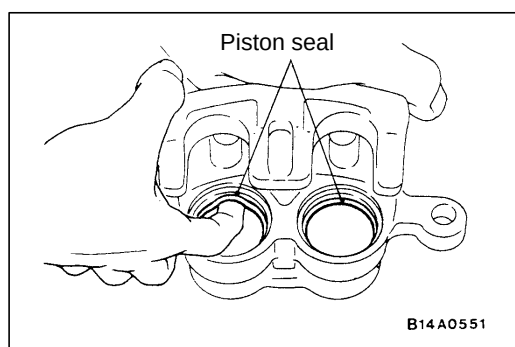
◀A▶ PISTON BOOT/PISTON REMOVAL

Pump in compressed air through the brake hose installation hole and remove the piston and piston boot.

Caution

When removing the pistons, be sure to use the handle of a plastic hammer and adjust the height of the two pistons while pumping air slowly in so that the pistons protrude evenly.

Do not remove one piston completely before trying to remove the other piston because it will become impossible to remove the second piston.



◀B▶ PISTON SEAL REMOVAL

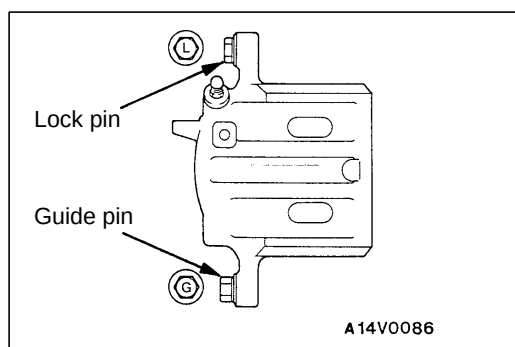
- (1) Remove piston seal with finger tip.

Caution

Do not use a screwdriver or other tool to prevent damage to inner cylinder.

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

Specified brake fluid: DOT3 or DOT4



REASSEMBLY SERVICE POINT

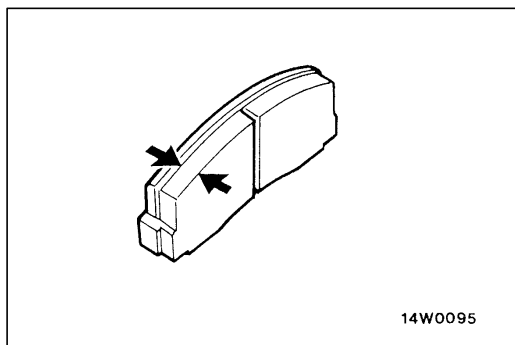
▶A◀ LOCK PIN/GUIDE PIN INSTALLATION

Install the lock pin and the guide pin to the caliper body as shown in the illustration..

INSPECTION

35200630015

- 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.

**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: 10 mm

Limit value: 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 thicknesses of the pads on the left and right sides, check the sliding condition of the piston, lock pin and guide pin.

HYDRAULIC UNIT

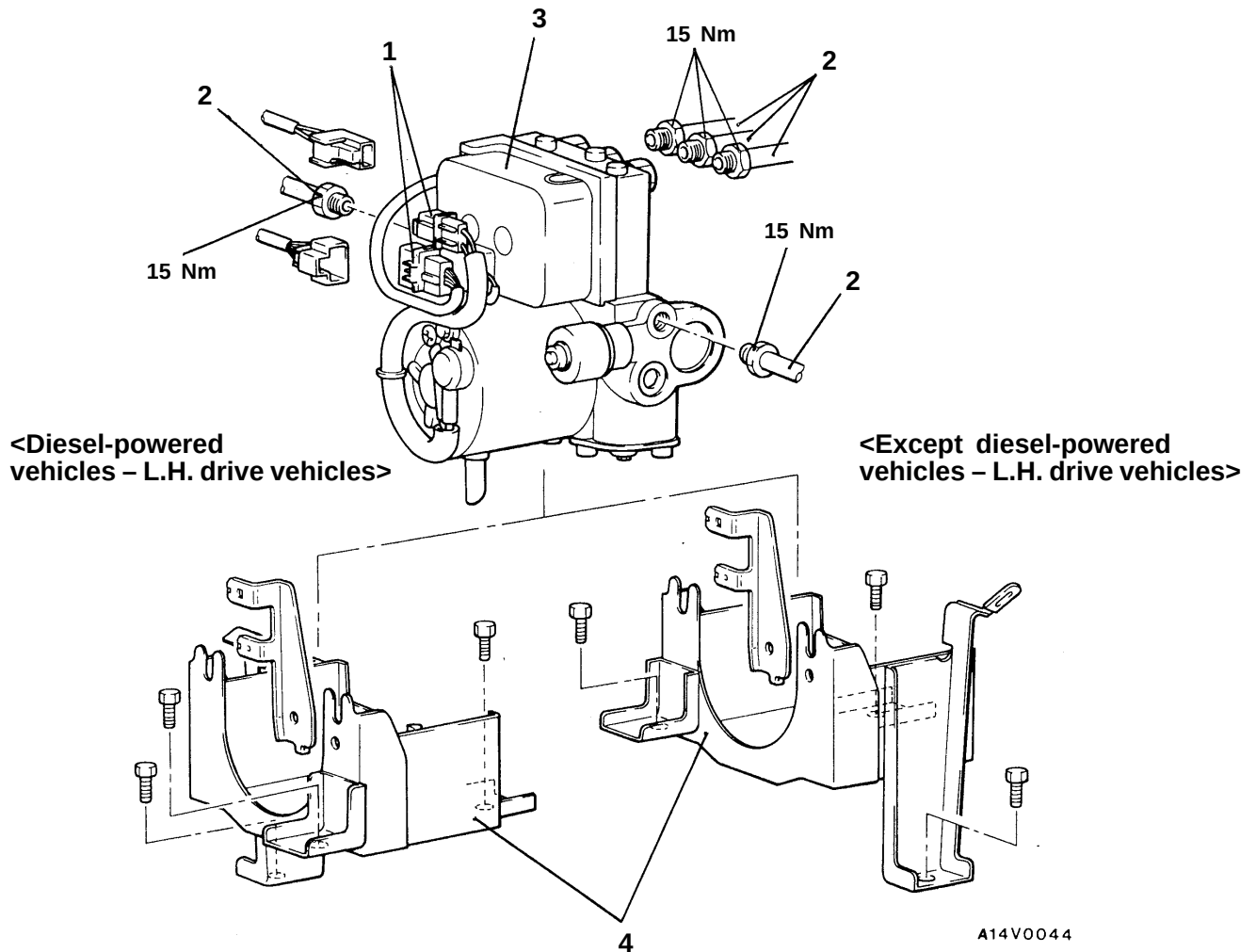
REMOVAL AND INSTALLATION

Pre-removal Operation

- Brake Fluid Draining

Post-installation Operation

- Brake Fluid Supplying
- Brake Lines Bleeding (Refer to P. 35B-23.)
- Hydraulic Unit Checking (Refer to P. 35B-26.)

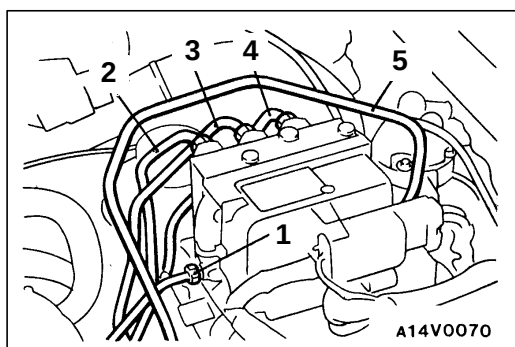
**Removal steps**

1. Harness connector
2. Brake tube connection
3. Hydraulic unit
4. Hydraulic unit bracket



REMOVAL SERVICE POINT**◀A▶ HYDRAULIC UNIT REMOVAL****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.

