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# PROPELLER SHAFT

REFER TO LAND CRUISER (STATION WAGON)  
REPAIR MANUAL FOR CHASSIS AND BODY  
(Pub. No. RM184E)

NOTE: The following pages contain only the  
points which differ from the above listed man-  
ual.

**(STATION WAGON)**

DESCRIPTION.....PR-2  
PROPELLER SHAFT.....PR-3

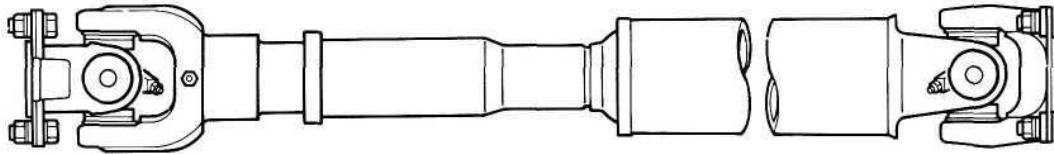
**PR**

## DESCRIPTION

### DESCRIPTION

The propeller shaft is connected to the front differential and the transfer via two joints.

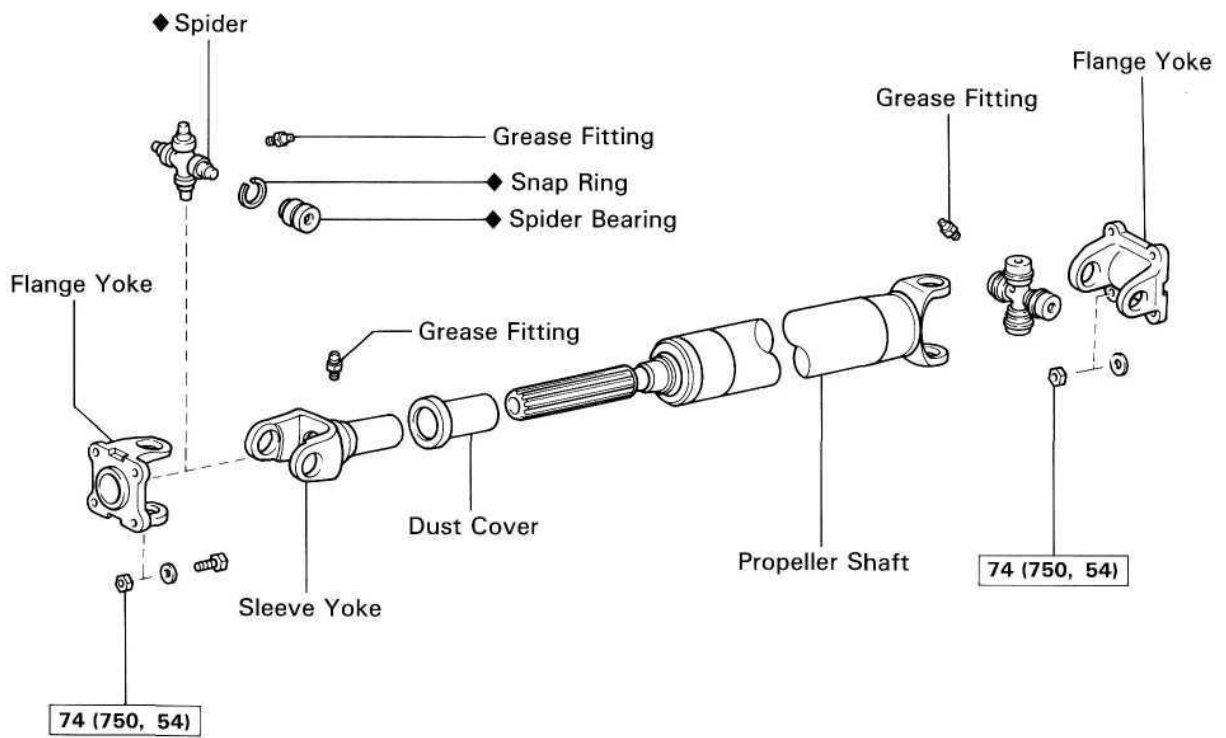
Front Propeller Shaft



R05260

# PROPELLER SHAFT COMPONENTS

• Front Propeller Shaft



N·m (kgf·cm, ft·lbf) : Specified torque

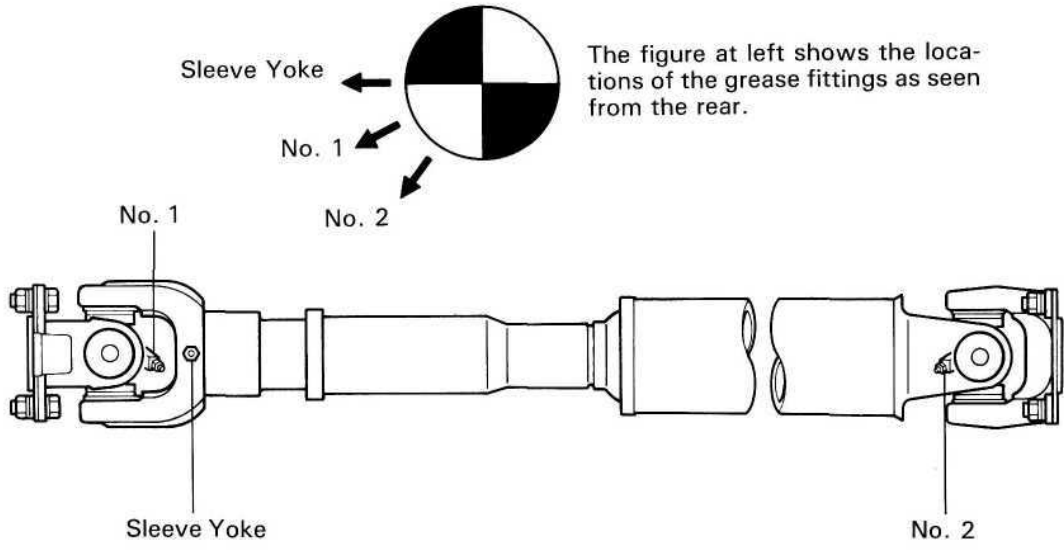
◆ Non-reusable part

### PROPELLER SHAFT ASSEMBLY

HINT: When replacing the spider, be sure that the grease fitting assembly hole is facing in the direction shown in the illustration.

#### SPIDER GREASE FITTING ASSEMBLY DIRECTION

Front Propeller Shaft



# SUSPENSION AND AXLE

REFER TO FOLLOWING REPAIR MANUALS:

Manual Name	Pub. No.
• Land Cruiser (Hardtop and Canvas Top) Chassis and Body Repair Manual	RM183E
• Land Cruiser (Station Wagon) Chassis and Body Repair Manual	RM184E
• Land Cruiser (Hardtop, Canvas Top and Station Wagon) Chassis and Body Repair Manual Supplement	RM290E

NOTE: The following pages contain only the points which differ from the above listed manuals.

**SA**

## (HARDTOP & CANVAS TOP)

FRONT DIFFERENTIAL.....	SA-2
ASSEMBLY REMOVAL AND INSTALLATION.....	SA-2

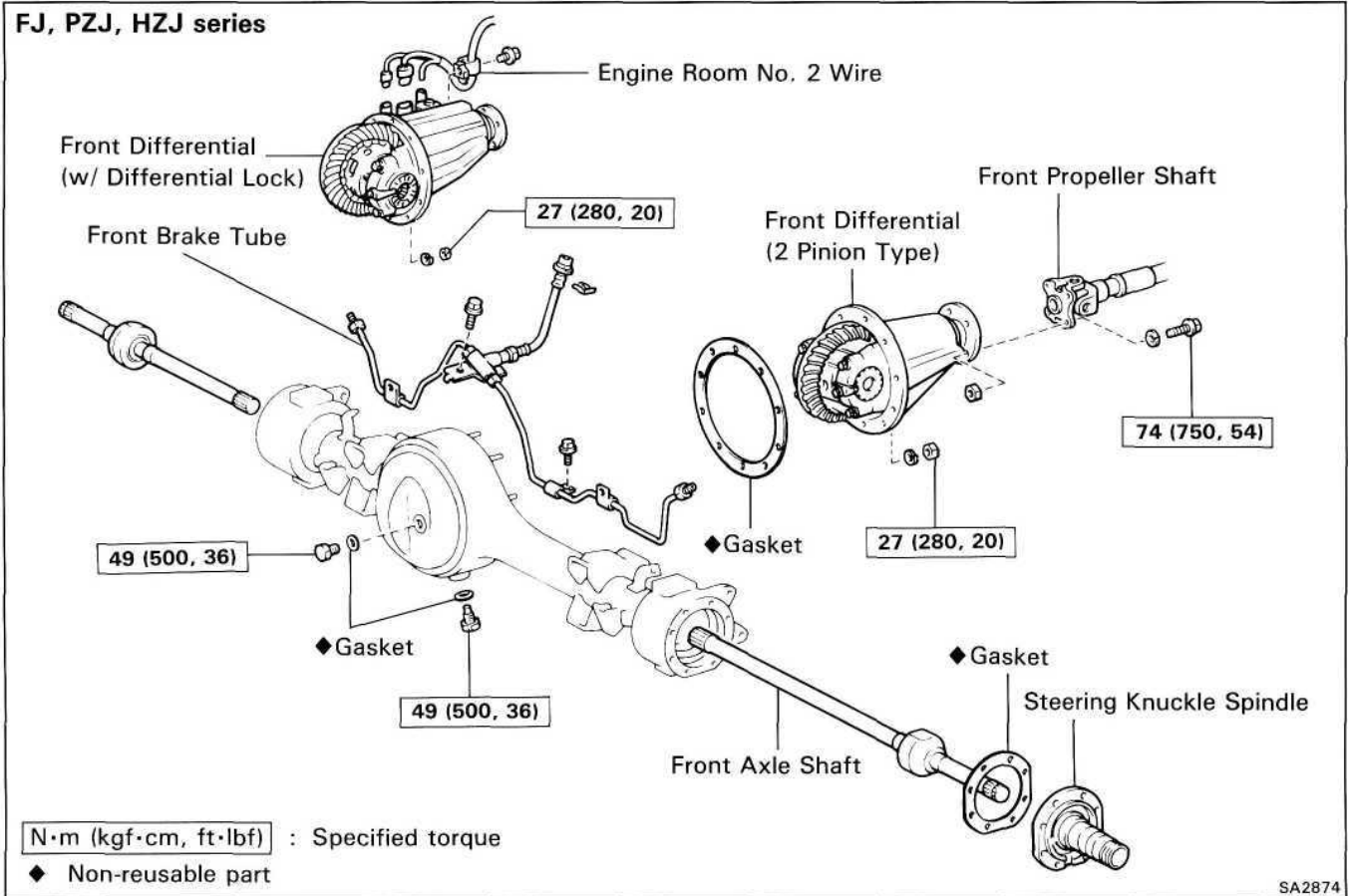
## (STATION WAGON)

WHEEL ALIGNMENT.....	SA-3
PRIMARY INSPECTION.....	SA-3
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FRONT DIFFERENTIAL.....	SA-6
ASSEMBLY REMOVAL AND INSTALLATION.....	SA-6
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# FRONT DIFFERENTIAL

## ASSEMBLY REMOVAL AND INSTALLATION

### COMPONENTS



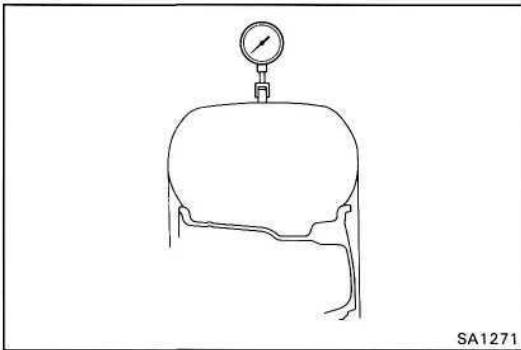
# WHEEL ALIGNMENT

## PRIMARY INSPECTION

**1. MAKE FOLLOW CHECKS AND CORRECT ANY PROBLEMS**

- (a) Check the tires for wear and proper inflation.

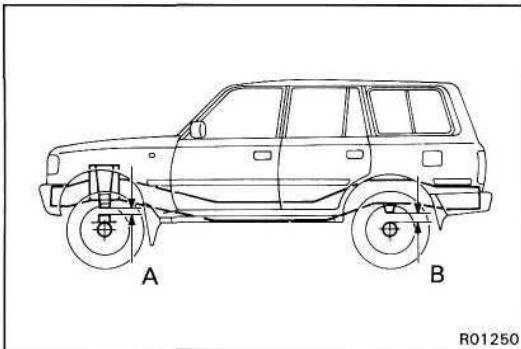
**Cold tire inflation pressure:**  
See page SA-7



- (b) Check the tire runout.

**Tire runout:**  
**3.0 mm (0.118 in.) or less**

- (c) Check the wheel bearings for looseness.
- (d) Check the suspension for looseness.
- (e) Check the steering linkage for looseness.
- (f) Check that the absorbers work properly by using the standard bounce test.



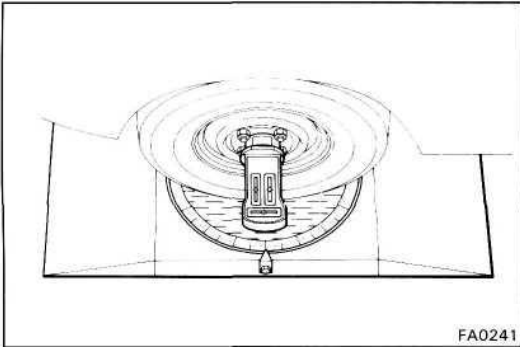
**2. MEASURE FOLLOW SPRING CLEARANCE AND BUMPER STOPPER CLEARANCE**

**A: Follow spring clearance (Front)**  
**B: Bumper stopper clearance (Rear)**

	A	B
For Europe	39 mm (1.54 in.)	117 mm (4.61 in.)
For Australia*	52 mm (2.01 in.)	105 mm (4.13 in.)
For Middle East	38 mm (1.50 in.)	92 mm (3.62 in.)
Others	38 mm (1.50 in.)	118 mm (4.66 in.)

\*: w/o Australia option

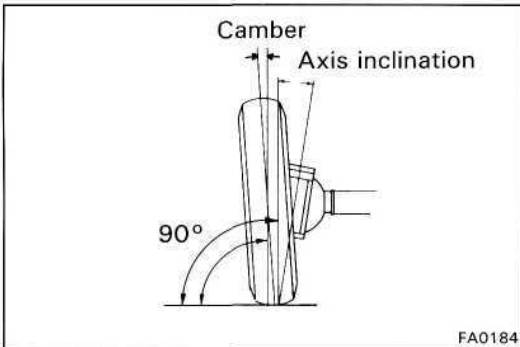
If the clearance of the vehicle is not standard, try to level the vehicle by rocking it down.



## FRONT WHEEL ALIGNMENT

### 1. INSTALL WHEEL ALIGNMENT EQUIPMENT

Follow the specific instructions of the equipment manufacturer.



### 2. INSPECT CAMBER AND STEERING AXIS INCLINATION

**Camber:**

$1^{\circ}00' \pm 45'$  ( $1.00^{\circ} \pm 0.75^{\circ}$ )

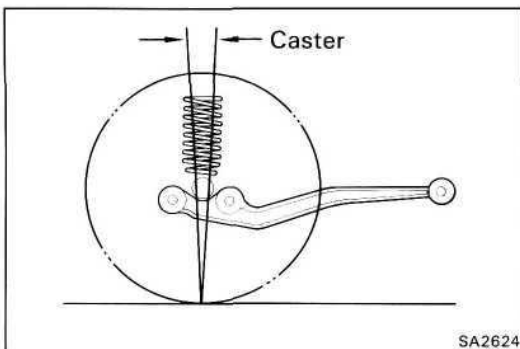
**Cross camber:**

30' or less ( $0.50^{\circ}$  or less)

**Steering axis inclination:**

$13^{\circ}00' \pm 45'$  ( $13.00^{\circ} \pm 0.75^{\circ}$ )

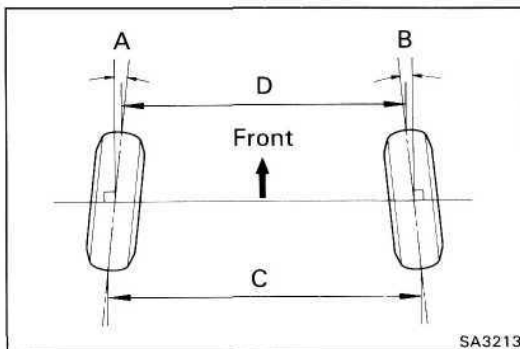
If the steering axis inclination is not as specified after camber have been correctly adjusted, recheck the steering knuckle and front wheel for bending or looseness.



### 3. INSPECT CASTER

$3^{\circ}00' \pm 1^{\circ}$  ( $3.00^{\circ} \pm 1^{\circ}$ )

If caster is not as specified, inspect and replace damaged or worn parts.

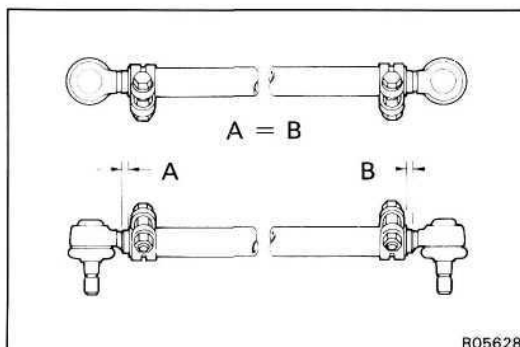


### 4. INSPECT TOE-IN

**Toe-in (total):**

Tire type	A + B	C - D
Bias tire	$0^{\circ}24' \pm 0^{\circ}12'$ ( $0.4^{\circ} \pm 0.2^{\circ}$ )	$4 \pm 2$ mm ( $0.16 \pm 0.08$ in.)
Radial tire	$0^{\circ}12' \pm 0^{\circ}12'$ ( $0.2^{\circ} \pm 0.2^{\circ}$ )	$2 \pm 2$ mm ( $0.08 \pm 0.08$ in.)

If toe-in is not specification, adjust by tie rod.

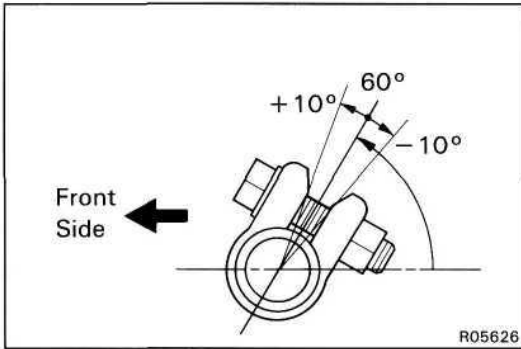


### 5. ADJUST TOE-IN

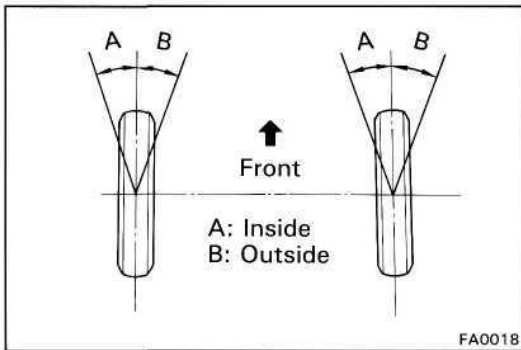
- Loosen the clamp bolts and nuts.
- Adjust toe-in to the correct value by turning the tie rod.
- Insure that the lengths of the tie rod ends are the same.
- Torque the tie rod clamp bolts and nuts.

**Torque:** 37 Nm (375 kgf-cm, 27 ftlbf)





HINT: The clamps opening must be positioned at the rear of the tie rod and and face within  $60^\circ \pm 10^\circ$  from the verticle axis.

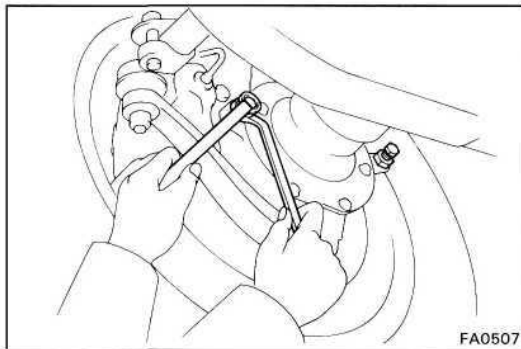


**6. INSPECT WHEEL ANGLE**

Remove the caps of the knuckle stopper bolts and check the steering angles.

**Wheel angle:**

Wheel angle (Max.)		
Inside wheel	w/ Power steering	$35^\circ \begin{smallmatrix} +0^\circ \\ -3^\circ \end{smallmatrix}$
	w/o Power steering	$32^\circ \begin{smallmatrix} +0^\circ \\ -3^\circ \end{smallmatrix}$
Outside wheel (reference)	w/ Power steering	$31^\circ$
	w/ Power steering	$29^\circ$



HINT: When the steering wheel is fully turned, make sure that the wheel is not touching the body or brake flexible hose.

If maximum steering angles differ from the standard value, adjust the wheel angle with the knuckle stopped bolts.

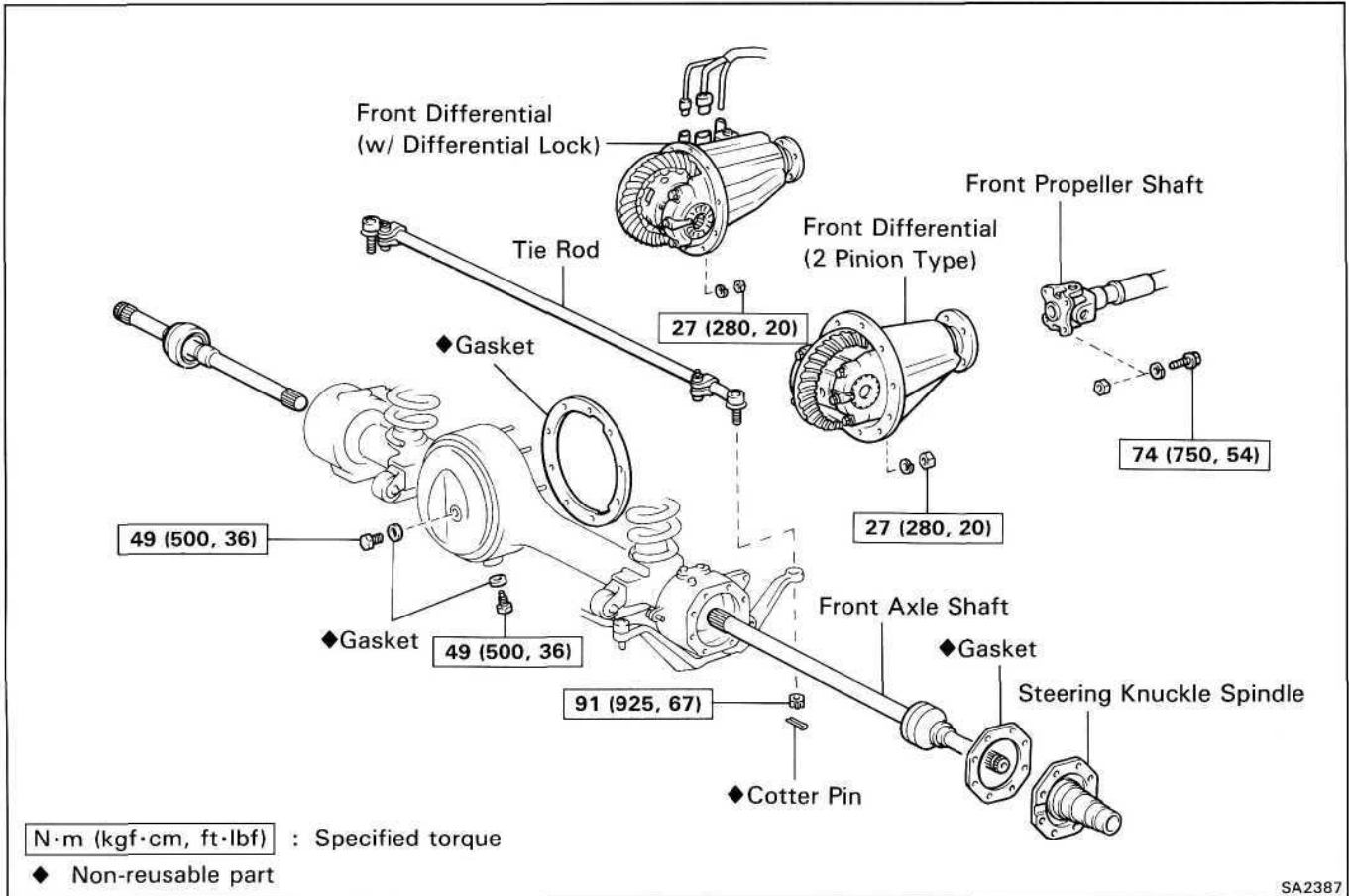
**Torque: 44 N·m (450 kgfcm, 33 ft-lbf)**

If the wheel angle still cannot be adjusted within limits, inspect and replace damaged or worn steering parts.

