

BRAKE SYSTEM

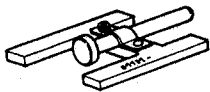
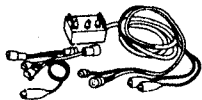
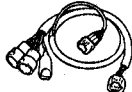
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GENERAL DESCRIPTION

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.
3. If the vehicle is equipped with a mobile communication system, refer to the precaution in the IN section.

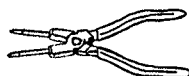
PREPARATION

SST (SPECIAL SERVICE TOOLS)

	09023-00100 Union Nut Wrench 10 mm	
	09703-30010 Brake Shoe Return Spring Tool	
	09709-29017 LSPV Gauge Set	
	09718-00010 Shoe Hold Down Spring Driver	
	09737-00010 Brake Booster Push Rod Gauge	
	09843-18020 Diagnosis Check Wire	
	09990-00150 ABS Actuator Checker and Sub-harness	
	09990-00200 ABS Actuator Checker Sub-harness "C"	
	09990-00210 ABS Actuator Checker Sub-harness "E"	
	09990-00370 ABS Actuator Checker Sheet "L"	

NEOS-1-0A

09082-00050 TOYOTA Electrical Tester Set.



09905-00013 Snap Ring Pliers .

NR017-10

Torque wrench

Micrometer

Brake disc

Dial indicator

Brake disc

Vernier calipers

Brake drum

BR018-0E

Item

Capacity

Classification

Brake fluid

SAE J1703 or FMVSS No.116 DOT 3

Use the table below to help you find the cause of the problem. The numbers indicate the priority of the likely cause of the problem. Check each part in order. If necessary, replace these parts.

See page

Part Name

Trouble

Low pedal or spongy pedal

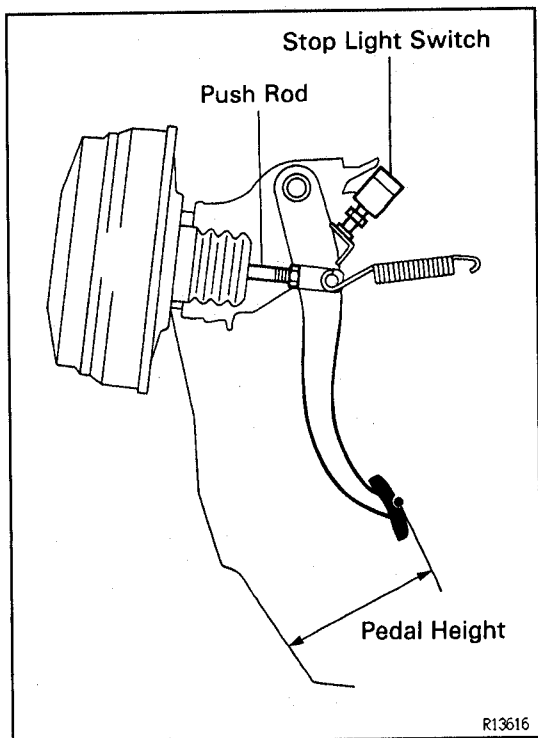
Brake drag

Brake pull

Hard pedal but brake inefficient

Noise from brakes

	1	Brake system (Fluid leaks)			-
	2	Brake system (Air in)			-
	3	Brake pad or lining (Worn)			BR-13,17, 21,25
		Piston seal (Worn or damaged)			BR-13,17
	1	Brake pedal (Freeplay minimal)			BR-4
	11	Master cylinder (Faulty)			BR-8
	5	Rear brake (Shoe clearance out of adjustment)			BR-21,25
	2	Parking brake (Lever travel out of adjustment)			BR-7
	3	Parking brake wire (Sticking)			-
	9	Booster push rod (Out of adjustment)			BR-12
8	8	Anchor or return spring (Faulty)			BR-21,25
1	5	Pad or lining (Cracked or distorted)			BR-13,17, 21,25
	1	Piston (Stuck)			BR-13,17
	6	Pad or lining (Oily)			BR-13,17, 21,25
	3	Piston (Frozen)			BR-13,17
	10	Booster system (Vacuum leaks)			BR-5
4		Pad support plate (Loose)			BR-13
2		Installation bolt (Loose)			BR-13,17
5		Sliding pin (Worn)			BR-13
3	4	Disc (Scored)			BR-13,17
6		Pad or lining (Dirty)			BR-13,17, 21,25
7	7	Pad or lining (Glazed)			BR-13,17, 21,25
9		Anti-squeal shim (Damaged)			BR-13,17
10		Hold-down spring (Damaged)			BR-21,25



CHECK AND ADJUSTMENT

BRAKE PEDAL CHECK AND ADJUSTMENT

1. CHECK PEDAL HEIGHT

Pedal height from asphalt sheet:

159.1 — 169.1 mm (6.264 — 6.657 in.)

2. IF NECESSARY, ADJUST PEDAL HEIGHT

- Disconnect the connector from the stop light switch.
 - Loosen the stop light switch lock nut and remove the stop light switch.
 - Loosen the push rod lock nut.
 - Adjust the pedal height by turning the pedal push rod.
 - Tighten the push rod lock nut.
- Torque: 25 N·m (260 kgf·cm, 19 ft·lbf)**
- Install the stop light switch and turn it until it lightly contacts the pedal stopper.
 - Turn the stop light switch back one turn.
 - Check the clearance (A) between stop light switch and pedal.

Clearance:

0.5 — 2.4 mm (0.020 — 0.094 in.)

- Tighten the stop light switch lock nut.
- Check the stop lights come on when the brake pedal is depressed, and go off when the brake pedal is released.
- After adjusting the pedal height, check the pedal freeplay.

HINT: If clearance (A) between the stop light switch and the brake pedal stopper had been adjusted correctly, the pedal freeplay will meet the specifications.

3. CHECK PEDAL FREEPLAY

- Stop the engine and depress the brake pedal several times until there is no more vacuum left in the booster.

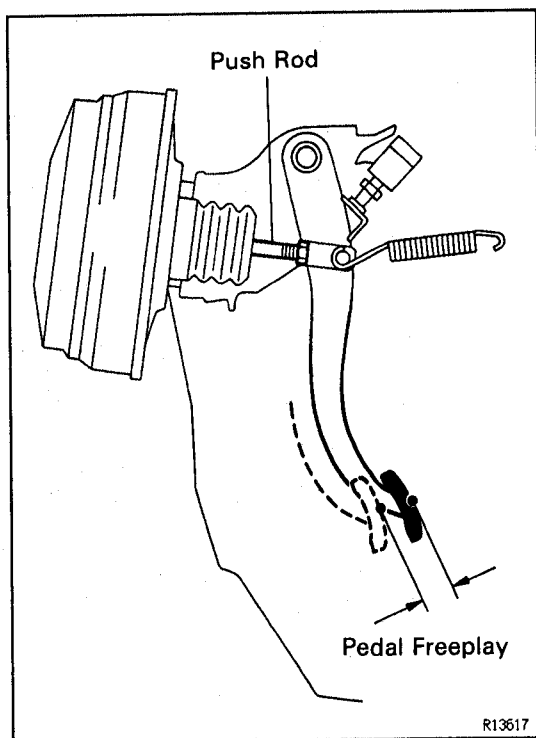
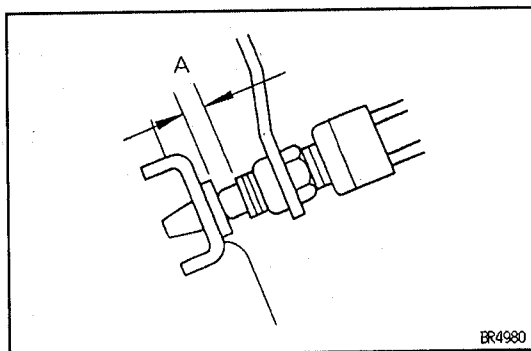
- Push in the pedal by hand until the beginning of the second resistance is felt. Measure the distance.

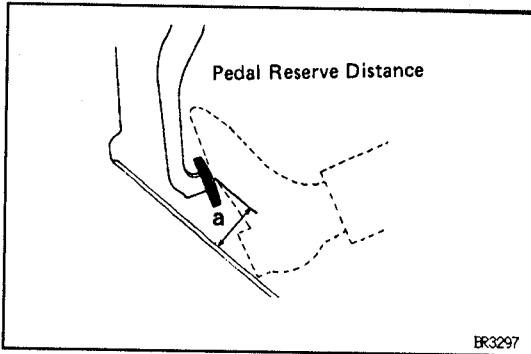
Pedal freeplay:

3 — 6 mm (0.12 — 0.24 in.)

HINT: The freeplay to the 1st resistance is due to the play between the clevis and pin. This is magnified up to 1 — 3 mm (0.04 — 0.12 in.) at the pedal.

If incorrect, check the stop light switch clearance. If the clearance is OK, then troubleshoot the brake system.





4. CHECK PEDAL RESERVE DISTANCE

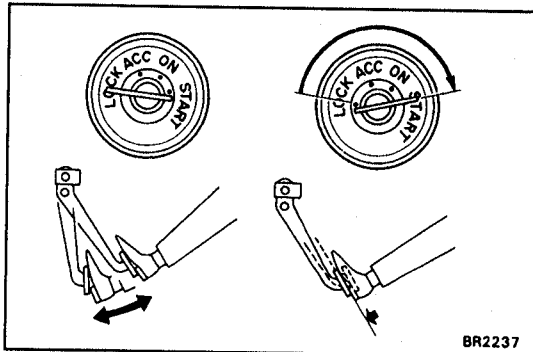
Release the parking brake.

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

Pedal reserve distance, 'a', at 490 N (50 kgf, 110.2 lbf):

More than 72 mm (2.83 in.)

If incorrect, troubleshoot the brake system.

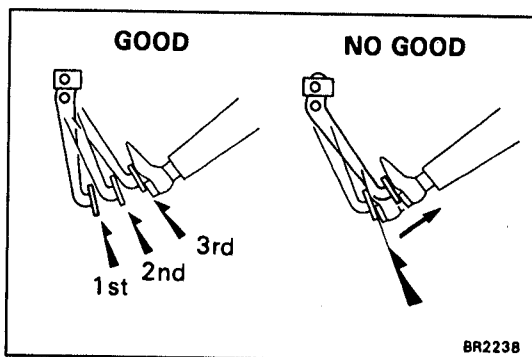


BRAKE BOOSTER OPERATIONAL TEST

BR047-08

1. OPERATING CHECK

- Depress the brake pedal several times with the engine off 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 1 or 2 minutes. Depress the brake pedal several times slowly. If the pedal goes down farthest the 1st time, but gradually rises after the 2nd or 3rd time, the booster is air tight.
- Depress the brake pedal while the engine is running, and stop the engine with the pedal depressed. If there is no change in the pedal reserve travel after holding the pedal for 30 seconds, the booster is air tight.

BR048-08

BRAKE SYSTEM BLEEDING

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

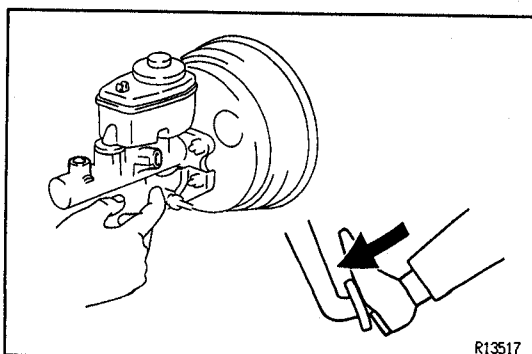
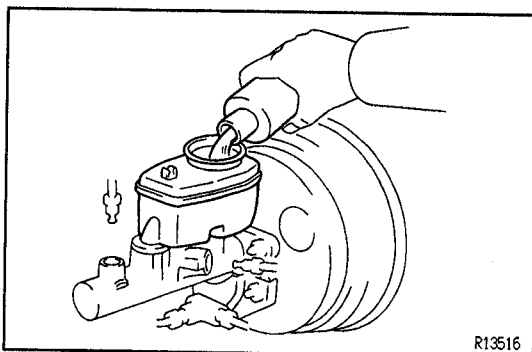
Check the fluid level in the reservoir after bleeding each wheel. Add fluid, if necessary.

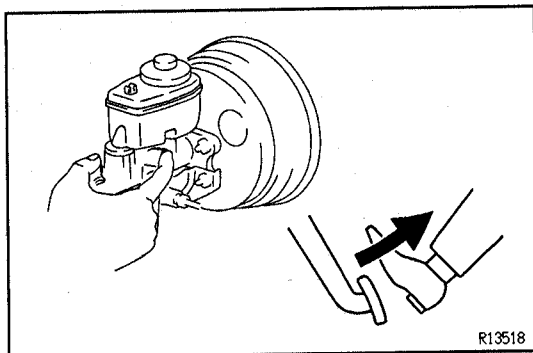
Fluid: SAEJ1703 or FMVSS No.116 DOT 3

2. BLEED MASTER CYLINDER

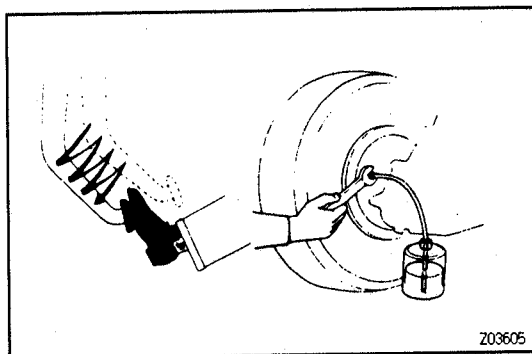
HINT: If the master cylinder has been disassembled or if the reservoir becomes empty, bleed the air from the master cylinder.

- Disconnect the brake lines from the master cylinder.
- Slowly depress the brake pedal and hold it.





- (c) Block off the outlet plug with your finger, and release the brake pedal.
- (d) Repeat (b) and (c) 3 or 4 times.



3. CONNECT VINYL TUBE TO BRAKE CALIPER OR WHEEL CYLINDER BLEEDER PLUG

Insert other end of the tube in a half—full container of brake fluid.

HINT: Begin air bleeding from the wheel cylinder with the longest hydraulic line.

4. BLEED BRAKE LINE

- (a) Slowly depress the brake pedal several times.
- (b) While an assistant depresses the pedal, loosen the bleeder plug until fluid starts to run out. Then tighten the bleeder plug.
- (c) Repeat this procedure until there are no more air bubbles in the fluid.

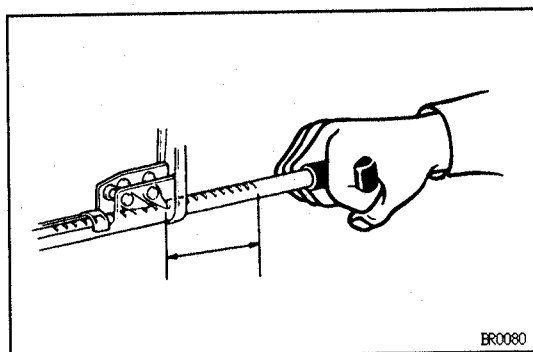
Bleeder plug tightening torque:

11 N·m (110 kgf·cm, 8 ft·lbf)

5. REPEAT PROCEDURE FOR EACH WHEEL

6. BLEED LSP & BV

BR



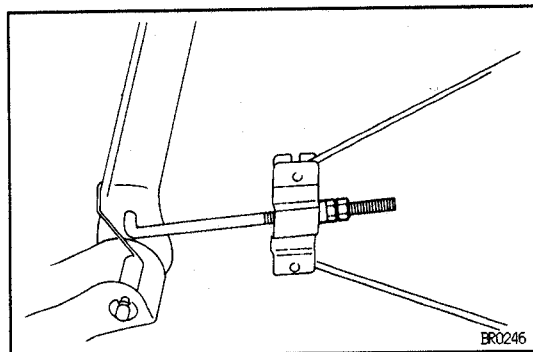
PARKING BRAKE CHECK AND ADJUSTMENT

1. CHECK PARKING BRAKE LEVER TRAVEL

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

Parking brake lever travel at 196 N (20 kgf, 44.1 lbf):

12 — 18 clicks

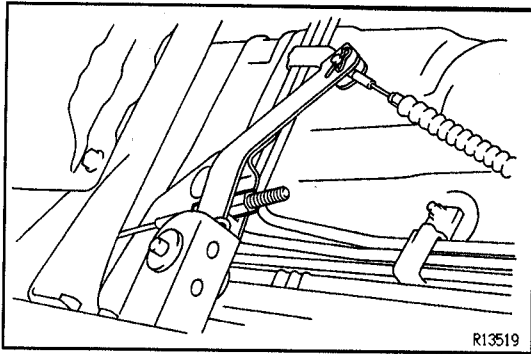


2. IF NECESSARY, ADJUST PARKING BRAKE

HINT: Before adjusting the parking brake, make sure that the rear brake shoe clearance has been adjusted. 2WD:

- (a) Tighten the adjusting nut until the travel is correct. Then tighten the lock nut.
- (b) After adjusting the parking brake, confirm that the rear brakes are not dragging.

BROAS-0A

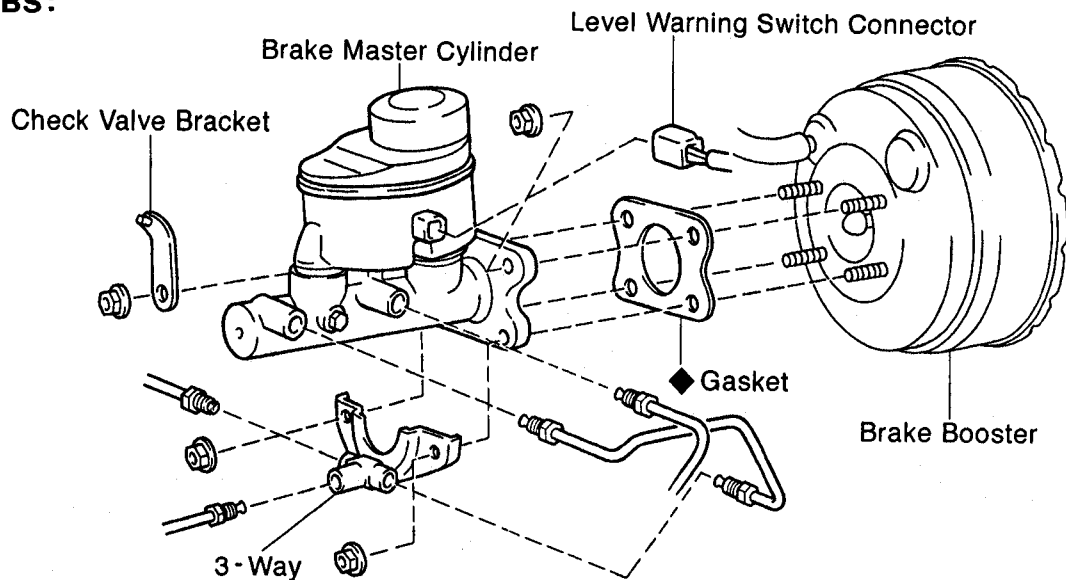
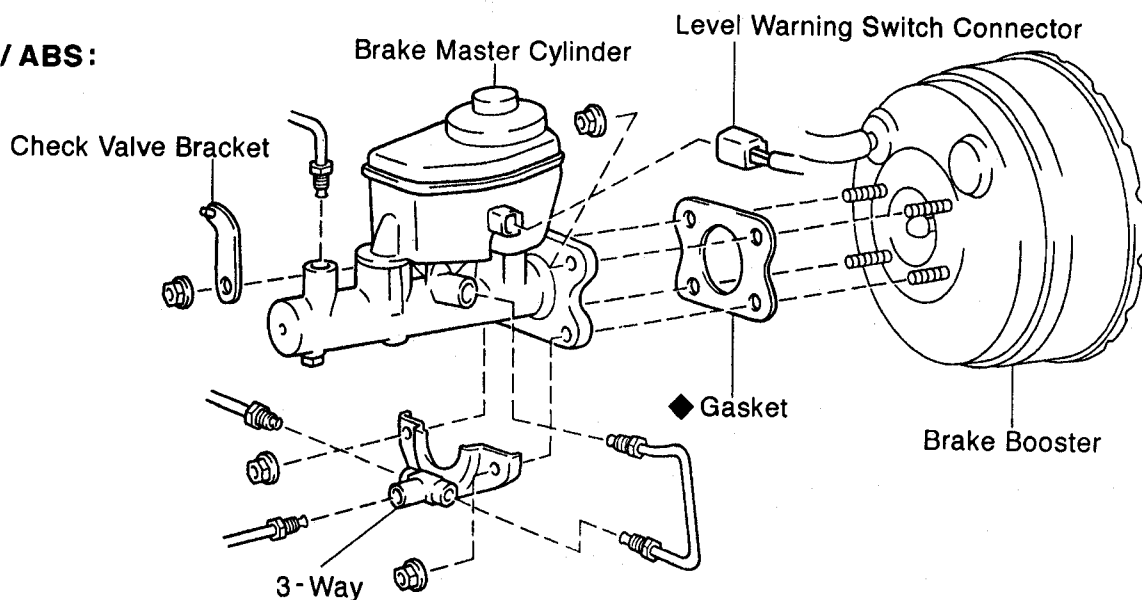
**4WD:**

- Tighten one of the adjusting nuts of the intermediate lever while loosening the other one until the travel is correct. Tighten the 2 adjusting nuts.
- After adjusting the parking brake, confirm that the bellcrank stopper screw comes into contact with the backing plate.

MASTER CYLINDER

MASTER CYLINDER REMOVAL

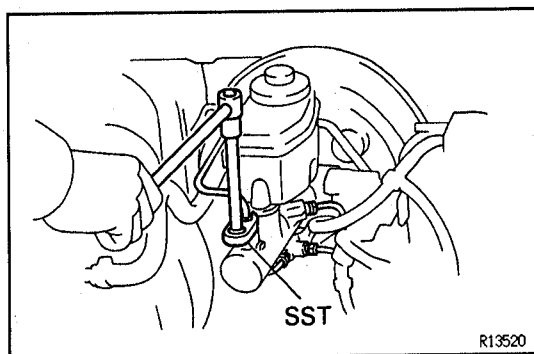
BROA3-08

w/o ABS:**w/ ABS:**

◆ Non-reusable part

BR

W00614



1. DISCONNECT LEVEL WARNING SWITCH CONNECTOR

2. TAKE OUT FLUID WITH SYRINGE

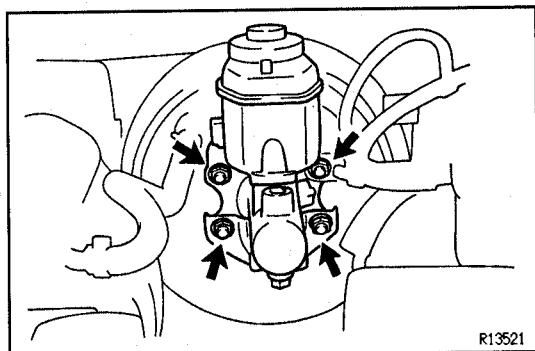
NOTICE: Do not let brake fluid remain on a painted surface. Wash it off immediately.

3. DISCONNECT BRAKE LINES

Using SST, disconnect the 5 brake lines.

SST 09023-00100

Torque: 15 N·m (155 kgf·cm, 11 ft·lbf)



4. REMOVE MASTER CYLINDER

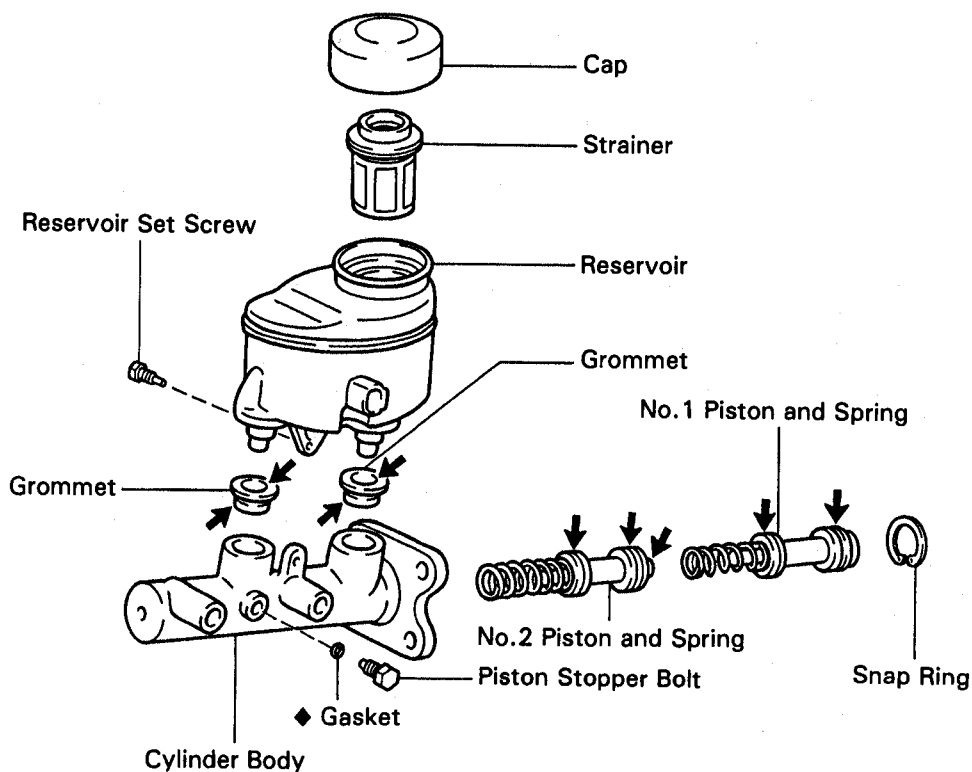
(a) Remove the 4 nuts, 3-way and check valve bracket.

Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

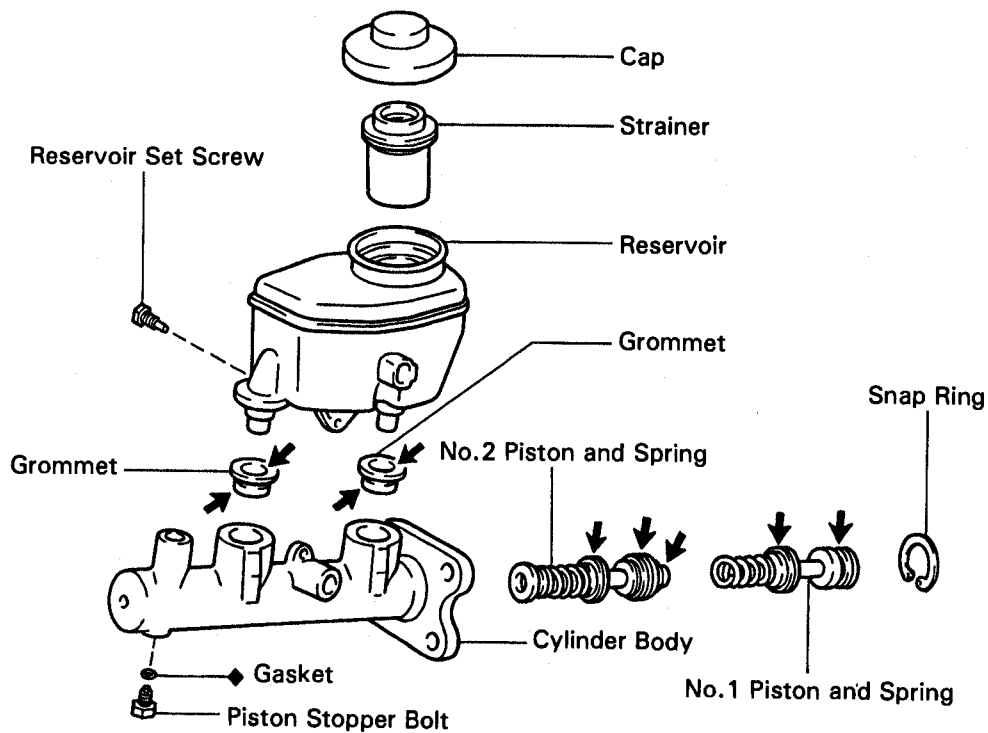
(b) Pull out the master cylinder and gasket.

COMPONENTS

w/o ABS:



w/ ABS:



- ◆ Non-reusable part
- ➔ Lithium Soap Base Glycol Grease

MASTER CYLINDER DISASSEMBLY

1. REMOVE RESERVOIR

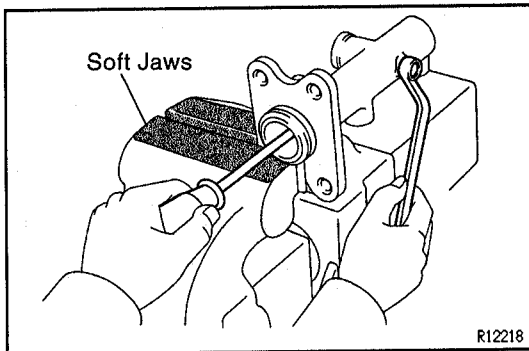
- (a) Remove the set screw and pull out the reservoir.

Torque:

w/o ABS 1.5 N·m (15 kgf·cm, 13 in.-lbf)

w/ ABS 1.7 N·m (18 kgf·cm, 16 in.-lbf)

- (b) Remove the cap and strainer from the reservoir.



R12218

2. REMOVE 2 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.

Torque:

w/o ABS 8 N·m (80 kgf·cm, 69 in.-lbf)

w/ ABS 10 N·m (100 kgf·cm, 7 ft.-lbf)

5. REMOVE 2 PISTONS AND SPRINGS

- (a) Push in the piston with a screwdriver and remove the snap ring with snap ring pliers.

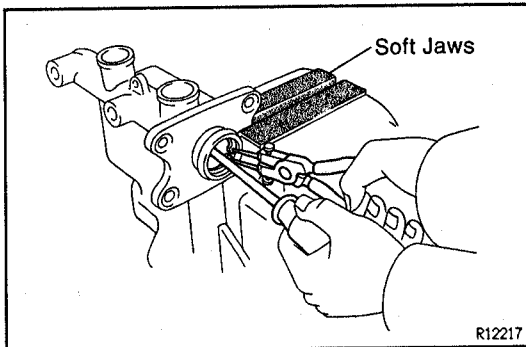
HINT: Tape the screwdriver tip before use.

- (b) Remove the No.1 piston and spring by hand, pulling straight out, not at an angle.

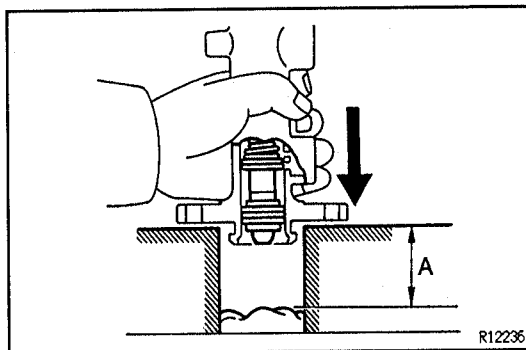
NOTICE: If pulled out and installed at an angle, there is a possibility that the cylinder bore could be damaged.

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

- (c) Place a rag and 2 wooden blocks on the work table, and lightly tap the cylinder flange against the block edges until the No.2 piston drops out of the cylinder. **DISASSEMBLY HINT:** Make sure the distance (A) from the rag to the top of the blocks is at least 100 mm (3.94 in.).



R12217



R12236

MASTER CYLINDER ASSEMBLY

BRTAM-01

Assembly is in the reverse order of disassembly.

ASSEMBLY NOTICE: Apply lithium soap base glycol grease to the rubber parts indicated by the arrows (See page BR-9).

MASTER CYLINDER COMPONENTS INSPECTION

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.

