

BRAKE SYSTEM

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PRECAUTIONS

1. Care must be taken to replace each part properly as it could affect the performance of the brake system and result in a driving hazard. Replace the parts with parts of the same part number or equivalent.
2. It is very important to keep parts and the area clean when repairing the brake system.

TROUBLESHOOTING

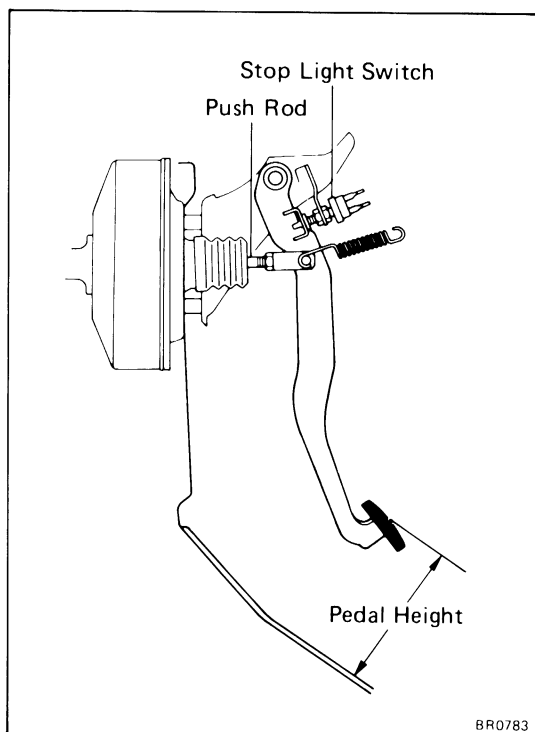
Problem	Possible cause	Remedy	Page
Low or spongy pedal	Brake pads worn	Replace pads	BR-23, 31
	Leak in brake system	Repair leak	
	Master cylinder faulty	Repair or replace master cylinder	BR-9
	Air in brake system	Bleed brake system	BR-6
	Brake cylinder faulty	Repair cylinder	BR-26, 34
	Piston seals worn or damaged	Repair brake cylinder	BR-26, 34
Brakes drag	Parking brake out of adjustment	Adjust parking brake	BR-45
	Binding parking brake wire	Repair as necessary	
	Booster push rod out of adjustment	Adjust push rod	BR-21
	Tension or return spring faulty	Replace spring	BR-39
	Brake line restricted	Repair as necessary	
	Lining cracked or distorted	Replace shoe	BR-39
	Pad cracked or distorted	Replace pad	BR-23, 31
	Caliper piston sticking	Repair as necessary	BR-26, 34
	Master cylinder faulty	Repair or replace master cylinder	BR-9
Brakes pull	Tires improperly inflated	Inflate tires to proper pressure	
	Oil or grease on shoes or pads	Check for cause. Replace shoes or pads	
	Brake shoes distorted, linings worn or glazed	Replace brake shoes	BR-39
	Brake pads distorted, worn or glazed	Replace pads	BR-23, 31
	Disc out of round	Replace disc	BR-26, 39
	Tension or return spring faulty	Replace spring	
	Brake cylinder faulty	Repair cylinder	BR-26, 34
	Piston frozen in brake cylinder	Repair cylinder	BR-26, 34
Brake pad sticking	Replace pads	BR-23, 31	
Hard pedal but brakes inefficient	Oil or grease on shoes or pads	Check for cause. Replace shoes or pads	
	Brake pads distorted, worn or glazed	Replace pads	BR-23, 31
	Piston frozen in brake cylinder	Repair cylinder	BR-26, 34
	Brake booster faulty	Repair booster	BR-20
	Vacuum leaks	Repair as necessary	
	Brake line restricted	Repair as necessary	

TROUBLESHOOTING (Cont'd)

Problem	Possible cause	Remedy	Page
Snapping or clicking noise when brakes are applied	Loose or missing pad support plate	Replace pad support plate	BR-23, 31
	Loose installation bolt	Tighten	BR-23, 31
	Wear on slide bushing	Replace slide bushing	BR-26, 34
Scraping or grinding noise when brakes are applied	Worn brake linings or pads	Replace or refinish rotors if heavily scored	BR-26, 39
	Caliper to wheel or rotor interference	Replace as required	BR-26, 34
	Dust cover to rotor interference	Correct or replace	BR-26, 39
	Other brake system components faulty	Repair or replace as necessary	
Squeaking, squealing, groaning or chattering noise when brakes are applied Note: Brake friction materials inherently generate noise and heat in order to dissipate energy. As a result, occasional squeal is normal and is aggravated by severe environmental conditions such as cold, heat, wetness, snow, salt, mud, etc. This occasional squeal is not a functional problem and does not indicate any loss of brake effectiveness	Tires rubbing against chassis and/or body	Repair as necessary	
	Rotors and pads worn or scored	Inspect, repair or replace	BR-26, 34
	Dirty, greased, contaminated or glazed linings or pads	Clean or replace	
	Improper linings or pads using	Inspect for correct usage or replace	
	Mal-adjustment of brake pedal or booster push rod (Disc brake)	Inspect and adjust	BR-5, 21
	Missing or damaged brake pad anti-squeal shim	Replace	BR-23, 31
	Pad wear and pad wear indicator making contact with the rotor	Replace	BR-23, 31
Burred or rusted calipers (Drum brake)	Clean or deburr	BR-26, 34	
Weak damaged or incorrect shoe hold-down springs, loose or damaged shoe hold-down spring pins and springs and grooved backing plate ledges	Inspect, repair or replace		

TROUBLESHOOTING (Cont'd)

Problem	Possible cause	Remedy	Page
Squealing and squeaking noise when brakes are not applied	Mal-adjustment of brake pedal or booster push rod	Inspect and adjust	BR-5, 21
	Poor return of brake booster or master cylinder (Disc brake)	Inspect, repair or replace	BR-9, 20
	Rusted or stuck piston	Inspect and lubricate as necessary	BR-26, 34
	Improper positioning of pad in caliper		
	Rotor rubbing against caliper housing		
	Improper installation of disc brake pad support plate		BR-23, 31
	Pad wear and pad wear indicator making contact with the rotor (Drum brake)	Replace	BR-23, 31
	Weak, damaged or incorrect shoe hold-down springs		
	Grooved backing plate ledges		
	Bent or warped backing plate causing interference with drum	Repair or replace	
	Improper machining of drum causing interference with backing plate or shoe	Replace drum	
	Other brake system components: Loose or extra parts in brakes Rear drum brake adjustment too tight causing lining to glaze Worn, damaged or insufficiently lubricated wheel bearings	Inspect, repair or replace as necessary	
Groaning, clicking or rattling noise when brakes are not applied	Stones or foreign material trapped inside wheel covers	Remove foreign material	
	Loose wheel nuts	Tighten to correct torque	
		Replace if stud holes are elongated	
	Mal-adjustment of brake pedal or booster push rod	Inspect and adjust	BR-5, 21
	Worn, damaged or dry wheel bearings (Disc brake)	Inspect and lubricate or replace	
	Loose or missing anti-rattle spring or pad support plate or crimping on outer pad	Inspect, repair or replace	BR-23, 31
	Failure of shim	Inspect, replace if necessary	BR-23, 31
	Wear on slide bushing	Inspect, replace if necessary	BR-26, 34
	Loose installation bolt	Inspect, tighten if necessary	BR-26, 34
	Poor return of piston (Drum brake)	Inspect, repair or replace	BR-26, 34
	Loose or extra parts	Inspect and repair	BR-39



CHECKS AND ADJUSTMENTS

CHECK AND ADJUSTMENT OF BRAKE PEDAL

1. CHECK THAT PEDAL HEIGHT IS CORRECT

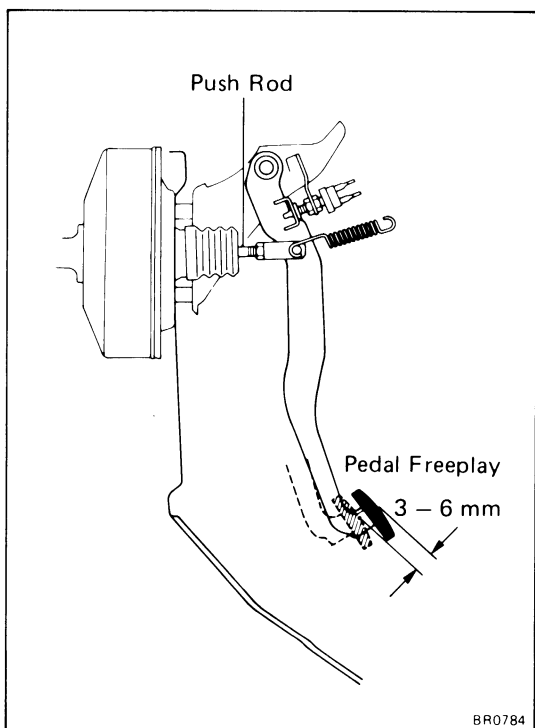
Pedal height from asphalt sheet:

151.5 – 161.5 mm (5.96 – 6.36 in.)

If incorrect, adjust the pedal height.

2. IF NECESSARY, ADJUST PEDAL HEIGHT

- (a) If necessary, remove the instrument lower finish panel and air duct.
- (b) Loosen the stop light switch lock nut.
- (c) Sufficiently loosen the stop light switch.
- (d) Loosen the push rod lock nut.
- (e) Adjust the pedal height by turning the pedal push rod.
- (f) Return the stop light switch until it lightly contacts the pedal stopper.
- (g) Tighten the two lock nuts.
- (h) Check that the stop lights light when the brake pedal depressed.
- (i) After adjusting the pedal height, check and adjust the pedal freeplay.



3. CHECK THAT PEDAL FREEPLAY IS CORRECT

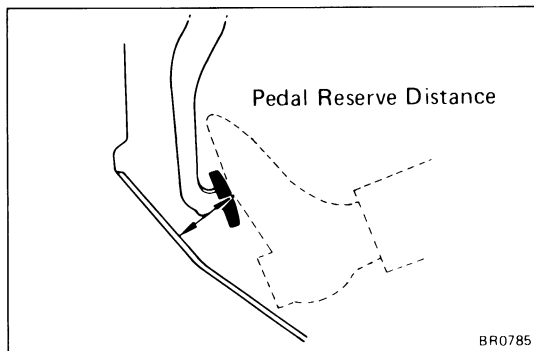
- (a) Stop the engine and depress the brake pedal several times until there is no more vacuum left in the booster.
- (b) Push in the pedal by hand until the beginning of the second resistance is felt, measure the distance, as shown.

Pedal freeplay: 3 – 6 mm (0.12 – 0.24 in.)

HINT: The freeplay to the first resistance is due to the play between the clevis and pin. And it is 1 – 3 mm (0.04 – 0.12 in.) on the pedal.

4. IF NECESSARY, ADJUST PEDAL FREEPLAY

- (a) If incorrect, adjust the pedal freeplay by turning the pedal push rod.
- (b) Start the engine and confirm that pedal freeplay exists.
- (c) After adjusting the pedal freeplay, check the pedal height.
- (d) Install the air duct and instrument lower finish panel.

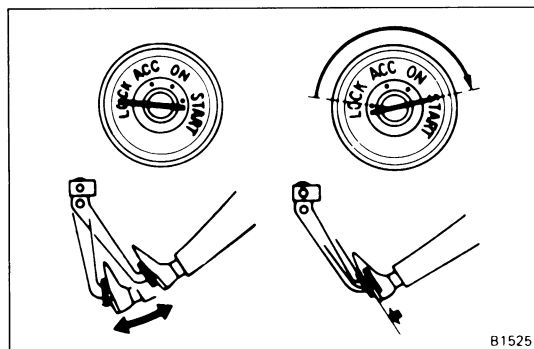


5. CHECK THAT PEDAL RESERVE DISTANCE IS CORRECT

Release the parking brake. With engine running, depress the pedal and measure the pedal reserve distance, as shown.

Pedal reserve distance from asphalt sheet at 50 kg (110.2 lb, 490N): More than 80 mm (3.15 in.)

If incorrect, troubleshoot the brake system.

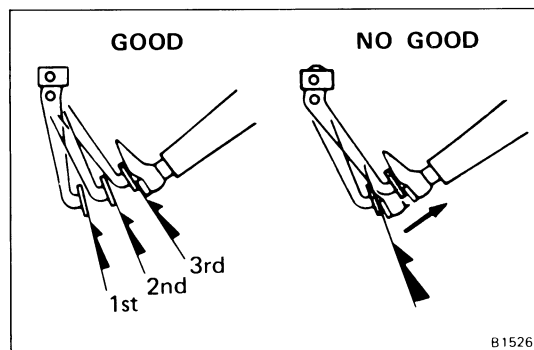


OPERATIONAL TEST OF BRAKE BOOSTER

HINT: If there is leakage or lack of vacuum, repair before testing. If available, use a brake booster tester to check the booster operating condition.

1. OPERATING CHECK

- Depress the brake pedal several times with the engine stopped, and check that there is no change in the pedal reserve distance.
- Depress the brake pedal and start the engine. If the pedal goes down slightly, operation is normal.



2. AIR TIGHTNESS CHECK

- Start the engine and stop it after one or two minutes. Depress the brake pedal several times slowly. If the pedal goes down further the first time, but gradually rises after the second or third time, the booster is air tight.
- Depress the brake pedal while the engine is running, and stop it with the pedal depressed. If there is no change in pedal reserve travel after holding the pedal for thirty seconds, the booster is air tight.

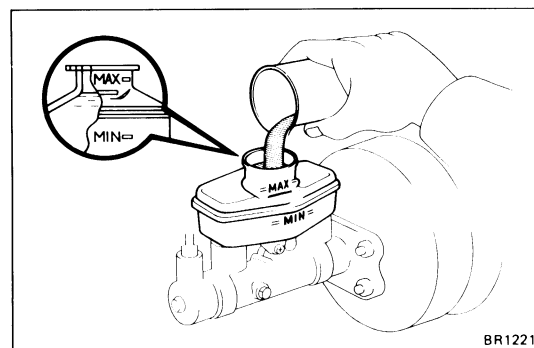
BLEEDING OF BRAKE SYSTEM

HINT: If any work is done on the brake system or if air is suspected in the brake lines, bleed the system of air.

NOTICE: Do not let brake fluid remain on a painted surface. Wash it off immediately.

1. FILL BRAKE RESERVOIR WITH BRAKE FLUID

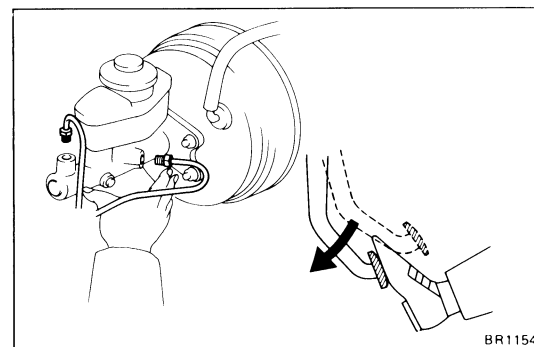
Check the fluid level in the reservoir. If necessary, add brake fluid.

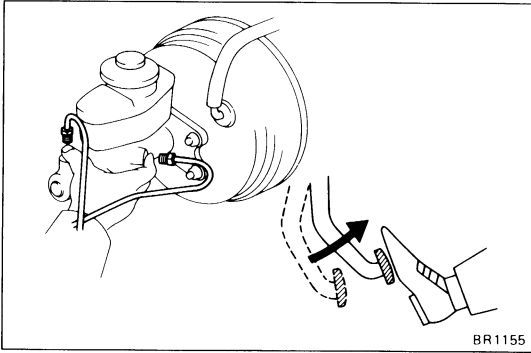


2. BLEED MASTER CYLINDER

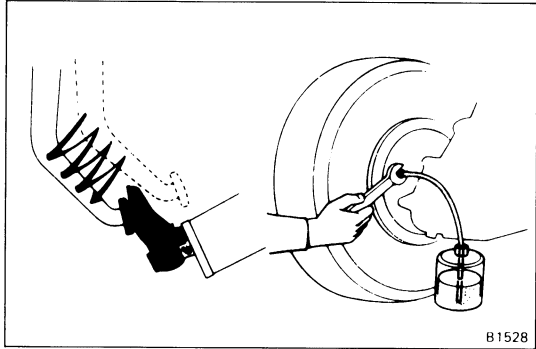
HINT: If the master cylinder was disassembled or if the reservoir becomes empty, bleed the air from the master cylinder.

- Disconnect the brake tubes from the master cylinder. Use a container to catch the brake fluid.
- Slowly depress the brake pedal and hold it.





BR1155



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- (c) Block off the outer holes with your fingers, and release the brake pedal.
- (d) Repeat (b) and (c) three or four times.
- (e) Connect the brake tubes to the master cylinder.

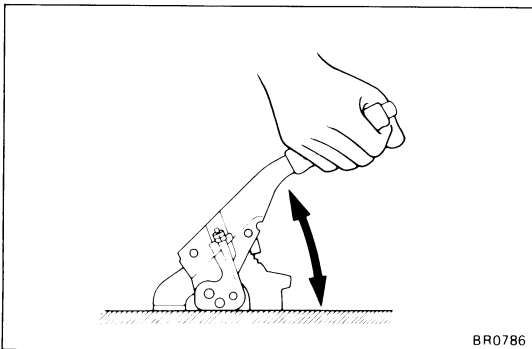
3. BEGIN BLEEDING AIR FROM BRAKE OR WHEEL CYLINDER WITH LONGEST HYDRAULIC LINE

- (a) Connect the vinyl tube to the brake or wheel cylinder bleeder plug, and insert the other end of tube in a half-full container of brake fluid.
- (b) Slowly depress the brake pedal several times.
- (c) While having an assistant press on the pedal, loosen the bleeder plug until fluid starts to run out. Then close the bleeder plug.
- (d) Repeat (b) and (c) until there are no more air bubbles in the fluid.
- (e) Tighten the bleeder plug.

Bleeder plug tightening torque:

85 kg-cm (74 in.-lb, 8.3 N·m)

4. REPEAT PROCEDURE FOR EACH WHEEL



BR0786

CHECK AND ADJUSTMENT OF PARKING BRAKE

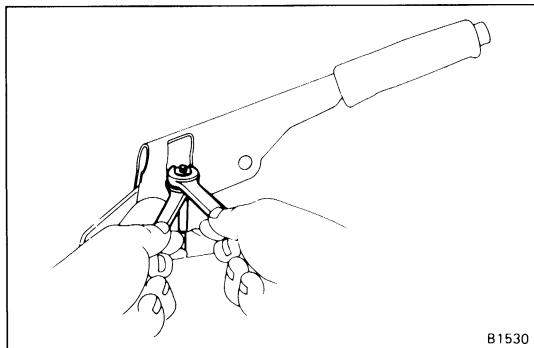
1. CHECK THAT PARKING BRAKE LEVER TRAVEL IS CORRECT

Pull the parking brake lever all the way up, and count the number of clicks.

Parking brake lever travel at 20 kg (44.1 lb, 196 N):

5 – 8 clicks

If incorrect, adjust the parking brake.

**2. IF NECESSARY, ADJUST PARKING BRAKE LEVER TRAVEL**

HINT: Before adjusting the parking brake, make sure that the rear brake shoe clearance has been adjusted.

For shoe clearance adjustment, see step 9 on page BR-45.

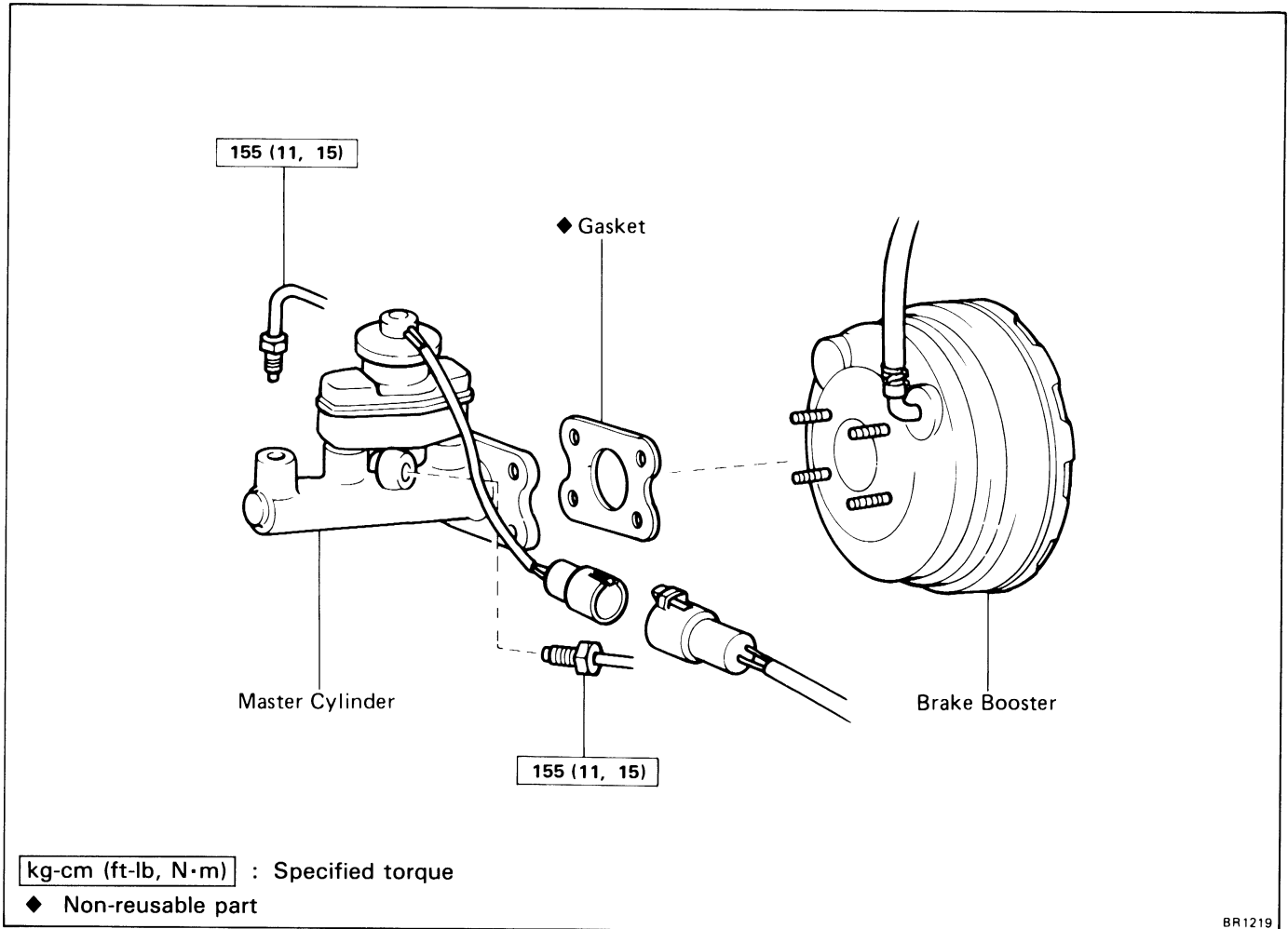
- (a) Remove the console box.
- (b) Loosen the lock nut and turn the adjusting nut until the lever travel is correct.
- (c) Tighten the lock nut.

Torque: 55 kg-cm (48 in.-lb, 5.4 N·m)

- (d) Install the console box.

MASTER CYLINDER

REMOVAL OF MASTER CYLINDER

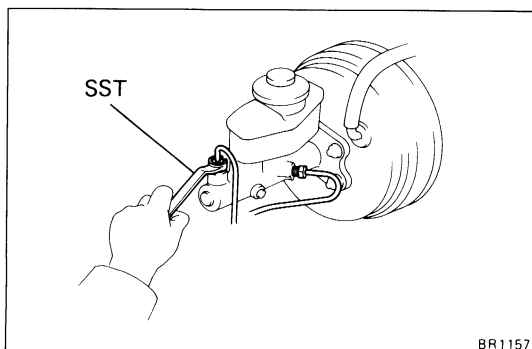


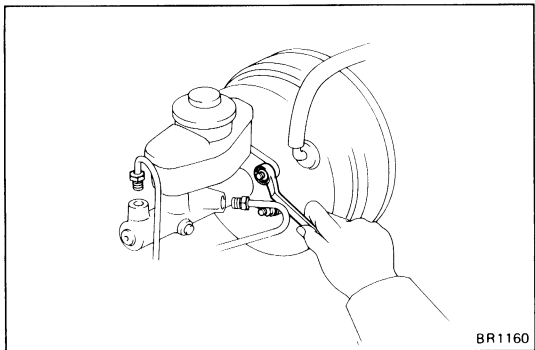
1. DISCONNECT LEVEL WARNING SWITCH CONNECTOR
2. TAKE OUT FLUID WITH SYRINGE OR SUCH
CAUTION: Do not let brake fluid remain on a painted surface. Wash off it immediately.

3. DISCONNECT TWO BRAKE TUBES

Using SST, disconnect two brake tubes from the master cylinder.

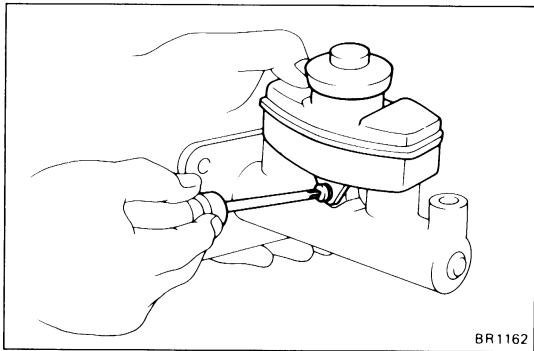
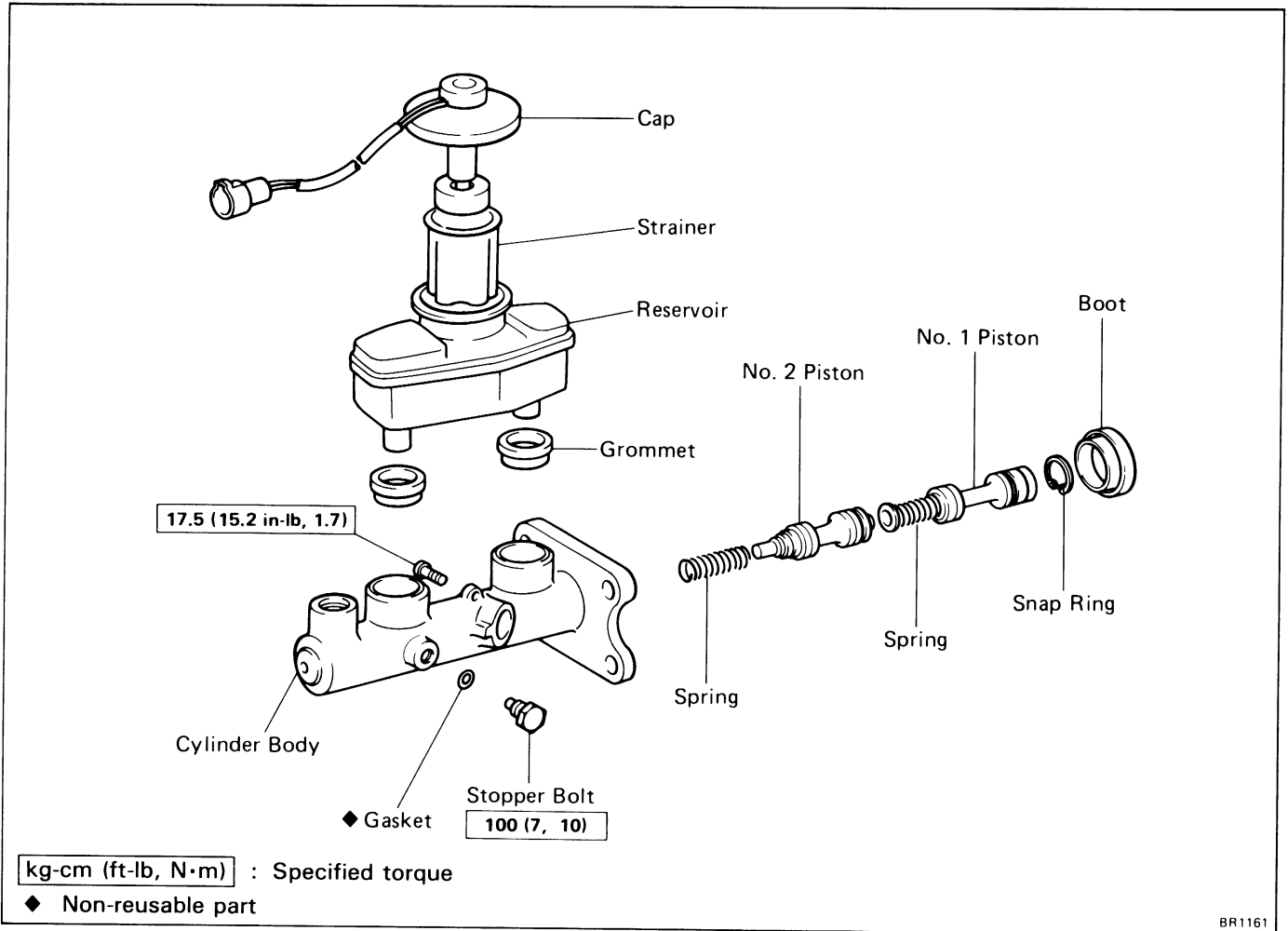
SST 09751-36011



**4. REMOVE MASTER CYLINDER**

- (a) Remove the four nuts.
- (b) Remove the master cylinder from the brake booster and remove the gasket.

(w/o Anti-lock Brake System)
COMPONENTS



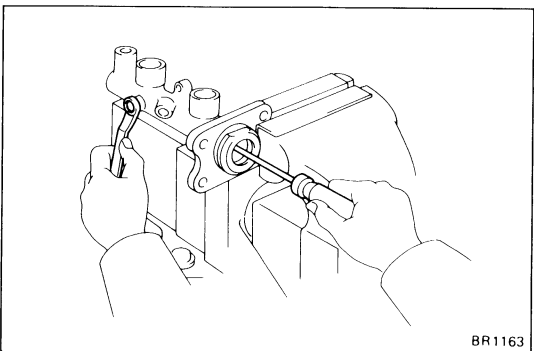
DISASSEMBLY OF MASTER CYLINDER

1. REMOVE RESERVOIR

- (a) Remove the set screw and pull out the reservoir.
- (b) Remove the cap and strainer from the reservoir.

2. REMOVE TWO GROMMETS

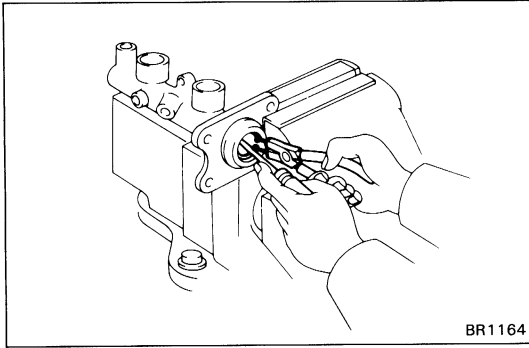
3. PLACE CYLINDER IN VISE



4. REMOVE PISTON STOPPER BOLT

Using a screwdriver, push the pistons in all the way and remove the piston stopper bolt and gasket.

