

GROUP 35A

BASIC BRAKE SYSTEM

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GENERAL INFORMATION

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Brake systems with higher reliability and durability have achieved distinguished braking performance.

FEATURES

IMPROVEMENT OF BRAKING PERFORMANCE

- In addition to the 10-inch single brake booster, the small and long stroke-type master cylinder is used to achieve the downsizing and secure the assist force.
- The installation of 16-inch ventilated disc brake on the front axle and 16-inch solid disc brake on the rear axle achieves the secure braking force and direct braking feeling.

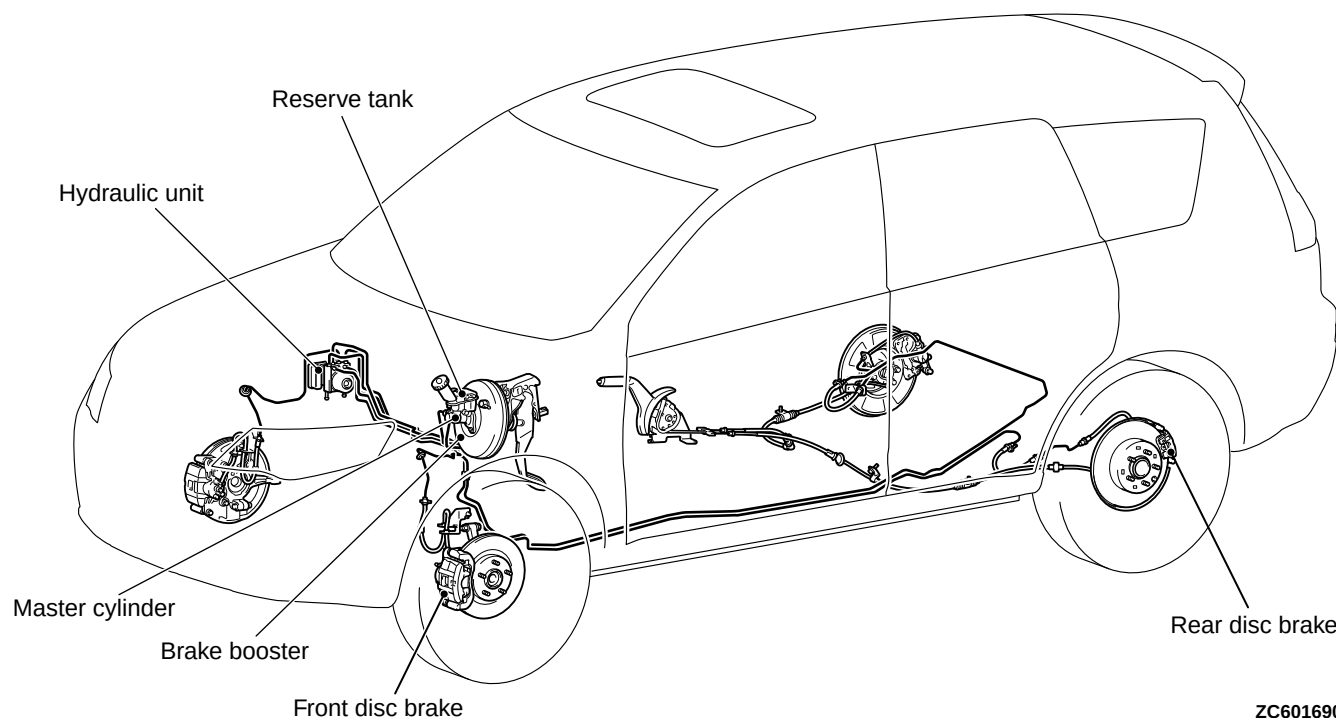
IMPROVEMENT IN SAFETY

- The 4-wheel anti-lock brake system (4ABS) has been installed to prevent slippage resulting from the wheel lock and assure stable vehicle posture and driveability.

- Electronic control braking force distribution system (EBD) has been adopted to assure the maximum braking force independently of the passenger's position in the vehicle.
- X-type piping of brake lines have been adopted for the front and rear wheels.
- Audible wear indicator has been adopted to the front and rear brake pads to warn the driver of the wear limit.

SERVICE QUALITY IMPROVEMENTS

- Diagnostic function has been adopted to ABS for easier inspection.
- Brake fluid reservoir, master cylinder, and brake booster have been integrated for downsizing and better serviceability.



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GENERAL SPECIFICATIONS

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Item		Specifications
Master cylinder	Type	Tandem type

**BASIC BRAKE SYSTEM
SERVICE SPECIFICATIONS**

Item		Specifications
	I.D. mm (in)	20.6 (0.81)
Brake booster	Type	Vacuum type, single
	Effective dia. of power cylinder mm (in)	255 (10.0)
	Boosting ratio	8.5 (Pedal pressure: 160N)
Rear wheel hydraulic control method		Electronic control braking force distribution system (EBD)
Front brake	Type	Floating caliper 1 piston ventilated disc (V6-S57)
	Disc effective dia × thickness mm (in)	294 × 26 (11.6 × 1.02)
	Wheel cylinder I.D. mm (in)	57.1 (2.25)
	Pad thickness mm (in)	10.0 (0.39)
	Clearance adjustment	Automatic adjustment
Rear brake	Type	Floating caliper 1 piston solid disc (S6-S38)
	Disc effective dia × thickness mm (in)	302 × 10 (11.9 × 0.39)
	Wheel cylinder I.D. mm (in)	38.1 (1.50)
	Pad thickness mm (in)	10.0 (0.39)
	Clearance adjustment	Automatic adjustment

SERVICE SPECIFICATIONS

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Item		Standard value	Limit
Brake pedal height mm (in)		221.8 - 227.8 (8.7 - 9.0)	-
Dimension from the brake booster stud bolt end to the clevis hole center mm (in)		75.8 - 80.2 (2.98 - 3.16)	-
Brake pedal play mm (in)		3 - 8 (0.12 - 0.31)	-
Pedal-to-floor clearance when brake pedal is depressed mm (in) [Pedal depression force: approx. 500 N]		80 (3.15) or more	-
Fluid pressure generated by brake booster non-servo effect test kPa (psi)	Pedal depression force: 100 N	200 (29) or more	-
	Pedal depression force: 300 N	1,800 (261) or more	-
Fluid pressure generated by brake booster servo effect test kPa (psi)	Pedal depression force: 100 N	6,050 - 7,950 (877 - 1,153)	-
	Pedal depression force: 300 N	10,720 (1,554) or more	-
Front disc brake	Pad thickness mm (in)	10.0 (0.39)	Minimum 2.0 (0.08)
	Brake disc thickness mm (in)	26.0 (1.02)	Minimum 24.4 (0.96)
	Brake disc runout mm (in)	-	0.06 (0.0024)

Item		Standard value	Limit
	Brake drag force N (lb)	68 (15.3) or less	-
Rear disc brake	Pad thickness mm (in)	10.0 (0.39)	Minimum 2.0 (0.08)
	Brake disc thickness mm (in)	10.0 (0.39)	Minimum 8.4 (0.33)
	Brake disc runout mm (in)	-	0.08 (0.0032)
	Brake drag force N (lb)	68 (15.3) or less	-
Front wheel bearing looseness mm (in)		-	0.05 (0.0020)
Rear wheel bearing looseness mm (in)		-	0.05 (0.0020)
Brake pedal distortion mm (in)		250 - 254 (9.8 - 10.0)	-

LUBRICANTS

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Item	Specified lubricant	Quantity
Brake fluid	DOT3 or DOT4	Adequate
Master cylinder body, wheel cylinder body, piston cup, piston, piston seal		
Guide pin, lock pin, pin boot, bushing	Repair kit grease (solid orange)	
Boot ring, piston boot	Repair kit grease (translucent red)	

BASIC BRAKE SYSTEM DIAGNOSIS

INTRODUCTION TO BASIC BRAKE SYSTEM DIAGNOSIS

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Hydraulic brakes are composed of the brake pedal, master cylinder, brake booster and disc brakes. Malfunctions such as insufficient braking power or the generation of noise may occur due to wear, damage or incorrect adjustment of these components.

BASIC BRAKE SYSTEM DIAGNOSTIC TROUBLESHOOTING STRATEGY

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- Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure that you have exhausted most of the possible ways to find a basic brake system fault.
1. Gather information from the customer.
 2. Verify that the condition described by the customer exists.
 3. Find the malfunction by following the symptom chart.
 4. Verify malfunction is eliminated.

SYMPTOM CHART

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SYMPTOM	INSPECTION PROCEDURE	REFERENCE PAGE
Vehicle pulls to one side when brakes are applied	1	P.35A-6
Insufficient braking power	2	P.35A-7
Increased pedal stroke (Reduced pedal-to-floor board clearance)	3	P.35A-7
Brake drag	4	P.35A-8
Scraping or grinding noise when brake are applied	5	P.35A-9

SYMPTOM	INSPECTION PROCEDURE	REFERENCE PAGE
Squealing, groaning or chattering noise when brake are applied	6	P.35A-10
Squealing noise when brakes are not applied	7	P.35A-11
Groaning, clicking or rattling noise when brakes are not applied	8	P.35A-12

SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: Vehicle Pulls to One Side when Brakes are Applied

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DIAGNOSIS

STEP 1. Check for oil, water, etc., on the pad contact surface of all brakes.

Q: Is oil, water, etc., on the pad contact surface?

YES: Replace the part and determine the source/cause of foreign material. Then go to Step 5.

NO: Go to Step 2.

STEP 2. Check disc brake pistons for smooth operation.

(1) With engine not running, depress the brake pedal rapidly several times to deplete booster vacuum reserves.

(2) Test each disc brake assembly one at a time. Remove the lower caliper bolt, then remove caliper from mount.

Have an assistant slowly depress the brake pedal. Confirm piston(s) extend slowly and smoothly with no jumpiness. Repeat for each disc brake assembly.

Q: Do (does) the piston(s) move correctly?

YES: Go to Step 3.

NO: Disassemble and inspect the brake assembly (Front: refer to P. 35A-30, Rear: refer to P. 35A-35). Then go to Step 5.

STEP 3. Check brake disc(s) for runout.

Refer to P.35A-21.

Q: Is runout outside of specifications?

YES: Repair or replace the brake disc(s) as necessary. Then go to Step 5.

NO: Go to Step 4.

STEP 4. Check brake discs for correct thickness.

Refer to P.35A-21.

Q: Is the thickness outside of specifications?

YES: Repair or replace the brake disc(s) as necessary. Then go to Step 5.

NO: Perform the brake line bleeding. Then go to Step 5.

STEP 5. Retest the system.

Q: Is the symptom eliminated?

YES: The procedure is complete.

NO: Start over at Step 1. If a new symptom appears, refer to the appropriate symptom chart.

INSPECTION PROCEDURE 2: Insufficient Braking Power

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DIAGNOSIS

STEP 1. Check that the specified brake fluid is used, its level is correct, and no contamination is found.

Q: Is there a fault?

YES: Refill or replace with the specified brake fluid DOT 3 or DOT 4. Bleed the brakes if necessary (Refer to P.35A-18). Then go to Step 6.

NO: Go to Step 2.

STEP 2. Check for spongy (not firm) brakes.

- (1) With engine not running, depress the brake pedal rapidly several times to deplete the booster vacuum reserve.
- (2) With the brake pedal fully released, depress the brake pedal slowly until it stops.
- (3) With a measuring device (ruler, etc.) next to the brake pedal, depress the pedal firmly and measure the distance the pedal traveled.

Q: Is the distance greater than 20 mm (0.8 inch)?

YES: Bleed the brakes to remove air in the fluid (Refer to P.35A-18). Then go to Step 6.

NO: Go to Step 3.

STEP 3. Check the brake booster function.

Refer to P.35A-16.

Q: Is there a fault?

YES: Replace the brake booster. Then go to Step 6.

NO: Go to Step 4.

STEP 4. Check for pinched or restricted brake tube or hose.

Q: Is there a pinched or restricted brake tube or hose?

YES: Replace that complete section of brake tube or brake hose. Then go to Step 6.

NO: Go to Step 5.

STEP 5. Check for oil, water, etc., on the pad contact surfaces of all brakes.

Q: Is oil, water, etc., on the pad contact surface?

YES: Replace the part and determine the source/cause of foreign material. Recheck symptom. Then go to Step 6.

NO: The procedure is complete. If condition persists for vehicles without ABS, go to Step 6.

STEP 6. Recheck symptom.

Q: Is the symptom eliminated?

YES: The procedure is complete.

NO: Start over at step 1. If a new symptom surfaces, refer to the appropriate symptom chart.

INSPECTION PROCEDURE 3: Increased Pedal Stroke (Reduced Pedal-to-Floor Board Clearance)

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DIAGNOSIS

STEP 1. Check for spongy (not firm) brakes.

- (1) With engine not running, depress the brake pedal rapidly several times to deplete booster vacuum reserve.
- (2) With the brake pedal fully released, depress the brake pedal slowly until it stops.

- (3) With a measuring device (ruler, etc.) next to the brake pedal, depress the pedal firmly and measure the distance the pedal traveled.

