

# BRAKE SYSTEM

## SECTION **BR**

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**When you read wiring diagrams:**

- Read GI section, "HOW TO READ WIRING DIAGRAMS".
- See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.

**When you perform trouble diagnoses, read GI section, "HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES" and "HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT".**

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## PRECAUTIONS AND PREPARATION



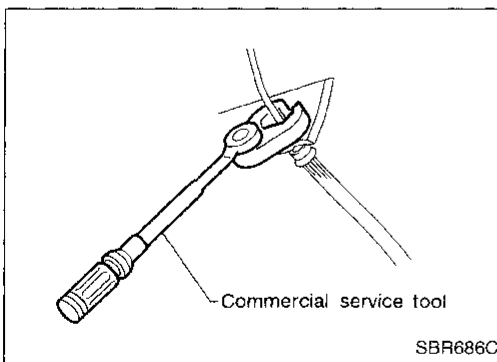
### Precautions

#### SUPPLEMENTAL RESTRAINT SYSTEM (SRS) "AIR BAG"

The Supplemental Restraint System "Air Bag", used along with a seat belt, helps to reduce the risk or severity of injury to the driver and front passenger in a frontal collision. The Supplemental Restraint System consists of air bag modules (located in the center of the steering wheel and on the instrument panel on the passenger side), a diagnosis sensor unit, warning lamp, wiring harness and spiral cable. Information necessary to service the system safely is included in the **RS section** of this Service Manual.

#### WARNING:

- To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN dealer.
- Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.
- Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses are covered with yellow insulation either just before the harness connectors or for the complete harness, for easy identification.



#### BRAKE SYSTEM

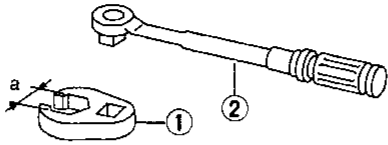
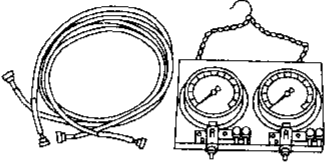
- Use brake fluid "DOT 3".
- Never reuse drained brake fluid.
- Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.
- To clean master cylinder parts, disc brake caliper parts or wheel cylinder parts, use clean brake fluid.
- Never use mineral oils such as gasoline or kerosene. They will ruin rubber parts of hydraulic system.
- Use flare nut wrench when removing or installing brake tubes.
- Always torque brake lines when installing.

#### WARNING:

- Clean brakes with a vacuum dust collector to minimize risk of health hazard from powder caused by friction.

# PRECAUTIONS AND PREPARATION

## Commercial Service Tools

Tool name	Description
<ul style="list-style-type: none"> <li>① Flare nut crowfoot</li> <li>② Torque wrench</li> </ul>	<p data-bbox="1084 268 1446 296">Removing and installing brake tubes</p>  <p data-bbox="444 436 505 464">NT360</p> <p data-bbox="1084 449 1279 476">a: 10 mm (0.39 in)</p>
<p data-bbox="164 491 375 548">Brake fluid pressure gauge</p>	<p data-bbox="1084 491 1403 518">Measuring brake fluid pressure</p>  <p data-bbox="444 667 505 695">NT151</p>

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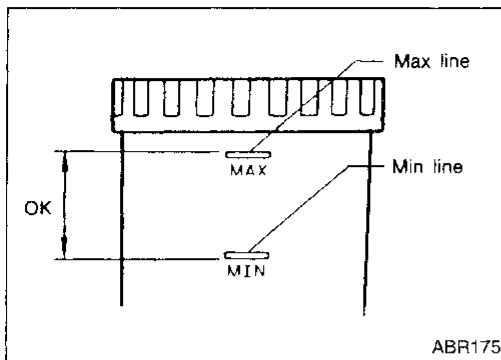
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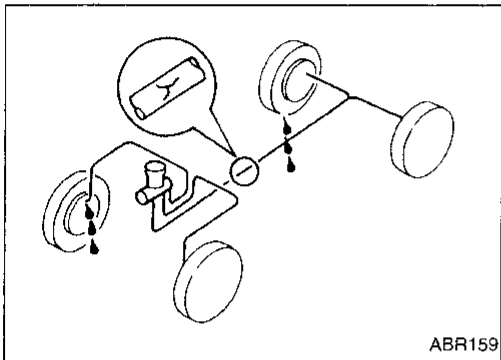
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## CHECK AND ADJUSTMENT



### Checking Brake Fluid Level

- Check fluid level in reservoir tank. It should be between Max. and Min. lines on reservoir tank.
- If fluid level is extremely low, check brake system for leaks.
- If the brake warning lamp comes on, check brake fluid level switch and parking brake switch.

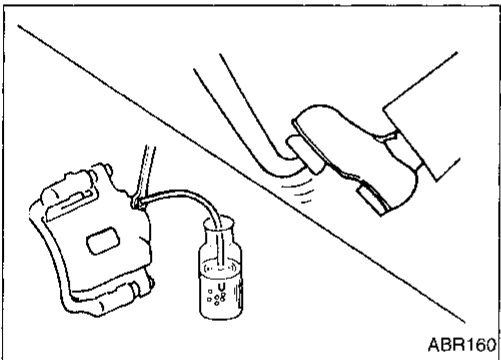


### Checking Brake Line

#### CAUTION:

If leakage occurs around joints, retighten or, if necessary, replace damaged parts.

1. Check brake lines (tubes and hoses) for cracks, deterioration or other damage. Replace any damaged parts.
2. Check for oil leakage by fully depressing brake pedal while engine is running.



### Changing Brake Fluid

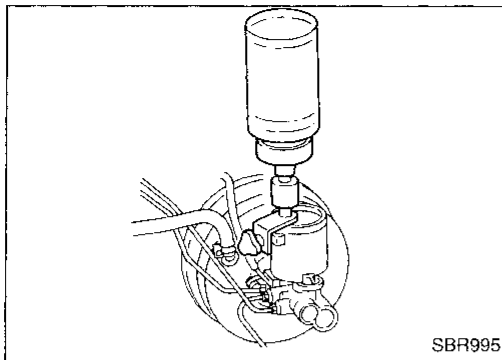
#### CAUTION:

- Refill with new brake fluid "DOT 3".
- Always keep fluid level higher than minimum line on reservoir tank.
- Never reuse drained brake fluid.
- Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.

1. Clean inside of reservoir tank, and refill with new brake fluid.
2. Connect a vinyl tube to each air bleeder valve.
3. Drain brake fluid from each air bleeder valve by depressing brake pedal.
4. Refill until new brake fluid comes out of each air bleeder valve.

Use same procedure as in bleeding hydraulic system to refill brake fluid. Refer to "Bleeding Procedure", BR-5.

## AIR BLEEDING



### Bleeding Procedure

#### CAUTION:

- Carefully monitor brake fluid level at master cylinder during bleeding operation.
- If master cylinder is suspected to have air inside, bleed air from master cylinder first. Refer to "Installation", "MASTER CYLINDER", BR-13.
- Fill reservoir with new brake fluid "DOT 3". Make sure it is full at all times while bleeding air out of system.
- Place a container under master cylinder to avoid spillage of brake fluid.
- For models with ABS, turn ignition switch OFF and disconnect ABS actuator connector or battery cable.

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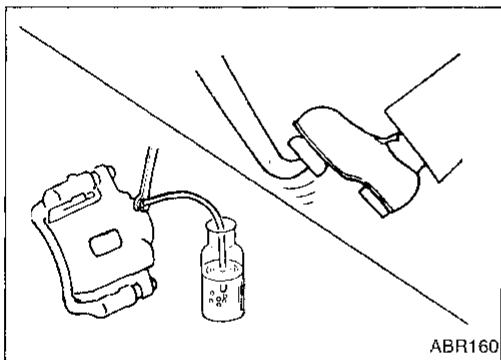
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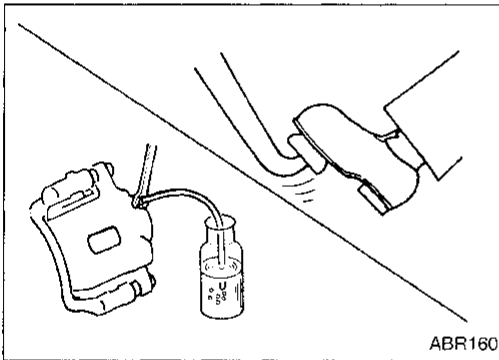
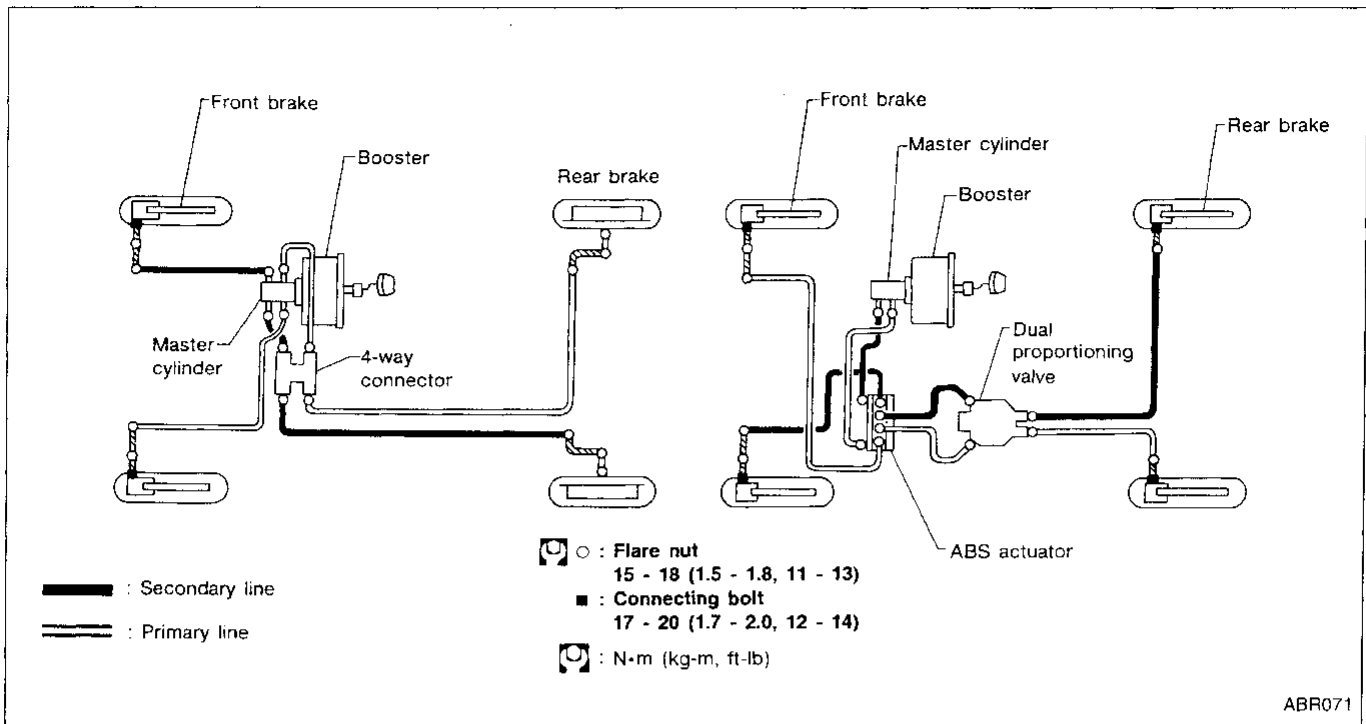
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- Bleed air in the following order:  
Right rear brake → Left front brake → Left rear brake → Right front brake
- a. Connect a transparent vinyl tube to air bleeder valve.
- b. Fully depress brake pedal several times.
- c. With brake pedal depressed, open air bleeder valve to release air.
- d. Close air bleeder valve.
- e. Release brake pedal slowly.
- f. Repeat steps b through e until clear brake fluid comes out of air bleeder valve.
- g. Tighten air bleeder valve.  
🔧: 7 - 9 N·m (0.7 - 0.9 kg-m, 61 - 78 in-lb)

# BRAKE HYDRAULIC LINE



## REMOVAL

### CAUTION:

- Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.
  - All hoses must be free from excessive bending, twisting and pulling.
1. Connect a vinyl tube to air bleeder valve.
  2. Drain brake fluid from each air bleeder valve by depressing brake pedal.
  3. Remove flare nut securing brake tube to hose, then withdraw lock spring.
  4. Cover openings to prevent entrance of dirt when disconnecting hydraulic line.

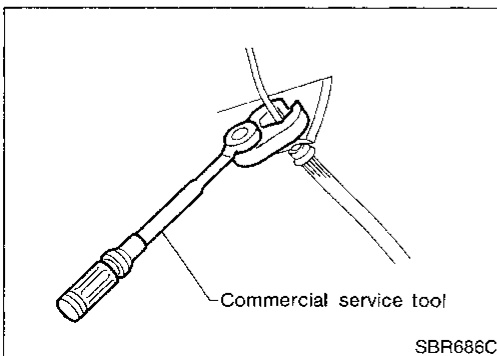
## INSPECTION

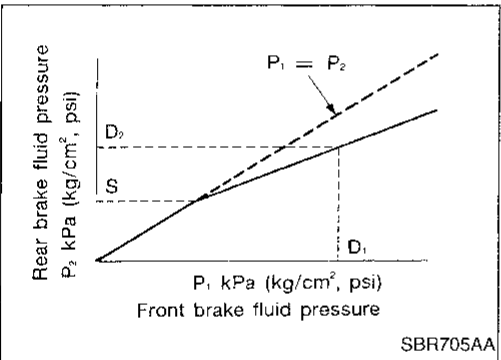
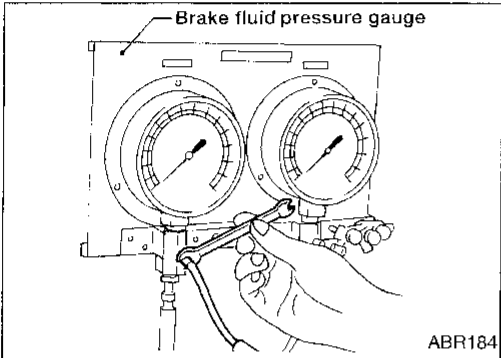
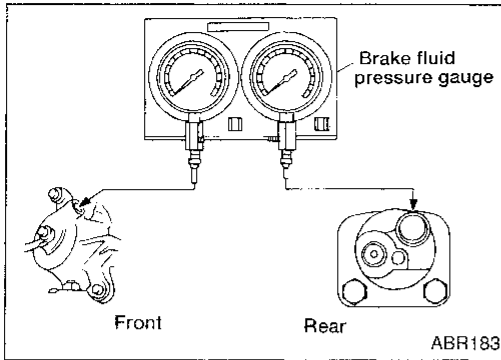
Check brake lines (tubes and hoses) for cracks, deterioration or other damage. Replace any damaged parts.

## INSTALLATION

### CAUTION:

- Refill with new brake fluid "DOT 3".
  - Never reuse drained brake fluid.
1. Tighten all flare nuts and connecting bolts.
    - Flare nut:**
    - : 15 - 18 N·m (1.5 - 1.8 kg·m, 11 - 13 ft·lb)
    - Connecting bolt:**
    - : 17 - 20 N·m (1.7 - 2.0 kg·m, 12 - 14 ft·lb)
  2. Refill until new brake fluid comes out of each air bleeder valve.
  3. Bleed air. Refer to "Bleeding Procedure", BR-5.





## Proportioning Valve INSPECTION

### CAUTION:

- Carefully monitor brake fluid level at master cylinder.
  - Use new brake fluid "DOT 3".
  - Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on paint areas, wash it away with water immediately.
  - Depress pedal slowly when raising front brake pressure.
  - Check rear brake pressure 2 seconds after front brake pressure reaches specified value.
  - For models with ABS, disconnect harness connectors from ABS actuator relay box before checking.
1. Connect Tool to air bleeders of front and rear brakes on either LH or RH side.
  2. Bleed air from the Tool.
  3. Check rear brake pressure by depressing brake pedal (increasing front brake pressure).

Unit: kPa (kg/cm<sup>2</sup>, psi)

Applied model	Without ABS		With ABS
	Except SE model	SE model	
Applied pressure (Front brake) $D_1$	5,394 (55, 782)		6,375 (65, 924)
Output pressure (Rear brake) $D_2$	2,452 - 2,844 (25 - 29, 356 - 412)	3,432 - 3,825 (35 - 39, 498 - 555)	

If output pressure is out of specification, replace dual proportioning valve (separated type) or master cylinder assembly (built-in type).

4. Bleed air after disconnecting the Tool. Refer to "Bleeding Procedure", BR-5.

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## CONTROL VALVE

### Proportioning Valve (Cont'd)

#### REMOVAL (Separated type)

##### CAUTION:

- Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.
- All hoses must be free from excessive bending, twisting and pulling.


1. Connect a vinyl tube to air bleeder valve.
2. Drain brake fluid from each air bleeder valve by depressing brake pedal.
3. Loosen flare nut.
4. Remove proportioning valve mounting bolt, then remove flare nut.

#### INSTALLATION (Separated type)

##### CAUTION:

- Refill with new brake fluid "DOT 3".
  - Never reuse drained brake fluid.
1. Temporarily fit flare nut to proportioning valve.
  2. Tighten proportioning valve mounting bolt, then tighten flare nut.

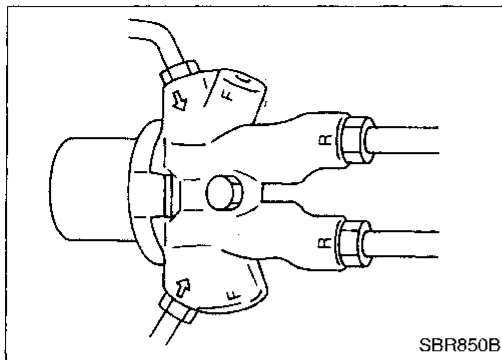
##### Flare nut:

: 15 - 18 N·m (1.5 - 1.8 kg-m, 11 - 13 ft-lb)

3. Refill until new brake fluid comes out of each air bleeder valve.
4. Bleed air. Refer to "Bleeding Procedure", BR-5.

#### REMOVAL AND INSTALLATION (Built-in type)

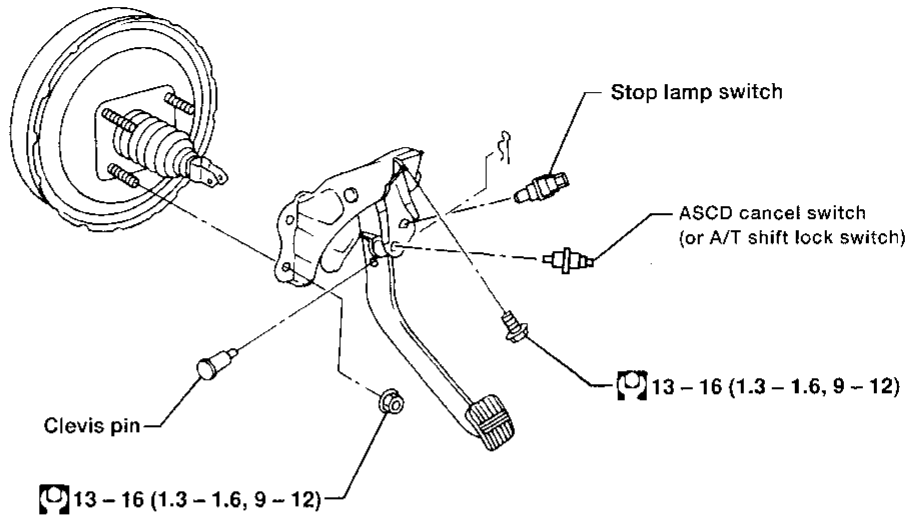
- Always replace together with master cylinder as an assembly.
- Refer to "MASTER CYLINDER", BR-11.



# BRAKE PEDAL AND BRACKET

## Removal and Installation

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: N·m (kg-m, ft-lb)

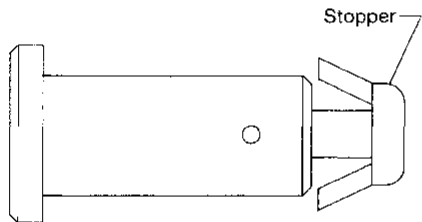
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### Inspection

Check brake pedal for following items:

- Brake pedal bend
- Clevis pin deformation
- Crack of any welded portion
- Crack or deformation of clevis pin stopper

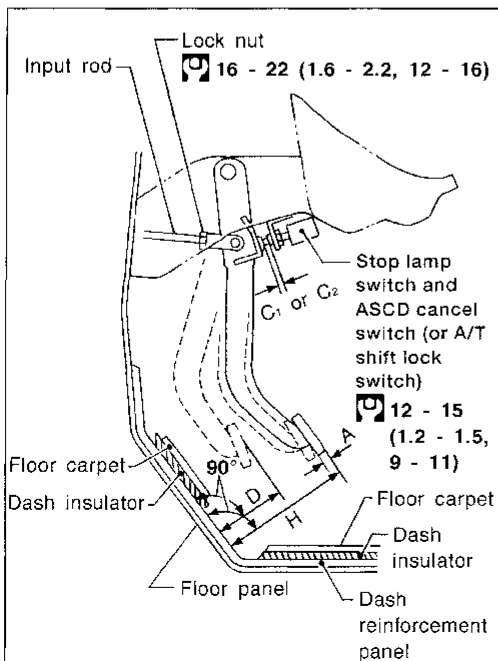


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### Adjustment

Check brake pedal free height from dash reinforcement panel.

- H: Free height**  
Refer to SDS, BR-69.
- D: Depressed height**  
Refer to SDS, BR-69.  
Under force of 490 N (50 kg, 110 lb) with engine running
- C<sub>1</sub>, C<sub>2</sub>: Clearance between pedal stopper and threaded end of stop lamp switch and ASCD cancel switch (or A/T shift lock switch)**  
0.3 - 1.0 mm (0.012 - 0.039 in)
- A: Pedal free play**  
1.0 - 3.0 mm (0.039 - 0.118 in)

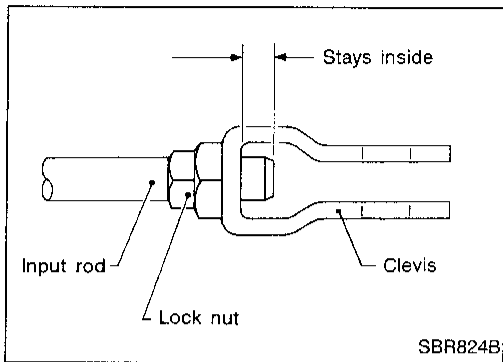


: N·m (kg-m, ft-lb)

ABR357

## BRAKE PEDAL AND BRACKET

### Adjustment (Cont'd)



If necessary, adjust brake pedal free height.

1. Loosen lock nut and adjust pedal free height by turning brake booster input rod. Tighten lock nut.
- **Make sure that tip of input rod stays inside of clevis.**

2. Loosen lock nut and adjust clearance "C<sub>1</sub>" and "C<sub>2</sub>" with stop lamp switch and ASCD cancel switch (or A/T shift lock switch) respectively. Then tighten lock nuts.
3. Check pedal free play.
  - **Make sure that stop lamps go off when pedal is released.**
4. Check brake pedal depressed height while engine is running. If lower than specification, check for leaks, air in system, or damage to components (master cylinder, wheel cylinder, etc.). Then make necessary repairs.

# MASTER CYLINDER

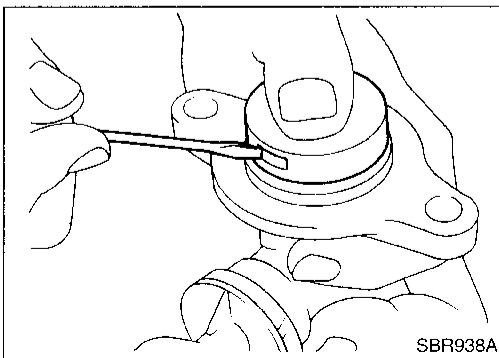
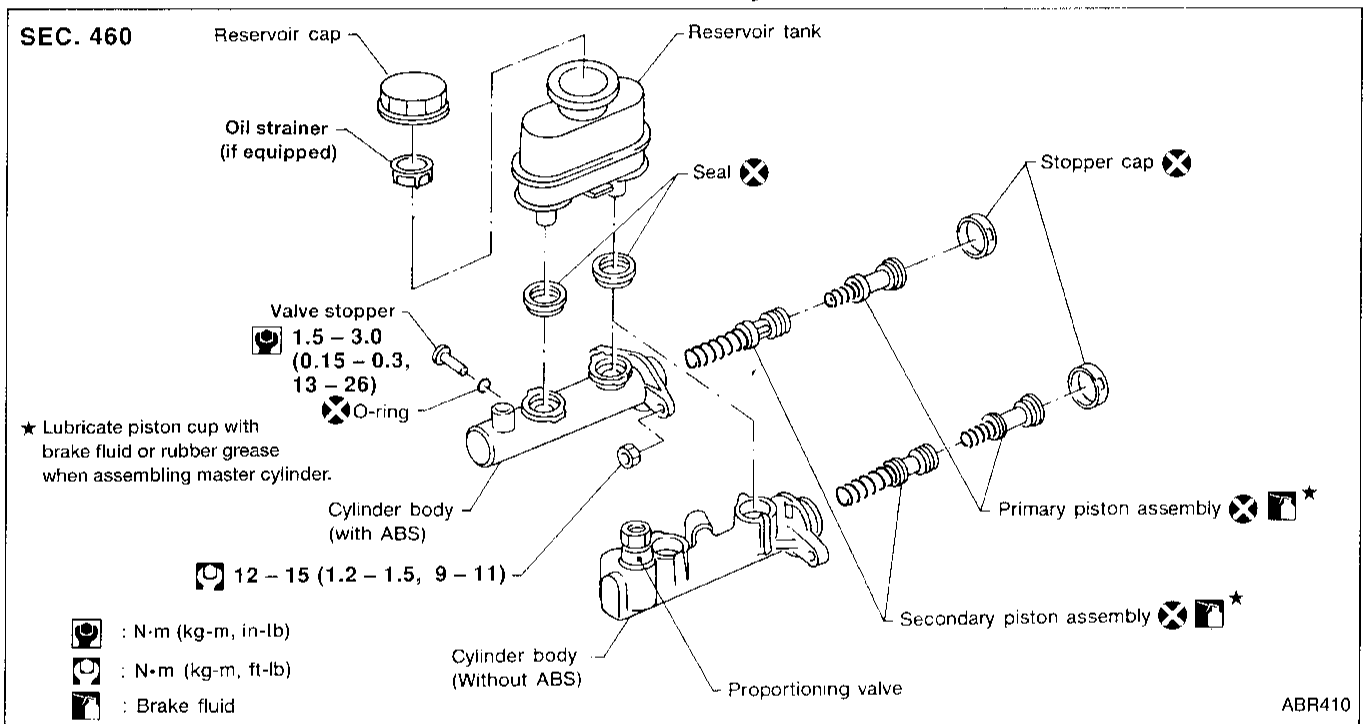
## Removal

### CAUTION:

- Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.
- In the case of brake fluid leakage from the master cylinder, disassemble the cylinder. Then check piston cups for deformation or scratches and replace necessary parts.

1. Connect a vinyl tube to air bleeder valve.
2. Drain brake fluid from each air bleeder valve, depressing brake pedal to empty fluid from master cylinder.
3. Remove brake pipe flare nuts.
4. Remove master cylinder mounting nuts.

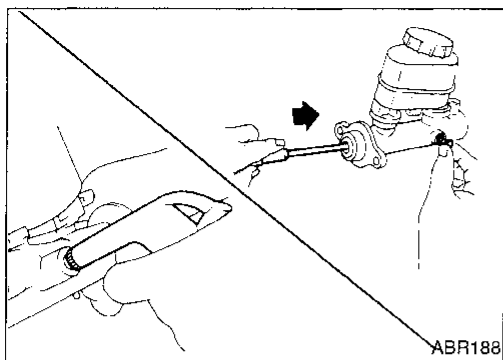
## Disassembly



1. Bend claws of stopper cap outward.

## MASTER CYLINDER

### Disassembly (Cont'd)

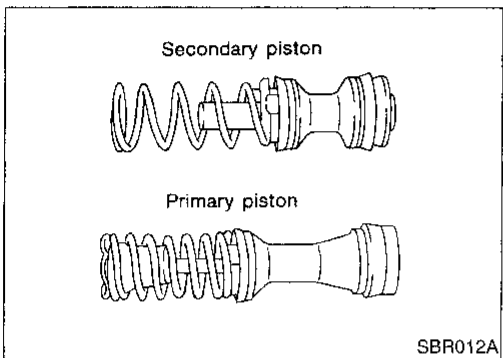


2. Remove valve stopper while piston is pushed into cylinder (Models with ABS only).
3. Remove piston assemblies.
  - If it is difficult to remove secondary piston assembly, gradually apply compressed air through fluid outlet.
4. Draw out reservoir tank.