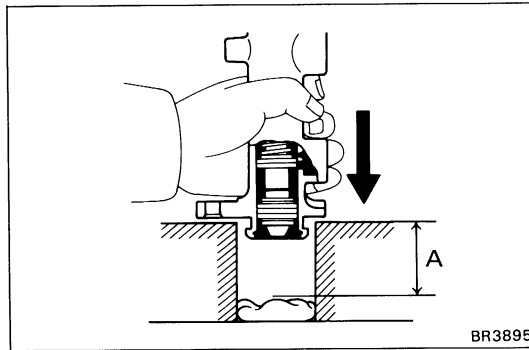
HINT: Tape the screwdriver tip before use.



5. REMOVE TWO PISTONS AND SPRINGS

- (a) Push in the piston with a screwdriver and remove the snap ring with snap ring pliers.
- (b) Remove the No.1 piston and spring by hand, pulling straight out, not at an angle.

NOTICE: If pulled out at an angle, there is possibility of damaging the cylinder bore.



- (c) Place a rag and two wooden blocks on the work table, and lightly tap the cylinder flange against the block edges until the No.2 piston drops out of cylinder.

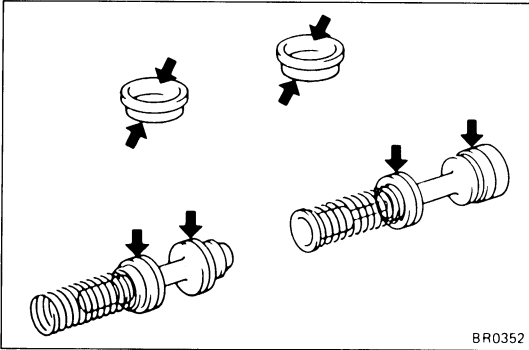
HINT: Make sure the distance (A) from the rag to the top of blocks is at least 100 mm (3.94 in.).

INSPECTION OF MASTER CYLINDER COMPONENTS

HINT: Clean the disassembled parts with compressed air.

1. **INSPECT CYLINDER BORE FOR RUST OR SCORING**
2. **INSPECT CYLINDER FOR WEAR OR DAMAGE**

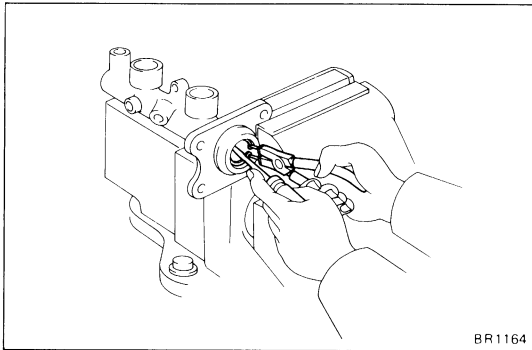
If necessary, clean or replace the cylinder.



ASSEMBLY OF MASTER CYLINDER

(See page BR-11)

1. APPLY LITHIUM SOAP BASE GLYCOL GREASE TO RUBBER PARTS INDICATED BY ARROWS



2. INSTALL TWO SPRINGS AND PISTONS

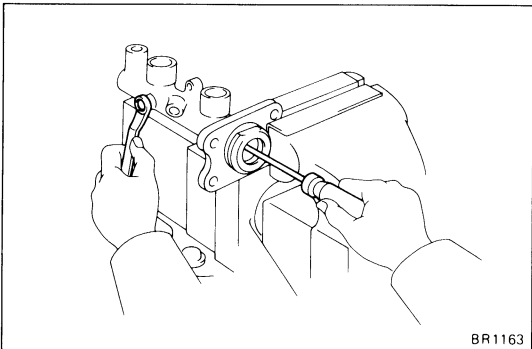
NOTICE: Be careful not to damage the rubber lips on the pistons.

(a) Insert the two springs and pistons straight in, not at an angle.

NOTICE: If inserted at an angle, there is a possibility of damaging the cylinder bore.

(b) Push in the piston with a screwdriver and install the snap ring with snap ring pliers.

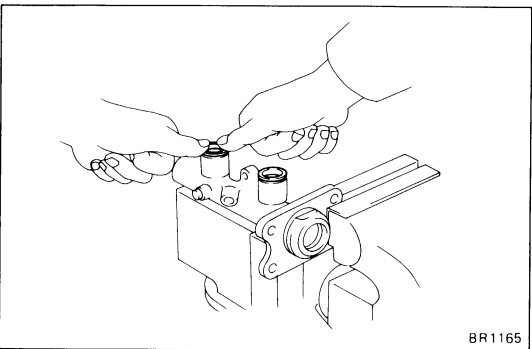
HINT: Tape the screwdriver tip before use.



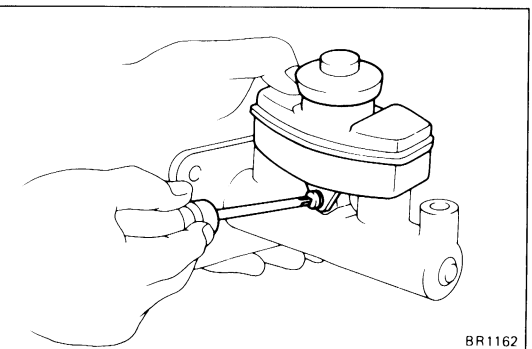
3. INSTALL PISTON STOPPER BOLT

Using a screwdriver, push the piston in all the way and install the piston stopper bolt over the gasket. Torque the bolt.

Torque: 100 kg-cm (7 ft-lb, 10 N·m)



4. INSTALL TWO GROMMETS



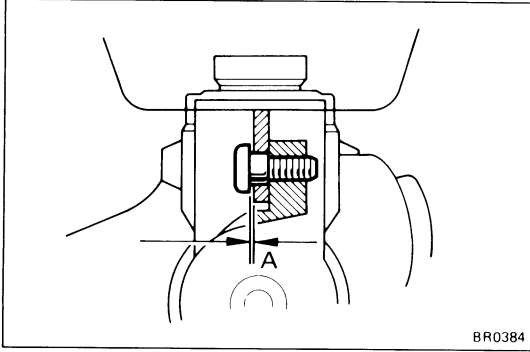
5. INSTALL RESERVOIR

(a) Install the cap and strainer to the reservoir.

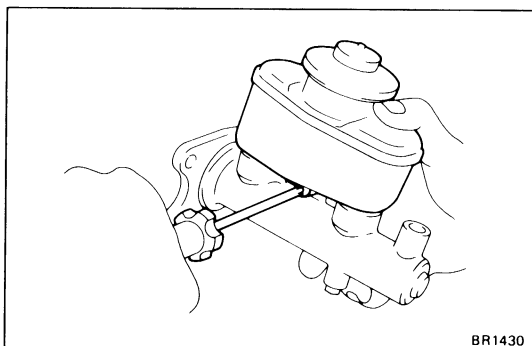
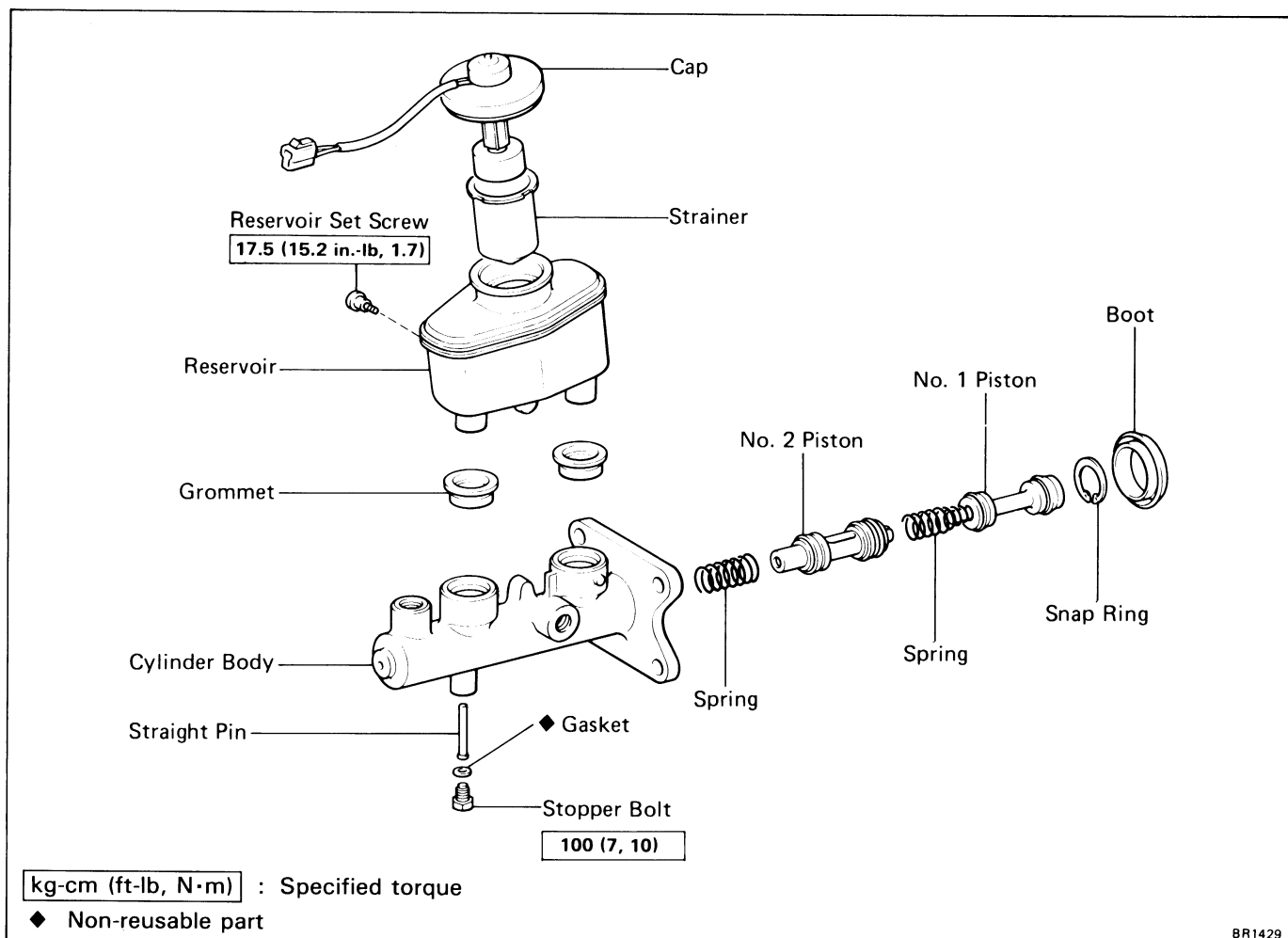
(b) Push the reservoir onto the cylinder.

(c) Install the set screw while pushing on the reservoir.

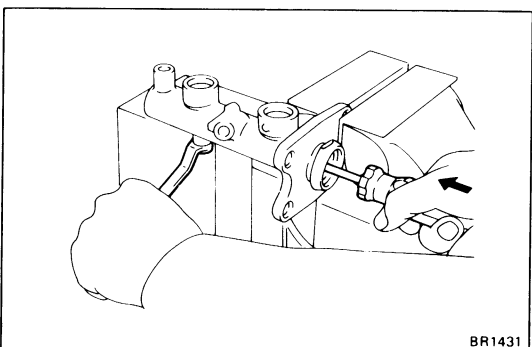
Torque: 17.5 kg-cm (15.2 in.-lb, 1.7 N·m)



NOTICE: Because the master cylinder and reservoir tank union is a grommet type, the set screw is designed to not separate the reservoir from cylinder and will not tighten down the reservoir. Therefore, there is a clearance at point A. Do not insert washers or an equivalent when tightening.

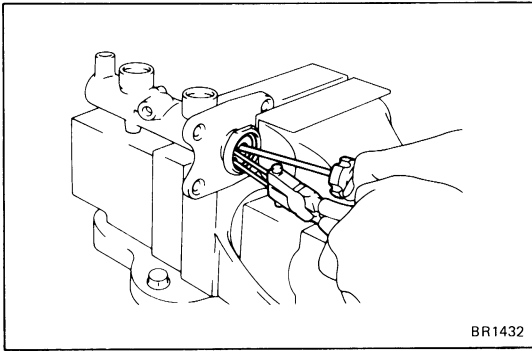
(w/ Anti-lock Brake System)**COMPONENTS****DISASSEMBLY OF MASTER CYLINDER****1. REMOVE RESERVOIR**

- (a) Remove the set screw and pull out the reservoir.
- (b) Remove the cap and strainer from the reservoir.

2. REMOVE TWO GROMMETS**3. PLACE CYLINDER IN VISE****4. REMOVE PISTON STOPPER BOLT**

Using a screwdriver, push the piston in all the way and remove the piston stopper bolt, straight pin and gasket.

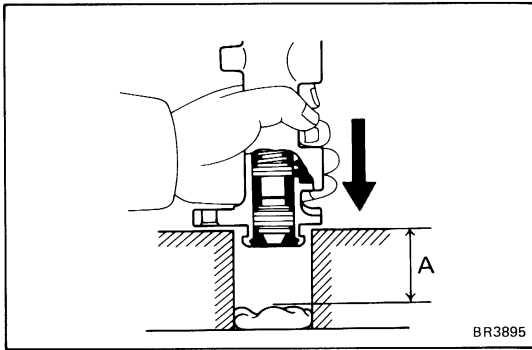
HINT: Tape the screwdriver tip before use.



5. REMOVE TWO PISTONS AND SPRINGS

- (a) Push in the piston with a screwdriver and remove the snap ring with snap ring pliers.
- (b) Remove the No. 1 piston and spring by hand, pulling straight out, not at an angle.

NOTICE: If pulled out at an angle, there is possibility of damaging the cylinder bore.



- (c) Place a rag and two wooden blocks on the work table, and lightly tap the cylinder flange against the block edges until the No. 2 piston drops out of cylinder.

HINT: Make sure the distance (A) from the rag to the top of the blocks is at least 100 mm (3.94 in.).

INSPECTION OF MASTER CYLINDER COMPONENTS

HINT: Clean the disassembled parts with compressed air.

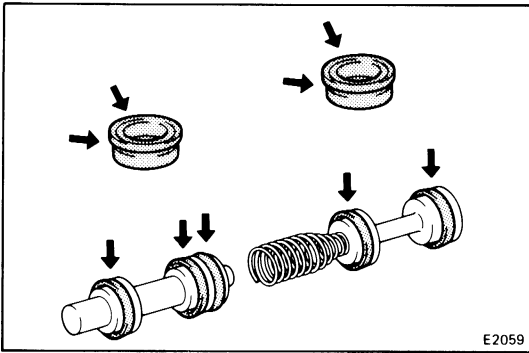
1. INSPECT CYLINDER BORE FOR RUST OR SCORING
2. INSPECT CYLINDER FOR WEAR OR DAMAGE

If necessary, clean or replace the cylinder.

ASSEMBLY OF MASTER CYLINDER

(See page BR-15)

1. APPLY LITHIUM SOAP BASE GLYCOL GREASE TO RUBBER PARTS INDICATED BY ARROWS



2. INSTALL TWO SPRINGS AND PISTONS

NOTICE: Be careful not to damage the rubber lips on the pistons.

(a) Insert the spring.

(b) Align the grooves on the No. 2 piston and master cylinder flange as shown, and insert the No. 2 piston straight in, not at an angle.

NOTICE: If inserted at an angle, there is a possibility of damaging the cylinder bore.

(c) Using a screwdriver, align the grooves again.

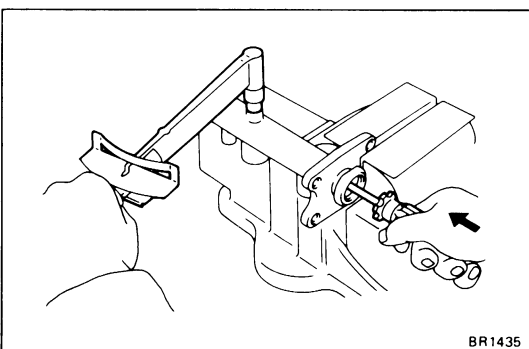
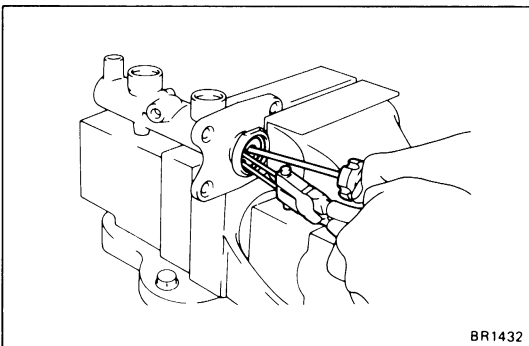
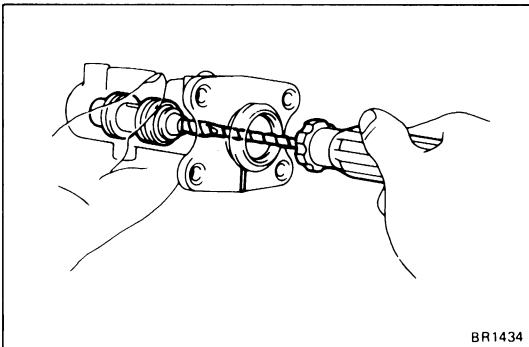
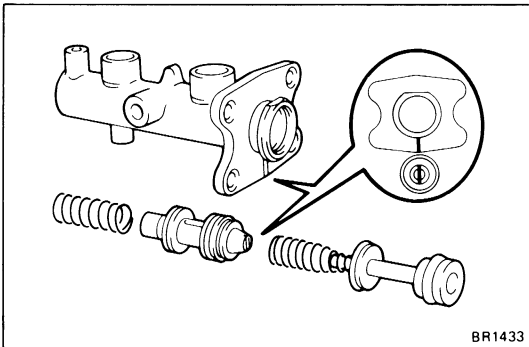
HINT: Wind vinyl tape on the screwdriver.

NOTICE: Be careful not to scratch the cylinder bore.

(d) Temporarily insert the straight pin, and check that it can be inserted easily.

(e) Insert the spring and No. 1 piston straight in, not an angle.

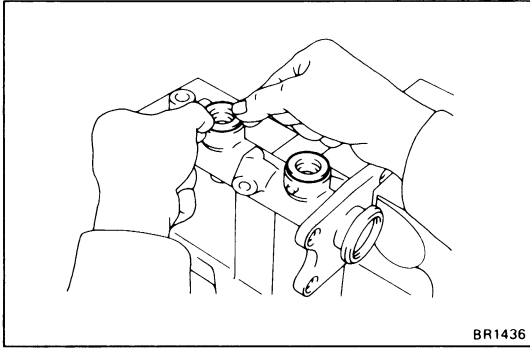
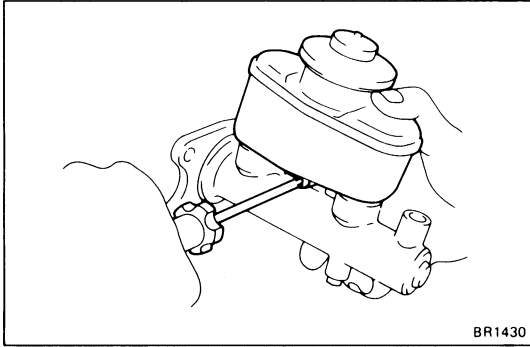
(f) Push in the piston with a screwdriver and install the snap ring with snap ring pliers.



3. INSTALL PISTON STOPPER BOLT

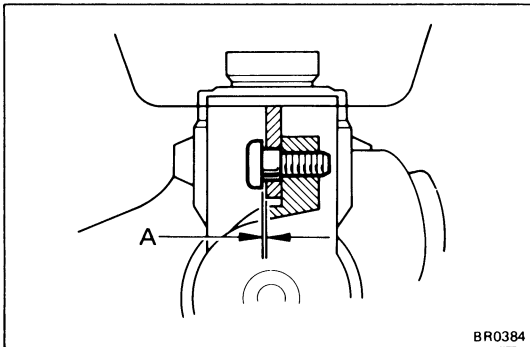
Using a screwdriver, push the piston in all the way and insert the straight pin and then install the piston stopper bolt over the gasket. Torque the bolt.

Torque: 100 kg-cm (7 ft-lb, 10 N·m)

**4. INSTALL TWO GROMMETS****5. INSTALL RESERVOIR**

- (a) Install the cap and strainer to the reservoir.
- (b) Push the reservoir onto the cylinder.
- (c) Install the set screw while pushing on the reservoir.

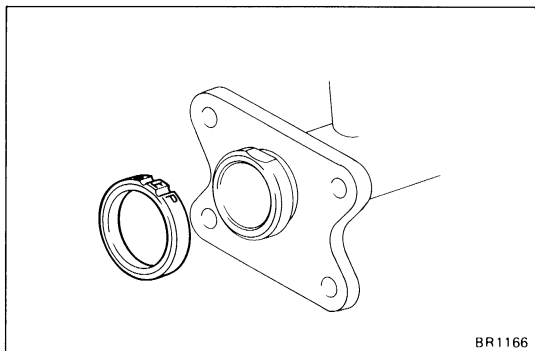
Torque: 17.5 kg-cm (15.2 in.-lb, 1.7 N·m)



NOTICE: Because the master cylinder and reservoir tank union is a grommet type, the set screw is designed to not separate the reservoir from cylinder and will not tighten down the reservoir. Therefore, there is a clearance at point A. Do not insert washers or an equivalent when tightening.

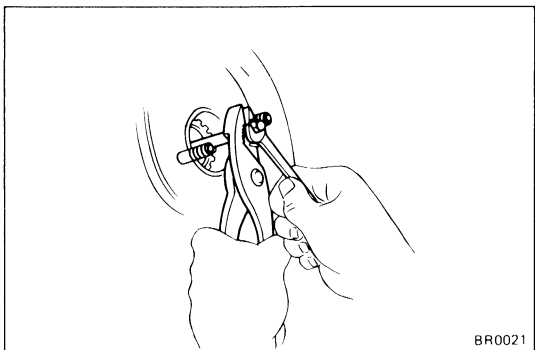
INSTALLATION OF MASTER CYLINDER

(See page BR-9)



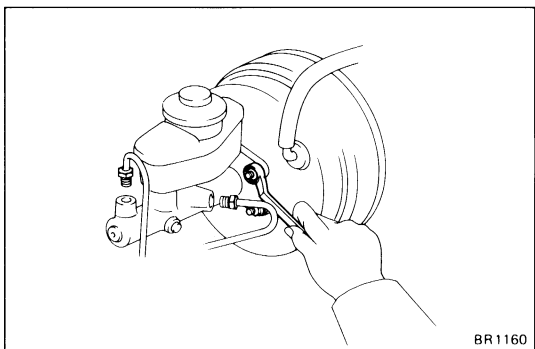
BR1166

1. **CLEAN OUT GROOVE ON LOWER INSTALLATION SURFACE OF MASTER CYLINDER**
2. **CONFIRM THAT "UP" MARK ON MASTER CYLINDER BOOT IS IN CORRECT POSITION**



BR0021

3. **ADJUST LENGTH OF BRAKE BOOSTER PUSH ROD BEFORE INSTALLING MASTER CYLINDER**
(See page BR-21)

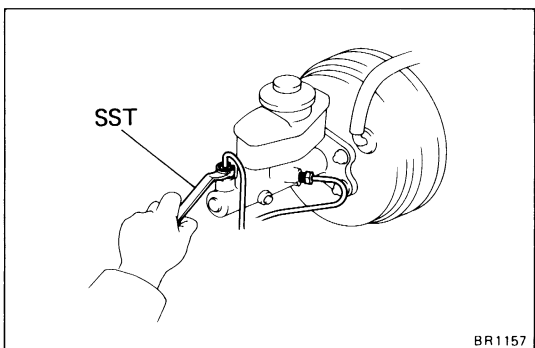


BR1160

4. **INSTALL MASTER CYLINDER**

Install the master cylinder and gasket on the brake booster with four nuts.

Torque: 130 kg-cm (9 ft-lb, 13 N·m)



BR1157

5. **CONNECT TWO BRAKE TUBES**

Using SST, connect the brake tubes to the master cylinder. Torque the union nuts.

SST 09751-36011

Torque: 155 kg-cm (11 ft-lb, 15 N·m)

6. **CONNECT LEVEL WARNING SWITCH CONNECTOR**

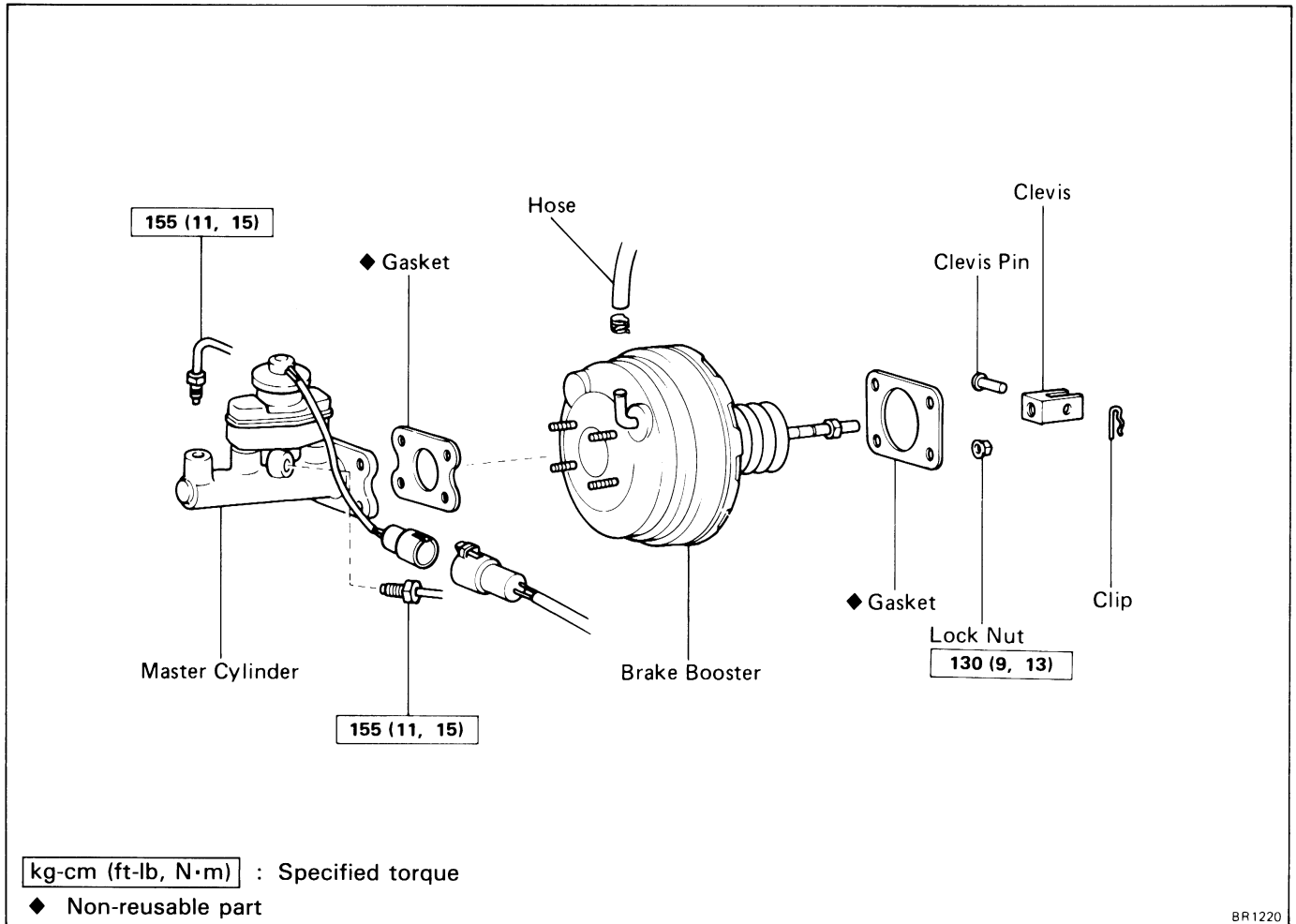
7. **FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM**

(See page BR-6)

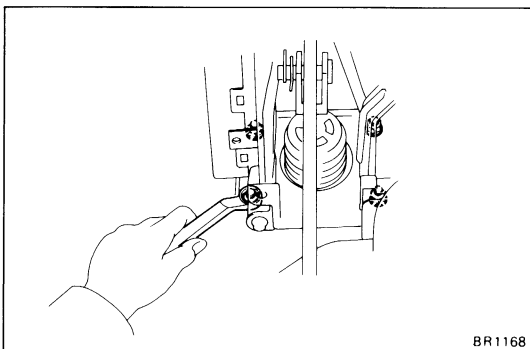
8. **CHECK FOR FLUID LEAKAGE**

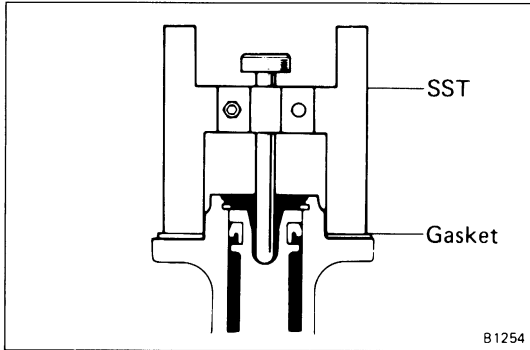
9. **CHECK AND ADJUST BRAKE PEDAL**

(See page BR-5)

BRAKE BOOSTER**REMOVAL OF BRAKE BOOSTER**

1. REMOVE MASTER CYLINDER
(See page BR-9)
2. REMOVE CRUISE CONTROL ACTUATOR BRACKET BOLTS
3. DISCONNECT VACUUM HOSE FROM BRAKE BOOSTER
4. REMOVE INSTRUMENT LOWER FINISH PANEL
5. REMOVE PEDAL RETURN SPRING
6. REMOVE CLIP AND CLEVIS PIN
7. REMOVE BRAKE BOOSTER, GASKET AND CLEVIS
 - (a) Remove the four nuts and clevis.
 - (b) Pull out the brake booster and gasket.





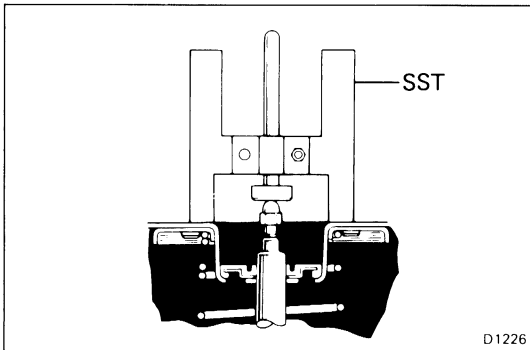
INSTALLATION OF BRAKE BOOSTER

(See page BR-20)

1. ADJUST LENGTH OF BOOSTER PUSH ROD

- (a) Set the SST on the master cylinder with the gasket, and then lower the pin until it slightly touches the piston.

