BRAKE SYSTEM

SECTION BR

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ABS

ABS

CONTENTS (Cont'd)

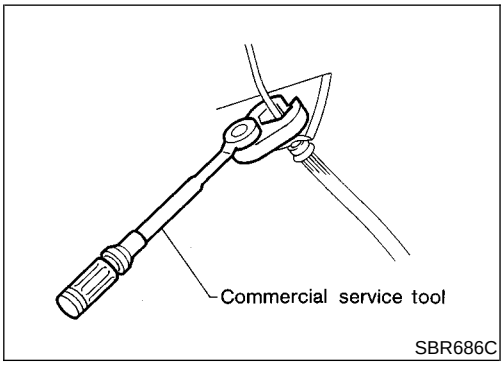
Supplemental Restraint System (SRS) “AIR BAG” and “SEAT BELT PRE-TENSIONER”

NEBR0199

The Supplemental Restraint System “AIR BAG” and “SEAT BELT PRE-TENSIONER”, used along with a seat belt, help 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 in the instrument panel on the passenger side), seat belt pre-tensioners, a diagnosis sensor unit, a crash zone sensor (4WD models), warning lamp, wiring harness, and spiral cable.
The vehicle is equipped with a passenger air bag deactivation switch. Because no rear seat exists where a rear-facing child restraint can be placed, the switch is designed to turn off the passenger air bag so that a rear-facing child restraint can be used in the front passenger seat. The switch is located in the center of the instrument panel, near the ashtray. When the switch is turned to the ON position, the passenger air bag is enabled and could inflate in a frontal collision. When the switch is turned to the OFF position, the passenger air bag is disabled and will not inflate in a frontal collision. A passenger air bag OFF indicator on the instrument panel lights up when the passenger air bag is switched OFF. The driver air bag always remains enabled and is not affected by the passenger air bag deactivation switch.
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. For removal of Spiral Cable and Air Bag Module, *RS-21*.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. Spiral cable and wiring harnesses (except “SEAT BELT PRE-TENSIONER”) are covered with yellow insulation either just before the harness connectors or on the complete harness, for easy identification.**
- **The vehicle (except crew cab model) is equipped with a passenger air bag deactivation switch which can be operated by the customer. When the passenger air bag is switched OFF, the passenger air bag is disabled and will not inflate in a frontal collision. When the passenger air bag is switched ON, the passenger air bag is enabled and could inflate in a frontal collision. After SRS maintenance or repair, make sure the passenger air bag deactivation switch is in the same position (ON or OFF) as when the vehicle arrived for service.**



Precautions for Brake System

NEBR0200

- **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 and 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-9.**

WARNING:

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

Wiring Diagrams and Trouble Diagnosis

NEBR0201

When you read wiring diagrams, refer to the following:

- Refer to ***GI-11***, “HOW TO READ WIRING DIAGRAMS”.
- Refer to ***EL-8***, “POWER SUPPLY ROUTING” for power distribution circuit.

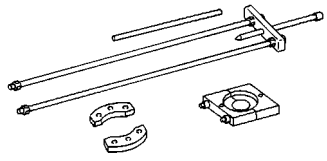
When you perform trouble diagnosis, refer to the following:

- Refer to ***GI-35***, “HOW TO FOLLOW TEST GROUP IN TROUBLE DIAGNOSIS”.
- Refer to ***GI-24***, “HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT”.

Special Service Tools

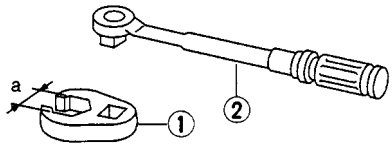
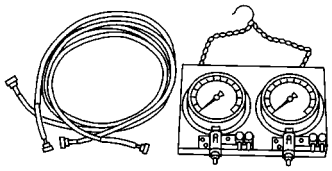
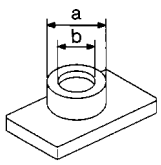
NEBR0202

The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

Tool number (Kent-Moore No.) Tool name	Description	
KV40106500 (J25852-B)Rear axle shaft bearing puller	 NT683	Removing wheel bearing and ABS sensor rotor

Commercial Service Tools

NEBR0203

Tool name	Description	
1 Flare nut crowfoot 2 Torque wrench	 NT360	Removing and installing each brake piping **a: 10 mm (0.39 in)**
Brake fluid pressure gauge	 NT151	Measuring brake fluid pressure
Rear wheel sensor rotor drift	 NT509	Installing rear wheel sensor rotor **a: 75 mm (2.95 in) dia.** **b: 63 mm (2.48 in) dia.**

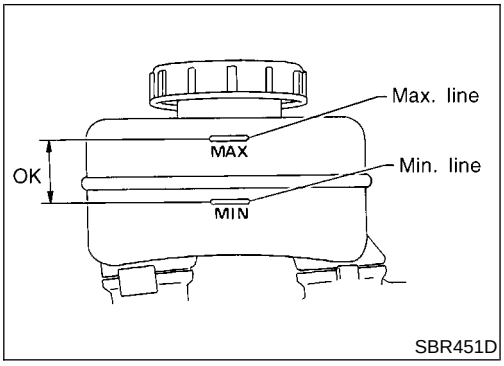
NVH Troubleshooting Chart

NEBR0204S01

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

Reference page			BR-30	BR-24, 30	BR-28	BR-24	—	—	BR-26, 30	—	—	—	BR-27	BR-30	NVH, ***PD-4***.	NVH, ***PD-4***.	NVH, ***AX-3***.	NVH, ***AX-3***.	NVH, ***SU-3***.	NVH, ***SU-3***.	NVH, ***SU-3***.	NVH, ***ST-5***.
Possible cause and SUSPECTED PARTS			Linings or pads - damaged	Linings or pads - uneven wear	Return spring damaged	Shims damaged	Rotor or drum imbalance	Rotor or drum damage	Rotor or drum runout	Rotor or drum deformation	Rotor or drum deflection	Rotor or drum rust	Rotor thickness variation	Drum out of round	PROPELLER SHAFT	DIFFERENTIAL	DRIVE SHAFT	AXLE	SUSPENSION	TIRES	ROAD WHEEL	STEERING
Symp-tom	BRAKE	Noise	×	×	×	×									×	×	×	×	×	×	×	×
		Shake					×								×		×	×	×	×	×	×
		Shimmy, Judder					×	×	×	×	×	×	×	×				×	×	×	×	×

×: Applicable

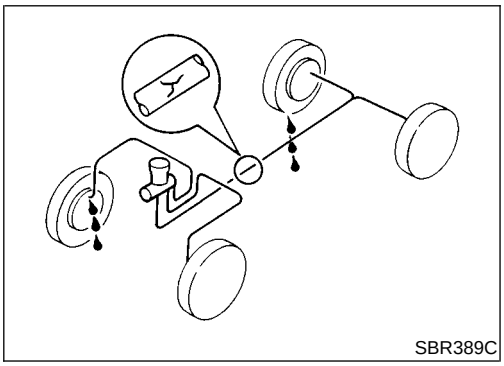


SBR451D

Checking Brake Fluid Level

NEBR0205

- 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.
- If the brake warning lamp comes on, check brake fluid level switch and parking brake switch.


SBR389C

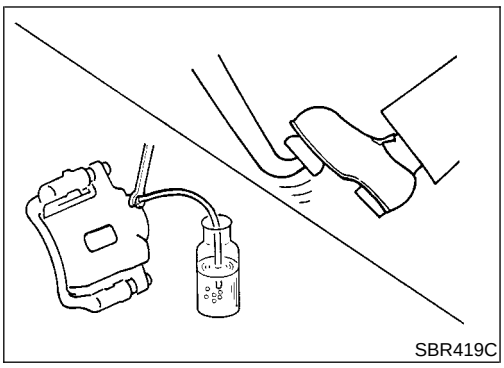
Checking Brake Line

NEBR0206

CAUTION:

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

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


SBR419C

Changing Brake Fluid

NEBR0207

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 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-10.

Brake Burnishing Procedure

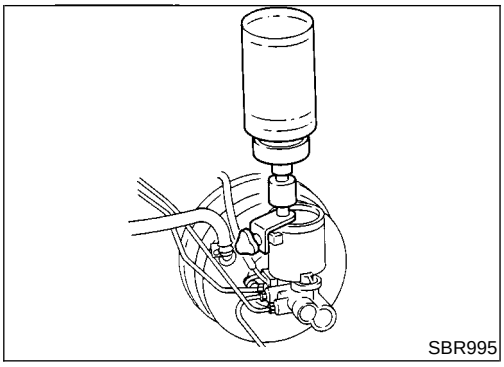
=NEBR0249

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


SBR995

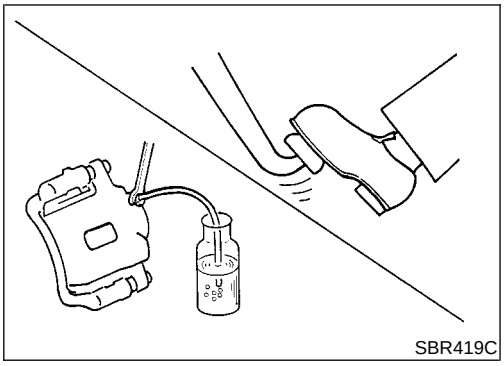
Bleeding Brake System

=NEBR0208

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-20.**
- **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.**
- **Turn ignition switch OFF and disconnect ABS actuator (2WD)/ABS actuator and electric unit (4WD) connector or battery cable.**
- **Bleed air in the following order.**

1. LSV air bleeder (Models equipped with LSV)
2. Left rear brake
3. Right rear brake
4. Left front brake
5. Right front brake
6. ABS actuator (2WD) or ABS actuator or ABS actuator and electric unit (4WD)

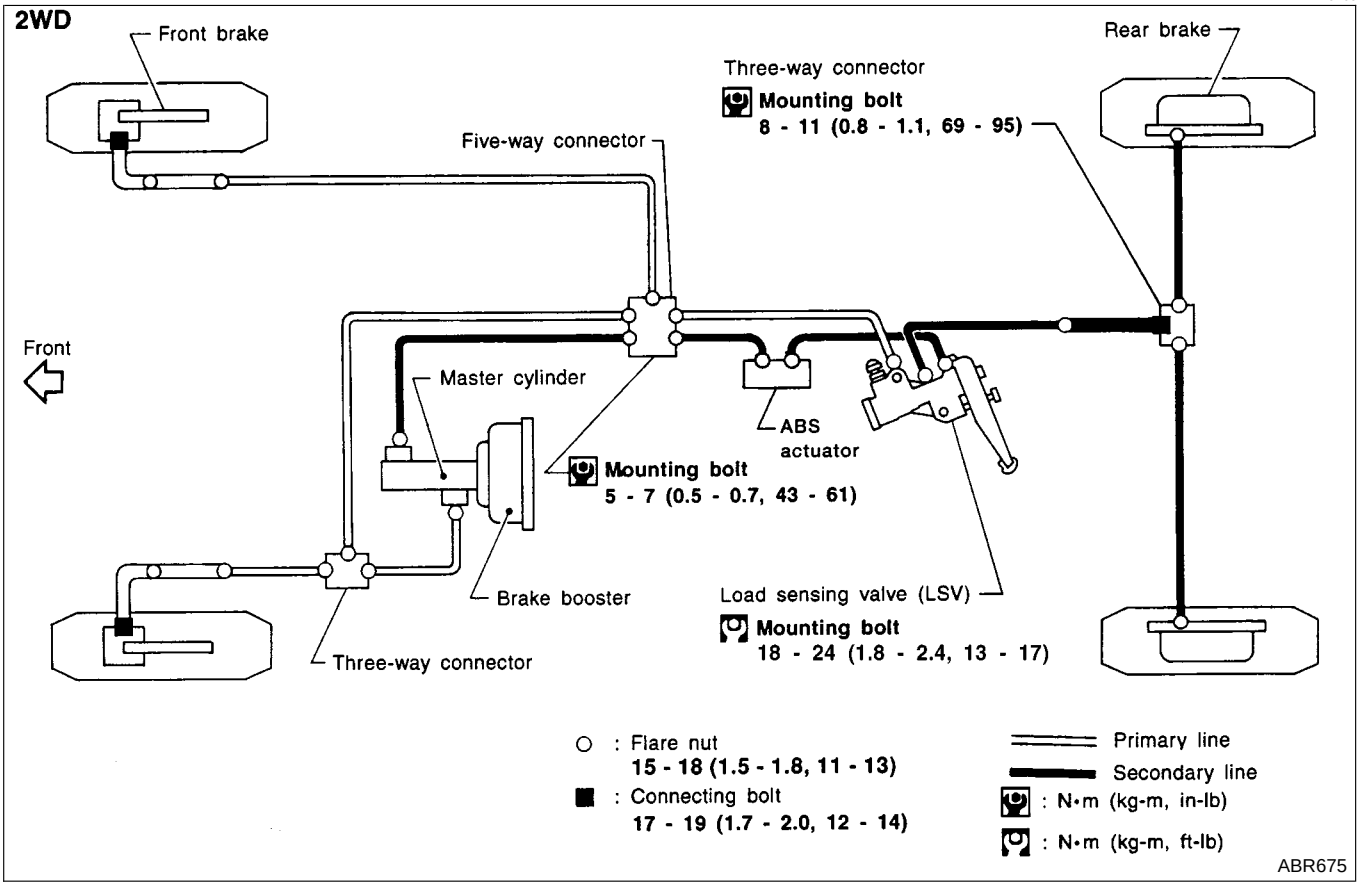

SBR419C

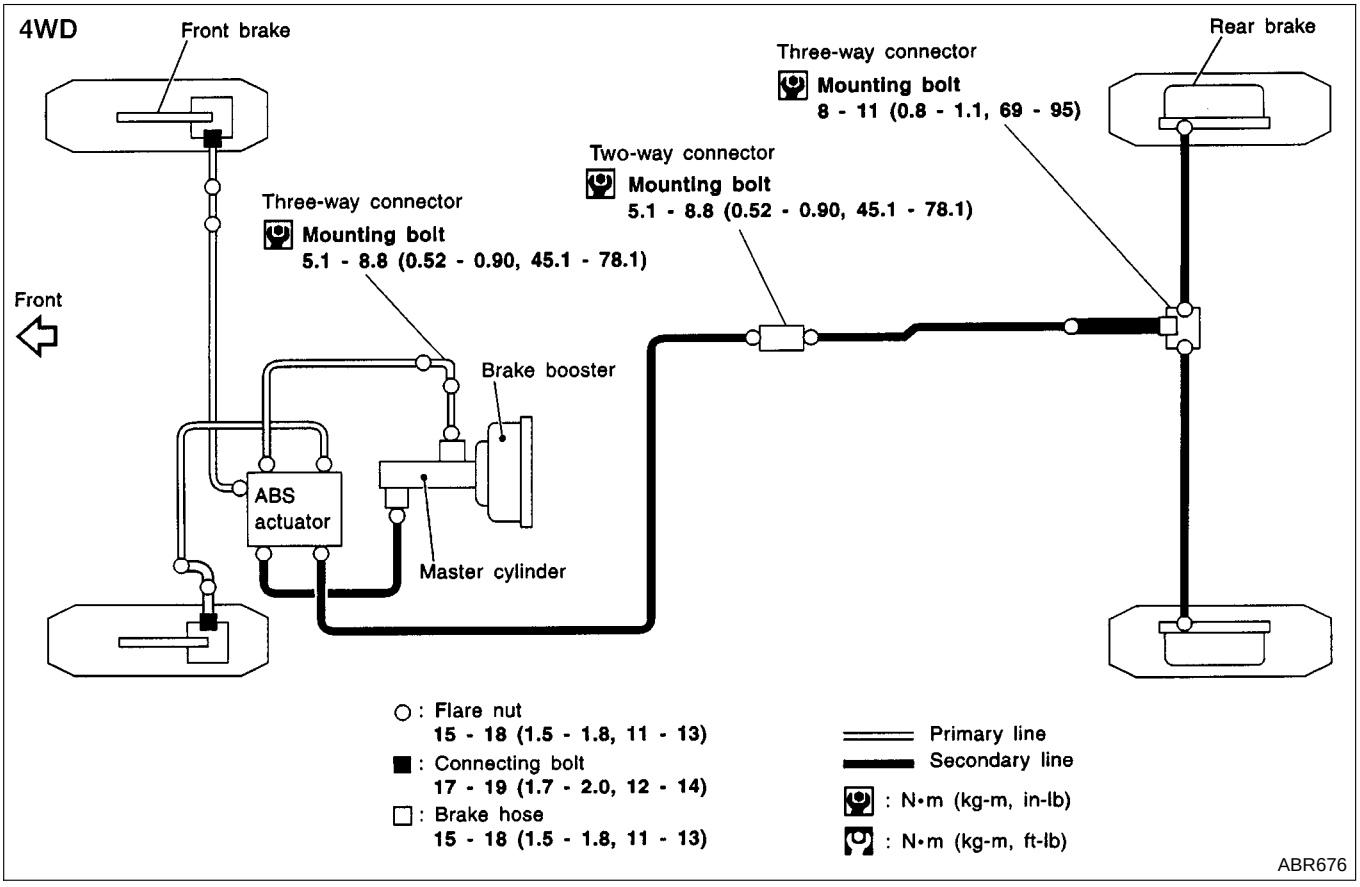
1. Connect a transparent vinyl tube to air bleeder valve.
2. Fully depress brake pedal several times.
3. With brake pedal depressed, open air bleeder valve to release air.
4. Close air bleeder valve.
5. Release brake pedal slowly.
6. Repeat steps 2. through 5. until clear brake fluid comes out of air bleeder valve.
7. Tighten air bleeder valve.

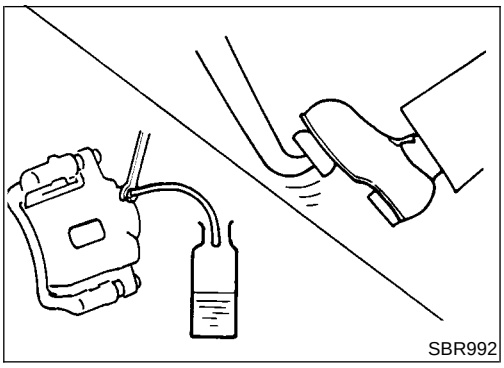
: 7 - 9 N·m (0.7 - 0.9 kg-m, 61 - 78 in-lb)

Hydraulic Circuit

NEBR0209






SBR992

Removal

NEBR0210

CAUTION:

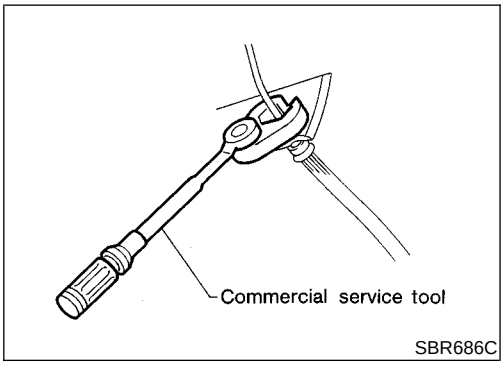
- **Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.**
- **All hoses must be free from excessive bending, twisting and pulling.**

1. Connect vinyl tube to air bleeder valve.
2. Drain brake fluid from each air bleeder valve by depressing brake pedal.
3. Remove flare nut connecting brake tube and hose, then withdraw lock spring.
4. Cover openings to prevent entrance of dirt whenever disconnecting brake line.

Inspection

NEBR0211

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



SBR686C

Installation

NEBR0212

CAUTION:

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

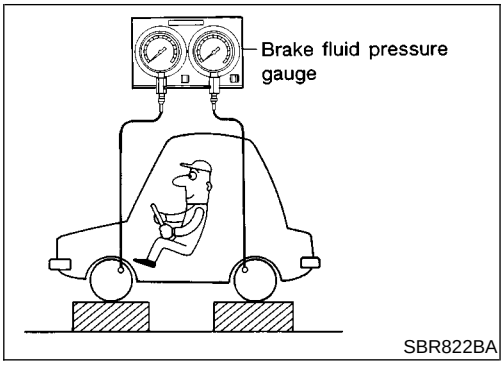
1. Tighten all flare nuts and connecting bolts.

   Flare nut:

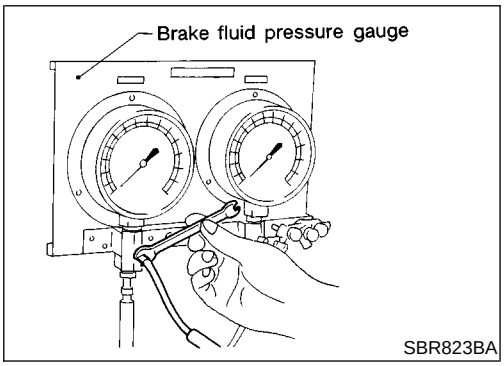
   : 15 - 18 N·m (1.5 - 1.8 kg-m, 11 - 13 ft-lb)

   Connecting bolt:

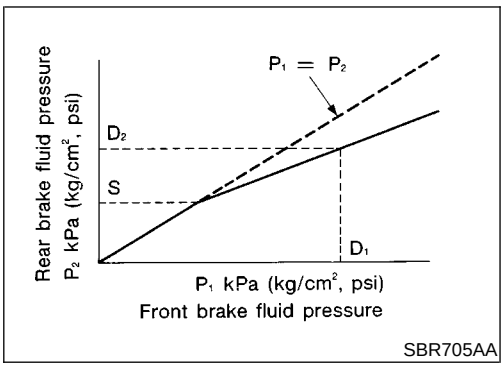
   : 17 - 19 N·m (1.7 - 2.0 kg-m, 12 - 14 ft-lb)
2. Refill until new brake fluid comes out of each air bleeder valve.
3. Bleed air. Refer to “Bleeding Brake System”, BR-10.



SBR822BA



SBR823BA



SBR705AA

Inspection

NEBR0213

CAUTION:

- **Carefully monitor brake fluid level at master cylinder.**
- **Use new brake fluid “DOT 3”.**
- **Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on paint areas, wash it away with water immediately.**
- **Depress pedal slowly when raising front brake pressure.**
- **Check rear brake pressure 2 seconds after front brake pressure reaches specified value.**
- **Disconnect harness connectors from ABS actuator and electric unit before checking.**

1. Remove front LH tire.
2. Connect tool to air bleeders on front LH brake caliper and rear LH or RH brake wheel cylinder.
3. Install front LH tire.

