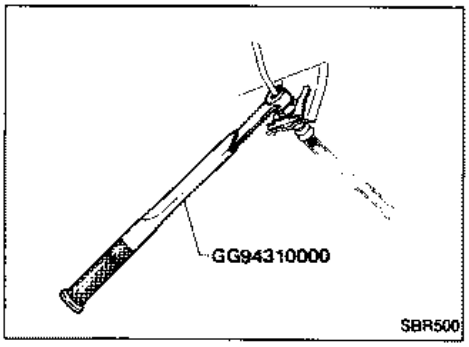
BRAKE SYSTEM

SECTION BR

CONTENTS

Precautions

- **Recommended fluid is brake fluid "DOT 3".**
- **Never reuse drained brake fluid.**
- **Be careful not to splash brake fluid on painted areas.**
- **To clean or wash all parts of master cylinder, disc brake caliper and wheel cylinder, use clean brake fluid.**
- **Never use mineral oils such as gasoline or kerosene. They will ruin rubber parts of hydraulic system.**



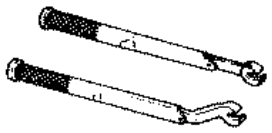
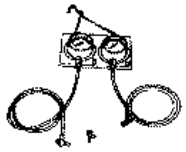
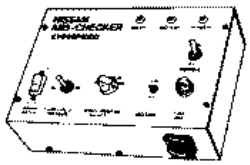
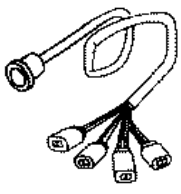
- **Use Tool when removing and installing brake tube.**

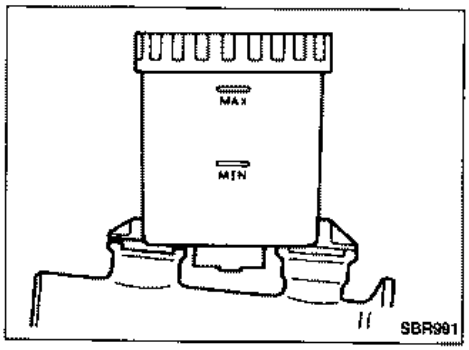
WARNING:

- **Clean brake pads and shoes with a waste cloth, then collect dust with a dust collector.**

Preparation

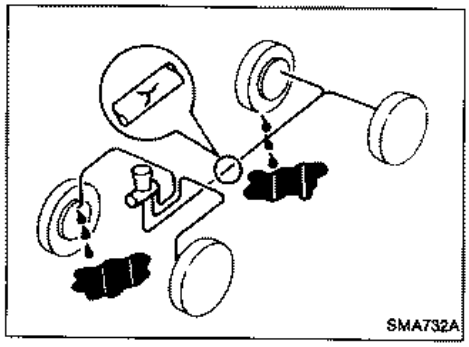
SPECIAL SERVICE TOOLS

Tool number Tool name	Description	
GG94310000 Flare nut torque wrench		Removing and installing each brake piping
KV991V0010 Brake fluid pressure gauge		Measuring brake fluid pressure
KV999P1000 A.B.S. checker		Checking brake fluid pressure of A.B.S. actuator
KV999P1020 A.B.S. checker adapter harness		Checking brake fluid pressure of A.B.S. actuator



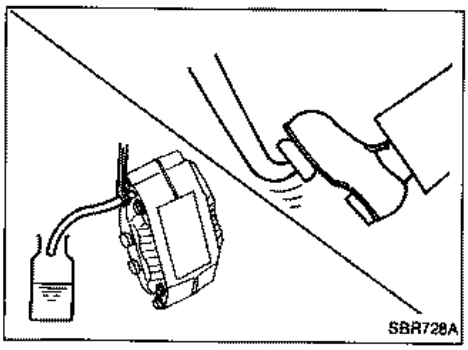
Checking Brake Fluid Level

- 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.



Checking Brake System

- Check brake lines (lines and flexible hoses) for cracks, deterioration or other damage. Replace any damaged parts.
  If leakage occurs around joints, retighten or, if necessary, replace damaged parts.
- Check for oil leakage by fully depressing brake pedal.

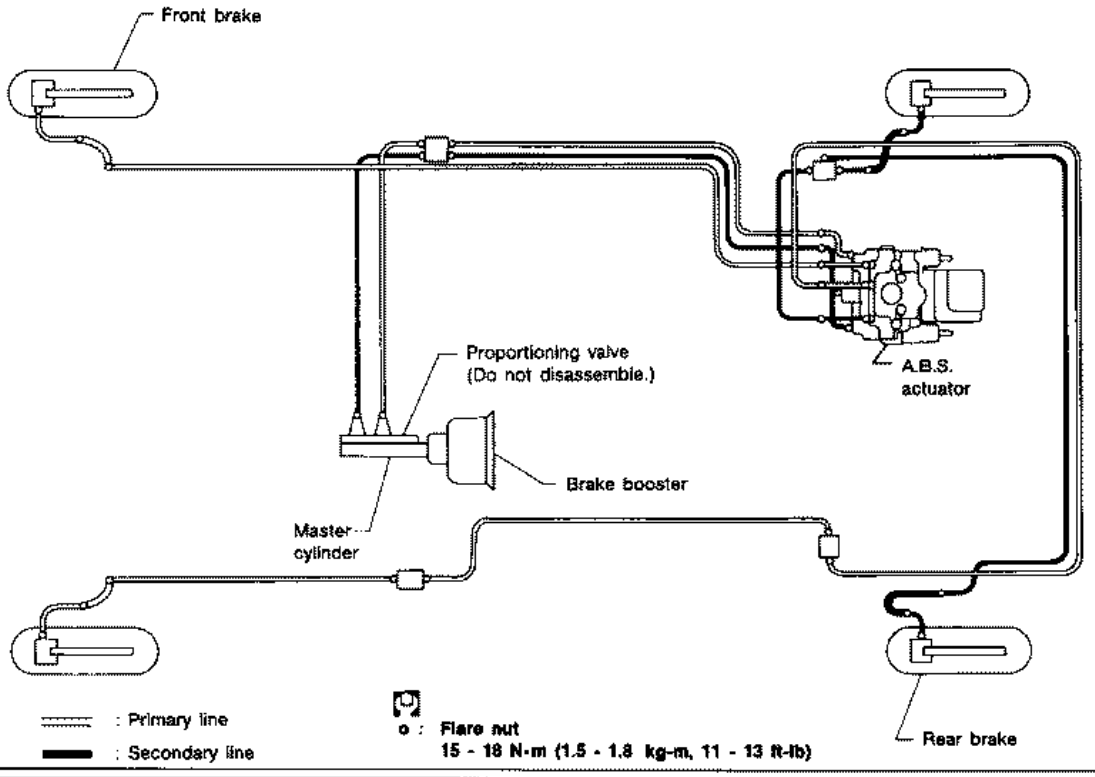


Changing Brake Fluid

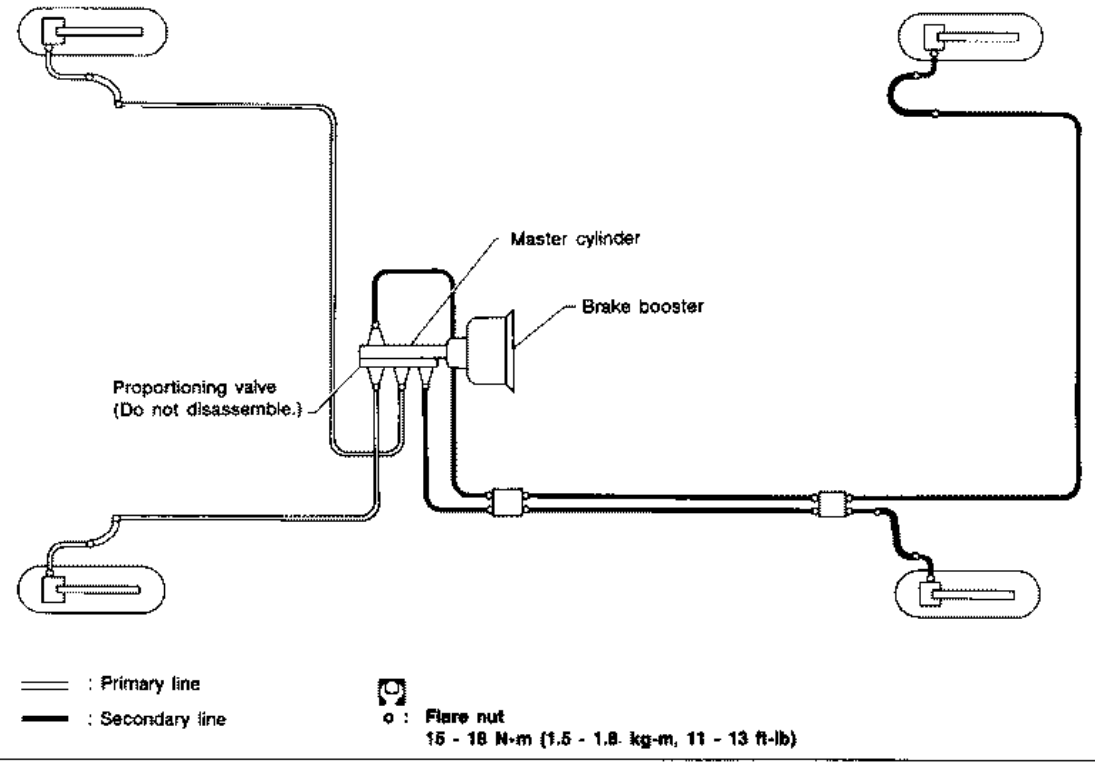
1. Drain brake fluid in each air bleeder valve.
2. Refill until new brake fluid comes out of each air bleeder valve.
   Use same procedure as in bleeding hydraulic system to refill brake fluid.
   Refer to Bleeding Procedure.

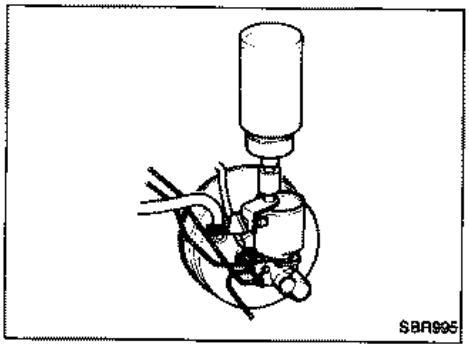
- **Refill with recommended brake fluid "DOT 3".**
- **Never reuse drained brake fluid.**
- **Be careful not to splash brake fluid on painted areas.**

Models with A.B.S.



Models without A.B.S.

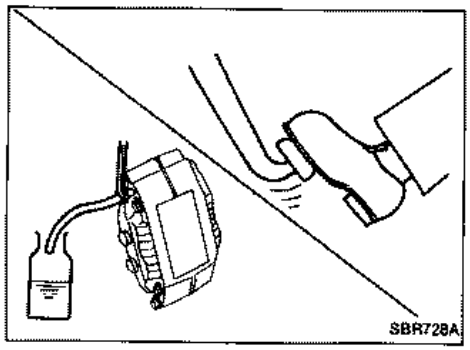




Bleeding Procedure

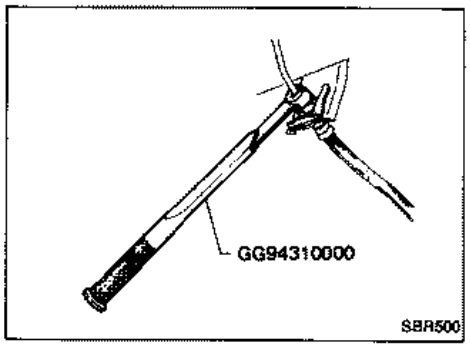
CAUTION:

- **Carefully monitor brake fluid level at master cylinder during bleeding operation.**
- **Fill reservoir with recommended brake fluid. Make sure it is full at all times while bleeding air out of system.**
- **Place a container beneath master cylinder to avoid spillage of brake fluid.**



- Bleed air according to the following procedure.
  Left rear caliper
  ↓
  Right rear caliper
  ↓
  Left front caliper
  ↓
  Right front caliper
  ↓
  Front side air bleeder on A.B.S. actuator (Models with A.B.S.)
  ↓
  Rear side air bleeder on A.B.S. actuator (Models with A.B.S.)
- **To bleed air out of lines, wheel cylinders and calipers, use the following procedure.**

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.



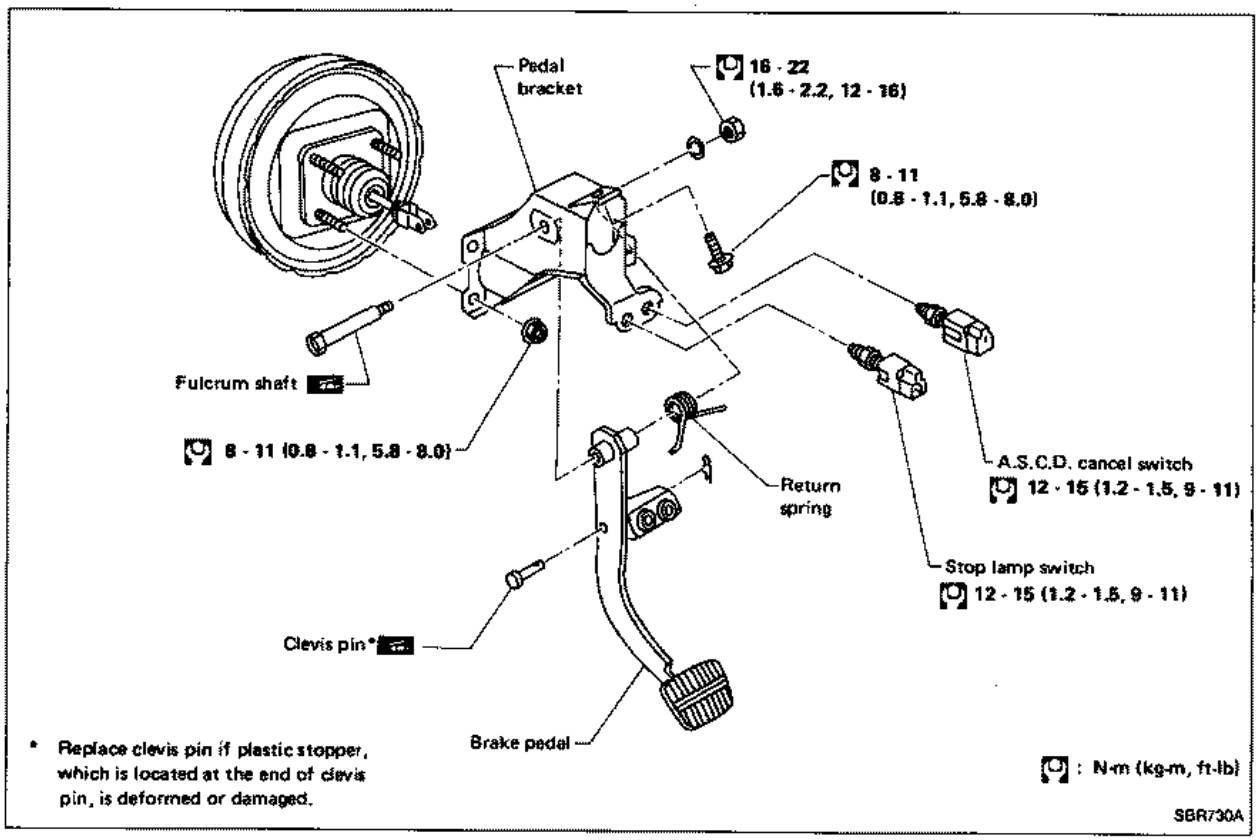
Removal and Installation

1. To remove brake flexible hose, first remove flare nut securing brake line to hose, then withdraw lock spring.
2. Cover openings to prevent entrance of dirt whenever disconnecting hydraulic line.
3. All hoses must be free from excessive bending, twisting and pulling.
4. After installing brake lines, check for oil leakage by fully depressing brake pedal.

Inspection

Check brake lines (lines and flexible hoses) for cracks, deterioration or other damage. Replace any damaged parts.
If leakage occurs around joints, retighten or, if necessary, replace damaged parts.

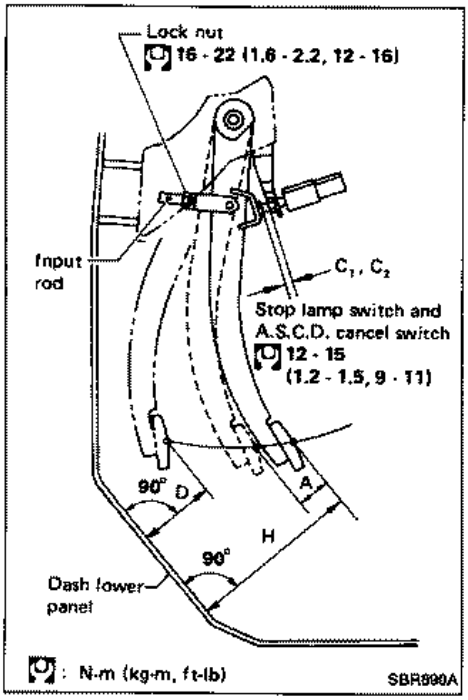
Removal and Installation

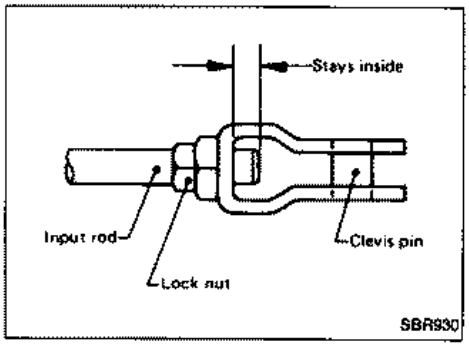


Inspection

Check brake pedal for following items.

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





Adjustment

Check brake pedal free height from dash reinforcement panel. Adjust if necessary.

H: Free height
Refer to S.D.S.

D: Depressed height
Refer to S.D.S.
Under force of 490 N (50 kg, 110 lb) with engine running

C_1: Clearance between pedal stopper and threaded end of stop lamp switch
0.3 - 1.0 mm (0.012 - 0.039 in)

C_2: Clearance between pedal stopper and threaded end of A.S.C.D. switch
0.3 - 1.0 mm (0.012 - 0.039 in)

A: Pedal free play
1 - 3 mm (0.04 - 0.12 in)

1. Adjust pedal free height with brake booster input rod. Then tighten lock nut.

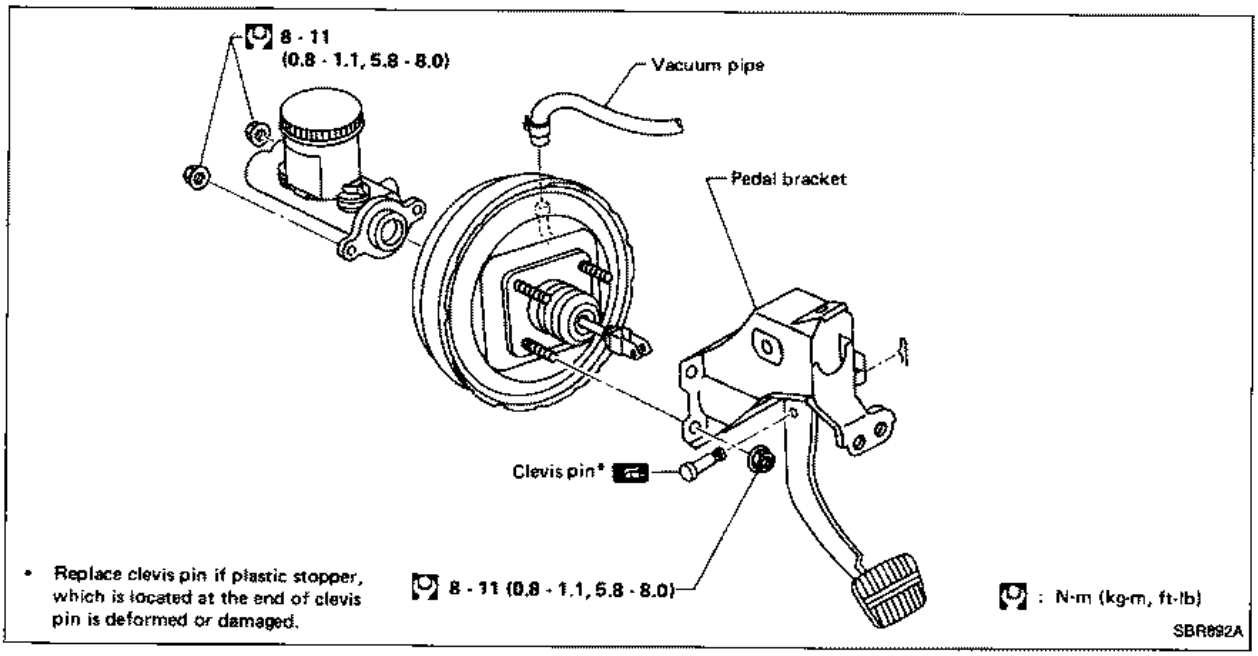
Make sure that tip of input rod stays inside.