**INSTALLATION SERVICE POINT****◀A▶ BRAKE TUBE CONNECTION**

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

1. Master cylinder (for front)
2. Front brake (R.H.)
3. Front brake (L.H.)
4. Rear brake
5. Master cylinder (for rear)

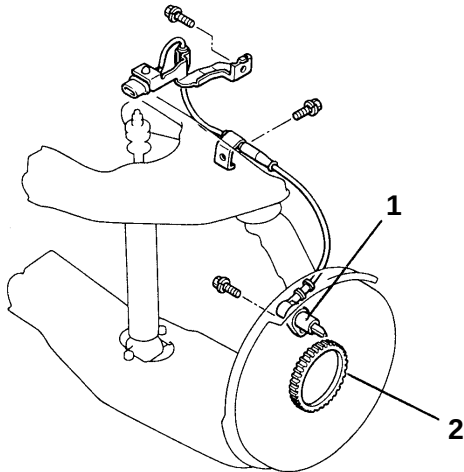
WHEEL SPEED SENSOR

REMOVAL AND INSTALLATION

Post-installation Operation

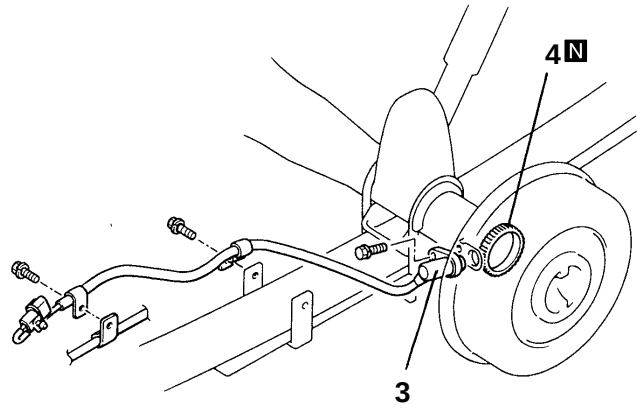
- Wheel Speed Sensor Output Voltage Checking
(Refer to P. 35B-24.)

Front



14V0055

Rear



14V0057

00004902

1. Front speed sensor
2. Front rotor (Refer to GROUP 26 – Front Hub.)
3. Rear speed sensor
4. Rear rotor (Refer to GROUP 27 – Rear Axle Shaft.)

INSPECTION

35200840128

SPEED SENSOR

- (1) Check whether any metallic foreign material has adhered to the parts shown in the illustration at the speed sensor tip, and if so, remove it.

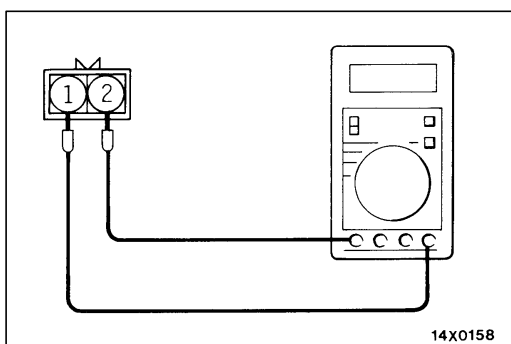
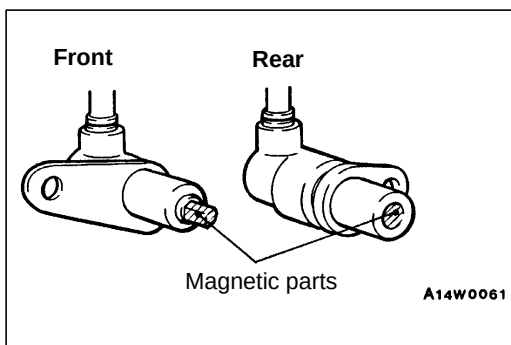
NOTE

The section shown in the illustration can become magnetized because of the magnet built into the speed sensor, with the result that foreign metallic material easily adheres to it.

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

Standard value: 1.2 – 1.4 kΩ

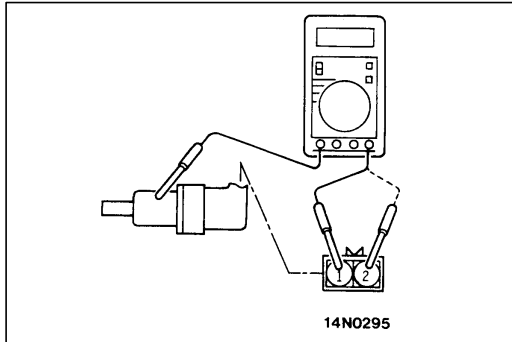
If the internal resistance of the speed sensor is not within the standard value, replace with a new speed sensor.



- (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. Check the connector connection and the terminal insertion.

**SPEED SENSOR INSULATION CHECK**

- (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

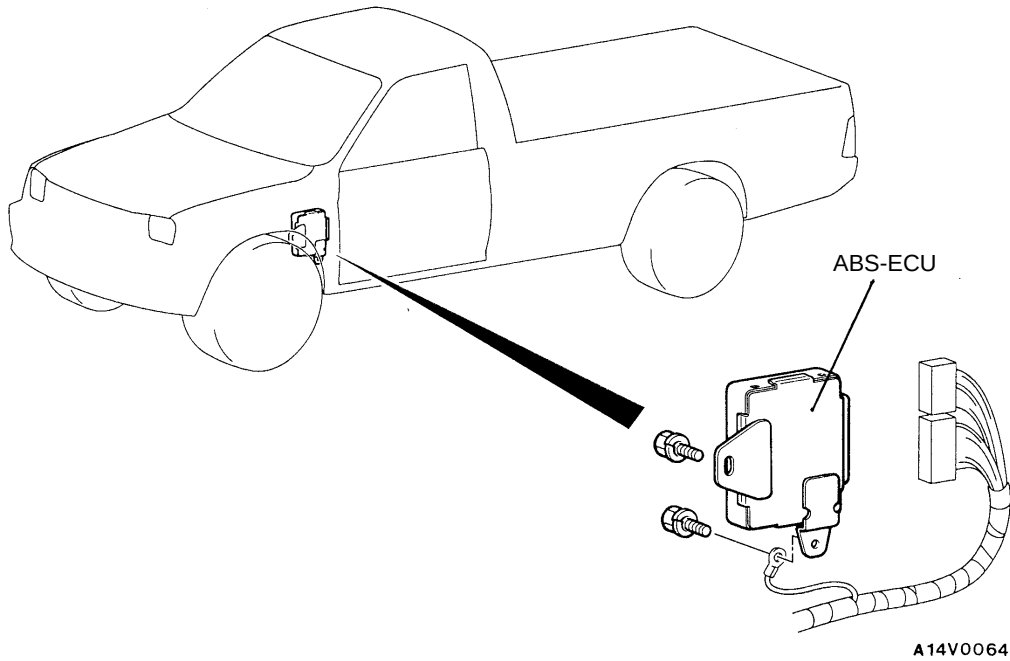
Check whether rotor teeth are broken or deformed, and if so, replace the rotor.

ABS-ECU

35200980141

REMOVAL AND INSTALLATION**Pre-removal and Post-installation Operation**

- Driver's Side Under Cover Removal and Installation (Refer to GROUP 52A – Instrument Panel.)
- Junction Block Installation Nut Removal and Installation.

**INSPECTION**

Refer to P. 35B-20.

35200990106

NOTES

ANTI-SKID BRAKING SYSTEM (ABS) <4WD>

CONTENTS

35209000138

GENERAL INFORMATION	3	TROUBLESHOOTING	5
SERVICE SPECIFICATION	4	FRONT DISC BRAKE	15
LUBRICANTS	4	WHEEL SPEED SENSOR	19
SPECIAL TOOLS	4	G-SENSOR*	20

WARNINGS 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: impact sensor, 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 an asterisk (*).