Q: Is the distance greater than 20 mm (0.8 inch)?

YES: Bleed the brakes to remove air in the fluid (Refer to P.35A-18). Then go to Step 6.

NO: Go to Step 2.

STEP 2. Check the pad for wear.

Refer to P.35A-21.

YES: Repair it. Then go to Step 6.**NO:** Go to Step 5.**Q:Is the pad thickness outside of specifications?****YES:** Replace the part. Then go to Step 6.**NO:** Go to Step 3.**STEP 3. Check the vacuum hose and check valve for damage.**

Refer to P.35A-18.

Q:Is there a damage?**YES:** Replace the part. Then go to Step 6.**NO:** Go to Step 4.**STEP 4. Check the master cylinder function.**

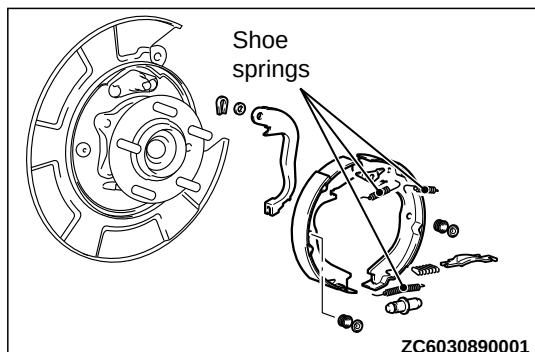
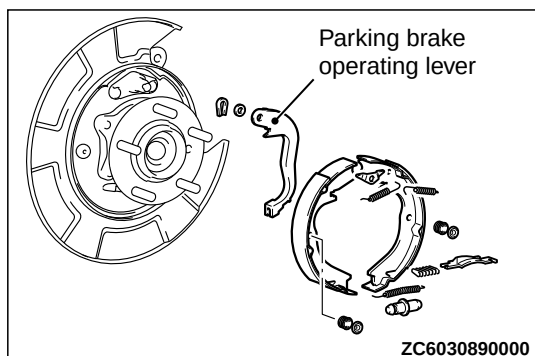
Refer to P.35A-22.

Q:Is there a fault?**STEP 5. Check for brake fluid leaks.****Q:Is there a leak?****YES:** Check the connection for looseness, corrosion, etc. Clean and repair as necessary. If leaking in any tube or hose section, replace the complete tube or hose. Then go to Step 6.**NO:** Go to Step 6.**STEP 6. Recheck symptom.****Q:Is the symptom eliminated?****YES:** The procedure is complete.**NO:** Start over at step 1. If a new symptom surfaces, refer to the symptom chart.**INSPECTION PROCEDURE 4: Brake Drag**

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DIAGNOSIS**STEP 1. Check the parking brake operating lever return.****Q:Is the operation faulty?****YES:** Repair it. Then go to Step 7.**NO:** Go to Step 2.**STEP 2. Check the brake shoe springs for breakage.****Q:Are the brake shoe springs broken?****YES:** Replace the spring. Then go to Step 7.**NO:** Go to Step 3.**STEP 3. Check the amount of grease at each sliding section.**

Refer to GROUP 36, Parking Brake Lining and Drum P. 36-14.



Q:Is the grease amount low?

YES: Apply grease. Then go to Step 7.

NO: Go to Step 4.

STEP 4. Check the parking brake pull amount.

Refer to GROUP 36, On-vehicle Service - Parking Brake lever Stroke Check and Adjustment P.36-11.

Q:Is there a fault?

YES: Adjust it. Then go to Step 7.

NO: Go to Step 5.

STEP 5. Check port for clogging.

Q:Is the port clogged?

YES: Repair it. Then go to Step 7.

NO: Go to Step 6.

STEP 6. Check disc brake pistons for sticking.

Depress the brake pedal, then release. Confirm each wheel spins freely.

Q:Does any wheel stick?

YES: Inspect that brake assembly. Then go to Step 7.

NO: Go to Step 7.

STEP 7. Recheck symptom.

Q:Is the symptom eliminated?

YES: The procedure is complete.

NO: Start over at step 1. If a new symptom surfaces, refer to the symptom chart.

INSPECTION PROCEDURE 5: Scraping or Grinding Noise when Brakes are Applied

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DIAGNOSIS

STEP 1. Check the front brakes, then rear brakes, for metal-to-metal condition.

Q:Is any metal-to-metal contact evident?

YES: Repair or replace the components. Then go to Step 6.

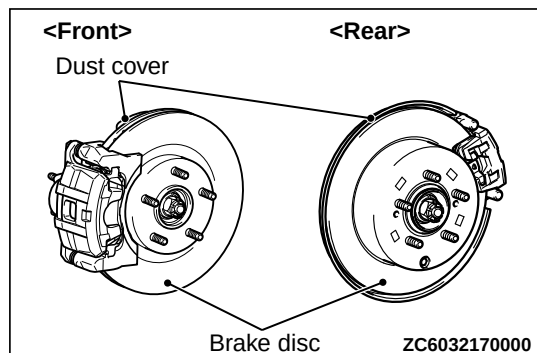
NO: Go to Step 2.

STEP 2. Check for interference between the caliper and wheel.

Q:Is there any interference?

YES: Repair or replace the part. Then go to Step 6.

NO: Go to Step 3.



STEP 3. Check for interference between the dust cover and brake disc.

Q: Is there any interference?

YES: Repair or replace the part. Then go to Step 6.

NO: Go to Step 4.

STEP 4. Check the brake drums or discs for cracks.

Q: Are there cracks?

YES: Repair or replace the part. Then go to Step 6.

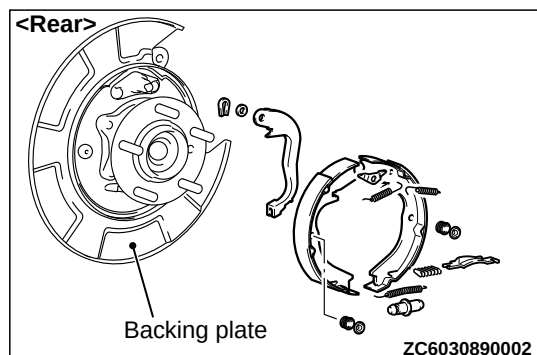
NO: Go to Step 5.

STEP 5. Check for bent backing plate(s).

Q: Is (Are) the backing plate(s) bent?

YES: Repair or replace the part. Then go to Step 6.

NO: Go to Step 6.



STEP 6. Recheck symptom.

Q: Is the symptom eliminated?

YES: The procedure is complete.

NO: Start over at step 1. If a new symptom surfaces, refer to the symptom chart.

INSPECTION PROCEDURE 6: Squealing, Groaning or Chattering Noise when Brakes are Applied

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DIAGNOSIS

STEP 1. Check the brake disc and pads for wear or cutting.

Q: Is there wear or cutting?

YES: Repair or replace the part. Then go to Step 4.

NO: Go to Step 2.

STEP 2. Check the calipers for rust.

Q: Is there any rust?

YES: Remove the rust. Then go to Step 4.

NO: Go to Step 3.

STEP 3. Adjust the brake pedal.

Refer to P.35A-14.

Q: Is the brake pedal adjusted correctly?

YES: Go to Step 4.

NO: Adjust the brake pedal. Then go to Step 4.

YES: The procedure is complete.

NO: Start over at step 1. If a new symptom surfaces, refer to the symptom chart.

STEP 4. Recheck symptom.

Q:Is the symptom eliminated?

INSPECTION PROCEDURE 7: Squealing Noise when Brakes are not Applied

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DIAGNOSIS

STEP 1. Check whether the backing plate is bent or loose and interfering with the drum.

Q:Is there a fault?

YES: Replace the part. Then go to Step 9.

NO: Go to Step 2.

STEP 2. Check whether the drum is damaged due to interference with the backing plate or shoe.

Q:Is there any damage?

YES: Replace the part. Then go to Step 9.

NO: Go to Step 3.

STEP 3. Check the brake drum for wear and the shoe spring for damage.

Q:Is there any wear or damage?

YES: Replace the part. Then go to Step 9.

NO: Go to Step 4.

STEP 4. Check the brake discs for rust.

Q:Are the brake discs rusted?

YES: Remove the rust by using sand paper. If still rusted, turn the rotors with an on-the-car brake lathe. Then go to Step 9.

NO: Go to Step 5.

STEP 5. Check the brake pads for correct installation.

Q:Are the pads installed incorrectly?

YES: Repair the pads. Then go to Step 9.

NO: Go to Step 6.

STEP 6. Check the calipers for correct installation.

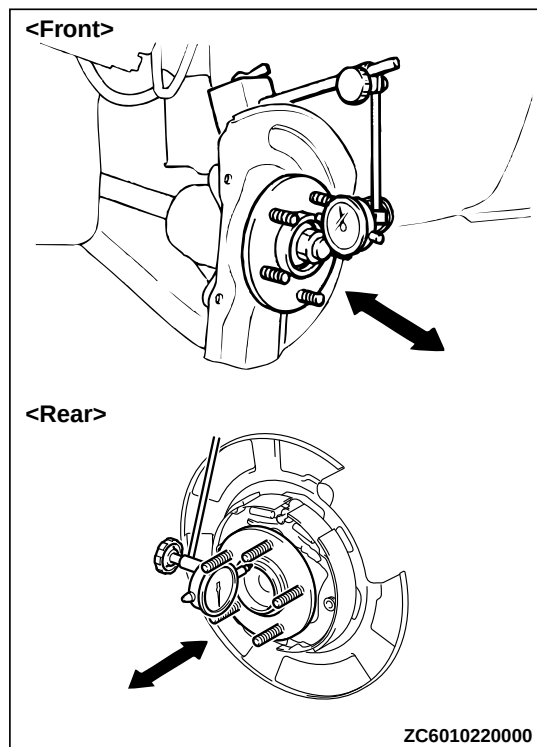
Q:Are the calipers installed incorrectly?

YES: Repair the calipers. Then go to Step 9.

NO: Go to Step 7.

STEP 7. Check the wheel bearings for end play.

(1) Remove the brake discs.



(2) Place a dial gauge as shown, and measure the end play while moving the hub in the axial direction.

Limit: 0.05 mm (0.002 inch)

Q: Does the measured end play exceed the limit?

YES: Replace the faulty hub assembly. Then go to Step 9.

NO: Go to Step 8.

STEP 8. Adjust the brake pedal.

Refer to P.35A-14.

Q: Is the brake pedal adjusted correctly?

YES: Go to Step 9.

NO: Adjust the brake pedal. Then go to Step 9.

STEP 9. Recheck symptom.

Q: Is the symptom eliminated?

YES: The procedure is complete.

NO: Start over at step 1. If a new symptom surfaces, refer to the symptom chart.

INSPECTION PROCEDURE 8: Groaning, Clicking or Rattling Noise when Brakes are not Applied.

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DIAGNOSIS

STEP 1. Check whether foreign material has entered the wheel covers.

Q: Is there any foreign material?

YES: Remove it. Then go to Step 5.

NO: Go to Step 2.

STEP 2. Check for looseness of the wheel nuts.

Q:Are the wheel nuts loose?

YES: Tighten to $98 \pm 10 \text{ N}\cdot\text{m}$ ($73 \pm 7 \text{ ft}\cdot\text{lb}$). Then go to Step 5.

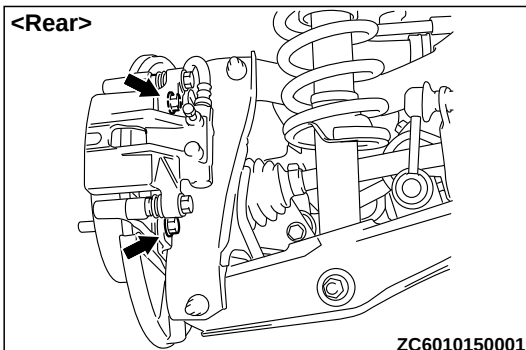
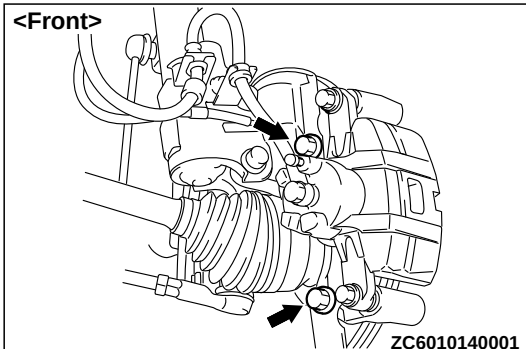
NO: Go to Step 3.

STEP 3. Check for looseness of the caliper installation bolt.

Q:Is the caliper installation bolt loose?

YES: Tighten to $100 \pm 10 \text{ N}\cdot\text{m}$ ($74 \pm 7 \text{ ft}\cdot\text{lb}$) for the front caliper. Tighten to $60 \pm 5 \text{ N}\cdot\text{m}$ ($45 \pm 3 \text{ ft}\cdot\text{lb}$) for the rear caliper. Then go to Step 5.

NO: Go to Step 4.