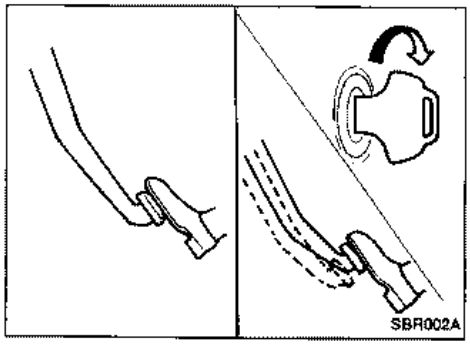
2. Adjust clearance "C_1" and "C_2" with stop lamp switch and A.S.C.D. switch respectively. Then tighten lock nuts.
3. Check pedal free play.

Make sure that stop lamp is off when pedal is released.

4. Check brake pedal's depressed height while engine is running.
   If depressed height is below specified value, check brake system for leaks, accumulation of air or any damage to components (master cylinder, wheel cylinder, etc.); then make necessary repairs.

Removal and Installation

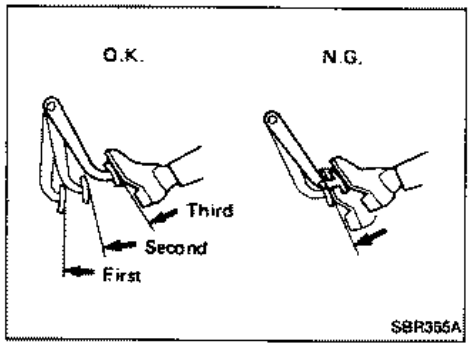




Inspection

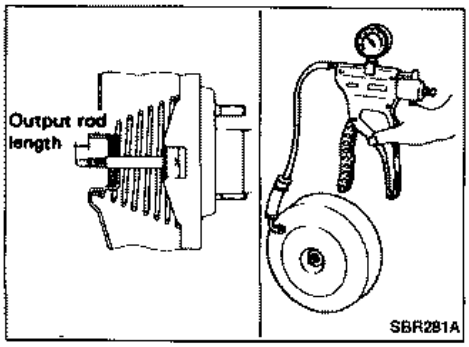
OPERATING CHECK

- Depress brake pedal several times with engine off, and check that there is no change in pedal stroke.
- Depress brake pedal, then start engine. If pedal goes down slightly, operation is normal.



AIRTIGHT CHECK

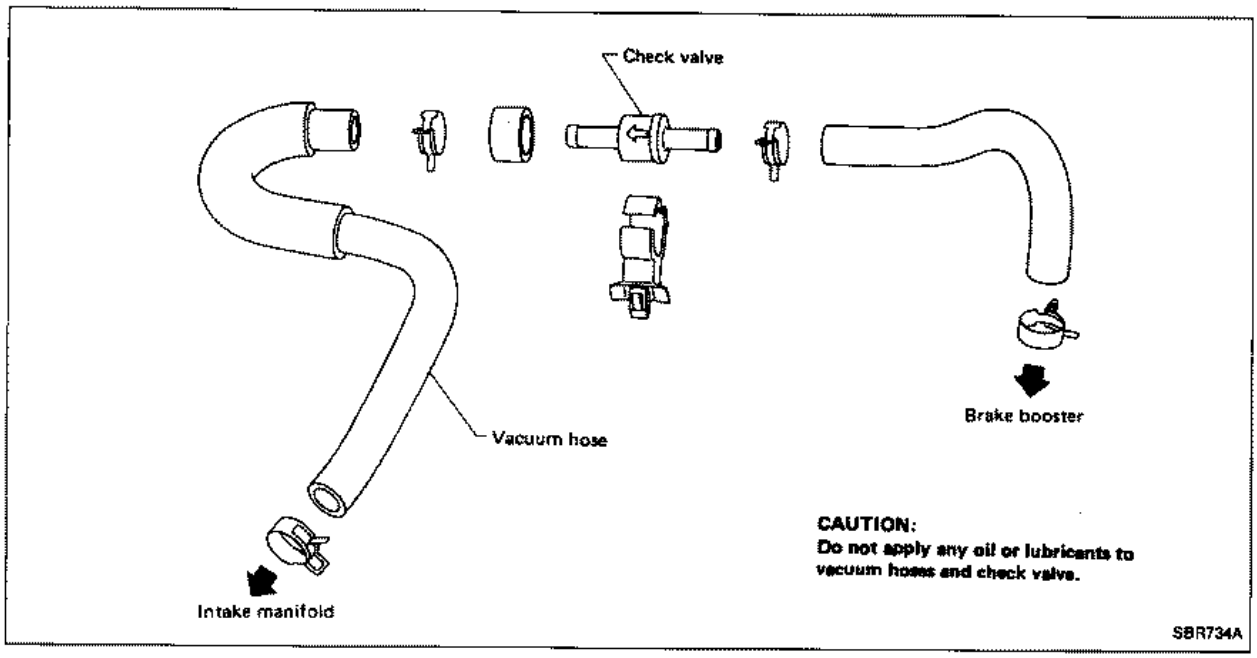
- Start engine, and stop it after one or two minutes. Depress brake pedal several times slowly. If pedal goes further down the first time and gradually rises after second or third time, booster is airtight.
- Depress brake pedal while engine is running, and stop engine with pedal depressed. If there is no change in pedal stroke after holding pedal down **30 seconds**, brake booster is airtight.

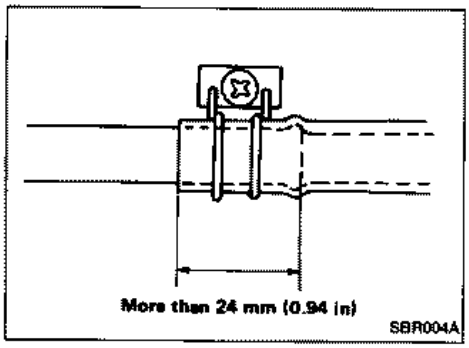


OUTPUT ROD LENGTH CHECK

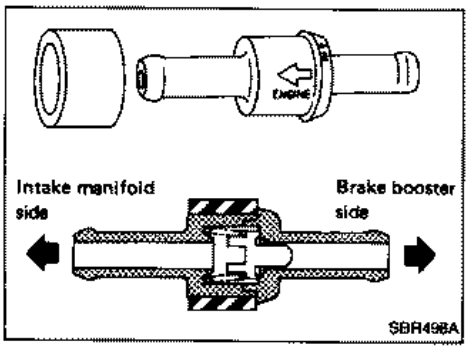
1. Supply brake booster with vacuum of –66.7 kPa (–667 mbar, –500 mmHg, –19.69 inHg) using a handy vacuum pump.
2. Check output rod length.
   Specified length:
   10.275 - 10.525 mm (0.4045 - 0.4144 in)

Removal and Installation

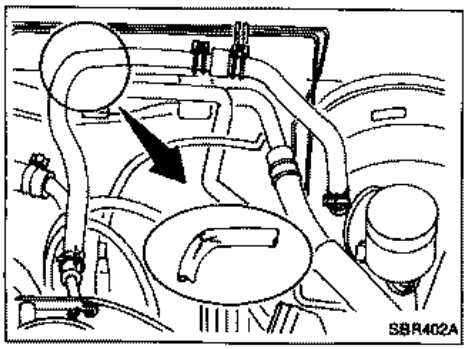




- Insert vacuum tube into vacuum hose more than 24 mm (0.94 in).



- Install check valve, paying attention to its direction.



Inspection

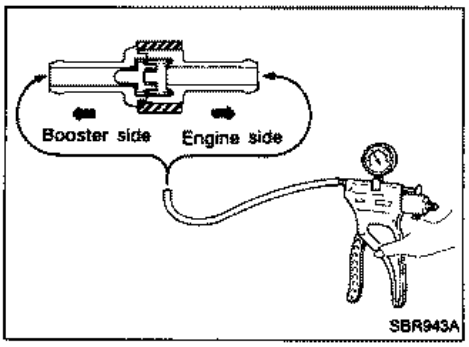
HOSES AND CONNECTORS

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

Inspection (Cont'd)

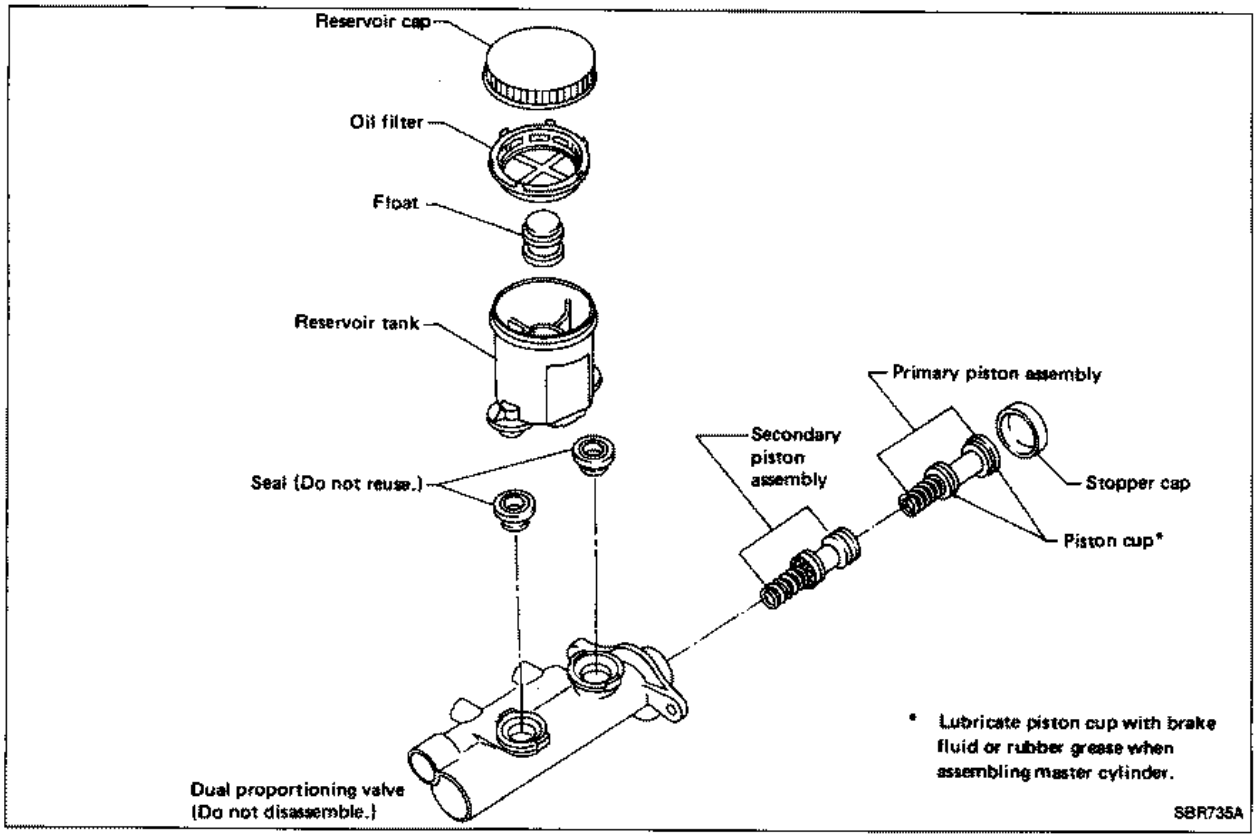
CHECK VALVE

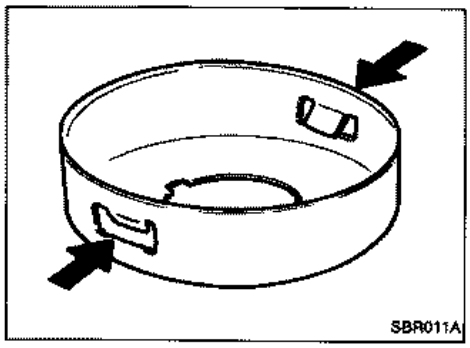
Check vacuum with a vacuum pump.



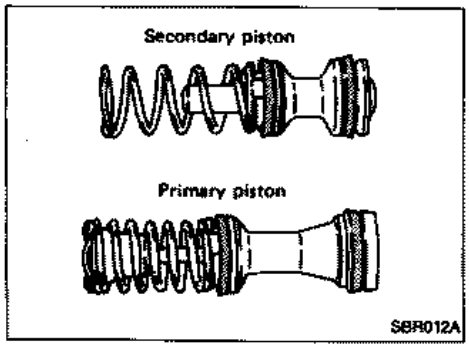
Connect to booster side	Vacuum should exist.
Connect to engine side	Vacuum should not exist.

Removal and Installation

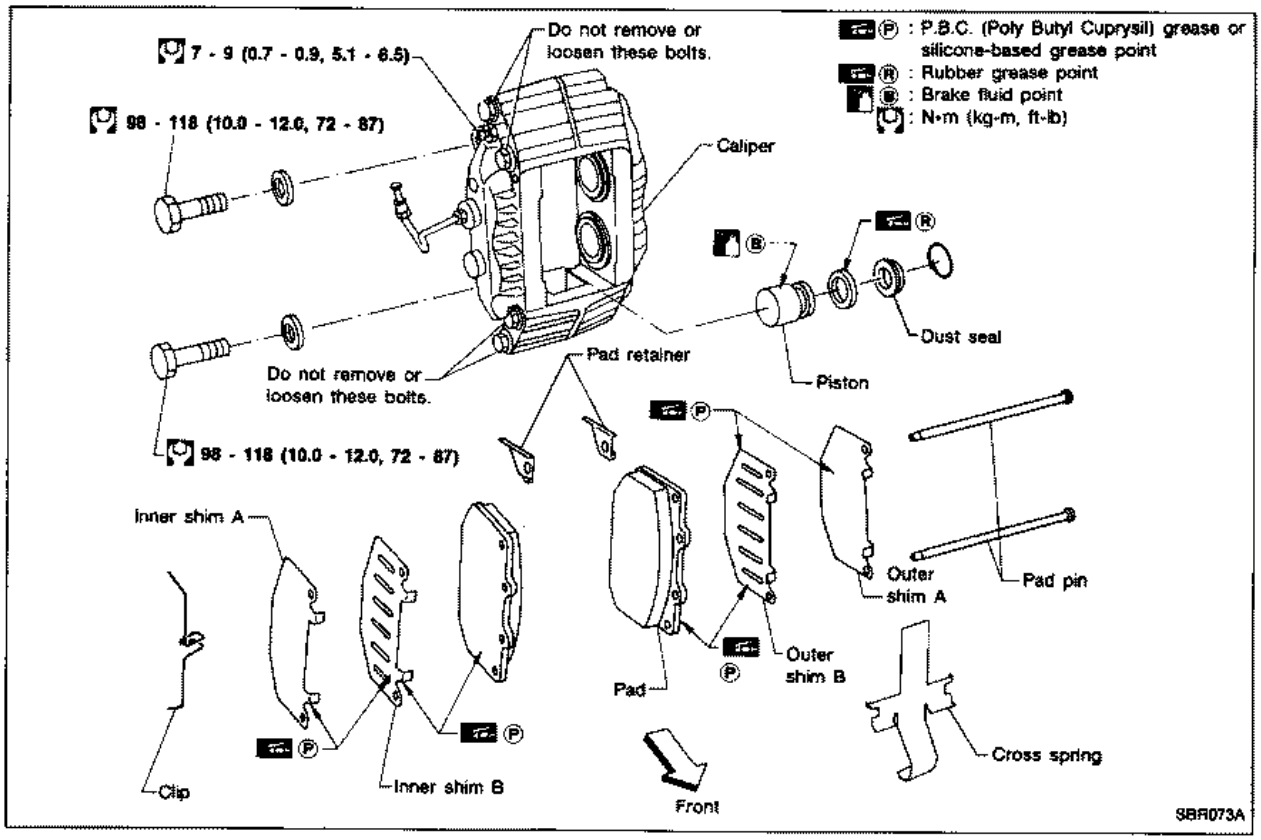


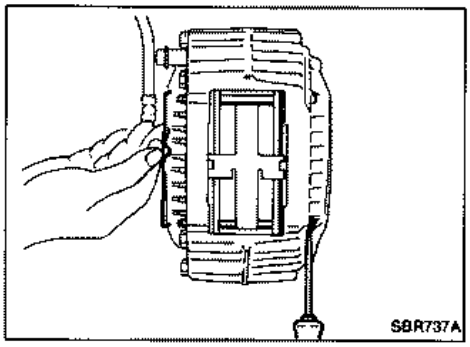


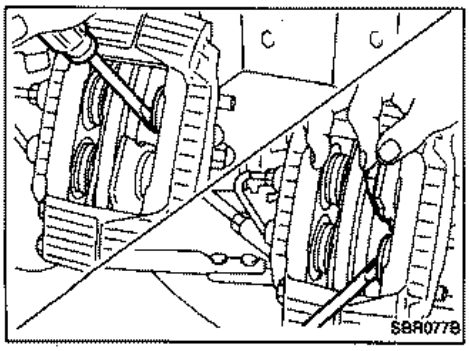
- Replace stopper cap if claw is damaged or deformed.
- Bend claws inward when installing stopper cap.



- Pay attention to direction of piston cups in figure at left.
- Check parts for wear or damage. Replace if necessary.





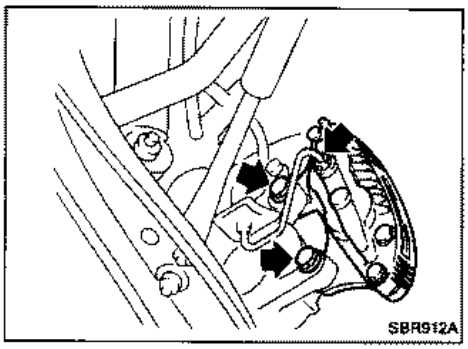


Pad Replacement

CAUTION:

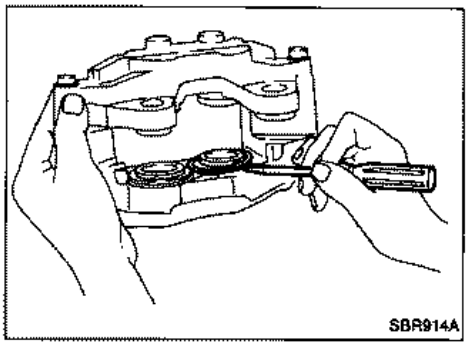
- **When pads are removed, do not depress brake pedal because piston will pop out.**
- **Be careful not to damage dust seal or get oil on rotor. Always replace shims when replacing pads.**

1. Remove clip from pad pin and then remove pad pin.
2. Remove cross spring.
3. Pull out outer pad and insert it temporarily between lower piston and rotor as shown.
4. Push back upper piston with a suitable tool and insert new pad so it contacts upper piston as shown.
5. Pull out old pad.
6. Push back lower piston with a suitable tool.
7. Pull out new pad and reinstall it in the proper position.
8. Repeat step 3 to 7 for inner pad.
9. Install cross spring, pad pin and clip.



