SECTION BR

CONTENTS

CONTENTS (Cont'd.)

When you read wiring diagrams:
- **Read GI section, "HOW TO READ WIRING DIAGRAMS".**
- **See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.**

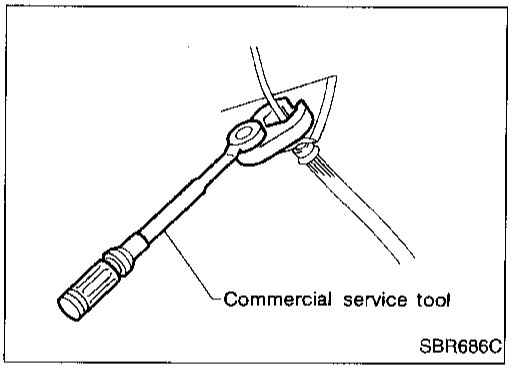
When you perform trouble diagnoses, read GI section, "HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES" and "HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT".

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 should 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 just before the harness connectors for easy identification.**



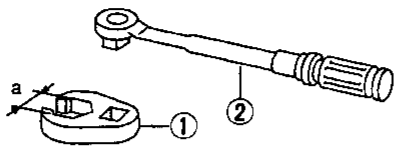
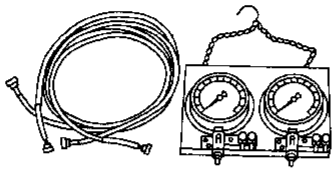
Precautions for Brake System

- **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.**
- **Burnish the brake contact surfaces after refinishing or replacing drums or rotors, after replacing pads or linings, or if a soft pedal occurs at very low mileage. Refer to "Brake Burnishing Procedure," "ON-VEHICLE SERVICE," BR-5.**

WARNING:

- **Clean brakes with a vacuum dust collector to minimize the hazard of airborne materials.**

Commercial Service Tools

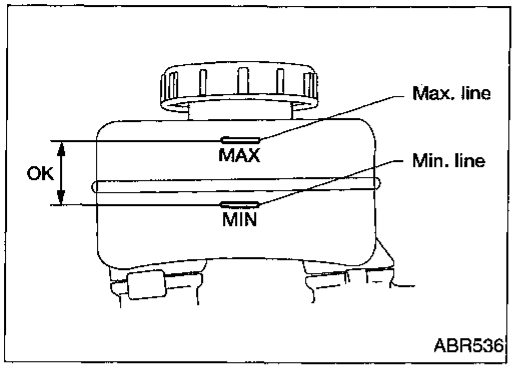
Tool name	Description	
① Flare nut crowfoot ② Torque wrench	 NT360	Removing and installing brake lines **a: 10 mm (0.39 in)**
Brake fluid pressure gauge	 NT151	Measuring brake fluid pressure

NVH Troubleshooting Chart

Use the chart below to help you find the cause of the symptom. If necessary, repair or replace these parts.

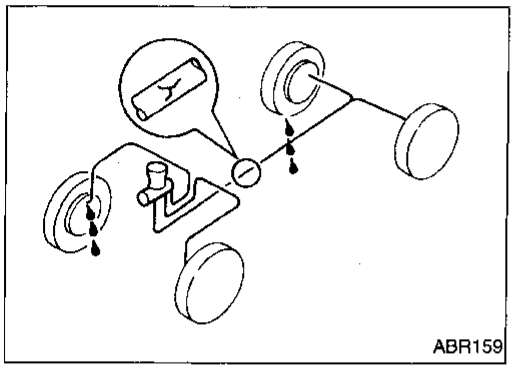
Reference page		BR-32, 24, 27	BR-18, 24, 27	BR-22	BR-18, 27	—	BR-21, 24, 32	BR-21, 24, 32	BR-21, 24, 32	BR-21, 32	BR-24	NVH in FA Section	NVH in FA, RA Section	NVH in FA Section	NVH in FA Section	NVH in ST Section
SUSPECTED PARTS (Possible cause)		Linings or pads - Damaged	Linings or pads - Uneven wear	Return springs damaged	Shims damaged	Rotor or drum imbalance	Rotor or drum runout	Rotor or drum deformation	Rotor or drum rust	Rotor thickness variation	Drum out of round	DRIVESHAFT	AXLE AND SUSPENSION	TIRES	ROAD WHEEL	STEERING
Symptom	Noise	X	X	X	X							X	X	X	X	X
	Shake					X						X	X	X	X	X
	Shimmy, Judder					X	X	X	X	X	X		X	X	X	X

X: Applicable



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.

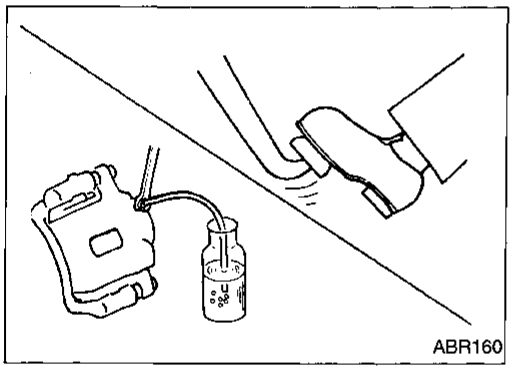


Checking Brake Line

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 fluid 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 Brake System", BR-6.

Brake Burnishing Procedure

- Burnish the brake contact surfaces according to the following procedure after refinishing or replacing drums or rotors, after replacing pads or linings, or if a soft pedal occurs at very low mileage.

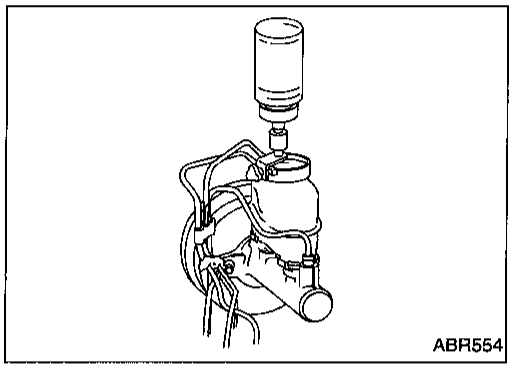
CAUTION:

Only perform this procedure under safe road and traffic conditions. Use extreme caution.

1. Drive the vehicle on a straight smooth road at 50 km/h (31 MPH).
2. Use medium brake pedal/foot effort to bring the vehicle to a complete stop from 50 km/h (31 MPH). Adjust brake pedal/foot pressure such that vehicle stopping time equals 3 to 5 seconds.
3. To cool the brake system, drive the vehicle at 50 km/h (31 MPH) for 1 minute without stopping.

Brake Burnishing Procedure (Cont'd)

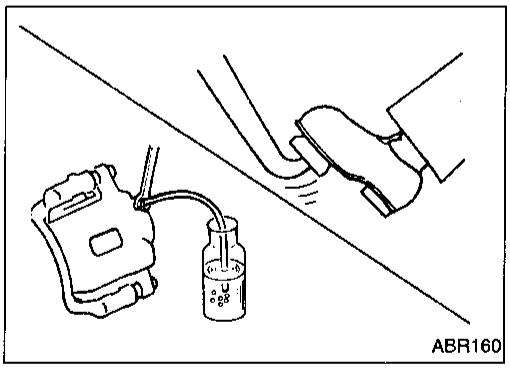
4. Repeat steps 1 to 3, 10 times or more to complete the burnishing procedure.


ABR554

Bleeding Brake System

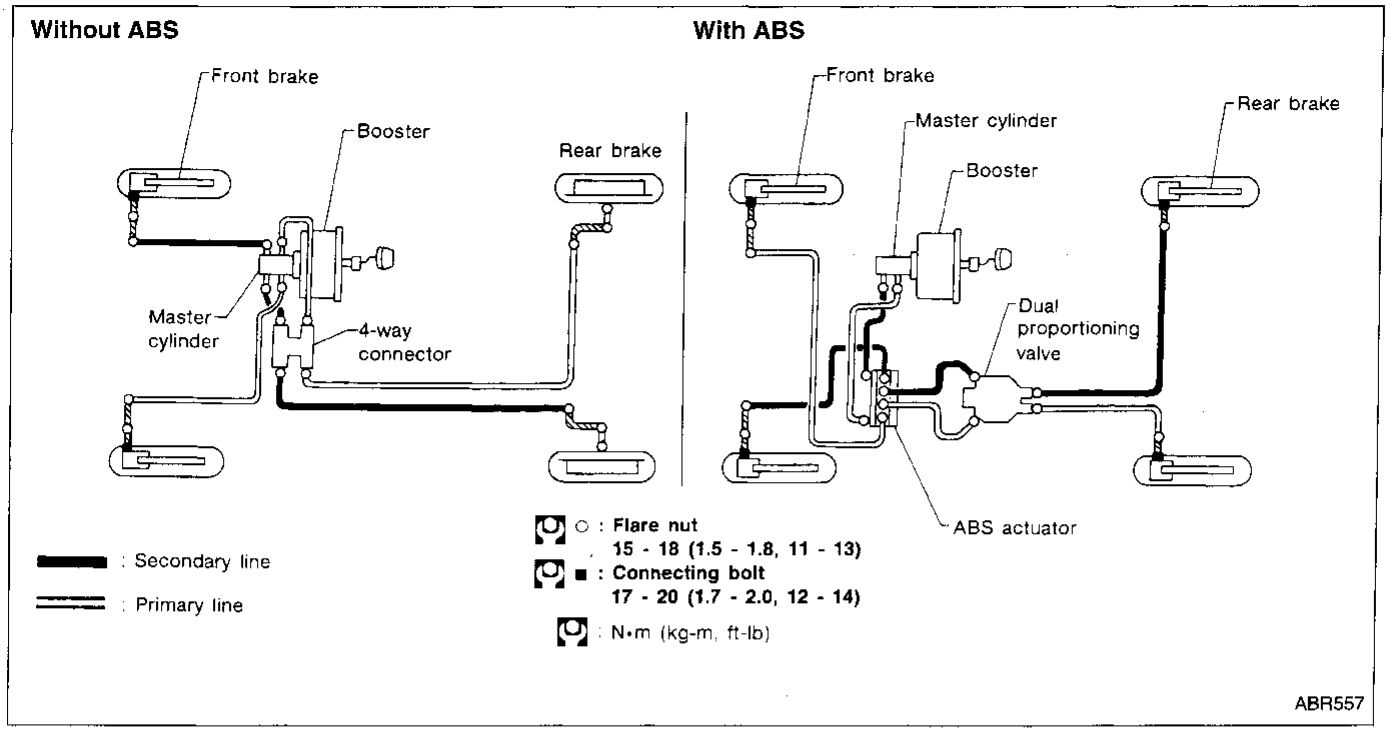
CAUTION:

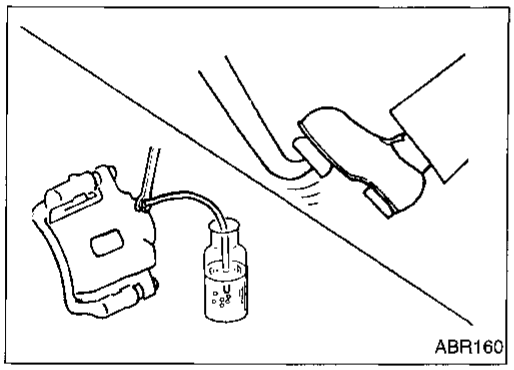
- **Carefully monitor brake fluid level at master cylinder during bleeding operation.**
- **If master cylinder is suspected to have air inside, bleed air from master cylinder first. Refer to "Installation", "MASTER CYLINDER", BR-14.**
- **Fill reservoir with new brake fluid DOT 3. Make sure it is full 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.**


ABR160

- Bleed air in the following order:
  Right rear brake→ Left front brake→ Left rear brake→ Right front brake

1. Connect a transparent vinyl tube to air bleeder valve.
2. Fully depress brake pedal several times.
3. With brake pedal depressed, open air bleeder valve to release air.
4. Close air bleeder valve.
5. Release brake pedal slowly.
6. Repeat steps 2 through 5 until clear brake fluid comes out of air bleeder valve.
7. Tighten air bleeder valve.
   : 7 - 9 N·m (0.7 - 0.9 kg-m, 61 - 78 in-lb)





REMOVAL

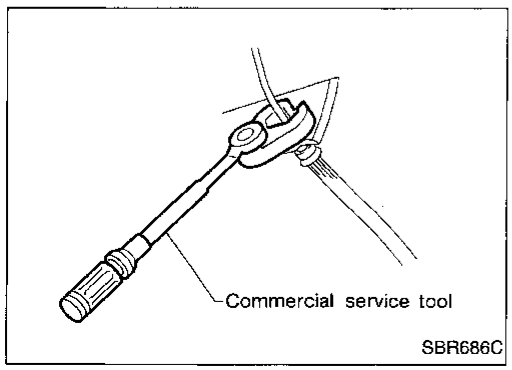
CAUTION:

- **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.

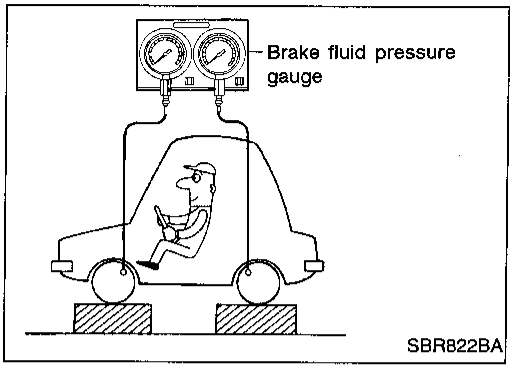


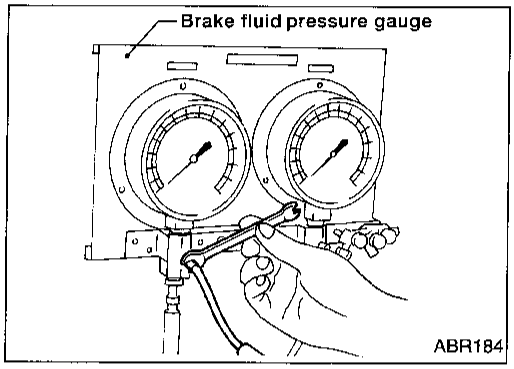
INSTALLATION

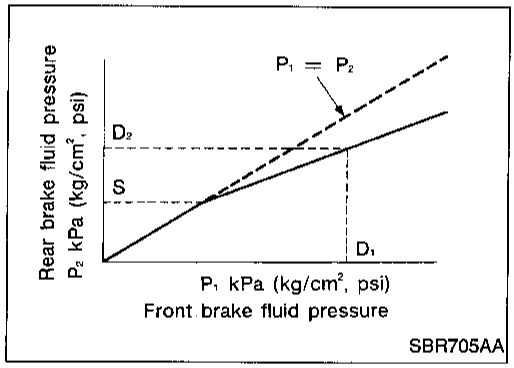
CAUTION:

- **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 Brake System", BR-6.







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 two 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).

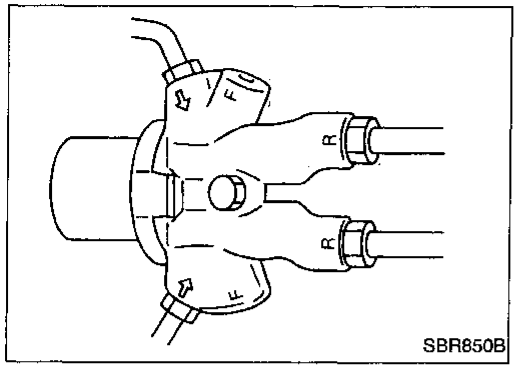
Unit: kPa (kg/cm^2, psi)

Applied model	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 Brake System", BR-6.

Proportioning Valve (Cont'd)



SBR850B

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:

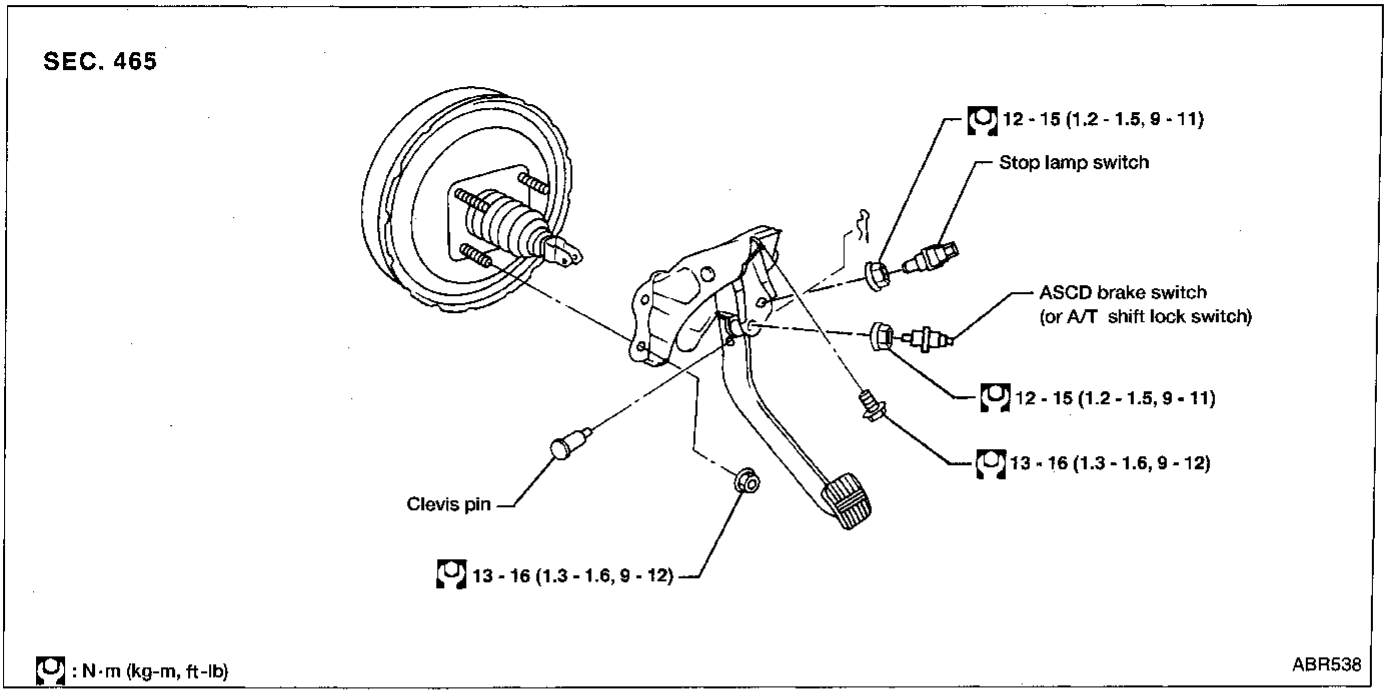
- **Refill with new brake fluid DOT 3.**
- **Never reuse drained brake fluid.**

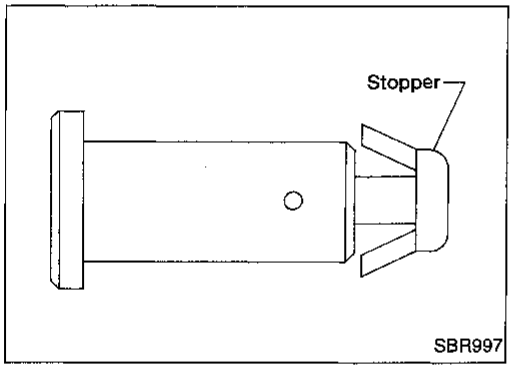
1. Temporarily fit flare nut to proportioning valve.
2. Tighten proportioning valve mounting bolt, then tighten flare nut.
   Flare nut:
   : 15 - 18 N·m (1.5 - 1.8 kg-m, 11 - 13 ft-lb)
3. Refill until new brake fluid comes out of each air bleeder valve.
4. Bleed air. Refer to "Bleeding Brake System", BR-6.

REMOVAL AND INSTALLATION (Built-in type)

- **Always replace proportioning valve and master cylinder as an assembly.**
- Refer to "MASTER CYLINDER", BR-12.

Removal and Installation

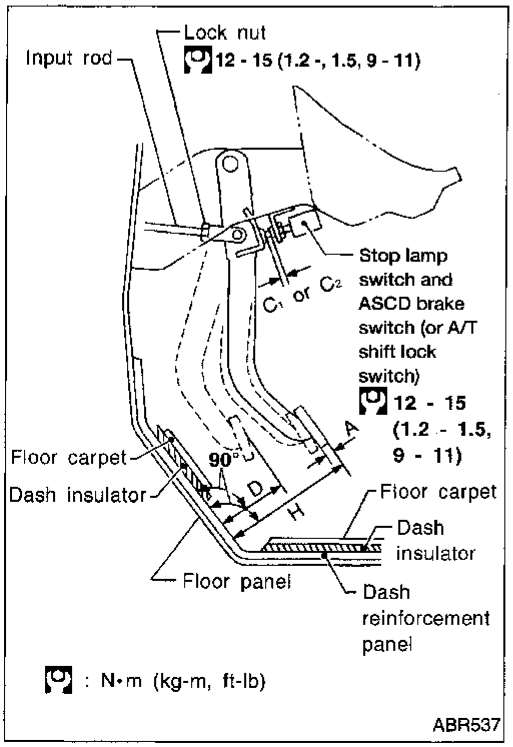




Inspection

Check brake pedal for following items:

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



Adjustment

Check brake pedal free height from dash reinforcement panel.

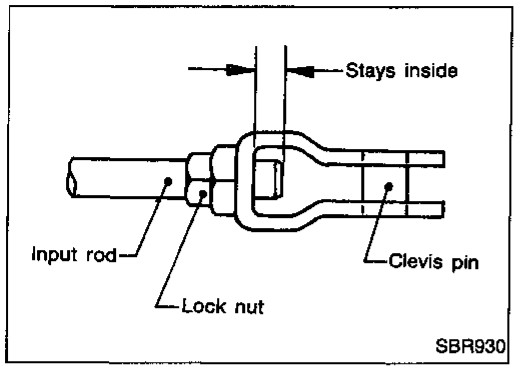
H: **Free height**
Refer to SDS, BR-82.

D: **Depressed height**
Refer to SDS, BR-82.
Under force of 490 N (50 kg, 110 lb) with engine running

C_1, C_2: **Clearance between pedal stopper and threaded end of stop lamp switch and ASCD brake 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)

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_1" and "C_2" with stop lamp switch and ASCD brake 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.

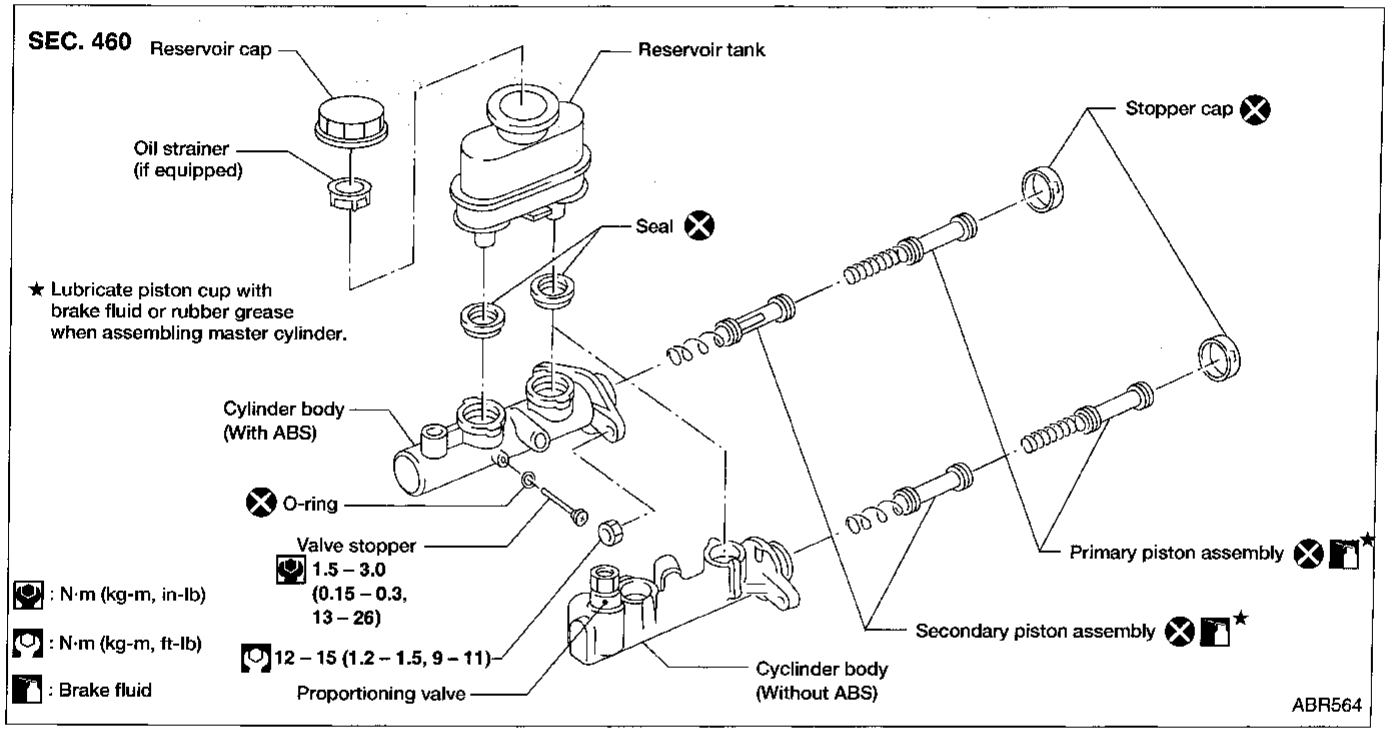
Removal

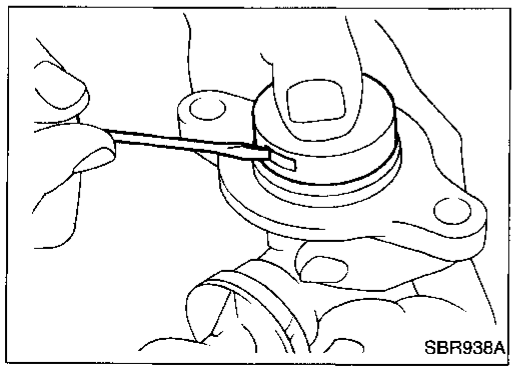
CAUTION:

- **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.

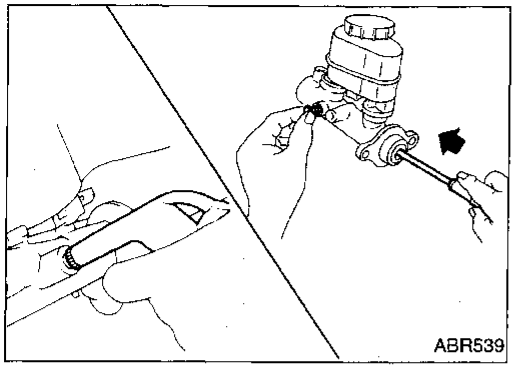
Disassembly





1. Bend claws of stopper cap outward.

Disassembly (Cont'd)



2. Remove valve stopper while piston is pushed into cylinder (Models with ABS only).
3. Remove piston assemblies.

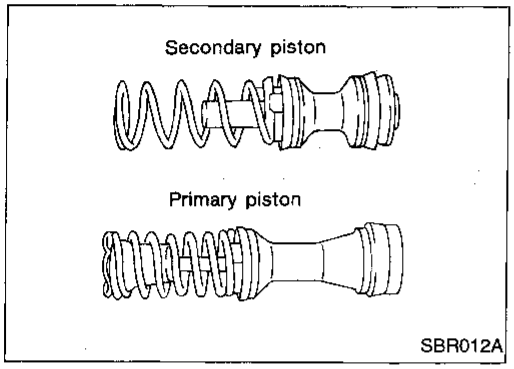
- **If it is difficult to remove secondary piston assembly, gradually apply compressed air through fluid outlet.**

4. Draw out reservoir tank.

Inspection

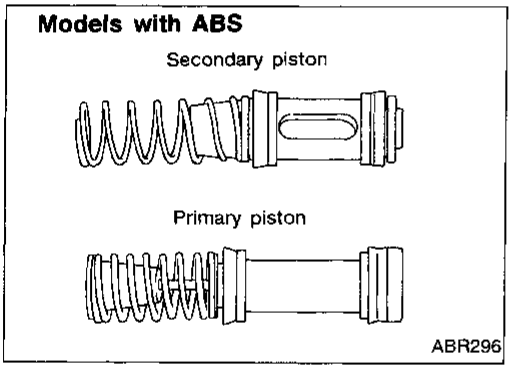
Check master cylinder inner wall for pin holes or scratches. Replace if damaged.

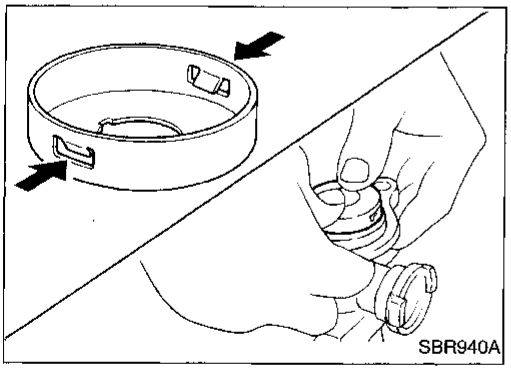
Assembly



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).**

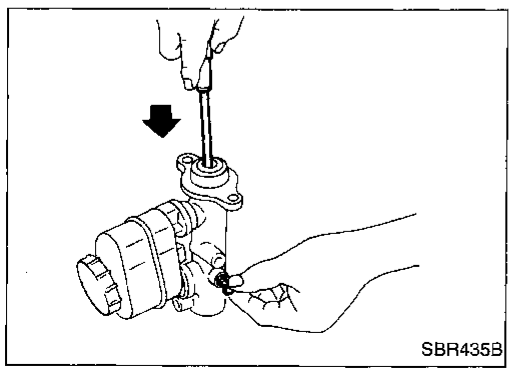




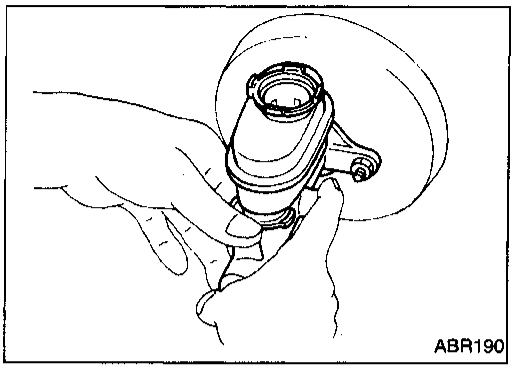
2. Install stopper cap.