# FRONT DIFFERENTIAL

## ASSEMBLY REMOVAL AND INSTALLATION

### COMPONENTS



# SERVICE SPECIFICATIONS

## SERVICE DATA (STATION WAGON)

Cold tire inflation pressure (For Europe)	Moving condition	Tire size	Engine (Grade)	Pressure kPa (kgf/cm <sup>2</sup> or bar, psi)		
				Front	Rear	
	For all loads including full rated loads	215/80R16	1HZ, 1HD-T (All grade)	240 (2.4, 35)	300 (3.0, 44)	
		275/70R16	1FZ, 1HD-T (GX, VX)	220 (2.2, 32)	220 (2.2, 32)	
	Optional inflation for reduced loads (2 front passengers + 2 rear passengers + 200 kg [440 lb.])	215/80R16	1HZ (Standard)	210 (2.1, 30)	220 (2.2, 32)	
1HZ (GX)			220 (2.2, 32)	240 (2.4, 35)		
1HD-T (GX, VX)			230 (2.3, 33)	240 (2.4, 35)		
	275/70R16	1FZ, 1HD-T (GX, VX)	220 (2.2, 32)	220 (2.2, 32)		
Cold tire inflation pressure (For Australia)	Moving condition	Tire size	Pressure kPa (kgf/cm <sup>2</sup> or bar, psi)			
			Front	Rear		
	For all loads including full rated loads	7.50R16-6PRLT		260 (2.6, 38)	350 (3.5, 51)	
		275/70R16		220 (2.2, 32)	220 (2.2, 32)	
	Optional inflation for reduced loads (2 front passengers + 2 rear passengers + 200 kg [440 lb.])	7.50R16-6PRLT		240 (2.4, 35)	320 (3.2, 46)	
275/70R16			220 (2.2, 32)	220 (2.2, 32)		
Cold tire inflation pressure (Others)	Tire size		Pressure kPa (kgf/cm <sup>2</sup> or bar, psi)			
			Front	Rear		
	7.50-16-6PRLT		200 (2.0, 29)	300 (3.0, 44)		
	7.50R16-6PRLT		250 (2.5, 36)	325 (3.25, 47)		
	245/85R16		210 (2.1, 30)	260 (2.6, 38)		
275/70R16		220 (2.2, 32)	220 (2.2, 32)			
Follow spring and bumper stopper clearance	A: Follow spring clearance (Front) B: Bumper stopper clearance (Rear)  *: w/o Australia option	A		B		
		For Europe		39 mm (1.54 in.)	117 mm (4.61 in.)	
		For Australia*		52 mm (2.01 in.)	105 mm (4.13 in.)	
		For Middle East		38 mm (1.50 in.)	92 mm (3.62 in.)	
		Others		38 mm (1.50 in.)	118 mm (4.66 in.)	
Front wheel alignment	Camber	Inspection standard		1°00' ± 45' (1.00° ± 0.75°)		
		Left-right error		30' or less (0.50° or less)		
	Steering axis inclination	Inspection standard		13°00' ± 45' (13.00° ± 0.75°)		
		Left-right error		30' or less (0.50° or less)		
	Caster	Inspection standard		3°00' ± 1° (3.00° ± 1°)		
		Left-right error		30' or less (0.50° or less)		
	Toe-in	Bias tire		0°24' ± 0°12' (0.4° ± 0.2°) (4 mm ± 2 mm, 0.16 in. ± 0.08 in.)		
		Radial tire		0°12' ± 0°12' (0.2° ± 0.2°) (2 mm ± 2 mm, 0.08 in. ± 0.08 in.)		
	Wheel angle (Max)			Inside wheel	Outside wheel	
		w/ Power steering		35°00' <sup>+0°</sup> <sub>-3°</sub>	31° (reference)	
w/o Power steering		32°00' <sup>+0°</sup> <sub>-3°</sub>	29°00' (reference)			

## TORQUE SPECIFICATIONS (HARDTOP & CANVAS TOP)

Part tightened	N·m	kgf·cm	ft·lbf
Front differential × Front axle housing	27	280	20
Front differential × Front propeller shaft	74	750	50
Front differential filler plug	49	500	36
Front differential drain plug	49	500	36

## (STATION WAGON)

Part tightened	N·m	kgf·cm	ft·lbf
Tie rod end clamp bolt	37	375	27
Steering knuckle stopper bolt lock nut	44	450	33
Front differential × Front axle housing	27	280	20
Front differential × Front propeller shaft	74	750	50
Front differential filler plug	49	500	36
Front differential drain plug	49	500	36

# BRAKE SYSTEM

REFER TO LAND CRUISER (STATION WAGON)  
REPAIR MANUAL FOR CHASSIS AND BODY (Pub.  
No. RM184E)

NOTE: The following pages contain only the  
points which differ from the above listed manual.










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**BR**

## PREPARATION

### SST (SPECIAL SERVICE TOOLS)

	09023-00100 Union Nut Wrench 10 mm	
	09709-29017 LSPV Gauge Set	
	09737-00010 Brake Booster Push Rod Gauge	
	09751-36011 Brake Tube Union Nut 10 x 12 mm Wrench	
	09843-18020 Diagnosis Check Wire	w/ABS
	09990-00150 ABS Actuator Checker and Sub-harness	w/ABS
	09990-00163 ABS Actuator Checker Sheet "A"	w/ ABS
	09990-00200 ABS Actuator Checker Sub-harness "C"	w/ ABS
	09990-00210 ABS Actuator Checker Sub-harness "E"	w/ABS

### RECOMMENDED TOOLS

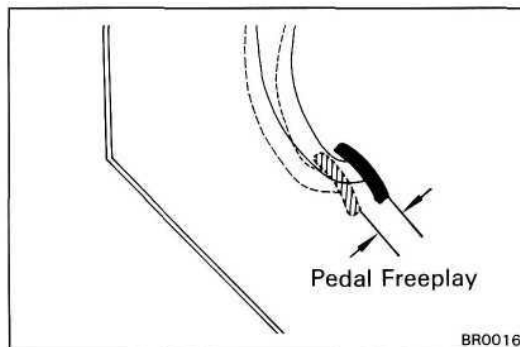
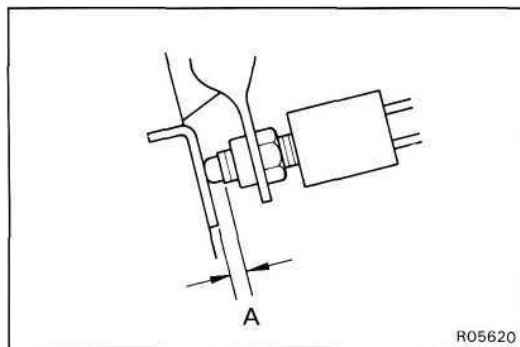
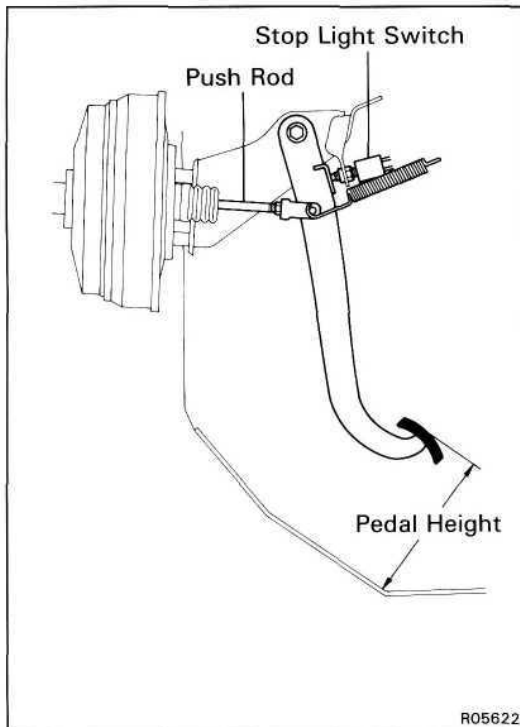
	09082-00015 TOYOTA Electrical Tester	
	09905-00013 Snap Ring Pillers	

### EQUIPMENT

Torque wrench	
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**LUBRICANT**

Item	Capacity	Classification
Brake fluid	-	SAE J1703 or FMVSS No.116 DOT 3



## CHECK AND ADJUSTMENT

### BRAKE PEDAL CHECK AND ADJUSTMENT

#### 1. CHECK THAT PEDAL HEIGHT IS CORRECT, AS SHOWN

**Pedal height from asphalt sheet:**

**167.5 - 177.5 mm (6.59 - 6.99 in.)**

If the pedal height is incorrect, adjust it.

#### 2. IF NECESSARY, ADJUST PEDAL HEIGHT

- (a) Disconnect the connector from the stop light switch.
- (b) Loosen the stop light switch lock nut and remove the stop light switch.
- (c) Loosen the push rod lock nut.
- (d) Adjust the pedal height by turning the pedal push rod.
- (e) Tighten the push rod lock nut.

**Torque: 25 Nm (260 kgfcm, 19 ftlbf)**

- (f) Install the stop light switch and turn it until it lightly contacts the pedal stopper.
- (g) Return the stop light switch one turn.
- (h) Check clearance (A) between the stop light switch and pedal.

**Clearance:**

**0.5 - 2.4 mm (0.02 - 0.09 in.)**

- (i) Tighten the stop light switch lock nut.
- (j) Connect the connector to the stop light switch.
- (k) Check that the stop lights come on when the brake pedal is depressed, and go off when the brake pedal is released.
- (l) After adjusting the pedal height, check the pedal freeplay.

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

#### 3. CHECK THAT PEDAL FREEPLAY IS CORRECT, AS SHOWN

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

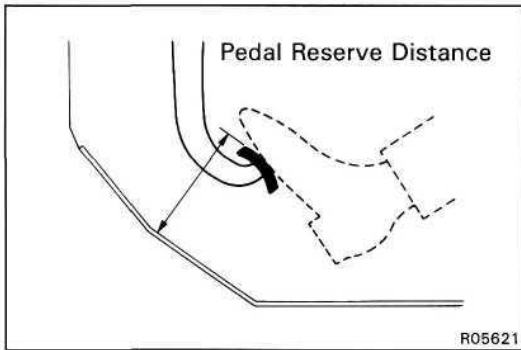
**Pedal freeplay:**

**3 - 6 mm (0.12 - 0.24 in.)**

**HINT:** The freeplay to the first point of resistance is due to the play between the clevis and pin. It is 3 — 6 mm (0.12 - 0.24 in.) on the pedal.

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





**4. CHECK THAT PEDAL RESERVE DISTANCE IS CORRECT, AS SHOWN**

Release the parking brake.

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

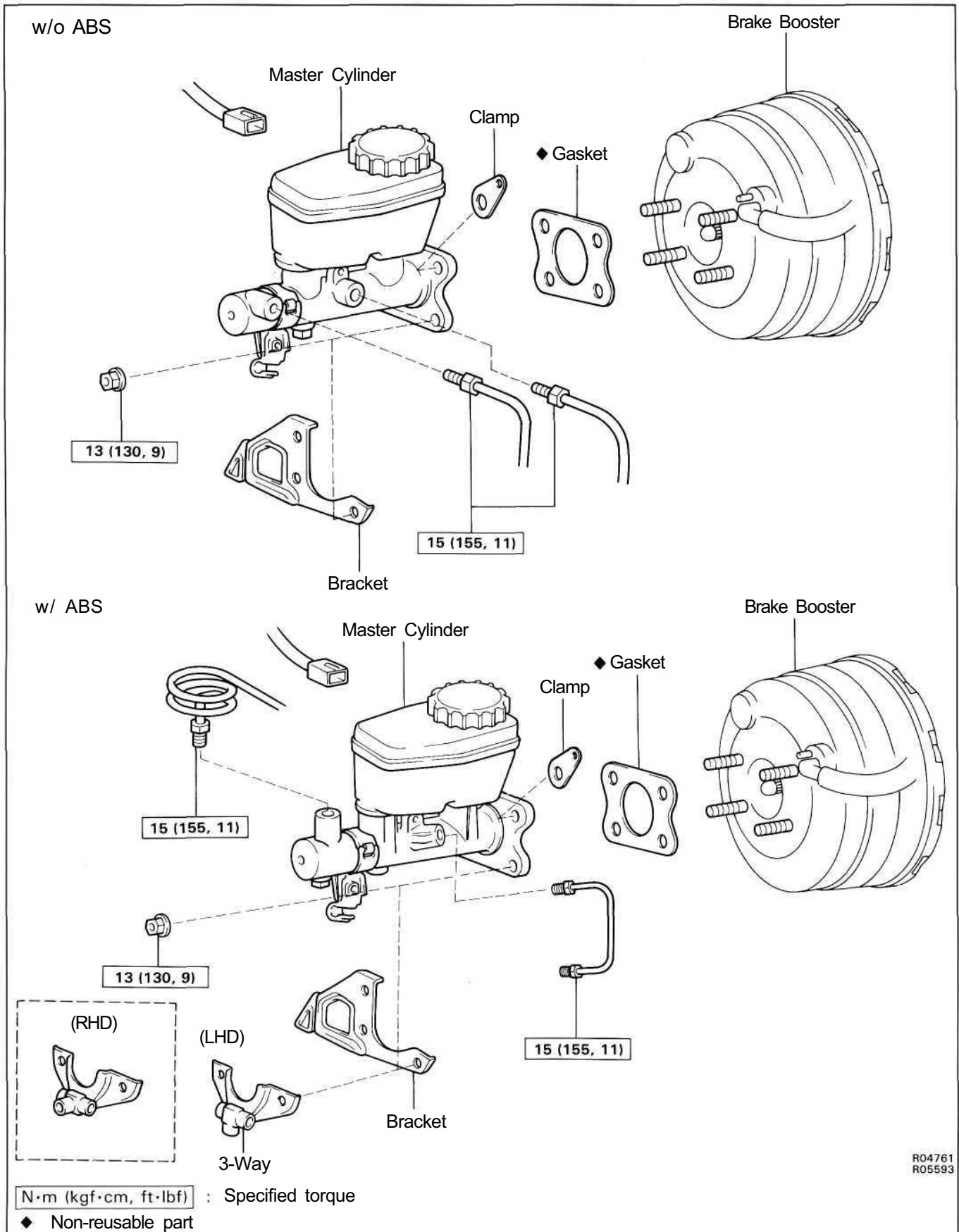
**Pedal reserve distance from asphalt sheet at 490 N (50 kgf, 110.2 lbf):**

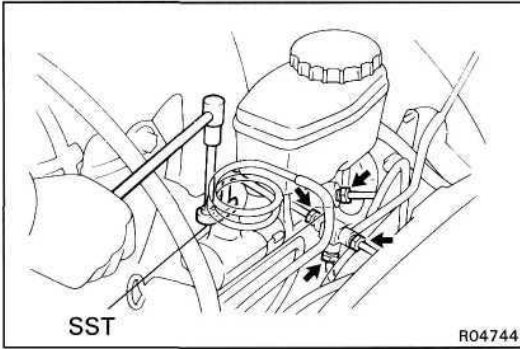
**More than 68 mm (2.68 in.)**

If the reserve distance is incorrect, troubleshoot the brake system.

# MASTER CYLINDER

## MASTER CYLINDER REMOVAL

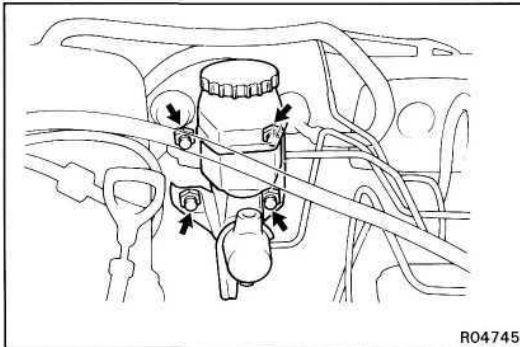




1. **DISCONNECT LEVEL WARNING SWITCH CONNECTOR**
2. **TAKE OUT FLUID WITH SYRINGE**  
**NOTICE:** Do not let brake fluid remain on a painted surface. Wash it off immediately.

3. **DISCONNECT BRAKE LINES**

Using SST, disconnect brake lines from the master cylinder.  
SST 09023-00100

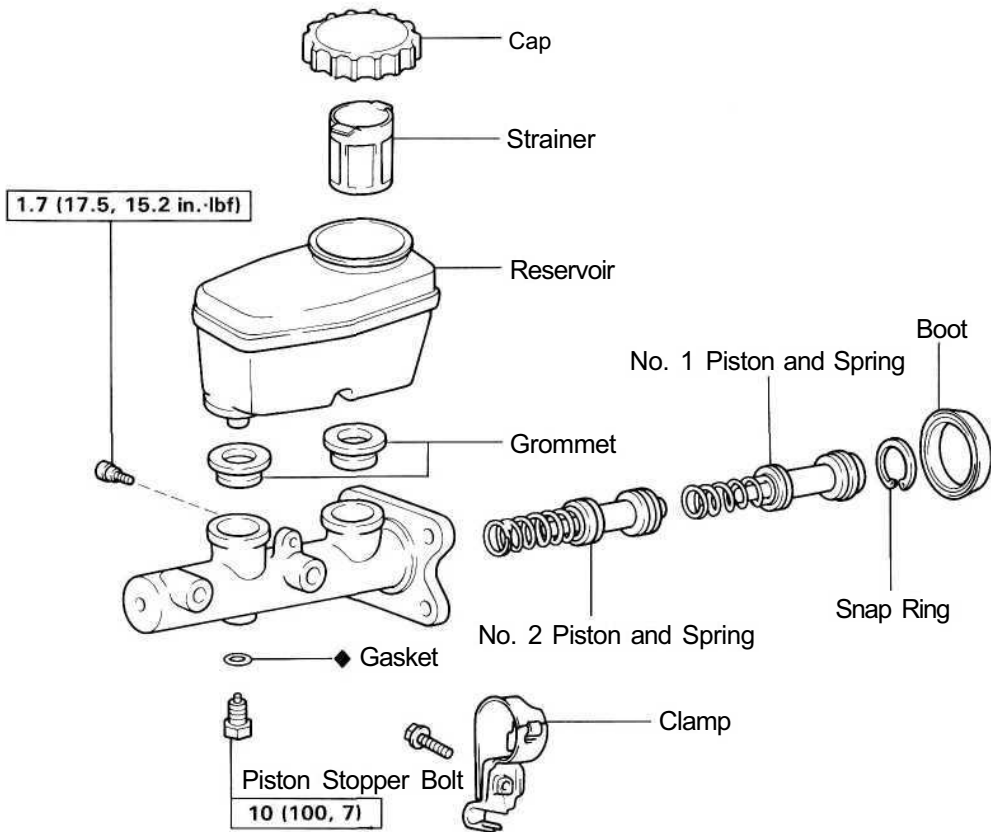


4. **REMOVE MASTER CYLINDER**

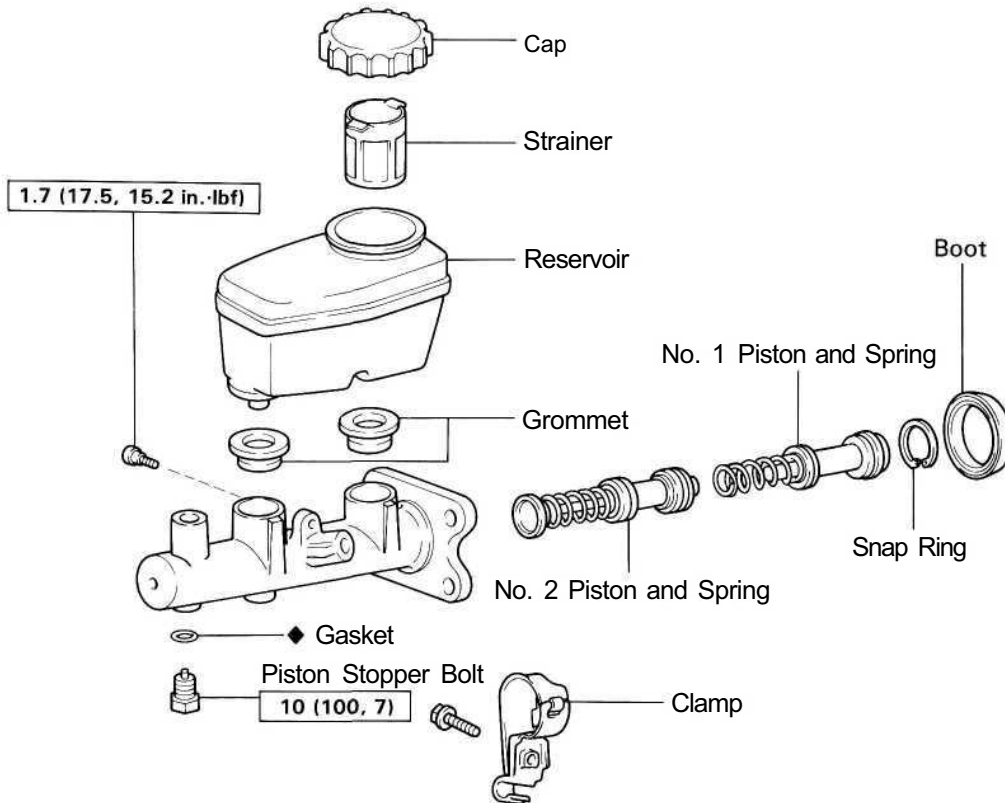
- (a) Remove the mounting nuts.
- (b) (w/ ABS)  
Remove the 3-way, clamp and the bracket.  
(w/o ABS)  
Remove the clamp and the bracket.
- (c) Pull out the master cylinder and gasket.

**COMPONENTS**

w/o ABS

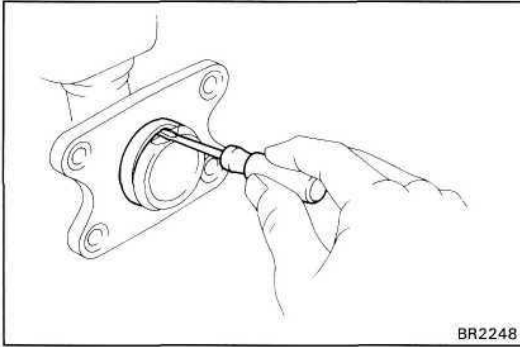


w/ ABS



**N·m (kgf·cm, ft·lbf)** : Specified torque

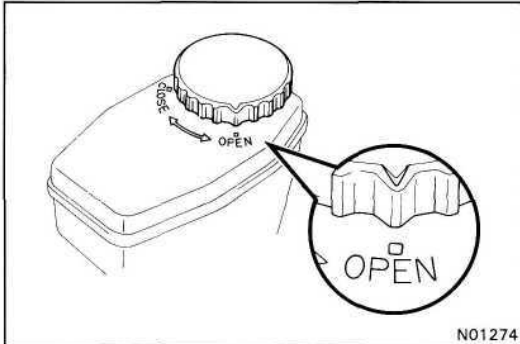
◆ Non-reusable part



## MASTER CYLINDER DISASSEMBLY

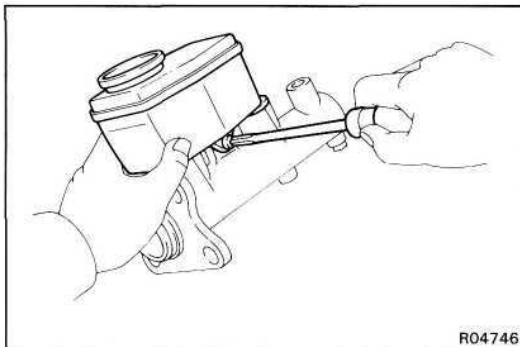
### 1. REMOVE MASTER CYLINDER BOOT

Using a screwdriver, remove the master cylinder boot.



### 2. REMOVE RESERVOIR CAP AND STRAINER

- (a) Turn the reservoir cap to the "OPEN" side and remove it.
- (b) Remove the strainer.

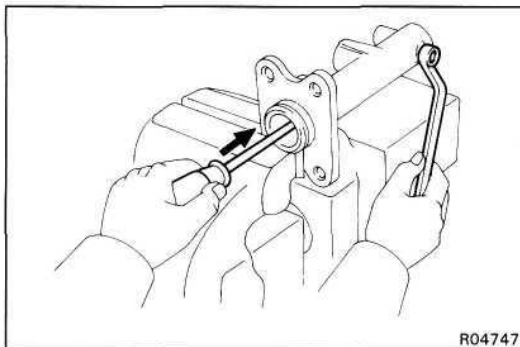


### 3. REMOVE RESERVOIR

Remove the set screw and pull out the reservoir.

### 4. REMOVE TWO GROMMETS

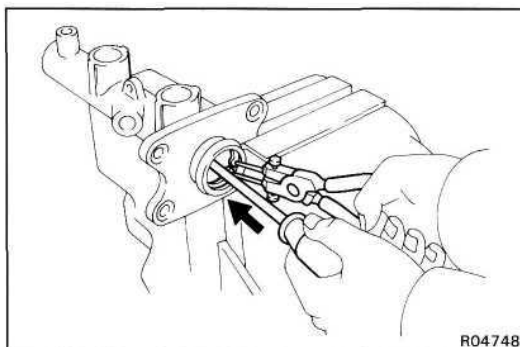
### 5. PLACE CYLINDER IN VISE



### 6. REMOVE NO.2 PISTON STOPPER BOLT

Using a screwdriver, push the pistons in all the way and remove the No.2 piston stopper bolt and gasket.

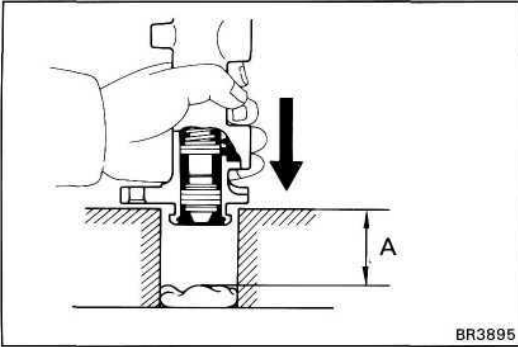
HINT: Tape the screwdriver tip before use.



### 7. REMOVE TWO PISTONS

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

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



- (c) Place a rag and two wooden blocks on the work table and lightly tap the cylinder flange against the blocks until the piston drops out of the cylinder.

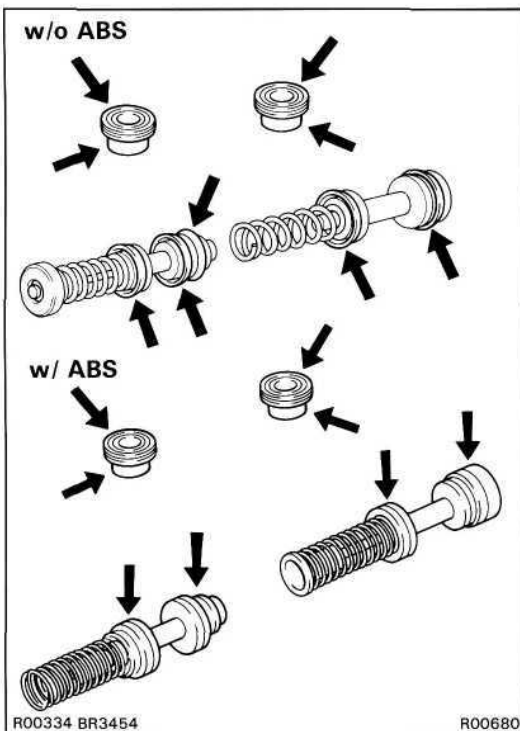
HINT: Make sure the distance (A) from the rag to the top of the blocks is at least 100 mm (3.94 in.).