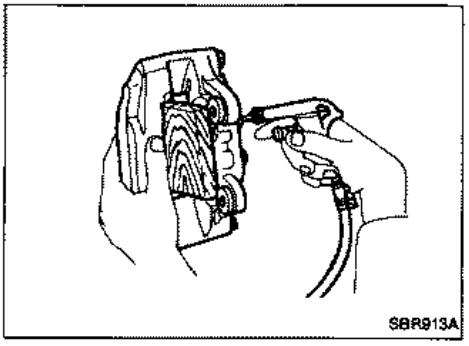
Removal and Installation

1. Disconnect brake tube.
2. Remove brake pad.
3. Remove brake caliper mounting bolts.

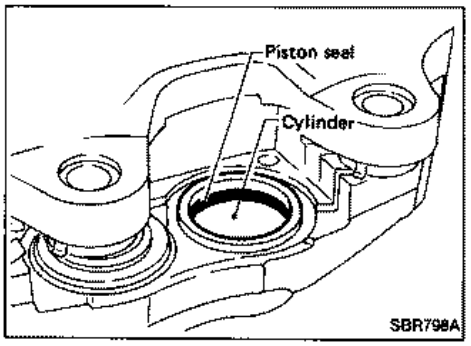


Disassembly

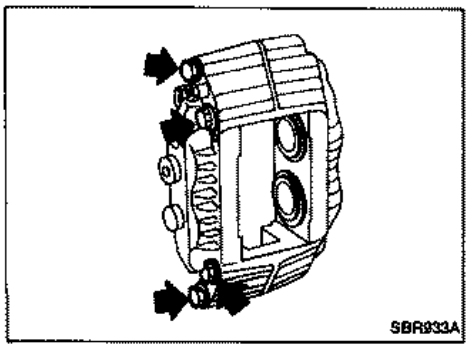
1. Remove retaining ring.



2. Push out piston with dust seal using compressed air.



3. Remove piston seal.



CAUTION:
Be careful not to loosen or remove bolts joining both sides of caliper.
If there is any fluid leakage, replace caliper assembly.

Inspection

CALIPER

- Check dust seals for damage.
- Check calipers for damage, rust or foreign materials.
- Check inside surface of cylinder for scoring, rust, wear, damage or foreign materials. Replace if any such condition exists.
- Eliminate minor damage from rust or foreign materials by polishing surface with fine emery paper.

CAUTION:
Use brake fluid to clean.

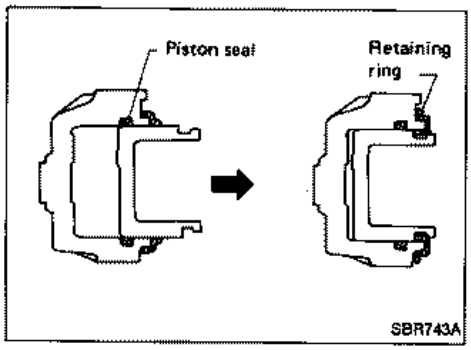
PISTON

Check piston for scoring, rust, wear, damage or foreign materials. Replace if any condition exists.

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

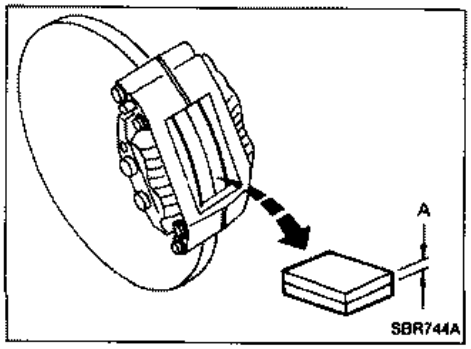
PAD PIN AND CLIPS

Check for wear, cracks deformation, deterioration, rust or other damage. Replace if any such condition exists.



Assembly

1. Insert piston seal into groove on cylinder body.
2. With dust seal fitted to piston, install piston into cylinder body.
3. Secure dust seal properly.
4. Install retaining ring.



Inspection (On-vehicle)

DISC PAD

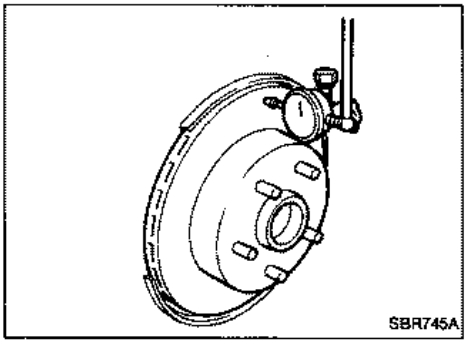
- Check pad shims for deformation or damage.
- Check disc pad for wear or damage.

Pad standard thickness (A):
10.0 mm (0.394 in)
Pad wear limit (A):
2.0 mm (0.079 in)

Inspection

RUBBING SURFACE

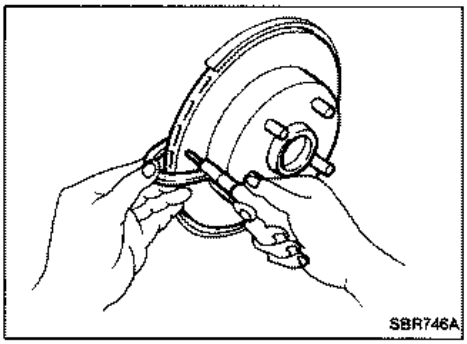
Check rotor for roughness, cracks or chips.



RUNOUT

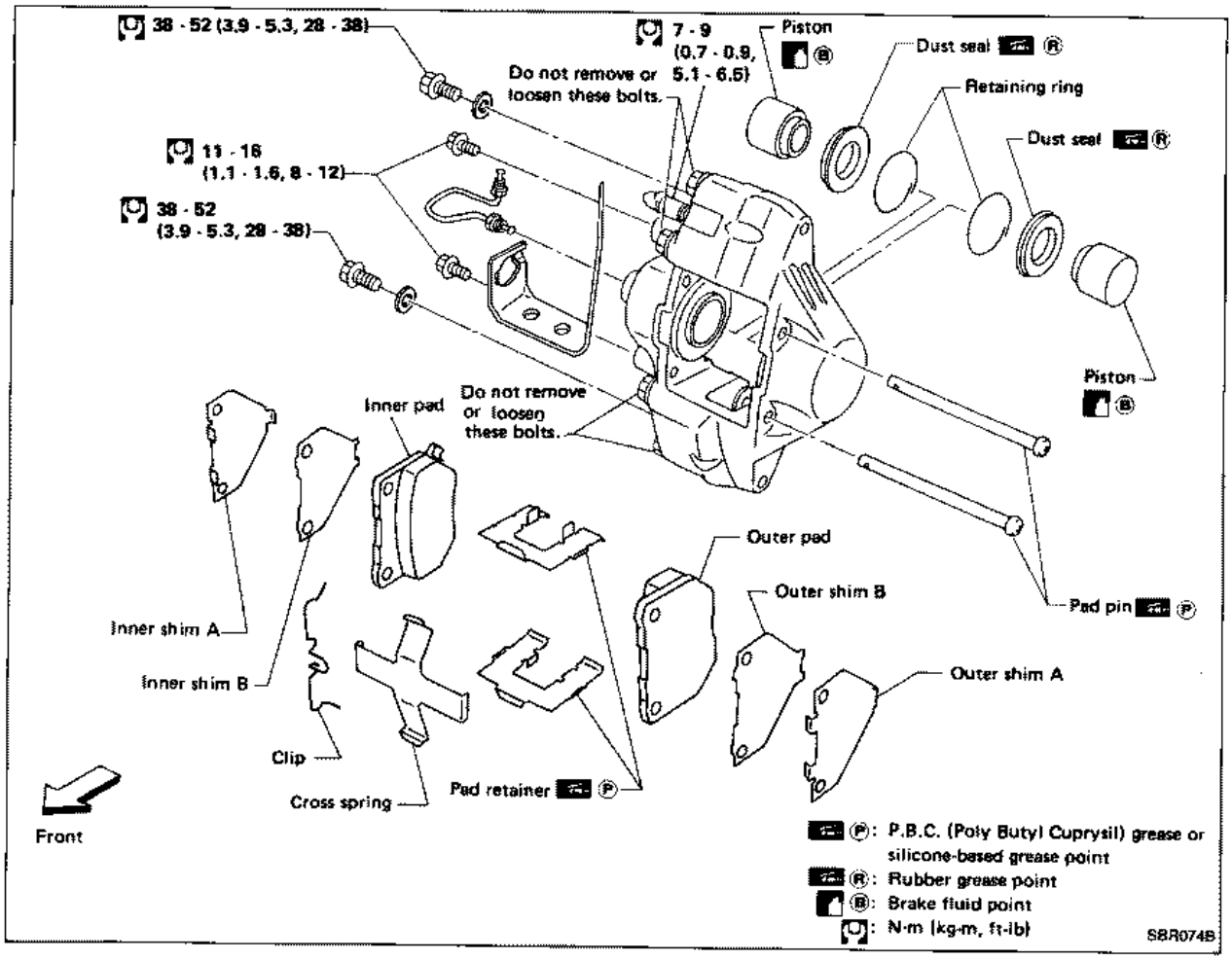
Check runout using a dial indicator. Make sure that axial end play is within the specifications before measuring. Refer to section FA.

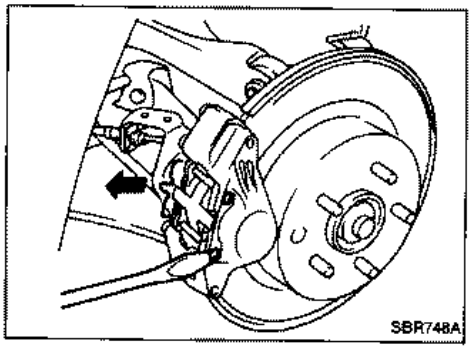
Rotor repair limit:
Maximum runout
(Total indicator reading at center of rotor pad contact surface)
0.07 mm (0.0028 in)



THICKNESS

Standard thickness:
OPZ25V
26.0 mm (1.024 in)
OPF25V
30.0 mm (1.181 in)
Minimum thickness:
OPZ25V
24.0 mm (0.945 in)
OPF25V
28.0 mm (1.102 in)



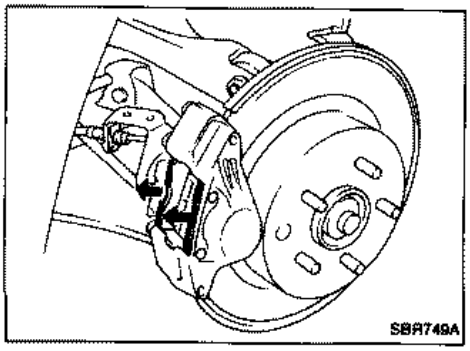


Pad Replacement

CAUTION:

When pads are removed, do not depress brake pedal because piston will pop out.

1. Remove clip from pad pin and then remove pad pin.
2. Remove cross spring.

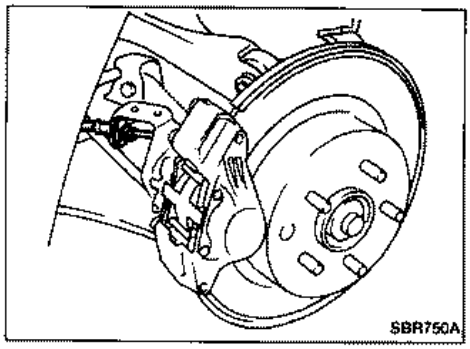


3. Pull out inner and outer pads.

CAUTION:

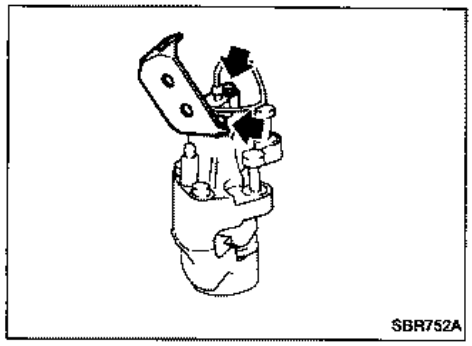
Be careful not to damage dust seal or get oil on rotor.

Always replace shims when replacing pads.

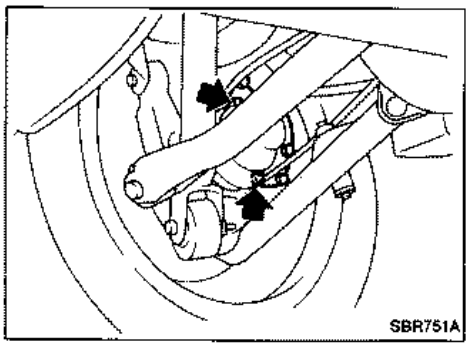


Removal and Installation

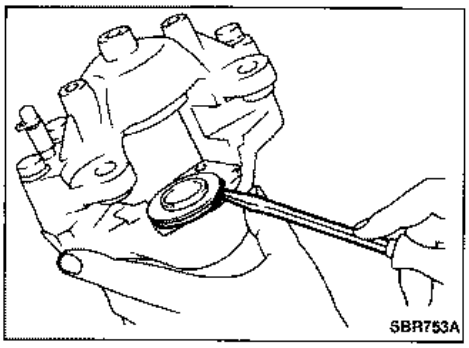
1. Disconnect brake tube.
2. Remove brake pad.



3. Remove brake cable and bracket.

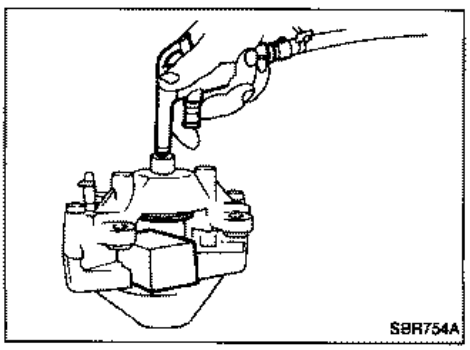


4. Remove axle housing fixing bolts.



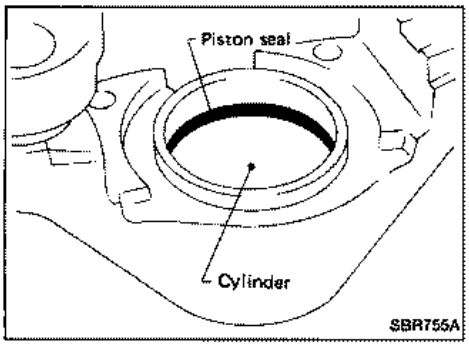
Disassembly

1. Remove retaining ring.

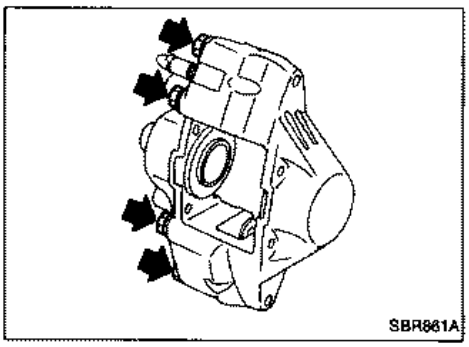


2. Push out piston with dust seal using compressed air.

Disassembly (Cont'd)



3. Remove piston seal.



CAUTION:
Be careful not to loosen or remove bolts joining both sides of caliper.
If there is any fluid leakage, replace caliper assembly.

Inspection

CALIPER

- Check dust seals for damage.
- Check calipers for damage, rust or foreign materials.
- Check inside surface of cylinder for score, rust, wear or other damage.
- Minor damage from rust of foreign materials may be eliminated by polishing surface with a fine emery paper. Replace if necessary.

CAUTION:
Use brake fluid to clean.

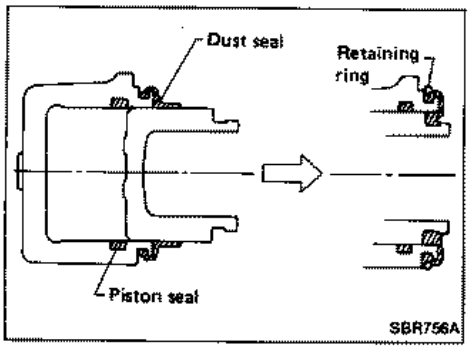
PISTON

Check piston for score, rust, wear or other damage. Replace if necessary.

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

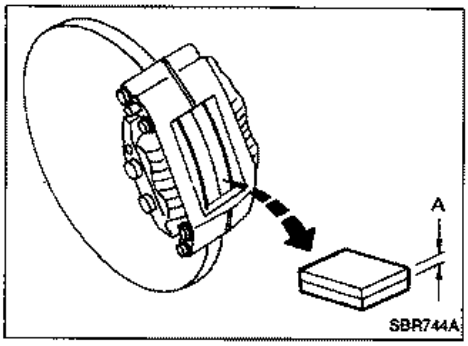
PAD PIN AND CLIP

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



Assembly

1. Insert piston seal into groove on cylinder body.
2. With dust seal fitted to piston, install piston into cylinder body.
3. Secure dust seal properly.
4. Install retaining ring.



Inspection (On-vehicle)

DISC PAD

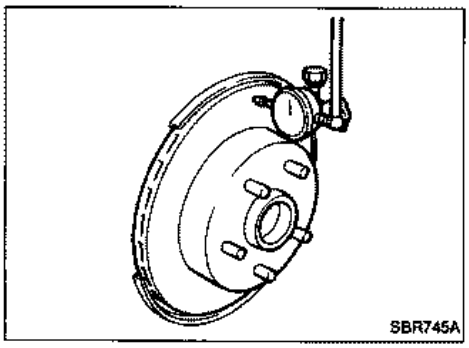
- Check pad shims for deformation or damage.
- Check disc pad for wear or damage.

Standard thickness (A):
11.5 mm (0.453 in)
Pad wear limit (A):
2.0 mm (0.079 in)

Inspection

RUBBING SURFACE

Check rotor for roughness, cracks or chips.

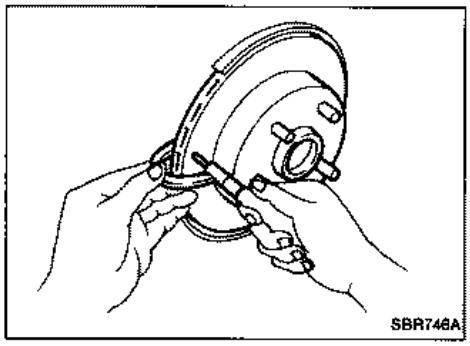

SBR745A

RUNOUT

- Check runout using a dial indicator.
- Make sure that axial end play is within the specifications before measuring. Refer to section RA.