STEP 4. Check the wheel bearings for end play.

(1) Remove the brake discs.

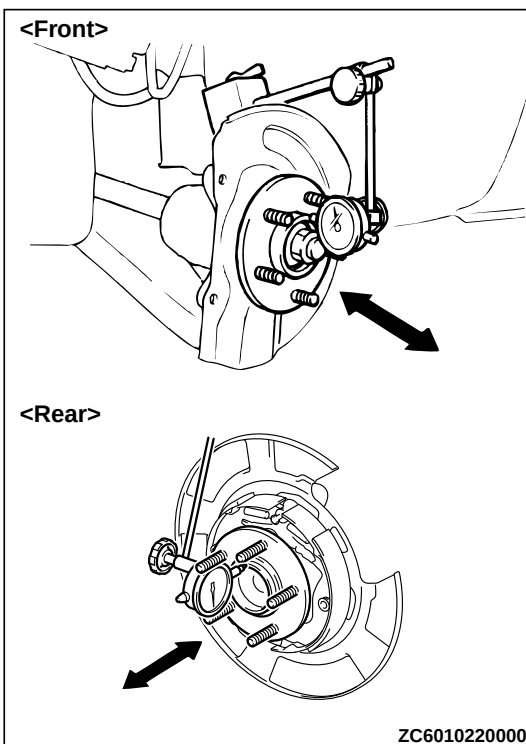
(2) Place a dial gauge as shown, and measure the end play while moving the hub in the axial direction.

Limit: 0.05 mm (0.002 inch)

Q:Does the measured end play exceed the limit?

YES: Replace the faulty hub assembly. Then go to Step 5.

NO: Go to Step 5.



STEP 5. Recheck symptom.

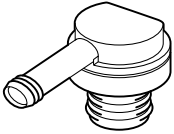
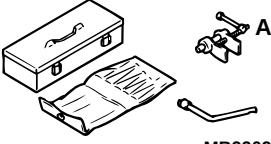
Q:Is the symptom eliminated?

YES: The procedure is complete.

NO: Start over at step 1. If a new symptom surfaces, refer to the symptom chart.

SPECIAL TOOL

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Tool	Number	Name	Use
 MB992146	MB992146	Booster adapter test	Inspection using a simplified tester
 MB990964	MB990964 A: MB990520	Brake tool set A: Piston expander	Disc brake piston pushing back

ON-VEHICLE SERVICE

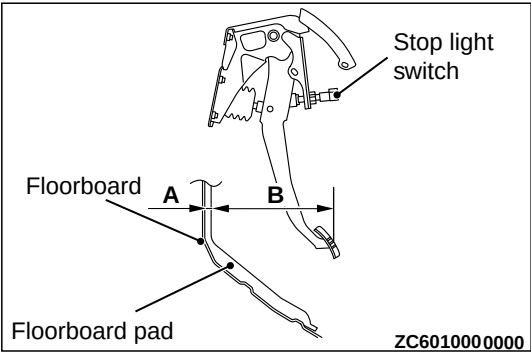
BRAKE PEDAL CHECK

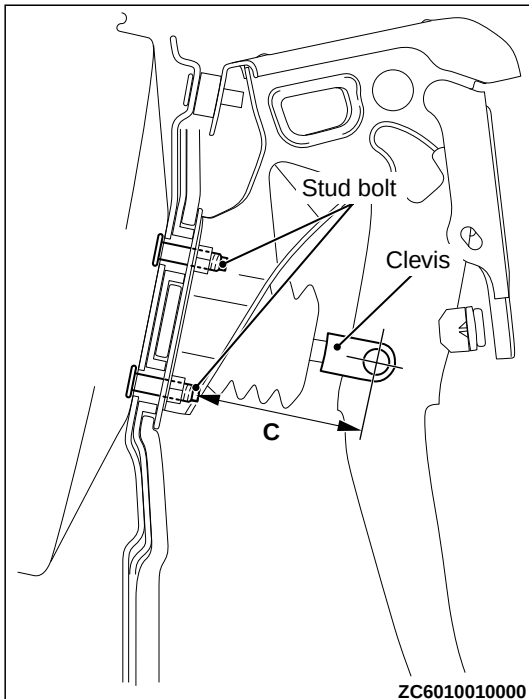
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BRAKE PEDAL HEIGHT CHECK

1. Turn up the floor carpet under the brake pedal.
2. Remove the stoplight switch. (Refer to P.35A-22.)
3. Use a needle or similar tool to measure the dimension A in the figure (distance from the dash panel pad surface to the dash panel).
4. Measure the dimension B in the figure (distance from the pedal pad surface to the dash panel pad surface).
5. Make sure that the total of the dimensions A and B measured in Steps 2 and 3 (brake pedal height) is within the standard value.

Standard value (A+B): 221.8 - 227.8 mm (8.7 - 9.0 inch)





6. When the brake pedal height is not within the standard value, inspect the brake pedal in the following procedure.
 - (1) Remove the brake pedal assembly. (Refer to P.35A-22.)
 - (2) Check the removed brake pedal assembly for distortion, and replace it when deformed. (Refer to P.35A-22.)
 - (3) Install the brake pedal assembly. (Refer to P.35A-22.)

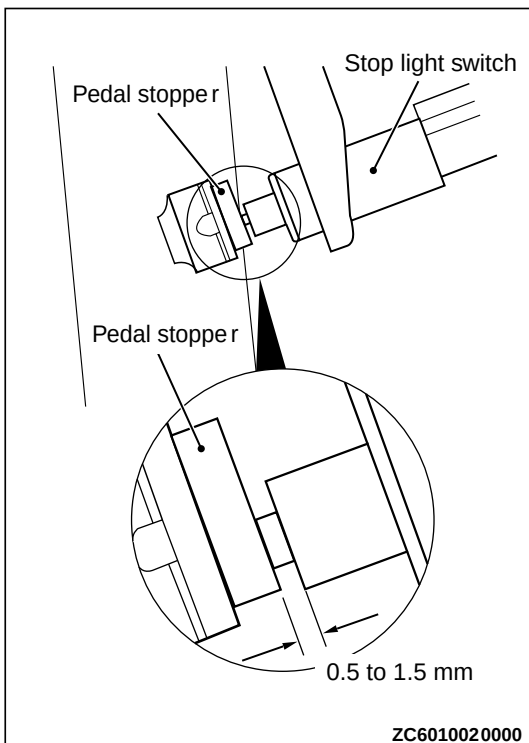
NOTE: When installing, compress the dash panel pad.

- (4) Measure the brake pedal height again, and make sure that it is within the standard value (A+B).

When the measured value is not within the standard value, measure the dimension C in the figure (distance from the stud bolt end to the clevis hole center), and make sure it is within the standard value (C).

Standard value (C): 75.8 - 80.2 mm (2.98 - 3.16 inch)

- (5) When the measured value is not within the standard value (C), replace the brake booster. (Refer to P.35A-22.)



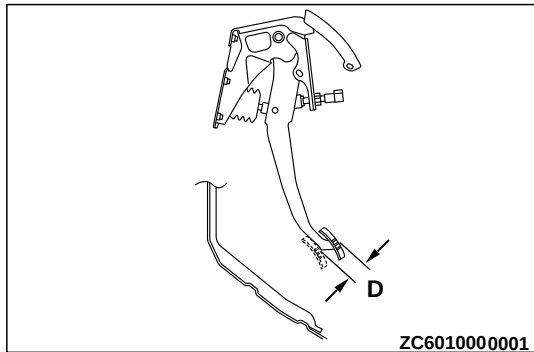
7. After checking the brake pedal height, install the stoplight switch in the following procedure:

- (1) Screw in the stoplight switch until its thread contacts the pedal stopper, then turn the switch approximately one eighth of a clockwise turn to fix it. While doing this, pull and hold the brake pedal by hand.
 - (2) Check that the clearance between the stoplight switch and the pedal stopper is as shown in the figure.

CAUTION

Make sure that the stoplight is not illuminated when the brake pedal is not depressed.

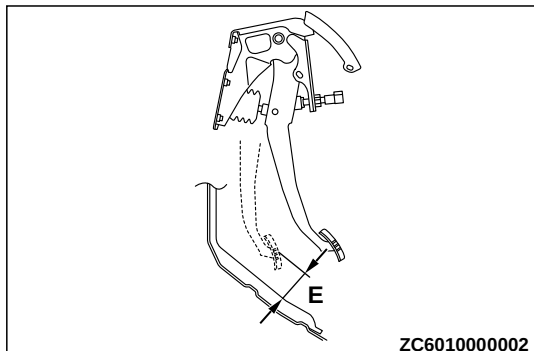
- (3) Connect the stoplight switch connector.
8. Check the key interlock mechanism and the shift lock mechanism. (Refer to GROUP 23 - On-vehicle Service, Key Interlock Mechanism Check P.23A-162, Shift Lock Mechanism Check P.23A-163.)
9. Recover the floor carpet under the brake pedal.

**BRAKE PEDAL PLAY CHECK AND ADJUSTMENT**

1. With the engine stopped, depress the brake pedal 2 or 3 times to relieve the vacuum in the brake booster. Then, press the brake pedal with your finger and check if the pedal stroke until the pedal becomes heavy (play) is within the standard value.

Standard value (D): 3 - 8 mm (0.12 - 0.31 inch)

2. When the brake pedal play is not within the standard value, check the brake pedal-to-clevis pin looseness, clevis pin-to-booster operating rod looseness, brake pedal height, and stoplight switch position, and adjust or replace as necessary.

**BRAKE PEDAL-TO-FLOOR PANEL CLEARANCE CHECK AND ADJUSTMENT**

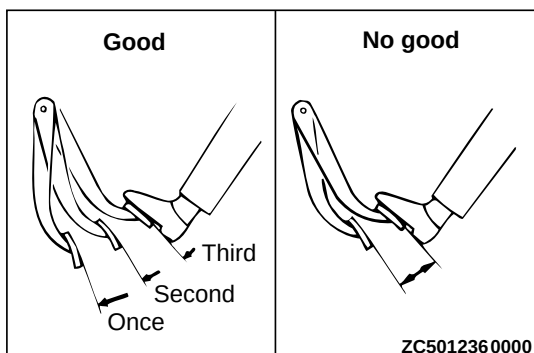
1. Turn up the floor carpet under the brake pedal.
2. Start the engine and depress the brake pedal with approximately 500 N (112 pounds), and measure clearance between the brake pedal and the floor panel.

Standard value (E): 80 mm (3.15 inch) or more

3. When the clearance is not within the standard value, check for the air in the brake line and thickness of the disc brake pad, and correct or replace as necessary.
4. Recover the floor carpet under the brake pedal.

BRAKE BOOSTER OPERATION CHECK

M13501000010USA0000010000

**INSPECTION WITHOUT USING TESTER**

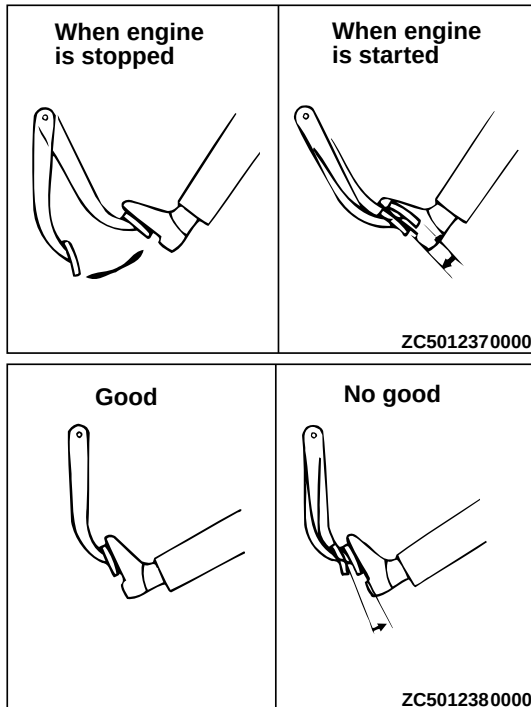
1. Carry out the simplified brake booster operation check in the following procedure:

(1) Run the engine for 1 to 2 minutes, and then stop. Depress the brake pedal with normal depression force. The result is judged as "Good" when the pedal stroke is great at the first depression, and becomes smaller as you repeat depressing the pedal. If the pedal stroke does not change, the result is judged as "No Good."

(2) With the engine stopped, depress the brake pedal several times. Keep the brake pedal depressed and start the engine. At this time, when the pedal moves down slightly, the result is judged as "Good." The result is judged as "No Good" if the pedal does not move down.

(3) With the engine running, depress the brake pedal. Stop the engine in this condition. The result is judged as "Good" when the pedal height does not change for approximately 30 seconds. The result is judged as "No Good" if the pedal moves up.