## MASTER CYLINDER 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 ASSEMBLY

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

2. INSTALL TWO PISTONS

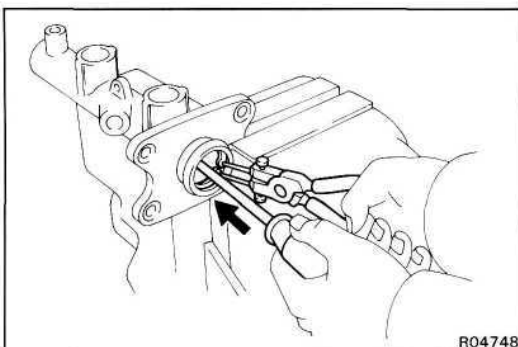
**NOTICE:** Be careful not to damage the rubber lips on the pistons.

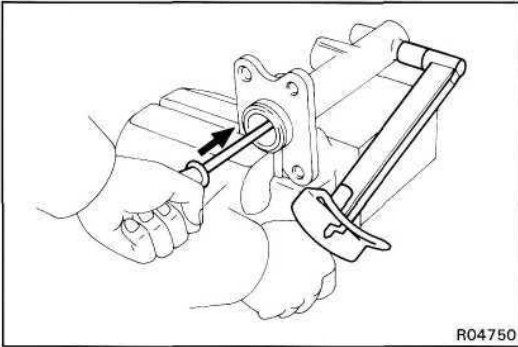
- (a) Install the two springs and pistons straight in, not at an angle.

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

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

HINT: Tape the screwdriver tip before use.

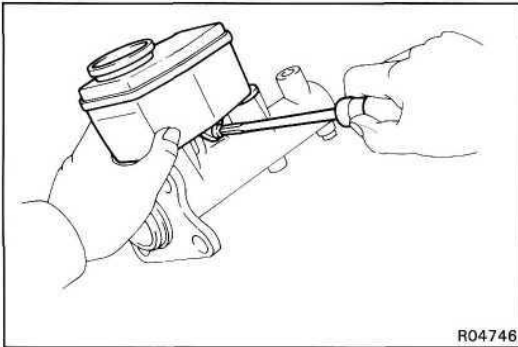




**3. INSTALL NO.2 PISTON STOPPER BOLT**

Using a screwdriver, push the piston in all the way and install the No.2 piston stopper bolt over a new gasket.

**Torque: 10 Nm (100 kgfcm, 7 ftlbf)**

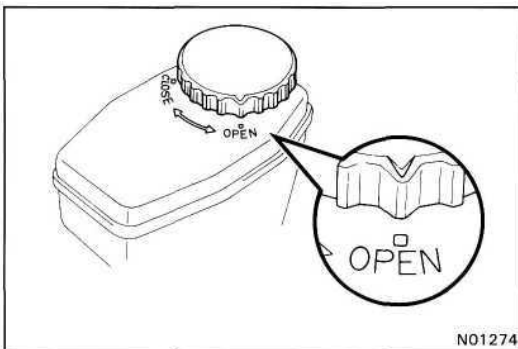


**4. INSTALL TWO GROMMETS**

**5. INSTALL RESERVOIR**

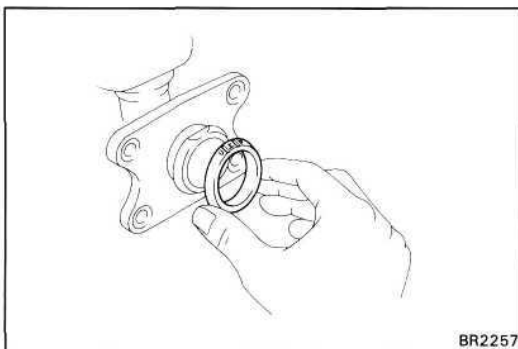
- (a) Install the strainer to the reservoir.
- (b) Push the reservoir onto the cylinder.
- (c) Install the set screw while pushing on the reservoir.

**Torque: 1.7 Nm (17.5 kgfcm, 15.2 in.lbf)**



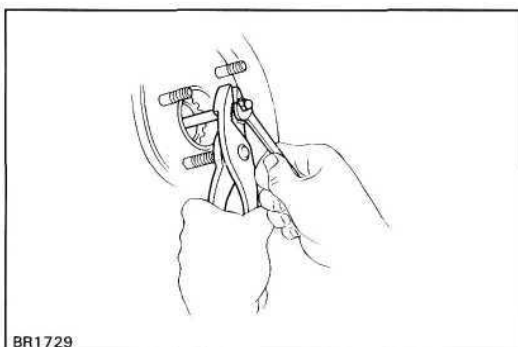
**6. INSTALL RESERVOIR CAP**

- (a) Align the matchmark on the reservoir cap with the matchmark on the "OPEN" side of reservoir.
- (b) Push down on the reservoir cap and turn it clockwise until it locks.
- (c) Check that the matchmark on the reservoir cap is now aligned with the matchmark on the "CLOSE" side of the reservoir.



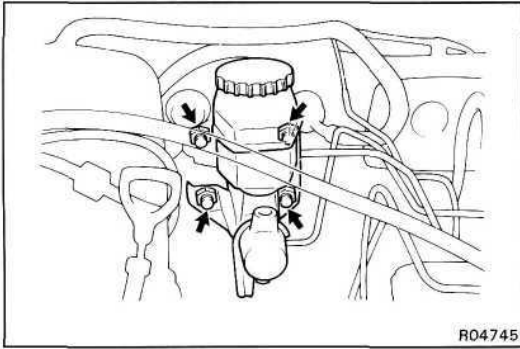
**7. INSTALL MASTER CYLINDER BOOT**

With the UP mark on the master cylinder boot facing upwards, install the cylinder boot on the master cylinder.



**MASTER CYLINDER INSTALLATION**

- 1. ADJUST LENGTH OF BRAKE BOOSTER PUSH ROD BEFORE INSTALLING MASTER CYLINDER**  
(See pub. No. RM184E, page BR-26)



## 2. INSTALL MASTER CYLINDER

### (a) (w/ ABS)

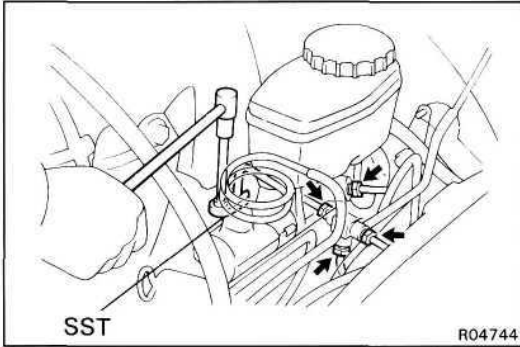
Install the master cylinder, gasket, 3-way, clamp and bracket on the brake booster with the four nuts.

### (w/o ABS)

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

### (b) Tighten the mounting nuts.

**Torque: 13 Nm (130 kgfcm, 9 ftlbf)**



## 3. CONNECT BRAKE LINES

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

SST 09023-00100

**Torque: 15 Nm (155 kgfcm, 11 ftlbf)**

## 4. CONNECT LEVEL WARNING SWITCH CONNECTOR

## 5. FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM

(See pub No. RM184E, page BR-7)

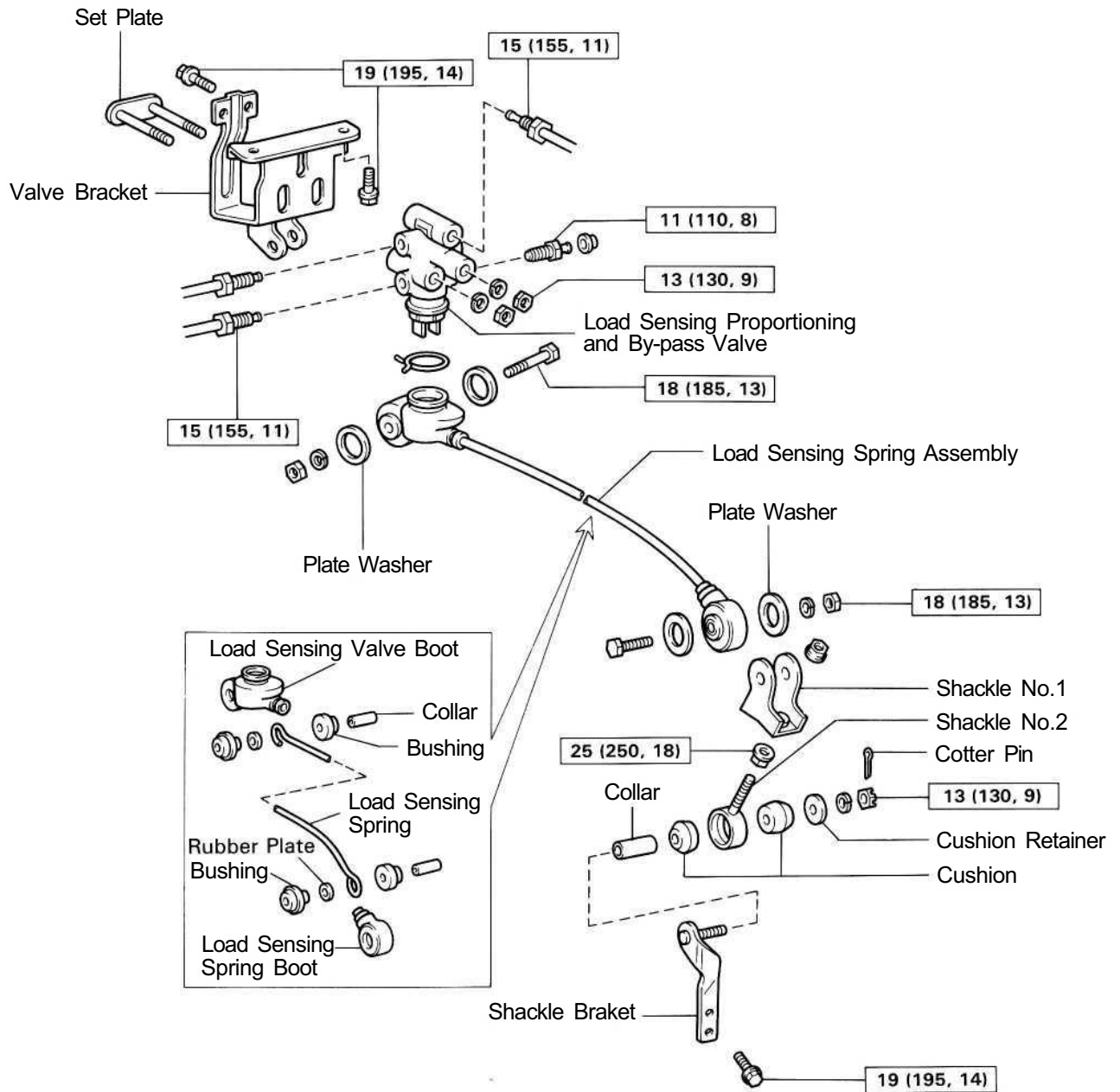
## 6. CHECK FOR LEAKS

## 7. CHECK AND ADJUST BRAKE PEDAL

(See page BR-4)

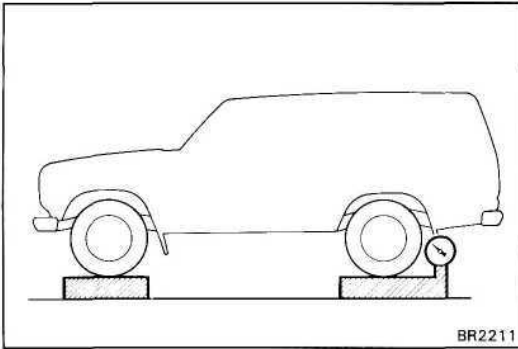


## LOAD SENSING PROPORTIONING AND BY-PASS VALVE (LSP & BV) COMPONENTS

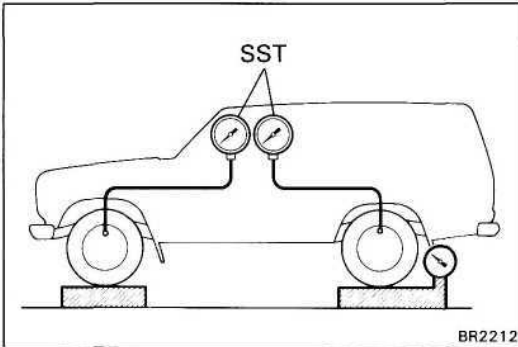


N·m (kgf·cm, ft·lbf) : Specified torque

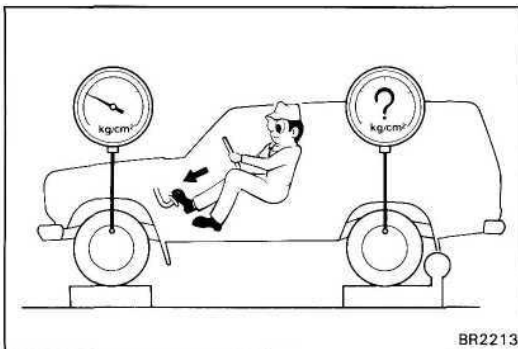
◆ Non-reusable part

**FLUID PRESSURE CHECK AND ADJUSTMENT****1. SET REAR AXLE LOAD**

Rear axle load (include vehicle weight):  
1,330 kg (2,932 lb)

**2. INSTALL LSPV GAUGE (SST) AND BLEED AIR**

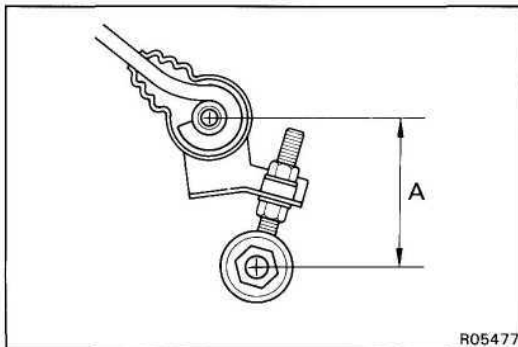
SST 09709-29017

**3. RAISE FRONT BRAKE PRESSURE TO 7,845 kPa (80 kgf/cm<sup>2</sup>, 1,138 psi) AND CHECK REAR BRAKE PRESSURE**

Rear brake pressure:

5,984 ± 589 kPa (61 ± 6 kgf/cm<sup>2</sup>, 869 ± 86 psi)

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

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

- Disconnect the No.2 shackle from the shackle bracket.
- Adjust the length of the No.2 shackle turning it.

Low pressure — Lengthen A

High pressure — Shorten A

Initial set:

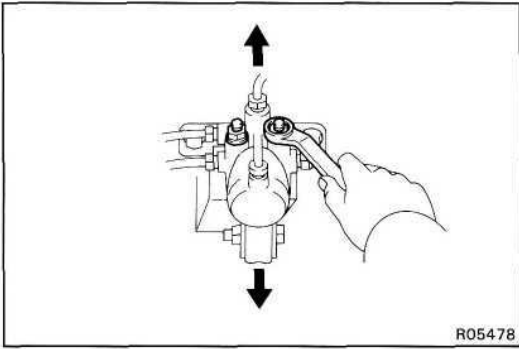
90 mm (3.54 in.)

Adjusting range:

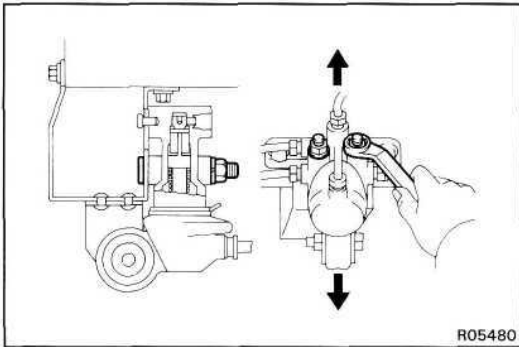
84 - 96 mm (3.31 - 3.78 in.)

HINT: One turn of the No.2 shackle changes the fluid pressure about following specification.

98.1 kPa (1.0 kgf/cm<sup>2</sup>, 14.2 psi)

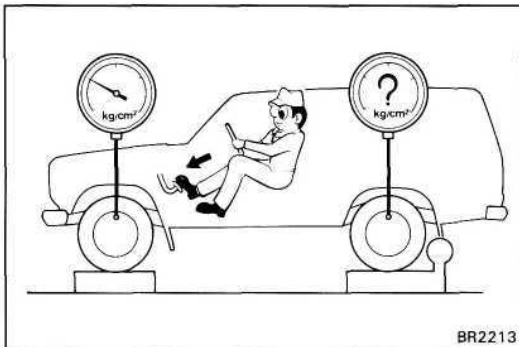


- (c) In event the pressure cannot be adjusted by No.2 shackle, raise or lower the valve body.  
Low pressure — Lower  
High pressure — Raise
- (d) Torque the nuts.  
Torque: 13 N-m (130 kgf-cm, 9 **ftlbf**)
- (e) Adjust the length of the No.2 shackle again.  
If it cannot be adjusted, inspect the valve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



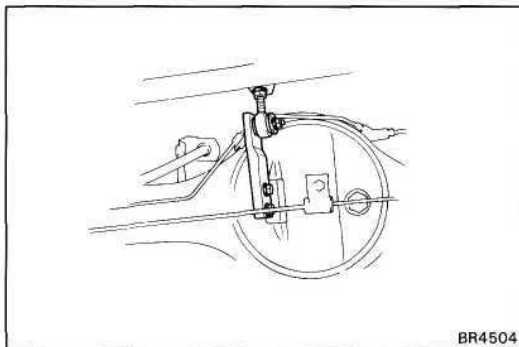
**5. IF NECESSARY, CHECK VALVE BODY**

- (a) Assemble the valve body in the uppermost position.  
HINT: When the brakes are applied, the piston will move down about 1 mm (0.039 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.

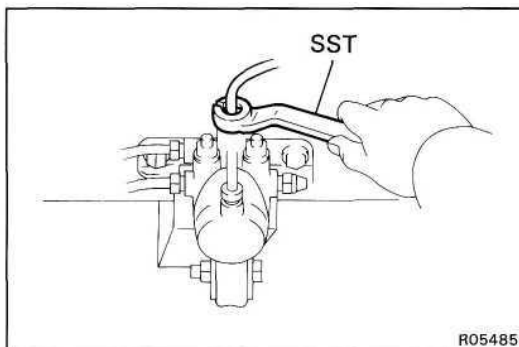
Front brake pressure kPa (kgf/cm <sup>2</sup> , psi)	Rear brake pressure kPa (kgf/cm <sup>2</sup> , psi)
3,434 (35, 498)	3,434 (35, 498)
5,396 (55, 783)	3,630 – 4,218 (37 – 43, 527 – 612)
9,810 (100, 1,424)	4,513 – 5,494 (46 – 56, 655 – 797)



**LSP & BV REMOVAL**

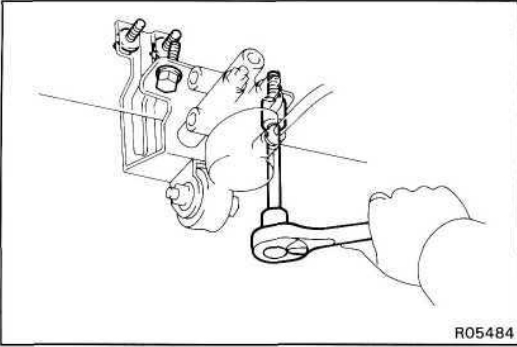
**1. DISCONNECT SHACKLE NO.2 FROM BRACKET**

- (a) Remove the cotter pin.
- (b) Remove the nut and disconnect the shackle No.2 from the bracket.
- (c) Remove the retainer, two cushions and collar.

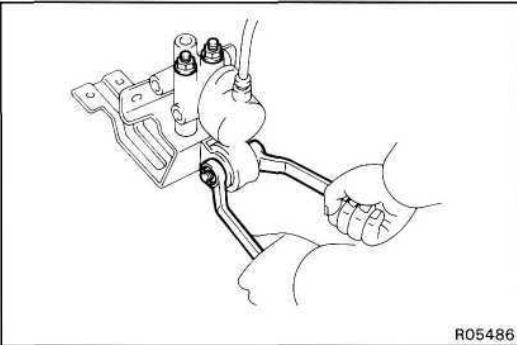


**2. REMOVE LSP & BV ASSEMBLY**

- (a) Using SST, disconnect the brake lines from the valve body.  
SST 09751-36011



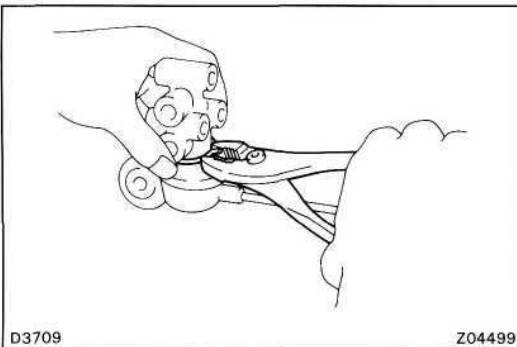
- (b) Remove the valve bracket and mounting bolts, then remove the LSP & BV assembly.



## LSP & BV ASSEMBLY DISASSEMBLY

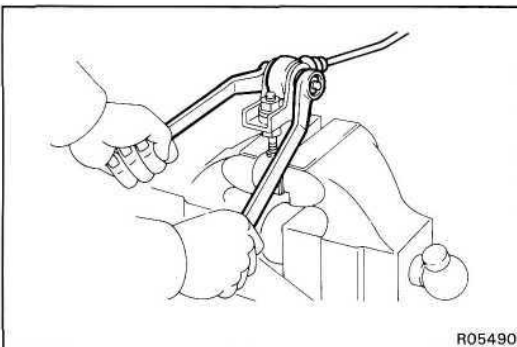
### 1. REMOVE VALVE BRACKET

- (a) Remove the nut and bolt as shown.  
 (b) Remove the two nuts, and remove the bracket and two bolts from the valve body.



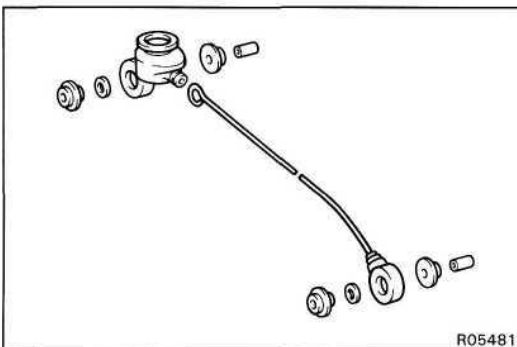
### 2. DISCONNECT SPRING FROM VALVE

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



### 3. REMOVE SHACKLE NO.1 AND NO.2

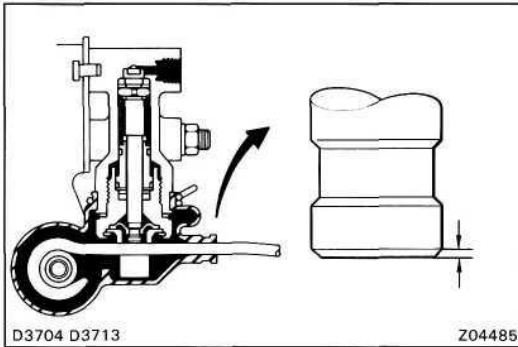
- (a) Remove the bolt and nut, then remove the following parts:
- Load sensing spring
  - Two plate washers
- (b) Loosen the two nuts, and remove the shackle No.1 from the shackle No.2.



### 4. DISASSEMBLY LOAD SENSING SPRING

Disassembly the following parts:

- (a) Bushings  
 (b) Collars  
 (c) Rubber plates  
 (d) Load sensing valve boot  
 (e) Load sensing spring boot

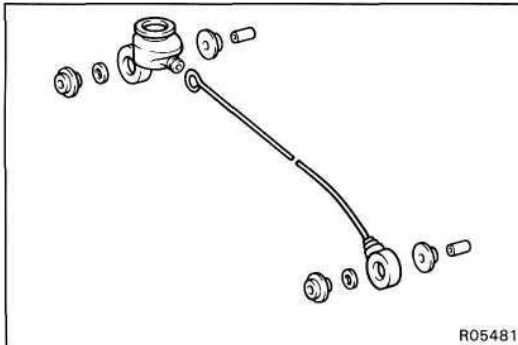


## LSP & BV INSPECTION

INSPECT VALVE PISTON PIN AND LOAD SENSING SPRING CONTACT SURFACE FOR WEAR

Wear limit:

0.7 mm (0.028 in.)



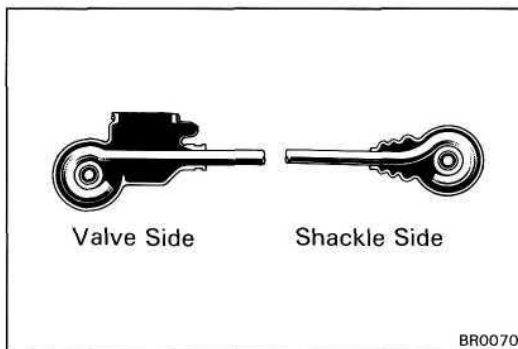
## LSP & BV ASSEMBLY

### 1. ASSEMBLE FOLLOWING PARTS TO LOAD SENSING SPRING:

- Load sensing valve boot
- Load sensing spring boot
- Bushings
- Rubber plates
- Collars

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

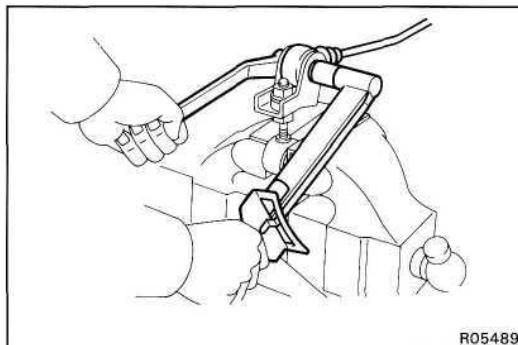
Do not mistake the valve side for the shackle side of the load sensing spring.



### 2. INSTALL SHACKLE NO. 1 AND NO.2 TO LOAD SENSING SPRING

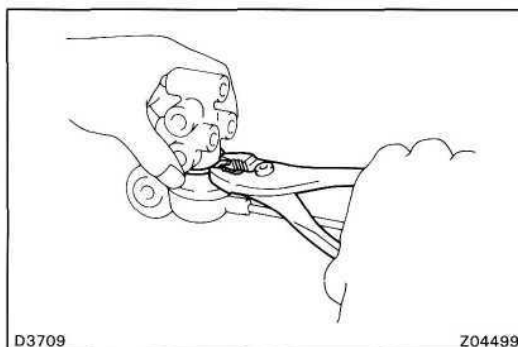
- Install the lock nut and shackle No. 1 to the shackle No.2.
- Install and torque the bolt and nut as shown in illustration.