Rotor repair limit:

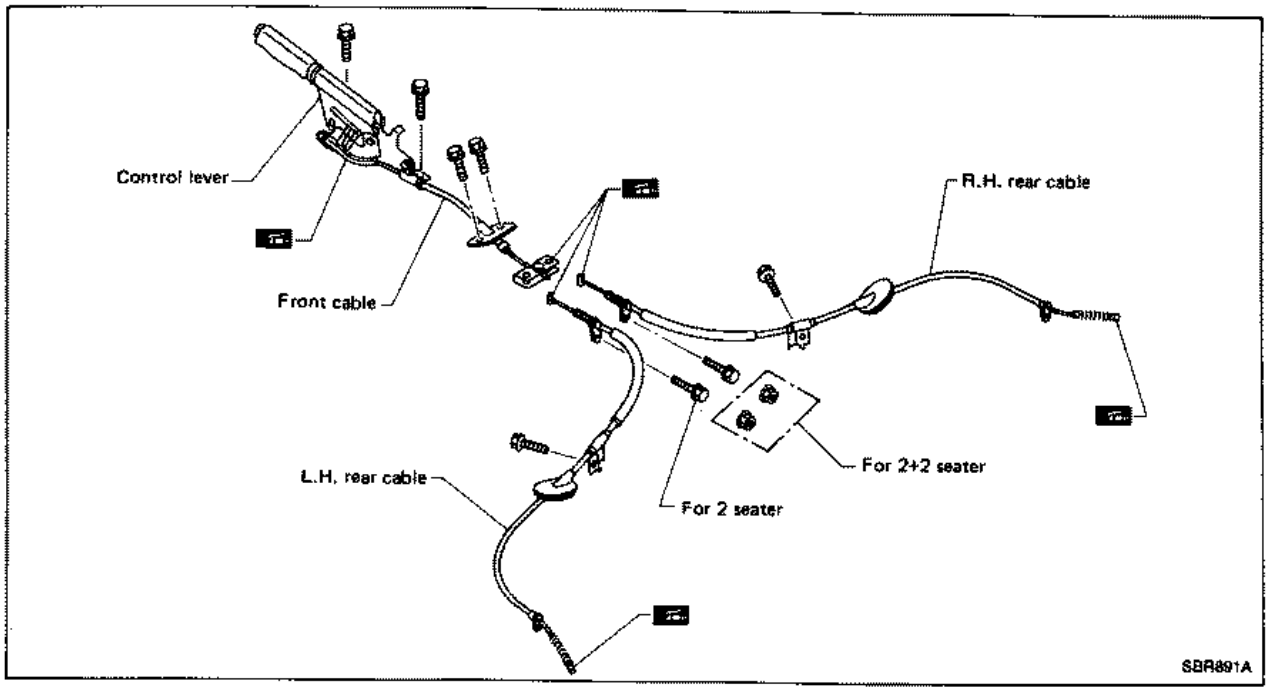
Maximum runout
(Total indicator reading at center of rotor pad contact surface)
0.07 mm (0.0028 in)


SBR746A

THICKNESS

Standard thickness:
18.0 mm (0.709 in)
Minimum thickness:
16.0 mm (0.630 in)

Removal and Installation



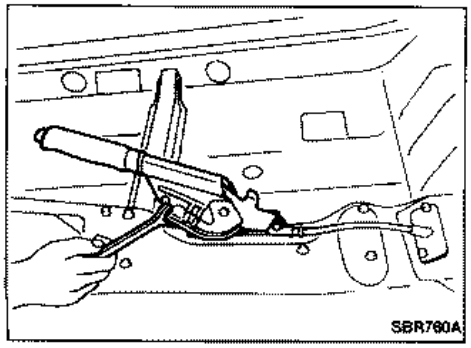
- Before removing parking brake control, remove console box.
- Loosen cable using control lever adjuster, and separate front and rear cables.

Apply multi-purpose grease to areas between control lever drum and cables.

Be careful not to damage boot and inner cable.

Inspection

1. Check control lever for wear or other damage. Replace if necessary.
2. Check parking brake cables, lamp and switch. Replace if necessary.
3. Check parts at each connecting portion for deformation or damage. If found, replace.

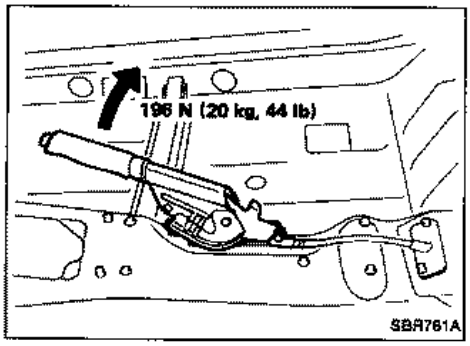


Adjustment

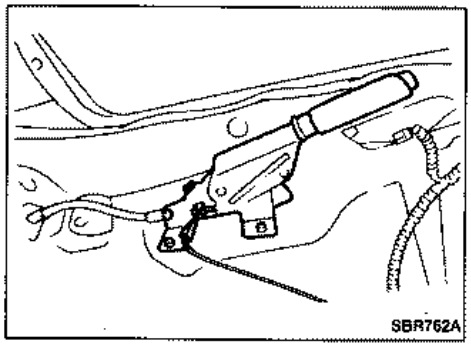
Perform shoe clearance adjustment before adjusting control lever stroke.

1. Turn adjusting nut.

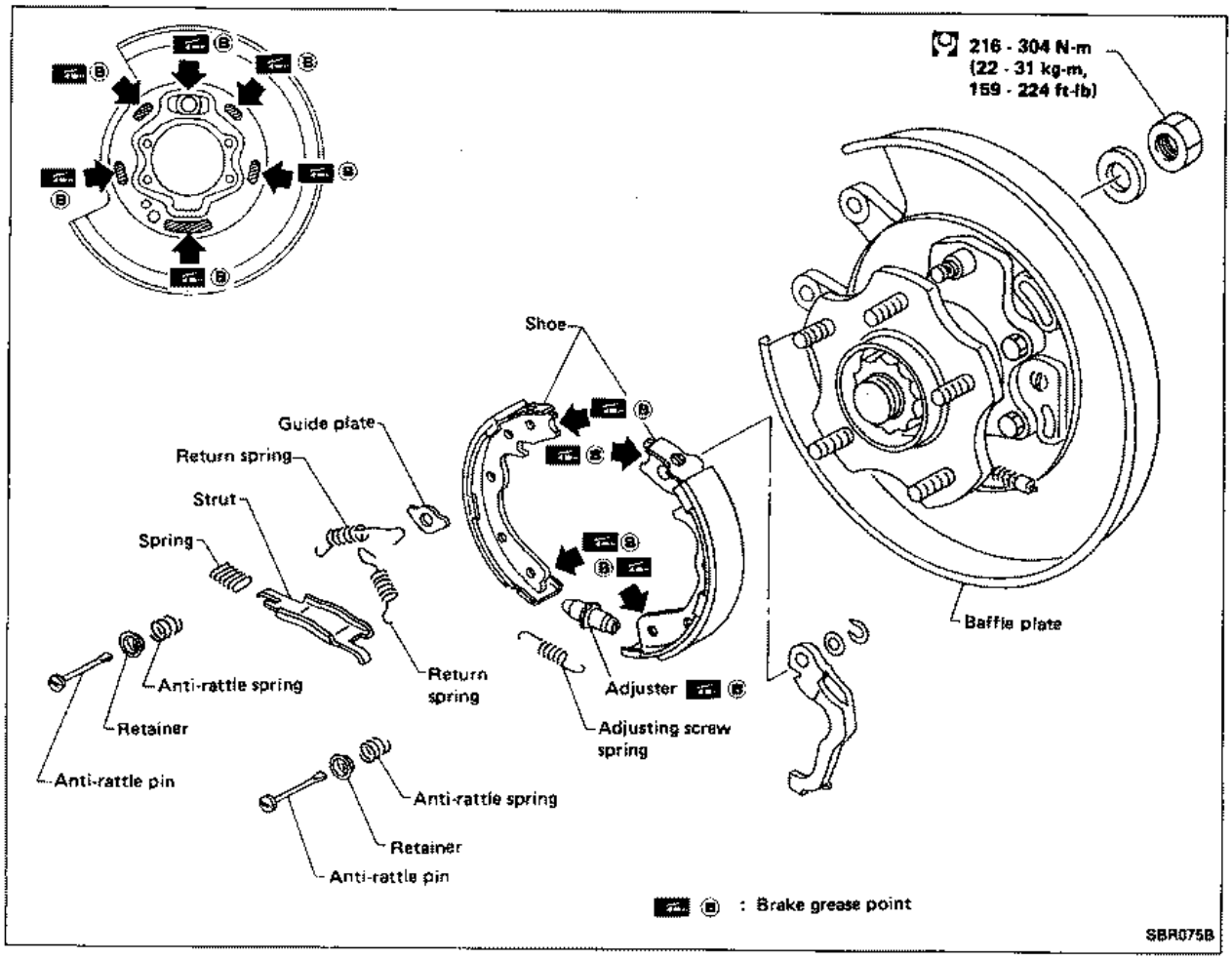
Adjustment (Cont'd)

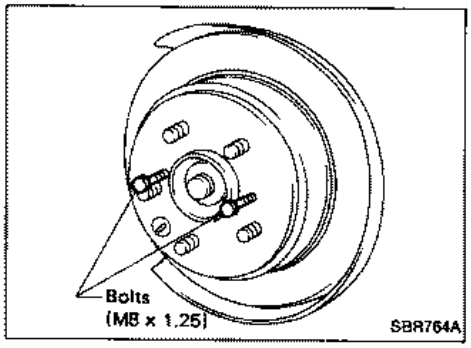


2. Pull control lever with specified amount of force. Check lever stroke and ensure smooth operation.
   Number of notches: 6 - 7



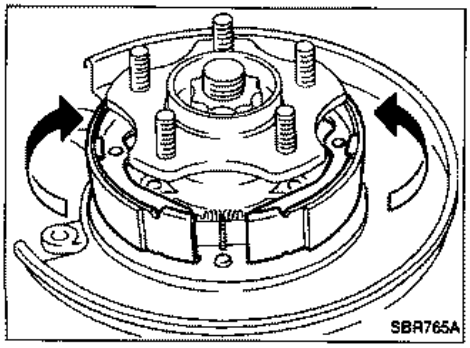
3. Bend parking brake warning lamp switch plate so that brake warning light comes on when ratchet at parking brake lever is pulled "A" notches and goes out when fully released.
   Number of notches "A": 1





Shoe Replacement

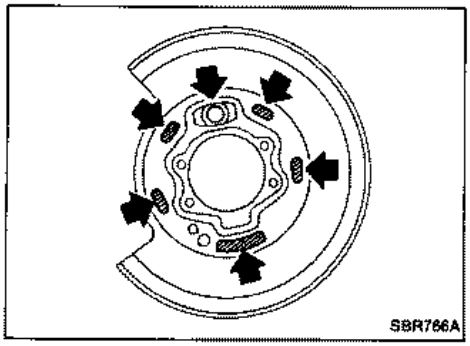
1. Remove disc rotor (With parking drum brake).
   Tighten two bolts gradually if disc rotor is hard to remove.



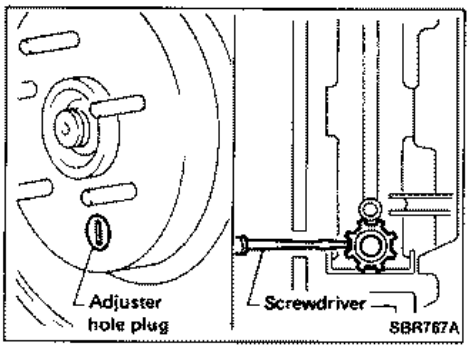
2. After removing anti-rattle pin, remove spring by rotating shoes.

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

Shoe Replacement (Cont'd)



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



Shoe Clearance Adjustment

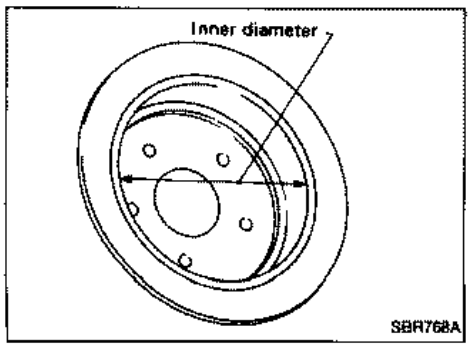
1. Remove adjuster hole plug, and turn adjuster wheel with a screwdriver until shoe touches brake drum.

Make sure that parking control lever is released completely.

2. Return adjuster wheel 5 to 6 latches.
3. Install adjuster hole plug, and make sure that there is no drag between shoes and brake drum when rotating disc rotor.

Breaking In Drum and Lining

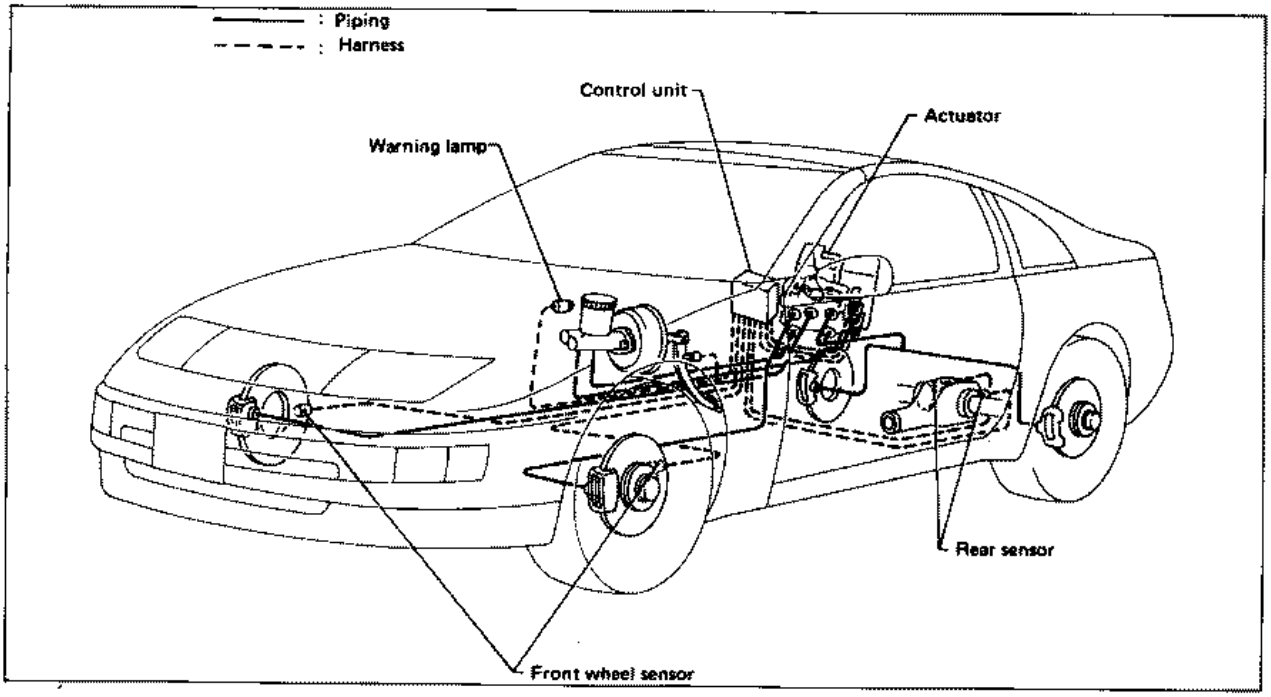
1. Using either low or 2nd transmission speed, drive the unloaded vehicle on a safe, level and dry road.
2. Depress the release button of parking brake lever, then pull the lever with a force of 98 N (10 kg, 22 lb).
3. While holding the lever, continue to drive the vehicle forward 100 m (328 ft) at approximately 35 km/h (22 MPH).
4. While holding the lever, drive the vehicle in reverse 10 m (33 ft) at approximately 10 km/h (6 MPH).
5. Repeat steps 1 through three times and then repeat only step 4 one more time.



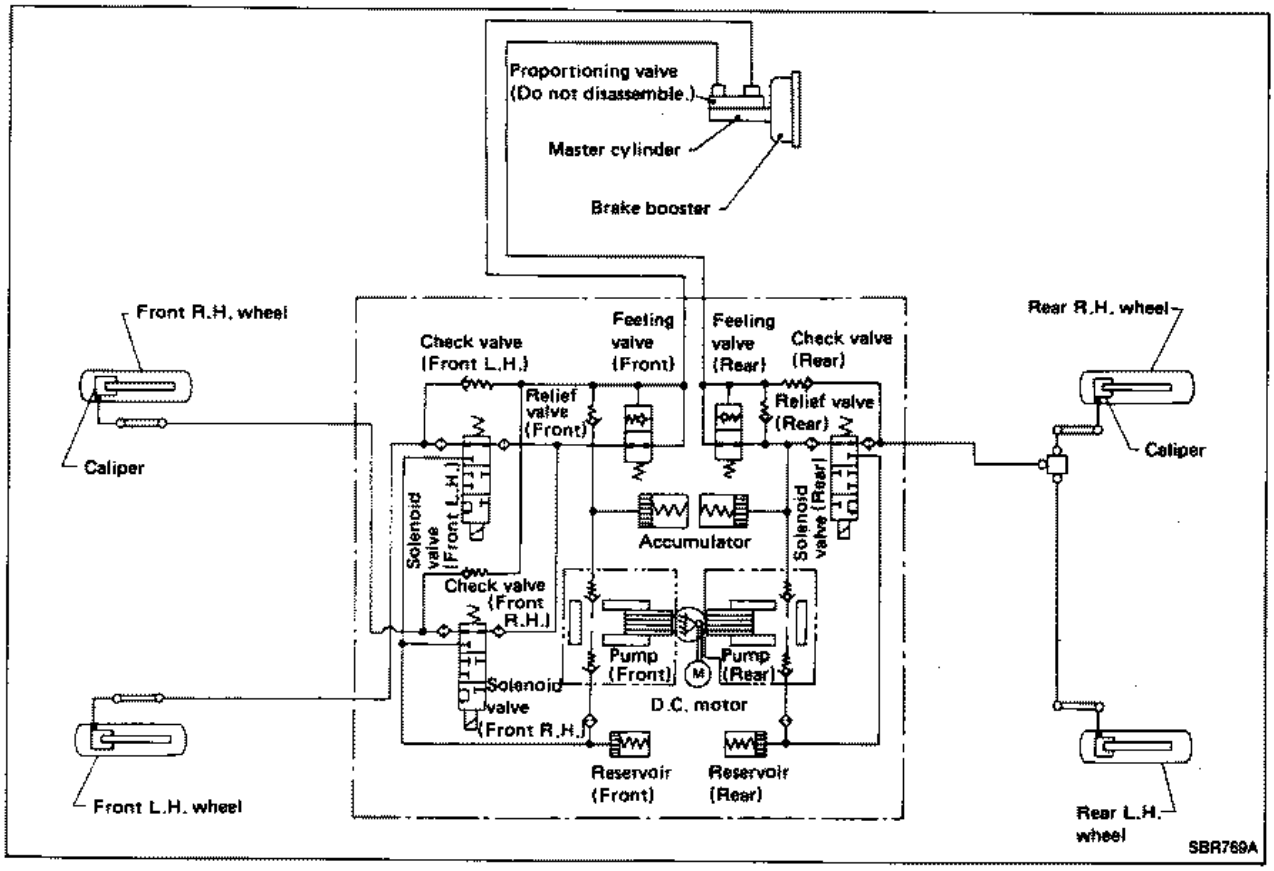
Drum Inspection

Standard inner diameter:
172.0 mm (6.77 in)
Maximum inner diameter:
173.0 mm (6.81 in)