For the items below, refer to GROUP 35A.

SEALANTS

ON-VEHICLE SERVICE

- Brake Pedal Check and Adjustment
- Stop Lamp Switch Inspection
- Brake Booster Operating Test
- Check Valve Operation Check
- Brake Booster Vacuum Switch Check
- Load Sensing Spring Length Check and Adjustment
- Load Sensing Proportioning Valve Function Test
- Front Disc Brake Rotor Check
- Brake Lining Thickness Check
- Brake Drum Inside Diameter Check
- Brake Lining and Brake Drum Connection Check

BRAKE PEDAL

LOAD SENSING PROPORTIONING VALVE

REAR DRUM BRAKE

For the items below, refer to GROUP 35B.

ON-VEHICLE SERVICE

- Bleeding
- Disc Brake Pad Check and Replacement
- Wheel Speed Sensor Output Voltage Check
- Hydraulic Unit Check
- Solenoid Valve Check
- Motor Operation Check
- Motor Relay and Valve Relay Continuity Check
- Remedy for a Flat Battery

MASTER CYLINDER AND BRAKE BOOSTER

HYDRAULIC UNIT

ABS-ECU

GENERAL INFORMATION

35200010130

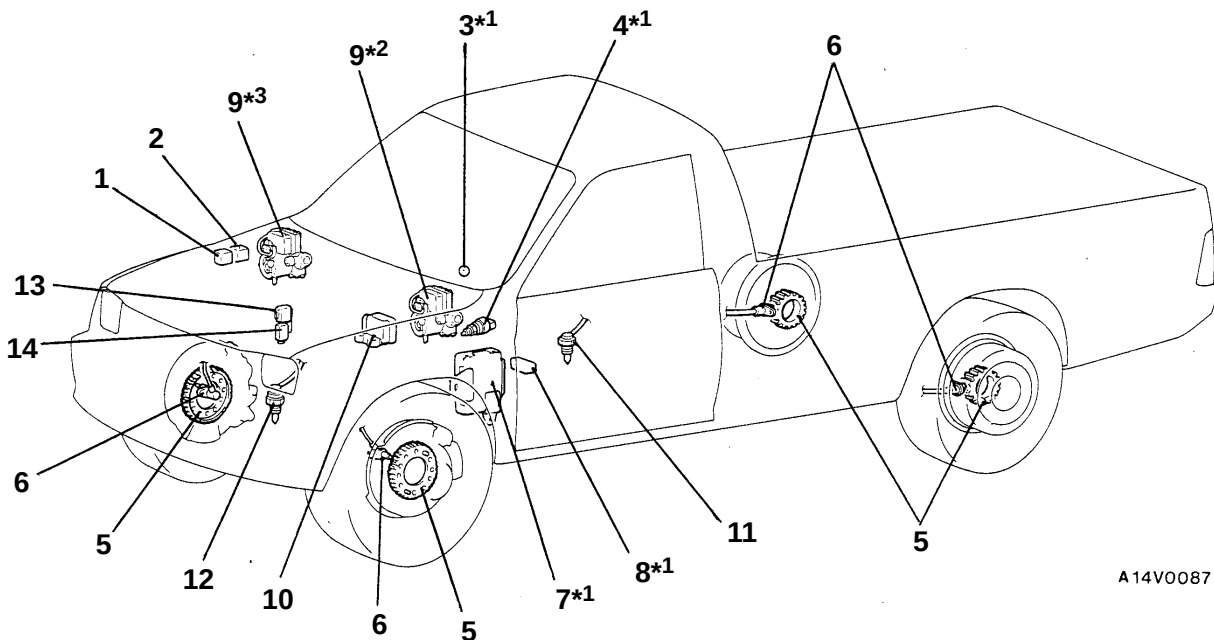
The ABS consists of wheel speed sensors, stop lamp switch hydraulic unit and the ABS-ECU. If a problem occurs in the system, the malfunctioning system can be identified by means of the diagnosis function, and the trouble symptom memory will not be erased even if the ignition switch is turned to

OFF. (However, it will be erased if the battery is disconnected.)

In addition, reading of diagnosis codes and data list and actuator of testing are possible using the MUT-II.

Items	Specifications
Speed sensor	Magnet coil type
Front rotor teeth	47
Rear rotor teeth	47

CONSTRUCTION DIAGRAM



A14V0087

NOTE

*1: For R.H. drive vehicles, those parts are installed at the right side.

*2: Diesel-powered vehicles – L.H. drive vehicles.

*3: Except diesel-powered vehicles – L.H. drive vehicles.

1. ABS valve relay
2. ABS motor relay
3. ABS warning lamp
4. Stop lamp switch
5. Rotor
6. Wheel speed sensor
7. ABS-ECU

8. Diagnosis connector
9. Hydraulic unit
10. G-sensor
11. 4WD position detection switch
12. Free wheel engage switch
13. Rear differential lock-ECU
14. 4WD indicator-ECU

SERVICE SPECIFICATION

35200030143

Items		Standard value	Limit
Front disc brake pad thickness mm		10	2.0
G-sensor output voltage V	When installed	2.4 – 2.6	–
	When removed with arrow mark facing down	3.4 – 3.6	–

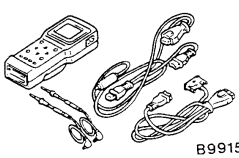
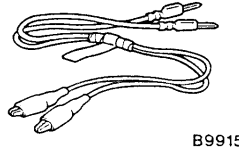
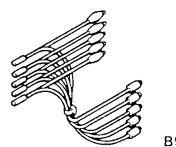
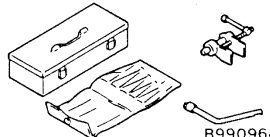
LUBRICANTS

35200040030

Items	Specified lubricant
Brake fluid	DOT3 or DOT4
Brake piston seal	Repair kit grease
Guide pin boot inner surfaces	
Lock pin boot inner surfaces	
Piston boot mounting grooves	
Brake piston boot inner surfaces	
Lock pin bush inner surfaces	
Piston cup surface	

SPECIAL TOOLS

35200060142

Tool	Number	Name	Use
 B991502	MB991502	MUT-II sub assembly	For checking of ABS (Diagnosis code display when using the MUT-II)
 B991529	MB991529	ABS check harness	For checking of ABS (Diagnosis code display when using the ABS warning lamp)
 B991348	MB991348	Test harness set	For checking of G-sensor
 B990964 MB990520	MB990964 MB990520	Brake tool set	Pushing-in of the brake piston

TROUBLESHOOTING

35101110143

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING

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

NOTES WITH REGARD TO DIAGNOSIS

The phenomena listed in the following table 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 is 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 operation. (whine) 2. Sound is the 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: tyres)
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.
Shock during system operation check	Shock may be felt when the brake pedal is depressed slightly at a low driving speed. This occurs due to ABS operation check (check at a vehicle speed of 8 km/h after starting), and does not indicate any malfunction.

Diagnosis detection condition can vary depending on the diagnosis code.

Make sure that checking requirements listed in the “Comment” are satisfied when checking the trouble symptom again.

DIAGNOSIS FUNCTION

35201120108

DIAGNOSIS CODES CHECK

Read a diagnosis code by the MUT-II or ABS warning lamp.
(Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points.)