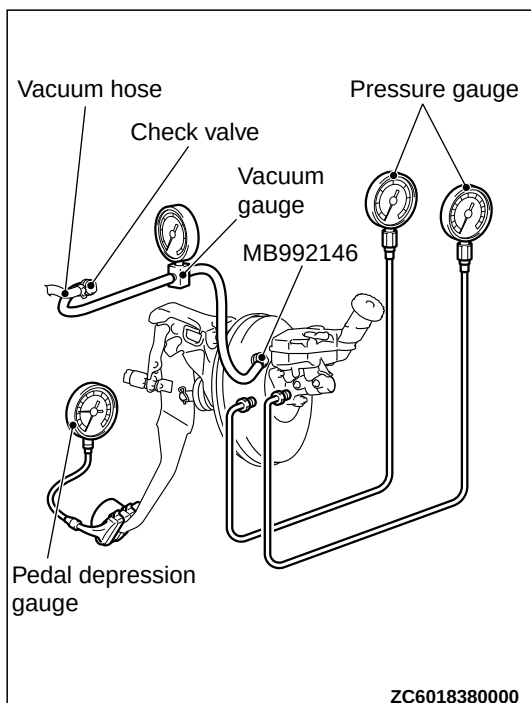
2. The brake booster is judged as normal when the results of all the above checks are "Good."



When one or more of the above check results are "No Good," then the check valve, vacuum hose, or brake booster is suspected faulty.

INSPECTION USING SIMPLIFIED TESTER

- Before starting this inspection, remove the brake booster check valve from the vehicle and check its operation (Refer to P.35A-14).
- After checking, install the check valve to the vacuum hose and connect it to the vacuum gauge. Install the booster test adapter (Special tool: MB992146) to the brake booster and connect it to the vacuum gauge. Connect the pressure gauge and pedal depression gauge as shown in the figure. Bleed the pressure gauge and then perform the following tests:



(1) Airtightness test with no load

Start the engine, and stop it when the vacuum gauge indicator has reached approximately -67 kPa (-9.7 psi). The result is judged as "Good" when the drop of the vacuum approximately 15 seconds after the engine was stopped is within -3.3 kPa (-0.5 psi).

(2) Airtightness test with load

Start the engine and depress the brake pedal with 200 N. Stop the engine when the vacuum gauge indicator reached approximately -67 kPa (-9.7 psi). The result is judged as "Good" when the drop of the vacuum approximately 15 seconds after the engine was stopped is within -3.3 kPa (-0.5 psi).

When one or more of the above check results are judged as "No Good," the vacuum hose or brake booster is suspected faulty.

(3) Brake booster characteristics test

Perform this test after the above (1) and (2) were performed.

a. Non-servo effect test

With the engine stopped, make sure that the vacuum gauge reading is 0 kPa (0 psi). Depress the brake pedal with 100 N and 300 N, and measure the fluid pressure generated.

Standard value:

Item	Pedal depression force	
	100 N	300 N
Generated fluid pressure (psi)	200 (29) or more	1,800 (261) or more

b. Servo effect test

Start the engine. Depress the brake pedal with 100 N and 300 N when the vacuum gauge indicator reached approximately -67 kPa (-9.7 psi), and measure the fluid pressure generated.

Standard value:

Item	Pedal depression force	
	100 N	300 N
Generated fluid pressure (psi)	6,050 - 7,950 (877 - 1,153)	10,720 (1,554) or more

CHECK VALVE OPERATION CHECK

M13501000090USA0000010000

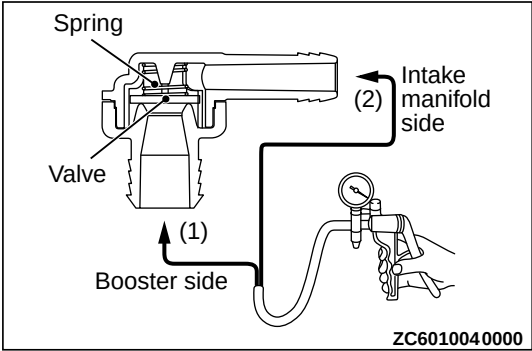
1. Remove the check valve.(Refer to P.35A-18.)

CAUTION

Replace the check valve when it is faulty.

2. Using a vacuum pump, check operation of the check valve.

Vacuum connection	pump	Normal condition
When connected to the booster side (1)		Vacuum is generated and maintained.
When connected to the engine side (2)		No vacuum is generated.



BLEEDING

M13501000014USA0000010000

CAUTION

Be sure to use the specified brand and type of brake fluid. Avoid mixing with other type of brake fluid.

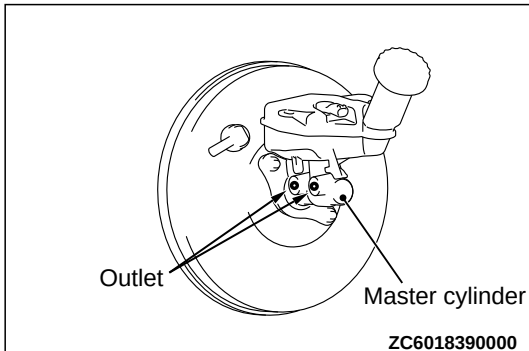
Brake fluid:

Mitsubishi Genuine Diamond Queen Brake Fluid Super

BLEEDING OF MASTER CYLINDER

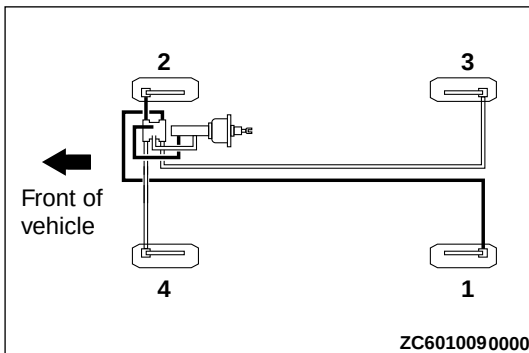
When removed the master cylinder assembly, bleed the master cylinder in the following procedure to make bleeding of the brake pipeline easier. (When no brake fluid is in the master cylinder)

1. Fill the brake fluid reservoir with the brake fluid.
2. Depress and hold the brake pedal.
3. Another operator closes the master cylinder outlets with his fingers.
4. In this condition, release the brake pedal.
5. Repeat Steps 2 to 4 for 3 or 4 times to fill the master cylinder with the brake fluid.



BLEEDING OF BRAKE PIPELINE

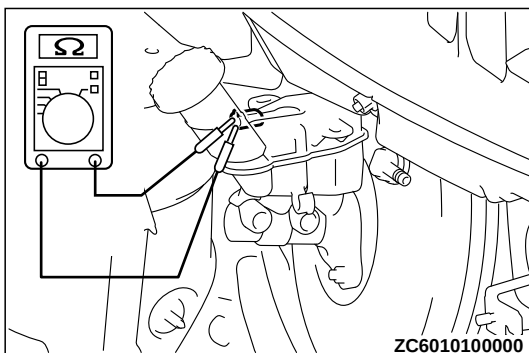
1. Perform the bleeding in the order shown in the figure.



BRAKE FLUID LEVEL SWITCH CHECK

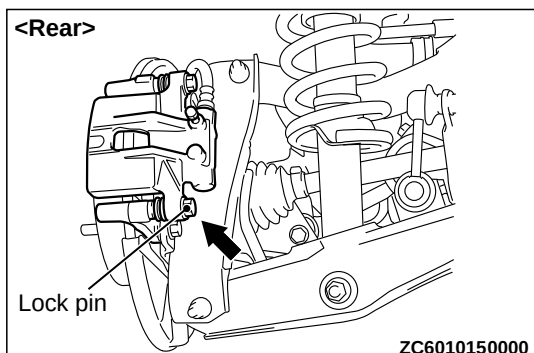
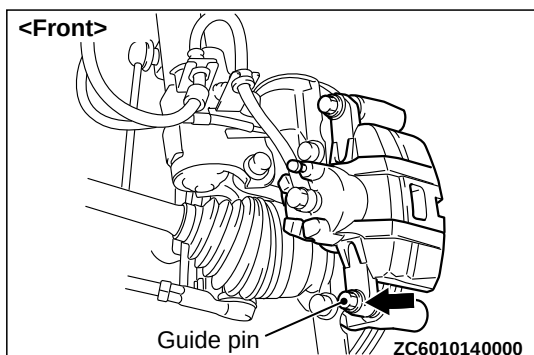
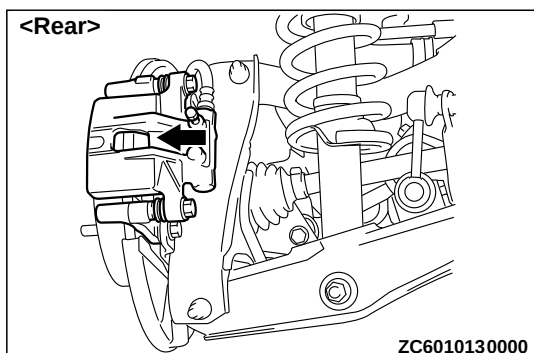
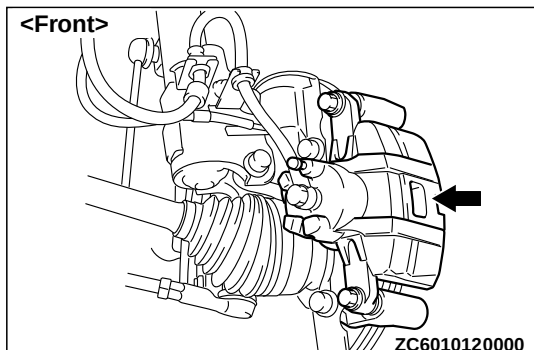
M13501000091USA0000010000

The brake fluid level switch is normal when the following conditions are met: When the brake fluid level is above "MIN," continuity is detected; and when the level is below "MIN," no continuity is detected.



DISC BRAKE PAD CHECK AND REPLACEMENT

M13501000023USA0000010000



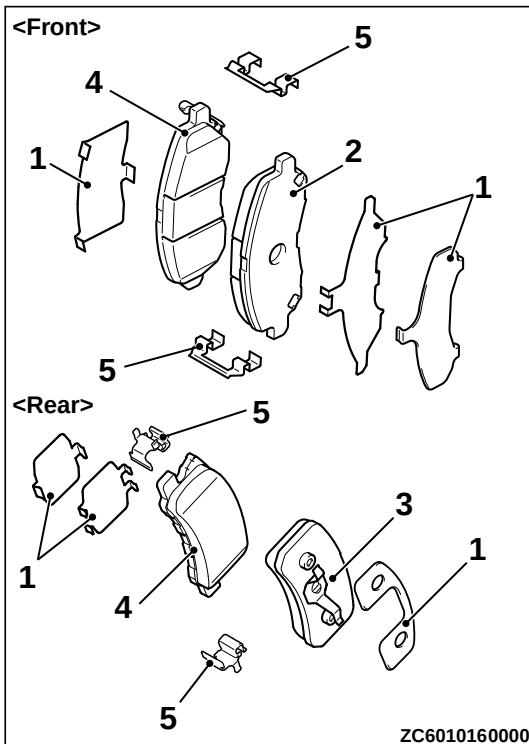
1. Visually check the thickness of brake pad from the inspection hole of the caliper body.

Standard value: 10.0 mm (0.39 inch)

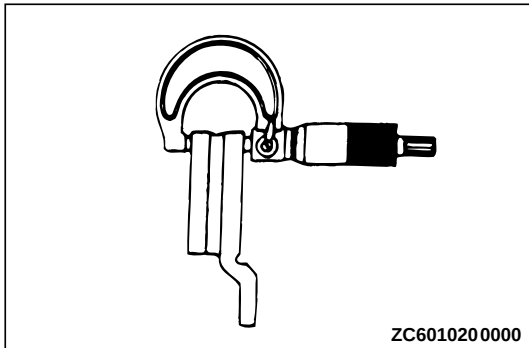
Minimum limit: 2.0 mm (0.08 inch)

2. When the thickness is lower than the limit value, replace both brake pads (right and left) as a set.

3. Remove the parts indicated in the figure, swivel the caliper assembly upward and retain it with a wire or similar tool.



4. Remove the following parts from the caliper assembly.
 - (1) Shim
 - (2) Pad assembly front
 - (3) Pad & clip assembly rear
 - (4) Pad assembly RH, pad & wear indicator assembly LH
 - (5) Clip
5. In order to measure the brake drag force after pad installation, measure the hub sliding torque with no pad attached.(Refer to P.35A-28.)
6. Install the pad and caliper assembly, and check the brake drag force.(Refer to P.35A-28.)



BRAKE DISC THICKNESS CHECK

M13501000024USA0000010000

1. Remove any dirt and rust on the brake disc surface.
2. Measure thickness of the brake disc at the sliding area with the brake pad at four or more points.

Standard value:

Front 26.0 mm (1.02 inch)

Rear 10.0 mm (0.39 inch)

Minimum limit:

Front 24.4 mm (0.96 inch)

Rear 8.4 mm (0.33 inch)

3. When any one of the thicknesses is lower than the limit value, replace both brake discs and pads (right and left) as a set.