System Components

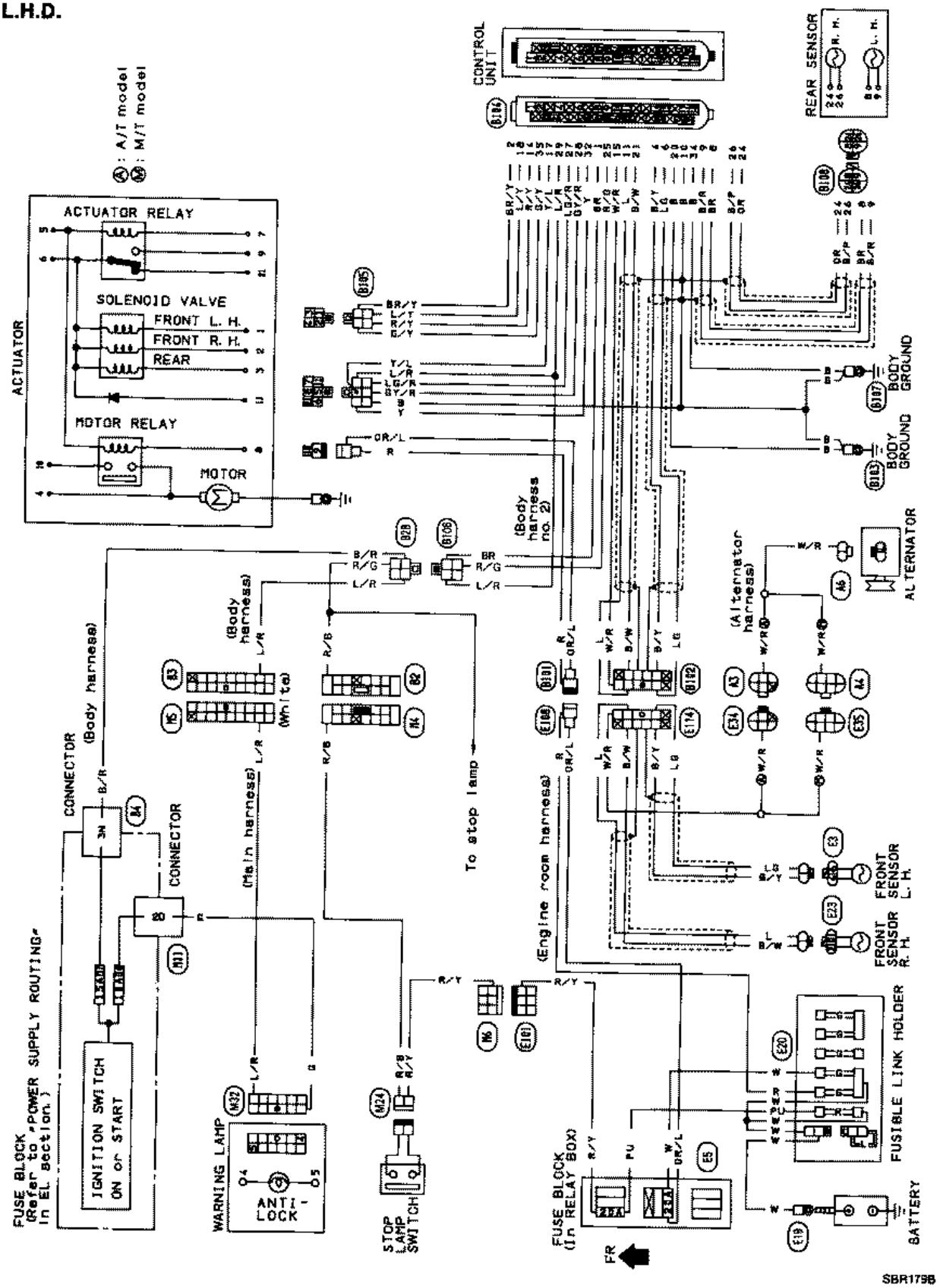


Hydraulic Circuit



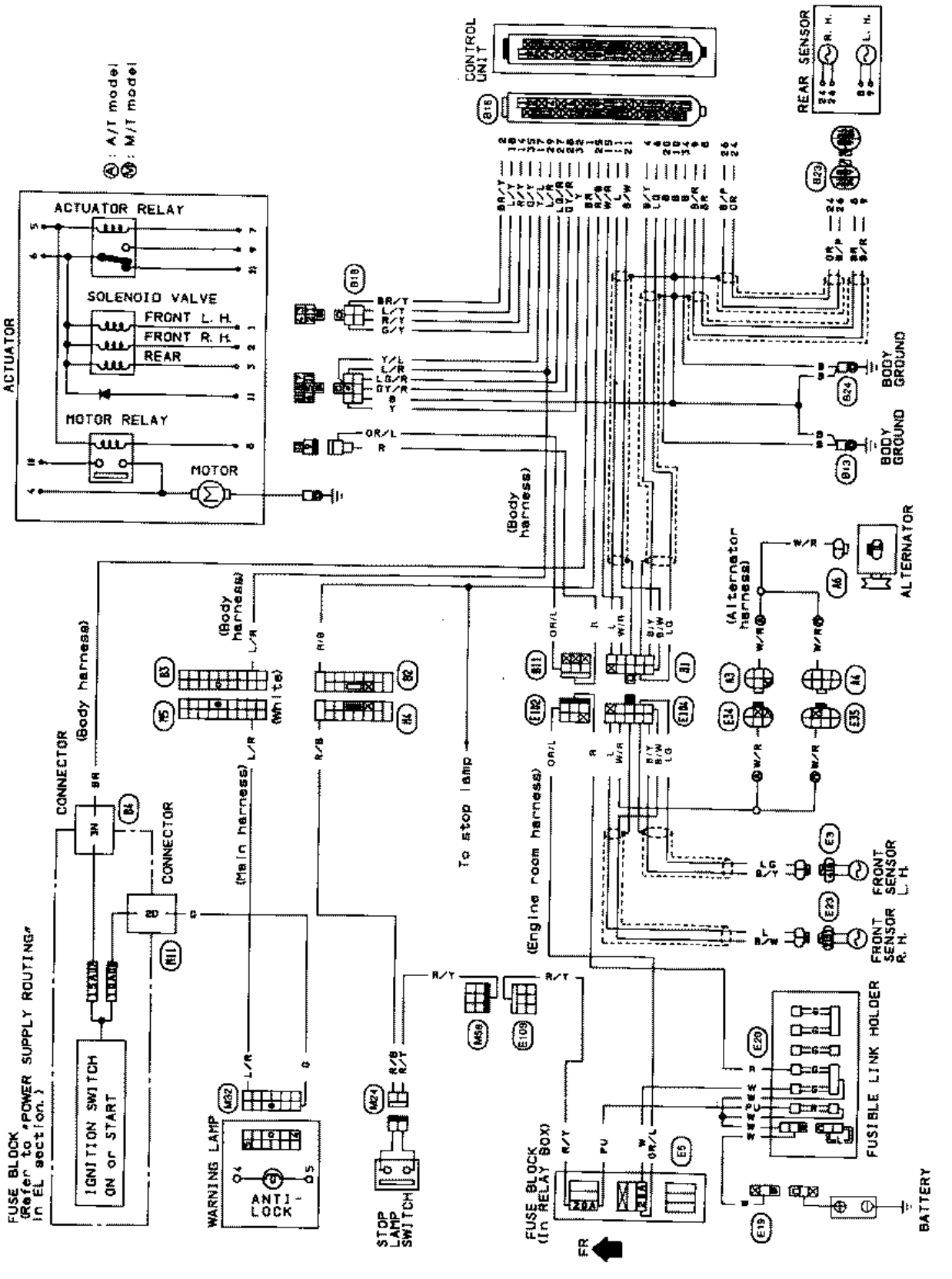
Wiring Diagram

L.H.D.



Wiring Diagram (Cont'd)

R.H.D.

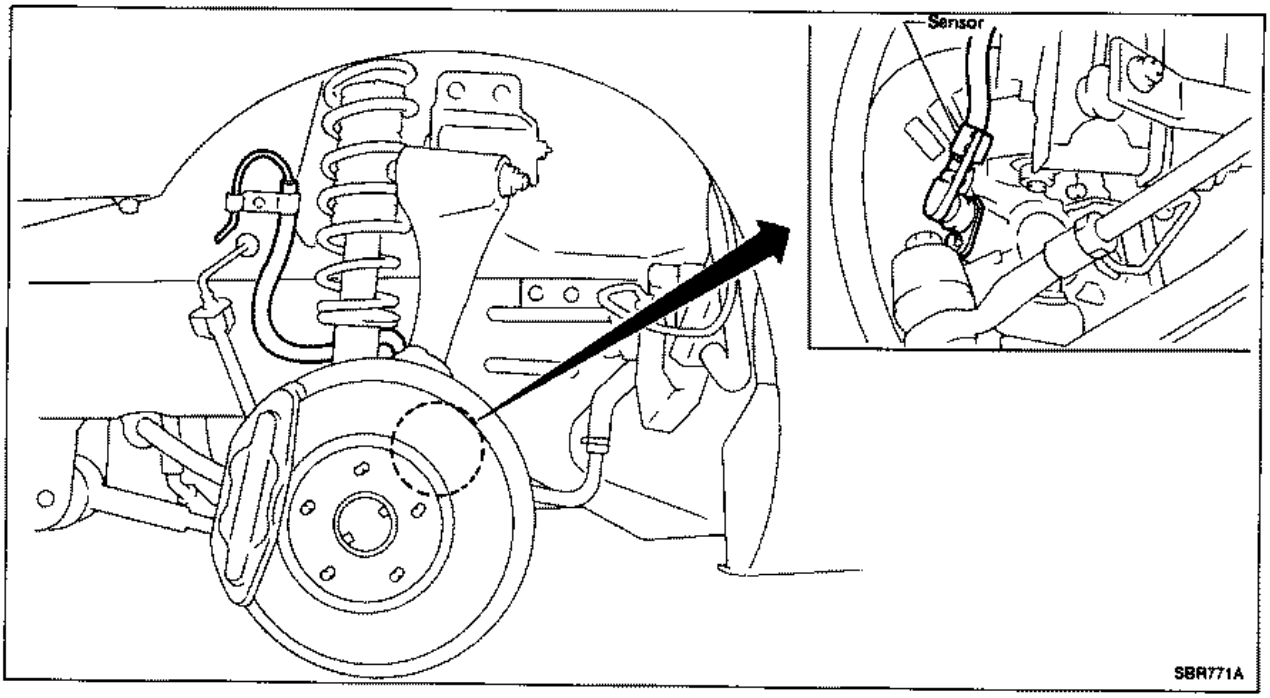


SBR180B

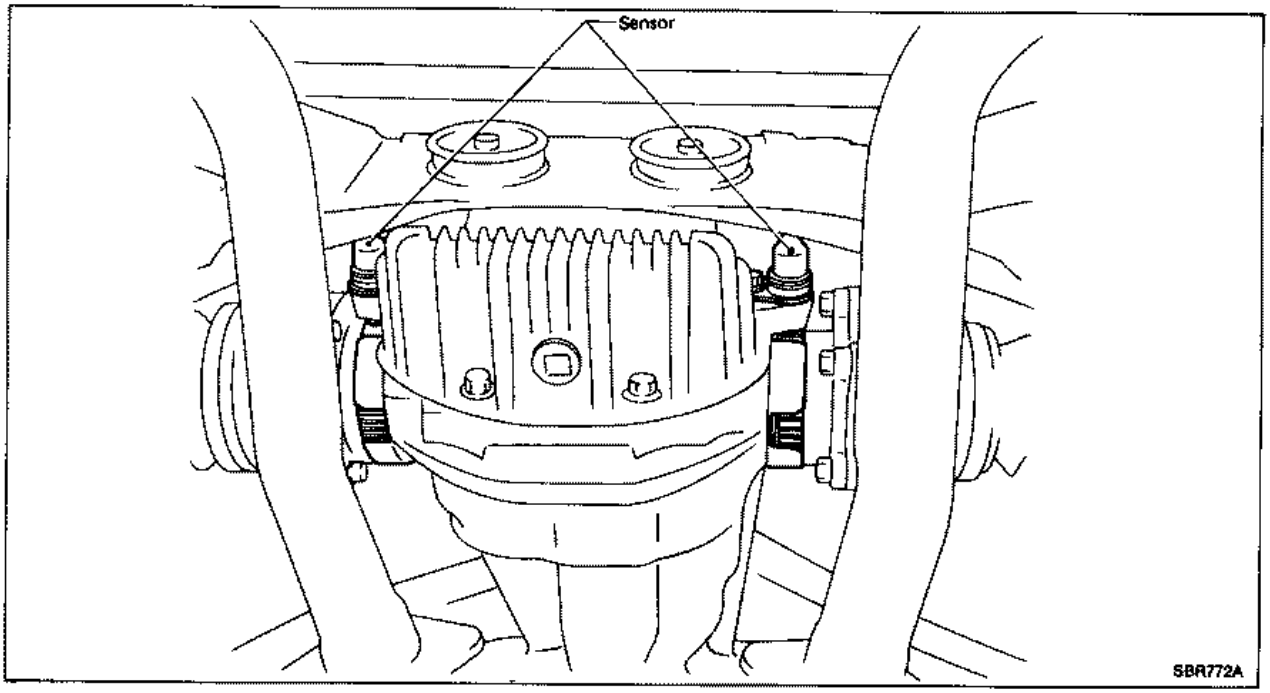
Removal and Installation

CAUTION:
Be careful not to damage sensor edge and sensor rotor teeth.

FRONT WHEEL SENSOR



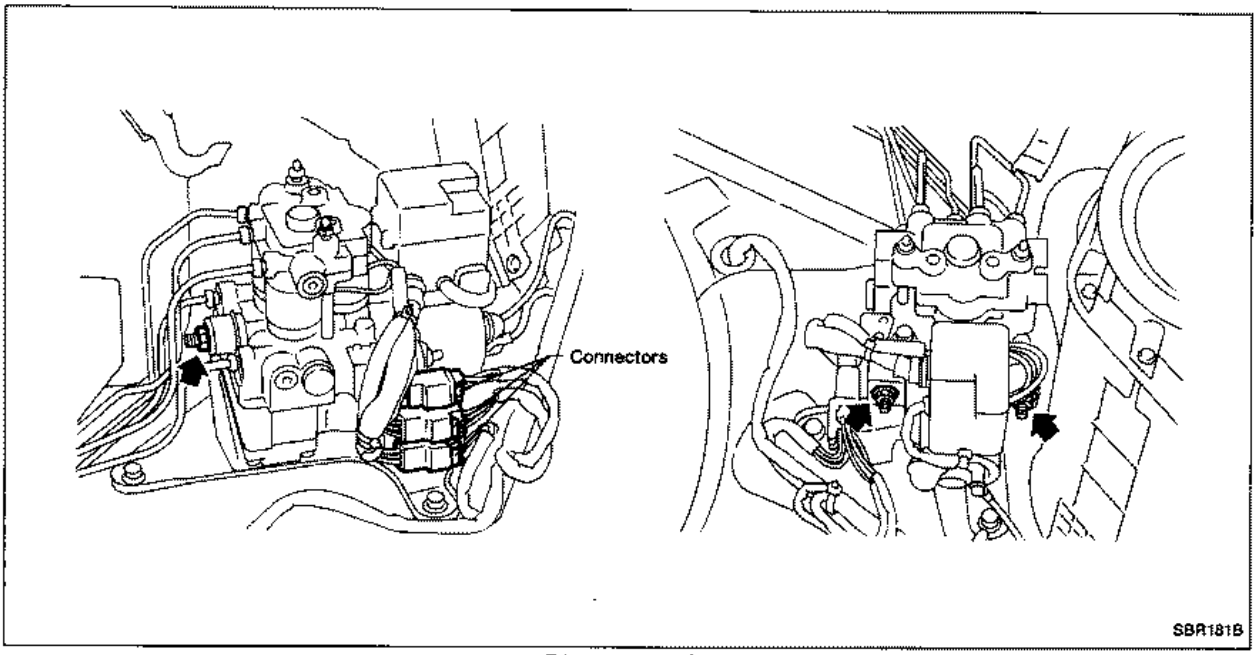
REAR SENSOR



- Remove rear sensor rotor with differential side flange after drive shaft removal.
  Refer to RA section.

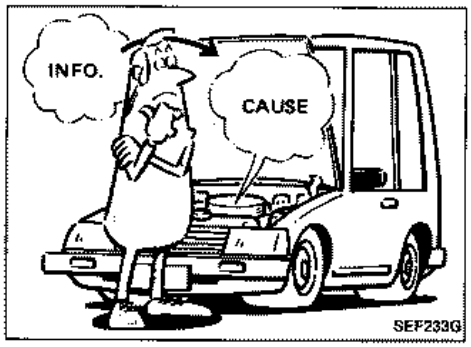
Removal and Installation (Cont'd)

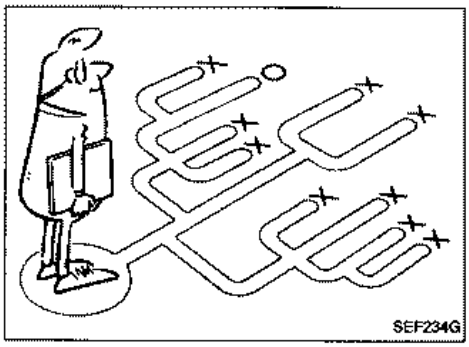
ACTUATOR



- Disconnect 3 connectors and brake tubes.
- Remove 3 nuts fixing actuator to bracket.

Contents





How to Perform Trouble Diagnoses for Quick and Accurate Repair

INTRODUCTION

The A.B.S. 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. At the same time, it is important that there are no conventional problems such as air leaks in the booster or lines, lack of brake fluid, or other problems with brake system.

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

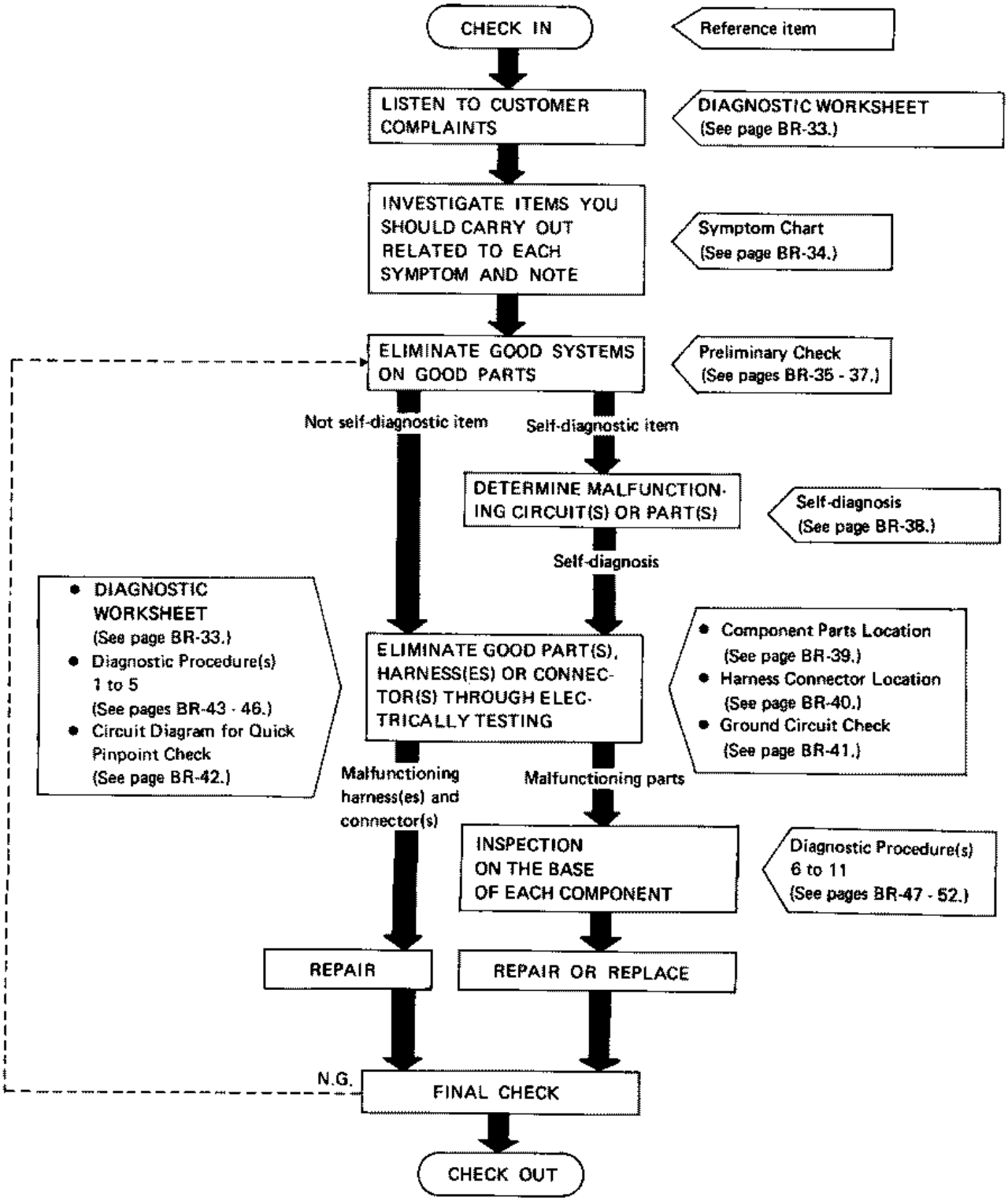
A visual check only may not find the cause of the problems, so a road test should be performed.

Before undertaking actual checks, take just a few minutes to talk with a customer who approaches with a A.B.S. complaint. The customer is a very good source of information on such problems; especially intermittent ones. 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 A.B.S. controlled vehicle.