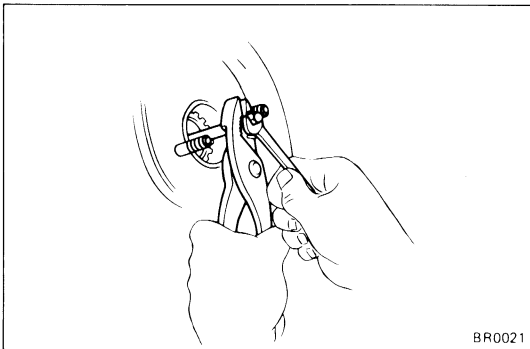
SST 09737-00010



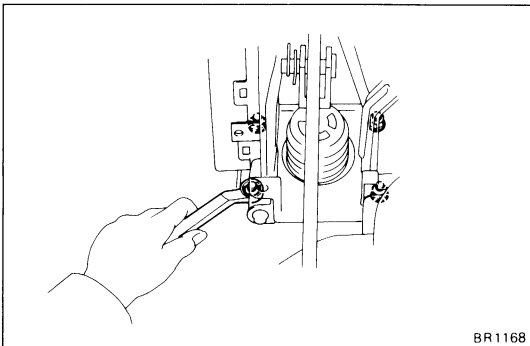
- (b) Turn the SST upside down and set it on the booster. SST 09737-00010

- (c) Measure the clearance between the booster push rod and pin head (SST).

Clearance: 0 mm (0 in.)



- (d) Adjust the booster push rod length until the push rod lightly touches the pin head.



2. INSTALL BRAKE BOOSTER, GASKET AND CLEVIS

- (a) Install the booster and gasket.
- (b) Install the clevis and tighten the lock nut.

Torque: 260 kg-cm (19 ft-lb, 25 N·m)

- (c) Install and torque the booster mounting nuts.

Torque: 130 kg-cm (9 ft-lb, 13 N·m)

3. CONNECT CLEVIS TO BRAKE PEDAL

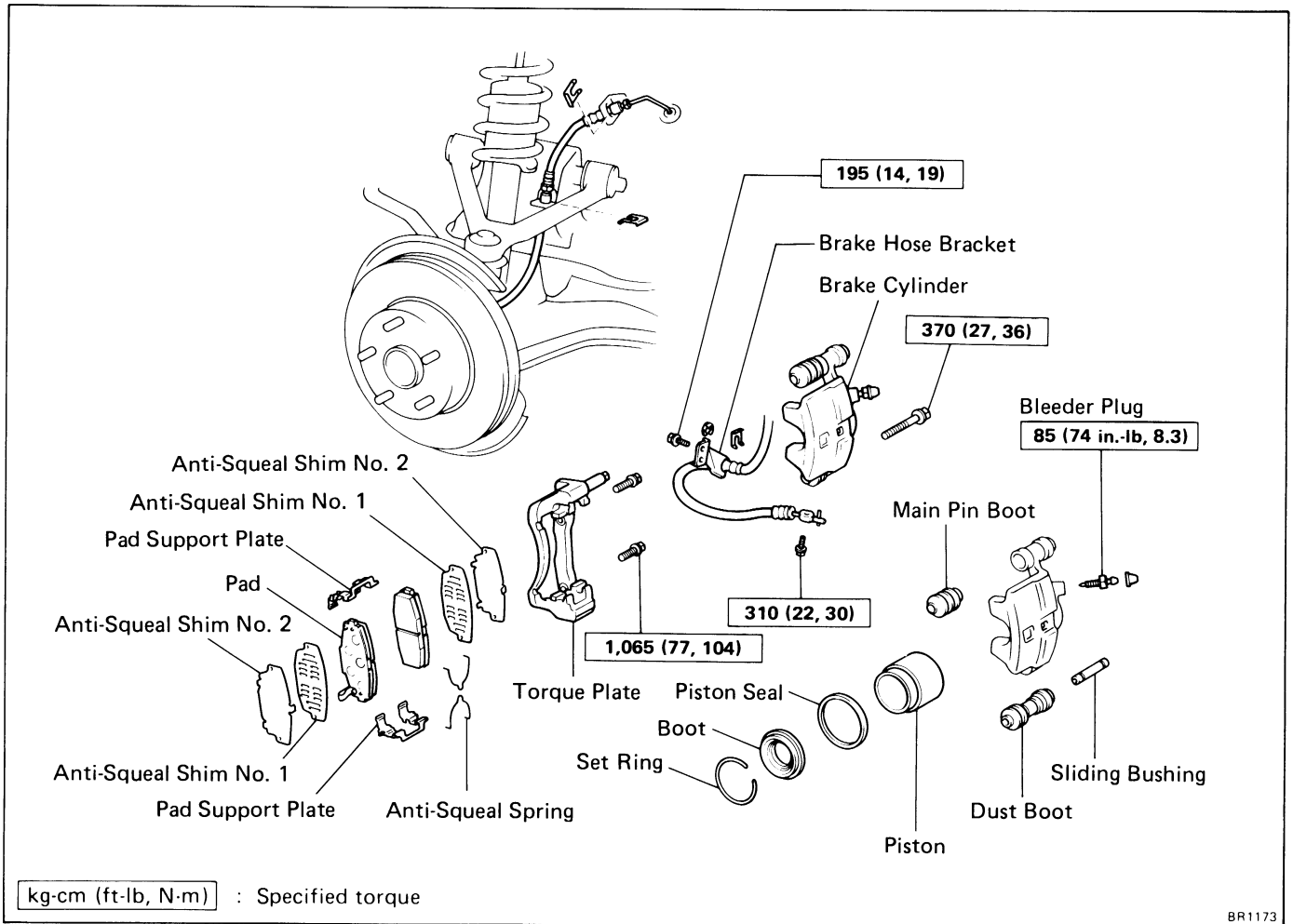
Insert the clevis pin into the clevis and brake pedal, and install the clip to the clevis pin.

4. INSTALL PEDAL RETURN SPRING

5. INSTALL INSTRUMENT LOWER FINISH PANEL

6. **INSTALL MASTER CYLINDER**
(See page BR-19)
7. **CONNECT VACUUM HOSE TO BRAKE BOOSTER**
8. **INSTALL CRUISE CONTROL ACTUATOR BRACKET BOLTS**
9. **FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM**
(See page BR-6)
10. **CHECK FOR FLUID LEAKAGE**
11. **CHECK AND ADJUST BRAKE PEDAL**
(See page BR-5)
12. **PERFORM OPERATIONAL CHECK**
(See page BR-6)

FRONT BRAKE COMPONENTS



REPLACEMENT OF BRAKE PADS

If a squealing noise occurs while braking, inspect the brake pads.

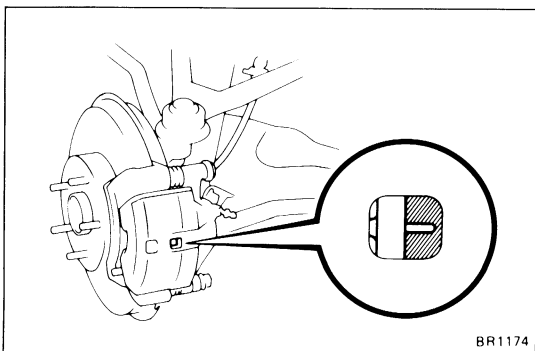
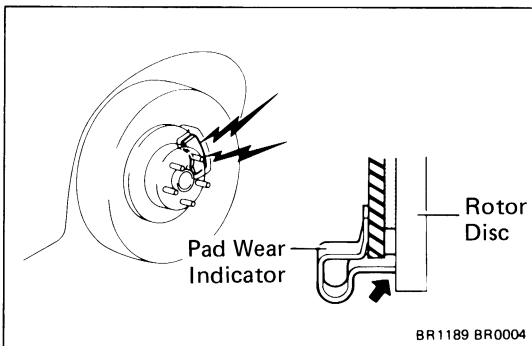
1. REMOVE FRONT WHEEL

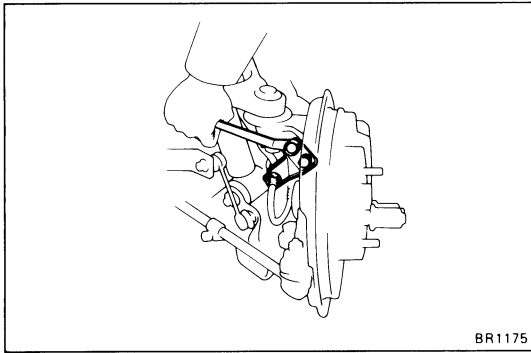
Remove the wheel and temporarily fasten the rotor disc with the hub nuts.

2. INSPECT PAD LINING THICKNESS

Check the pad thickness through the cylinder inspection hole and replace pads if not within specification.

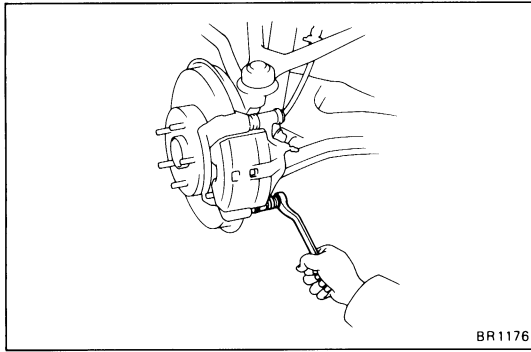
Minimum thickness: 1.0 mm (0.039 in.)





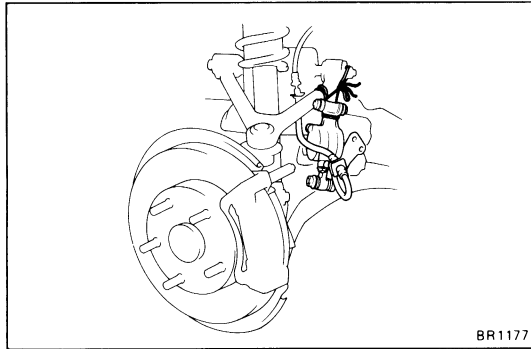
3. REMOVE BRAKE HOSE BRACKET

Remove the two bolts and remove the bracket.



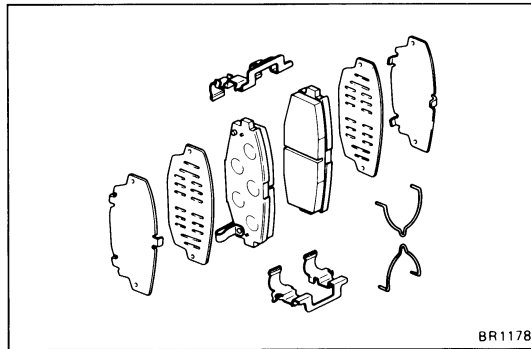
4. REMOVE CYLINDER FROM TORQUE PLATE

(a) Remove the installation bolt from the torque plate.



(b) Remove the brake cylinder and suspend it so the hose is not stretched.

HINT: Do not disconnect the brake hose.

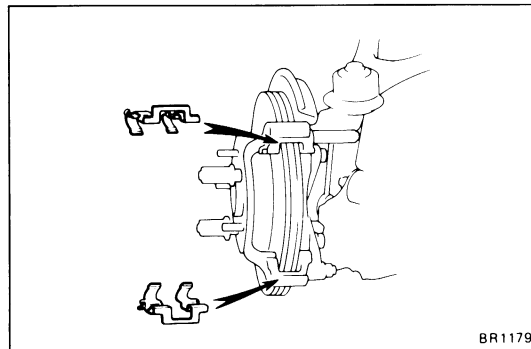


5. REMOVE FOLLOWING PARTS

- (a) Two anti-squeal springs
- (b) Two brake pads
- (c) Four anti-squeal shims
- (d) Two pad support plates

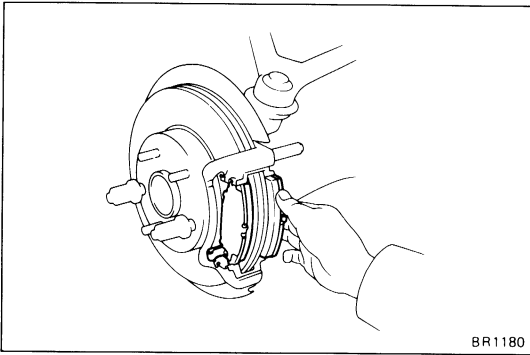
6. CHECK ROTOR DISC THICKNESS (See step 2 on page BR-28)

7. CHECK ROTOR DISC RUNOUT (See step 3 on page BR-28)



8. INSTALL TWO PAD SUPPORT PLATES

Install the two pad support plates to the torque plate.



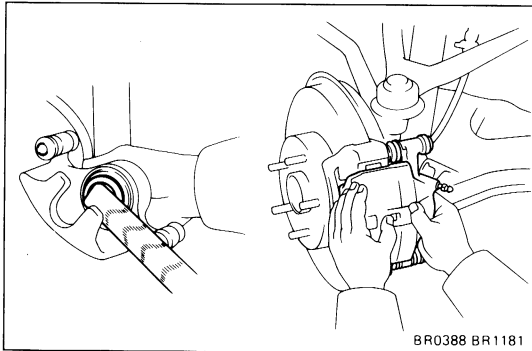
9. INSTALL NEW PADS

- (a) Install anti-squeal shim No.1 to the pad.
- (b) Install the pads onto each support plate.

HINT: Install the pads so the wear indicator is at the bottom side.

- (c) Install the anti-squeal shim No.2 over shim No.1.
- (d) Install the two anti-squeal springs.

NOTICE: Do not allow oil or grease to get on the rubbing face.



10. INSTALL CYLINDER

- (a) Draw out a small amount of brake fluid from the reservoir.

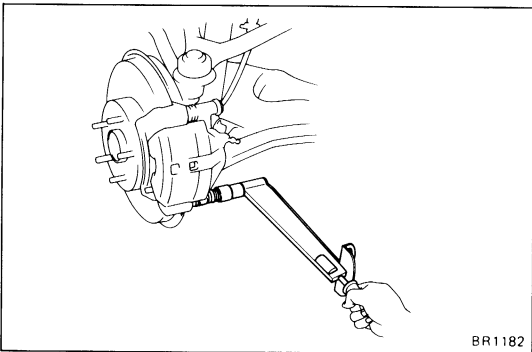
- (b) Press in piston with a hammer handle or an equivalent.

HINT: Always change the pad on one wheel at a time as there is a possibility of the opposite piston flying out.

- (c) Insert the brake cylinder carefully so the boot is not wedged.

- (d) Install and torque the installation bolt.

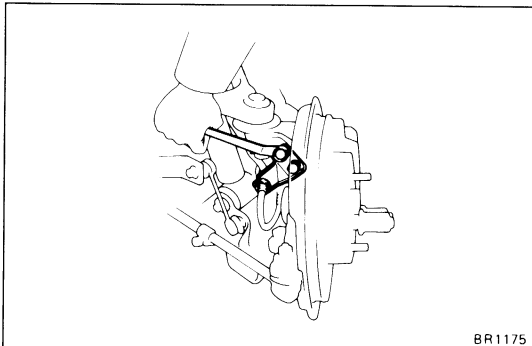
Torque: 370 kg-cm (27 ft-lb, 36 N·m)



11. INSTALL BRAKE HOSE BRACKET

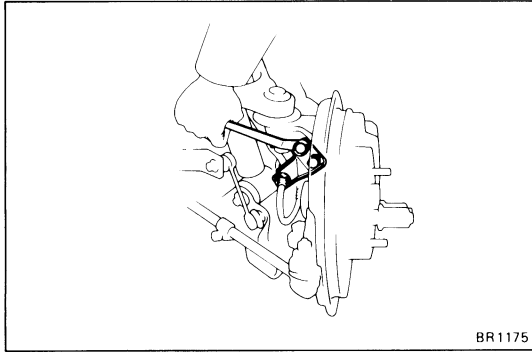
Install the brake hose bracket and torque the two bolts.

Torque: 195 kg-cm (14 ft-lb, 19 N·m)



12. INSTALL FRONT WHEEL

13. CHECK THAT FLUID LEVEL IS AT MAX LINE

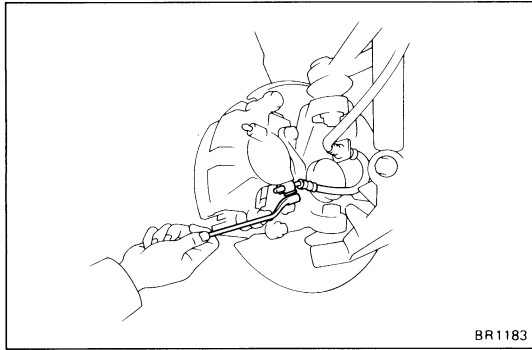


REMOVAL OF CYLINDER

(See page BR-23)

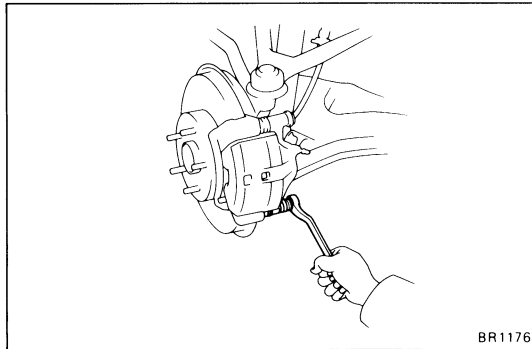
1. REMOVE BRAKE HOSE BRACKET

Remove the two bolts and bracket.



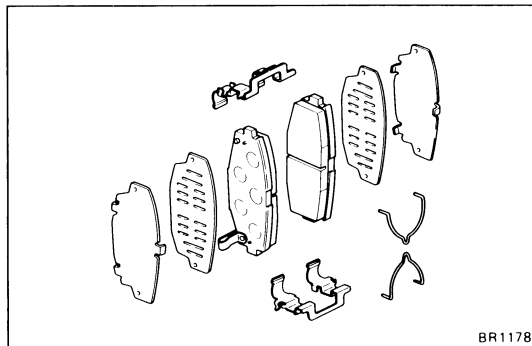
2. DISCONNECT BRAKE LINE

Remove the union bolt and disconnect the brake line. Use a container to catch the brake fluid.



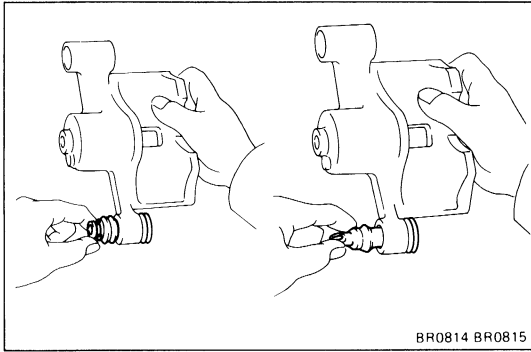
3. REMOVE CYLINDER FROM TORQUE PLATE

Remove the installation bolt and cylinder.



4. REMOVE PADS

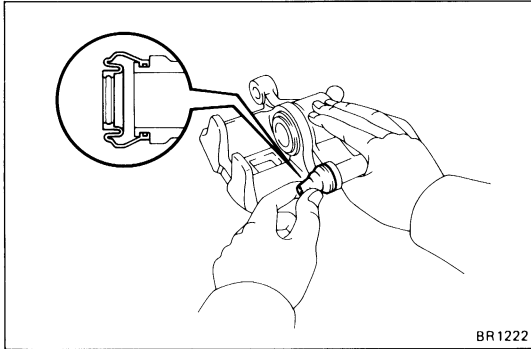
(See step 5 on page BR-24)



DISASSEMBLY OF CYLINDER

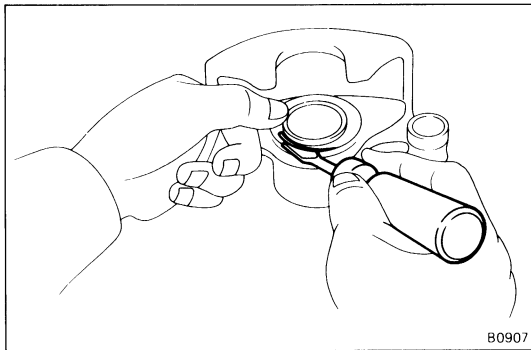
(See page BR-23)

1. REMOVE SLIDING BUSHING AND DUST BOOT



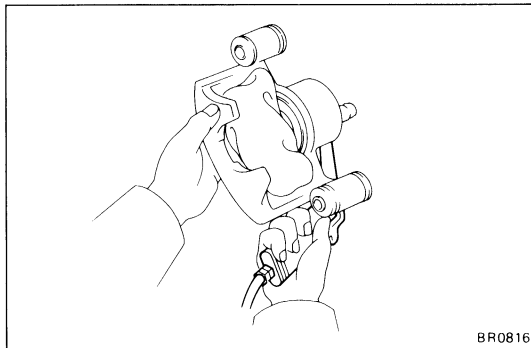
2. REMOVE MAIN PIN BOOT

Pull out the main pin boot.



3. REMOVE CYLINDER BOOT SET RING AND CYLINDER BOOT

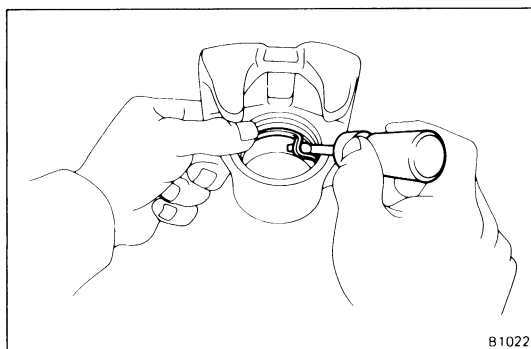
Using a screwdriver, remove the cylinder boot set ring and cylinder boot.



4. REMOVE PISTON FROM CYLINDER

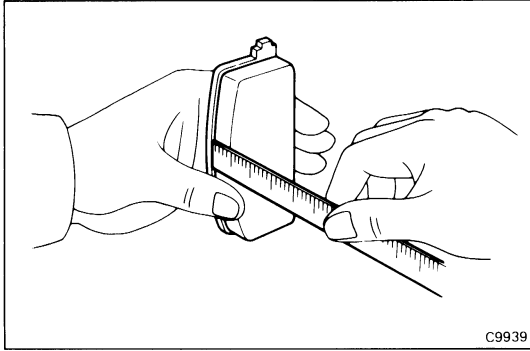
- (a) Put a piece of cloth or an equivalent as shown.
- (b) Use compressed air to remove the piston from the cylinder.

CAUTION: Do not place your fingers in front of the piston when using compressed air.



5. REMOVE PISTON SEAL FROM BRAKE CYLINDER

Using a screwdriver, remove the piston seal.



C9939

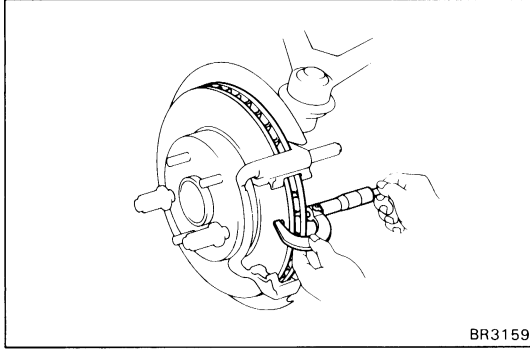
INSPECTION AND REPAIR OF FRONT BRAKE COMPONENTS

1. MEASURE PAD LINING THICKNESS

Standard thickness: 10.0 mm (0.394 in.)

Minimum thickness: 1.0 mm (0.039 in.)

Replace the pad if the thickness is less than the minimum or if it shows signs of uneven wear.



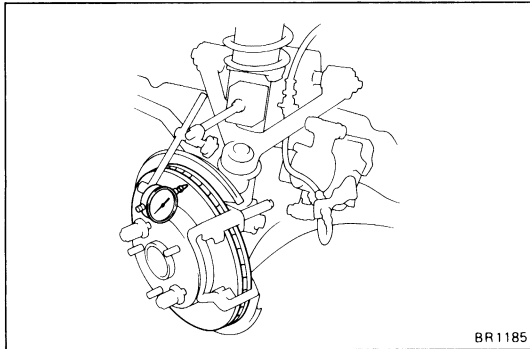
BR3159

2. MEASURE ROTOR DISC THICKNESS

Standard thickness: 22.0 mm (0.866 in.)

Minimum thickness: 21.0 mm (0.827 in.)

If the disc is scored or worn, or if thickness is less than minimum, repair or replace the disc.



BR1185

3. MEASURE ROTOR DISC RUNOUT

HINT: Before measuring the runout, confirm that the front hub bearing play is within specification.

Measure the rotor disc runout at 10 mm (0.39 in.) from the outer edge of the rotor disc.

Maximum disc runout: 0.13 mm (0.0051 in.)

If the runout is greater than the maximum, inspect and adjust it following the procedure below:

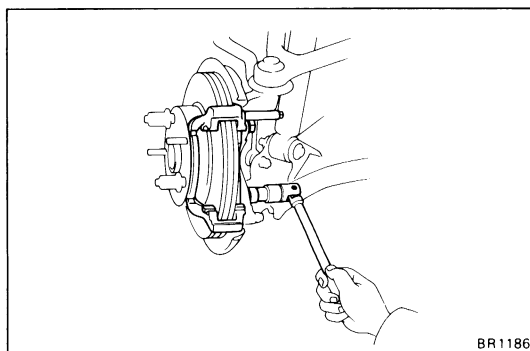
Then replace the disc if necessary.

- (a) Remove the torque plate from the knuckle.
- (b) Remove the hub nuts of the temporarily installed disc and pull off the rotor disc.
- (c) Check that the hub axial play is within specification, and replace the bearing if not within specification. **(See page FA-8)**
- (d) Install the rotor disc and measure the disc runout, then shift the rotor disc one fifth of a turn and measure the disc runout. Similarly measure the runout at each position, and select the position where the runout is minimum.

- (e) In this position, if the runout is within specification, install the torque plate and torque the mounting bolts.

Torque: 1,065 kg-cm (77 ft-lb, 104 N·m)

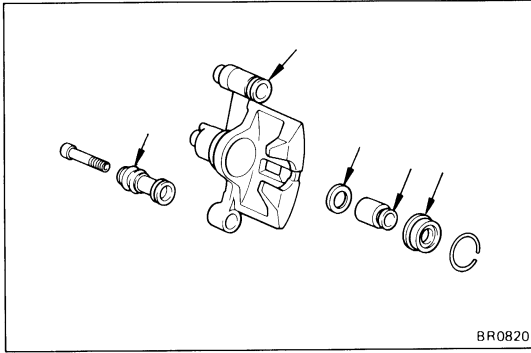
- (f) If not within specification, replace the rotor disc, and repeat (d) and (e).



BR1186

ASSEMBLY OF CYLINDER

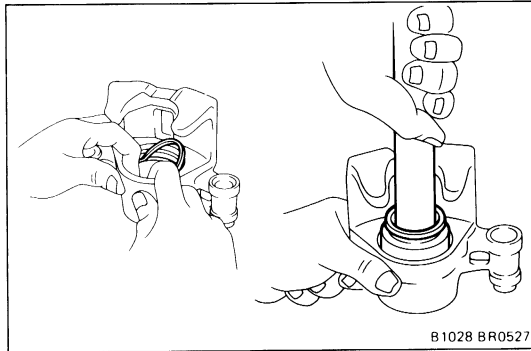
(See page BR-23)



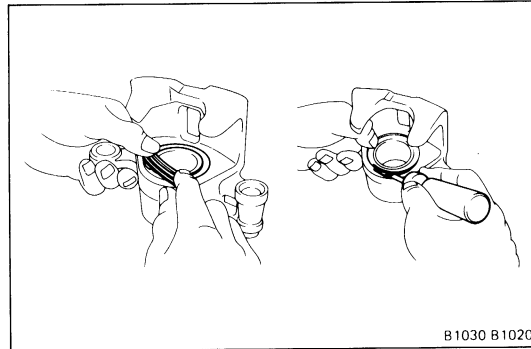
BR0820

1. APPLY LITHIUM SOAP BASE GLYCOL GREASE TO FOLLOWING PARTS

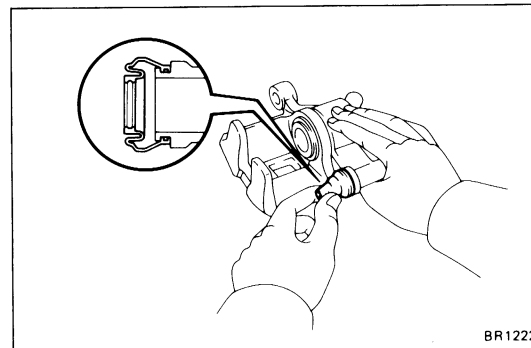
- (a) Main pin boot
- (b) Sliding bushing and boot
- (c) Piston, piston seal and cylinder boot



B1028 BR0527

2. INSTALL PISTON SEAL AND PISTON IN CYLINDER

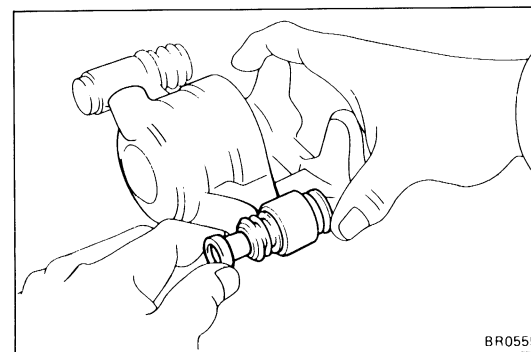
B1030 B1020

3. INSTALL CYLINDER BOOT AND SET RING IN CYLINDER

BR1222

4. INSTALL MAIN PIN BOOT

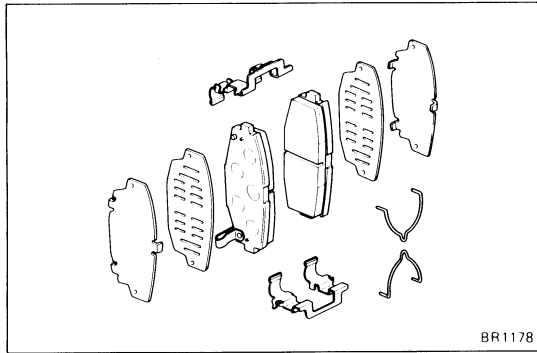
Push in the main pin boot.



BR0555

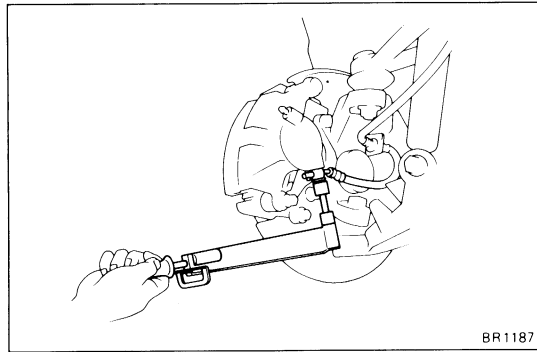
5. INSTALL SLIDING BUSHING AND DUST BOOT

- (a) Install the sliding bushing and dust boot into the brake cylinder.
- (b) Insure that the boot is secured firmly to the brake cylinder groove.