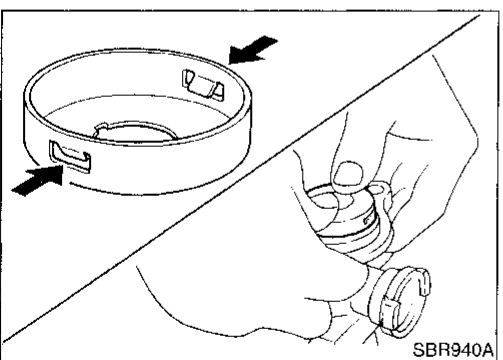
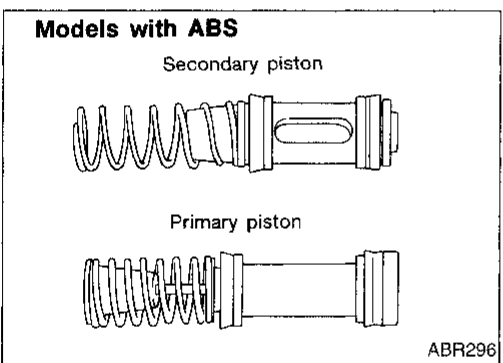
### Inspection

Check master cylinder inner wall for pin holes or scratches. Replace if damaged.

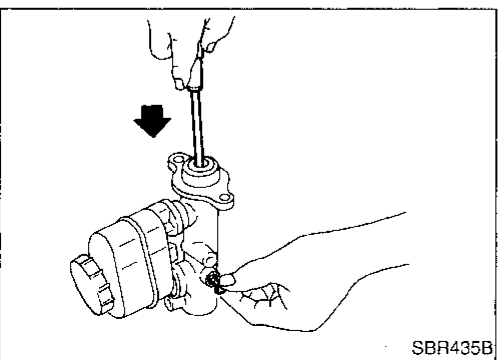
### Assembly



1. Insert secondary piston assembly. Then insert primary piston assembly.
  - Pay attention to direction of piston cups in figure. Also, insert pistons squarely to avoid scratches on cylinder bore.
  - Pay attention to alignment of secondary piston slit with valve stopper mounting hole of cylinder body (For models with ABS only).

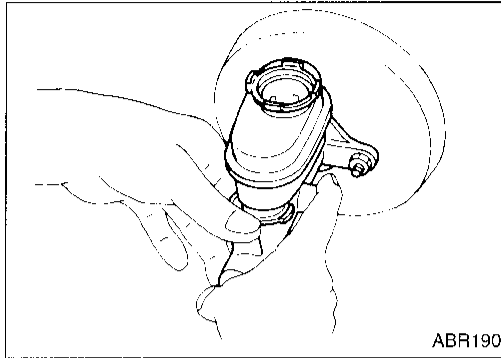


2. Install stopper cap.
  - Before installing stopper cap, ensure that claws are bent inward.
3. Push reservoir tank seals into cylinder body.
4. Push reservoir tank into cylinder body.



5. Install valve stopper while piston is pushed into cylinder. (Models with ABS only)

# MASTER CYLINDER



## Installation

### CAUTION:

- Refill with new brake fluid "DOT 3".
  - Never reuse drained brake fluid.
1. Place master cylinder onto brake booster and secure mounting nuts lightly.
  2. Tighten mounting nuts.  
**⚙️: 12 - 15 N·m (1.2 - 1.5 kg-m, 9 - 11 ft-lb)**
  3. Fill up reservoir tank with new brake fluid.
  4. Plug all ports on master cylinder with fingers to prevent air suction while releasing brake pedal.
  5. Have driver depress brake pedal slowly several times until no air comes out of master cylinder.
  6. Fit brake lines to master cylinder.
  7. Tighten flare nuts.  
**⚙️: 15 - 18 N·m (1.5 - 1.8 kg-m, 11 - 13 ft-lb)**
  8. Bleed air. Refer to "Bleeding Procedure" (BR-5).

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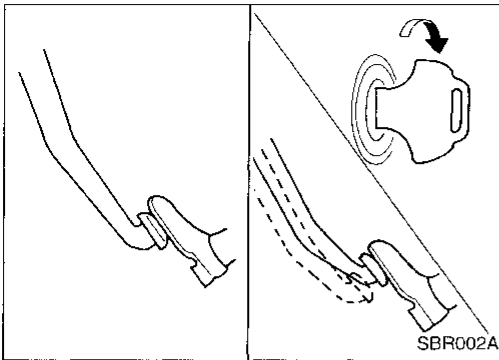
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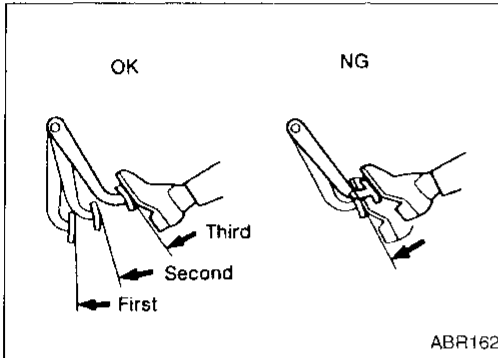
# BRAKE BOOSTER



## On-vehicle Service

### OPERATING CHECK

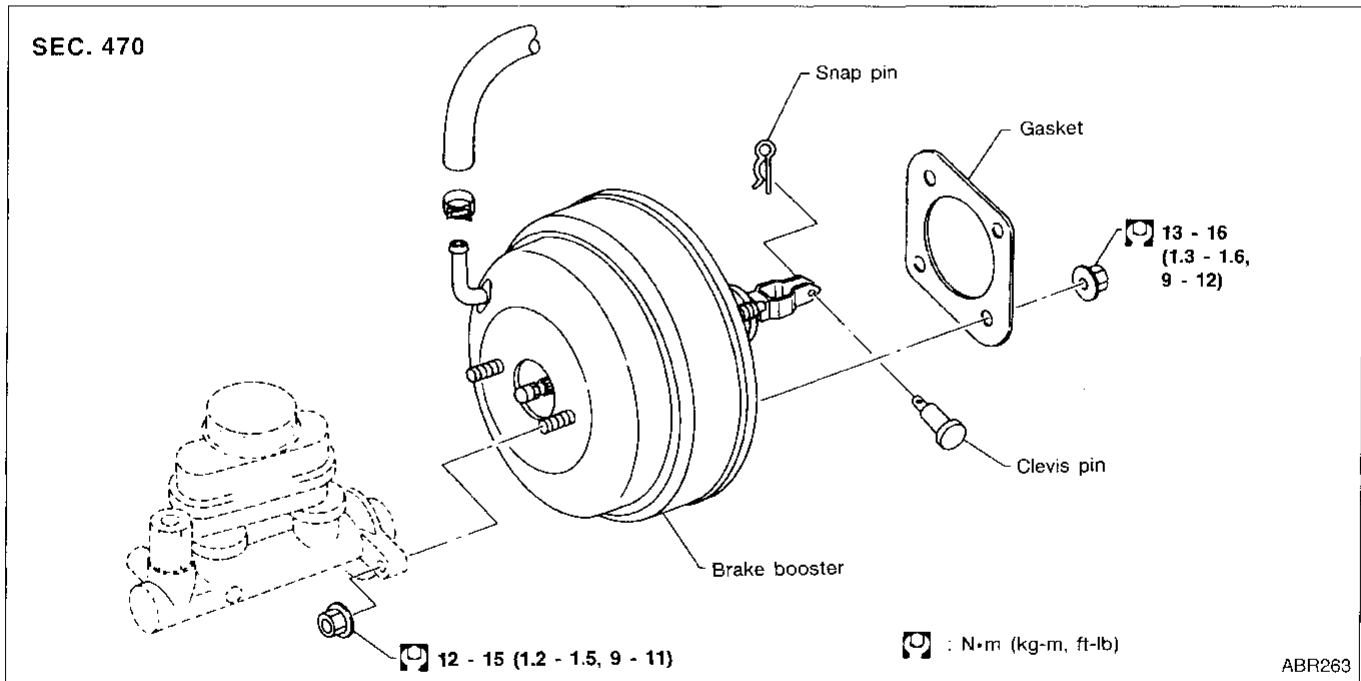
- Depress brake pedal several times with engine off. After exhausting vacuum, make sure there is no change in pedal stroke.
- Depress brake pedal, then start engine. If pedal goes down slightly, operation is normal.



### AIRTIGHT CHECK

- Start engine, and stop it after one or two minutes. Depress brake pedal several times slowly. Booster is airtight if pedal stroke is less each time.
- Depress brake pedal while engine is running, and stop engine with pedal depressed. The pedal stroke should not change after holding pedal down **30 seconds**.

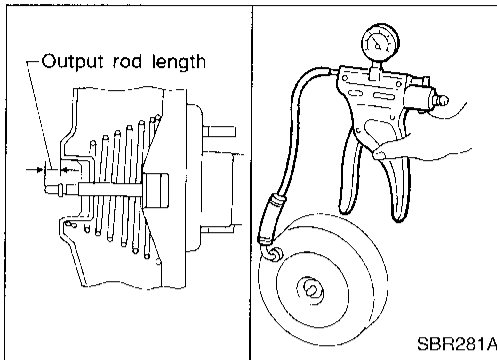
## Removal



### CAUTION:

- Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.
- Be careful not to deform or bend brake pipes during removal of booster.
- It is necessary to remove ABS actuator and actuator bracket first because space around booster is limited.

# BRAKE BOOSTER



## Inspection

### OUTPUT ROD LENGTH CHECK

1. Apply vacuum of  $-66.7$  kPa ( $-500$  mmHg,  $-19.69$  inHg) to brake booster with a hand vacuum pump.
2. Check output rod length.

#### Specified length:

**10.275 - 10.525 mm (0.4045 - 0.4144 in)**

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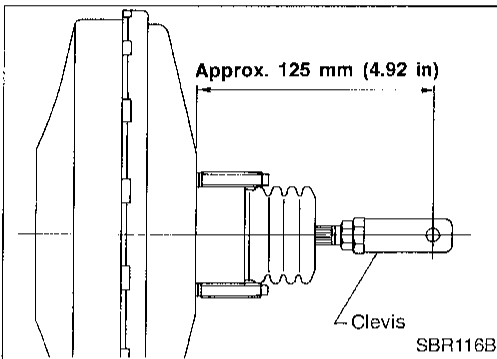
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## Installation

### CAUTION:

- Be careful not to deform or bend brake pipes during installation of booster.
- Replace clevis pin if damaged.
- Refill with new brake fluid "DOT 3".
- Never reuse drained brake fluid.
- Take care not to damage brake booster mounting bolt thread when installing. Due to the narrow angle of installation, the threads can be damaged by the dash panel.

1. Before fitting booster, temporarily adjust clevis to dimension shown.
2. Fit booster, then secure mounting nuts (brake pedal bracket to brake booster) lightly.
3. Connect brake pedal and booster input rod with clevis pin.
4. Secure mounting nuts.

**⚙️: 13 - 16 N·m (1.3 - 1.6 kg·m, 9 - 12 ft·lb)**

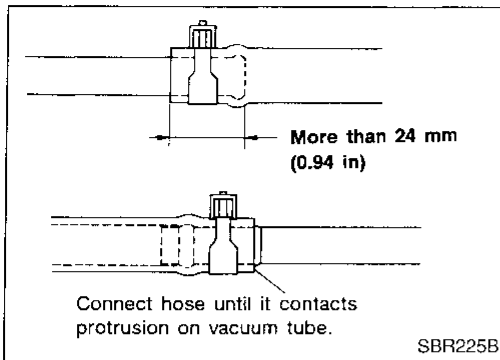
5. Install master cylinder. Refer to BR-13.
6. Adjust brake pedal height and free play. Refer to "Adjustment" in "BRAKE PEDAL AND BRACKET", BR-9.
7. Secure lock nut for clevis.

**⚙️: 16 - 22 N·m (1.6 - 2.2 kg·m, 12 - 16 ft·lb)**

8. Bleed air. Refer to "Bleeding Procedure", BR-5.



# VACUUM HOSE

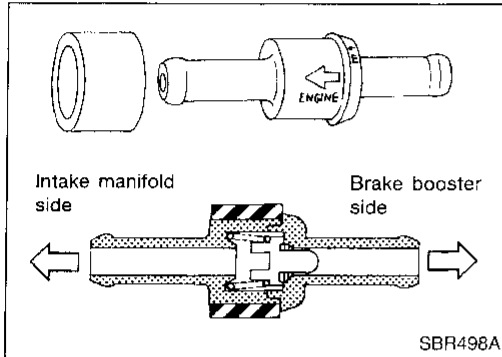


## Removal and Installation

### CAUTION:

When installing vacuum hoses, pay attention to the following points.

- Do not apply any oil or lubricants to vacuum hose and check valve.
- Insert vacuum tube into vacuum hose as shown.

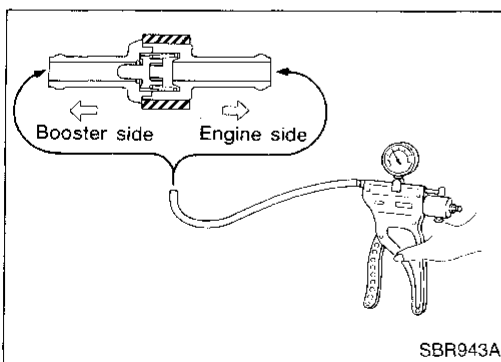


- Install check valve, paying attention to its direction.

## Inspection

### HOSES AND CONNECTORS

Check vacuum lines, connections and check valve for airtightness, improper attachment, chafing or deterioration.



### CHECK VALVE

Check vacuum with a vacuum pump.

Connect to booster side	Vacuum should exist.
Connect to engine side	Vacuum should not exist.

# FRONT DISC BRAKE

## Pad Replacement

### WARNING:

Clean brake pads with a vacuum dust collector to minimize the hazard of airborne particles or other materials.

### CAUTION:

- When cylinder body is open, do not depress brake pedal or piston will pop out.
- Be careful not to damage piston boot or get oil on rotor. Always replace shims when replacing pads.
- If shims are rusted or show peeling of the rubber coat, replace them with new shims.
- It is not necessary to remove connecting bolt except for disassembly or replacement of caliper assembly. In this case, suspend cylinder body with wire so as not to stretch brake hose.

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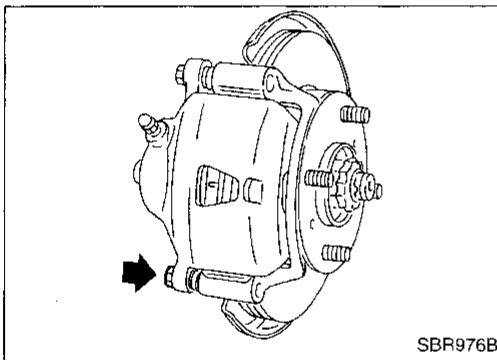
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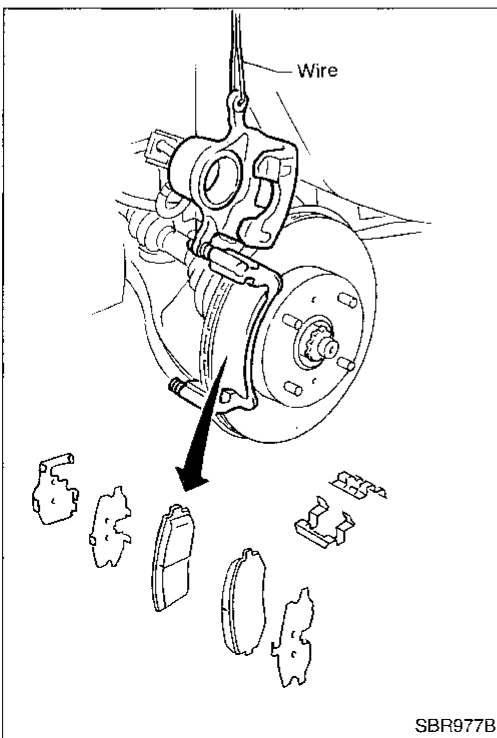
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1. Remove master cylinder reservoir cap.
2. Remove lower pin bolt.



3. Open cylinder body upward. Then remove pad retainers, and inner and outer shims.

#### Standard pad thickness:

M/T model 11.0 mm (0.433 in)

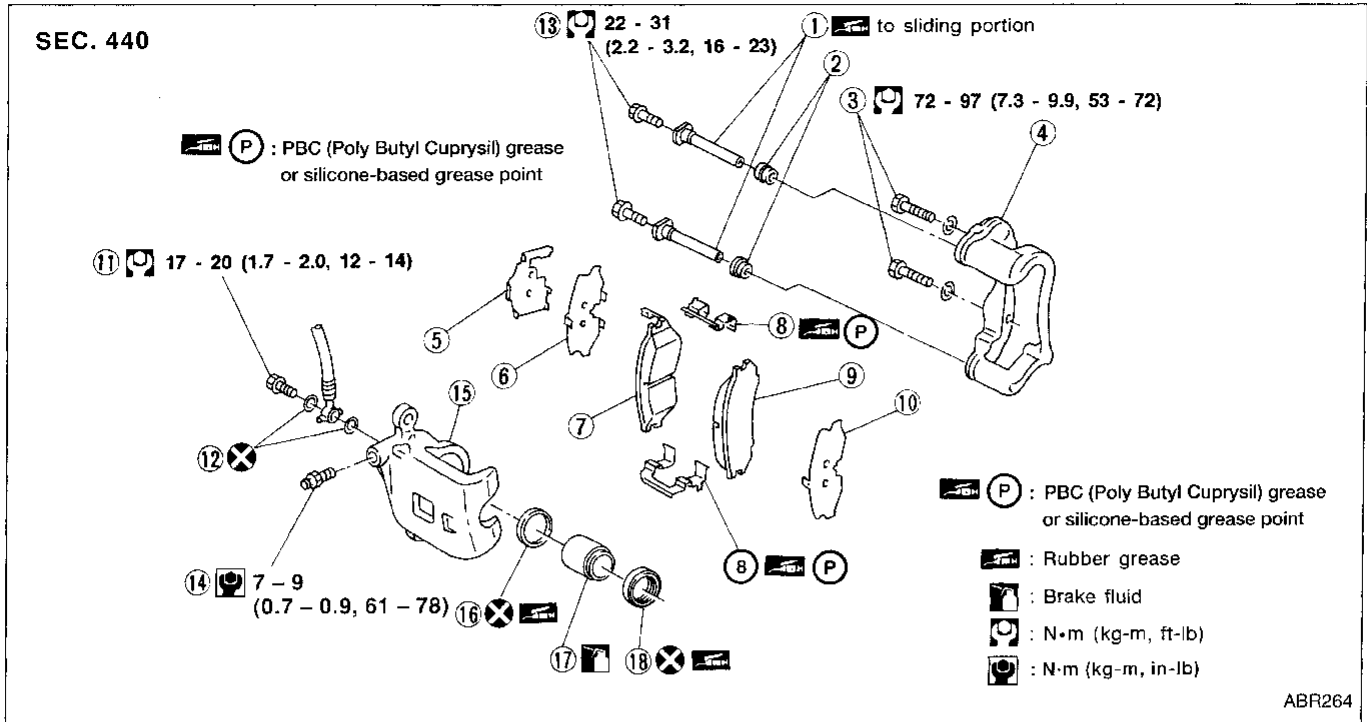
A/T model 10.0 mm (0.394 in)

#### Pad wear limit:

2.0 mm (0.079 in)

- Carefully monitor brake fluid level because brake fluid will return to reservoir when pushing back piston.

# FRONT DISC BRAKE



ABR264

- |                             |                   |                 |
|-----------------------------|-------------------|-----------------|
| ① Main pin                  | ⑦ Inner pad       | ⑬ Main pin bolt |
| ② Pin boot                  | ⑧ Pad retainer    | ⑭ Bleed valve   |
| ③ Torque member fixing bolt | ⑨ Outer pad       | ⑮ Cylinder body |
| ④ Torque member             | ⑩ Outer shim      | ⑯ Piston seal   |
| ⑤ Shim cover                | ⑪ Connecting bolt | ⑰ Piston        |
| ⑥ Inner shim                | ⑫ Copper washer   | ⑱ Piston boot   |

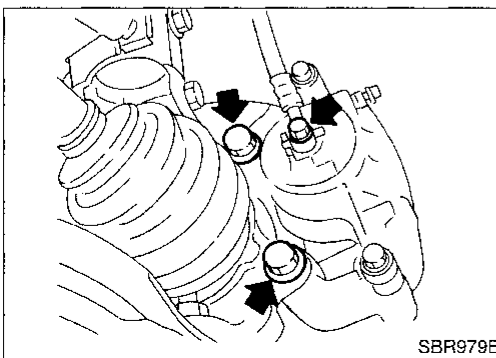
## Removal

### WARNING:

Clean brake pads with a vacuum dust collector to minimize the hazard of airborne particles or other materials.

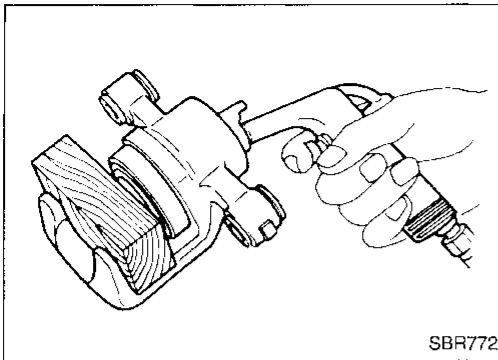
### CAUTION:

Suspend caliper assembly with wire so as not to stretch brake hose.



Remove torque member fixing bolts and connecting bolt. It is not necessary to remove connecting bolt except for disassembly or replacement of caliper assembly. In this case, suspend caliper assembly with wire so as not to stretch brake hose.

# FRONT DISC BRAKE



## Disassembly

### WARNING:

Do not place your fingers in front of piston.

### CAUTION:

Do not scratch or score cylinder wall.

1. Push out piston with dust seal with compressed air.
2. Remove piston seal with a suitable tool.

## Inspection — Caliper

### CYLINDER BODY

- Check inside surface of cylinder for score, rust, wear, damage or presence of foreign objects. If any of these conditions are observed, replace cylinder body.
- Minor damage from rust or foreign objects may be eliminated by polishing surface with a fine emery paper. Replace cylinder body if necessary.

### CAUTION:

Use brake fluid to clean. Never use mineral oil.

### PISTON

Check piston for score, rust, wear, damage or presence of foreign objects. Replace if any of these conditions are observed.

### CAUTION:

Piston sliding surface is plated. Do not polish with emery paper even if rust or foreign objects are stuck to sliding surface.

### SLIDE PIN, PIN BOLT AND PIN BOOT

Check for wear, cracks, rust or other damage. Replace if any of these conditions are observed.

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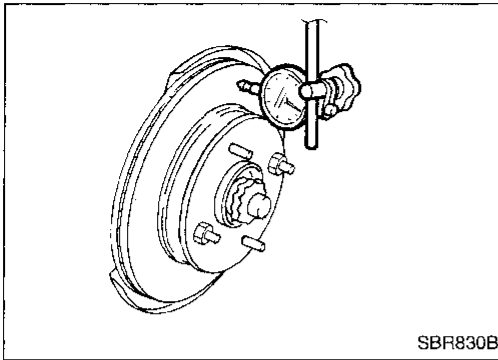
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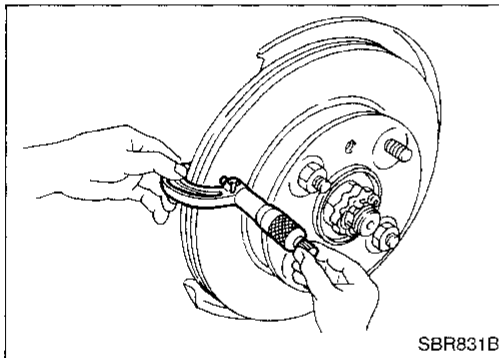
# FRONT DISC BRAKE



## Inspection — Rotor

### RUNOUT

1. Secure rotor to wheel hub with at least two nuts (M12 x 1.25).
  2. Check runout using a dial indicator.
    - **Make sure that wheel bearing axial end play is within the specifications before measuring. Refer to FA section ("Front Wheel Bearing", "ON-VEHICLE SERVICE").**
- Maximum runout:**  
**0.07 mm (0.0028 in)**
3. If the runout is out of specification, find minimum runout position as follows:
    - a. Remove nuts and rotor from wheel hub.
    - b. Shift the rotor one hole and secure rotor to wheel hub with nuts.
    - c. Measure runout.
    - d. Repeat steps a through c so that minimum runout position can be found.
  4. If the runout is still out of specification, turn rotor with on-car brake lathe ("MAD, DL-8700", "AMMCO 700 and 705" or equivalent).

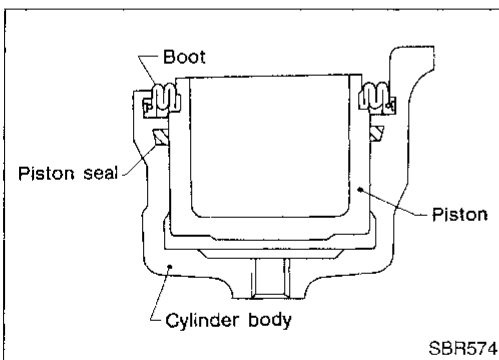


### THICKNESS

**Maximum thickness variation (At least 8 positions):**  
**0.01 mm (0.0004 in)**

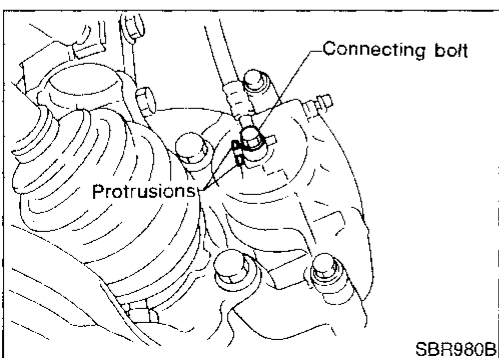
If thickness variation exceeds the specification, turn rotor with on-car brake lathe.

**Rotor repair limit:**  
**20.0 mm (0.787 in)**



### Assembly

1. Insert piston seal into groove on cylinder body.
2. With piston boot fitted to piston, insert piston boot into groove on cylinder body and install piston.
3. Properly secure piston boot.



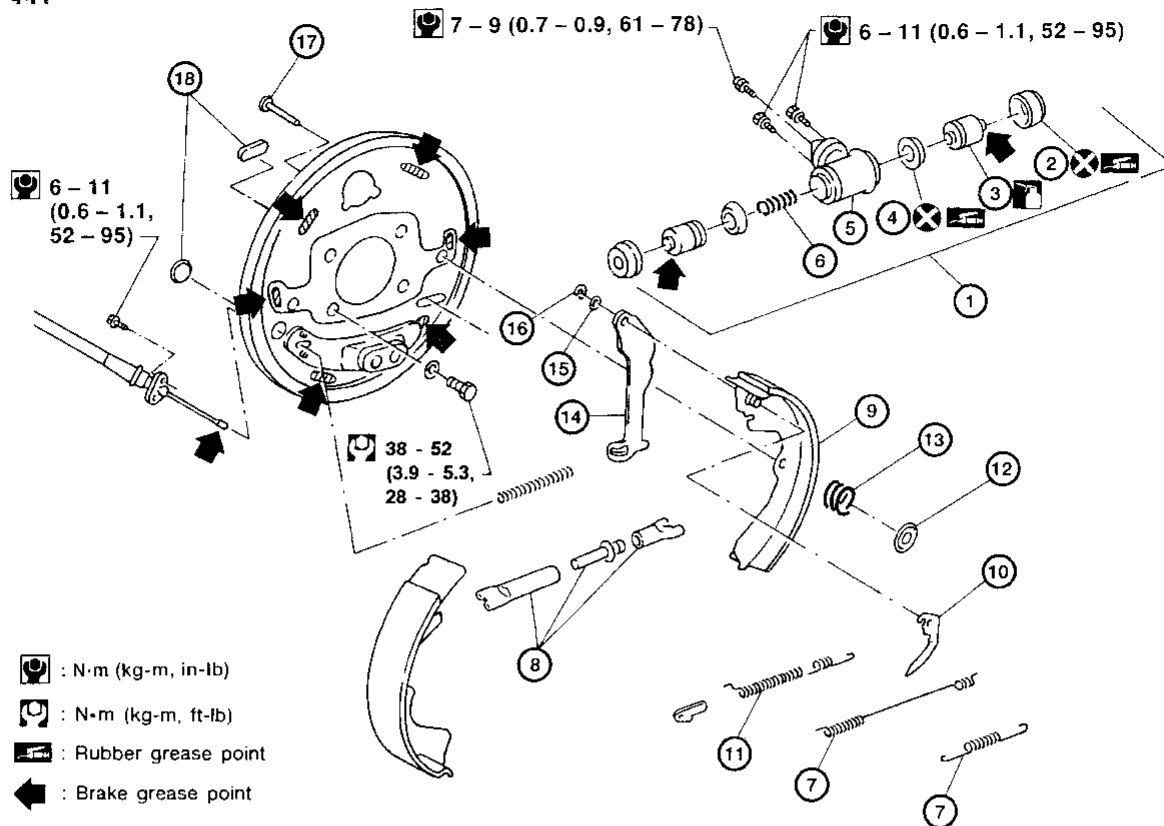
### Installation

#### CAUTION:

- **Refill with new brake fluid "DOT 3".**
  - **Never reuse drained brake fluid.**
1. Install caliper assembly.
  2. Install brake hose to caliper securely.
  3. Install all parts and secure all bolts.
  4. Bleed air. Refer to "Bleeding Procedure", BR-5.