Before installing front LH tire, confirm the tool is not touching the front LH wheel.

4. Bleed air from the tool.
5. Check fluid pressure by depressing brake pedal.

kPa (kg/cm^2, psi)

Applied pressure (Front brake) D_1	6,375 (65, 924)
Output pressure (Rear brake) D_2	3,432 - 3,825 (35 - 39, 498 - 555)

If output pressure is out of specifications, replace master cylinder assembly (built-in type).

6. Bleed air after disconnecting the tool. Refer to “Bleeding Brake System”, BR-10.
7. Install front LH tire.

Removal and Installation (Built-in type)

NEBR0214

Always replace together with master cylinder as an assembly.

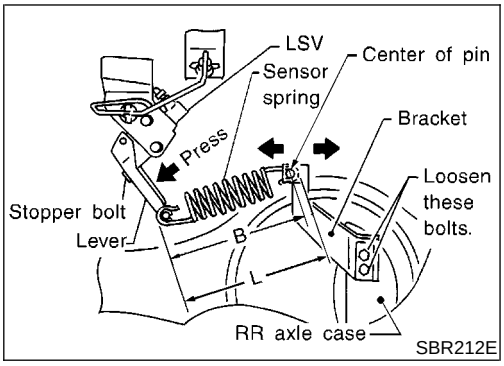
- Refer to “MASTER CYLINDER”, BR-18.

Inspection

NEBR0278

CAUTION:

- **Carefully monitor brake fluid level at master cylinder.**
- **Use new brake fluid “DOT 3”.**
- **Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on paint areas, wash it away with water immediately.**
- **Depress pedal slowly when raising front brake pressure.**
- **Check rear brake pressure 2 seconds after front brake pressure reaches specified value.**
- **Disconnect harness connectors from ABS actuator and electric unit before checking.**



1. Park vehicle on a level surface with vehicle unloaded*.
   * Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.
2. Press a lever to the stopper bolt, then adjust length “B” as follows:

Length “B”	Reference (Length “L”)
207.7 mm (8.18 in)	217.3 mm (8.56 in)

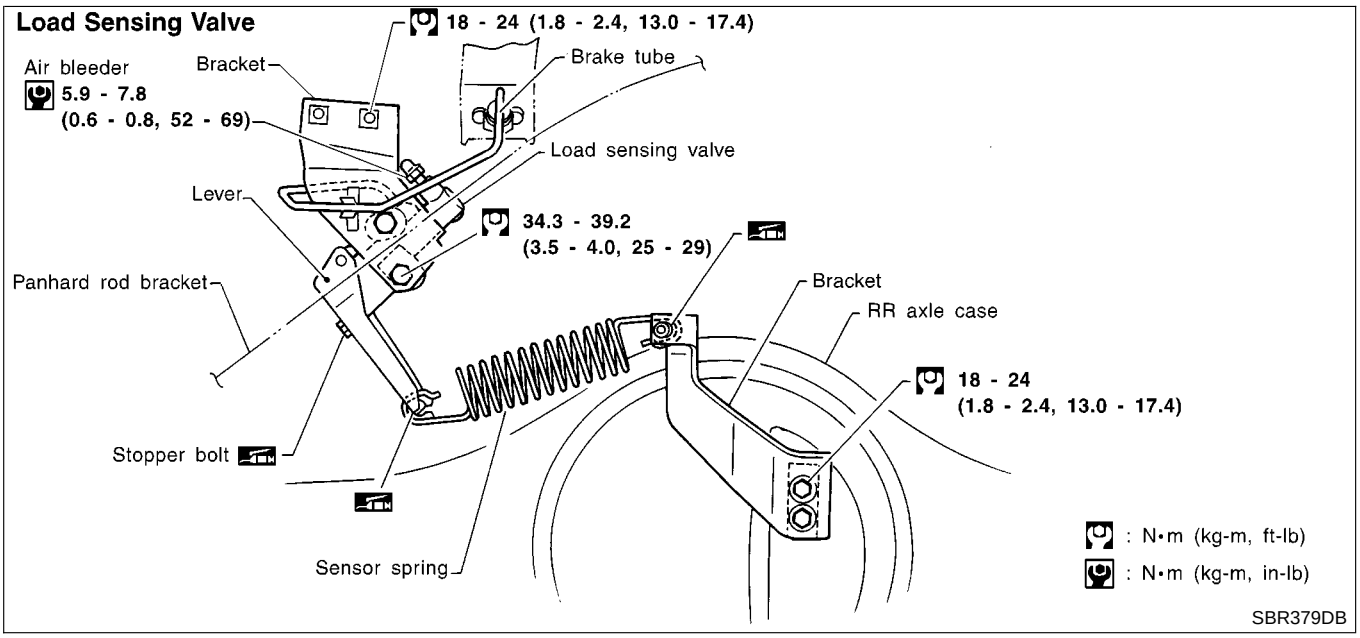
3. If length “B” is not within specification, adjust sensor spring length.

Removal and Installation

=NEBR0279

CAUTION:

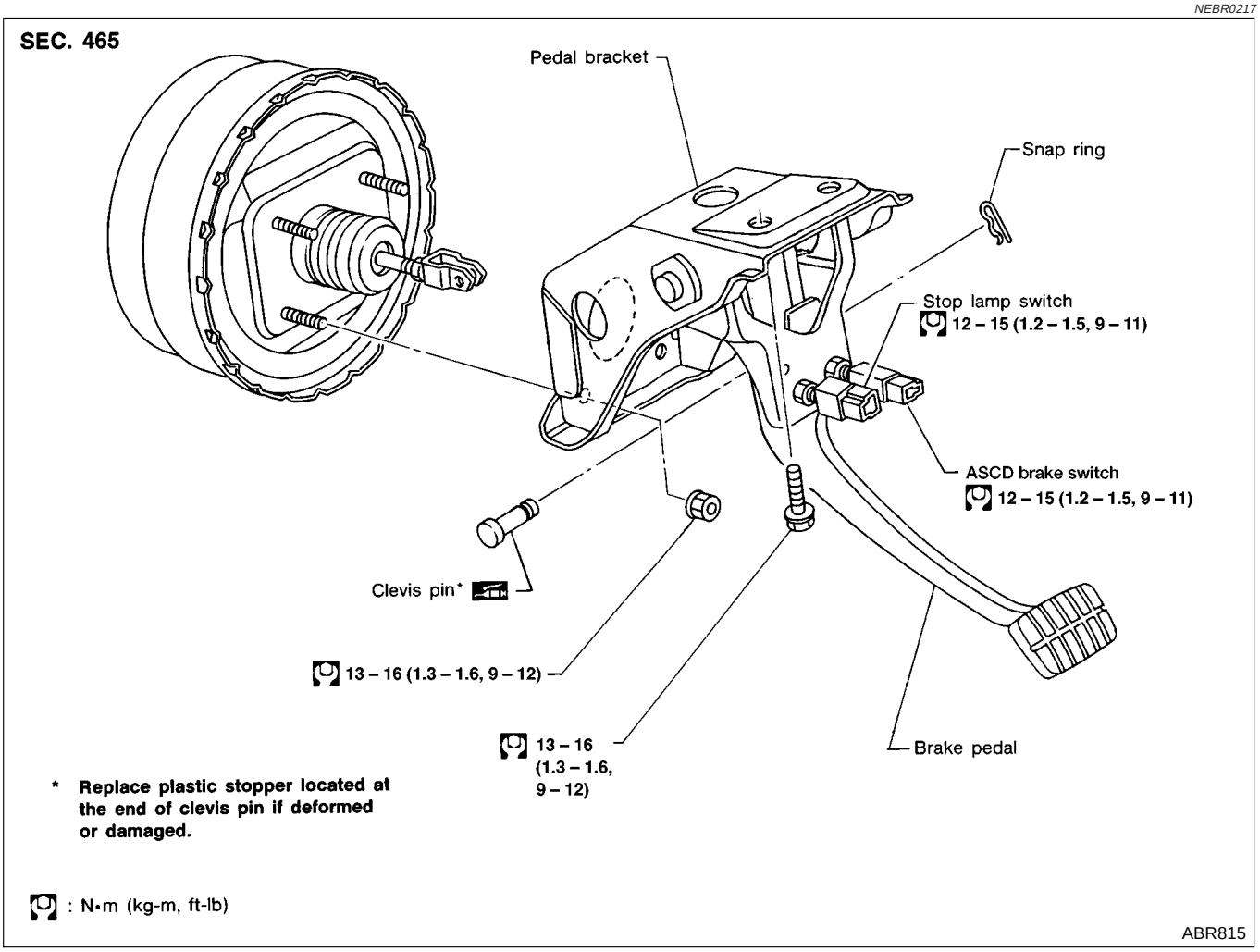
- **Refill with new brake fluid “DOT 3”.**
- **Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.**
- **Do not reuse Load Sensing Valve once it is disassembled.**
- **Replace damaged Load Sensing Valve as an assembly.**
- **When disassembling, apply multi-purpose grease to all rubbing areas.**

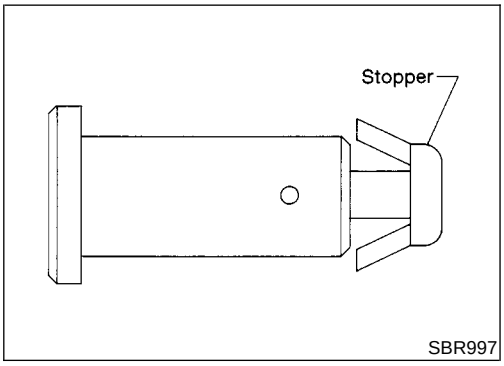


1. Tighten all flare nuts and mounting bolts.
   Flare nut:
   : 15 - 17 N·m (1.5 - 1.8 kg-m, 11 - 13 ft-lb)
2. Refill until new brake fluid comes out of each air bleeder valve.
3. Bleed air. Refer to “Bleeding Brake System”, BR-10.

Removal and Installation

NEBR0217



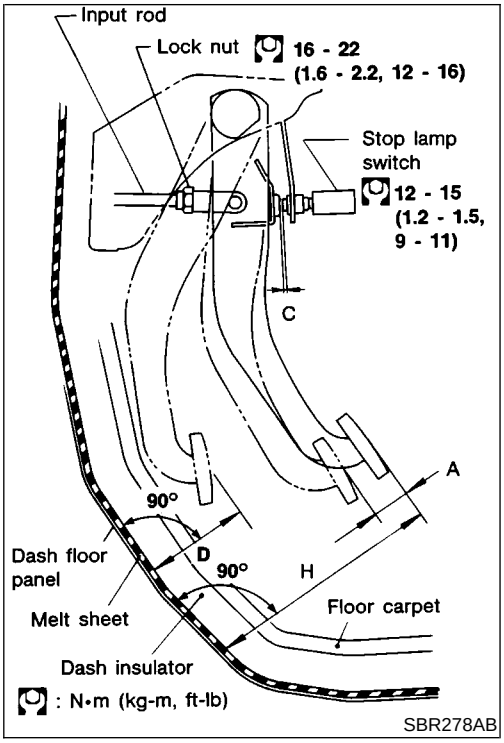


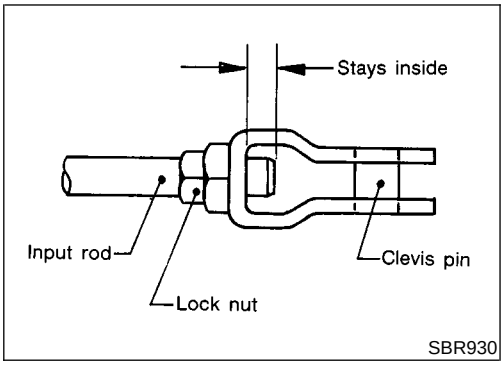
Inspection

NEBR0218

Check brake pedal for following items.

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





Adjustment

NEBR0219

Check brake pedal free height from metal panel.

H: Free height

Refer to SDS, BR-116.

D: Depressed height

Refer to SDS, BR-116.

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 switch

0.3 - 1.0 mm (0.012 - 0.039 in)

A: Pedal free play

1 - 3 mm (0.04 - 0.12 in)

If necessary, adjust brake pedal free height.

1. Loosen lock nut and adjust pedal free height by turning brake booster input rod. Then tighten lock nut.

Make sure that tip of input rod stays inside.

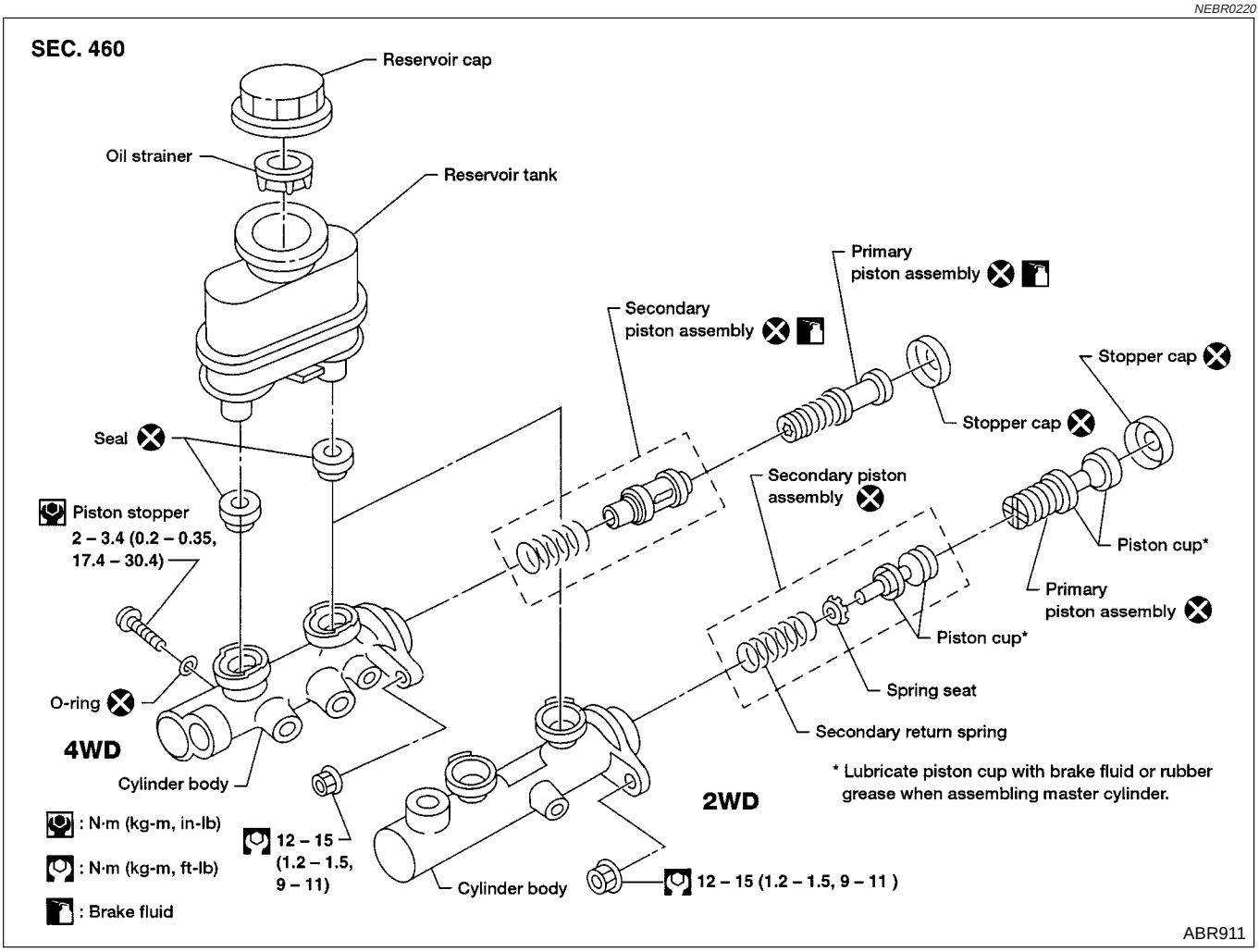
2. Loosen lock nut and adjust clearance “C” with stop lamp switch respectively, Then tighten lock nuts.
3. Check pedal free play.

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

4. Check brake pedal’s depressed height while engine is running. If lower than specification, check for leaks, air in system, or damage to components (master cylinder, wheel cylinder, etc). Then make necessary repairs.

Removal

NEBR0220



CAUTION:

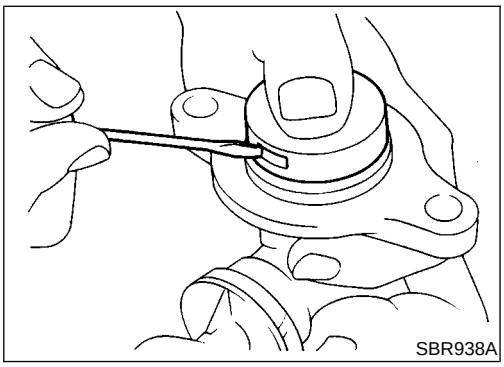
- **Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.**
- **In the case of brake fluid leakage from the master cylinder, disassemble the cylinder. Then check piston cups for deformation and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

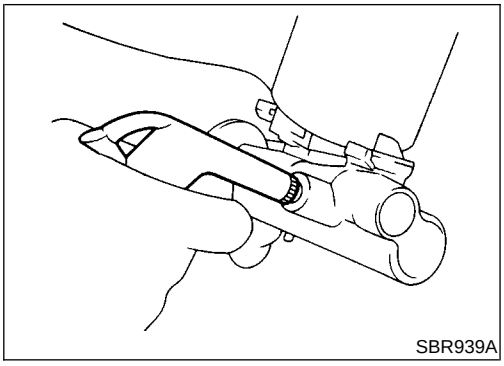
1. Connect a vinyl tube to air bleeder valve.
2. Drain brake fluid from each air bleeder valve, depressing brake pedal to empty fluid from master cylinder.
3. Remove brake pipe flare nuts.
4. Remove master cylinder mounting nuts.

Disassembly

NEBR0221

1. Bend claws of stopper cap outward.




SBR939A

2. Remove piston assemblies.

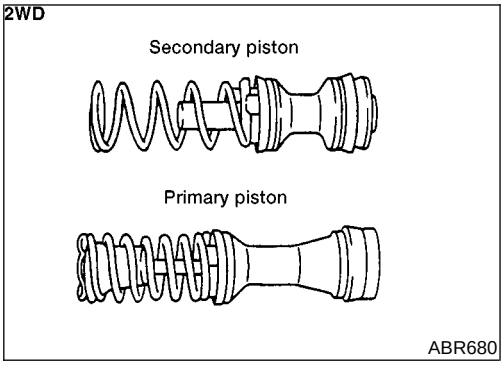
If it is difficult to remove secondary piston assembly, gradually apply compressed air through fluid outlet.

3. Draw out reservoir tank.

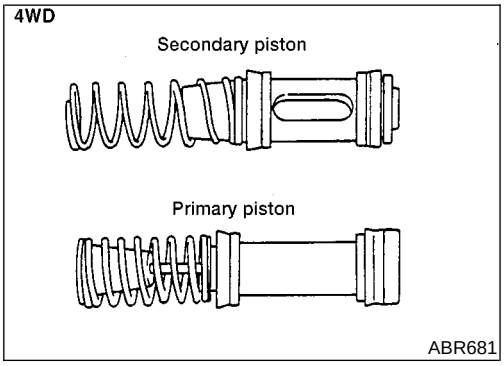
Inspection

NEBR0222

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



ABR680



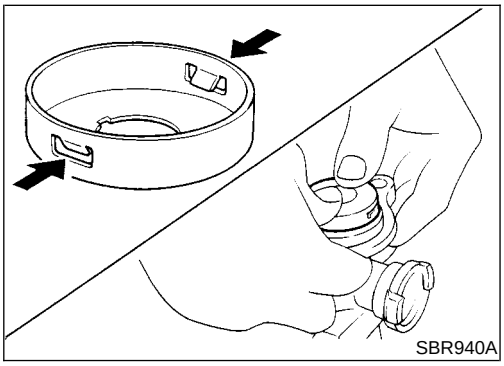
ABR681

Assembly

NEBR0223

1. Insert secondary piston assembly. Then insert primary piston assembly.

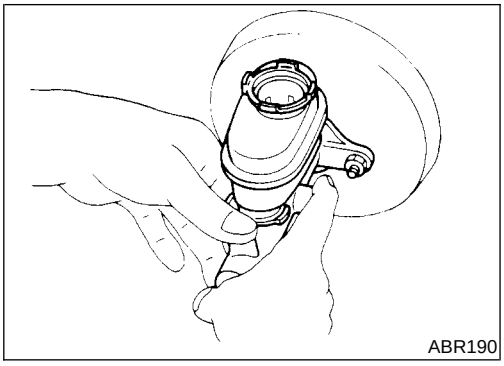
- **Pay attention to direction of piston cups in figure at left. Also, insert pistons squarely to avoid scratches on cylinder bore.**


SBR940A

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.


ABR190

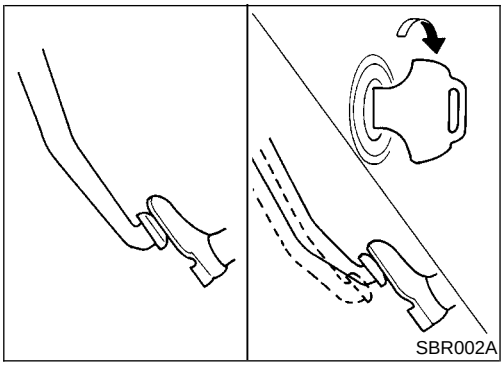
Installation

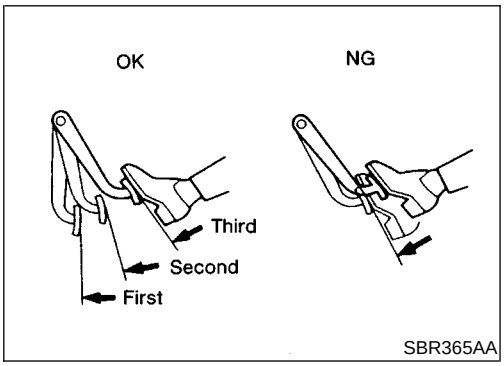
NEBR0224

CAUTION:

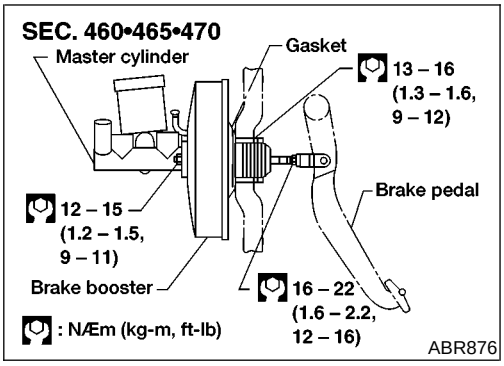
- **Refill with new brake fluid “DOT 3”.**
- **Never reuse drained brake fluid.**

1. Place master cylinder onto brake booster and secure mounting nuts lightly.
2. Torque 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 - 17 N·m (1.5 - 1.8 kg-m, 11 - 13 ft-lb)
8. Bleed air from brake system. Refer to “Bleeding Brake System”, BR-10.