INSTALLATION OF CYLINDER (See page BR-23)

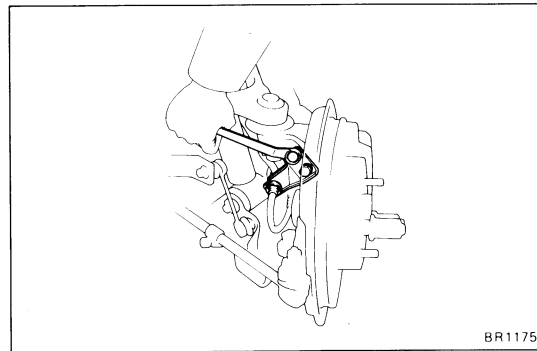
1. **INSTALL PADS**
(See step 8 to 9 on page BR-24 and 25)
2. **INSTALL CYLINDER**
(See step 10 on page BR-25)



3. **INSTALL FLEXIBLE HOSE TO BRAKE CYLINDER**

Set the flexible hose and new gaskets in position and install the union bolt.

Torque: 310 kg-cm (22 ft-lb, 30 N·m)



4. **INSTALL BRAKE HOSE BRACKET**

Install the brake hose bracket and tighten the two bolts.

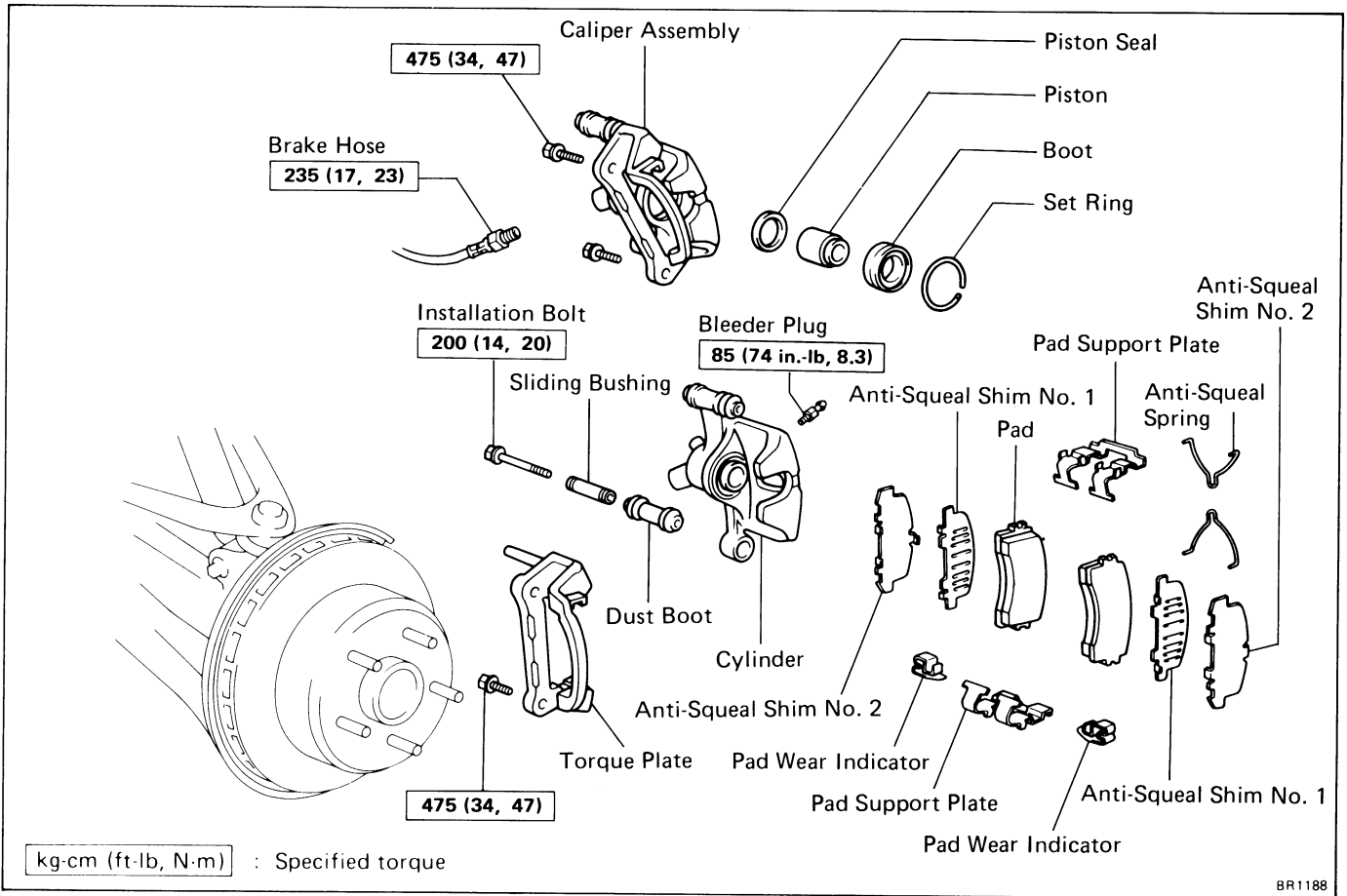
Torque: 195 kg-cm (14 ft-lb, 19 N·m)

5. **FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM**
(See page BR-6)
6. **CHECK FOR LEAKS**

REAR BRAKE

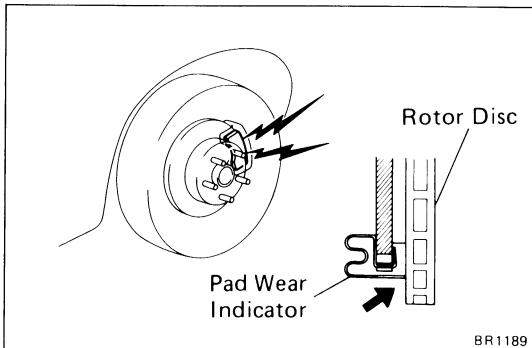
Disc Brake

COMPONENTS



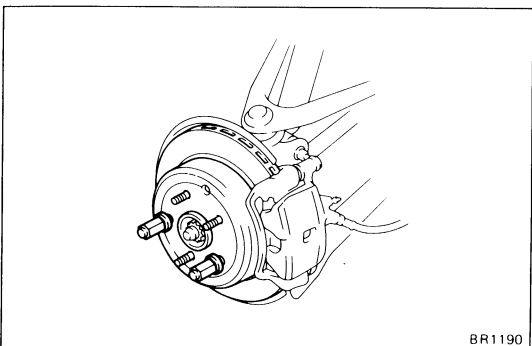
REPLACEMENT OF BRAKE PADS

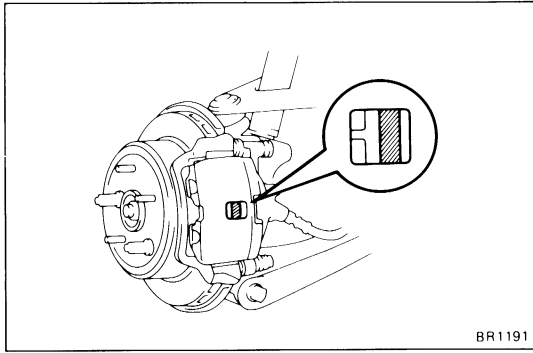
If a squealing noise occurs while braking, inspect the brake pads.



1. REMOVE REAR WHEEL

Remove the wheel and temporarily fasten the rotor disc with the hub nuts.



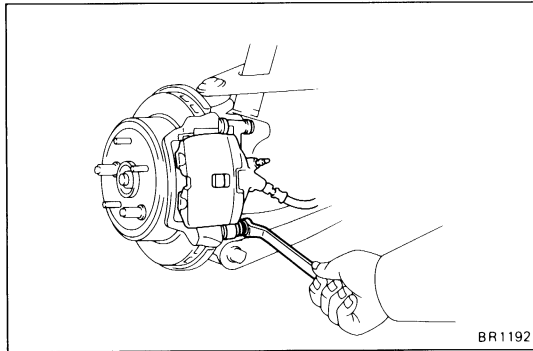


2. INSPECT PAD LINING THICKNESS

Check the pad thickness through the cylinder inspection hole and replace pads if not within specification.

Standard thickness: 10.0 mm (0.394 in.)

Minimum thickness: 1.0 mm (0.039 in.)

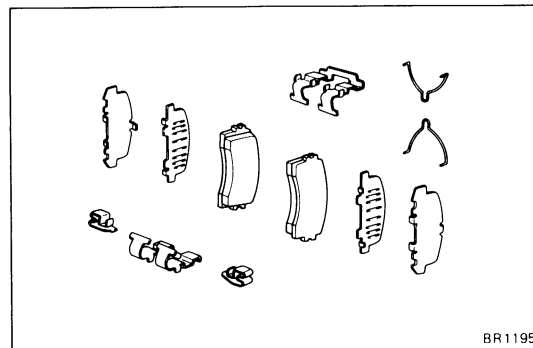
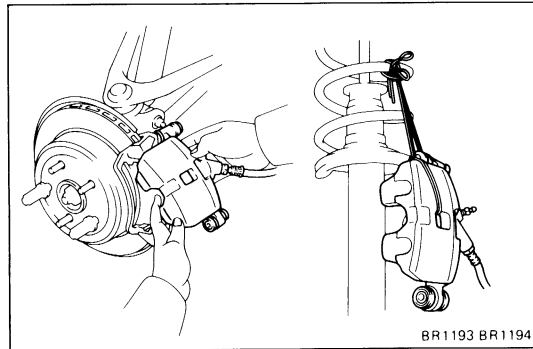


3. REMOVE CYLINDER FROM TORQUE PLATE

(a) Remove the installation bolt from the torque plate.

(b) Remove the brake cylinder and suspend it so the hose is not stretched.

HINT: Do not disconnect the brake hose.



4. REMOVE FOLLOWING PARTS

- (a) Two anti-squeal springs
- (b) Two brake pads
- (c) Four anti-squeal shims
- (d) Two pad wear indicators
- (e) Two pad support plates

5. CHECK ROTOR DISC THICKNESS

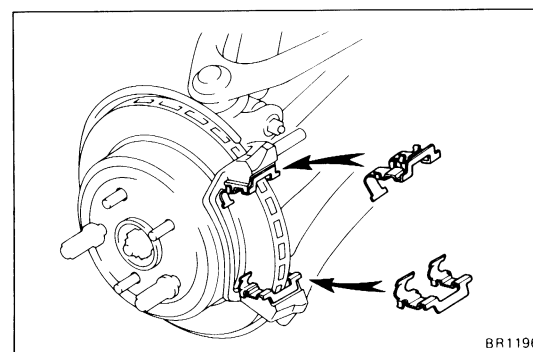
(See step 2 on page BR-36)

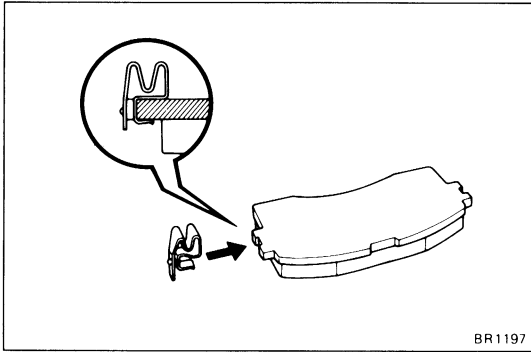
6. CHECK ROTOR DISC RUNOUT

(See step 3 on page BR-36)

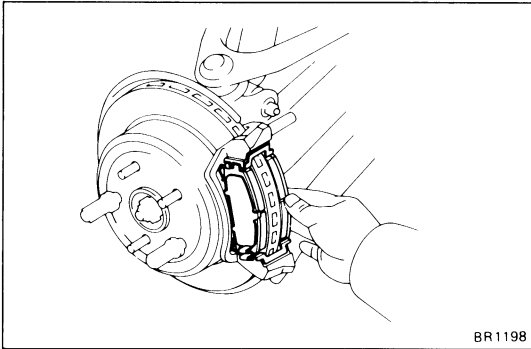
7. INSTALL TWO PAD SUPPORT PLATES

Install the two pad support plates to the torque plate.



**8. INSTALL NEW PADS**

- (a) Install the new pad wear indicators to the lower side of the pads.
- (b) Install the anti-squeal shim No.1 to the pads.

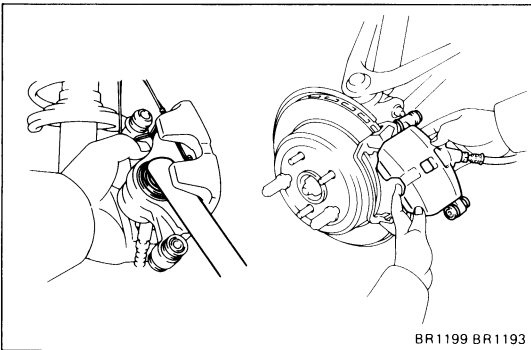


- (c) Install the pads onto each pad support plate.

NOTE: Install the pads so the wear indicator is at the bottom side.

- (d) Install the anti-squeal shim No.2 over shim No.1.
- (e) Install the two anti-squeal springs.

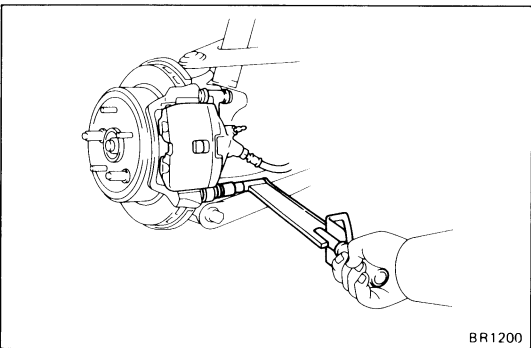
NOTICE: Do not allow oil or grease to get on the rubbing face.

**9. INSTALL CYLINDER**

- (a) Draw out a small amount of brake fluid from the reservoir.
- (b) Press in piston with a hammer handle or an equivalent.

HINT: Always change the pad on one wheel at a time as there is a possibility of the opposite piston flying out.

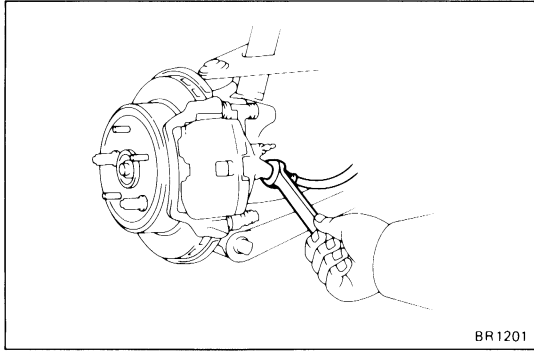
- (c) Insert the brake cylinder carefully so the boot is not wedged.



- (d) Install and torque the installation bolt.

Torque: 200 kg-cm (14 ft-lb, 20 N·m)

10. INSTALL REAR WHEEL**11. CHECK THAT FLUID LEVEL IS AT MAX LINE**

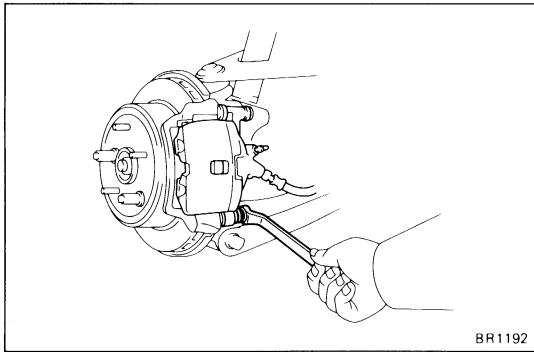


REMOVAL OF CYLINDER

(See page BR-31)

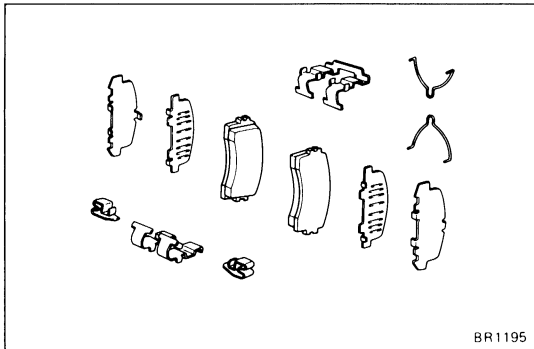
1. DISCONNECT BRAKE LINE

Disconnect the brake hose. Use a container to catch the brake fluid.



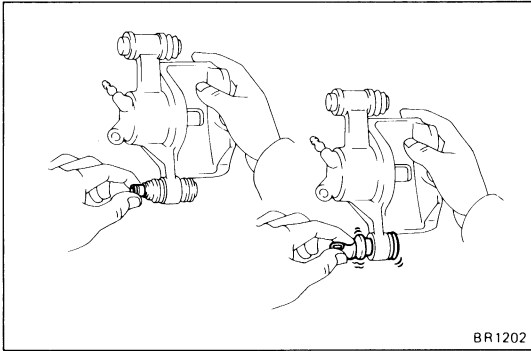
2. REMOVE CYLINDER FROM TORQUE PLATE

Remove the installation bolt and cylinder.



3. REMOVE PADS

(See step 4 on page BR-32)

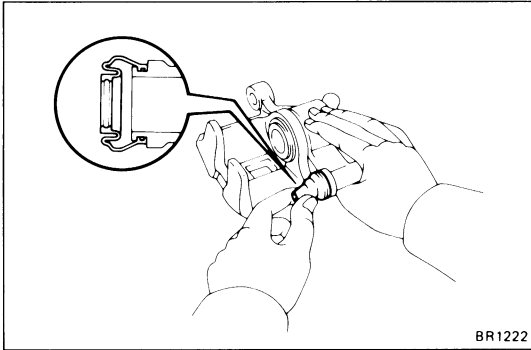


BR1202

DISASSEMBLY OF CYLINDER

(See page BR-31)

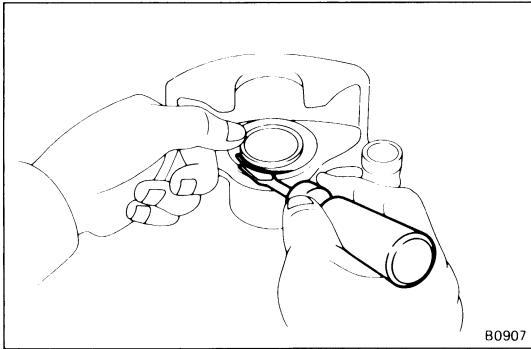
1. REMOVE SLIDING BUSHING AND DUST BOOT



BR1222

2. REMOVE MAIN PIN BOOT

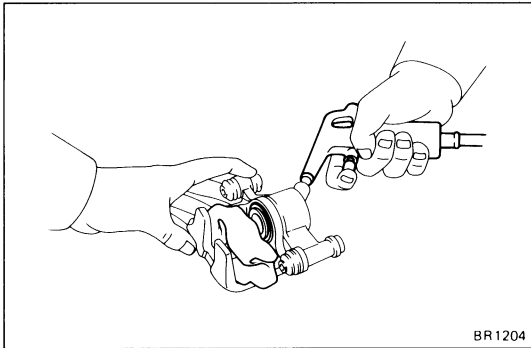
Pull out the main pin boot.



B0907

3. REMOVE CYLINDER BOOT SET RING AND CYLINDER BOOT

Using a screwdriver, remove the cylinder boot set ring and cylinder boot.

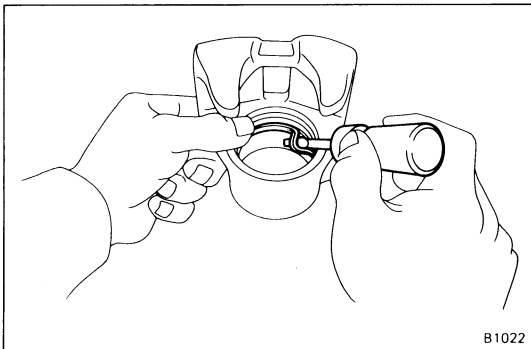


BR1204

4. REMOVE PISTON FROM CYLINDER

- (a) Put a piece of cloth or an equivalent as shown.
- (b) Use compressed air to remove the piston from the cylinder.

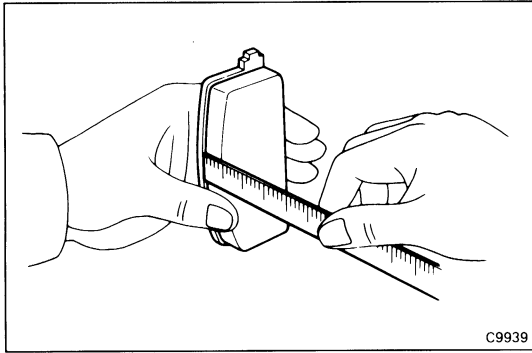
CAUTION: Do not place your fingers in front of the piston when using compressed air.



B1022

5. REMOVE PISTON SEAL FROM BRAKE CYLINDER

Using a screwdriver, remove the piston seal.



C9939

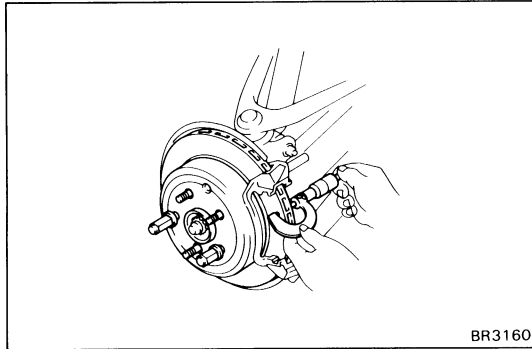
INSPECTION AND REPAIR OF REAR BRAKE COMPONENTS

1. MEASURE PAD LINING THICKNESS

Standard thickness: 10.0 mm (0.394 in.)

Minimum thickness: 1.0 mm (0.039 in.)

Replace the pad if the thickness is less than the minimum or if it shows signs of uneven wear.



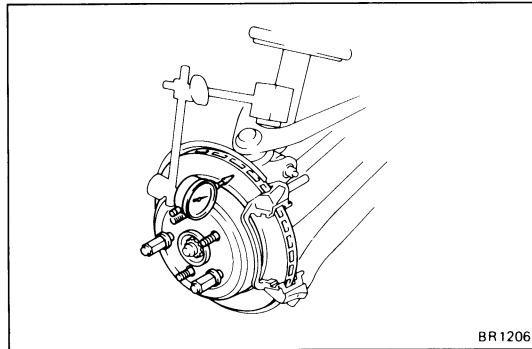
BR3160

2. MEASURE ROTOR DISC THICKNESS

Standard thickness: 18.0 mm (0.709 in.)

Minimum thickness: 17.0 mm (0.669 in.)

If the disc is scored or worn, or if thickness is less than minimum, repair or replace the disc.



BR1206

3. MEASURE ROTOR DISC RUNOUT

HINT: Before measuring the runout, confirm that the rear hub bearing play is within specification.

Measure the rotor disc runout at 10 mm (0.39 in.) from the outer edge of the rotor disc.

Maximum disc runout: 0.13 mm (0.0051 in.)

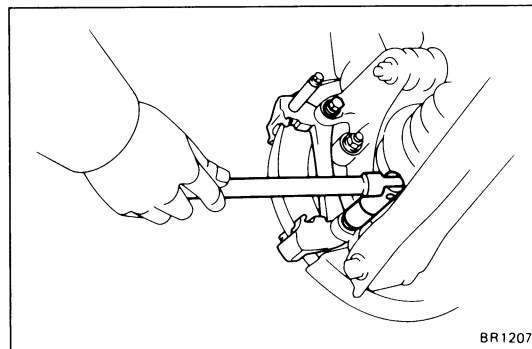
If the runout is greater than the maximum, inspect and adjust following the procedure listed below.

Then replace the disc if necessary.

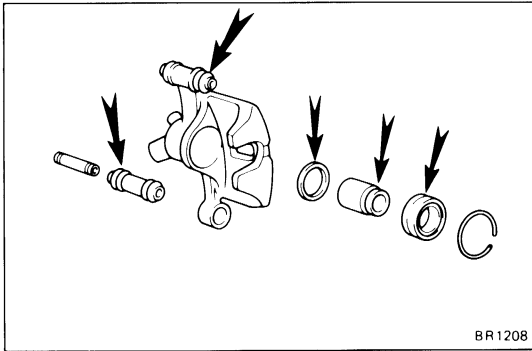
- (a) Remove the torque plate from the rear carrier.
- (b) Remove the hub nuts of the temporarily installed disc and pull off the rotor disc.
- (c) Check that the axle shaft axial play is within specification, and replace the bearing if not within specification.
(See page RA-6)
- (d) Install the rotor disc and measure the disc runout, then shift the rotor disc one fifth a turn and measure the disc runout. Similarly measure the runout in each position, and select the position where the runout is minimum.
- (e) In this position, if the runout is within specification, install the torque plate and torque the mounting bolts.

Torque: 475 kg-cm (34 ft-lb, 47 N·m)

- (f) If not within specification, replace the rotor disc.
- (g) Remove the parking brake shoe, and inspect the parking brake lining and the new rotor disc for proper contact.
(See page BR-39 to 41)
- (h) Install the parking brake shoe and rotor.
(See page BR-43)
- (i) Repeat (d) and (e).



BR1207

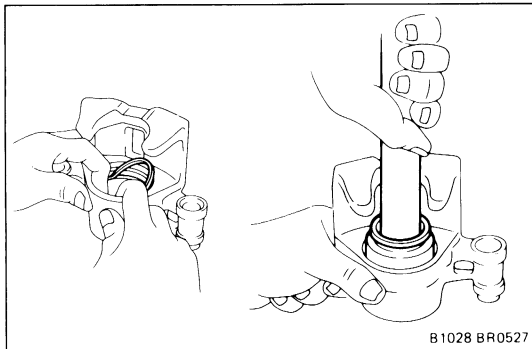


ASSEMBLY OF CYLINDER

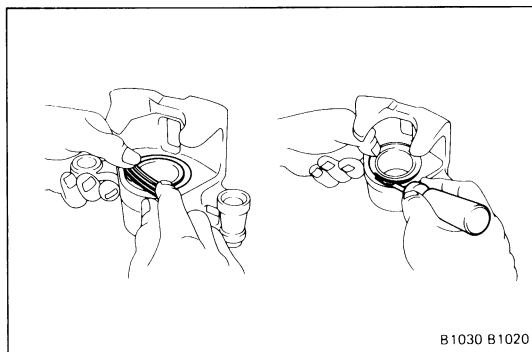
(See page BR-31)

1. APPLY LITHIUM SOAP BASE GLYCOL GREASE TO FOLLOWING PARTS

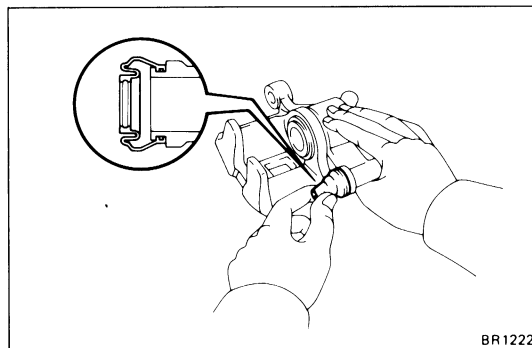
- (a) Main pin boot
- (b) Sliding bushing and boot
- (c) Piston, piston seal and cylinder boot



2. INSTALL PISTON SEAL AND PISTON IN CYLINDER

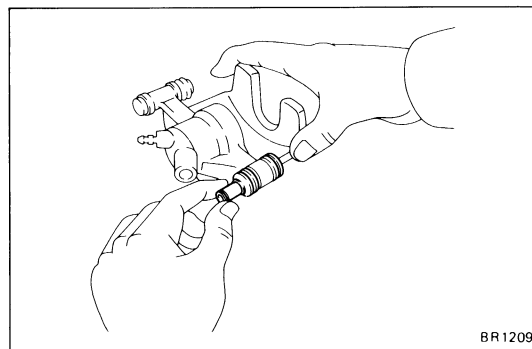


3. INSTALL CYLINDER BOOT AND SET RING IN CYLINDER



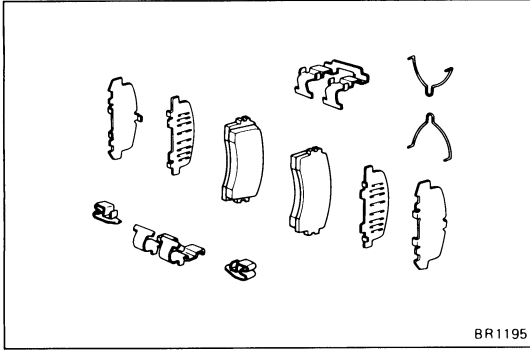
4. INSTALL MAIN PIN BOOT

Push in the main pin boot.



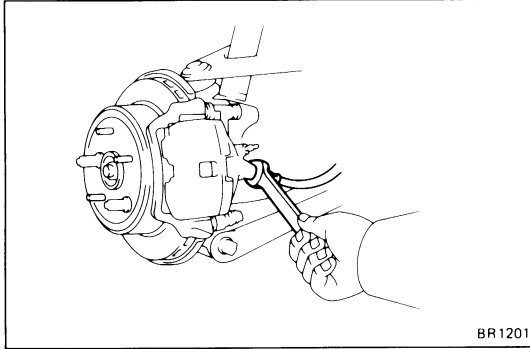
5. INSTALL SLIDING BUSHING AND DUST BOOT

- (a) Install the sliding bushing and dust boot into the brake cylinder.
- (b) Insure that the boot is secured firmly to the brake cylinder groove.