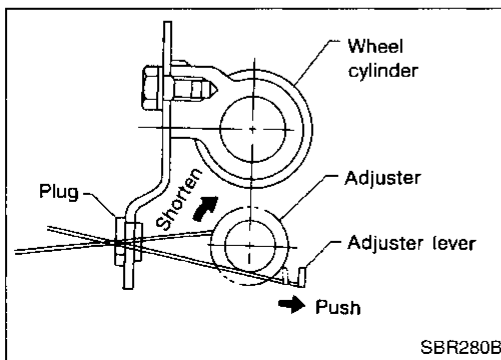
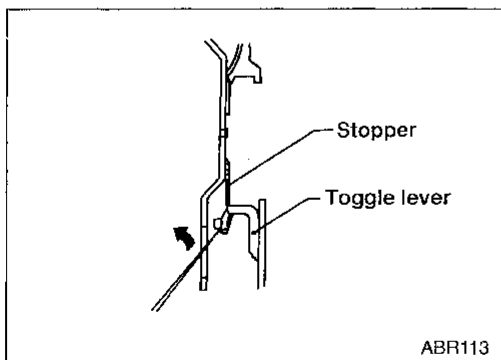
# REAR DRUM BRAKE

SEC. 441



ABR265

- |                           |                   |                         |
|---------------------------|-------------------|-------------------------|
| ① Wheel cylinder assembly | ⑦ Return spring   | ⑬ Shoe hold-down spring |
| ② Boot                    | ⑧ Adjuster        | ⑭ Toggle lever          |
| ③ Piston                  | ⑨ Shoe            | ⑮ Washer                |
| ④ Piston cup              | ⑩ Adjuster lever  | ⑯ Retainer ring         |
| ⑤ Cylinder body           | ⑪ Adjuster spring | ⑰ Shoe hold-down pin    |
| ⑥ Spring                  | ⑫ Retainer        | ⑱ Plug                  |



## Removal

### WARNING:

Clean brakes with a vacuum dust collector to minimize the hazard of airborne particles or other materials.

### CAUTION:

Make sure parking brake lever is released completely.

1. Release parking brake lever fully, then remove drum.

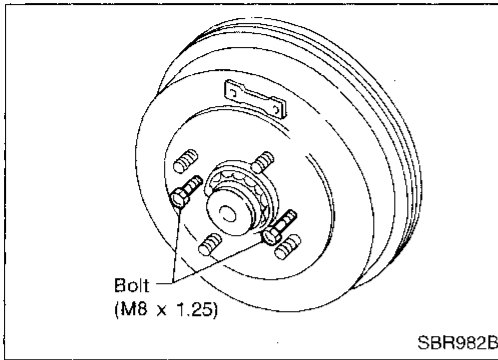
• If drum is hard to remove, the following procedures should be carried out.

- a. Remove plug. Then push down stopper to back plate to make clearance between brake shoe and drum as shown.
- b. Rotate adjuster to shorten if necessary.

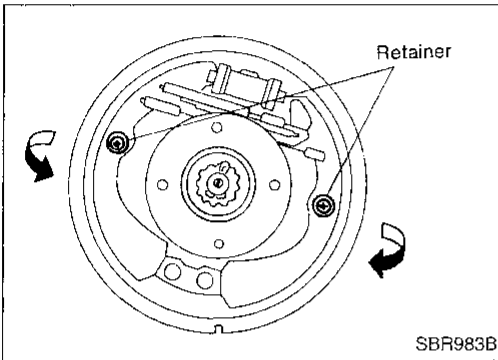
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## REAR DRUM BRAKE

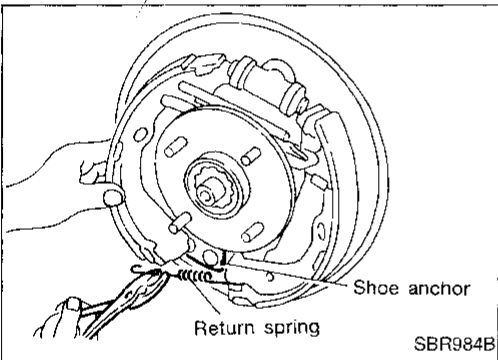
### Removal (Cont'd)



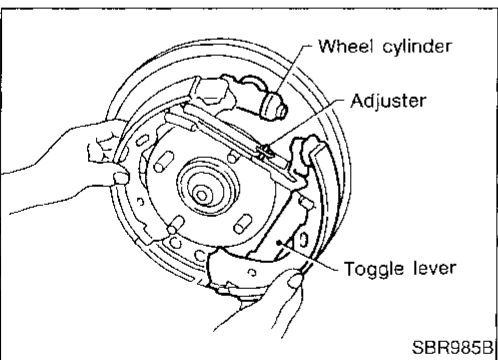
- b. Tighten the two bolts gradually.



2. Push in shoe hold-down pins from behind the back plate. While pushing in the retainer, turn it and remove the shoe hold-down pins.
3. Pull out brake shoes in the direction of the arrows as illustrated.

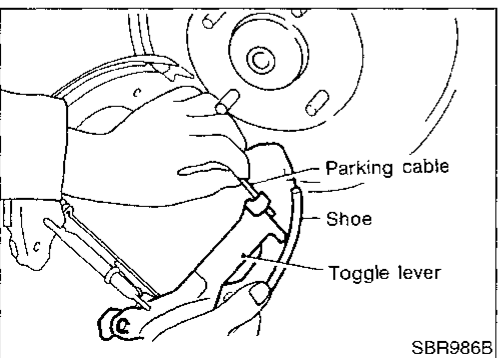


4. Using pliers, remove the lower return spring from shoe.



5. Separate shoes, one at a time, from wheel cylinder, and remove them from back plate with the adjuster assembly still on as shown.

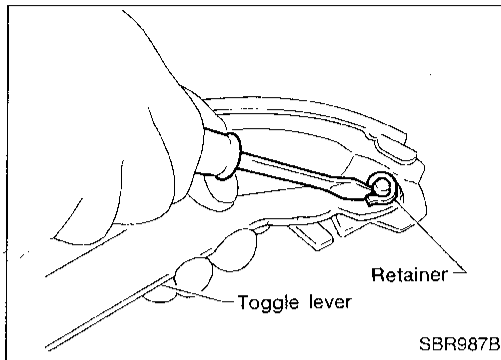
- **Be careful not to scratch or damage wheel cylinder boot.**



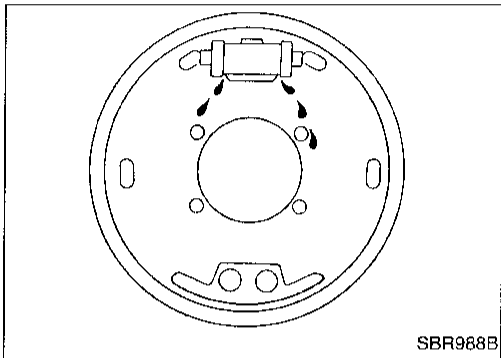
6. Disconnect parking brake cable from toggle lever.
  - **Be careful not to damage parking brake cable when separating it.**
7. Remove adjuster return spring and shoe return spring.

# REAR DRUM BRAKE

## Removal (Cont'd)

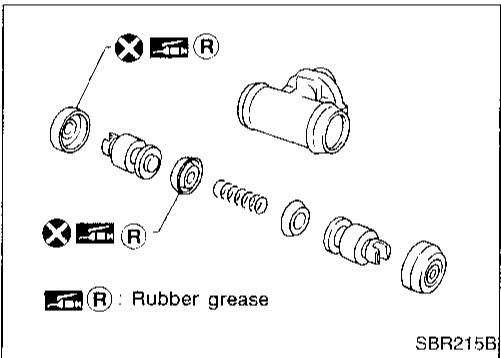


8. Remove retainer ring with a suitable tool. Then separate toggle lever and brake shoe.



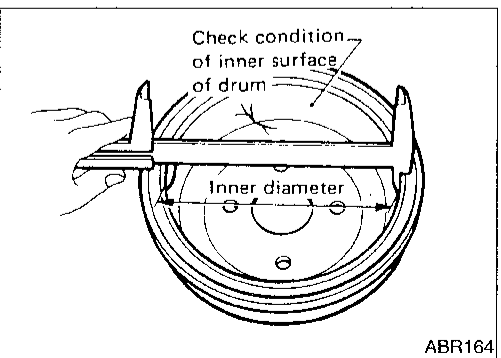
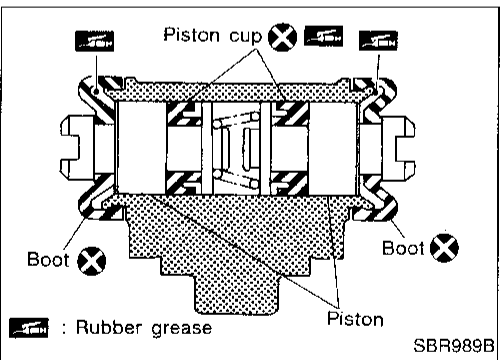
## Inspection — Wheel Cylinder

- Check wheel cylinder for leakage.
- Check for wear, damage and loose conditions. Replace if any such condition exists.



## Wheel Cylinder Overhaul

- Check all internal parts for wear, rust and damage. Replace if necessary.
- Pay attention so as not to scratch cylinder when installing pistons.



## Inspection — Drum

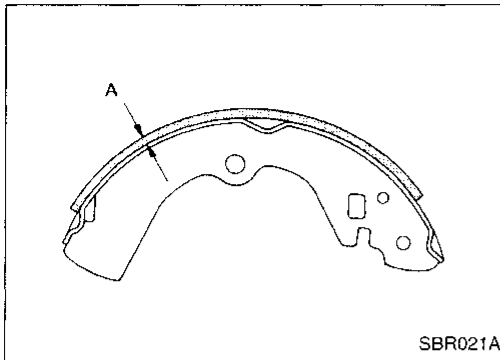
**Maximum inner diameter:**  
230 mm (9.06 in)

**Out-of-roundness:**  
0.03 mm (0.0012 in) or less

- Contact surface should be fine finished with No. 120 to 150 emery paper.
- Using a drum lathe, lathe brake drum if it shows scoring, partial wear or stepped wear.
- After brake drum has been completely reconditioned or replaced, check drum and shoes for proper contact pattern.



# REAR DRUM BRAKE



## Inspection — Lining

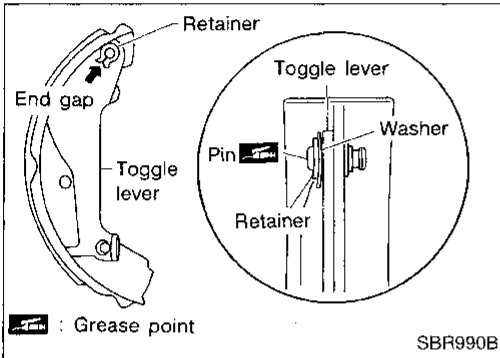
Check lining thickness.

**Standard lining thickness:**

4.1 mm (0.161 in)

**Lining wear limit (A):**

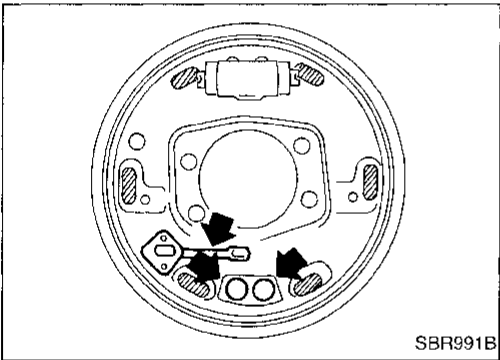
1.5 mm (0.059 in)



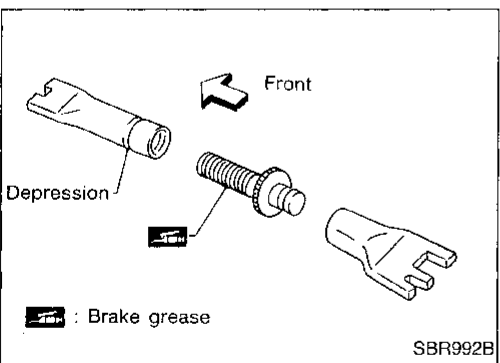
## Installation

- **Always perform shoe clearance adjustment. Refer to BR-34.**

1. Fit toggle lever to brake shoe with retainer ring.



2. Apply brake grease to the contact areas shown at left.

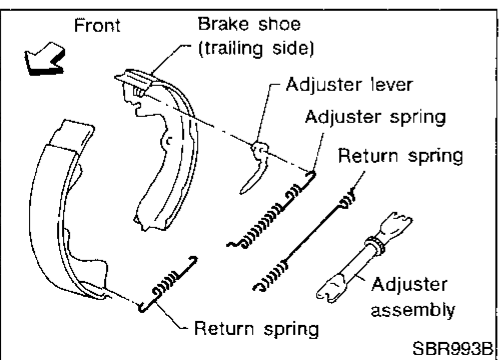


3. Shorten adjuster by rotating it.

- **Pay attention to direction of adjuster.**

Wheel	Screw	Depression
Left	Left-hand thread	Yes
Right	Right-hand thread	No

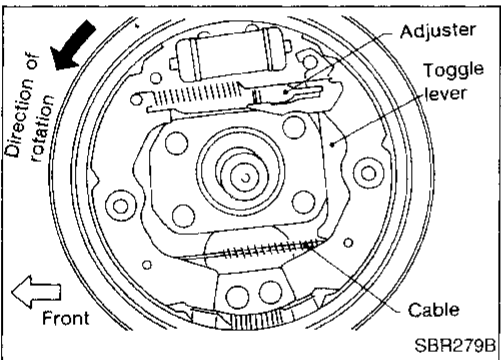
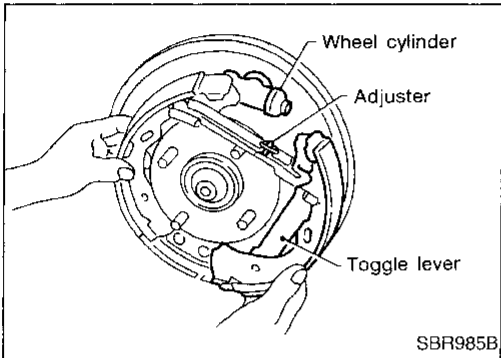
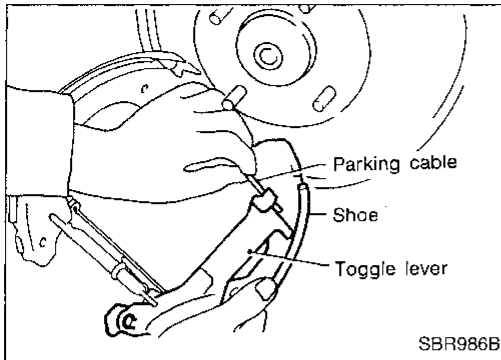
4. Apply brake grease to adjuster as shown.



5. Install adjuster and adjuster lever; then install upper return spring and adjuster spring as shown.

## REAR DRUM BRAKE

### Installation (Cont'd)



6. Connect parking brake cable to toggle lever.

- **Be careful not to damage brake cable.**

7. Install shoes on wheel cylinder one at a time.

- **Do not allow the piston to spring away when assembling.**
- **Be careful not to damage wheel cylinder piston boots.**

8. Install lower return spring.

9. Secure shoe installation with shoe hold-down pins and retainer.

10. Check all parts are installed properly.

- **Pay attention to direction of adjuster assembly.**

11. Install brake drum.

12. When installing new wheel cylinder or overhauling wheel cylinder, bleed air. Refer to "Bleeding Procedure", BR-5.

13. Adjust parking brake. Refer to BR-34.

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## REAR DISC BRAKE

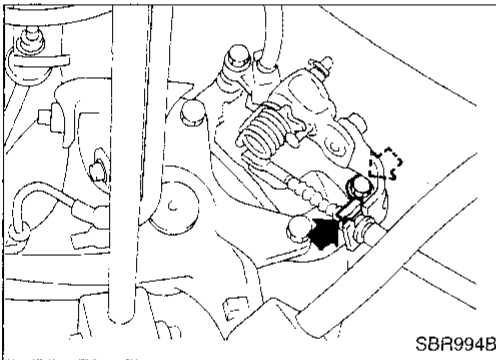
### Pad Replacement

#### WARNING:

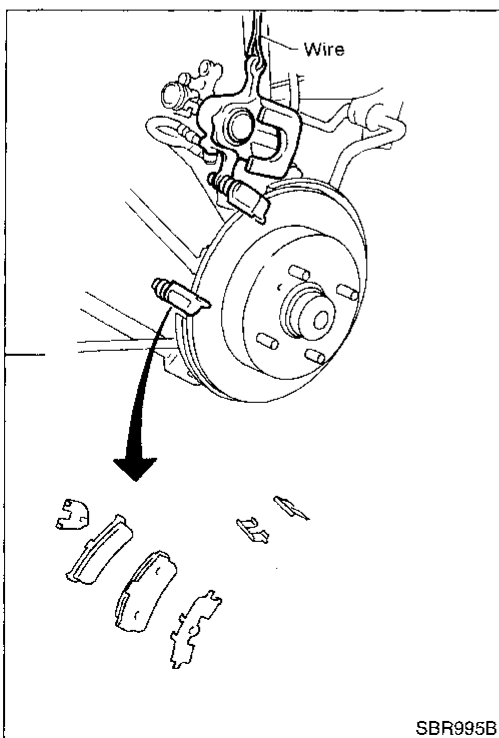
Clean brake pads with a vacuum dust collector to minimize the hazard of airborne particles or other materials.

#### CAUTION:

- When cylinder body is open, do not depress brake pedal, or piston will pop out.
- Be careful not to damage piston boot or get oil on rotor. Always replace shims when replacing pads.
- If shims are rusted or show peeling of rubber coat, replace them with new shims.
- It is not necessary to remove connecting bolt except for disassembly or replacement of caliper assembly. In this case, suspend cylinder body with wire so as not to stretch brake hose.
- Carefully monitor brake fluid level because brake fluid will return to reservoir when pushing back piston.



1. Remove master cylinder reservoir cap.
2. Remove brake cable lock spring.
3. Disconnect cable.
4. Remove lower pin bolt.



5. Open cylinder body upward. Then remove pad retainers, and inner and outer shims.

#### Standard pad thickness:

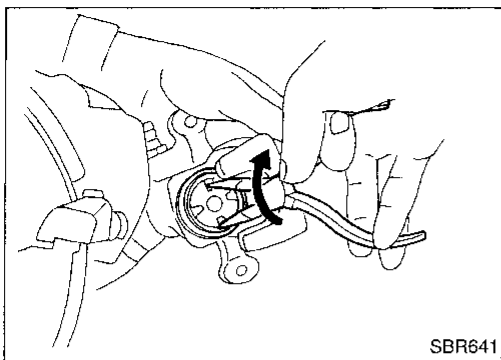
10 mm (0.39 in)

#### Pad wear limit:

1.5 mm (0.059 in)

# REAR DISC BRAKE

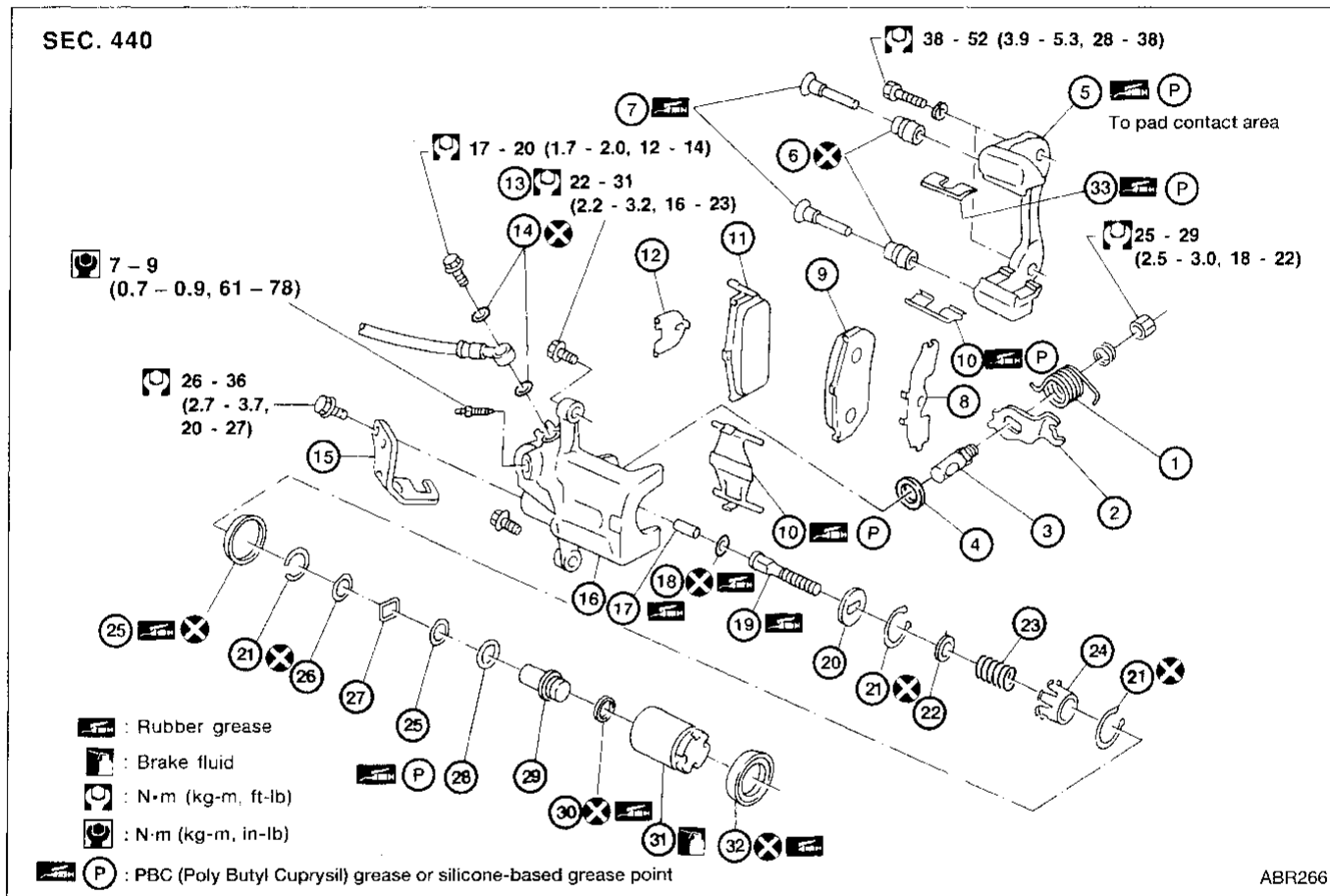
## Pad Replacement (Cont'd)



6. When installing new pads, push piston into cylinder body by turning piston clockwise.

- Carefully monitor brake fluid level because brake fluid will return to reservoir when pushing back piston.

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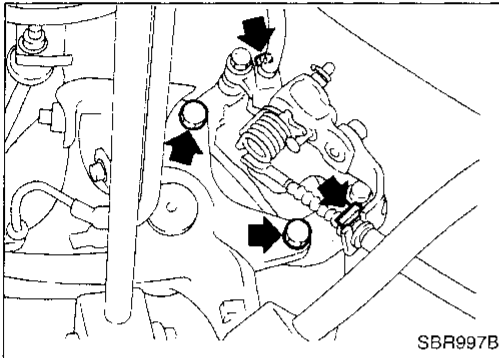
- |                 |                 |                |
|-----------------|-----------------|----------------|
| ① Spring        | ⑫ Inner shim    | ⑳ Spring       |
| ② Toggle lever  | ⑬ Pin bolt      | ㉑ Spring cover |
| ③ Cam           | ⑭ Copper washer | ㉒ Piston seal  |
| ④ Cam boot      | ⑮ Cable guide   | ㉓ Spacer       |
| ⑤ Torque member | ⑯ Cylinder      | ㉔ Wave washer  |
| ⑥ Pin boot      | ⑰ Strut         | ㉕ Bearing      |
| ⑦ Side pin      | ⑱ O-ring        | ㉖ Adjuster nut |
| ⑧ Outer shim    | ㉒ Push rod      | ㉗ Piston cup   |
| ⑨ Outer pad     | ㉓ Key plate     | ㉘ Piston       |
| ⑩ Pad retainer  | ㉔ Snap ring     | ㉙ Piston boot  |
| ⑪ Inner pad     | ㉕ Spring seat   | ㉚ Pad retainer |

## REAR DISC BRAKE

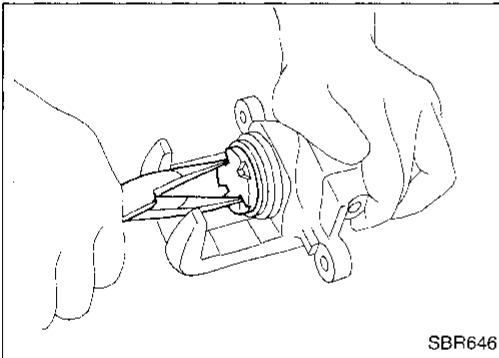
### Removal

#### WARNING:

Clean brake pads with a vacuum dust collector to minimize the hazard of airborne particles or other materials.

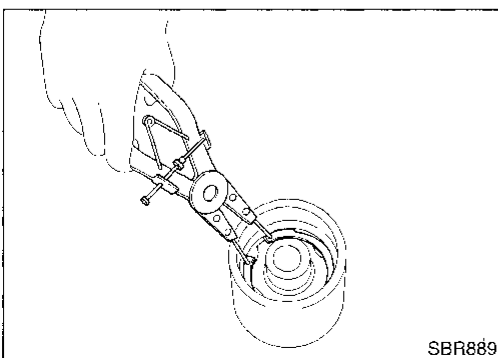
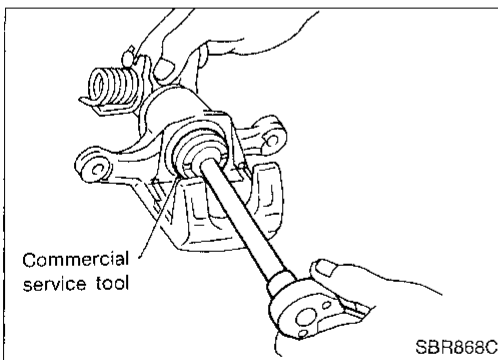


1. Remove brake cable mounting bracket bolt and lock spring.
  2. Remove torque member fixing bolts and connecting bolt.
- **It is not necessary to remove connecting bolt except for disassembly or replacement of caliper assembly. In this case, suspend caliper assembly with wire so as not to stretch brake hose.**



### Disassembly

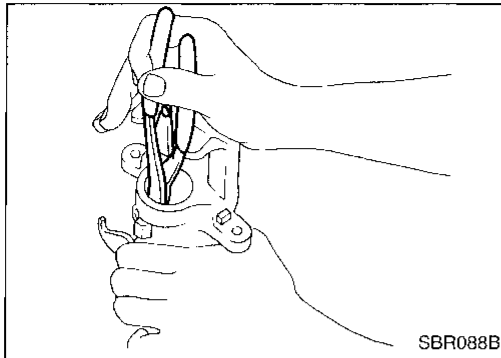
1. Remove piston by turning it counterclockwise with suitable long nose pliers or commercial service tool.



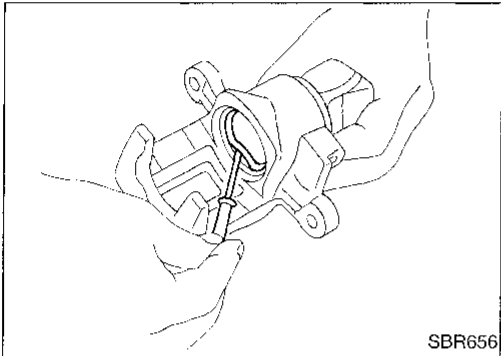
2. Remove snap ring from piston with suitable pliers and remove adjusting nut.

## REAR DISC BRAKE

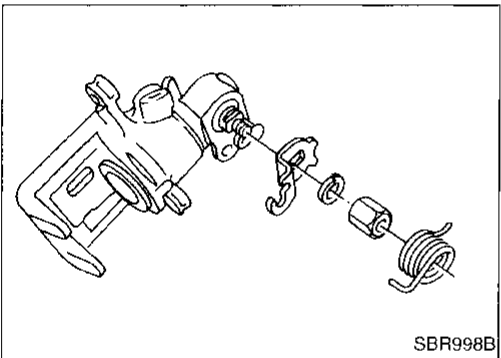
### Disassembly (Cont'd)



3. Disassemble cylinder body.
  - a. Pry off snap ring with suitable pliers, then remove spring cover, spring and seat.
  - b. Remove snap ring, then remove key plate, push rod and strut.



- c. Remove piston seal.
  - **Be careful not to damage cylinder body.**



4. Remove return spring and toggle lever.

### Inspection — Caliper

#### CAUTION:

Use brake fluid to clean cylinder. Never use mineral oil.

#### CYLINDER BODY

- Check inside surface of cylinder for score, rust, wear, damage or presence of foreign objects. If any of the above conditions are observed, replace cylinder body.
- Minor damage from rust or foreign objects may be eliminated by polishing surface with a fine emery paper. Replace cylinder body if necessary.

#### TORQUE MEMBER

Check for wear, cracks or other damage. Replace if necessary.