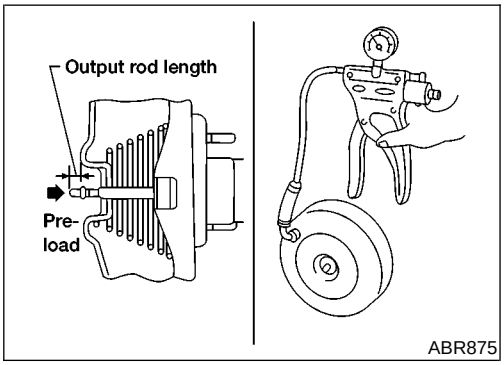

SBR002A



SBR365AA



ABR876



ABR875

On-vehicle Service

NEBR0225

OPERATING CHECK

NEBR0225S01

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

AIRTIGHT CHECK

NEBR0225S02

- 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 for **30 seconds.**

Removal

NEBR0226

CAUTION:

- **Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.**
- **Be careful not to deform or bend brake pipes, during removal of booster.**

Inspection

NEBR0227

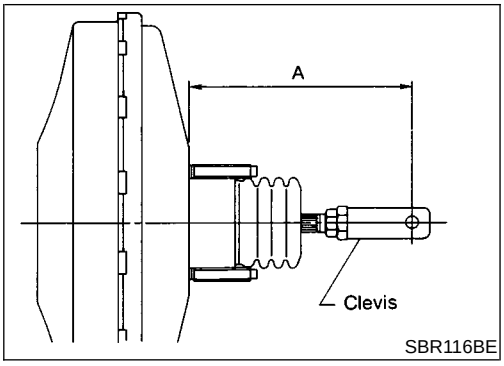
OUTPUT ROD LENGTH CHECK

NEBR0227S01

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 (2.0 kg, 4.4 lb) to output rod length.
3. Check output rod length.

Specified length:

10.275 - 10.525 mm (0.4045 - 0.4144 in)



Installation

=NEBR0228

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.**

A:

2WD

160 mm (6.30 in)

4WD

165 mm (6.50 in)

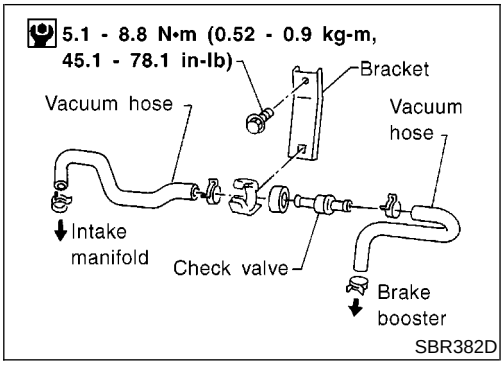
1. Before fitting booster, temporarily adjust clevis to dimension shown.
2. Fit booster, then secure mounting nuts (brake pedal bracket to brake booster) lightly.
3. Connect brake pedal and booster input rod with clevis pin.
4. Secure mounting nuts.

   Specification: 13 - 16 N·m (1.3 - 1.6 kg-m, 9 - 12 ft-lb)
5. Install master cylinder. Refer to “Installation” in “MASTER CYLINDER”, BR-20.
6. Adjust brake pedal height and free play. Refer to “Adjustment” in “BRAKE PEDAL AND BRACKET”, BR-17.
7. Secure lock nut for clevis.

   : 16 - 22 N·m (1.6 - 2.2 kg-m, 12 - 16 ft-lb)
8. Bleed air. Refer to “Bleeding Brake System”, BR-10.

Vacuum Hose

NEBR0229



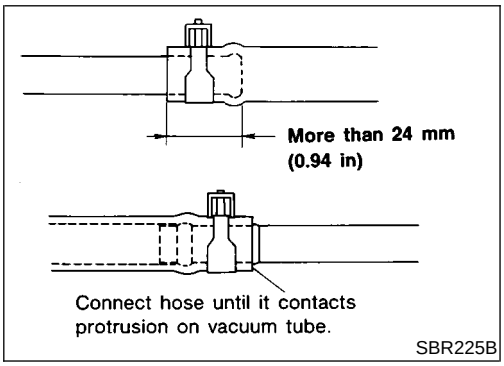
Removal and Installation

NEBR0230

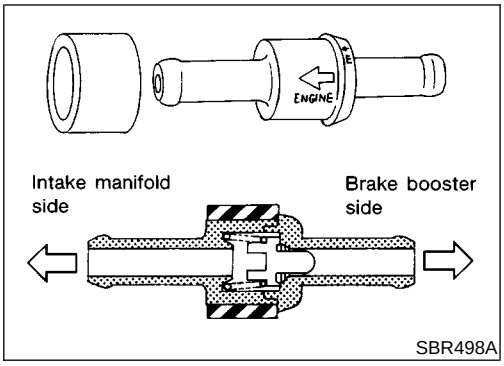
CAUTION:

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.**



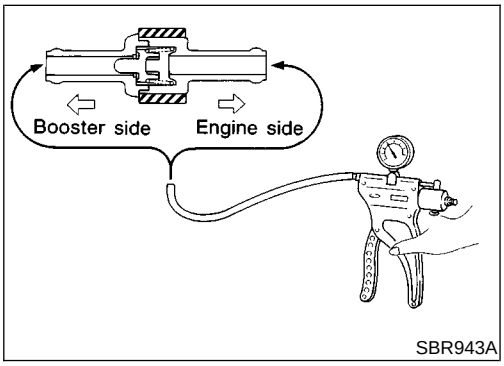
Inspection

NEBR0231

HOSES AND CONNECTORS

NEBR0231S01

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



CHECK VALVE

NEBR0231S02

Check vacuum with a vacuum pump.

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

Pad Replacement

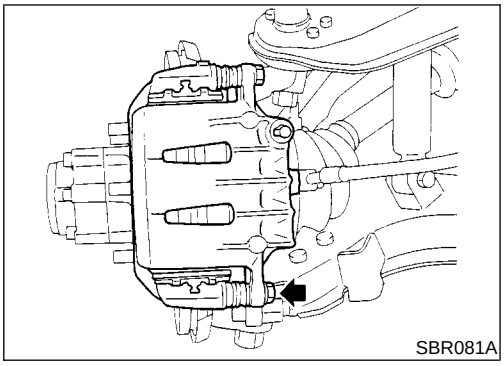
NEBR0232

WARNING:

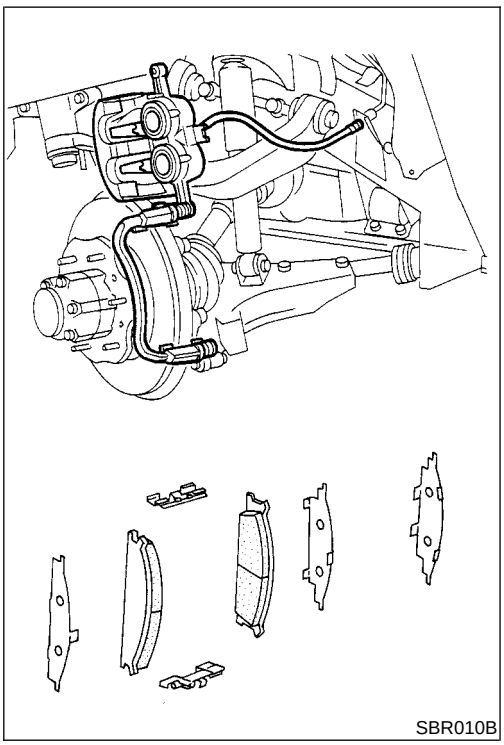
Clean brakes with a vacuum dust collector to minimize the hazard of airborne particles or other materials.

CAUTION:

- **When cylinder body is open, do not depress brake pedal, or piston will pop out.**
- **Be careful not to damage piston boot or get oil on rotor. Always replace shims when replacing pads.**
- **If shims are rusted or show peeling of the rubber coat, replace them with new shims.**
- **It is not necessary to remove connecting bolt except for disassembly or replacement of caliper assembly. In this case, suspend cylinder body with wire so as not to stretch brake hose.**
- **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-9.**


SBR081A

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


SBR010B

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

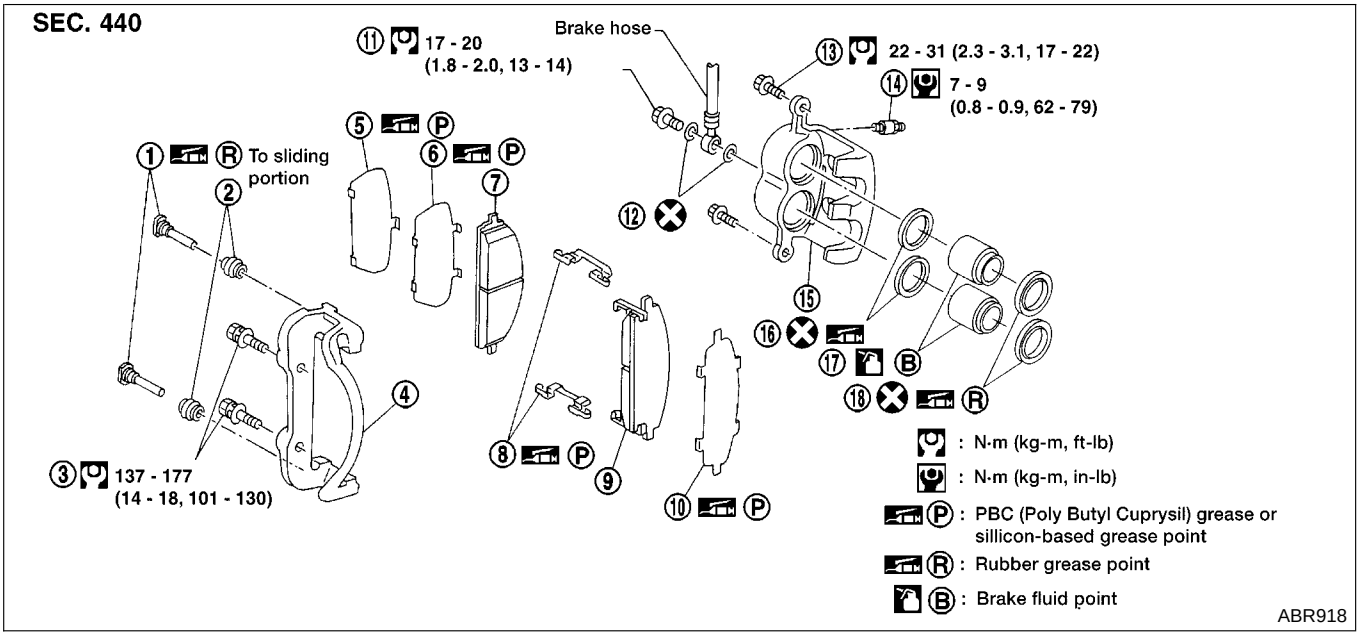
   Standard pad thickness:

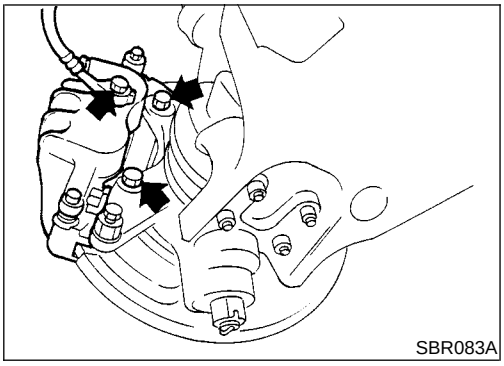
   10 mm (0.39 in)

   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.





Removal

NEBR0233

WARNING:

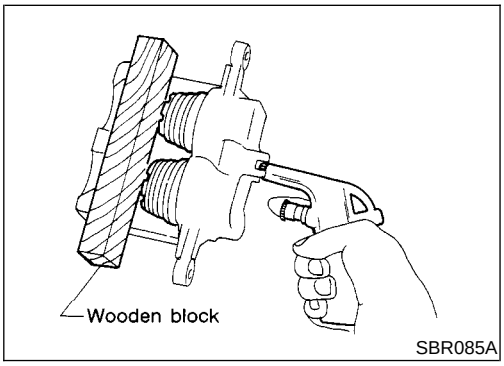
Clean brake pads with a vacuum dust collector to minimize the hazard of airborne particles or other materials.

CAUTION:

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

Remove torque member fixing bolts and connecting bolt.

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



Disassembly

NEBR0234

WARNING:

Do not place your fingers in front of piston.

CAUTION:

- **Do not scratch or score cylinder wall.**
- **CL28VD type front disc brake uses plastic pistons. Handle them carefully.**

1. Push out piston and dust covers with compressed air. Use a wooden block so that both pistons come out evenly.
2. Remove piston seal with a suitable tool.

Inspection

NEBR0235

CALIPER

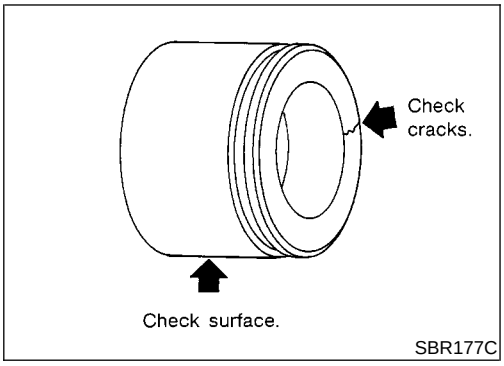
NEBR0235S01

Cylinder Body

NEBR0235S0101

- Check inside surface of cylinder for score, rust, wear, damage and 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.

CAUTION:
Use brake fluid to clean. Never use mineral oil.



Piston

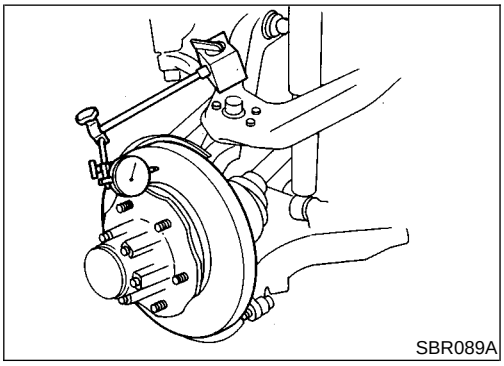
NEBR0235S0102

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

NEBR0235S0103

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



ROTOR

NEBR0235S02

Runout

NEBR0235S0201

1. Check runout using a dial indicator.

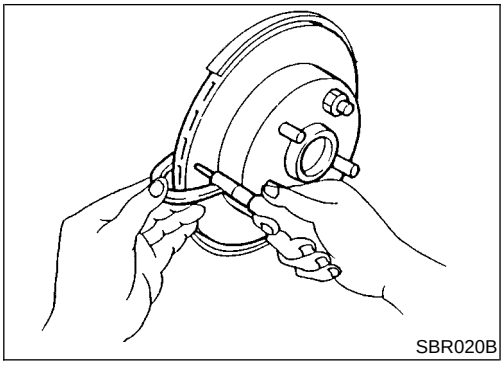
Make sure that wheel bearing axial end play is within the specifications before measuring. Refer to "Front Wheel Bearing", *AX-4*.

Maximum runout:
0.07 mm (0.0028 in)

2. 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. to c. so that minimum runout position can be found.

3. If the runout is still out of specification, turn rotor with on-car brake lathe ("MAD, DL-8700", "AMMCO 700 and 705" or equivalent).


SBR020B

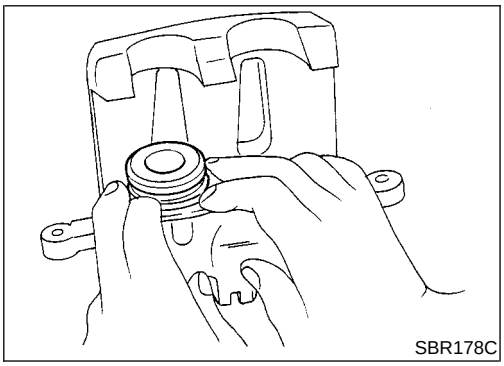
Thickness

NEBR0235S0202

Thickness variation (At least 8 positions):
Maximum 0.02 mm (0.0008 in)

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

Rotor repair limit:
24.0 mm (0.945in)


SBR178C

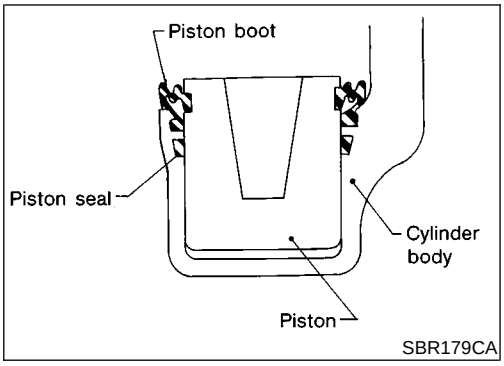
Assembly

NEBR0236

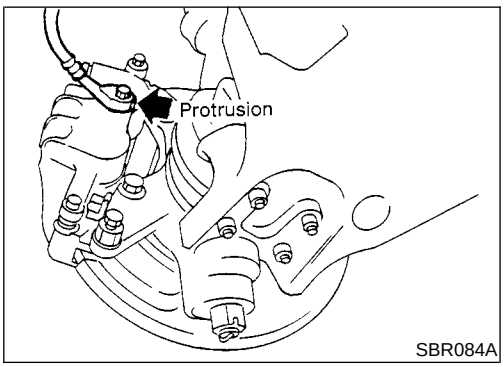
1. Insert piston seal into groove on cylinder body.
2. With piston boot fitted to piston, insert piston boot into groove on cylinder body and install piston.
3. Properly secure piston boot.

CAUTION:

- **Secure dust seal properly.**
- **Lubricate with new brake fluid before installing plastic pistons into cylinder body.**



SBR179CA



SBR084A

Installation

NEBR0237

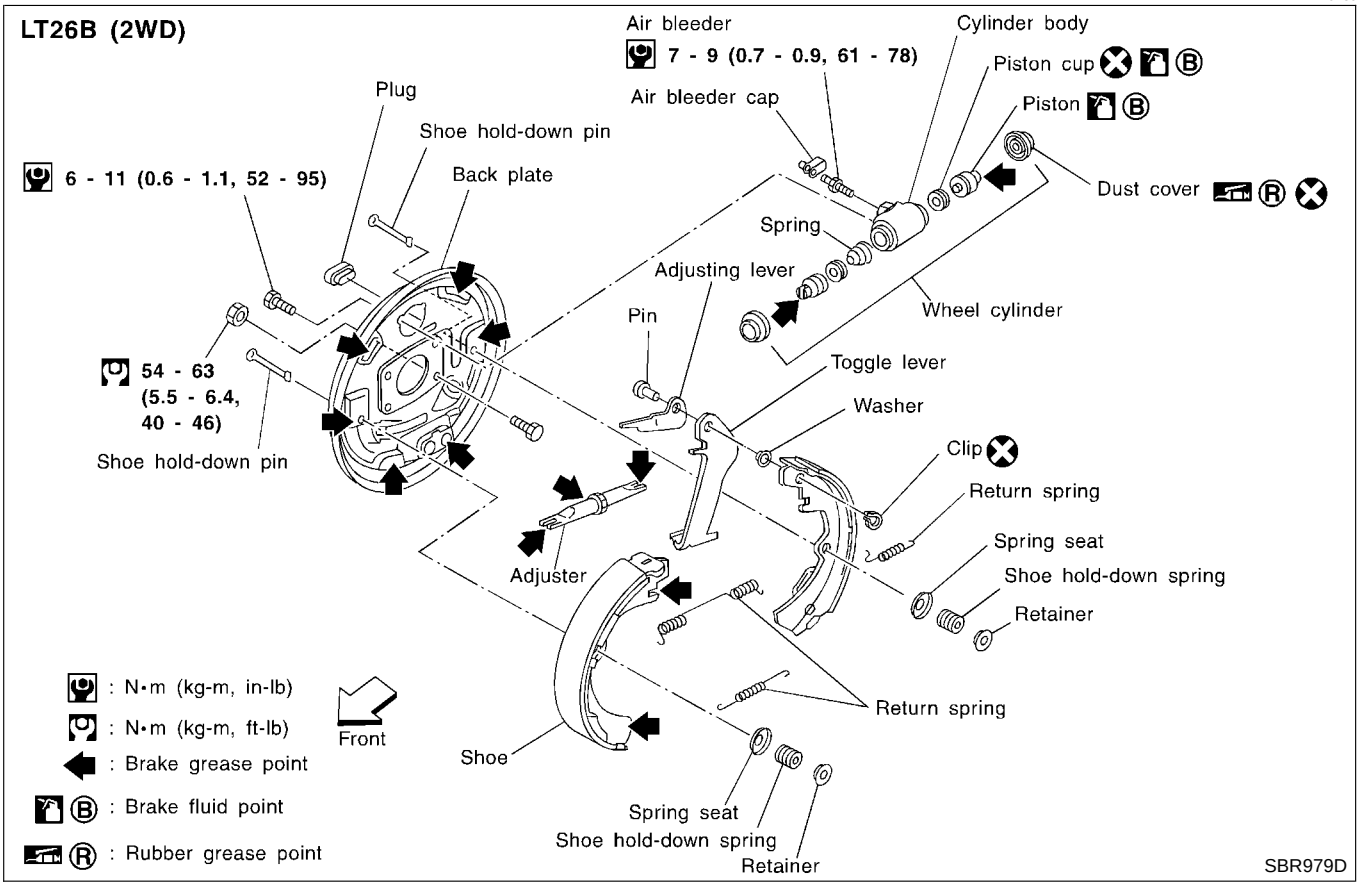
CAUTION:

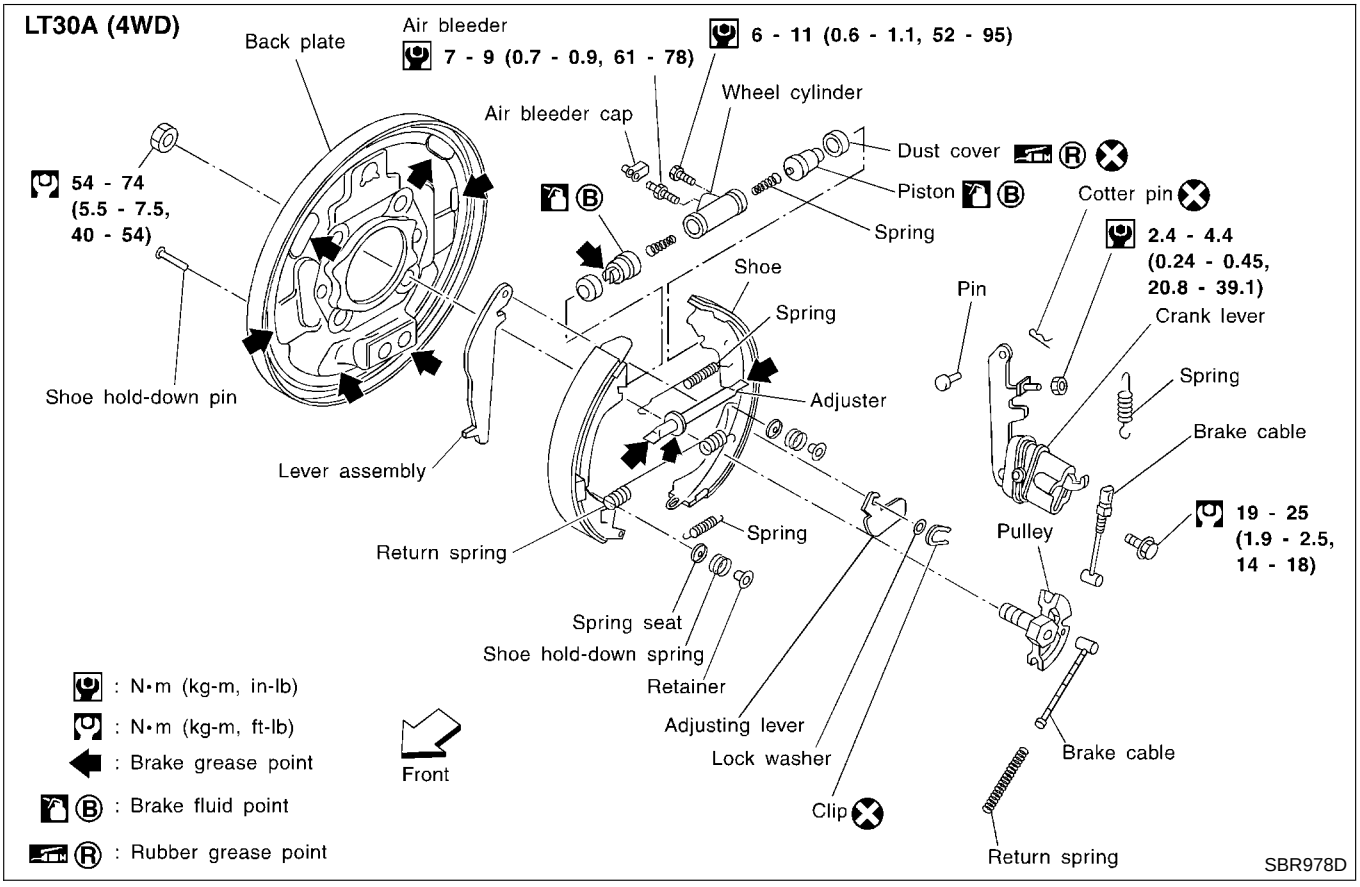
- **Refill with new brake fluid "DOT 3".**
- **Never reuse drained brake fluid.**

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-10.

Components

NEBR0239





Removal

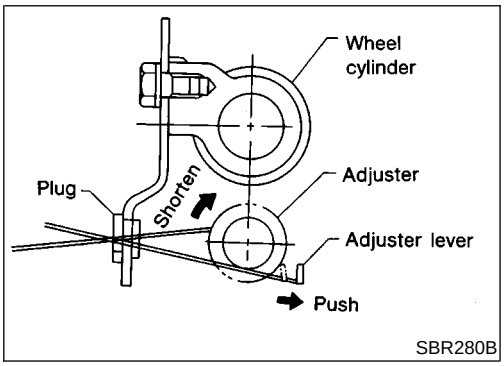
NEBR0240

WARNING:

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

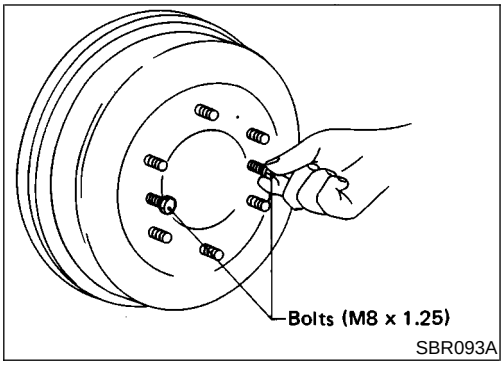
CAUTION:

Make sure parking brake lever is released completely.



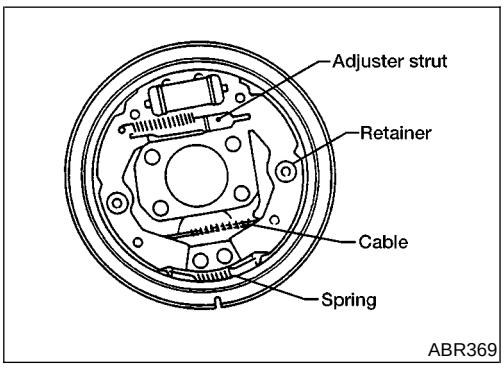
SBR280B

1. Release parking brake lever fully, then remove drum.
   If drum is hard to remove, the following procedures should be carried out.
a. **Remove plug. Then shorten adjuster to make clearance between brake shoe and drum.**



SBR093A

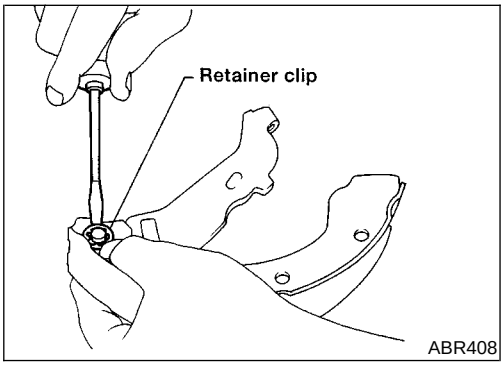
b. **Install two bolts as shown. Tighten the two bolts gradually.**



ABR369

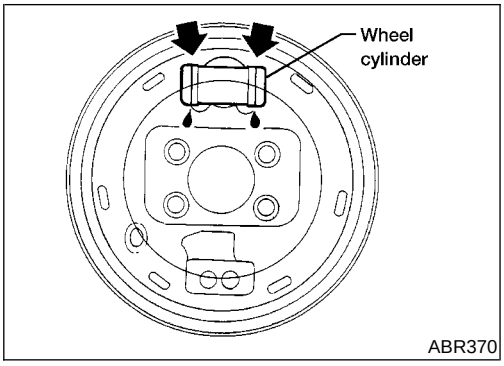
2. After removing shoe hold pin by rotating push retainer, remove leading shoe then remove trailing shoe. Remove spring by rotating shoes in direction arrow.
- **Be careful not to damage wheel cylinder piston boots.**
- **Be careful not to damage parking brake cable when separating it.**
3. Remove adjuster.
4. Disconnect parking brake cable from toggle lever.

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



ABR408

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



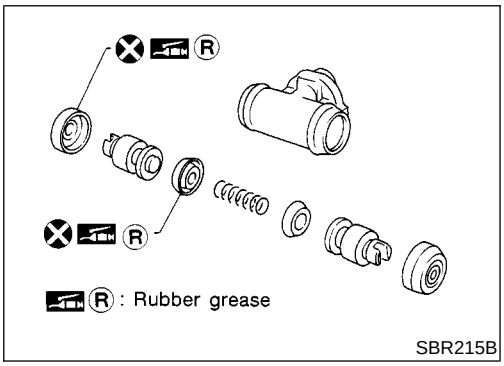
Inspection

NEBR0241

WHEEL CYLINDER

NEBR0241S01

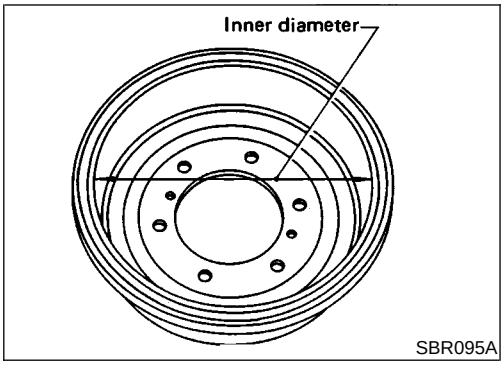
- Check wheel cylinder for leakage.
- Check for wear, damage and loose conditions. Replace if any such condition exists.



Wheel Cylinder Overhaul

NEBR0242

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



Inspection

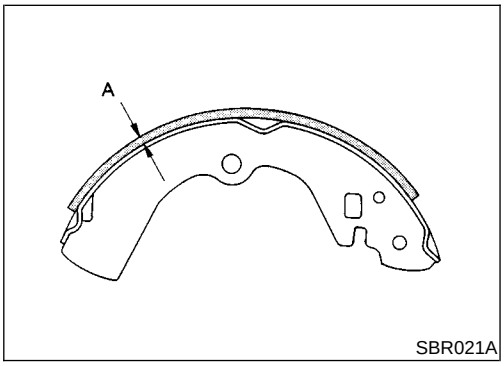
NEBR0243

DRUM

NEBR0243S01

Maximum inner diameter (Repair limit):
LT26B 261.5 mm (10.30 in)
LT30A 296.5 mm (11.67 in)

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

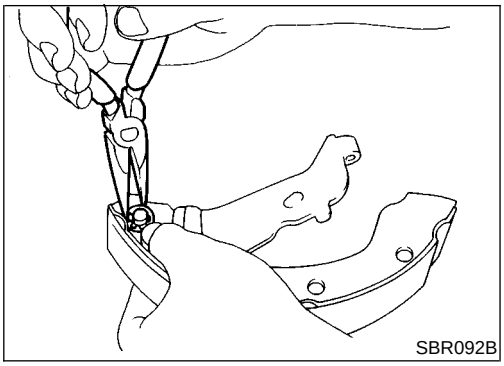


LINING

NEBR0243S02

Check lining thickness.

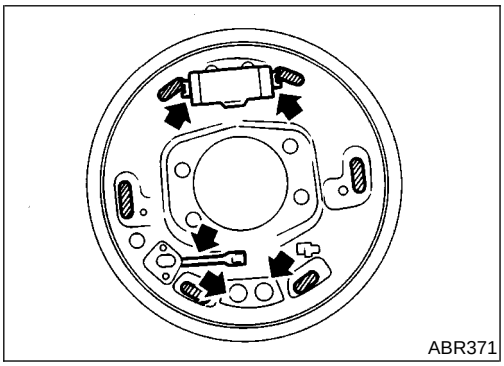
Standard lining thickness:
LT26B 5.5 mm (0.217)
LT30A 6.1 mm (0.240 in)
Lining wear limit (A):
LT26B 1.5 mm (0.059 in)
LT30A 1.5 mm (0.059 in)


SBR092B

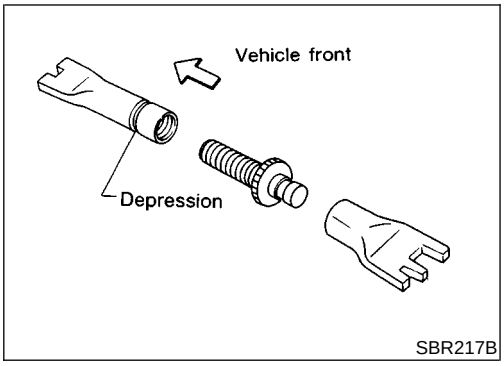
Installation

NEBR0244

1) **Always perform shoe clearance adjustment. Refer to BR-34.**
2) **Burnishing 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-9.**
1. Fit toggle lever to brake shoe (trailing side) with retainer ring.


ABR371

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



SBR217B

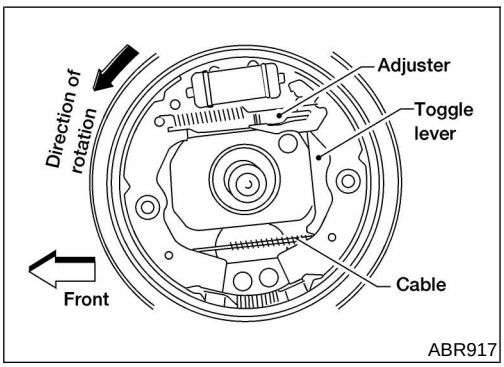
3. Shorten adjuster by rotating it.

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

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

4. Connect parking brake cable to toggle lever.
5. Install all parts.

Be careful not to damage wheel cylinder piston boots.



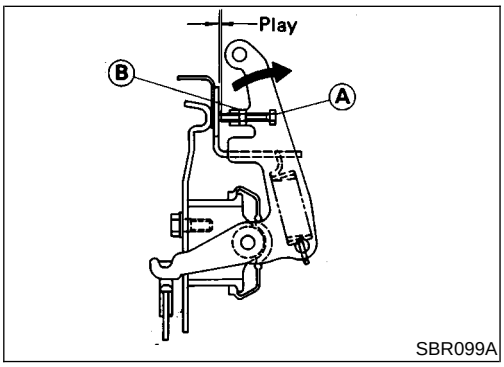
ABR917

6. Check all parts are installed properly.

- **After installation is completed, adjust shoe-to-drum clearance.**

7. Install brake drum.
8. When installing new wheel cylinder or overhauling wheel cylinder, bleed air. Refer to "Bleeding Brake System", BR-10.
9. Adjust parking brake. Refer to "Adjustment", "PARKING BRAKE CONTROL", BR-34.

- Install all the parts by referring to the figure below.



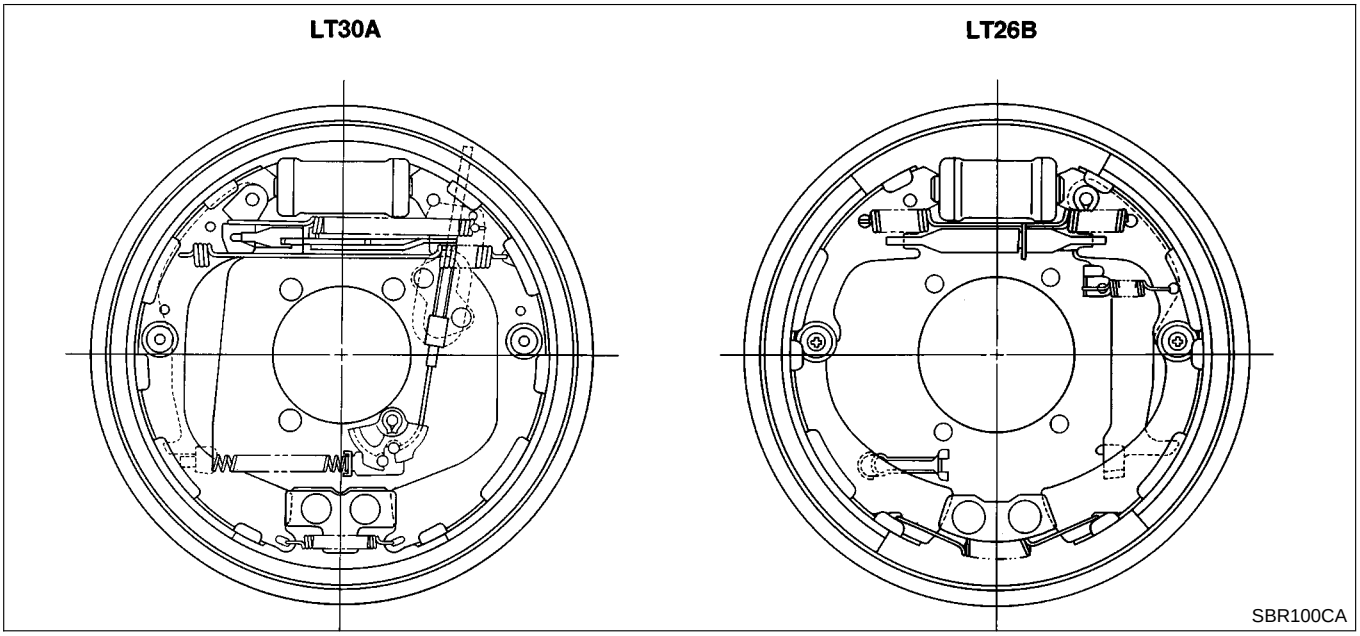
SBR099A

LT30A MODEL

NEBR0244S02

- After installing crank lever on back plate, make sure that there is no play between crank lever and back plate. If play exists, adjust bolt **A** and lock nut **B**.

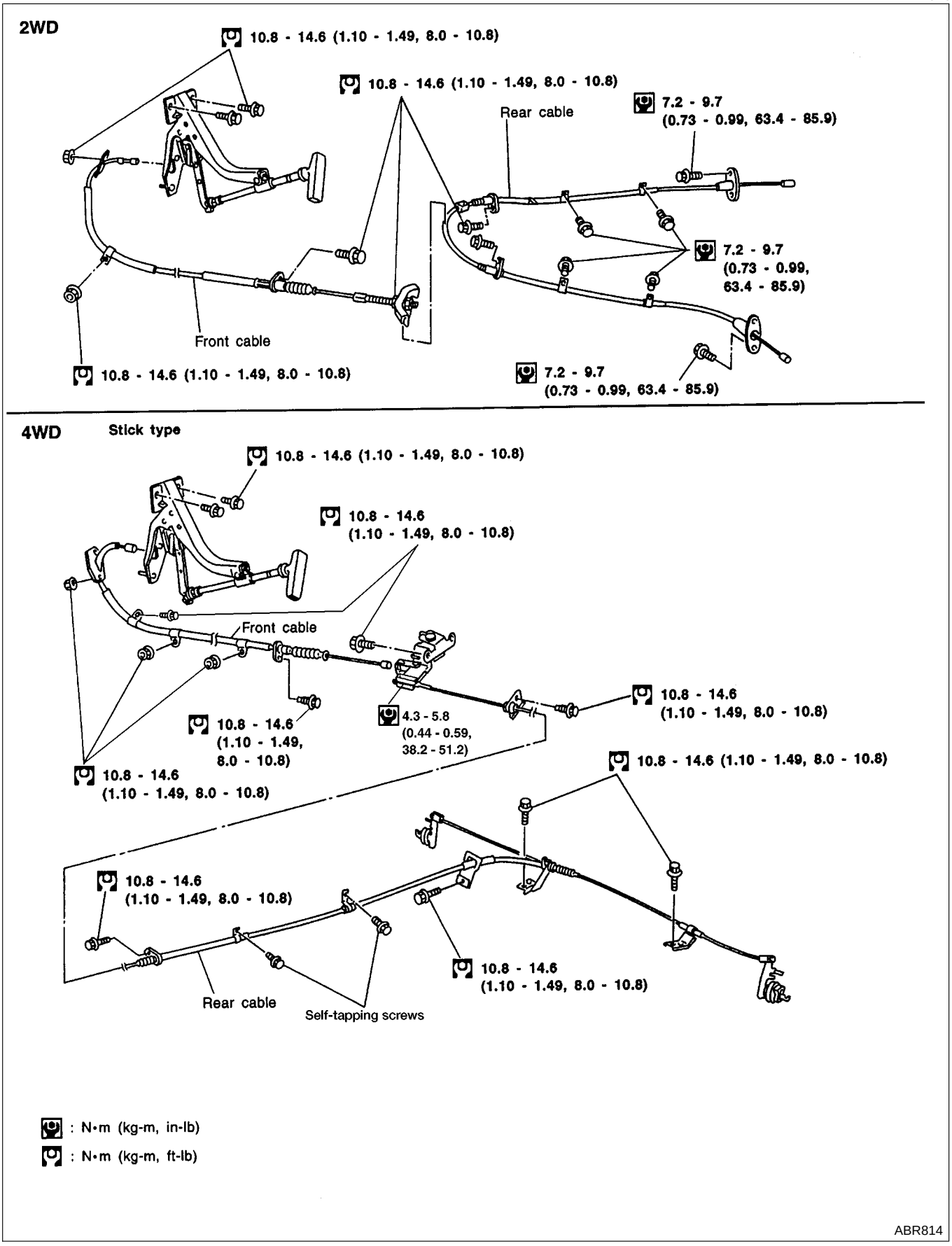
Installation (Cont'd)



LH wheel

Components

NEBR0245



Removal and Installation

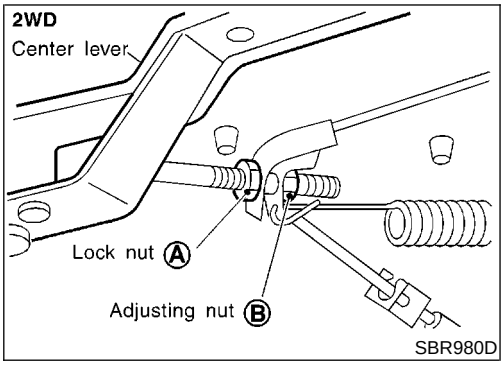
NEBR0246

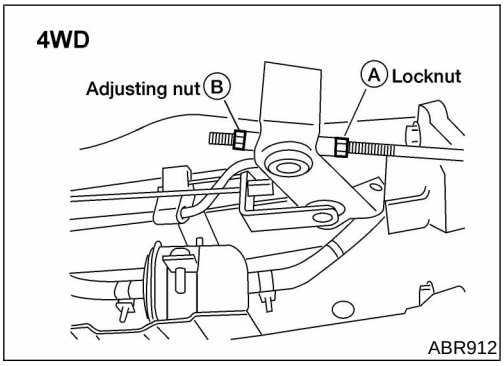
- Be careful not to damage cable.
- Make sure there is no free play after installation.