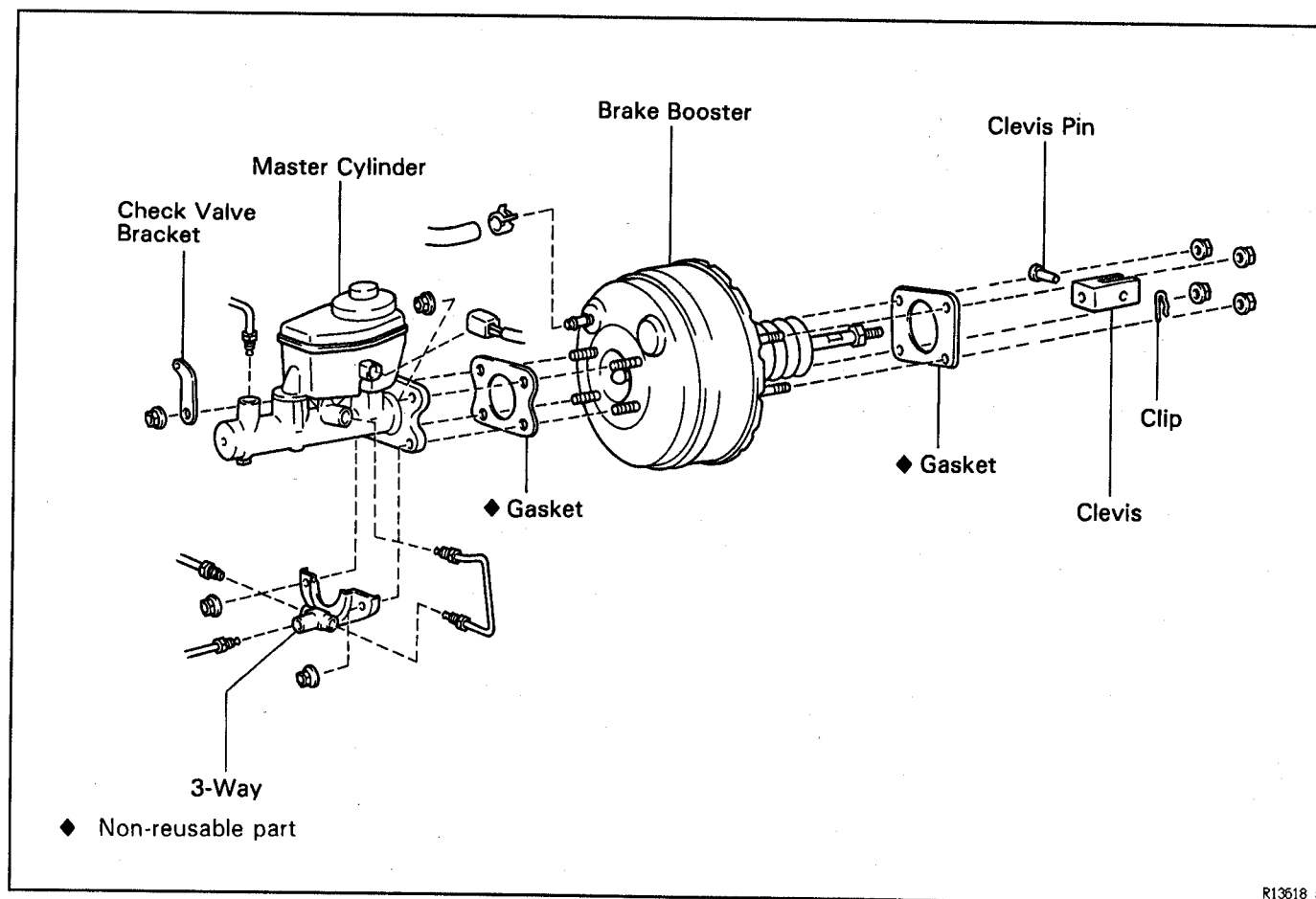
MASTER CYLINDER INSTALLATION

BRIAN-01

Installation is in the reverse order of removal.
BEFORE INSTALLATION, ADJUST LENGTH OF
BRAKE BOOSTER PUSH ROD (See page BR-12)
AFTER INSTALLATION, FILL BRAKE RESERVOIR
WITH BRAKE FLUID, BLEED BRAKE SYSTEM (See
page BR-5), CHECK FOR LEAKS, CHECK AND AD-
JUSTMENT BRAKE PEDAL (See page BR-4)

BRAKE BOOSTER BRAKE BOOSTER REMOVAL

BR126-02



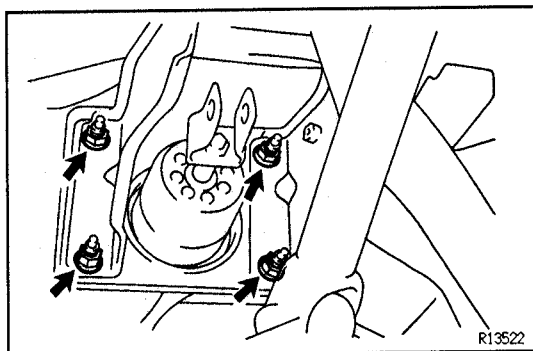
BR

1. REMOVE MASTER CYLINDER

(See page BR-7)

2. REMOVE THESE PARTS:

- Return spring
- Clip and clevis pin
- Clevis
- Vacuum hose

**3. REMOVE BRAKE BOOSTER**

- (a) Remove the 4 booster installation nuts.
- (b) Remove the booster and gasket.

BRAKE BOOSTER INSTALLATION

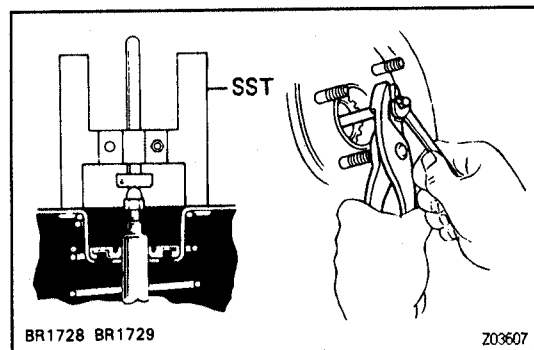
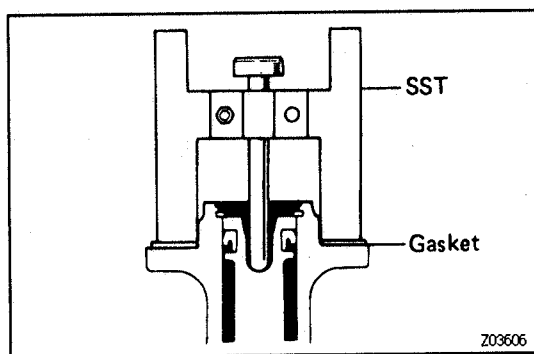
BROAG-0A

1. INSTALL BRAKE BOOSTER

- (a) Install the booster and a new gasket.
- (b) Install the clevis to the operating rod.
- (c) Install and torque the booster installation nuts.
Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)
- (d) Install the clevis, and torque the lock nut.
Torque: 25 N·m (250 kgf·cm, 19 ft·lbf)
- (e) Install the clevis pin into the clevis and brake pedal, and install the clip to the clevis pin.
- (f) Install the pedal return spring.

2. ADJUST LENGTH OF BOOSTER PUSH ROD

- (a) Install a new gasket on the master cylinder.
- (b) Set the SST on the gasket, and lower the pin until its tip slightly touches the piston.
SST 09737-00010

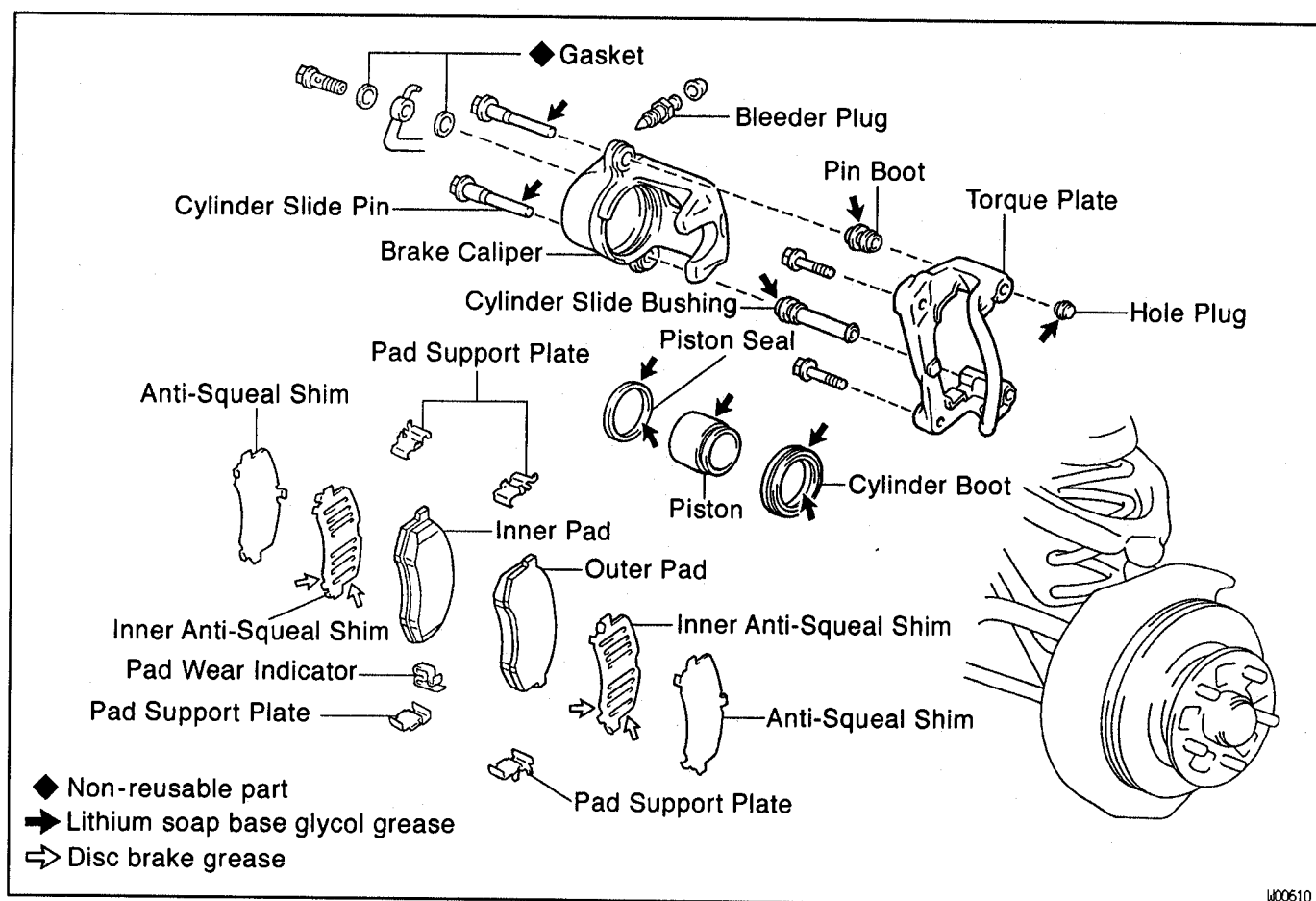


- (c) Turn the SST upside down, and set it on the booster.
SST 09737-00010
- (d) Measure the clearance between the booster push rod and pin head (SST).
Clearance:
0 mm (0 in.)
- (e) Adjust the booster push rod length until the push rod lightly touches the pin head.

3. **INSTALL MASTER CYLINDER**
(See page BR-7)
4. **CONNECT VACUUM HOSE TO BRAKE BOOSTER**
5. **FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM** (See page BR-5)
6. **CHECK FOR FLUID LEAKAGE**
7. **CHECK AND ADJUST BRAKE PEDAL**
(See page BR-4)
8. **DO OPERATIONAL CHECK** (See page BR-5)

FRONT BRAKE (2WD) COMPONENTS

BROAH-06



W00610

BRAKE PADS REPLACEMENT

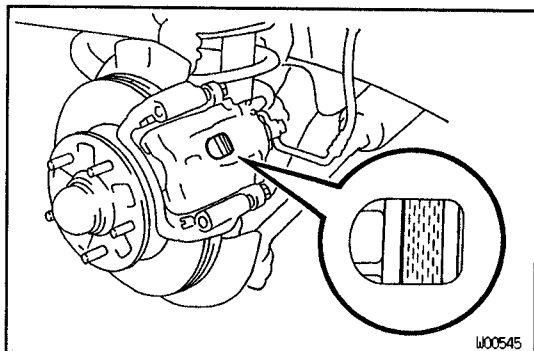
BR1AP-01

1. **REMOVE FRONT WHEEL**
2. **INSPECT PAD LINING THICKNESS**

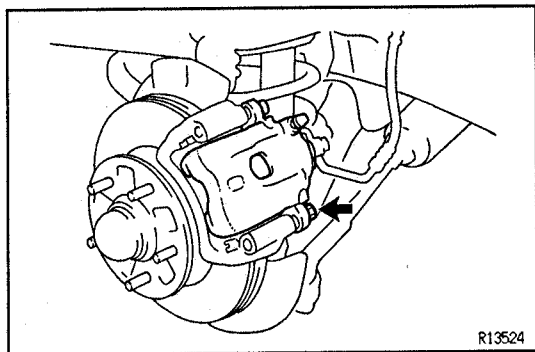
Check the pad thickness through the caliper inspection hole and replace pads if not within specification.

Minimum thickness:

1.0 mm (0.039 in.)



W00545



3. LIFT UP CALIPER

- (a) Remove the sliding pin.
 - (b) Lift up the caliper and suspend it securely.
- HINT:** Do not disconnect the flexible hose from the caliper.

4. REMOVE THESE PARTS:

- 2 brake pads
- 4 anti-squeal shims
- Pad wear indicator plate
- 4 pad support plates

NOTICE: The pad support plates can be used again provided that they have sufficient rebound, no deformation, cracks or wear, and have had all rust, dirt and foreign particles cleaned off.

5. CHECK DISC THICKNESS AND RUNOUT

(See page BR-16)

6. INSTALL 4 PAD SUPPORT PLATES

7. INSTALL NEW PADS

NOTICE: When replacing worn pads, the anti-squeal shims and wear indicator plates must be replaced together with the pads.

- (a) Install a pad wear indicator plate to the inner pad.
 - (b) Install the 2 anti-squeal shims to each pad.
- HINT:** Apply disc brake grease to both sides of inner anti-squeal shims (See page BR-13).
- (c) Install the inner pad so that the wear indicator plate is facing downward, then install the outer pad.
- NOTICE:** Do not allow oil or grease to get on the rubbing face.

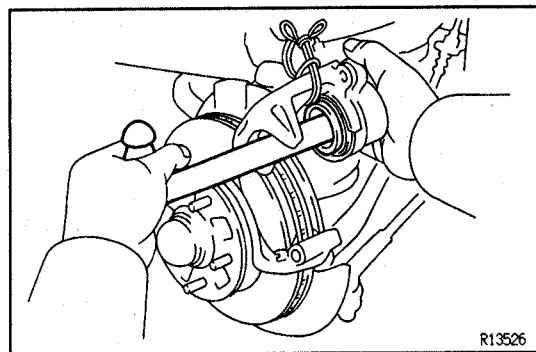
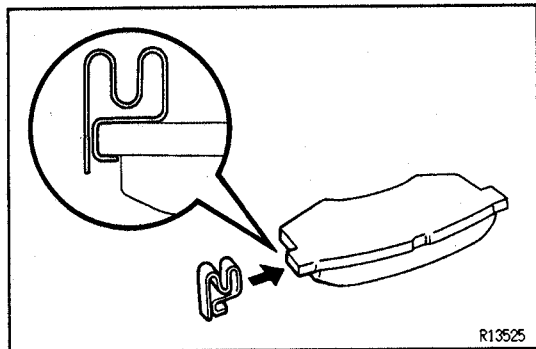
8. INSTALL CALIPER

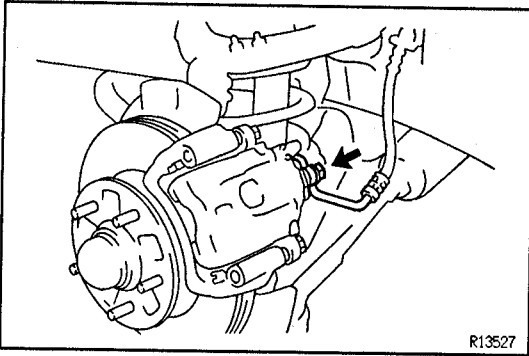
- (a) Draw out a small amount of brake fluid from the reservoir.
 - (b) Press in piston with a hammer handle or equivalent.
- HINT:** If the piston is difficult to push in, loosen the bleeder plug and push in the piston while letting some brake fluid escape.
- (c) Insert the brake caliper carefully so the boot is not wedged.
 - (d) Install and torque the sliding pin.
- Torque:** 88 N·m (900 kgf·cm, 65 ft·lbf)

9. INSTALL FRONT WHEEL

10. CHECK THAT FLUID LEVEL IS AT MAX LINE

BR





CALIPER REMOVAL

BR02J-04

1. DISCONNECT FLEXIBLE HOSE

- (a) Remove the union bolt and disconnect the flexible hose.

Torque: 30 N·m (310 kgf·cm, 22 ft·lbf)

INSTALLATION NOTICE: For correct brake hose routing, ensure that the hose hangs down before installing hose to caliper.

- (b) Use a container to catch the brake fluid.

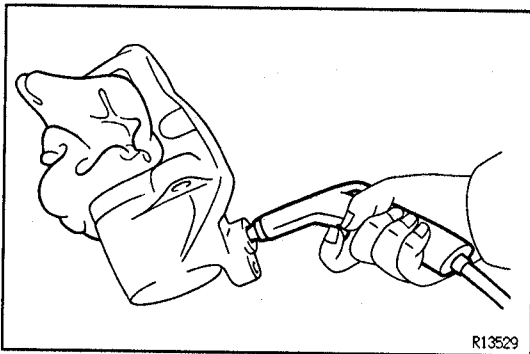
2. REMOVE CALIPER FROM TORQUE PLATE

Remove the 2 sliding pins and caliper.

Torque: 88 N·m (900 kgf·cm, 65 ft·lbf)

3. REMOVE THESE PARTS:

- 2 brake pads with anti-squeal shims and pad wear indicator
- 4 pads support plates



CALIPER DISASSEMBLY

BR128-02

1. REMOVE PISTON AND CYLINDER BOOT

- (a) Put a piece of cloth or an equivalent between the piston and caliper.
- (b) Use compressed air to remove the piston and cylinder boot from the cylinder.

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

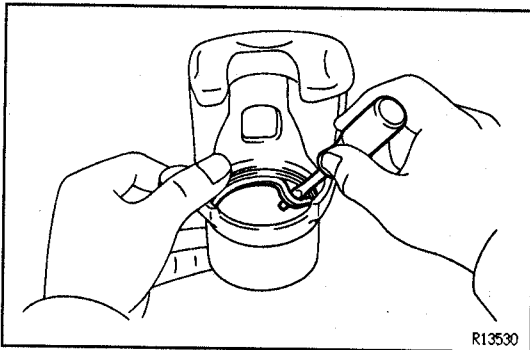
2. REMOVE PISTON SEAL FROM BRAKE CYLINDER

Using a screwdriver, remove the piston seal.

3. REMOVE SLIDING BUSHING AND BOOT

- (a) Remove the sliding bushing and boot from the torque plate.

ASSEMBLY HINT: Ensure that the sliding bushing and boot is secured firmly to the caliper grooves.

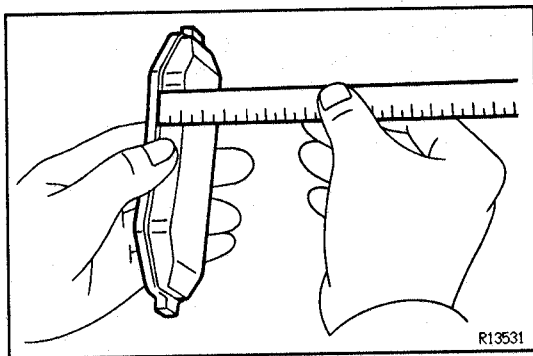


CALIPER ASSEMBLY

BR1A0-01

Assembly is in the reverse order of disassembly.

ASSEMBLY NOTICE: Apply lithium soap base glycol grease to the parts indicated by the arrows (See page BR-13).



FRONT BRAKE COMPONENTS INSPECTION AND REPAIR

1. MEASURE PAD LINING THICKNESS

Using a ruler, measure the pad lining thickness.

Standard thickness:

12.0 mm (0.472 in.)

Minimum thickness:

1.0 mm (0.039 in.)

Replace the pad if the thickness is less than the minimum (the 1.0 mm slit is no longer visible), or if it shows signs of uneven wear.

2. MEASURE DISC THICKNESS

Using a micrometer, measure the disc thickness.

Standard thickness:

22.0 mm (0.866 in.)

Minimum thickness:

20.0 mm (0.787 in.)

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

3. MEASURE DISC RUNOUT

Using a dial indicator, measure the disc runout at a position 10 mm (0.39 in.) from the outside edge.

Maximum disc runout:

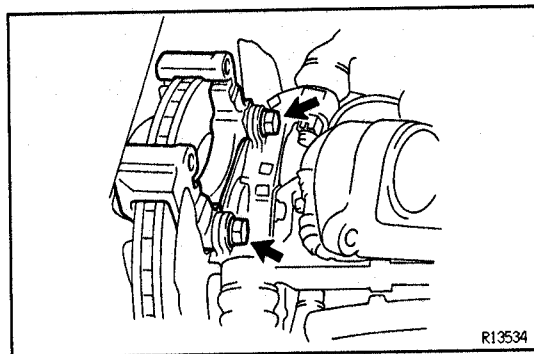
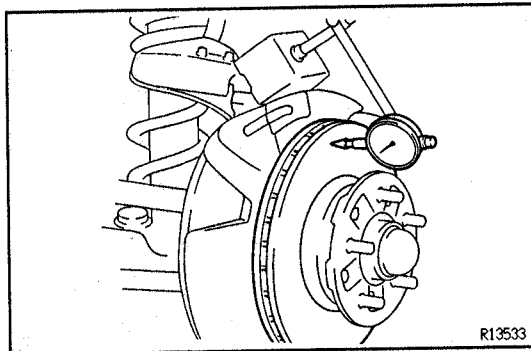
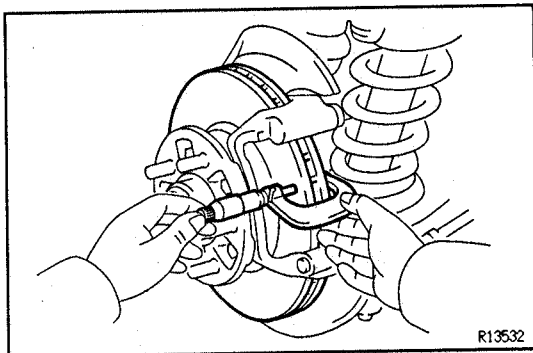
0.07 mm (0.0028 in.)

If the runout is greater than the maximum, replace the disc.

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

4. IF NECESSARY, REPLACE DISC

- Remove the torque plate from the knuckle.
- Remove the axle hub. (See page SA-14)
- Remove the disc from the axle hub.
- Install a new disc. Torque the bolts.
Torque: 64 N·m (650 kgf·cm, 47 ft·lbf)
- Install the axle hub and adjust the front bearing preload. (See page SA-16)
- Install the torque plate onto the knuckle.
Torque: 108 N·m (1,100 kgf·cm, 80 ft·lbf)



CALIPER INSTALLATION

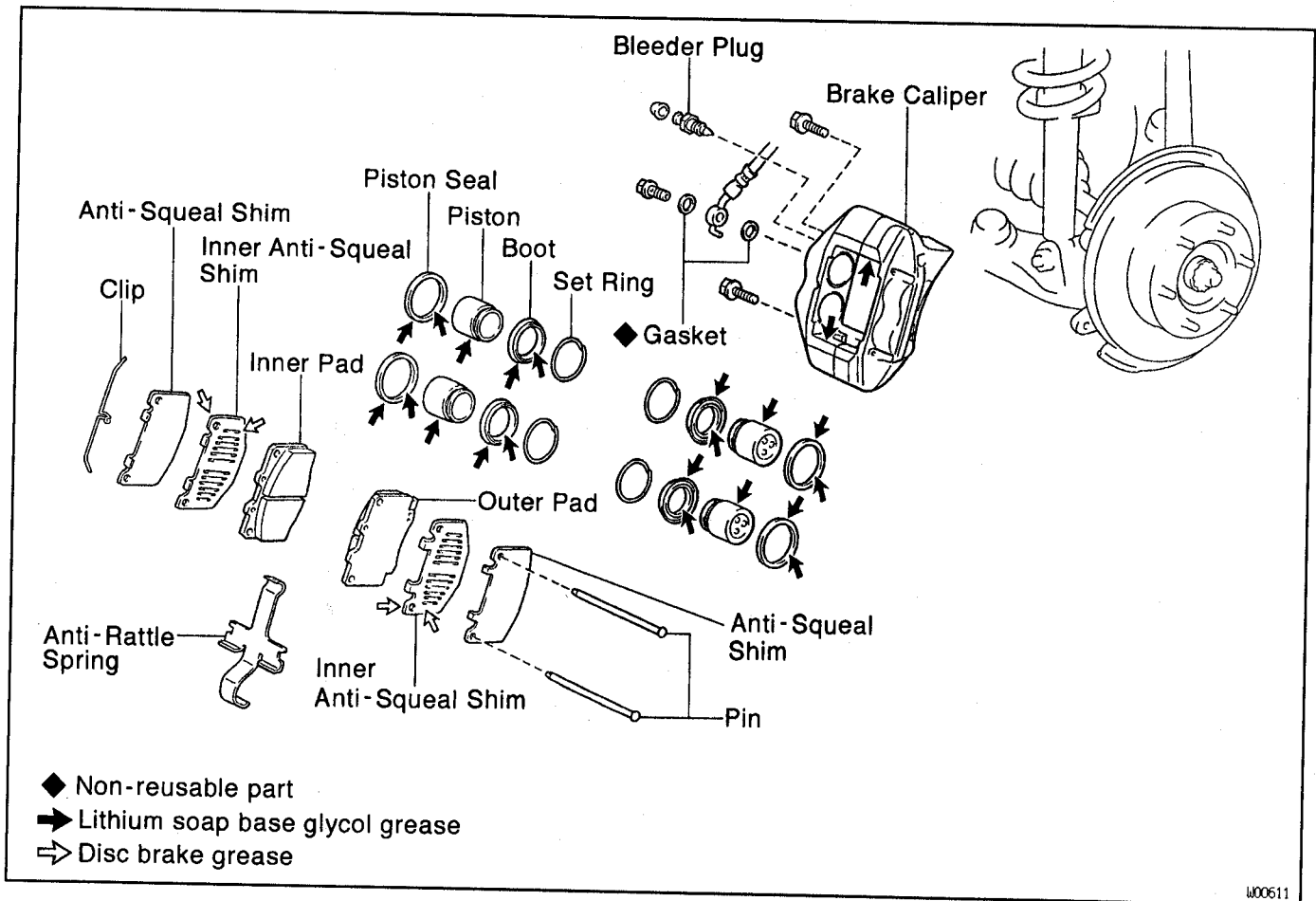
BRIAR-01

Installation is in the reverse order of removal.

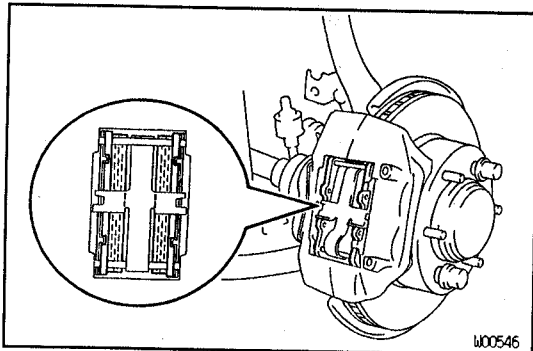
AFTER INSTALLATION, FILL BRAKE RESERVOIR WITH BRAKE FLUID, BLEED BRAKE SYSTEM (See page BR-5) AND CHECK FOR LEAKS

FRONT BRAKE (4WD) COMPONENTS

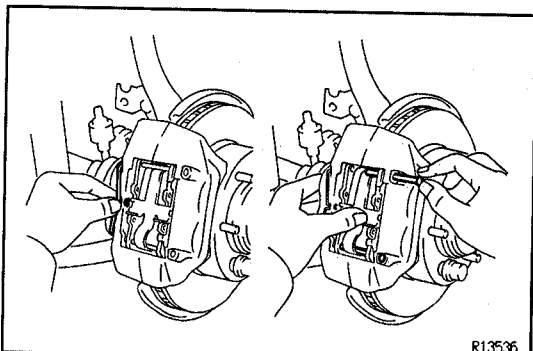
BROAX-0F



W00611



W00546



R13536

BRAKE PADS REPLACEMENT

BROZK-04

BR

1. REMOVE FRONT WHEEL
2. INSPECT PAD LINING THICKNESS

Check the pad thickness and replace pads if not within specification.

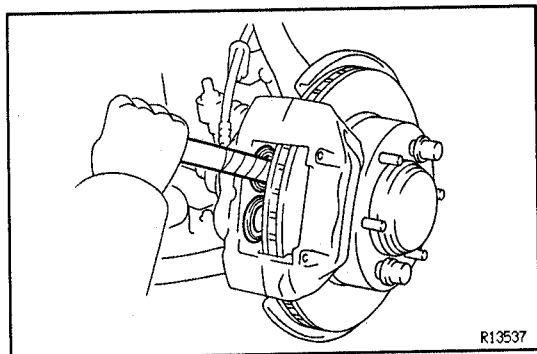
Minimum thickness:

1.0 mm (0.039 in.)

3. REMOVE THESE PARTS:

- Clip
- 2 pins
- Anti-rattle spring
- 2 pads
- 4 anti-squeal shims

NOTICE: The anti-rattle spring can be used again provided that they have sufficient rebound, no deformation, cracks or wear, and have had all rust, dirt and foreign particles cleaned off.



4. CHECK DISC THICKNESS AND RUNOUT

(See page BR-20)

5. INSTALL NEW PADS

NOTICE: When replacing worn pads, the anti-squeal shims must be replaced together with the pads.

- (a) Draw out a small amount of brake fluid from the reservoir.
- (b) Press in the pistons with a monkey wrench handle or equivalent.

HINT:

- Tape the monkey wrench handle before use.
- Always change the pad on one wheel at a time as there is a possibility of the opposite piston flying out.
- If the piston is difficult to push in, loosen the bleeder plug and push in the piston while letting some brake fluid escape.

- (c) Install the anti-squeal shims to new pads.

HINT: Apply disc brake grease to inside of the anti-squeal shims (See page BR-17).

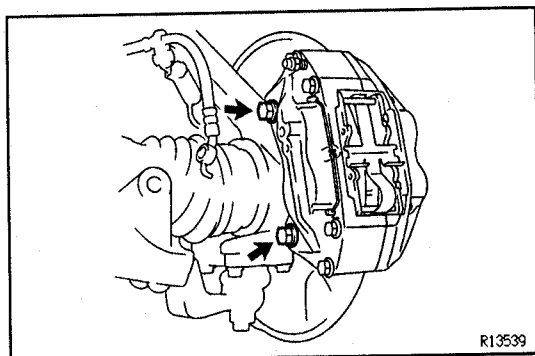
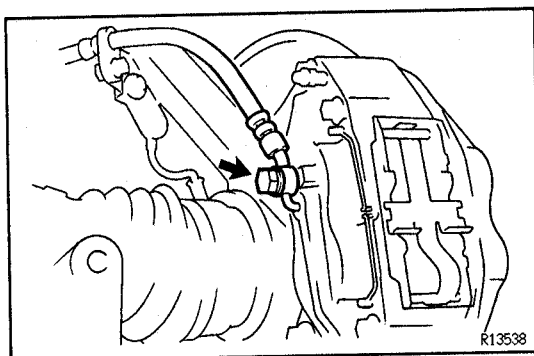
- (d) Install the 2 pads.