ERASING DIAGNOSIS CODES

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

INSPECTION CHART FOR DIAGNOSIS CODES

35201130163

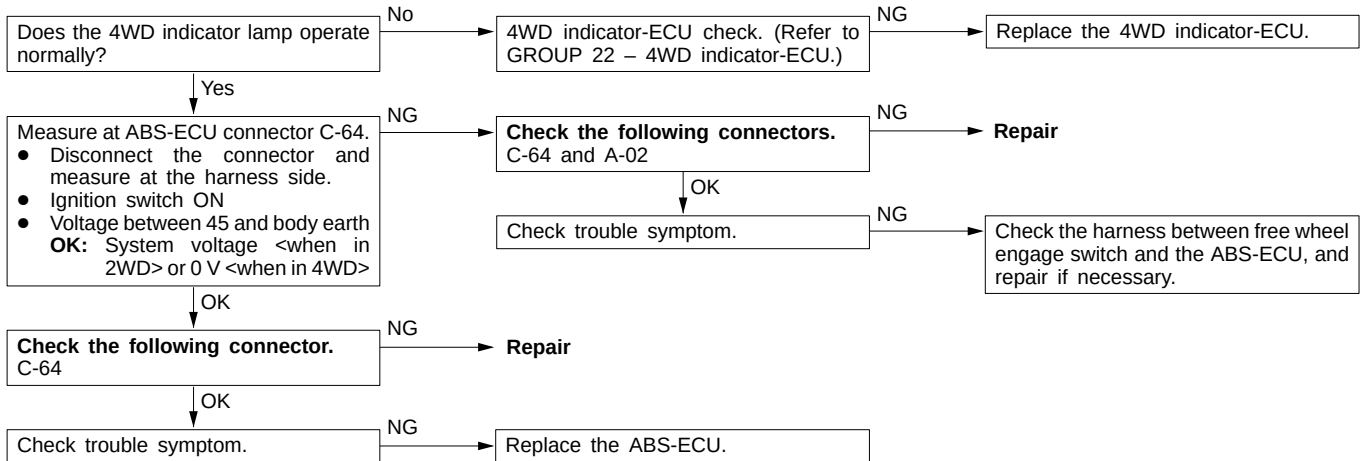
Inspect according to the inspection chart that is appropriate for the malfunction code.

Diagnosis code No.	Inspection item	Diagnosis content	Reference page
11	Front right wheel speed sensor	Open or short circuit	Refer to GROUP 35B – Troubleshooting.
12	Front left wheel speed sensor		
13	Rear right wheel speed sensor		
14	Rear left wheel speed sensor		
15	Wheel speed sensor	Abnormal output signal	Refer to GROUP 35B – Troubleshooting.
16	Power supply system		Refer to GROUP 35B – Troubleshooting.
21	Front right wheel speed sensor	Abnormal	Refer to GROUP 35B – Troubleshooting.
22	Front left wheel speed sensor		
23	Rear right wheel speed sensor		
24	Rear left wheel speed sensor		
25	Free wheel engage switch		35C-7
26	4WD position detection switch		35C-8
27	Rear differential lock detection switch		35C-9
32	G-sensor system		35C-10
33	Stop lamp switch system		Refer to GROUP 35B – Troubleshooting.
41	Front right solenoid valve		Refer to GROUP 35B – Troubleshooting.
42	Front left solenoid valve		
43	Rear solenoid valve		
51	Valve relay		Refer to GROUP 35B – Troubleshooting.
53	Motor relay, motor		Refer to GROUP 35B – Troubleshooting.
63	ABS-ECU		Refer to GROUP 35B – ABS-ECU. (Replace the ABS-ECU.)
64			

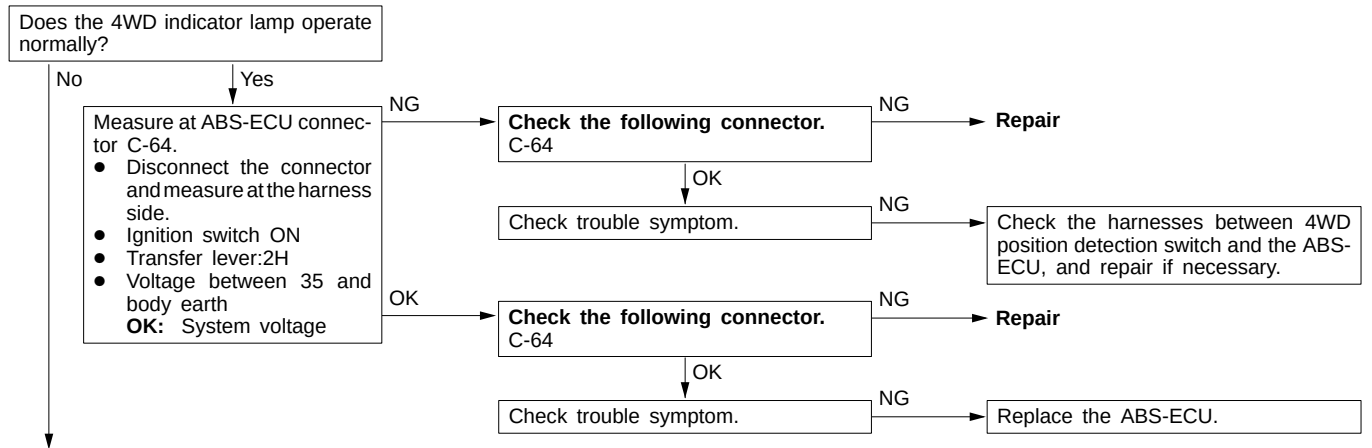
INSPECTION PROCEDURE CLASSIFIED BY DIAGNOSIS CODES

For diagnosis code numbers other than those listed below, refer to GROUP 35B – Troubleshooting.

Code No. 25 Free wheel engage switch	Probable cause
ABS-ECU determines that an open circuit exists in the free wheel engage switch system.	• Malfunction of wiring harness or connector • Malfunction of 4WD indicator-ECU • Malfunction of ABS-ECU



Code No. 26 4WD position detection switch	Probable cause
This code is output at the following times: ABS-ECU determines that an open circuit exists in the 4WD detection switch system. The free wheel engage switch is off and the 4WD detection switch is on at a vehicle speed of 15km/h or more for 5 seconds or more.	• Malfunction of wiring harness or connector • Malfunction of free wheel engage switch • Malfunction of 4WD indicator-ECU • Malfunction of 4WD position detection switch • Malfunction of ABS-ECU