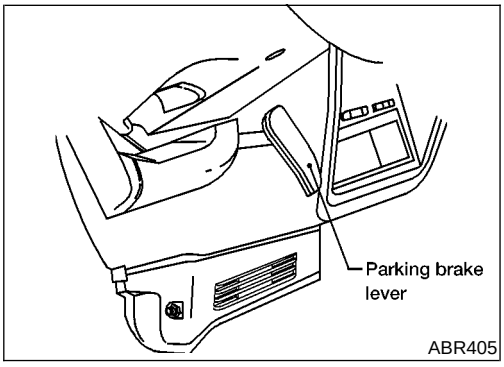
Inspection

NEBR0247

1. Check control lever for wear and other damage. Replace if necessary.
2. Check wires for discontinuity and 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

NEBR0248

Adjust parking as follows:

1. Fully release parking brake lever.
2. Loosen **A** and rotate **B** until parking brake pedal loosens.
3. Depress brake pedal several times until clicking sound does not occur from rear brakes.
4. Adjust clearance between rear brake shoe and drum.
5. Adjust parking brake lever stroke by rotating **B**.
6. Pull parking brake lever with specified force. Check lever stroke and ensure smooth operation.
7. Readjust clearance between rear brake shoe and drum.

Purpose

NEBR0252

The Rear Wheel Anti-Lock Brake System (ABS) consists of electronic and hydraulic components. It controls rear braking force so locking of the rear wheels can be avoided.

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

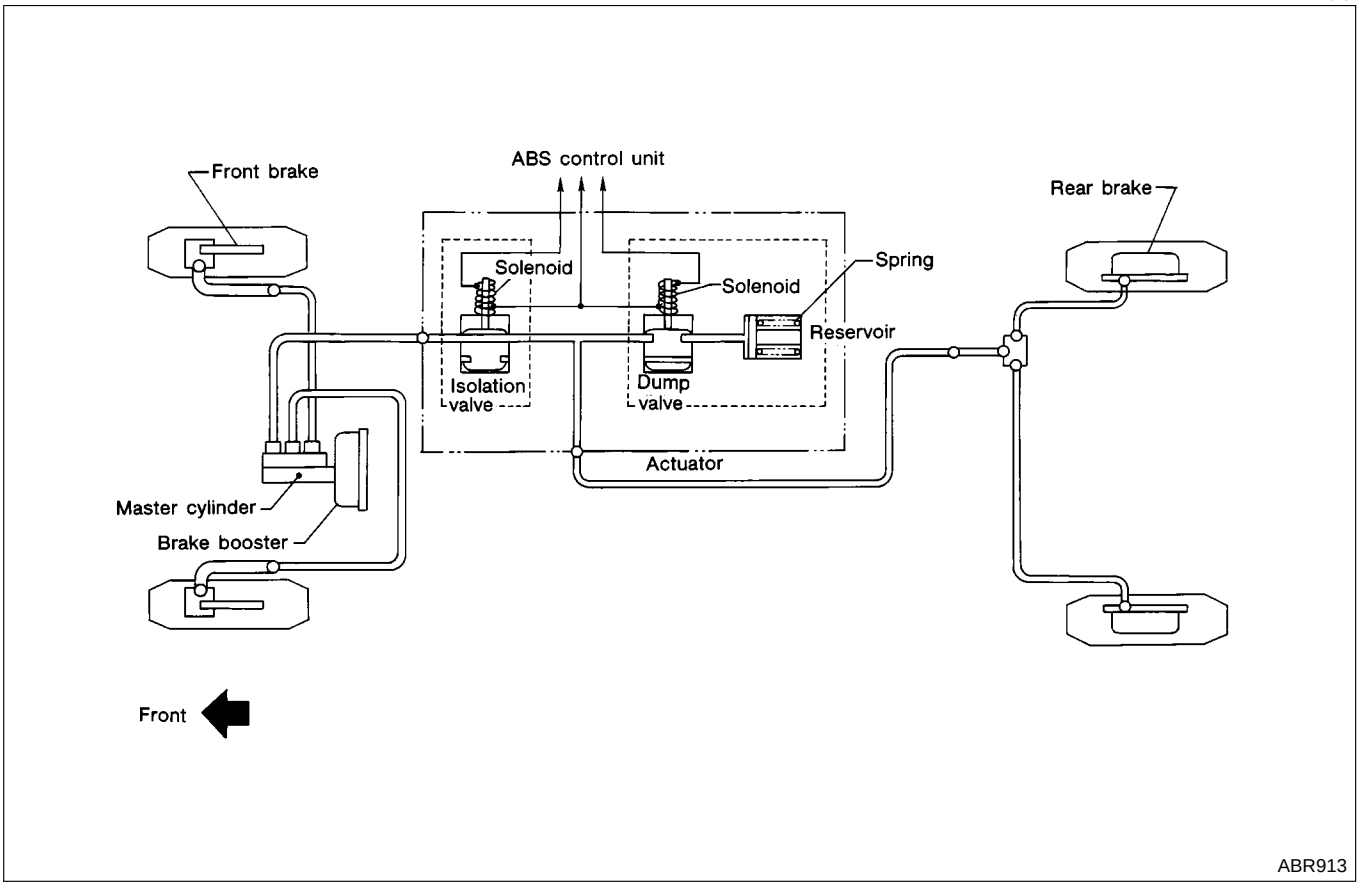
Operation

NEBR0253

- When the vehicle speed is less than 10 km/h (6 MPH) this system does not work.
- The Rear Wheel Anti-Lock Brake System (ABS) has a self-test function. The system turns on the ABS warning lamp for a few seconds each time the ignition switch is turned ON. After the engine is started, the ABS warning lamp turns off. The system performs a circuit check when the ignition switch is turned ON. After the engine is started, the ABS warning lamp turns off. If a malfunction is found during this check, the ABS warning lamp will stay on.
- While driving, a mechanical noise may be heard and a slight pedal pulsation may be felt during ABS operation. This is a normal condition.

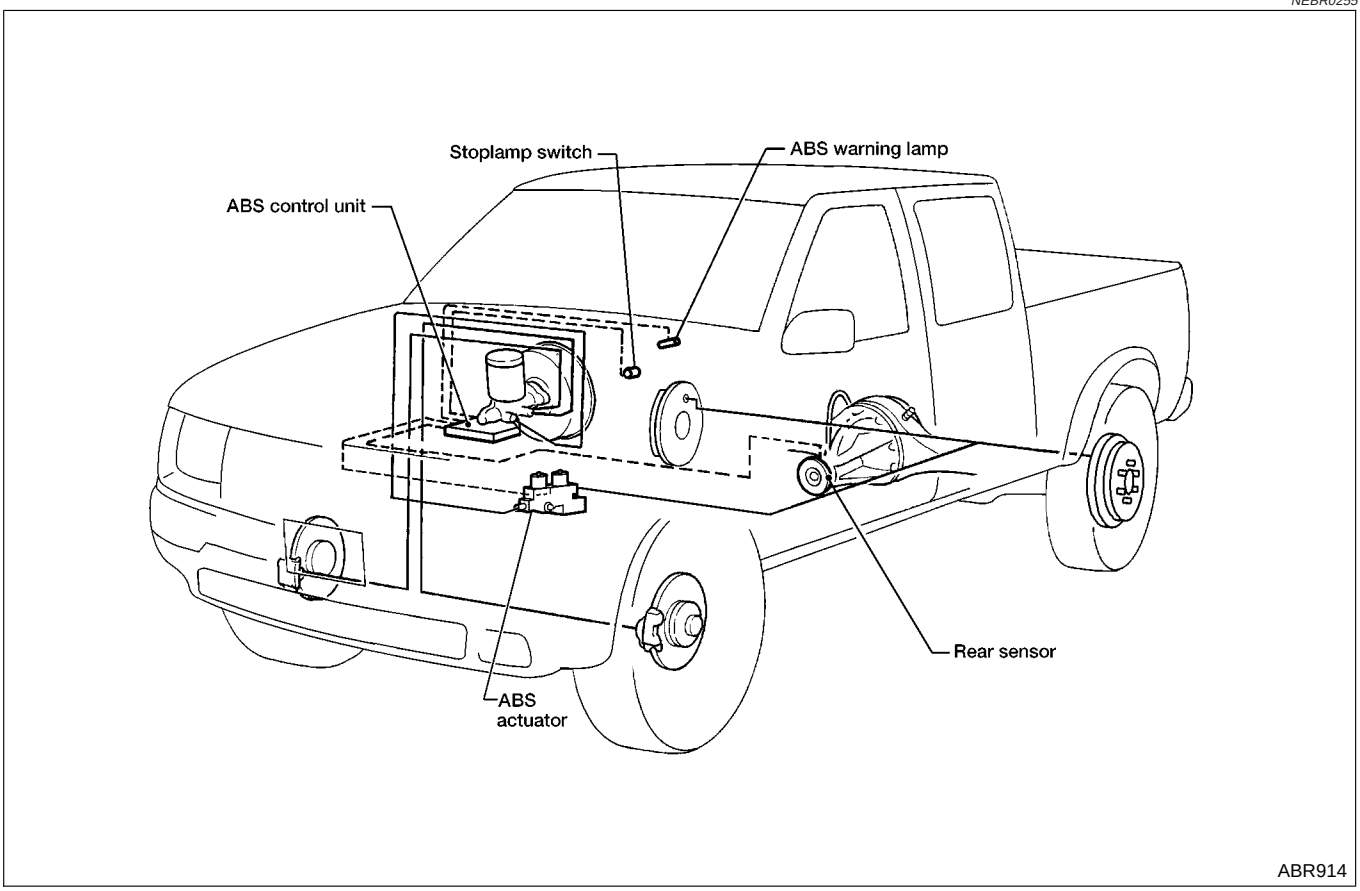
ABS Hydraulic Circuit

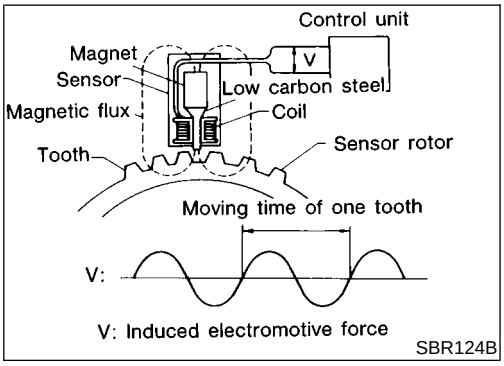
NEBR0254

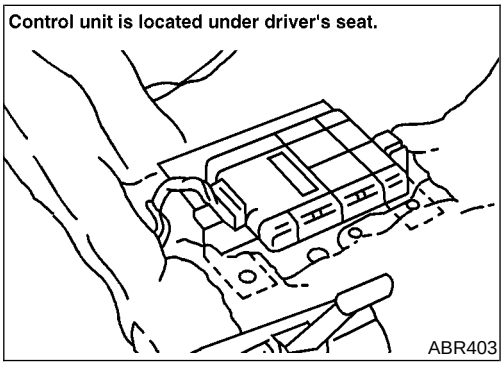


System Components

NEBR0255







System Description

NEBR0256

REAR SENSOR

NEBR0256S01

The rear sensor unit consist of a gear-shaped sensor rotor and a sensor element. The element contains a bar magnet around which a coil is wound. The sensor rotor is installed at the companion flange of the rear axle housing and the sensor unit is installed on the rear axle housing. As the rear axle pinion rotates, the sensor generates a sine-wave pattern. The frequency and voltage increase as the rotating speed increases.

ABS CONTROL UNIT

NEBR0256S02

The ABS control unit computes the rear axle rotating speed by the signal current sent from the sensor unit. Then it supplies a DC current to the ABS actuator. 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 system will be deactivated by the control unit, and the vehicle's brake system reverts to normal operation.

Removal and Installation

NEBR0257

CAUTION:

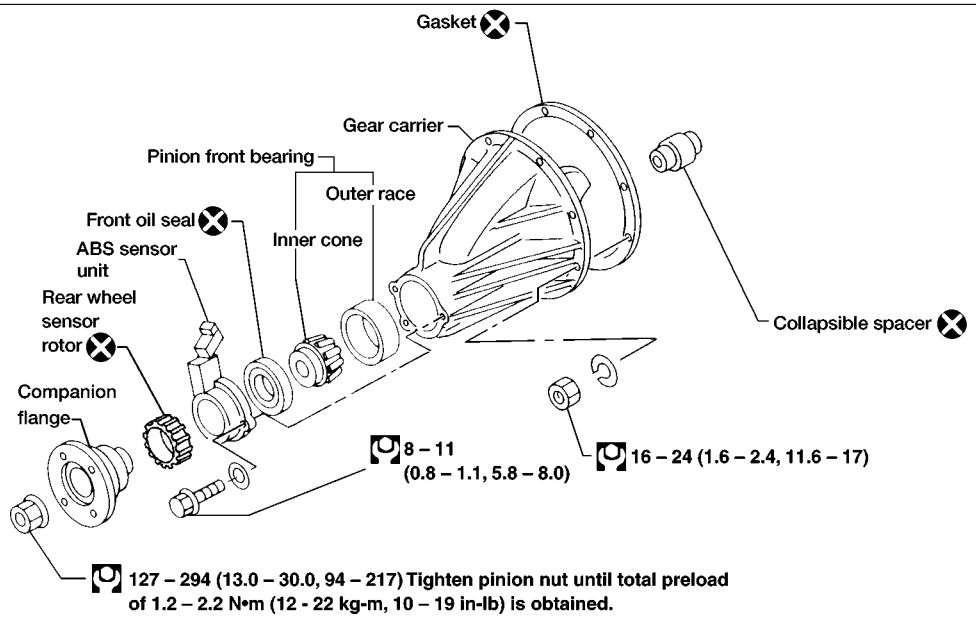
Be careful not to damage sensor edge and sensor rotor teeth. In case the final drive assembly needs to be removed, disconnect the ABS sensor from the assembly and move it away. Failure to do so may result in damage to the sensor wires making the sensor inoperative.

For final drive models using collapsible spacer (H190A, C200), bearing preload must be adjusted whenever companion flange is removed. Therefore, final drive overhaul is required.

REAR SENSOR

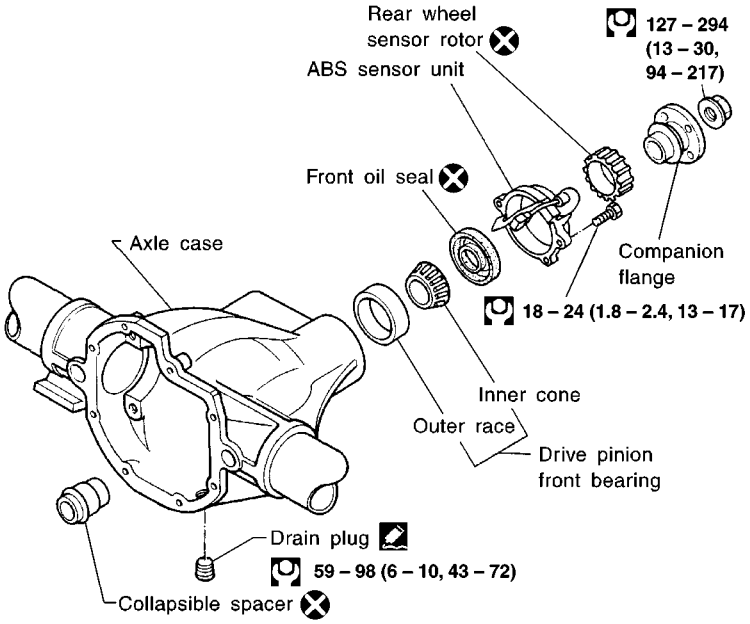
NEBR0257S01

H190A

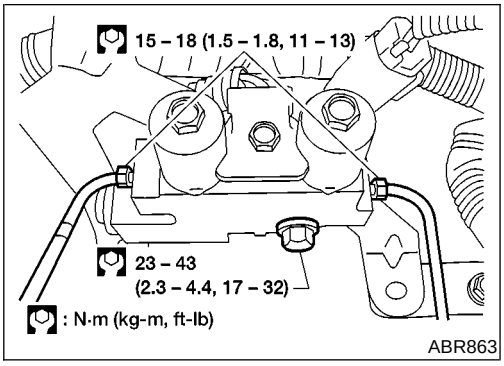


ABR848

C200



ABR849



ACTUATOR

NEBR0257S02

Removal

NEBR0257S0201

1) Disconnect battery cable.
2) Drain brake fluid.
3) Disconnect connectors, brake pipes, and remove fixing bolts and flare nuts.

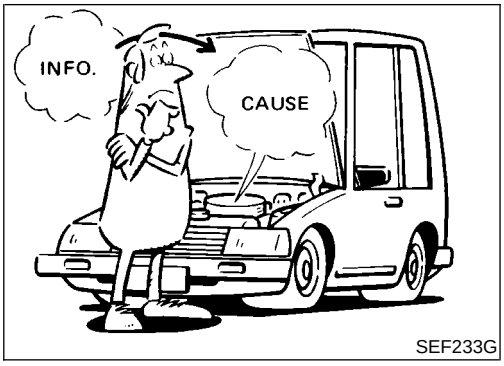
Installation

NEBR0257S0202

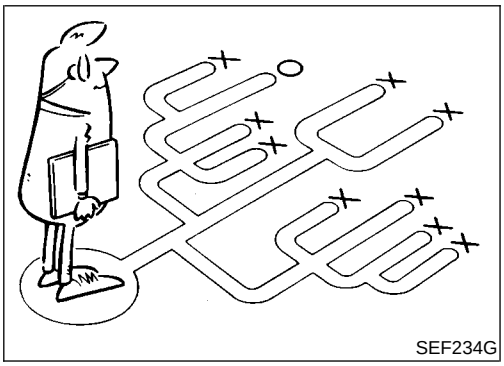
CAUTION:

After installation, refill brake fluid. Then bleed air. Refer to "Bleeding Procedure", BR-10.

1) Connect pipes temporarily.
2) Secure fixing bolts.
3) Torque brake pipe flare nuts.
4) Connect connectors and battery cable.



SEF233G


SEF234G

How to Perform Trouble Diagnoses for Quick and Accurate Repair

NEBR0258

INTRODUCTION

NEBR0258S01

The ABS system has an electronic control unit to control major functions. The control unit accepts input signals from sensors and instantly drives the 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 booster lines, lack of brake fluid, or other problems with the brake system.

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

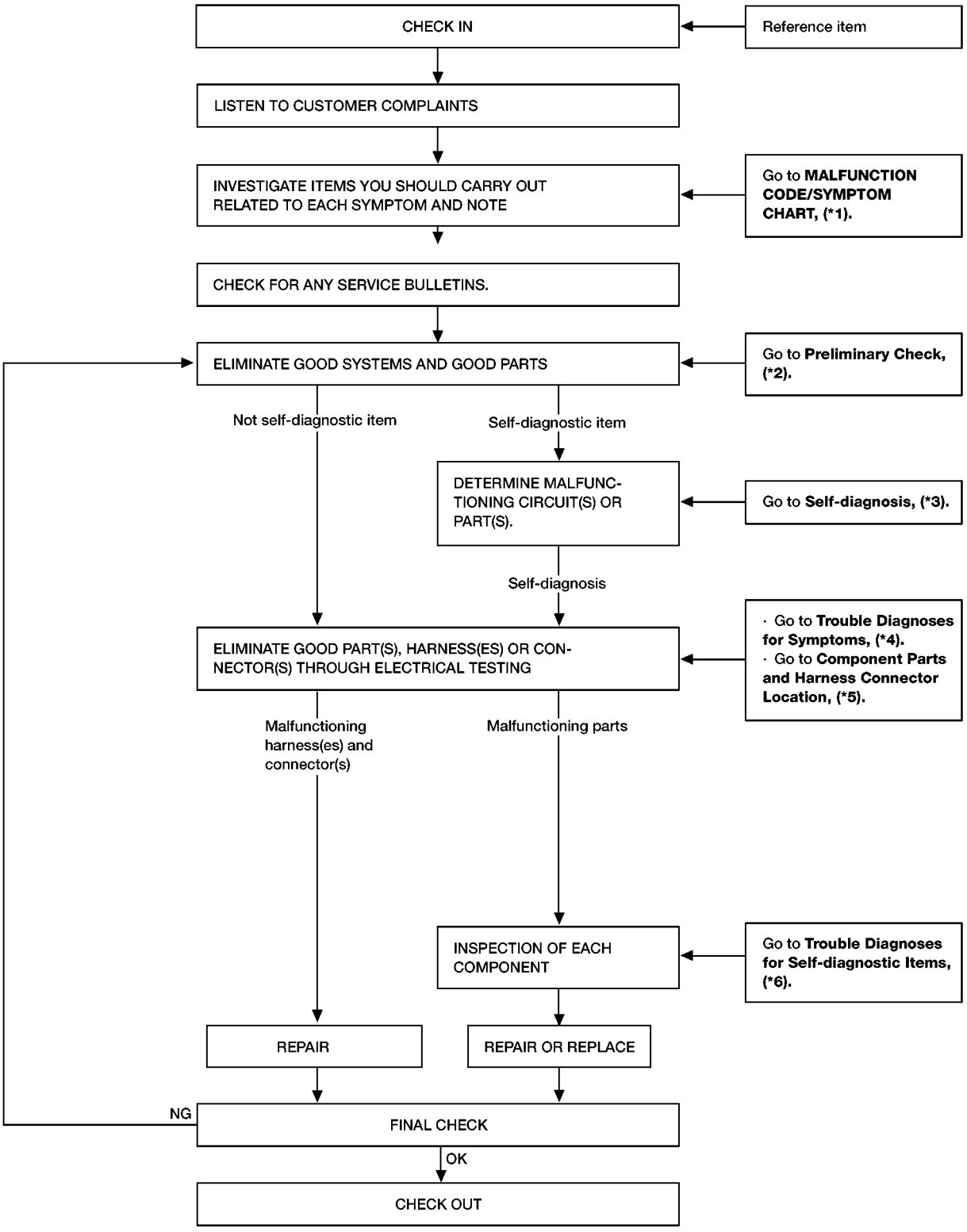
A visual check only may not find the cause of the problems, so a road test should be performed.

Before undertaking actual checks, take a few minutes to talk with a customer who approaches with an ABS complaint. The customer is a very good source of information on such problems; especially intermittent ones. By talking to 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 related Service bulletins for information.