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

6. INSTALL ANTI-RATTLE SPRING AND 2 PINS

7. INSTALL CLIP

BR



CALIPER REMOVAL

1. REMOVE FRONT WHEEL

2. DISCONNECT BRAKE LINE

Torque: 30 N·m (310 kgf·cm, 22 ft·lbf)

3. REMOVE CALIPER

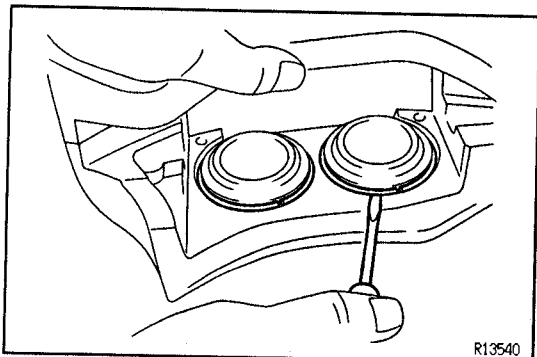
Remove the 2 mounting bolts and caliper.

Torque: 123 N·m (1,250 kgf·cm, 90 ft·lbf)

4. REMOVE THESE PARTS:

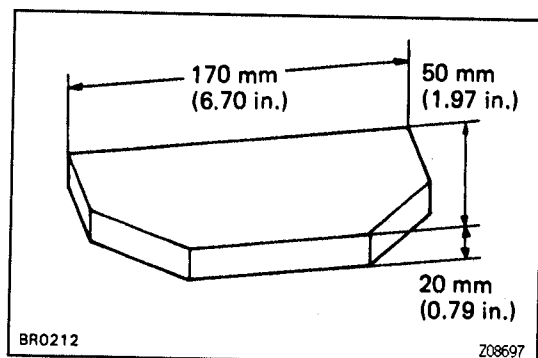
- Clip
- 2 pins
- Anti-rattle spring
- 2 pads
- 4 anti-squeal shims

BR080-0M



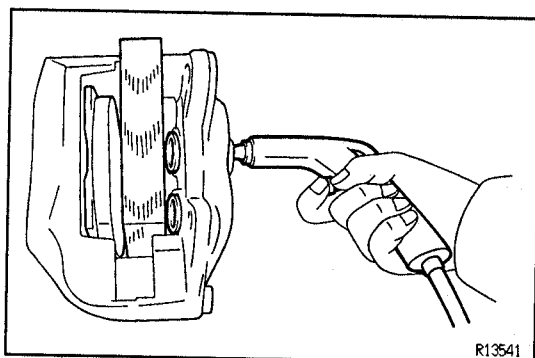
CALIPER DISASSEMBLY

1. **REMOVE CYLINDER BOOT SET RINGS AND BOOTS**
Using a screwdriver, remove the 4 cylinder boot set rings and boots.



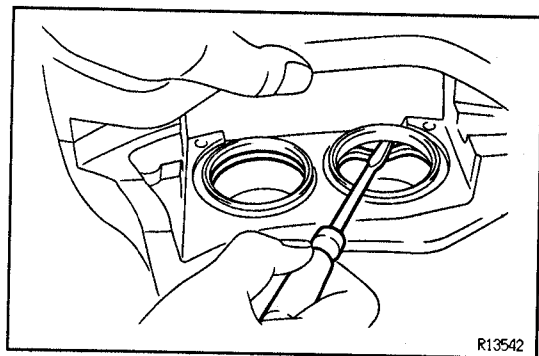
2. **REMOVE PISTONS FROM CYLINDER**

- (a) Prepare the wooden plate to hold the pistons.



- (b) Place the plate between the pistons and insert a pad at one side.
- (c) Use compressed air to remove the pistons alternately from the cylinder.

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



3. **REMOVE PISTON SEALS**

Using a screwdriver, remove the 4 seals from the cylinder.

BR

CALIPER ASSEMBLY

BR1A8-01

Assembly is in the reverse order of disassembly.
ASSEMBLY NOTICE: Apply lithium soap base glycol grease to the parts indicated by the arrows (See page BR-17).

FRONT BRAKE COMPONENTS INSPECTION AND REPAIR

1. MEASURE PAD LINING THICKNESS

(See step 1. on page BR-16)

Standard thickness:

11.5 mm (0.453 in.)

Minimum thickness:

1.0 mm (0.039 in.)

2. MEASURE DISC THICKNESS

(See step 2. on page BR-16)

Standard thickness:

22.0 mm (0.866 in.)

Minimum thickness:

20.0 mm (0.787 in.)

3. MEASURE DISC RUNOUT

(a) Tighten the disc with the 3 hub nuts.

(b) Using a dial indicator, measure the disc runout at a position 10 mm (0.39 in.) from the outside edge.

Maximum disc runout:

0.07 mm (0.0028 in.)

If the runout is greater than maximum, replace the disc.

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

4. IF NECESSARY, ADJUST DISC RUNOUT

(a) Remove the hub nuts and disc. Reinstall the disc 1/6 of a turn round from its original position on the hub. Install and torque the hub nuts.

Remeasure the disc runout. Make a note of the runout and the disc's position on the hub.

(b) Repeat (a) until the disc has been installed on the 4 remaining hub position.

(c) If the minimum runout recorded in (a) and (b) is less than maximum disc runout, install the disc in that position.

(d) If the minimum runout recorded in (a) and (b) is greater than maximum disc runout, replace the disc and repeat step 3.

CALIPER INSTALLATION

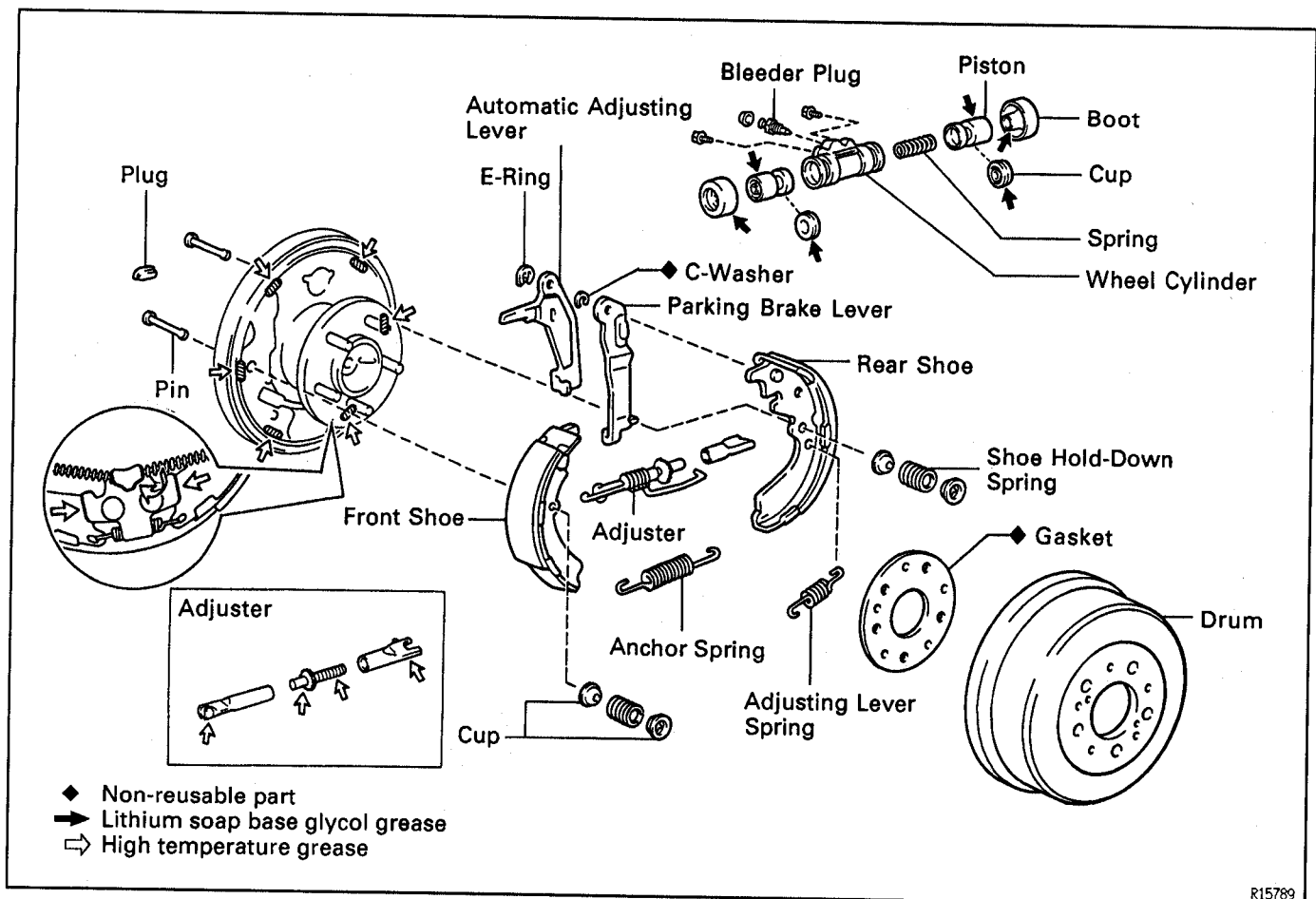
BRIAU-01

Installation is in the reverse order of removal.

AFTER INSTALLATION, FILL BRAKE RESERVOIR WITH BRAKE FLUID, BLEED BRAKE SYSTEM (See page BR-5) AND CHECK FOR LEAKS

REAR BRAKE (2WD) COMPONENTS

BROB4-0A



R15789

BROZM-04

BR

REAR BRAKE REMOVAL

1. INSPECT SHOE LINING THICKNESS

Remove the inspection hole plug, and check the shoe lining thickness through the hole.

If it is less than minimum, replace the shoes.

Minimum thickness:

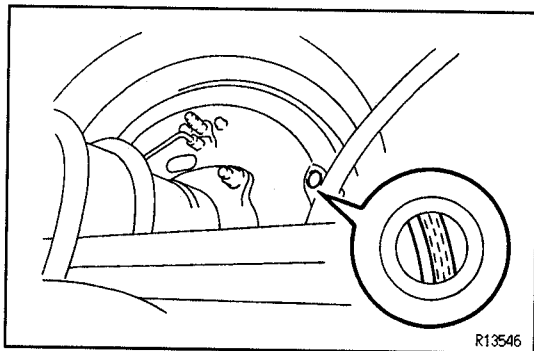
1.0 mm (0.039 in.)

2. REMOVE REAR WHEEL

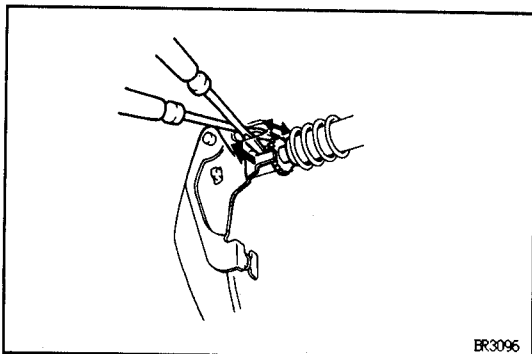
3. REMOVE BRAKE DRUM

HINT: If the brake drum cannot be removed easily, do the following steps.

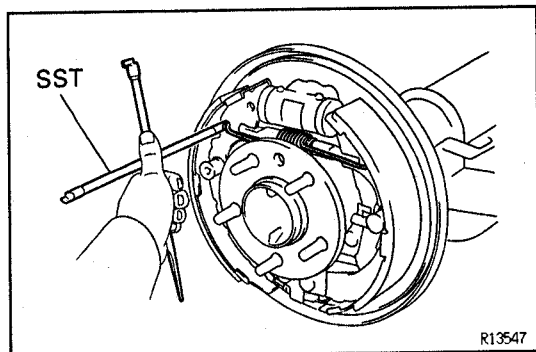
- Insert a screwdriver through the hole in the backing plate, and hold the automatic adjusting lever away from the adjusting bolt.
- Using another screwdriver, reduce the brake shoe adjustment by turning the adjusting bolt.



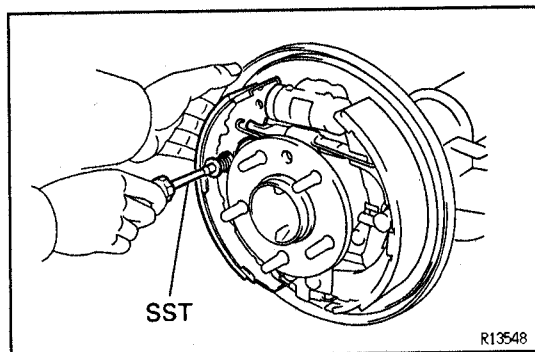
R13546



BR3096

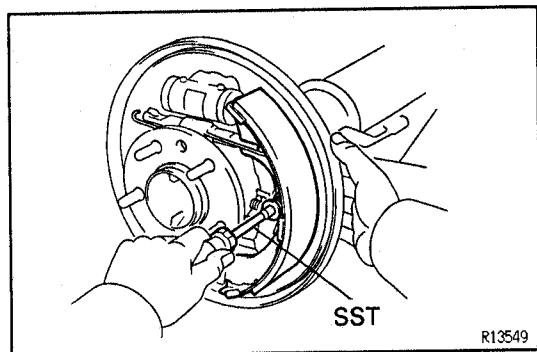
**4. REMOVE FRONT SHOE**

- (a) Using SST, disconnect the return spring.
SST 09703-30010



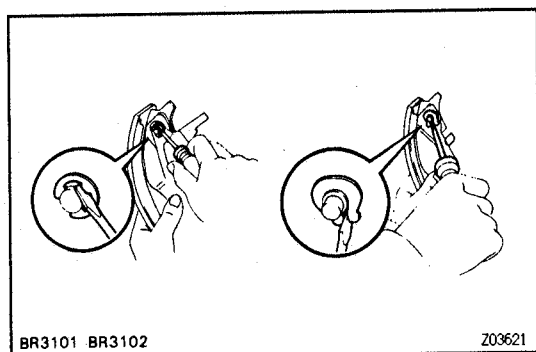
- (b) Using SST, remove the shoe hold-down spring, cups and pin.
SST 09718-00010

- (c) Disconnect the anchor spring from the front shoe and remove the front shoe.
(d) Remove the anchor spring from the rear shoe.

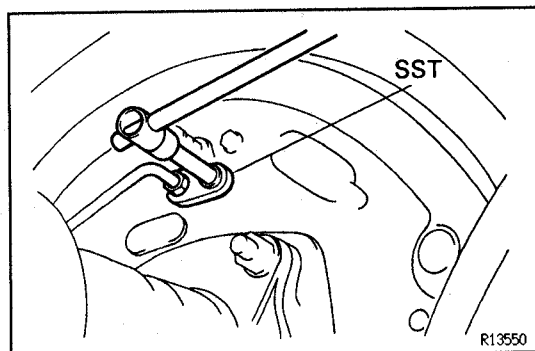
**5. REMOVE ADJUSTER AND REAR SHOE**

- (a) Using SST, remove the shoe hold-down spring, cups and pin.
SST 09718-00010
(b) Remove the adjusting lever spring.
(c) Remove the adjuster together with the return spring.
(d) Using pliers, disconnect the parking brake cable from the lever and remove the rear shoe.

BR

**6. REMOVE AUTOMATIC ADJUSTING LEVER AND PARKING BRAKE LEVER**

- (a) Remove the E-ring.
(b) Remove the automatic adjusting lever.
(c) Remove the C-washer.
(d) Remove the parking brake lever.

**7. DISCONNECT BRAKE LINE FROM WHEEL CYLINDER**

Using SST, disconnect the brake line. Use a container to catch the brake fluid.

SST 09023-00100

Torque: 15 N·m (155 kgf·cm, 11 ft·lbf)

8. REMOVE WHEEL CYLINDER

Remove the 2 bolts and wheel cylinder.

Torque: 10 N·m (100 kgf·cm, 7 ft·lbf)

9. DISASSEMBLE WHEEL CYLINDER

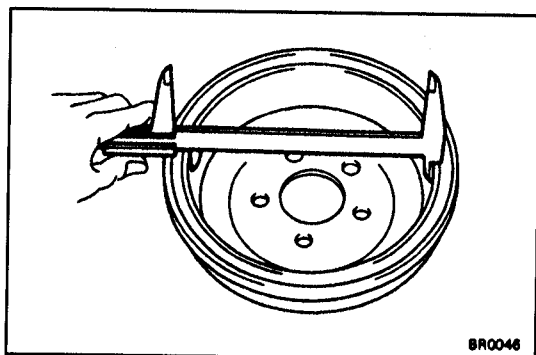
Remove the these parts from the wheel cylinder.

- 2 boots
- 2 pistons
- 2 piston cups
- Spring

REAR BRAKE COMPONENTS INSPECTION AND REPAIR BR0046-0A

1. INSPECT DISASSEMBLED PARTS

Inspect the disassembled parts for wear, rust or damage.



2. MEASURE BRAKE DRUM INSIDE DIAMETER

Using a vernier calipers, measure the inside diameter of the drum.

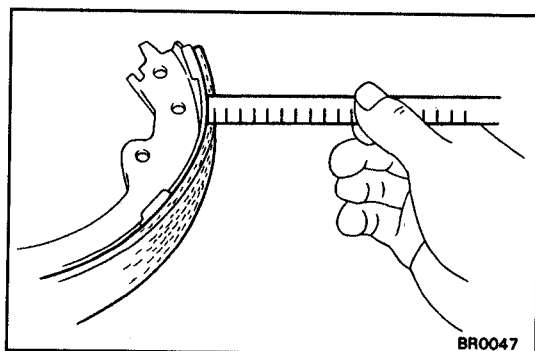
Standard inside diameter:

254.0 mm (10.000 in.)

Maximum inside diameter:

256.0 mm (10.079 in.)

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



3. MEASURE BRAKE SHOE LINING THICKNESS

Using a ruler, measure the shoe lining thickness.

Standard thickness:

5.5 mm (0.217 in.)

Minimum thickness:

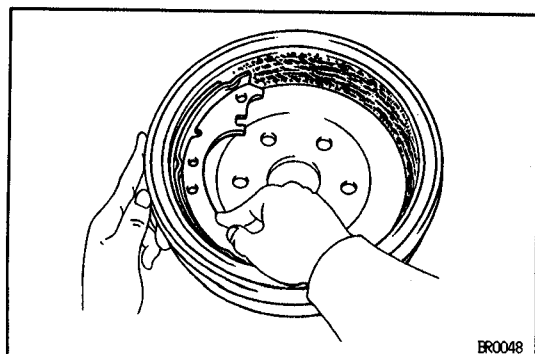
1.0 mm (0.039 in.)

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

HINT: If any of the brake shoes have to be replaced, replace all of the rear brake shoes in order to maintain even braking.

4. INSPECT BRAKE LINING AND DRUM FOR PROPER CONTACT

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

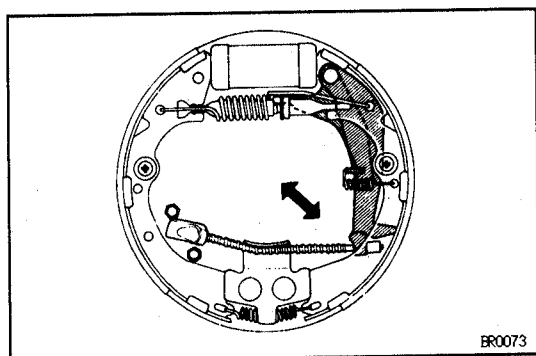


REAR BRAKE INSTALLATION

Installation is in the reverse order of removal.

AFTER INSTALLATION, FILL BRAKE RESERVOIR WITH BRAKE FLUID, BLEED BRAKE SYSTEM (See page BR-5) AND CHECK FOR LEAKS

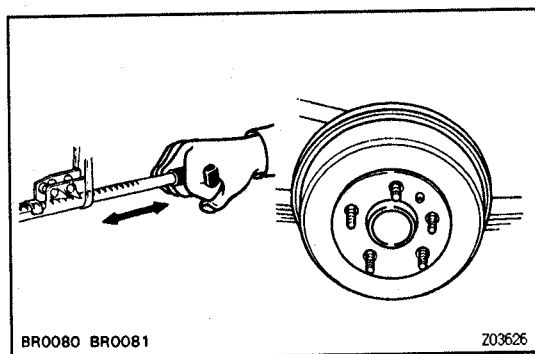
NOTICE: Apply lithium soap base glycol grease and high temperature grease to the parts indicated by the arrows (See page BR-21).



1. CHECK OPERATION OF AUTOMATIC ADJUSTER MECHANISM

- (a) Move the parking brake lever of the rear shoe back and forth, as shown. Check that the adjusting bolt turns.

If it does not turn, check for incorrect installation of the rear brakes.



- (b) Adjust the adjuster length to the shortest possible amount.

- (c) Install the drum.

- (d) Pull the parking brake lever all the way up until a clicking sound can no longer be heard.

2. CHECK CLEARANCE BETWEEN BRAKE SHOES AND DRUM

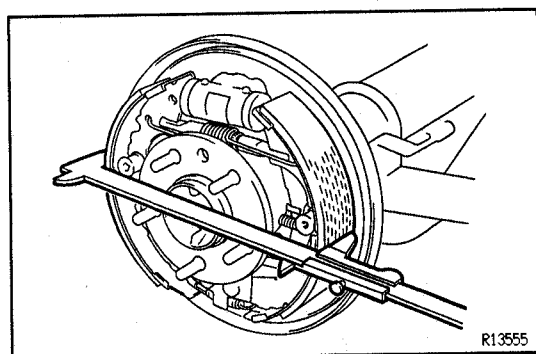
- (a) Remove the drum.

- (b) Measure the brake drum inside diameter and diameter of the brake shoes. Check that the difference between the diameters is the correct shoe clearance.

Shoe clearance:

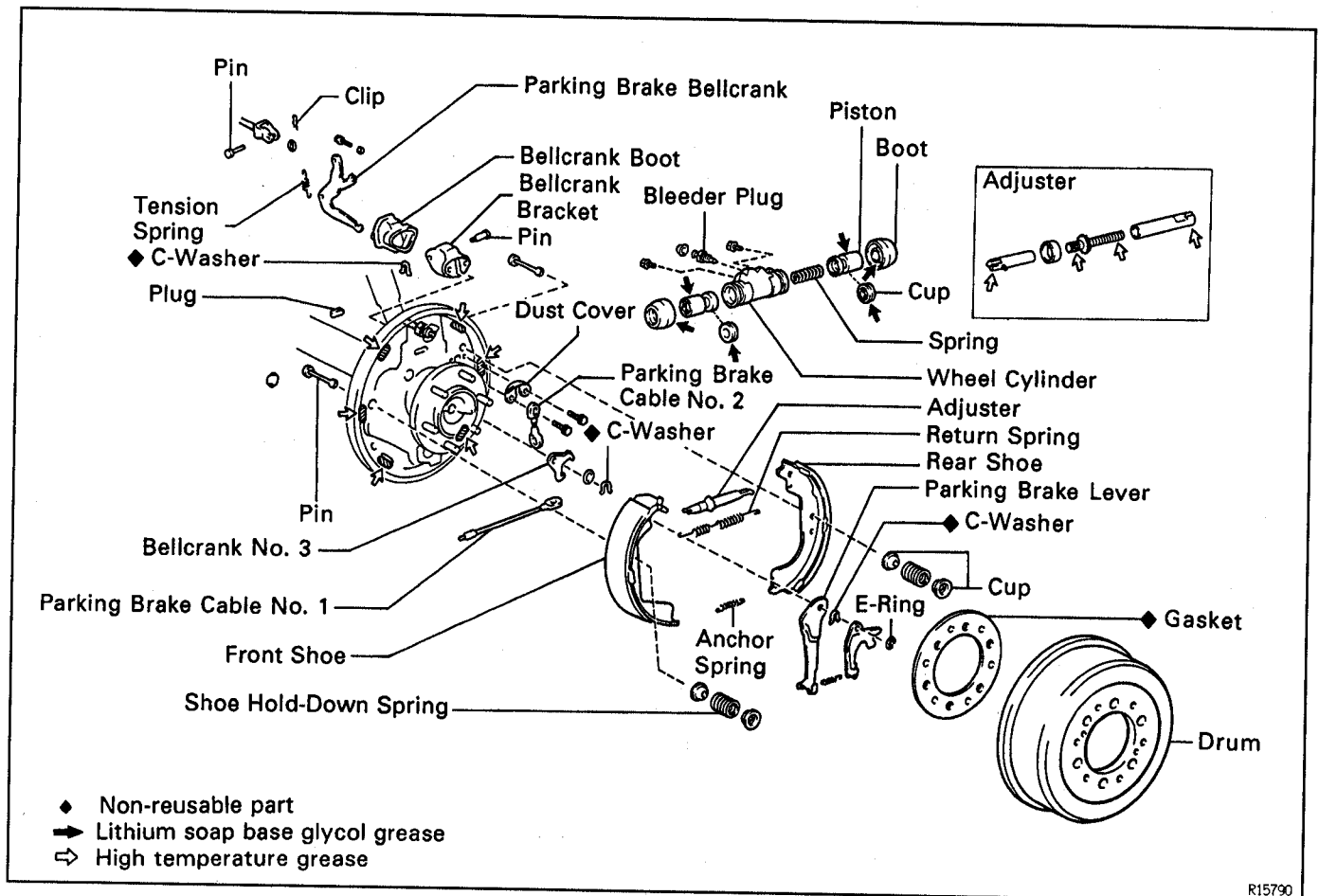
0.6 mm (0.024 in.)

If it is incorrect, check the parking brake system.



REAR BRAKE (4WD) COMPONENTS

BROB-06



R15790

BR128-02

BR

REAR BRAKE REMOVAL

1. INSPECT SHOE LINING THICKNESS

Remove the inspection hole plug, and check the shoe lining thickness through the hole.

If less than minimum, replace the shoes.

Minimum thickness:

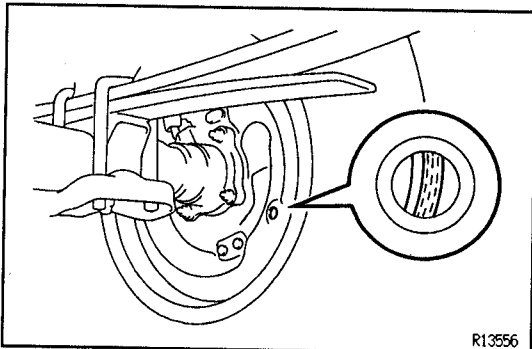
1.0 mm (0.039 in.)

2. REMOVE REAR WHEEL

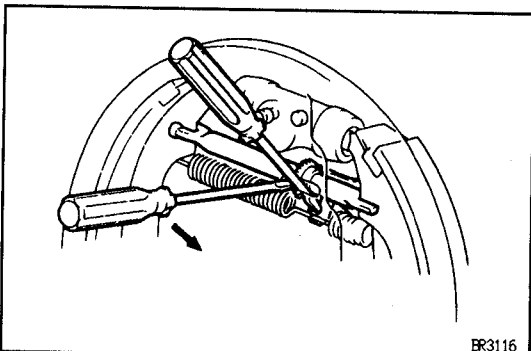
3. REMOVE BRAKE DRUM

HINT: If the brake drum cannot be removed easily, do the following steps.

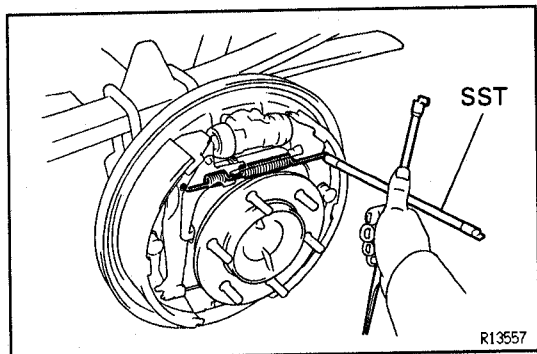
- Remove the adjusting hole plug in the backing plate.
- Insert a screwdriver through the hole in the backing plate, and hold the automatic adjusting lever away from the adjusting bolt.
- Using another screwdriver, reduce the brake shoe adjustment by turning the adjusting bolt.



R13556

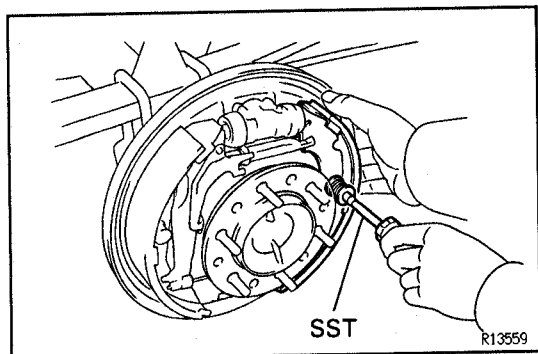


BR3116

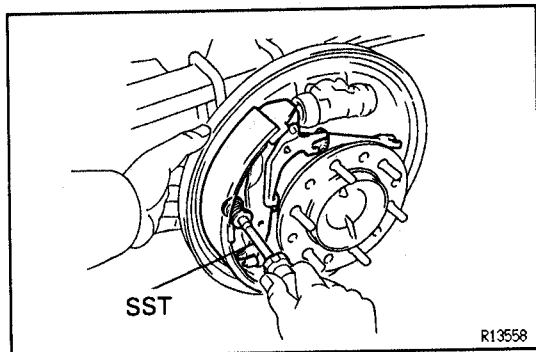


4. REMOVE REAR SHOE

- (a) Using SST, disconnect the return spring.
SST 09703-30010



- (b) Using SST, remove the shoe hold-down spring, cups and pin.
SST 09718-00010
- (c) Disconnect the anchor spring from the rear shoe and remove the rear shoe.
- (d) Remove the anchor spring from the front shoe.



5. REMOVE FRONT SHOE

- (a) Using SST, remove the shoe hold-down spring, cups and pin.
SST 09718-00010
- (b) Remove the return spring from the front shoe.
- (c) Disconnect the parking brake cable No.1 from the parking brake bellcrank No.3.
- (d) Remove the front shoe with adjuster.
- (e) Disconnect the parking brake cable from the front shoe.

6. REMOVE ADJUSTER FROM FRONT SHOE

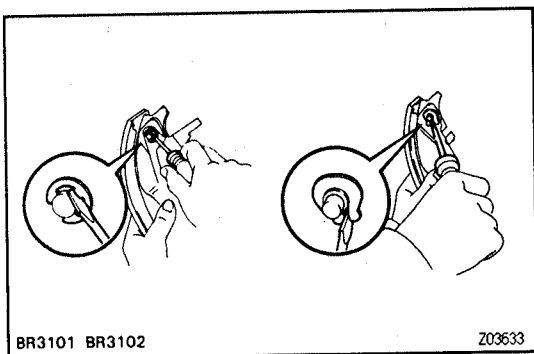
- (a) Remove the adjusting lever spring.
- (b) Remove the adjuster.