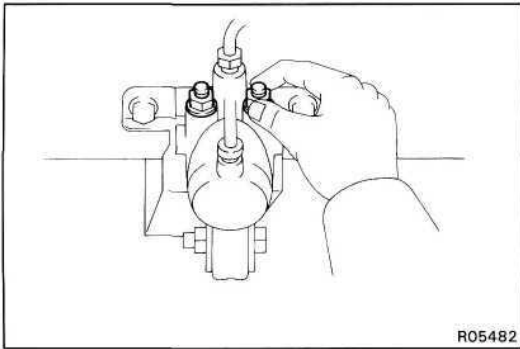
Torque: 18 Nm (185 kgf-cm, 13 ftlbf)



### 3. INSTALL LOAD SENSING SPRING TO VALVE BODY

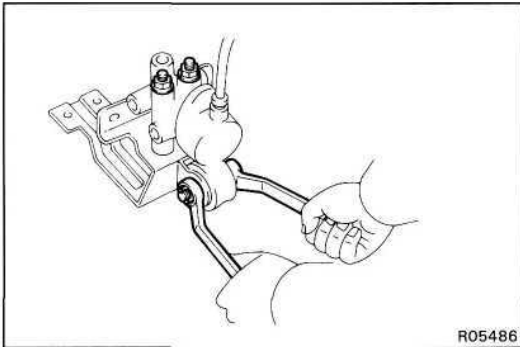
Install the load sensing spring assembly to the load sensing valve with the clip.



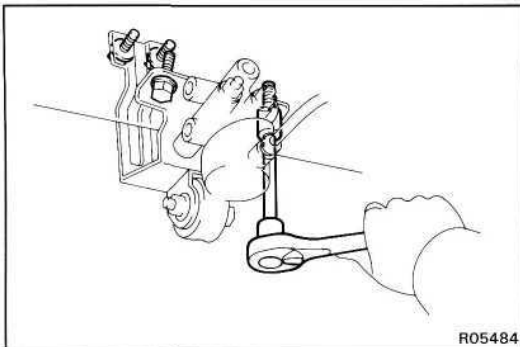


#### 4. INSTALL VALVE BRACKET

- (a) Install the two set bolts to the valve assembly through the valve bracket and temporarily tighten the two valve body mounting nuts.



- (b) Torque the bolt and nut through the two plate washers.  
**Torque: 18 Nm (185 kgfcm, 13 ftlbf)**

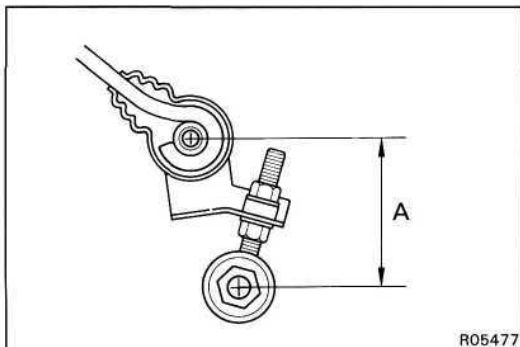


### LSP & BV INSTALLATION

#### 1. INSTALL LSP & BV ASSEMBLY

Install the LSP & BV assembly to the frame with the four bolts.

**Torque: 19 Nm (195 kgfcm, 14 ftlbf)**



#### 2. CONNECT SHACKLE NO.2 TO BRACKET

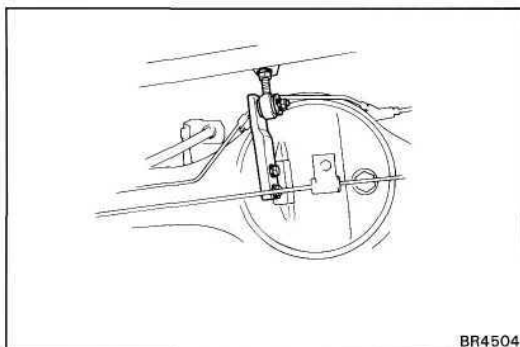
- (a) Set the dimension A by turning shackle No.2.

**Initial set:**

**90 mm (3.54 in.)**

- (b) Tighten the lock nut.

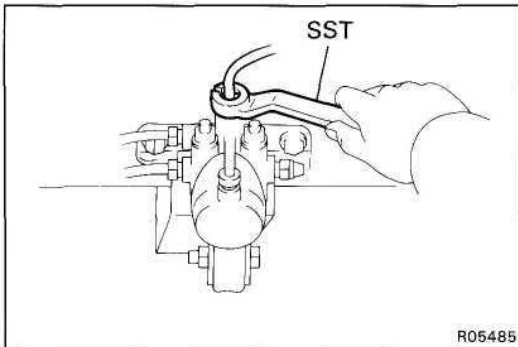
**Torque: 25 Nm (250 kgfcm, 18 ftlbf)**



- (c) Install the two bushings and collar to the load sensing spring shackle.  
(d) Install the load sensing spring to the shackle bracket with a retainer and nut.

**Torque: 13 Nm (130 kgfcm, 9 ftlbf)**

- (e) Install a new cotter pin.



**3. CONNECT BRAKE LINES**

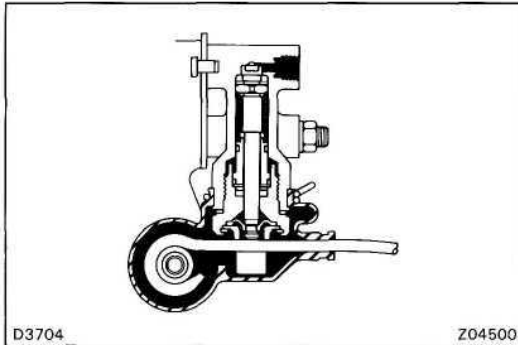
Using SST, connect the brake lines.

SST 09751-36011

**Torque: 15 Nm (155 kgfcm, 11 ft-lbf)**

**4. SET REAR AXLE LOAD**

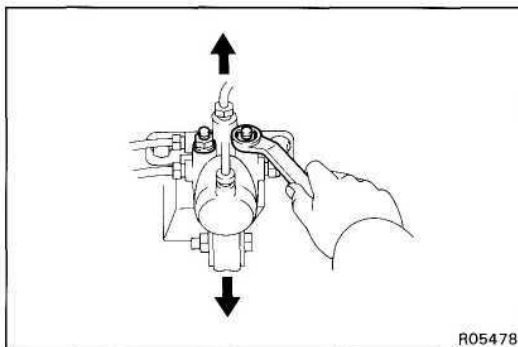
(See page BR-16)



**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.

**Torque: 13 Nm (130 kgfcm, 9 ft-lbf)**

**6. BLEED BRAKE SYSTEM**

(See pub No. RM184E, page BR-7)

**7. CHECK FLUID LEAKAGE**

**8. CHECK AND ADJUST LSP & BV FLUID PRESSURE**

(See page BR-16)

# ANTI-LOCK BRAKE SYSTEM (ABS)

## DESCRIPTION

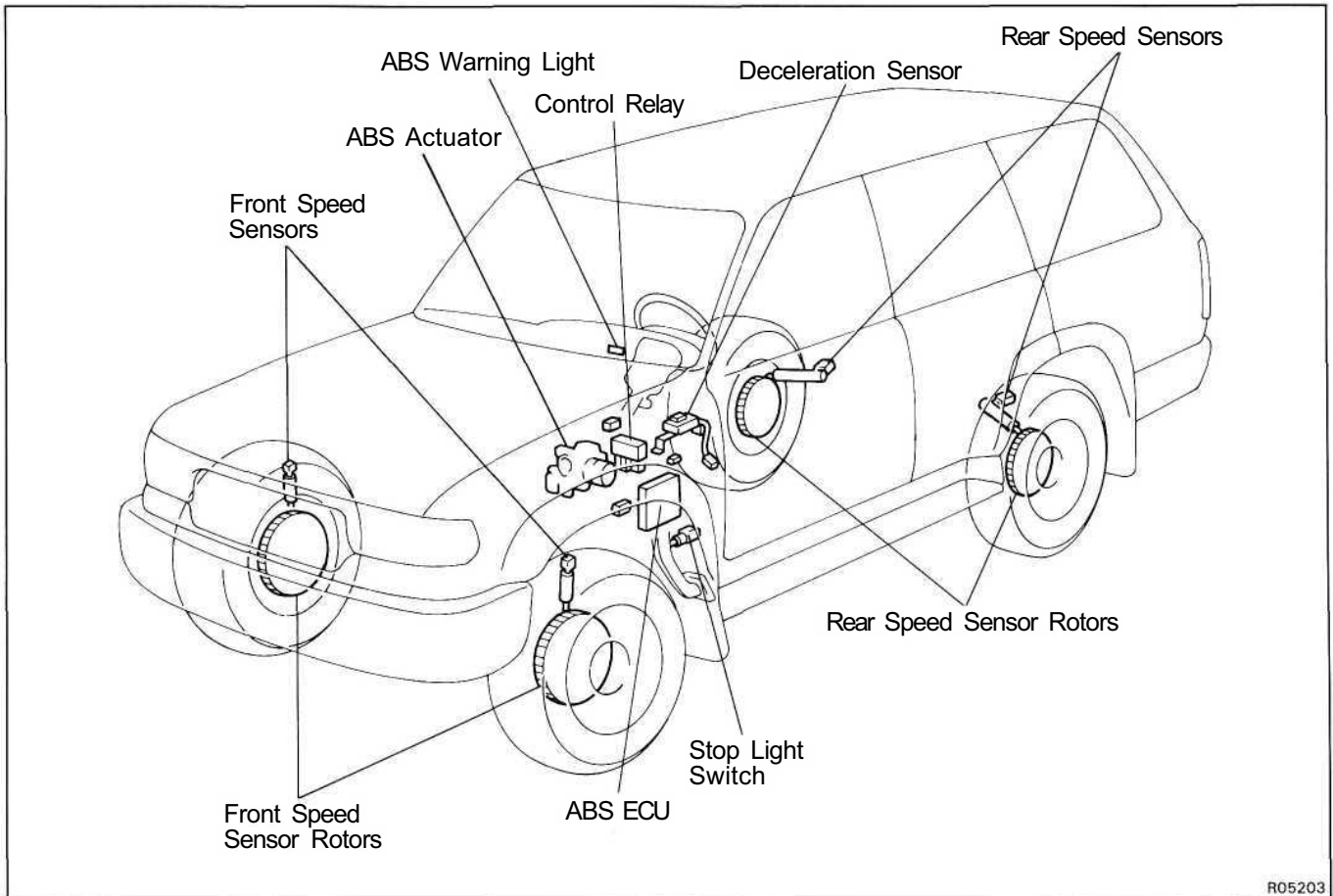
- The ABS is a brake system which controls the brake cylinder hydraulic pressure of all four wheels during sudden braking and braking on slippery road surfaces, preventing the wheels from locking. This ABS provides the following benefits:
  - (1) Enables steering round an obstacle with a greater degree of certainty even when panic braking.
  - (2) Enables stopping in a panic brake while keeping the effect upon stability and steerability to a minimum, even on curves.
- The function of the ABS is to help maintain directional stability and vehicle steerability on most road conditions. However, the system cannot prevent the vehicle from skidding if the cornering speed limit is exceeded.
- The ABS has a longitudinal deceleration sensor to match braking characteristics to the full-time four wheel drive.
- In case a malfunction occurs, a diagnosis function and fail-safe system have been adopted for the ABS to increase serviceability.
- When the center differential is locked, the ABS does not operate, so the ABS warning light lights up to indicate this.



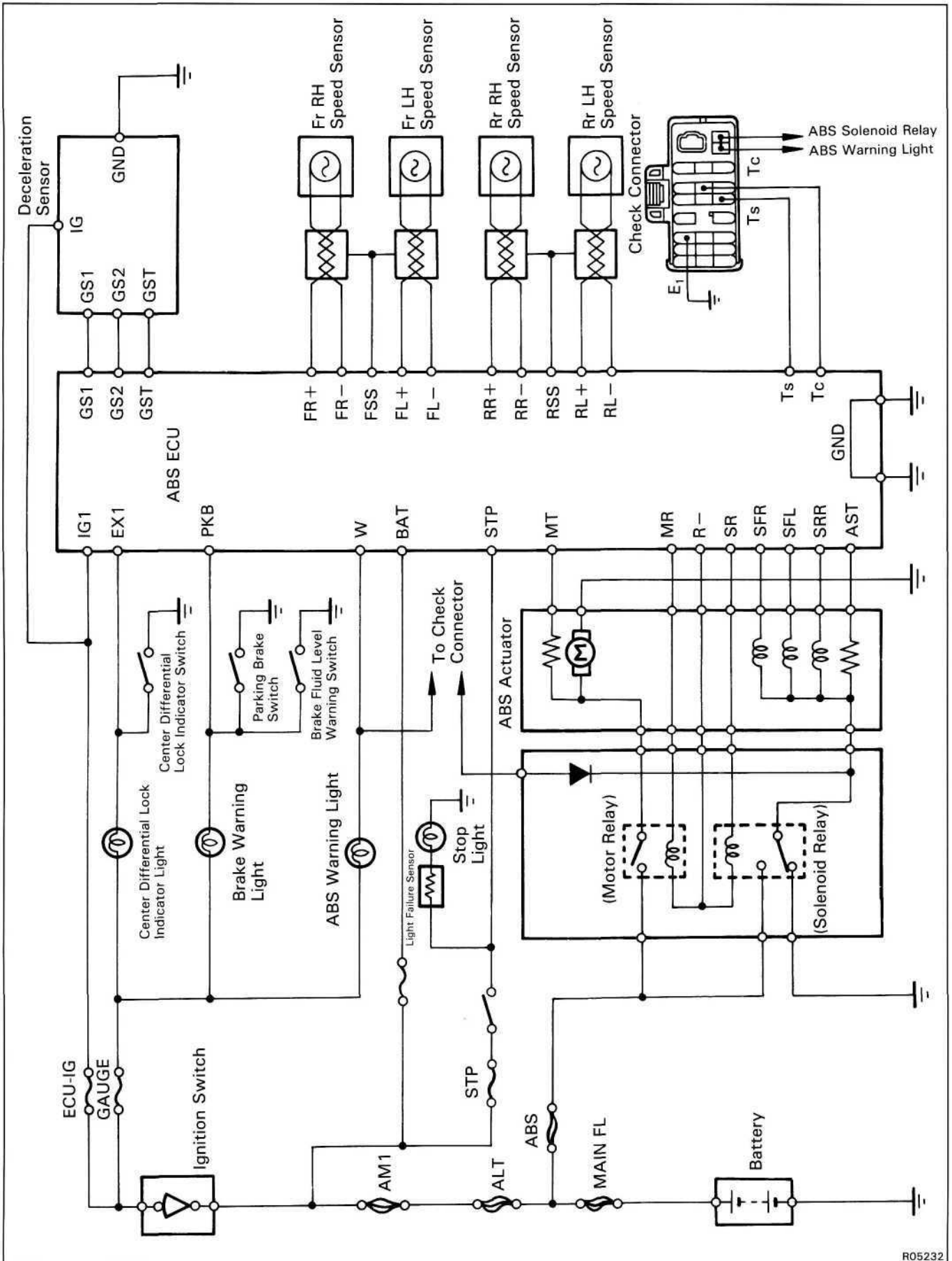
**COMPONENTS FUNCTION**

Component	Function
Front Speed Sensor	Detect the wheel speed of each of the left and right front wheels.
Rear Speed Sensor	Detect the wheel speed of each of the left and right rear wheels.
ABS Warning Light	Lights up to alert the driver when trouble has occurred in the Anti-Lock Brake System and when the center differential is locked.
Actuator	Controls the brake fluid pressure to each disc brake cylinder through signals from the ECU.
ABS ECU	From the wheel speed signals from each sensor, it calculates acceleration, deceleration and slip values and sends signals to the actuator to control brake fluid pressure.
Deceleration Sensor	Detect the deceleration speed of the vehicle and sends a signal accordingly to the ABS ECU.

**SYSTEM PARTS LOCATION**

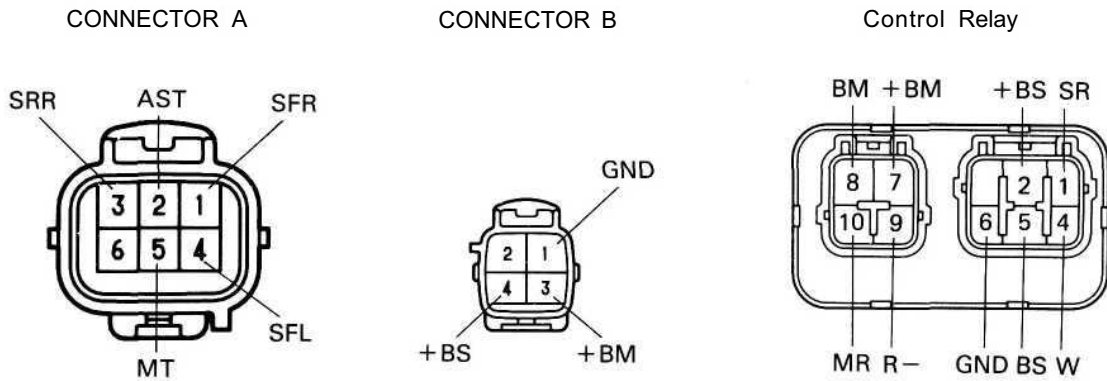


### WIRING DIAGRAM

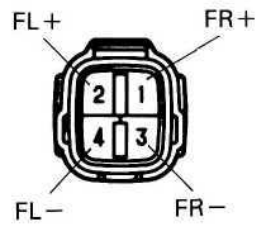


### CONNECTORS

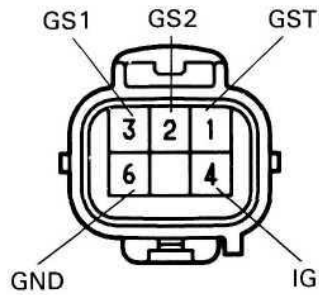
#### ABS Actuator



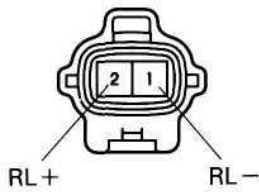
#### Front Speed Sensor



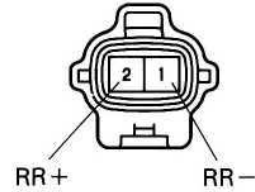
#### Deceleration Sensor



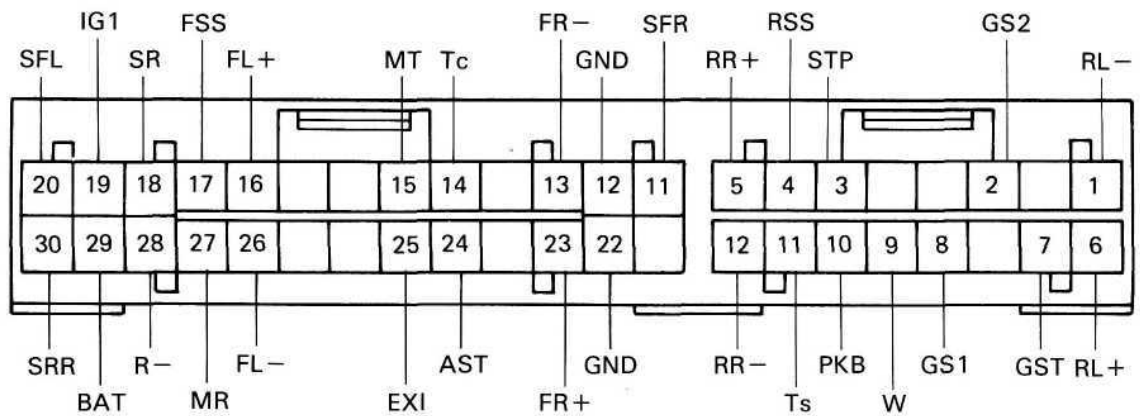
#### Rear Speed Sensor (LH)



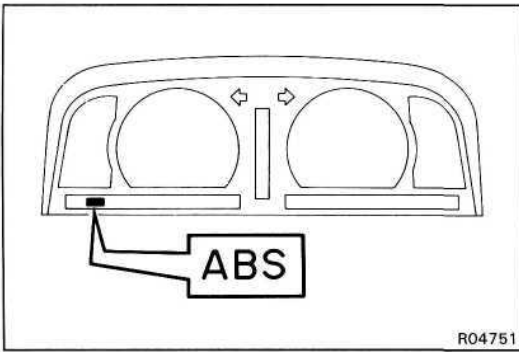
#### Rear Speed Sensor (RH)



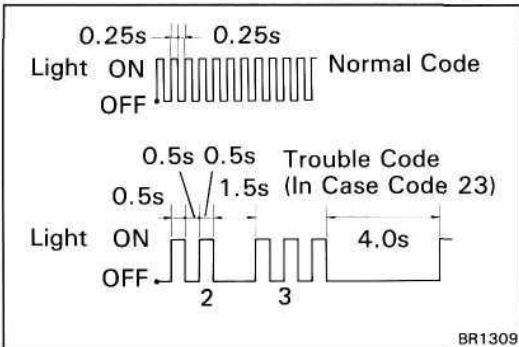
#### ABS ECU



le-6-2-C lg-4-2-A BR3999  
 le-4-2-H le-6-2-C  
 le-2-2-T le-2-2-T  
 R00463



R04751



BR1309

## DIAGNOSIS SYSTEM

### DESCRIPTION

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

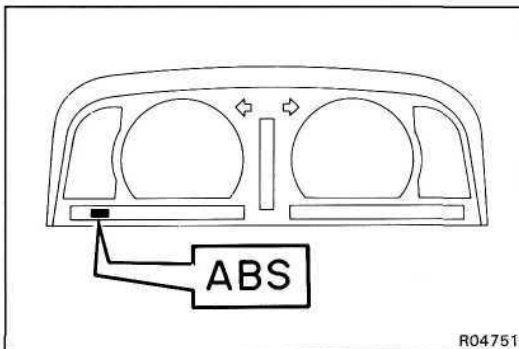
At the same time, the system informs the driver of a malfunction via the "ABS" warning light in the combination meter.

By turning on the ignition switch, disconnecting the short pin of the check connector and use SST to connect Tc and Ei of the check connector, the trouble can be identified by the number of blinks (diagnostic code) of the warning light.

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

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

When the transfer is in L (center differential lock) position, the ABS does not operate and the ABS warning light stays on.



R04751

### DIAGNOSIS SYSTEM INSPECTION

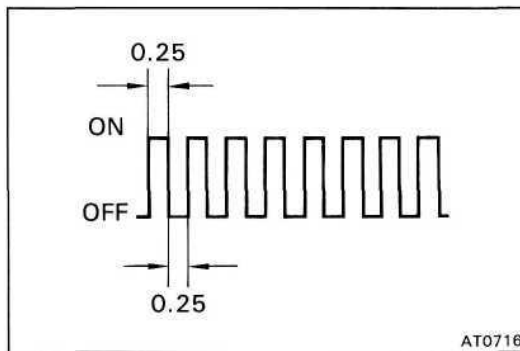
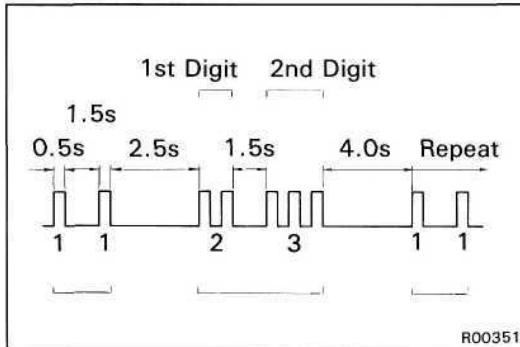
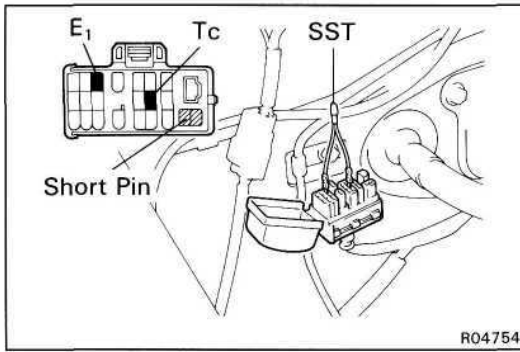
#### 1. INSPECT BATTERY VOLTAGE

Inspect that the battery voltage is about 12 V.

#### 2. CHECK THAT WARNING LIGHT TURNS ON

- (a) Confirm that the center differential is free.
- (b) Turn the ignition switch on.
- (c) Check that the "ABS" warning light turns on for 3 seconds.

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



**3. READ DIAGNOSTIC CODE**

- (a) Turn the ignition switch on.
- (b) Using SST, connect terminals Tc and E<sub>1</sub> of the check connector.  
SST 09843-18020
- (c) Pull out the short pin from the terminals WA and WB of the check connector in the engine room.

- (d) In event of a malfunction, 4 seconds later the warning light will begin to blink. Read the number of blinks.  
(See page BR-26)




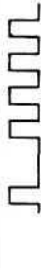
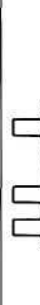

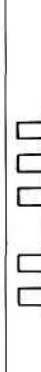





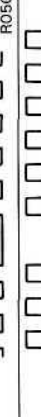

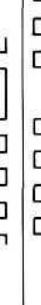
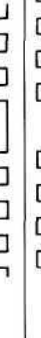
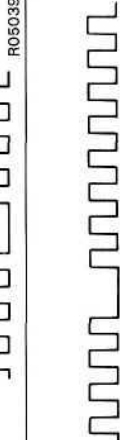
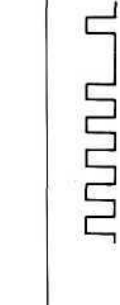

HINT: The first number of blinks will equal the first digit of a two digit diagnostic code. After a 1.5 second pause, the 2nd number of blinks will equal the 2nd number of a two digit code. If there are two or more codes, there will be a 2.5 second pause between each, and indication will begin after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

- (e) If the system is operating normally (no malfunction), the warning light will blink once every 0.5 seconds.
- (f) Repair the system.
- (g) After the malfunctioning components has been repaired, clear the diagnostic codes stored in the ECU.  
(See page BR-27)

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

- (h) Remove the SST from terminals Tc and Ei of the check connector.  
SST 09843-18020
- (i) Install the short pin to the terminals WA and WB.
- (j) Turn the ignition switch on, and check that the "ABS" warning light goes off after the warning light goes on for 3 seconds.