**INSTALLATION OF CYLINDER**

(See page BR-31)

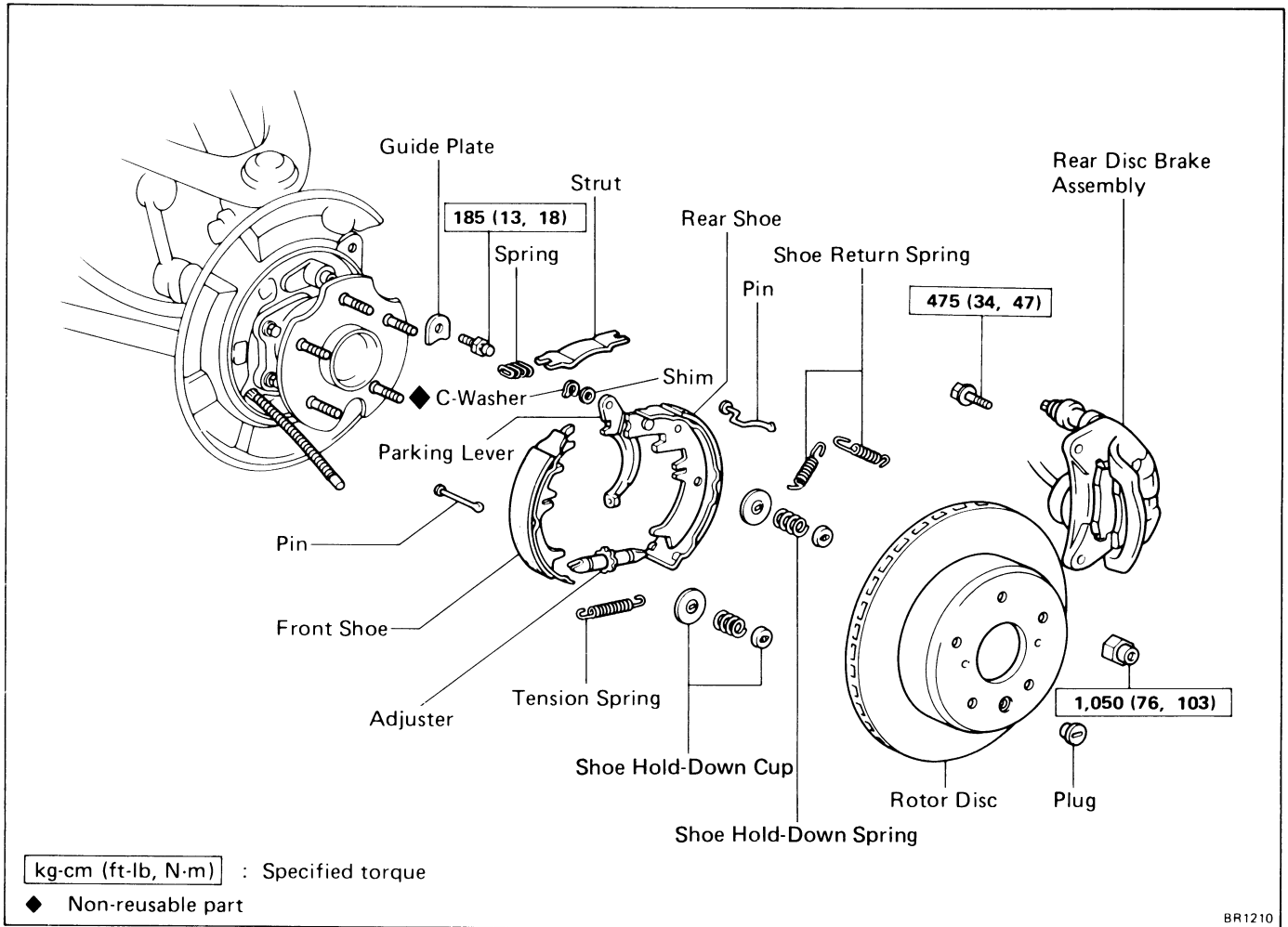
1. **INSTALL PADS**
(See step 7 to 8 on page BR-32 and 33)
2. **INSTALL CYLINDER**
(See step 9 on page BR-33)



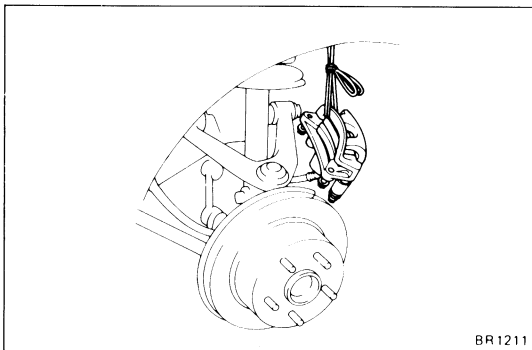
3. **INSTALL FLEXIBLE HOSE TO BRAKE CYLINDER**
Torque: 235 kg-cm (17 ft-lb, 23 N·m)

4. **FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM**
(See page BR-6)
5. **CHECK FOR LEAKS**

Parking Brake COMPONENTS



BR1210

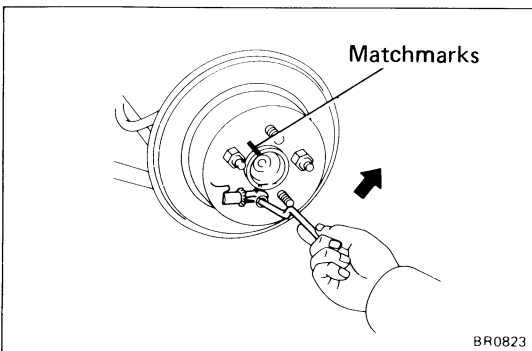


BR1211

DISASSEMBLY OF PARKING BRAKE

1. REMOVE REAR DISC BRAKE ASSEMBLY

- (a) Remove the two mounting bolts and remove the disc brake assembly.
- (b) Suspend the disc brake so the hose is not stretched.

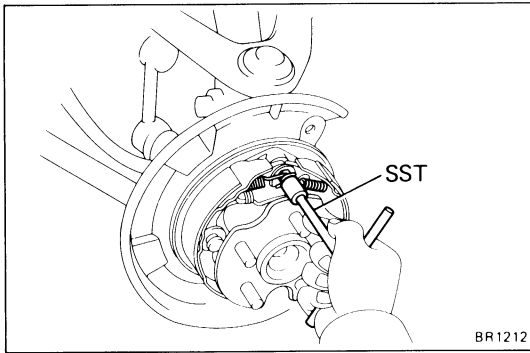


BR0823

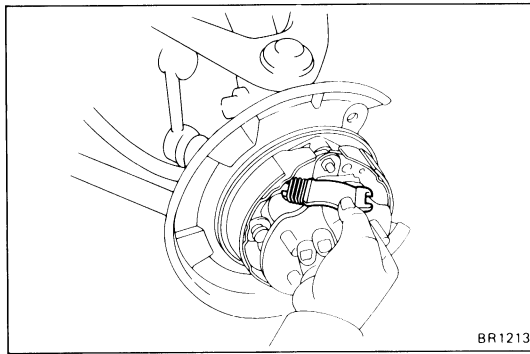
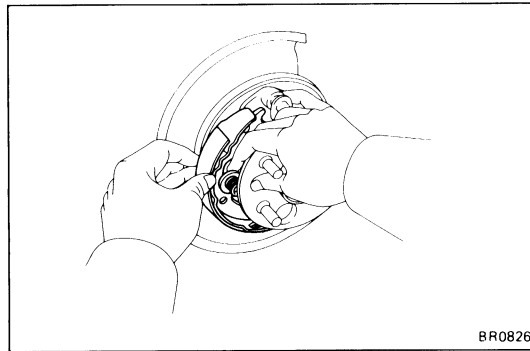
2. REMOVE ROTOR DISC

Place the matchmarks on the rotor disc and rear axle shaft, and remove the rotor disc.

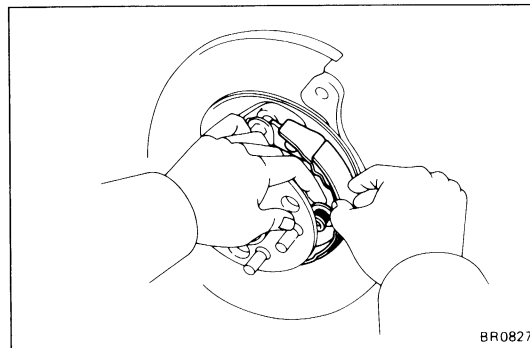
HINT: If the drum cannot be removed easily, return the shoe adjuster until the wheel turns freely.

**3. REMOVE SHOE RETURN SPRINGS**

Using SST, remove the shoe return springs.
SST 09717-20010

**4. REMOVE SHOE STRUT WITH SPRING****5. REMOVE FRONT SHOE, ADJUSTER AND TENSION SPRING**

- (a) Slide out the front shoe and remove the shoe adjuster.
- (b) Disconnect the tension spring and remove the front shoe.

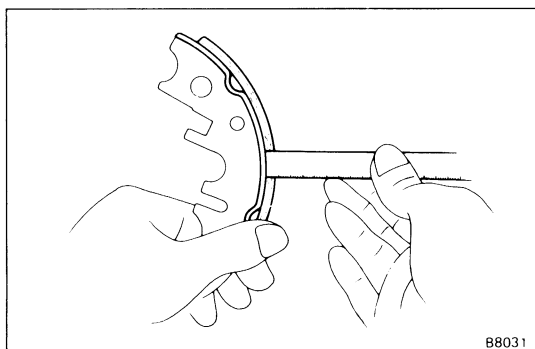
**6. REMOVE REAR SHOE**

- (a) Slide out the rear shoe.
- (b) Remove the tension spring from the rear shoe.
- (c) Disconnect the parking brake cable from the parking brake shoe lever.
- (d) Remove the shoe hold-down spring cups, springs and pins.

INSPECTION AND REPAIR OF PARKING BRAKE COMPONENTS

1. INSPECT DISASSEMBLED PARTS

Inspect the disassembled parts for wear, rust or damage.

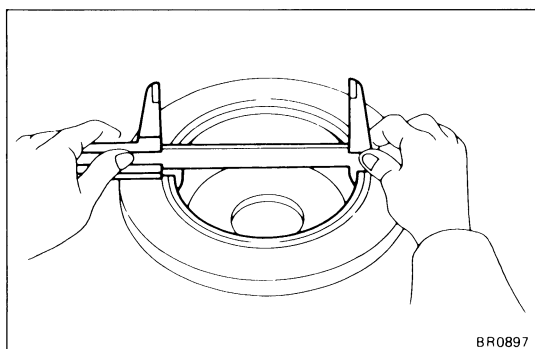


2. MEASURE BRAKE SHOE LINING THICKNESS

Standard thickness: 2.5 mm (0.098 in.)

Minimum thickness: 1.0 mm (0.039 in.)

If the shoe lining is less than minimum or shows signs of uneven wear, replace the parking brake shoes.

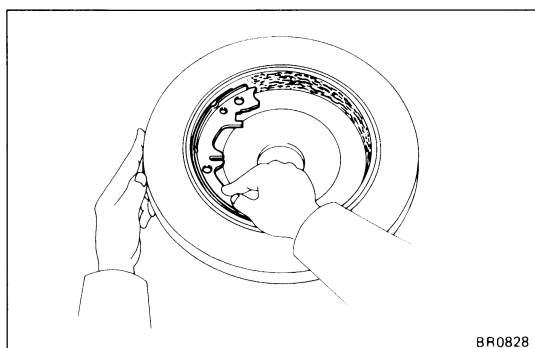


3. MEASURE BRAKE DISC INSIDE DIAMETER

Standard inside diameter: 190 mm (7.48 in.)

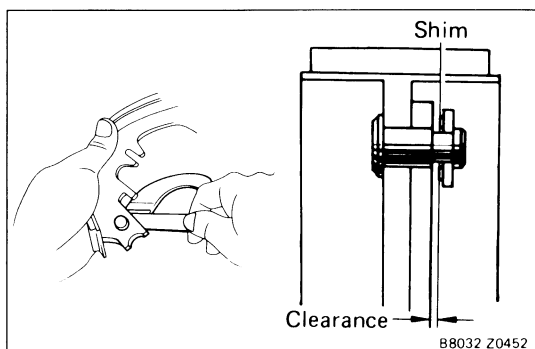
Maximum inside diameter: 191 mm (7.52 in.)

If the disc is scored or worn, the brake disc may be lathed to the maximum inside diameter.



4. INSPECT PARKING BRAKE LINING AND DISC FOR PROPER CONTACT

If the contact between the brake lining and disc is improper, repair the lining with a brake shoe grinder, or replace the brake shoe assembly.



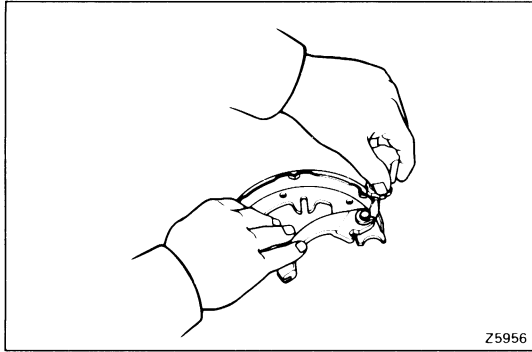
5. MEASURE CLEARANCE BETWEEN PARKING BRAKE SHOE AND LEVER

Using a feeler gauge, measure the clearance.

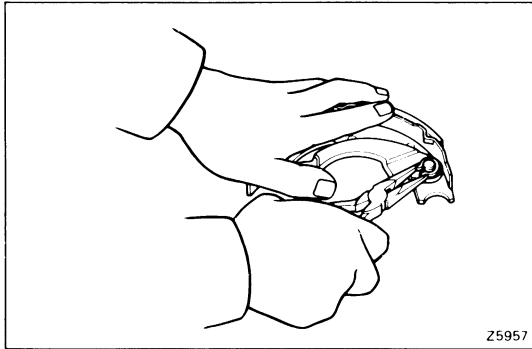
Standard clearance: Less than 0.35 mm (0.0138 in.)

If the clearance is not within specification, replace the shim with one of the correct size.

		Thickness		mm (in.)	
0.3	(0.012)	0.9	(0.035)		
0.6	(0.024)				

**6. IF NECESSARY, REPLACE SHIM**

- (a) Remove the parking brake lever, and install the correct size shim.

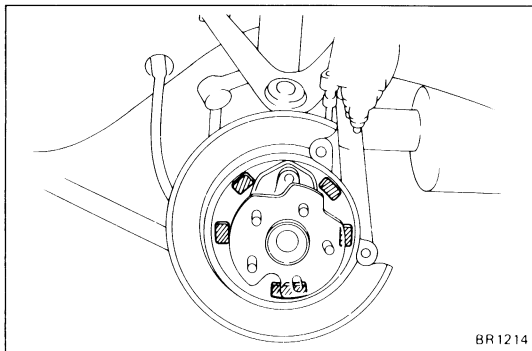
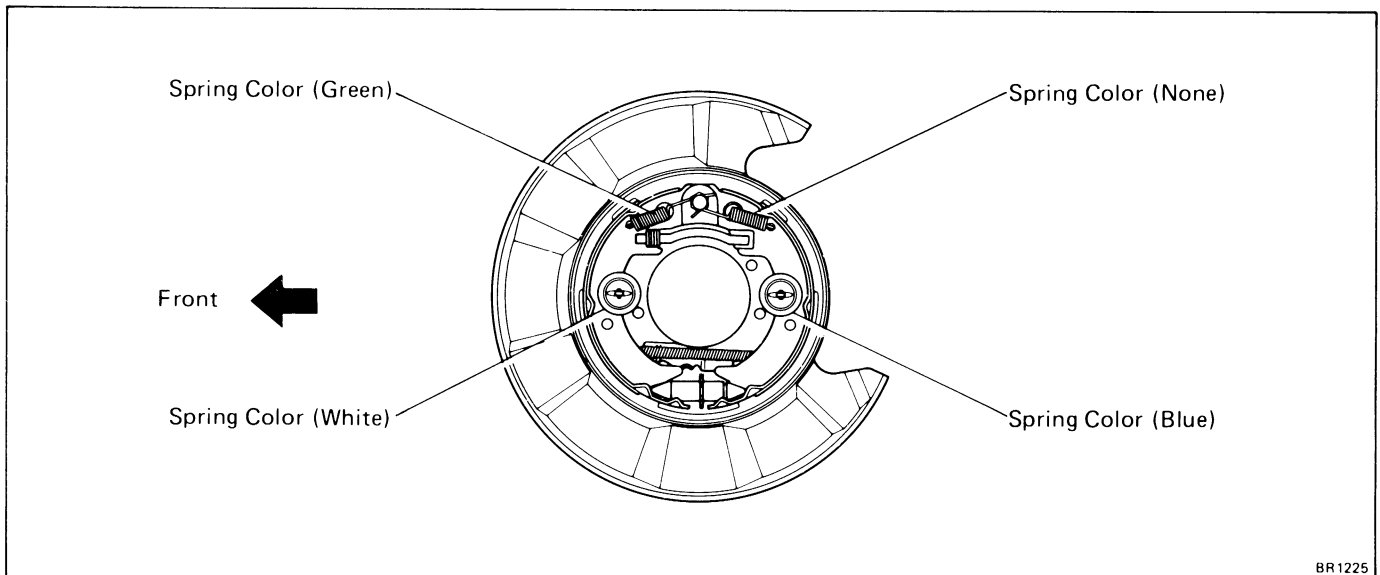


- (b) Install the parking brake lever with a new C- washer.
- (c) Remeasure the clearance.

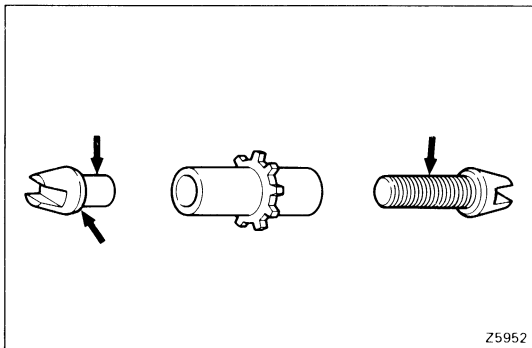
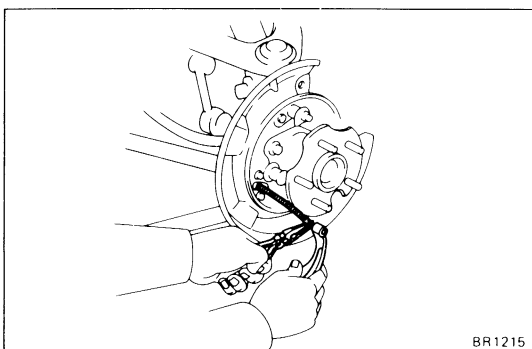
ASSEMBLY OF PARKING BRAKE

(See page BR-39)

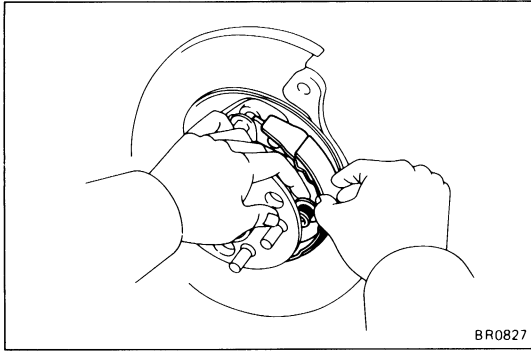
HINT: Assemble the parts in the correct direction as shown.

**1. APPLY HIGH TEMPERATURE GREASE ON BACKING PLATE AS SHOWN**

Apply high temperature grease to the sliding surfaces of the shoe.

**2. APPLY HIGH TEMPERATURE GREASE TO ADJUSTER AS SHOWN****3. CONNECT PARKING BRAKE CABLE TO PARKING BRAKE LEVER**

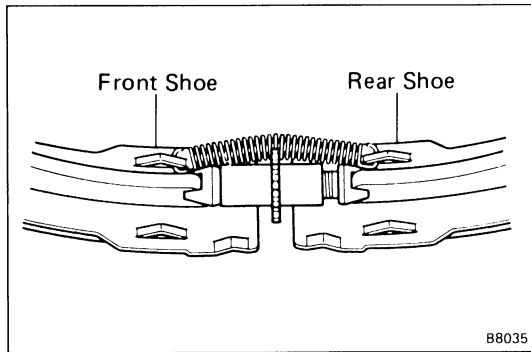
- (a) Install the shoe hold-down springs, cups and pins.
- (b) Connect the parking brake cable to the parking brake lever of the rear shoe.



4. INSTALL REAR SHOE

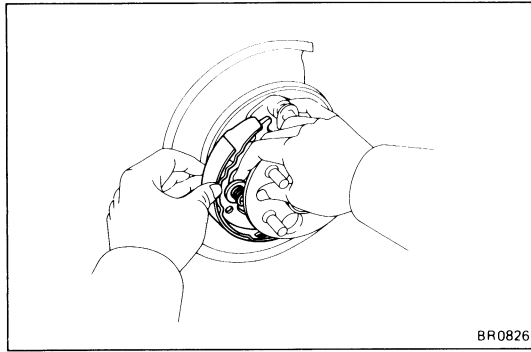
Slide in the rear shoe between the shoe hold-down spring cup and the backing plate, and check that the parking brake cable is properly hooked in the cable guide.

CAUTION: Do not allow oil or grease to get on the rubbing face.

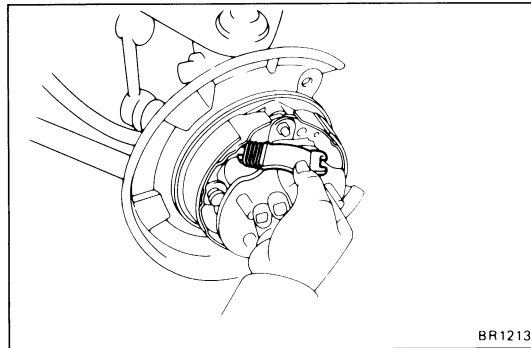


5. INSTALL TENSION SPRING, FRONT SHOE AND ADJUSTER

- (a) Install the tension spring to the rear shoe.
- (b) Install the front shoe to the tension spring.
- (c) Install the adjuster between the front and rear shoes.

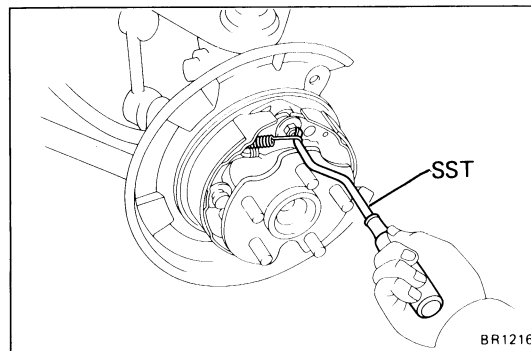


- (d) Slide in the front shoe between the shoe hold-down spring cup and the backing plate.



6. INSTALL STRUT WITH SPRING

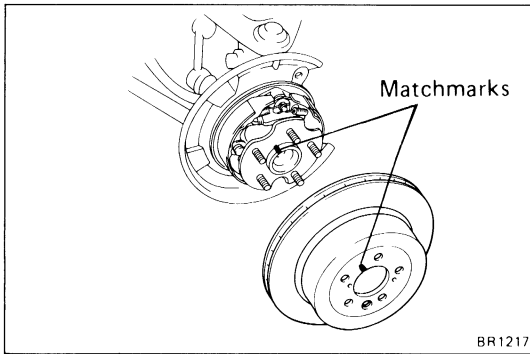
Install the strut with the spring forward.



7. INSTALL SHOE RETURN SPRINGS

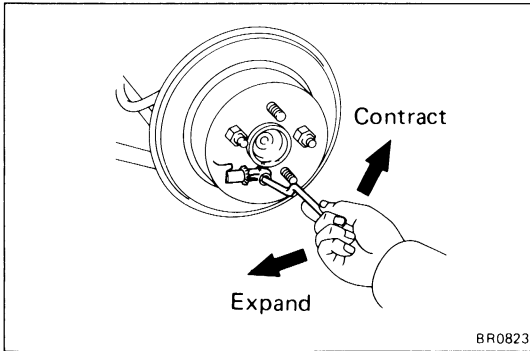
Using SST, install the front return spring and then install the rear return spring.

SST 09718-20010



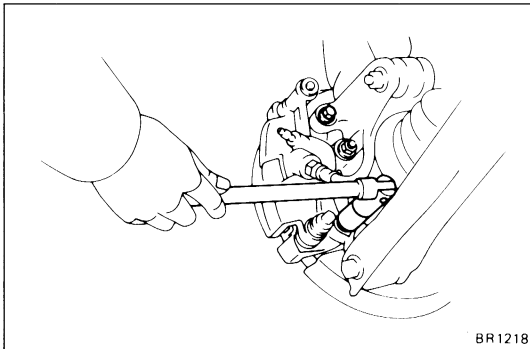
8. INSTALL ROTOR DISC

- (a) Before installing, polish the disc and shoe surfaces with sandpaper.
 - (b) Align the matchmarks and install the rotor disc.
- HINT:** If there is no matchmarks, temporarily install the rotor disc and measure the rotor disc runout and install the rotor disc in best position. (See step 3 on page BR-36)



9. ADJUST PARKING BRAKE SHOE CLEARANCE

- (a) Temporarily install the hub nuts.
- (b) Remove the hole plug.
- (c) Turn the adjuster and expand the shoes until the rotor disc locks.
- (d) Return the adjuster eight notches.
- (e) Install the hole plug.



10. INSTALL REAR DISC BRAKE ASSEMBLY

Install the disc brake and torque the two mounting bolts.

Torque: 475 kg-cm (34 ft-lb, 47 N·m)

11. INSTALL REAR WHEEL

12. BEDDING DOWN PARKING BRAKE SHOES AND DISC

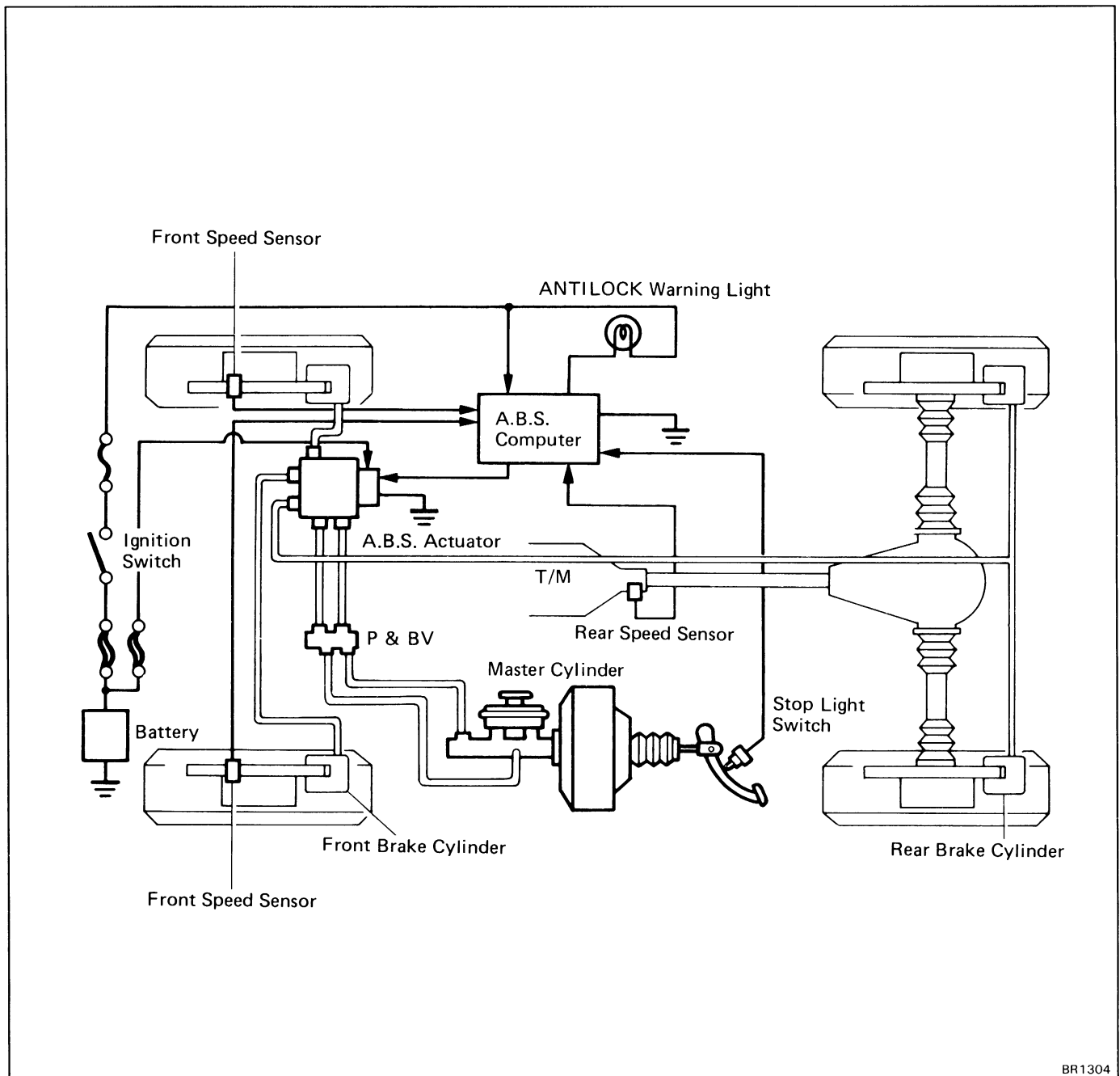
- (a) Drive the vehicle at about 50 km/h (31 mph) on a safe, level and dry road.
- (b) With the parking brake release button pushed in, pull on the lever with 9 kg (19.8 lb, 88 N) of force.
- (c) Drive the vehicle for about 400 meters (0.25 mile) in this condition.
- (d) Repeat this procedure two or three times.

13. RECHECK AND ADJUST PARKING BRAKE LEVER TRAVEL (See page BR-7)

ANTI-LOCK BRAKE SYSTEM (A.B.S.)

Description

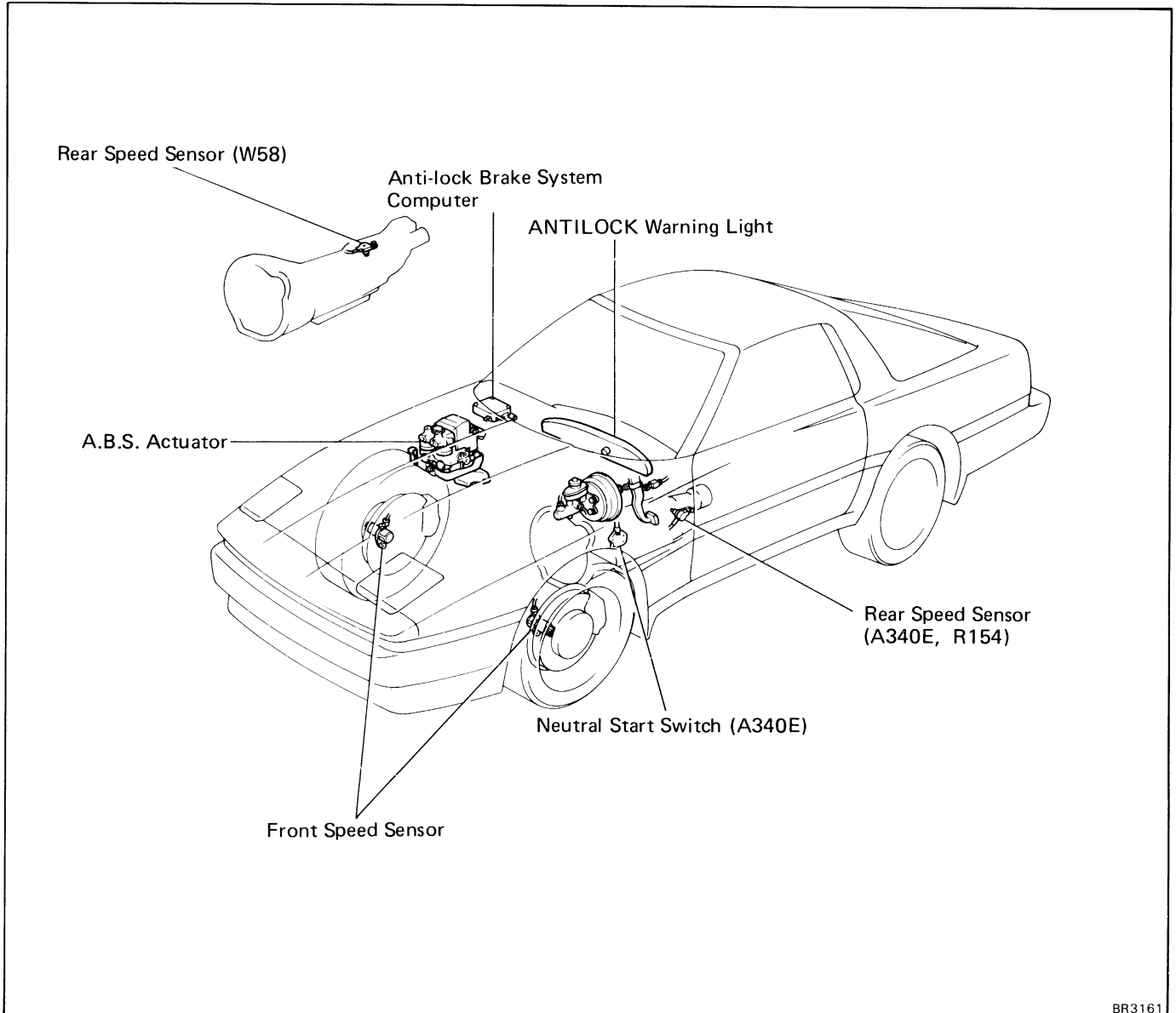
- The A.B.S. is a brake system which controls the wheel cylinder hydraulic pressure of all four wheels during sudden braking and braking on slippery road surfaces, preventing the wheels from locking. This A.B.S. provides the following benefits:
 - (1) Enables steering round an obstacle with a greater degree of certainty even when panic braking.
 - (2) Enables stopping in a panic brake while keeping the effect upon stability and steerability to a minimum, even on curves.
- The function of the A.B.S. is to help maintain directional stability and vehicle steerability on most road conditions. However, the system cannot prevent the vehicle from skidding if the cornering speed limit is exceeded.
- In case a malfunction occurs, a diagnosis function and fail-safe system have been adopted for the A.B.S. to increase serviceability.