How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd)

WORK FLOW



How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd)

KEY POINTS

WHAT ..... Vehicle model
WHEN ..... Date, Frequencies
WHERE ..... Road conditions
HOW ..... Operating conditions, Weather conditions, Symptoms

DIAGNOSTIC WORKSHEET

There are many kinds of operating conditions that lead to customer complaints, even if the system is normal.
A good grasp of such conditions can make trouble-shooting faster and more accurate.
In general, feelings for a problem depend on each customer's information. It is therefore important to fully understand the symptoms or under what conditions a customer complains.
Make good use of a diagnostic worksheet such as the one shown below in order to utilize all the complaints for trouble-shooting.

Worksheet sample

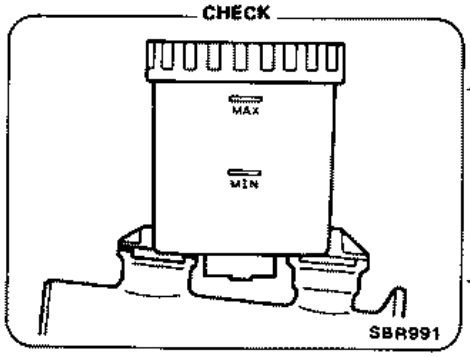
Customer name MR/MS		Model & Year			VIN		
Engine #		Trans.			Mileage		
Incident Date		Manuf. Date			In Service Date		
Symptoms	☐ Pedal vibration and noise	☐ Warning activates	☐ Long stopping distance	☐ Abnormal pedal action	☐ A.B.S. doesn't work	☐ A.B.S. works but warning activates	☐ A.B.S. works frequently
Engine conditions	☐ When starting ☐ After starting ☐ Engine speed: 5,000 rpm or more						
Road conditions	☐ Low friction road (☐ Snow ☐ Gravel ☐ Other) ☐ Protrusion						
Driving conditions	☐ High speed cornering ☐ Vehicle speed: Greater than 10 km/h (6 MPH) ☐ Vehicle speed: 10 km/h (6 MPH) or less ☐ Vehicle is stopped						
Applying brake conditions	☐ Suddenly ☐ Gradually						
Other conditions	☐ Operation of electrical equipment ☐ Large pedal stroke ☐ Operation of clutch						

Symptom Chart

PROCEDURE	REFERENCE PAGE	SYMPTOM	Pedal vibration & noise	Warning activates	Long stopping distance	Abnormal pedal action	A.B.S. doesn't work	A.B.S. works but warning activates
Electrical Components Inspection	BR-53	Actuator inspection					○	
Ground Circuit Check	BR-41	Motor ground					○	
	BR-41	Control unit ground					○	
Diagnostic Procedure (Select inspection with L.E.D. flashing No.)	BR-52	Diagnostic Procedure 11	○	○	○	○	○	○
	BR-51	Diagnostic Procedure 10	○	○	○	○	○	○
	BR-50	Diagnostic Procedure 9	○	○	○	○	○	○
	BR-49	Diagnostic Procedure 8	○	○	○	○	○	○
	BR-48	Diagnostic Procedure 7	○	○	○	○	○	○
	BR-47	Diagnostic Procedure 6	○	○	○	○	○	○
Diagnostic Procedure	BR-46	Diagnostic Procedure 5						○
	BR-46	Diagnostic Procedure 4					○	
	BR-45	Diagnostic Procedure 3				○		
	BR-45	Diagnostic Procedure 2			○			
	BR-43	Diagnostic Procedure 1	○					
Preliminary Check	BR-37	Preliminary Check 4	○	○	○	○	○	○
	BR-37	Preliminary Check 3	○	○				
	BR-36	Preliminary Check 2		○			○	
	BR-35	Preliminary Check 1			○	○		

Preliminary Check 1

CHECK

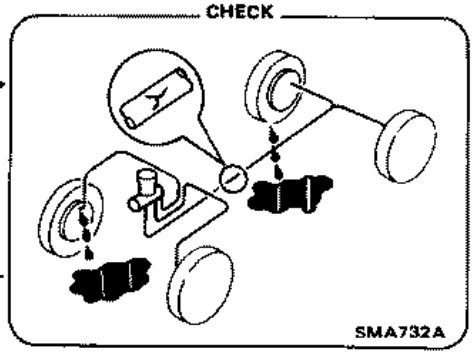


Check brake fluid level in reservoir tank.

N.G. → Fill up brake fluid.

O.K.

CHECK

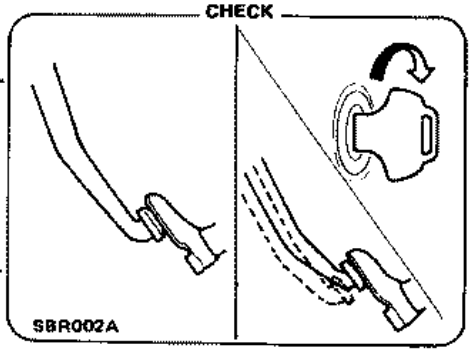


Check brake system.
Refer to CHECK AND ADJUSTMENT.

N.G. ← Repair brake system.

O.K.

CHECK

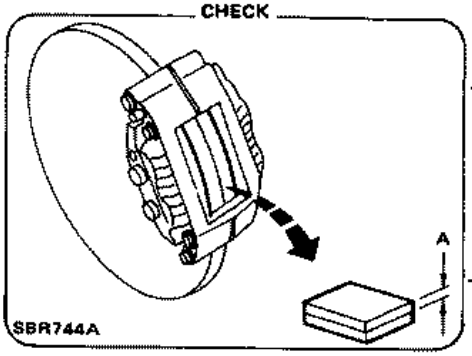


Check brake booster operation and airtightness.
Refer to "Inspection" of BRAKE BOOSTER.

N.G. ← Repair or replace booster system.

O.K.

CHECK

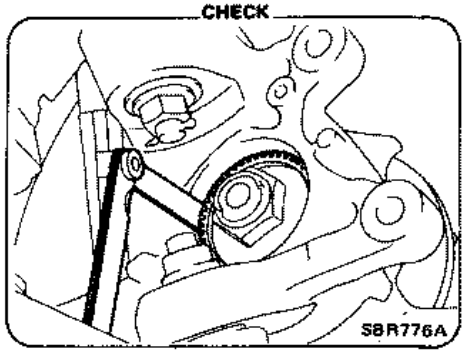


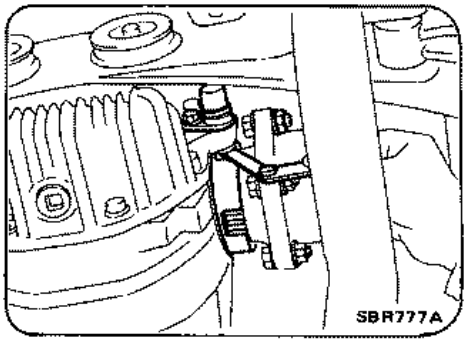
Check brake pads and rotor.
Refer to "Inspection" of FRONT and REAR DISC BRAKE.

N.G. → Replace malfunctioning parts.

Preliminary Check 2

CHECK





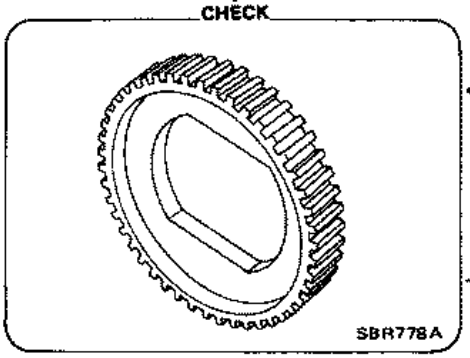
Check sensor clearance.

	Clearance mm (in)
Front wheel sensor	0.06 - 0.93 (0.0024 - 0.0366)
Rear sensor	0.18 - 1.15 (0.0071 - 0.0453)

N.G. → Check sensor for the following items:
- Dust, foreign materials, etc., at fastening portion
- Improper installation
- Breakage

O.K. → CHECK

N.G. → Repair or replace malfunctioning sensor.



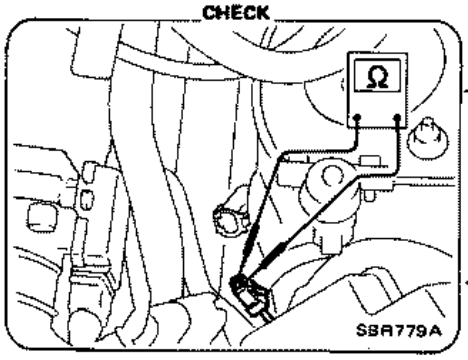
N.G. → Replace sensor rotor.

Check sensor rotor for teeth damage.

Preliminary Check 3, 4

Preliminary Check 3

CHECK



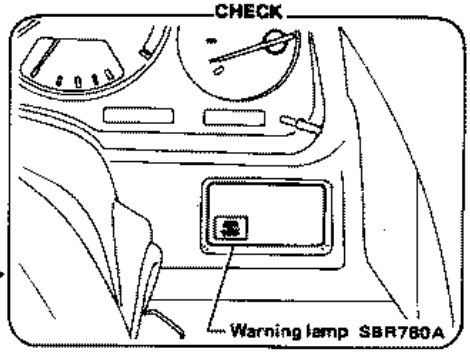
N.G. → Replace.

O.K.

Measure each sensor resistance.
0.8 - 1.2 kΩ

Preliminary Check 4

CHECK



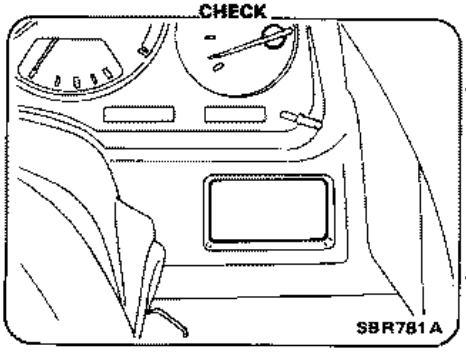
Check warning lamp activation.
When ignition switch is turned on, warning lamp turns on.

O.K.

N.G.

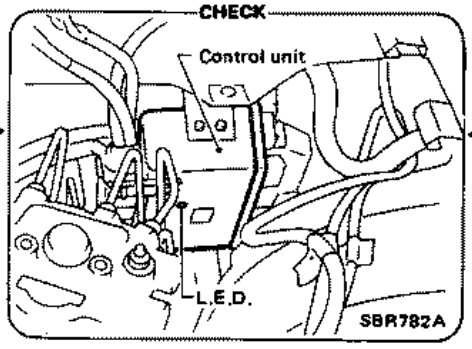
Check fuse.
Check bulb condition and remedy.

CHECK



N.G.

CHECK



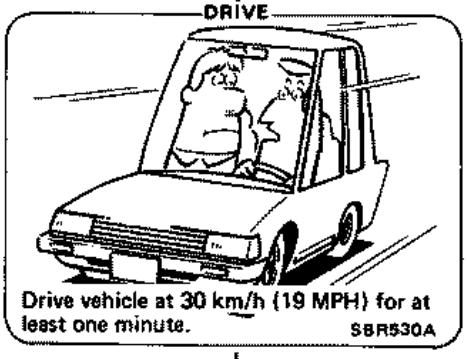
- Keep engine on and running.
- Count the number of L.E.D. flashes during 5 to 10 second "OFF" period.

Go to Self-diagnosis.
(See page BR-38.)

Check warning lamp for deactivation.
When engine starts, warning lamp deactivates.

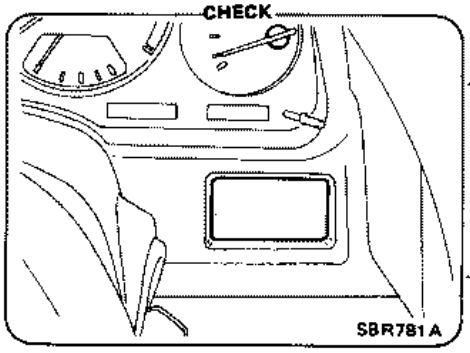
O.K.

DRIVE



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

CHECK



N.G.

O.K. → If Preliminary Check 2 is not performed and there is abnormal A.B.S. operation, perform Preliminary Check 2.

Ensure warning lamp remains off while driving.

Self-diagnosis

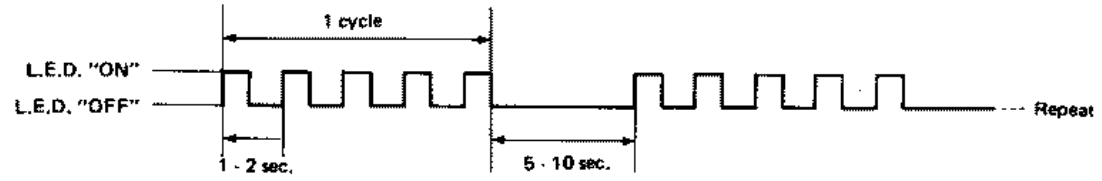
CHECKING THE NUMBER OF L.E.D. FLASHES

When a problem occurs in the A.B.S., the warning light on the instrument panel comes on. As shown in the Table, the control unit performs self-diagnosis.
To obtain satisfactory self-diagnosing results, the vehicle must be driven above 30 km/h (19 MPH) for at least one minute before the self-diagnosis is performed. After the vehicle is stopped, the number of L.E.D. flashes is counted while the engine is running.
The L.E.D. is located on the control unit, identifying a malfunctioning part or unit by the number of flashes. Both the warning light and the L.E.D. persistently activate, even after a malfunctioning part or unit has been repaired, unless the ignition switch is turned "OFF". After repairs, turn the ignition switch "OFF". Then start the engine and drive the vehicle over 30 km/h (19 MPH) for at least one minute to ensure that the malfunctioning part or unit has been repaired properly.
If more than two circuits malfunction at the same time, the L.E.D. will flash to indicate one of the malfunctioning circuits. After the circuit has been repaired, the L.E.D. will then flash to indicate that the other circuit is malfunctioning.

No. of L.E.D. flashes	Malfunctioning part or unit	Diagnostic Procedure
1	Left front actuator solenoid circuit	Diagnostic Procedure 6
2	Right front actuator solenoid circuit	
3 or 4	Rear actuator solenoid circuit	
5	Left front wheel sensor circuit	Diagnostic Procedure 7
6	Right front wheel sensor circuit	
7 or 8	Rear wheel sensor circuit	
9	Motor and motor relay	Diagnostic Procedure 8
10	Solenoid valve relay	Diagnostic Procedure 9
16 or continuous	Control unit	Diagnostic Procedure 10
Warning activates and L.E.D. "OFF"	Power supply or ground circuit for control unit	Diagnostic Procedure 11