## DIAGNOSTIC CODE

Code No.	Light Pattern	Diagnosis	Trouble Part	
11	ON OFF 	Open circuit in solenoid relay circuit	<ul style="list-style-type: none"> <li>• Actuator inside wire harness</li> <li>• Solenoid relay</li> <li>• Wire harness and connector of solenoid relay circuit (include AST circuit)</li> </ul>	
12		Short circuit in solenoid relay circuit	<ul style="list-style-type: none"> <li>• Actuator inside wire harness</li> <li>• Pump motor relay</li> <li>• Wire harness and connector of pump motor relay circuit (include MT circuit)</li> </ul>	
13		Open circuit in pump motor relay circuit	<ul style="list-style-type: none"> <li>• Actuator solenoid</li> <li>• Wire harness and connector of actuator solenoid circuit</li> </ul>	
14		Short circuit in pump motor relay circuit		
21		Open or short circuit in 3 position solenoid of front right wheel		
22		Open or short circuit in 3 position solenoid of front left wheel		
23		Open or short circuit in 3 position solenoid of rear wheel		
31		Front right wheel speed sensor signal malfunction	<ul style="list-style-type: none"> <li>• Speed sensor</li> <li>• Sensor rotor</li> <li>• Wire harness and connector of speed sensor</li> </ul>	
32		Front left wheel speed sensor signal malfunction		
33		Rear right wheel speed sensor signal malfunction		
34		Rear left wheel speed sensor signal malfunction		
35		Open circuit in front left or rear right wheel speed sensor		
36		Open circuit in front right or rear left wheel speed sensor		
41		Abnormally high or low battery voltage		<ul style="list-style-type: none"> <li>• Battery</li> <li>• Voltage regulator</li> </ul>
43		Malfunction in deceleration sensor		<ul style="list-style-type: none"> <li>• Deceleration sensor</li> <li>• Deceleration sensor installation</li> <li>• Wire harness and connector of deceleration sensor</li> </ul>
44		Open or short circuit in deceleration sensor	<ul style="list-style-type: none"> <li>• Center differential lock</li> <li>• Center differential lock indicator light</li> <li>• Center differential lock indicator switch</li> <li>• Wire harness and connector of center differential lock</li> </ul>	
48		Open or short circuit in center differential lock indicator	<ul style="list-style-type: none"> <li>• Pump motor, relay and battery</li> <li>• Wire harness, connector and ground bolts of actuator pump motor circuit (include MT circuit)</li> </ul>	
51		Pump motor of actuator locked or open circuit in pump motor circuit in actuator		
Always on		Malfunction in ECU	<ul style="list-style-type: none"> <li>• ECU</li> </ul>	

## DIAGNOSTIC CODES CLEARING

### CLEAR DIAGNOSTIC CODES

- (a) Confirm that the center differential is free.
- (b) Turn the ignition switch on.
- (c) Using SST, connect terminals Tc and E<sub>1</sub> of the check connector.

SST 09843-18020

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

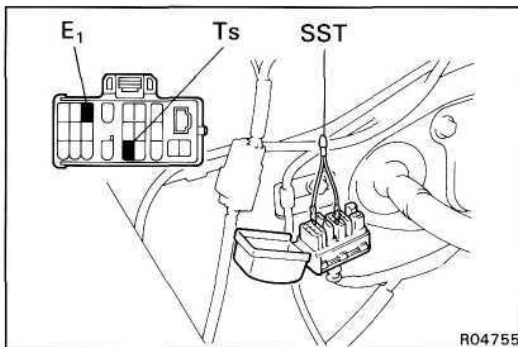
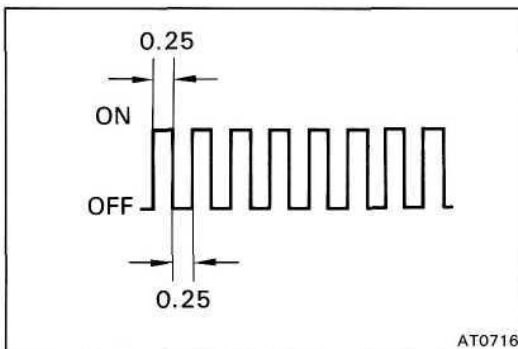
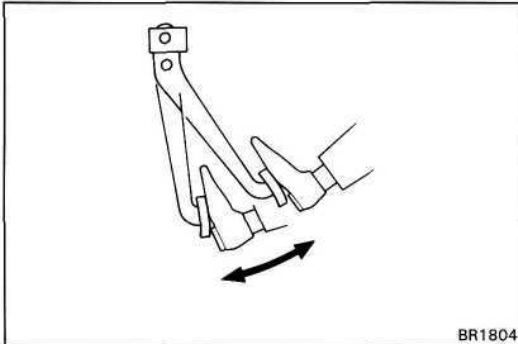
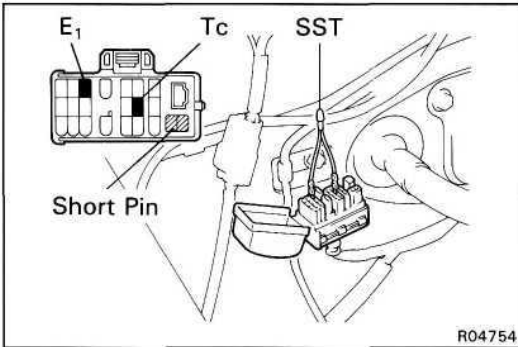
- (d) Clear the diagnostic codes stored in ECU by depressing the brake pedal 8 or more times within 3 seconds.

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

- (f) Remove the SST from terminals Tc and E<sub>1</sub> of the check connector.

SST 09843-18020

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

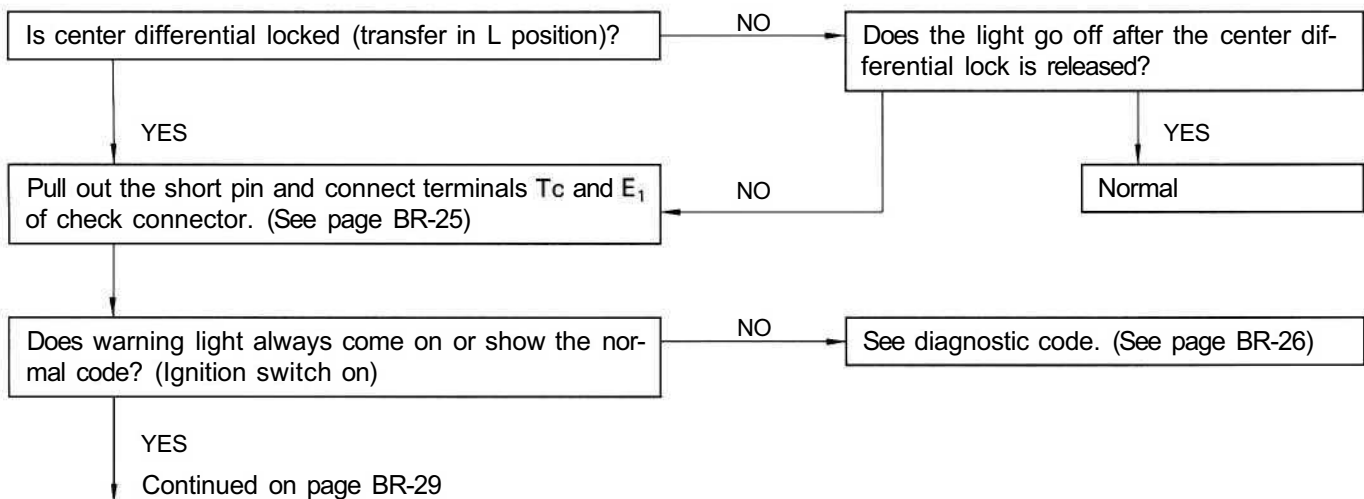


## TROUBLESHOOTING

	Problem	No.
"ABS" warning light	Always comes on after ignition switch is turned on.	1
	Does not come on for 3 seconds after ignition switch on.	2
	Goes on and off.	3
	Comes on while running.	1
	Does not light up when the transfer is in L (center differential lock) position.	6
Brake condition	Brakes pull.*	4
	Braking inefficient.*	4
	ABS operates at ordinary braking.	4
	ABS operates just before stopping at ordinary braking.	4
	Brake pedal pulsates abnormally while ABS is operating.	4
	Skidding noise occurs while ABS operating. (ABS operates inefficiently)	5
	When the transfer is in L (center differential lock) position, the ABS operates.	6

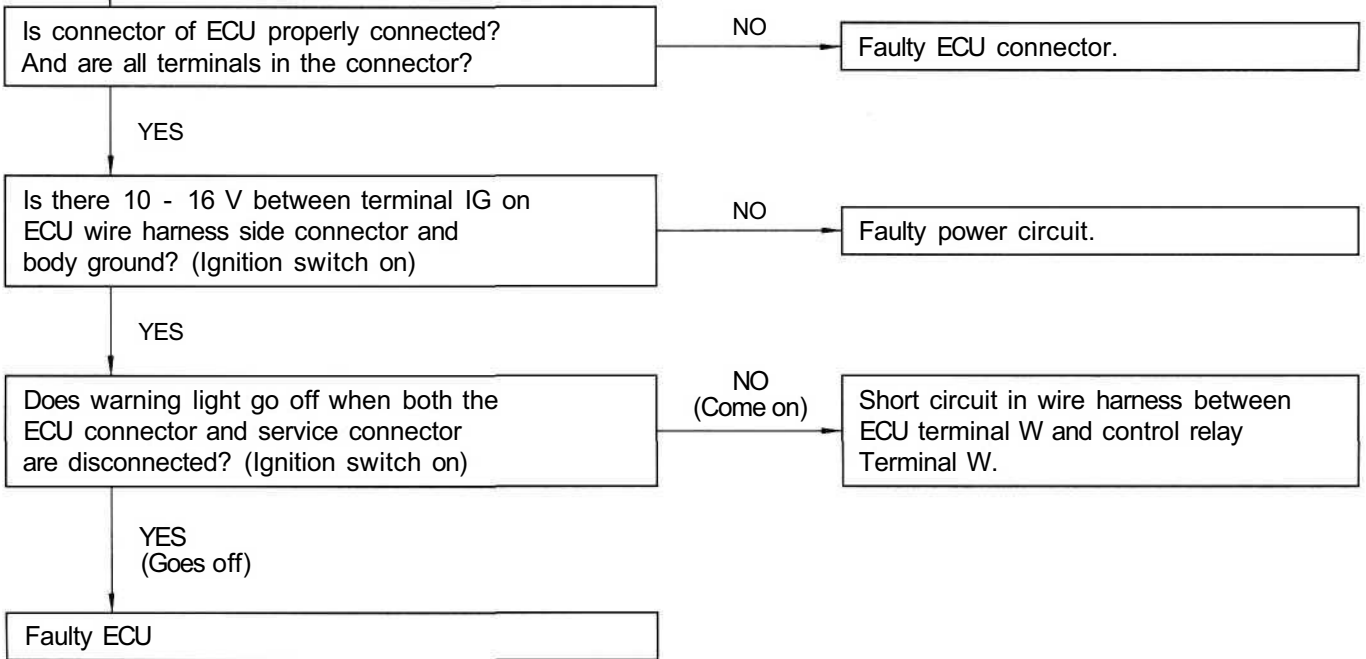
\* Also check the parts of the brake system (brake cylinders, pads, hydraulic lines, etc.) not specifically part of the ABS.

1	"ABS" warning light comes on.
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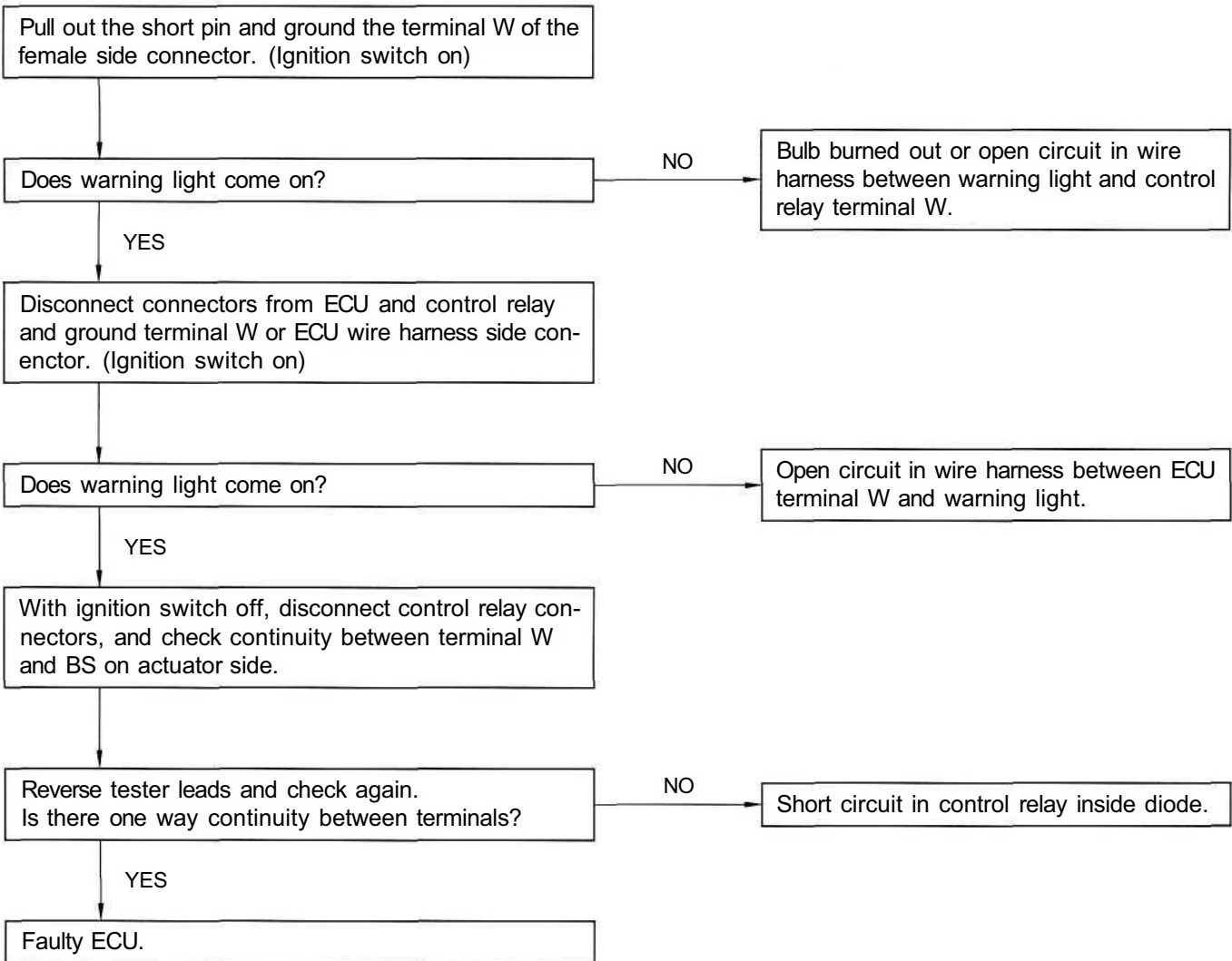




Continued from page BR-28



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

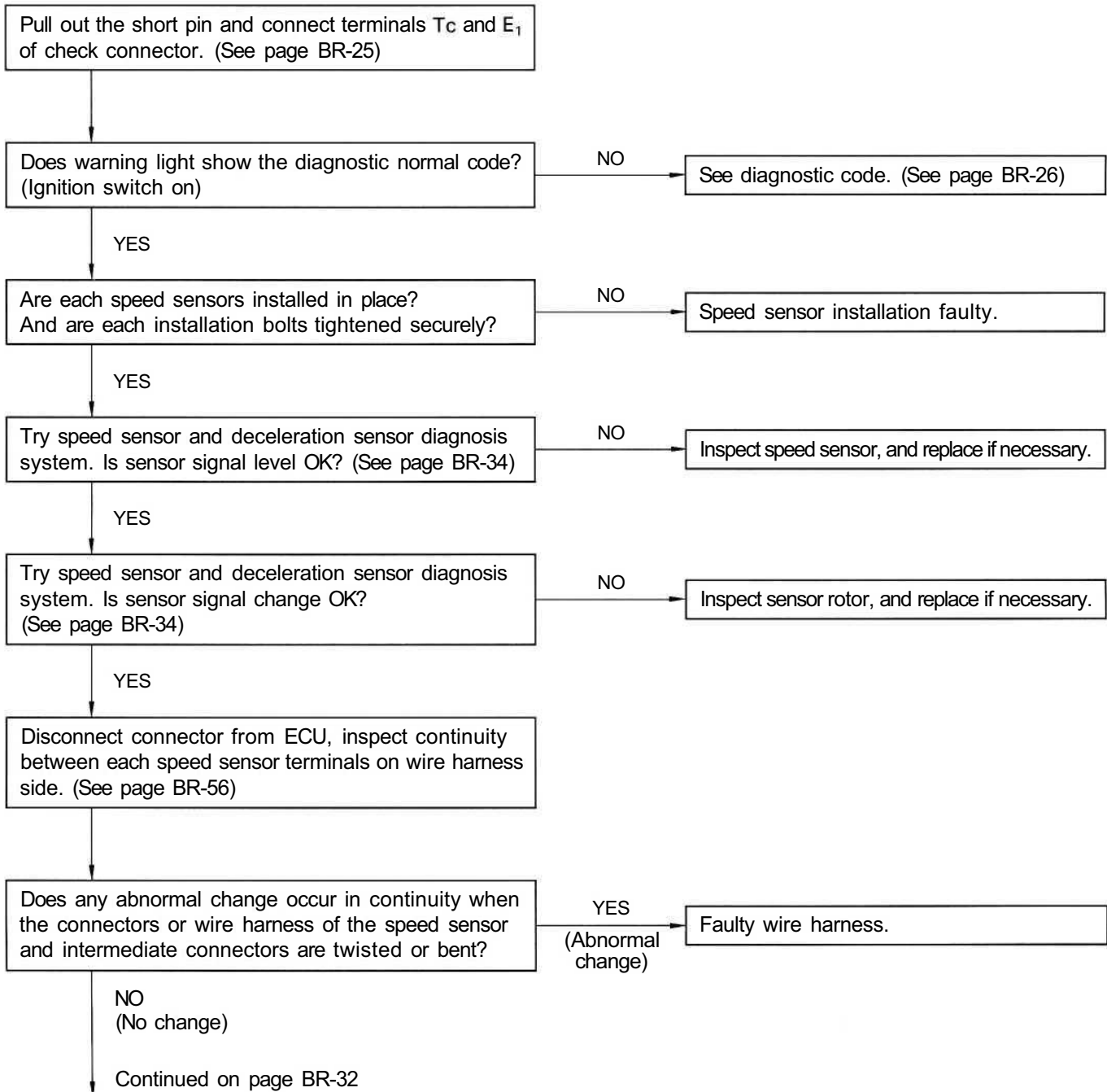


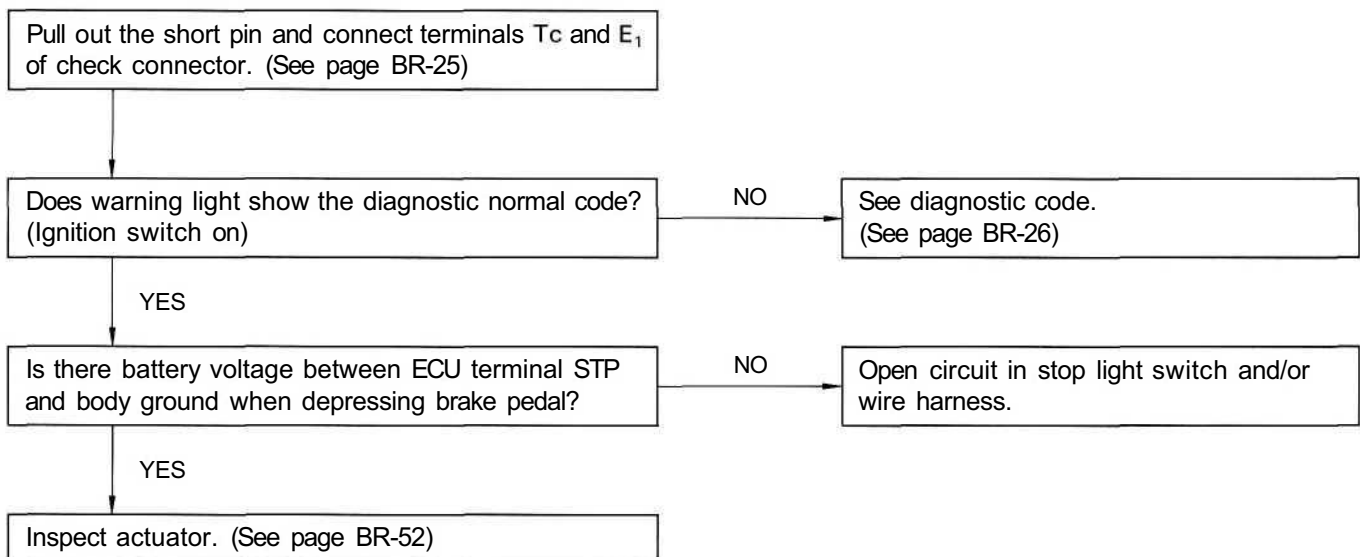
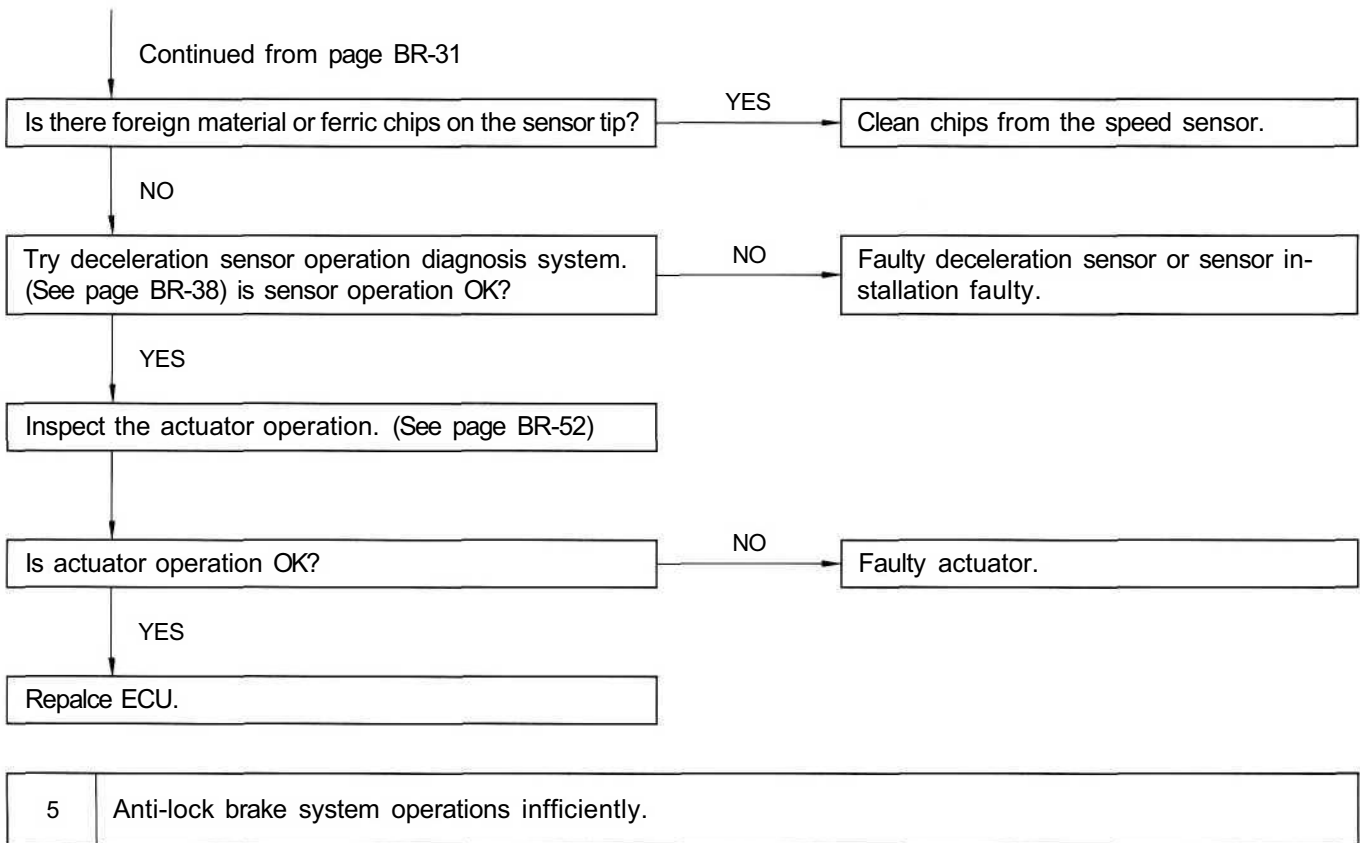
HINT: If the diode is short-circuited, a malfunction at ECU terminal W will occur. When inspecting the terminal, connect the ECU connector, and disconnect actuator connectors and check connector. Then turn the ignition switch on, and check that the warning light goes on. If it does, the ECU terminal is OK.

3	"ABS" warning light comes on and off.
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- Check for short circuit in wire harness between terminal T<sub>c</sub> and E<sub>1</sub> of check connector.

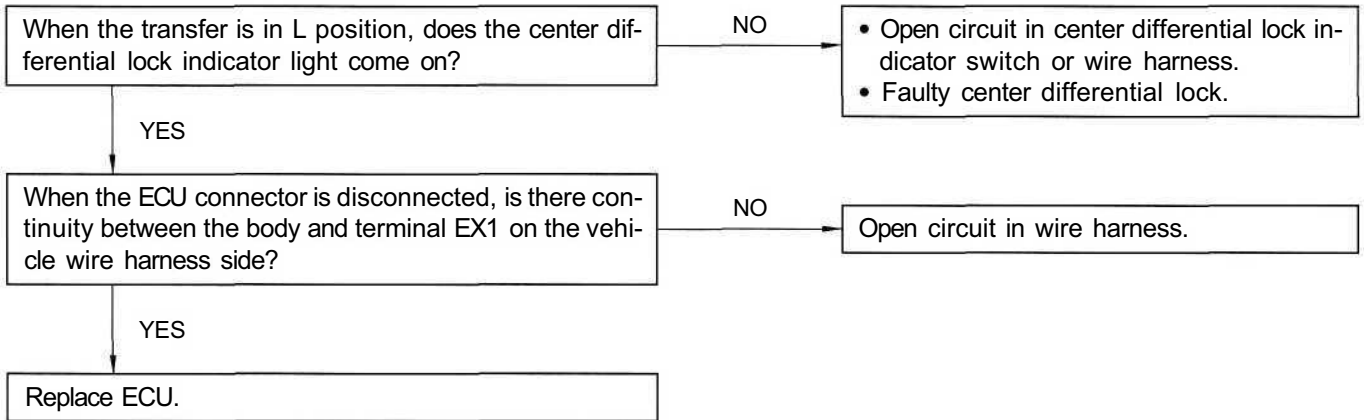
4	<ul style="list-style-type: none"> <li>• Brakes pull.</li> <li>• Braking inefficient.</li> <li>• ABS operates at ordinary braking.</li> <li>• ABS operates just before stopping at ordinary braking.</li> <li>• Brake pedal pulsates abnormally while ABS is operating.</li> </ul>
---	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------





6

- Does not light up when the transfer is in L position.
- When the transfer is in L position, the ABS operates.