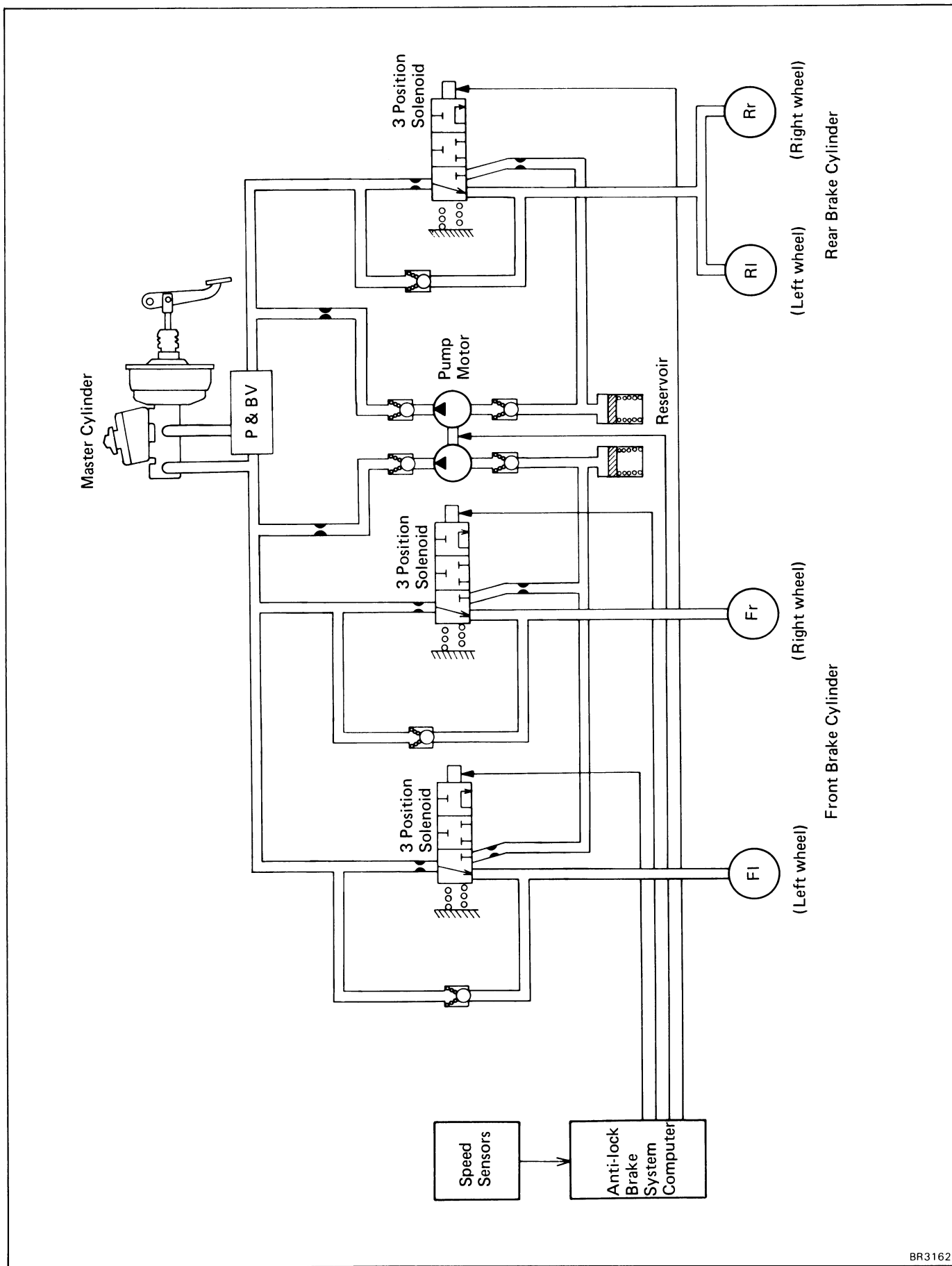
FUNCTION OF COMPONENTS

Component	Function
Front Speed Sensor	Detects the wheel speed of each of the left and right front wheels.
Rear Speed Sensor	Detects the average wheel speed of the left and right rear wheels.
ANTILOCK Warning Light	Lights up to alert the driver when trouble has occurred in the Anti-lock Brake System.
A.B.S. Actuator	Controls the brake fluid pressure to each disc brake cylinder through signals from the computer.
Anti-lock Brake System Computer	From the wheel speed signals from each sensor, it calculates acceleration, deceleration and slip values and sends signals to the actuator to control brake fluid pressure.

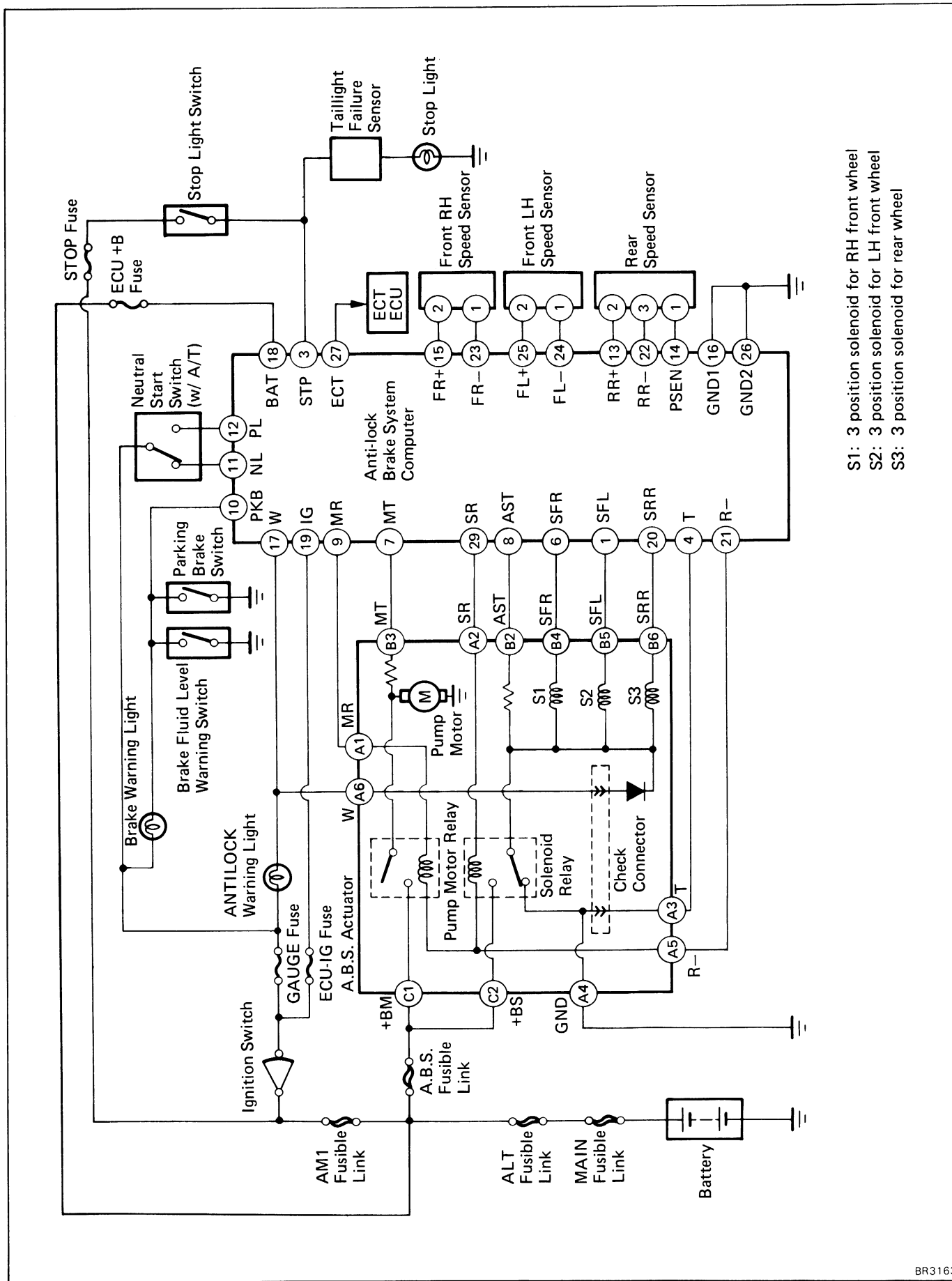
LOCATION OF SYSTEM PARTS



SYSTEM DIAGRAM

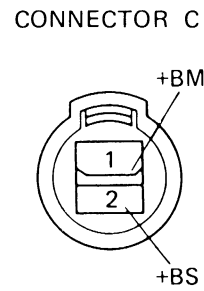
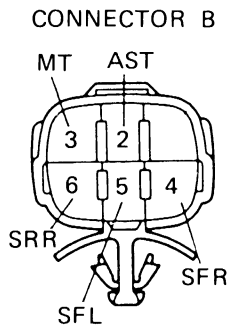
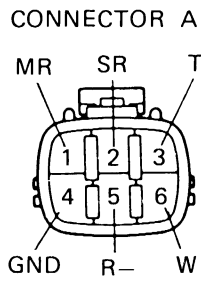


WIRING DIAGRAM

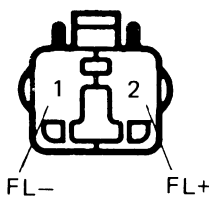


CONNECTORS

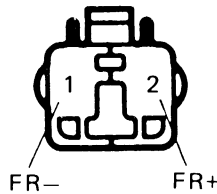
A.B.S. Actuator



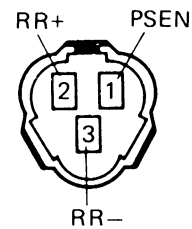
Front Speed Sensor (LH)



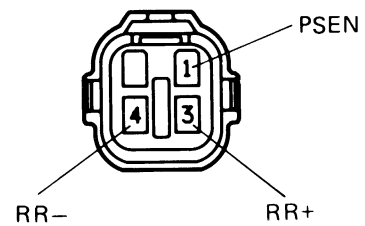
Front Speed Sensor (RH)



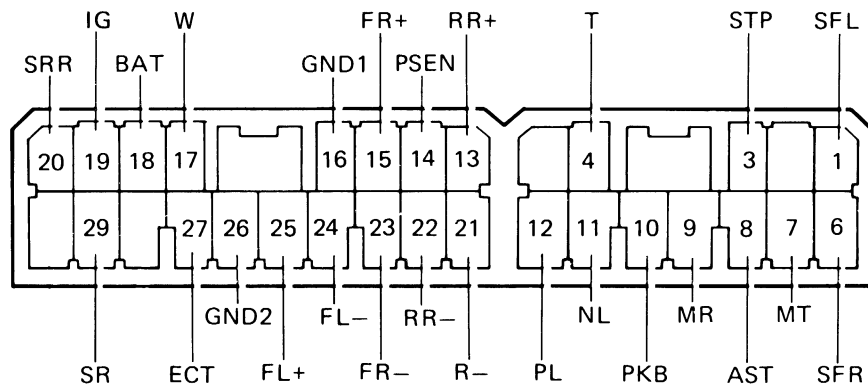
Rear Speed Sensor (A/T)

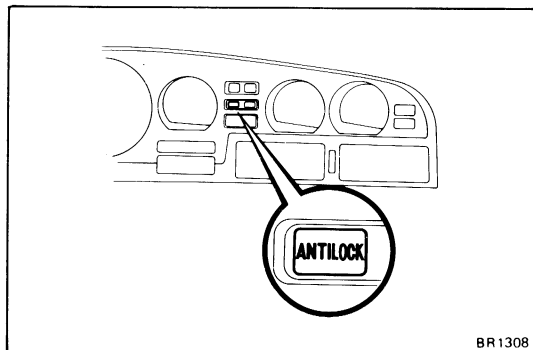


Rear Speed Sensor (M/T)



Anti-lock Brake System Computer





BR1308

Diagnosis System

DESCRIPTION

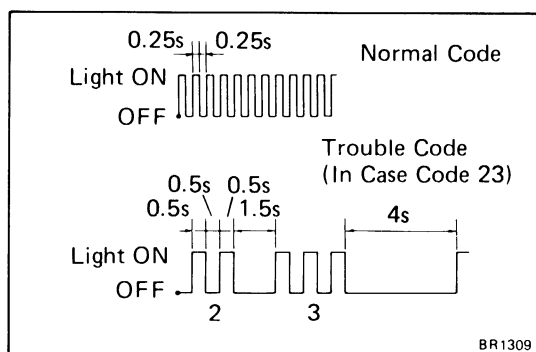
If a malfunction occurs, the system will identify the problem and the computer will store the codes for the trouble items.

At the same time, the system informs the driver of a malfunction via the "ANTILOCK" warning light in the combination meter.

By turning on the ignition switch and disconnecting the actuator check connector, the trouble can be identified by the number of blinks (diagnostic code) of the warning light.

In the event of two codes, that having the smallest number (code) will be identified first.

HINT: The warning light does not show the diagnostic codes while the vehicle running.



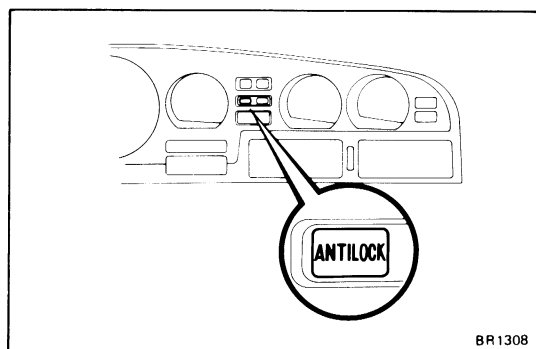
BR1309

INITIAL CHECK

CHECK ACTUATOR OPERATION NOISE

- (a) Start the engine and drive at a speed over 6 km/h (4 mph).
- (b) Check that the actuator operation noise is heard.

NOTE: A initial check is carried out once each time after the engine has been started and initial speed exceeds 6 km/h (4 mph). The respective functions, in order, of the 3 position solenoids and pump motor in the actuator are checked. However, if the brake pedal is depressed, the initial check is not carried out.



BR1308

INSPECTION OF DIAGNOSIS SYSTEM

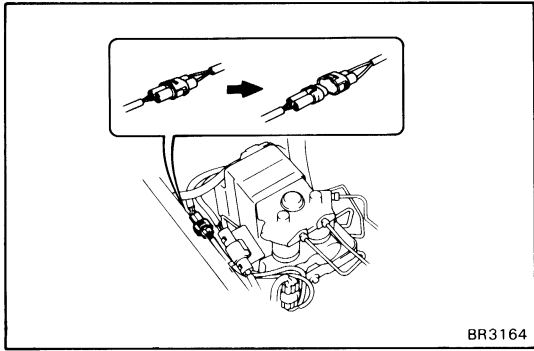
1. INSPECT BATTERY VOLTAGE

Inspect that the battery voltage is about 12 V.

2. CHECK THAT WARNING LIGHT TURNS ON

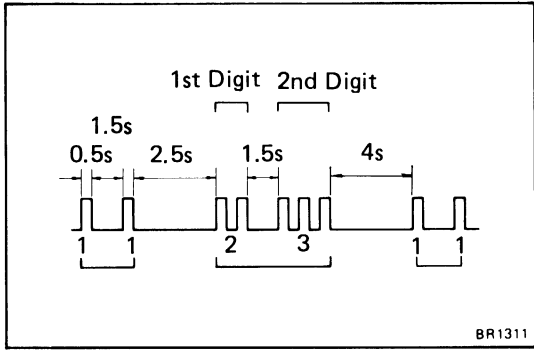
- (a) Turn the ignition switch on.
- (b) Check that the "ANTILOCK" warning light turns on for 3 seconds.

If not, inspect and repair or replace the fuse, bulb and wire harness.



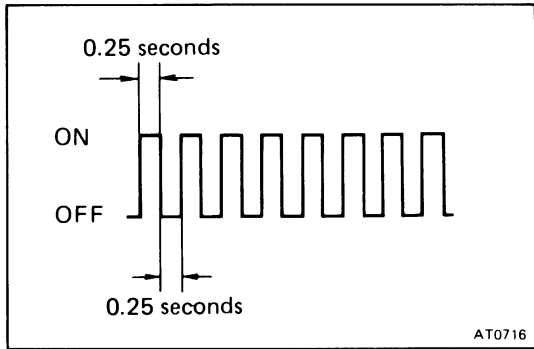
3. READ DIAGNOSTIC CODE

- (a) Turn the ignition switch on.
- (b) Disconnect the actuator check connector.



- (c) In event of a malfunction, 4 seconds later the warning light will begin to blink. Read the number of blinks. (See DIAGNOSTIC CODE on page BR-53)

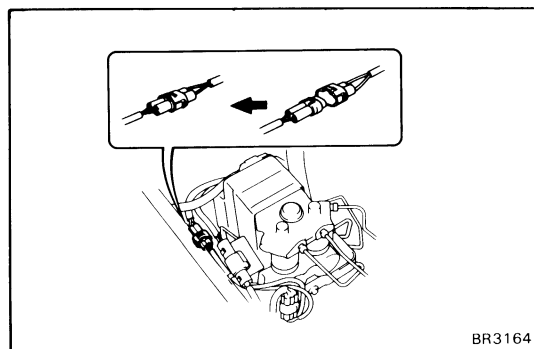
HINT: The first number of blinks will equal the first digit of a two digit diagnostic code. After a 1.5 second pause, the 2nd number of blinks will equal the 2nd number of a two digit code. If there are two or more codes, there will be a 2.5 second pause between each, and indication will begin after 4.0 seconds pause from the smaller value and continue in order to larger.



- (d) If the system is operating normally (no malfunction), the warning light will blink once every 0.5 seconds.

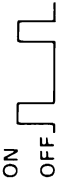
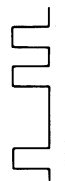
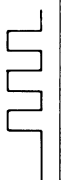
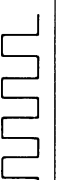

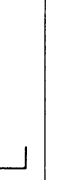

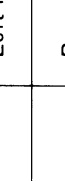
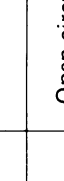
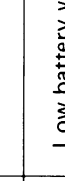
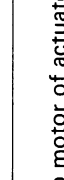
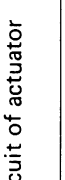
- (e) Repair the system.
- (f) After the malfunctioning components has been repaired, clear the diagnostic codes stored in the computer. (See page BR-54)

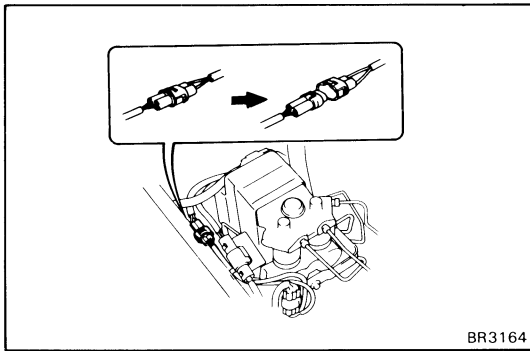
HINT: If you disconnect the battery cable while repairing, all diagnostic codes in the computer will erased.



- (g) Connect the actuator check connector.
- (h) Turn the ignition switch on, and check that the "ANTILOCK" warning light goes off after the warning light goes on for 3 seconds.

DIAGNOSTIC CODE

Code No.	Light Pattern	Diagnosis	Trouble Area
11	ON OFF 	Open circuit in solenoid relay	<ul style="list-style-type: none"> ● Actuator inside wire harness ● Solenoid relay
12		Short circuit in solenoid relay	<ul style="list-style-type: none"> ● Wire harness and connector of solenoid relay circuit
13		Open circuit in pump motor relay	<ul style="list-style-type: none"> ● Actuator inside wire harness ● Pump motor relay
14		Short circuit in pump motor relay	<ul style="list-style-type: none"> ● Wire harness and connector of pump motor relay circuit
21		Open or short circuit in 3 position solenoid of right front wheel	<ul style="list-style-type: none"> ● Actuator solenoid ● Wire harness and connector of actuator solenoid circuit
22		Open or short circuit in 3 position solenoid of left front wheel	
23		Open or short circuit in 3 position solenoid of rear wheel	
31		Right front wheel speed sensor signal malfunction	<ul style="list-style-type: none"> ● Speed sensor ● Sensor rotor ● Wire harness and connector of speed sensor
32		Left front wheel speed sensor signal malfunction	
33		Rear wheel speed sensor signal malfunction	
34		Open circuit in front speed sensor	<ul style="list-style-type: none"> ● Battery ● Voltage regulator
41		Low battery voltage (9.5 V or lower)	
42		Abnormally high battery voltage (17.2 V or higher)	<ul style="list-style-type: none"> ● Pump motor, relay and battery ● Wire harness, connector and ground bolt of actuator pump motor circuit
51		Pump motor of actuator locked or open circuit in pump motor circuit of actuator	
Always on		Malfunction in computer	<ul style="list-style-type: none"> ● Computer

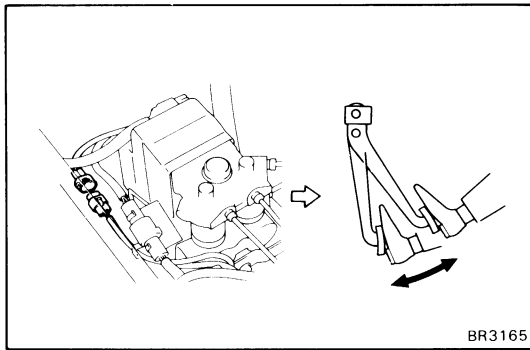


CLEARING OF DIAGNOSTIC CODES

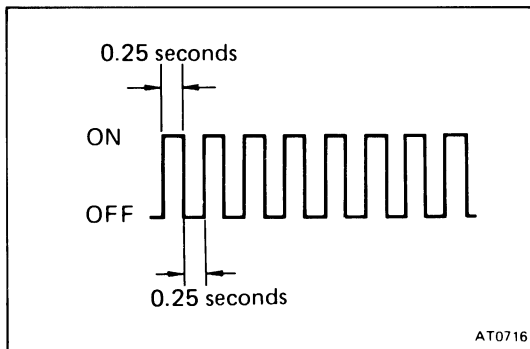
CLEAR DIAGNOSTIC CODES

- (a) Turn the ignition switch on.
- (b) Disconnect the actuator check connector.

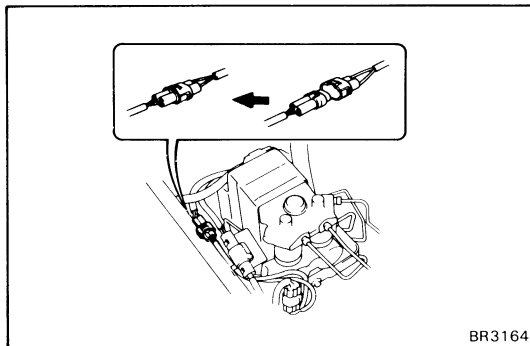
HINT: Keep the vehicle stopped (vehicle speed 0 km/h (0 mph)).



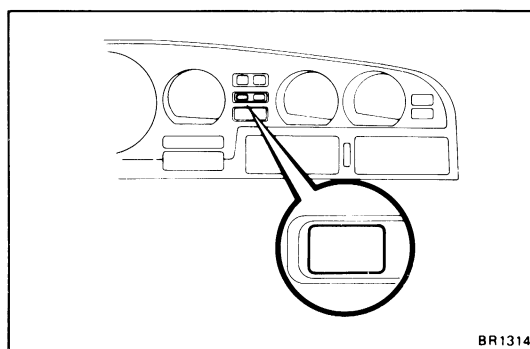
- (c) Clear the diagnostic codes stored in computer by depressing the brake pedal 8 or more times within 3 seconds.



- (d) Check that the warning light shows the normal code.



- (e) Connect the actuator check connector.

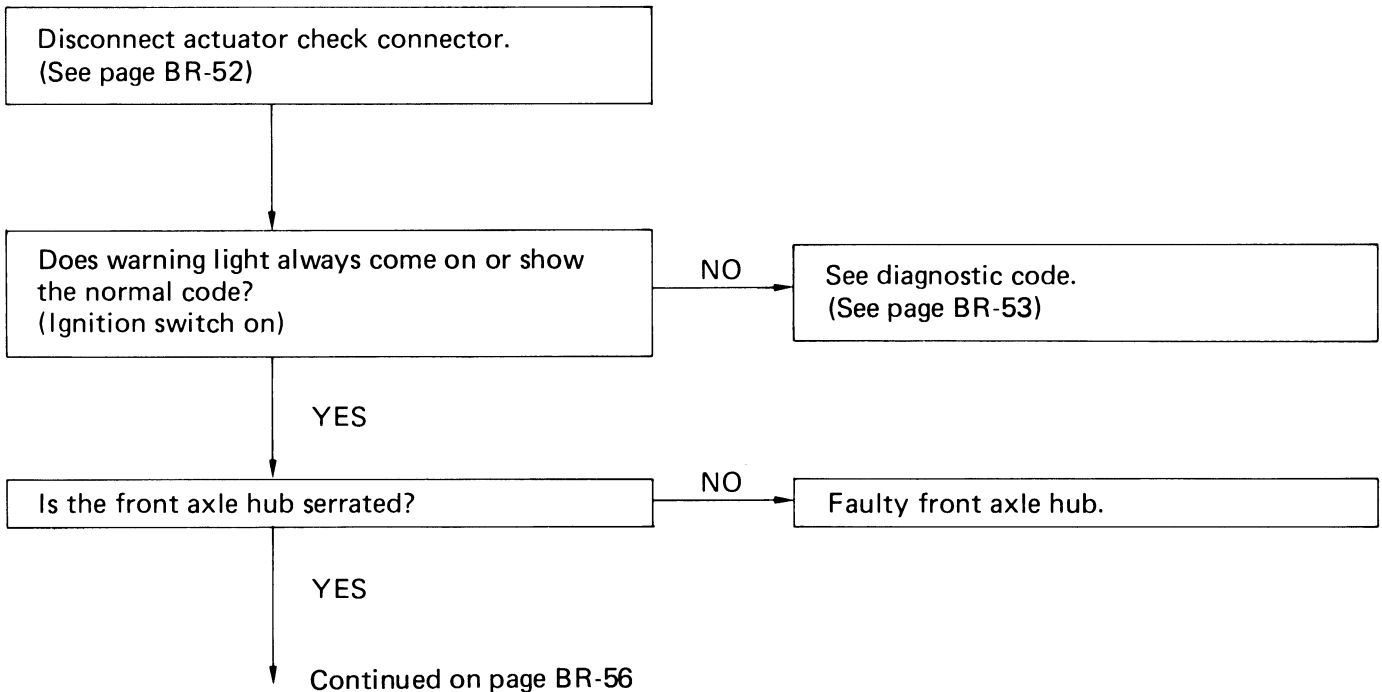


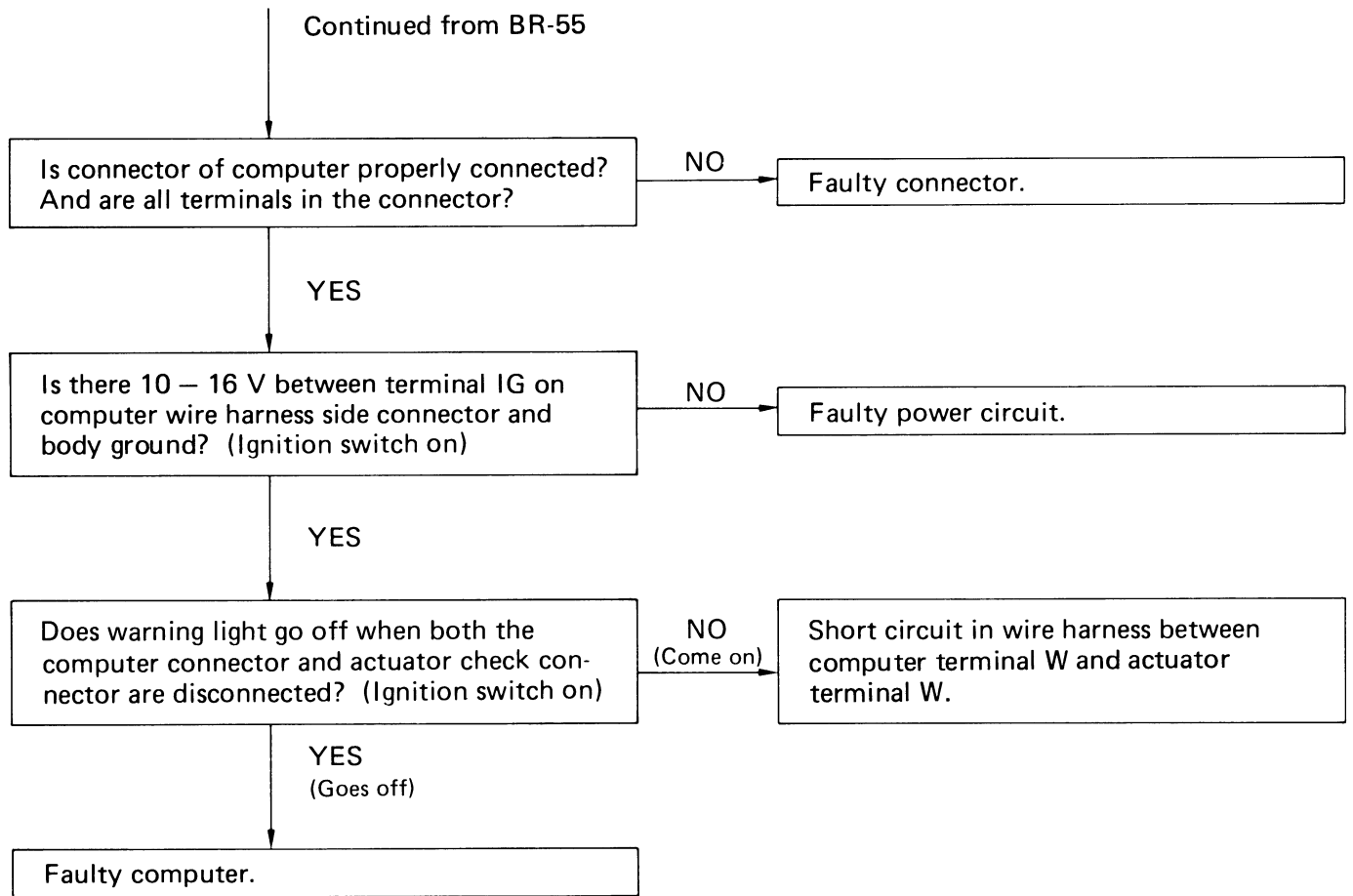
- (f) Check that the warning light goes off.