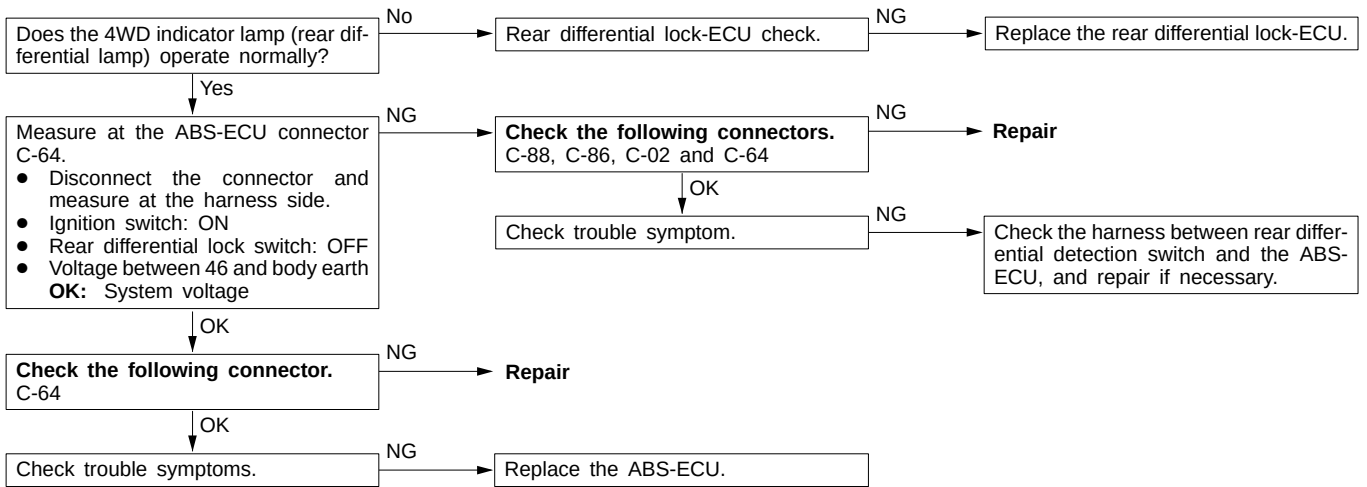


Trouble symptom	Main cause	Remedy
Even when the transfer shift lever is in the "4H" position, the 4WD front wheel indicator lamp does not illuminate.	Broken harness wire between the 4WD indicator-ECU and the free-wheel engage switch, or broken earth wire from the free wheel engage switch	Repair the harness.
	Free wheel engage switch is defective.	Replace the switch.
Even when the transfer shift lever is in the "4H" position, the free wheel differential indicator lamp does not illuminate.	Broken harness wire between the 4WD indicator-ECU and the 4WD position detection switch	Repair the harness.
	Broken wire in the 4WD indicator-ECU circuit	4WD indicator-ECU inspection (Refer to GROUP 22 – 4WD indicator-ECU.)
Free wheel differential indicator lamp illuminates regardless of the position of the transfer shift lever.	Short in the harness wire in the 4WD position detection switch circuit	Repair the harness.
	4WD position detection switch is defective.	Replace the switch.
	Short in the ABS-ECU circuit	Replace the ABS-ECU.
	Short in the 4WD indicator-ECU circuit	4WD indicator-ECU inspection (Refer to GROUP 22 – 4WD indicator-ECU.)
No indicator is illuminated	Power circuit in the 4WD indicator-ECU is defective.	Repair the harness.
	4WD indicator-ECU is defective.	4WD indicator-ECU inspection (Refer to GROUP 22 – 4WD indicator-ECU.)

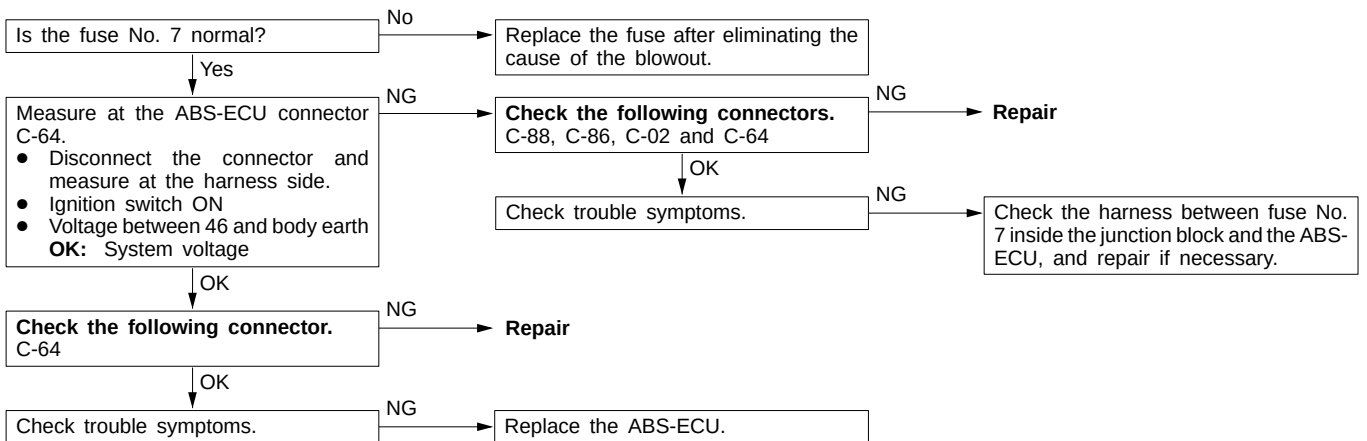
NOTE

When checking a short in the ABS-ECU circuit, remove the ABS-ECU connector and check if the 4WD indicator returns to normal. If it returns to normal, the ABS-ECU is defective. Furthermore, if the ABS-ECU is normal, then the 4WD indicator-ECU will be defective.

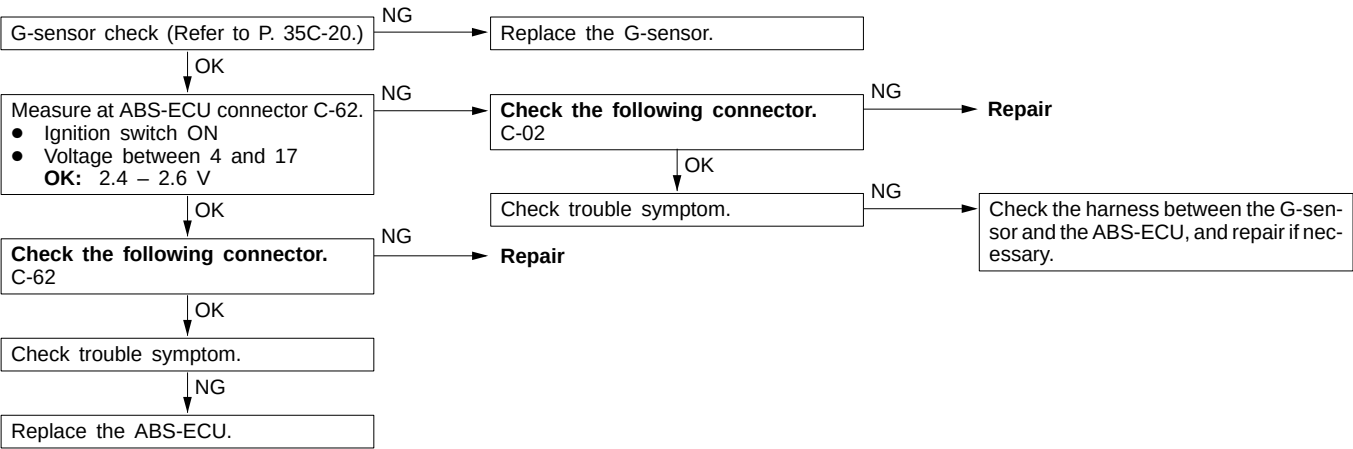
Code No. 27 Rear differential lock detection switch <Vehicles with rear differential lock>	Probable cause
The ABS-ECU determines that an open circuit occurs in rear differential detection switch system.	• Malfunction of wiring harness or connector • Malfunction of rear differential lock-ECU • Malfunction of ABS-ECU



Code No. 27 Rear differential lock detection switch <Vehicles without rear differential lock>	Probable cause
For vehicles without rear differential lock, battery positive voltage is applied to the ABS-ECU terminal No. 46. This code is output when this line is interrupted.	• Malfunction of wiring harness or connector • Malfunction of ABS-ECU



Code No. 32 G-sensor system	Probable cause
This code is output at the following times: The G-sensor output is less than 0.5 V or more than 4.5 V. An open or short circuit is present in the G-sensor system.	• Malfunction of G-sensor • Malfunction of wiring harness or connector • Malfunction of ABS-ECU



ABS WARNING LAMP INSPECTION

35201200086

Refer to GROUP 35B – Troubleshooting.

INSPECTION CHART FOR TROUBLE SYMPTOMS

35201140159

Refer to GROUP 35B – Troubleshooting.

DATA LIST REFERENCE TABLE

35201150107

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
25	Free wheel engage switch	Engage 4WD	ON
		Engage 2WD	OFF
26	4WD detection switch	Place the transfer lever at 4H.	ON
		Place the transfer lever at 2H.	OFF
27	Rear differential lock detection switch	Turn on the switch.	ON
		Turn off the switch.	OFF
32	G-sensor output voltage	Stop the vehicle.	2.4 – 2.6 V
		Perform a test run.	Display value fluctuates with a mean value of 2.5 V.
33	Stop lamp switch	Depress the brake pedal.	ON
		Release the brake pedal.	OFF

2. When the ABS-ECU shut off ABS operation.

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

ACTUATOR TEST INSPECTION TABLE

35201160056

Refer to GROUP 35B – Troubleshooting.