- **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)

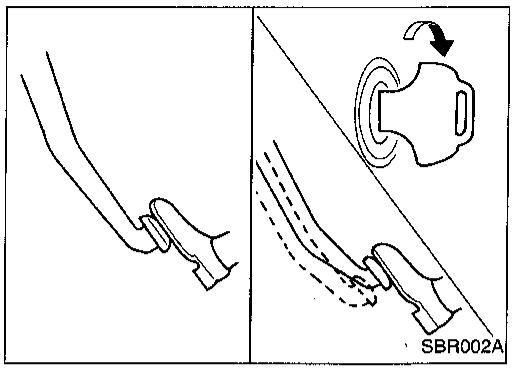


Installation

CAUTION:

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

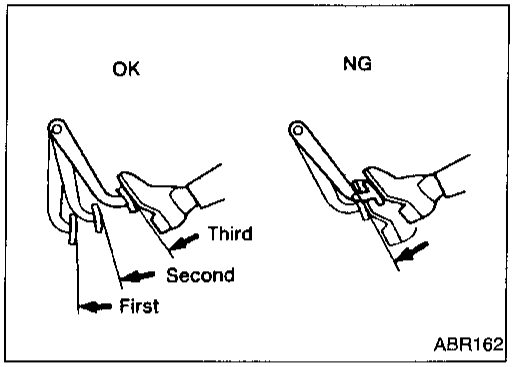
1. Place master cylinder onto brake booster and secure mounting nuts slightly.
2. Tighten mounting nuts.
   : 12 - 15 N·m (1.2 - 1.5 kg-m, 9 - 11 ft-lb)
3. Fill up reservoir tank with new brake fluid.
4. Plug all ports on master cylinder with fingers to prevent air suction while releasing brake pedal.
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 Brake System", BR-6.



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, booster operation is normal.

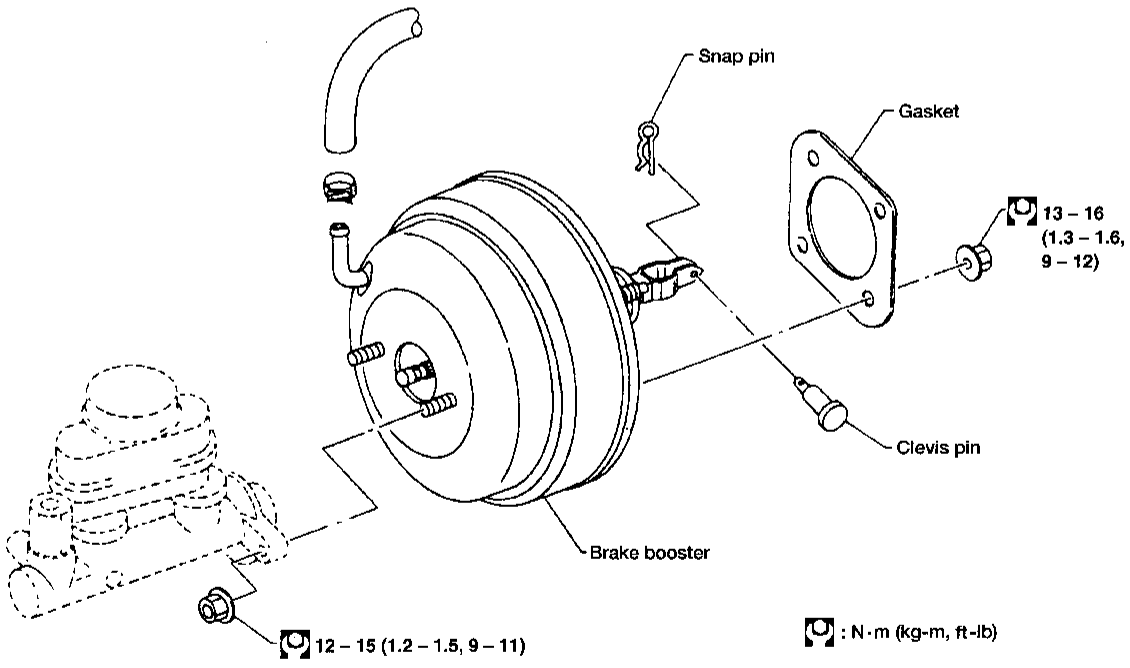


AIRTIGHT CHECK

- 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

SEC. 470

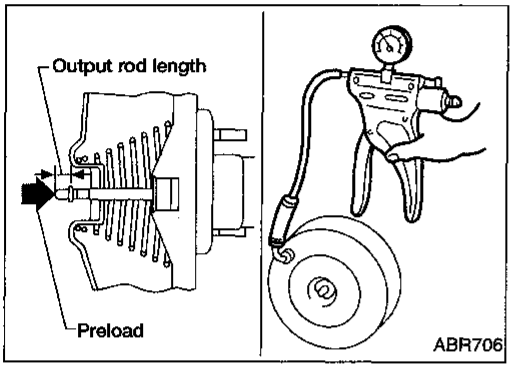


CAUTION:

- **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.**

Removal (Cont'd)

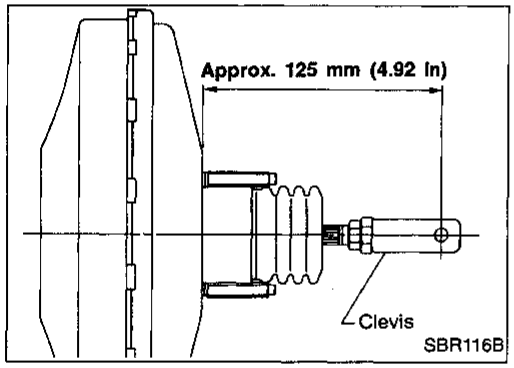
- **Be careful not to deform or bend brake pipes during removal of booster.**
- **It is necessary to remove ABS actuator and actuator bracket first because space around booster is limited.**



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. Add preload of 19.6 N (2 kg, 4.4 lb) to output rod.
3. Check output rod length.
   Specified length:
   10.275 - 10.525 mm (0.4045 - 0.4144 in)

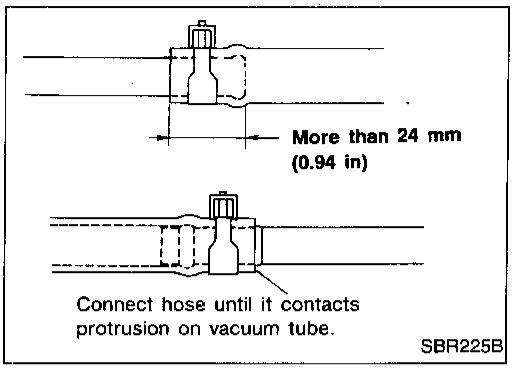


Installation

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.**

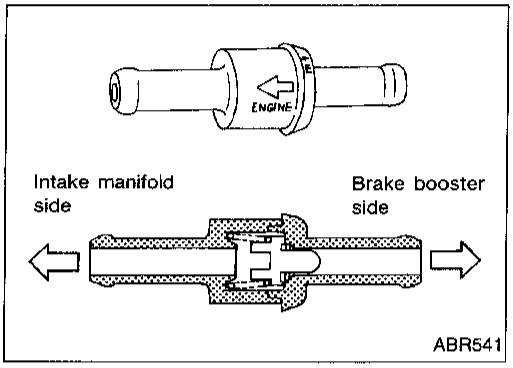
1. Before fitting booster, temporarily adjust clevis to dimension shown.
2. Fit booster, then secure mounting nuts (brake pedal bracket to brake booster) lightly.
3. Connect brake pedal and booster input rod with clevis pin.
4. Secure mounting nuts.
   : 13 - 16 N·m (1.3 - 1.6 kg-m, 9 - 12 ft-lb)
5. Install master cylinder. Refer to BR-14.
6. Adjust brake pedal height and free play. Refer to "Adjustment" in "BRAKE PEDAL AND BRACKET", BR-10.
7. Secure lock nut for clevis.
   : 12 - 15 N·m (1.2 - 1.5 kg-m, 9 - 11 ft-lb)
8. Bleed air. Refer to "Bleeding Brake System", BR-6.



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.**

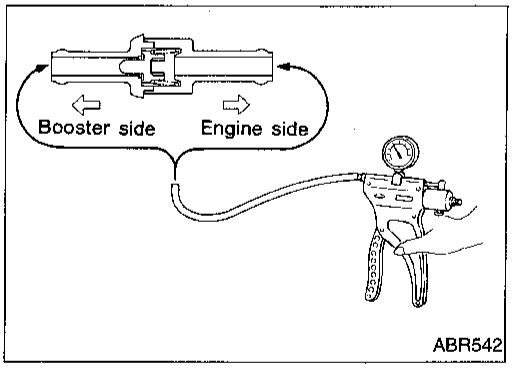


- **Install check valve, paying attention to its direction.**

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.

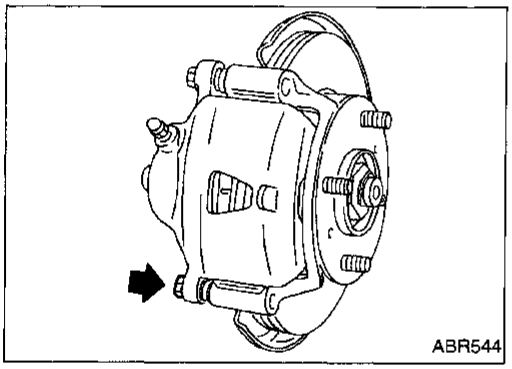
Connect to booster side	Vacuum should exist.
Connect to engine side	Vacuum should not exist.

Pad Replacement

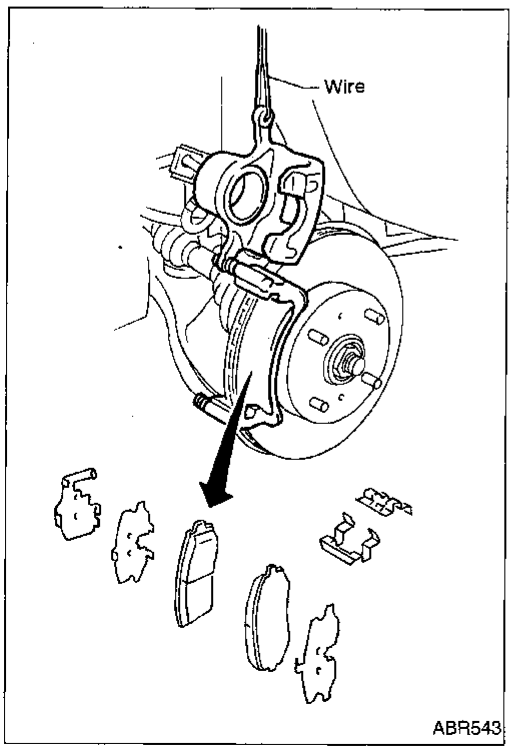
WARNING:
Clean brake pads with a vacuum dust collector to minimize the hazard of airborne particles or other materials.

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 only necessary to remove connecting bolt if disassembling or replacing caliper assembly. Otherwise, suspend cylinder body with wire so as not to stretch brake hose.**
- **Burnish the brake contact surfaces after refinishing or replacing drums or rotors, after replacing pads or linings, or if a soft pedal occurs at very low mileage. Refer to "Brake Burnishing Procedure," "ON-VEHICLE SERVICE," BR-5.**


ABR544

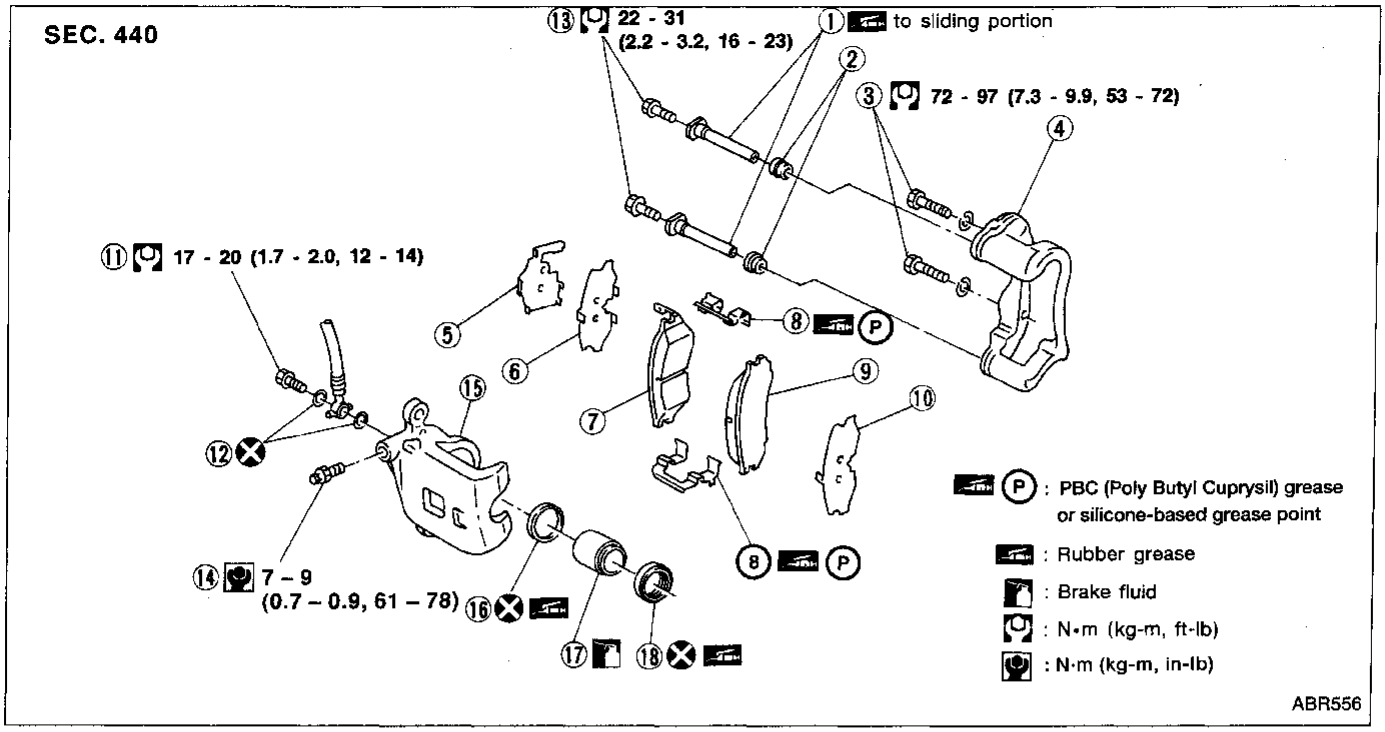
1. Remove master cylinder reservoir cap.
2. Remove lower pin bolt.



ABR543

3. Open cylinder body upward. Then remove pad retainers and inner and outer shims.
   Standard pad thickness:
   11.0 mm (0.433 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.**

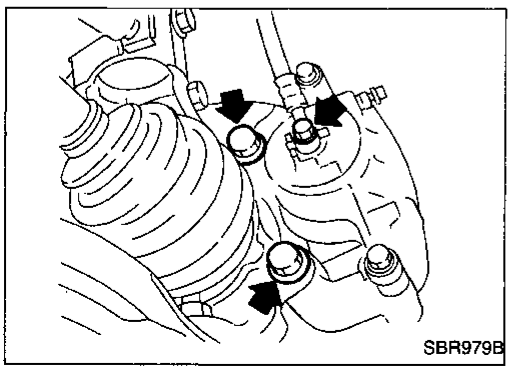


① Main pin
② Pin boot
③ Torque member fixing bolt
④ Torque member
⑤ Shim cover
⑥ Inner shim
⑦ Inner pad
⑧ Pad retainer
⑨ Outer pad
⑩ Outer shim
⑪ Connecting bolt
⑫ Copper washer
⑬ Main pin bolt
⑭ Bleed valve
⑮ Cylinder body
⑯ Piston seal
⑰ Piston
⑱ Piston boot

Removal

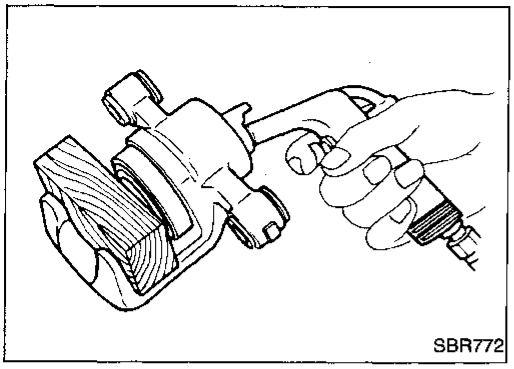
WARNING:
Clean brake pads with a vacuum dust collector to minimize the hazard of airborne materials.

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



Remove torque member fixing bolts and connecting bolt.

It is only necessary to remove connecting bolt if disassembling or replacing caliper assembly. Otherwise, suspend caliper assembly with wire so as not to stretch brake hose.


SBR772

Disassembly

WARNING:
Do not place your fingers in front of piston.
CAUTION:
Do not scratch or score cylinder wall.

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

Inspection — Caliper

CYLINDER BODY

- Check inside surface of cylinder for scores, 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.

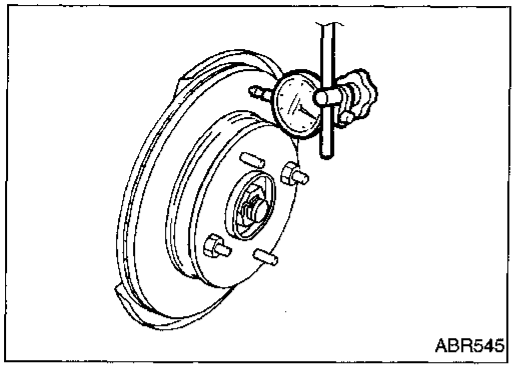
PISTON

Check piston for scores, 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.


ABR545

Inspection — Rotor

RUNOUT

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

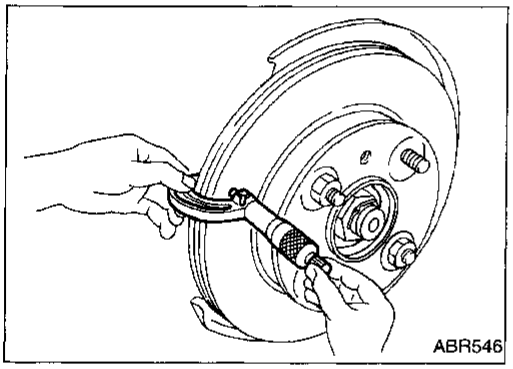
- **Make sure that wheel bearing axial end play is within the specifications before measuring. Refer to FA section ("Front Wheel Bearing", "ON-VEHICLE SERVICE").**

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).

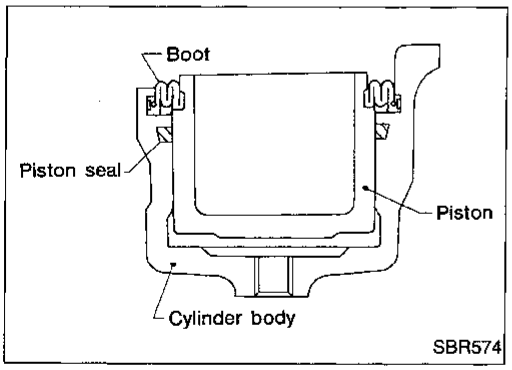

ABR546

THICKNESS

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

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

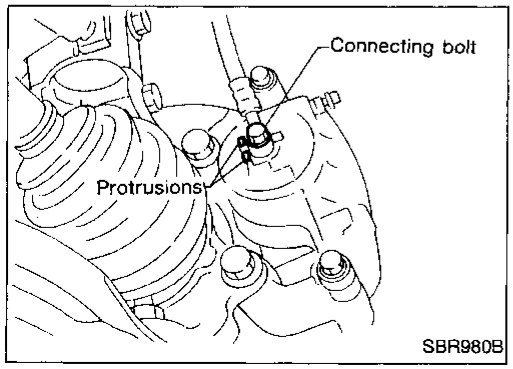
Rotor repair limit:
Minimum thickness:
20.0 mm (0.787 in)



SBR574

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.



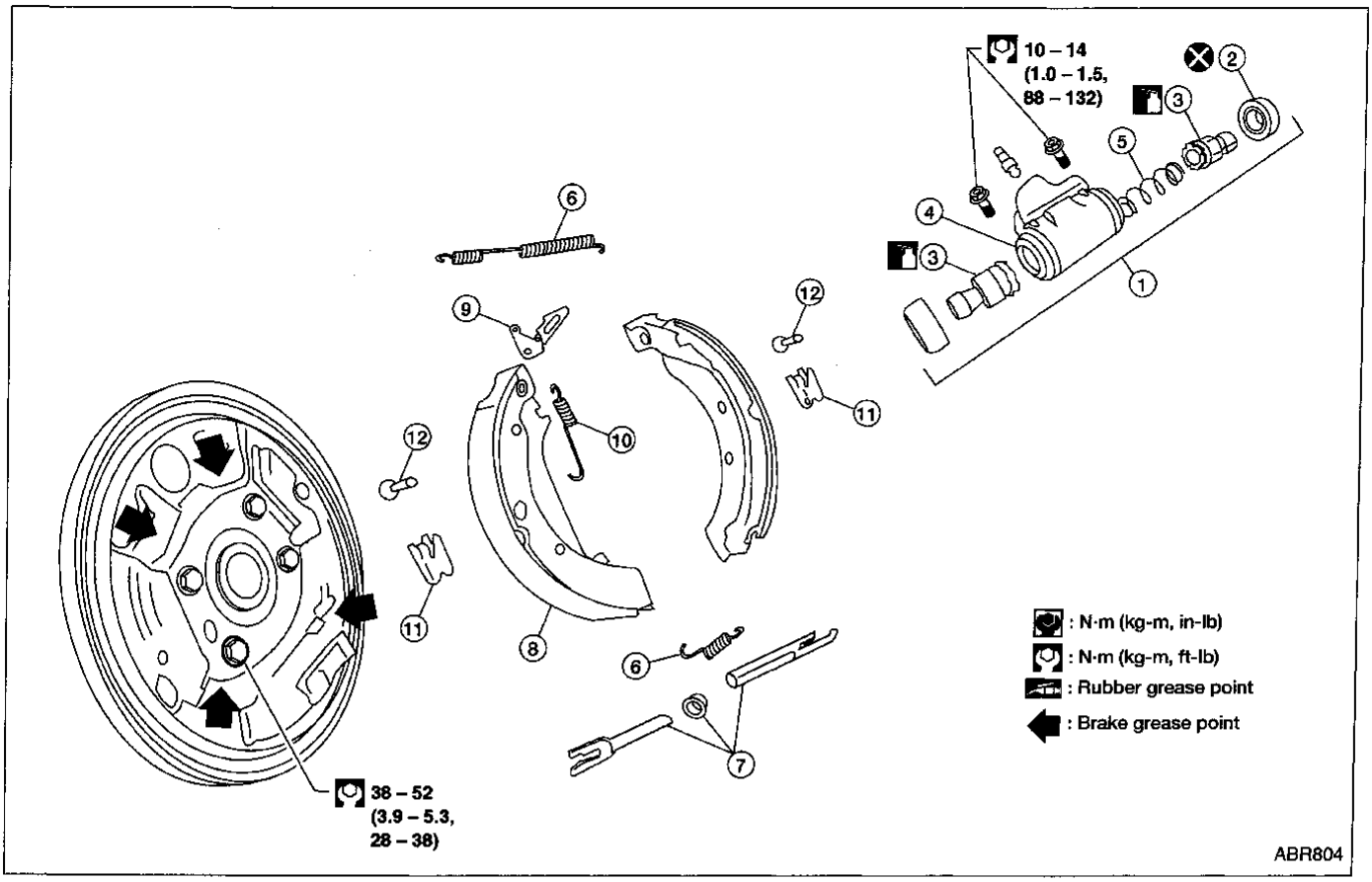
SBR980B

Installation

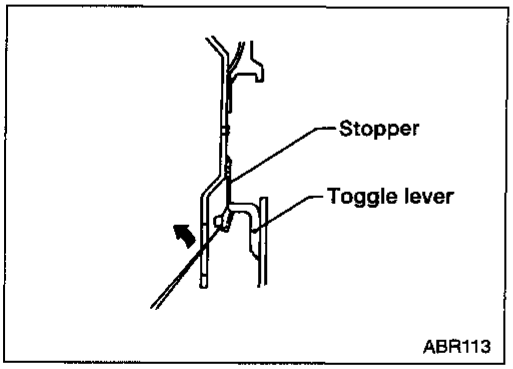
CAUTION:

- **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 Brake System", BR-6.



① Wheel cylinder assembly
② Boot
③ Piston
④ Cylinder body
⑤ Spring
⑥ Return spring
⑦ Adjuster
⑧ Shoe
⑨ Adjuster lever
⑩ Adjuster spring
⑪ Retainer
⑫ Shoe hold-down pin

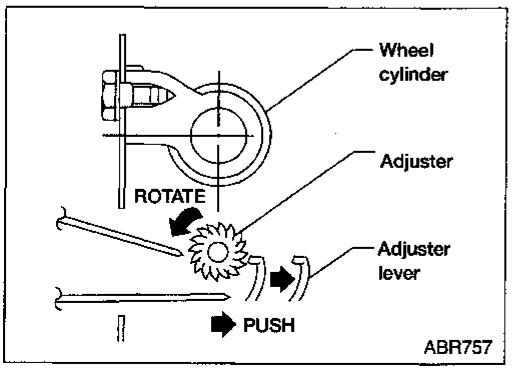


Removal

WARNING:
Clean brakes with a vacuum dust collector to minimize the hazard of airborne materials.

CAUTION:
Make sure parking brake lever is released completely.

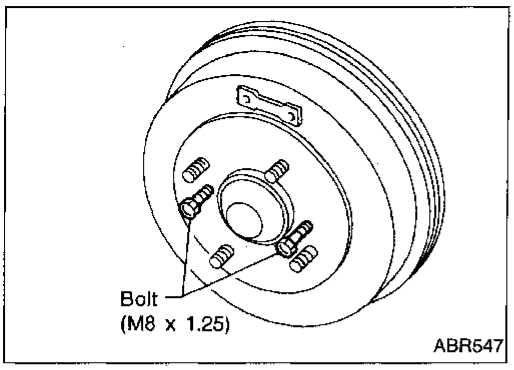
1. Release parking brake lever fully, then remove drum.



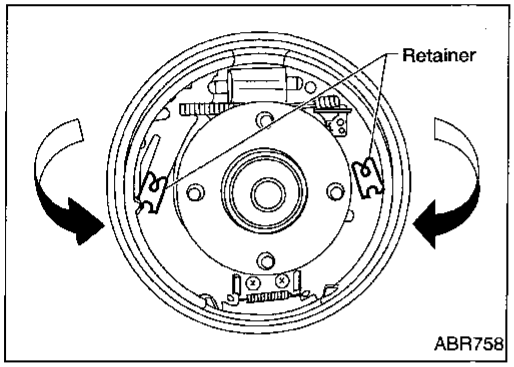
- **If drum is hard to remove, the following procedures should be carried out.**

a. **Remove adjuster plug. Shorten adjuster as shown to make clearance between brake shoe and drum.**

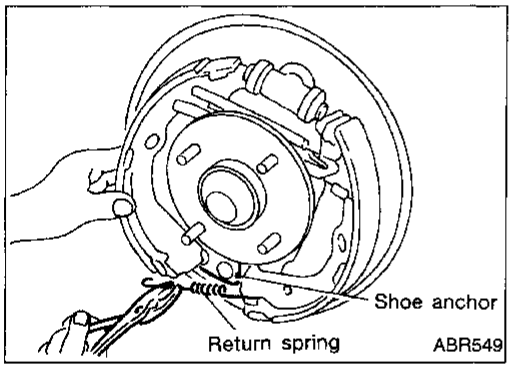
Removal (Cont'd)



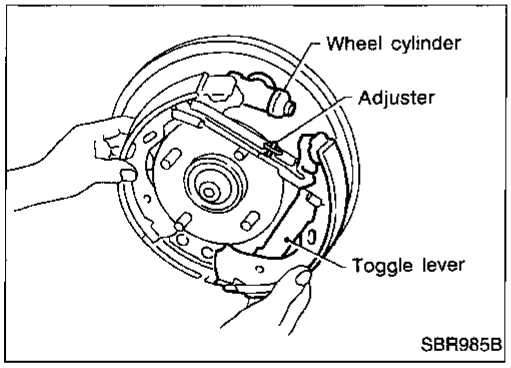
b. Install two bolts as shown. Tighten the two bolts gradually.



2. Pull out retainers and remove the shoe hold-down pins.
3. Pull out brake shoes in the direction of the arrows as illustrated.

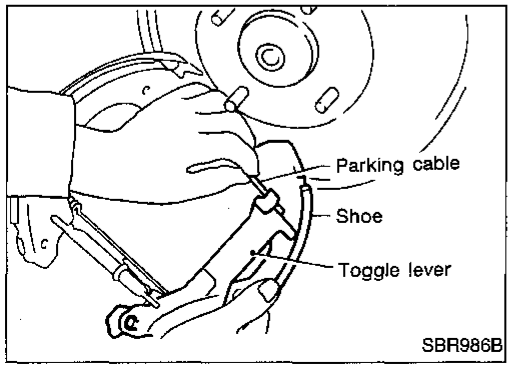


4. Using pliers, remove the lower return spring from shoe.



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

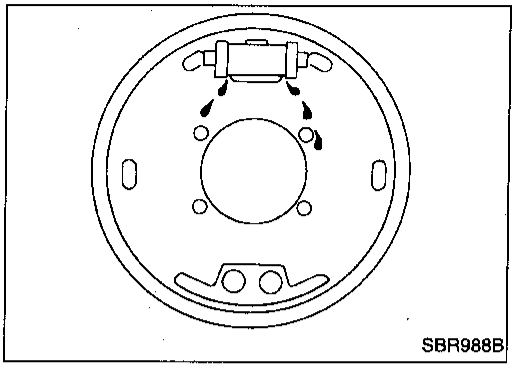
- **Be careful not to scratch or damage wheel cylinder boot.**



6. Disconnect parking brake cable from toggle lever.

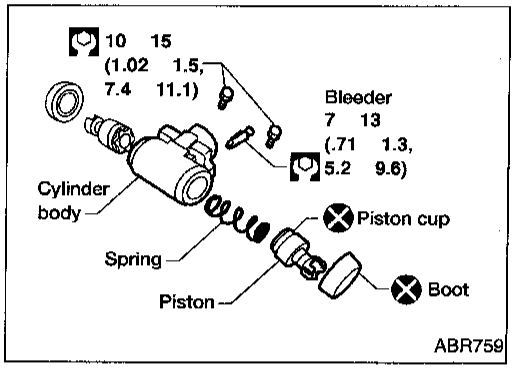
- **Be careful not to damage parking brake cable when separating it.**

7. Remove adjuster return spring and shoe return spring.


SBR988B

Inspection — Wheel Cylinder

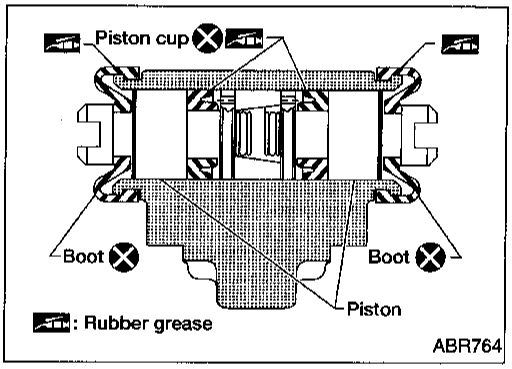
- Check wheel cylinder for leakage.
- Check for wear, damage and loose conditions. Replace if any such condition exists.