#### PISTON

#### CAUTION:

Piston sliding surface is plated. Do not polish with emery paper even if rust or foreign objects are stuck to sliding surface.

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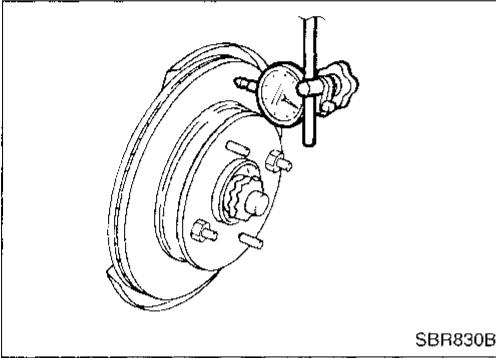
## REAR DISC BRAKE

### Inspection — Caliper (Cont'd)

Check piston for score, rust, wear, damage or presence of foreign objects. Replace if any of the above conditions are observed.

### SLIDE PIN, PIN BOLT AND PIN BOOT

Check for wear, cracks, rust or other damage. Replace if any of the above conditions are observed.



### Inspection — Rotor

#### RUBBING SURFACE

Check rotor for roughness, cracks or chips.

#### RUNOUT

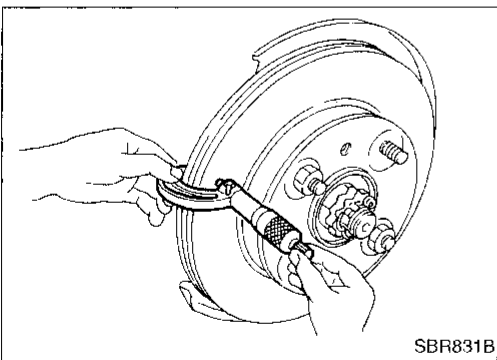
1. Secure rotor to wheel hub with two nuts (M12 x 1.25).
2. Check runout using a dial indicator.

**Make sure that wheel bearing axial end play is within the specifications before measuring. Refer to RA section ("Rear Wheel Bearing", "ON-VEHICLE SERVICE").**

3. Change relative positions of rotor and wheel hub so that runout is minimized.

**Maximum runout:**

**0.07 mm (0.0028 in)**



#### THICKNESS

**Rotor repair limit:**

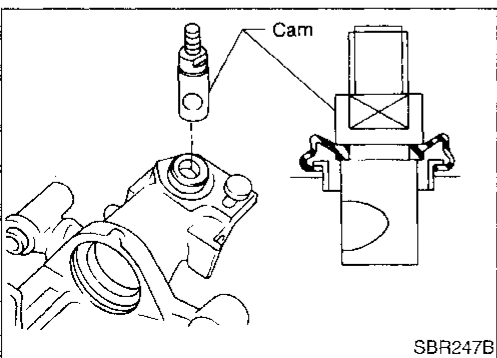
**Minimum thickness**

**8.0 mm (0.315 in)**

**Thickness variation (At least 8 portions)**

**Maximum 0.02 mm (0.0008 in)**

Replace rotor if any of the above do not meet the specifications.

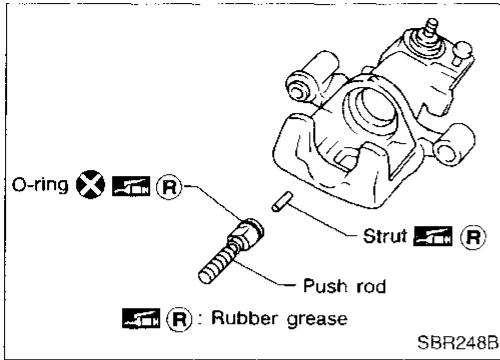


### Assembly

1. Insert cam with depression facing toward open end of cylinder.

# REAR DISC BRAKE

## Assembly (Cont'd)



2. Generously apply rubber grease to strut and push rod to make insertion easy.

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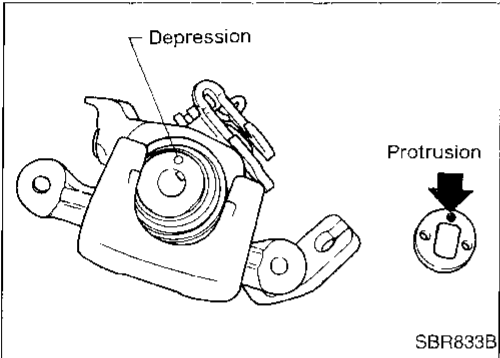
RS

BT

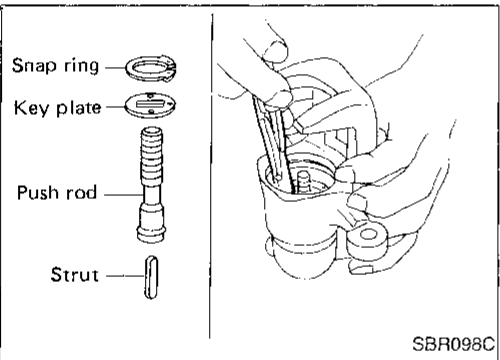
HA

EL

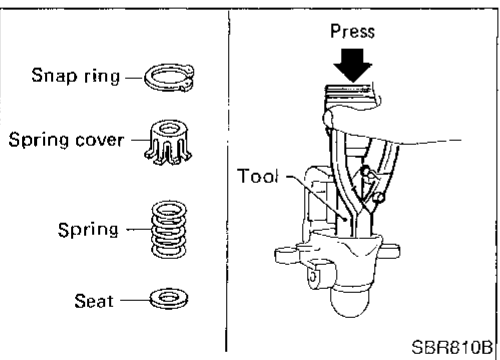
MX



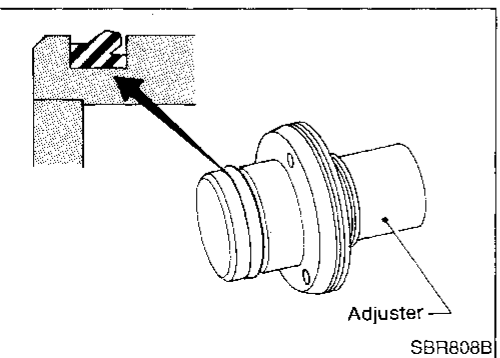
3. Match protrusion on key plate with depression in cylinder.



4. Install snap ring with a suitable tool.



5. Install seat, spring, spring cover and snap ring while depressing with a suitable tool.

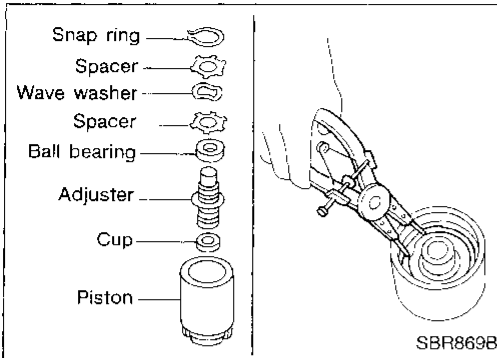


6. Install adjuster in the specified direction.

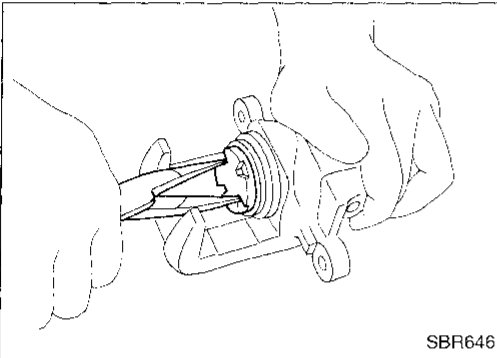


## REAR DISC BRAKE

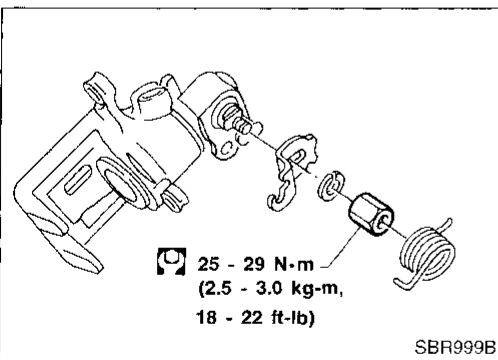
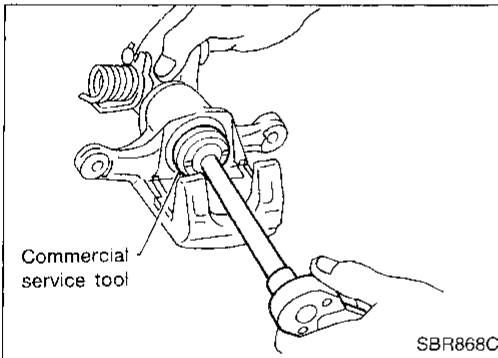
### Assembly (Cont'd)



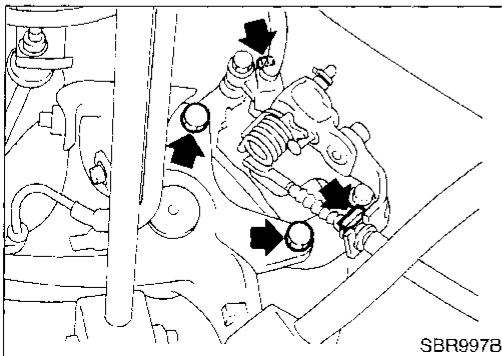
7. Install cup, adjuster, bearing, spacers, washers and snap ring with a suitable tool.



8. Insert piston seal into groove on cylinder body.
9. With piston boot fitted to piston, insert piston boot into groove on cylinder body and fit piston by turning it clockwise with long nose pliers or commercial service tool.



10. Fit toggle lever and return spring.



### Installation

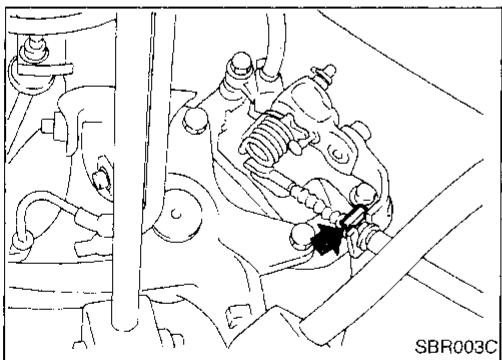
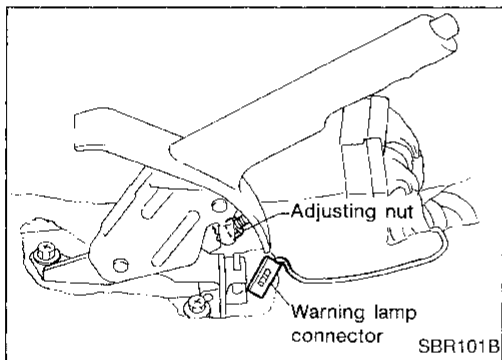
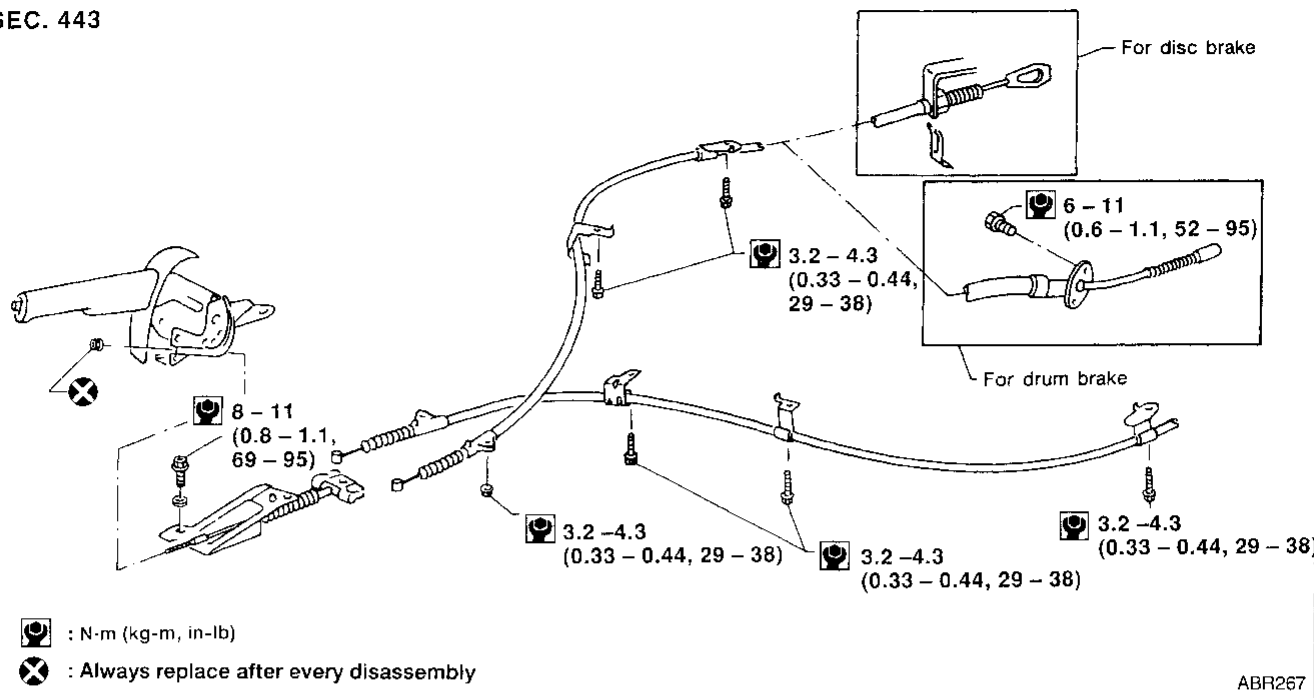
#### CAUTION:

- Refill with new brake fluid "DOT 3".
- Never reuse drained brake fluid.

1. Install caliper assembly.
2. Install brake hose to caliper securely.
3. Install all parts and secure all bolts.
4. Bleed air. Refer to "Bleeding Procedure", BR-5.

# PARKING BRAKE CONTROL

SEC. 443



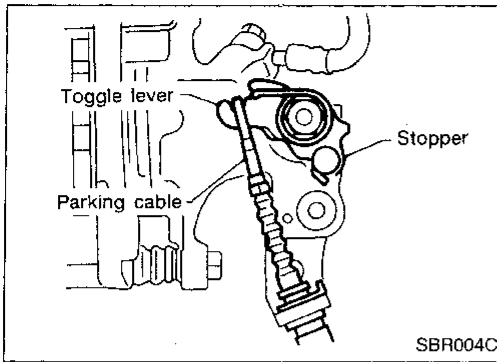
## Removal and Installation

1. To remove parking brake cable, first remove center console. Refer to BT section ("INSTRUMENT PANEL").
2. Disconnect warning lamp connector.
3. Remove adjusting nut.
4. Remove bolts securing parking brake cable.
5. Remove lock plate and disconnect cable (disc brake only). For drum brake models, refer to BR-21.

## Inspection

1. Check control lever for wear or other damage. Replace if necessary.
2. Check wires for discontinuity or deterioration. Replace if necessary.
3. Check warning lamp and switch. Replace if necessary.
4. Check parts at each connecting portion and, if deformed or damaged, replace.

## PARKING BRAKE CONTROL

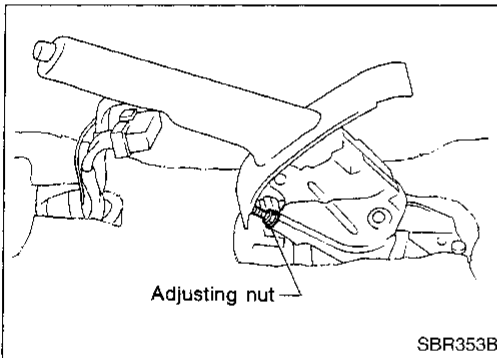


### Adjustment

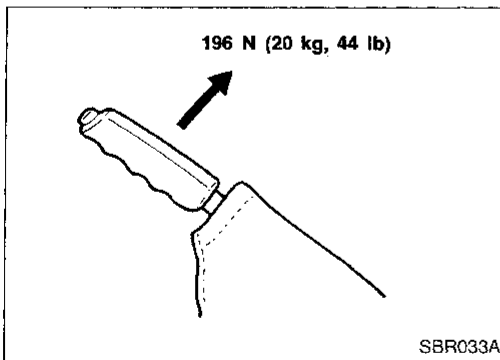
Before or after adjustment, pay attention to the following points.

- For rear disc brake be sure that toggle lever returns to stopper when parking brake lever is released.
- There is no drag when parking brake lever is released.

1. Adjust clearance between shoe and drum/pad and rotor as follows:
  - a. Release parking brake lever and loosen adjusting nut.
  - b. Depress brake pedal fully at least 10 times with engine running.



2. Pull control lever 4 - 5 notches. Then adjust control lever by turning adjusting nut.



3. Pull control lever with specified amount of force. Check lever stroke and ensure smooth operation.

**Number of notches: 7 - 8**

4. Bend warning lamp switch plate to ensure:
  - Warning lamp comes on when lever is lifted "A" notches.
  - Warning lamp goes out when lever is fully released.

**Number of "A" notches: 1 or less**

# ANTI-LOCK BRAKE SYSTEM

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## Purpose

The Anti-Lock Brake System (ABS) consists of electronic and hydraulic components. It allows for control of braking force so that locking of the wheels can be avoided.

The ABS:

- 1) Improves proper tracking performance through steering wheel operation.
- 2) Eases obstacle avoidance through steering wheel operation.
- 3) Improves vehicle stability.

## Operation

- When the vehicle speed is less than 10 km/h (6 MPH) this system does not work.
- The Anti-Lock Brake System (ABS) has a self-test function. The system turns on the ABS warning lamp for one second each time the ignition switch is turned ON. After the engine is started, the ABS warning lamp turns off. The system performs a test the first time the vehicle reaches 6 km/h (4 MPH). A mechanical noise may be heard as the ABS performs this self-test. This is a normal part of the self-test feature. If a malfunction is found during this check, the ABS warning lamp will stay on.
- While driving, a mechanical noise may be heard during ABS operation. This is a normal condition.

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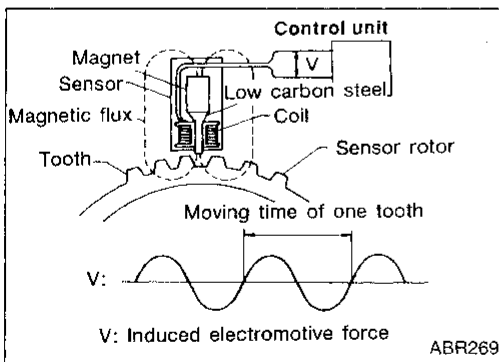
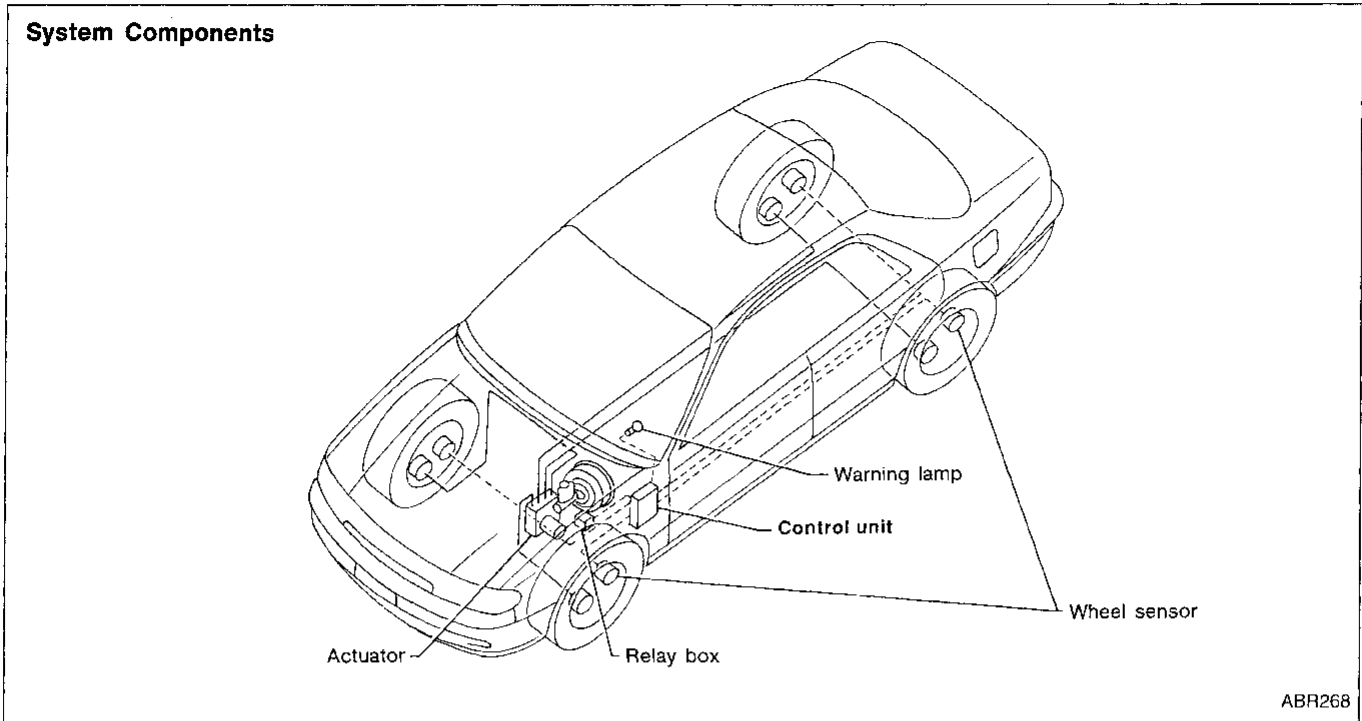
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# ANTI-LOCK BRAKE SYSTEM

## System Components



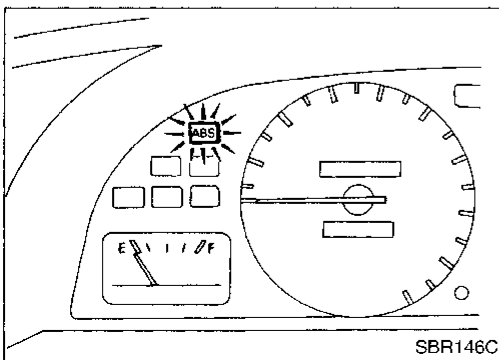
## System Description

### SENSOR

The sensor unit consists of a gear-shaped sensor rotor and a sensor element. The element contains a bar magnet around which a coil is wound. The sensor is installed on the back side of the brake rotor. Sine-wave current is generated by the sensor as the wheel rotates. The frequency and voltage increase(s) as the rotating speed increases.

### CONTROL UNIT

The control unit computes the wheel rotating speed by the signal current sent from the sensor. Then it supplies a DC current to the actuator solenoid valve. It also controls ON-OFF operation of the valve relay and pump relay. If any electrical malfunction should be detected in the system, the control unit causes the warning lamp to light up. In this condition, the ABS will be deactivated by the control unit, and the vehicle's braking system reverts to normal operation.



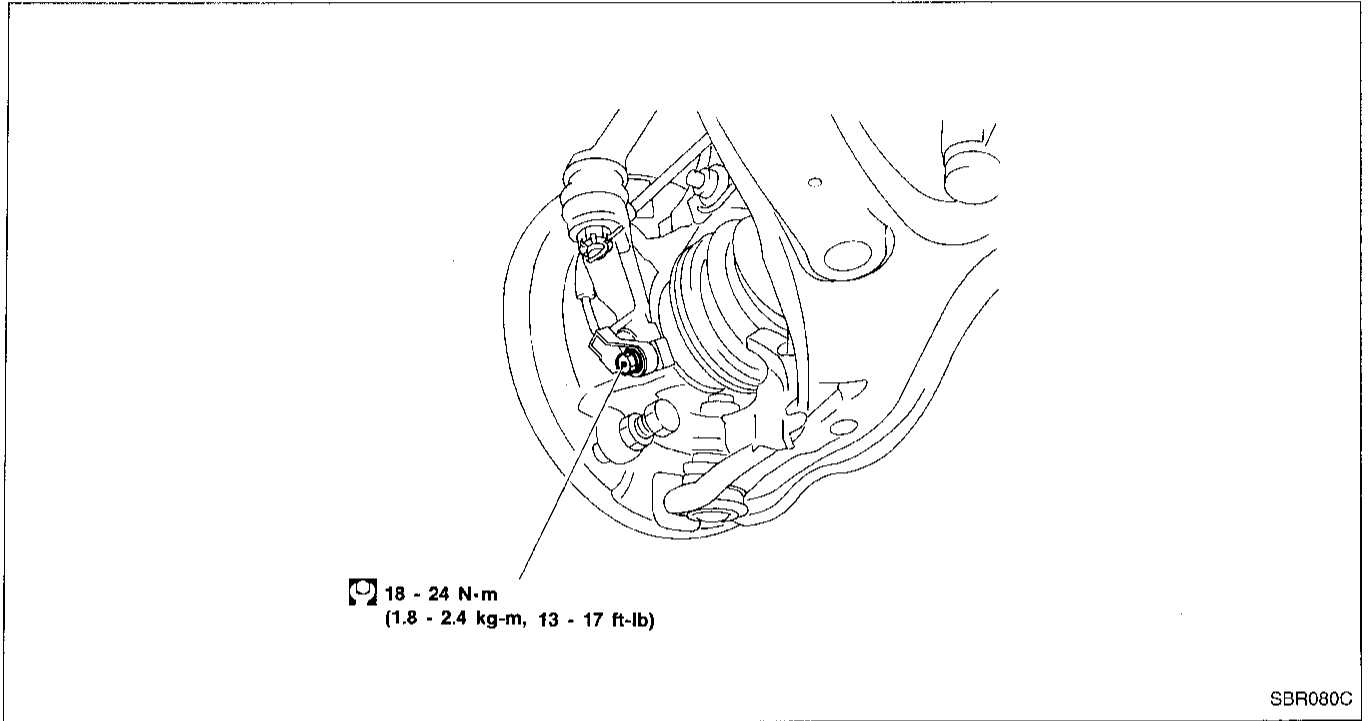
# ANTI-LOCK BRAKE SYSTEM

## Removal and Installation

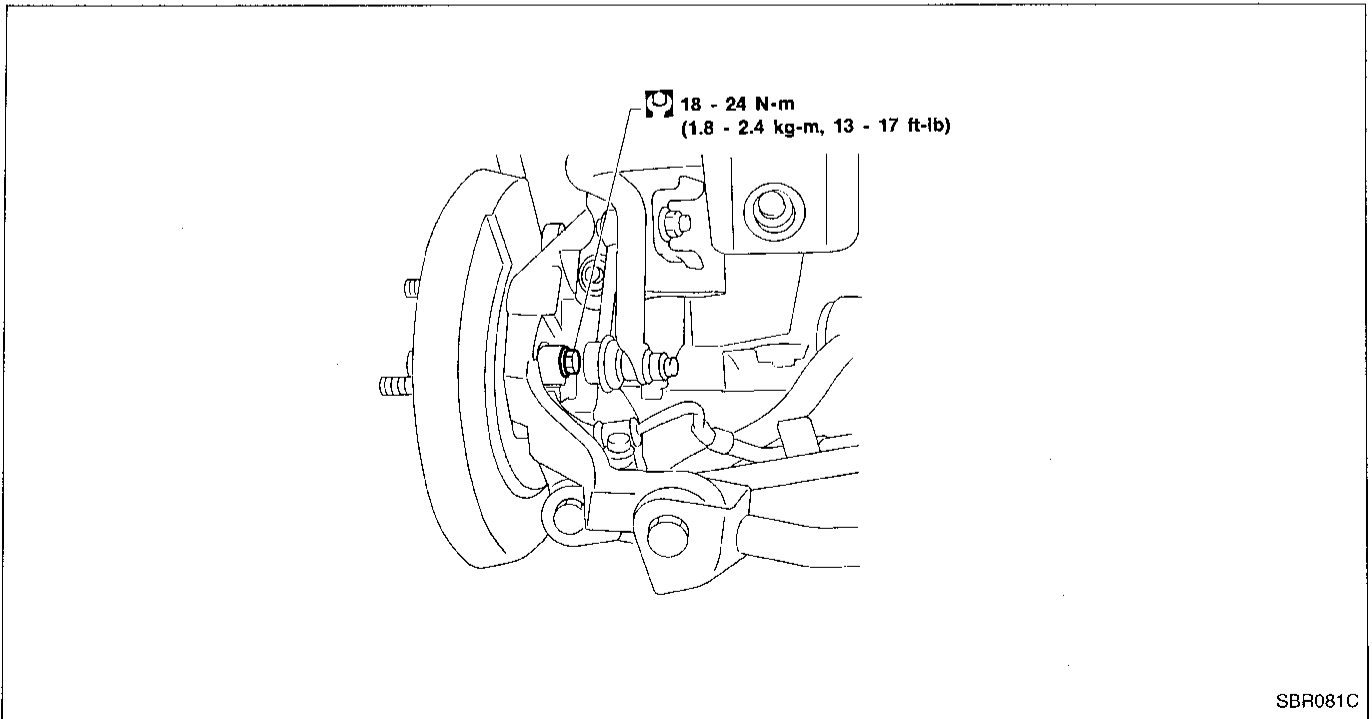
### CAUTION:

- Be careful not to damage sensor edge and sensor rotor teeth.
- When removing the front or rear wheel hub assembly, disconnect the ABS wheel sensor from the assembly and move it away.