WORK FLOW

NEBR0258S02



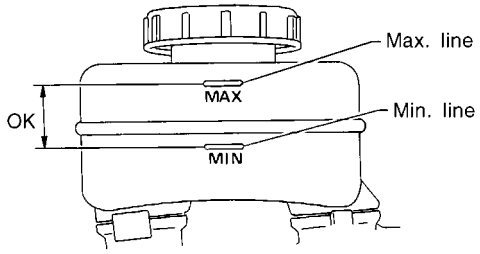
ABR839

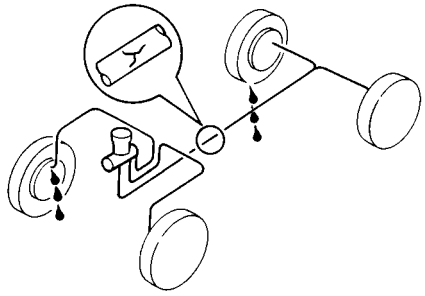
*1: BR-50
*2: BR-41
*3: BR-48
*4: BR-60 - 62
*5: BR-44
*6: BR-54 - 59

Preliminary Check

NEBR0259

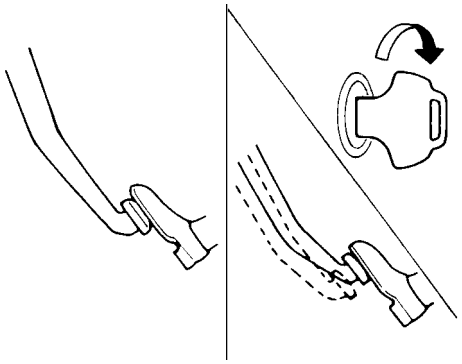
1	CHECK BRAKE FLUID	
Check brake fluid for contamination. **Has brake fluid been contaminated?**		
Yes	▶	Replace. GO TO 2.
No	▶	GO TO 2.

2	CHECK BRAKE FLUID LEVEL	
Check brake fluid level in reservoir tank. Low fluid level may indicate brake pad wear or leakage from brake line.  SBR451D **Is brake fluid filled between MAX and MIN lines on reservoir tank ?**		
Yes	▶	GO TO 3.
No	▶	Fill up brake fluid. GO TO 3.

3	CHECK BRAKE LINE	
Check brake line for leakage.  SBR389C **Is leakage present at or around brake lines, tubes or hoses or are any of these parts cracked or damaged?**		
Yes	▶	Repair. GO TO 4.
No	▶	GO TO 4.

4	CHECK BRAKE BOOSTER OPERATION

Check brake booster for operation and air tightness.
Refer to "ON-VEHICLE SERVICE", "Brake Booster", BR-21.



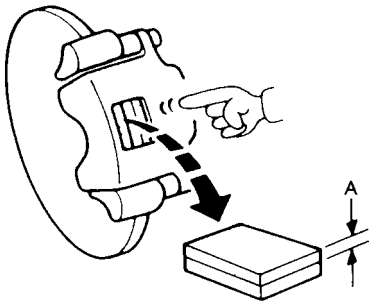
SBR058C

Is brake booster airtight and functioning properly?

Yes	▶	GO TO 5.
No	▶	Replace. GO TO 5.

5	CHECK BRAKE PAD AND ROTOR

Check brake pad and rotor.
Refer to BR-24, 26.



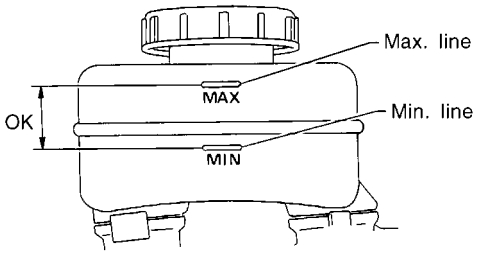
SBR059C

Are brake pads and rotors functioning properly?

Yes	▶	GO TO 6.
No	▶	Replace.

6	RECHECK BRAKE FLUID LEVEL

Check brake fluid level in reservoir tank again.



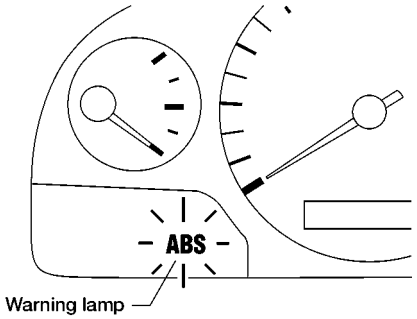
SBR451D

Is brake fluid filled between MAX and MIN lines on reservoir tank ?

Yes	▶	GO TO 7.
No	▶	Fill up brake fluid.

7	CHECK WARNING LAMP ACTIVATION

Check warning lamp activation.



ABR838

Does warning lamp turn on when ignition switch is turned ON?

Yes	▶	GO TO 8.
No	▶	Check fuse, warning lamp bulb and warning lamp circuit.

8	CHECK WARNING LAMP DEACTIVATION

Check warning lamp for deactivation after engine is started.

Does warning lamp turn off when engine is started?

Yes	▶	GO TO 9.
No	▶	Go to Self-diagnosis, BR-48.

9	DRIVE VEHICLE

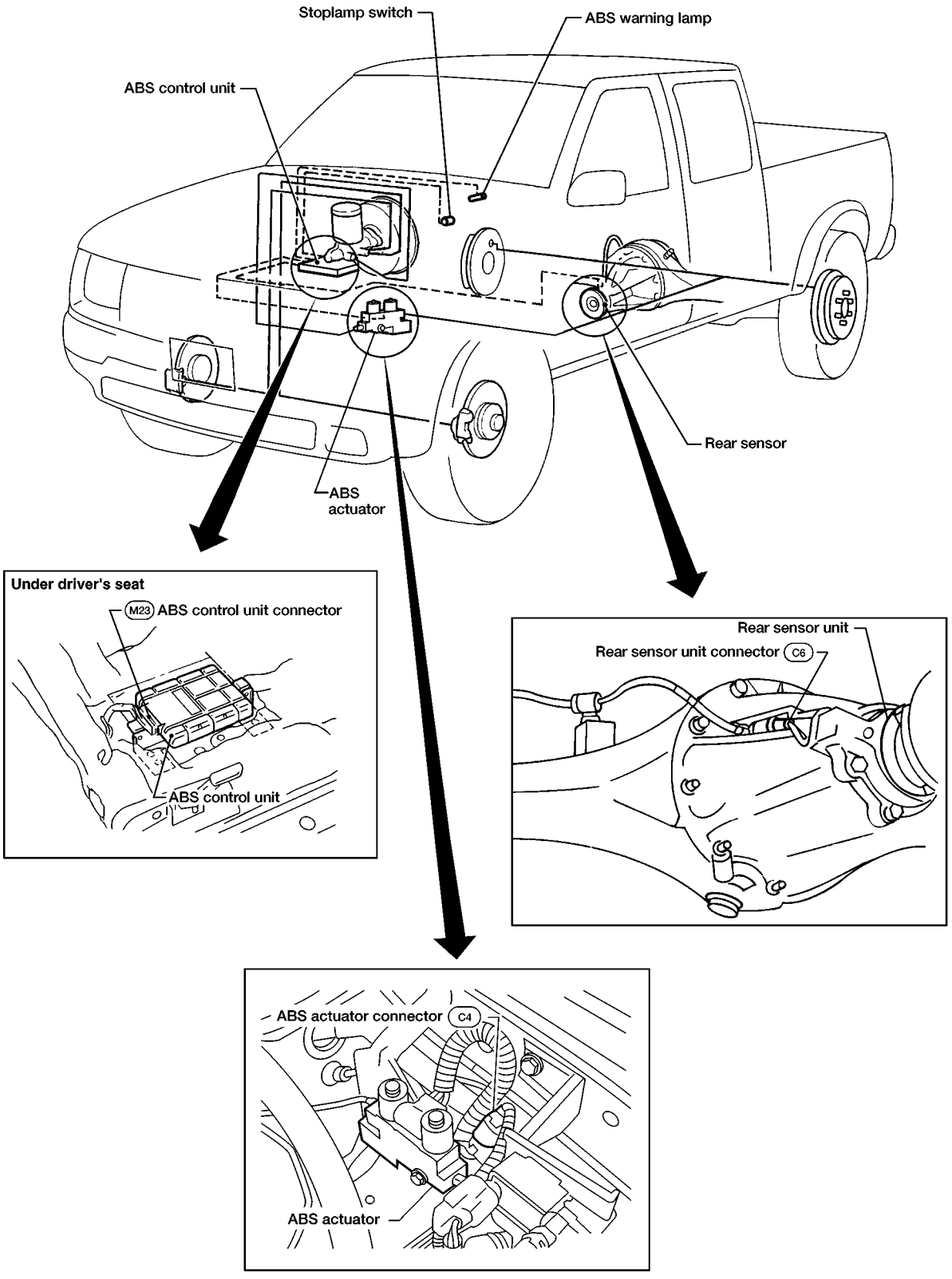
Drive vehicle at speeds over 30 km/h (19 MPH) for at least one minute.

Does warning lamp remain off after vehicle has been driven at 30 km/h (19 MPH) for at least one minute?

Yes	▶	**INSPECTION END**
No	▶	Go to Self-diagnosis, BR-48.

Component Parts and Harness Connector Location

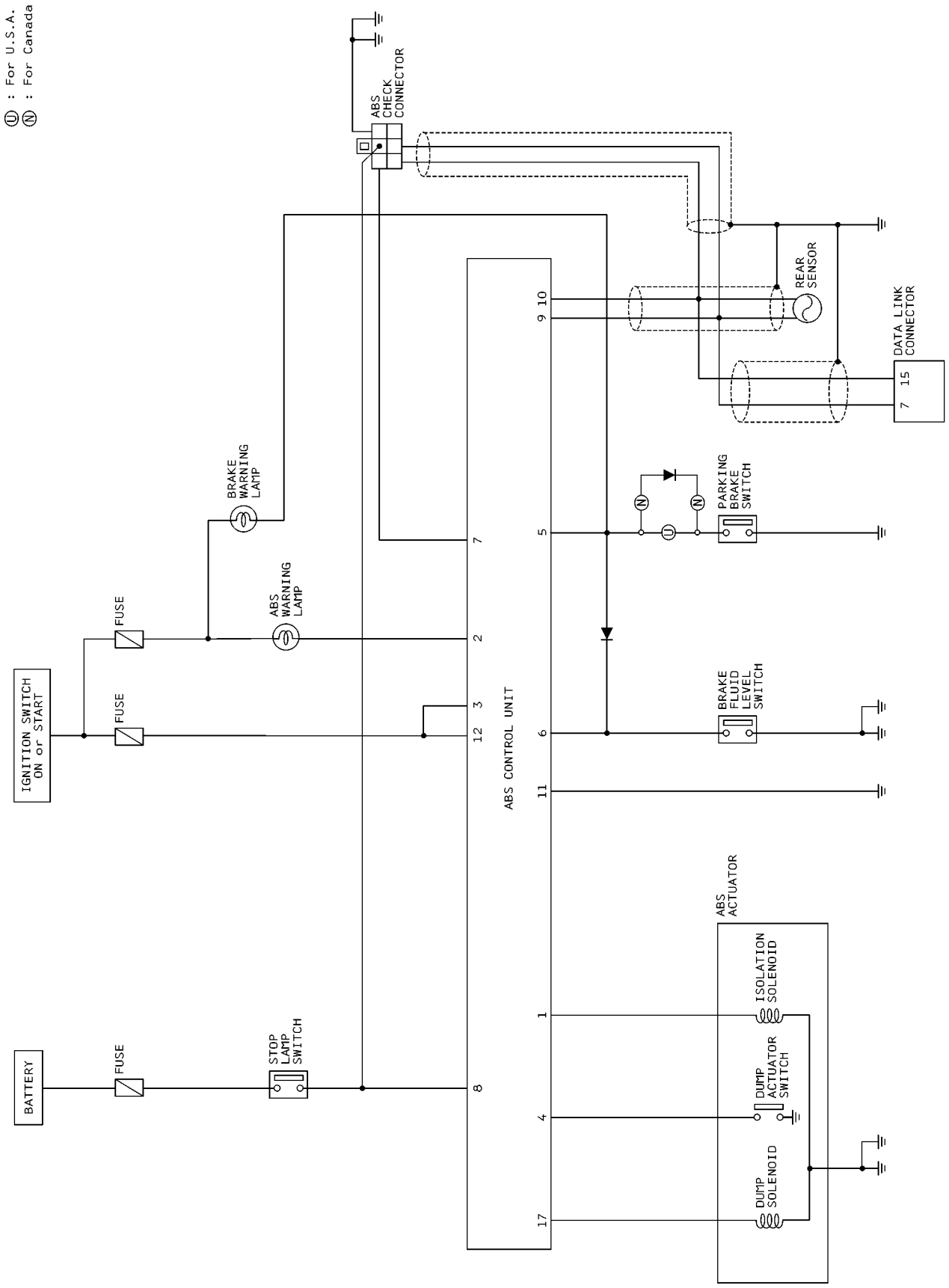
NEBR0260



ABR855

Schematic

NEBR0261

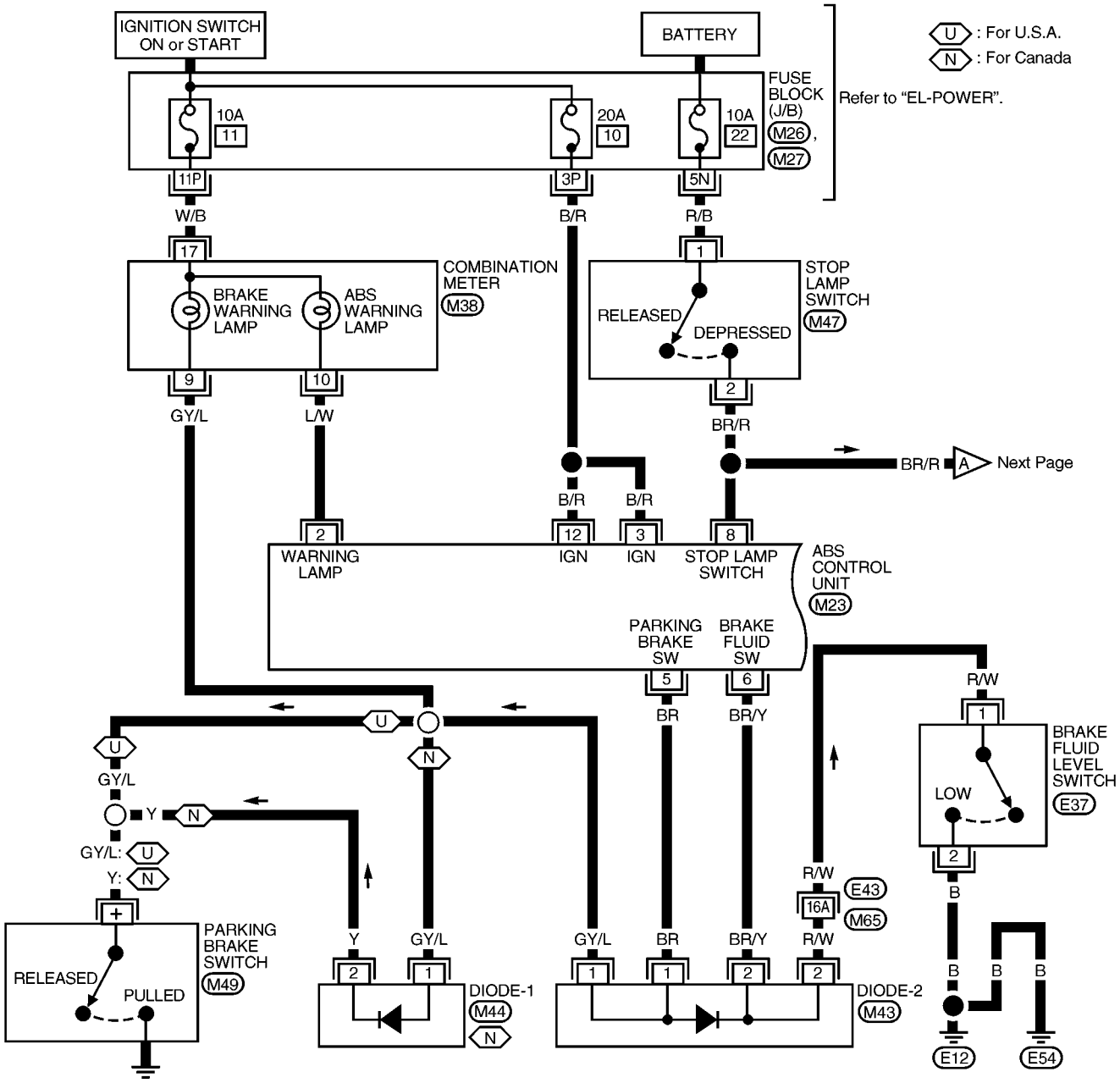


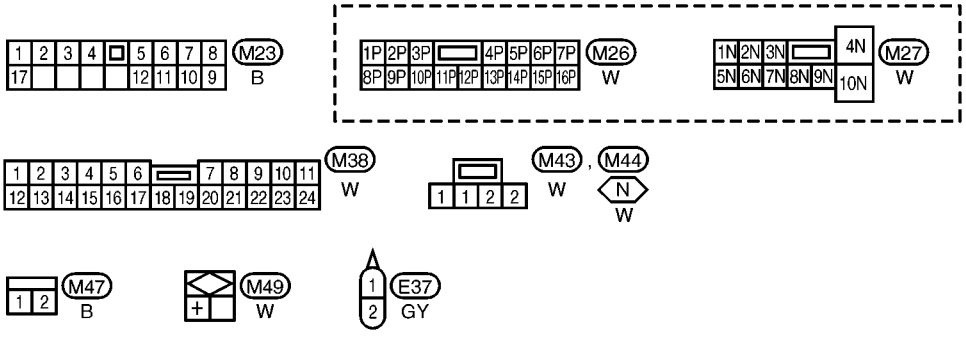
ABR830

Wiring Diagram — ABS —

NEBR0262

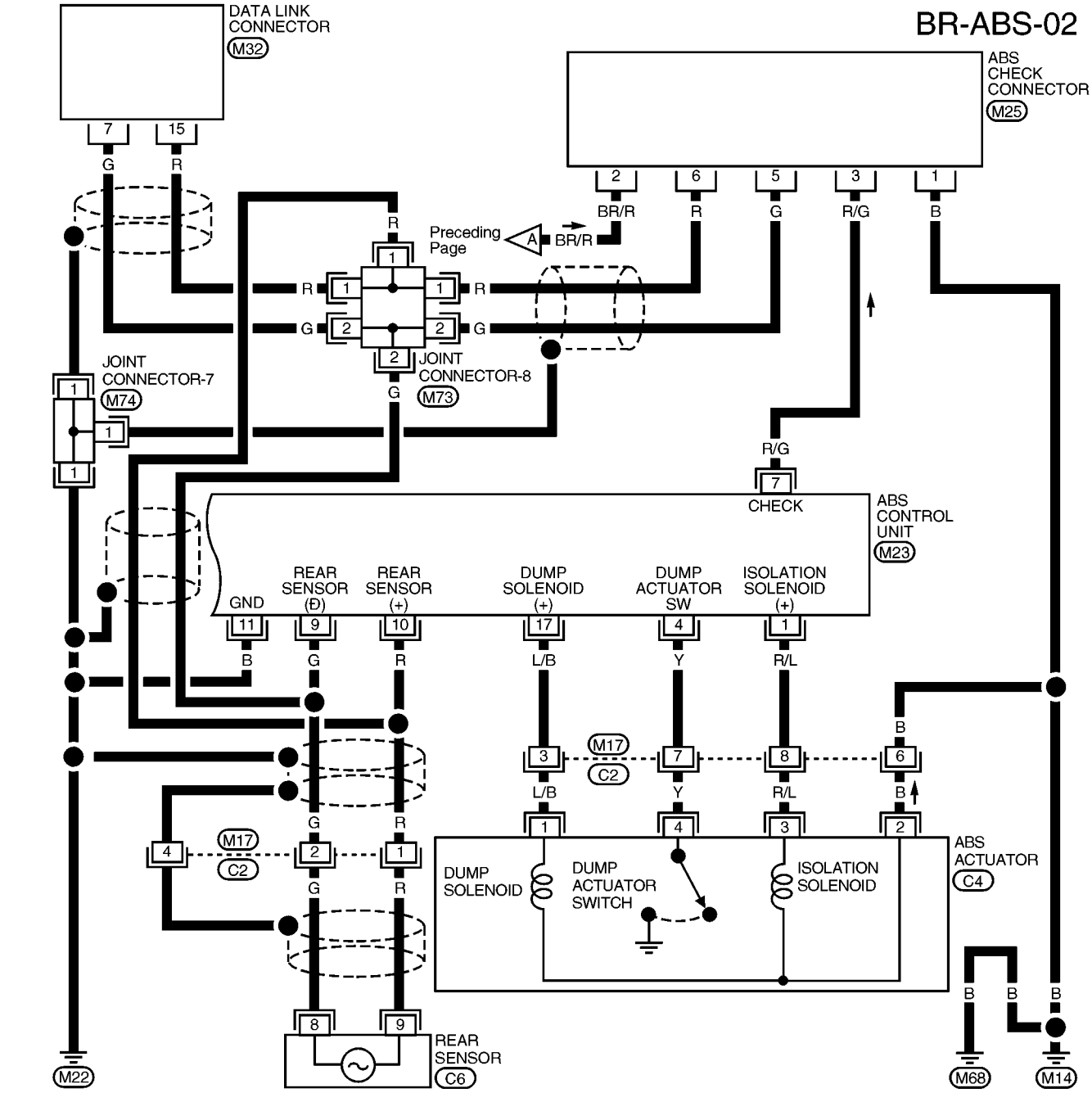
BR-ABS-01

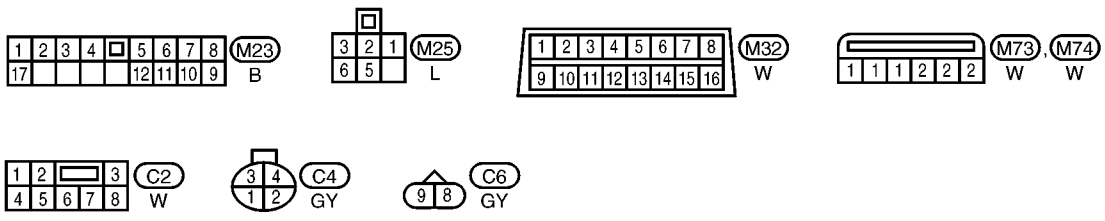




Refer to the following.
M65, E43 - SUPER MULTIPLE JUNCTION (SMJ)

ABR831


BR-ABS-02
DATA LINK CONNECTOR
M32
ABS CHECK CONNECTOR
M25
Preceding Page
A
BR/R
JOINT CONNECTOR-7
M74
JOINT CONNECTOR-8
M73
CHECK
ABS CONTROL UNIT
M23
GND
REAR SENSOR (Đ)
REAR SENSOR (+)
DUMP SOLENOID (+)
DUMP ACTUATOR SW
ISOLATION SOLENOID (+)
DUMP SOLENOID
DUMP ACTUATOR SWITCH
ISOLATION SOLENOID
ABS ACTUATOR
C4
REAR SENSOR
C6
M17
C2
M22
M68
M14


M23 B
M25 L
M32 W
M73 W
M74 W
C2 W
C4 GY
C6 GY

ABR832

Self-diagnosis

NEBR0263

CHECKING THE NUMBER OF WARNING LAMP FLASHES

NEBR0263S01

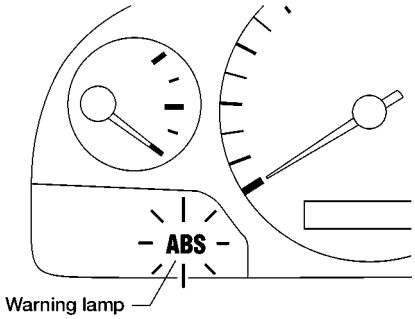
When a problem occurs in ABS, the ABS warning lamp on the instrument panel turns on. As shown in the table, the control unit performs self-diagnosis.
To obtain satisfactory self-diagnosing results, the vehicle must be driven above 40 km/h (25 MPH) for at least one minute before the self-diagnosis is performed. After the vehicle has been stopped, with the engine still running, the number of ABS warning lamp flashes are counted by grounding the check terminal, thereby identifying the malfunction code(s).
If more than two parts or units malfunction at the same time, the ABS warning lamp will flash to indicate one of the malfunctioning parts or units. After the part or unit has been repaired, The ABS warning lamp will then flash to indicate the other part or unit that is malfunctioning.