CHECK AT ABS-ECU

35201180137

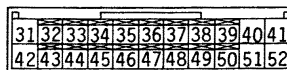
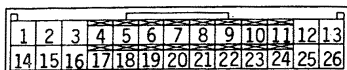
TERMINAL VOLTAGE CHECK CHART

1. Measure the voltages between terminals (15), (16), (25) and (42) (earth terminals) and each respective terminal.

NOTE

Do not measure terminal voltage for approx. 3 seconds after the ignition switch is turned on. The ABS-ECU performs the initial check for that period.

2. The terminal layouts are shown in the illustrations below.



14W0043

Connector terminal No.	Signal	Checking requirements		Normal condition
1	Output to front-left hydraulic unit solenoid valve (OUT side)	Ignition switch: ON (When solenoid valve is off approximately 1 second after engine is started)		System voltage
2	Output to rear hydraulic unit solenoid valve (OUT side)			
3	Output to rear hydraulic unit solenoid valve (IN side)			
4	G-sensor signal	Ignition switch: ON		2.4 – 2.6 V (Horizontal condition)
13	ABS-ECU power supply	Ignition switch: ON		System voltage
		Ignition switch: START		0 V
14	Output to front-left hydraulic unit solenoid valve (IN side)	Ignition switch: ON (When solenoid valve is off approximately 1 second after engine is started)		System voltage
17	G-sensor earth	Always		0 V
26	Output to relay power supply	Ignition switch: ON		System voltage
31	Free wheel engage switch	Ignition switch: ON	2WD	System voltage
			4WD	1 V or less
32	Memory power supply	Always		System voltage
34	Input from stop lamp switch	Ignition switch: ON	Stop lamp switch ON	System voltage
			Stop lamp switch OFF	1 V or less
35	Input from 4WD detection switch	Ignition switch: ON	Transfer lever position: 2H	System voltage
			Transfer lever position: 4H	1 V or less
36	MUT-II	Connect the MUT-II.		Serial communication with MUT-II
		Do not connect the MUT-II.		1 V or less

Connector terminal No.	Signal	Checking requirements		Normal condition
37	Output to valve relay	Ignition switch: ON	Approximately 1 second after engine is started. The relay is on.	2 V or less
			The system runs down. The relay is off.	System voltage
38	Output to motor relay	Ignition switch: ON (Approximately 1 second after engine is started)	Motor is on	2 V or less
			Motor is off	System voltage
39	Idle-up solenoid valve (+)	Ignition switch: ON (When motor is on approximately 1 second after engine is started)		System voltage
41	Output to front-right hydraulic unit solenoid valve (OUT side)	Ignition switch: ON (When solenoid valve is off approximately 1 second after engine is started)		System voltage
43	Idle-up solenoid valve (–)	Ignition switch: ON (When motor is on approximately 1 second after engine is started)		2 V or less
45	Input from free wheel engage switch	Ignition switch: ON	Engage 2WD	System voltage
			Engage 4WD	1 V or less
46*1	Ignition switch	Ignition switch: ON		System voltage
		Ignition switch: START		0 V
46*2	Input from rear differential lock detection switch	Ignition switch: ON	Rear differential lock switch: ON	0 V
			Rear differential lock switch: OFF	System voltage
47	Input from diagnosis indication selection	Connect the MUT-II.		0 V
		Do not connect the MUT-II.		Approx. 12 V
48	Input from valve relay monitor	Ignition switch: ON		System voltage
49	Motor monitor	Ignition switch: ON (Approximately 1 second after engine is started)	Motor is on	System voltage
			Motor is off	0.5 V or less
50	Output to ABS warning lamp	Ignition switch: ON	The lamp is switched off	System voltage
			The lamp illuminates	0 – 2 V
52	Output to front-right hydraulic unit solenoid valve (IN side)	Ignition switch: ON (When solenoid valve is off approximately 1 second after engine is started)		System voltage

NOTE

*1: Vehicles without rear differential lock

*2: Vehicles with rear differential lock

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.

41	40	39	38	37	36	35	34	33	32	31
52	51	50	49	48	47	46	45	44	43	42

13	12	11	10	9	8	7	6	5	4	3	2	1
26	25	24	23	22	21	20	19	18	17	16	15	14

14W0042

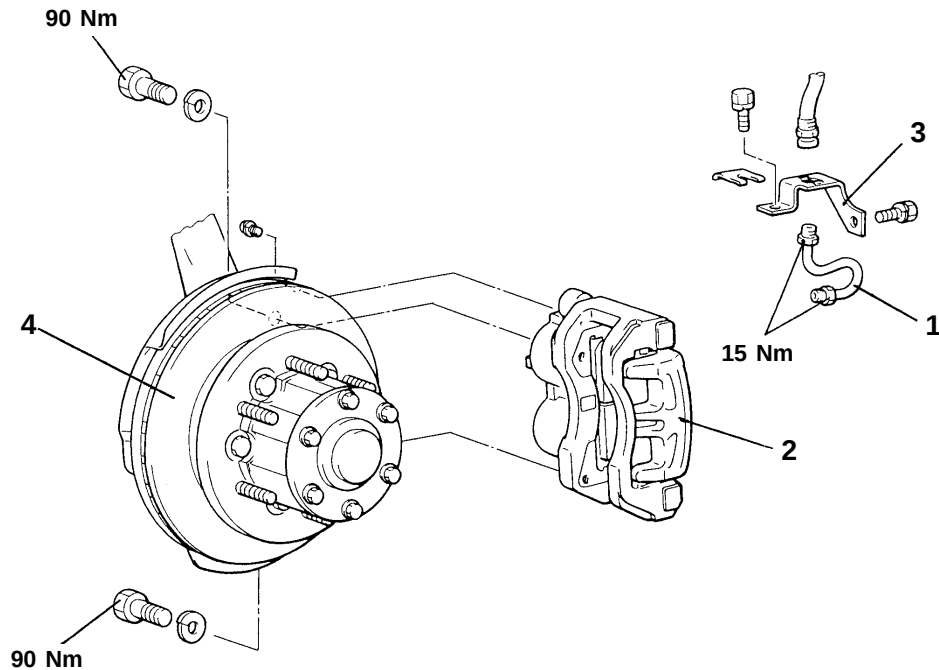
Connector terminal No.	Signal	Normal condition
1 – Body earth	Front-left solenoid valve (OUT side)	2.2 Ω
2 – Body earth	Rear solenoid valve (OUT side)	2.2 Ω
3 – Body earth	Rear solenoid valve (IN side)	5.0 Ω
7 – 20	Front-left wheel speed sensor (+ wire)	1.2 – 1.4 kΩ
8 – 21	Rear-right wheel speed sensor (+ wire)	1.2 – 1.4 kΩ
9 – 22	Rear-left wheel speed sensor (+ wire)	1.2 – 1.4 kΩ
10 – 23	Front-right wheel speed sensor (+ wire)	1.2 – 1.4 kΩ
14 – Body earth	Front-left solenoid valve (IN side)	5.0 Ω
15 – Body earth	ABS-ECU earth	Continuity
16 – Body earth		
25 – Body earth		
39 – 43	Idle-up solenoid valve	37 – 44 Ω
41 – Body earth	Front-right solenoid valve (OUT side)	2.2 Ω
42 – Body earth	ABS-ECU earth	Continuity
48 – Body earth	Input from valve relay monitor	Continuity
49 – Body earth	Motor monitor	Continuity
52 – Body earth	Front-right solenoid valve (IN side)	5.0 Ω

FRONT DISC BRAKE**REMOVAL AND INSTALLATION****Pre-removal Operation**

- Brake Fluid Draining

Post-installation Operation

- Brake Fluid Supplying
- Brake Line Bleeding
(Refer to GROUP 35B – On-vehicle Service.)