7. REMOVE AUTOMATIC ADJUSTING LEVER AND PARKING BRAKE LEVER

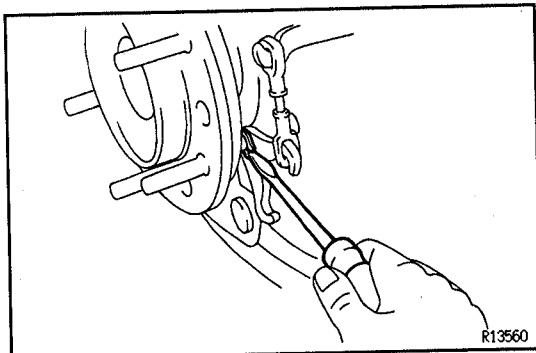
- (a) Remove the E-ring.
- (b) Remove the automatic adjusting lever.
- (c) Remove the C-washer.
- (d) Remove the parking brake lever.

8. REMOVE AND DISASSEMBLE PARKING BRAKE BELLCRANK

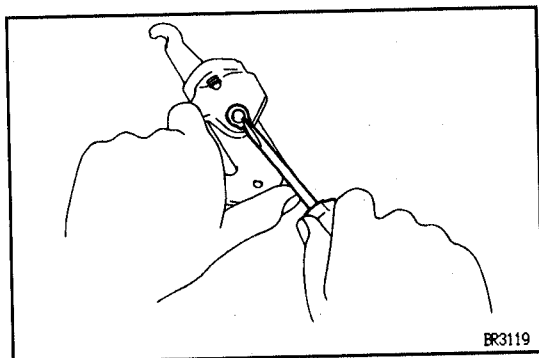
- (a) Remove the clip and disconnect the parking brake cable.
- (b) Remove the tension spring.



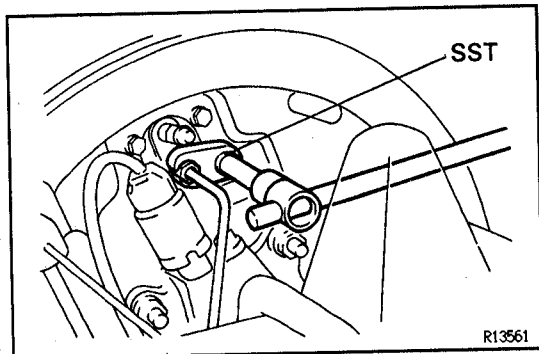
BRAKE SYSTEM — REAR BRAKE(4WD)



- (c) Using a screwdriver, remove the bellcrank No.3 from the backing plate with parking brake cable No.2.
- (d) Remove the parking brake bellcrank No.1 or No.2 and dust cover with the 2 bolts.
- (e) Remove the bellcrank boot from the bellcrank bracket.



- (f) Remove the C-washer and pin.
- (g) Remove the parking brake bellcrank from the bellcrank bracket.

**9. REMOVE WHEEL CYLINDER**

- (a) Using SST, disconnect the brake line. Use a container to catch the brake fluid.
SST 09023-00100

- (b) Remove the 2 bolts and the wheel cylinder.

10. DISASSEMBLE WHEEL CYLINDER

Remove the these parts from the wheel cylinder.

- 2 boots
- 2 pistons
- 2 piston cups
- Spring

REAR BRAKE COMPONENTS INSPECTION AND REPAIR

1. INSPECT DISASSEMBLED PARTS

Inspect the disassembled parts for wear, rust or damage.

2. MEASURE BRAKE SHOE LINING THICKNESS

(See step 1. on page BR-23)

Standard thickness:

6.0 mm (0.236 in.)

Minimum thickness:

1.0 mm (0.039 in.)

3. MEASURE BRAKE DRUM INSIDE DIAMETER

(See step 2. on page BR-23)

Standard inside diameter:

295.0 mm (11.614 in.)

Maximum inside diameter:

297.0 mm (11.693 in.)

4. INSPECT REAR BRAKE LINING AND DRUM FOR PROPER CONTACT

(See step 4. on page BR-23)

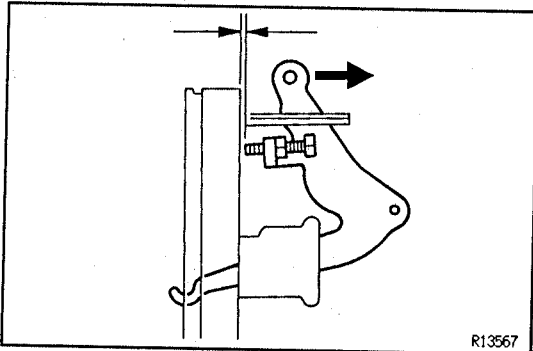
REAR BRAKE INSTALLATION

BR1AX-01

Installation is in the reverse order of removal.

AFTER INSTALLATION, FILL BRAKE RESERVOIR WITH BRAKE FLUID, BLEED BRAKE SYSTEM (See page BR-5) AND CHECK FOR LEAKS

NOTICE: Apply lithium soap base glycol grease and high temperature grease to the parts indicated by the arrows (See page BR-25).



1. ADJUST BELLCRANK

- Lightly pull the bellcrank in direction A until there is no slack at part B.
- In this condition, turn the adjusting bolt so that dimension C will be 0.4–0.8 mm (0.016–0.031 in.).
- Lock the adjusting bolt with the lock nut.
- Connect the parking brake cable to the parking brake bellcrank and install the clip.
- Install the tension spring.

2. CHECK OPERATION OF AUTOMATIC ADJUSTING MECHANISM

(See step 1. on page BR-24)

3. CHECK CLEARANCE BETWEEN BRAKE SHOES AND DRUM

(See step 2. on page BR-24)

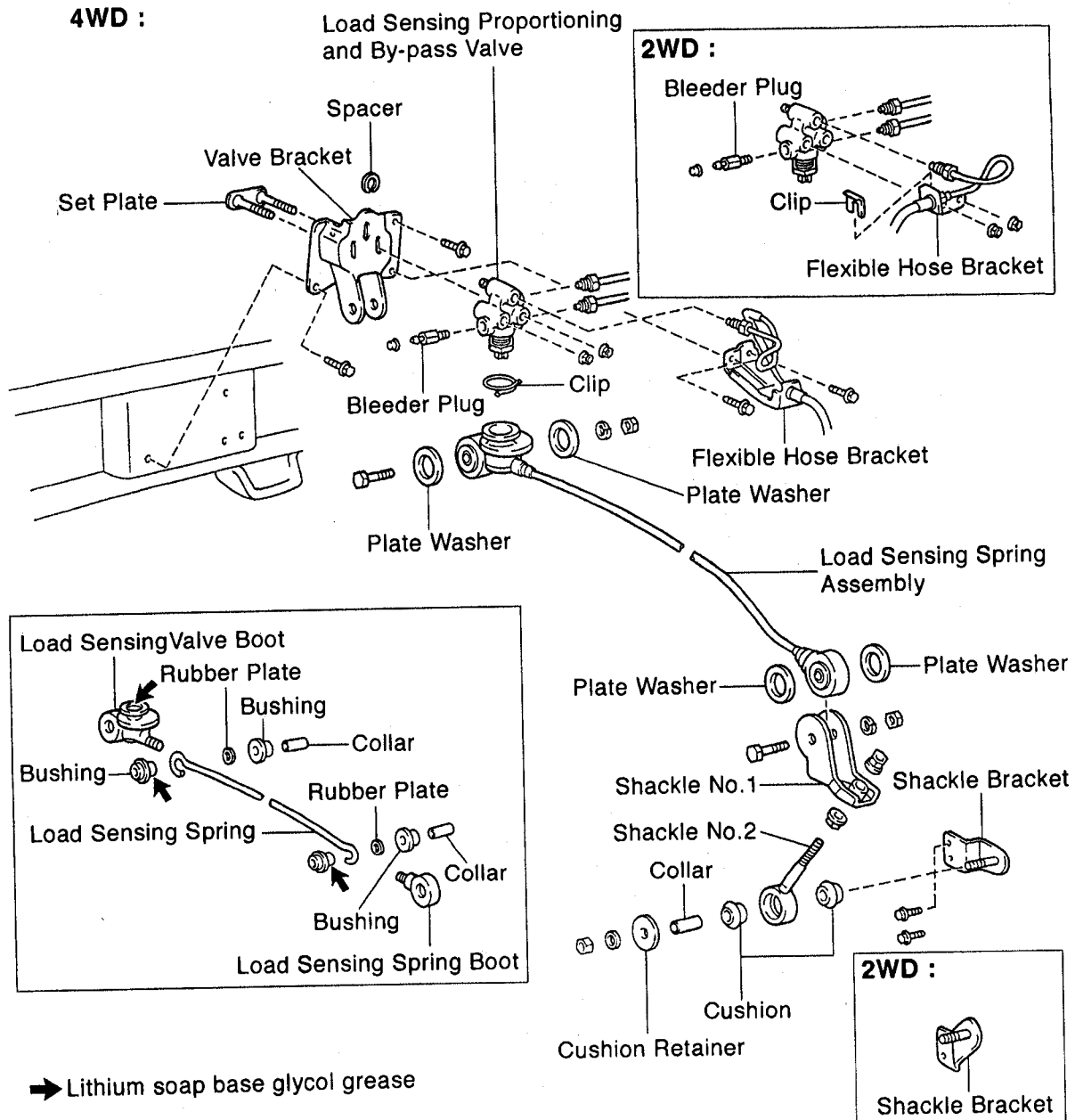
Shoe clearance:

0.6 mm (0.024 in.)

LOAD SENSING PROPORTIONING AND BY-PASS VALVE (LSP & BV)

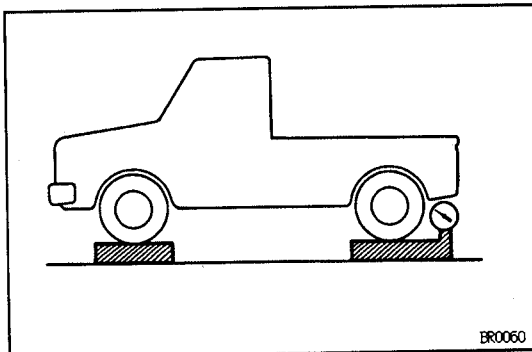
COMPONENTS

BR08C-0A



W00613

BR08G-06



FLUID PRESSURE INSPECTION

1. SET REAR AXLE LOAD

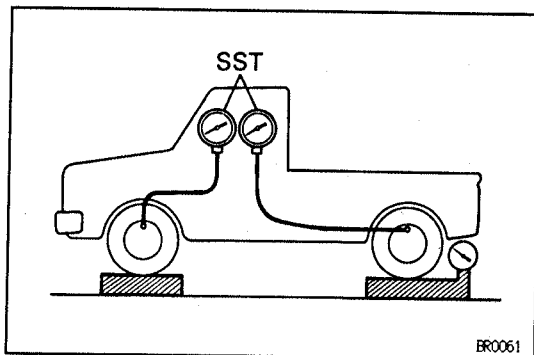
Rear axle load (includes vehicle weight):

2WD:

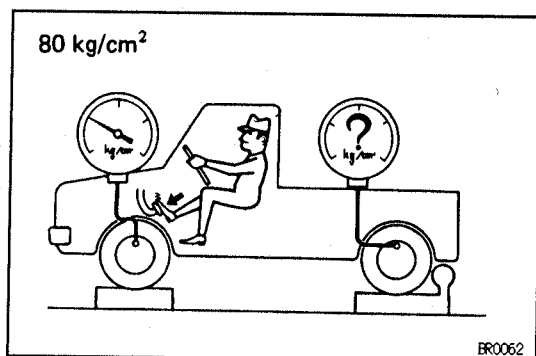
700 kg (1,543 lb)

4WD:

850 kg (1,874 lb)



2. **INSTALL LSP & BV GAUGE (SST) AND BLEED AIR**
SST 09709-29017



3. **RAISE FRONT BRAKE PRESSURE TO 7,845 kPa (80 kgf/cm², 1,138 psi) AND CHECK REAR BRAKE PRESSURE**

Rear brake pressure:

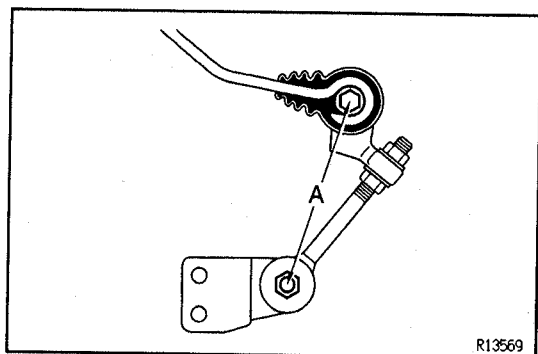
2WD:

$4,913 \pm 490$ kPa (50.1 ± 5 kgf/cm², 713 ± 71 psi)

4WD:

$4,383 \pm 490$ kPa (44.7 ± 5 kgf/cm², 636 ± 71 psi)

HINT: The brake pedal should not be depressed twice and/or returned while setting to the specified pressure. Read the value of rear brake pressure 2 seconds after adjusting the specified fluid pressure. If the brake pressure is incorrect, adjust the fluid pressure.



4. **IF NECESSARY, ADJUST FLUID PRESSURE**

- (a) Adjust the length of the No.2 shackle.

Low pressure: Lengthen A

High pressure: Shorten A

Initial set:

2WD: 78 mm (3.07 in.)

4WD: 120 mm (4.72 in.)

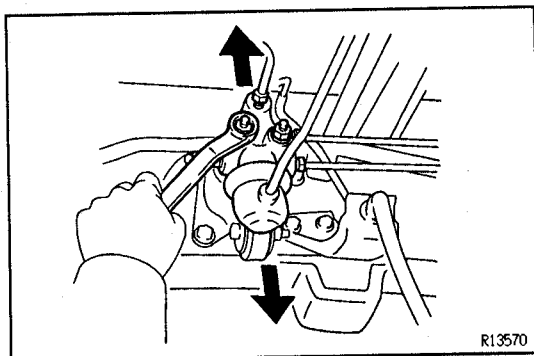
Adjustment range:

2WD: 72-84 mm (2.83-3.31 in.)

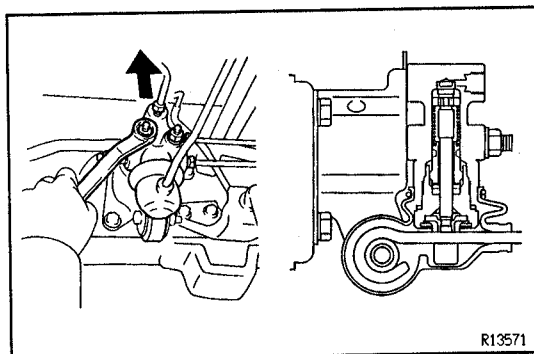
4WD: 114-126 mm (4.49-4.96 in.)

HINT: One turn of the nut changes the fluid pressure as shown in the following table.

Model	Rear brake pressure kPa (kgf/cm ² , psi)
2WD	55 (0.56, 8)
4WD	52 (0.53, 7.5)



- (b) If the pressure cannot be adjusted by the No.2 shackle, raise or lower the valve body.
Low pressure—Lower body
High pressure—Raise body
- (c) Torque the nuts.
Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)
- (d) Adjust the length of the No.1 shackle again.
If it cannot be adjusted, inspect the valve housing.



5. IF NECESSARY, CHECK VALVE BODY

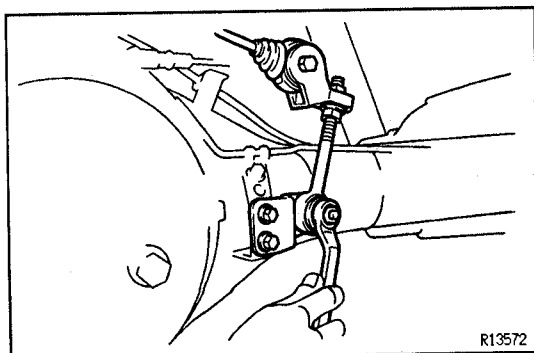
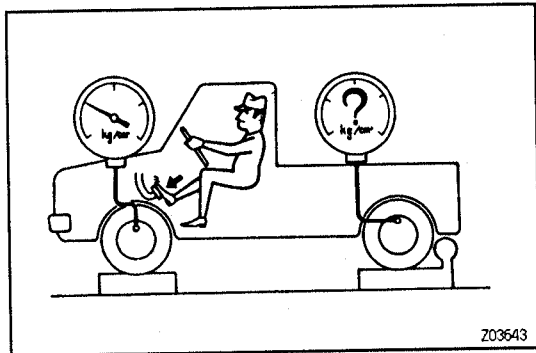
- (a) Assemble the valve body in the uppermost position.
HINT: When the brakes are applied, the piston will move down about 0.8 mm (0.03 in.). Even at this time, the piston should not make contact with or move the load sensing spring.
- (b) In this position, check the rear brake pressure.
2WD:

Front brake pressure kPa (kgf/cm ² , psi)	Rear brake pressure kPa (kgf/cm ² , psi)
1,960 (20, 285)	1,960 (20, 285)
3,920 (40, 570)	2,450±196 (25±2, 356±28.5)
6,860 (70, 997.5)	3,190±343 (32.5±3.5, 463±50)

4WD:

Front brake pressure kPa (kgf/cm ² , psi)	Front brake pressure kPa (kgf/cm ² , psi)
1,470 (15, 213.5)	1,470 (15, 213.5)
3,920 (40, 570)	1,960±196 (20±2, 285±28.5)
6,860 (70, 997.5)	2,550±343 (26±3.5, 370.5±50)

If the measured value is not within standard, replace the valve body.



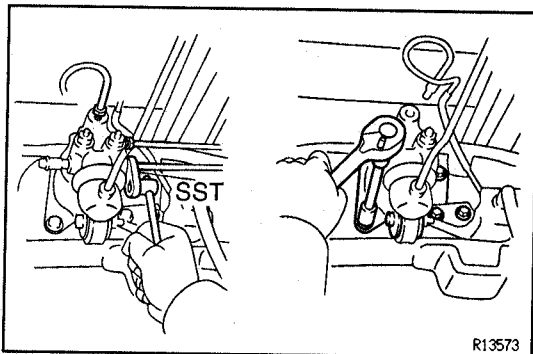
LSP & BV REMOVAL

1. DISCONNECT SHACKLE NO.2 FROM BRACKET

- (a) Remove the nut and disconnect the shackle No. 2.
- (b) Remove the cushion retainer, 2 cushions and collar.

2. REMOVE LSP & BV ASSEMBLY

- (a) Using SST, disconnect the brake lines from the valve body.
SST 09023-00100



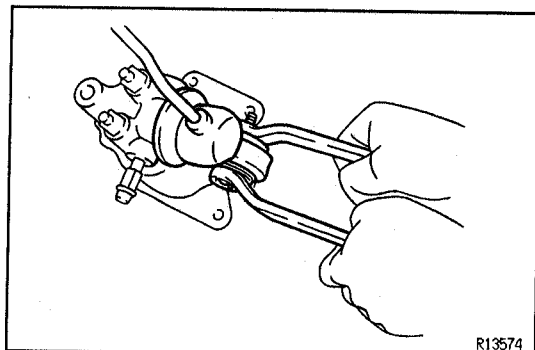
(b) Remove the clip from the flexible hose bracket.

(c) 2WD:

Remove the 3 valve bracket mounting bolts and spacer, and remove the LSP & BV assembly.

4WD:

Remove the 3 valve bracket mounting bolts, spacer and flexible hose bracket mounting bolt, and remove the LSP & BV assembly and flexible hose bracket.



LSP & BV DISASSEMBLY

BR08F-DC

1. REMOVE VALVE BRACKET

(a) Remove the nut, bolt and 2 plate washers.

(b) 2WD:

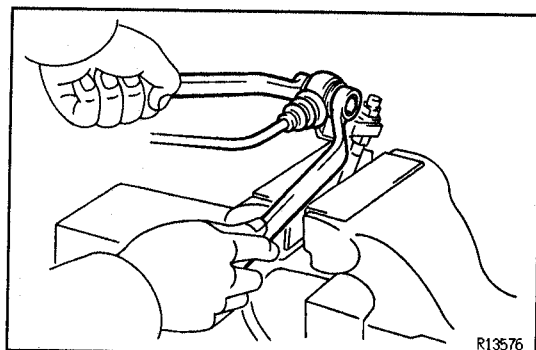
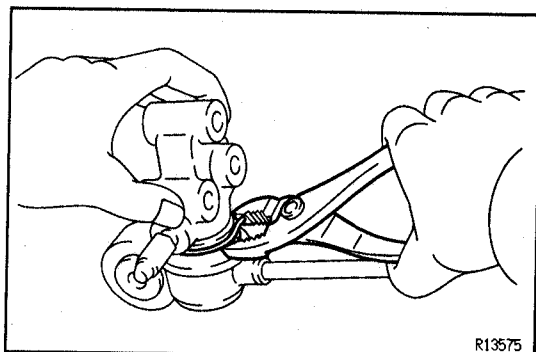
Remove the 2 nuts and flexible hose bracket, and remove the valve bracket and set plate from the valve body.

4WD:

Remove the 2 nuts, and remove the valve bracket and set plate from the valve body.

2. DISCONNECT SPRING FROM VALVE

Using pliers, remove the clip, and remove the spring from the valve.



3. REMOVE SHACKLES NO.1 AND NO.2

(a) Remove the nuts and bolts, and remove the load sensing spring and 2 plate washers.

(b) Loosen the 2 nuts, and remove the shackle No. 1 from the shackle No. 2.

4. DISASSEMBLE LOAD SENSING SPRING

Disassemble the these parts.

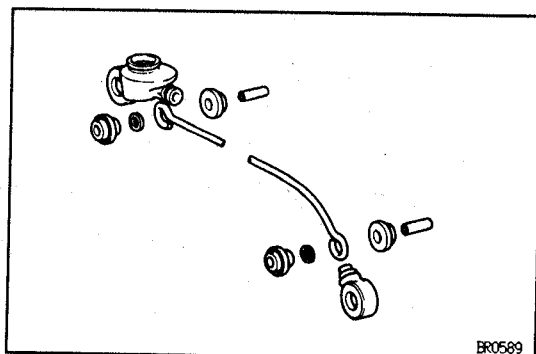
(a) 4 bushings

(b) 2 collars

(c) 2 rubber plates

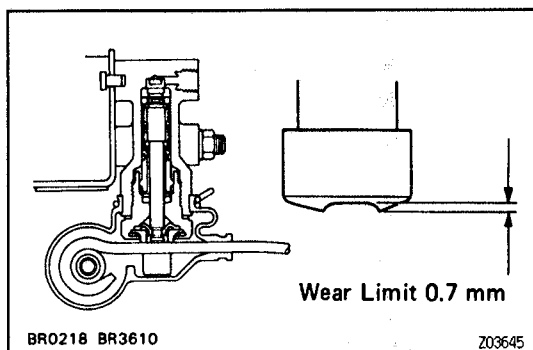
(d) Load sensing valve boot

(e) Load sensing spring boot



BR0589

BR030-08



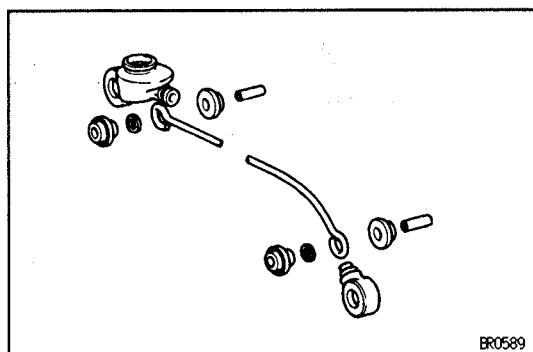
LSP & BV INSPECTION

INSPECT VALVE PISTON PIN AND LOAD SENSING CONTACT SURFACE FOR WEAR

Wear limit:

0.7 mm (0.028 in.)

BR12D-02



LSP & BV ASSEMBLY

1. ASSEMBLE THESE PARTS TO LOAD SENSING SPRING:

- Load sensing valve boot
- Load sensing spring boot
- 4 bushings
- 2 rubber plates
- 2 collars

HINT: Apply lithium soap—base glycol grease to all rubbing areas.

Do not mistake the valve side for the shackle side of the load sensing spring.

2. INSTALL SHACKLE NO. 1 AND NO. 2

- Install the lock nut and shackle No. 1 to the shackle No.2.
- Torque the nut.
Torque: 24 N·m (250 kgf·cm, 18 ft·lbf)

3. INSTALL LOAD SENSING SPRING TO SHACKLE NO.1

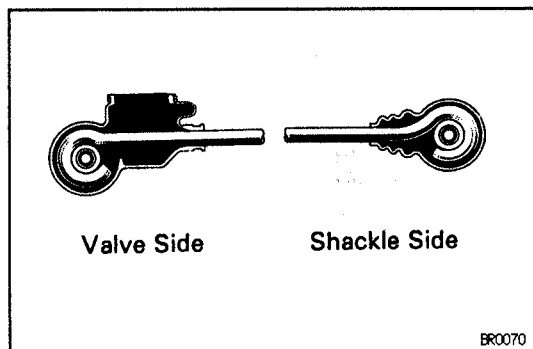
- Install the load sensing spring and 2 plate washer to the shackle No.1.
- Torque the bolt and nut.
Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

4. INSTALL LOAD SENSING SPRING TO VALVE BODY

Install the load sensing spring to the load sensing valve with the clip.

5. INSTALL VALVE BRACKET

- 2WD:**
Install the set plate to the valve assembly through the valve bracket and temporarily tighten the 2 valve body mounting nuts with flexible hose bracket.
4WD:
Install the set plate to the valve assembly through the valve bracket and temporarily tighten the 2 valve body mounting nuts.
- Torque the bolt and nut with the 2 plate washers.
Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)



BR

LSP & BV INSTALLATION**1. INSTALL LSP & BV ASSEMBLY TO FRAME****2WD:**

Install the 3 valve bracket mounting bolts and spacer with the LSP & BV.

4WD:

Install the 3 valve bracket mounting bolts, spacer and flexible hose bracket mounting bolt with the LSP & BV assembly and flexible hose bracket.

Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)

2. CONNECT BRAKE LINE

Using SST, connect the brake lines.

Torque: 15 N·m (155 kgf·cm, 11 ft·lbf)

SST 09023-00100

3. CONNECT SHACKLE NO.2 BRACKET**(a) Set dimension A.**

Initial set:

2WD: 78 mm (3.07 in.)

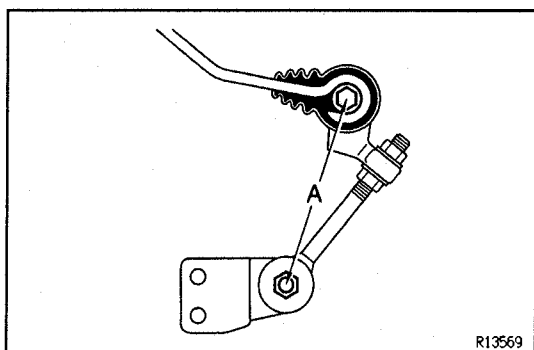
4WD: 120 mm (4.72 in.)

(b) Tighten the lock nut.

Torque: 24 N·m (250 kgf·cm, 18 ft·lbf)

(c) Install the shackle No. 2 with the 2 cushions and collar to the shackle bracket.**(d) Torque the nut with the cushion retainer.**

Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)



R13569

4. SET REAR AXLE LOAD

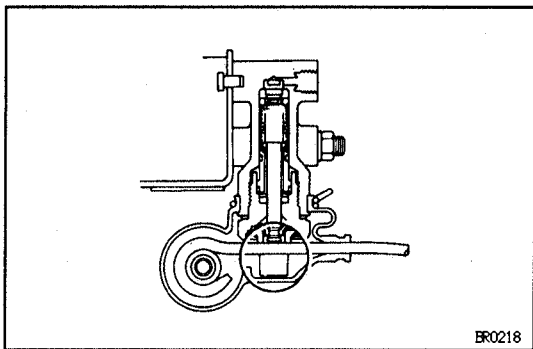
(See page BR-29)

5. SET VALVE BODY**(a) When pulling down the load sensing spring, confirm that the valve piston moves down smoothly.****(b) Position the valve body so that the valve piston lightly contacts the load sensing spring.****(c) Tighten the valve body mounting nuts.****6. BLEED BRAKE LINE**

(See page BR-5)

7. CHECK AND ADJUST LSP & BV FLUID PRESSURE

(See page BR-30)

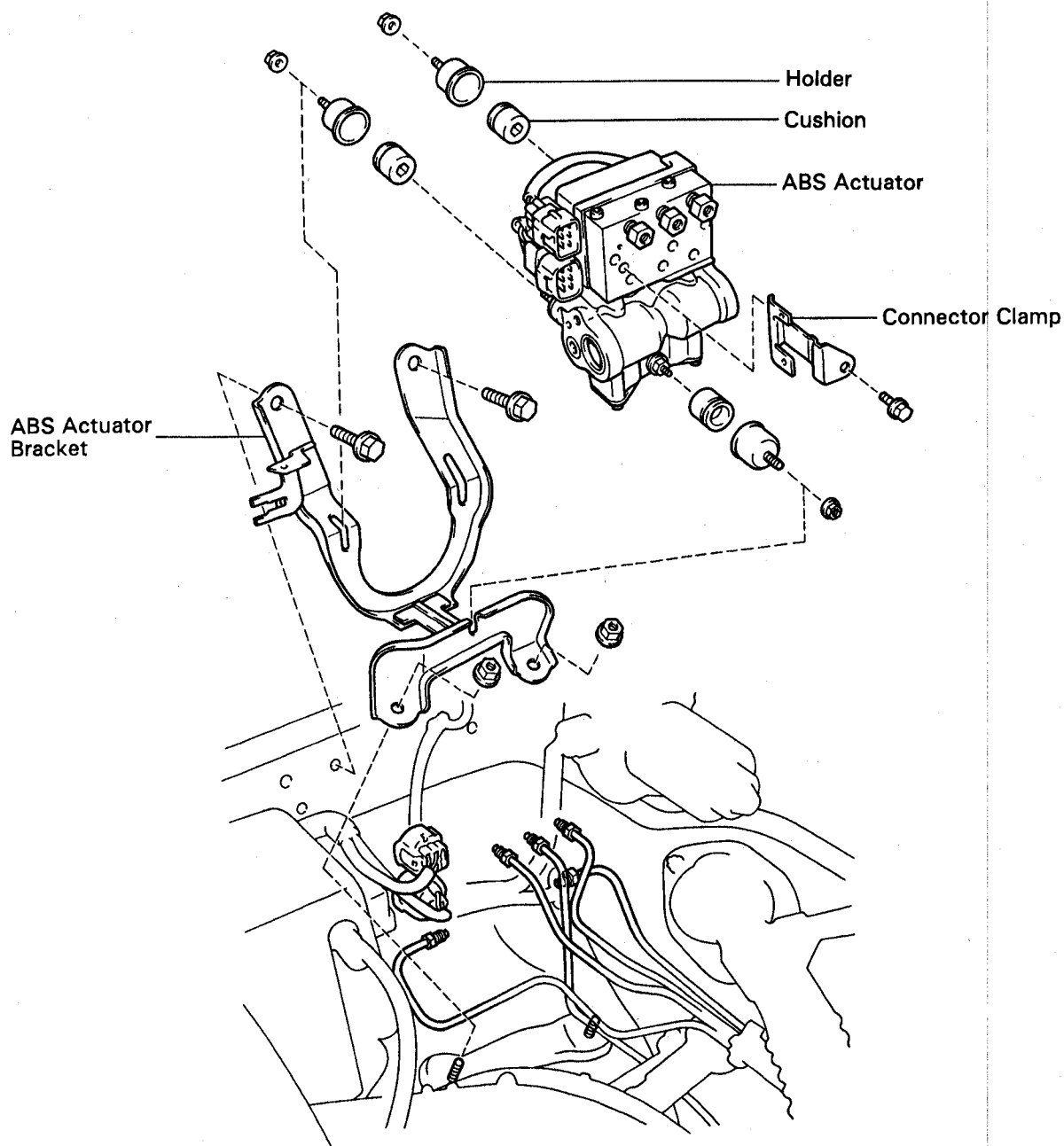


BR0218

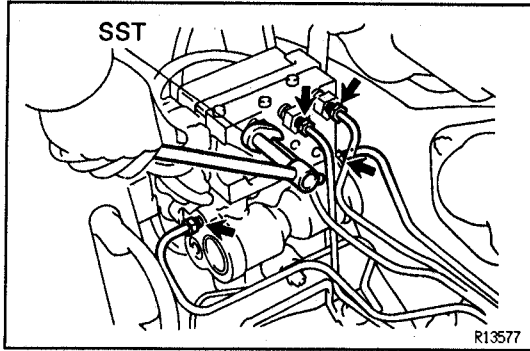
ANTI-LOCK BRAKE SYSTEM (ABS)

ABS ACTUATOR COMPONENTS

BROWX-03



BR



ABS ACTUATOR REMOVAL

BROWY-03

1. DISCONNECT BRAKE LINES

Using SST, disconnect the 5 brake lines from the ABS actuator.