### FRONT WHEEL SENSOR



### REAR WHEEL SENSOR



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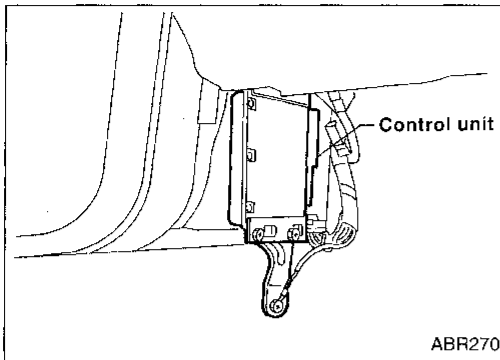
# ANTI-LOCK BRAKE SYSTEM

## Removal and Installation (Cont'd)

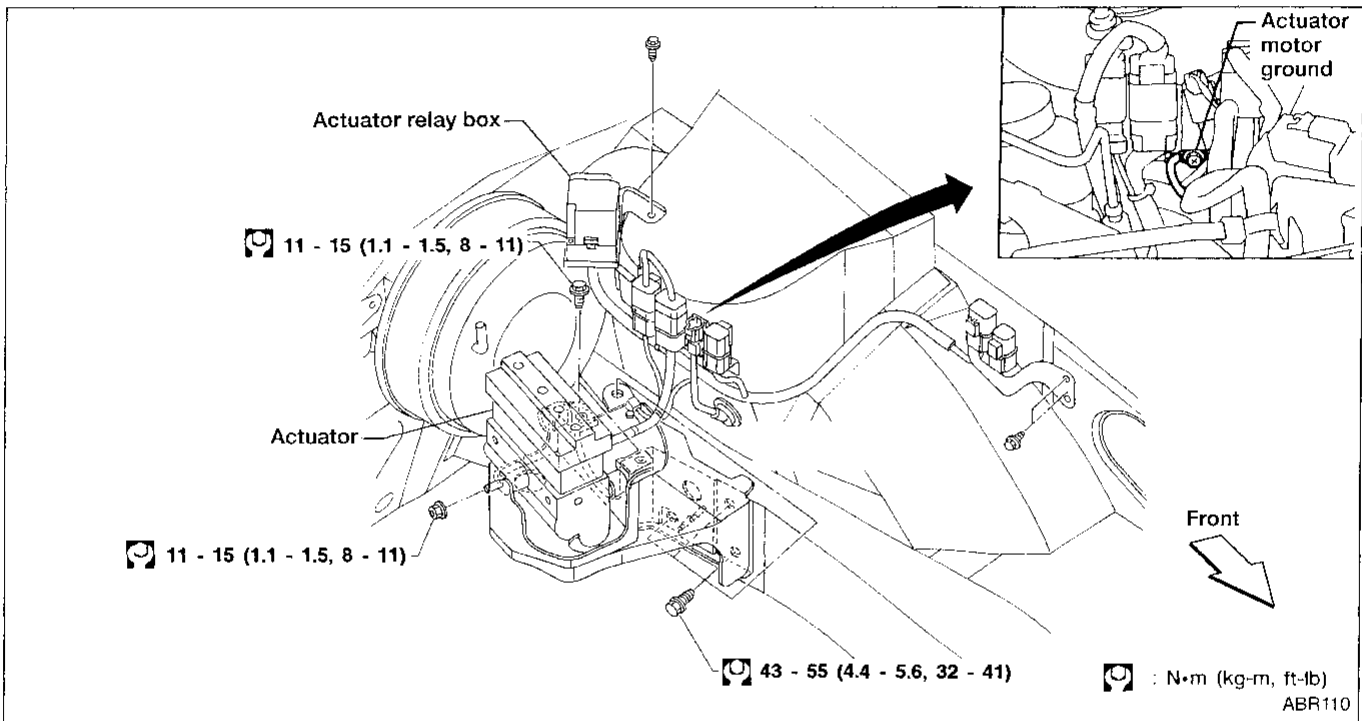
### CONTROL UNIT

Location: Driver side dash side lower.

- Make sure that the sensor shield ground cable is secured with mounting bolt.



### ACTUATOR



### CAUTION:

After installation, pay attention to the following points.

- Refill brake fluid and bleed air. Refer to BR-4 and BR-5, respectively.

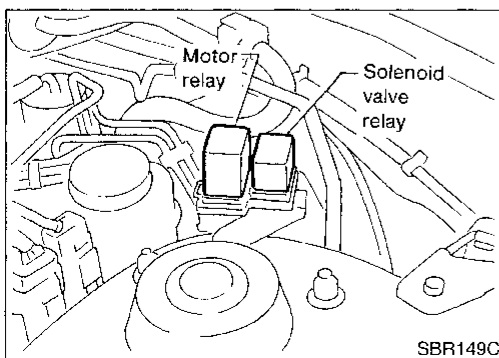
1. Remove actuator relay assembly.
2. Drain brake fluid. Remove master cylinder.
3. Remove actuator.

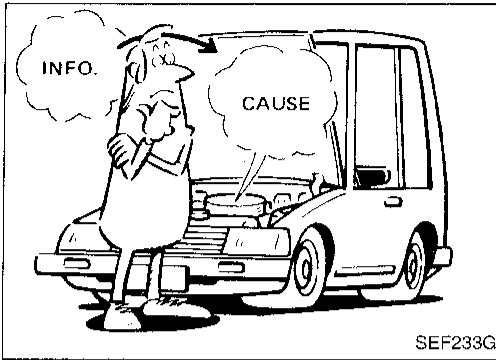
### ACTUATOR RELAYS

Large: MOTOR RELAY

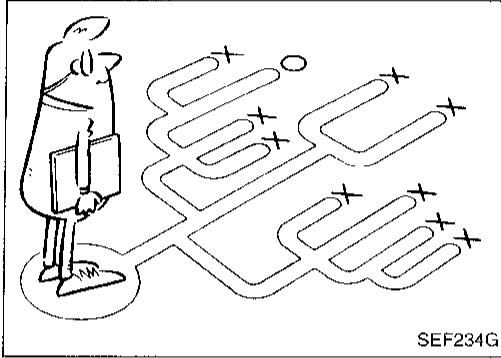
Small: SOLENOID VALVE RELAY

1. Disconnect battery cable.
  2. Remove actuator relay cover.
- It is not necessary to remove the two screws for relay box.





SEF233G



SEF234G

## How to Perform Trouble Diagnoses for Quick and Accurate Repair

### INTRODUCTION

The ABS system has an electronic control unit to control major functions. The control unit accepts input signals from sensors and instantly drives actuators. It is essential that both kinds of signals are proper and stable. It is also important to check for conventional problems such as air leaks in the booster lines, lack of brake fluid, or other problems with the brake system.

It is much more difficult to diagnose a problem that occurs intermittently rather than continuously. Most intermittent problems are caused by poor electric connections or faulty wiring. In this case, careful checking of suspicious circuits may help prevent the replacement of good parts.

A visual check only may not find the cause of the problems, so a road test should be performed.

Before undertaking actual checks, take a few minutes to talk with a customer who approaches with a ABS complaint. The customer is a very good source of information; especially on intermittent problems. Through the talks with the customer, find out what symptoms are present and under what conditions they occur.

Start your diagnosis by looking for "conventional" problems first. This is one of the best ways to troubleshoot brake problems on an ABS controlled vehicle.

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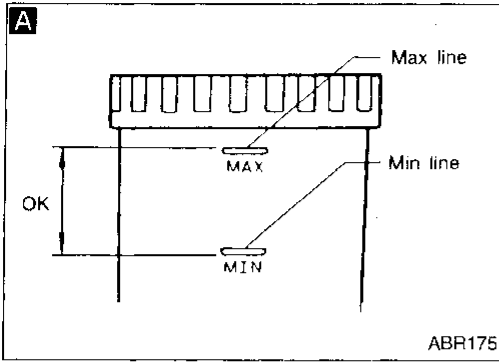
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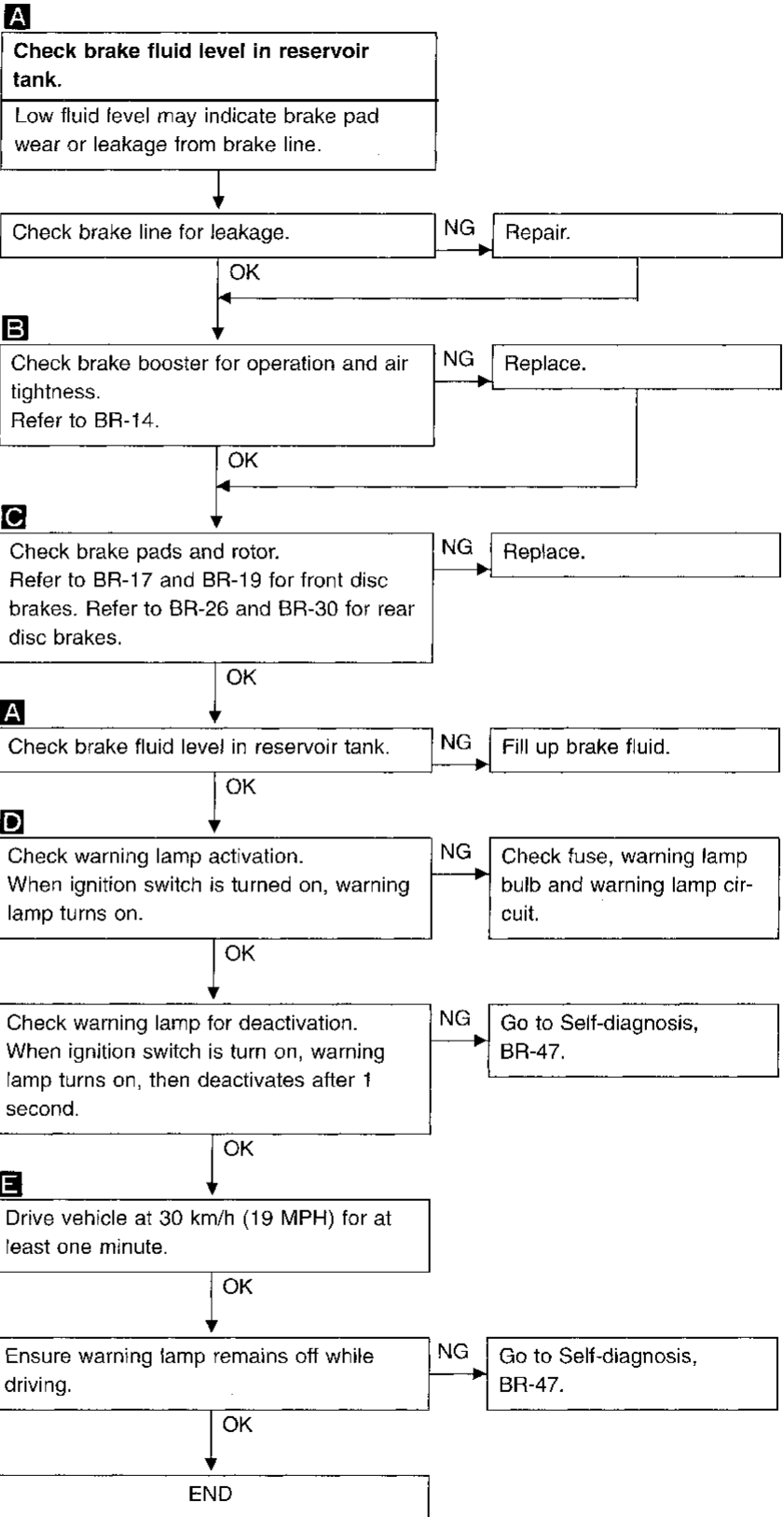
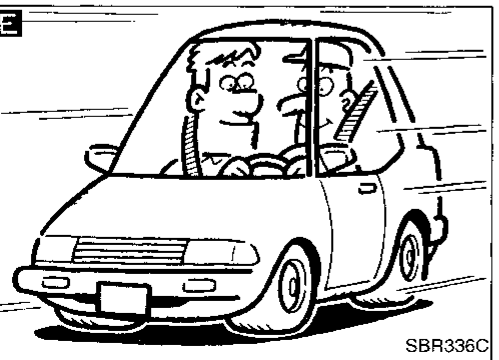
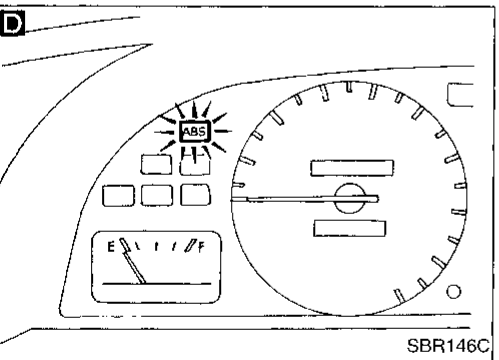
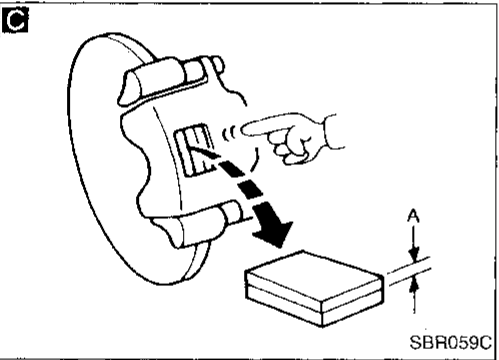
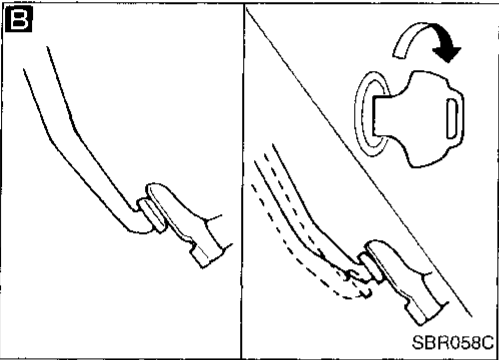
IDX



# TROUBLE DIAGNOSES

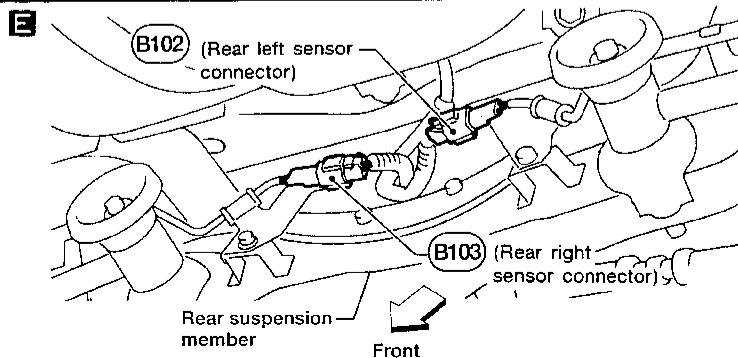
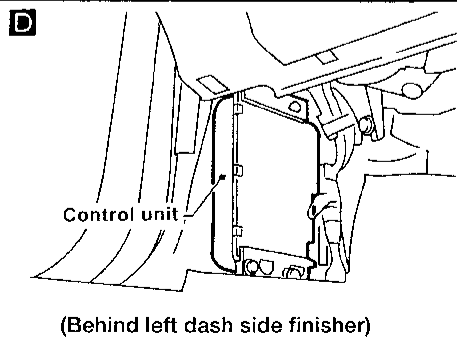
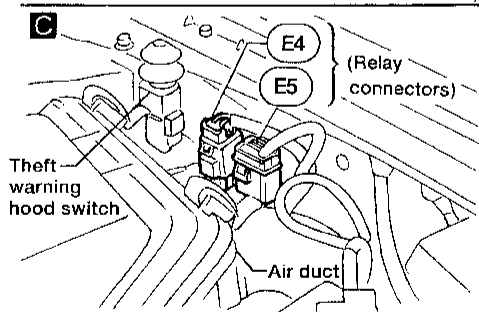
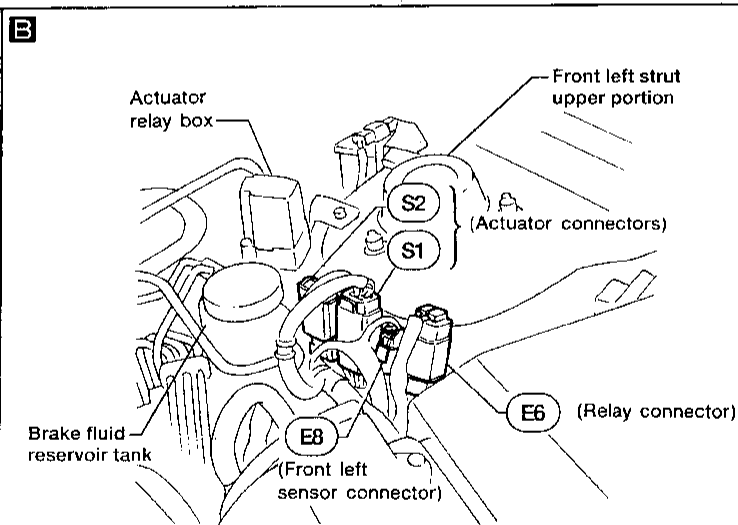
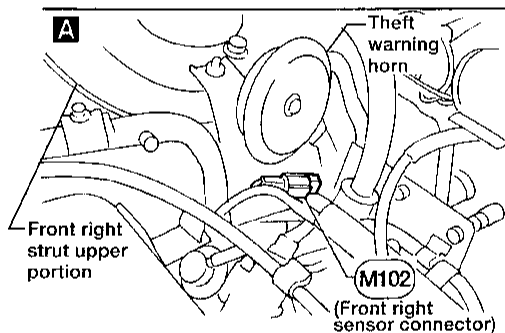
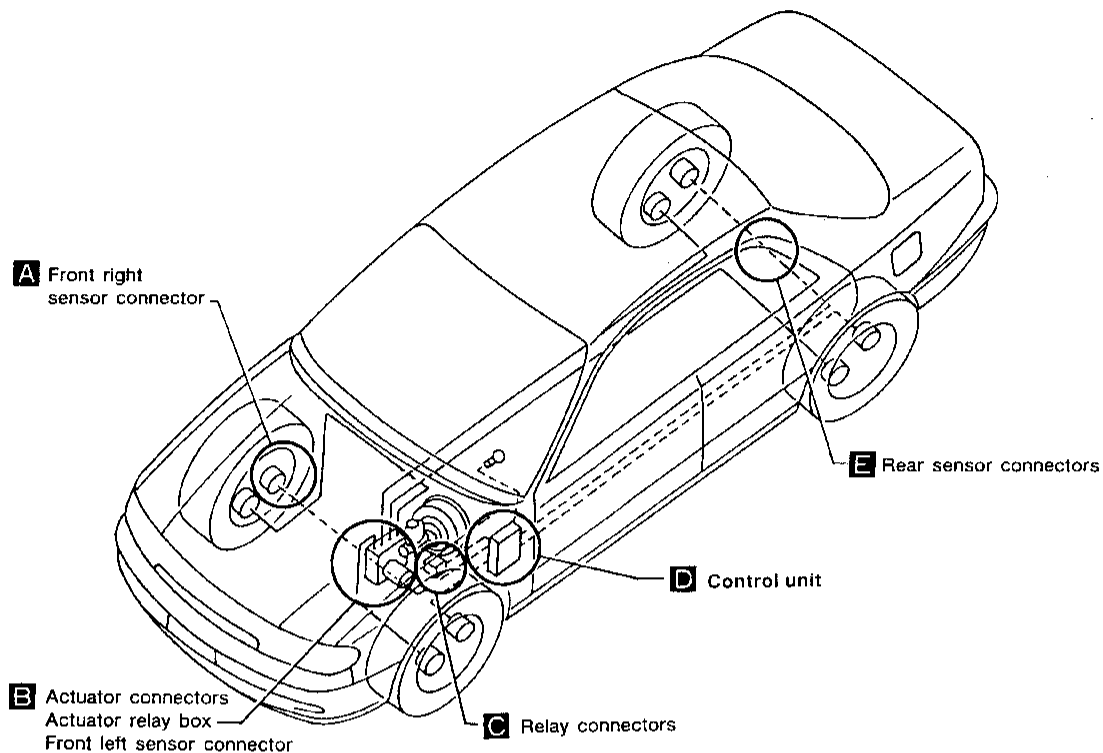


## Preliminary Check



# TROUBLE DIAGNOSES

## Component Parts and Harness Connector Location



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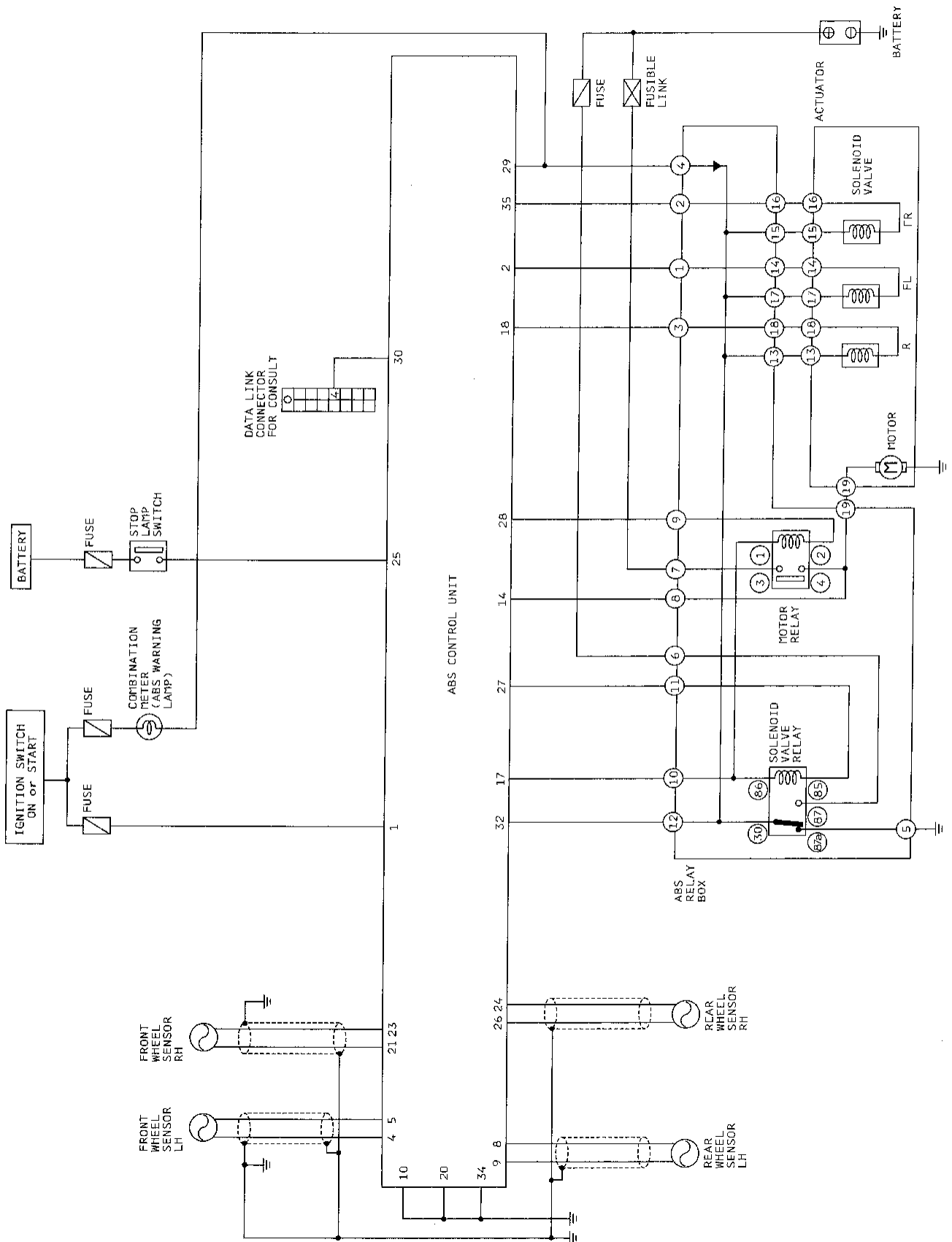
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# TROUBLE DIAGNOSES

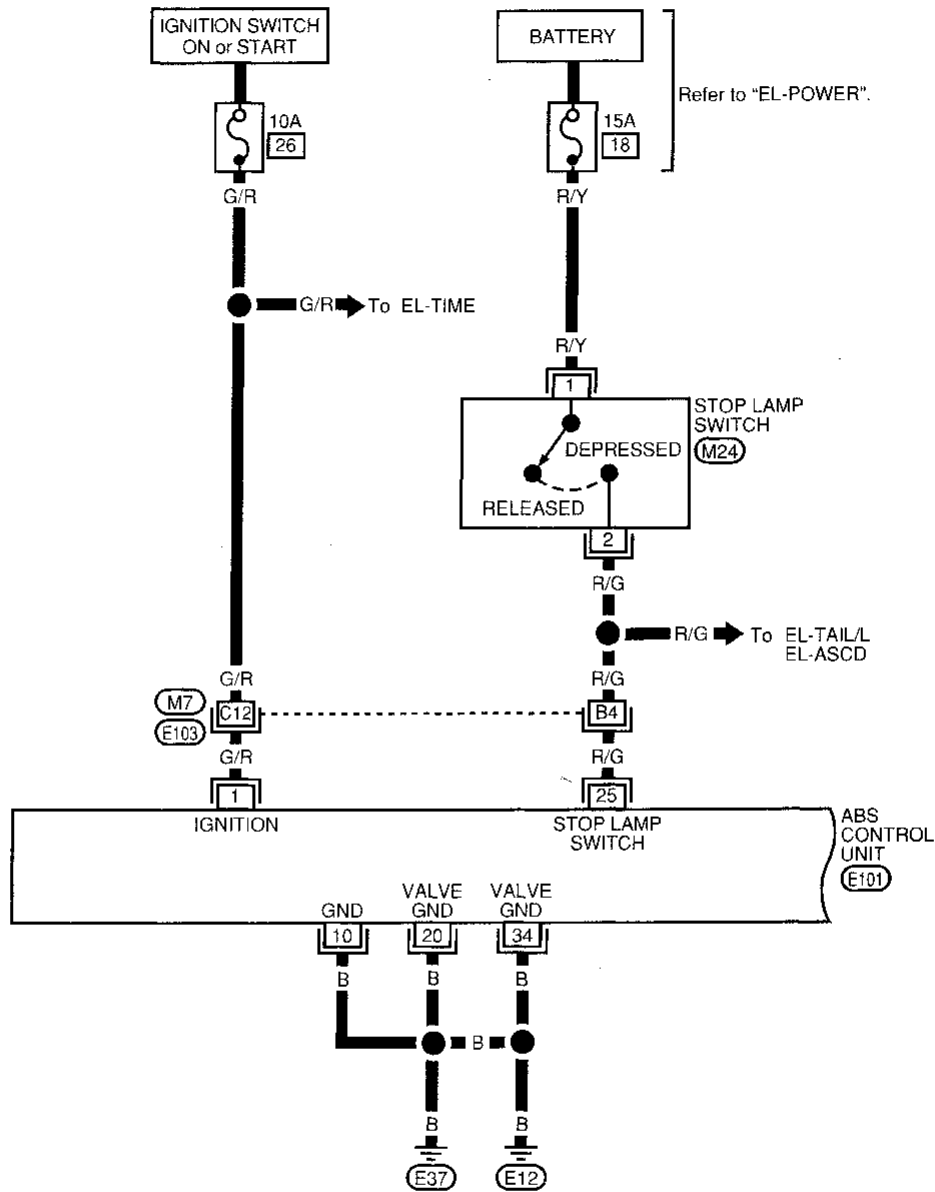
## Circuit Diagram for Quick Pinpoint Check



# TROUBLE DIAGNOSES

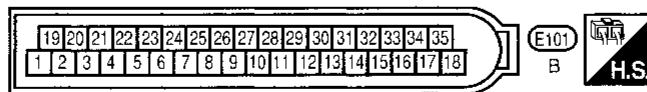
## Wiring Diagram -ABS-

BR-ABS-01



Refer to last page (Foldout page).