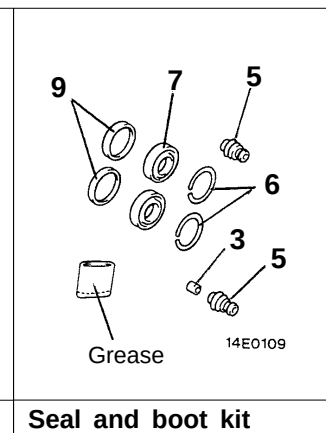
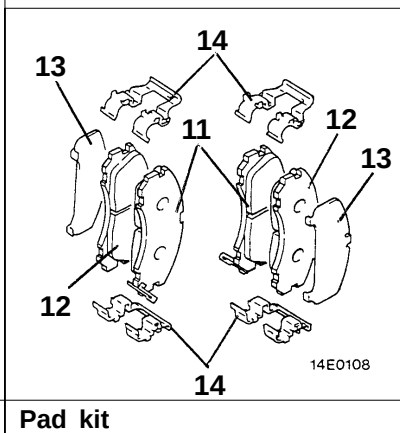
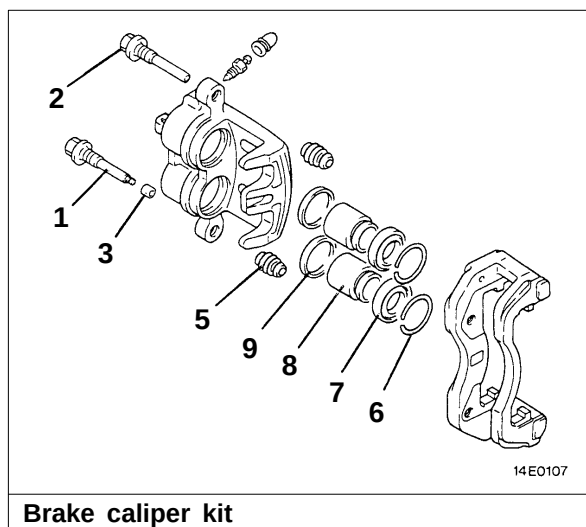
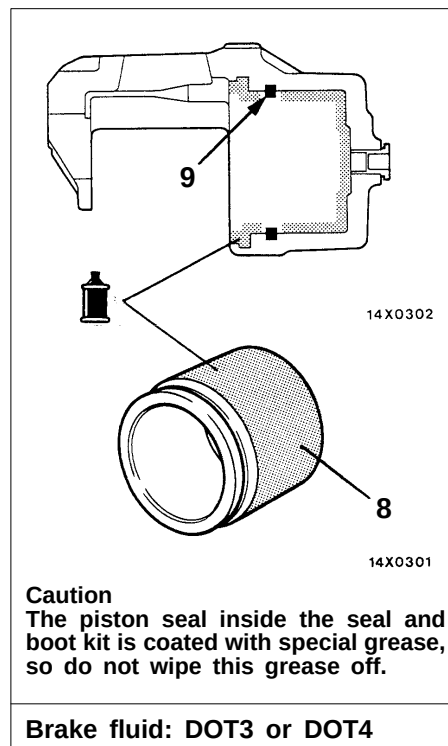
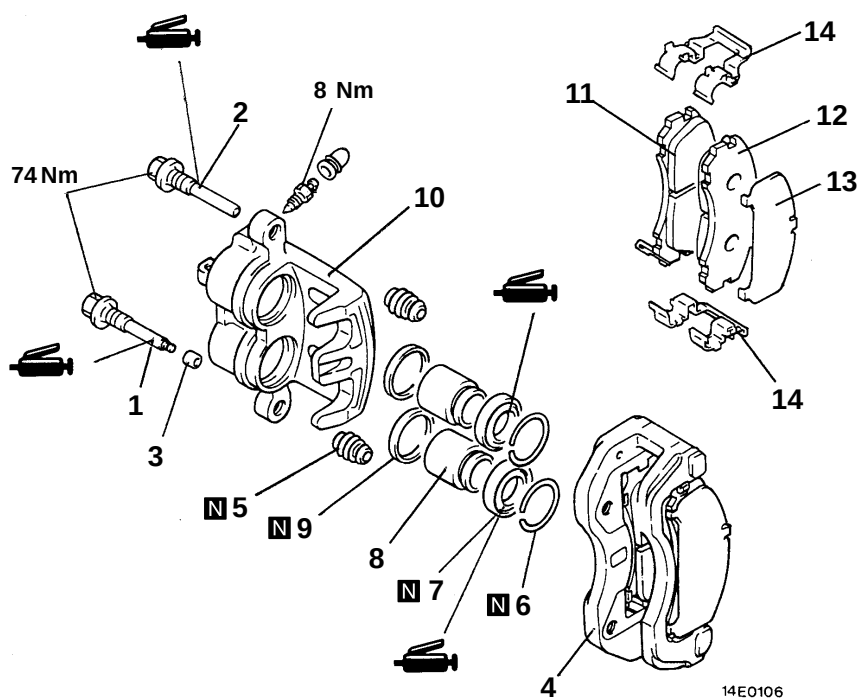
A14V0047

Removal steps

1. Brake tube
2. Front brake assembly (Refer to GROUP 35B – Front Disc Brake.)
3. Brake hose bracket
4. Brake disc (Refer to GROUP 26 – Front Hub Assembly.)

DISASSEMBLY AND REASSEMBLY

35200620029



00004876

Caliper assembly disassembly steps

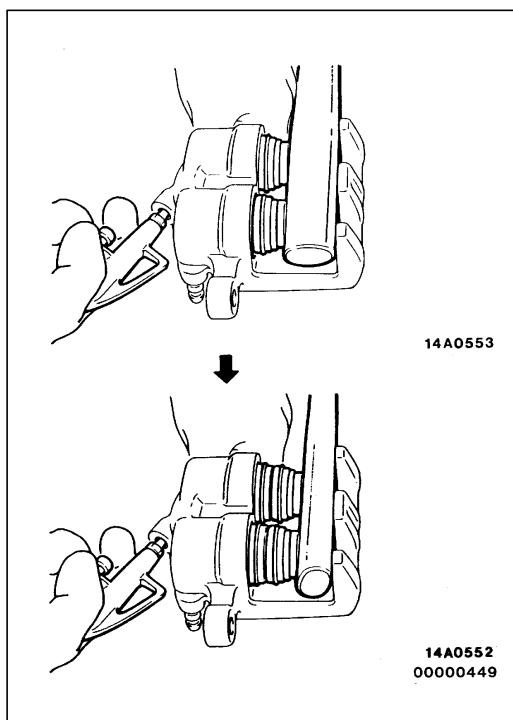


1. Lock pin
2. Guide pin
3. Bushing
4. Caliper support (Pad, clip and shim)
5. Pin boot
6. Boot ring
7. Piston boot
8. Piston
9. Piston seal
10. Caliper body

Pad assembly disassembly steps



1. Lock pin
2. Guide pin
3. Bushing
4. Caliper support (Pad, clip and shim)
11. Pad and wear indicator assembly
12. Pad assembly
13. Outer shim
14. Clip



DISASSEMBLY SERVICE POINTS

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

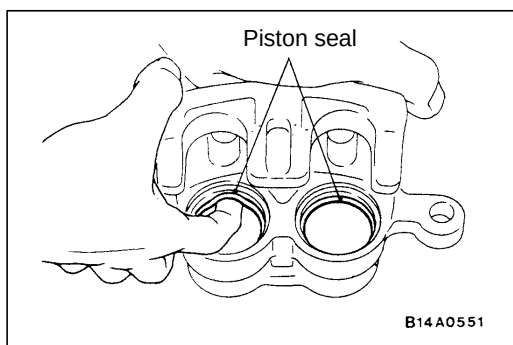
◀A▶ PISTON BOOT/PISTON REMOVAL

Pump in compressed air through the brake hose installation hole and remove the pistons and piston boot.