SST 09023-00100

Torque: 15 N·m (155 kgf·cm, 11 ft·lbf)

2. DISCONNECT CONNECTORS

Disconnect the 2 connectors from the actuator.

3. REMOVE CONTROL RELAY FROM ACTUATOR BRACKET

4. REMOVE ABS ACTUATOR

- (a) Remove the 2 bolts, 2 nuts and ABS actuator assembly.

Torque: 19 N·m (195 kgf·cm, 14 ft·lbf)

- (b) Remove the bolt and connector clamp.

- (c) Remove the 3 nuts and ABS actuator from the actuator bracket.

Torque: 5.4 N·m (55 kgf·cm, 48 in·lbf)

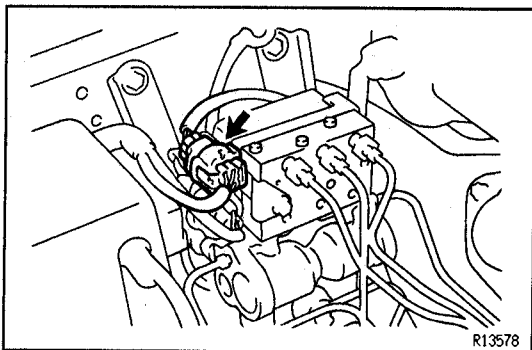
- (d) Remove the 3 cushions and holders from the ABS actuator.

ABS ACTUATOR INSTALLATION

BRIAZ-01

Installation is in the reverse order of removal.

AFTER INSTALLATION, FILL BRAKE RESERVOIR WITH BRAKE FLUID, BLEED BRAKE SYSTEM (See page BR-5) AND CHECK FOR LEAKS



ABS ACTUATOR INSPECTION

BRI80-01

1. INSPECT BATTERY POSITIVE VOLTAGE

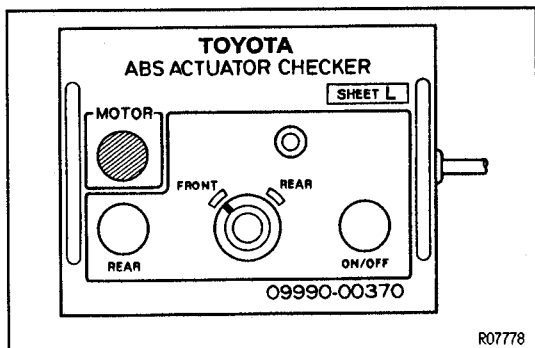
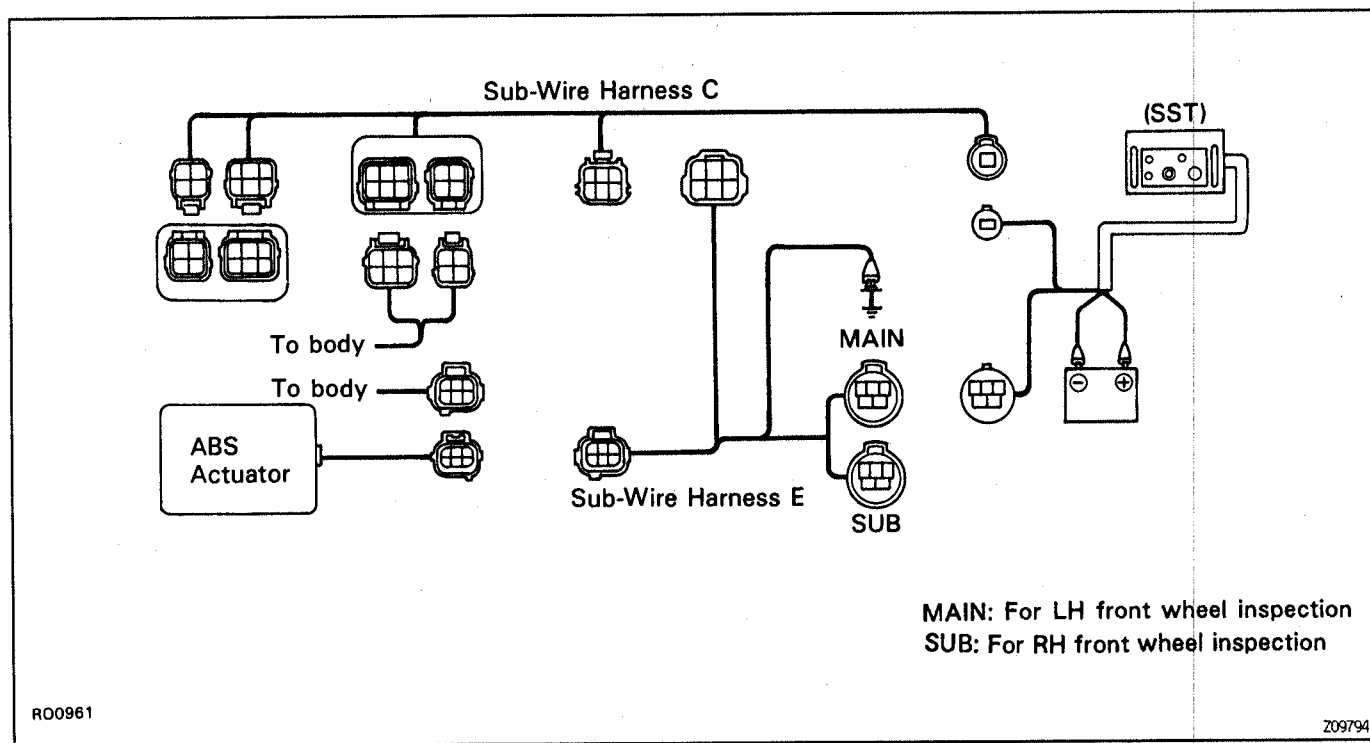
Battery positive voltage:

10-14 V

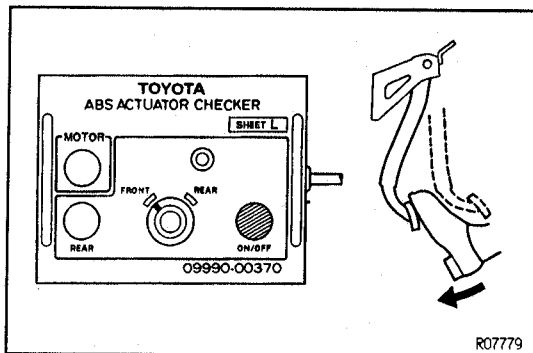
2. DISCONNECT CONNECTORS

- (a) Disconnect the connector from the actuator.
- (b) Disconnect the 2 connectors from the control relay.

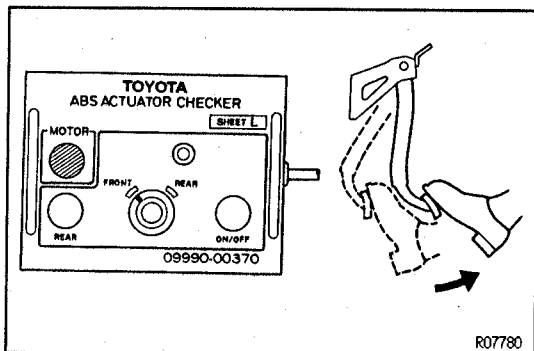
- (a) Connect the actuator checker (SST) to the actuator, control relay and body side wire harness through the sub-wire harness C (SST) and E (SST), as shown.
SST 09990-00150, 09990-00200, 09990-00210
- (b) Connect the red cable of the checker to the battery positive (+) terminal and black cable to the negative (-) terminal. Connect the black cable of the sub-wire harness to the battery negative (-) terminal or body ground.
- (c) Place "SHEET L" (SST) on the actuator checker.
SST 09990-00370



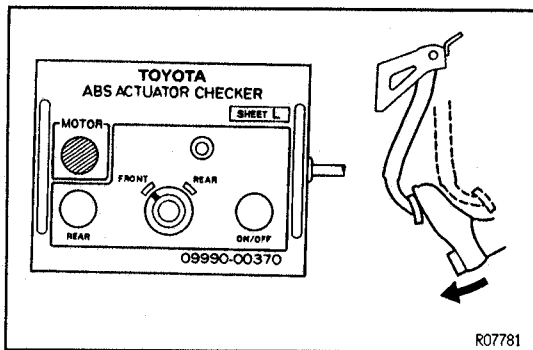
- (a) Start the engine, and run it at idle.
- (b) Turn the selector switch of the actuator checker to "FRONT" position.
- (c) Push and hold in the MOTOR switch for a few seconds.
- (d) Depress the brake pedal and hold it until the step (g) is completed.



- (e) Push the POWER switch, and check that the brake pedal does not go down.
NOTICE: Do not keep the POWER switch pushed down for more than 10 seconds.
- (f) Release the switch, and check that the pedal goes down.



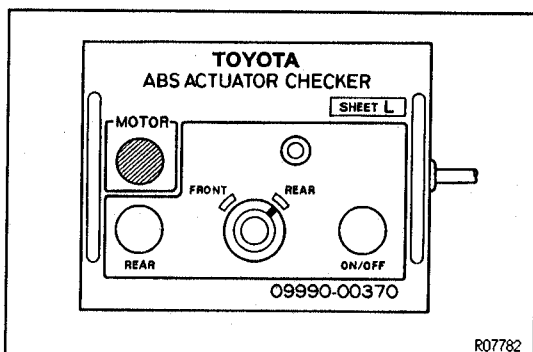
- (g) Push and hold in the MOTOR switch for a few seconds, and check that the pedal returns.
- (h) Release the brake pedal.



- (i) Push and hold in the 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 MOTOR switch for a few seconds. Check that the brake pedal does not pulsate.
- (k) Release the brake pedal.

5. INSPECT FOR OTHER WHEELS

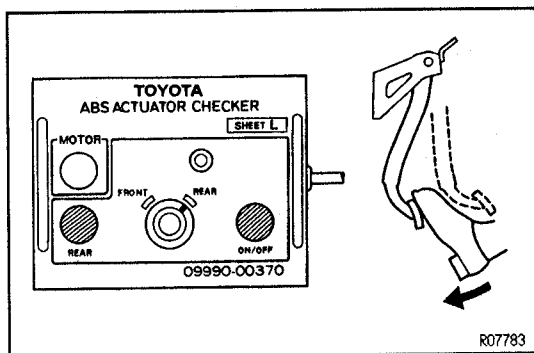
- (a) Change the connection of the actuator checker(SST) to the sub-wire harness E(SST) — from the sub-wire harness MAIN connector to the SUB connector, or vice versa.
- (b) Repeating (c) to (j) of the step 4, check the actuator operation same way.



6. INSPECT FOR REAR WHEEL

- (a) Turn the selector switch to the "REAR" position.
- (b) Push and hold in the MOTOR switch for a few seconds.
- (c) Depress the brake pedal and hold it until the step (g) is completed.

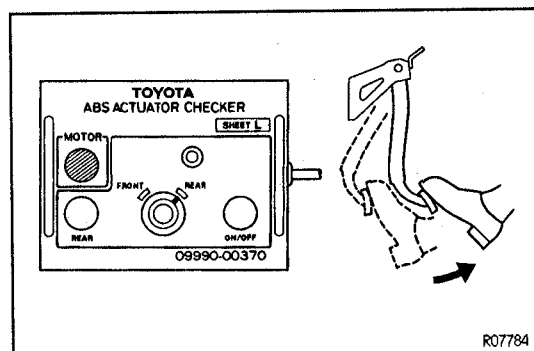
BRAKE SYSTEM — ANTI-LOCK BRAKE SYSTEM (ABS)



- (d) Push the REAR switch while pressing the POWER switch, and check that the brake pedal cannot be depressed.

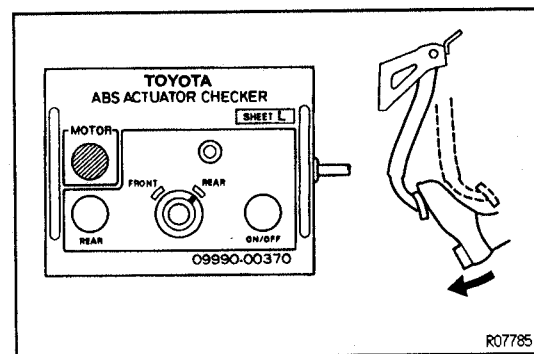
NOTICE: Do not keep the POWER switch pushed down for more than 10 seconds.

- (e) Release the REAR switch then the POWER switch, and check that the brake pedal can be depressed.



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

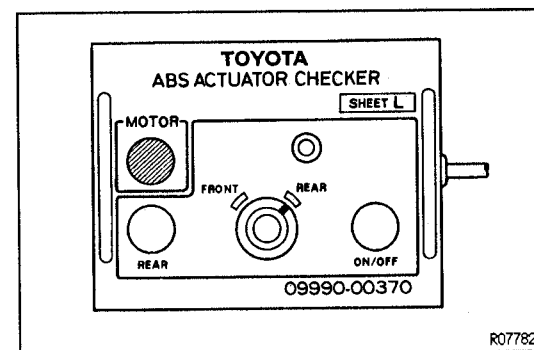
- (g) Release the brake pedal.



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

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

- (j) Release the brake pedal.



7. PUSH MOTOR SWITCH

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

- (b) Stop the engine.

8. DISCONNECT ACTUATOR CHECKER (SST) FROM ACTUATOR

Disconnect the actuator checker (SST) and sub-wire harness (SST) from the actuator, control relay and body side wire harness.

SST 09990-00150, 09990-00200, 09990-00210,
09990-00370

9. CONNECT CONNECTORS

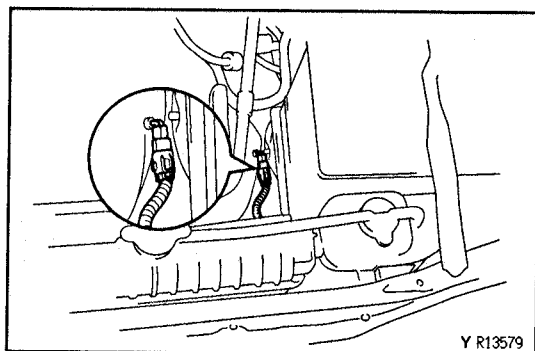
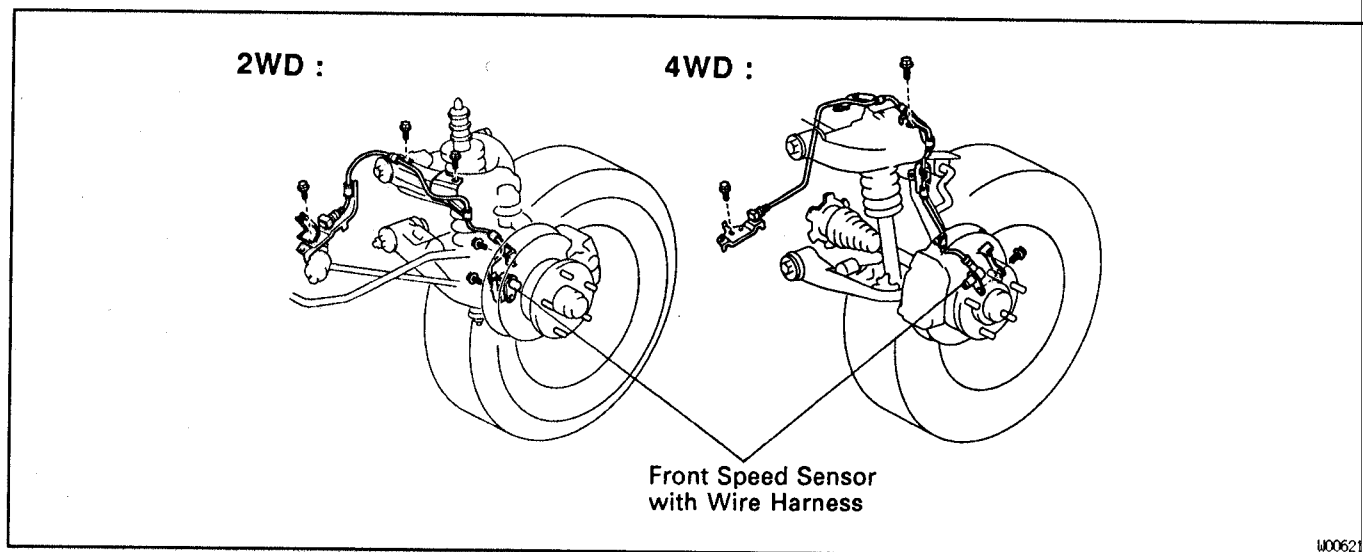
- (a) Connect the 2 connectors to the control relay.
(b) Connect the connector to the actuator.

10. CLEAR DTC

(See page BR-47)

FRONT SPEED SENSOR COMPONENTS

BR02Z-11

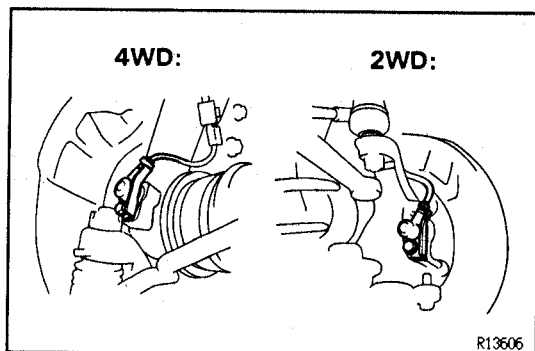


FRONT SPEED SENSOR REMOVAL

BR12F-02

1. REMOVE SPEED SENSOR

- Disconnect the speed sensor connector.
- Remove the 2 clamp bolts holding the sensor harness from the steering knuckle, upper arm and side rail.



- Remove the speed sensor installation bolt from the steering knuckle.

Torque: 8 N·m (82 kgf·cm, 71 in.-lbf)

INSTALLATION NOTICE: Make sure that

- There are no foreign objects on the sensor or the part of the knuckle to which the sensor is to be installed.
- The sensor is installed flat against the knuckle when you tighten the bolt.
- When installing the resin clips, use new ones.

FRONT SPEED SENSOR INSTALLATION

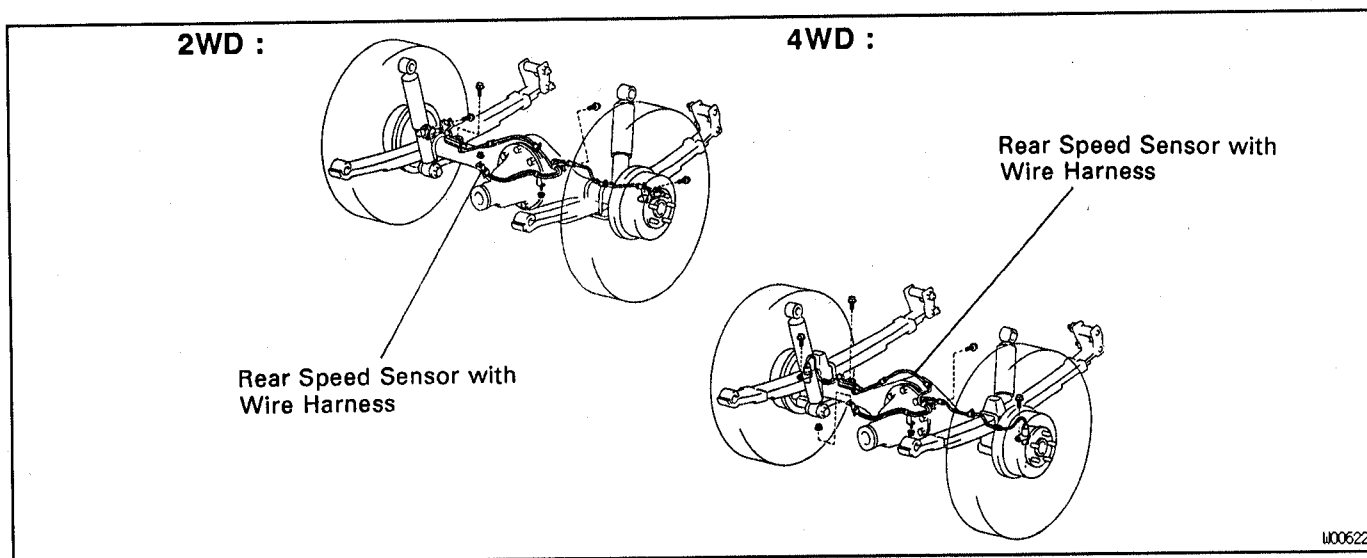
BR181-02

Installation is in the reverse order of removal.

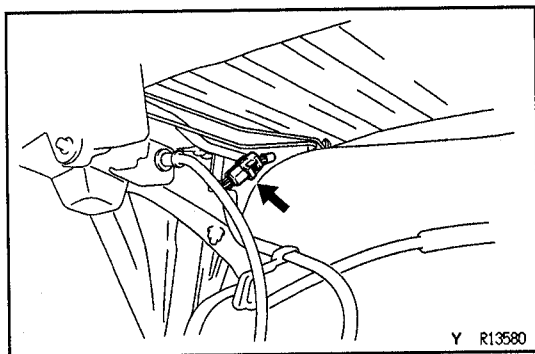
AFTER INSTALLATION, CHECK SPEED SENSOR SIGNAL (See page BR-51)

REAR SPEED SENSOR COMPONENTS

BR034-12



BR129-02



REAR SPEED SENSOR REMOVAL

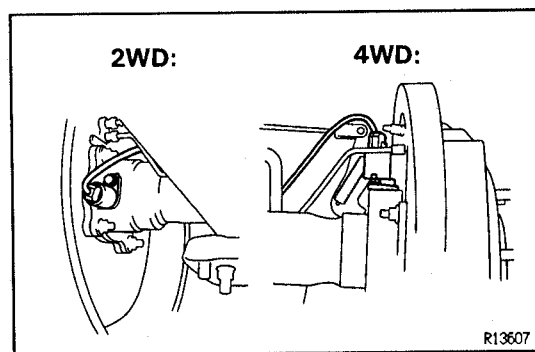
1. REMOVE SPEED SENSOR

- Disconnect the speed sensor connector, and pull out the sensor wire harness with grommet.
- Remove the 5 resin clips, 2 clamp set bolts and 2 nuts holding the sensor wire harness from the side rail, fuel tank and axle housing.
- Remove the 2 mounting bolts and speed sensor.

Torque: 8 N·m (82 kgf·cm, 71 in.-lbf)

INSTALLATION NOTICE: Make sure that

- There are no foreign objects on the sensor or the part of the axle end to which the sensor is to be installed.
- The sensor is installed flat against the axle end when you tighten the bolt.
- When installing the resin clips, use new ones.



REAR SPEED SENSOR INSTALLATION

BR182-01

Installation is in the reverse order of removal.
AFTER INSTALLATION, CHECK SPEED SENSOR SIGNAL (See page BR-51)

— MEMO —

BR

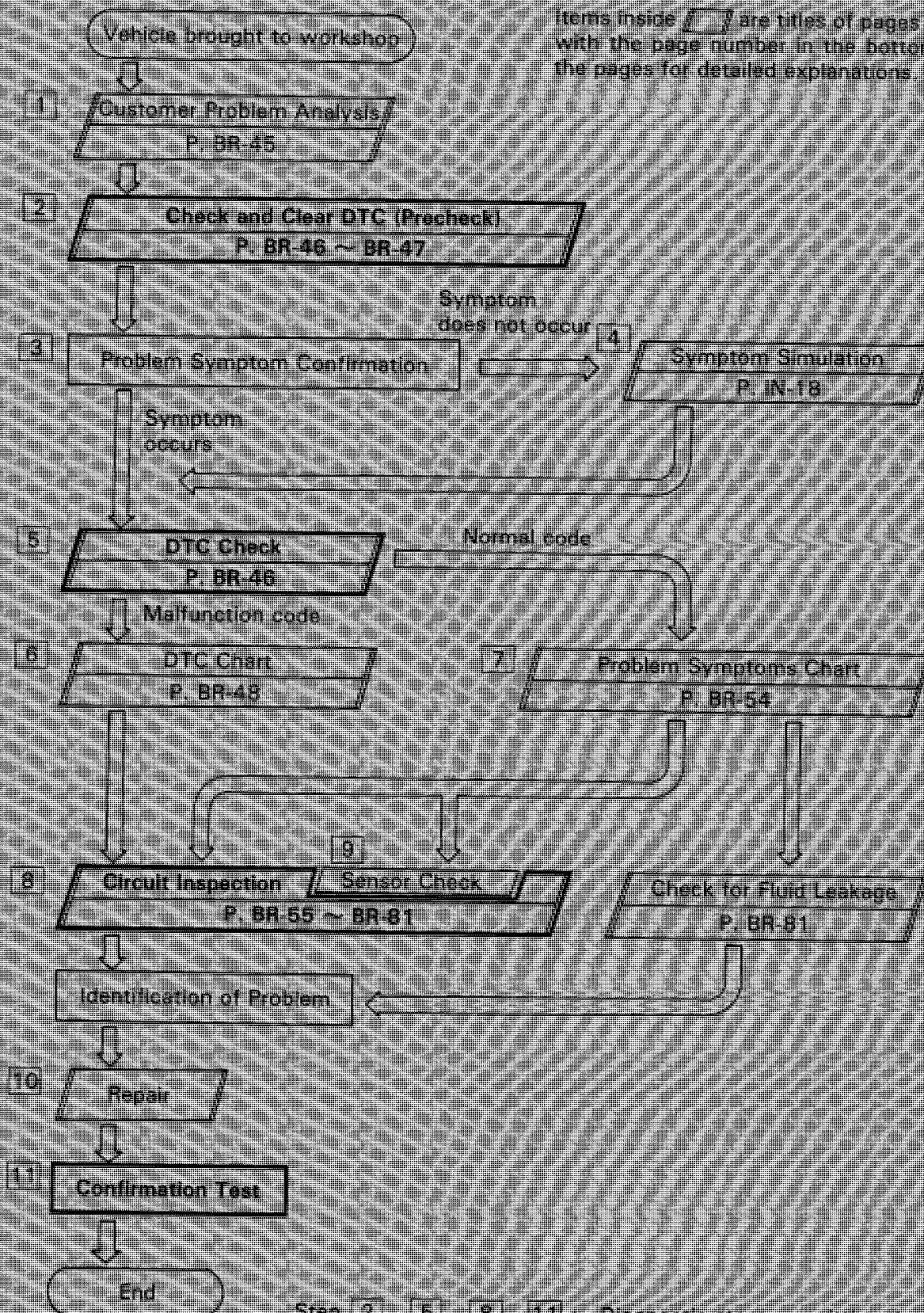
TROUBLESHOOTING

HOW TO PROCEED WITH TROUBLESHOOTING	BR-44
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CHECK SHEET	BR-45
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SPEED SENSOR SIGNAL AND	
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DTC 13, 14 ABS Control	
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Neither Front Speed Sensor	
Rotor Missing	BR-67
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Circuit	BR-68
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DTC 48 Rear Differential Lock	
Circuit	BR-72
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ABS Warning Light Circuit	BR-77
Tc Terminal Circuit	BR-79
Ts Terminal Circuit	BR-80
Check for Fluid Leakage	BR-81

HOW TO PROCEED WITH TROUBLESHOOTING

Troubleshoot in accordance with the procedure on the following pages.

Items inside are titles of pages in this manual, with the page number in the bottom portion. See the pages for detailed explanations.



Step 2 , 5 , 8 , 11 : Diagnostic steps permitting the use of the TOYOTA hand-held tester or TOYOTA break-out-box.

CUSTOMER PROBLEM ANALYSIS CHECK SHEET

ABS Check Sheet

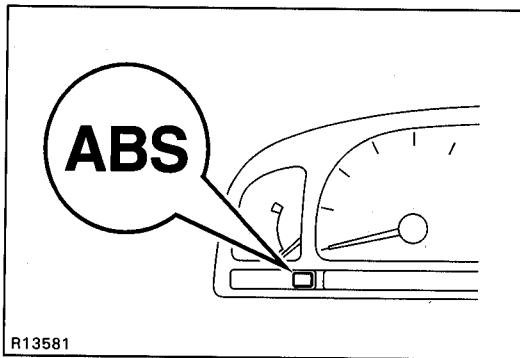
Inspector's
Name _____

Customer's Name		Registration No.	
		Registration Year	/ /
		Frame No.	
Date Vehicle Brought In	/ /	Odometer Reading	km miles

Date Problem First Occurred	/ /
Frequency Problem Occurs	☐ Continuous ☐ Intermittent (times a day)

Symptoms	☐ ABS does not operate.	
	☐ ABS does not operate efficiently.	
	ABS Warning Light Abnormal	☐ Remains ON ☐ Does not Light Up

DTC Check	1st Time	☐ Normal Code ☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code ☐ Malfunction Code (Code)

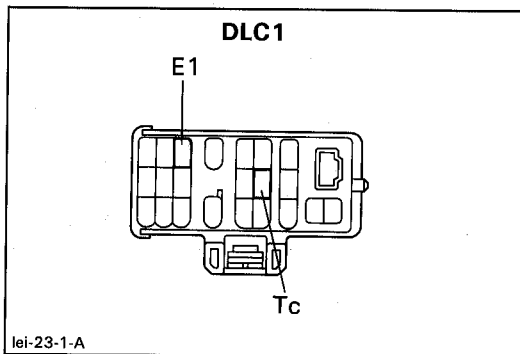
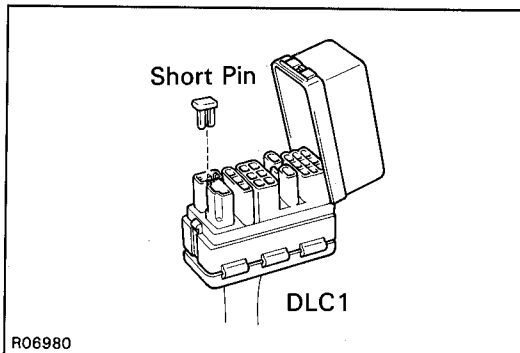


DIAGNOSIS SYSTEM

INDICATOR CHECK

When the ignition switch is turned ON, check that the ABS warning light goes on for 3 seconds.

HINT: If the indicator check result is not normal, proceed to troubleshooting for the ABS warning light circuit (See page BR-77).