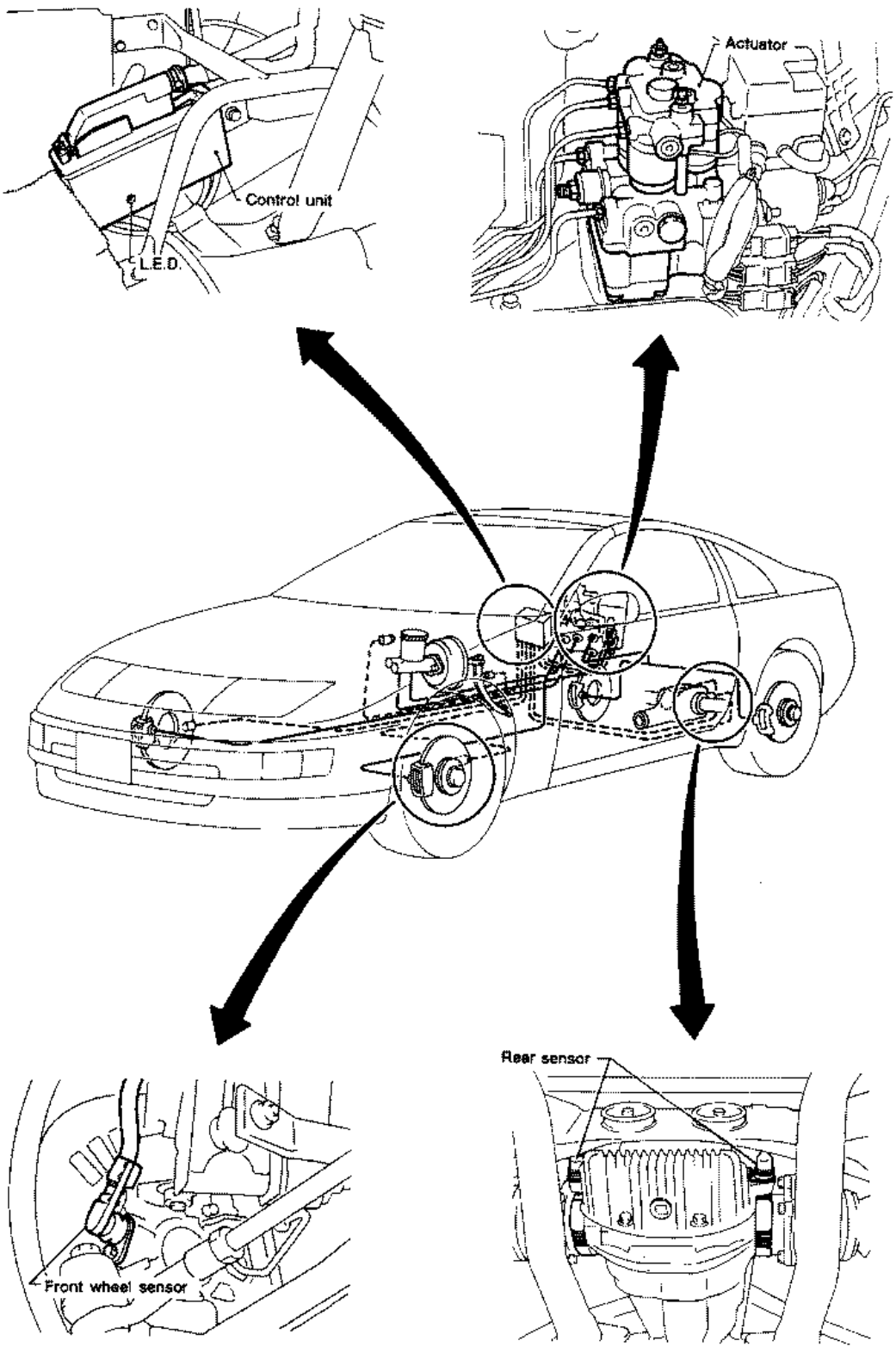
Example

Improper operation of left front rotor sensor circuit



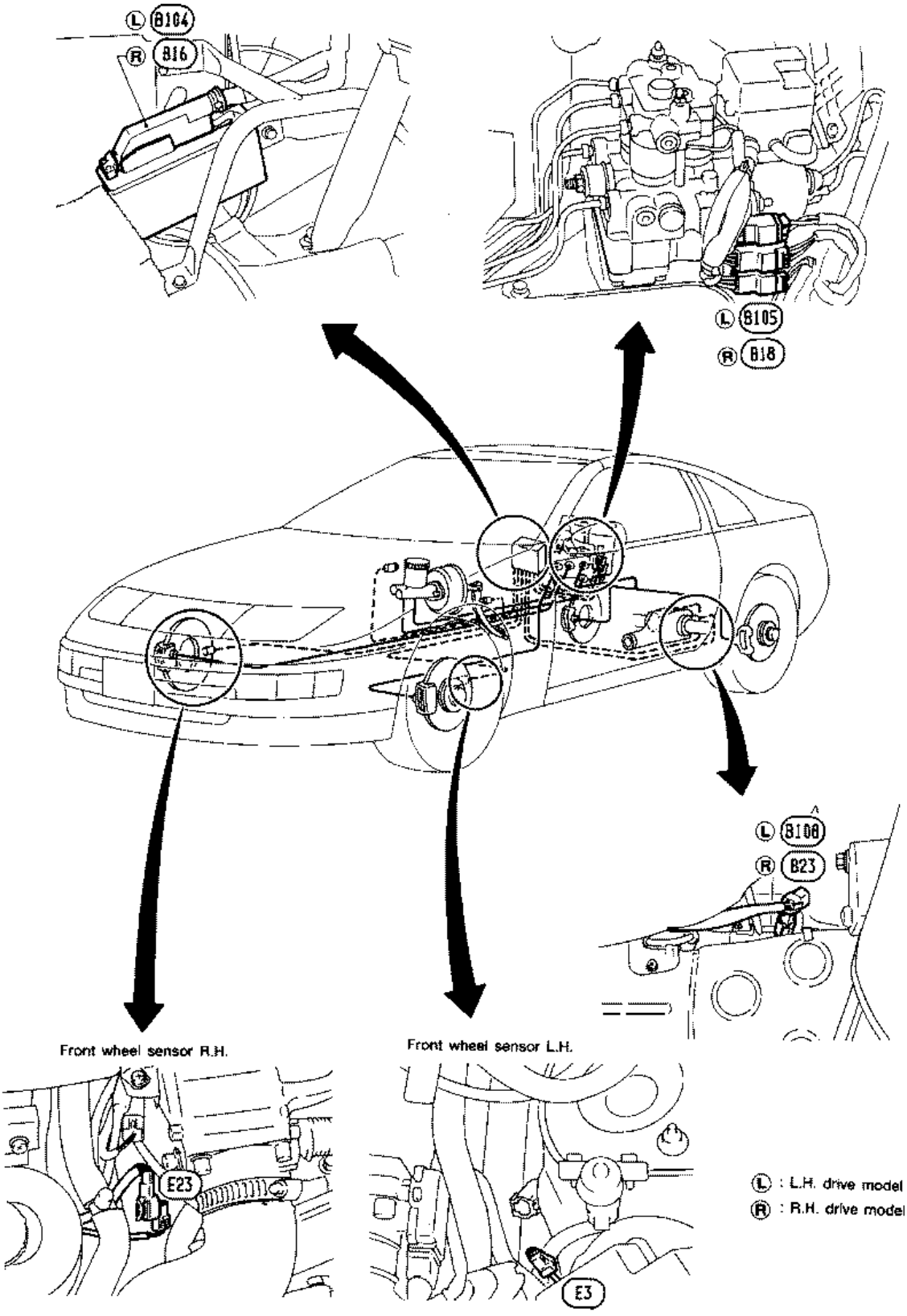
SBR531A

Component Parts Location

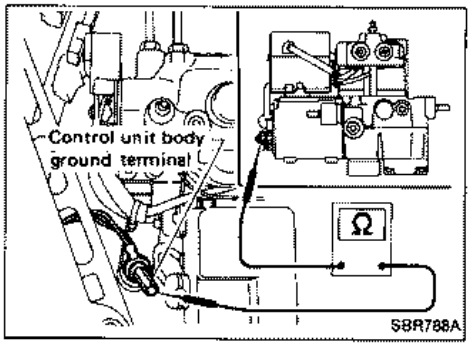


SBR182B

Harness Connector Location



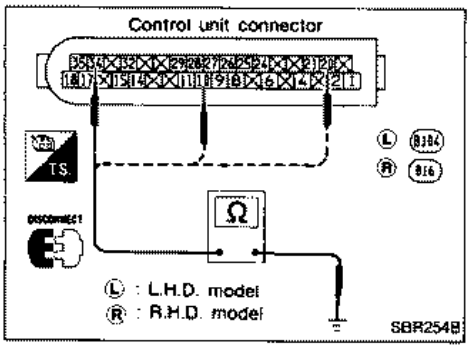
SBR183B



Ground Circuit Check

ACTUATOR MOTOR GROUND

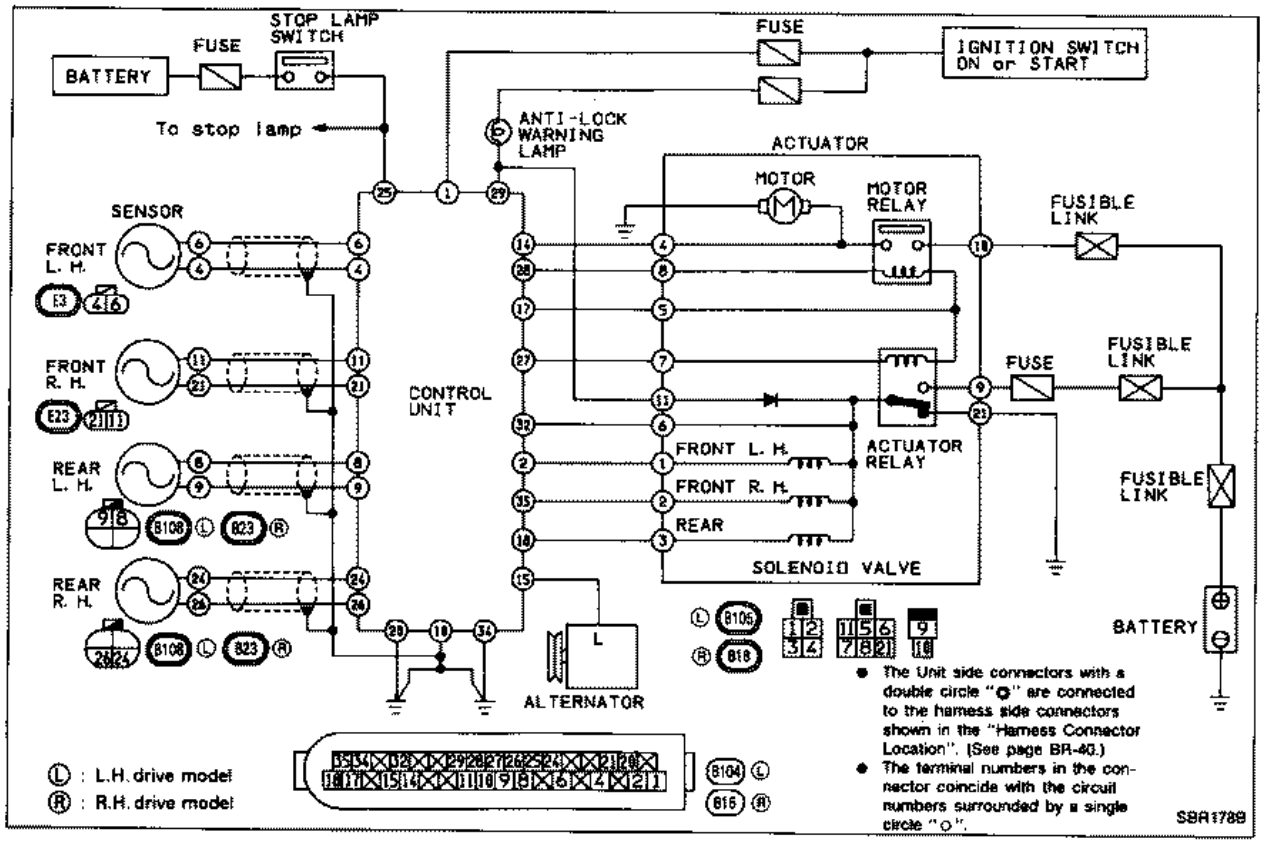
- Check resistance between both terminals.
  Resistance: approx. 0Ω

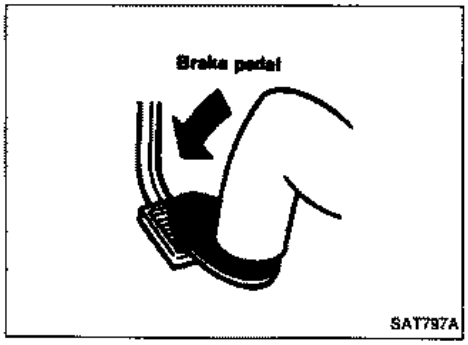


CONTROL UNIT GROUND

- Check resistance between both terminals.
  Resistance: 0Ω

Circuit Diagram for Quick Pinpoint Check





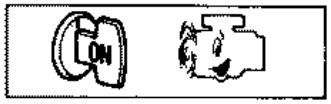
Diagnostic Procedure 1

SYMPTOM: Pedal vibration and noise

Refer to worksheet result.

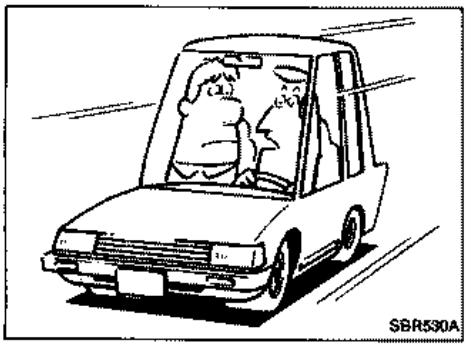
Check whether the symptom appears only when brake is applied suddenly.
- Yes → When brake is normally applied, A.B.S. works and produces pedal vibration or noise.
- No ↓

Check whether the symptom appears only when engine is started.

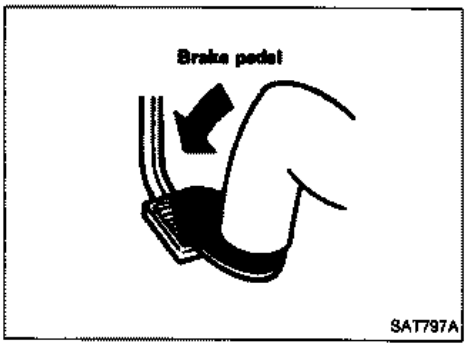


- Yes → Refer to Preliminary Check 4 result.
- No ↓

Check whether the symptom appears only when the vehicle speed is within 10 km/h (6 MPH) after starting engine.
- Yes → Check whether the symptom disappears within 5 seconds.
  - No → Ⓐ
  - Yes → A.B.S. may sometimes operate when load is high and voltage is low due to insufficient alternator output.
- No ↓



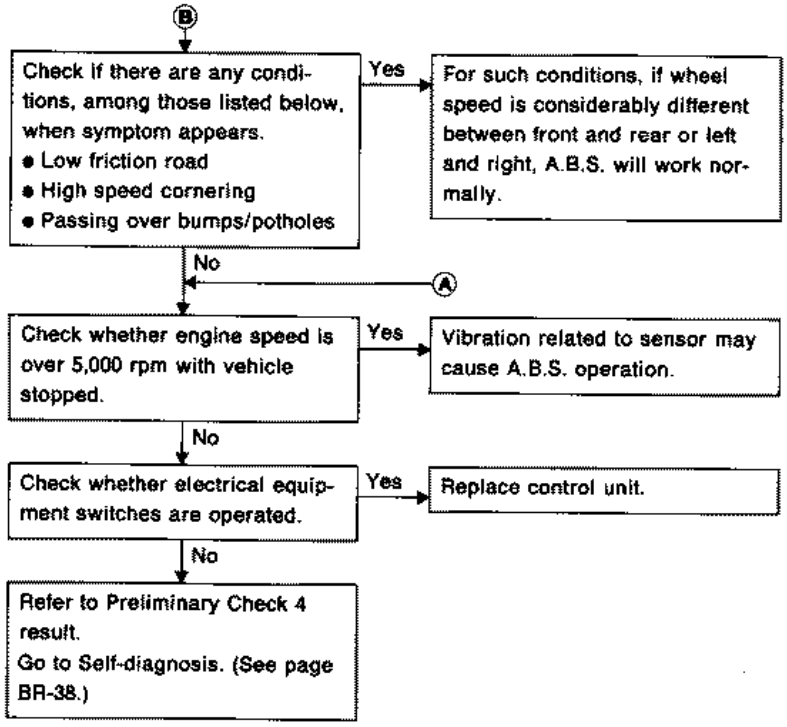
Check whether the symptom appears while the vehicle is being driven.
- No → Ⓐ
- Yes ↓

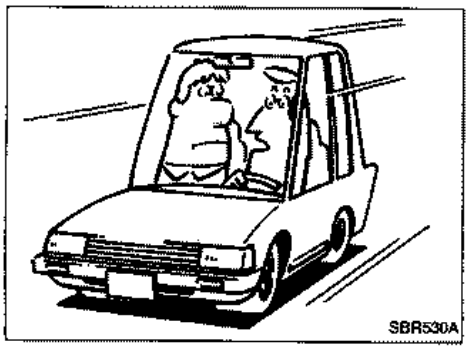


Check whether the symptom appears when brake is applied gradually.
- No (Appears when brake is not applied.) → Check if there are any conditions, among those listed below, when symptom appears.
  - ● Shifting
  - ● Operating clutch
  - ● Passing over bumps/potholes
  - No → Ⓐ
  - Yes → Under these conditions individual wheel speed can change suddenly. This may sometimes cause the A.B.S. to operate.
- Yes ↓

Ⓑ

Diagnostic Procedure 1 (Cont'd)




SBR530A

Diagnostic Procedure 2

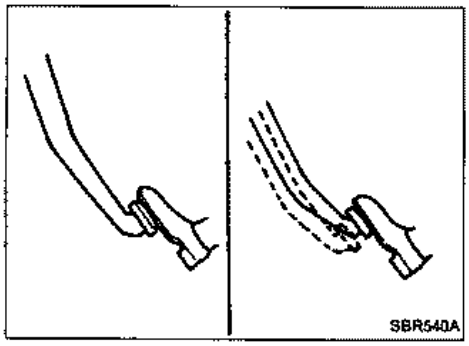
SYMPTOM: Long stopping distance

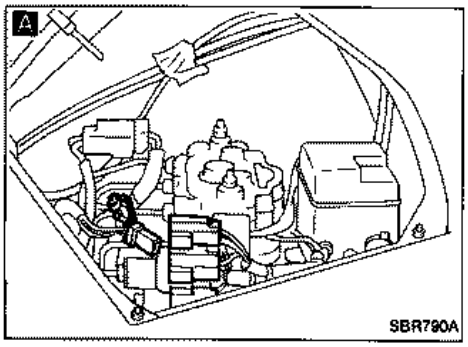
Refer to worksheet results.

Check if road condition is slippery with snow or gravel.
- Yes → Stopping distance may be longer than vehicles which are not equipped with A.B.S.
- No ↓

Disconnect actuator connector and check whether stopping distance is still long.
- Yes → Refer to Preliminary Check 4 result. Go to Self-diagnosis. (See page BR-38.)
- No ↓

Perform Preliminary Check 1 and air bleeding.


SBR540A



SBR790A

Diagnostic Procedure 3

SYMPTOM: Abnormal pedal action

Refer to worksheet results.

Check whether brake pedal stroke is abnormally large.
- Yes → Vehicle equipped with A.B.S. may have a tendency for large pedal strokes.
- No ↓

Check that brake pedal force is firm but brake is effective.
- Yes → Normal condition.
- No ↓

A

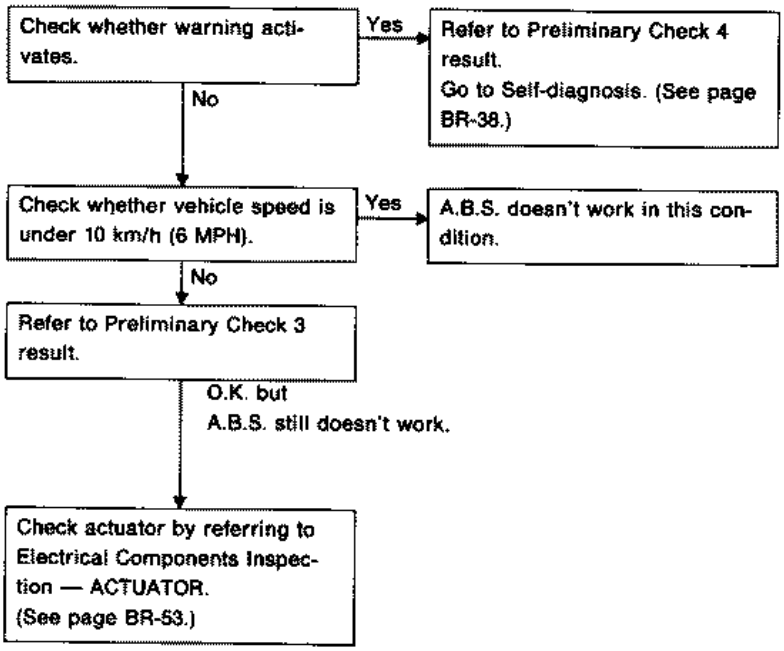
Disconnect actuator connector and check whether brake is effective.
- Yes → Refer to Preliminary Check 4 result. Go to Self-diagnosis. (See page BR-38.)
- No ↓

Perform Preliminary Check 1.

Diagnostic Procedure 4

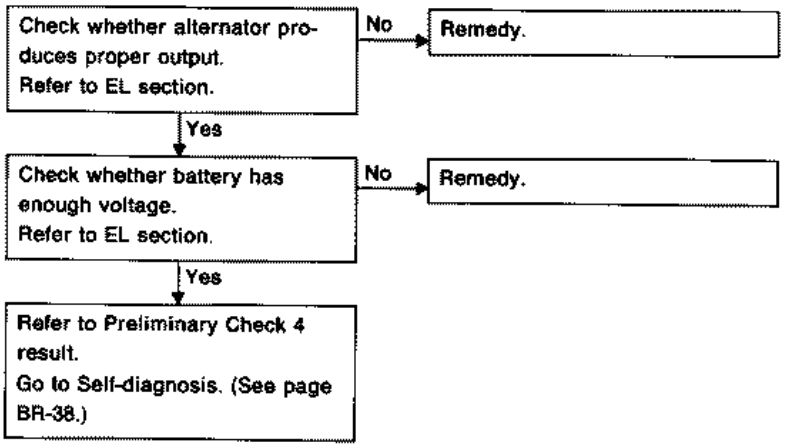
SYMPTOM: A.B.S. doesn't work.

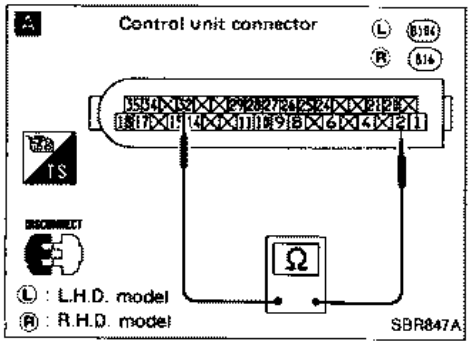
Refer to worksheet results.

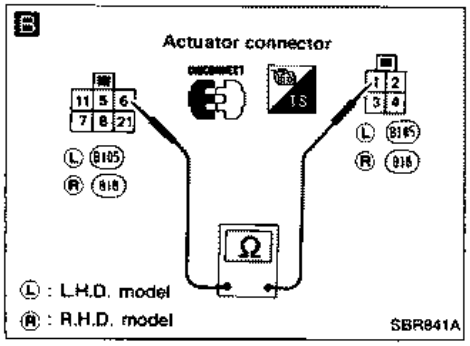


Diagnostic Procedure 5

SYMPTOM: A.B.S. works but warning activates.







Diagnostic Procedure 6

ACTUATOR SOLENOID (L.E.D. flashing number 1 - 4)

INSPECTION START
Remove battery negativeterminal connector.

A

CHECK SOLENOID VALVE RESISTANCE.
Disconnect control unit connector.
Check resistance between controlunit connector (vehicle side) terminals.
Flashing number 1:
Terminals ㉜ and ②
Flashing number 2:
Terminals ㉜ and ㉟
Flashing number 3 or 4:
Terminals ㉜ and ⑱
Resistance:0.7 - 1.6Ω

O.K. → Replace controlunit.

N.G.

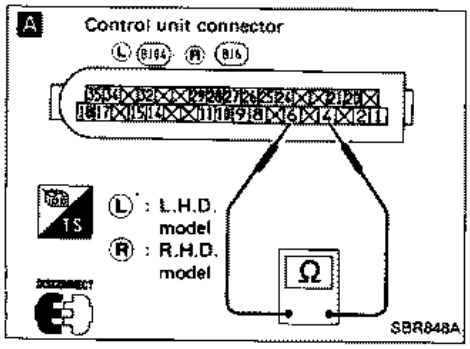
B

Disconnect actuator connector.
Checkresistance between actuator connector (actuator side) terminals.
Flashing number 1:
Terminals ⑥ and ①
Flashing number 2:
Terminals ⑥ and ②
Flashing number 3 or 4:
Terminals ⑥ and ③
Resistance: 0.7 - 1.6Ω

O.K. → Repair harnessbetween actuator connector and control unit connector.