Caution

When removing the pistons, be sure to use the handle of a plastic hammer and adjust the height of the two pistons while pumping air slowly in so that the pistons protrude evenly.

Do not remove one piston completely before trying to remove the other piston because it will become impossible to remove the second piston.



◀B▶ PISTON SEAL REMOVAL

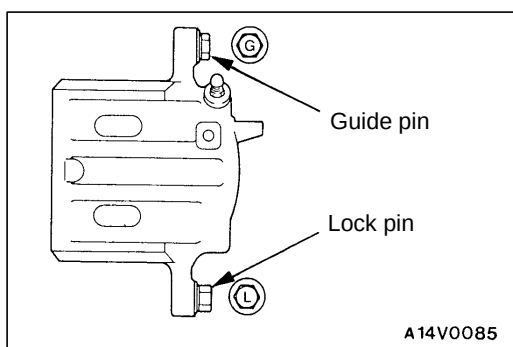
- (1) Remove piston seal with finger tip.

Caution

Do not use a screwdriver or other tool to prevent damage to inner cylinder.

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

Specified brake fluid: DOT3 or DOT 4



REASSEMBLY SERVICE POINT

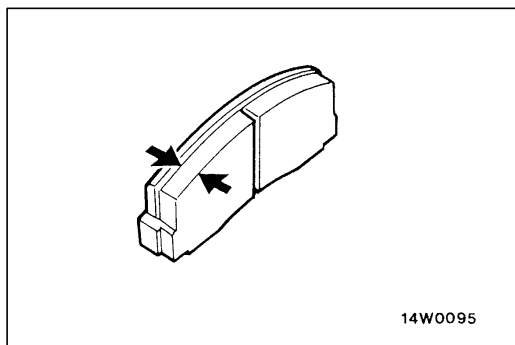
▶A◀ LOCK PIN/GUIDE PIN INSTALLATION

Install the lock pin and the guide pin to the caliper body as illustrated.

INSPECTION

35200630015

- 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.

**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: 10 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 thicknesses of the pads on the left and right sides, check the sliding condition of the piston, lock pin and guide pin.

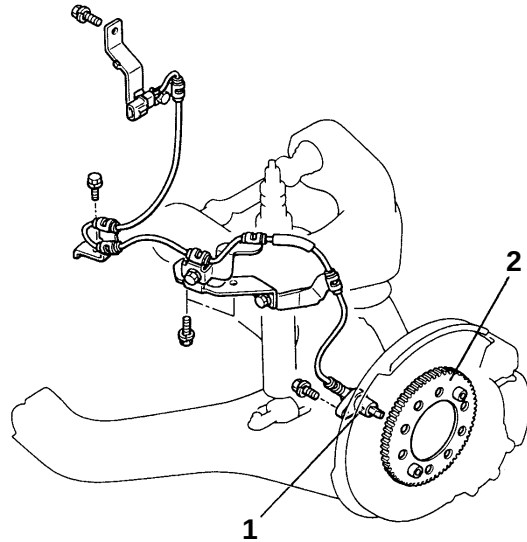
WHEEL SPEED SENSOR

35200830170

REMOVAL AND INSTALLATION

Post-installation Operation

- Wheel Speed Sensor Output Voltage Checking
(Refer to GROUP 35B – On-vehicle Service.)



A14V0056

1. Front speed sensor
2. Front rotor
(Refer to GROUP 26 – Front Hub.)

NOTE

The rear wheel speed sensor is the same as 2WD.

INSPECTION

Refer to GROUP 35B.

35200840135

G-SENSOR

35201010078

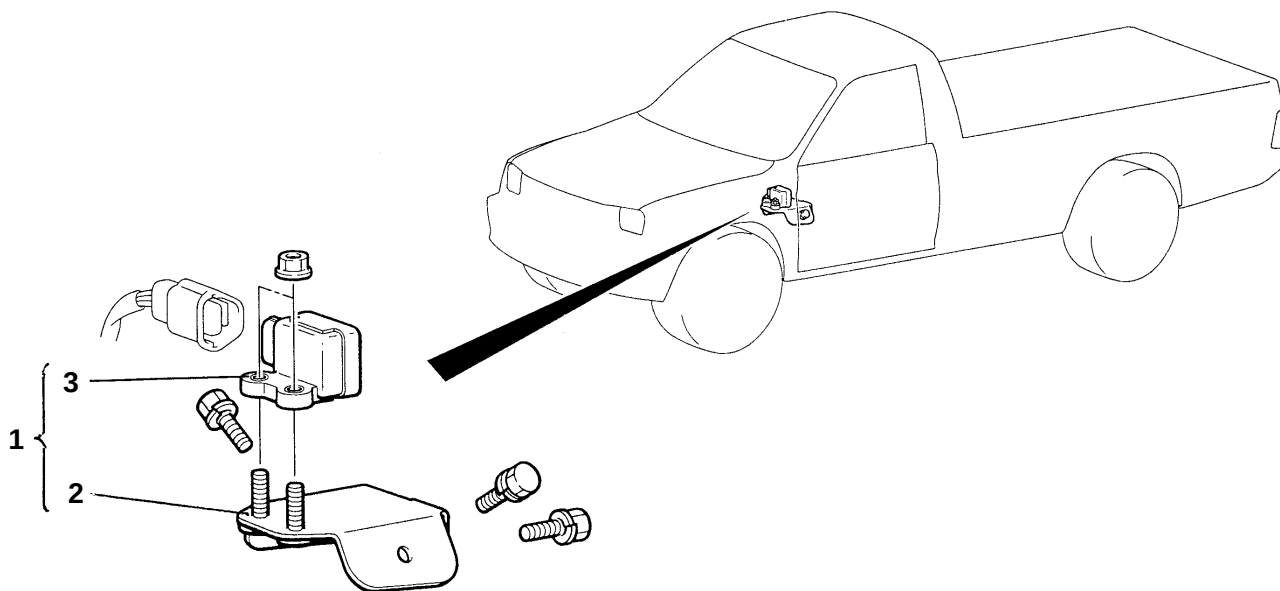
REMOVAL AND INSTALLATION

CAUTION: SRS

When removing and installing the G-sensor from/to vehicles equipped with SRS, do not let it bump against the SRS diagnostic unit or other components.

Pre-removal and Post-installation Operation

- SRS diagnostic unit Removal and Installation (Refer to GROUP 52B.)



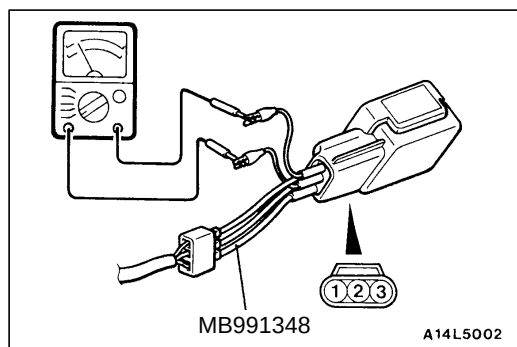
A 14V0065

Removal steps

1. G-sensor assembly
2. G-sensor bracket
3. G-sensor

Caution

Do not drop the G-sensor or subject it to shocks.

**INSPECTION**

35201020057

- (1) Disconnect the G-sensor connector and connect the special tool between the terminals of the disconnected connector.
- (2) Turn the ignition switch to ON and take a reading of the following output voltage. Between terminals (2) and (3).

Standard value: 2.4 – 2.6 V

- (3) With the special tool still connected, secure the G-sensor so that the arrow mark on the sensor mounting surface faces straight down, and then take a reading of the following output voltage between terminals (2) and (3).

Standard value: 3.4 – 3.6 V

- (4) If the voltages is outside the standard value, after checking to be sure that there is no abnormality in the power supply and earth wires, replace the G-sensor.