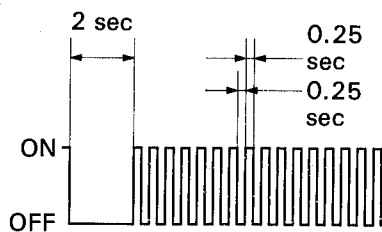
DTC CHECK

1. Turn the ignition switch ON.
2. Disconnect the Short Pin from DLC1.

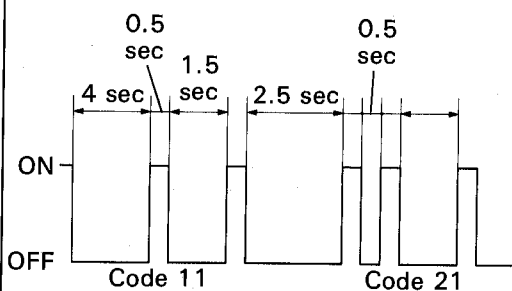
3. Using SST, connect terminals Tc and E1 of DLC1.
SST 09843 – 18020
4. Read the DTC from the ABS warning light on the combination meter.

HINT: If no code appears, inspect the diagnostic circuit or ABS warning light circuit (See page BR-79 or BR-77).

Normal Code



Code 11 and 21

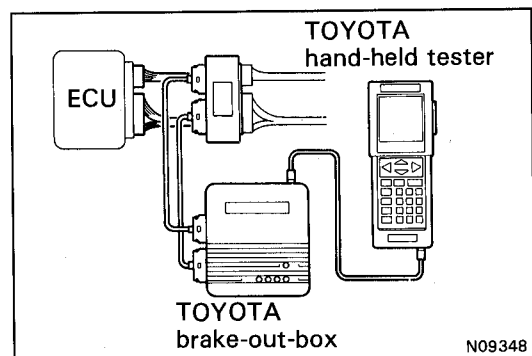
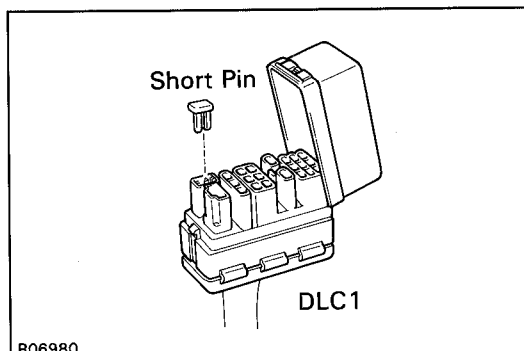
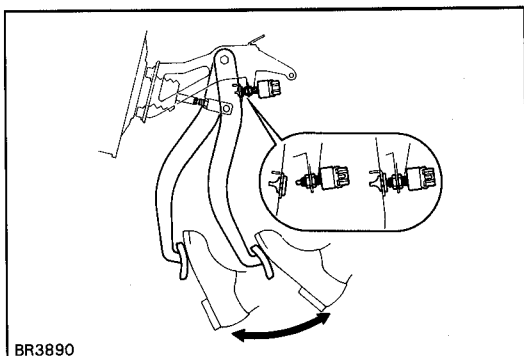


R05495
BE4033

As an example, the blinking patterns for normal code and codes 11 and 21 are shown on the left.

5. Codes are explained in the code table on page BR-48.
6. After completing the check, disconnect terminals Tc and E1, and turn off the display.

If 2 or more malfunctions are indicated at the same time, the lowest numbered DTC will be displayed first.



DTC CLEARANCE

1. Using SST, connect terminals Tc and E1 of DLC1.
SST 09843 – 18020
2. IG switch ON.
3. Clear the DTC stored in ECU by depressing the brake pedal 8 or more times within 3 seconds.
4. Check that the warning light shows the normal code.
5. Remove the SST from the terminals of DLC1.
6. Connect the Short Pin to DLC1.

HINT: Cancellation can also be done by removing the ECU-B fuse, but in this case, other memory systems will also be cancelled out.

ECU TERMINAL VALUES MEASUREMENT USING TOYOTA BREAK-OUT-BOX AND TOYOTA HAND-HELD TESTER

1. Hook up the TOYOTA hand-held tester and TOYOTA break-out-box to the vehicle.
2. Read the ECU input/output values by following the prompts on the tester screen.

HINT: TOYOTA hand-held tester has a "Snapshot" function.

This records the measured values and is effective in the diagnosis of intermittent problems.

Please refer to the TOYOTA hand-held tester/TOYOTA break-out-box operators manual for further details.

DTC CHART

If a malfunction code is displayed during the DTC check, check the circuit listed for that code in the table below and proceed to the relevant page.

HINT: Using SST 09843 – 18020, connect the terminals Tc and E₁, and remove the short pin.

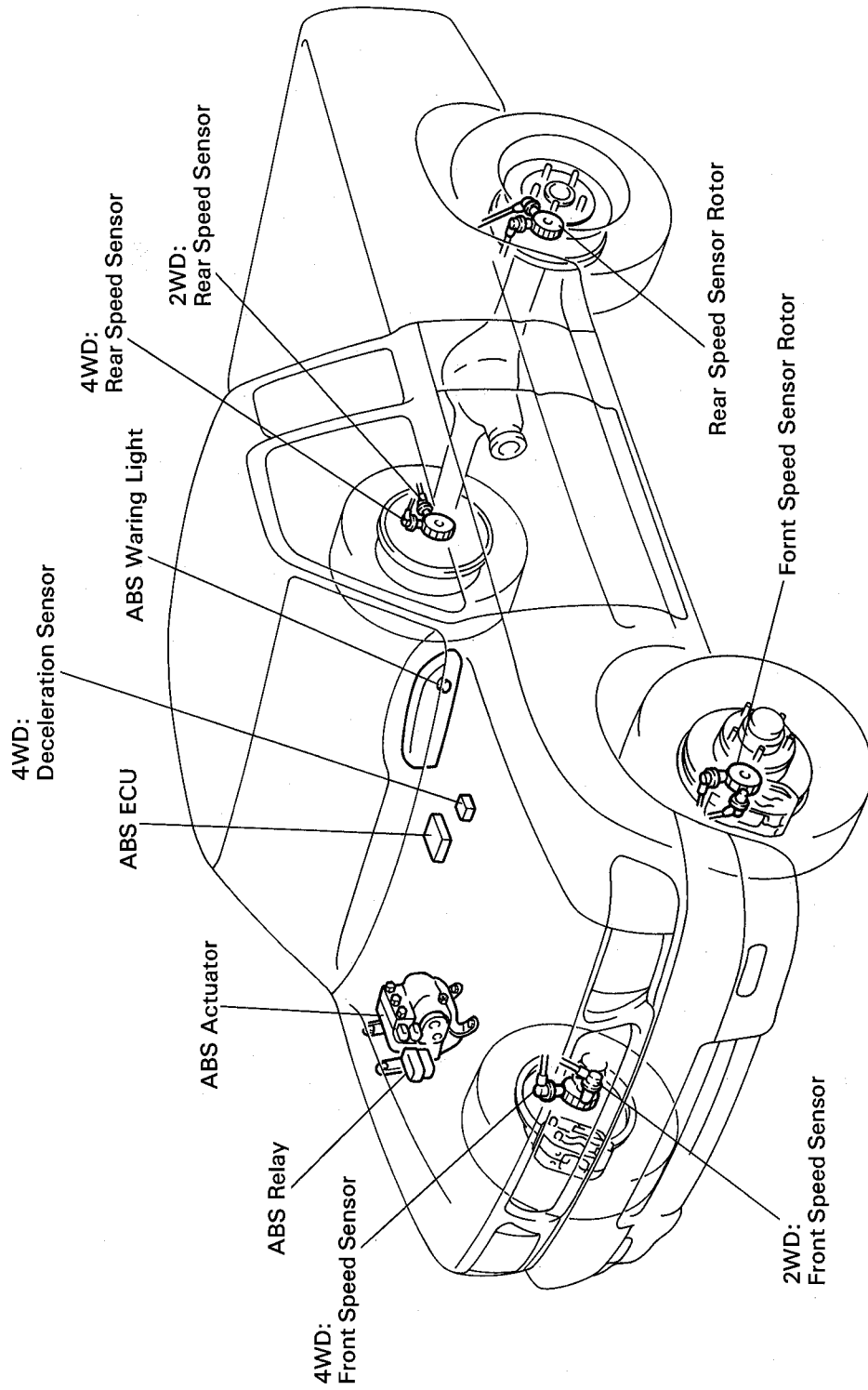
DTC No. (See page)	Detection Item	Trouble Area
11 (BR-55)	Open circuit in ABS control (solenoid) relay circuit	• ABS control (solenoid) relay • Open or short in ABS control (solenoid) relay circuit • ECU
12 (BR-55)	Short circuit in ABS control (solenoid) relay circuit	• ABS control (solenoid) relay • B+ short in ABS control (solenoid) relay circuit • ECU
13 (BR-58)	Open circuit in ABS control (motor) relay circuit	• ABS control (motor) relay • Open or short in ABS control (motor) relay circuit • ECU
14 (BR-58)	Short circuit in ABS control (motor) relay circuit	• ABS control (motor) relay • B+ short in ABS control (motor) relay circuit • ECU
21 (BR-61)	Open or short circuit in 2-position solenoid circuit for right front wheel	• ABS actuator • Open or short in SFRR or SFRH circuit • ECU
22 (BR-61)	Open or short circuit in 2-position solenoid circuit for left front wheel	• ABS actuator • Open or short in SFLR or SFLH circuit • ECU
23 (BR-61)	Open or short circuit in 2-position solenoid circuit for rear wheel	• ABS actuator • Open or short in SRR or SRH circuit • ECU
31 (BR-63)	Right front wheel speed sensor signal malfunction	• Right front, left front, right rear and left rear speed sensor • Open or short in each speed sensor circuit • ECU
32 (BR-63)	Left front wheel speed sensor signal malfunction	
33 (BR-63)	Right rear wheel speed sensor signal malfunction	
34 (BR-63)	Left rear wheel speed sensor signal malfunction	
35 (BR-63)	Open circuit in left front or right rear speed sensor circuit	• Open in left front or right rear speed sensor circuit • ECU
36 (BR-63)	Open circuit in right front or left rear speed sensor circuit	• Open in right front or left rear speed sensor circuit • ECU
37 (BR-67)	Neither front speed sensor rotor missing	• Front axle hub • Right front, left front speed sensor • Wire harness for sensor system • ECU
*137 (BR-67)	Some tire is different size from the other tires	• Tire size • ECU
41 (BR-68)	Low battery positive voltage or abnormally high battery positive voltage	• Battery • IC regulator • Open or short in power source circuit • ECU
*243 (BR-70)	Malfunction in deceleration sensor	• Deceleration sensor • Wire harness for deceleration sensor system • ECU
*244 (BR-71)	Open or short in deceleration sensor circuit	• Deceleration sensor • Open or short in deceleration sensor circuit • ECU
*348 (BR-72)	Open or short circuit in rear differential lock circuit Rear differential is locking	• Rear differential lock • ECU
51 (BR-74)	Pump motor is locked Open in pump motor ground	• ABS pump motor
Always ON	Malfunction in ECU	• ECU

*1: 2WD models

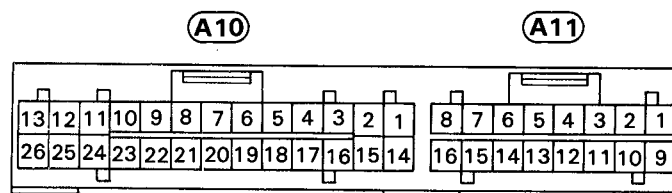
*2: 4WD models

*3: w/ Rear differential lock

PARTS LOCATION

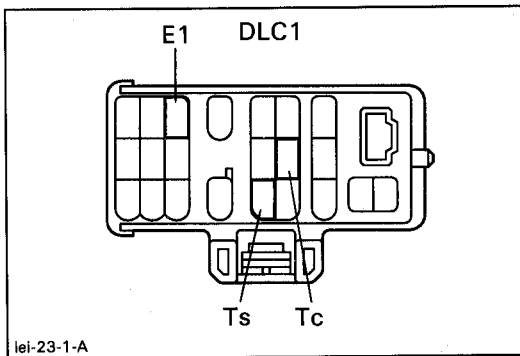


STANDARD VALUE OF ECU TERMINALS



R00463

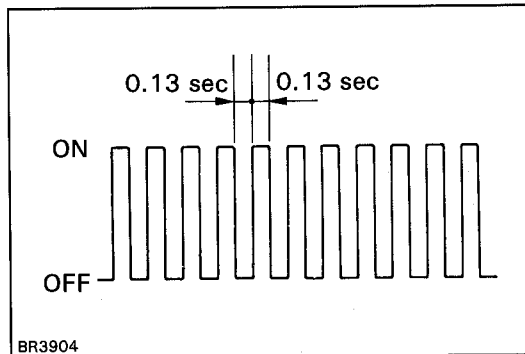
Symbols (Terminals No.)	STD Voltage (V)	Condition
BAT — GND (A10-22) — (A10-11)	10 – 14	Always
IG1 — GND (A10-10) — (A10-11)	10 – 14	IG switch ON
SR — R— (A11-5) — (A11-15)	9 – 14	IG switch ON, ABS warning light OFF
MR — R— (A11-4) — (A11-15)	Below 1.0	IG switch ON
SFRH — GND (A11-1) — (A10-11)	10 – 14	IG switch ON, ABS warning light OFF
SFRR — GND (A11-2) — (A10-11)	10 – 14	IG switch ON, ABS warning light OFF
SFLH — GND (A10-13) — (A10-11)	10 – 14	IG switch ON, ABS warning light OFF
SFLR — GND (A10-12) — (A10-11)	10 – 14	IG switch ON, ABS warning light OFF
SRR — GND (A10-25) — (A10-11)	10 – 14	IG switch ON, ABS warning light OFF
SRH — GND (A10-26) — (A10-11)	10 – 14	IG switch ON, ABS warning light OFF
AST — GND (A11-11) — (A10-11)	10 – 14	IG switch ON, ABS warning light OFF
WA — GND (A11-12) — (A10-11)	Below 2.0 10 – 14	IG switch ON, ABS warning light ON IG switch ON, ABS warning light OFF
PKB — GND (A10-9) — (A10-11)	Below 1.5 10 – 14	IG switch ON, PKB switch ON IG switch ON, PKB switch OFF
STP — GND (A10-21) — (A10-11)	Below 1.5 8 – 14	Stop light switch OFF Stop light switch ON
Tc — GND (A10-20) — (A10-11)	10 – 14	IG switch ON
Ts — GND (A10-6) — (A10-11)	10 – 14	IG switch ON
FR+ — FR— (A11-7) — (A11-6)	AC generation	IG switch ON Slowly turn right front wheel
FL+ — FL— (A11-14) — (A11-13)	AC generation	IG switch ON Slowly turn left front wheel
RR+ — RR— (A10-15) — (A10-16)	AC generation	IG switch ON Slowly turn right rear wheel
RL+ — RL— (A10-1) — (A10-2)	AC generation	IG switch ON Slowly turn left rear wheel
GS1 — GND (A10-19) — (A10-11)	4 – 6 or 7 – 11	IG switch ON
GS2 — GND (A10-7) — (A10-11)	4 – 6	IG switch ON



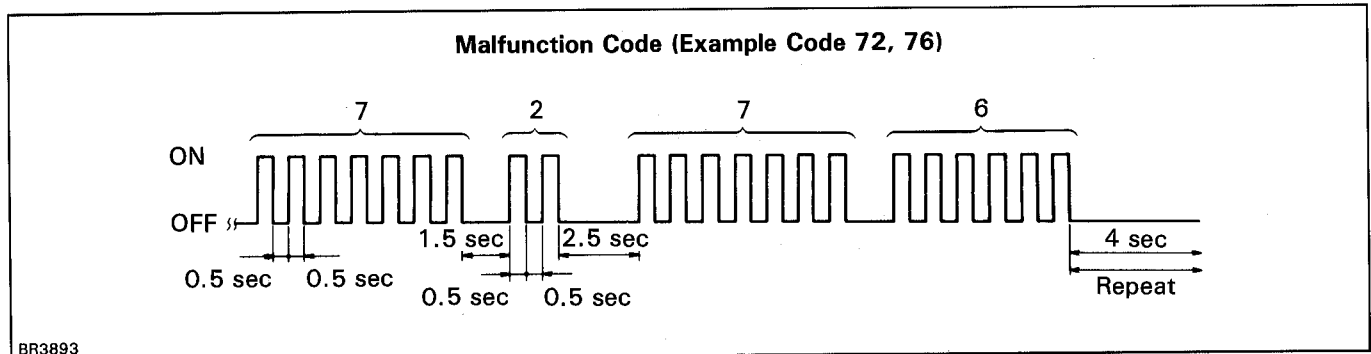
SPEED SENSOR SIGNAL AND DECELERATION SENSOR CHECK

SPEED SENSOR SIGNAL CHECK

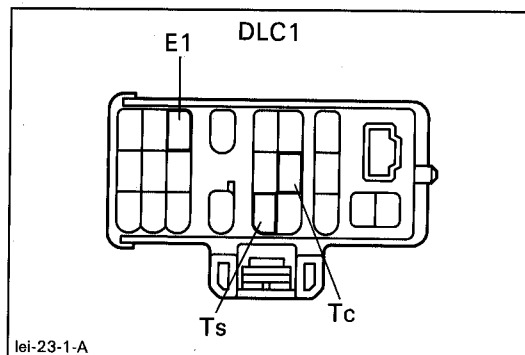
1. Turn the ignition switch OFF.
2. Using SST, connect terminals Ts and E1 of DLC1.
SST 09843-18020
3. Start the engine.
4. Check that the ABS warning light blinks.
HINT: If the ABS warning light does not blink, inspect the ABS warning light circuit (See page BR-77).
5. Drive vehicle straight forward.
HINT: Drive vehicle faster than 45 km/h (28 mph) for several seconds.
6. Stop the vehicle.
7. Using SST, connect terminals Tc and E1 of DLC1.
SST 09843-18020
8. Read the number of blinks of the ABS warning light.
HINT: See the list of DTC shown on the next page.
If every sensor is normal, a normal code is output (A cycle of 0.25 sec. ON and 0.25 sec. OFF is repeated).
If 2 or more malfunctions are indicated at the same time, the lowest numbered code will be displayed 1st.



Malfunction Code (Example Code 72, 76)



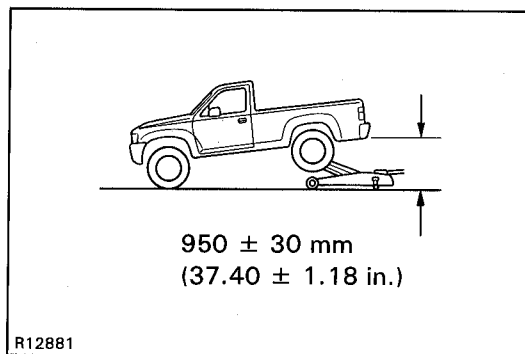
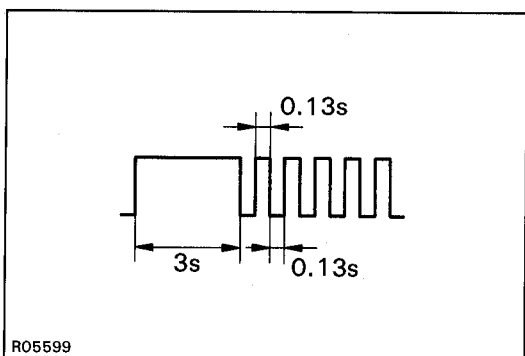
9. After doing the check, disconnect terminals Ts and E1, Tc and E1 of DLC1, and ignition switch turned OFF.

**DECELERATION SENSOR DETECTION POINT CHECK**

1. Turn the ignition switch OFF.
2. Using SST, connect terminals Ts and E1 of DLC1.
SST 09843-18020
3. Start the engine.

4. Check that the ABS warning light blinks.

HINT: If the ABS warning light does not blink, inspect the ABS warning light circuit (See page BR-77).

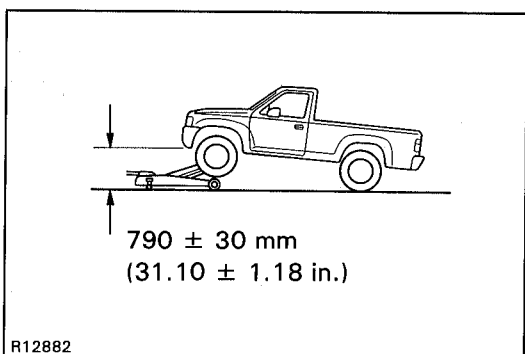


5. Jack up the rear side of the vehicle slowly.

HINT: When measuring the height, measure at the center of the lower body of the vehicle.

6. Check that the warning light blinks.
If the warning light turns on, inspect the deceleration sensor installation. If the sensor installation is OK, replace the deceleration sensor.

7. Jack down the vehicle slowly.



8. Jack up the front side of the vehicle slowly, as shown.

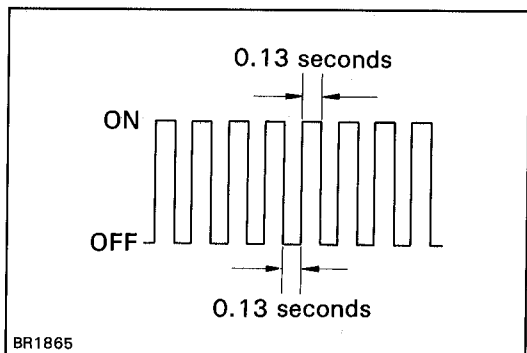
HINT: When measuring the height, measure at the center of the lower body of the vehicle.

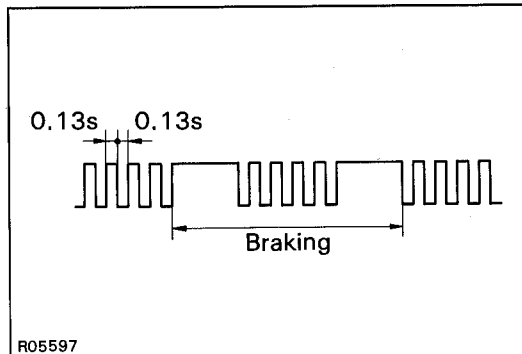
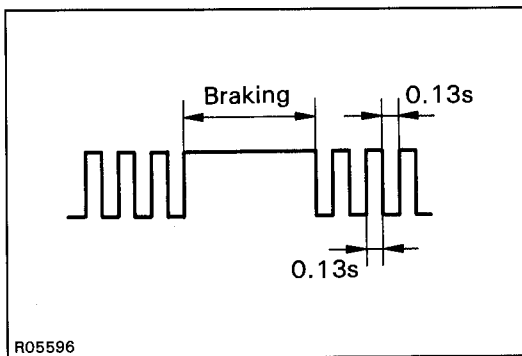
9. Check that the warning light blinks.
If the warning light turns on, inspect the deceleration sensor installation. If the sensor installation is OK, replace the deceleration sensor.

10. Jack down the vehicle slowly.

DECELERATION SENSOR OPERATION CHECK

1. Drive the vehicle straight ahead at about 20 km/h (12.4 mph) or more, lightly depress the brake pedal.
2. Check that there is no change in the warning light pattern.





3. Drive the vehicle straight ahead at about 20 km/h (12.4 mph) or more, and depress the brake pedal moderately.
4. Check that the warning light turns on while braking.
5. Drive the vehicle straight ahead at about 20 km/h (12.4 mph) or more, and depress the brake pedal strongly.
6. Check that the warning light pattern changes while braking, as shown.
If the operation is not as specified, inspect the deceleration sensor installation. If the sensor installation is OK, replace the deceleration sensor.
7. Stop the vehicle and turn the ignition switch OFF.
8. Remove SST from the terminals Ts and E₁ of the DLC 1.
SST 09843-18020

DTC of Speed Sensor Check Function

Code No.	Diagnosis	Trouble Area
71	Low output voltage of right front speed sensor	• Right front speed sensor • Sensor installation
72	Low output voltage of left front speed sensor	• Left front speed sensor • Sensor installation
73	Low output voltage of right rear speed sensor	• Right rear speed sensor • Sensor installation
74	Low output voltage of left rear speed sensor	• Left rear speed sensor • Sensor installation
75	Abnormal change in output voltage of right front speed sensor	• Right front speed sensor rotor
76	Abnormal change in output voltage of left front speed sensor	• Left front speed sensor rotor
77	Abnormal change in output voltage of right rear speed sensor	• Right rear speed sensor rotor
78	Abnormal change in output voltage of left rear speed sensor	• Left rear speed sensor rotor
*79	Deceleration sensor is faulty	• Deceleration sensor • Sensor installation

*: 4WD models

PROBLEM SYMPTOMS CHART

If a normal code is displayed during the DTC check but the problem still occurs, check the circuits for each problem symptom in the order given in the table below and proceed to the relevant troubleshooting page.

Symptoms	Inspection Circuit	See page
ABS does not operate.	Only when 1. ~ 4. are all normal and the problem is still occurring, replace the ABS ECU. 1. Check the DTC reconfirming that the normal code is output. 2. IG power source circuit. 3. Speed sensor circuit. 4. Check the ABS actuator with a checker. If abnormal, check the hydraulic circuit for leakage (See page BR-81).	BR-46 BR-68 BR-63 BR-36
ABS does not operate efficiently	Only when 1. ~ 4. are all normal and the problem is still occurring, replace the ABS ECU. 1. Check the DTC reconfirming that the normal code is output. 2. Speed sensor circuit. 3. Stop light switch circuit. 4. Check the ABS actuator with a checker. If abnormal, check the hydraulic circuit for leakage (See page BR-81).	BR-46 BR-63 BR-75 BR-36
ABS warning light abnormal.	1. ABS warning light circuit. 2. ABS ECU.	BR-77
DTC check cannot be done	Only when 1. and 2. are all normal and the problem is still occurring, replace the ABS ECU. 1. ABS warning light circuit. 2. Tc terminal circuit.	BR-77 BR-79
Speed sensor signal check cannot be done	1. Ts terminal circuit. 2. ABS ECU.	BR-80

CIRCUIT INSPECTION

DTC 11, 12 ABS Control (Solenoid) Relay Circuit

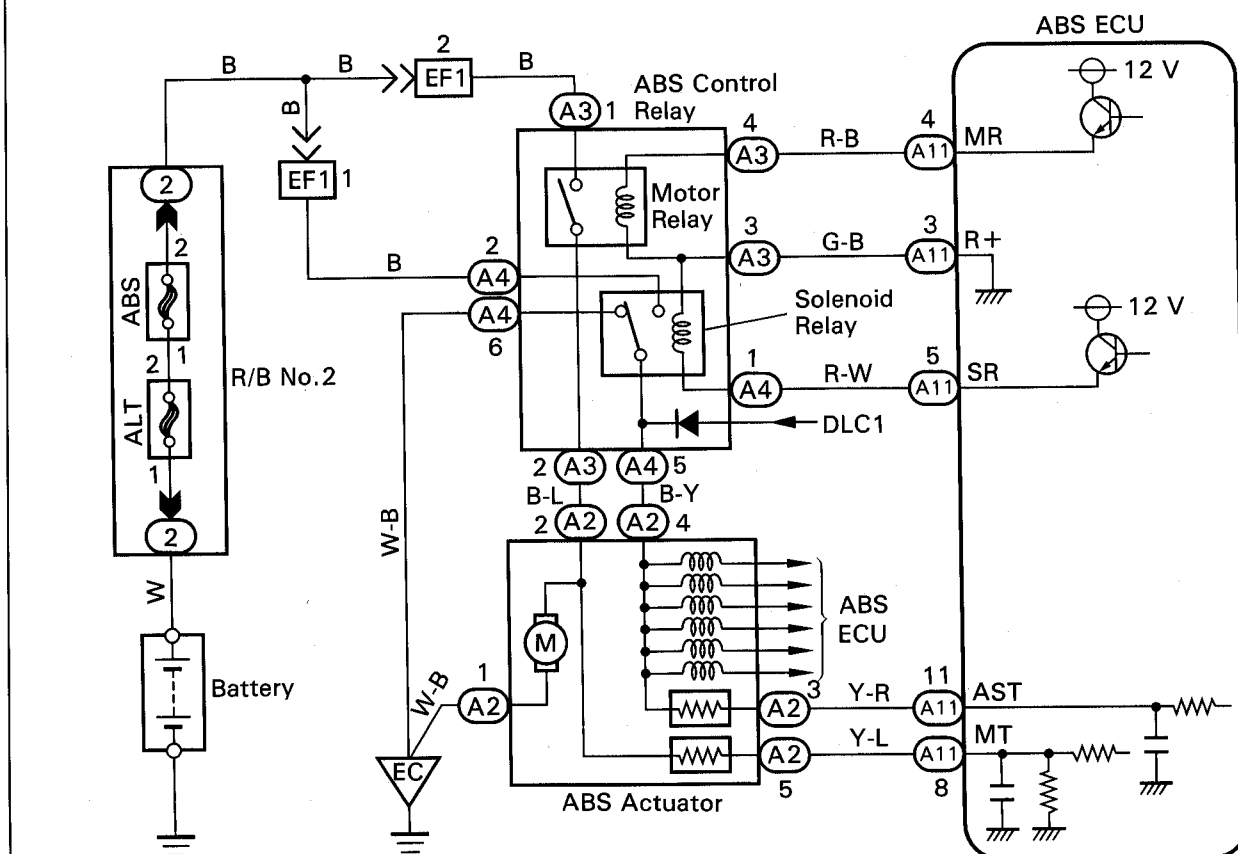
CIRCUIT DESCRIPTION

This relay supplies power to each ABS solenoid. After the ignition switch is turned ON, if the initial check is OK, the relay goes on.

DTC No.	DTC Detecting Condition	Trouble Area
11	Conditions (1) and (2) continue for 0.2 sec. or more: (1) ABS control (solenoid) relay terminal (SR) voltage: Battery positive voltage (2) ABS control (solenoid) relay monitor terminal (AST) voltage: 0 V	• ABS control (solenoid) relay • Open or short in ABS control (solenoid) relay circuit • ECU
12	Conditions (1) and (2) continue for 0.2 sec. or more: (1) ABS control (solenoid) relay terminal (SR) voltage: 0 V (2) ABS control (solenoid) relay monitor terminal (AST) voltage: Battery positive voltage	• ABS control (solenoid) relay • B+ short in ABS control (solenoid) relay circuit • ECU

Fail safe function: If trouble occurs in the ABS control (solenoid) relay circuit, the ECU cuts off current to the ABS control (solenoid) relay and prohibits ABS control.

WIRING DIAGRAM



R13718

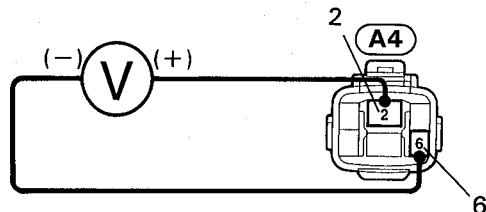
BR

INSPECTION PROCEDURE

1

Check voltage between terminals (A4) 2 and (A4) 6 of ABS control (solenoid) relay connector.

LOCK

BE6653
R14203

P Disconnect the ABS control relay connector.

C Measure the voltage between terminals (A4) 2 and (A4) 6 of ABS control relay harness side connector.

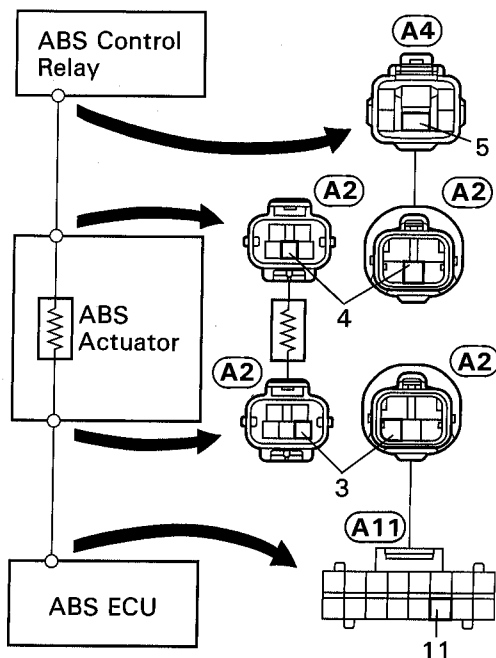
OK Voltage: 10 – 14 V

OK

NG Check and repair harness or connector.