## SPEED SENSOR AND DECELERATION SENSOR DIAGNOSIS SYSTEM

### DIAGNOSIS SYSTEM INSPECTION

#### PRECAUTION

While checking the speed sensor diagnosis system, ABS does not operate and brake system operates as normal brake system.

#### 1. INSPECT BATTERY VOLTAGE

Inspect that the battery voltage is about 12 V.

#### 2. CHECK THAT WARNING LIGHT TURNS ON

(a) Turn the ignition switch on.

(b) Check that the "ABS" warning light turns on for 3 seconds.

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

(c) Check that the "ABS" warning light turns off.

(d) Turn the ignition switch off.

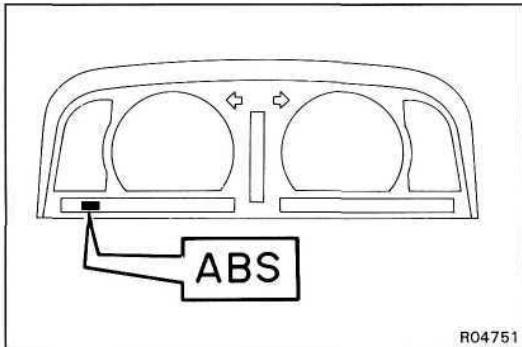
#### 3. PERFORM FOLLOWING STEPS

(a) Using SST, connect terminals Ts and E<sub>1</sub> of the check connector in engine room.

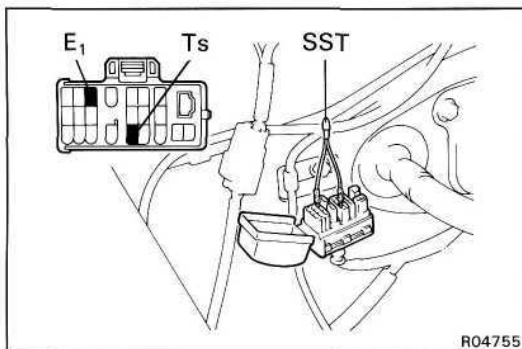
SST 09843-18020

(b) Start the engine.

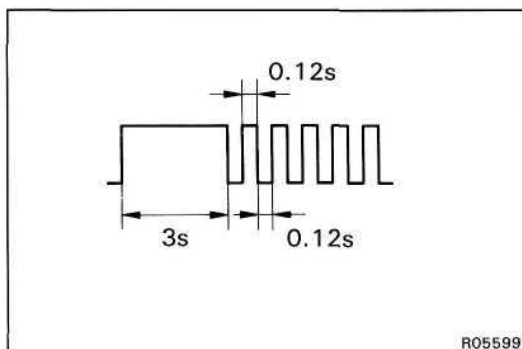
(c) Check that the warning light blinks about 4 times every 1 second as shown.



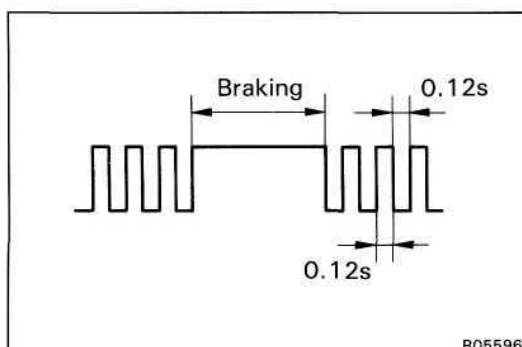
R04751



R04755



R05599

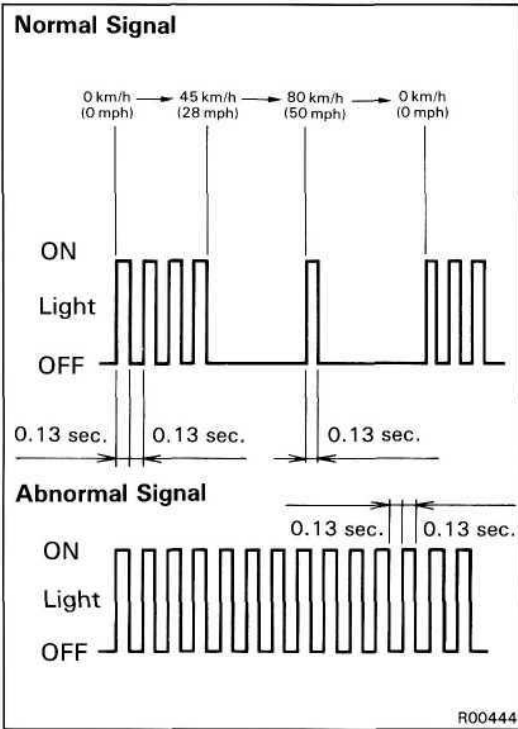


R05596

#### 4. INSPECT DECELERATION SENSOR OPERATION

(a) Drive the vehicle straight ahead at about 20 km/h (12.4 mph) or more, depress the brake pedal a little strong.

(b) Check that the warning light turns on while braking.

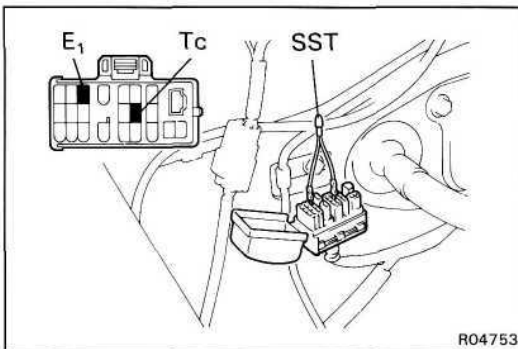


**5. INSPECT SPEED SENSOR SIGNAL CHANGE**

- (a) Drive the faster than 45 km/h (28 mph) for several seconds.
- (b) Check the warning light signal.  
If the warning light signal is abnormal, perform the steps 6 and 7.

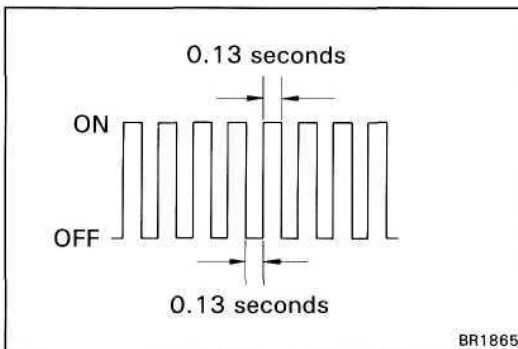
**HINT:**

- If the deceleration sensor operation in step 4 does not occur, an abnormal signal is output.
- The high-speed check is possible at 80 km/h (50 mph) or higher.



**6. READ DIAGNOSTIC CODE**

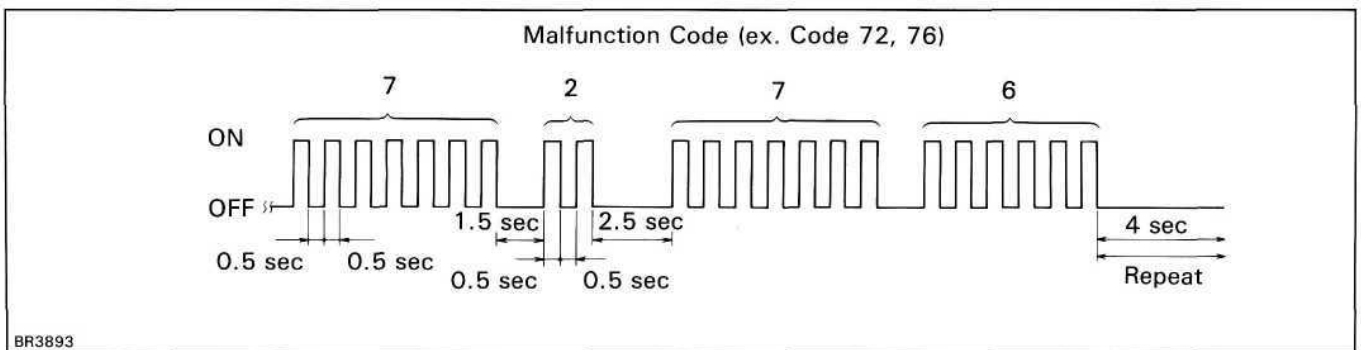
- (a) Stop the vehicle, and warning light will be to blink.
- (b) Using SST, connect the terminals T<sub>c</sub> and E<sub>1</sub> of check connector.



- (c) Read the number of blinks of the ABS warning light.  
(See page BR-37)

**HINT:** If normal, the warning light blinks about 4 times every 1 second.

If two or more malfunctions are indicated at the same time, the smallest numbered code will be displayed first.



**7. REPAIR MALFUNCTIONING PARTS**

Repair or replace the malfunctioning parts.

HINT: When repairing or replacing parts, turn the ignition switch to OFF.








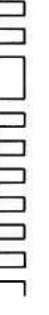



**8. REMOVE SST**

Remove the SST from terminals Tc, Ts and E<sub>1</sub> of the check connector.

SST 09843-18020



DIAGNOSTIC CODE

Code No.	Light Pattern	Diagnosis	Malfunctioning Part
	ON  OFF 	All speed sensors and sensor rotors are normal	
71		Low voltage of front right speed sensor signal	<ul style="list-style-type: none"> <li>• Front right speed sensor</li> <li>• Sensor installation</li> </ul>
72		Low voltage of front left speed sensor signal	<ul style="list-style-type: none"> <li>• Front left speed sensor</li> <li>• Sensor installation</li> </ul>
73		Low voltage of rear right speed sensor signal	<ul style="list-style-type: none"> <li>• Rear right speed sensor</li> <li>• Sensor installation</li> </ul>
74		Low voltage of rear left speed sensor signal	<ul style="list-style-type: none"> <li>• Rear left speed sensor</li> <li>• Sensor installation</li> </ul>
75		Abnormal change of front right speed sensor signal	<ul style="list-style-type: none"> <li>• Front right sensor rotor</li> </ul>
76		Abnormal change of front left speed sensor signal	<ul style="list-style-type: none"> <li>• Front left sensor rotor</li> </ul>
77		Abnormal change of rear right speed sensor signal	<ul style="list-style-type: none"> <li>• Rear right sensor rotor</li> </ul>
78		Abnormal change of rear left speed sensor signal	<ul style="list-style-type: none"> <li>• Rear left sensor rotor</li> </ul>
79		Deceleration sensor is faulty	<ul style="list-style-type: none"> <li>• Deceleration sensor</li> <li>• Sensor installation</li> </ul>

## DECELERATION SENSOR OPERATION DIAGNOSIS SYSTEM

### PRECAUTION

While checking the deceleration sensor operating diagnosis system, the Anti-lock Brake System does not work and brake system works as normal brake system.

### DIAGNOSIS SYSTEM INSPECTION

#### 1. INSPECT BATTERY VOLTAGE

Inspect that the battery voltage is about 12 V.

#### 2. CHECK THAT WARNING LIGHT TURNS ON

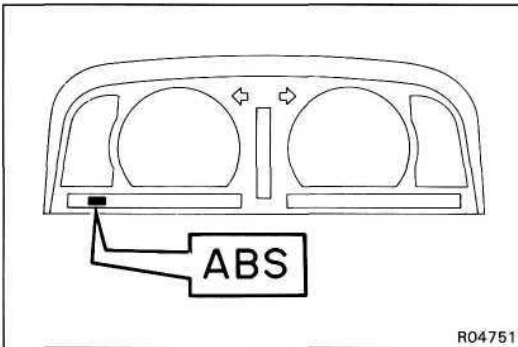
- (a) Turn the ignition switch to ON.
- (b) Check that the "ABS" warning light turns on for about 3 seconds.  
If not, inspect and repair or replace the fuse, bulb and wire harness.
- (c) Check that the "ABS" warning light turns off.
- (d) Turn the ignition switch to OFF.

#### 3. PERFORM FOLLOWING STEPS

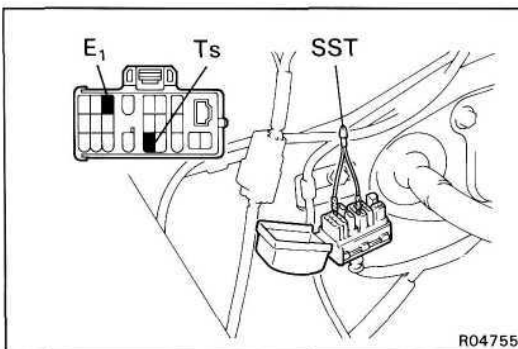
- (a) Using SST, connect the terminal Ts to E<sub>1</sub> of the check connector.

SST 09843-18020

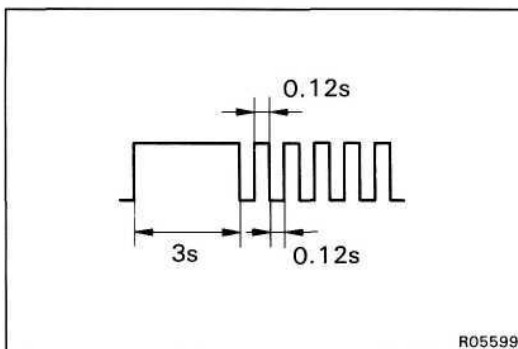
- (b) Check that the warning light blinks about 4 time every 1 second when 3 seconds after the engine is started.



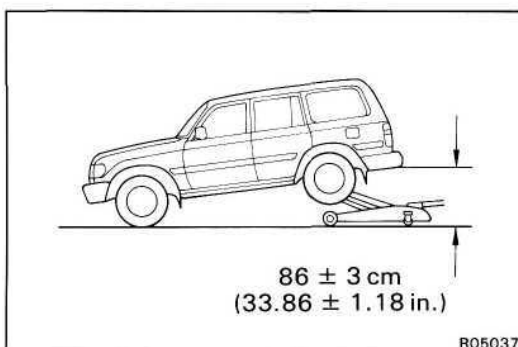
R04751



R04755



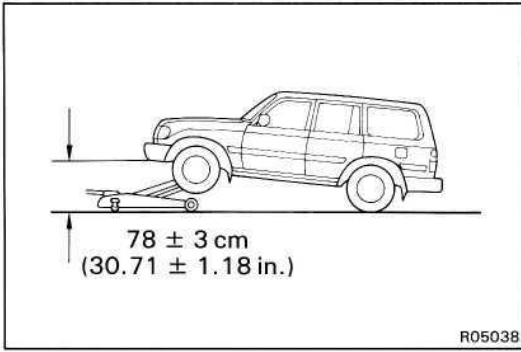
R05599



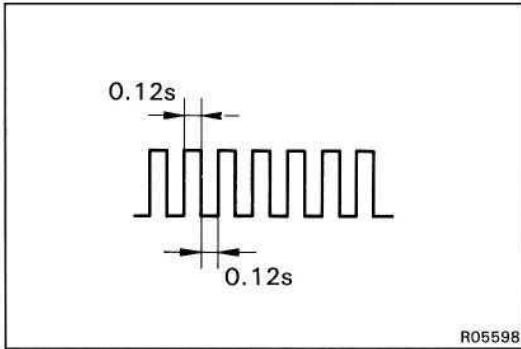
R05037

#### 4. INSPECT SENSOR DETECTION POINT

- (a) Jack up the rear side of the vehicle slowly as shown.  
HINT: When measuring the height, measure at the center of the lower body of the vehicle.
- (b) Check that the warning light does not turn on.  
If the warning light turns on, inspect the deceleration sensor installation. And if the sensor installation is OK, replace the deceleration sensor.
- (c) Jack down the vehicle slowly.

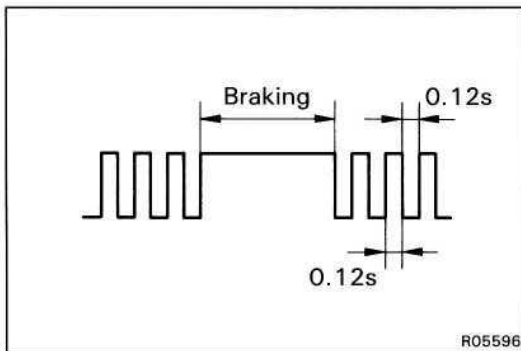


- (d) Jack up the front side of the vehicle slowly as shown.  
HINT: When measuring the height, measure at the center of the lower body of the vehicle.
- (e) Check that the warning light does not turn on.  
If the warning light turns on, inspect the deceleration sensor installation. And if the sensor installation is OK, replace the deceleration sensor.
- (f) Jack down the vehicle slowly.

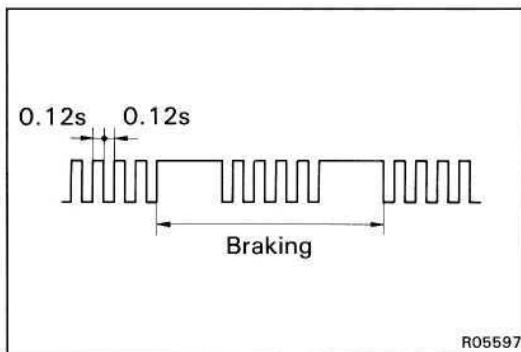


**5. INSPECT SENSOR OPERATION**

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



- (c) Drive the vehicle straight ahead at about 20 km/h (12.4 mph) or more, depress the brake pedal a little strong.
- (d) Check that the warning light turns on while braking.



- (e) Drive the vehicle straight ahead at about 20 km/h (12.4 mph) or more, depress the brake pedal strongly.
- (f) Check that the warning light pattern changes while braking as shown.  
If the operation is not as specified, inspect the deceleration sensor installation. And if the sensor installation is OK, replace the deceleration sensor.

**6. PERFORM FOLLOWING STEPS**

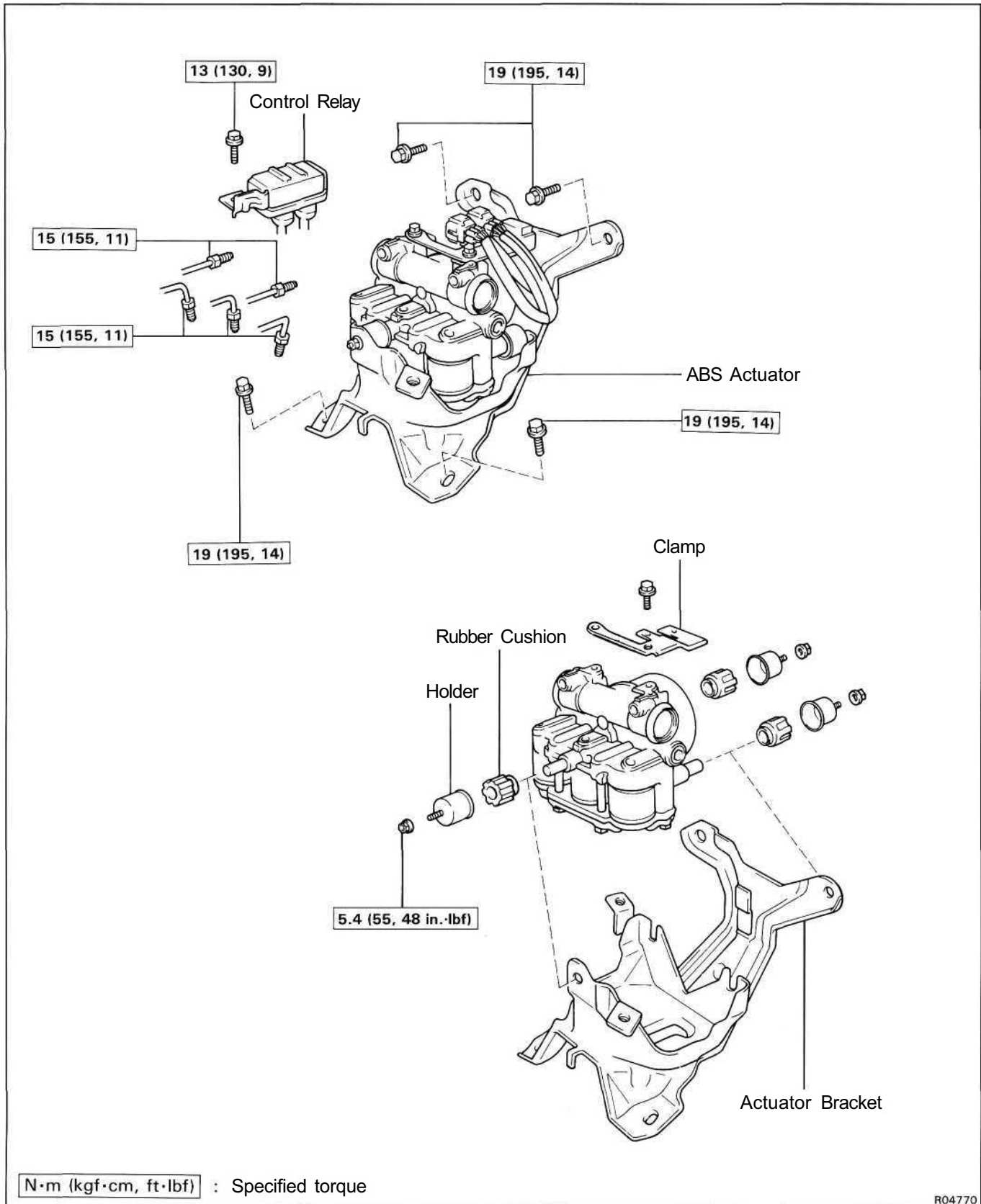
- (a) Stop the vehicle and turn the ignition switch to OFF.
- (b) Remove SST from the terminals T<sub>s</sub> and E<sub>1</sub> of the check connector.

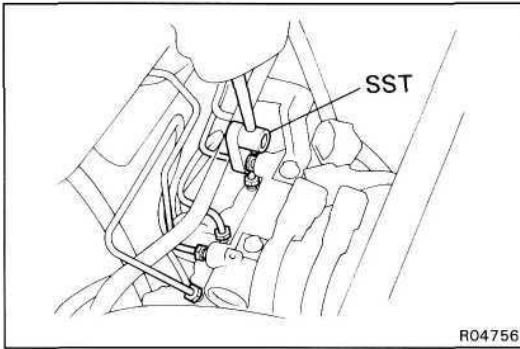
SST 09843-18020

## ABS ACTUATOR

### ABS ACTUATOR REMOVAL AND INSTALLATION

Remove and install the parts as shown.





## MAIN POINTS OF REMOVAL AND INSTALLATION

### 1. DISCONNECT AND CONNECT BRAKE LINES

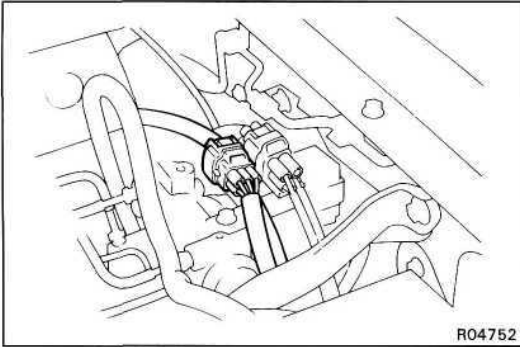
Using SST, disconnect and connect the brake lines from/to the ABS actuator.

SST 09023-00100

**Torque: 15 Nm (155 kgfcm, 11 ftlbf)**

### 2. BLEED BRAKE SYSTEM

(See pub No.RM184E, page BR-7)



## ABS ACTUATOR INSPECTION

### 1. INSPECT BATTERY VOLTAGE

Battery voltage:  
10 - 14.5 V

### 2. DISCONNECT CONNECTORS

(a) Disconnect the connector from the actuator.

(b) Remove the control relay from the actuator bracket.

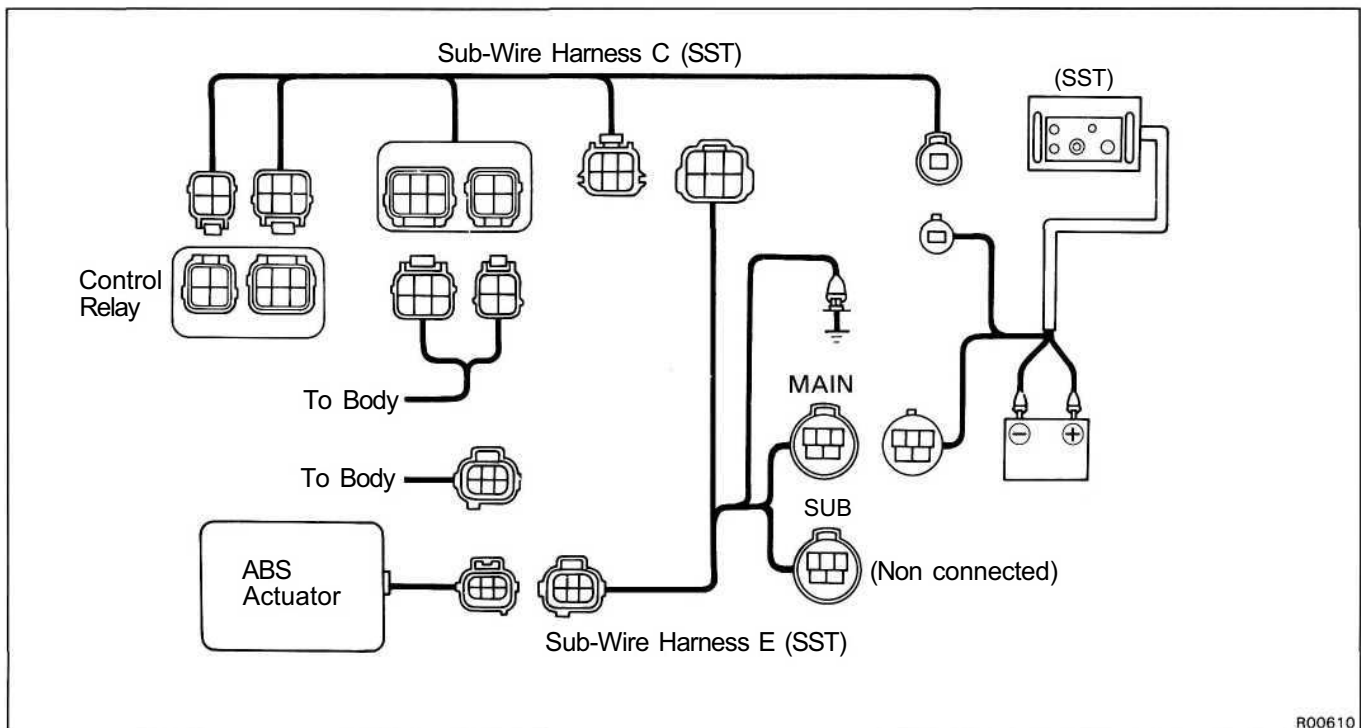
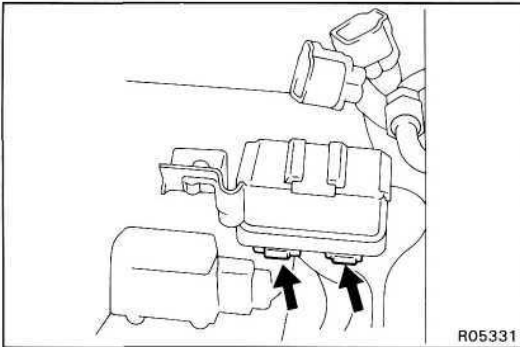
(c) Disconnect the two connectors from the control relay.