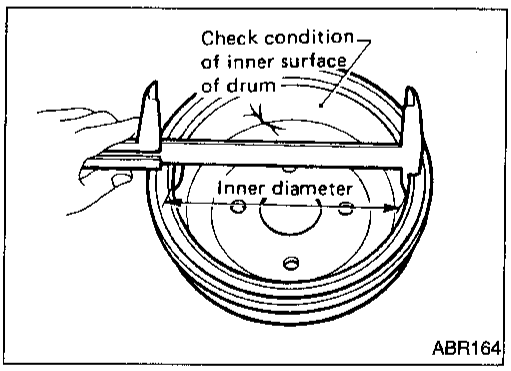
ABR759

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.



ABR764

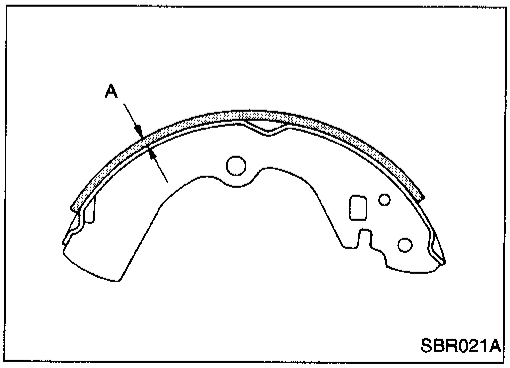


ABR164

Inspection — Drum

Maximum inner diameter:
230 mm (9.06 in)
Maximum out-of-round:
0.03 mm (0.0012 in)

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



SBR021A

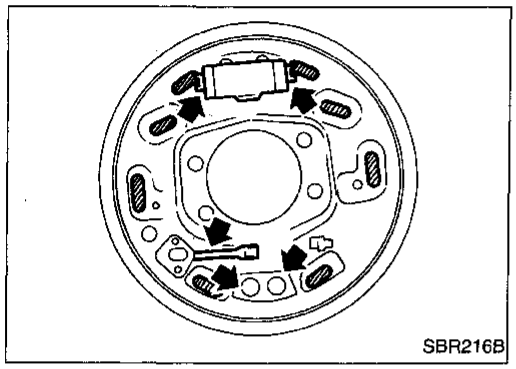
Inspection — Lining

Check lining thickness.

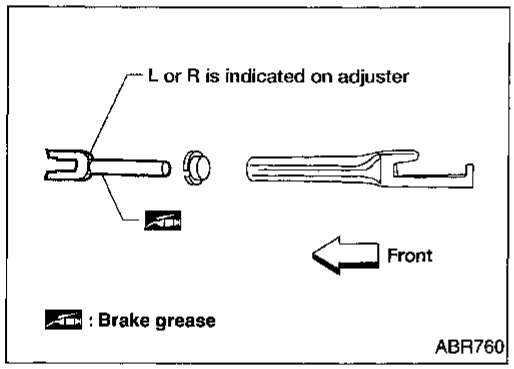
Standard lining thickness:
4.3 mm (0.169 in)
Lining wear limit (A):
1.5 mm (0.059 in)

Installation

- **Always perform shoe clearance adjustment. Refer to BR-37.**
- **Burnish the brake contact surfaces after refinishing or replacing drums or rotors, after replacing pads or linings, or if a soft pedal occurs at very low mileage. Refer to "Brake Burnishing Procedure," "ON-VEHICLE SERVICE," BR-5.**


SBR216B

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

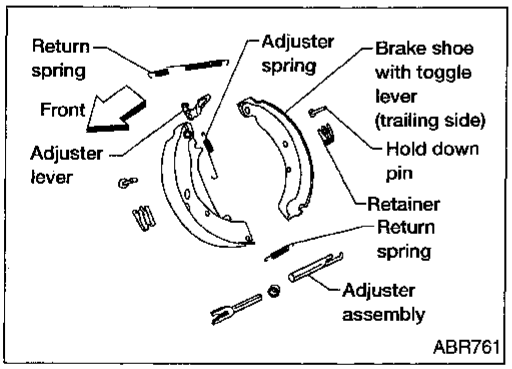


ABR760

3. Shorten adjuster by rotating it.
- **Pay attention to direction of adjuster.**

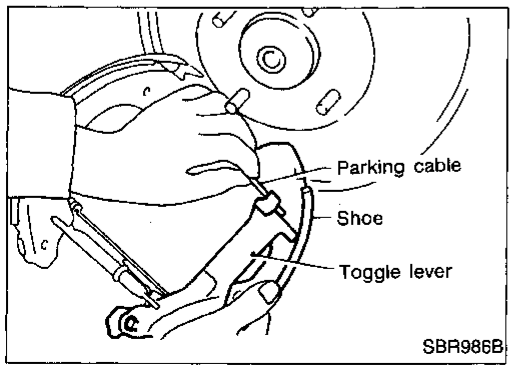
Wheel	Screw
Left	Right-hand thread
Right	Left-hand thread

4. Apply brake grease to adjuster as shown.



ABR761

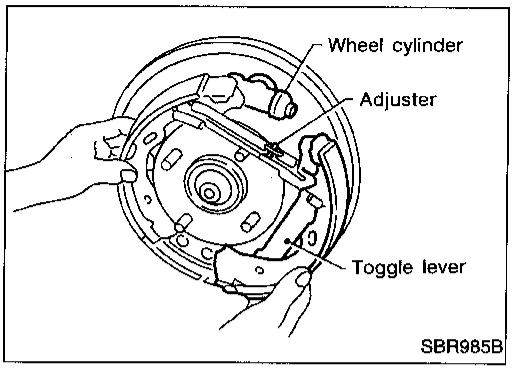
5. Install adjuster and adjuster lever; then install upper return spring and adjuster spring.



SBR986B

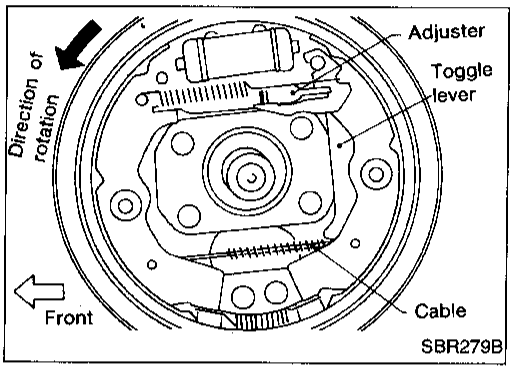
6. Connect parking brake cable to toggle lever.
- **Be careful not to damage brake cable.**

Installation (Cont'd)



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.



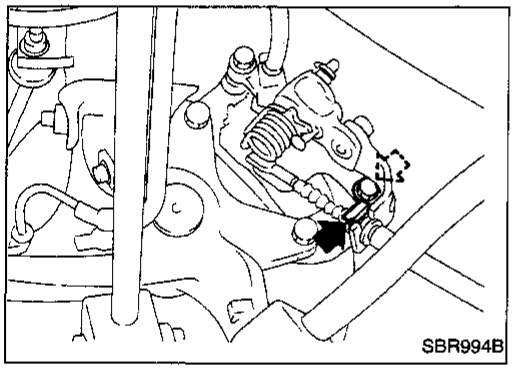
9. Secure shoe installation with shoe hold-down pins and retainers.
10. Check all parts are installed properly.
- **Pay attention to direction of adjuster assembly.**

11. Install brake drum.
12. When installing new wheel cylinder or overhauling wheel cylinder, bleed air. Refer to "Bleeding Brake System", BR-6.
13. Adjust parking brake. Refer to BR-37.

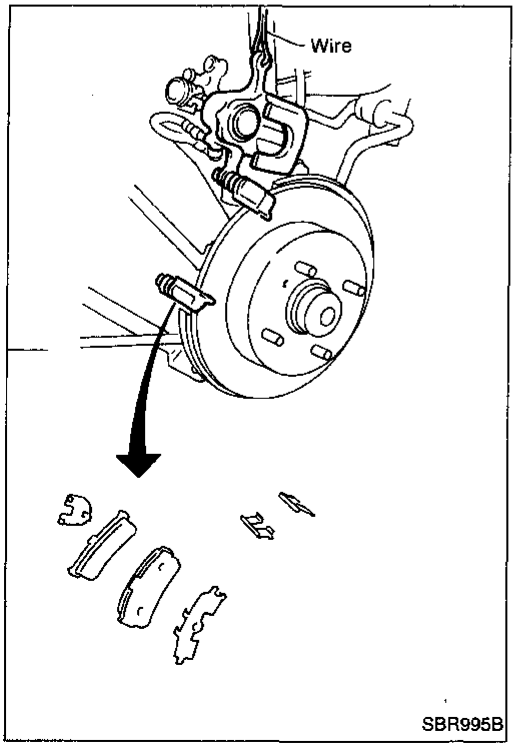
Pad Replacement

WARNING:
Clean brake pads with a vacuum dust collector to minimize the hazard of airborne 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 only necessary to remove connecting bolt if disassembling or replacing caliper assembly. Otherwise, suspend cylinder body with wire so as not to stretch brake hose.**
- **Burnish the brake contact surfaces after refinishing or replacing drums or rotors, after replacing pads or linings, or if a soft pedal occurs at very low mileage. Refer to "Brake Burnishing Procedure," "ON-VEHICLE SERVICE," BR-5.**


SBR994B

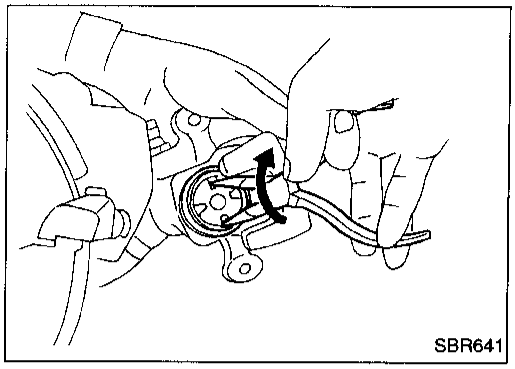
1. Remove master cylinder reservoir cap.
2. Remove brake cable lock spring.
3. Disconnect cable.
4. Remove lower pin bolt.



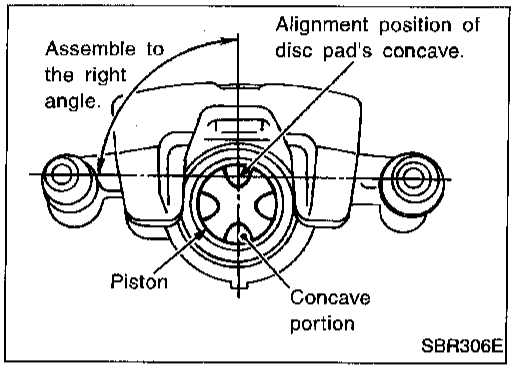
SBR995B

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)

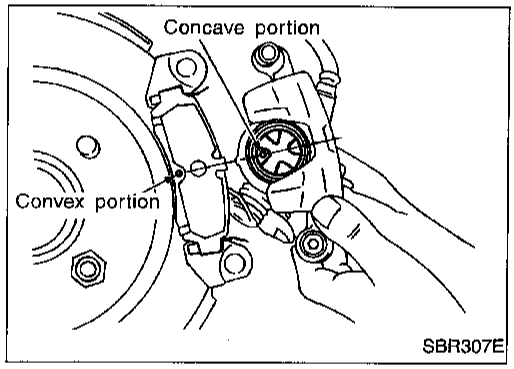
Pad Replacement (Cont'd)



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.**

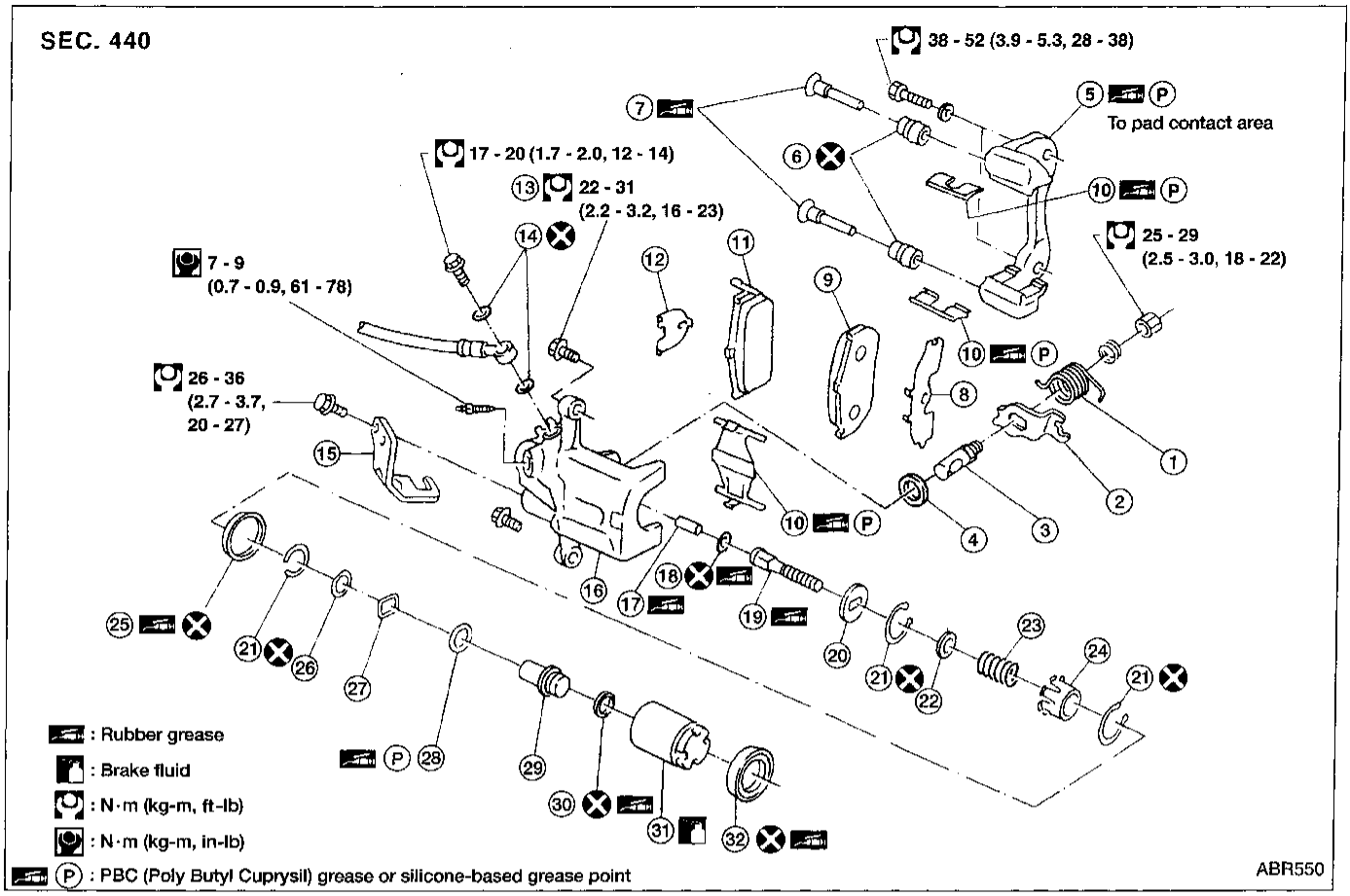


7. Adjust the piston to the right angle as shown in the figure.



8. As shown in the figure, align the piston's concave to the pad's convex, then install the cylinder body to the torque member.

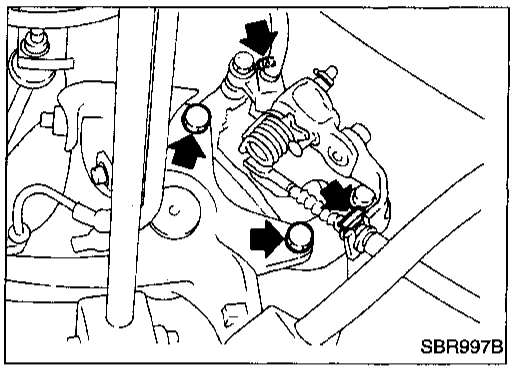
Pad Replacement (Cont'd)



① Return spring
② Toggle lever
③ Cam
④ Cam boot
⑤ Torque member
⑥ Pin boot
⑦ Slide pin
⑧ Outer shim
⑨ Outer pad
⑩ Pad retainer
⑪ Inner pad
⑫ Inner shim
⑬ Pin bolt
⑭ Copper washer
⑮ Cable guide
⑯ Cylinder
⑰ Strut
⑱ O-ring
⑲ Push rod
⑳ Key plate
㉑ Snap ring
㉒ Spring seat
㉓ Spring
㉔ Spring cover
㉕ Piston seal
㉖ Spacer
㉗ Wave washer
㉘ Bearing
㉙ Adjuster nut
㉚ Piston cup
㉛ Piston
㉜ Piston boot

Removal

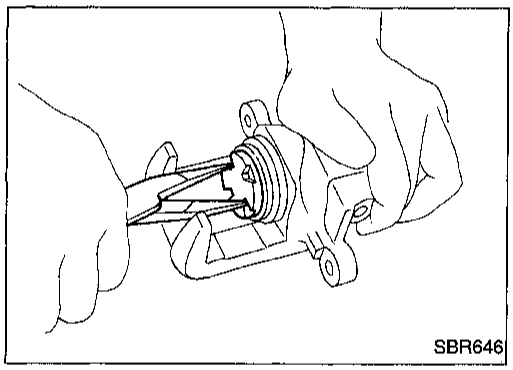
WARNING:
Clean brake pads with a vacuum dust collector to minimize the hazard of airborne materials.



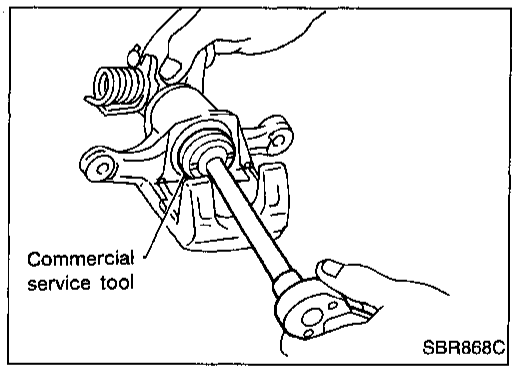
1. Remove brake cable mounting bracket bolt and lock spring.
2. Remove torque member fixing bolts and connecting bolt.

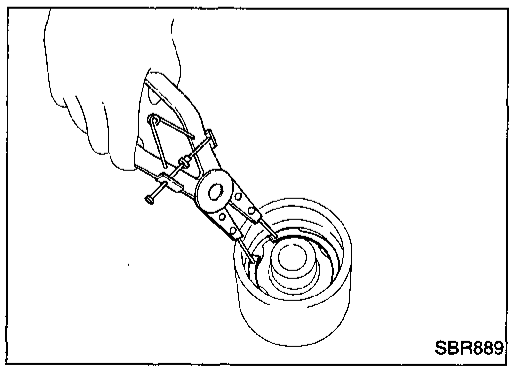
- **It is only necessary to remove connecting bolt if disassembling or replacing caliper assembly. Otherwise, suspend caliper assembly with wire so as not to stretch brake hose.**

Disassembly



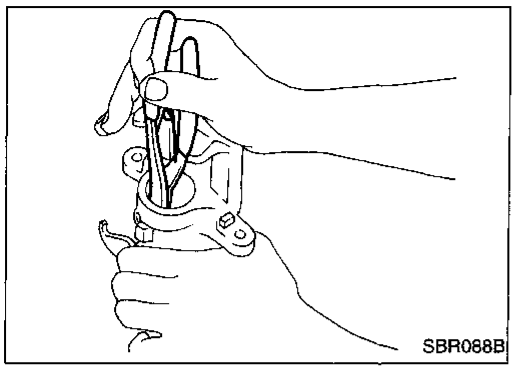
1. Remove piston by turning it counterclockwise with suitable long nose pliers or commercial service tool.



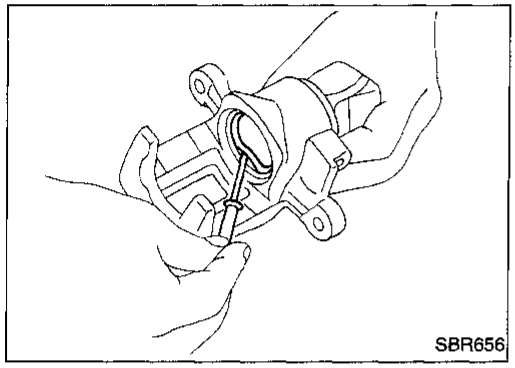


2. Remove snap ring from piston with suitable pliers and remove adjusting nut.

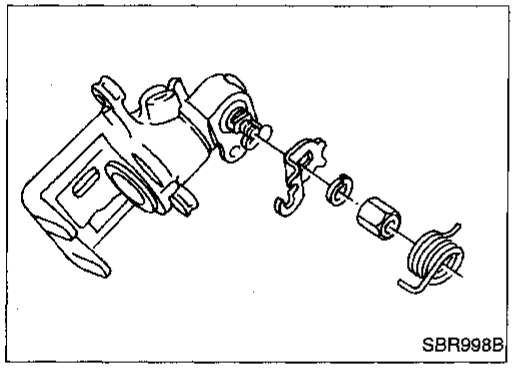
Disassembly (Cont'd)


SBR088B

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.


SBR656

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


SBR998B

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

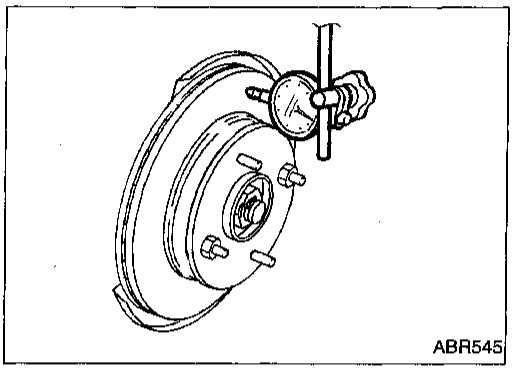
CAUTION:
Piston sliding surface is plated. Do not polish with emery paper even if rust or foreign objects are stuck to sliding surface.

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.


ABR545

Inspection — Rotor

RUBBING SURFACE

Check rotor for roughness, cracks or chips.

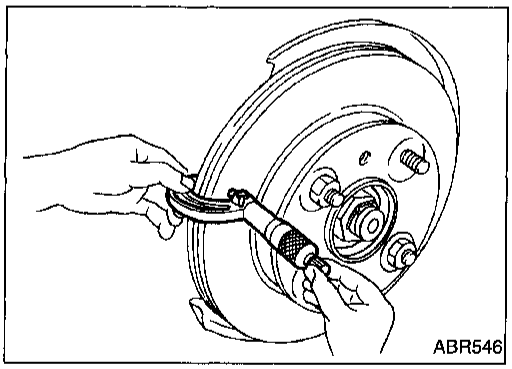
RUNOUT

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.

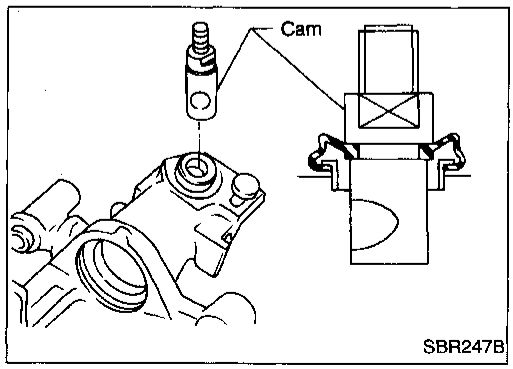
Maximum runout:
0.07 mm (0.0028 in)


ABR546

THICKNESS

Rotor repair limit:
Minimum thickness
8.0 mm (0.315 in)
Thickness variation (At least 8 positions)
Maximum 0.02 mm (0.0008 in)

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

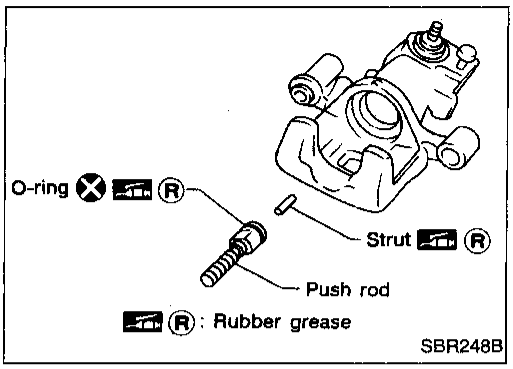


SBR247B

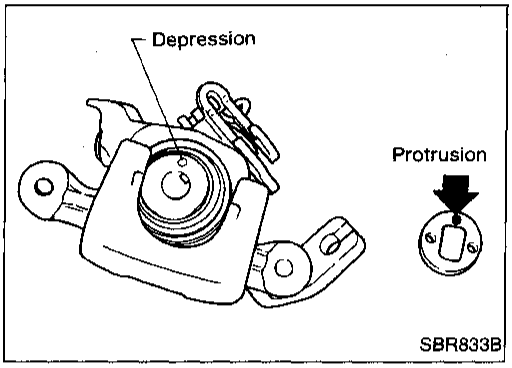
Assembly

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

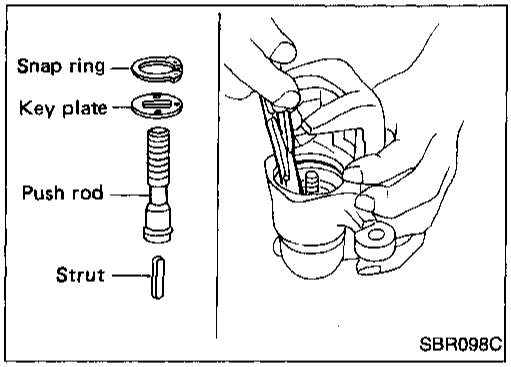
Assembly (Cont'd)



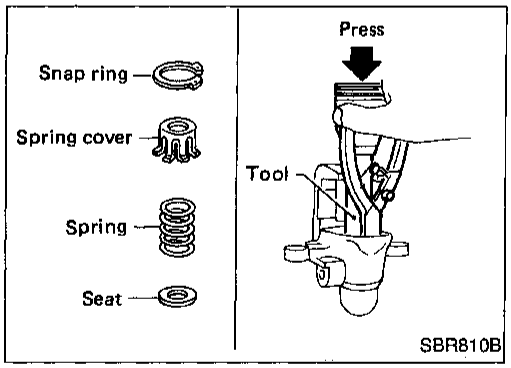
2. Generously apply rubber grease to strut and push rod to make insertion easy.



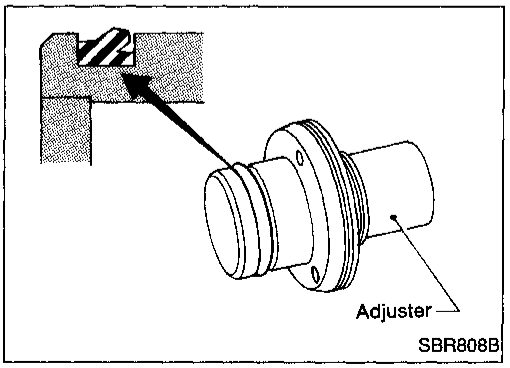
3. Match protrusion on key plate with depression in cylinder.



4. Install snap ring with a suitable tool.

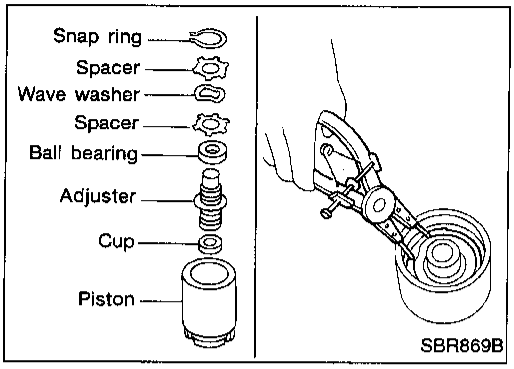


5. Install seat, spring, spring cover and snap ring while depressing with a suitable tool.

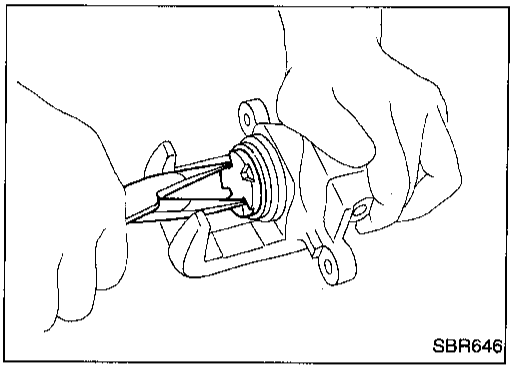


6. Install adjuster in the specified direction.

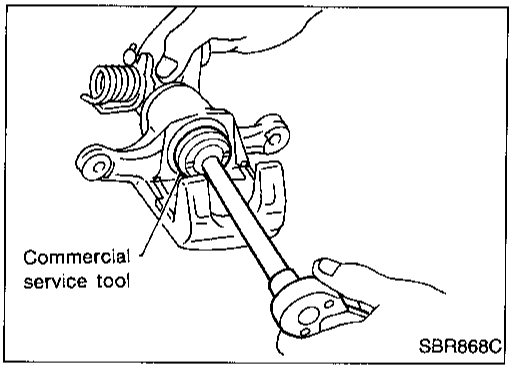
Assembly (Cont'd)

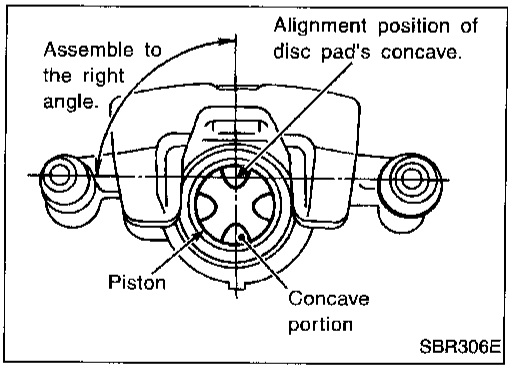


7. Install cup, adjuster, bearing, spacers, washer and snap ring with a suitable tool.

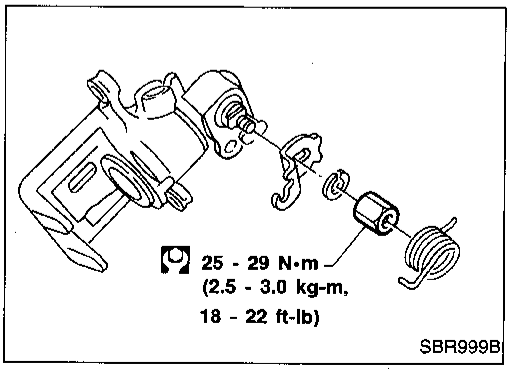


8. Insert piston seal into groove on cylinder body.
9. With piston boot fitted to piston, insert piston boot into groove on cylinder body and fit piston by turning it clockwise with long nose pliers or commercial service tool.