2

Check continuity between terminals (A4) 5 and (A2) 4, (A2) 4 and (A2) 3, (A2) 3 and (A11) 11.



P Disconnect the 2 connectors from ABS actuator.

C Check continuity between terminals (A4) 5 and (A2) 4, (A2) 4 and (A2) 3, (A2) 3 and (A11) 11.

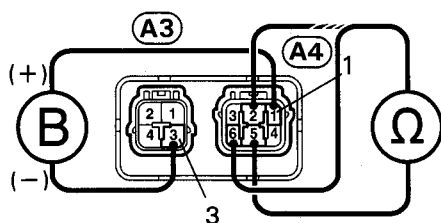
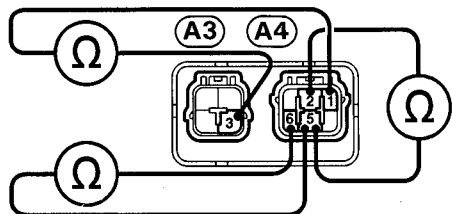
OK Continuity

HINT: There is a resistance of 26 ~ 40 Ω between terminals (A2) 4 and (A2) 3.

R13727

OK

NG Repair or replace harness or ABS actuator.

3**Check ABS control (solenoid) relay.**R14139
R14140**OK****C** Check continuity between each terminal of ABS control (solenoid) relay.**OK**

Terminals (A4) 1 and (A3) 3	Continuity (Reference value 80 Ω)
Terminals (A4) 5 and (A4) 6	Continuity
Terminals (A4) 2 and (A4) 5	Open

C 1. Apply battery voltage between terminals (A4) 1 and (A3) 3.
2. Check continuity between each terminal of ABS control (solenoid) relay.**OK**

Terminals (A4) 5 and (A4) 6	Open
Terminals (A4) 2 and (A4) 5	Continuity

NG

Replace ABS control relay.

4**Check for open and short in harness and connector between ABS control relay and ABS ECU (See page IN-24).****OK****NG**

Repair or replace harness or connector.

If the same code is still output after the DTC is deleted, check the contact condition of each connection.

If the connections are normal, the ECU may be defective.

BR

DTC

13, 14

ABS Control (Motor) Relay Circuit

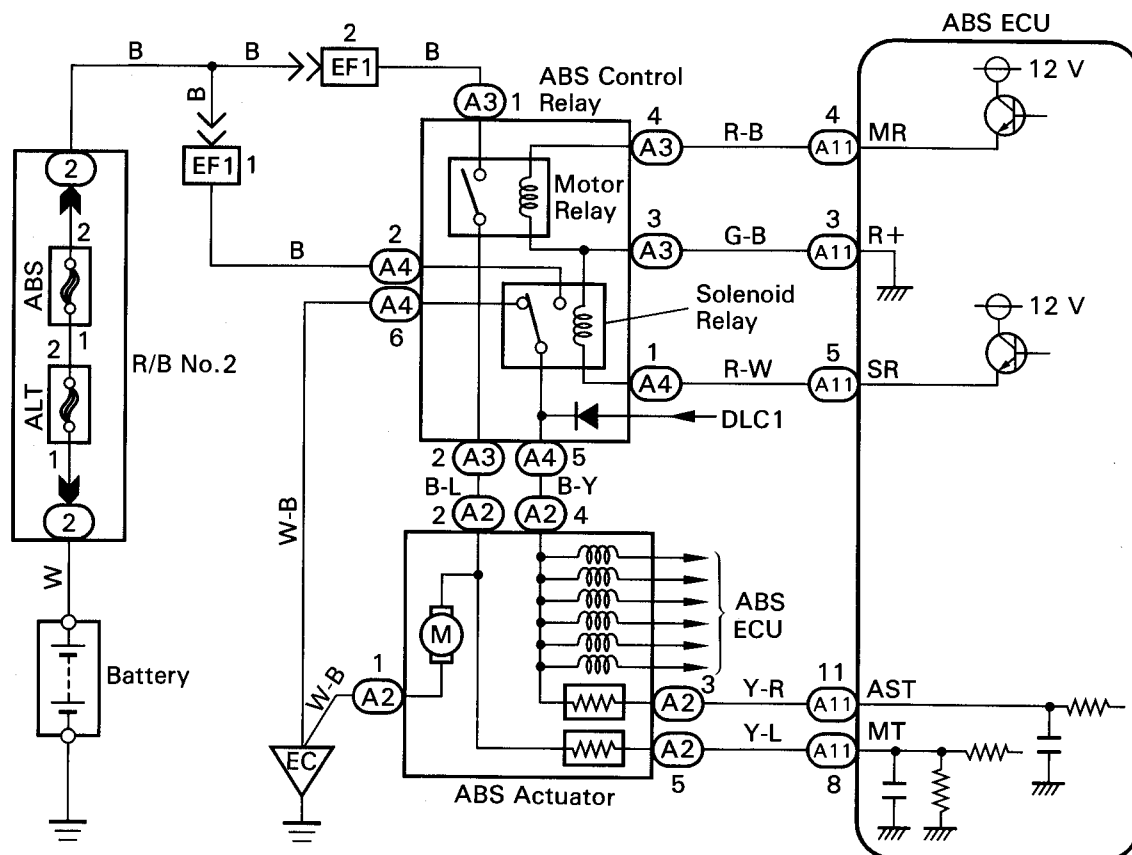
CIRCUIT DESCRIPTION

The ABS control (motor) relay supplies power to the ABS pump motor. While the ABS is activated, the ECU switches the control (motor) relay ON and operates the ABS pump motor.

DTC No.	DTC Detecting Condition	Trouble Area
13	Conditions (1) and (2) continued for 0.2 sec. or more: (1) ABS control (motor) relay terminal (MR) voltage: Battery positive voltage (2) ABS control (motor) relay monitor terminal (MT) voltage: 0 V	• ABS control (motor) relay • Open or short in ABS control (motor) relay circuit • ECU
14	Conditions (1) and (2) continued for 2.5 sec. or more: (1) ABS control (motor) relay terminal (MR) voltage: 0 V (2) ABS control (motor) relay monitor terminal (MT) voltage: Battery positive voltage	• ABS control (motor) relay • B+ short in ABS control (motor) relay circuit • ECU

Fail safe function: If trouble occurs in the ABS control (motor) relay circuit, the ECU cuts off current to the ABS control (solenoid) relay and prohibits ABS control.

WIRING DIAGRAM

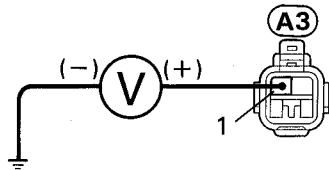


INSPECTION PROCEDURE

1

Check voltage between terminal (A3) 1 of ABS control (motor) relay and body ground.

LOCK



BE6653
R14667

P Disconnect the ABS control relay connector.

C Measure voltage between terminal (A3) 1 of ABS control relay harness side connector and body ground.

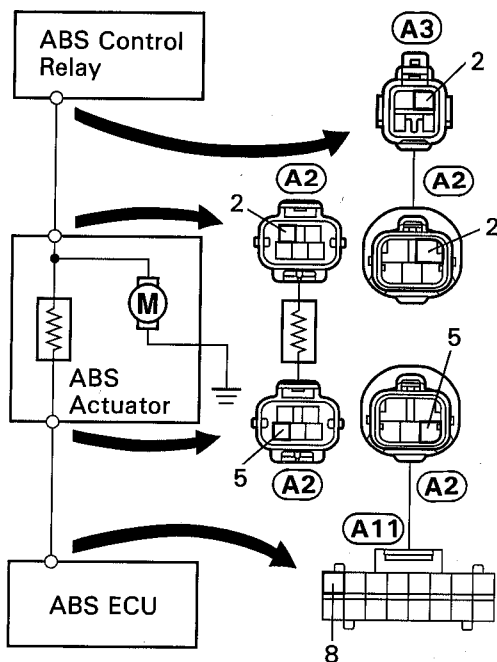
OK Voltage: 10 – 14 V

OK

NG Check and repair harness or connector.

2

Check continuity between terminals (A3) 2 and (A2) 2, (A2) 2 and (A2) 5, (A2) 5 and (A11) 8.



R13728

P Disconnect the 2 connectors from ABS actuator.

C Check continuity between terminals (A3) 2 and (A2) 2, (A2) 2 and (A2) 5, (A2) 5 and (A11) 8.

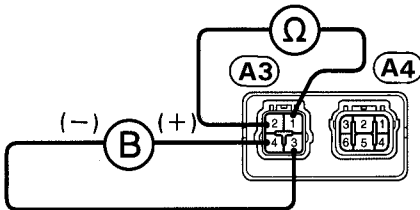
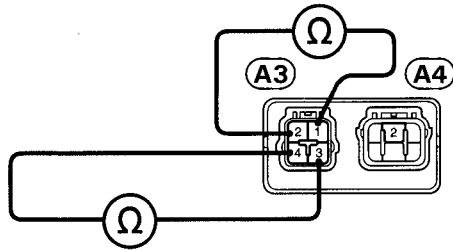
OK Continuity

HINT: There is a resistance of 26 ~ 40 Ω between terminals (A2) 2 and (A2) 5.

OK

NG Repair or replace harness or ABS actuator.

BR

3**Check ABS control (motor) relay.**

C Check continuity between each terminal of ABS control relay.

OK

Terminals (A3) 3 and (A3) 4	Continuity (Reference value 62 Ω)
Terminals (A3) 1 and (A3) 2	Open

C 1. Apply battery voltage between terminals (A3) 3 and (A3) 4.
2. Check continuity between each terminal of ABS control relay.

OK

Terminals (A3) 1 and (A3) 2	Continuity
-----------------------------	------------

OK**NG** Replace ABS control relay.**4****Check for open and short in harness and connector between ABS control relay and ABS ECU (See page IN-24).****OK****NG** Repair or replace harness or connector.

If the same code is still output after the DTC is deleted, check the contact condition of each connection.

If the connections are normal, the ECU may be defective.

W00572
W00573

BR

DTC

21, 22,
23

ABS Actuator Solenoid Circuit

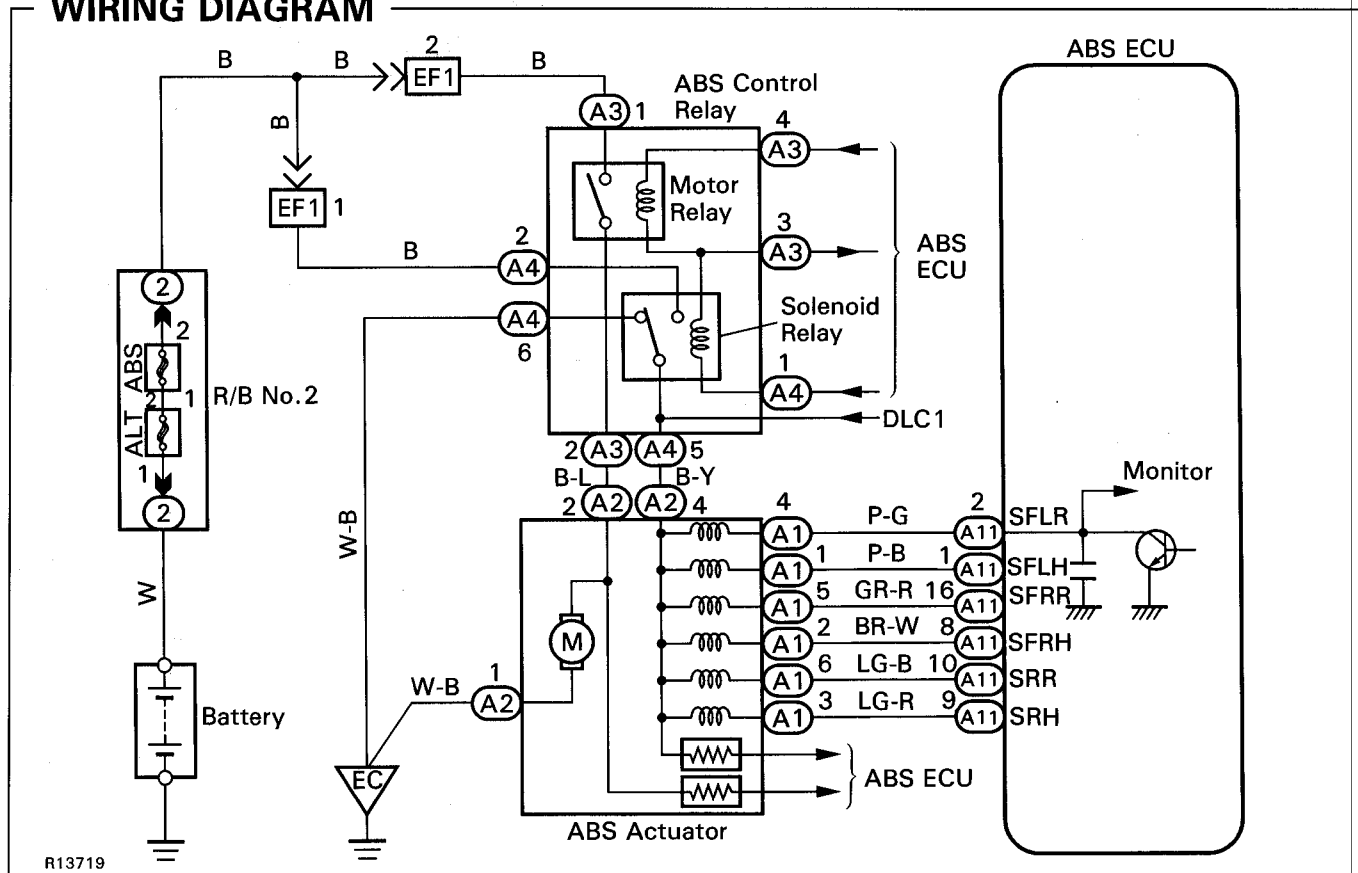
CIRCUIT DESCRIPTION

This solenoid goes on when signals are received from the ECU and controls the pressure acting on the wheel cylinders, thus controlling the braking force.

DTC No.	DTC Detecting Condition	Trouble Area
21	Conditions (1) through (3) continue for 0.02 sec. or more: (1) ABS control (solenoid) relay terminal (SR) voltage: Battery positive voltage (2) Voltage of ABS ECU terminal AST: Battery positive voltage (3) When power transistor of ECU is ON, voltage of terminal SFRR or SFRH is 0 V or battery positive voltage.	• ABS actuator • Open or short in SFRR or SFRH circuit • ECU
22	Conditions (1) through (3) continue for 0.02 sec. or more: (1) ABS control (solenoid) relay terminal (SR) voltage: Battery positive voltage (2) Voltage of ABS ECU terminal AST: Battery positive voltage (3) When power transistor of ECU is ON, voltage of terminal SFLR or SFLH is 0 V or battery positive voltage.	• ABS actuator • Open or short in SFLR or SFLH circuit • ECU
23	Conditions (1) through (3) continue for 0.02 sec. or more: (1) ABS control (solenoid) relay terminal (SR) voltage: Battery positive voltage (2) Voltage of ABS ECU terminal AST: Battery positive voltage (3) When power transistor of ECU is ON, voltage of terminal SRR or SRH is 0 V or battery positive voltage.	• ABS actuator • Open or short in SRR or SRH circuit • ECU

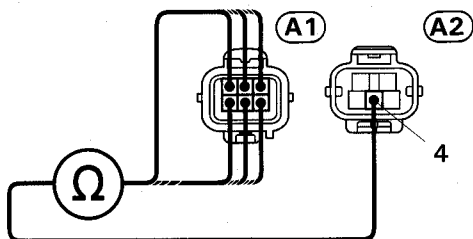
Fail safe function: If trouble occurs in the actuator solenoid circuit, the ECU cuts off current to the ABS control (solenoid) relay and prohibits ABS control.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 Check ABS actuator solenoid.



P Disconnect the 2 connectors from ABS actuator.

C Check continuity between terminals (A2) 4 and (A1) 1, 2, 3, 4, 5, 6 of ABS actuator connector.

OK Continuity

HINT: Resistance of each solenoid coil

SFRH, SFLH, SRH: 5.0 Ω

SFRR, SFLR, SRR: 2.2 Ω

OK

NG Replace ABS actuator.

2 Check for open and short in harness and connector between ABS ECU and actuator (See page IN-24).

OK

NG Repair or replace harness or connector.

If the same code is still output after the DTC is deleted, check the contact condition of each connection.

If the connections are normal, the ECU may be defective.

DTC

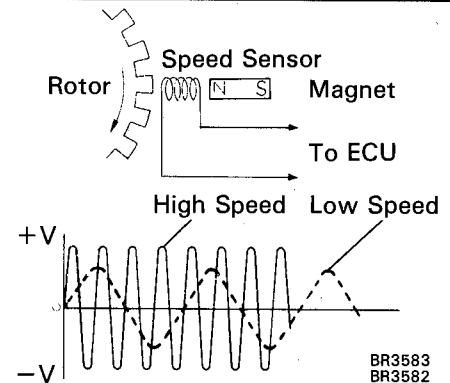
31, 32, 33,
34, 35, 36

Speed Sensor Circuit

CIRCUIT DESCRIPTION

The speed sensor detects the wheel speed and sends the appropriate signals to the ECU. These signals are used to control the ABS system. The front and rear rotors each have 48 serrations.

When the rotors rotate, the magnetic field emitted by the permanent magnet in the speed sensor generates an AC voltage. Since the frequency of this AC voltage changes in direct proportion to the speed of the rotor, the frequency is used by the ECU to detect the speed of each wheel.

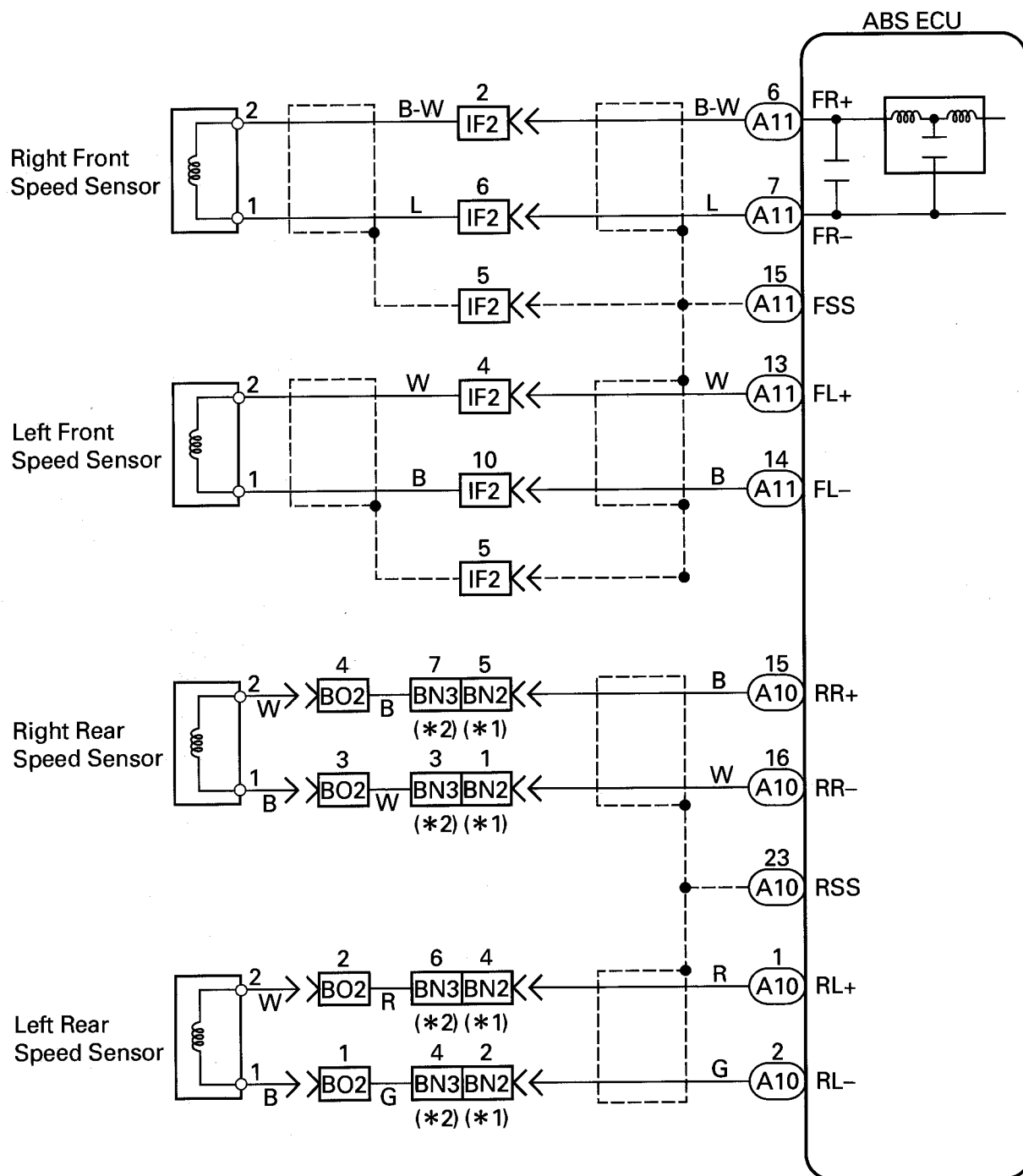


DTC No.	DTC Detecting Condition	Trouble Area
31, 32, 33, 34	Detection of any of conditions (1) through (3): (1) At vehicle speed of 10 km/h (6 mph) or more, pulses are not input for 5 sec. (2) Momentary interruption of the speed sensor signal occurs at least 7 times in the time between switching the ignition switch ON and switching it OFF. (3) Abnormal fluctuation of speed sensor signals with the vehicle speed 20 km/h (12 mph) or more.	• Right front, left front, right rear and left rear speed sensor • Open or short in each speed sensor circuit • ECU
35	Speed sensor signal is not input for about 1 sec. while the left front and right rear speed sensor signals are being checked with the IG switch ON.	• Open in left front or right rear speed sensor circuit • ECU
36	Speed sensor signal is not input for about 1 sec. while the right front and left rear speed sensor signals are being checked with the IG switch ON.	• Open in right front or left rear speed sensor circuit • ECU

HINT: DTC No.31 is for the right front speed sensor.
DTC No.32 is for the left front speed sensor.
DTC No.33 is for the right rear speed sensor.
DTC No.34 is for the left rear speed sensor.

Fail safe function: If trouble occurs in the speed sensor circuit, the ECU cuts off current to the ABS control (solenoid) relay and prohibits ABS control.

WIRING DIAGRAM



*1: w/o Rear Differential Lock

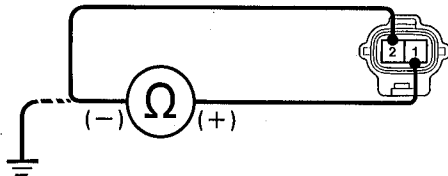
*2: w/ Rear Differential Lock

INSPECTION PROCEDURE

1

Check speed sensor.

Front



Front

P Disconnect speed sensor connector.

C Measure resistance between terminals 1 and 2 of speed sensor connector.

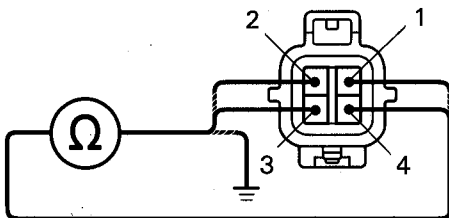
OK Resistance: 0.9 – 1.3 kΩ

C Measure resistance between terminals 1 and 2 of speed sensor connector and body ground.

OK Resistance: 1 MΩ or higher

Rear

Rear



P Disconnect speed sensor connector.

C Measure resistance between terminals 1 and 2, 3 and 4 of speed sensor connector.

OK Resistance: 0.9 – 1.3 kΩ

C Measure resistance between terminals 1 and 2, 3 and 4 of speed sensor connector and body ground.

OK Resistance: 1 MΩ or higher

R14205
R15781

OK

NG

Replace speed sensor.

NOTICE: Check the speed sensor signal last
(See page BR-51).

2

Check for open and short in harness and connector between each speed sensor and ECU (See page IN-24).

OK

NG

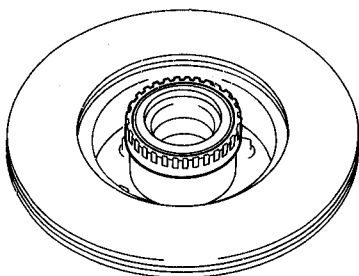
Repair or replace harness or connector.

BR

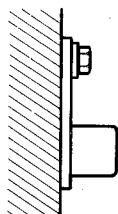
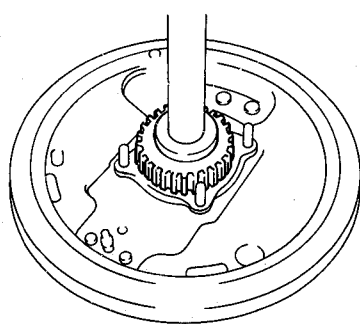
3

Check sensor rotor and sensor installation

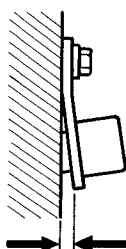
Front



Rear



OK



NG

Front

- P** Remove brake disc (See SA section).
- C** Check sensor rotor serrations.
- OK** No scratches or missing teeth.
- C** Check the front speed sensor installation.
- OK** The installation bolt is tightened properly.

Rear

- P** Remove the axle shaft (See SA section).
- C** Check the sensor rotor serrations.
- OK** No scratches or missing teeth.
- C** Check the speed sensor installation.
- OK** The installation bolt is tightened properly and there is no clearance between the sensor and rear axle carrier.

OK

NG

Replace speed sensor or rotor.

NOTICE: Check the speed sensor signal last
(See page BR-51).

Check and replace ABS ECU.

R07880
R07772
BR3795

BR

DTC**37****Neither Front Speed Sensor Rotor Missing****CIRCUIT DESCRIPTION**

DTC No.	DTC Detecting Condition	Trouble Area
37	With the front wheels stationary and rear wheels rotating at 20+ km/h (12+ mph) for 10+ secs, turn ignition switch ON then OFF 8 times, in succession.	• Front axle hub • Right front, left front speed sensor • Wire harness for sensor system • ECU

INSPECTION PROCEDURE**1****Check front axle hub (See page SA-13 or SA-21).****OK****NG****Replace front axle hub.****2****Check front speed sensor (See page BR-51).****OK****NG****Replace front speed sensor.****3****Check for open or short in harness and connector between speed sensor and ECU (See page IN-24).****OK****NG****Repair or replace harness and connector.****Check and replace ABS ECU.****DTC****37****Tires of Different Size (2WD vehicles)****CIRCUIT DESCRIPTION**

DTC No.	DTC Detecting Condition	Trouble Area
37	Driving at more than 30 km/h (19 mph) for more than 60 seconds with 1 or 2 tires of different size.	• Tire size • ECU

BR

INSPECTION PROCEDURE

1

Check tire size.

OK

NG

Replace tires so that all 4 tires are of the same size.

Check and replace ABS ECU.

DTC

41

IG Power Source Circuit

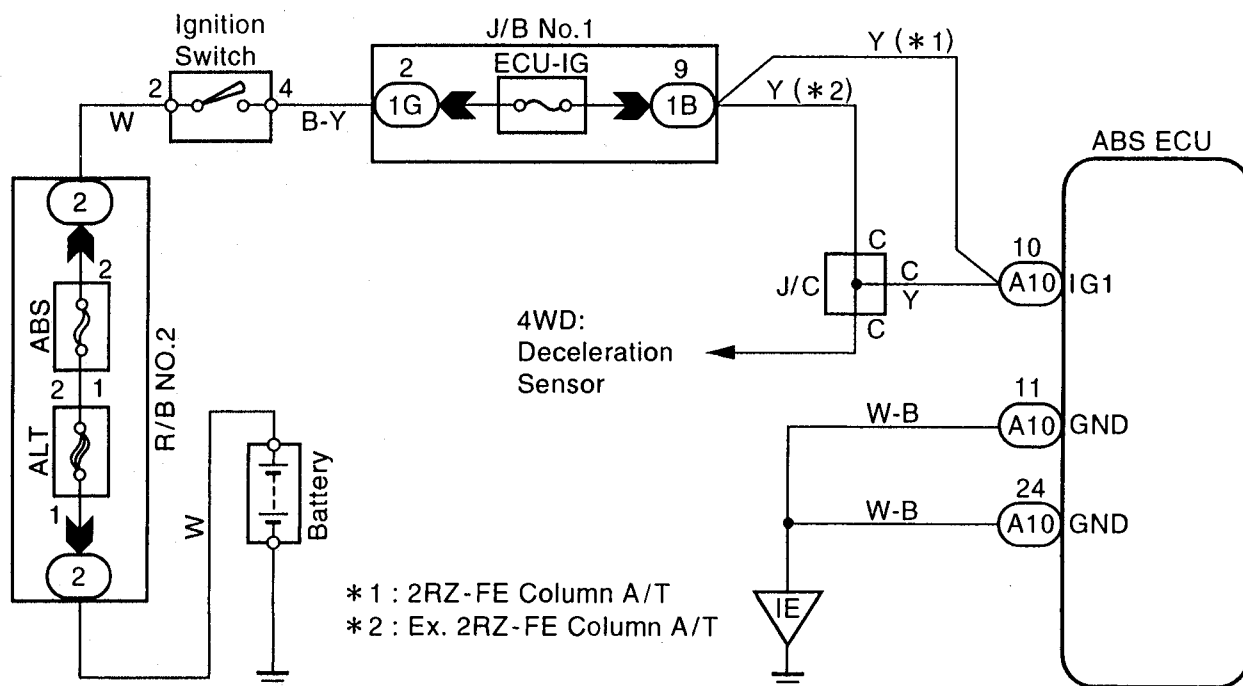
CIRCUIT DESCRIPTION

This is the power source for the ECU, hence the CPU, and the actuators.

DTC No.	DTC Detecting Condition	Trouble Area
41	Vehicle speed is 3 km/h (1.9 mph) or more and voltage of ECU terminal IG1 remains at more than 17 V or below 9.5 V for more than 10 sec.	• Battery • IC regulator • Open or short in power source circuit • ECU

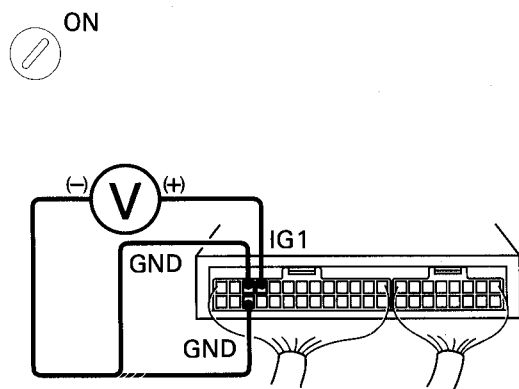
Fail safe function: If trouble occurs in the power source circuit, the ECU cuts off current to the ABS control (solenoid) relay and prohibits ABS control.