Troubleshooting

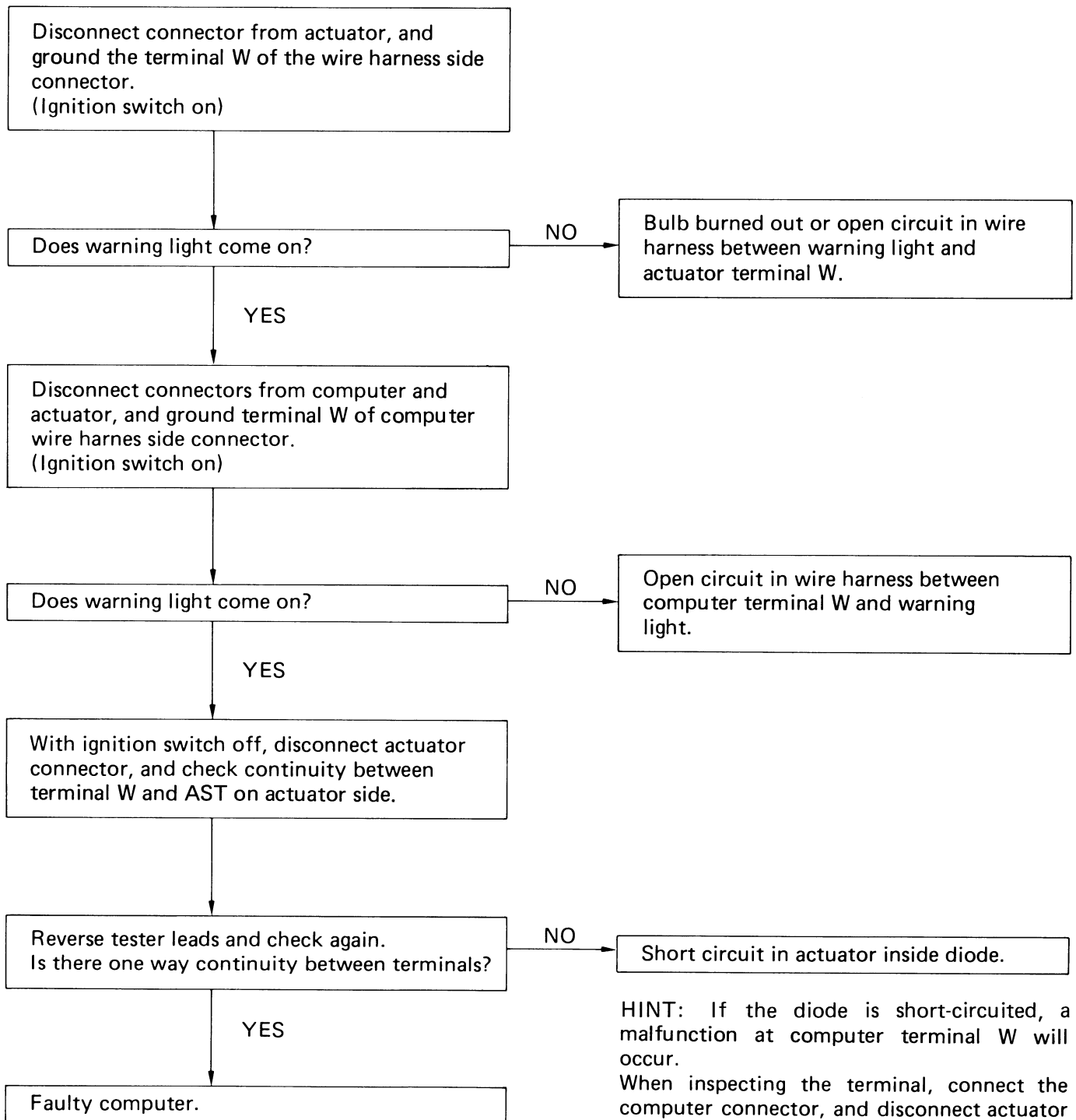
Problem		No.
"ANTILOCK" warning light	Always comes on after ignition switch is turned on.	1
	Does not come on for 3 seconds after ignition switch on.	2
	Comes on and off below 10 km/h (6 mph).	3
	Comes on while running.	1
Brake working	Brakes pull.	4
	Braking inefficient.	4
	A.B.S. operates at ordinary braking.	4
	A.B.S. operates just before stopping at ordinary braking.	4
	Brake pedal pulsates abnormally while A.B.S. is operating.	4
	Skidding noise occurs while A.B.S. working. (A.B.S. works inefficiently)	5

1 "ANTILOCK" warning light comes on.





2 "ANTILOCK" warning light does not come on for 3 seconds after ignition switch on.



HINT: If the diode is short-circuited, a malfunction at computer terminal W will occur.

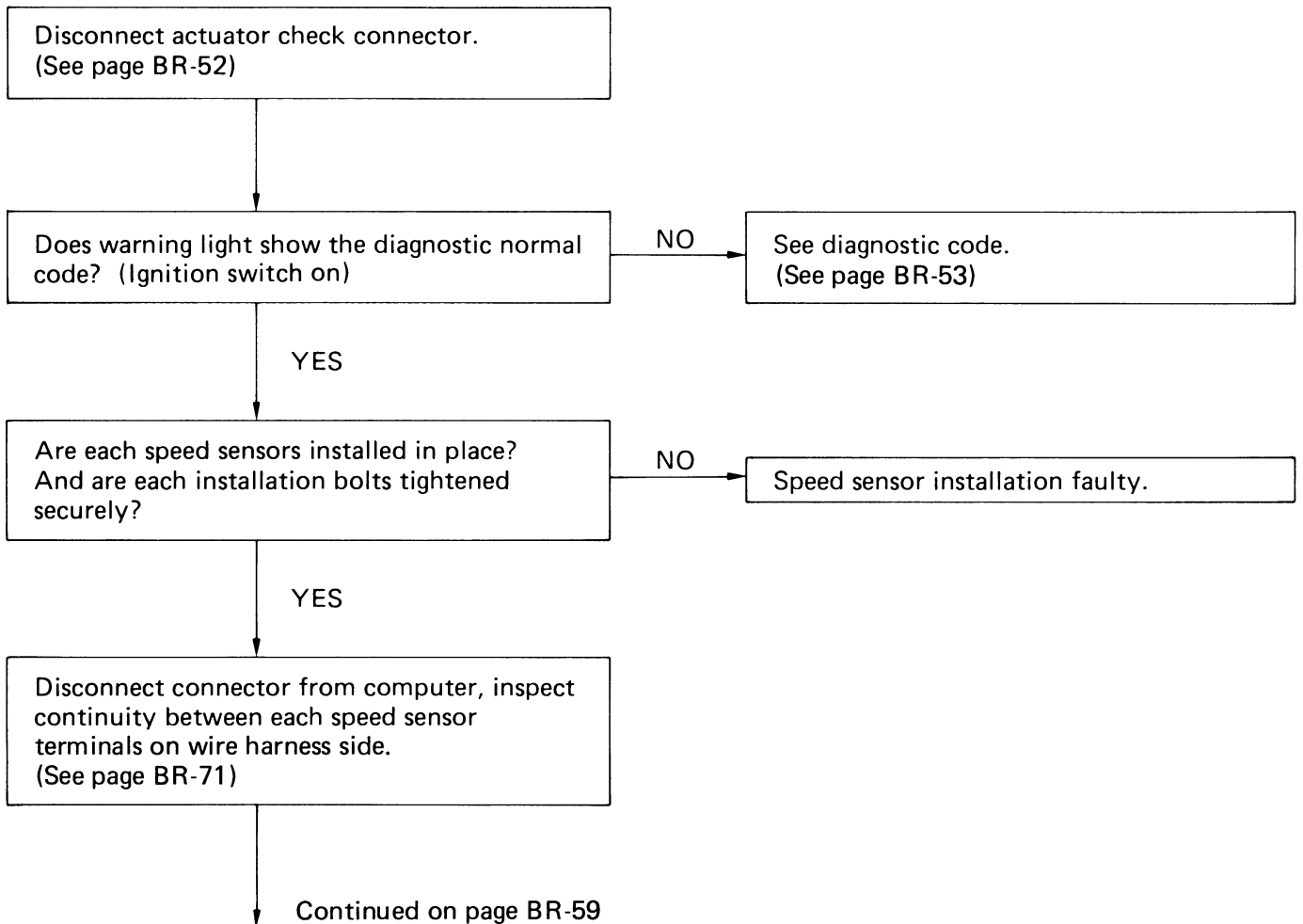
When inspecting the terminal, connect the computer connector, and disconnect actuator connector. Then turn the ignition switch on, and check that the warning light goes on. If it does, the computer terminal is OK.

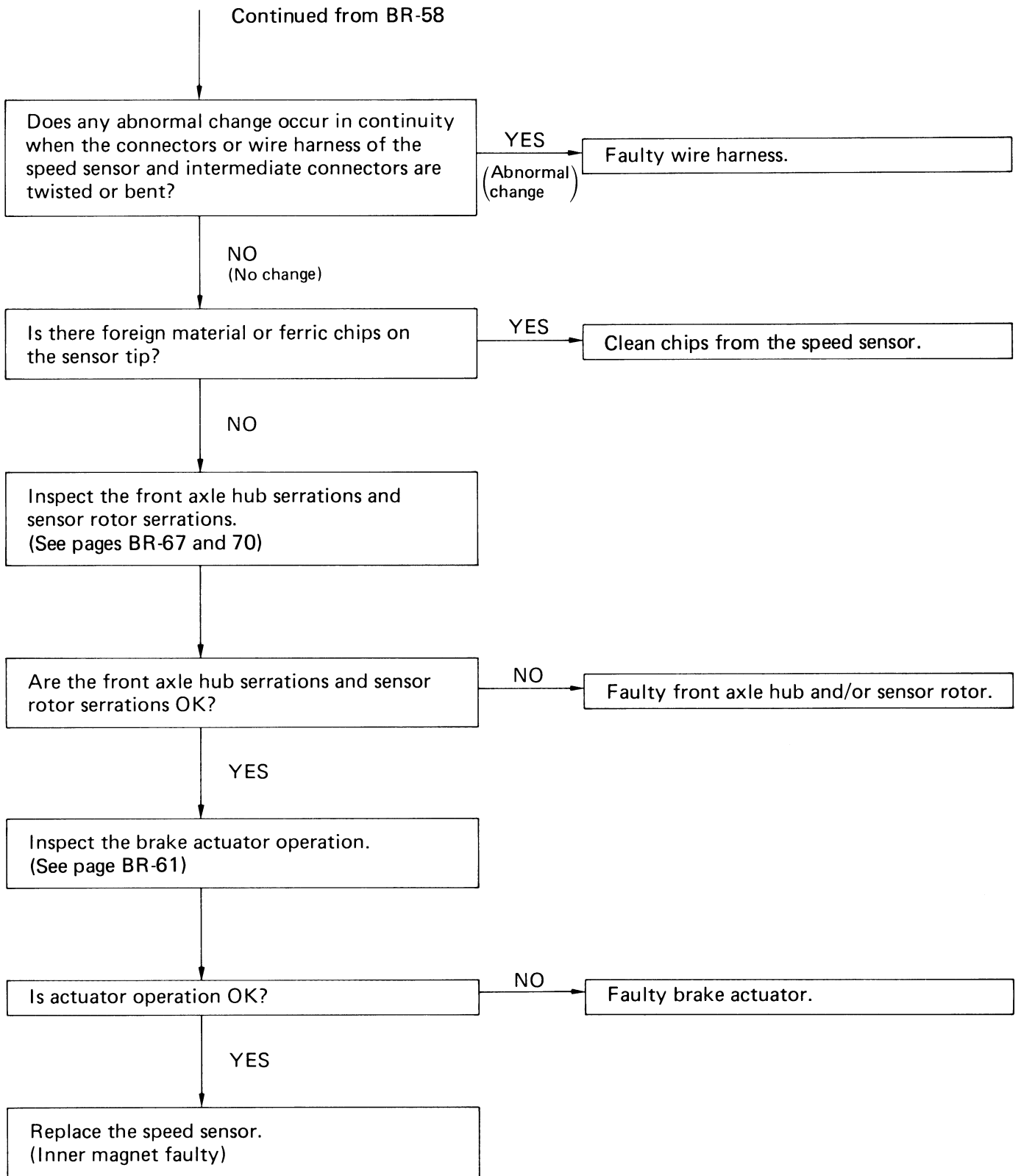
3 "ANTILOCK" warning light comes on and off.

- Actuator check connector is disconnected.
- Open circuit in wire harness between computer terminal T and actuator terminal T.
- Actuator terminal GND is improperly connected or open circuit in wire harness between actuator terminal GND and body ground.

4

- Brakes pull.
- Braking inefficient.
- A.B.S. operates at ordinary braking.
- A.B.S. operates just before stopping at ordinary braking.
- Brake pedal pulsates abnormally while A.B.S. working.





5 Anti-lock brake system works inefficiently.

Disconnect actuator check connector.
(See page BR-52)

Does warning light show the diagnostic normal code? (Ignition switch on)

NO

See diagnostic code.
(See page BR-53)

YES

Is there battery voltage between computer terminal STP and body ground when depressing brake pedal?

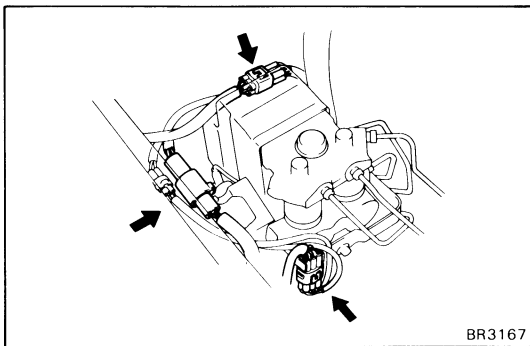
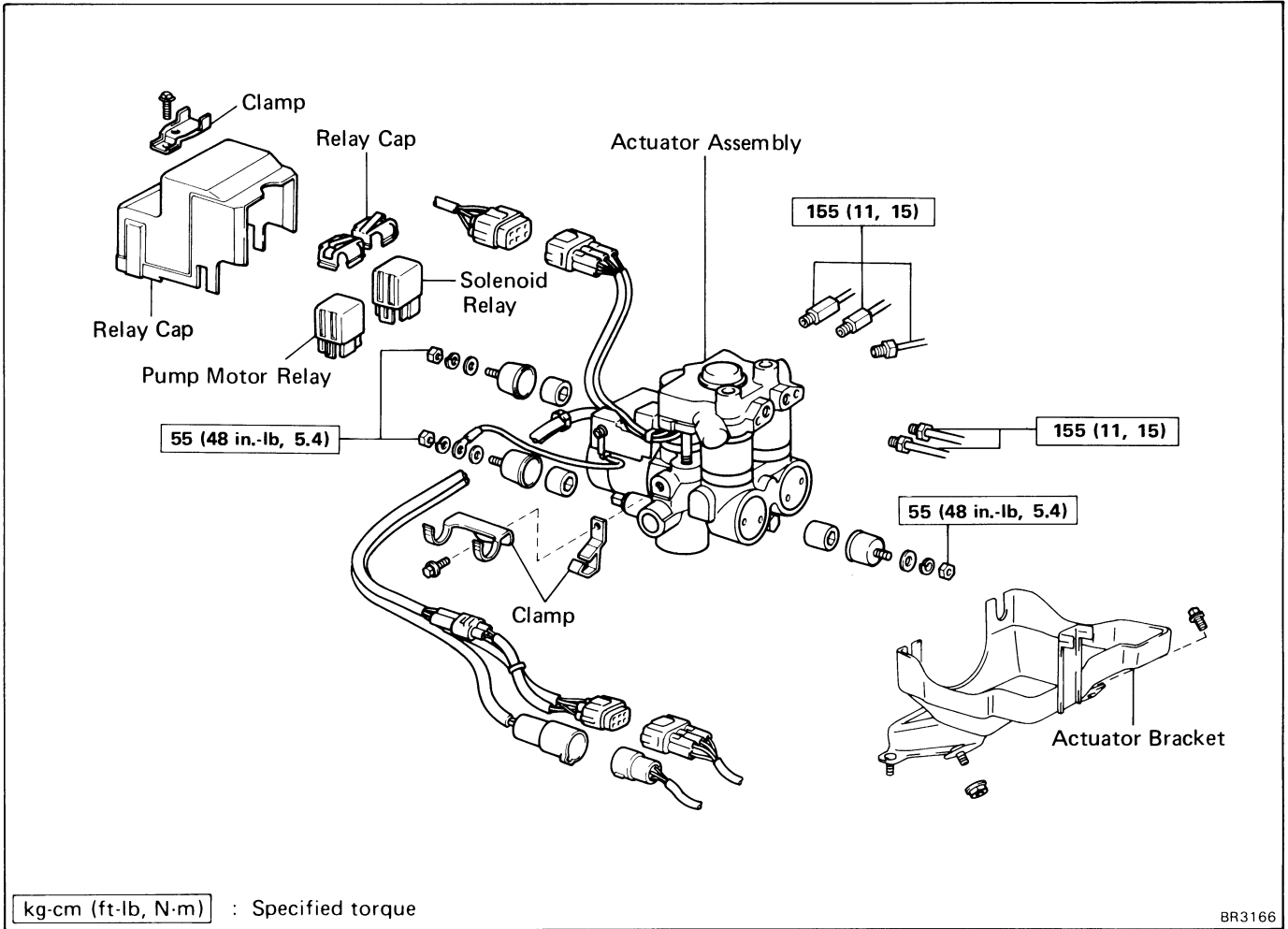
NO

Open circuit in stop light switch and/or wire harness.

YES

Inspect actuator.
(See page BR-61)

A.B.S. Actuator COMPONENTS



INSPECTION OF ACTUATOR OPERATION

1. INSPECT BATTERY VOLTAGE

Battery voltage: 10 – 14.5 V

2. DISCONNECT CONNECTORS FROM ACTUATOR

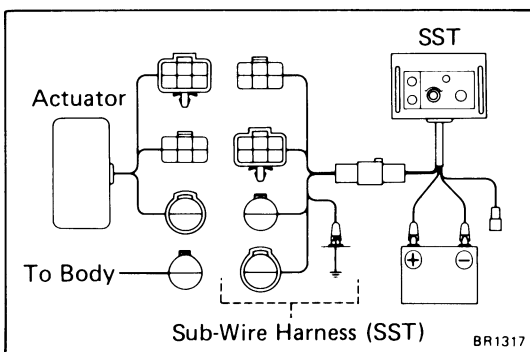
Disconnect the three connectors from the actuator.

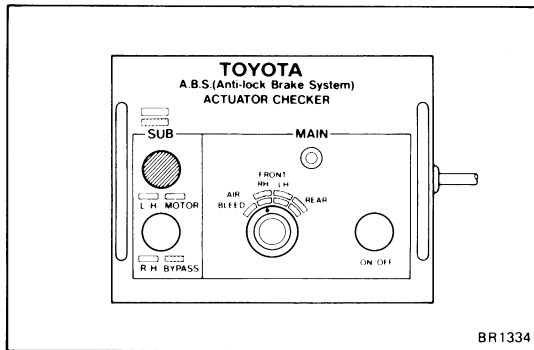
3. CONNECT ACTUATOR CHECKER (SST) TO ACTUATOR

(a) Connect the actuator checker (SST) to the actuator and body side wire harness through the sub-wire harness (SST) as shown.

SST 09990-00150

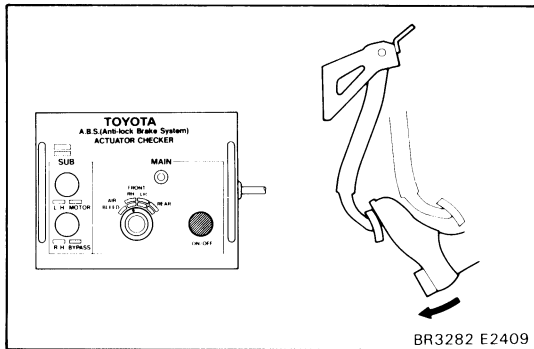
(b) Connect the red cable of the checker to the battery positive (+) terminal and black to the negative (-) terminal. Connect the black cable of the sub-wire harness to the battery negative (-) terminal or body ground.





4. INSPECT ACTUATOR OPERATION

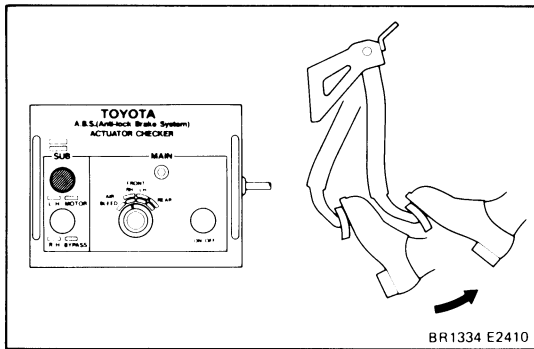
- (a) Start the engine, and run it at idle.
- (b) Turn the MAIN select switch of the actuator checker to "FRONT RH" position.
- (c) Push and hold in the SUB MOTOR switch for a few seconds.
- (d) Depress the brake pedal and hold it until the step (g) is completed.



- (e) Push the MAIN push switch. Check that the brake pedal does not go down.

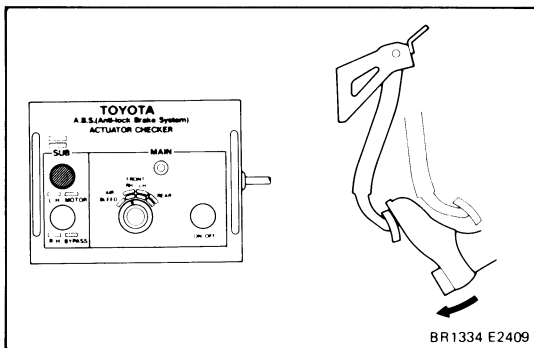
NOTICE: Do not keep the MAIN switch pushing more than 10 seconds.

- (f) Release the switch, and check that the pedal go down.



- (g) Push and hold in the SUB MOTOR switch for a few seconds, and check that the pedal returns.

- (h) Release the brake pedal.

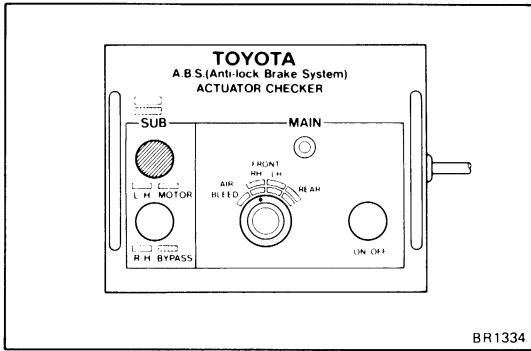


- (i) Push and hold in the SUB MOTOR switch for a few seconds.

- (j) Depress the brake pedal and hold it for about 15 seconds. As you hold the pedal down, push the SUB MOTOR switch for a few seconds. Check that the brake pedal does not pulsate.

5. INSPECT FOR OTHER WHEELS

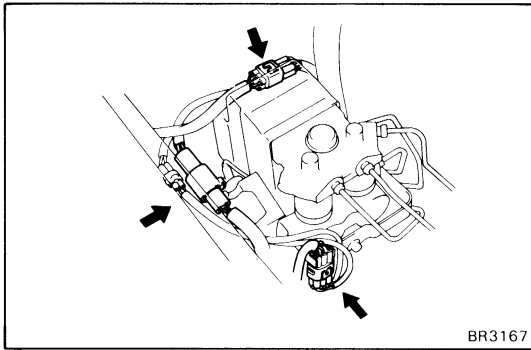
- (a) Turn the MAIN switch to "FRONT LH" position.
- (b) Repeating (c) to (j) of the step 4, check the actuator operation similarly.
- (c) Similarly, inspect "REAR" position.



BR1334

6. PUSH SUB MOTOR SWITCH

Push and hold in the SUB MOTOR switch for a few seconds.



BR3167

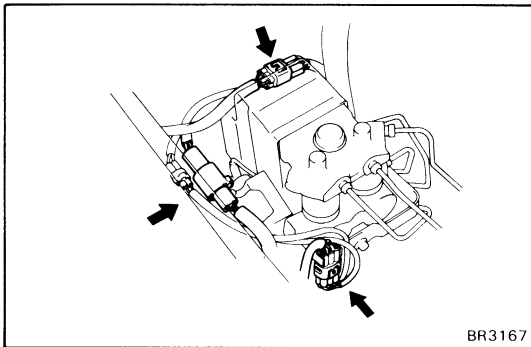
7. DISCONNECT ACTUATOR CHECKER (SST) FROM ACTUATOR

(a) Disconnect the actuator checker (SST) and sub-wire harness (SST) from the actuator.

SST 09990-00150

(b) Connect the actuator connectors.

(c) Clear the diagnostic codes.
(See page BR-54)



BR3167

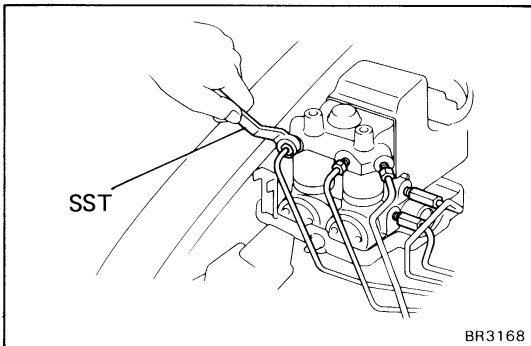
REMOVAL OF ACTUATOR

1. TAKE OUT FLUID WITH SYRINGE OR AN EQUIVALENT

CAUTION: Do not let brake fluid remain on a painted surface. Wash off it immediately.

2. DISCONNECT ACTUATOR CONNECTORS

Disconnect the three connectors from the actuator.

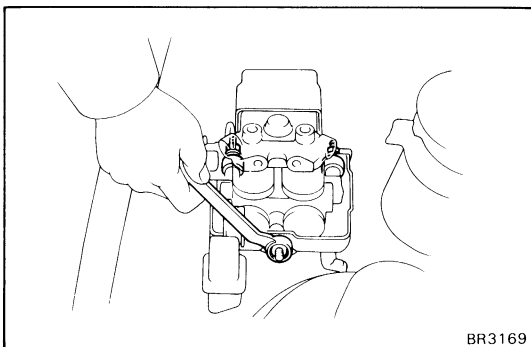


BR3168

3. DISCONNECT BRAKE TUBES FROM ACTUATOR

Using SST, disconnect the five brake tubes from the actuator.

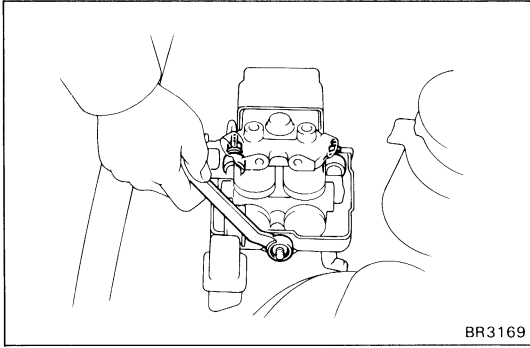
SST 09751-36011



BR3169

4. REMOVE ACTUATOR

Remove the three nut and remove the actuator.



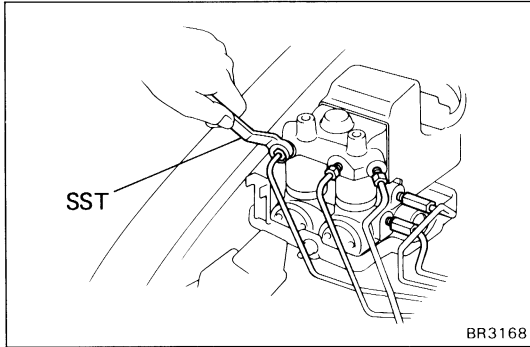
INSTALLATION OF ACTUATOR

1. INSTALL ACTUATOR

Install the actuator to the actuator bracket with three nuts and washers, and tighten them.

Torque: 55 kg-cm (48 in.-lb, 5.4 N·m)

HINT: Install the motor ground wire between the plate washer and spring washer before installing the rear right side nut.

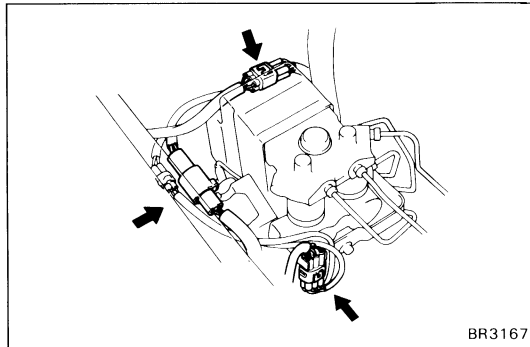


2. CONNECT BRAKE TUBES TO ACTUATOR

Connect the five brake tubes to the actuator by hand, and using SST, tighten them.

SST 09751-36011

Torque: 155 kg-cm (11 ft-lb, 15 N·m)



3. CONNECT ACTUATOR CONNECTORS

Connect the three connectors of the actuator.

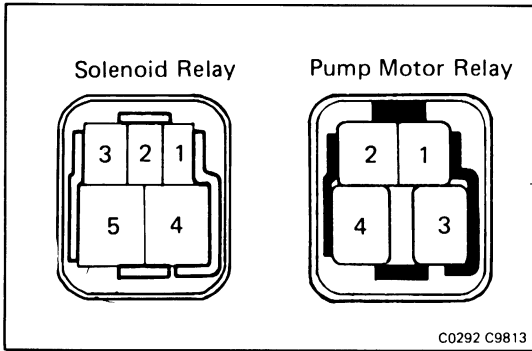
4. FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM

5. CHECK FOR FLUID LEAKAGE

6. CHECK ACTUATOR OPERATION (See page BR-61)

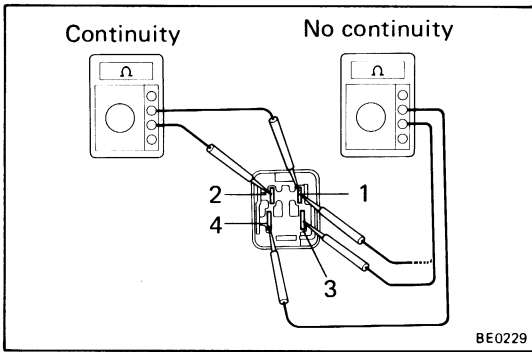
Control Relays

INSPECTION OF CONTROL RELAYS



1. REMOVE CONTROL RELAYS

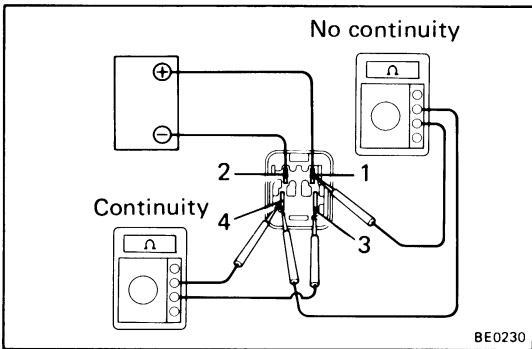
Remove the two control relays from the actuator.