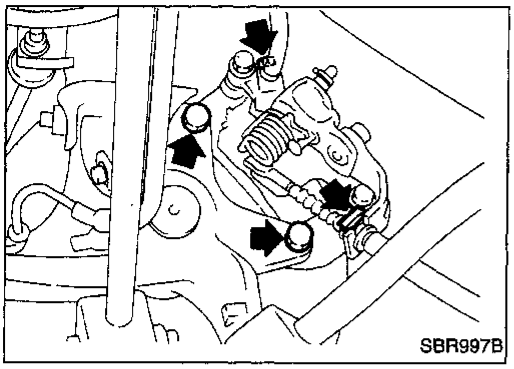




10. Adjust the piston to the right angle as shown in the figure.



11. Fit toggle lever and return spring.

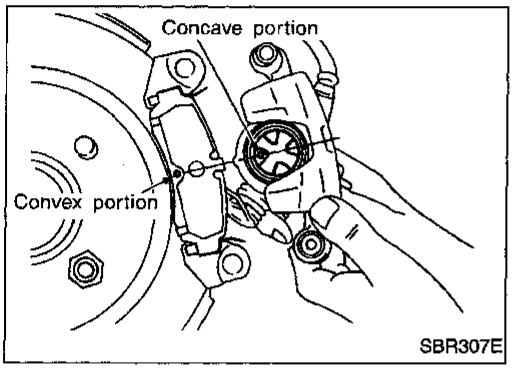

SBR997B

Installation

CAUTION:

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

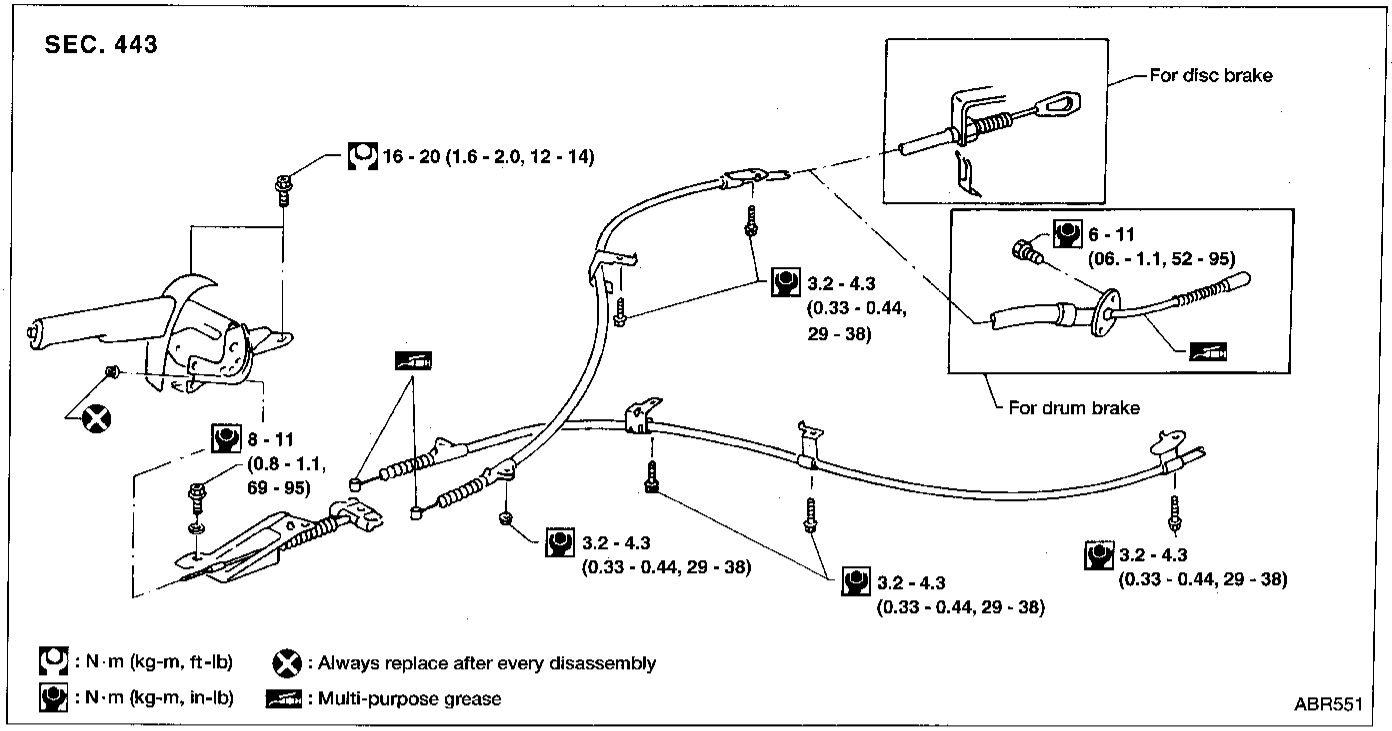
1. Install caliper assembly.

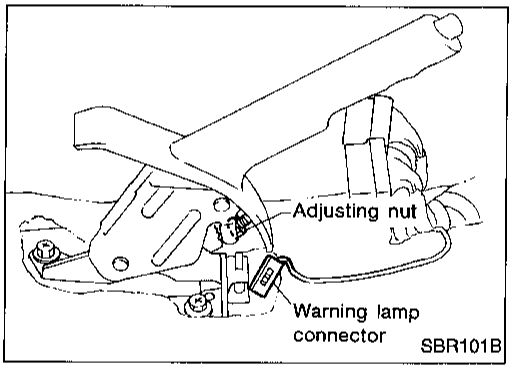


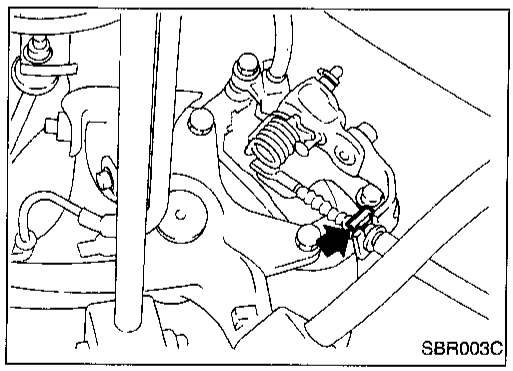
SBR307E

- As shown in the figure, align the piston's concave to the pad's convex, then install the cylinder body to the torque member.

2. Install brake hose to caliper securely.
3. Install all parts and secure all bolts.
4. Bleed air. Refer to "Bleeding Brake System", BR-6.





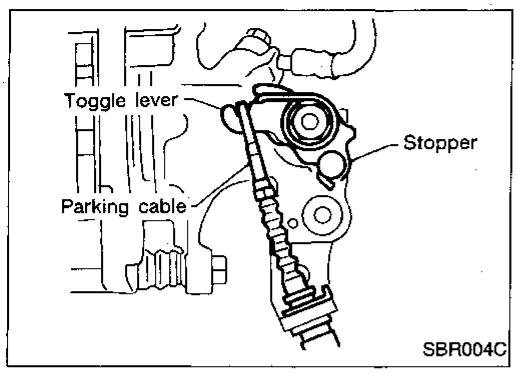


Removal and Installation

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-22.

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.



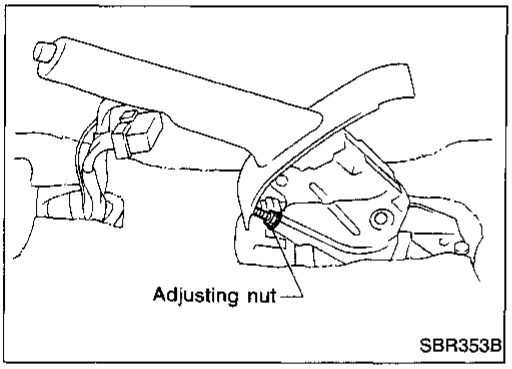
Adjustment

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

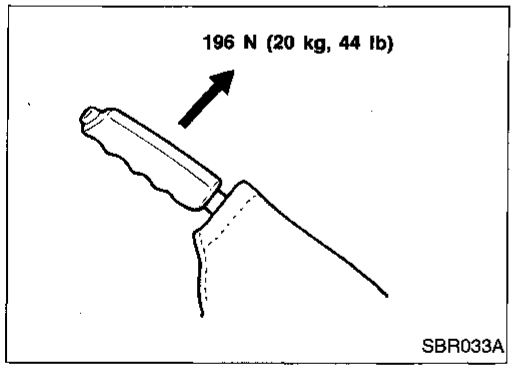
- For rear disc brake be sure that toggle lever returns to stopper when parking brake lever is released.
- There is no drag when parking brake lever is released.

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

Purpose

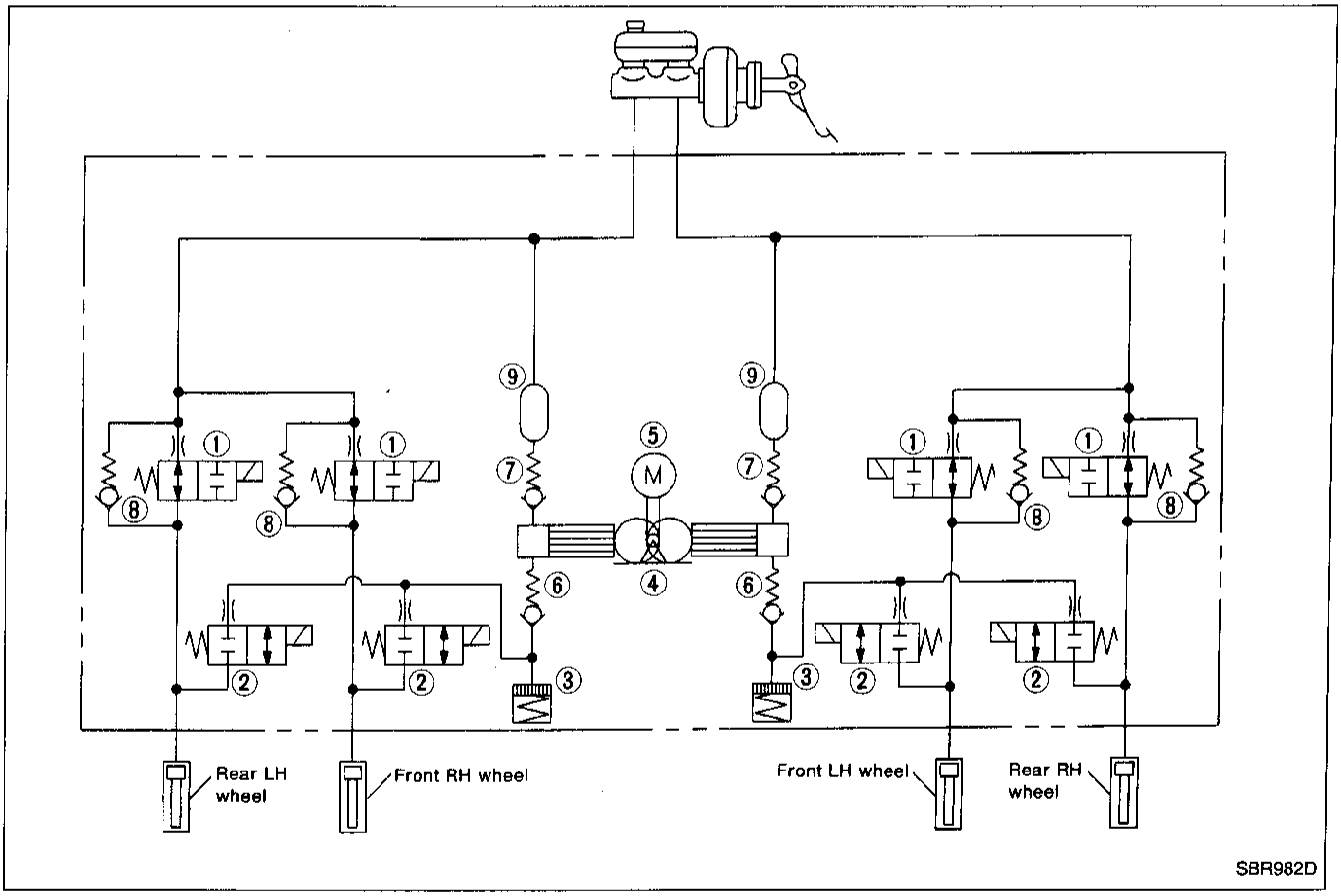
The Anti-Lock Brake System (ABS) consists of electronic and hydraulic components. It allows for control of braking force so that locking of the wheels can be avoided.
The ABS:

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

Operation

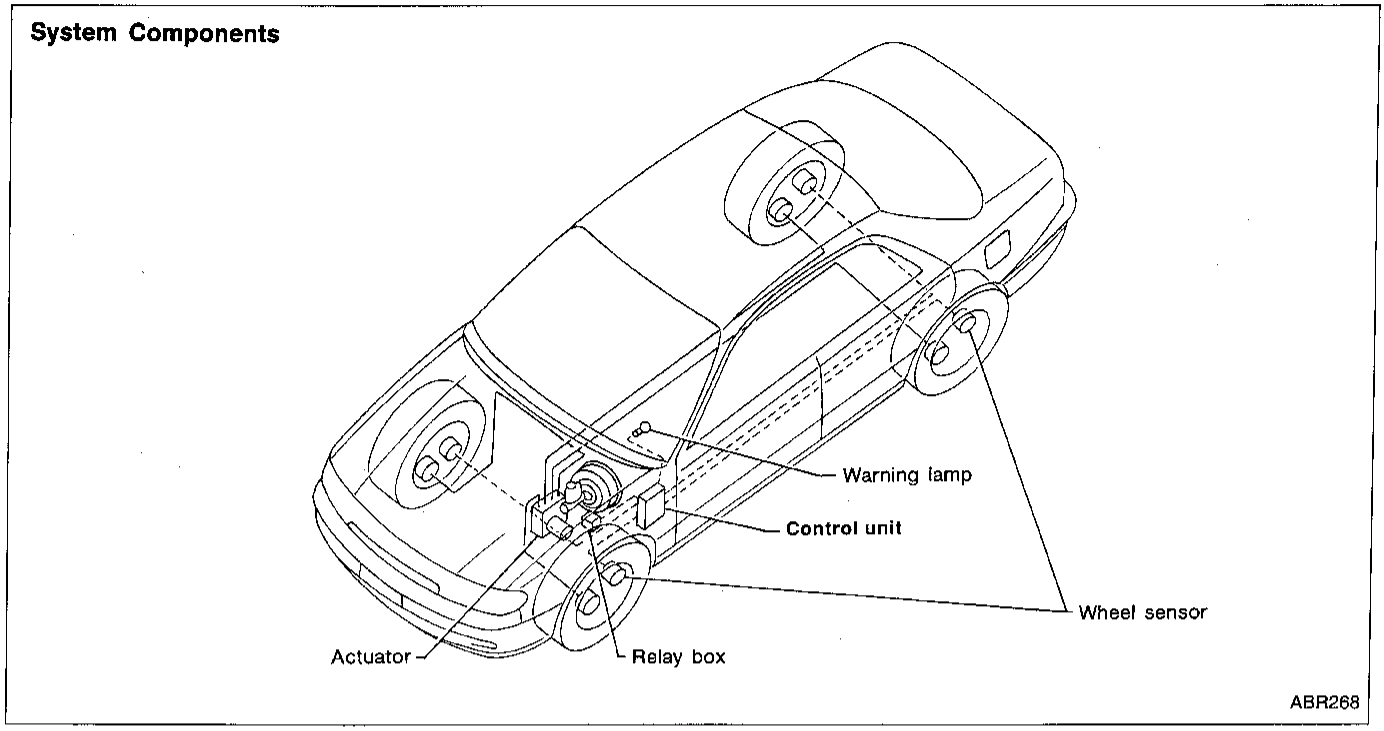
- When the vehicle speed is less than 10 km/h (6 MPH) this system does not work.
- The Anti-Lock Brake System (ABS) has a self-test function. The system turns on the ABS warning lamp for one second each time the ignition switch is turned ON. After the engine is started, the ABS warning lamp turns off. 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.

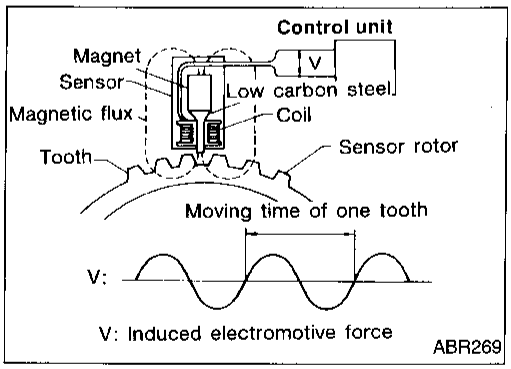
ABS Hydraulic Circuit

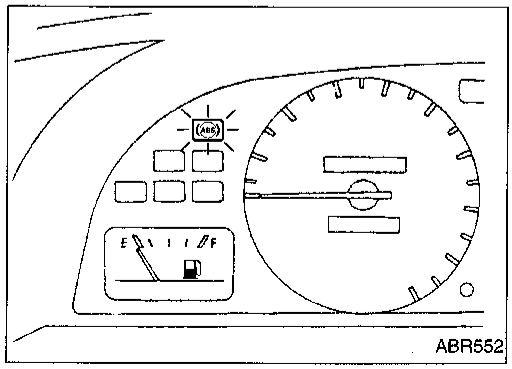


① Inlet solenoid valve
② Outlet solenoid valve
③ Reservoir
④ Pump
⑤ Motor
⑥ Inlet valve
⑦ Outlet valve
⑧ Bypass check valve
⑨ Damper

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

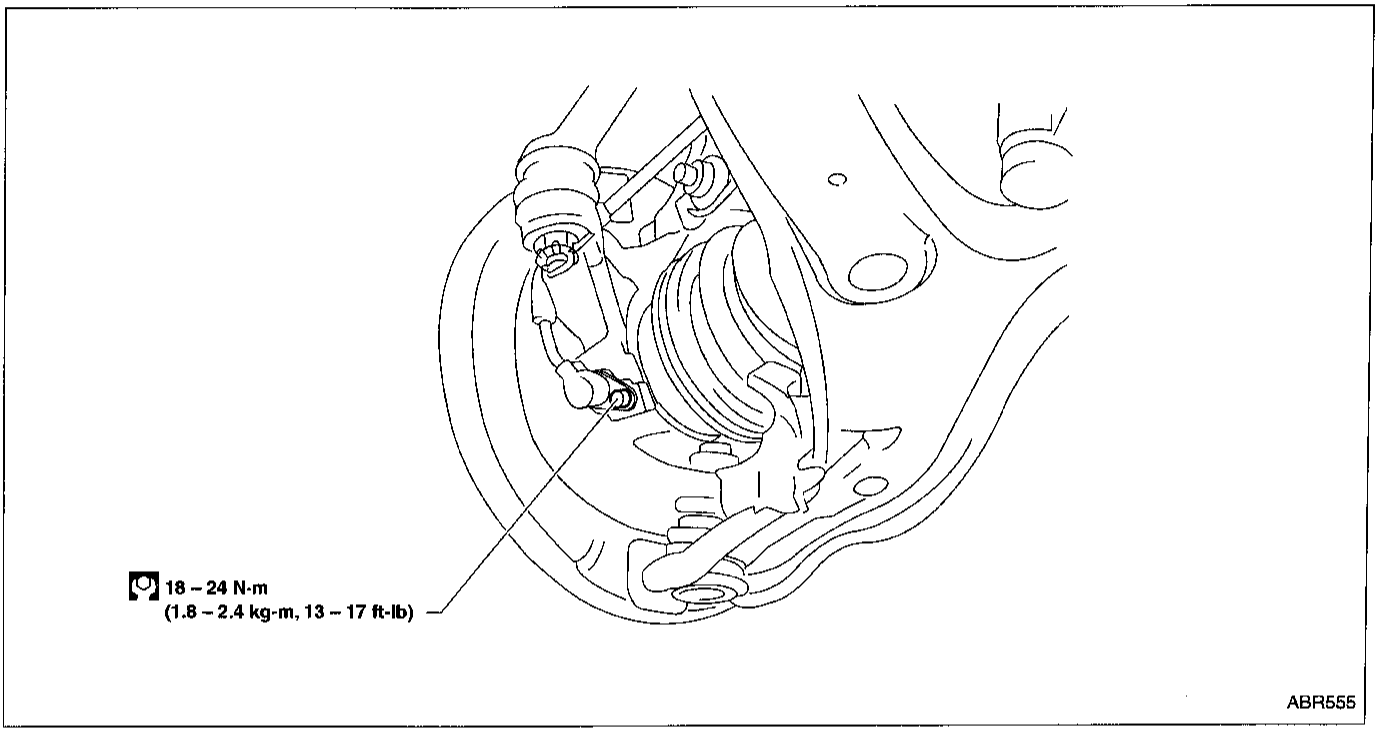
The control unit computes the wheel rotating speed by the signal current sent from the sensor. Then it supplies a DC current to the actuator solenoid valve. It also controls ON-OFF operation of the valve relay and pump relay. If any electrical malfunction should be detected in the system, the control 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.

Removal and Installation

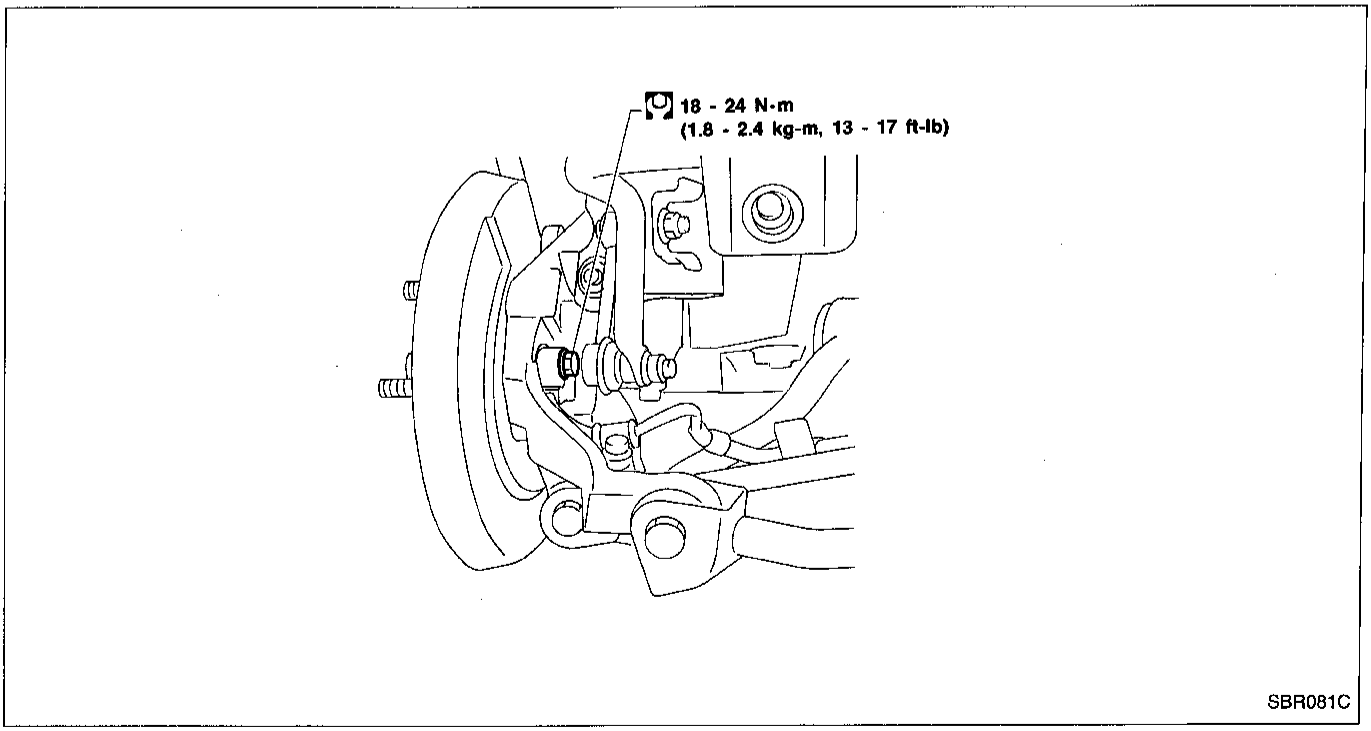
CAUTION:

- **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

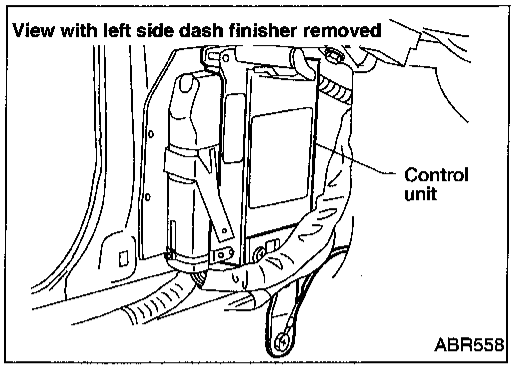


REAR WHEEL SENSOR



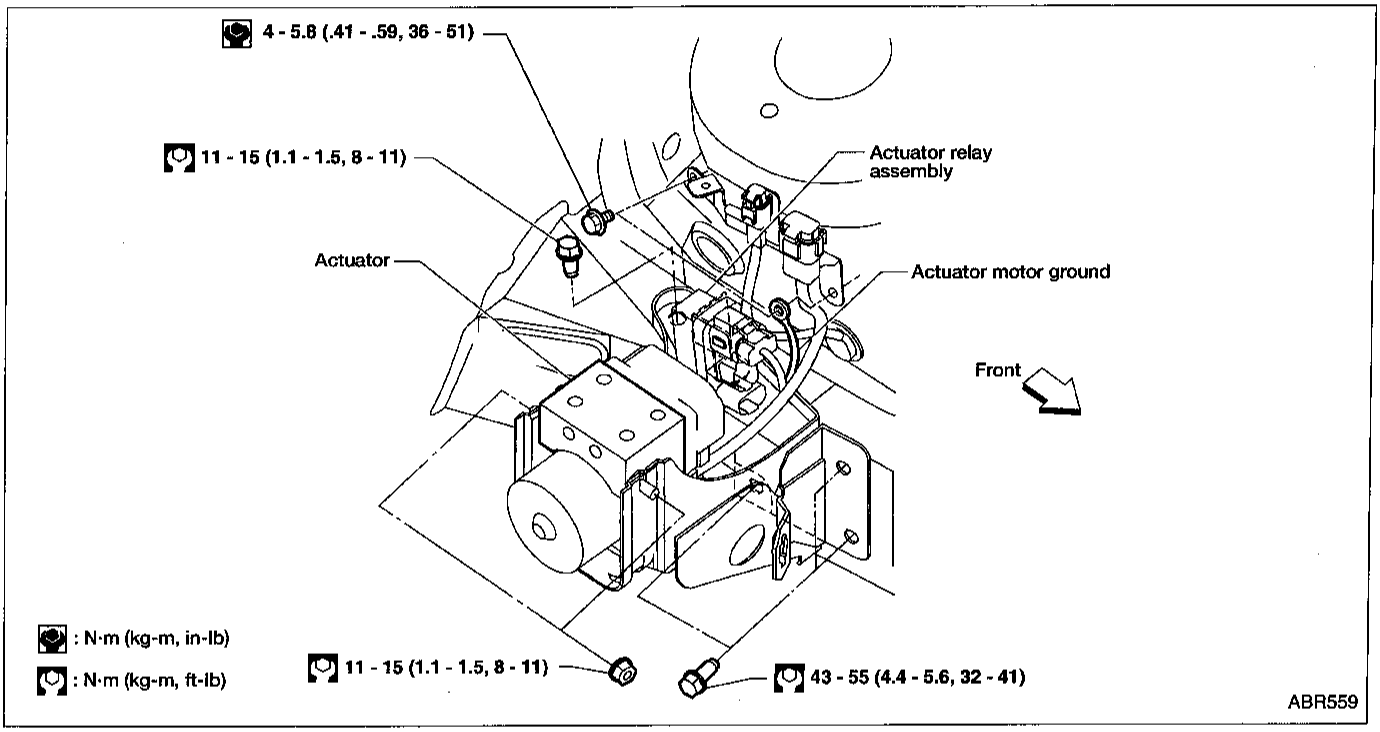
Removal and Installation (Cont'd)

CONTROL UNIT



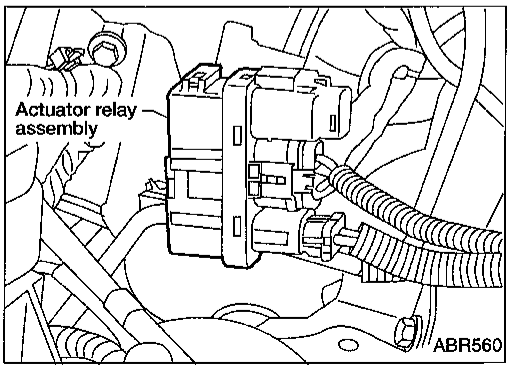
•Make sure that the sensor shield ground cable is secured with mounting bolt.

ACTUATOR



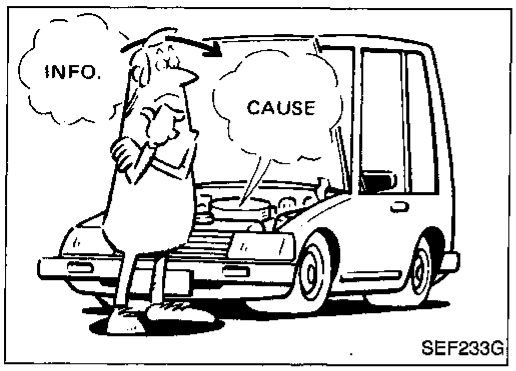
1. Disconnect battery cable.
2. Remove actuator.

CAUTION:
After installation, refill brake fluid and bleed air. Refer to BR-5 and BR-6, respectively.

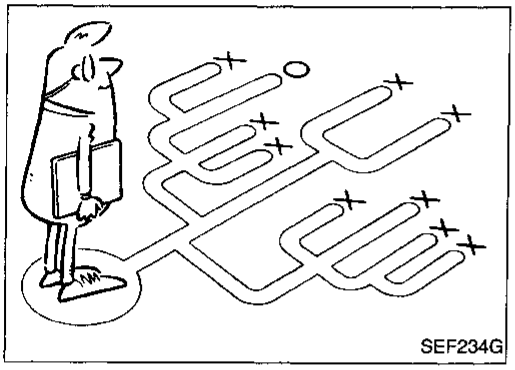


ACTUATOR RELAY ASSEMBLY

1. Disconnect battery cable.
2. Remove air cleaner and air duct.
3. Disconnect relay assembly connectors.
4. Unclip and remove relay assembly.



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 electrical connections or faulty wiring. In this case, careful checking of suspicious circuits may help prevent the replacement of good parts.

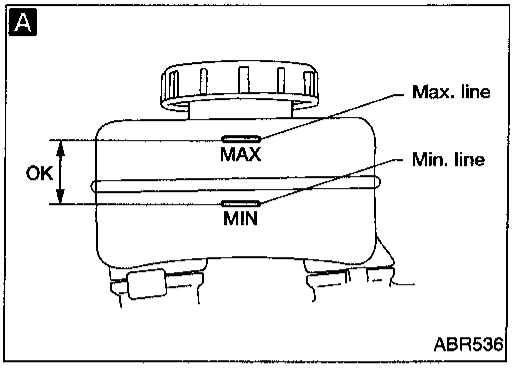
A visual check only may not find the cause of the problems, so a road test should be performed.