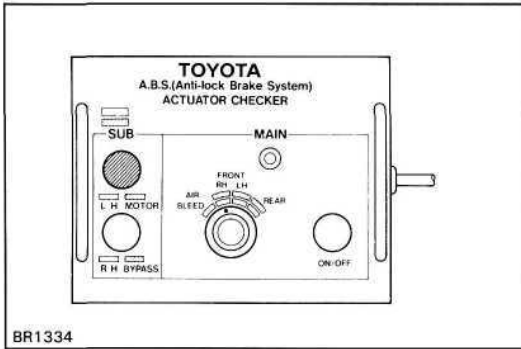
### 3. CONNECT ACTUATOR CHECKER (SST) TO ACTUATOR

(a) Connect the actuator checker (SST) to the actuator, control relay and body side wire harness through the sub-wire harness C 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.

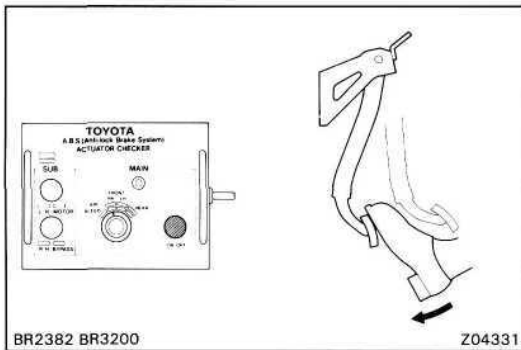




BR1334

**4. INSPECT BRAKE ACTUATOR OPERATION**

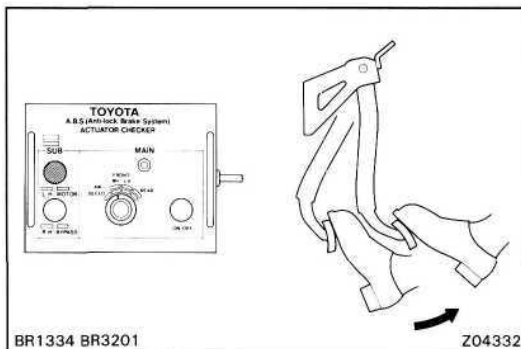
- (a) Start the engine, and run it at idle.
- (b) Turn the selector switch of the actuator checker to "FRONT RH" position.
- (c) Push and hold in the MOTOR SWITCH for a few seconds.
- (d) Depress the brake pedal and hold it until the step (g) is completed.



BR2382 BR3200

Z04331

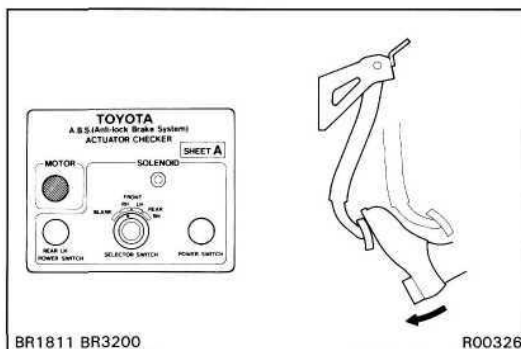
- (e) Push the POWER SWITCH, and check that the brake pedal does not go down.
- NOTICE: Do not keep the POWER SWITCH pushed down for more than 10 seconds.**
- (f) Release the switch, and check that the pedal goes down.



BR1334 BR3201

Z04332

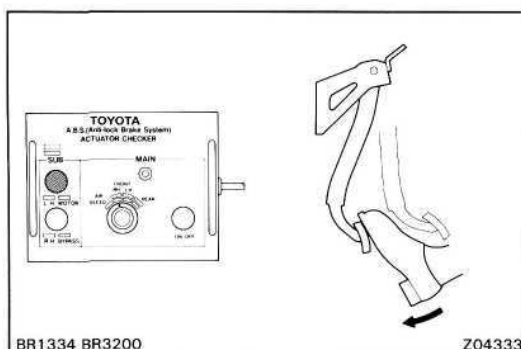
- (g) Push and hold in the SUB MOTOR switch for a few seconds, and check that the pedal returns.
- (h) Release the brake pedal.



BR1811 BR3200

R00326

- (i) Push and hold in the SUB MOTOR switch for a few seconds.
- (j) Depress the brake pedal and hold it for about 1.5 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.

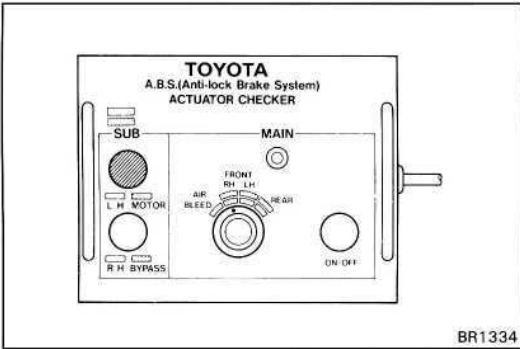


BR1334 BR3200

Z04333

**5. INSPECT FOR OTHER WHEELS**

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



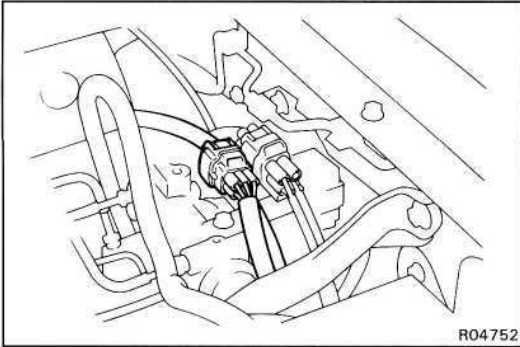
## 6. PUSH SUB MOTOR SWITCH

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

## 7. DISCONNECT ACTUATOR CHECKER (SST) FROM ACTUATOR

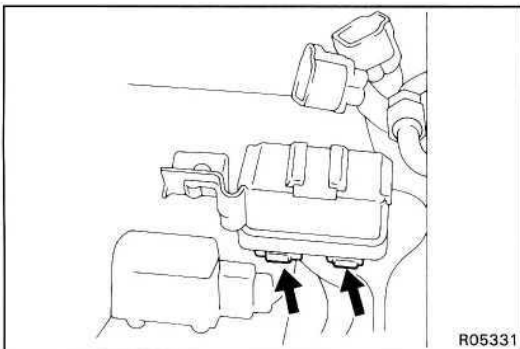
Disconnect the actuator checker (SST) and sub-wire harness (SST) from the actuator, control relay and body side wire harness.

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



## 8. CONNECT CONNECTORS

- (a) Connect the two connectors to the control relay.



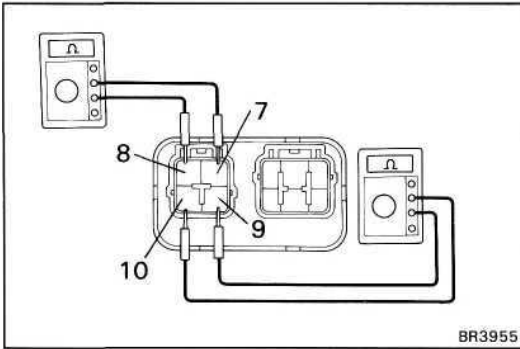
- (b) Connect the connector to the actuator.
- (c) Install the control relay to the actuator bracket.

## 9. CLEAR DIAGNOSTIC CODES (See page BR-27)



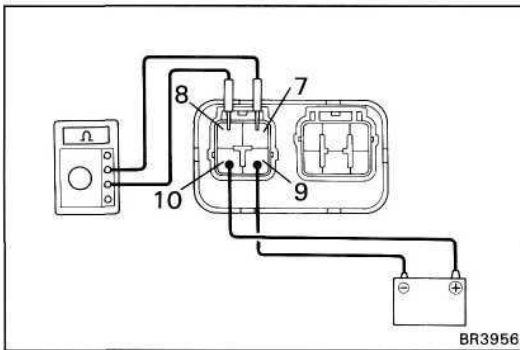
## CONTROL RELAY

### CONTROL RELAY INSPECTION



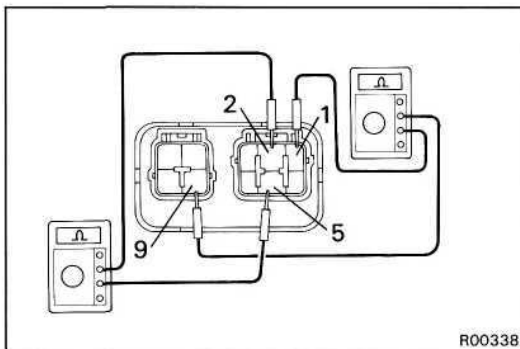
#### 1. INSPECT CONTINUITY OF MOTOR RELAY CIRCUIT

- (a) Check that there is continuity between terminals 9 and 10.
- (b) Check that there is no continuity between terminals 7 and 8.  
If continuity is not as specified, replace the relay.



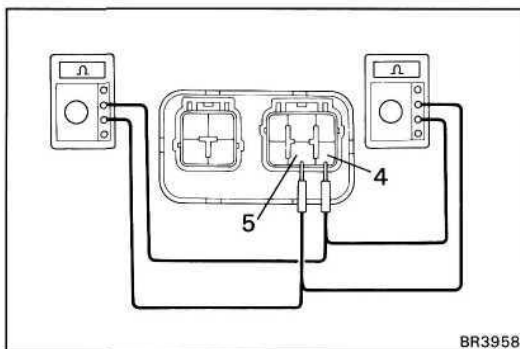
#### 2. INSPECT OPERATION OF MOTOR RELAY CIRCUIT

- (a) Connect the positive (+) lead from the battery to terminal 10 and negative (—) lead to terminal 9.
- (b) Check that there is continuity between terminals 7 and 8.  
If operation is not as specified, replace the relay.



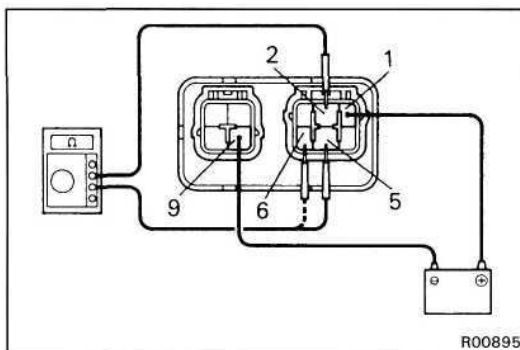
#### 3. INSPECT CONTINUITY OF SOLENOID RELAY CIRCUIT

- (a) Check that there is continuity between terminals 1 and 9.
- (b) Check that there is no continuity between terminals 2 and 5.



- (c) Connect the positive lead from the ohmmeter to terminal 5 and connect negative lead to terminal 4.
- (d) Check that there is continuity between terminals.
- (e) Connect the two leads in reverse, and check that there is no continuity between terminals.  
If continuity is not as specified, replace the relay.

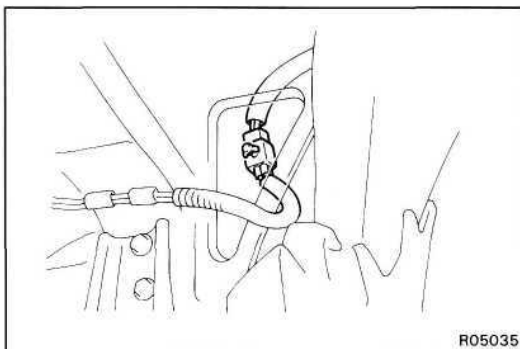
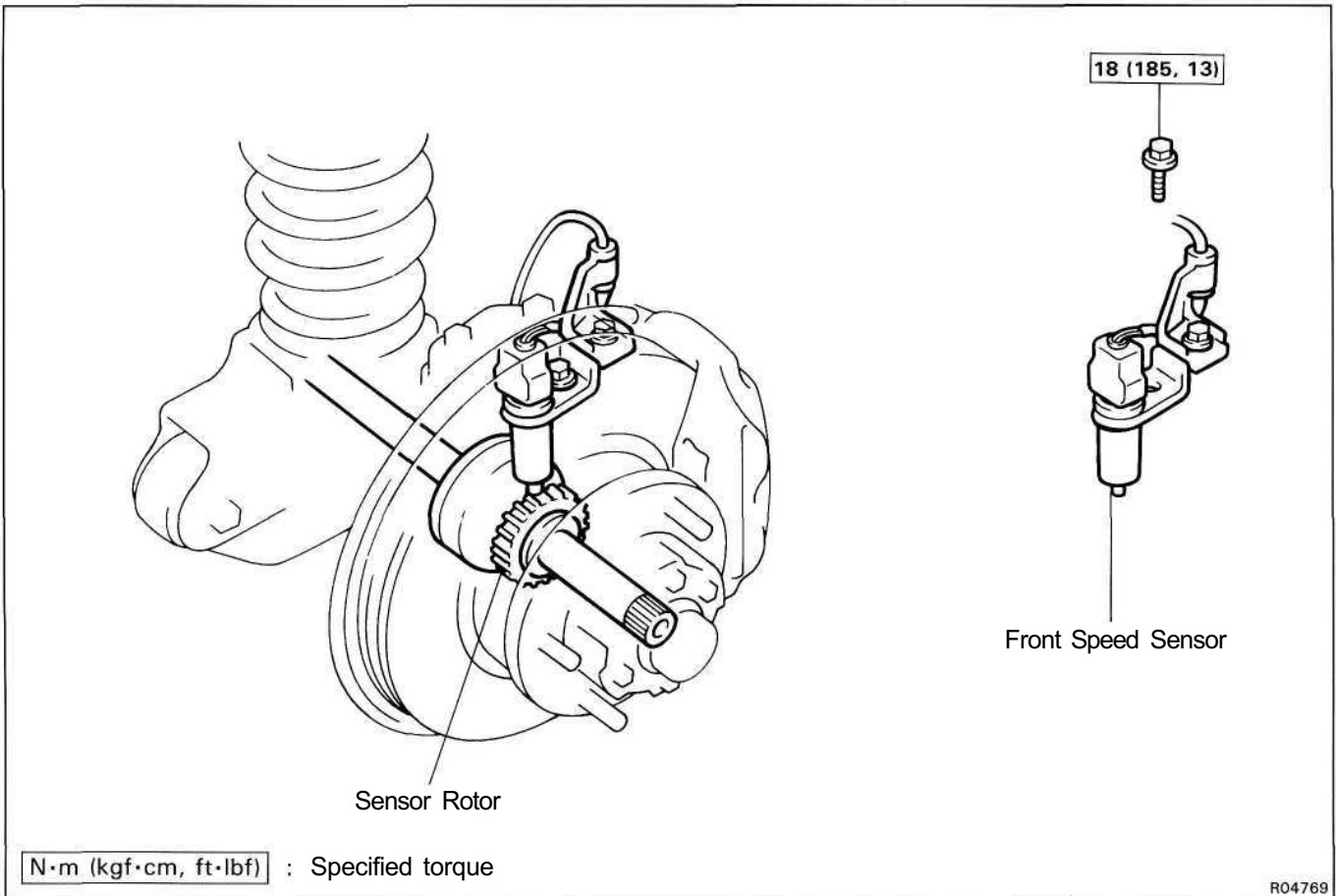
HINT: For the different type ohmmeter, there is no continuity for step (d), and there is continuity for step (e).



#### 4. INSPECT OPERATION OF SOLENOID RELAY CIRCUIT

- (a) Connect the positive (+) lead from the battery to terminal 1 and negative (—) lead to terminal 9.
- (b) Check that there is continuity between terminals 2 and 5.
- (c) Check that there is no continuity between terminals 2 and 6.  
If operation is not as specified, replace the relay.

## FRONT SPEED SENSOR COMPONENTS



### FRONT SPEED SENSOR INSPECTION

#### 1. INSPECT SPEED SENSOR

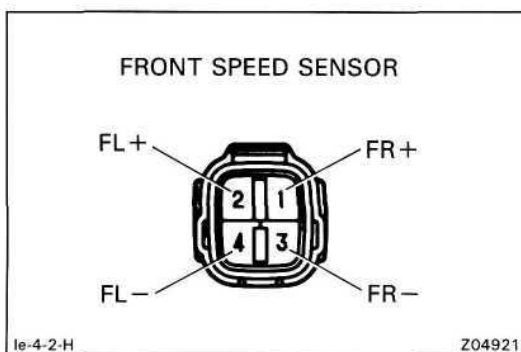
- (a) Disconnect the speed sensor connector.

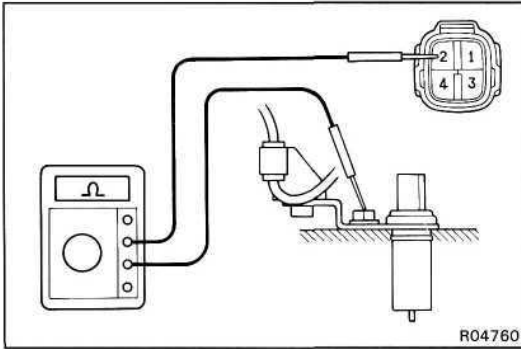
- (b) Measure the resistance between terminals FR+, FR— and FL+, FL—.

**Resistance:**

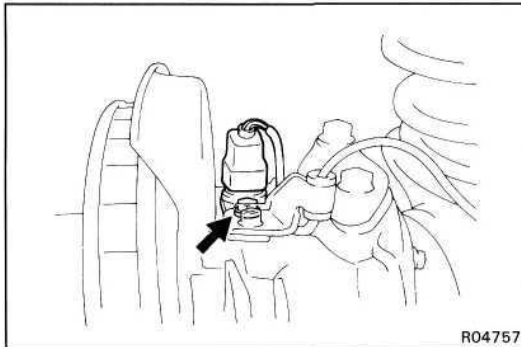
**0.87 - 1.27 kΩ**

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





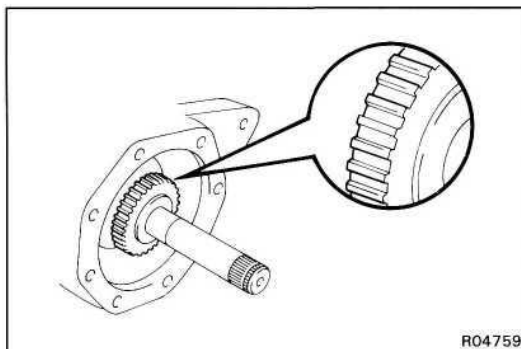
- (c) Check that there is no continuity between each terminal and sensor body.  
If there is continuity, replace the sensor.
- (d) Connect the speed sensor connector.



## 2. INSPECT SENSOR INSTALLATION

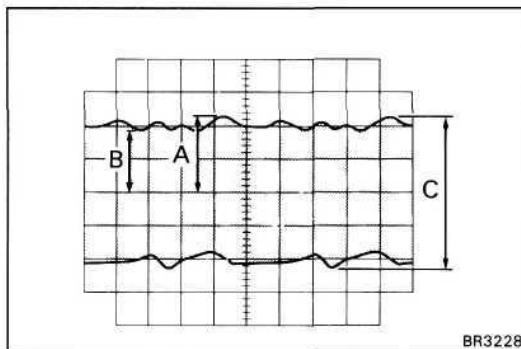
Check that the sensor installation bolt is tightened properly. If not, tighten the bolt.

Torque: 18 Nm (184 kgf-cm, 13 ft-lbf)



## 3. VISUALLY INSPECT SENSOR ROTOR SERRATIONS

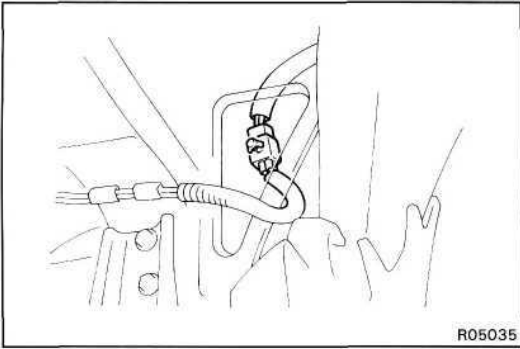
- (a) Remove the axle hub with disc.  
(See pub No. RM184E, page SA-16)
- (b) Inspect the sensor rotor serrations for scratches, cracks, warping or missing teeth.
- (c) Install the axle hub with disc.  
(See pub No. RM184E, page SA-19)



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

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

- (a) Connect an oscilloscope to the speed sensor connector.
- (b) Run the vehicle at 20 km/h (12.4 mph), and inspect speed sensor output wave.
- (c) Check that C is 0.5 V or more.  
If not as specified, replace the speed sensor.
- (d) Check that B is 50 % or more of A.  
If not as specified, replace the sensor rotor.

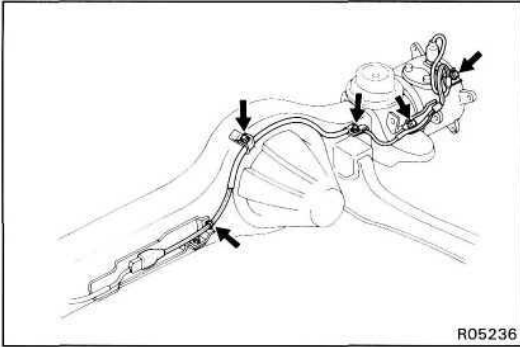


## FRONT SPEED SENSOR REMOVAL

HINT: When replacing the sensor or sensor harness, replace the sensor and sensor harness together as a set.

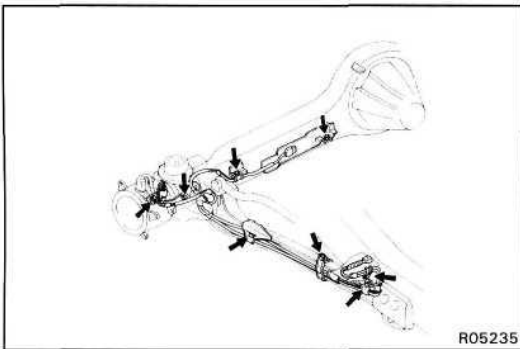
Disconnect the speed sensor connector.

### 1. DISCONNECT SPEED SENSOR CONNECTOR

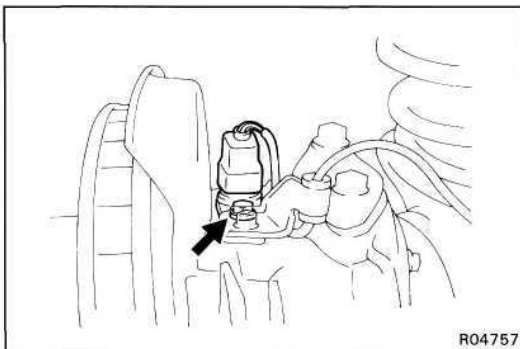


### 2. REMOVE SPEED SENSOR

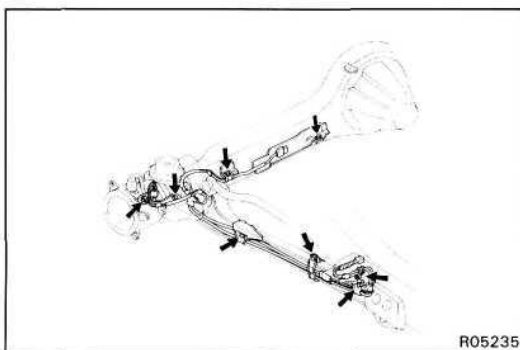
- (a) Remove the four clamp bolts holding the sensor harness RH from the axle housing.



- (b) Remove the eight clamp bolts holding the sensor harness LH from the axle housing and leading arm.



- (c) Remove the speed sensor LH and RH from the steering knuckle.

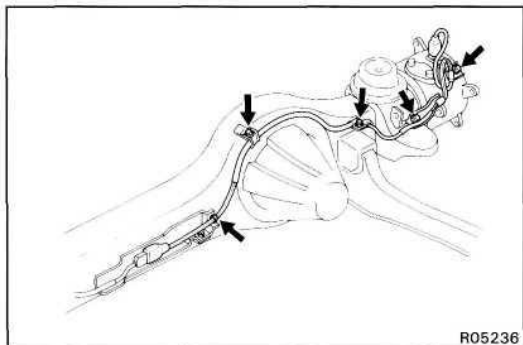


## FRONT SPEED SENSOR INSTALLATION

### 1. INSTALL SPEED SENSOR WIRE HARNESS

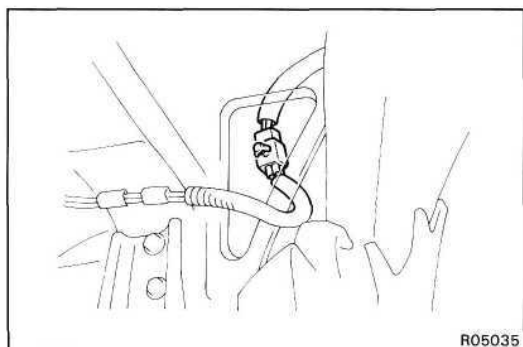
- (a) Install the sensor harness LH with the clamps and bolts in place.