SELF-DIAGNOSIS PROCEDURE 1

NEBR0263S02

1	INSPECTION START

1. Turn ignition switch ON.
2. Check warning lamp activation.
   When ignition switch is turned on, warning lamp should turn on.



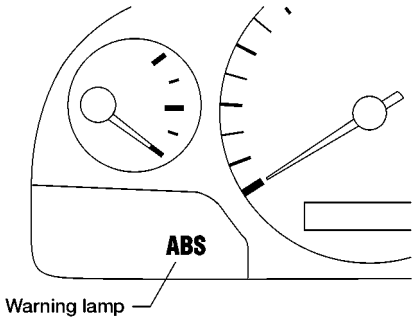
ABR838

Does warning lamp turn on?

Yes	▶	GO TO 2.
No	▶	Go to “Main Power Supply and Ground Circuit Check”, BR-51.

2	CHECK WARNING LAMP OPERATION

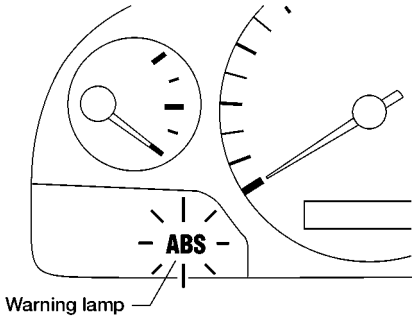
Check if warning lamp deactivates after a few seconds.

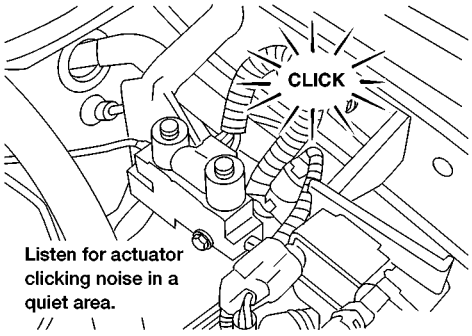


ABR837

Warning lamp should deactivate after a few seconds.

OK	▶	GO TO 3.
NG	▶	Go to “Self Diagnostic Procedure 2”, BR-50.

3	ROAD TEST	
Drive vehicle above 40 km/h (25 MPH) for at least one minute.  ABR838 **Does warning lamp activate again?**		
Yes	▶	Go to "Self Diagnostic Procedure 2", BR-50.
No	▶	GO TO 4.

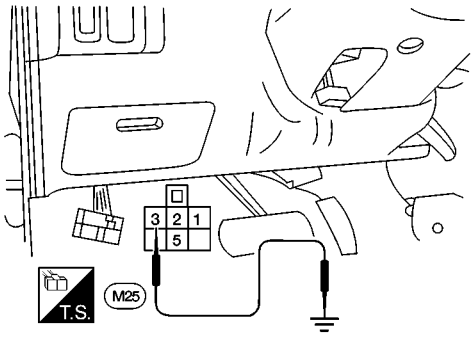
4	CHECK ACTUATOR	
1. Stop engine. 2. Turn ignition switch ON. Check actuator clicking noise, when warning lamp deactivates.  ABR854 **Actuator should make clicking noise when warning lamp deactivates.**		
OK	▶	**INSPECTION END**
NG	▶	Check actuator Go to "Electrical Component Inspection", BR-63.

SELF-DIAGNOSIS PROCEDURE 2

NEBR0263S03

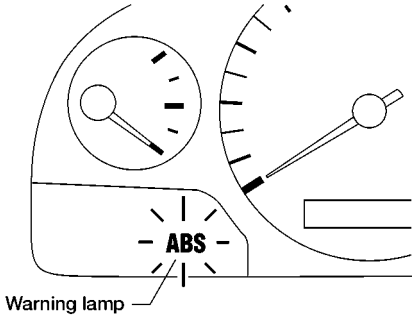
1	CHECK FOR MALFUNCTION CODE

1. Start engine.
2. Ground the check terminal of the ABS check connector.



ABR696

3. Observe the warning lamp.



ABR838

Is the warning lamp flashing?

Yes ▶	Count the number of flashes. Refer to the "Malfunction Codes/Symptom Chart", BR-50.
No ▶	Check the brake fluid level. Go to the "Main Power Supply and Ground Circuit Check", BR-51. If OK, replace ABS control unit.

MALFUNCTION CODE/SYMPTOM CHART

NEBR0263S04

Code No./Symptom (No. of warning lamp flashes)	Malfunctioning part	Diagnostic Procedure
2	Actuator ISO solenoid (open-circuit)	BR-54
7	Actuator DUMP solenoid (open-circuit)	BR-54
4	Actuator DUMP solenoid (short-circuit)	BR-55
3	Actuator dump solenoid (open-circuit)	BR-56
8	Actuator dump solenoid (short-circuit)	BR-56
9	Rear sensor (open-circuit)	BR-58
10	Rear sensor (short-circuit)	BR-58
6	Sensor signal (erratic)	BR-58
13	Control	BR-59
14		
15		
16	None (system OK)	None
5	ABS actuator	BR-59

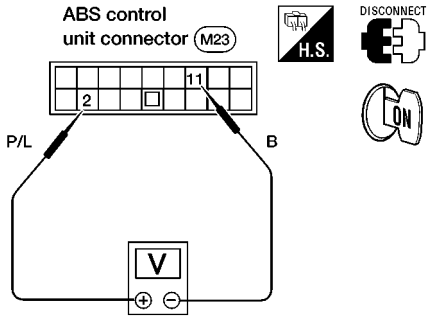
Code No./Symptom (No. of warning lamp flashes)	Malfunctioning part	Diagnostic Procedure
Pedal vibration or noise	—	BR-60
Long stopping distance	—	BR-61
Brake pedal stroke is large	—	BR-61
ABS does not work	—	BR-62
ABS works frequently	—	BR-62

Main Power Supply and Ground Circuit Check

NEBR0264

1	CHECK WARNING LAMP POWER SUPPLY

1. Confirm battery voltage is 12V.
2. Disconnect ABS control unit connector.
3. Turn ignition switch ON.



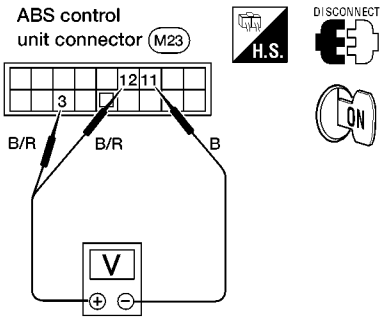
ABR624

Does approx. 12 volts exist between ABS control unit connector M23 terminals 2 and 11?

Yes	▶	GO TO 2.
No	▶	GO TO 5.

2	CHECK ABS CONTROL UNIT POWER SUPPLY

1. Turn ignition switch ON.
2. Does approx. 12 volts exist between ABS control unit connector M23 terminals (3, 12) and 11?



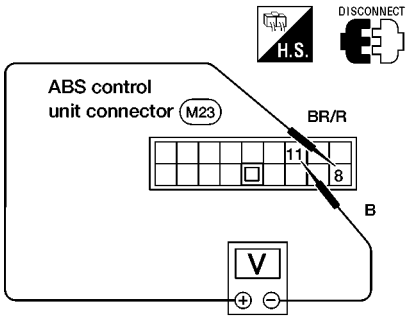
ABR625

Approx. 12 volts should exist.

OK	▶	GO TO 3.
NG	▶	GO TO 5..

3	CHECK STOP LAMP SWITCH POWER SUPPLY

1. Depress brake pedal.
2. Does approx. 12 volts exist between ABS control unit connector M23 terminals 8 and 11?



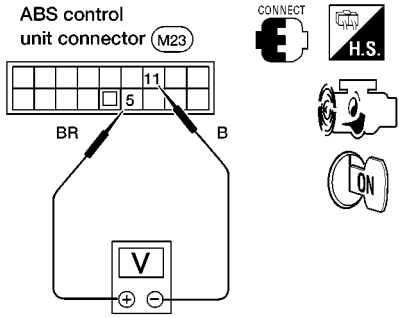
ABR627

Approx. 12 volts should exist.

OK	▶	GO TO 4.
NG	▶	Adjust stop lamp switch, if necessary. Replace stop lamp switch or repair harness or connectors, if necessary.

4	CHECK PARKING BRAKE SWITCH POWER SUPPLY

1. Confirm that brake fluid level is adequate.
   If necessary, refill it.
2. Start engine.
3. Does approx. 12 volts exist between ABS control unit connector M23 terminals 5 and 11 without the parking brake applied? Does approx. 0 volts exist with the parking brake applied?



ABR628

Yes or No?

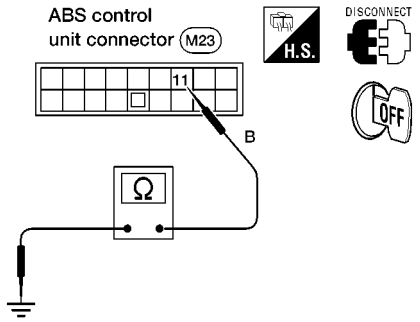
Yes	▶	**INSPECTION END**
No	▶	Adjust parking brake switch, if necessary. Replace parking brake switch, or repair harness or connectors, if necessary.

5	CHECK FUSE

Check 10A fuse No. 11. For fuse layout refer to "POWER SUPPLY ROUTING" in EL section.

Is fuse OK?

Yes	▶	GO TO 6.
No	▶	GO TO 7.

6	CHECK GROUND CIRCUIT	
Check harness for continuity between ABS control unit connector M23 terminal 11 and ground.		
 ABR626		
Does continuity exist?		
Yes	▶	Check warning lamp and replace if necessary. If OK, check repair harness or connectors.
No	▶	Check and repair harness or connector between ABS control unit connector M23 terminal 11 and ground.

7	REPLACE FUSE	
Replace fuse. **Does the fuse blow out when the ignition switch is turned ON?**		
Yes	▶	Check and repair harness between ABS control unit connector M23 terminals (3, 12) and fuse block connector M26 terminal 3P (for fuse block details refer to "POWER SUPPLY ROUTING" in EL section).
No	▶	**INSPECTION END**

ABS Actuator ISO Solenoid Short or Open

NEBR0265

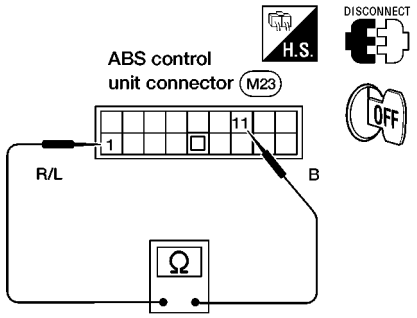
MALFUNCTION CODE NO. 2 OR 7

NEBR0265S01

1	CHECK ISO SOLENOID CIRCUITS

Disconnect battery cable ground connection.

1. Disconnect ABS control unit connector.
2. Check resistance between ABS control unit connector M23 terminals 1 and 11.



ABR629

Resistance should be approx. 4Ω

OK	▶	Replace ABS control unit.
NG	▶	GO TO 2.

2	CHECK ABS CONTROL UNIT GROUND CIRCUIT

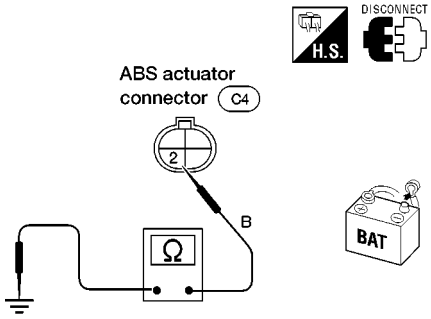
Check ABS control unit ground circuit. Refer to BR-51.

OK or NG

OK	▶	GO TO 3.
NG	▶	Repair harness or connectors.

3	CHECK ABS ACTUATOR GROUND CIRCUIT

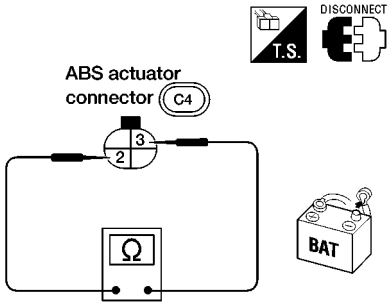
Check harness continuity between ABS actuator connector C4 terminal 2 and ground.



ABR630

Does continuity exist?

Yes	▶	GO TO 4.
No	▶	Repair ABS actuator harness or connectors.

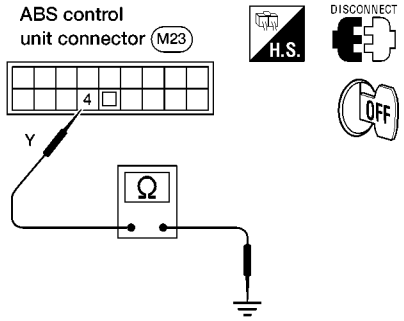
4	CHECK ISO SOLENOID	
Check resistance between ABS actuator connector C4 terminals 2 and 3.  ABR631 **Resistance should be approx. 4Ω**		
OK	▶	Repair harness and connectors between the ISO solenoid and ABS control unit.
NG	▶	Replace ABS actuator.

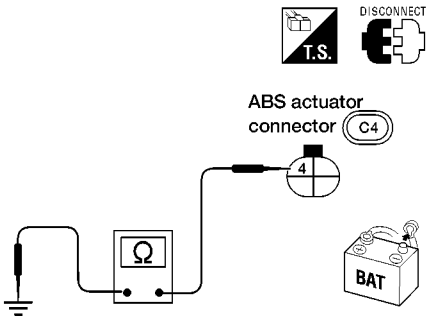
ABS Actuator ISO Blocked

NEBR0266

MALFUNCTION CODE NO. 4

NEBR0266S01

1	CHECK ABS ACTUATOR SWITCH	
Disconnect battery cable ground connection. 1. Disconnect ABS control unit connector. 2. Check for continuity between ABS control unit connector M23 terminal 4 and ground.  ABR632 **Continuity should not exist.**		
OK	▶	Replace ABS control unit.
NG	▶	GO TO 2.

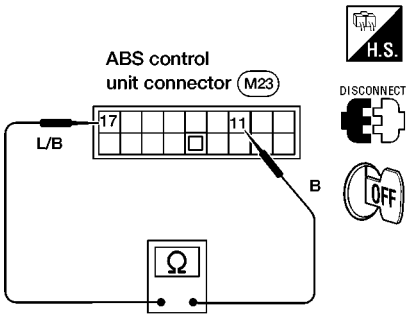
2	CHECK ABS ACTUATOR CIRCUIT	
1. Disconnect ABS actuator connector. 2. Check for continuity between ABS actuator connector C4 terminal 4 and ground.  ABR787 **Continuity should not exist.**		
OK	▶	Repair harness or connectors between ABS control unit and ABS actuator.
NG	▶	Replace ABS actuator.

ABS Actuator Dump Solenoid Short Circuit or Open

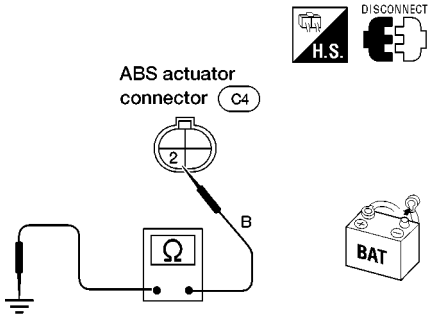
NEBR0267

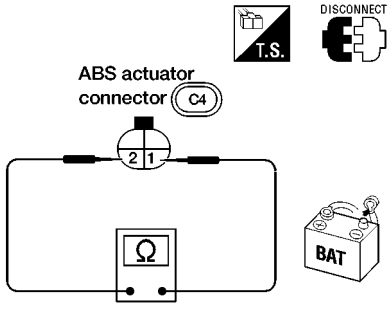
MALFUNCTION CODE NO. 3 OR 8

NEBR0267S01

1	CHECK DUMP SOLENOID	
Disconnect battery cable ground connection. 1. Disconnect ABS control unit connector. 2. Check resistance between ABS control unit connector M23 terminals 11 and 17.  ABR634 **Resistance should be approx. 1.5Ω**		
OK	▶	Replace ABS control unit.
NG	▶	GO TO 2.

2	CHECK ABS CONTROL UNIT GROUND CIRCUIT	
BR-51 **OK or NG**		
OK	▶	GO TO 3.
NG	▶	Repair harness or connectors.

3	CHECK ABS ACTUATOR GROUND CIRCUIT	
Check harness continuity between ABS actuator connector C4 terminal 2 and ground.  ABR635 **Continuity should exist.**		
OK	▶	GO TO 4.
NG	▶	Repair harness or connectors.

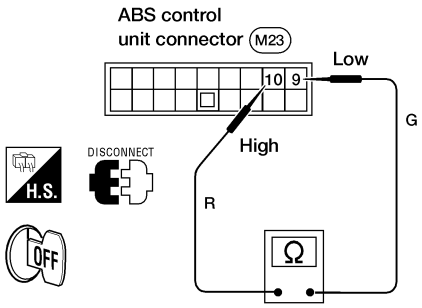
4	CHECK DUMP SOLENOID	
1. Disconnect ABS actuator connector. 2. Check resistance between ABS actuator connector C4 terminals 1 and 2.  ABR636 **Resistance should be approx. 1.5Ω**		
OK	▶	Repair harness or connectors between ABS control unit and ABS actuator.
NG	▶	Replace ABS actuator.

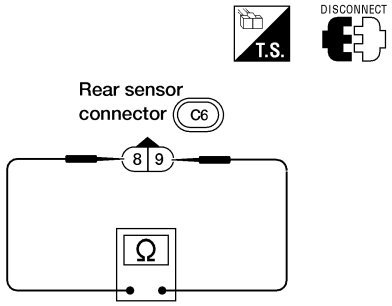
Rear Sensor Open or Short

=NEBR0268

MALFUNCTION CODE NO. 9 OR 10

NEBR0268S01

1	CHECK REAR SENSOR CIRCUIT	
Disconnect battery cable ground connection. 1. Disconnect ABS control unit connector. 2. Check resistance between ABS control unit connector M23 terminals 9 and 10.  ABR637 **Resistance should be 1.05 - 1.35 kΩ**		
OK	▶	Replace ABS control unit.
NG	▶	GO TO 2.

2	CHECK REAR SENSOR	
Disconnect rear sensor connector C6 and check resistance between terminals 8 and 9.  ABR638 **Resistance should be 1.05 - 1.35 kΩ**		
OK	▶	Repair harness or connectors between ABS control unit and rear sensor.
NG	▶	Replace rear sensor unit.

Sensor Signal Erratic

NEBR0269

MALFUNCTION CODE NO. 6

NEBR0269S01

1	CHECK REAR SENSOR ROTOR TOOTH CONDITION	
1. Remove propeller shaft. 2. Remove companion flange, refer to ***PD-71*** (H190A rear axle) or ***PD-92*** (C200 rear axle). 3. Check rotor on companion flange. **OK or NG**		
OK	▶	Replace ABS control unit.
NG	▶	Replace rear sensor rotor with companion flange.

ABS Control Unit

=NEBR0270

MALFUNCTION CODE NO. 13, 14 OR 15

NEBR0270S01

There has been an ABS control unit Malfunction.
Replace ABS control unit.

ABS Actuator

NEBR0271

MALFUNCTION CODE NO. 5

NEBR0271S01

1	CHECK BRAKE SYSTEM	
Overhaul both rear brakes. 1. Refer to “SELF-DIAGNOSIS PROCEDURE 1”, BR-48 2. Check if ABS system is OK. **OK or NG**		
OK	▶	**INSPECTION END**
NG	▶	GO TO 2.

2	CHECK FOR MALFUNCTION CODES	
Does warning lamp still flash malfunction code No. 5? **Yes or No**		
Yes	▶	Replace ABS actuator.
No	▶	Inspect ABS system, referring to warning flashes.

1. Pedal Vibration or Noise

NEBR0272

1	INSPECTION START
Pedal vibration and noise inspection Brake pedal  SAT797A	
▶	GO TO 2.

2	CHECK SYMPTOM
1. Apply brake. 2. Start engine. **Does the symptom appear only when engine is started?**	
Yes ▶	Carry out self-diagnosis. Refer to BR-48.
No ▶	Go to “3. CHECK WARNING LAMP INDICATION” in “2. Unexpected Pedal Action”, BR-62.

NOTE:
ABS may operate and cause vibration under any of 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.