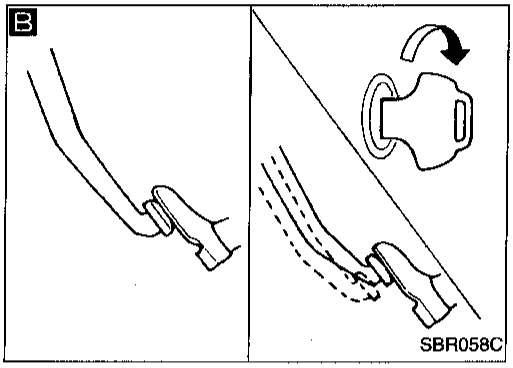
Before undertaking actual checks, take a few minutes to talk with a customer who approaches with an ABS complaint. The customer is a very good source of information; especially for intermittent problems. Through the talks with the customer, find out what symptoms are present and under what conditions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

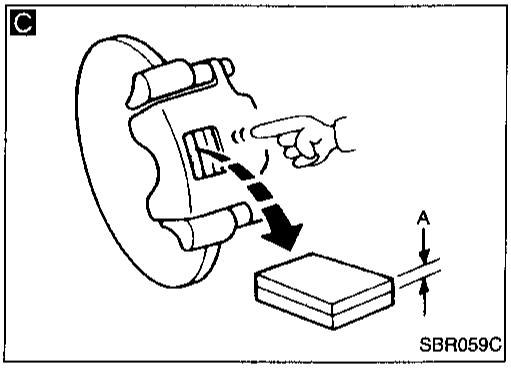
Start your diagnosis by looking for "conventional" problems first. This is one of the best ways to troubleshoot brake problems on an ABS controlled vehicle.

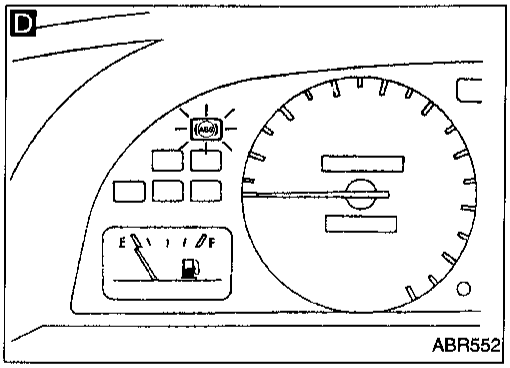
Also check service bulletins for information.

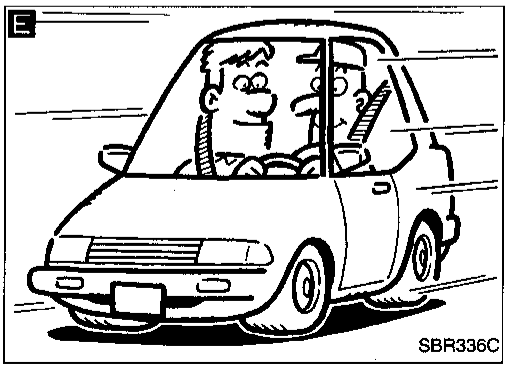
Preliminary Check











A
Check brake fluid level in reservoir tank.
Low fluid level may indicate brake pad wear or leakage from brake line.

Check brake line for leakage. NG → Repair.
OK

B
Check brake booster for operation and air tightness.
Refer to BR-15. NG → Replace.
OK

C
Check brake pads and rotor.
Refer to BR-18 and BR-20 for front disc brakes. Refer to BR-27 and BR-32 for rear disc brakes. NG → Replace.
OK

A
Check brake fluid level in reservoir tank. NG → Fill up brake fluid.
OK

D
Check warning lamp activation.
When ignition switch is turned ON, warning lamp turns on. NG → Check fuse, warning lamp bulb and warning lamp circuit.
OK

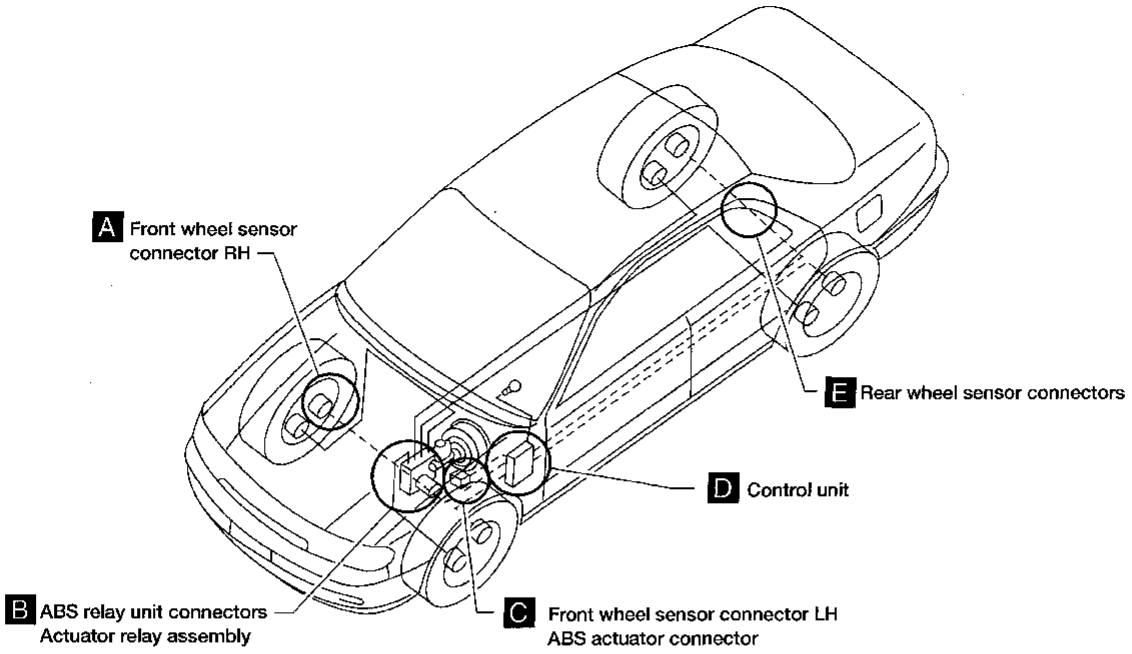
Check warning lamp for deactivation.
When ignition switch is turned ON, warning lamp turns on, then deactivates after 1 second. NG → Go to Self-diagnosis, BR-52.
OK

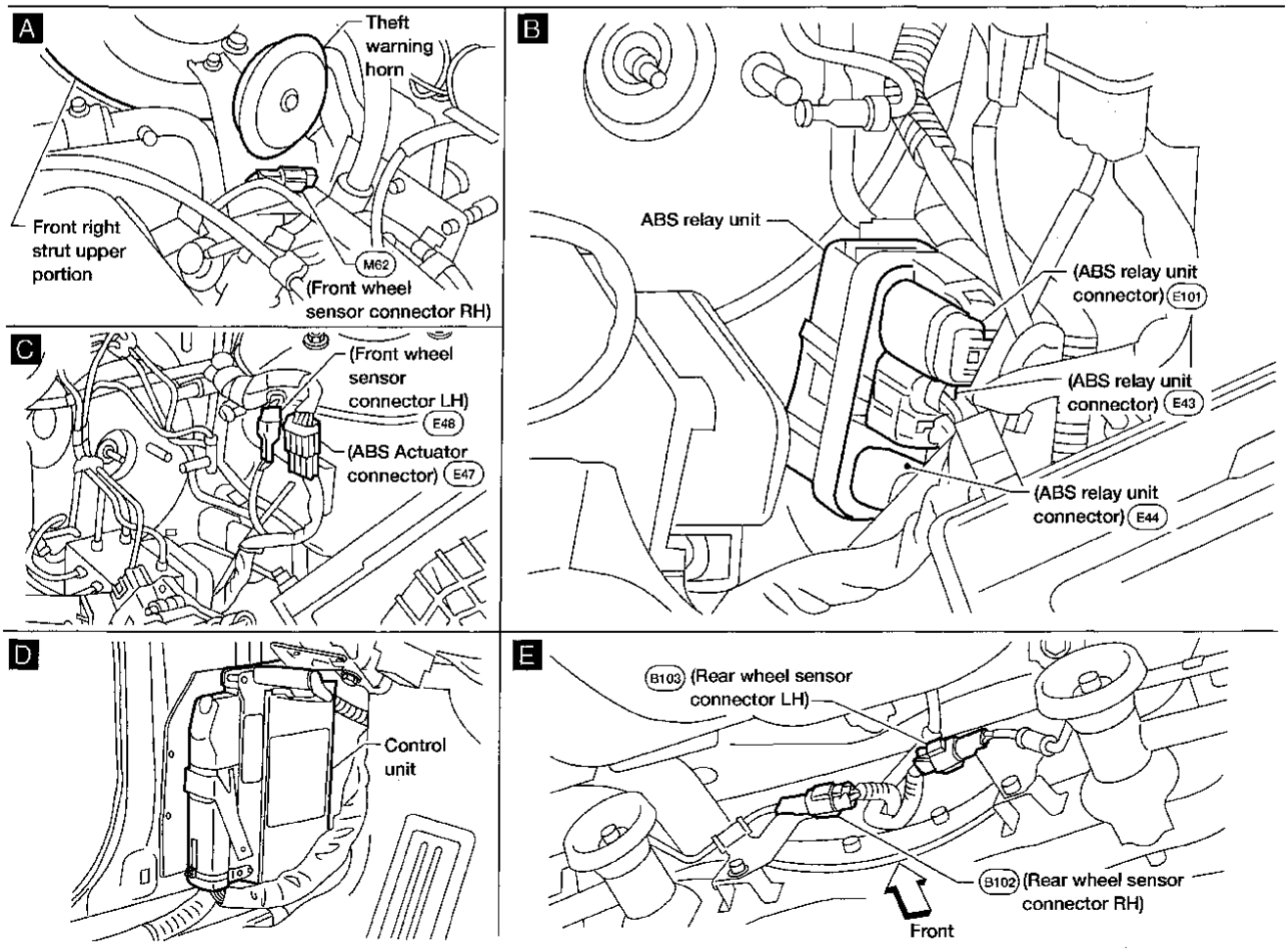
E
Drive vehicle at 30 km/h (19 MPH) for at least one minute.
OK

Ensure warning lamp remains off while driving. NG → Go to Self-diagnosis, BR-52.
OK

END

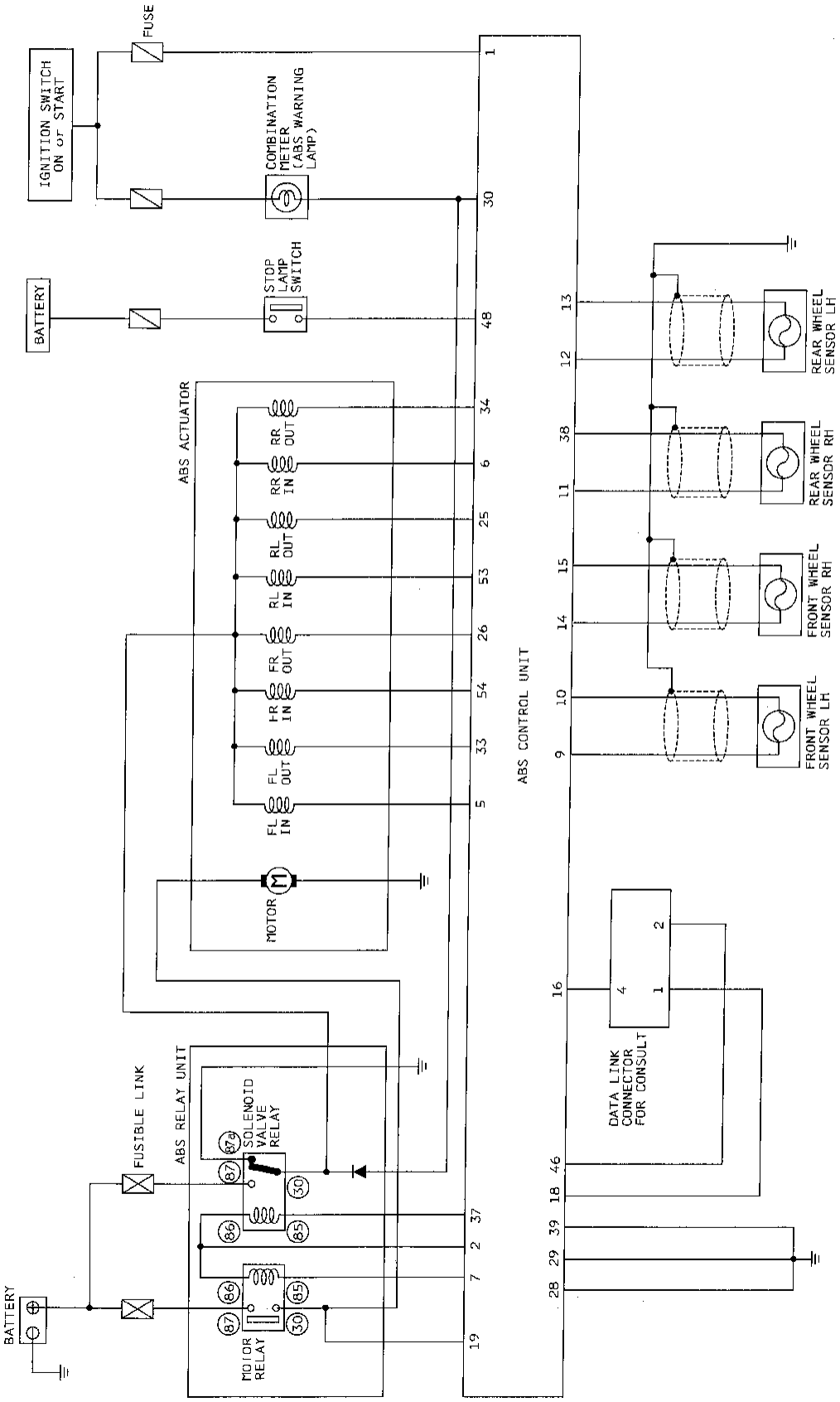
Component Parts and Harness Connector Location





ABR798

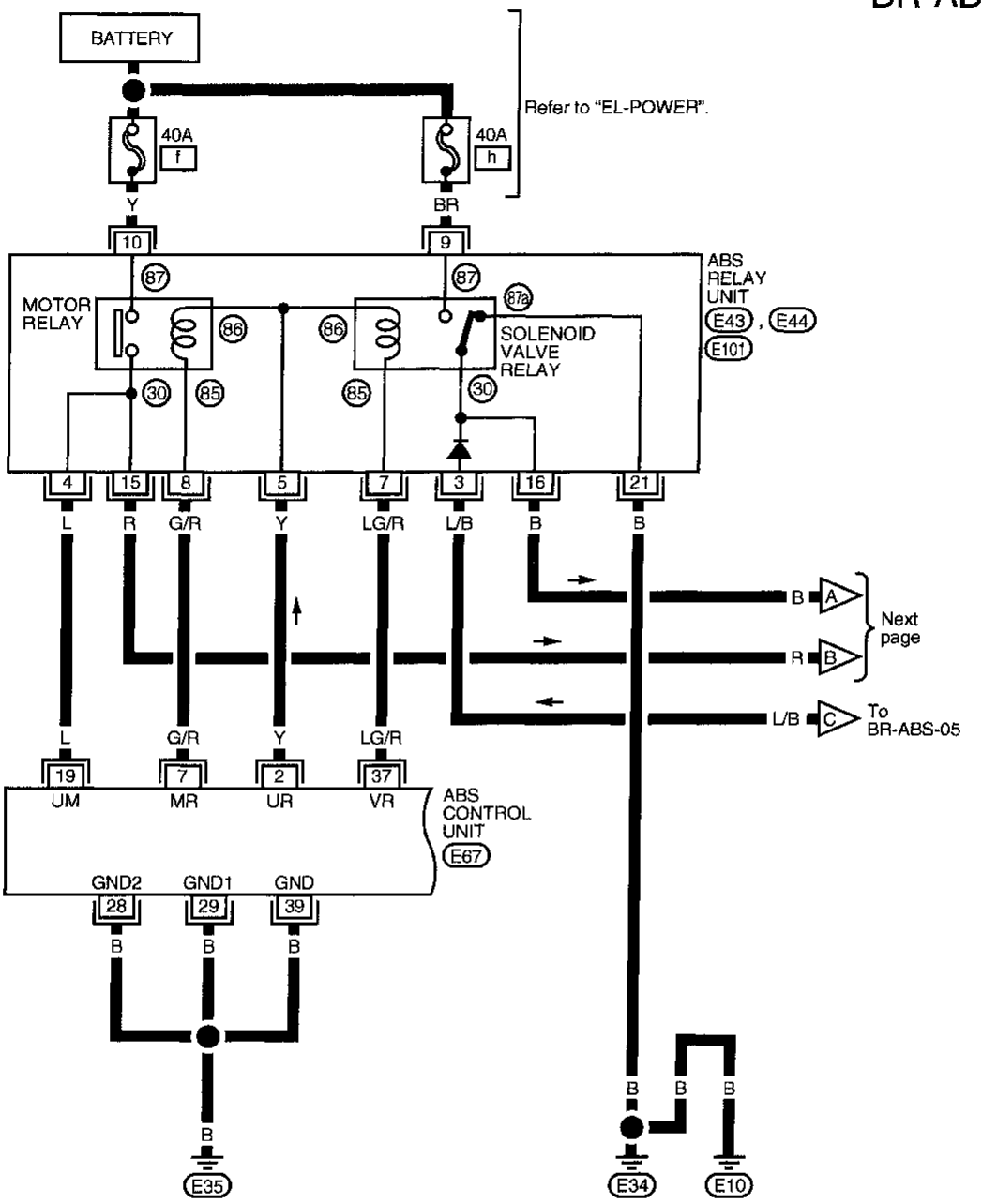
Schematic

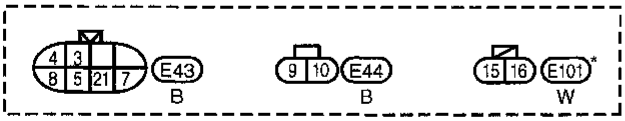


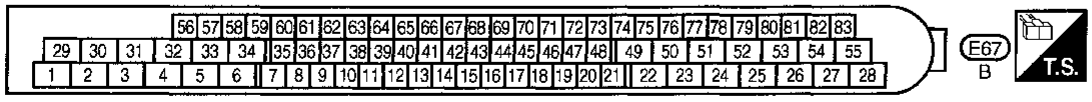
ABR495

Wiring Diagram –ABS–

BR-ABS-01



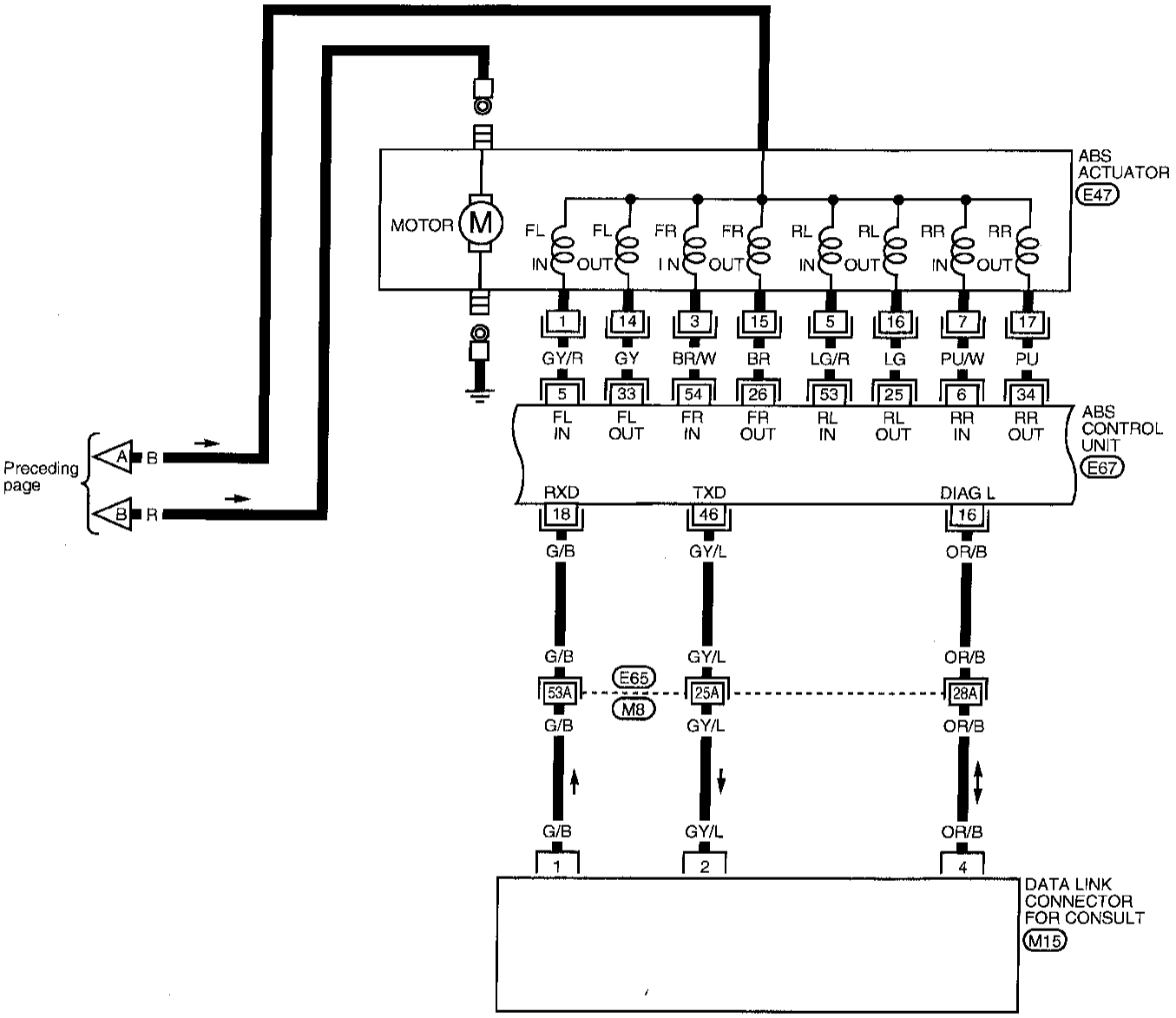




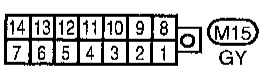
* : This connector is not shown in "HARNESS LAYOUT" of EL Section.

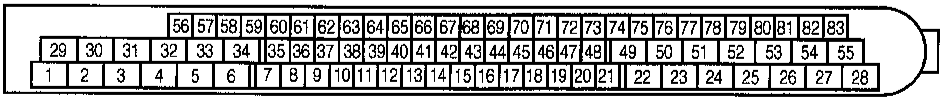
ABR490

BR-ABS-02



Refer to last page (Foldout page).
M8 , E65

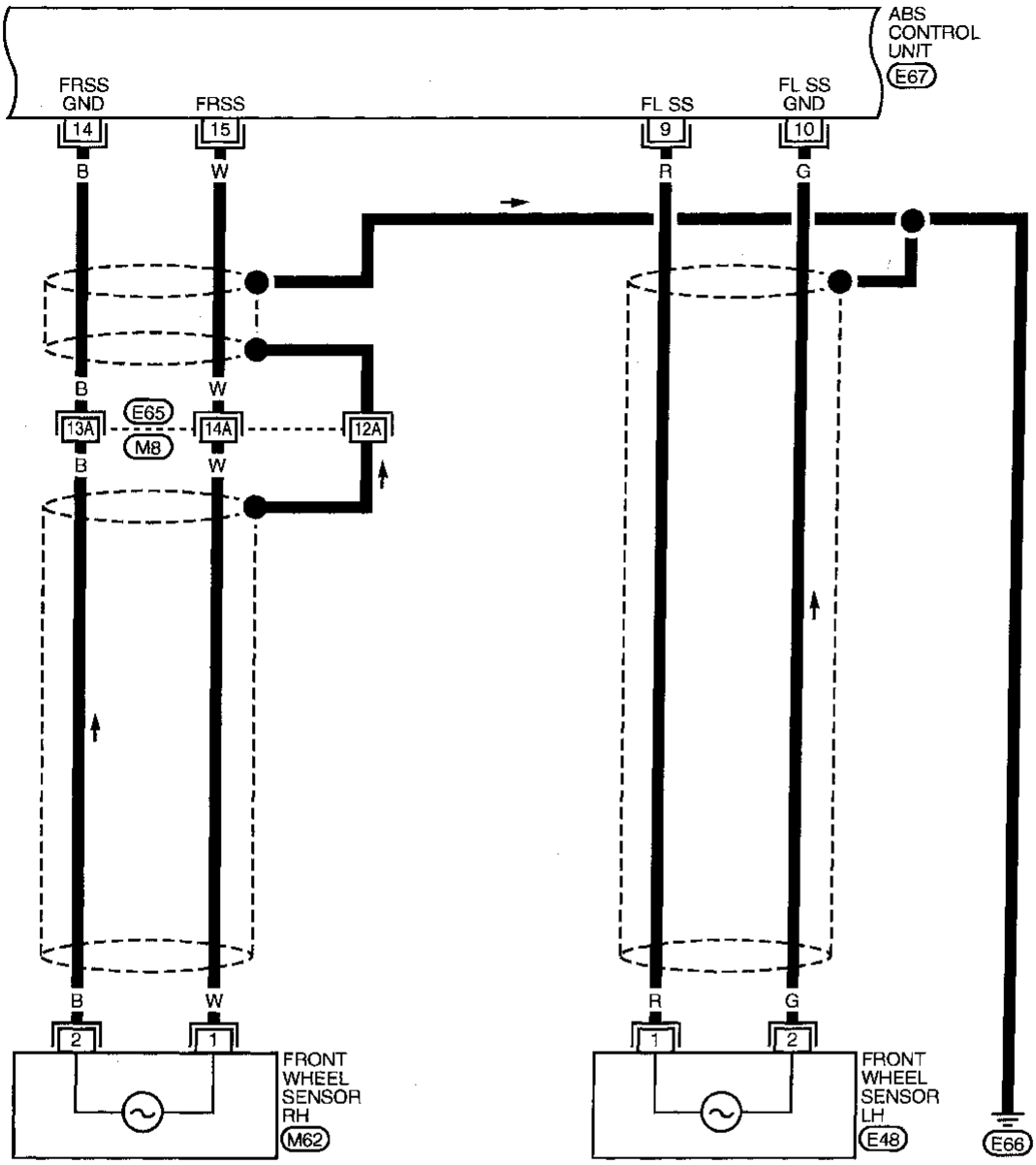




ABR491

Wiring Diagram –ABS– (Cont'd)

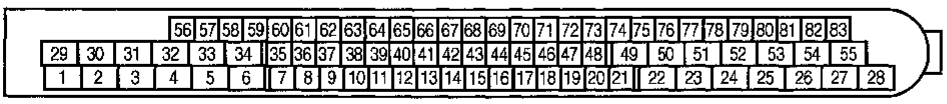
BR-ABS-03



Refer to last page (Foldout page).
M8, E65

1 2 M62 GY, E48 BR

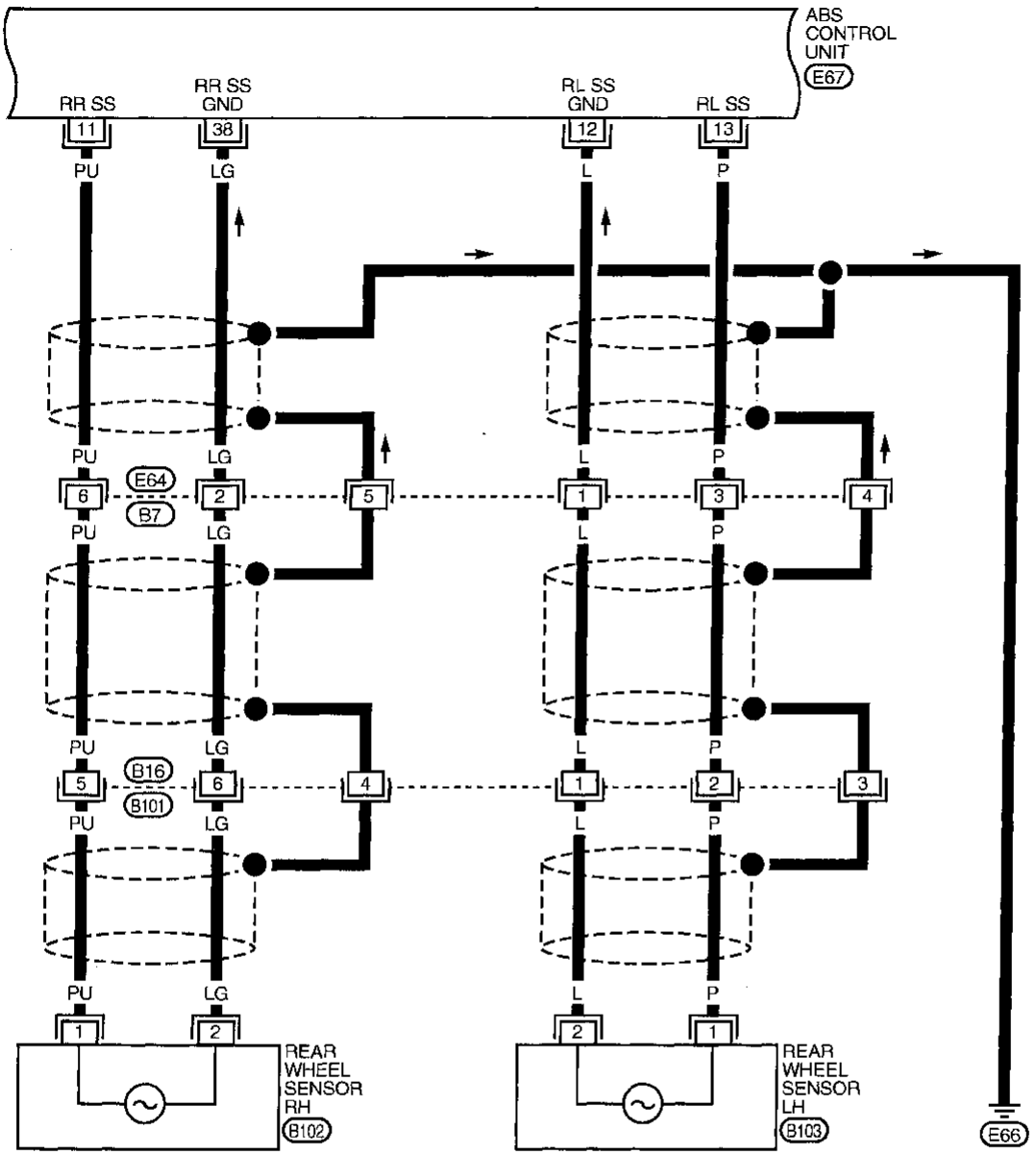
E67 B T.S.