N.G.

Replace actuator.



Diagnostic Procedure 7

WHEEL SPEED SENSOR (L.E.D. flashing number 5 - 8)

INSPECTIONSTART
Remove battery negative terminal connector.

A

CHECK SPEED SENSOR RESISTANCE.
Disconnectcontrol unit connector.
Check resistance between control unitconnector (vehicle side) terminals.
Flashing number 5:
Terminals ④and ⑥
Flashing number 6:
Terminals ⑪ and ㉑
Flashing number 7 or 8:
Terminals ⑦and ⑨
Resistance:0.8 - 1.2 kΩ

O.K. → Replace controlunit.

N.G.

Refer to Preliminary Check 3 result.
Checkwhether sensor has 0.8 - 1.2 kΩ resistance.

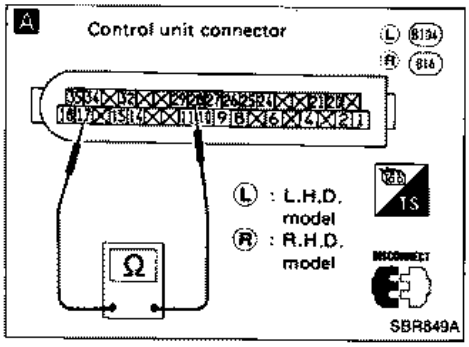
N.G. → Replace sensor.

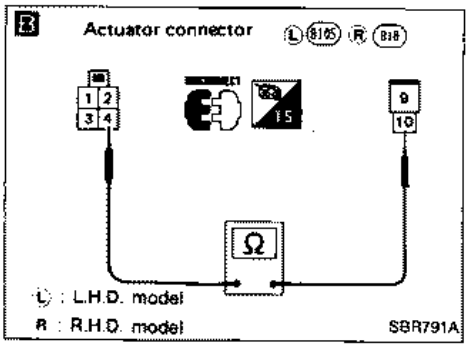
O.K.

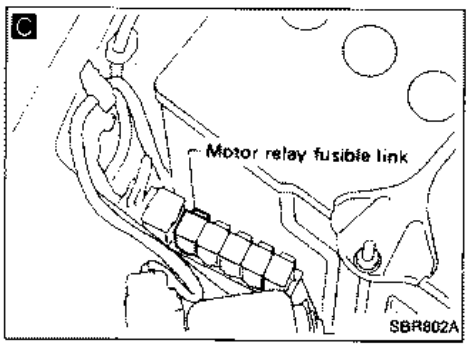
Repair harness between sensor connector andcontrol unit connector.

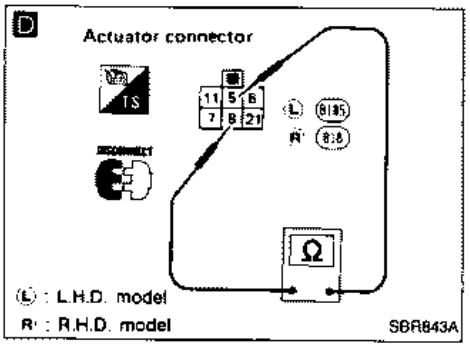
Diagnostic Procedure 8

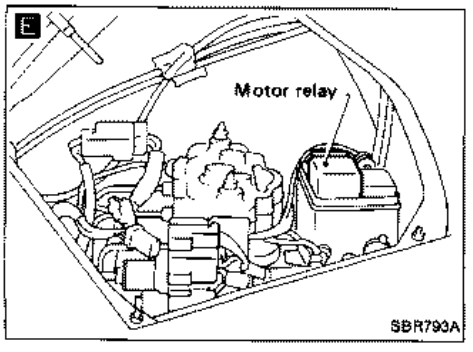
ACTUATOR MOTOR RELAY (L.E.D. flashing number 9)











INSPECTION START
Remove battery negativeterminal connector.

A
CHECK MOTOR RELAY SOLENOID RESISTANCE.
Disconnect control unit connector.
Check resistance between controlunit connector (vehicle side) terminals ⑰ and ㉘.
Resistance: 45 - 55Ω

N.G. → D
Disconnect actuatorconnector.
Check resistance between actuator connector (actuatorside) terminals ⑧ and ⑤.
Resistance: 45 - 55Ω

O.K. → Repair harness between actuator and controlunit.

N.G. → E
Replace motor relay.

O.K. →

B
CHECK MOTOR RELAY DEACTIVATION.
Disconnectactuator connector.
Check continuity between actuator connector(actuator side) terminals ④ and ⑩.

Yes → E
Replace motor relay.

No →

C
Check if motor's fusible link is blown.

No → Perform ElectricalComponents Inspection — ACTUATOR. (See page BR-53.)

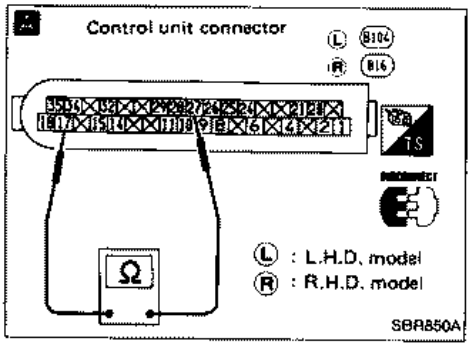
O.K. → Replace control unit.

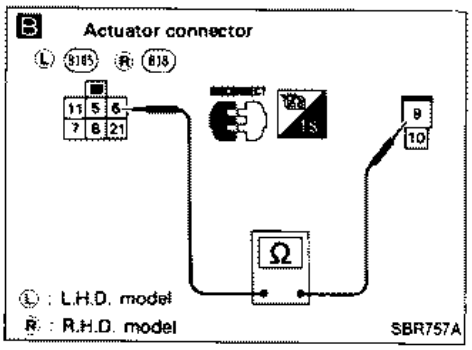
N.G. → Replace actuator.

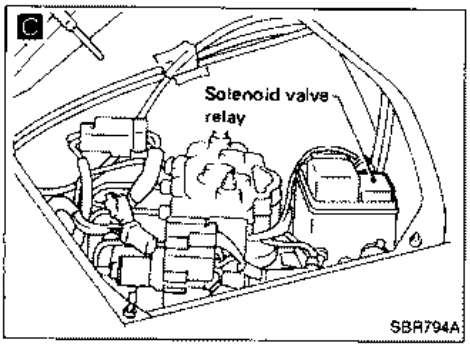
Yes → Replace fusible link.

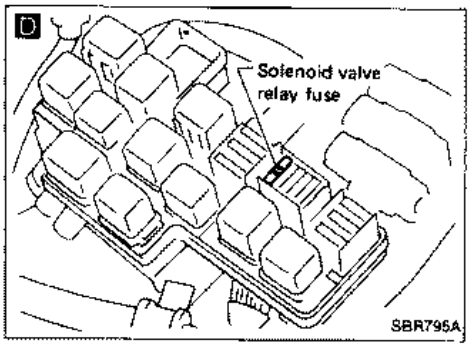
Diagnostic Procedure 9

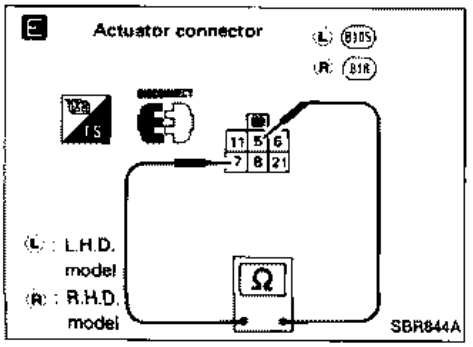
ACTUATOR SOLENOID VALVE RELAY (L.E.D. flashing number 10)











INSPECTION START
Remove battery negativeterminal connector.

CHECK SOLENOID VALVE RELAY RESISTANCE.
Disconnect control unit connector.
Check resistance between controlunit connector (vehicle side) terminals ㉗ and ⑰.
Resistance: 80 - 90Ω

N.G. → Check resistancebetween actuator connector (actuator side) terminals ⑦ and ⑤.
Resistance: 80 - 90Ω

O.K. → Repair harness between actuator and controlunit.

N.G. → Replace solenoid valve relay.

O.K.

CHECK SOLENOID VALVE RELAY MOVEMENT.
Disconnect actuator connector.
Check continuity between actuatorconnector (actuator side) terminals ⑥ and ⑨.

Yes → Replace solenoid valverelay.

No

Check if solenoid valve relay fuse is blown.

No → Perform ElectricalComponents Inspection — ACTUATOR.
(See page BR-53.)

N.G. → Replace actuator.

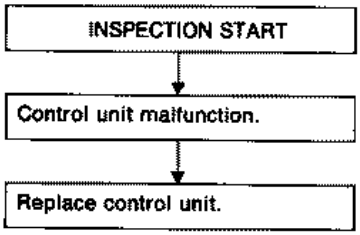
O.K. → Replace control unit.

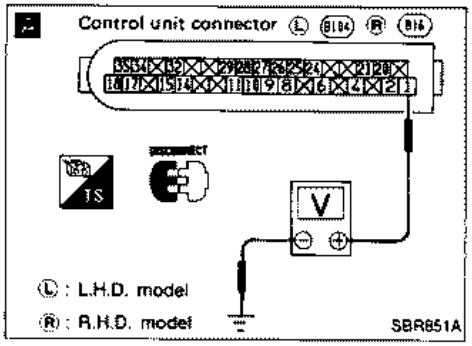
Yes

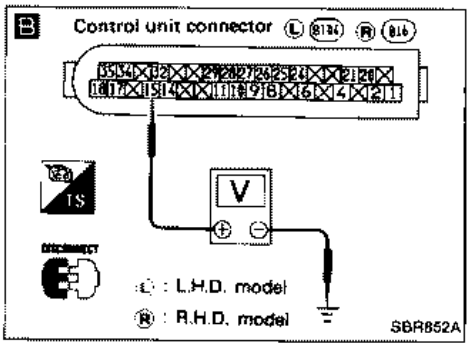
Replace fuse.

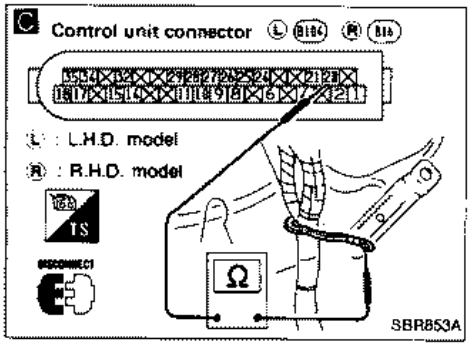
Diagnostic Procedure 10

CONTROL UNIT (L.E.D. flashing number 16)









Diagnostic Procedure 11

CONTROL UNIT OR POWER SUPPLY AND GROUND CIRCUIT (Warningactivates but L.E.D. comes off.)

INSPECTION START

A

CHECK CONTROL UNIT POWER SUPPLY.
Disconnect control unit connector.
Check voltage between controlunit connector (vehicle side) terminal ① and body ground with ignitionswitch turned on.

N.G. → Check if controlunit "10A" fuse is blown.

Yes → Replace fuse.

No → Repair power supply harness.

O.K.

B

CHECK ALTERNATOR L TERMINAL VOLTAGE.
Disconnect control unit connector.
Check voltage between controlunit connector (vehicle side) terminal ⑮ and body ground after enginestarting.
Voltage: 6V or more

N.G. → Check if otherwarnings activate.

Yes → Repair harness between alternator and controlunit.

No → Malfunctioning alternator.

O.K.

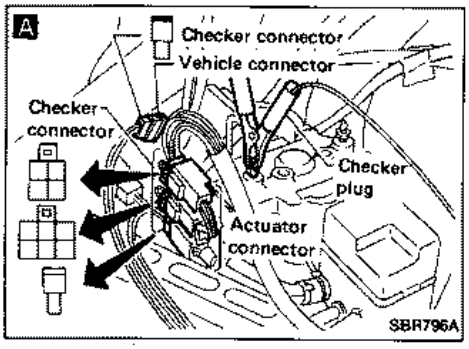
C

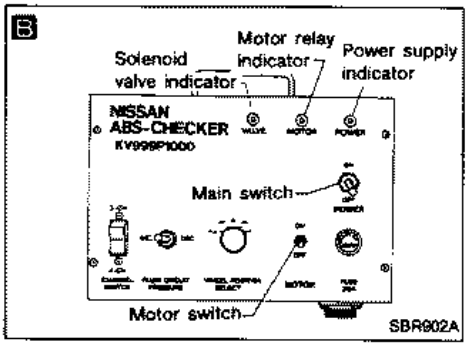
Check continuity between control unitconnector (vehicle side) terminal ⑳ and body ground with ignitionswitch "OFF".

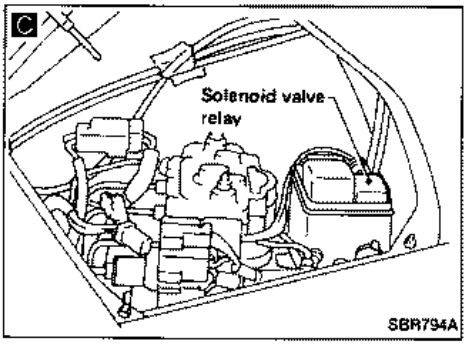
N.G. → Repair groundharness.

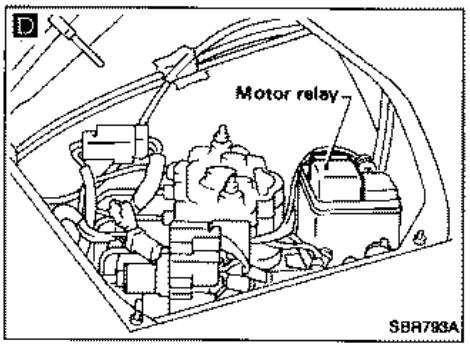
O.K.

Replace control unit.









Electrical Components Inspection

ACTUATOR (Not self-diagnostic item)

INSPECTION START

A

Connect A.B.S. checker to actuator connector and vehicle harness with battery terminal connected and all checker switch turning off.
Use harness for 3 channel.
Set channel select switch to 3 channel.

B

Turn checker main switch on.
Check power supply indicator for coming on.

No → Replace battery with fully charged new one, if checker connection is correct.

Yes

B

Check checker valve relay indicator for coming on.

No → C Replace solenoid valve relay, if checker connection is correct.

Yes

B Step Ⓐ

Select one valve — FL, FR or RR. (valves corresponding to each wheel position.)
Select brake circuit pressure decreasing position by switch then turn motor switch on.
Select pressure increasing position.

B

Check motor relay indicator for coming on while motor switch is turned on.

No → D Replace motor relay, if checker connection is correct.

Yes

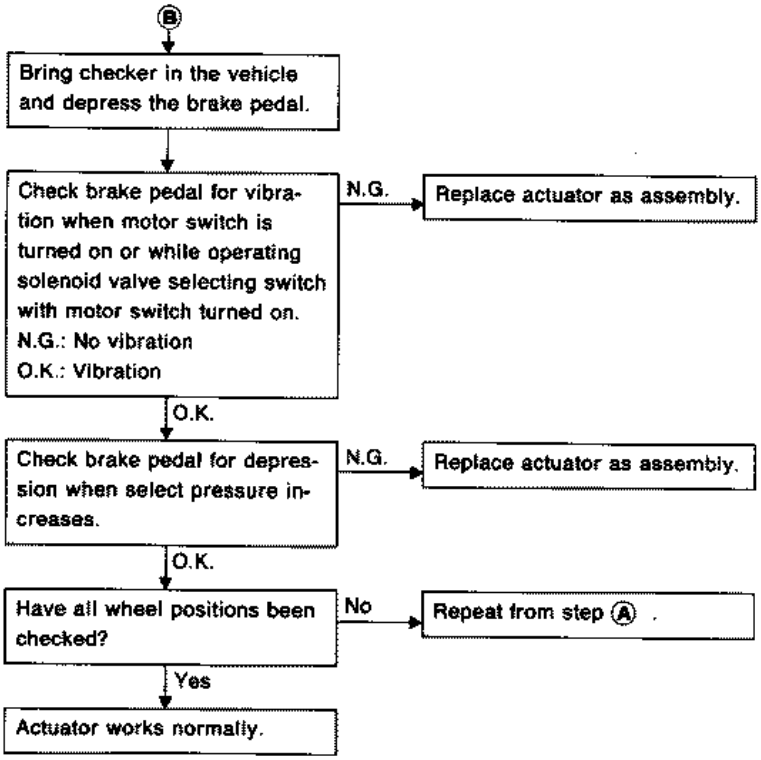
Check motor for operational sound beside the actuator in a quiet place.

No → Replace actuator as assembly, if Diagnostic Procedures 6 - 11 are already performed and checker connection is correct.

Yes

Ⓑ

Electrical Components Inspection (Cont'd)



CAUTION:
Do not set checker at pressure decrease position for more than 5 seconds at a time. Actuator solenoid valve may be damaged.

General Specifications

Applied model	Australia		Europe
	Without A.B.S.	With A.B.S.	-
Front brake			
Brake model	OPZ25V		OPF25V
Cylinder bore diameter mm (in)	40.45 (1.5925) x 4		
Pad length x width x thickness mm (in)	116 x 50 x 10 (4.57 x 1.97 x 0.39)		
Rotor outer diameter x thickness mm (in)	280 x 26 (11.02 x 1.02)		280 x 30 (11.02 x 1.18)
Rear brake			
Brake model	OPZ11VB		
Cylinder bore diameter mm (in)	38.1 (1.500) x 2		
Pad length x width x thickness mm (in)	71.8 x 36.5 x 11.5 (2.827 x 1.437 x 0.453)		
Rotor outer diameter x thickness mm (in)	297 x 18 (11.69 x 0.71)		
Master cylinder			
Cylinder bore diameter mm (in)	23.81 (15/16)	26.99 (17/16)	
Control valve			
Valve model	Proportioning valve (within master cylinder)		
Split point x reducing ratio kPa (bar, kg/cm^2, psi)	3,432 (34.3, 35, 498) x 0.4		
Brake booster			
Booster model	M215T		
Diaphragm diameter mm (in)	Primary: 230 (9.06) Secondary: 205 (8.07)		
Brake fluid			
Recommended brake fluid	DOT 3		
Parking drum brake			
Brake model	DS17HD		
Lining			
Width x thickness x length mm (in)	154.1 x 25.0 x 3.0 (6.07 x 0.984 x 0.118)		
Drum inner diameter mm (in)	172.0 (6.77)		

Inspection and Adjustment

FRONT DISC BRAKE

Unit: mm (in)

Brake model	OPZ25V	OPF25V
Pad wear limit		
Minimum thickness	2.0 (0.079)	
Rotor repair limit		
Minimum thickness	24.0 (0.945)	28.0 (1.102)
Maximum runout	0.07 (0.0028)	

REAR DISC BRAKE

Unit: mm (in)

Brake model	OPZ11VB
Pad wear limit	
Minimum thickness	2.0 (0.079)
Rotor repair limit	
Minimum thickness	16.0 (0.630)
Maximum runout	0.07 (0.0028)

PARKING DRUM BRAKE

Unit: mm (in)

Brake model	DS17HD
Lining replacement limit	
Minimum thickness	1.5 (0.059)
Drum repair limit	
Maximum inner diameter	173.0 (6.81)

BRAKE PEDAL

Unit: mm (in)

Applied model	M/T	A/T
Free height	186 - 196 (7.32 - 7.72)	195 - 205 (7.68 - 8.07)
Depressed height [under force of 490 N (50 kg, 110 lb) with engine running]		
With A.B.S.	105 (4.13)	110 (4.33)
Without A.B.S.	95 (3.74)	105 (4.13)
Clearance between pedal stopper and threaded end of switches	0.3 - 1.0 (0.012 - 0.039)	
Pedal free play at clevis	1 - 3 (0.04 - 0.12)	

PARKING BRAKE

Number of notches [under force of 196 N (20 kg, 44 lb)]	6 - 7
Number of notches (when warning lamp switch comes on)	1