Torque: 18 N-m (185 kgf-cm, 13 ft-lbf)



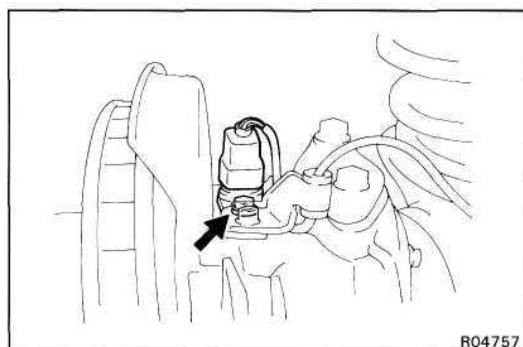
- (b) Install the sensor harness RH with the clamps and bolts in place.

**Torque: 18 N-m (185 kgf-cm, 13 ft-lbf)**



- (c) Connect the speed sensor connector.

**Torque: 18 N-m (185 kgfcm, 13 ft-lbf)**



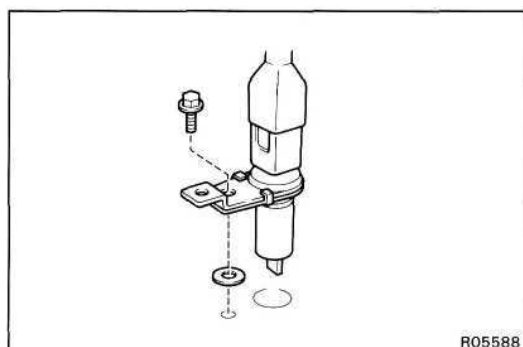
## 2. INSTALL SPEED SENSOR

HINT: When replacing the sensor, adjust the air gap.

- (a) Install the speed sensor LH and RH to the steering knuckle.

**Torque: 18 N-m (185 kgf-cm, 13 ft-lbf)**

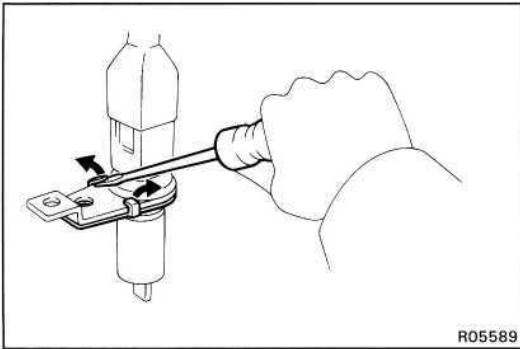
- (b) Connect the connector.



## FRONT SPEED SENSOR AIR GAP ADJUSTMENT

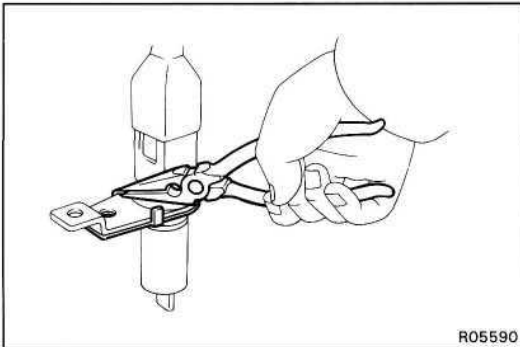
### FRONT SPEED SENSOR AIR GAP ADJUSTMENT

- (a) Install the speed sensor and 0.2 mm spacer to the steering knuckle.
- (b) Try speed sensor and deceleration sensor diagnosis system.
- (c) If diagnosis code 71 or 72 is not displayed, remove the 0.2 mm spacer and install the speed sensor to the steering knuckle.



- (d) If diagnosis code 71 or 72 is displayed, replace the 0.5 mm spacer inserted in the speed sensor with a 0.35 mm spacer.

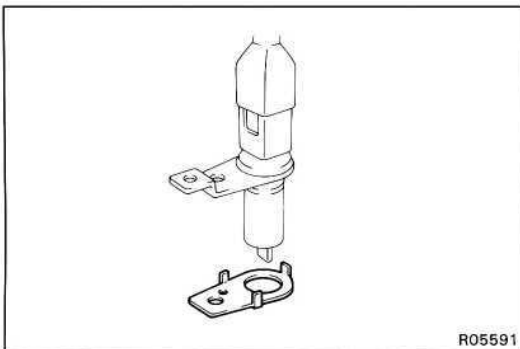
(1) Using a screwdriver to remove the 0.5 mm spacer.



(2) Using needle-nose pliers to install the 0.35 mm spacer.

- (e) Repeating (a) and (b) to the step 1.

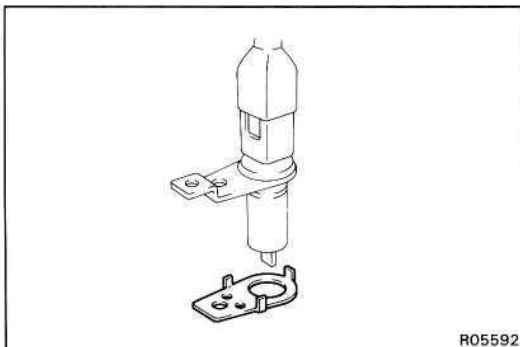
- (f) If diagnosis code 71 or 72 is not displayed, remove the 0.2 mm spacer and install the speed sensor to the steering knuckle.



- (g) If diagnosis code 71 or 72 is displayed, replace the 0.35 mm spacer with a 0.25 mm spacer.

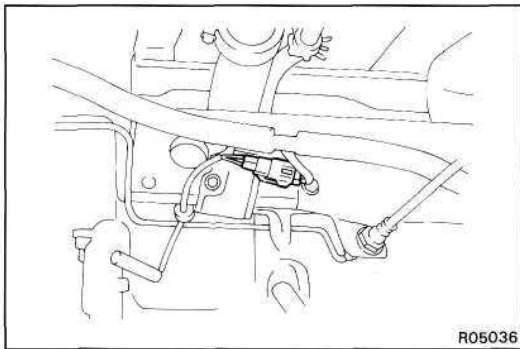
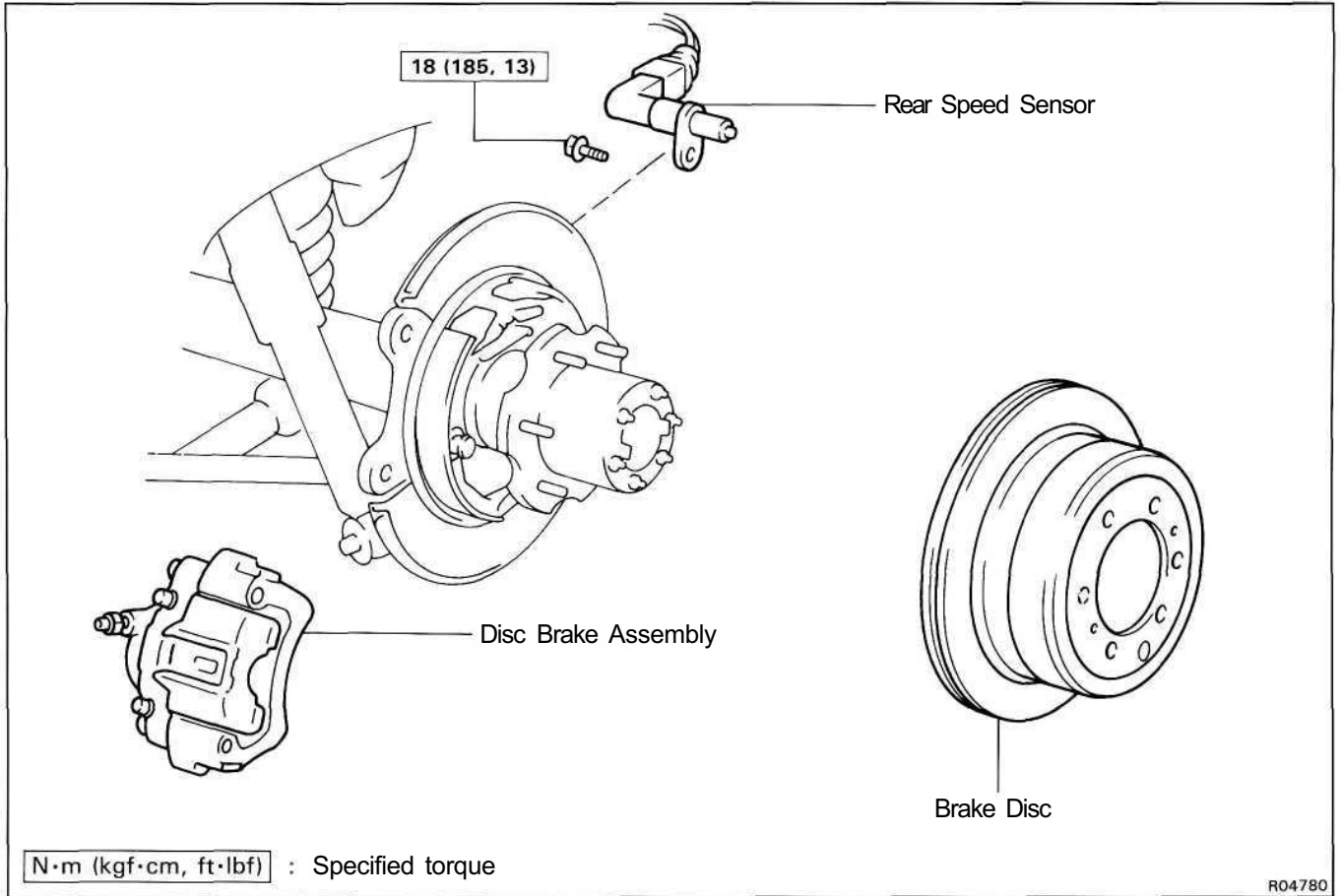
(h) Repeating (a) and (b) to the step 1.

- (i) If diagnosis code 71 or 72 is not displayed, remove the 0.2 mm spacer and install the speed sensor to the steering knuckle.



- (j) If diagnosis code 71 or 72 is displayed, replace the 0.25 mm spacer with a 0.15 mm spacer and install the speed sensor to the steering knuckle without using the 0.2 mm spacer.

## REAR SPEED SENSOR COMPONENTS



### REAR SPEED SENSOR INSPECTION

#### 1. INSPECT SPEED SENSOR

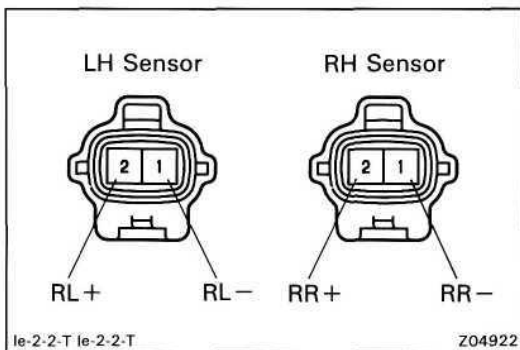
(a) Disconnect the speed sensor connector.

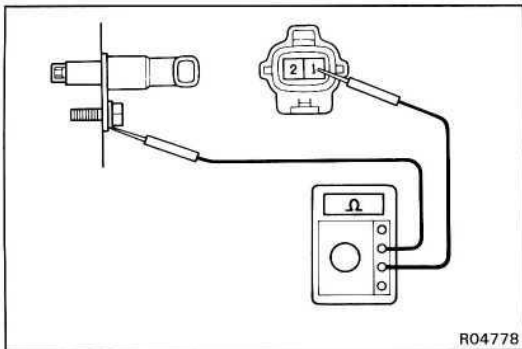
(b) Measure the resistance between terminals.

**Resistance:**

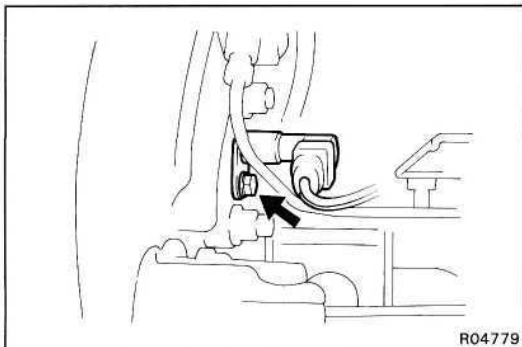
**0.7 - 1.1 kΩ**

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





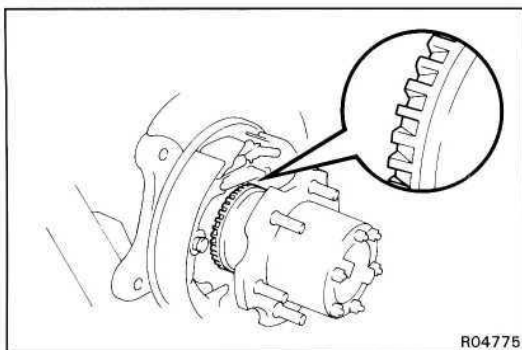
- (c) Check that there is no continuity between each terminal and sensor body.  
If there is continuity, replace the sensor.
- (d) Connect the speed sensor connector.



## 2. INSPECT SENSOR INSTALLATION

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

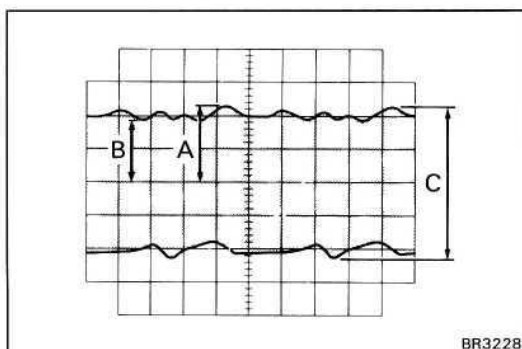
**Torque: 18 N-m (185 kgf-cm, 13 ftlbf)**



## 3. VISUALLY INSPECT SENSOR ROTOR SERRATIONS

- (a) Remove the brake disc.  
(See pub No. RM184E, page BR-57)
- (b) Inspect the sensor rotor serrations for scratches, cracks, warping or missing teeth.
- (c) Install the brake disc.  
(See pub No. RM184E, page BR-64)

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

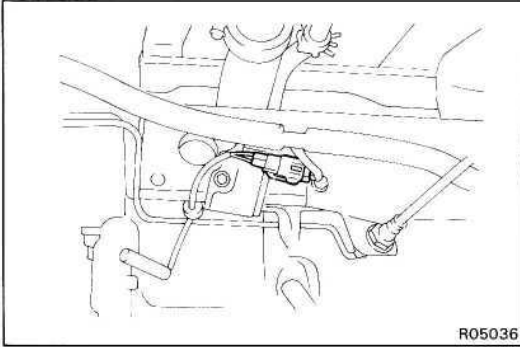


## REAR SPEED SENSOR AND SENSOR ROTOR SERRATIONS INSPECTION (REFERENCE)

### INSPECT REAR SPEED SENSOR AND SENSOR ROTOR SERRATIONS BY USING AN OSCILLOSCOPE

- (a) Connect an oscilloscope to the speed sensor connector.
- (b) Run the vehicle at 20 km/h (12.4 mph), and inspect speed sensor output wave.
- (c) Check that C is 0.5 V or more.  
If not as specified, replace the speed sensor.
- (d) Check that B is 50 % or more of A.  
If not as specified, replace the rear axle hub.





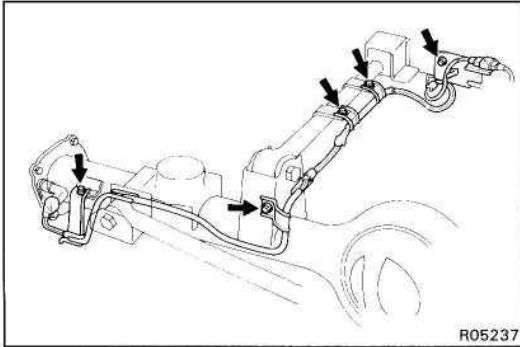
R05036

## REAR SPEED SENSOR REMOVAL

HINT: When replacing the sensor or sensor harness, replace the sensor and sensor harness together as a set.

### 1. DISCONNECT SPEED SENSOR CONNECTOR

- (a) Disconnect the speed sensor connector.

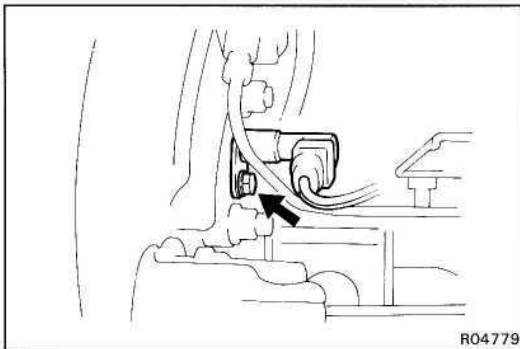


R05237

- (b) Remove the five clamp bolts holding the sensor wire harness from the suspension arm and frame.

### 2. REMOVE SPEED SENSOR

Remove the speed sensor from the axle end.



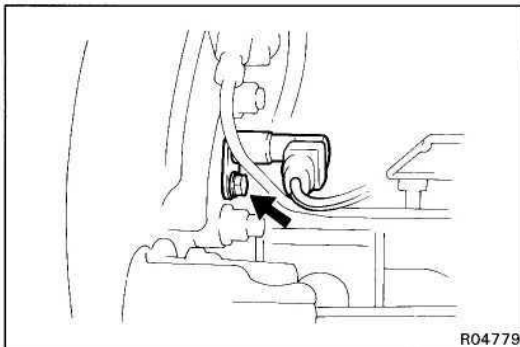
R04779

## REAR SPEED SENSOR INSTALLATION

### 1. INSTALL SPEED SENSOR

Install the speed sensor to the axle end.

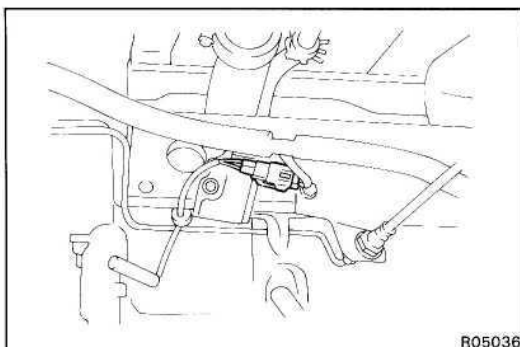
Torque: **18 Nm** (185 kgf-cm, 13 ft-lbf)



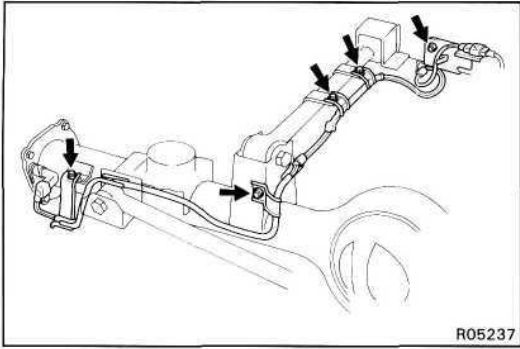
R04779

### 2. CONNECT SPEED SENSOR CONNECTOR

- (a) Connect the speed sensor connector.

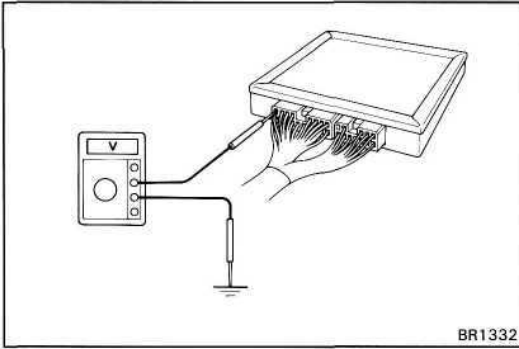


R05036



(b) Install the sensor harness with the clamps and bolts in place.

**3. INSPECT SPEED SENSOR AND DECELERATION SENSOR DIAGNOSIS SYSTEM**

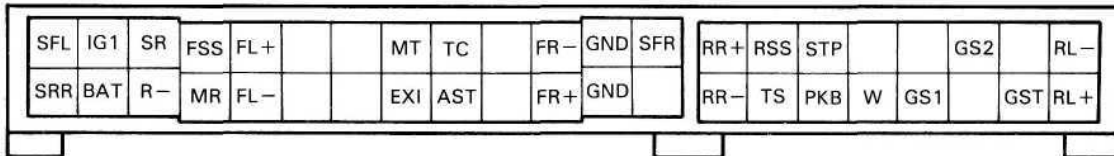


# ANTI-LOCK BRAKE SYSTEM CIRCUIT

## SYSTEM CIRCUIT INSPECTION

### 1. INSPECT SYSTEM CIRCUIT WITH CONNECTOR CONNECTED

- (a) Remove the ABS ECU.
- (b) Using a voltmeter with high impedance (10 k $\Omega$ /V minimum), measure the voltage at each terminal and body ground.

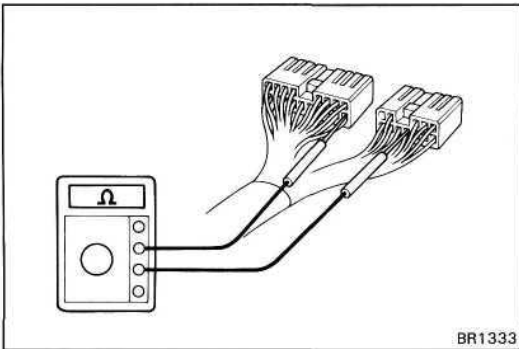


R01275

Tester Connection	Check Item	Condition	Specified Value	Trouble Part
RL-	Continuity	IG switch off	Continuity	ABS ECU
GS2	Voltage	IG switch on	4 ~ 6 V	Deceleration Sensor
STP	Voltage	IG switch off and brake pedal depressed	Battery voltage	Stop light switch Stop Light
	Continuity	IG switch off and brake pedal returned	Continuity	
RSS	Continuity	IG switch off	Continuity	ABS ECU
GS1	Voltage	IG switch on	4 ~ 6 V or 7 ~ 12 V	Deceleration Sensor
W	Voltage	IG switch on and "ABS" warning light goes on	About 0 V	ABS ECU "ABS" warning light
		IG switch on and "ABS" warning light goes off	Battery voltage	
PKB	Voltage	IG switch on and PKB lever pulled	About 0 V	Parking brake switch Level warning switch
		IG switch on and PKB lever returned	Battery voltage	
TS	Voltage	IG switch on and check connector Tc-E <sub>1</sub> connected	About 0 V	ABS ECU
RR-	Continuity	IG switch off	Continuity	
SFR	Voltage	IG switch on and "ABS" warning light goes on	About 0 V	Actuator
		IG switch on and "ABS" warning light goes off	Battery voltage	
GND	Continuity	IG switch off	Continuity	Wiring harness
FR-	Continuity	IG switch off	Continuity	ABS ECU
		IG switch on and check connector Tc-E <sub>1</sub> not connected	Battery voltage	
TC	Voltage	IG switch on and check connector Tc-E <sub>1</sub> not connected	Battery voltage	
		IG switch on and check connector Tc-E <sub>1</sub> connected	About 0 V	
FSS	Continuity	IG switch off	Continuity	
SR	Voltage	IG switch on and "ABS" warning light goes on	About 0 V	
		IG switch on and "ABS" warning light goes off	Battery voltage	
IG1	Voltage	IG switch on	Battery voltage	

Tester Connection	Check Item	Condition	Specified Value	Trouble Part
SFL	Voltage	IG switch on and "ABS" warning light goes on	About 0 V	Actuator
		IG switch on and "ABS" warning light goes off	Battery voltage	
AST	Voltage	IG switch on and "ABS" warning light goes on	About 0 V	
		IG switch on and "ABS" warning light goes off	Battery voltage	
EXI	Voltage	IG switch on and center differential lock indicator light goes off	Battery voltage	GAUGE Fuse
FL-	Continuity	IG switch off	Continuity	ABS ECU
R-	Continuity	IG switch off	Continuity	
BAT	Voltage	IG switch off	Battery voltage	DOME Fuse
SRR	Voltage	IG switch on and "ABS" warning light goes on	About 0 V	Actuator
		IG switch on and "ABS" warning light goes off	Battery voltage	

If the circuit is not as specified, check and repair or replace the trouble part shown in the table above.



## 2. INSPECT SYSTEM CIRCUIT WITH CONNECTOR DISCONNECTED

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

Tester Connection	Check Item	Specified Value	Trouble Part	Tester Connection	Check Item	Specified Value	Trouble Part
RR+ ↔ RR-	Resistance	*0.7 ~1.1 kΩ	Rear RH speed sensor	SFL ↔ AST	Resistance	*About 6 Ω	Actuator
RL+ ↔ RL-	Resistance	*0.7 ~1.1 kΩ	Rear LH speed sensor	FR+ ↔ FR-	Resistance	*0.87 ~1.27 kΩ	Front RH speed sensor
SFR ↔ AST	Resistance	*About 6 Ω	Actuator	AST ↔ Body ground	Resistance	*About 5 Ω	Actuator
MT ↔ Body ground	Continuity	Continuity	Actuator	MR ↔ R-	Resistance	*55.8 ~68.2 Ω	Control relay
FL+ ↔ FL-	Resistance	*0.87 ~1.27 kΩ	Front LH speed sensor	SRR ↔ AST	Resistance	*About 6 Ω	Actuator
SR ↔ R-	Resistance	*60~100 Ω	Control relay				

\*: 20°C (68°F)

If the circuit is not as specified, check and repair or replace the trouble part shown in the table above.

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

## SERVICE SPECIFICATIONS

### SERVICE DATA

Brake pedal height from asphalt sheet	167.5 – 177.5 mm (6.59 – 6.99 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 59 mm (2.32 in.)
Brake booster push rod to piston clearance (W/SST)	0 mm (0 in.)

### TORQUE SPECIFICATIONS

Part tightened	N·m	kgf·cm	ft·lbf
Master cylinder × Piston stopper bolts	10	100	7
Master cylinder × Reservoir	1.7	17.5	15.2 in.·lbf
Master cylinder × Brake booster	13	130	9
Brake tube union nut	15	155	11
LSP & BV Bracket × Frame	19	195	14
LSP & BV × LSP & BV Bracket	13	130	9
LSP & BV Spring × LSP & BV Bracket	18	185	13
LSP & BV Spring × Shackle No. 1	18	185	13
LSP & BV Shackle lock nut	25	250	18
LSP & BV Shackle × Shackle bracket	13	130	9
LSP & BV Shackle bracket × Rear axle housing	19	195	14
ABS actuator bracket × Body	19	195	14
Front speed sensor installation bolt	18	185	13
Rear speed sensor installation bolt	18	185	13