WIRING DIAGRAM

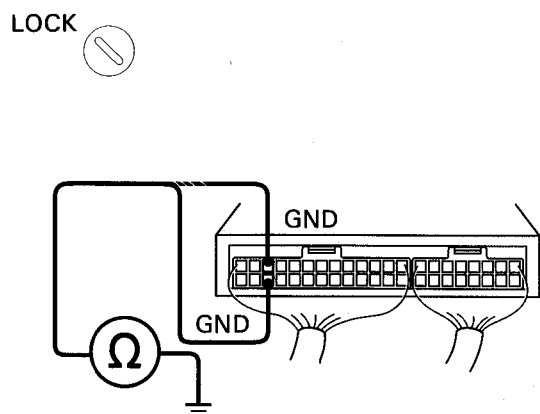


* 1 : 2RZ-FE Column A/T
* 2 : Ex. 2RZ-FE Column A/T

INSPECTION PROCEDURE

1 Check battery positive voltage.**OK** Voltage: 10 – 14 V**OK****NG** Check and repair the charging system.**2** Check voltage between terminals IG1 and GND of ABS ECU connector.**P** Remove ABS ECU with connectors still connected.

- C**
1. Turn the ignition switch ON.
 2. Measure voltage between terminals IG1 and GND of ABS ECU connector.

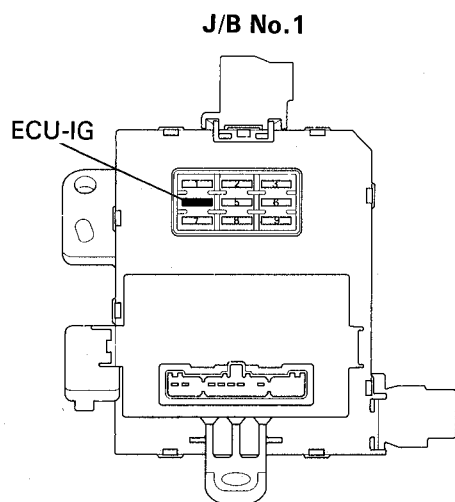
OK Voltage: 10 – 14 V**NG****OK** Check and replace ABS ECU.**3** Check continuity between terminals GND of ABS ECU connector and body ground.

C Measure resistance between terminals GND of ABS ECU connector and body ground.

OK Resistance: 1 Ω or less**OK****NG** Repair or replace harness or connector.

4

Check ECU-IG fuse.



N14134

- P** Remove ECU-IG fuse from J/B No.1.
- C** Check continuity of ECU-IG fuse.
- OK** Continuity

OK

NG

Check for short in all the harness and components connected to ECU-IG fuse (See attached wiring diagram).

Check for open in harness and connector between ABS ECU and battery (See page IN-24).

DTC

43

Malfunction in Deceleration Sensor

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
43	Either of the following (1) or (2) is detected: (1) After the battery terminal is connected, input from the deceleration sensor does not change at one cycle (0 km/h→ more than 30 km/h→ 0 km/h) for 16 times continuously. (2) When the brake pedal is not depressed at vehicle speed of 5 km/h or more, forward and backward G (more than 0.4G) is detected for 30 seconds or more.	• Deceleration sensor • Wire harness for deceleration sensor system • ECU

INSPECTION PROCEDURE

1

Check deceleration sensor (See page BR-51).

OK

NG

Replace deceleration sensor.

Check for open or short in harness and connector between sensor and ECU (See page IN-24).

- **Repair or replace harness and connector.**

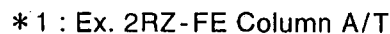
DIC

44

Deceleration Sensor Circuit

This sensor detects deceleration on the vehicle. The sensor signal is used in ABS control. If the sensor functions abnormally, the ABS warning light comes on but the ABS still operates.

WIRING DIAGRAM



INSPECTION PROCEDURE

1

Check for open and short in harness and connector between sensor and ECU
(See page IN-24).

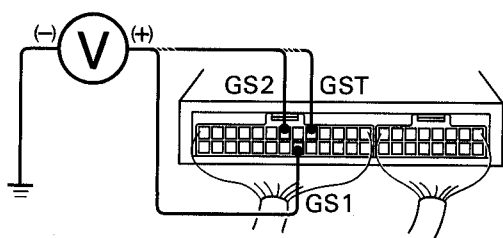
OK

NG

Repair or replace harness or connector.

2

Check voltage between terminals GS1, GS2, GST of ECU and body ground.

BE6653
R15784

P

1. Remove ABS ECU with connectors still connected.
2. Disconnect sensor connector.
3. Turn the ignition switch ON.

C

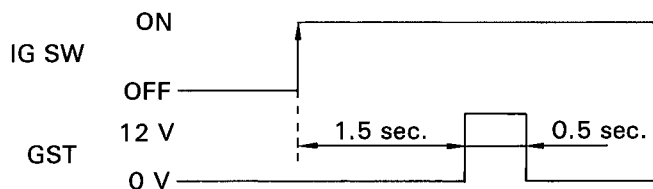
Measure voltage between terminals GS1, GS2, GST of ECU and body ground.

OK

Voltage:

GS1, GS2: 10 – 14 V

GST: As shown below



OK

NG

Check and replace ABS ECU.

BR

Check and replace deceleration sensor.

DTC

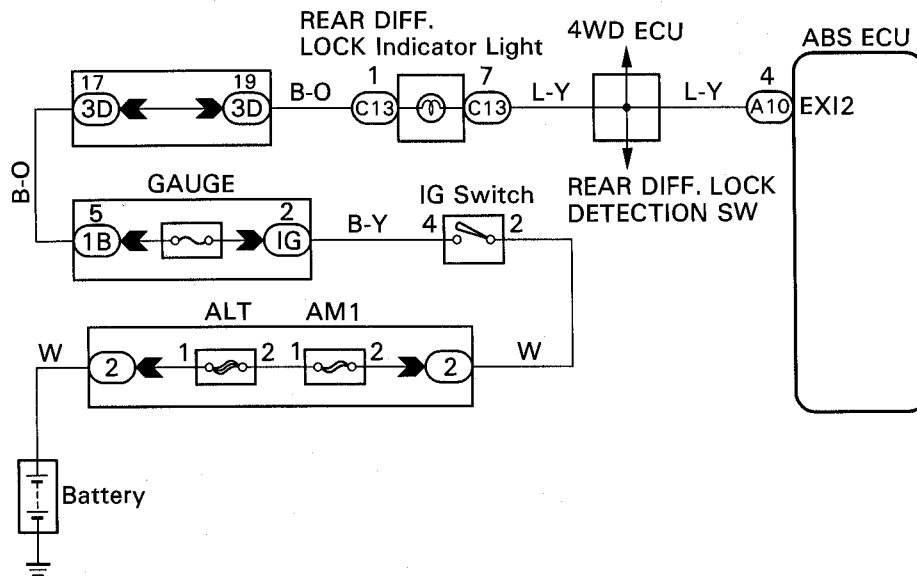
48

Rear Differential Lock circuit
(w/ Rear Differential Lock)

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
48	Open or short circuit in rear differential lock circuit. Rear differential is locking.	• Rear differential lock • ECU

WIRING DIAGRAM



W01019

INSPECTION PROCEDURE

HINT: Rear differential lock switch is OFF.

1 Check the rear differential lock is free (See page SA-151).

OK

NG Repair the rear differential lock system.

2 Is DTC output?

Check DTC on page BR-46.

YES

NO Normal.

3 Check that rear differential lock indicator light close not go off.

YES

NO Go to step **6**.

4 Check that bulb for rear differential lock indicator light is not burnt out.

NO

YES Replace indicator light.

5

Check for open in harness and connector between battery and rear differential lock indicator light, rear lock indicator light and ABS ECU (See page IN-24).

OK**NG**

Repair or replace harness or connector.

Check and replace ABS ECU.

6

Check for short in harness and connector between rear differential lock indicator light and ABS ECU (See page IN-24).

OK**NG**

Repair or replace harness or connector.

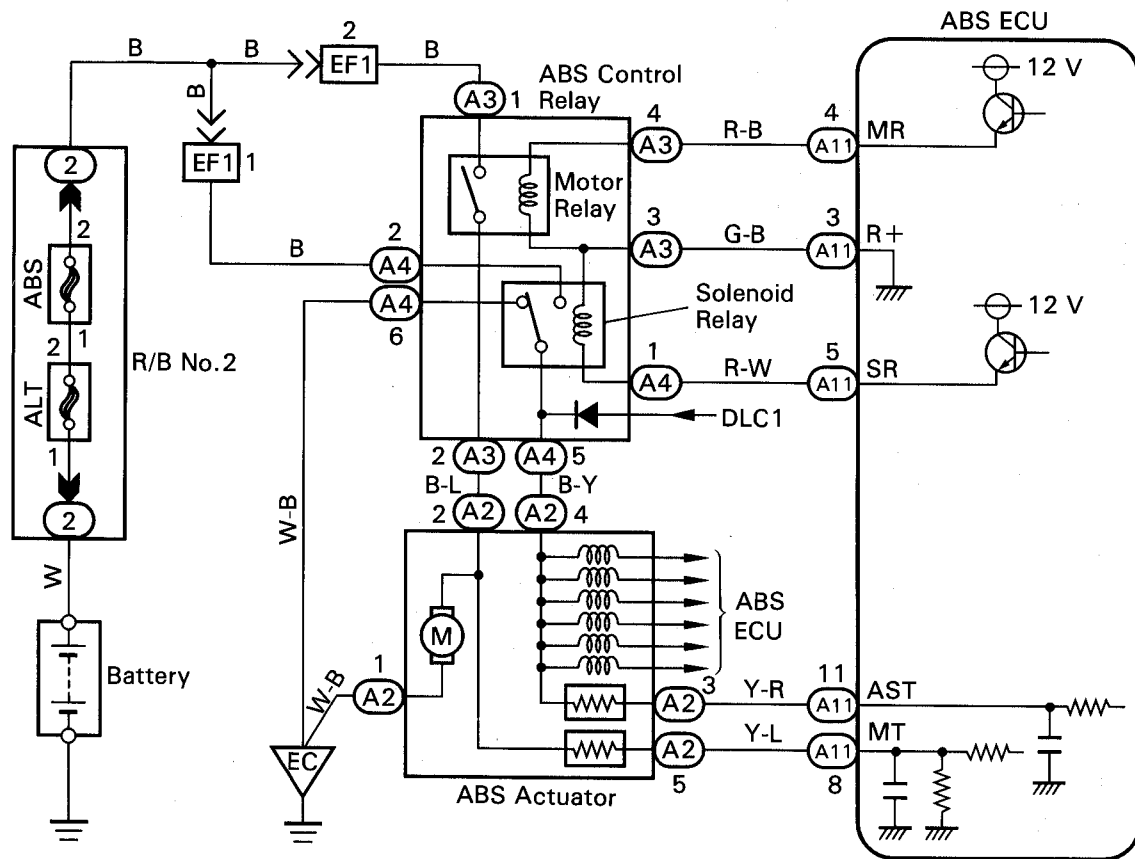
Check and replace ABS ECU.

DTC**51****ABS Pump Motor Lock****CIRCUIT DESCRIPTION**

DTC No.	DTC Detecting Condition	Trouble Area
51	Pump motor is not operating normally during initial check.	• ABS pump motor

Fail safe function: If trouble occurs in the ABS pump motor, the ECU cuts off current to the ABS control (solenoid) relay and prohibits ABS control.

WIRING DIAGRAM



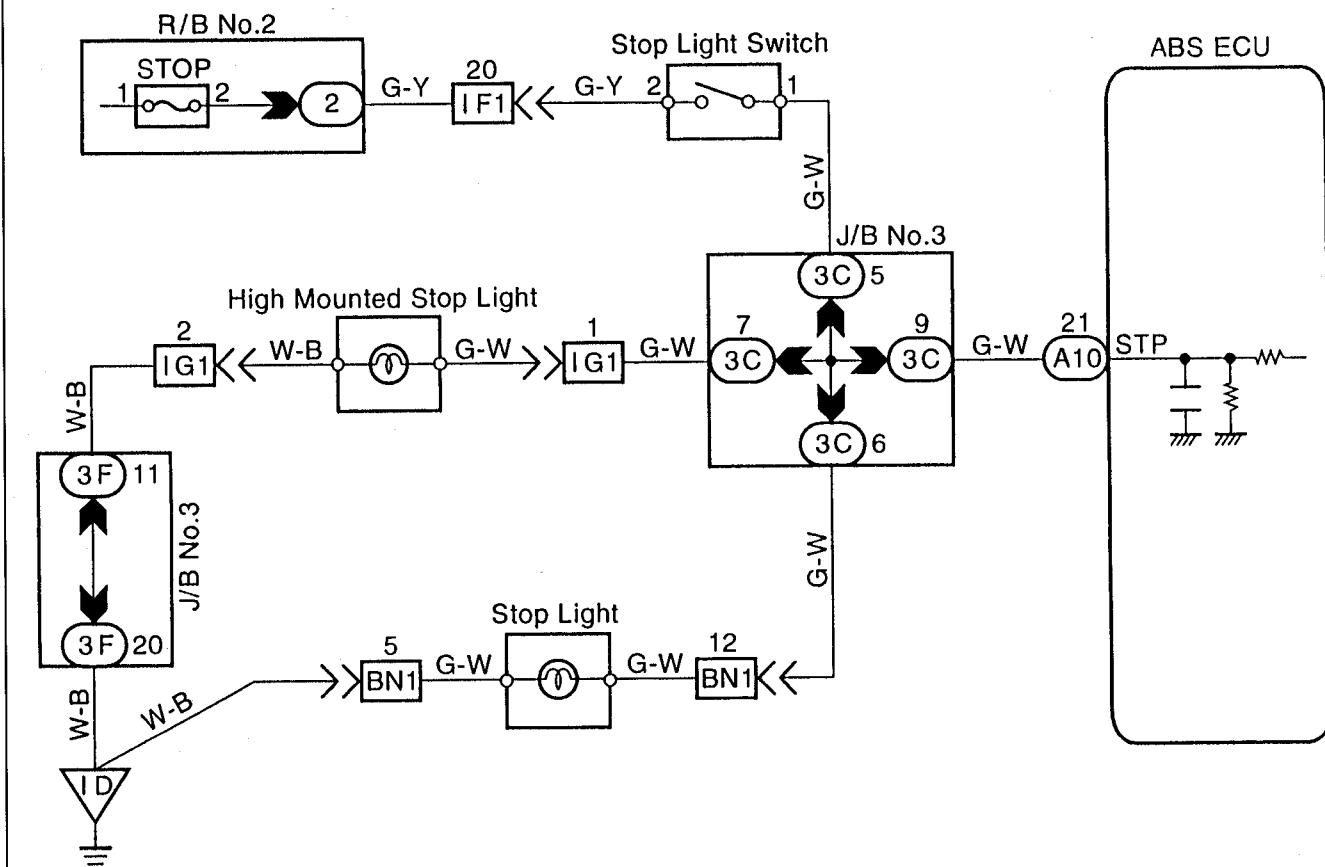
R13718

Stop Light Switch Circuit

CIRCUIT DESCRIPTION

This stop light switch senses whether the brake pedal is depressed or released, and sends the signal to the ECU.

WIRING DIAGRAM



W01170

INSPECTION PROCEDURE

BR

1 Check operation of stop light.

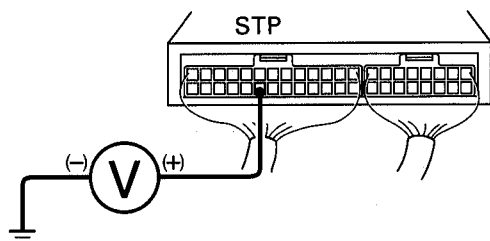
- C** Check that stop light lights up when brake pedal is depressed and turns off when brake pedal is released.

OK

NG Repair stop light circuit (See page BE-24).

2

Check voltage between terminal STP of ABS ECU and body ground.



R15785

- P** Remove ABS ECU with connectors still connected.

- C** Measure voltage between terminal STP of ABS ECU and body ground when brake pedal is depressed.

OK Voltage: 8 – 14 V

NG

OK Proceed to next circuit inspection shown on problem symptoms chart (See page BR-54).

3

Check for open in harness and connector between ABS ECU and stop light switch (See page IN-24).

OK**NG**

Repair or replace harness or connector.

Check and replace ABS ECU.

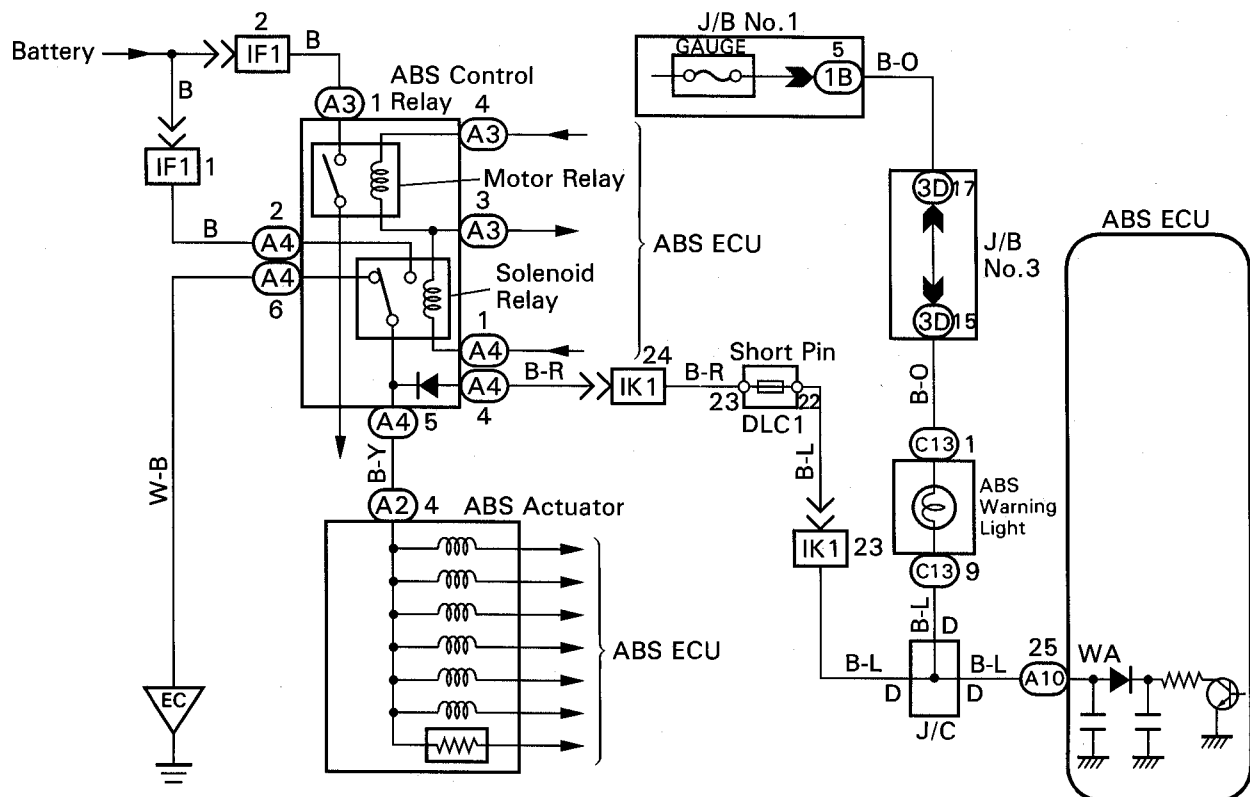
ABS Warning Light Circuit

CIRCUIT DESCRIPTION

If the ECU detects trouble, it lights the ABS warning light while at the same time prohibiting ABS control. At this time, the ECU records a DTC in memory.

After removing the short pin of the DLC1, connect terminals Tc and E1 of the DLC1 to make the ABS warning light blink and output the DTC.

WIRING DIAGRAM



INSPECTION PROCEDURE

Troubleshoot in accordance with the chart below for each trouble symptom.

ABS warning light does not light up	Go to step 1
ABS warning light remains on	Go to step 3

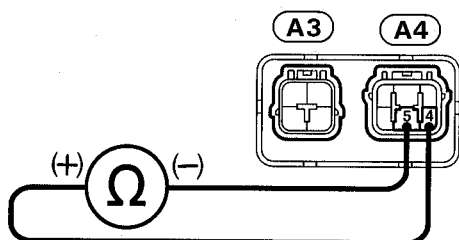
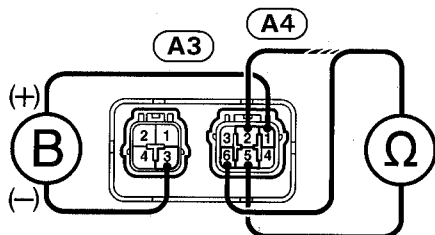
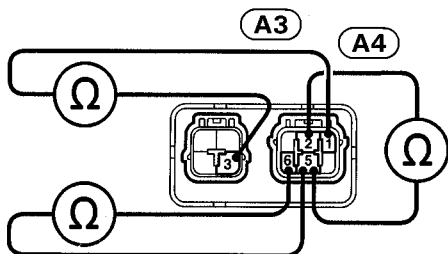
1 Check ABS warning light.

See Combination Meter Troubleshooting on page BE-33.

OK

NG Replace bulb or combination meter assembly.

2 Check ABS control relay.



R14139
R14140
R14144

P Disconnect the connectors from control relay.

C Check continuity between each terminal of ABS control relay.

OK

Terminals (A4) 1 and (A3) 3	Continuity (Reference value 80 Ω)
Terminals (A4) 5 and (A4) 6	Continuity
Terminals (A4) 2 and (A4) 5	Open

C 1. Apply battery voltage between terminals (A4) 1 and (A3) 3.
2. Check continuity between each terminal of ABS control relay.

OK

Terminals (A4) 5 and (A4) 6	Open
Terminals (A4) 2 and (A4) 5	Continuity

C Connect the (+) test lead to terminal 4 of (A4) and the (-) lead to terminal 5 of (A4). Check continuity between the terminals.

OK

Continuity

If there is no continuity, connect the (-) test lead to terminal 4 of (A4) and the (+) lead to terminal 5 of (A4). Recheck continuity between terminals.

OK

NG Replace ABS control relay.

Check for open in harness and connector between DLC1 and ABS control relay and body ground (See page IN-24).

3 Is DTC output?

Check DTC on page BR-46.

NO**YES**

Repair circuit indicated by the code output.

4 Does ABS warning light go off if short pin is removed?**YES****NO**

Check for short in harness and connector between warning light and DLC1 and ECU (See page IN-24).

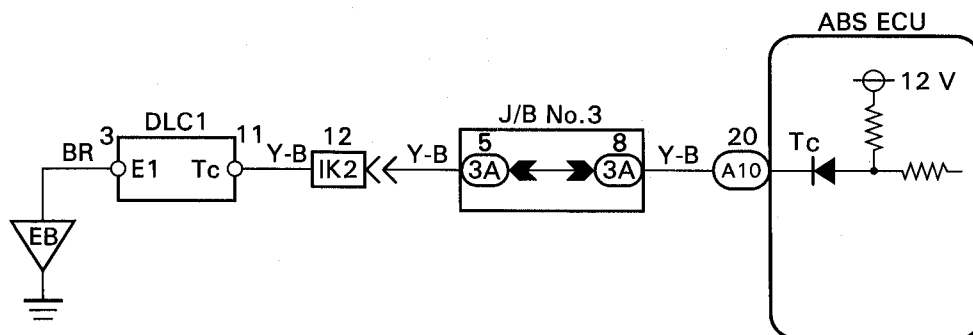
5 Check ABS control relay (See step No.2).**OK****NG**

Replace ABS control relay.

Check for short in harness and connector between DLC1 and ABS control relay (See page IN-24).

Tc Terminal Circuit**CIRCUIT DESCRIPTION**

Connecting terminals Tc and E1 of the DLC1 causes the ECU to display the DTC by flasing the ABS warning light.

WIRING DIAGRAM

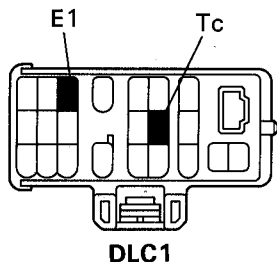
R13725

BR

INSPECTION PROCEDURE

1

Check voltage between terminals Tc and E1 of DLC1.



lei-23-1-A

C

1. Turn the ignition switch ON.
2. Measure voltage between terminals Tc and E1 of DLC1.

OK

Voltage: 10 – 14 V

NG

OK

If ABS warning light does not blink even after Tc and E1 are connected, the ECU may be defective.

2

Check for open and short in harness and connector between ABS ECU and DLC1, DLC1 and body ground (See page IN-24).

OK

NG

Repair or replace harness or connector.

Check and replace ABS ECU.

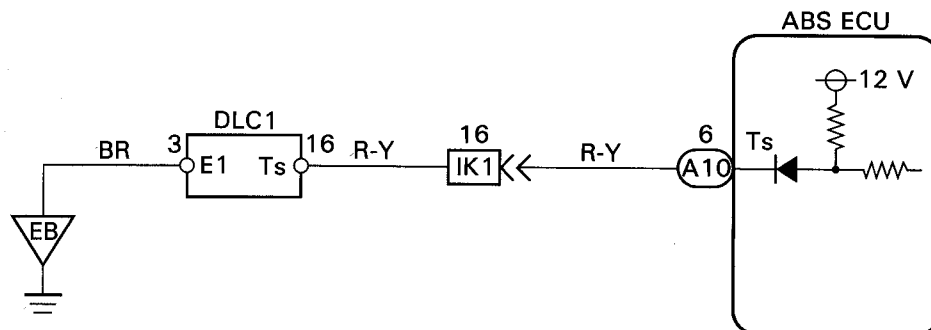
Ts Terminal Circuit

CIRCUIT DESCRIPTION

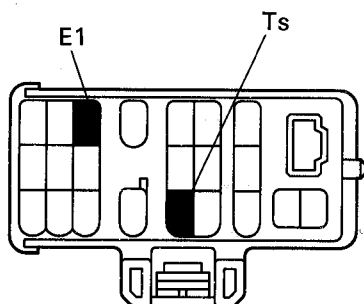
The sensor check circuit detects abnormalities in the speed sensor signal which cannot be detected with the DTC check.

Connecting terminals Ts and E1 of the DLC1 in the engine compartment starts the check.

WIRING DIAGRAM



INSPECTION PROCEDURE

1**Check voltage between terminals Ts and E1 of DLC1.**

DLC1

lei-23-1-A

C

1. Turn the ignition switch ON.
2. Measure voltage between terminals Ts and E1 of DLC1.

OK

Voltage: 10 – 14 V

NG**OK**

If ABS warning light does not blink even after Ts and E1 are connected, the ECU may be defective.

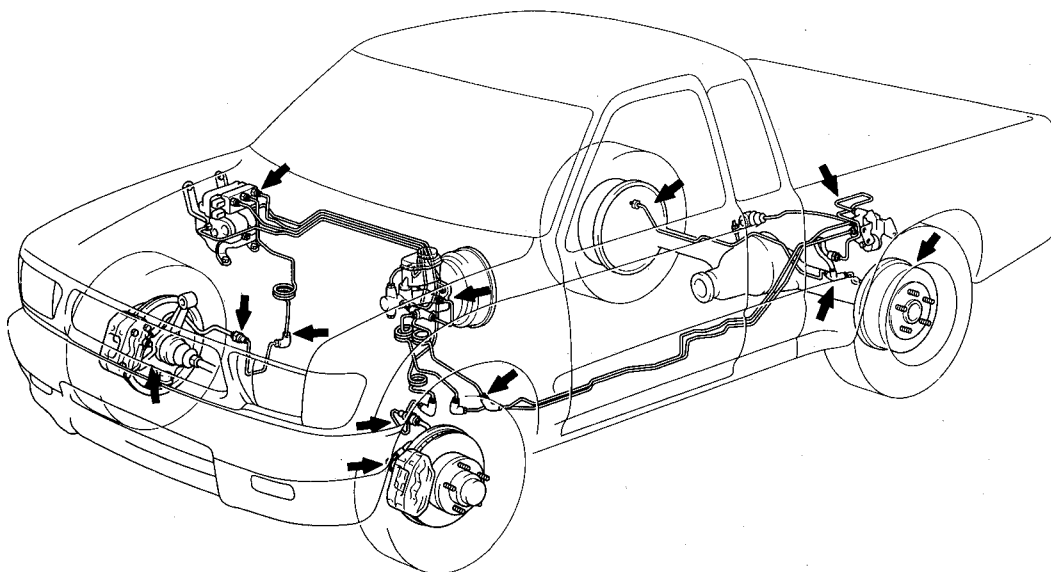
2**Check for open and short in harness and connector between ABS ECU and DLC1, DLC1 and body ground (See page IN-24).****OK****NG**

Repair or replace harness or connector.

Check and replace ABS ECU.

Check for Fluid Leakage

Check for fluid leakage from actuator or hydraulic lines.



R15791

BR

SERVICE SPECIFICATIONS

SERVICE DATA

BROSA-23

Brake pedal height (from asphalt sheet)		159.1 — 169.1 mm (6.264 — 6.657 in.)
Brake pedal freeplay		3 — 6 mm (0.12 — 0.24 in.)
Brake pedal reserve distance at 490 N (50 kgf, 110.2 lbf)		More than 72 mm (2.83 in.)
Brake booster push rod to piston clearance (w/SST)		0 mm (0 in.)
Front brake pad thickness		
2WD	STD	12.0 mm (0.472 in.)
	Minimum	1.0 mm (0.039 in.)
4WD	STD	11.5 mm (0.453 in.)
	Minimum	1.0 mm (0.039 in.)
Disc thickness	STD	22.0 mm (0.866 in.)
	Minimum	20.0 mm (0.787 in.)
Disc runout	Maximum	0.07 mm (0.0028 in.)
Rear brake drum inside diameter		
2WD	STD	254.0 mm (10.00 in.)
	Maximum	256.0 mm (10.08 in.)
4WD	STD	295.0 mm (11.61 in.)
	Maximum	297.0 mm (11.69 in.)
Rear brake shoe lining thickness		
2WD	STD	5.5 mm (0.217 in.)
	Minimum	1.0 mm (0.039 in.)
4WD	STD	6.0 mm (0.236 in.)
	Minimum	1.0 mm (0.039 in.)
Rear brake drum to shoe clearance		0.6 mm (0.024 in.)
Parking brake lever travel at 196 N (20 kgf, 44 lbf)		12 — 18 clicks

TORQUE SPECIFICATIONS

Part tightened		N·m	kgf·cm	ft·lbf
Master cylinder x Piston stopper bolt	w/ ABS	10	100	7
	w/o ABS	8	80	60 in·lbf
Master cylinder x Reservoir	w/ ABS	1.7	18	16 in·lbf
	w/o ABS	1.5	15	13 in·lbf
Master cylinder x Brake booster		13	130	9
Brake line union nut		15	155	11
Brake booster clevis lock nut		25	260	19
Brake booster x Pedal bracket		13	130	9
Bleeder plug		11	110	8
Front disc brake caliper x Sliding pin	2WD	88	900	65
Front disc brake caliper x Steering knuckle	4WD	123	1,250	90
Front disc brake torque plate x Steering knuckle	2WD	108	1,100	80
Front disc x Front axle hub	2WD	64	650	47
Front disc brake caliper x Flexible hose		30	310	22
Rear drum brake wheel cylinder x Backing plate		10	100	7
Parking brake bellcrank bracket x Backing plate		13	130	9
LSP & BV x LSP & BV bracket		13	130	9
LSP & BV x Load Sensing Spring Assembly		18	185	13
Load Sensing Spring Assembly x Shackle No.1		18	185	13
Shackle No.1 x Shackle No.2		24	250	18
Shackle No.2 x Shackle Bracket		13	130	9
LSP & BV bracket x Frame		29	300	22
ABS actuator x ABS actuator bracket		5.4	55	48 in·lbf
ABS actuator bracket x Body		19	195	14
Speed sensor installation bolt		8	82	71 in·lbf

BR