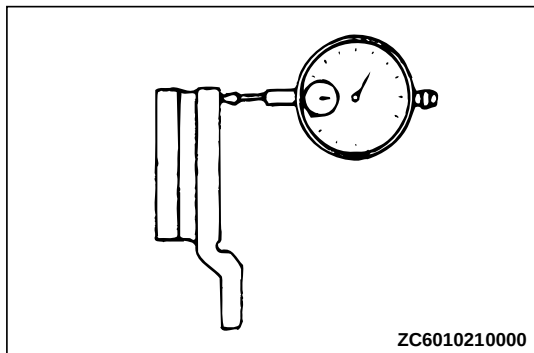
BRAKE DISC RUNOUT INSPECTION AND CORRECTION

M13501000094USA0000010000

CAUTION

When working on the brake disc such as for replacement, make sure that the wheel speed detection magnetic encoder should not collect foreign materials.

1. Remove the caliper assembly and hold it with a wire.
2. Temporarily fix the brake disc with the hub nut.

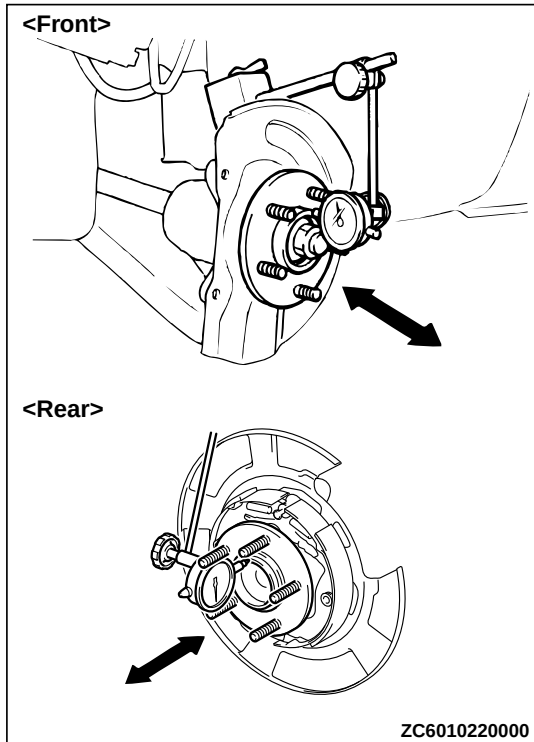


3. Set a dial gauge on the brake disc approximately 5 mm inside the periphery, and measure the runout of the brake disc.

Limit:

0.06 mm (0.0024 inch) <Front>

0.08 mm (0.0032 inch) <Rear>



4. When the runout exceeds the limit value, correct the brake disc runout in the following procedure.

- (1) Before removing the brake disc, mark the wheel stud on the side of greater runout and its both sides with a chalk.
- (2) Remove the brake disc. Set a dial gauge as shown in the figure, and measure looseness of the hub in the axial direction.

Limit: 0.05 mm (0.0020 inch)

- (3) When the looseness exceeds the limit value, replace the front or rear hub assembly.
 - (4) When the looseness is within the limit value, install the brake disc after changing the phase between the hub and the brake disc, then check the runout of the brake disc again.
5. If the runout cannot be corrected by changing the phase of the brake disc, replace the brake disc.

MASTER CYLINDER FUNCTION CHECK

1. Remove the reservoir cap.
2. While watching the open reservoir from a distance of 50 cm (20 inches), have an assistant depress the brake pedal. If there was a stream of brake fluid rising from the reservoir, proceed to Step 3. If there was no stream of brake fluid rising from the reservoir, replace the master cylinder.

3. While watching the open reservoir from a distance of 50 cm (20 inches), have the assistant release the brake pedal. If there was a small amount of air bubbles rising through the brake fluid, master cylinder function is normal. If there were no bubbles rising through the brake fluid, replace the master cylinder.

M13501000102USA0000010000

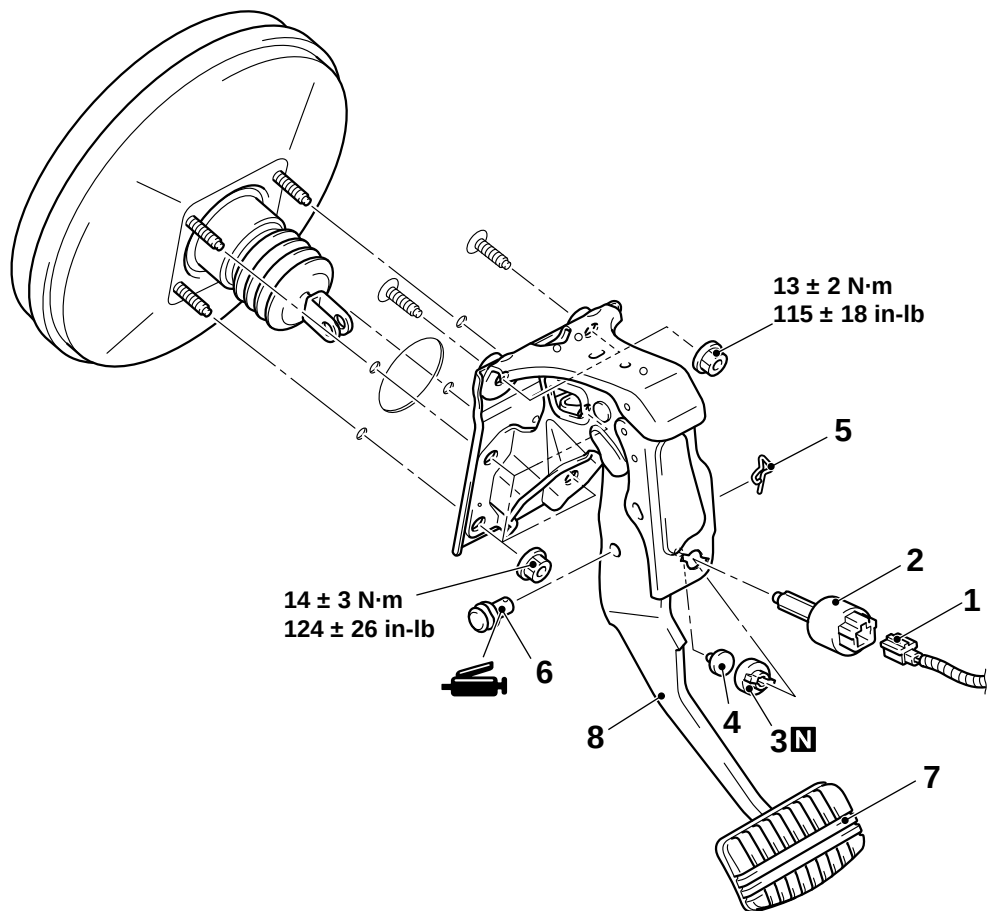
BRAKE PEDAL

REMOVAL AND INSTALLATION

M13501000034USA0000010000

Pre-removal and Post-installation operation

Bottom Cover Assembly (driver's seat) Removal and Installation (Refer to GROUP 52A - Instrument Panel Assembly P. 52A-2).



ZC6018000000

Removal steps

1. Harness connector
2. Stop light switch
3. Pedal clip
4. Pedal stopper
5. Snap pin

>>A<<

Removal steps

6. Pin assembly
7. Pedal pad
8. Brake pedal assembly

<<A>>

REMOVAL SERVICE POINT

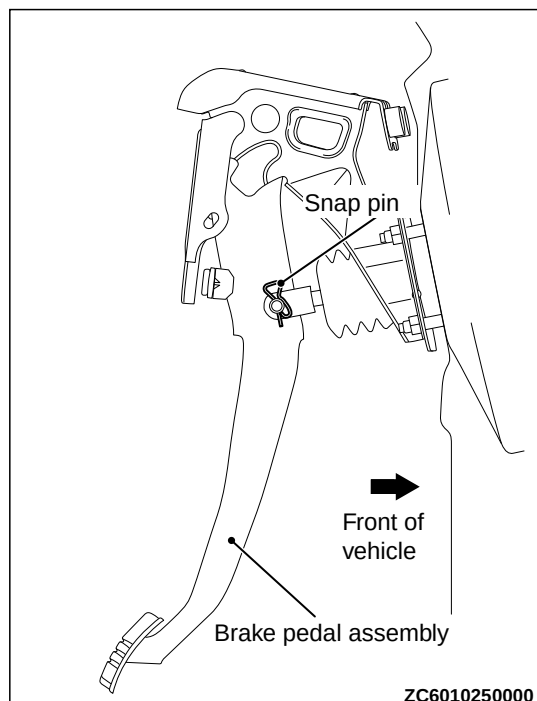
<<A>> BRAKE PEDAL ASSEMBLY REMOVAL

From the engine compartment side, remove the brake pedal assembly while pulling the brake booster.

INSTALLATION SERVICE POINT

>>A<< SNAP PIN INSTALLATION

1. Install the snap pin as shown in the figure.

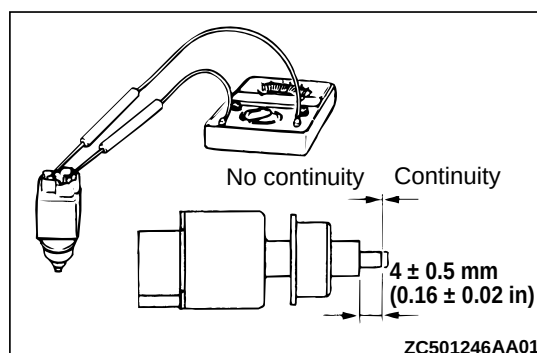


BRAKE PEDAL INSPECTION

CHECK THE STOPLIGHT SWITCH CONTINUITY.

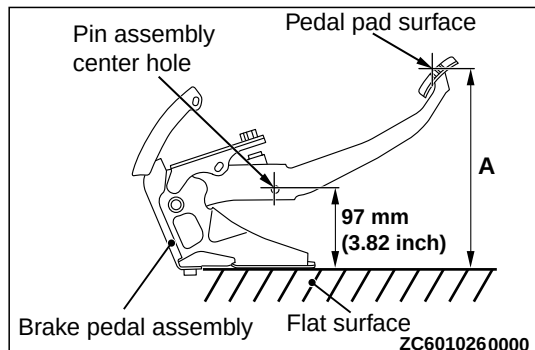
M13501000089USA0000010000

1. Connect a circuit tester (Ωrange) to the stop light switch connector.
2. When no continuity is detected with the plunger pressed from the edge of the outer case by the dimension shown in the figure and when continuity is detected with the plunger released, the stoplight switch is in good condition.



BRAKE PEDAL DISTORTION CHECK

M13501000903USA0000010000



1. Place the brake pedal assembly on a level surface as shown in the figure, and set the distance from the center of the pin assembly mounting hole to the level surface to 97 mm (3.82 inch). Make sure that the dimension A in the figure (distance from the pedal pad surface to the level surface) is within the standard value.

Standard value (A): 250 - 254 mm (9.8 - 10.0 inch)

2. When dimension A is not within the standard value, replace the brake pedal assembly.

MASTER CYLINDER ASSEMBLY AND BRAKE BOOSTER

REMOVAL AND INSTALLATION

M13501000037USA0000010001

CAUTION

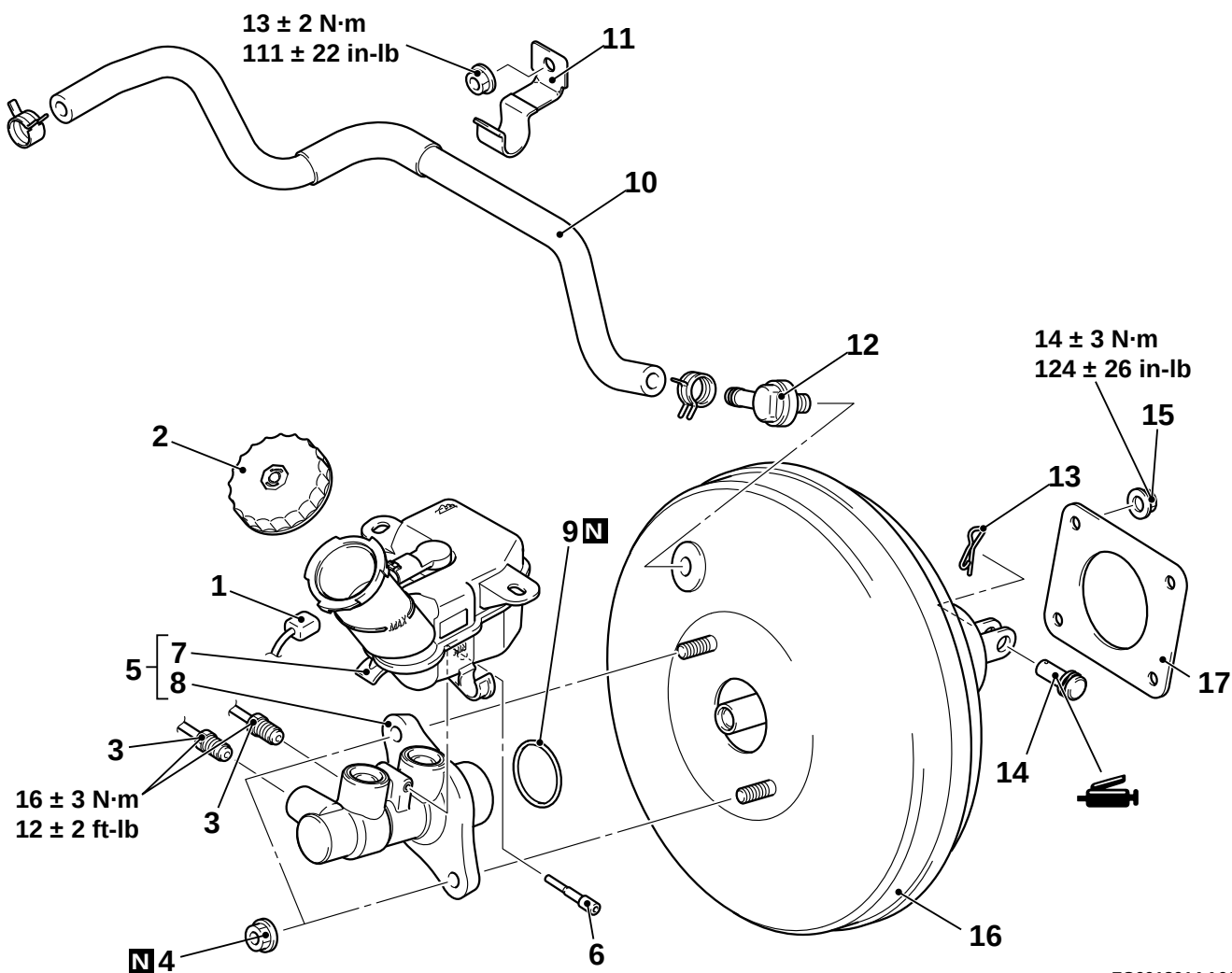
Do not touch the push rod in the brake booster because it is already adjusted.