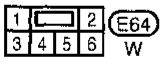


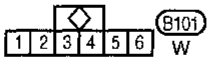
ABR492

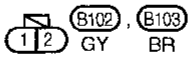
Wiring Diagram –ABS– (Cont'd)

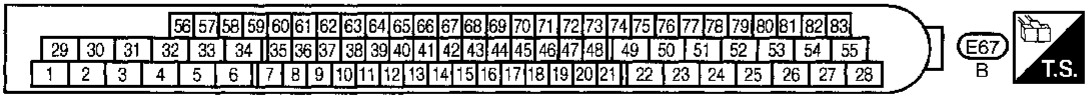
BR-ABS-04





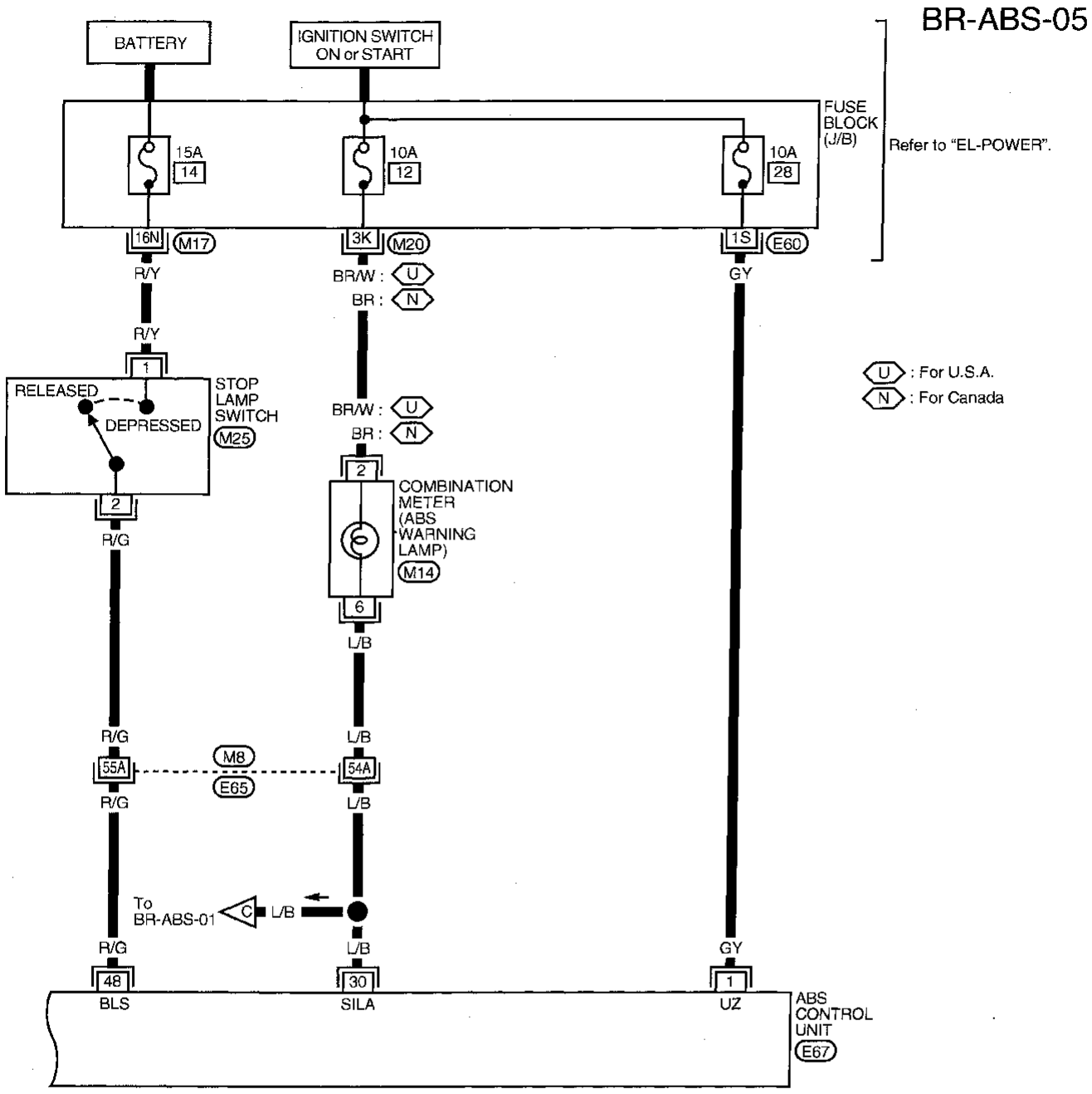


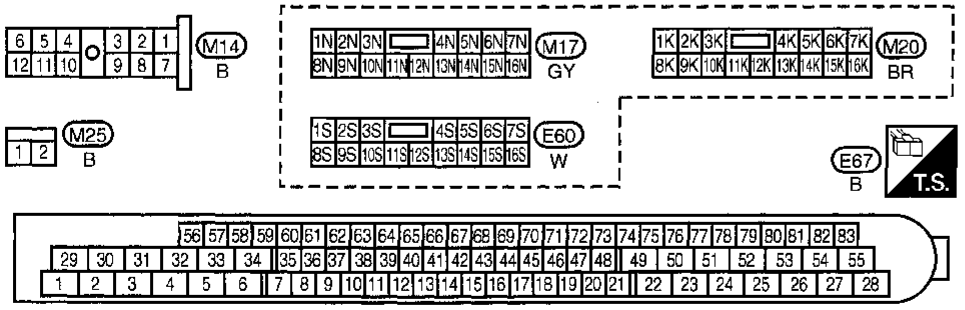




ABR493

Wiring Diagram –ABS– (Cont'd)





Refer to last page (Foldout page).
M8 , E65

ABR494

ABS Control Unit Terminal Reference Chart

Terminal No.	Wire color	Connections
1	GY	Ignition switch (ON or START)
2	Y	ABS relay unit (solenoid valve and motor relays)
5	GY/R	ABS actuator (actuator front left inlet solenoid valve)
6	PU/W	ABS actuator (actuator rear right inlet solenoid valve)
7	G/R	ABS relay unit (motor relay)
9	R	Front wheel sensor LH (signal)
10	G	Front wheel sensor LH (ground reference)
11	PU	Rear wheel sensor RH (signal)
12	L	Rear wheel sensor LH (ground reference)
13	P	Rear wheel sensor LH (signal)
14	B	Front wheel sensor RH (ground reference)
15	W	Front wheel sensor RH (signal)
16	OR/B	Data link connector for Consult
18	G/B	Data link connector for Consult
19	L	ABS relay unit (motor relay)
25	LG	ABS actuator (actuator rear left outlet solenoid valve)
26	BR	ABS actuator (actuator front right outlet solenoid valve)
28	B	Ground
29	B	Ground
30	L/B	Combination meter (ABS warning lamp)
33	GY	ABS actuator (actuator front left outlet solenoid valve)
34	PU	ABS actuator (actuator rear right outlet solenoid valve)
37	LG/R	ABS relay unit (solenoid valve relay)
38	LG	Rear wheel sensor RH (ground reference)
39	B	Ground
46	GY/L	Data link connector for Consult
48	R/G	Stop lamp switch
53	LG/R	ABS actuator (actuator rear left inlet solenoid valve)
54	BR/W	ABS actuator (actuator front right inlet solenoid valve)

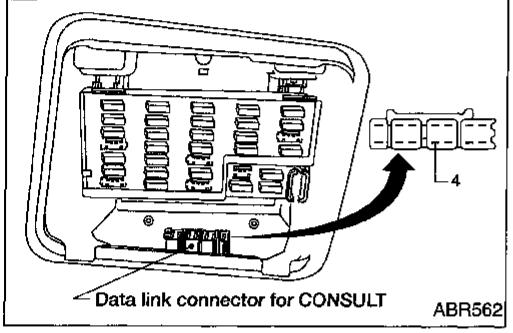
Self-diagnosis

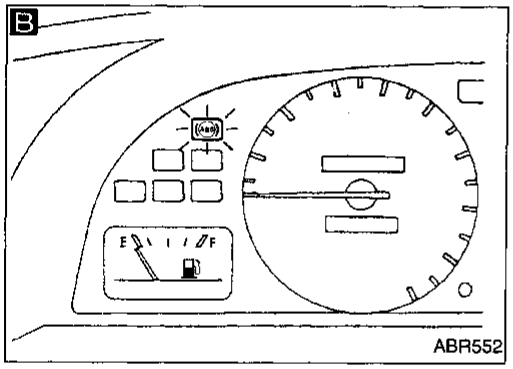
FUNCTION

- 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.

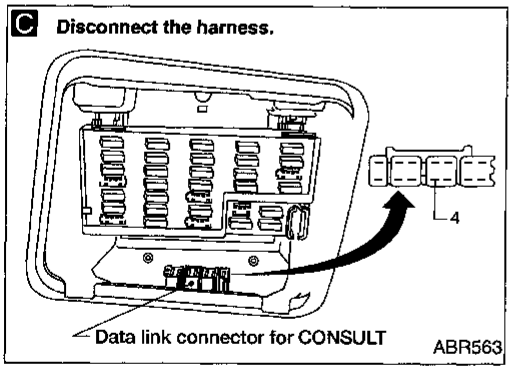
SELF-DIAGNOSIS PROCEDURE

A Ground terminal 4 with a suitable harness.





C Disconnect the harness.



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

↓

Turn ignition switch OFF.

↓

A

Ground terminal ④ of "Data Link Connector for CONSULT" with a suitable harness.

↓

Turn ignition switch ON while grounding terminal ④.
Do not depress brake pedal.

↓

B

After 3.0 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-54. 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-53.

↓

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.

Self-diagnosis (Cont'd)

Ⓐ

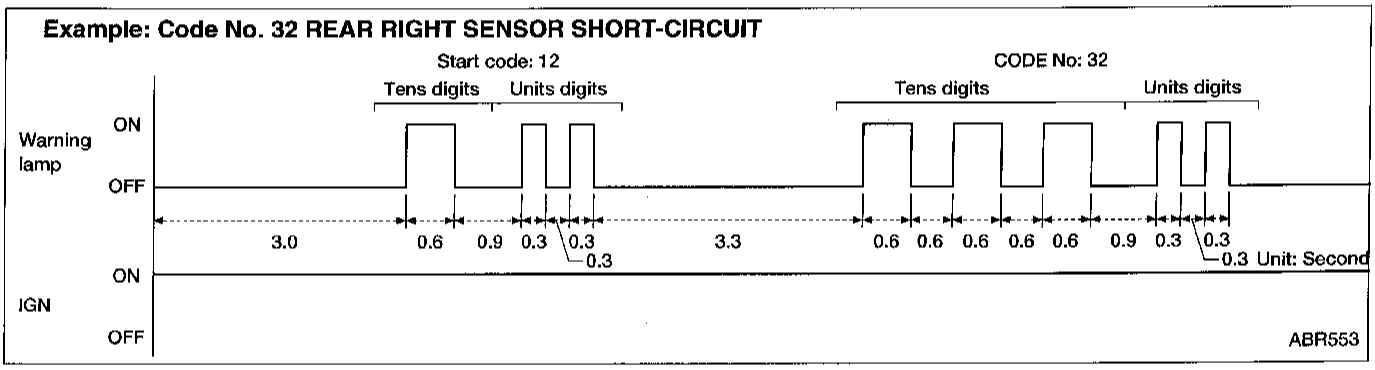
Check warning lamp for deactivation after driving vehicle over 30 km/h (20 MPH) for at least one minute.

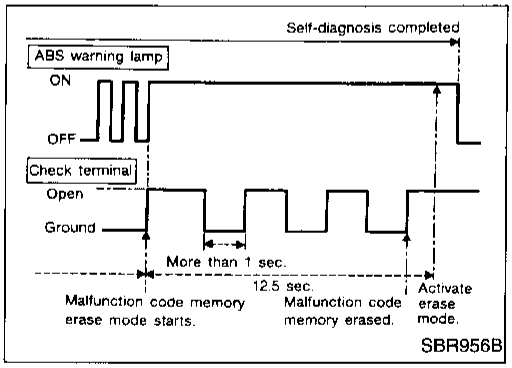
After making certain that warning lamp does not come on, test the ABS in a safe area to verify that it functions properly.

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.

Example: Code No. 32 REAR RIGHT SENSOR SHORT-CIRCUIT





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 three times. Each terminal ground must last more than one second. The ABS warning lamp goes out after the erase operation has been completed.
3. Perform self-diagnosis again, refer to BR-52. Only the start-code should appear, no malfunction codes.

Self-diagnosis (Cont'd)

MALFUNCTION CODE/SYMPTOM CHART

Code No. (No. of LED flashes)	Malfunctioning part	Diagnostic procedure
45	Actuator front left outlet solenoid valve	1
46	Actuator front left inlet solenoid valve	1
41	Actuator front right outlet solenoid valve	1
42	Actuator front right inlet solenoid valve	1
51	Actuator rear right outlet solenoid valve	1
52	Actuator rear right inlet solenoid valve	1
55	Actuator rear left outlet solenoid valve	1
56	Actuator rear left inlet solenoid valve	1
25 *1	Front left sensor (open-circuit)	2
26 *1	Front left sensor (short-circuit)	2
21 *1	Front right sensor (open-circuit)	2
22 *1	Front right sensor (short-circuit)	2
35 *1	Rear left sensor (open-circuit)	2
36 *1	Rear left sensor (short-circuit)	2
31 *1	Rear right sensor (open-circuit)	2
32 *1	Rear right sensor (short-circuit)	2
18 *1	Sensor rotor	2
61 *3	Actuator motor or motor relay	3
63	Solenoid valve relay	4
57 *2	Power supply (Low voltage)	5
71	Control unit	6
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	13
Warning lamp stays on during self-diagnosis.	Control unit	—
Warning lamp does not come on when ignition switch is turned ON.	Fuse, warning lamp bulb or warning lamp circuit Control unit	12
Warning lamp does not come on during self-diagnosis.	Control unit	—
Pedal vibration and noise	—	11
Long stopping distance	—	9
Unexpected pedal action	—	8
ABS does not work.	—	10
ABS works frequently.	—	7

*1: If one or more wheels spin on a rough or slippery road for 40 seconds or more, the ABS warning lamp will illuminate. This does not indicate a malfunction. Only in the case of the short-circuit (Code Nos. 26, 22, 32, and 36), after repair the ABS warning lamp also illuminates when the ignition switch is turned ON. In this case, drive the vehicle at speeds greater than 30 km/h (19 MPH) for approximately 1 minute as specified in "SELF-DIAGNOSIS PROCEDURE", BR-52. Check to ensure that the ABS warning lamp goes out while the vehicle is being driven.

*2: The trouble code "57", which refers to a low power supply voltage, does not indicate that the ABS control unit is malfunctioning. Do not replace the ABS control unit with a new one.

*3: The trouble code "61" can sometimes appear when the ABS motor is not properly grounded. If it appears, be sure to check the condition of the ABS motor ground circuit connection.

CONSULT

CONSULT APPLICATION TO ABS

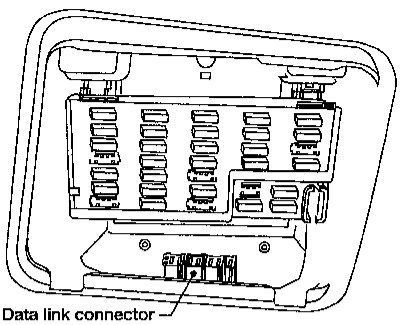
ITEM	SELF-DIAGNOSTIC RESULTS	DATA MONITOR	ACTIVE TEST
Front right wheel sensor	X	X	—
Front left wheel sensor	X	X	—
Rear right wheel sensor	X	X	—
Rear left wheel sensor	X	X	—
Stop lamp switch	—	X	—
Front right inlet solenoid valve	X	X	X
Front right outlet solenoid valve	X	X	X
Front left inlet solenoid valve	X	X	X
Front left outlet solenoid valve	X	X	X
Rear right inlet solenoid valve	X	X	X
Rear left inlet solenoid valve	X	X	X
Rear right outlet solenoid valve	X	X	X
Rear left outlet solenoid valve	X	X	X
Actuator solenoid valve relay	X	X	—
Actuator motor relay (ABS MOTOR is shown on the Data Monitor screen.)	X	X	X
ABS warning lamp	—	X	—
Battery voltage	X	X	—
Control unit	X	—	—

X: Applicable
—: Not applicable

ECU part number mode

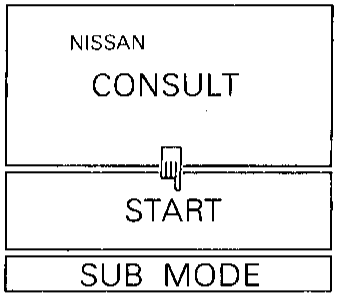
Ignore the ECU part number displayed in the ECU PART NUMBER MODE. Refer to parts catalog to order the ECU.

A



ABR579

B



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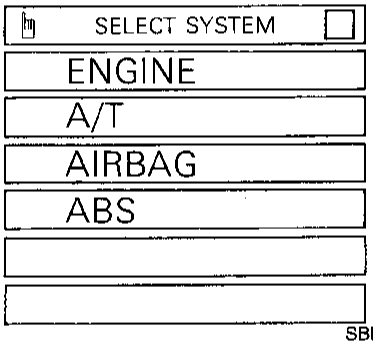
C



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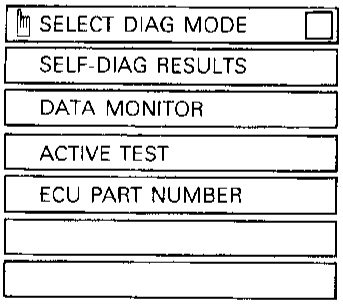
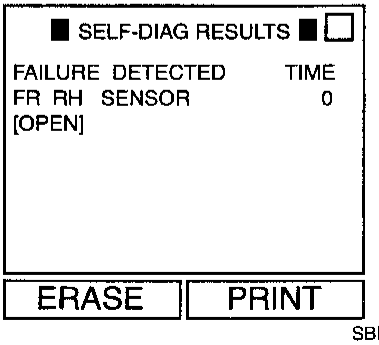
D



SST412B

E



SBR950C

CONSULT Inspection Procedure

SELF-DIAGNOSIS PROCEDURE

A

1) Turn ignition switch OFF.
2) Connect CONSULT to Data Link Connector for CONSULT.

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

B 1) Stop vehicle with engine running and touch "START" on CONSULT screen.
C 2) Touch "ABS".
D E 3) Touch "SELF-DIAG RESULTS".
- **The screen shows maximum three malfunctions.**
- **Does the screen show the detected malfunction?**

No → WARNING LAMP INSPECTION
Check warning lamp and the circuit and repair if necessary.

Yes

MALFUNCTION REPAIR
Make the necessary repairs following the diagnostic procedures.

E

After repairing the malfunctions, start engine and drive vehicle over 30 km/h (20 MPH) for at least one minute. Then erase the self-diagnostic results stored in the control unit by touching "ERASE".
Are the self-diagnostic results erased?

No → (return to MALFUNCTION REPAIR)

Yes

Check warning lamp for deactivation after driving vehicle over 30 km/h (20 MPH) for at least one minute.
Does the warning lamp activate?

Yes → Go to B above.

No

End

Note: "SELF-DIAG RESULTS" screen shows the detected malfunction and the times of ignition switch ON and OFF after it occurred.

SELF-DIAGNOSTIC RESULTS MODE

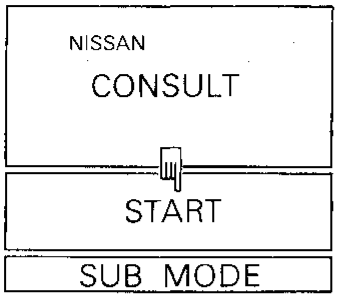
Diagnostic item	Diagnostic item is detected when ...	Diagnostic procedure
FR RH SENSOR [OPEN]	● Circuit for front right wheel sensor is open. (An abnormally high input voltage is entered.)	2
FR LH SENSOR [OPEN]	● Circuit for front left wheel sensor is open. (An abnormally high input voltage is entered.)	2
RR RH SENSOR [OPEN]	● Circuit for rear right sensor is open. (An abnormally high input voltage is entered.)	2
RR LH SENSOR [OPEN]	● Circuit for rear left sensor is open. (An abnormally high input voltage is entered.)	2
FR RH SENSOR [SHORT]*1	● Circuit for front right wheel sensor is shorted. (An abnormally low input voltage is entered.)	2
FR LH SENSOR [SHORT]*1	● Circuit for front left wheel sensor is shorted. (An abnormally low input voltage is entered.)	2
RR RH SENSOR [SHORT]*1	● Circuit for rear right sensor is shorted. (An abnormally low input voltage is entered.)	2
RR LH SENSOR [SHORT]*1	● Circuit for rear left sensor is shorted. (An abnormally low input voltage is entered.)	2
ABS SENSOR [ABNORMAL SIGNAL]	● Teeth damage on sensor rotor or improper installation of wheel sensor. (Abnormal wheel sensor signal is entered.)	2
FR RH IN ABS SOL [OPEN]	● Circuit for front right inlet solenoid valve is open. (An abnormally low output voltage is entered.)	1
FR LH IN ABS SOL [OPEN]	● Circuit for front left inlet solenoid valve is open. (An abnormally low output voltage is entered.)	1
RR RH IN ABS SOL [OPEN]	● Circuit for rear right inlet solenoid valve is open. (An abnormally low output voltage is entered.)	1
RR LH IN ABS SOL [OPEN]	● Circuit for rear left inlet solenoid valve is open. (An abnormally low output voltage is entered.)	1
FR RH IN ABS SOL [SHORT]	● Circuit for front right inlet solenoid valve is shorted. (An abnormally high output voltage is entered.)	1
FR LH IN ABS SOL [SHORT]	● Circuit for front left inlet solenoid valve is shorted. (An abnormally high output voltage is entered.)	1
RR RH IN ABS SOL [SHORT]	● Circuit for rear right inlet solenoid valve is shorted. (An abnormally high output voltage is entered.)	1
RR LH IN ABS SOL [SHORT]	● Circuit for rear left inlet solenoid valve is shorted. (An abnormally high output voltage is entered.)	1
FR RH OUT ABS SOL [OPEN]	● Circuit for front right outlet solenoid valve is open. (An abnormally low output voltage is entered.)	1
FR LH OUT ABS SOL [OPEN]	● Circuit for front left outlet solenoid valve is open. (An abnormally low output voltage is entered.)	1
RR RH OUT ABS SOL [OPEN]	● Circuit for rear right outlet solenoid valve is open. (An abnormally low output voltage is entered.)	1
RR LH OUT ABS SOL [OPEN]	● Circuit for rear left outlet solenoid valve is open. (An abnormally low output voltage is entered.)	1
FR RH OUT ABS SOL [SHORT]	● Circuit for front right outlet solenoid valve is shorted. (An abnormally high output voltage is entered.)	1
FR LH OUT ABS SOL [SHORT]	● Circuit for front left outlet solenoid valve is shorted. (An abnormally high output voltage is entered.)	1
RR RH OUT ABS SOL [SHORT]	● Circuit for rear right outlet solenoid valve is shorted. (An abnormally high output voltage is entered.)	1
RR LH OUT ABS SOL [SHORT]	● Circuit for rear left outlet solenoid valve is shorted. (An abnormally high output voltage is entered.)	1
ABS ACTUATOR RELAY [ABNORMAL]	● Actuator solenoid valve relay is ON, even control unit sends off signal. ● Actuator solenoid valve relay is OFF, even control unit sends on signal.	4
ABS MOTOR [ABNORMAL]	● Circuit for actuator motor is open or shorted. ● Actuator motor relay is stuck.	3
BATTERY VOLT [VB-LOW]	● Power source voltage supplied to ABS control unit is abnormally low.	5
CONTROL UNIT	● Function of calculation in ABS control unit has failed.	6

*1: Be sure to confirm the ABS warning lamp illuminates when the ignition switch is turned ON after repairing the shorted sensor circuit, but the lamp goes out when driving the vehicle over 30 km/h (20 MPH) for one minute in accordance with SELF-DIAGNOSIS PROCEDURE.

CONSULT Inspection Procedure (Cont'd)

DATA MONITOR PROCEDURE

A

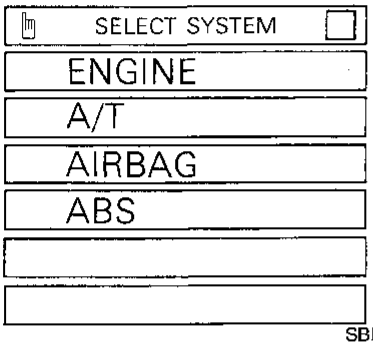


SEF392I

1) Turn ignition switch OFF.
2) Connect CONSULT to Data link connector for CONSULT.
3) Turn ignition switch ON.

A 1) Touch "START" on CONSULT screen.
B 2) Touch "ABS".
C 3) Touch "DATA MONITOR".

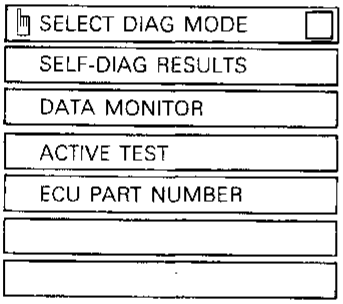
B



SBR385C

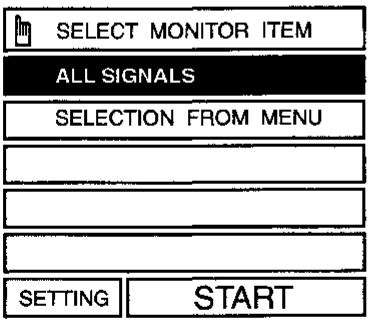
D 1) Touch "SETTING" on "SELECT MONITOR ITEM" screen.
E 2) Touch "LONG TIME" on "SET RECORDING COND" screen.
D 3) Touch "START" on "SELECT MONITOR ITEM".

C



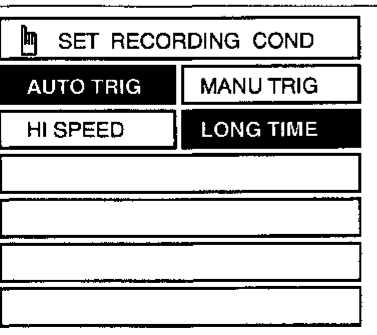
SST412B

D



SBR936C

E

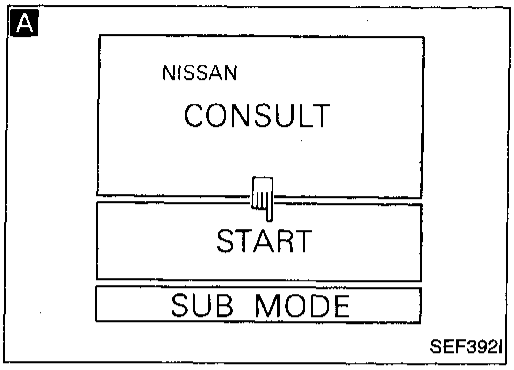


SBR937C

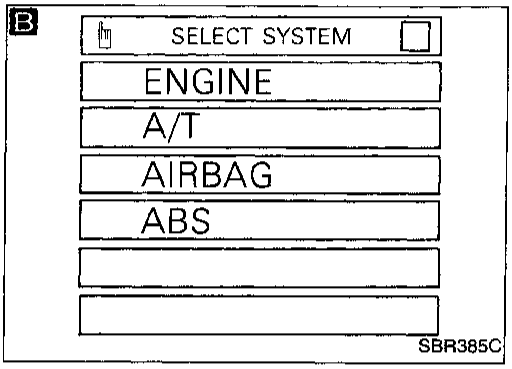
CONSULT Inspection Procedure (Cont'd)

ACTIVE TEST PROCEDURE

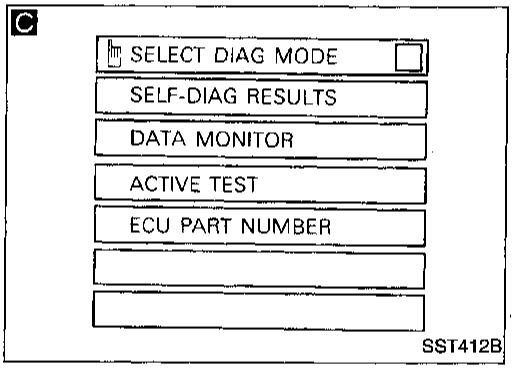
- When conducting Active Test, vehicle must be stationary.
- When ABS warning lamp stays on, never conduct Active Test.



1) Turn ignition switch OFF.
2) Connect CONSULT to Data link connector for CONSULT.
3) Turn ignition switch ON.

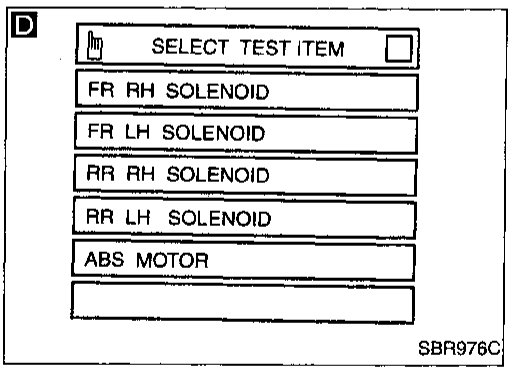


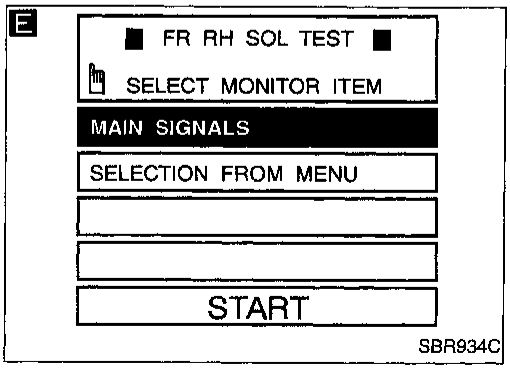
A 1) Touch "START" on CONSULT screen.
B 2) Touch "ABS".
C 3) Touch "ACTIVE TEST".



D 1) Select active test item by touching screen.
E 2) Touch "START".

Carry out the active test by touching screen key.