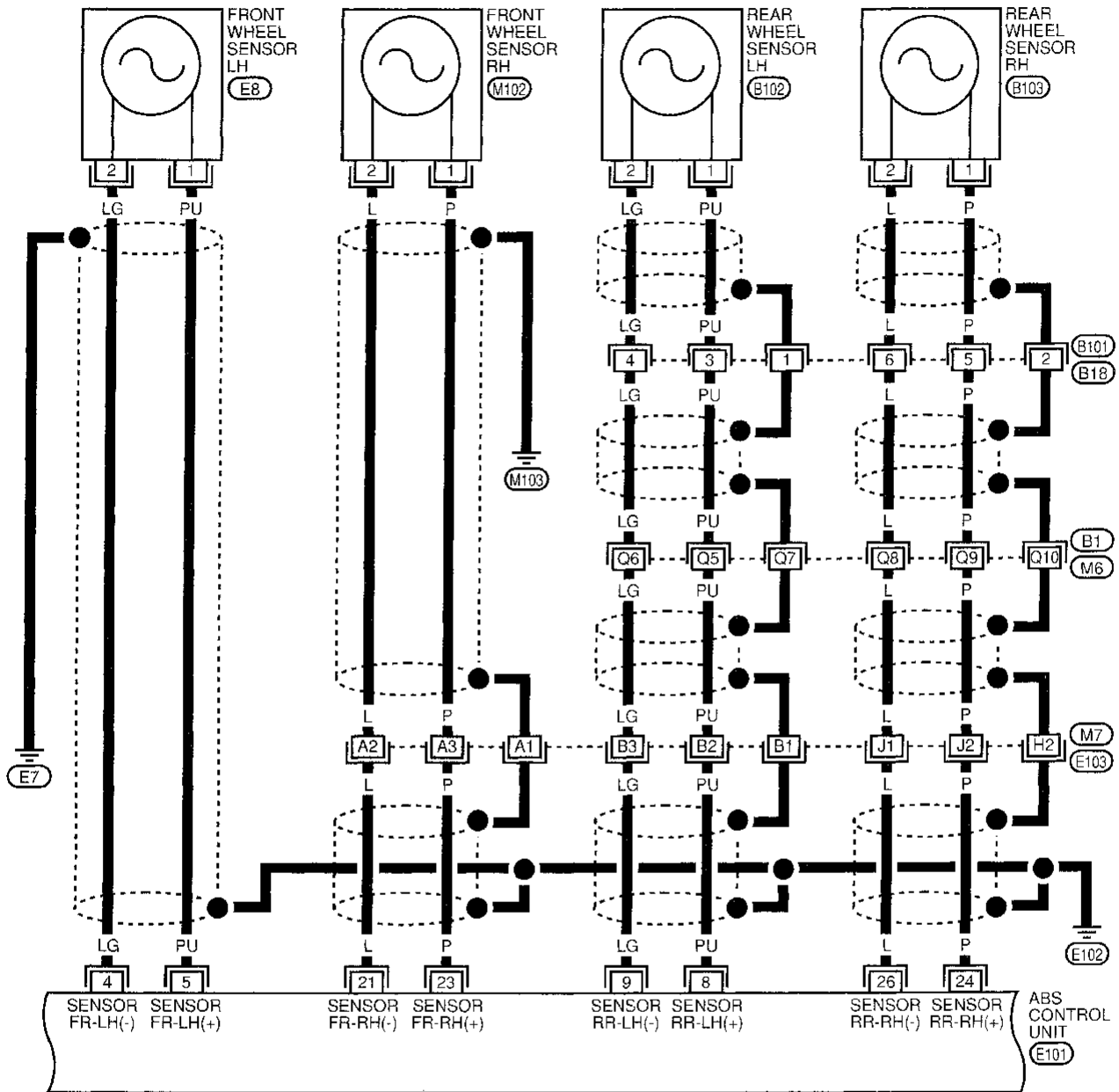
M7 E103



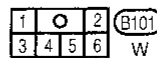
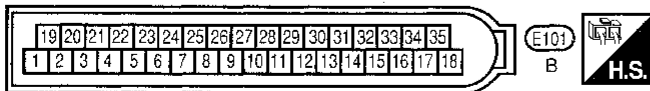
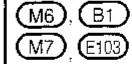
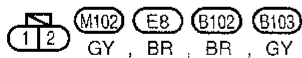
# TROUBLE DIAGNOSES

## Wiring Diagram -ABS- (Cont'd)

BR-ABS-02



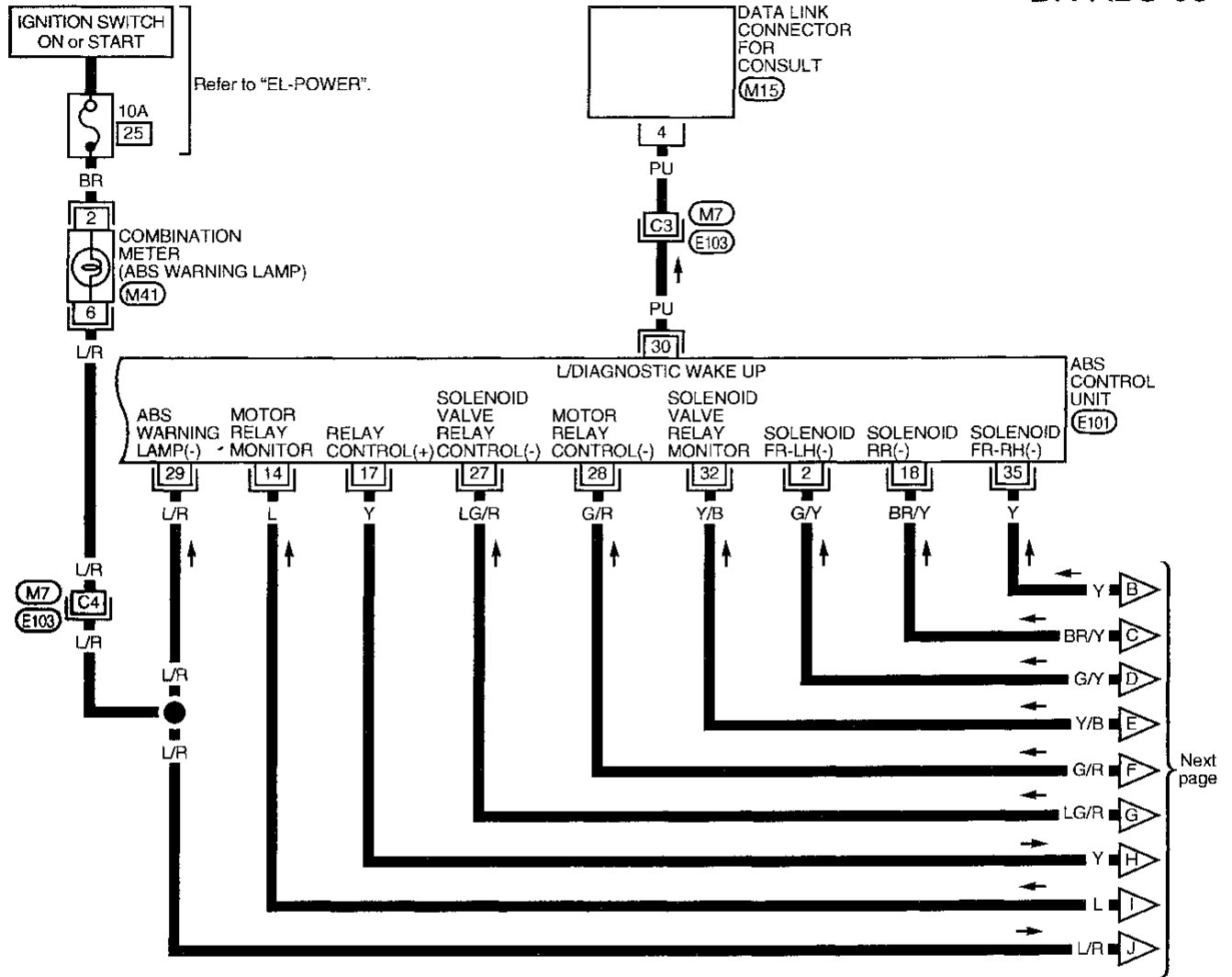
Refer to last page (Foldout page).



# TROUBLE DIAGNOSES

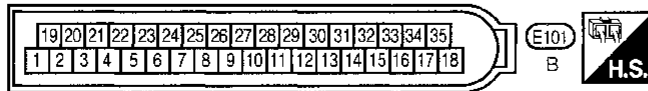
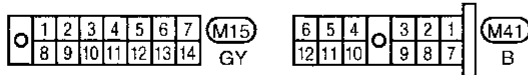
## Wiring Diagram -ABS- (Cont'd)

BR-ABS-03



Refer to last page (Foldout page).

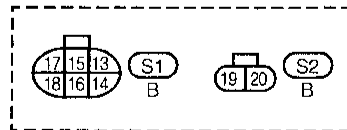
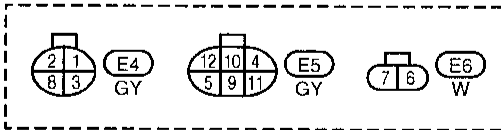
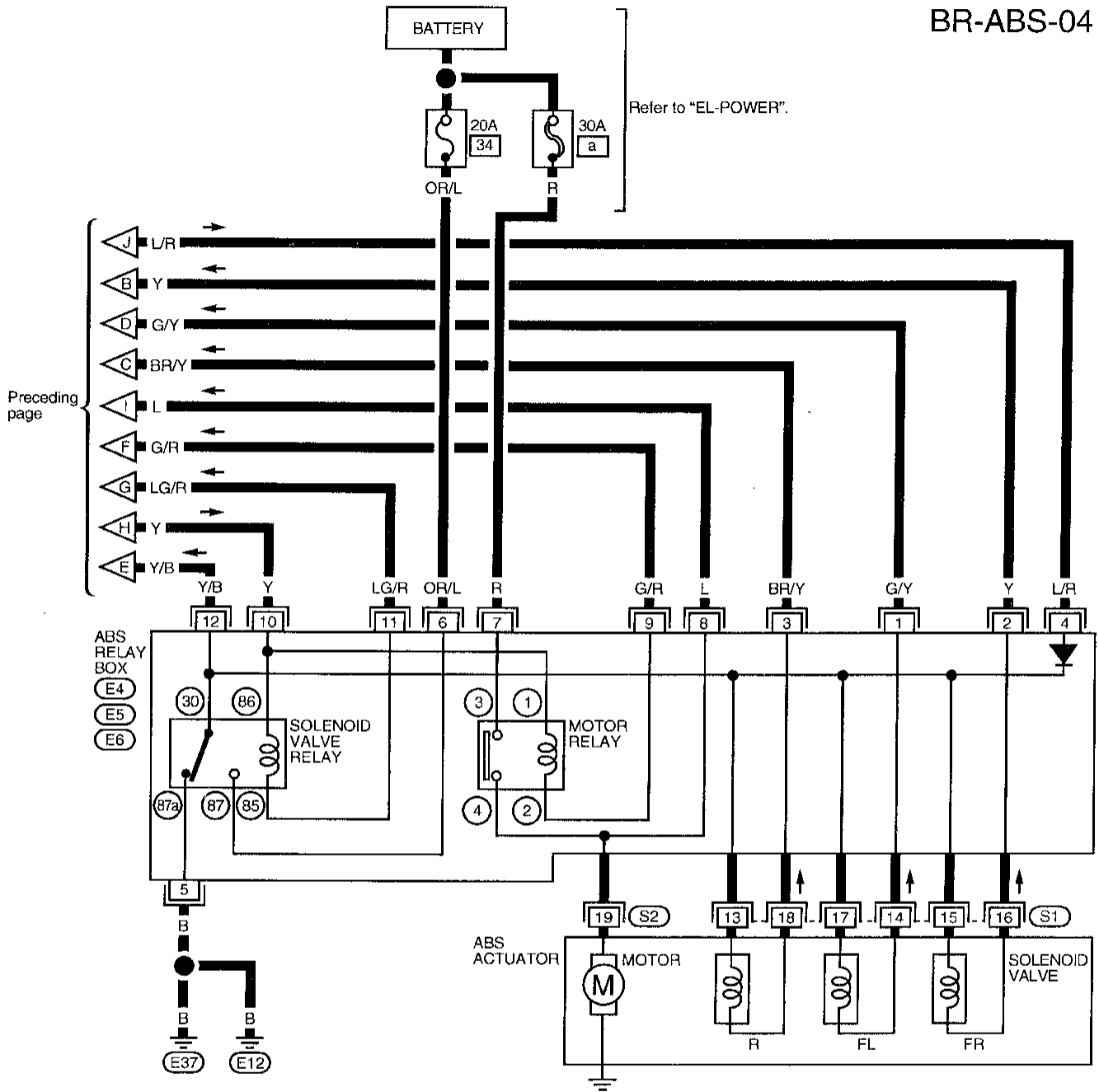
(M7) (E103)

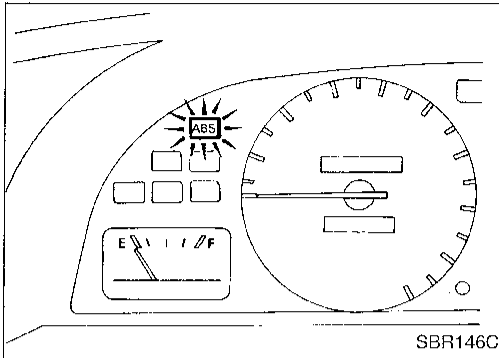


# TROUBLE DIAGNOSES

## Wiring Diagram -ABS- (Cont'd)

BR-ABS-04





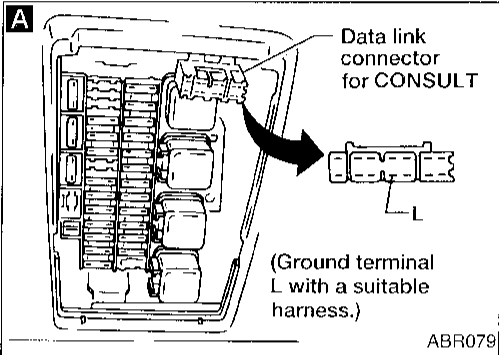
## Self-diagnosis

### FUNCTION

- When a problem occurs in the ABS, the warning lamp on the instrument panel comes on. To start the self-diagnostic results mode, ground the self-diagnostic (check) terminal located on the "Data Link Connector for CONSULT". The location of the malfunction is indicated by the warning lamp flashing on the instrument panel.

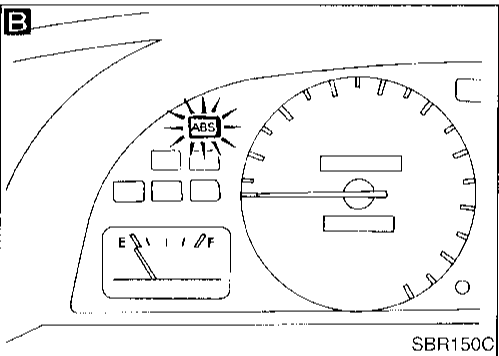
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IX

### SELF-DIAGNOSIS PROCEDURE



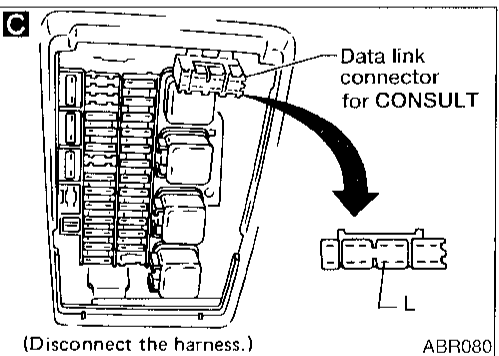
Drive vehicle over 30 km/h (20 MPH) for at least one minute.

Turn ignition switch OFF.



**A** Ground terminal "L" of "Data Link Connector for CONSULT" with a suitable harness.

Turn ignition switch ON while grounding terminal "L".  
**Do not depress brake pedal.**



**B** After 3.6 seconds, the warning lamp starts flashing to indicate the malfunction code No. (See NOTE.)

Verify the location of the malfunction with the malfunction code chart. Refer to BR-49. Then make the necessary repairs following the diagnostic procedures.

After the malfunctions are repaired, erase the malfunction codes stored in the control unit. Refer to BR-48.

Rerun the self-diagnostic results mode to verify that the malfunction codes have been erased.

**C** Disconnect the check terminal from the ground. The self-diagnostic results mode is now complete.

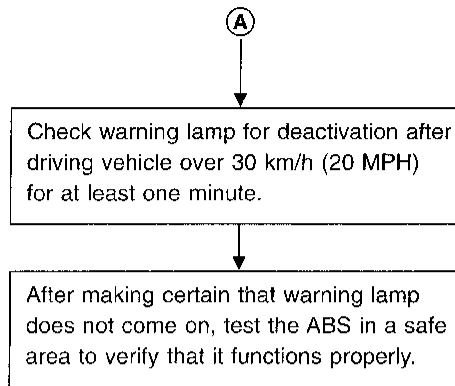
**NOTE:** The indication terminates after five minutes. However, when the ignition switch is turned from OFF to ON, the indication starts flashing again.

(A)



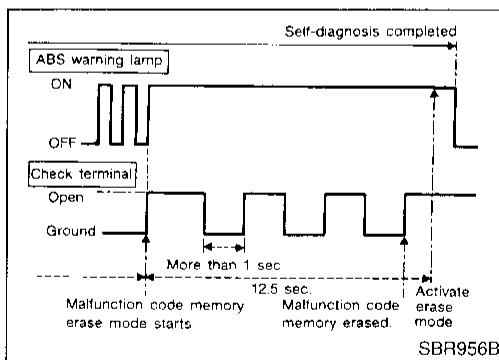
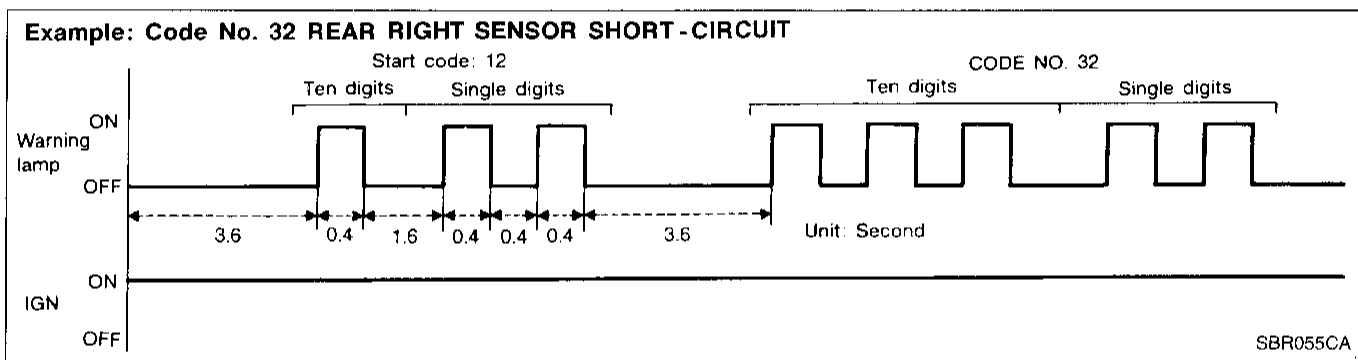
# TROUBLE DIAGNOSES

## Self-diagnosis (Cont'd)



### HOW TO READ SELF-DIAGNOSTIC RESULTS (Malfunction codes)

- Determine the code No. by counting the number of times the warning lamp flashes on and off.
- When several malfunctions occur at one time, up to three code numbers can be stored; the latest malfunction will be indicated first.
- The indication begins with the start code 12. After that a maximum of three code numbers are shown, with the latest one appearing first. The indication then returns to the start code 12 to repeat (the indication will stay on for a maximum of five minutes).
- The malfunction code chart is given on the next page.



### HOW TO ERASE SELF-DIAGNOSTIC RESULTS (Malfunction codes)

1. Disconnect the check terminal from ground (ABS warning lamp will stay lit.)
2. Within 12.5 seconds, ground the check terminal 3 times. Each terminal ground must last more than 1 second. The ABS warning lamp goes out after the erase operation has been completed.
3. Perform self-diagnosis again, refer to BR-47. Only the start-code should appear, no malfunction codes.

## TROUBLE DIAGNOSES

### Self-diagnosis (Cont'd)

#### MALFUNCTION CODE/SYMPTOM CHART

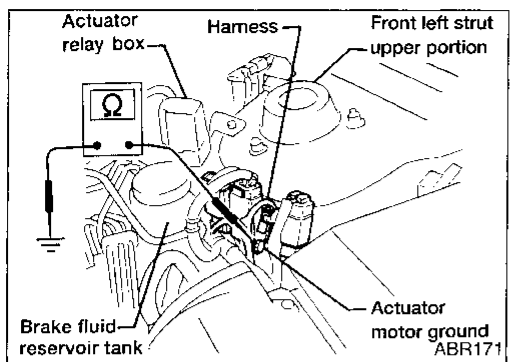
Code No. or symptom	Malfunctioning part	Diagnostic procedure	
45	Front left actuator solenoid valve	3	GI
41	Front right actuator solenoid valve	3	
55	Rear actuator solenoid valve	3	MA
25	Front left sensor (open-circuit)	4	
26	Front left sensor (short-circuit)	4	EM
21	Front right sensor (open-circuit)	4	
22	Front right sensor (short-circuit)	4	LC
35	Rear left sensor (open-circuit)	4	
36	Rear left sensor (short-circuit)	4	
31	Rear right sensor (open-circuit)	4	EC
32	Rear right sensor (short-circuit)	4	
18	Sensor rotor	4	FE
61	Actuator motor or motor relay	5	
63	Solenoid valve relay circuit (except power supply for relay coil)	6	CL
57	Power supply (Low voltage)	7	
16	Stop lamp switch circuit	8	MT
71	Control unit	9	
Warning lamp stays on when ignition switch is turned on	Control unit power supply circuit Warning lamp bulb circuit Control unit or control unit connector Solenoid valve relay stuck Power supply for solenoid valve relay coil	2	AT FA
Warning lamp stays on, during self-diagnosis	Control unit	-	RA
Warning lamp does not come on when ignition switch is turned on	Fuse, warning lamp bulb or warning lamp circuit Control unit	1	<b>BR</b>
Warning lamp does not come on during self-diagnosis	Control unit	-	
Pedal vibration and noise	-	10	ST
Long stopping distance	-	11	
Unexpected pedal action	-	12	RS
ABS does not work	-	13	
ABS works frequently	-	14	BT

HA

EL

IDX

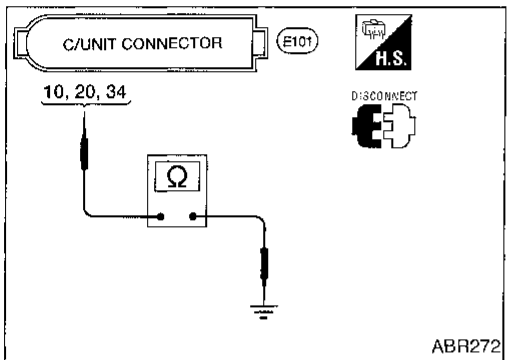
# TROUBLE DIAGNOSES



## Ground Circuit Check

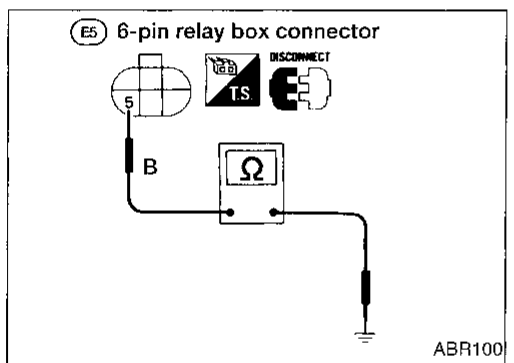
### ACTUATOR MOTOR GROUND

- Check resistance between actuator motor ground terminal and body ground.  
**Resistance: 0Ω**



### CONTROL UNIT GROUND

- Check resistance between the terminals and ground.  
**Resistance: 0Ω**



### RELAY BOX GROUND

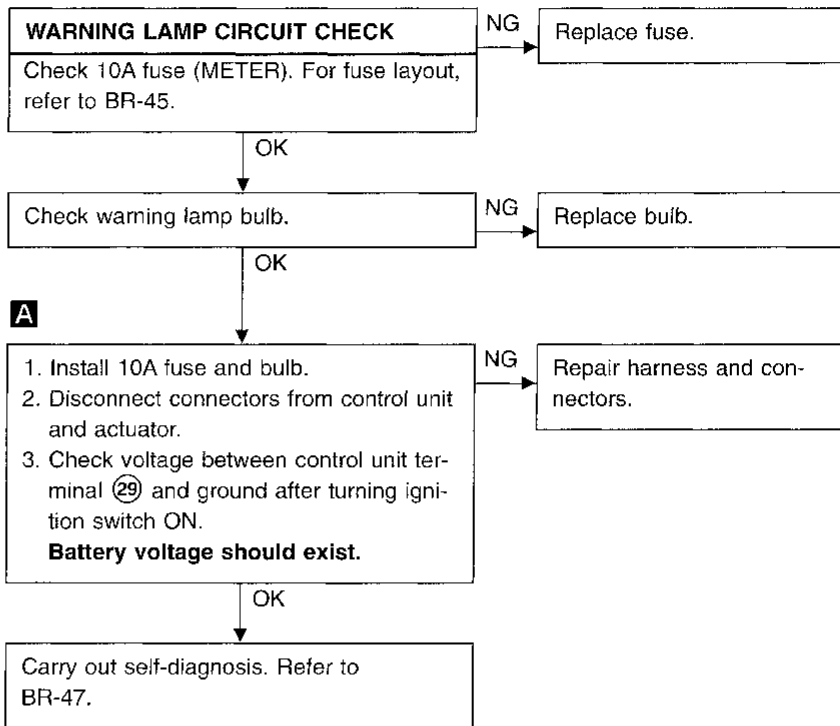
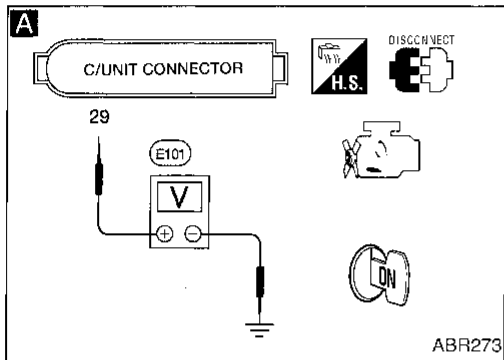
- Check resistance between relay box harness connector terminal (E5) and ground.  
**Resistance: 0Ω**

# TROUBLE DIAGNOSES

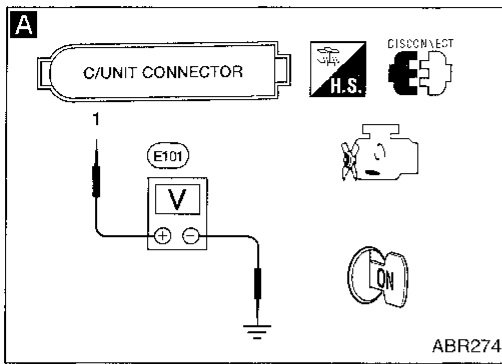
## Diagnostic Procedure 1 (Not self-diagnostic item)

Warning lamp does not come on when ignition switch is turned ON.

GI  
 MA  
 EM  
 LC  
 EC  
 FE  
 CL  
 NT  
 AT  
 FA  
 RA  
**BR**  
 ST  
 RS  
 BT  
 HA  
 EL  
 DX



# TROUBLE DIAGNOSES



## Diagnostic Procedure 2 (Not Self-diagnostic Item)

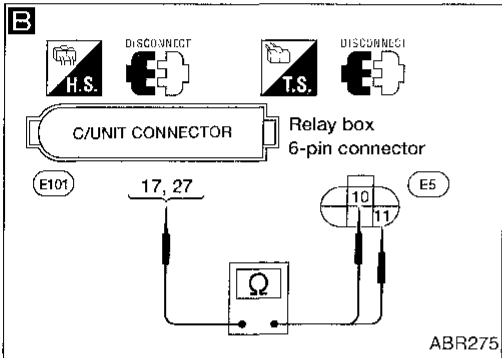
Warning lamp stays on when ignition switch is turned ON.

### CONTROL UNIT POWER SUPPLY CIRCUIT

Check 10A fuse for control unit.  
For fuse layout, refer to BR-43.

NG (Go to (B) on BR-54.)

OK



1. Disconnect connector from control unit.  
2. Check voltage between control unit connector terminal ① and ground after turning ignition switch ON.  
**Battery voltage should exist.**

NG Repair harness and connector.

OK

### SOLENOID VALVE RELAY COIL POWER SUPPLY CIRCUIT

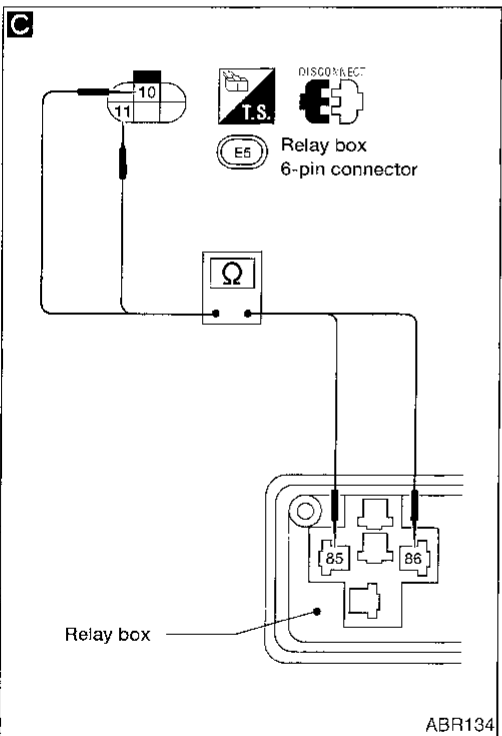
1. Turn ignition switch OFF. Disconnect relay box 6-pin connector.  
2. Check continuity between control unit connector terminals and relay box 6-pin connector (body side) terminals.

NG Repair harness and connector.

Control unit	Relay box
①⑦	⑩
②⑦	⑪

Continuity should exist.

OK



### CIRCUIT CHECK

1. Disconnect solenoid valve relay.  
2. Check continuity between relay box 6-pin connector (relay box side) terminals and solenoid valve relay box terminals.