2. INSPECT PUMP MOTOR RELAY CONTINUITY

- (a) Check that there is continuity between terminals 1 and 2.
- (b) Check that there is no continuity between terminals 3 and 4.
- (c) Check that there is no continuity between terminals 1 and 4.

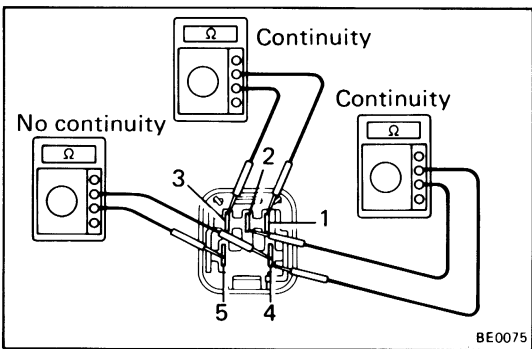
If continuity is not as specified, replace the relay.



3. INSPECT PUMP MOTOR RELAY OPERATION

- (a) Apply battery voltage to terminals 1 and 2.
- (b) Check that there is continuity between terminals 3 and 4.
- (c) Check that there is no continuity between terminals 1 and 4.

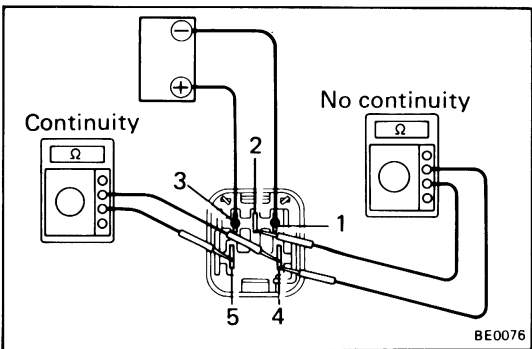
If operation is not as specified, replace the relay.



4. INSPECT SOLENOID RELAY CONTINUITY

- (a) Check that there is continuity between terminals 1 and 3.
- (b) Check that there is continuity between terminals 2 and 4.
- (c) Check that there is no continuity between terminals 4 and 5.

If continuity is not as specified, replace the relay.



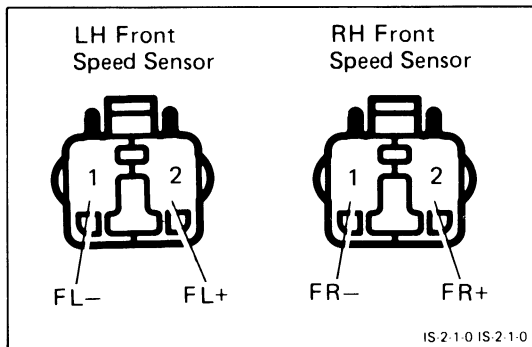
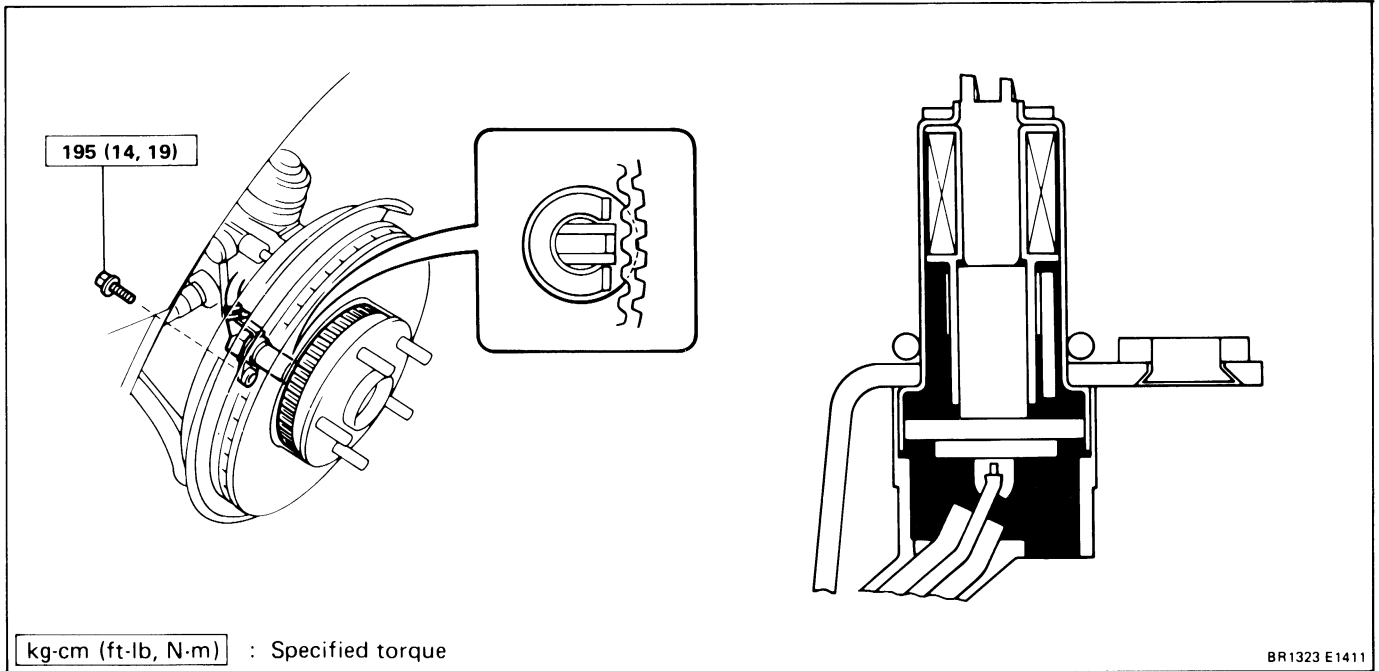
5. INSPECT SOLENOID RELAY OPERATION

- (a) Apply battery voltage to terminals 1 and 3.
- (b) Check that there is continuity between terminals 4 and 5.
- (c) Check that there is no continuity between terminals 2 and 4.

If operation is not as specified, replace the relay.

6. INSTALL TWO CONTROL RELAYS

Front Speed Sensor



INSPECTION OF FRONT SPEED SENSOR

1. INSPECT SPEED SENSOR

(a) Disconnect the speed sensor connector in the engine compartment.

(b) Measure the resistance between terminals.

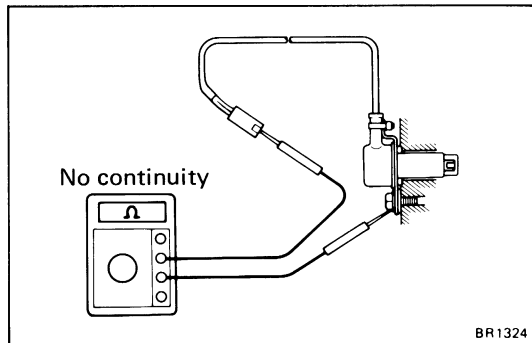
Resistance: 0.8 – 1.3 k Ω

If resistance value is not as specified, replace the sensor.

(c) Check that there is no continuity between each terminal and sensor body.

If there is continuity, replace the sensor.

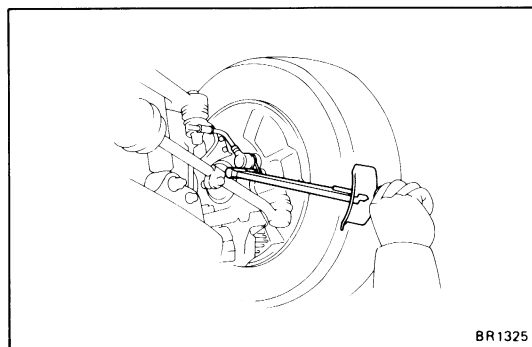
(d) Connect the speed sensor connector.

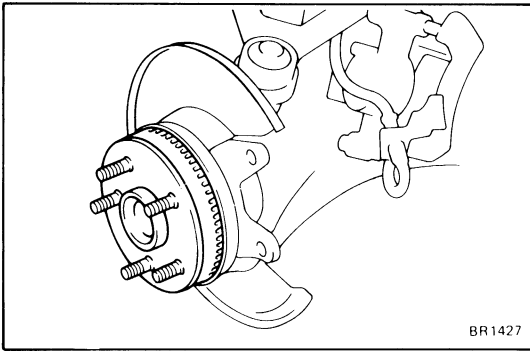


2. INSPECT SENSOR INSTALLATION

Check that the sensor installation bolt is tightened properly. If not, tighten the bolt.

Torque: 195 kg-cm (14 ft-lb, 19 N·m)



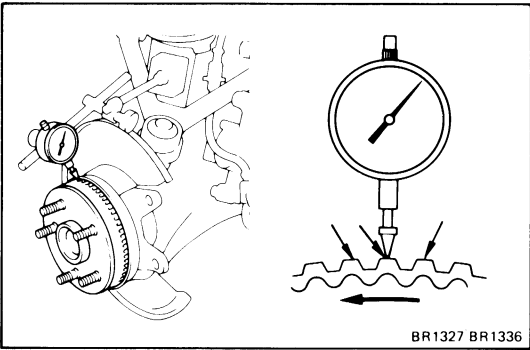


3. VISUALLY INSPECT SENSOR ROTOR SERRATIONS

- Remove the two bolts and remove the torque plate with brake cylinder.
- Remove the rotor disc.
- Inspect the sensor rotor serrations for scratches, cracks, warping or missing teeth.
- Install the rotor disc and brake cylinder assembly with two bolts.

Torque: 1,065 kg-cm (77 ft-lb, 104 N-m)

NOTICE: To prevent damage to the serrations, do not strike the axle hub.



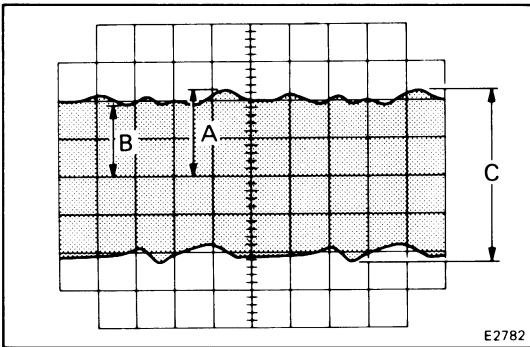
4. INSPECT SENSOR ROTOR RUNOUT

Measure the sensor rotor runout at 2 mm (0.08 in.) from the serration edge.

Maximum sensor rotor runout

(the runout fluctuation measured at the top of 3 consecutive serrations): 0.1 mm (0.004 in.)

If not as specified, replace the front axle hub.



INSPECTION OF FRONT SPEED SENSOR AND SENSOR ROTOR SERRATIONS (REFERENCE)

INSPECT FRONT SPEED SENSOR AND SENSOR ROTOR SERRATIONS BY USING AN OSCILLOSCOPE

- Connect an oscilloscope to the speed sensor connector.
- Run the vehicle at 20 km/h (12.4 mph), and inspect speed sensor output wave.
- Check that C is 0.5 V or more.

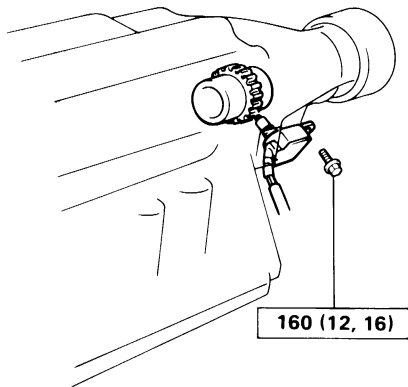
If not as specified, replace the speed sensor.

- Check that B is 70% or more of A.

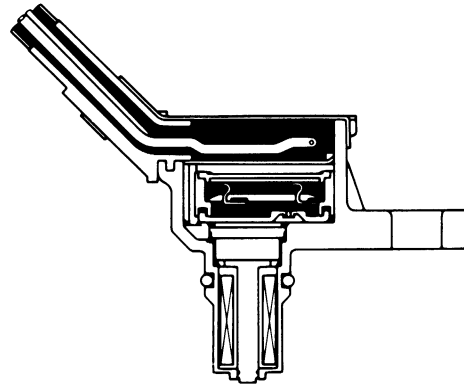
If not as specified, replace the front axle hub.

Rear Speed Sensor

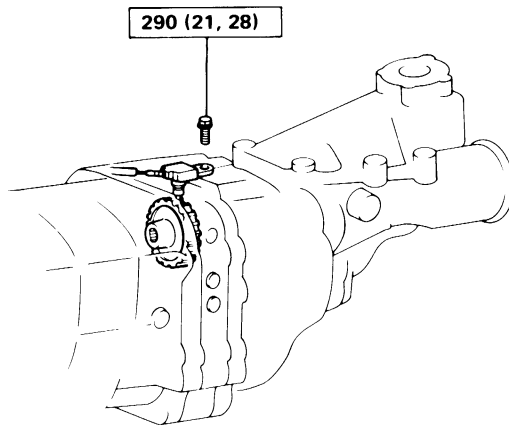
A340E and R154



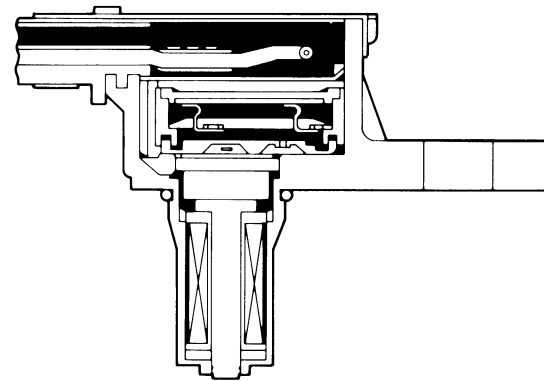
160 (12, 16)



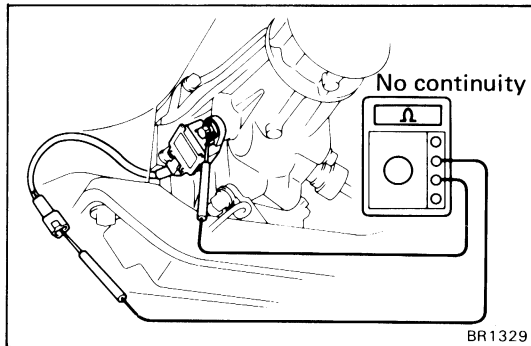
W58



290 (21, 28)



kg-cm (ft-lb, N-m) : Specified torque

BR1328 ZD0053
BR1337 BR1338

BR1329

INSPECTION OF REAR SPEED SENSOR

1. INSPECT SPEED SENSOR

- (a) Disconnect the speed sensor connector.
- (b) Check that there is no continuity between each terminal and sensor body.

If there is continuity, replace the speed sensor.

- (c) Remove the speed sensor from the transmission.
- (d) Remove the terminals from the connector.

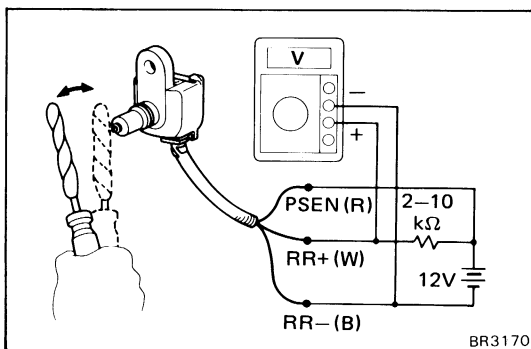
- (e) Using a resistor (2 — 10 k Ω), complete the circuit as shown in the illustration.

HINT: Do not short any terminal.

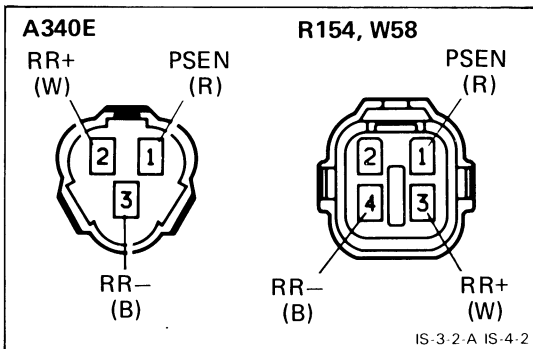
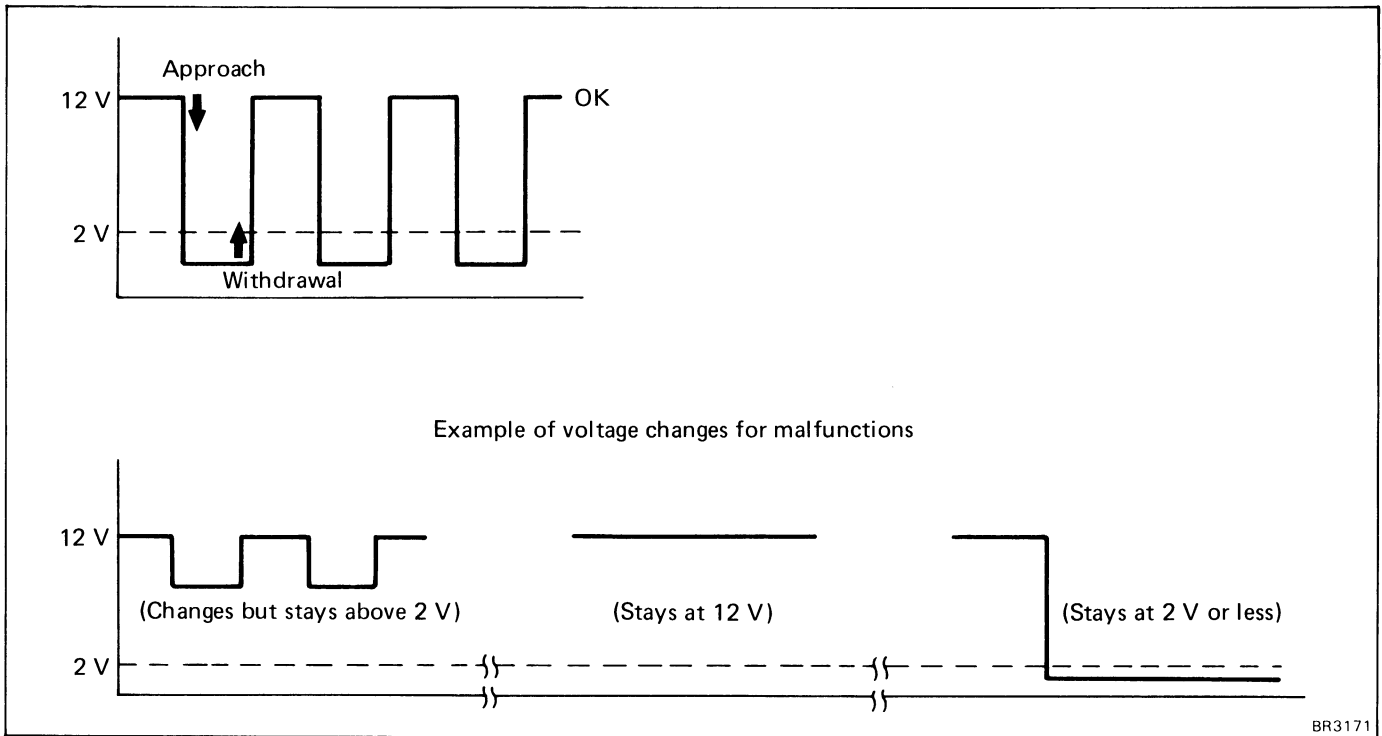
- (f) Check that the voltmeter alternately indicates 12 V and 2 V or less as the screwdriver is repeatedly brought towards the sensor and then withdrawn.

If indications are not as specified, replace the speed sensor.

HINT: Cover the screwdriver tip with a cloth before use to prevent scratching the tip of the speed sensor.

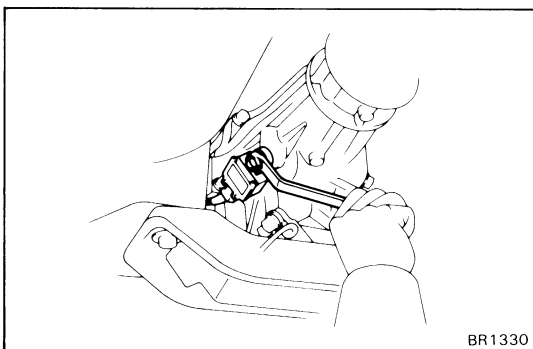


BR3170



(g) Install the terminals to the connector.

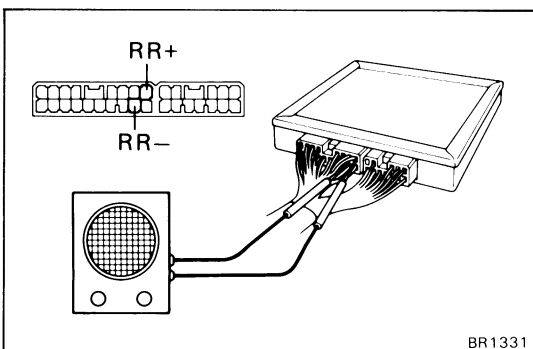
NOTICE: Do not misinstall the terminals.



(h) Install the speed sensor properly with a bolt, and tighten the bolt.

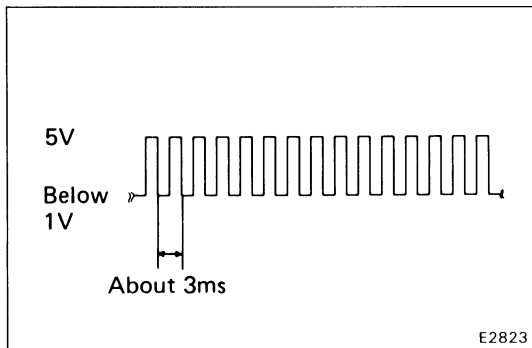
Torque:

A340E, R154 160 kg-cm (12 ft-lb, 16 N·m)
W58 290 kg-cm (21 ft-lb, 28 N·m)

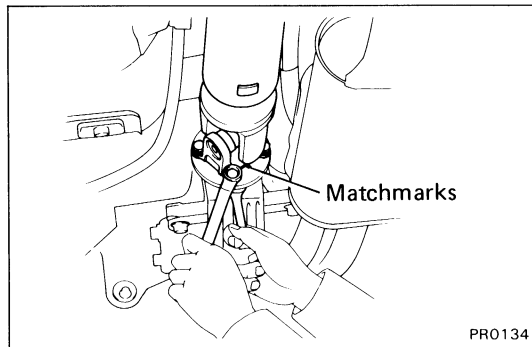


On-Vehicle Inspection (Reference)

- (a) Remove the glove box and pull out the A.B.S. computer with connector connected.
- (b) From back side of the connector, connect the oscilloscope to the terminal RR+ (input) and RR- (ground).

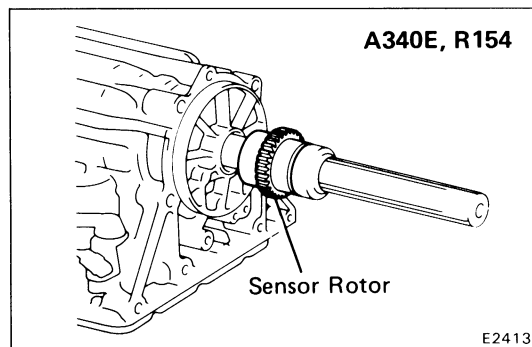


- (c) Run the vehicle at 20 km/h (12.4 mph), check that the speed sensor output wave matches the wave pattern shown in the illustration.
- (d) Disconnect the oscilloscope and install the computer in place.
- (e) Install the glove box.

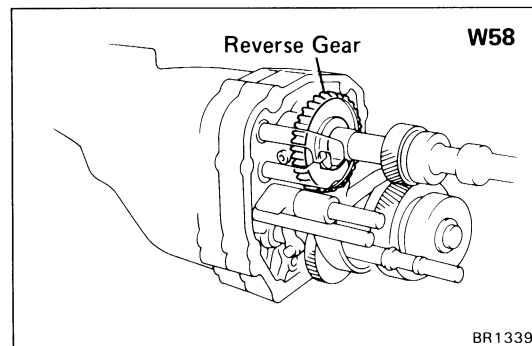


2. INSPECT SENSOR ROTOR SERRATIONS

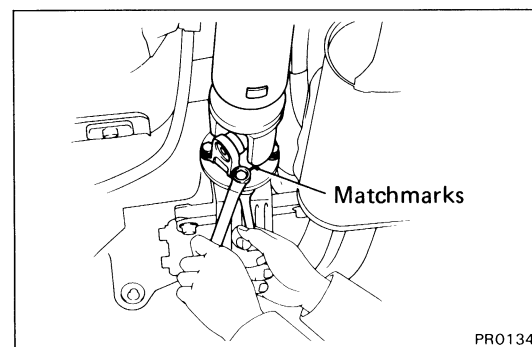
- (a) Drain the transmission fluid.
- (b) Remove the propeller shaft.
(See page PR-3)
- (c) Remove the extension housing.



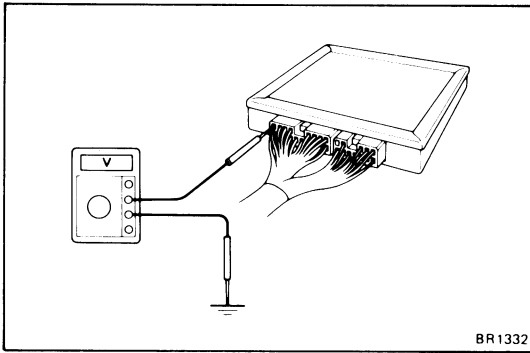
- (d) (A340E, R154)
Inspect the sensor rotor serration for scratches, cracks, missing teeth or abnormal play.



- (e) (W58)
Inspect the reverse gear serration for scratches, cracks, missing teeth or abnormal play.



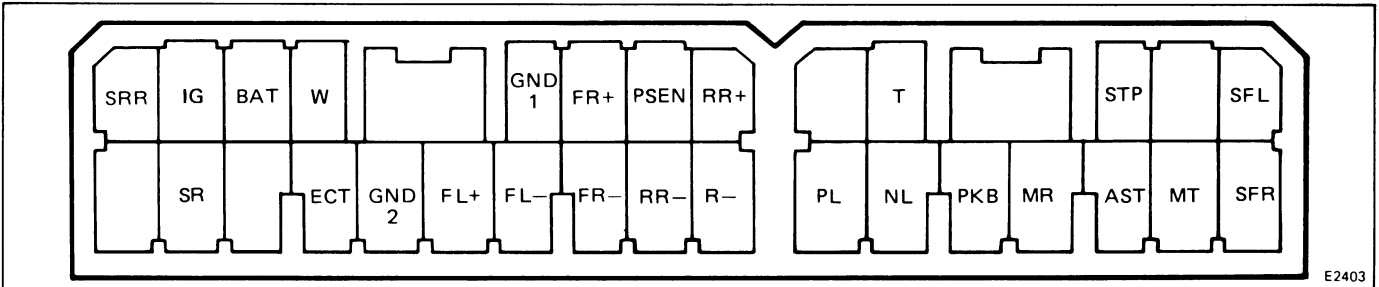
- (f) Install the extension housing.
- (g) Install the propeller shaft.
(See page PR-9)
- (h) Fill the transmission fluid and check fluid level.



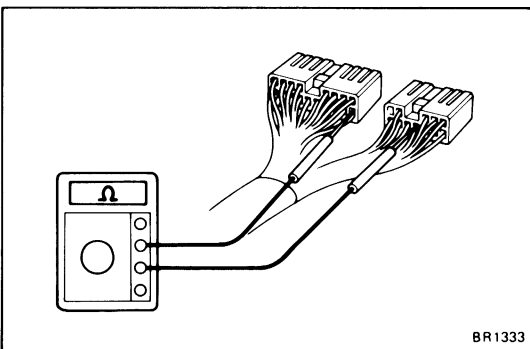
Anti-lock Brake System Circuit INSPECTION OF SYSTEM CIRCUIT

1. INSPECT SYSTEM CIRCUIT WITH CONNECTOR CONNECTED

- (a) Remove the glove box and pull out the A.B.S. computer.
- (b) Using a voltmeter with high impedance (10 kΩ/V minimum), measure the voltage at each terminal and body ground.



Tester Connection	Condition	Voltage
SFL – Body ground	Ignition switch on	Battery voltage
	Ignition switch on and “ANTILOCK” warning light goes on	About 0 V
SFR – Body ground	Ignition switch on	Battery voltage
	Ignition switch on and “ANTILOCK” warning light goes on	About 0 V
AST – Body ground	Ignition switch on	Battery voltage
	Ignition switch on and “ANTILOCK” warning light goes on	About 0 V
PESN – Body ground	Ignition switch on	Battery voltage
W – Body ground	Ignition switch on	Battery voltage
	Ignition switch on and “ANTILOCK” warning light goes on	About 0 V
SRR – Body ground	Ignition switch on	Battery voltage
	Ignition switch on and “ANTILOCK” warning light goes on	About 0 V



2. INSPECT SYSTEM CIRCUIT WITH CONNECTOR DISCONNECTED

- (a) Disconnect the connectors from the computer, inspect at the wire harness side connector.

Tester Connection	Check Item	Condition	Voltage or Resistance Value
SFL – AST	Resistance	Ignition switch off	About 1 Ω
STP – Body ground	Voltage	Ignition switch off and brake pedal depressed	Battery voltage
	Continuity	Ignition switch off and brake pedal returned	Continuity
T – Body ground	Continuity	Ignition switch off	Continuity
SFR – AST	Resistance	Ignition switch off	About 1 Ω
MT – Body ground	Continuity	Ignition switch off	Continuity
AST – Body ground	Continuity	Ignition switch off	Continuity
MR – R \ominus	Resistance	Ignition switch off	50 – 80 Ω
PKB – Body ground	Voltage	Ignition switch on and PKB lever pulled	About 0 V
		Engine running and PKB lever returned	Battery voltage
NL – Body ground	Voltage	Ignition switch on and shift into "N" range	Battery voltage
PL – Body ground	Voltage	Ignition switch on and shift into "P" range	Battery voltage
FR \oplus – FR \ominus	Resistance	Ignition switch off	0.8 – 1.3 k Ω
GND1 – Body ground	Continuity	Ignition switch off	Continuity
BAT – Body ground	Voltage	–	Battery voltage
IG – Body ground	Voltage	Ignition switch on	Battery voltage
SRR – AST	Resistance	Ignition switch off	About 1 Ω
R \ominus – Body ground	Continuity	Ignition switch off	No continuity
RR \ominus – Body ground	Continuity	Ignition switch off	No continuity
FR \ominus – Body ground	Continuity	Ignition switch off	No continuity
FL \ominus – Body ground	Continuity	Ignition switch off	No continuity
FL \oplus – FL \ominus	Resistance	Ignition switch off	0.8 – 1.3 k Ω
GND2 – Body ground	Continuity	Ignition switch off	Continuity
ECT – Body ground	Voltage	Ignition switch on and shift into "N" or "P" range	About 5 V
SR – R \ominus	Resistance	Ignition switch off	65 – 100 Ω

(b) Connect the connectors, and install the computer in place.

(c) Install the glove box.