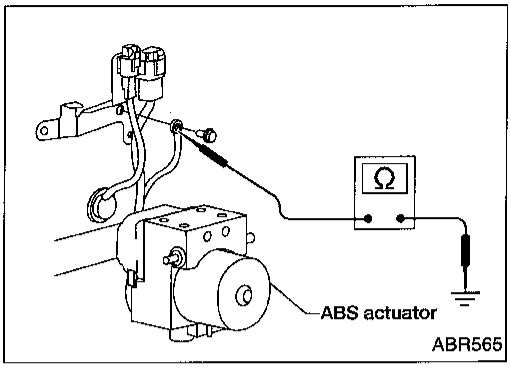
DATA MONITOR MODE

MONITOR ITEM	CONDITION	SPECIFICATION
FR RH SENSOR FR LH SENSOR RR RH SENSOR RR LH SENSOR	Drive vehicle. (Each wheel is rotating.)	Displays computed vehicle speed from wheel sensor signal. Almost the same speed as speedometer.
STOP LAMP SW	Turn ignition switch ON and depress brake pedal.	Depress the pedal: ON Release the pedal: OFF
FR RH IN SOL FR RH OUT SOL FR LH IN SOL FR LH OUT SOL RR RH IN SOL RR RH OUT SOL RR LH IN SOL RR LH OUT SOL	Ignition switch is turned ON or engine is running.	Operating conditions for each solenoid valve are indicated. ABS is not operating: OFF
ACTUATOR RLY	Ignition switch is turned ON or engine is running.	Displays ON/OFF condition of ABS actuator relay. When turning ignition switch ON, ABS actuator relay is operated.
MOTOR RELAY		ABS is not operating: OFF ABS is operating: ON
WARNING LAMP		Warning lamp is turned on: ON Warning lamp is turned off: OFF
BATTERY VOLT		Power supply voltage for control unit

ACTIVE TEST MODE

TEST ITEM	CONDITION	JUDGMENT
FR RH SOLENOID FR LH SOLENOID RR RH SOLENOID RR LH SOLENOID	Ignition switch is turned ON.	Brake fluid pressure control operation IN SOL / OUT SOL UP (Increase): OFF / OFF KEEP (Hold): ON / OFF DOWN (Decrease): ON / ON
ABS MOTOR		ABS actuator motor ON: Motor runs OFF: Motor stops

Note: Active test will automatically stop ten seconds after the test starts. (TEST IS STOPPED monitor shows ON.)

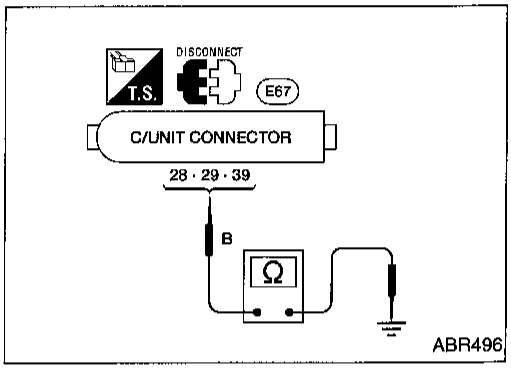


Ground Circuit Check

ACTUATOR MOTOR GROUND

- Check resistance between actuator motor ground terminal and body ground.

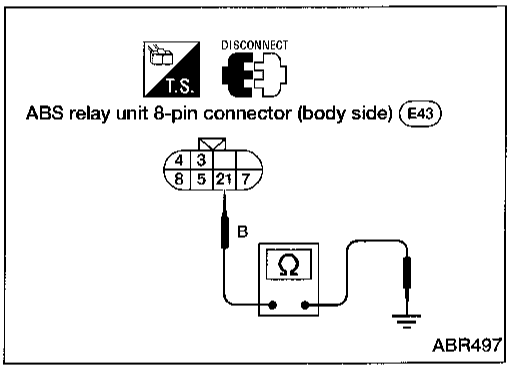
Resistance: approximately 0Ω



CONTROL UNIT GROUND

- Check resistance between the terminals and ground.

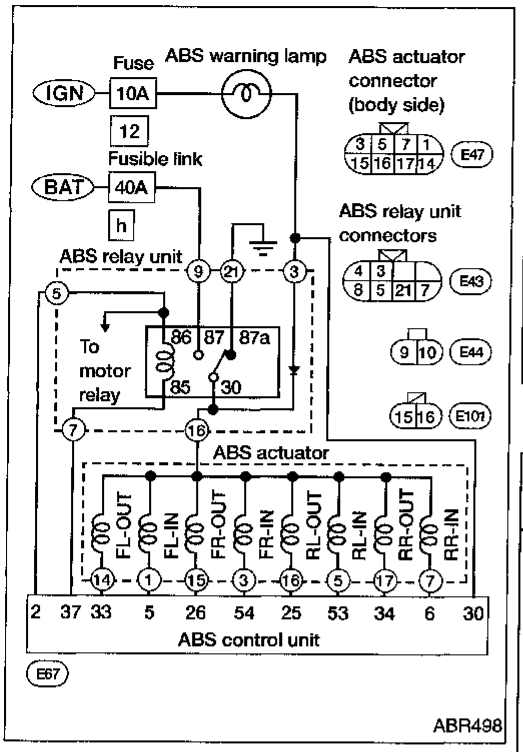
Resistance: approximately 0Ω

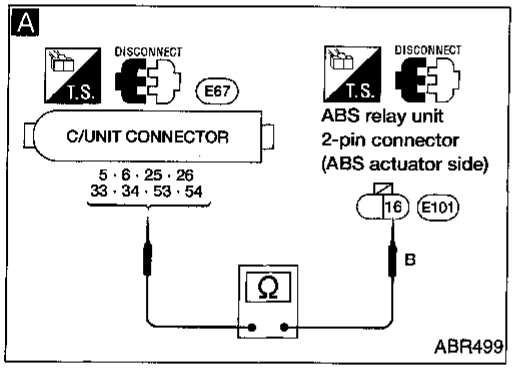


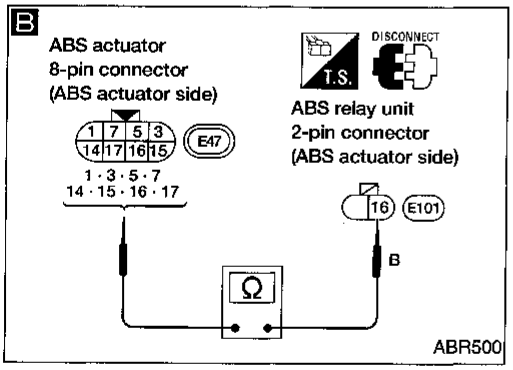
ABS RELAY UNIT GROUND

- Check resistance between ABS relay unit harness 8-pin connector (body side) terminal ㉑ and ground.

Resistance: approximately 0Ω







Diagnostic Procedure 1 (ABS actuator solenoid valve)

Malfunction code No. 41, 45, 51, 55, 42, 46, 52, 56

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

No → Inspection end

Yes ↓

A

ABS ACTUATOR SOLENOID VALVE CHECK

OK → Ⓐ (Go to next page.)

1. Disconnect connectors from control unit and ABS actuator.
2. Check resistance between control unit connector terminals and ABS relay unit 2-pin connector (E101) (ABS actuator side) terminals.

Code No.	Control unit	ABS actuator	Resistance
41	26	16	3.1 - 6.2Ω
45	33	16	
51	34	16	
55	25	16	
42	54	16	6.2 - 12.3Ω
46	5	16	
52	6	16	
56	53	16	

NG ↓

B

OK →

1. Disconnect ABS actuator 8-pin connector.
2. Check resistance between ABS actuator 8-pin connector (E47) (ABS actuator side) terminals and ABS relay unit 2-pin connector (E101) (ABS actuator side) terminals.

Code No.	ABS actuator		Resistance
41	15	16	3.1 - 6.2Ω
45	14	16	
51	17	16	
55	16	16	
42	3	16	6.2 - 12.3Ω
46	1	16	
52	7	16	
56	5	16	

Check the following:
- Harness connectors (E47), (E101)
- Harness for open or short between actuator connector and control unit
- Harness for open or short between actuator 8-pin connector and relay unit 2-pin connector

If NG, repair harness or connectors.

NG ↓

Ⓑ

Diagnostic Procedure 1 (ABS actuator solenoid valve) (Cont'd)

Ⓑ

Check resistance between ABS actuator 8-pin connector terminals ①, ③, ⑤, ⑦, ⑭, ⑮, ⑯, ⑰.

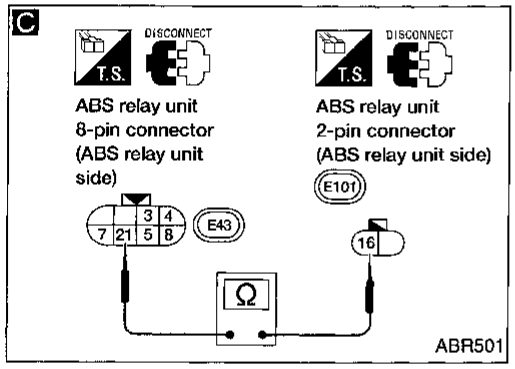
ABS actuator				Resistance
OUT solenoid valve		⑭	⑮, ⑯, ⑰	6.2 - 12.4Ω
		⑮	⑯, ⑰	
		⑯	⑰	
Solenoid valve	IN	①, ③, ⑤, ⑦	—	9.3 - 18.5Ω
	OUT	—	⑭, ⑮, ⑯, ⑰	
IN solenoid valve		①	③, ⑤, ⑦	12.4 - 24.6Ω
		③	⑤, ⑦	
		⑤	⑦	

OK → Check the following.
- Harness connectors E47, E101
- Harness for open or short between actuator connector and control unit
- Harness for open or short between actuator 8-pin connector and relay unit 2-pin connector

If NG, repair harness or connectors.

NG → Replace ABS actuator.

Ⓒ



Ⓐ

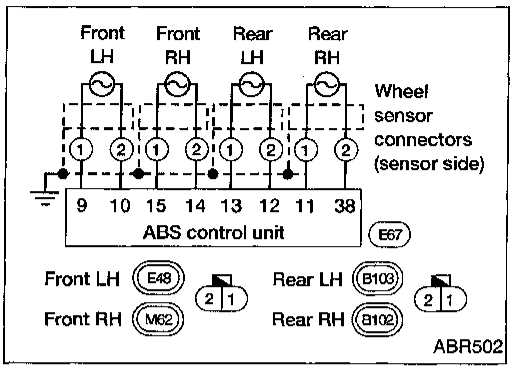
Ⓒ

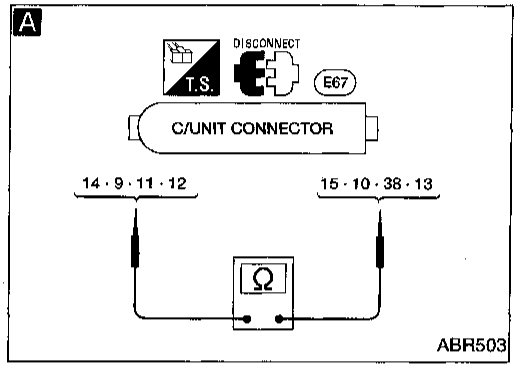
1. Disconnect ABS relay unit connectors.
2. Check continuity between ABS relay unit 2-pin connector E101 (ABS relay unit side) terminal ⑯ and ABS relay unit 8-pin connector E43 (ABS relay unit side) terminal ㉑.

Continuity should exist.

NG → Replace ABS relay unit.

OK → Go to Diagnostic Procedure 4, BR-69.





Diagnostic Procedure 2 (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 of malfunction code No. Check terminals for damage or loose connections. Then reconnect connectors.
2. Carry out self-diagnosis again.
   Does warning lamp activate again?

No → Inspection end

Yes ↓

A

WHEEL SENSOR ELECTRICAL CHECK

OK → Ⓐ (See next page.)

1. Disconnect control unit connector.
2. Check resistance between control unit connector terminals.
   Code No. 21 or 22 (Front RH wheel)
   Terminals ⑭ and ⑮
   Code No. 25 or 26 (Front LH wheel)
   Terminals ⑨ and ⑩
   Code No. 31 or 32 (Rear RH wheel)
   Terminals ⑪ and ㊳
   Code No. 35 or 36 (Rear LH wheel)
   Terminals ⑫ and ⑬
   Resistance: 0.6 - 3.25 kΩ

NG ↓

Note

CHECK WHEEL SENSOR.

Refer to Wheel sensor in COMPONENT INSPECTION, BR-65.

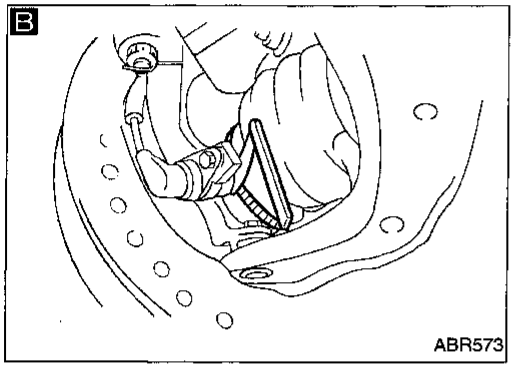
NG → Note: Replace wheel sensor.

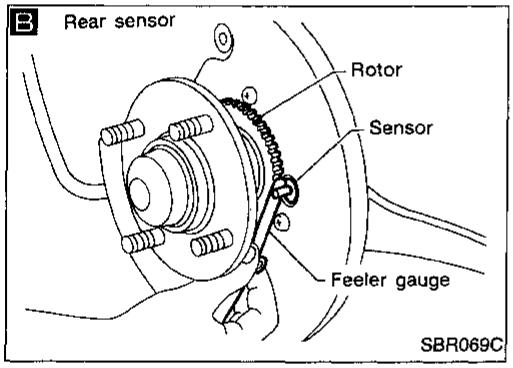
OK ↓

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).

Diagnostic Procedure 2 (Wheel sensor or rotor) (Cont'd)





Ⓐ

Note
WHEEL SENSOR MECHANICAL CHECK
Check for inflation pressure, wear and size of each tire.

NG → Note: Adjust tire pressure or replace tire(s).

OK

Note
Check wheel bearing axial end play.

OK

B Note
Check clearance between sensor and rotor.
Clearance:
Front
0.6 - 1.6 mm
(0.0236 - 0.0630 in)
Rear
disc 0.43 - 1.45 mm
(0.0169 - 0.0571 in)
drum 0.22 - 1.25 mm
(0.0087 - 0.0492 in)

NG → Note: Clean sensor fixing portion, or replace sensor.

OK

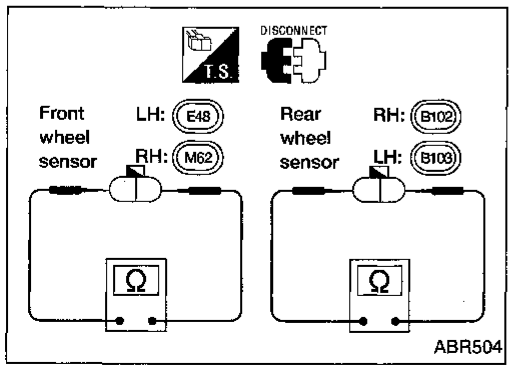
Note
Check sensor rotor for teeth damage.

NG → Note: Replace sensor rotor. Refer to FA section for front sensor rotor. Refer to RA section for rear sensor rotor.

OK

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

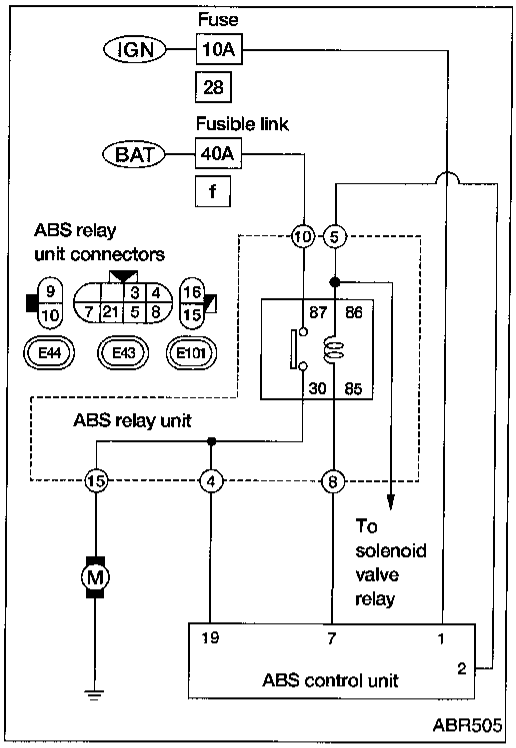
Note: Wheel position should be distinguished by code No. except code No. 18 (sensor rotor).

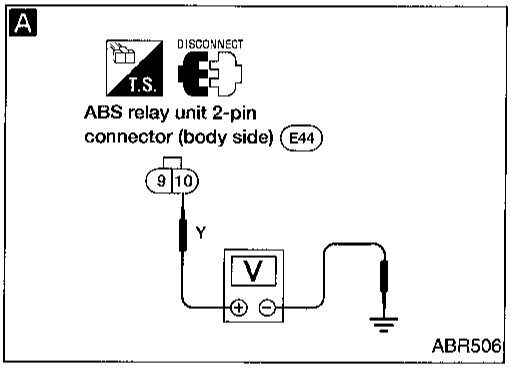


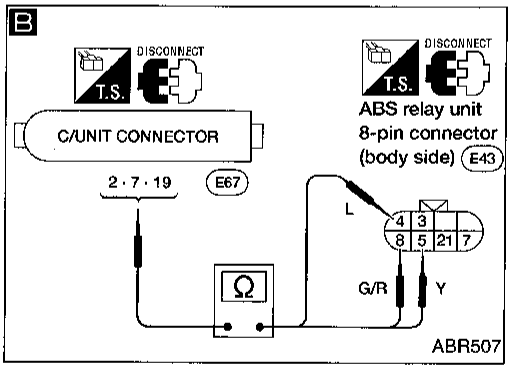
COMPONENT INSPECTION

Wheel sensor

Check resistance for each sensor.
Resistance: 0.6 - 3.25 kΩ







Diagnostic Procedure 3 (Motor relay or motor)

Malfunction code No. 61

MOTOR POWER SUPPLY CIRCUIT

Check 40A fusible link [f] for ABS relay unit. For fusible link layout, refer to POWER SUPPLY ROUTING in EL section.

NG → Ⓑ (Skip page.)

OK ↓

Check 10A fuse [28]. For fuse layout, refer to POWER SUPPLY ROUTING in EL section.

NG → Ⓒ (See next page.)

OK ↓

1. Disconnect connectors from control unit and ABS relay unit. 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 ↓

Ⓐ

1. Disconnect ABS relay unit 2-pin connector (E44).
2. Check voltage between connector (body side) terminal ⑩ and ground.
   Battery voltage should exist.

NG → Check the following.
- Harness connector (E44)
- Harness for open or short between ABS relay unit and fuse

If NG, repair harness or connectors.

OK ↓

Ⓑ

CIRCUIT CHECK

1. Disconnect ABS relay unit 8-pin connector (E43) and control unit connector (E67).
2. Check continuity between control unit connector terminals and ABS relay unit 8-pin connector (E43) (body side) terminals.

Control unit	ABS relay unit
⑦	⑧
⑲	④
②	⑤

Continuity should exist.

NG → Check the following.
- Harness connectors (E67), (E43)
- Harness for open or short between ABS relay unit (body side) and control unit

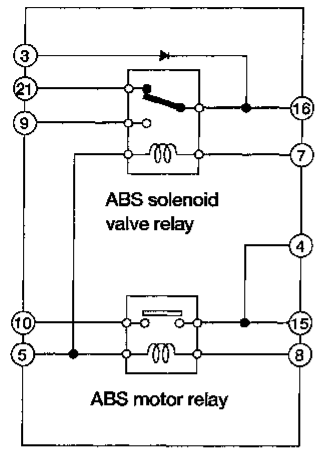
If NG, repair harness or connectors.

OK ↓

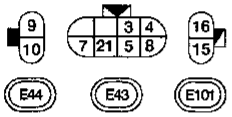
Ⓐ
(Go to next page.)

Diagnostic Procedure 3 (Motor relay or motor) (Cont'd)

C ABS motor relay and solenoid valve relay (Built into ABS relay unit)

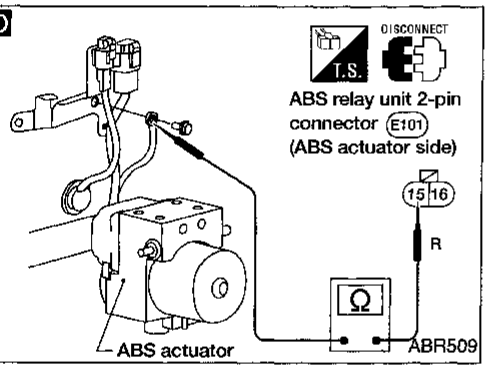


ABS relay unit connector (ABS relay unit side)



ABR508

D

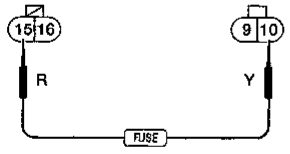


ABR509

E

ABS relay unit 2-pin connector E101 (ABS actuator side)

ABS relay unit 2-pin connector E44 (body side)



ABR510

Ⓐ

C

MOTOR RELAY CHECK — NG → Replace ABS relay unit.

Relay type		ABS motor relay
Condition		Continuity existence between terminals ④ or ⑮ and ⑩
Battery voltage not applied between each terminal	⑤ and ⑧	No
Battery voltage applied between each terminal	⑤ and ⑧	Yes
Check resistance between each terminal	⑤ and ⑧	70.8 - 157.8Ω

OK ↓

ACTUATOR MOTOR GROUND CHECK — NG → Repair harness and terminals.

Refer to ACTUATOR MOTOR GROUND in Ground Circuit Check, BR-61.

OK ↓

D

1. Disconnect actuator motor ground.
2. Check continuity between ABS relay unit 2-pin connector (E101) (ABS actuator side), terminal ⑮ and actuator motor ground.

Continuity should exist. — NG → Repair harness and connectors.

OK ↓

E

MOTOR CHECK — NG → Repair ABS actuator.

1. Disconnect ABS relay unit 2-pin connector (E44) and ABS relay unit 2-pin connector (E101).
2. Connect suitable wire between ABS relay unit 2-pin connector (body side) terminal ⑩ and ABS relay unit 2-pin connector (ABS actuator side) terminal ⑮.

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

OK ↓

Go to Diagnostic Prodecure 5, BR-72.

Ⓒ

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

Yes → Check the following:
- Harness connector (E67)
- Harness for open or short between ABS control unit connector and fuse

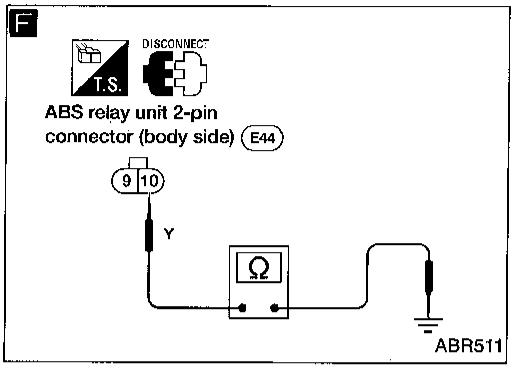
If NG, repair harness or connectors.

No ↓

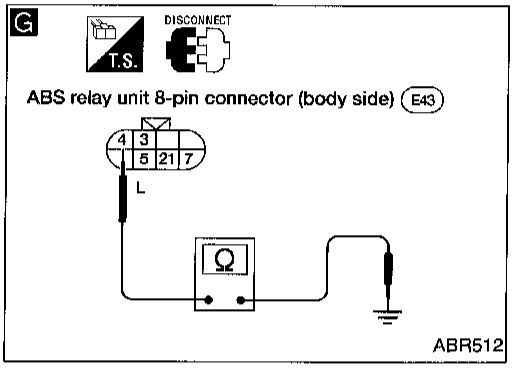
Inspection end.

Diagnostic Procedure 3 (Motor relay or motor) (Cont'd)

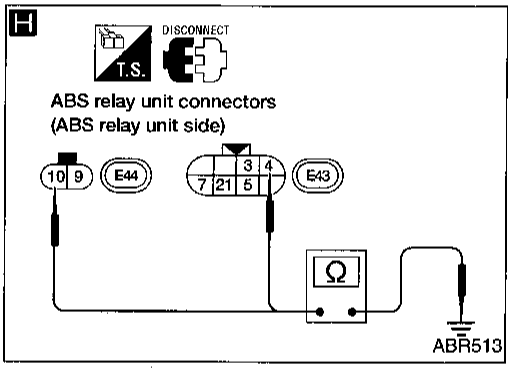
F



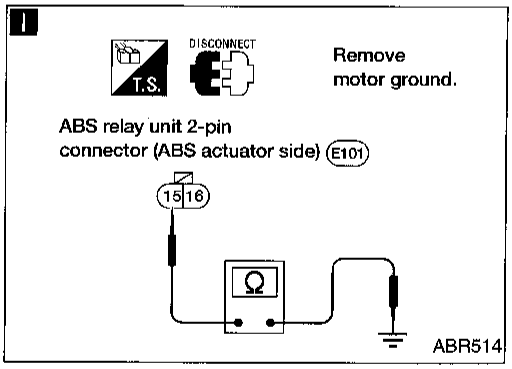
G



H



I



Ⓑ

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

No → Inspection end.

Yes

F

MOTOR POWER SUPPLY CIRCUIT

1. Disconnect battery cable and ABS relay unit 2-pin connector E44 .
2. Check continuity between ABS relay unit 2-pin connector E44 (body side) terminal 10 and ground.

Continuity should not exist.

NG → Check the following:
- Harness connector E44
- Harness for open or short between ABS relay unit and fuse

If NG, repair harness or connectors.

OK

G

1. Disconnect ABS relay unit 8-pin connector and control unit connector.
2. Check continuity between ABS relay unit 8-pin connector E43 (body side) terminal 4 and ground.

Continuity should not exist.

NG → Check the following:
- Harness connectors E67 , E43
- Harness for open or short between ABS relay unit (body side) and control unit

If NG, repair harness or connectors.

OK

H

Check continuity between ABS relay unit 8-pin connector E43 (ABS relay unit side) terminal 4 and ground, 2-pin connector E44 (ABS relay unit side) terminal 10 and ground.

Continuity should not exist.

NG → Replace ABS relay unit.

OK

I

1. Remove motor ground.
2. Check continuity between ABS relay unit 2-pin connector E101 (ABS actuator side) terminal 15 and ground.

Continuity should not exist.

NG → Replace ABS actuator.

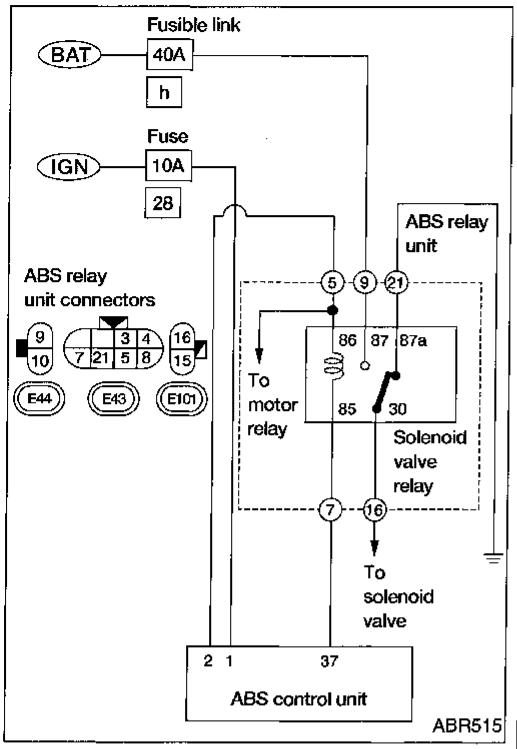
OK

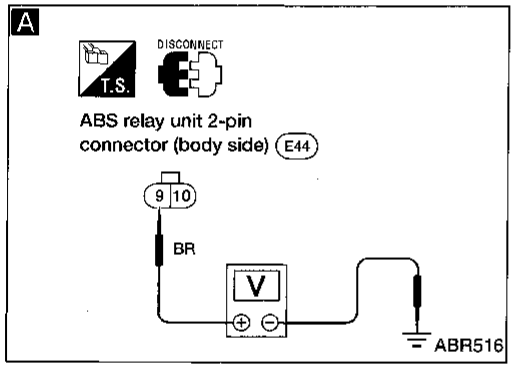
MOTOR CHECK

Go to E in Diagnostic Procedure 3 (preceding page).

OK

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





Diagnostic Procedure 4 (Solenoid valve relay)

Malfunction code No. 63

SOLENOID VALVE POWER SUPPLY

Check 40A fusible link [h]. For fusible link layout, refer to POWER SUPPLY ROUTING in EL section.

NG → Ⓐ (Skip page.)

OK ↓

Check 10A fuse [28]. For fuse layout, refer to POWER SUPPLY ROUTING in EL section.

NG → Ⓑ (Skip page.)

OK ↓

1. Disconnect connectors from control unit and ABS relay unit. 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 ↓

GROUND CIRCUIT CHECK

Refer to CONTROL UNIT GROUND and ABS RELAY UNIT GROUND in Ground Circuit Check, BR-61.

NG → Repair harness and connectors.

OK ↓

A

SOLENOID VALVE POWER SUPPLY CHECK

1. Disconnect connectors from ABS relay unit.
2. Check voltage between ABS relay unit 2-pin connector (E44) (body side) terminal (9) and ground.

Battery voltage should exist.

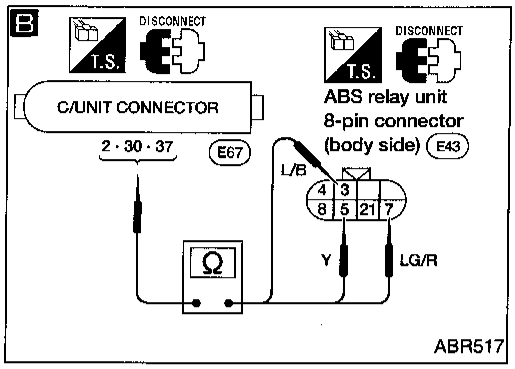
NG → Check the following:
- Harness connector (E44)
- Harness for open or short between ABS relay unit and fuse

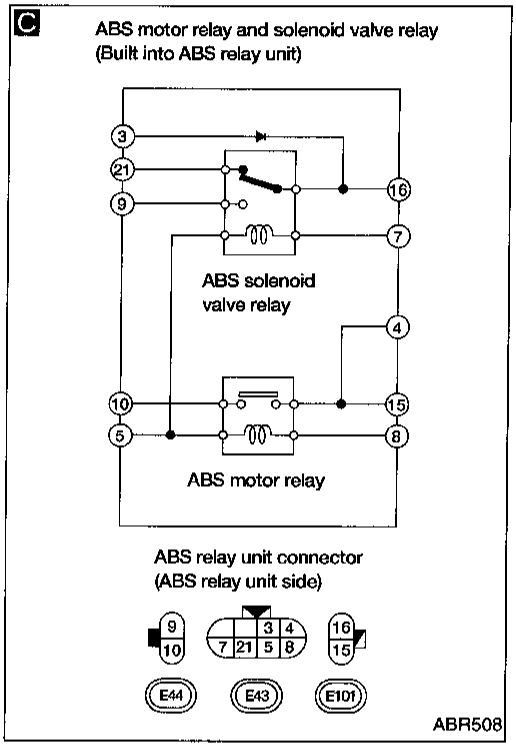
If NG, repair harness or connectors.

OK ↓

Ⓒ

Diagnostic Procedure 4 (Solenoid valve relay) (Cont'd)





Ⓒ

B

CIRCUIT CHECK

1. Disconnect ABS relay unit 8-pin connector E43 and control unit connector E67 .
2. Check continuity between control unit connector terminals and ABS relay unit 8-pin connector E43 (body side) terminals.