NG Replace relay box assembly.

Relay box connector	Relay box
⑩	⑧⑥
⑪	⑧⑤

Continuity should exist.

OK

### SOLENOID VALVE RELAY CHECK

Refer to SOLENOID VALVE RELAY in Electrical Components Inspection (BR-68).

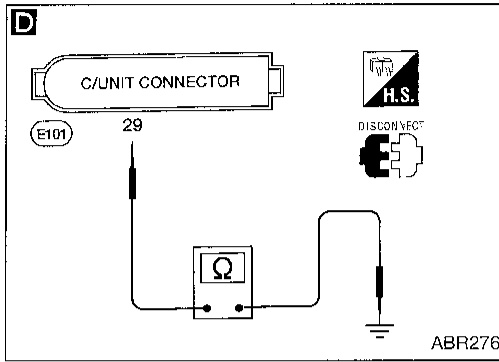
NG Replace solenoid valve relay.

OK

(Go to next page.)

# TROUBLE DIAGNOSES

## Diagnostic Procedure 2 (Not Self-diagnostic Item) (Cont'd)



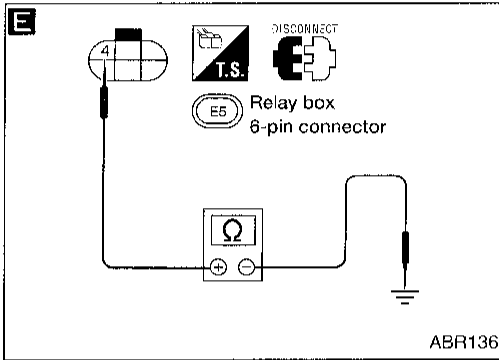
**D**

**GROUND-SHORT CHECK FOR WARNING LAMP CIRCUIT.**

1. Turn ignition switch OFF.  
2. Disconnect connectors from control unit and relay box.  
3. Check continuity between control unit connector terminal ②9 and body ground.  
**Continuity should not exist.**

NG → Repair harness and connector.

OK →

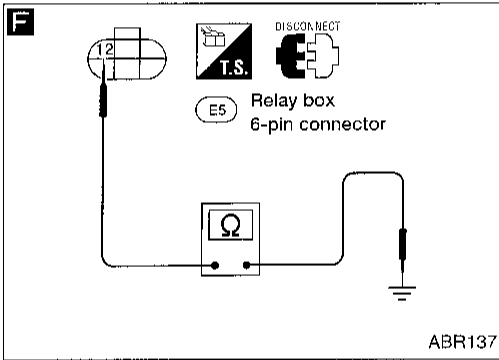


**E**

1. Disconnect relay box 6-pin connector.  
2. Check continuity between relay box 6-pin connector (relay box side) terminal ④ and body ground.  
**Continuity should not exist.**  
**Note: Pay attention to tester polarity\*.**

NG → Replace relay box assembly.

OK →



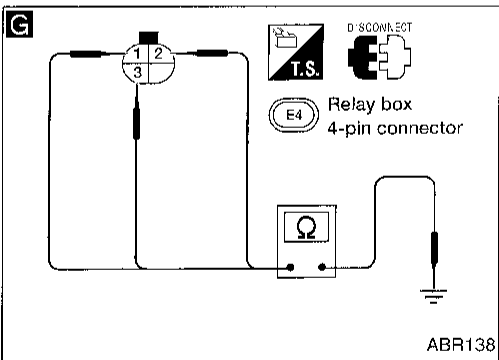
**F**

**SOLENOID VALVE CHECK CIRCUIT**

Check continuity between relay box 6-pin connector (body side) terminal ⑫ and body ground.  
**Continuity should not exist**

NG → Repair harness and connector.

OK →



**G**

**SOLENOID VALVE CIRCUIT**

1. Disconnect relay box 6-pin connector.  
2. Disconnect relay box 4-pin connector.  
3. Check continuity between relay box 4-pin connector (relay box side) terminals ①, ②, ③ and body ground.  
**Continuity should not exist.**

NG → Replace relay box assembly.

OK →

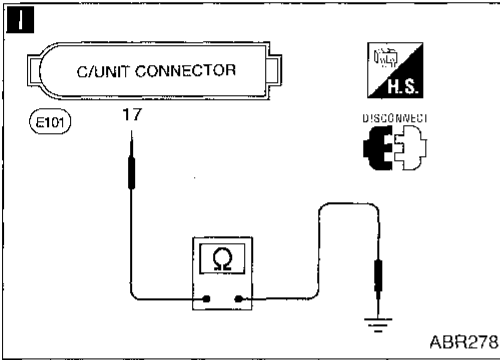
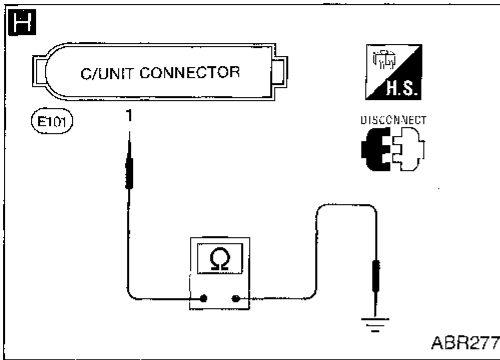
Check control unit pin terminals for damage or the connection of control module harness connector.  
Reconnect control unit harness connector.  
Then retest.

\*: Specifications may vary depending on the type of tester.  
Before performing this inspection, refer to the instruction manual of the tester.

GI  
MA  
HM  
LC  
EC  
FE  
CL  
MT  
AT  
FA  
RA  
BR  
ST  
RS  
BT  
HA  
EL  
IOX

# TROUBLE DIAGNOSES

## Diagnostic Procedure 2 (Not Self-diagnostic Item) (Cont'd)



Ⓑ

Replace 10A fuse.  
Does the fuse blow out when ignition switch is turned ON?

No

Inspection end.

Yes

### CONTROL UNIT POWER SUPPLY CIRCUIT

1. Disconnect control unit connector.
  2. Check continuity between control unit connector terminal ① and body ground.
- Continuity should not exist.**

NG

Repair harness and connector.

OK

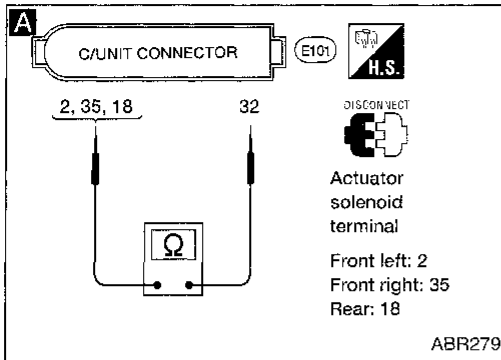
1. Check continuity between control unit connector terminal ⑰ and body ground.
- Continuity should not exist.**

NG

Repair harness and connector.

OK

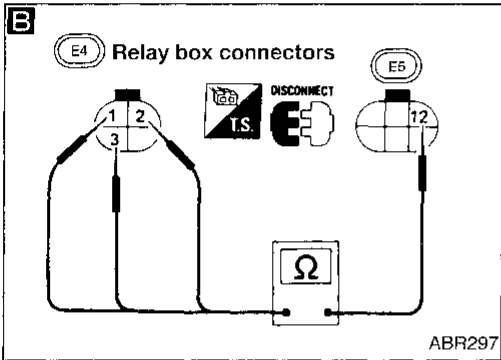
Check control unit pin terminals for damage or the connection of control unit harness connector.  
Reconnect control unit harness connector.  
Then retest.



## Diagnostic Procedure 3 ACTUATOR SOLENOID VALVE (Malfunction code No. 45, 41 or 55)

1. Disconnect connectors from control unit and actuator. Check terminals for damage or loose connection. Then reconnect connectors.
  2. Carry out self-diagnosis again.
- Does warning lamp activate again?**

No → Inspection end.



Yes

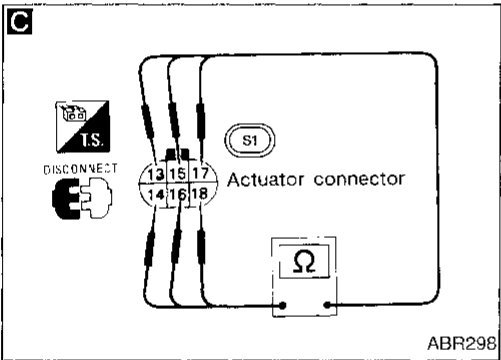
**A ACTUATOR SOLENOID VALVE CHECK.**

1. Disconnect control unit connector.
2. Check resistance between control unit connector terminals.

Code No.	Terminals
45	(32)-(2)
41	(32)-(35)
55	(32)-(18)

**Resistance: 1.07 - 1.17Ω**

OK → Replace control unit.



NG

**B**

1. Disconnect relay box connectors.
2. Check resistance between relay box connector (relay box side) terminals.

Code No.	4-pin connector	6-pin connector
45	(1)	(12)
41	(2)	(12)
55	(3)	(12)

**Resistance: 1.07 - 1.17Ω**

OK → Repair harness between relay box 6-pin connector terminal (12) and control unit connector terminal (32), or between relay box 4-pin connector terminals (1), (2), (3) and control unit connector terminals (2), (35), (18).

NG

**C**

1. Disconnect actuator connector.
2. Check resistance between actuator connector (actuator side) terminals.

Code No.	Terminals
45	(17)-(14)
41	(15)-(16)
55	(13)-(18)

**Resistance: 1.07 - 1.17Ω**

OK → Replace relay box assembly.

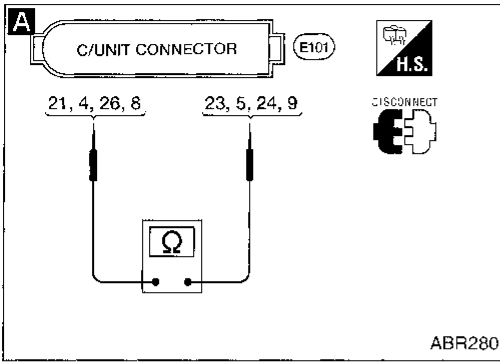
NG

Replace actuator.

GI  
WA  
EM  
LC  
EC  
FE  
CL  
MT  
AT  
FA  
RA  
BR  
ST  
RS  
BT  
HA  
EL  
IDX



# TROUBLE DIAGNOSES



## Diagnostic Procedure 4

### WHEEL SENSOR OR ROTOR

(Malfunction code No. 21, 22, 25, 26, 31, 32, 35, 36 or 18)

1. Disconnect connectors from control unit and wheel sensor indicated by malfunction code No. Check terminals for damage or loose connection. Then reconnect connectors.
  2. Carry out self-diagnosis again.
- Does warning lamp activate again?**

No → Inspection end.

Yes

#### WHEEL SENSOR ELECTRICAL CHECK

- Disconnect control unit connector.
  - Check resistance between control unit connector terminals.
- Code No. 21 or 22 (Front RH wheel)  
Terminals ②① and ②③
- Code No. 25 or 26 (Front LH wheel)  
Terminals ④ and ⑤
- Code No. 31 or 32 (Rear RH wheel)  
Terminals ②⑥ and ②④
- Code No. 35 or 36 (Rear LH wheel)  
Terminals ⑧ and ⑨
- Resistance: 1.0 - 1.25kΩ**

OK → (A) (Go to next page.)

NG

Note

#### CHECK WHEEL SENSOR

Refer to "Electrical Components Inspection", BR-68.

Note

NG → Replace wheel sensor.

OK

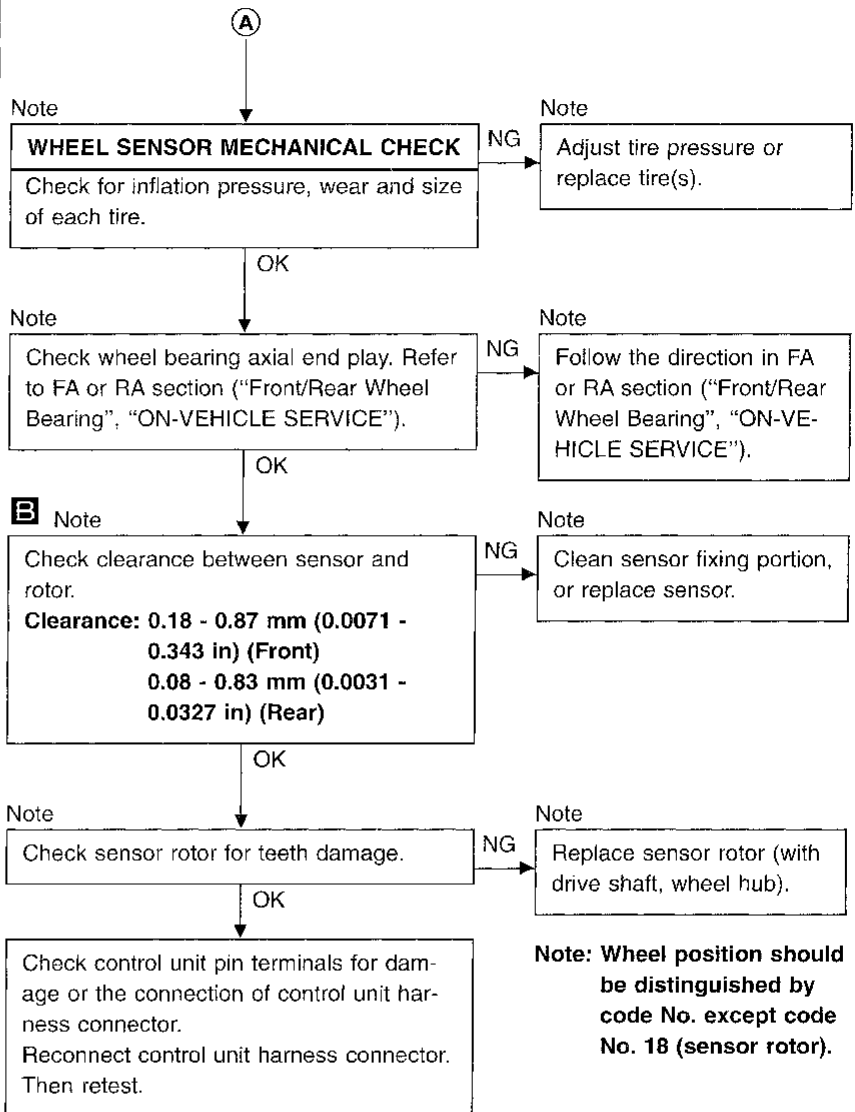
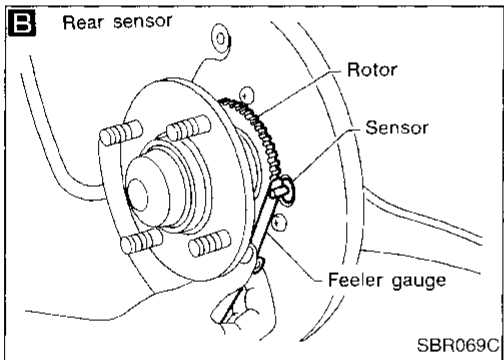
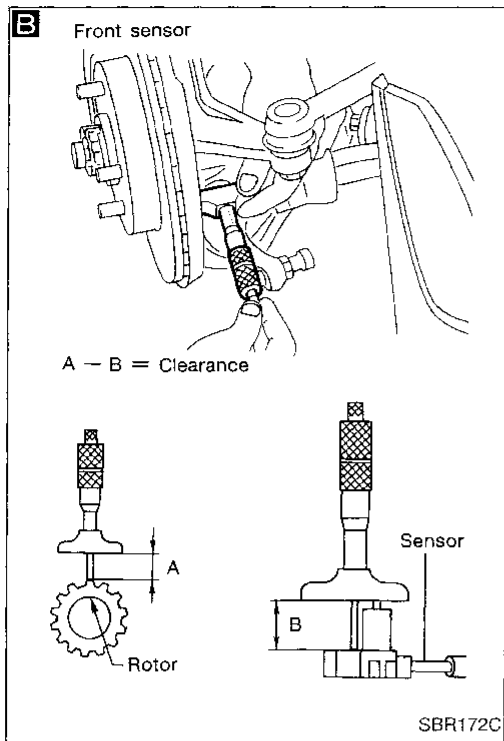
Note

Repair harness and connectors between control unit connector and wheel sensor connector.

**Note: Wheel position should be distinguished by code No. except code No. 18 (sensor rotor).**

# TROUBLE DIAGNOSES

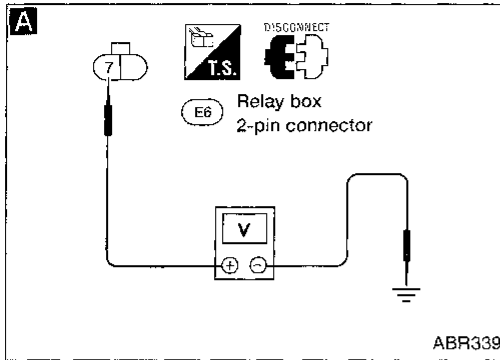
## Diagnostic Procedure 4 (Cont'd)



GI  
 MA  
 EM  
 LC  
 EC  
 FE  
 CL  
 MT  
 AT  
 FA  
 RA  
**BR**  
 ST  
 RS  
 BT  
 HA  
 EL  
 IDX

# TROUBLE DIAGNOSES

## Diagnostic Procedure 5 MOTOR RELAY OR MOTOR (Malfunction code No. 61)

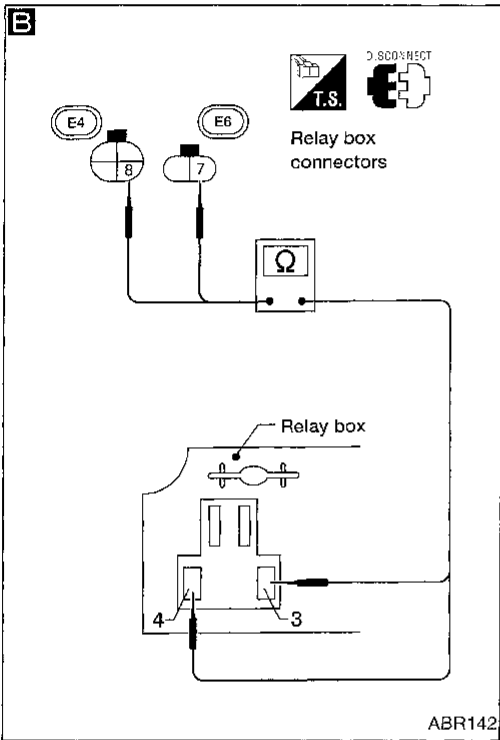


**MOTOR POWER SUPPLY CIRCUIT**

Check fusible link for relay box. For fusible link layout, refer to Wiring Diagram (BR-46).

NG → (B) (Go to (B) on BR-60.)

OK



1. Disconnect connectors from control unit and actuator. Check terminals for damage or loose connection. Then reconnect connectors.

2. Carry out self-diagnosis again.

**Does warning lamp activate again?**

No → Inspection end.

Yes

**A**

1. Disconnect relay box 2-pin connector.

2. Check voltage between connector (body side) terminal (7) and ground.

**Battery voltage should exist.**

NG → Repair harness and connectors.

OK

**B**

**MOTOR RELAY CIRCUIT**

1. Remove motor relay.

2. Disconnect relay box connectors.

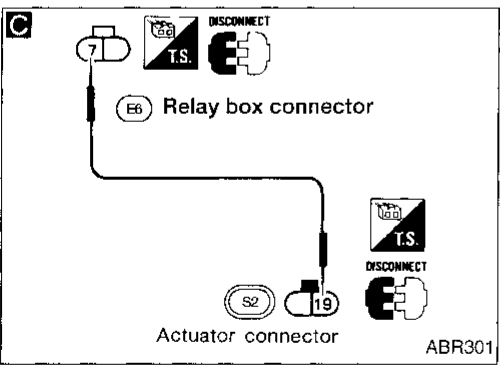
3. Check continuity between relay box connector (relay box side) terminals and relay box terminals.

NG → Replace actuator assembly.

Relay box connector	Relay box
(7)	(3)
(8)	(4)

**Continuity should exist.**

OK



**C**

**MOTOR CHECK**

Check motor by connecting terminal (7) for relay box connector and terminal (19) for actuator connector with a suitable harness.

**Motor should operate.**

**Do not connect harness for more than 5 seconds.**

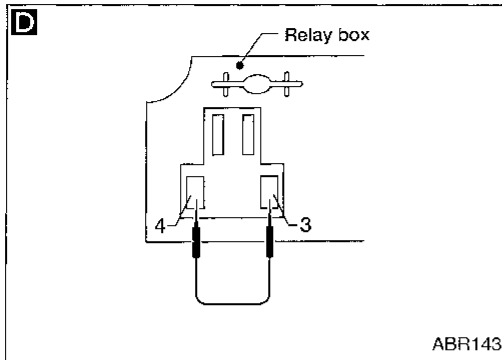
NG → Check continuity between actuator and ground. If OK, replace actuator.

OK

(A)  
(Go to next page.)

# TROUBLE DIAGNOSES

## Diagnostic Procedure 5 (Cont'd)



(A)

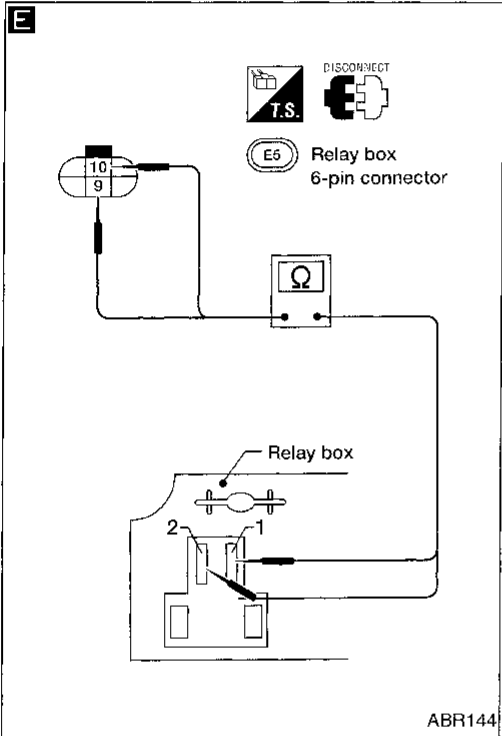
**D**

**MOTOR CHECK**

1. Connect relay box connectors.
2. Connect suitable wire between relay box terminals (3) and (4).

**Motor should operate.**  
**Do not connect wire for more than 5 seconds.**

NG → Replace relay box assembly.



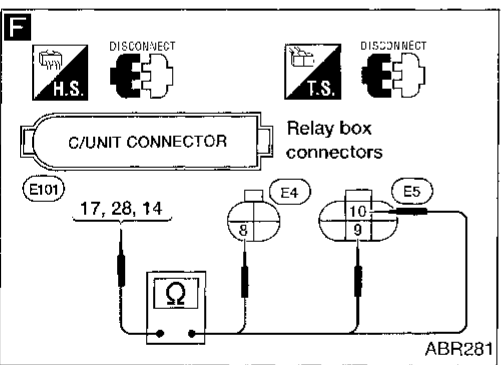
OK

**MOTOR RELAY CHECK**

Refer to "Electrical Components Inspection", BR-68.

NG → Replace motor relay.

OK



OK

**E**

**MOTOR RELAY CIRCUIT**

1. Disconnect relay box 6-pin connector.
2. Check continuity between relay box connector (relay box side) terminals and relay box terminals.

Relay box connector	Relay box
(10)	(1)
(9)	(2)

**Continuity should exist.**

NG → Replace relay box assembly.

OK

OK

**F**

**CIRCUIT CHECK**

- Disconnect control unit connector.
- Check continuity between control unit connector terminals and relay box connector (body side) terminals.

Control unit connector	Relay box connector
(17)	(10)
(28)	(9)
(14)	(8)

**Continuity should exist.**

NG → Repair harness and connectors.

OK

OK

Check control unit pin terminals for damage or the connection of control unit harness connector.

Reconnect control unit harness connector.

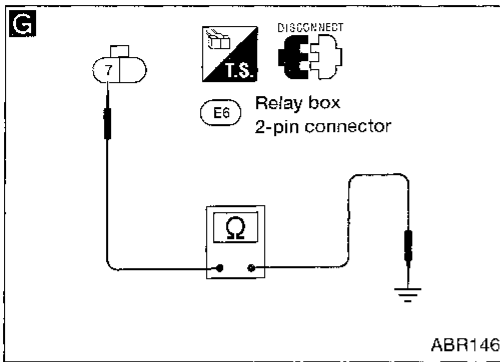
Then retest.

NG → Repair harness and connectors.

GI  
MA  
EM  
LC  
EC  
FE  
CL  
MT  
AT  
FA  
RA  
BR  
ST  
RS  
BT  
HA  
EL  
IDX

# TROUBLE DIAGNOSES

## Diagnostic Procedure 5 (Cont'd)

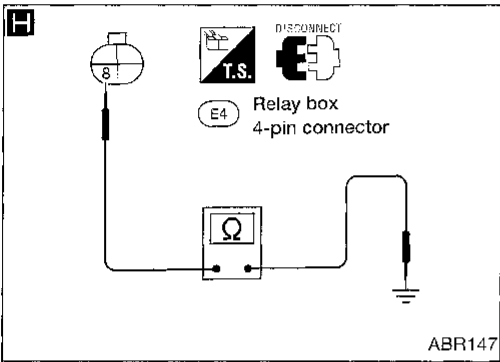


Ⓑ

Replace fusible link.  
**Does the fusible link blow out when ignition switch is turned ON?**

No → Inspection end.

Yes →

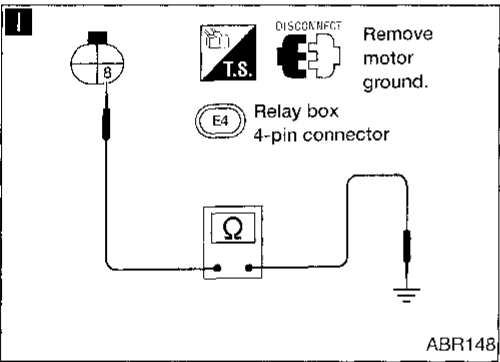


**MOTOR POWER SUPPLY CIRCUIT**

1. Disconnect relay box 2-pin connector.  
 2. Check continuity between relay box 2-pin connector (body side) terminal ⑦ and ground.  
**Continuity should not exist.**

NG → Repair harness and connector.

OK →



1. Disconnect relay box 4-pin connector and control unit connector.  
 2. Check continuity between relay box 4-pin connector (body side) terminal ⑧ and ground.  
**Continuity should not exist.**

NG → Repair harness and connector.

OK →

1. Remove motor ground.  
 2. Check continuity between relay box 4-pin connector (relay box side) terminal ⑧ and ground.  
**Continuity should not exist.**

NG → Replace relay box assembly.