Pre-removal operation

- Brake fluid draining
- Bottom Cover Assembly (driver's seat) Removal (Refer to GROUP 52A - Instrument Panel Assembly P.52A-2).
- Strut Tower Bar Removal (Refer to GROUP 42Aa - Strut Tower Bar P.42Aa-11).
- Air Cleaner Body Removal (Refer to GROUP 15 - Air Cleaner P.15-6).

Post-installation operation

- Air Cleaner Body Installation (Refer to GROUP 15 - Air Cleaner P.15-6).
- Brake fluid refilling and air bleeding (Refer to P.35A-18).
- Strut Tower Bar Installation (Refer to GROUP 42Aa - Strut Tower Bar P.42Aa-11).
- Bottom Cover Assembly (driver's seat) Installation (Refer to GROUP 52A - Instrument Panel Assembly P.52A-2).



ZC601801AA00

Removal steps

1. Brake fluid level switch connector
2. Reservoir cap
3. Brake pipe connection
4. Master cylinder mounting nuts
5. Reservoir assembly and master cylinder assembly
6. Torx bolt
7. Reservoir assembly
8. Master cylinder assembly
9. O-ring

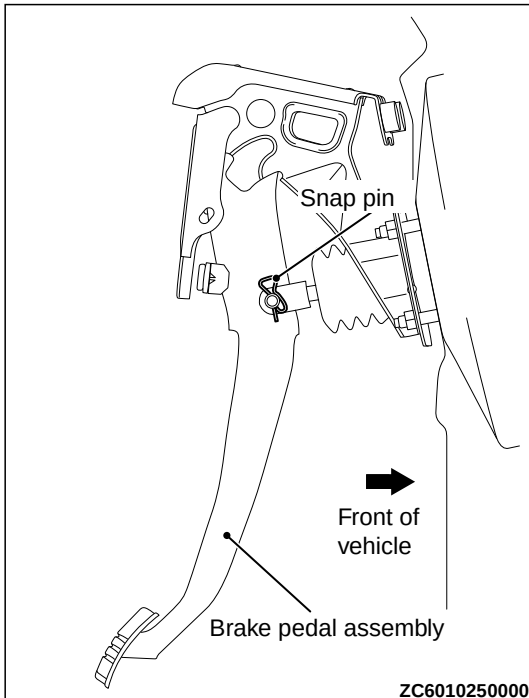
Removal steps

- | | |
|-------|--------------------------------|
| >>B<< | 10. Vacuum hose |
| | 11. Clamp |
| >>B<< | 12. Check valve |
| >>A<< | 13. Snap pin |
| | 14. Pin assembly |
| | 15. Brake booster mounting nut |
| | 16. Brake booster assembly |
| | 17. Seal |

INSTALLATION SERVICE POINTS

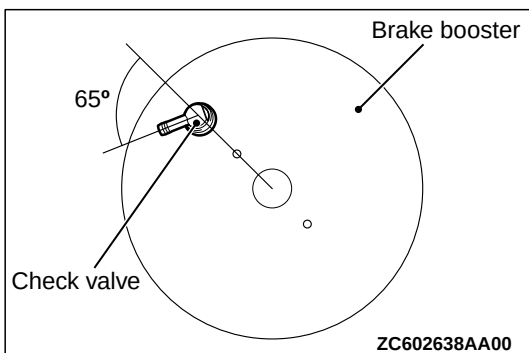
>>A<< SNAP PIN INSTALLATION

1. Install the snap pin as shown in the figure.

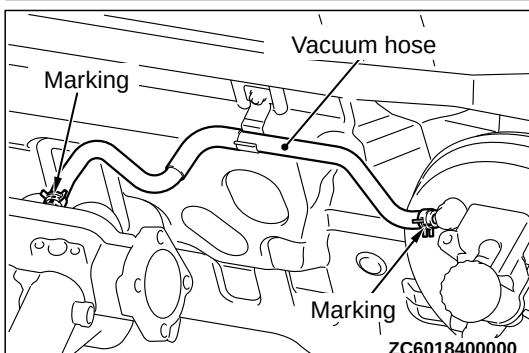


>>B<< CHECK VALVE/VACUUM HOSE INSTALLATION

1. Install the check valve to the brake booster as shown in the figure.



2. As shown in the figure, insert the brake booster-side vacuum hose into the brake booster check valve with its yellow mark facing the vehicle front, and fix with a hose clip. Insert the inlet manifold-side vacuum hose into the vacuum pipe with the white marks aligned, and fix with a hose clip.

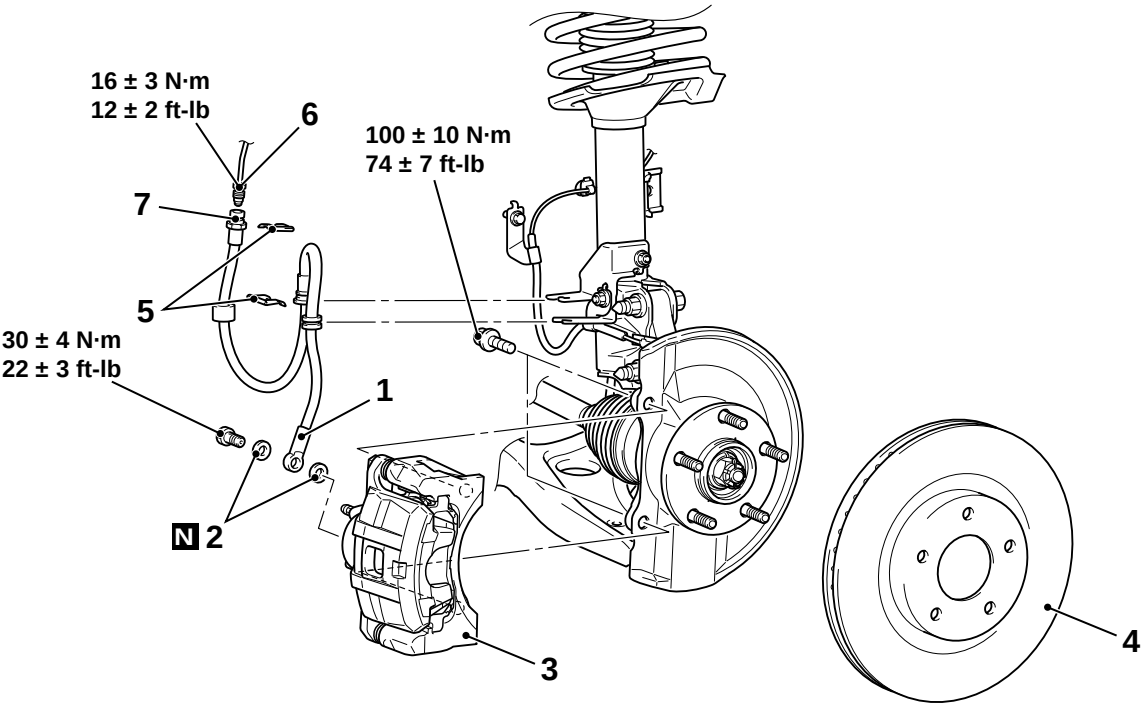


FRONT DISC BRAKE ASSEMBLY

REMOVAL AND INSTALLATION

M13501000060USA0000010000

Pre-removal operation **Post-installation operation**
Brake fluid draining Brake fluid refilling and air bleeding (Refer to P.35A-18).



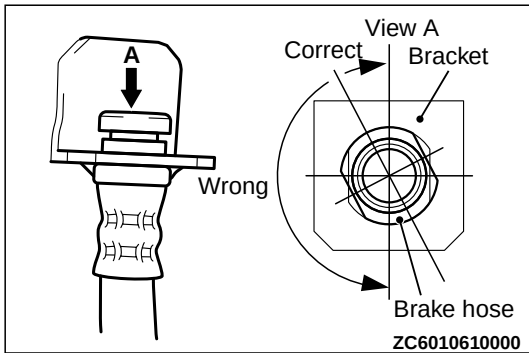
ZC601939AA00

- | | |
|--|--|
| <p>Removal steps</p> <ol style="list-style-type: none"> 1. Brake hose (brake caliper side) connection 2. Gasket 3. Brake caliper assembly 4. Front brake disc | <p>Removal steps</p> <ol style="list-style-type: none"> 5. Clip 6. Brake pipe 7. Brake hose (brake pipe side) connection |
|--|--|

INSTALLATION SERVICE POINTS

>>A<< BRAKE HOSE INSTALLATION

1. Pass the brake hose through the hole in the body-side bracket.
2. Install the brake hose to the brake caliper.
3. Install the brake hose at the two fixing points.

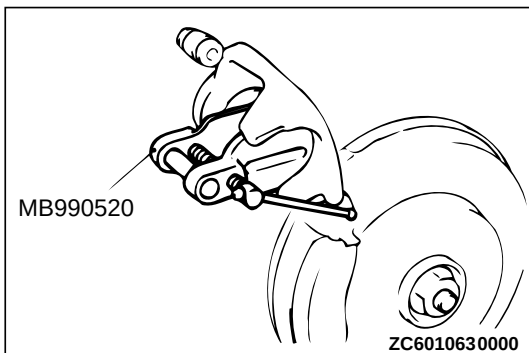
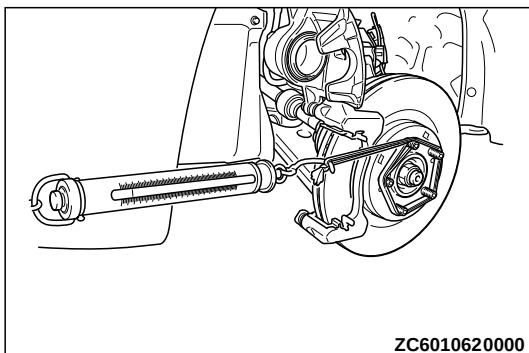


4. Twist the brake hose toward the lesser torsion between the brake hose and body-side bracket as shown in the figure, and fix it to the body-side bracket with a clip.

>>B<< BRAKE CALIPER ASSEMBLY INSTALLATION

Measure the brake drag force in the following procedure:

1. Using a spring scale, measure the hub sliding torque in the forward direction.



CAUTION

Keep grease or other soiling off the pad and brake disc friction surfaces.

2. Clean the piston, and press the piston into the cylinder using the piston expander (Special tool: MB990520).
3. Assemble the pad clip and pad to the caliper support, and tighten the guide pin to the specified torque.

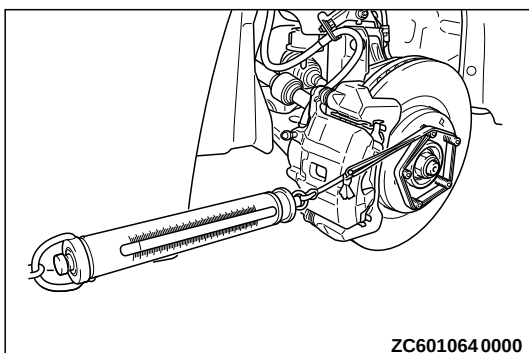
Tightening torque: 44 ± 5 N·m (32 ± 4 ft-lb)

4. Start the engine, and depress the brake pedal forcibly two or three times. Then, stop the engine.
5. Turn the brake disc 10 times in the forward direction.
6. Using a spring scale, measure the hub sliding torque in the forward direction.