Control unit	ABS relay unit
37	7
2	5
30	3

Continuity should exist.

NG → Check the following.
- Harness connectors E67 , E43
- Harness for open or short between ABS relay unit 8-pin connector (body side) and control unit

If NG, repair harness or connectors.

OK ↓

C

SOLENOID VALVE RELAY CHECK

Relay type		Solenoid valve relay
Condition		Continuity existence between terminals 16 and 21
Battery voltage not applied between each terminal	5 and 7	Yes
Battery voltage applied between each terminal	5 and 7	No
Check resistance between each terminal	5 and 7	70.8 - 157.8Ω

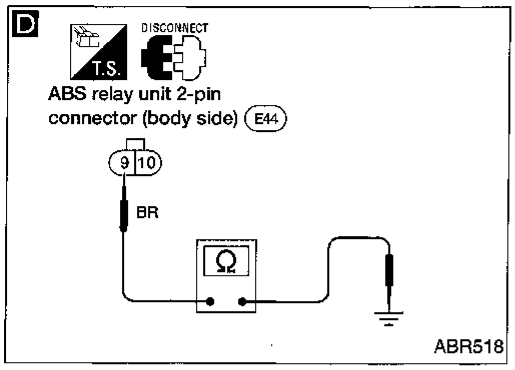
NG → Replace ABS relay unit.

OK ↓

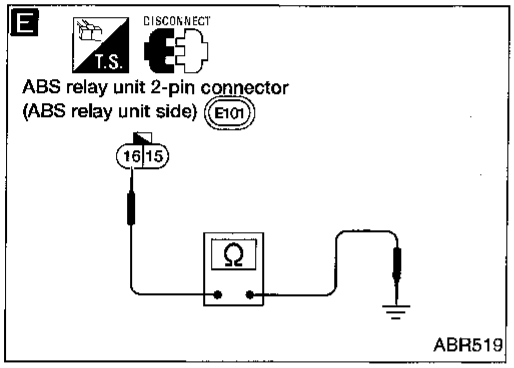
Go to Diagnostic Procedure 1, BR-62

Diagnostic Procedure 4 (Solenoid valve relay) (Cont'd)

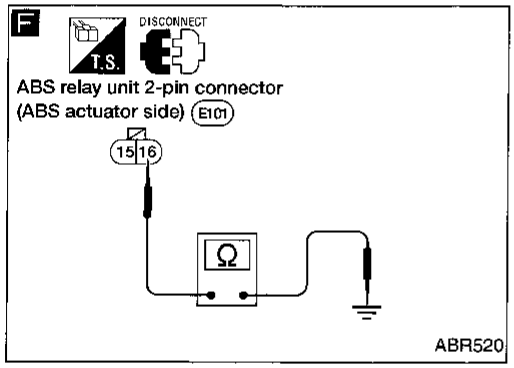
D



E



F



Ⓐ

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 unit 2-pin connector E44 .
2. Check continuity between ABS relay unit 2-pin connctor E44 (body side) terminal 9 and ground.
Continuity should not exist.

NG → Check the following:
- Harness connector E44
- Harness for open or short between ABS relay unit and fuse

If NG, repair harness or connectors.

OK

E

1. Disconnect ABS relay unit 8-pin connector E43 and 2-pin connector E101 .
2. Check continuity between ABS relay unit 2-pin connector E101 (ABS relay unit side) terminal 16 and ground.
Continuity should not exist.

NG → Replace ABS relay unit.

OK

F

Check continuity between ABS relay unit 2-pin connector E101 (ABS actuator side) terminal 16 and ground.
Continuity should not exist.

NG → Replace ABS actuator.

OK

Go to Diagnostic Procedure 1, BR-62

Ⓑ

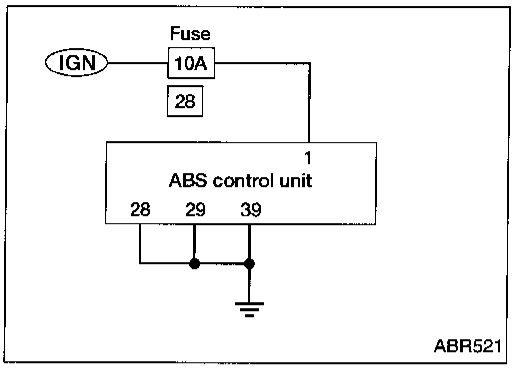
Replace fuse.
Does the fuse blow out when ignition switch is turned ON?

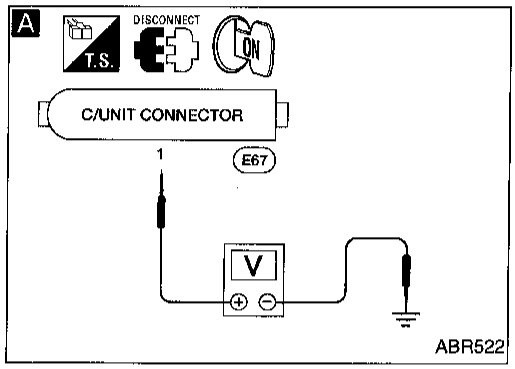
Yes → Check the following:
- Harness connector E67
- Harness for open or short between ABS control unit connector and fuse

If NG, repair harness or connectors.

No

Inspection end





Diagnostic Procedure 5 (Low voltage)

Malfunction code No. 57

1. Disconnect control unit connectors. Check terminals for damage or loose connections. 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 E67 terminal ① and ground.
   Battery voltage should exist when ignition switch is turned ON.

NG → Ⓐ (See below.)

OK

CONTROL UNIT GROUND CHECK

Refer to CONTROL UNIT GROUND in Ground Circuit Check, BR-61.

NG → Check the following:
- Harness connector E67
- Harness for open or short between control unit and fuse

If NG, repair harness or connectors.

OK

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

Ⓐ

Check 10A fuse 28. Refer to POWER SUPPLY ROUTING in EL section.

NG → Replace fuse.

OK

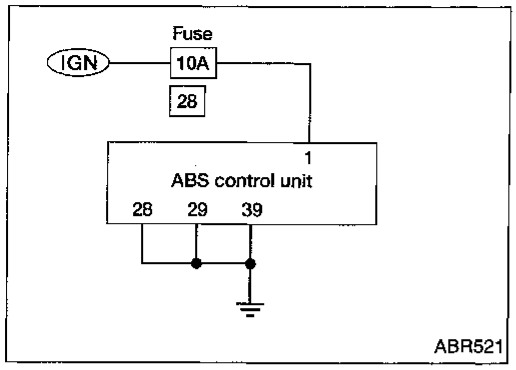
Check continuity between battery and control unit connector terminal ①.

NG → Check the following:
- Harness connector E67
- Harness for open or short between control unit and fuse

If NG, repair harness or connectors.

OK

Check battery. Refer to BATTERY in EL section.



Diagnostic Procedure 6 (Control unit)

Malfunction code No. 71

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

No → Inspection end.

Yes ↓

CONTROL UNIT POWER SUPPLY CHECK

Check voltage. Refer to A in Diagnostic Procedure 5, BR-72.

↓

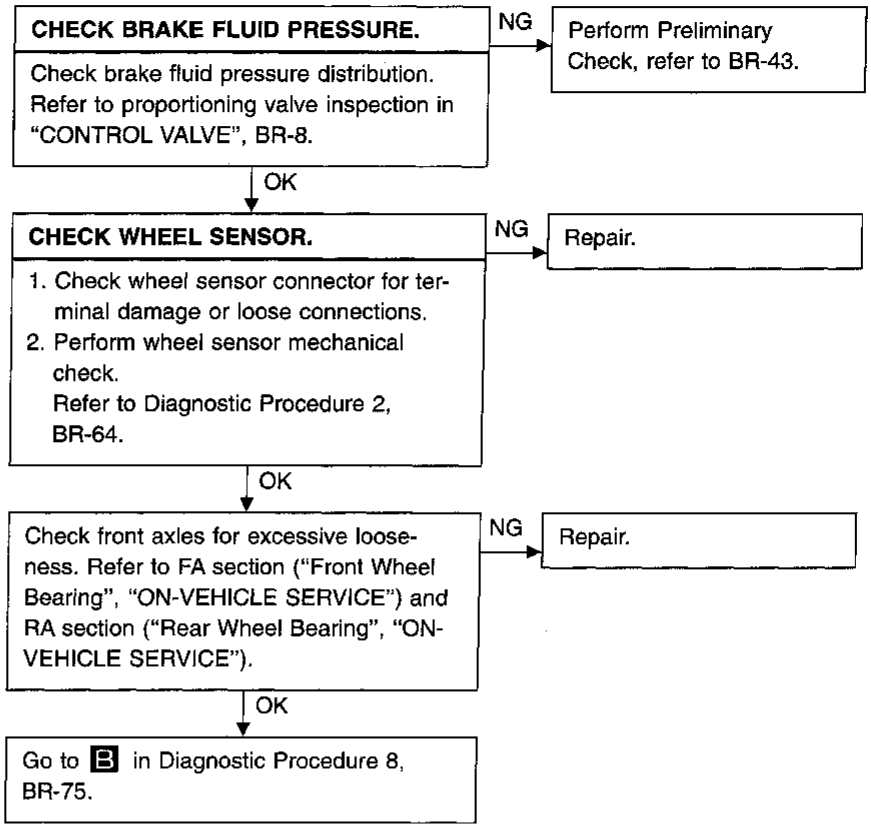
Does warning lamp indicate code No. 71 again?

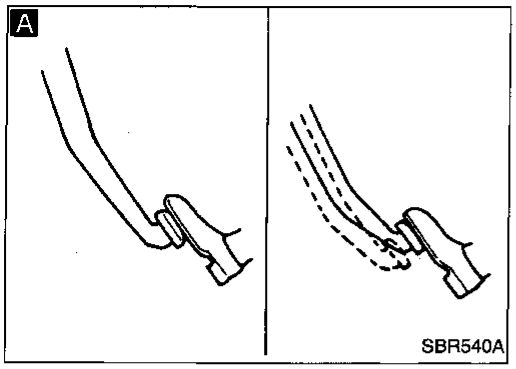
Yes → Replace control unit.

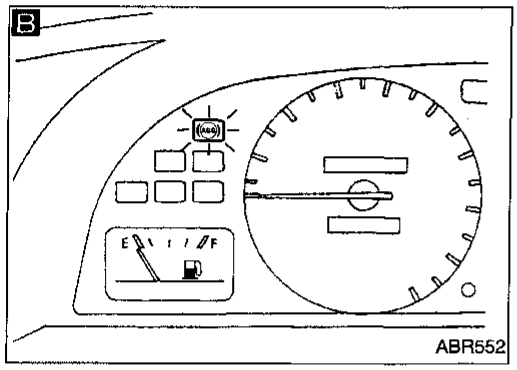
No ↓

Inspect the system according to the code No.

Diagnostic Procedure 7 (ABS works frequently.)







Diagnostic Procedure 8 (Unexpected pedal action)

A

Check brake pedal stroke. Is stroke excessively large? — Yes → Perform Preliminary Check, refer to BR-43.

No ↓

Disconnect ABS relay unit 8-pin connector and check whether brake is effective. — No → Perform Preliminary Check, refer to BR-43.

Yes ↓

B

Ensure warning lamp remains off while driving. — NG → Carry out Self-diagnosis. Refer to BR-52.

OK ↓

CHECK WHEEL SENSOR. — NG → Repair.

1. Check wheel sensor connector for terminal damage or loose connection.
2. Perform wheel sensor mechanical check.
   Refer to Diagnostic Procedure 2, BR-64.

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 9 (Long stopping distance)

Disconnect ABS relay unit 8-pin connector and check whether stopping distance is still long. — No → Go to B in Diagnostic Procedure 8, on this page.

Yes ↓

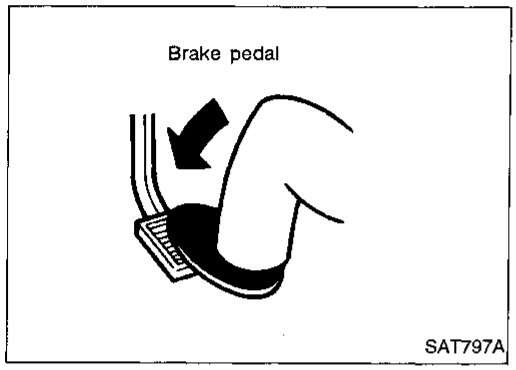
Perform Preliminary Check and air bleeding. Refer to BR-5.

Note: Stopping distance may be larger than vehicles without ABS when road condition is slippery.

Diagnostic Procedure 10 (ABS does not work)

Does the ABS warning lamp activate?
- Yes → Carry out self-diagnosis. Refer to BR-52.
- No → Go to B in Diagnostic Procedure 8, BR-75.

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



Diagnostic Procedure 11 (Pedal vibration and noise)

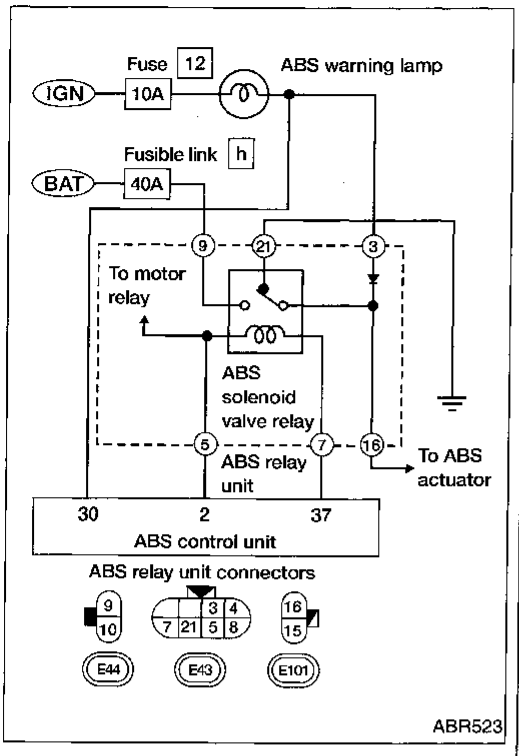
1. Apply brake.
2. Start engine.
3. Does the symptom appear only when engine is started?
   - Yes → Carry out self-diagnosis. Refer to BR-52.
   - No ↓

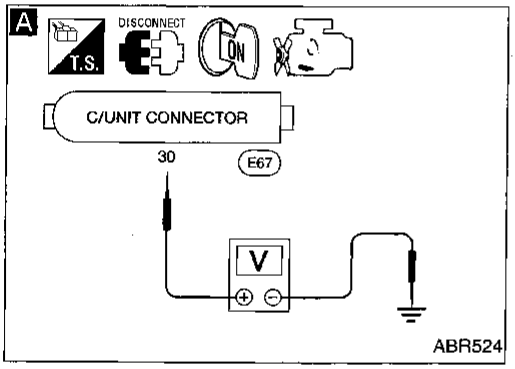
Does the symptom appear when electrical equipment switches (such as headlamps) are operated?
- No → Go to B in Diagnostic Procedure 8, BR-75.
- Yes ↓

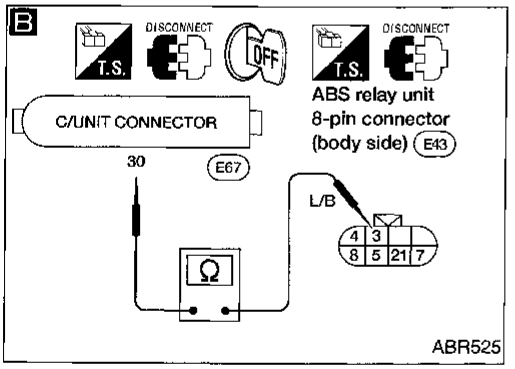
Check wheel sensor shield ground. For location of shield ground, refer to wiring diagram and "HARNESS LAYOUT" in EL section.
- NG → Repair.
- OK ↓

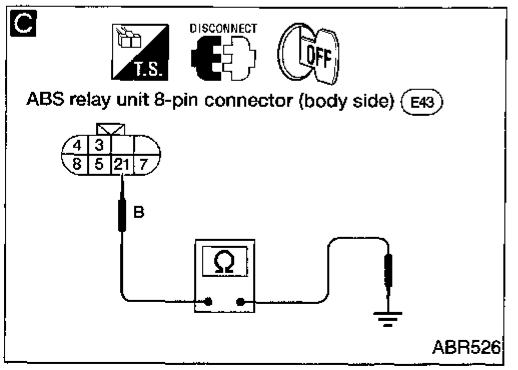
Check control unit pin terminals for damage or the connection of control unit harness connector.
Reconnect control unit harness connector.
Then retest.

Note: ABS may operate and cause vibration under the following conditions:
- **Applying brake gradually when shifting or operating clutch.**
- **Low-friction (slippery) road.**
- **High speed cornering.**
- **Driving over bumps and pot holes.**
- **Engine speed is over 5,000 rpm with vehicle stopped.**









Diagnostic Procedure 12 (Warning lamp does not come on when ignition switch is turned ON.)

WARNING LAMP CIRCUIT CHECK

Check 10A fuse 12 for warning lamp. For fuse layout, refer to POWER SUPPLY ROUTING in EL section.

NG → Replace fuse.

OK ↓

A

1. Install 10A fuse.
2. Disconnect connectors from control unit and ABS relay unit.
3. Check voltage between control unit connector E67 terminal 30 and ground after turning ignition switch ON.
   Battery voltage should exist after turning ignition switch ON.

NG → Check warning lamp bulb.

NG → Replace bulb

OK → Repair harness and connectors between battery and control unit connector E67 terminal 30 (including combination meter).

OK ↓

B

1. Turn ignition switch OFF. Disconnect ABS relay unit 8-pin connector E43.
2. Check continuity between control unit connector E67 terminal 30 and ABS relay unit 8-pin connector E43 (body side) terminal 3.
   Continuity should exist.

NG → Repair harness and connectors between control unit and ABS relay unit.

OK ↓

C

1. Disconnect ABS relay unit 8-pin connector E43.
2. Check continuity between ABS relay unit harness 8-pin connector E43 (body side) terminal 21 and ground.
   Continuity should exist.

NG → Repair harness and connectors.

OK ↓

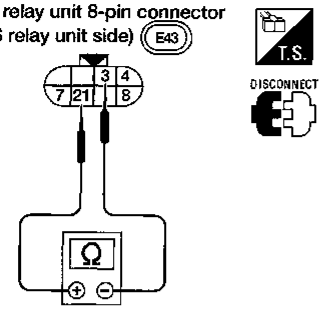
Ⓐ

(Go to next page.)

Diagnostic Procedure 12 (Warning lamp does not come on when ignition switch is turned ON.) (Cont'd)

D

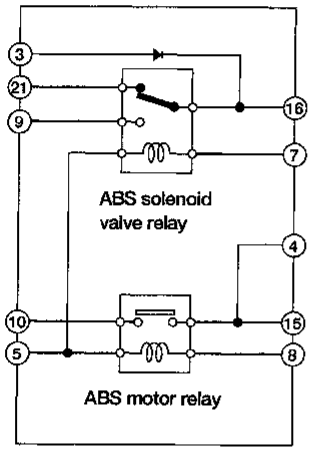
ABS relay unit 8-pin connector (ABS relay unit side) E43



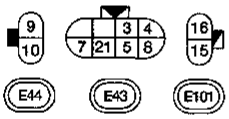
ABR527

E

ABS motor relay and solenoid valve relay (Built into ABS relay unit)



ABS relay unit connector (ABS relay unit side)



ABR508

Ⓐ

D

1. Disconnect ABS relay unit 8-pin connector E43 .
2. Check continuity between ABS relay unit 8-pin connector E43 (ABS relay unit side) terminals ③ ⊕ and ㉑ ⊖
   Continuity should exist.

Note: Pay attention to tester polarity*.

NG → Replace ABS relay unit.

OK ↓

CONTROL UNIT POWER SUPPLY CIRCUIT.

Go to A in Diagnostic Procedure 13, BR-79.

NG → Repair harness and connectors.

OK ↓

E

CHECK SOLENOID VALVE RELAY

NG → Replace ABS relay unit.

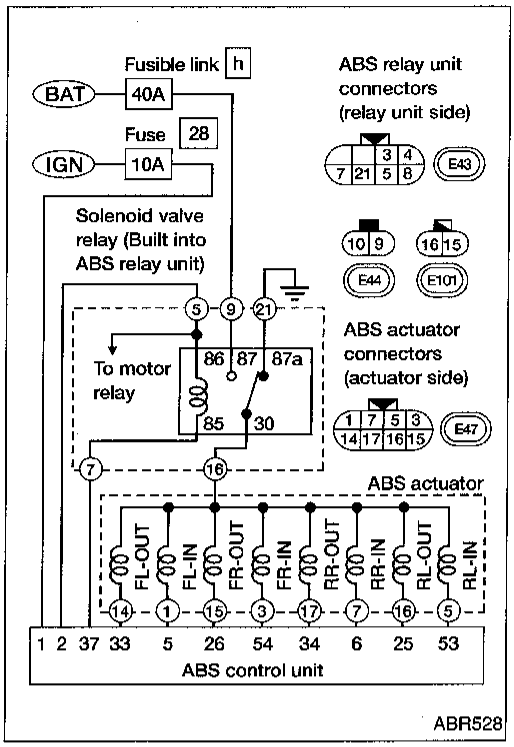
Relay type		Solenoid valve relay only
Condition		Continuity exists between terminals ③ or ⑯ and ㉑
Battery voltage not applied between each terminal	⑤ and ⑦	Yes
Battery voltage applied between each terminal	⑤ and ⑦	No
Check resistance between each terminal	⑤ and ⑦	70.8 - 157.8Ω

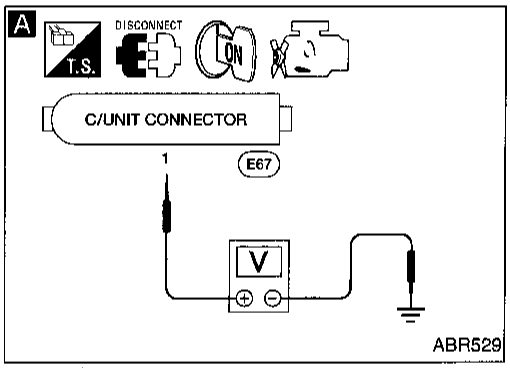
Note: Pay attention to tester polarity*.

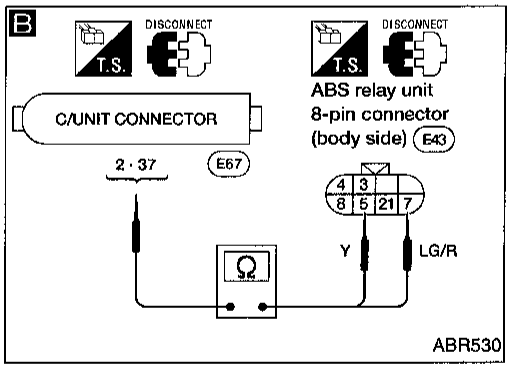
OK ↓

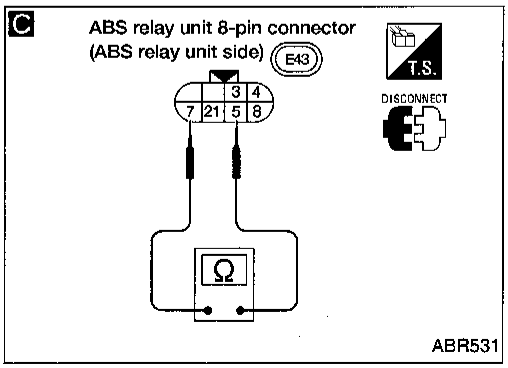
Go to Diagnostic Procedures 5, BR-72.

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









Diagnostic Procedure 13 (Warning lamp stays on when ignition switch is turned ON.)

CONTROL UNIT POWER SUPPLY CIRCUIT

Check 10A fuse 28 for control unit. For fuse layout, refer to POWER SUPPLY ROUTING in EL section.

NG → Ⓑ (Skip page.)

OK ↓

A

1. Disconnect connector E67 from control unit.
2. Check voltage between control unit connector E67 terminal ① and ground after turning ignition switch ON.

Battery voltage should exist.

NG → Check the following.
- Harness connector E67
- Harness for open or short between control unit and fuse

If NG, repair harness or connectors.

OK ↓

B

SOLENOID VALVE RELAY COIL POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF. Disconnect ABS relay unit 8-pin connector E43.
2. Check continuity between control unit connector E67 terminals and ABS relay unit 8-pin connector E43 (body side) terminals.

Control unit	ABS relay unit
②	⑤
㊲	⑦

Continuity should exist.

NG → Check the following.
- Harness connectors E67, E43
- Harness for open or short between control unit and ABS relay unit 8-pin connector

If NG, repair harness or connectors.

OK ↓

C

CIRCUIT CHECK

1. Disconnect ABS relay unit 8-pin connector E43.
2. Check continuity between ABS relay unit 8-pin connector E43 (ABS relay unit side) terminals ⑤ and ⑦.

Continuity should exist.

NG → Replace ABS relay unit.

OK ↓

SOLENOID VALVE RELAY CHECK

Go to E in Diagnostic Procedure 12 BR-78.

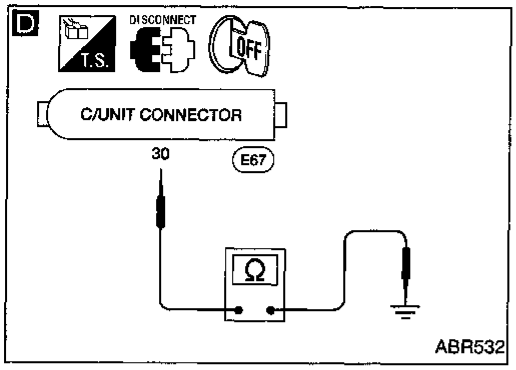
NG → Replace ABS relay unit.

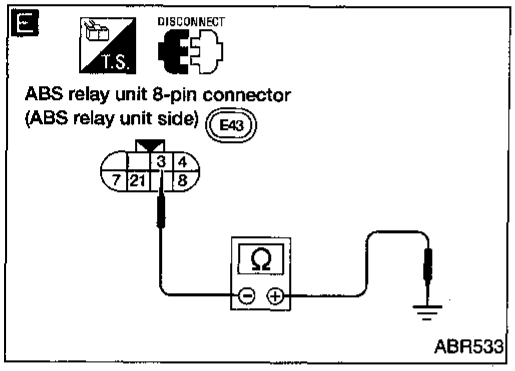
OK ↓

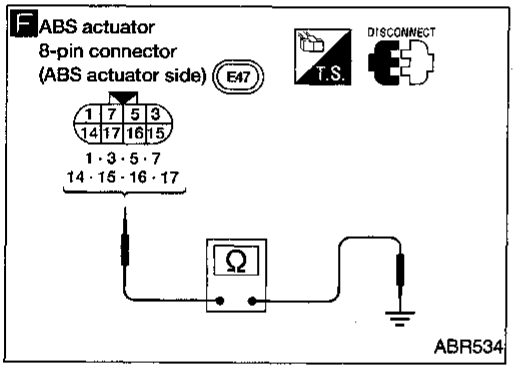
Ⓐ

(Go to next page.)

Diagnostic Procedure 13 (Warning lamp stays on when ignition switch is turned ON.) (Cont'd)







Ⓐ

D

GROUND-SHORT CHECK FOR WARNING LAMP CIRCUIT.

1. Turn ignition switch OFF.
2. Disconnect connectors from control unit and ABS relay unit 8-pin connector (E43).
3. Check continuity between control unit connector terminal (30) and ground.
   Continuity should not exist.

NG → Check the following:
- Harness connector (E67)
- Harness for open or short between control unit and fuse

If NG, repair harness or connectors.

OK ↓

E

1. Disconnect actuator ground terminal and ABS relay unit 8-pin connector (E43).
2. Check continuity between ABS relay unit 8-pin connector (E43) (ABS relay unit side) terminal (3) (+) and ground (-). **Continuity should not exist.**

Note: Pay attention to tester polarity*.

NG → Replace ABS relay unit.

OK ↓

F

SOLENOID VALVE CIRCUIT

1. Disconnect ABS actuator 8-pin connector (E47) and ABS relay unit 8-pin connector (E43).
2. Check continuity between each ABS actuator 8-pin connector (E47) (ABS actuator side) terminal and ground.
   Continuity should not exist.

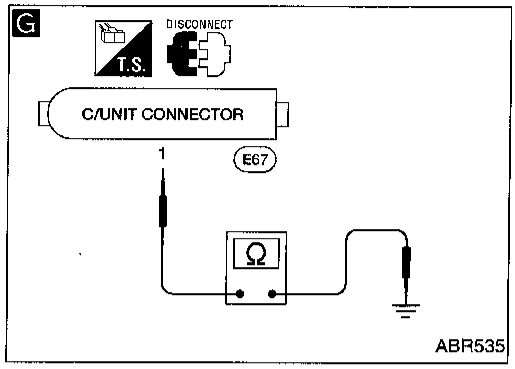
NG → Replace ABS actuator.

OK ↓

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

Diagnostic Procedure 13 (Warning lamp stays on when ignition switch is turned ON.) (Cont'd)



Ⓑ

Replace 10A fuse 28.
Does the fuse blow out when ignition switch is turned ON?

No → Inspection end.

Yes

G

CONTROL UNIT POWER SUPPLY CIRCUIT

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

NG → Check the following:
- Harness connector E67
- Harness for open or short between control unit and fuse

If NG, repair harness or connectors.

OK

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

General Specifications

Applied model	Except SE Model		SE Model	
	Without ABS	With ABS	Without ABS	With ABS
Front brake				
Brake model	CL25VB			
Cylinder bore diameter mm (in)	57.2 (2.252)			
Pad mm (in)				
Length x width x thickness	125.6 x 46.0 x 11.0 (4.94 x 1.811 x 0.433)			
Rotor outer diameter x thickness mm (in)	280 x 22 (11.02 x 0.87)			
Rear brake				
Brake model	LT23E		CL9HA	
Cylinder bore diameter mm (in)	19.05 (3/4)		33.96 (1.3370)	
Lining or pad mm (in)				
Length x width x thickness	219.4 x 35 x 4.3 (8.64 x 1.38 x 0.169)		89.1 x 39.5 x 10 (3.508 x 1.555 x 0.39)	
Drum inner diameter or rotor outer diameter x thickness mm (in)	228.6 (9)		258 x 9 (10.16 x 0.35)	

Applied model	Except SE Model		SE Model	
	Without ABS	With ABS	Without ABS	With ABS
Master cylinder	23.81	25.40	23.81	25.40
Cylinder bore diameter mm (in)	(15/16)	(1)	(15/16)	(1)
Control valve	Dual proportioning valve			
Valve model	built-in type	separated type	built-in type	separated type
Split point kPa (kg/cm^2, psi) x reducing ratio	1,961 (20, 284) x 0.2		2,942 (30, 427) x 0.2	
Brake booster				
Booster model	M215T			
Diaphragm diameter mm (in)	Primary: 230 (9.06) 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)
Maximum Out-of-round	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 comes on	1