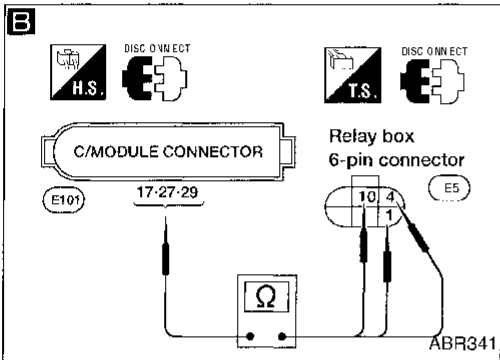
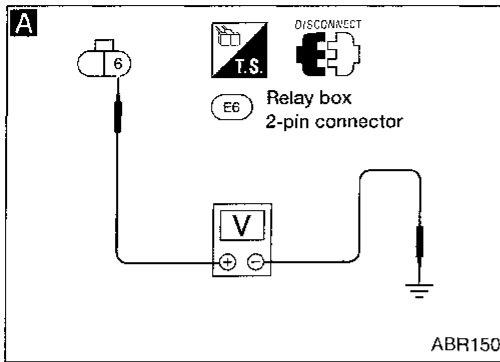
OK →

**MOTOR CHECK**

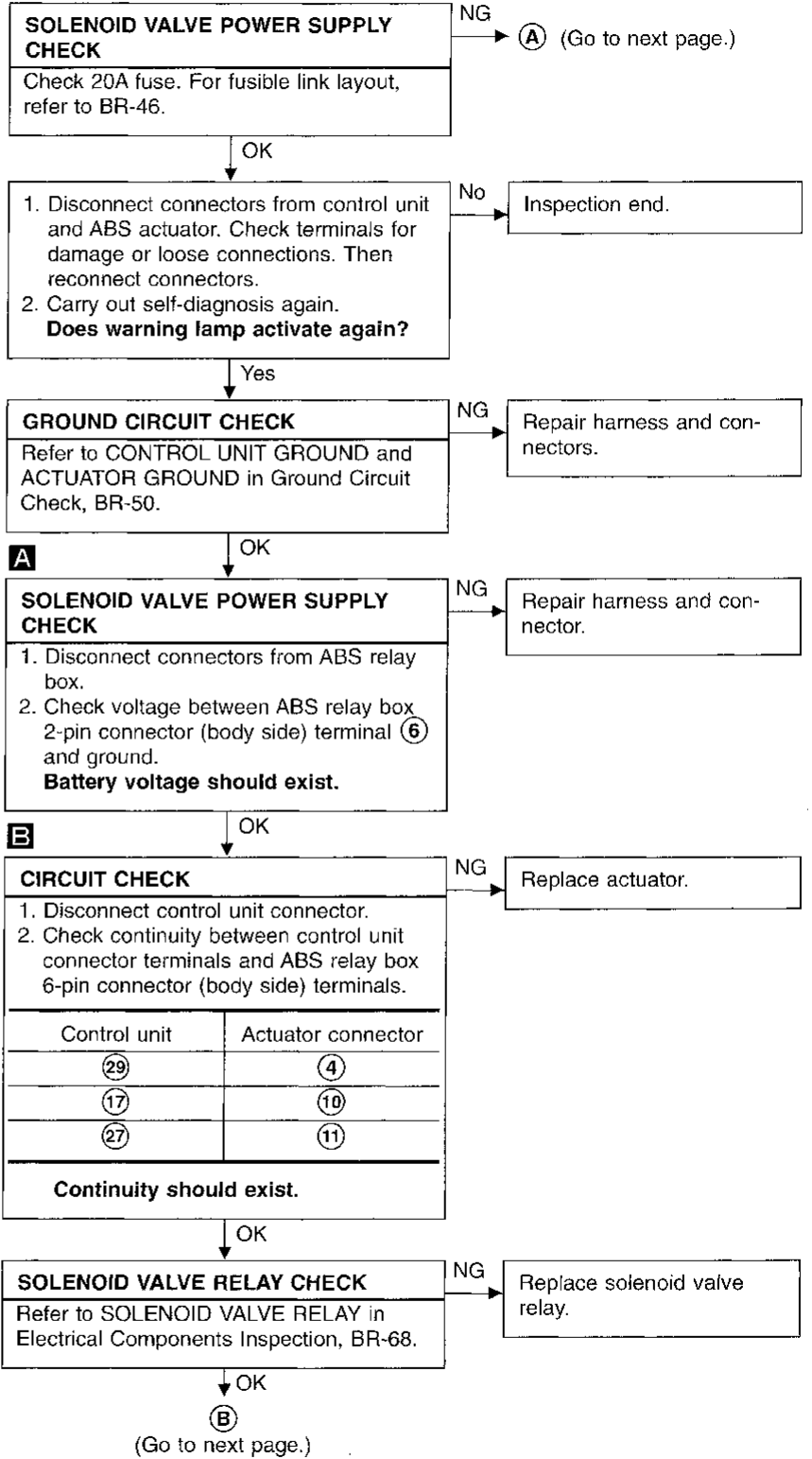
Go to Ⓒ in Diagnostic Procedure 5, BR-58.

OK →

Check control unit pin terminals for damage or the connection of control unit harness connector.  
 Reconnect control unit harness connector.  
 Then retest.



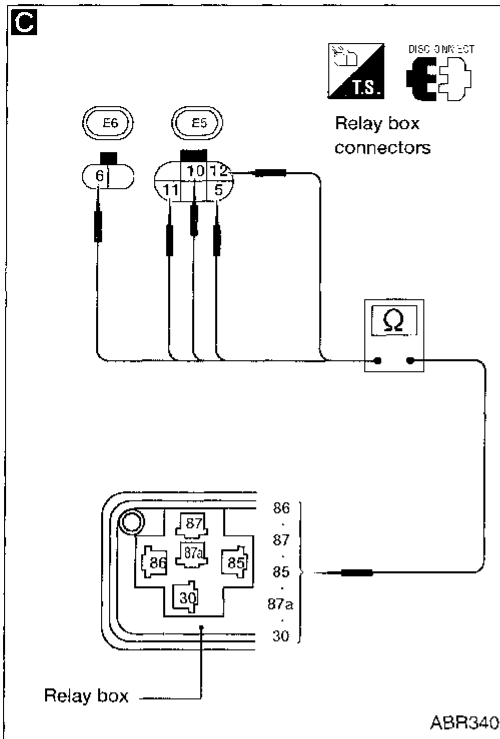
## Diagnostic Procedure 6 SOLENOID VALVE RELAY (Malfunction code No. 63)



CI  
MA  
EM  
LC  
EC  
FE  
CL  
WIT  
AT  
FA  
RA  
**BR**  
ST  
RS  
BT  
HA  
EL  
IDX

# TROUBLE DIAGNOSES

## Diagnostic Procedure 6 (Cont'd)



**C**

**SOLENOID VALVE RELAY CIRCUIT CHECK**

Check continuity between ABS relay terminals and ABS actuator connector and ABS relay box connector (ABS relay box side) terminals.

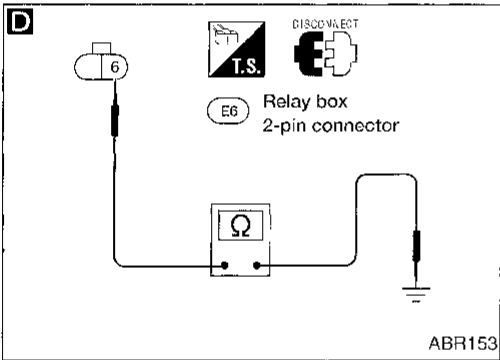
ABS relay terminals	ABS actuator connector
87	6
87a	5
85	11
86	10
30	12

Continuity should exist.

OK

Go to Diagnostic Procedure 3, BR-55.

No → Replace ABS relay box.



**D**

Replace fusible link.

Does the fusible link blow out when ignition switch is turned ON?

No → Inspection end

Yes

**D**

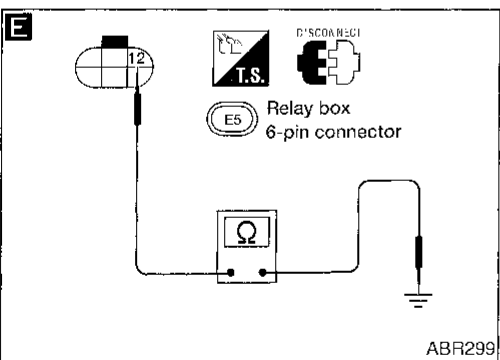
**RELAY UNIT POWER SUPPLY CIRCUIT**

1. Disconnect ABS relay box 2-pin connector.
2. Check continuity between ABS relay box 2-pin connector (body side) terminal 6 and ground.

Continuity should not exist.

NG → Repair harness and connector.

OK



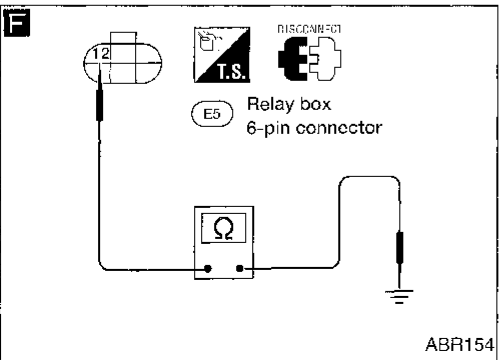
**E**

1. Disconnect ABS relay box connectors and control unit connector.
2. Check continuity between ABS actuator 2-pin connector (ABS relay box side) terminal 12 and ground.

Continuity should not exist.

NG → Replace ABS relay box.

OK



**F**

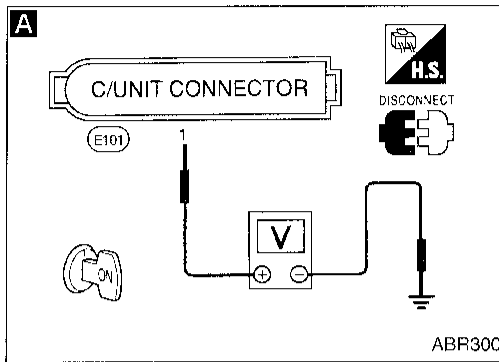
Check continuity between ABS actuator 2-pin connector (ABS actuator side) terminal 12 and ground.

Continuity should not exist.

NG → Replace ABS actuator.

OK

Go to Diagnostic Procedure 3, BR-55.



## Diagnostic Procedure 7 POWER SUPPLY (Low voltage) (Malfunction code No. 57)

1. Disconnect control unit connectors.  
Check terminals for damage or connection. Then reconnect connectors.  
2. Carry out self-diagnosis again.  
**Does warning lamp activate again?**

No → Inspection end.

Yes

**A**

**CONTROL UNIT POWER SUPPLY CHECK**

1. Disconnect control unit connector.  
2. Check voltage between control unit connector terminal ① and ground.  
**Battery voltage should exist when ignition switch is turned ON.**

NG → (A) (See below.)

OK

**CONTROL UNIT GROUND CHECK**

Refer to CONTROL UNIT GROUND in Ground Circuit Check, BR-50.

NG → Repair harness and connectors.

OK

Check control unit pin terminals for damage or the connection of control unit harness connector.  
Reconnect control unit harness connector.  
Then retest.

(A)

Check 10A fuse. Refer to POWER SUPPLY ROUTING in EL section.

NG → Replace fuse.

OK

Check continuity between battery and control unit connector terminal ①.

NG → Repair harness and connectors.

OK

Check battery. Refer to BATTERY in EL section.

GI

MA

EM

LC

EC

FE

CL

MT

AT

FA

RA

**BR**

ST

RS

BT

HA

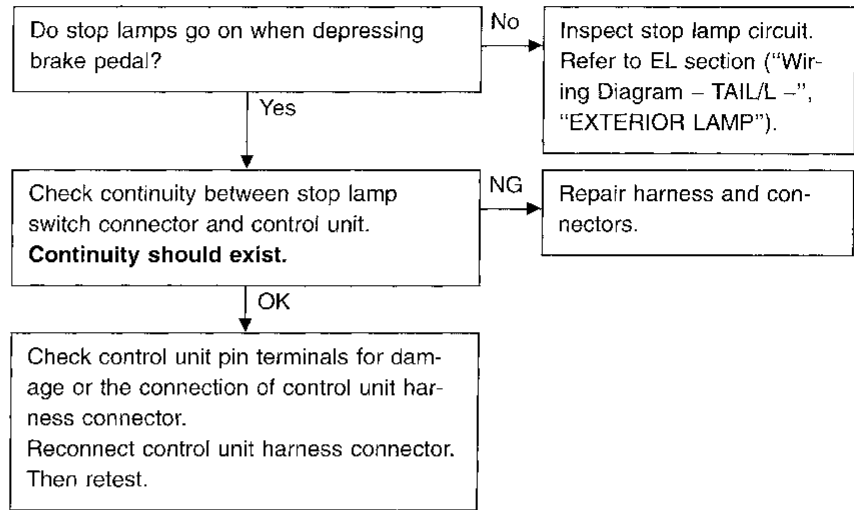
FL

IDX

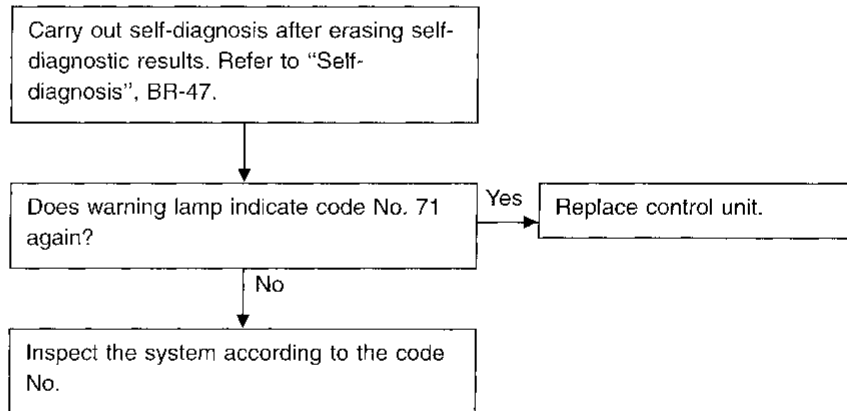


# TROUBLE DIAGNOSES

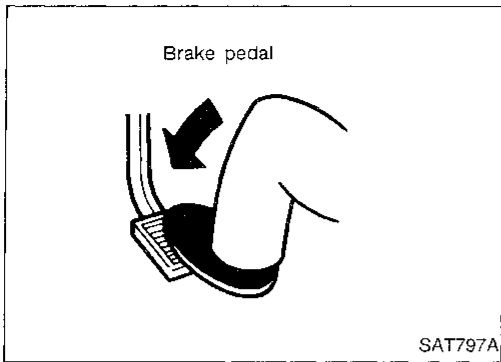
## Diagnostic Procedure 8 STOP LAMP SWITCH CIRCUIT (Malfunction code No. 16)



## Diagnostic Procedure 9 CONTROL UNIT (Malfunction code No. 71)

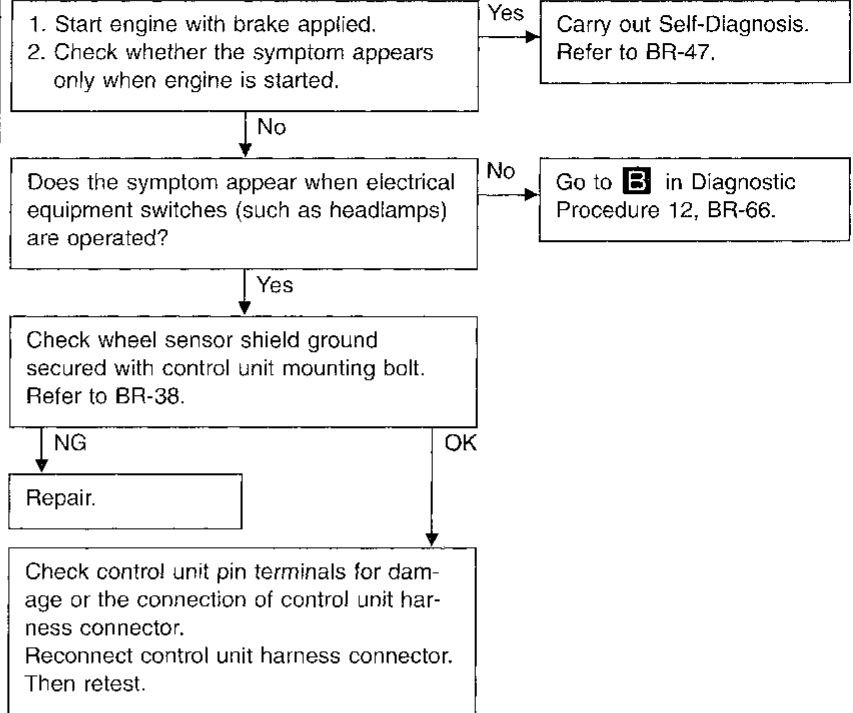


# TROUBLE DIAGNOSES



## Diagnostic Procedure 10

### SYMPTOM: Pedal vibration and noise

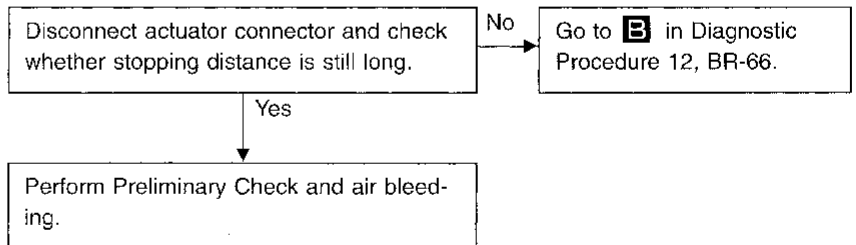


**Note:** ABS may operate and cause vibration under the following conditions:

- Applying brake gradually when shifting or operating clutch.
- Low-friction road
- High speed cornering
- Passing over bumps/potholes
- Engine speed is over 5,000 rpm with vehicle stopped.

## Diagnostic Procedure 11

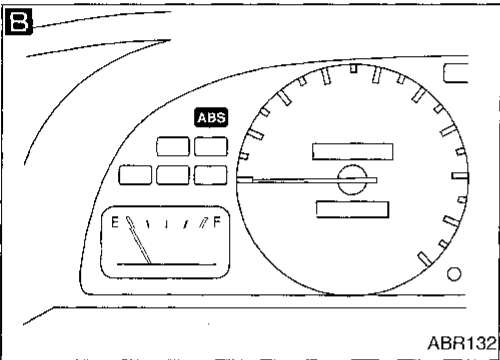
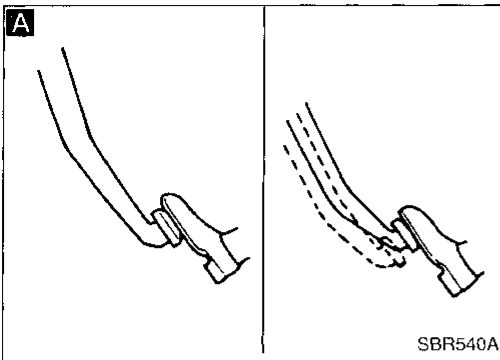
### SYMPTOM: Long stopping distance



**Note:** Stopping distance may be longer than that of vehicles without ABS when road condition is slippery.

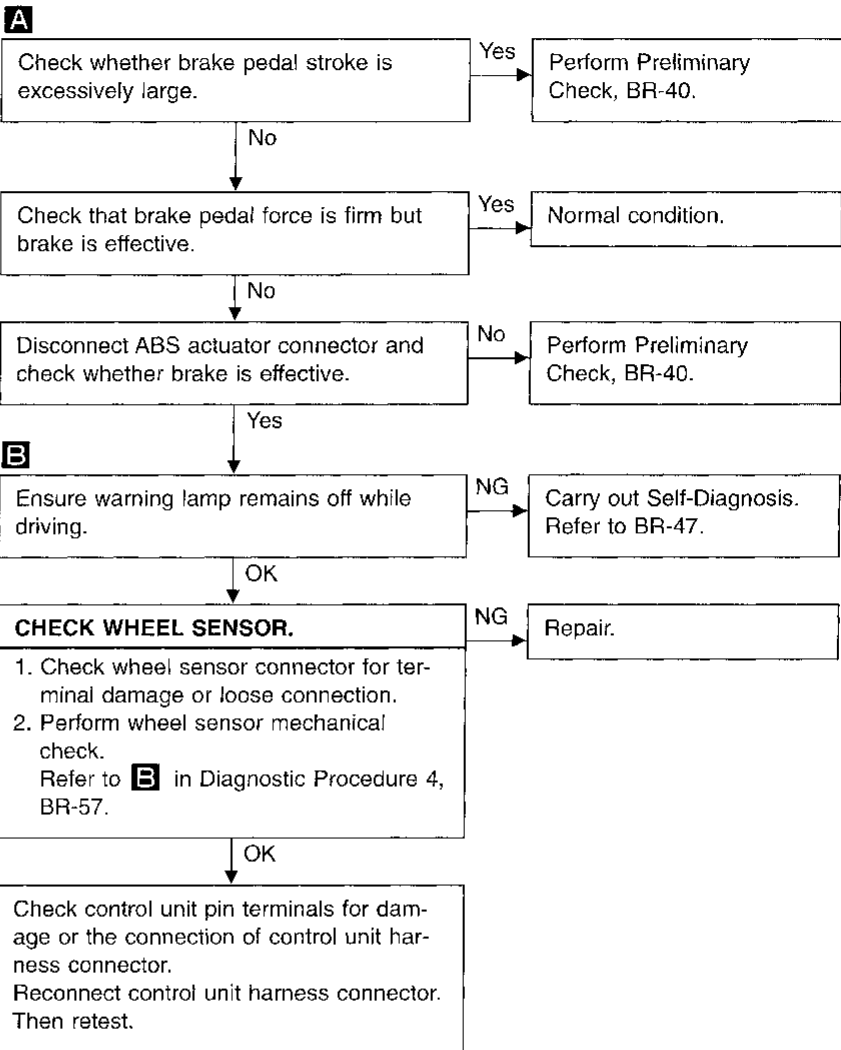
GI  
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# TROUBLE DIAGNOSES



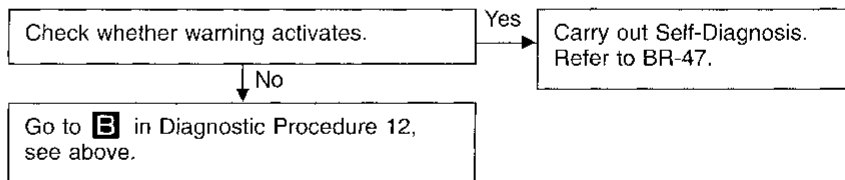
## Diagnostic Procedure 12

**SYMPTOM: Unexpected pedal action**



## Diagnostic Procedure 13

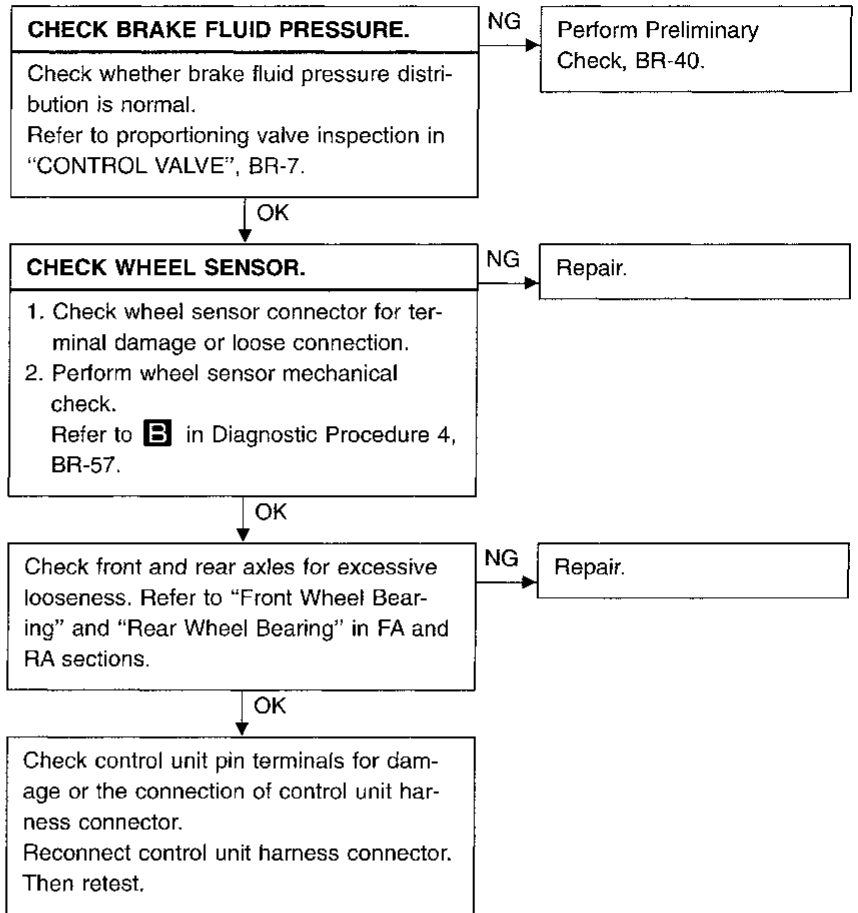
**SYMPTOM: ABS does not work.**



**Note: ABS does not work when vehicle speed is under 10 km/h (6 MPH).**

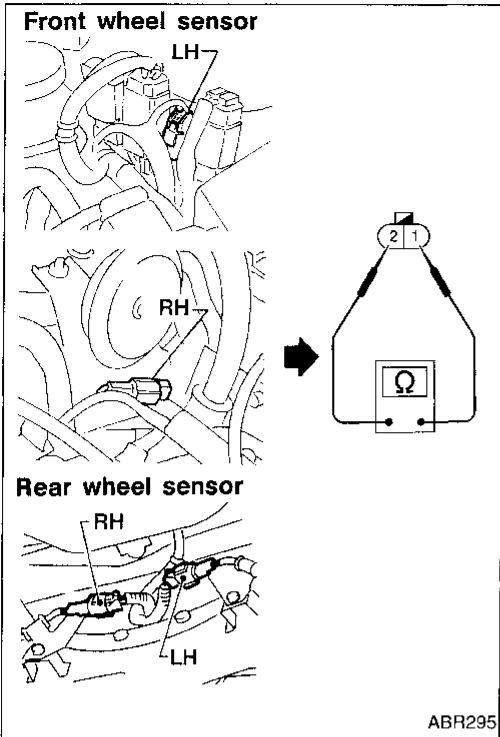
**Diagnostic Procedure 14**

**SYMPTOM: ABS works frequently.**



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# TROUBLE DIAGNOSES

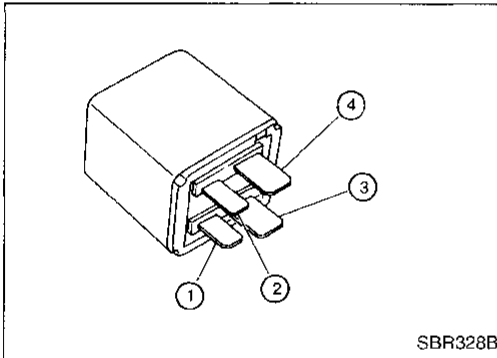


## Electrical Components Inspection

### WHEEL SENSOR

Check resistance between terminals ① and ②.

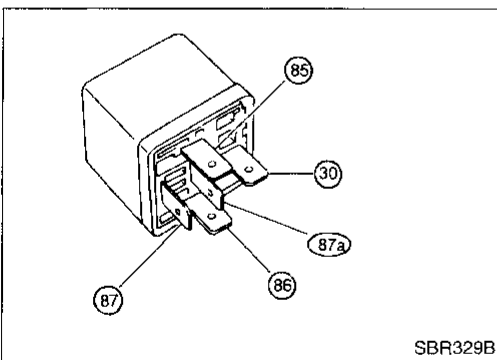
**Resistance: 1.0 - 1.25kΩ**



### MOTOR RELAY

Condition	Continuity existence between terminals ③ and ④
Battery positive voltage not applied between terminals ① and ②.	No
Battery positive voltage applied between terminals ① and ②.	Yes

**While applying battery voltage to relay terminals, insert fuse into the circuit.**



### SOLENOID VALVE RELAY

Condition	Continuity existence between terminals ③⑩ and ⑧⑦a	Continuity existence between terminals ③⑩ and ⑧⑦
Battery positive voltage not applied between terminals ⑧⑤ and ⑧⑥.	Yes	No
Battery positive voltage applied between terminals ⑧⑤ and ⑧⑥.	No	Yes

**While applying battery voltage to relay terminals, insert fuse into the circuit.**

# SERVICE DATA AND SPECIFICATIONS (SDS)

## General Specifications

Applied model	Without ABS		With ABS
	Except SE model	SE model	
Front brake			
Brake model	CL25VB		
Cylinder bore diameter	57.2 (2.252)		
mm (in)			
Pad			
mm (in)			
Length x width x thickness	M/T model: 125.6 x 45.3 x 10.0 (4.94 x 1.783 x 0.394) A/T model: 125.6 x 45.3 x 11.0 (4.94 x 1.783 x 0.433)		
Rotor outer diameter x thickness	280 x 22		
mm (in)	(11.02 x 0.87)		
Rear brake			
Brake model	LT23E	CL9HA	
Cylinder bore diameter	19.05 (3/4)	33.96 (1.3370)	
mm (in)			
Lining or pad			
mm (in)			
Length x width x thickness	219.4 x 35 x 4.1	89.1 x 39.5 x 10	
	(8.64 x 1.38 x 0.161)	(3.508 x 1.555 x 0.39)	
Drum inner diameter or rotor outer diameter x thickness	258 x 9		
mm (in)	(10.16 x 0.35)		

Applied model	Without ABS		With ABS
	Except SE model	SE model	
Master cylinder			
Cylinder bore diameter	23.81 (15/16)		25.40 (1)
mm (in)			
Control valve			
Valve model	Dual proportioning valve (built-in type)		Dual proportioning valve (separated type)
Split point	1,961 (20,284) x 0.2	2,942 (30,427) x 0.2	
kPa (kg/cm <sup>2</sup> , psi) x reducing ratio			
Brake booster			
Booster model	M195T	M215T	
Diaphragm diameter	Primary: 205 (8.07)	Primary: 230 (9.06)	
mm (in)	Secondary: 180 (7.09)	Secondary: 205 (8.07)	
Recommended brake fluid			DOT 3

## Inspection and Adjustment

### DISC BRAKE

Brake model	CL25VB	CL9HA
Pad wear limit		
mm (in)		
Minimum thickness	2.0 (0.079)	1.5 (0.059)
Rotor repair limit		
mm (in)		
Minimum thickness	20.0 (0.787)	8.0 (0.315)

### DRUM BRAKE

Brake model	LT23E
Lining wear limit	
mm (in)	
Minimum thickness	1.5 (0.059)
Drum repair limit	
mm (in)	
Maximum inner diameter	230 (9.06)
Out-of-roundness	0.03 (0.0012)

### BRAKE PEDAL

Free height "H"	mm (in)	
M/T		169 - 179 (6.65 - 7.05)
A/T		177 - 187 (6.97 - 7.36)
Depressed height "D"	mm (in)	
[under force of 490 N (50 kg, 110 lb) with engine running]		90 (3.54)
Clearance between switches and pedal stopper bracket "C"	mm (in)	0.3 - 1.0 (0.012 - 0.039)
Pedal free play "A"	mm (in)	1.0 - 3.0 (0.039 - 0.118)

\*: Measured from surface of dash reinforcement panel.

### PARKING BRAKE

Number of notches	
[under force of 196 N (20 kg, 44 lb)]	7 - 8
Number of notches when warning lamp switch comes on	1