7. Obtain the disc brake drag force (difference between measured values of item 1 and item 6).

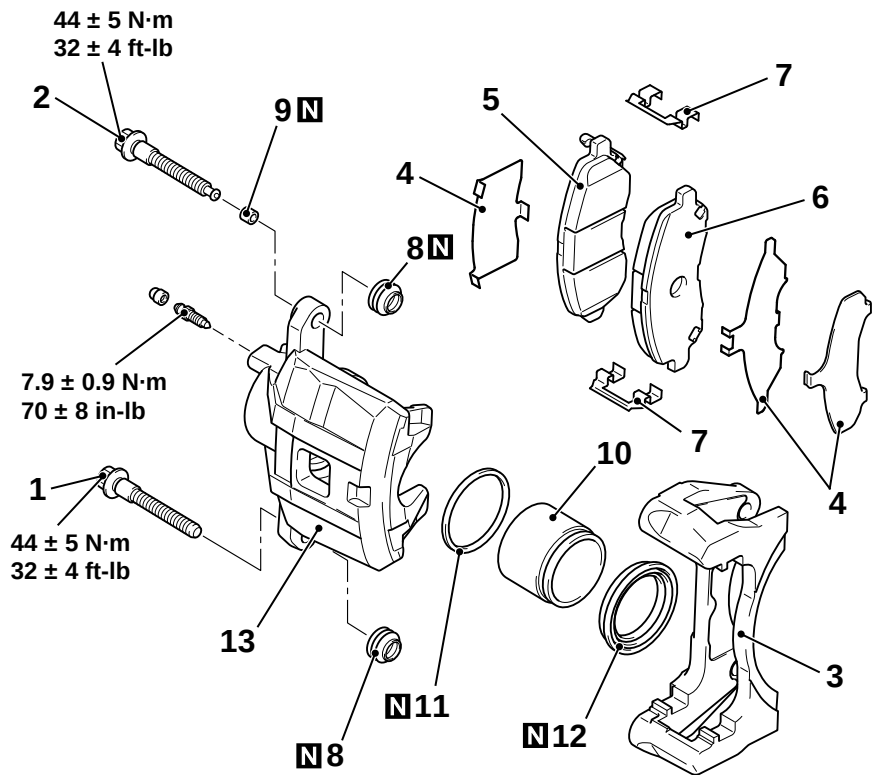
Standard value: 68 N (15.3 pounds) or less

8. If the brake drag force exceeds the standard value, disassemble the piston to check for fouling/rust on the piston sliding section and piston/seal deterioration, and confirm whether the slide pin slides properly.



DISASSEMBLY AND ASSEMBLY

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Clip set
Shim kit
Brake caliper kit
Seal and boot kit
Pad set

ZC601942AA00

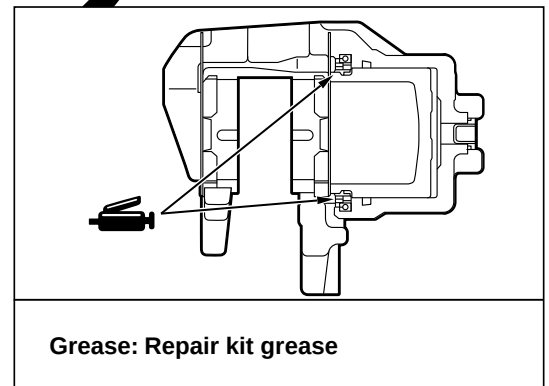
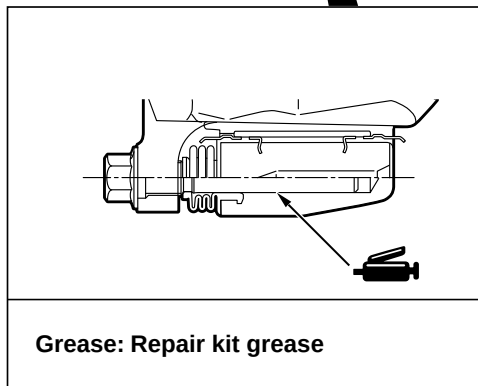
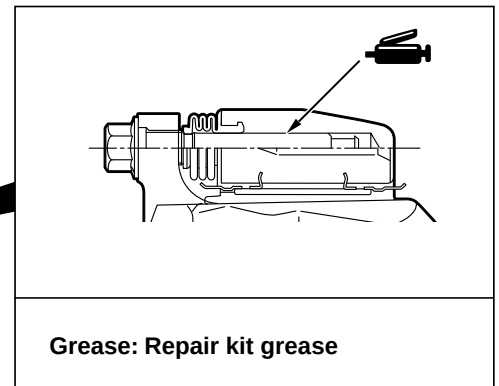
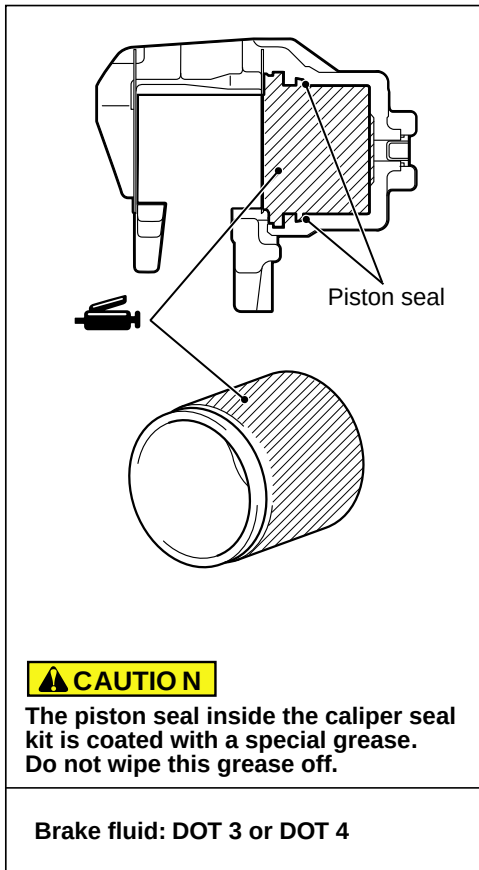
Disassembly steps

1. Lock pin
2. Guide pin
3. Caliper support (including pad, clip, and shim) <<A>>
4. Shim <>
5. Pad & wear indicator assembly <<A>>
6. Pad assembly
7. Clip

Disassembly steps

8. Pin boot
9. Bushing
10. Piston
11. Piston seal
12. Piston boot
13. Caliper body

LUBRICATION POINTS



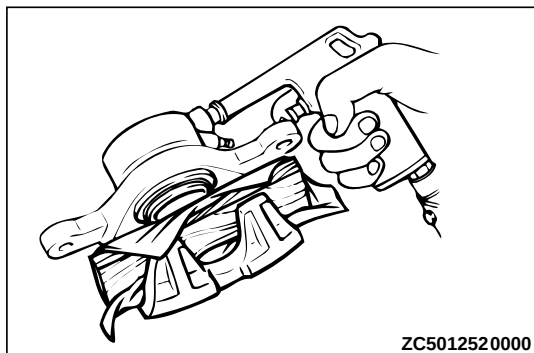
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DISASSEMBLY SERVICE POINT

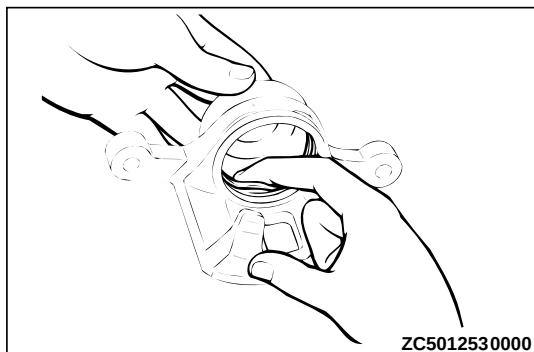
<<A>> PISTON BOOT/PISTON REMOVAL

CAUTION

Blow air gradually to remove the pistons. The pistons will rush out if a force of air is applied suddenly.



Cover the caliper body outer side with a cloth or similar materials. Blow compressed air through the brake hose installation area to remove the piston and piston boot.



<> PISTON SEAL REMOVAL

⚠ CAUTION

Do not use a flat-tipped screwdriver to remove the piston seal. This may damage the inner side of the cylinder.

1. Remove the piston seal with your finger tip.
2. Clean the piston surface and cylinder inner face with alcohol or specified brake fluid.

Brake fluid: DOT3 or DOT4

FRONT DISC BRAKE ASSEMBLY INSPECTION

M13501000061USA0000010000

PAD WEAR INSPECTION

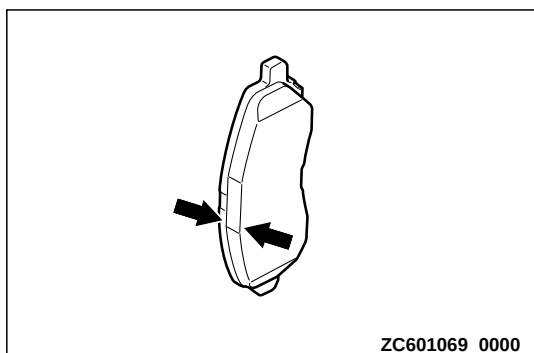
⚠ CAUTION

- When replacing, replace both pads (right and left) as a set.
- If there is a significant difference in thickness between the pads at right and left, check the sliding area of the brake caliper.

Measure the pad thickness at the most worn area. If the pad thickness is less than the limit value, replace the pad.

Standard value: 10.0 mm (0.39 inch)

Minimum limit: 2.0 mm (0.08 inch)



REAR DISC BRAKE ASSEMBLY

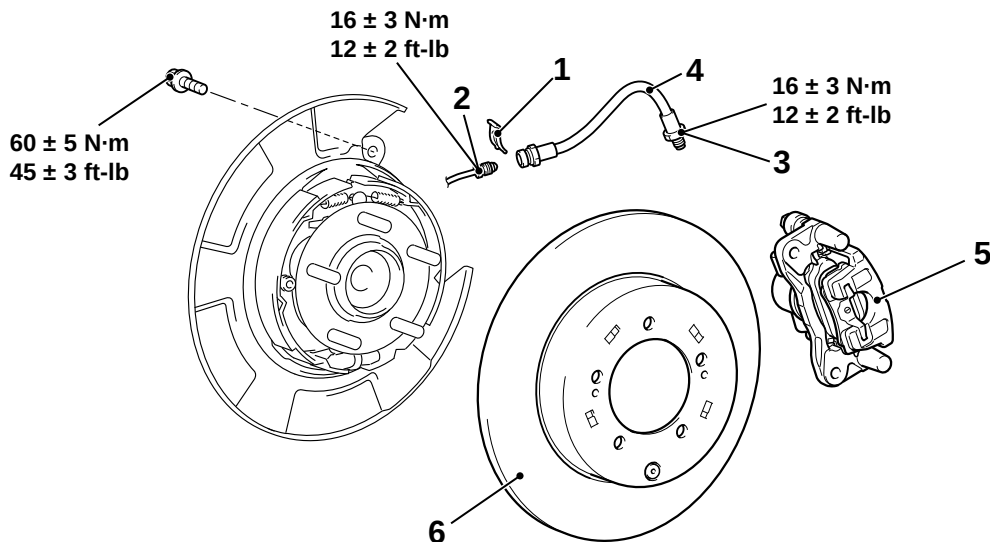
REMOVAL AND INSTALLATION

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Pre-removal operation Post-installation operation

Brake fluid draining

Brake fluid refilling and air bleeding (Refer to P.35A-18).



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Removal steps

1. Clip
2. Connection between brake pipe and brake hose
3. Connection between brake hose and rear brake caliper assembly

Removal steps

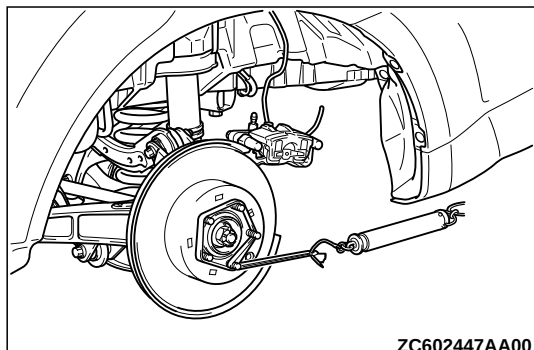
- >>A<<
4. Brake hose
 5. Rear brake caliper assembly
 6. Rear brake disc

INSTALLATION SERVICE POINTS

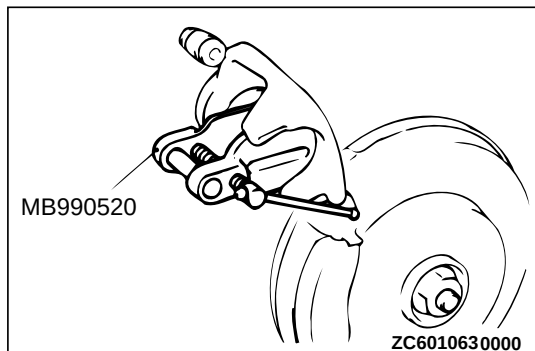
>>A<< REAR BRAKE CALIPER ASSEMBLY INSTALLATION

Measure the brake drag force in the following procedure:

1. Using a spring scale, measure the hub sliding torque in the forward direction.



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**⚠ CAUTION**

Keep grease or other soiling off the pad and brake disc friction surfaces.

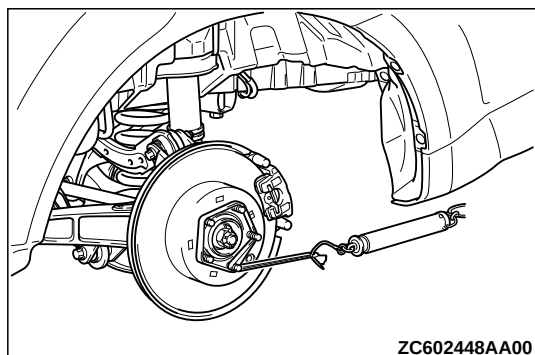
2. Clean the piston, and press the piston into the cylinder using the piston expander (Special tool: MB990520).
3. Install the caliper support to the backing plate assembly, and assemble the pad clip and pad to the caliper support.
4. Lower the caliper assembly with care not to catch the piston boot, and tighten the lock pin to the specified torque.

Tightening torque: $44 \pm 5 \text{ N}\cdot\text{m}$ ($32 \pm 4 \text{ ft}\cdot\text{lb}$)

5. Start the engine, and depress the brake pedal forcibly two or three times. Then, stop the engine.
6. Turn the brake disc 10 times in the forward direction.
7. Using a spring scale, measure the hub sliding torque in the forward direction.
8. Obtain the disc brake drag force (difference between measured values of item 1 and item 7).

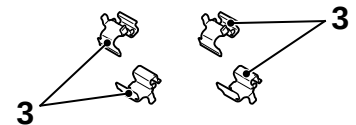
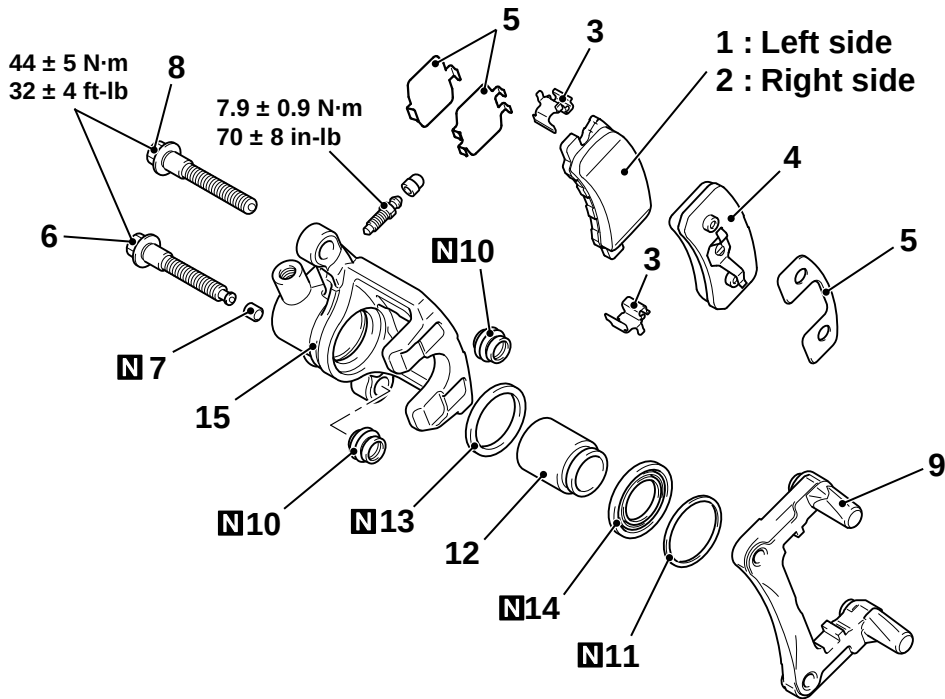
Standard value: 68 N (15.3 pounds) or less

9. If the brake drag force exceeds the standard value, disassemble the piston to check for fouling/rust on the piston sliding section and piston/seal deterioration, and confirm whether the slide pin slides properly.

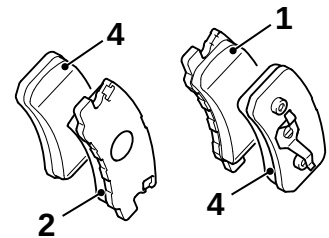


DISASSEMBLY AND ASSEMBLY

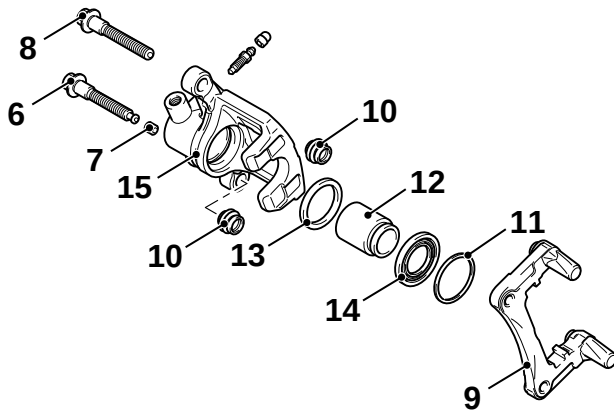
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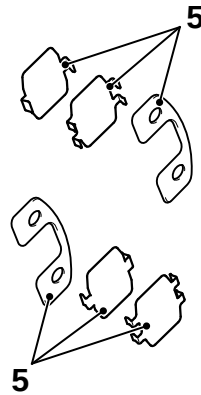
Clip set



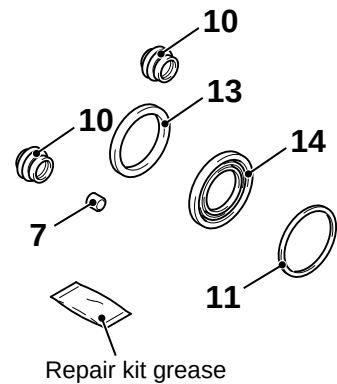
Pad set



Brake caliper kit



Shim kit



Seal & boots kit

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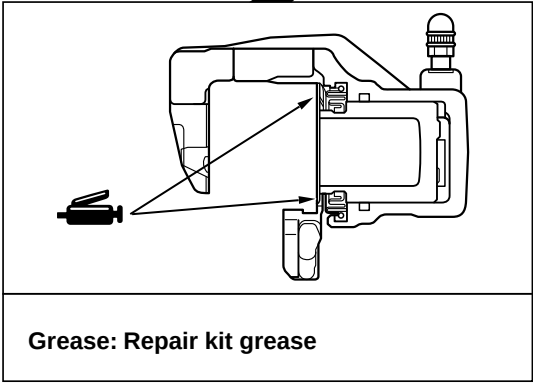
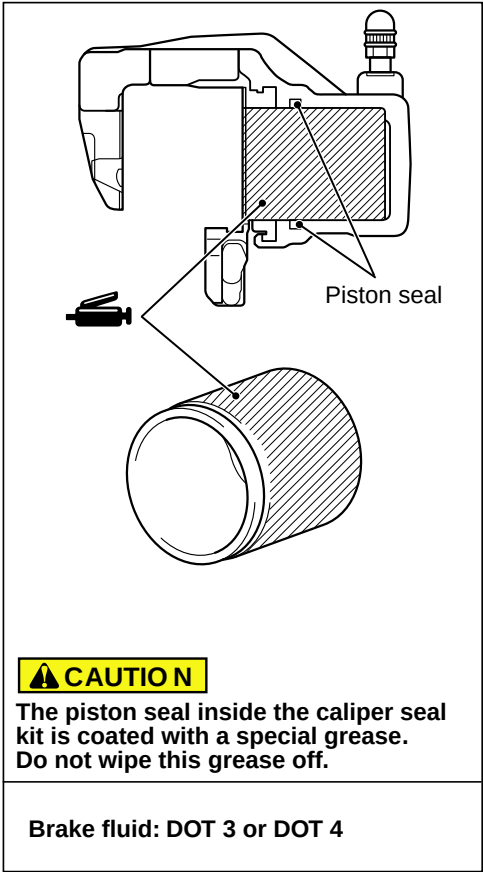
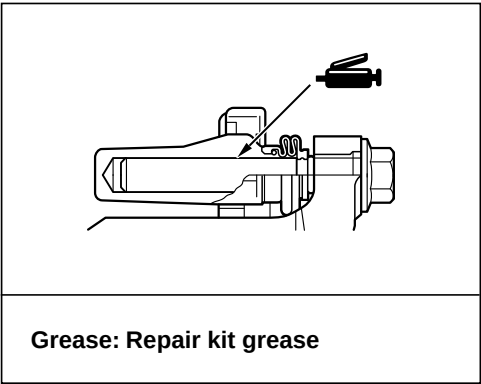
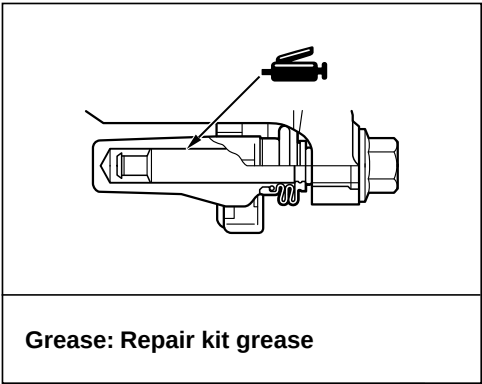
Disassembly steps

1. Pad/wear indicator assembly (inner)
2. Pad assembly (inner)
3. Clip
4. Pad/clip assembly (outer) <<A>>
5. Shim <>
6. Lock pin <<A>>
7. Bushing
8. Guide pin

Disassembly steps

9. Caliper support
10. Pin boot
11. Boot ring
12. Piston
13. Piston seal
14. Piston boot
15. Caliper body

LUBRICATION POINTS



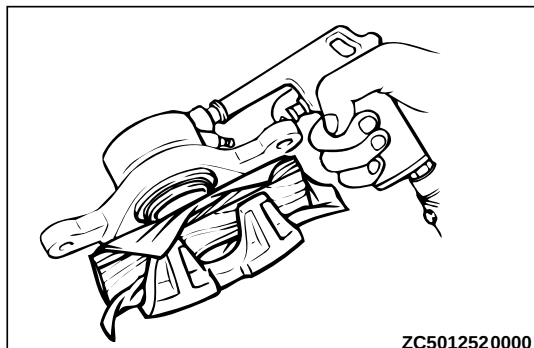
DISASSEMBLY SERVICE POINT

<<A>> PISTON/PISTON BOOT REMOVAL

⚠ CAUTION

Blow air gradually to remove the pistons. The pistons will rush out if a force of air is applied suddenly.

Cover the caliper body outer side with a cloth or similar materials. Blow compressed air through the brake hose installation area to remove the piston and piston boot.



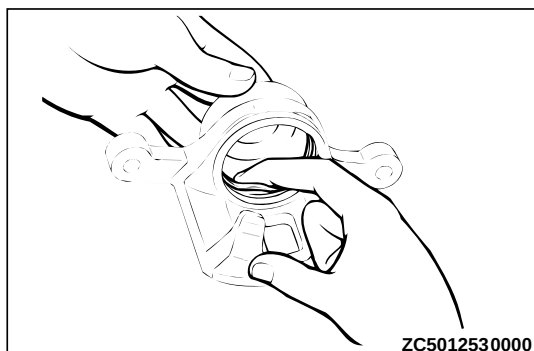
<> PISTON SEAL REMOVAL

⚠ CAUTION

Do not use a flat-tipped screwdriver to remove the piston seal. This may damage the inner side of the cylinder.

1. Remove the piston seal with your finger tip.
2. Clean the piston surface and cylinder inner face with alcohol or specified brake fluid.

Brake fluid: DOT3 or DOT4



REAR DISC BRAKE ASSEMBLY INSPECTION

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PAD WEAR INSPECTION

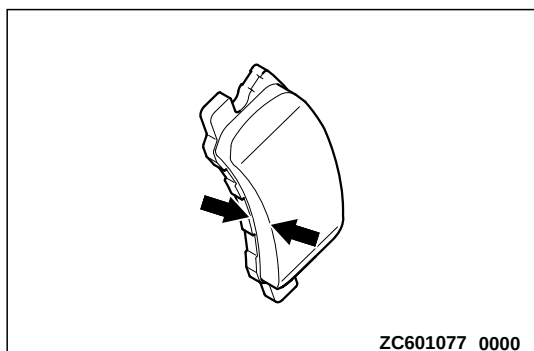
⚠ CAUTION

- When replacing, replace both pads (right and left) as a set.
- If there is a significant difference in thickness between the pads at right and left, check the sliding area.

Measure the pad thickness at the most worn area. If the pad thickness is less than the limit value, replace the pad assembly.

Standard value: 10.0 mm (0.39 inch)

Minimum limit: 2.0 mm (0.08 inch)



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