2. Long Stopping Distance

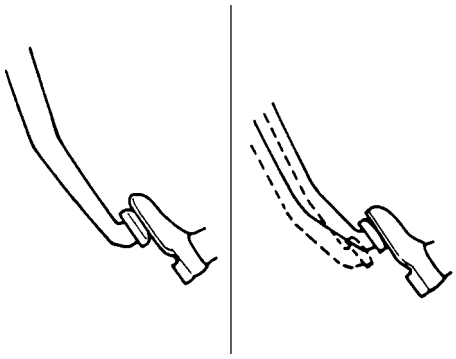
=NEBR0273

1	CHECK MECHANICAL BRAKE SYSTEM PERFORMANCE	
Disconnect ABS actuator connector and check whether stopping distance is still long. **Does brake system function properly when brake pedal is depressed?**		
Yes	▶	Perform Preliminary Check and air bleeding (if necessary).
No	▶	Go to “3. CHECK WARNING LAMP INDICATION” in “3. Unexpected Pedal Action”, BR-62.

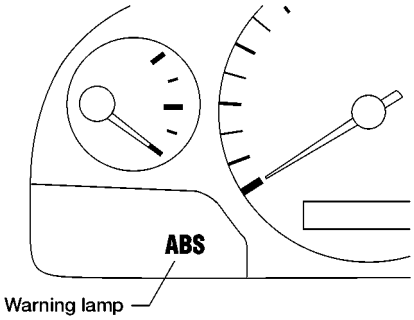
NOTE:
Stopping distance may be longer for vehicles without ABS when road condition is slippery.

3. Unexpected Pedal Action

NEBR0274

1	CHECK BRAKE PEDAL STROKE	
Check brake pedal stroke.  SBR540A **Is brake pedal stroke excessively large?**		
Yes	▶	Perform Preliminary Check. Refer to BR-41.
No	▶	GO TO 2.

2	CHECK MECHANICAL BRAKE SYSTEM PERFORMANCE	
Disconnect ABS actuator connector and check whether brake is effective. **Does brake system function properly when brake pedal is depressed?**		
Yes	▶	GO TO 3.
No	▶	Perform Preliminary Check. Refer to BR-41.

3	CHECK WARNING LAMP INDICATION	
Ensure warning lamp remains off while driving.  ABR837 **Is warning lamp turned off?**		
Yes	▶	GO TO 4.
No	▶	Carry out self-diagnosis. Refer to BR-48.

4	CHECK REAR SENSOR	
1. Check rear sensor connector for terminal damage or loose connection. 2. Perform rear sensor check. Refer to BR-58. **Is rear sensor OK?**		
Yes	▶	Check ABS actuator terminals for damage or the connection of ABS actuator harness connector. Reconnect ABS actuator harness connector. Then retest.
No	▶	Repair or replace as necessary.

4. ABS Does Not Work

NEBR0275

1	CHECK WARNING LAMP INDICATION	
Does the ABS warning lamp activate? **Yes or No**		
Yes	▶	Carry out "Self-diagnosis". Refer to BR-62.
No	▶	Go to "Self-diagnosis Procedure 1", BR-48.

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

5. ABS Works Frequently

NEBR0276

1	CHECK BRAKE FLUID PRESSURE	
Check brake fluid pressure distribution. Refer to "INSPECTION", "Proportioning Valve (2WD)", BR-13. **Is brake fluid pressure distribution normal?**		
Yes	▶	GO TO 2.
No	▶	Repair. Then perform "PRELIMINARY CHECK", refer to BR-41.

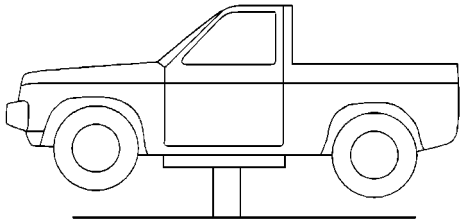
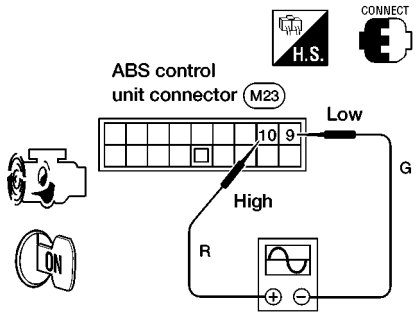
2	CHECK WHEEL SENSOR	
1. Check rear sensor connector for terminal damage or loose connections. 2. Refer to "REAR SENSOR OPEN OR SHORT", BR-58. **Is rear sensor OK?**		
Yes	▶	Check ABS actuator terminals for damage or the connection of ABS actuator harness connector. Reconnect ABS actuator harness connector. Then retest.
No	▶	Repair or replace as necessary.

Electrical Components Inspection

NEBR0277

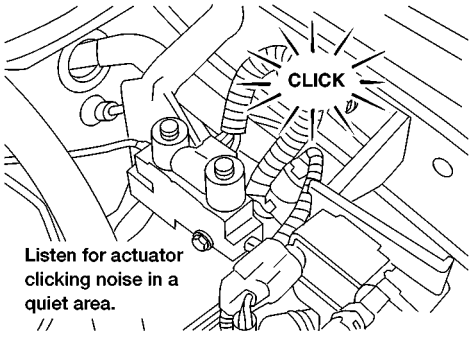
REAR SENSOR UNIT AND ACTUATOR

NEBR0277S01

1	CHECK REAR SENSOR SIGNAL	
1. Raise vehicle. Confirm it is safe to rotate rear wheels.  SBR373D 2. Start engine and rotate rear wheels with transmission in D position or first gear position. 3. Check rear sensor voltage between ABS control unit connector M23 terminals 9 and 10 with voltmeter set to AC voltage scale.  ABR639 **NOTE:** **A/T at 850 rpm** **NOTE:** **M/T at 700 rpm** **Voltage should be 0.4V or higher.**		
OK	▶	GO TO 2.
NG	▶	GO TO 4.

2	CHECK ABS ACTUATOR OPERATION

Refer to "Self-diagnosis Procedure 2", BR-50. Clicking noise sounds should be heard from ABS actuator when the ignition switch is turned ON.



ABR854

Was clicking noise heard?

Yes	▶	GO TO 3.
No	▶	GO TO 5.

3	CHECK ABS OPERATION

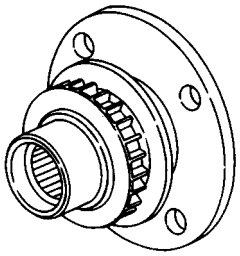
1. Perform ABS check in a safe place without obstacles in the vicinity.
2. Drive the vehicle for more than one minute at speeds over 40 km/h (25 MPH), then check that the ABS warning lamp does not light. After this, check for proper operation.
3. Check if ordinary braking occurs, and also check that the rear wheels do not lock when abrupt braking causes the front wheels to lock.

OK or NG

OK	▶	The ABS system is functioning normally.
NG	▶	Replace ABS actuator.

4	CHECK REAR SENSOR ROTOR

Check the rear sensor rotor for the following points.
- Tooth condition
- Proper installation on the companion flange
- Deformation
- Wear
- Looseness



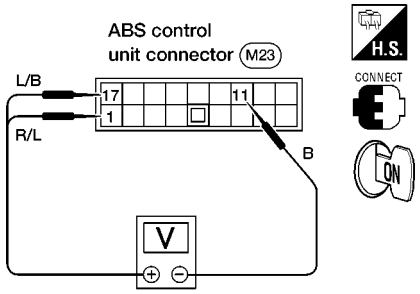
ABR870

OK or NG

OK	▶	Replace rear sensor unit.
NG	▶	Replace rear sensor rotor with companion flange.

5	CHECK PULSING VOLTAGE FROM ABS CONTROL UNIT

Using a suitable digital voltmeter
1. Check pulsing voltage for ISO solenoid between ABS control unit connector M23 terminals 11 and 17.
2. Also check pulsing voltage for DUMP solenoid between ABS control unit connector M23 terminals 11 and 1.
Pulsing voltage appears when ABS lamp goes off after ignition is turned on.



ABR640

Voltage: 0.3 - 3.5V for approx. 13 msec

OK or NG

OK	▶	Replace ABS actuator.
NG	▶	Replace ABS control unit.

Purpose

NEBR0146

The Anti-Lock Brake System (ABS) consists of electronic and hydraulic components. It allows for control of braking force so 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.

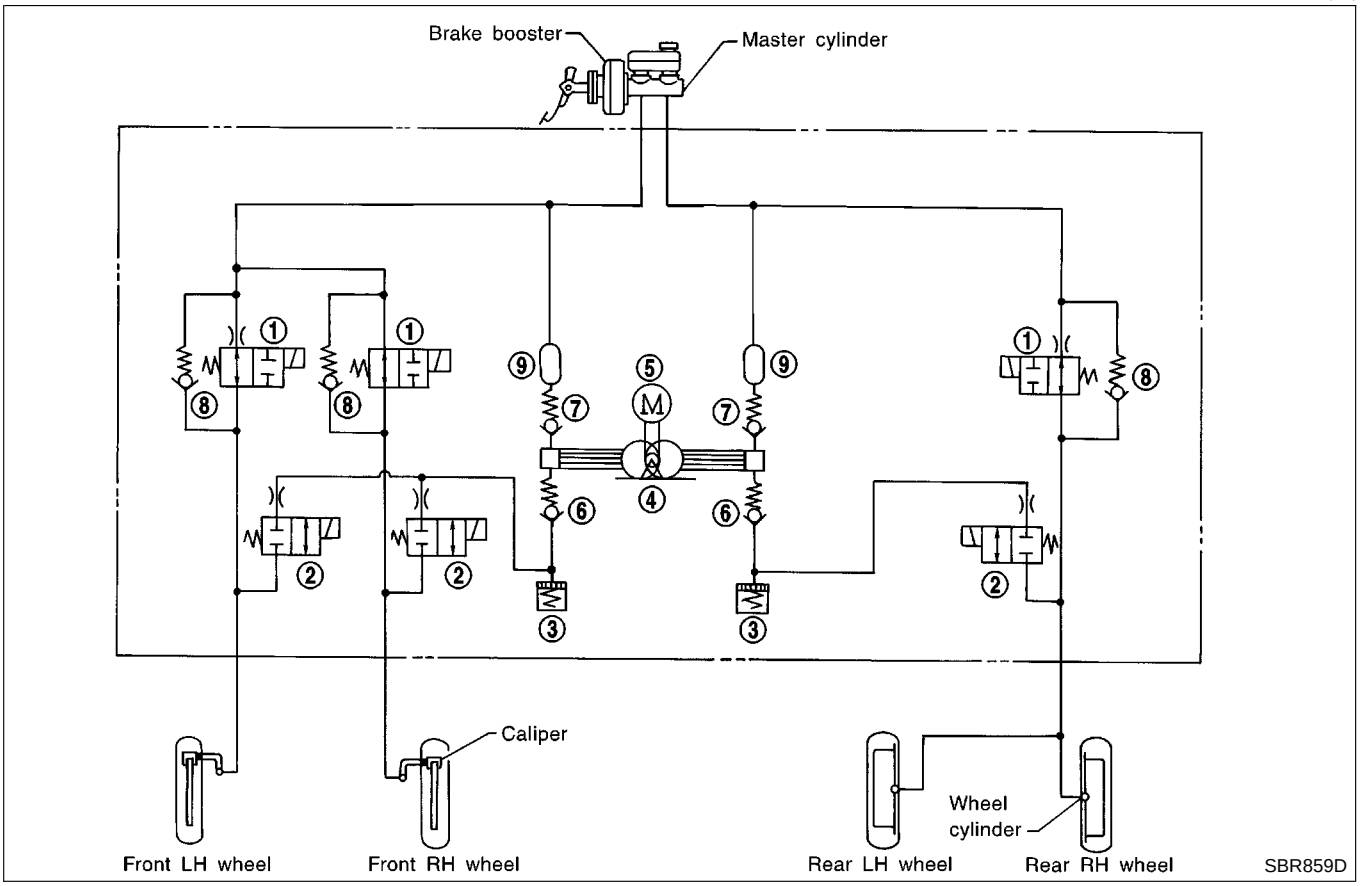
Operation

NEBR0147

- 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 1 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

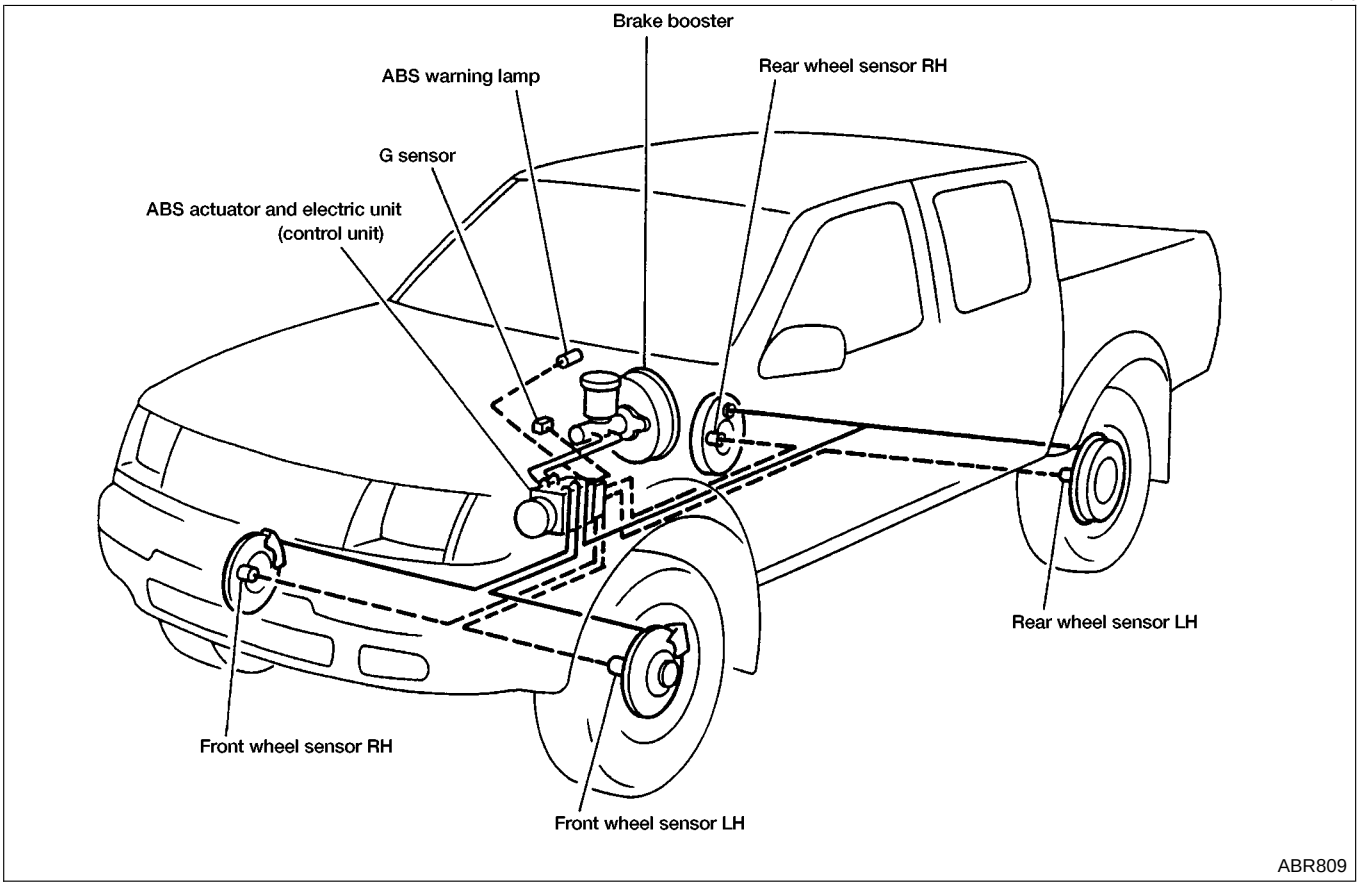
NEBR0148

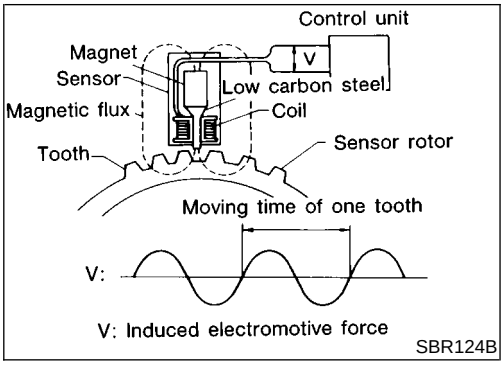


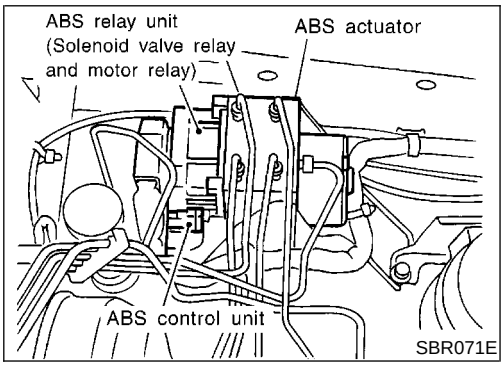
1. Inlet solenoid valve
2. Outlet solenoid valve
3. Reservoir
4. Pump
5. Motor
6. Inlet valve
7. Outlet valve
8. Bypass check valve
9. Damper

System Components

NEBR0149







System Description

=NEBR0150

WHEEL SENSOR

NEBR0150S01

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 front sensors are installed on the back of the brake rotors and the rear sensors are installed on the back of the brake drums. As the wheel rotates, the sensor generates a sine-wave pattern. The frequency and voltage increase(s) as the rotating speed increases.

ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)

NEBR0150S02

The ABS actuator and electric unit (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 motor 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 brake system reverts to normal operation.

The ABS actuator and electric unit (control unit) contains:

- An electric motor and pump
- Two relays
- Six solenoid valves, each inlet and outlet for
  — LH front
  — RH front
  — Rear
- ABS control unit

This component controls the hydraulic circuit and increases, holds or decreases hydraulic pressure to all or individual wheels. The ABS actuator and electric unit is serviced as an assembly.

ABS Actuator Operation

NEBR0150S0201

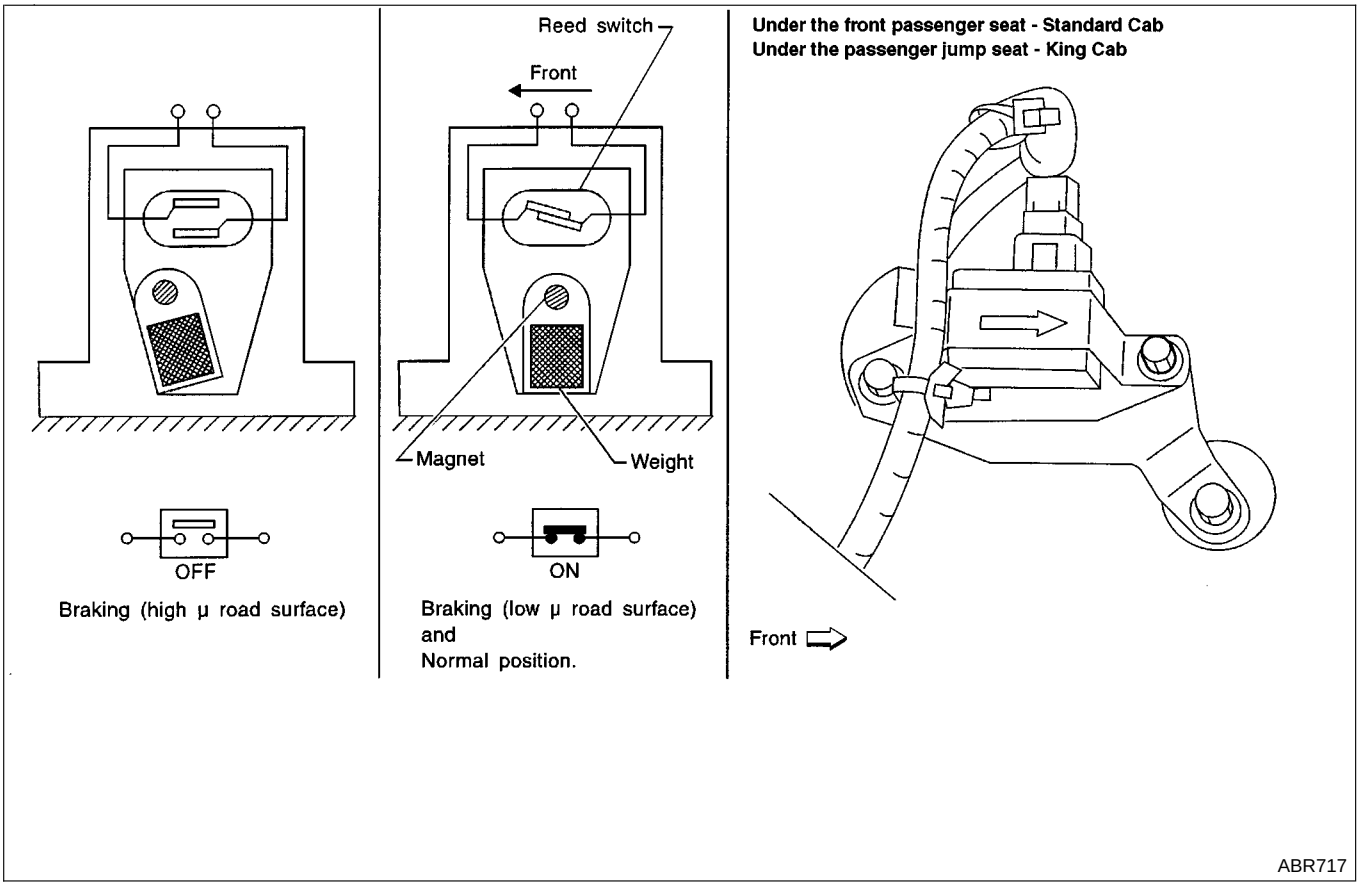
		Inlet solenoid valve	Outlet solenoid valve	
Normal brake operation		OFF (Open)	OFF (Closed)	Master cylinder brake fluid pressure is directly transmitted to caliper via the inlet solenoid valve.
ABS operation	Pressure hold	ON (Closed)	OFF (Closed)	Hydraulic circuit is shut off to hold the caliper brake fluid pressure.
	Pressure decrease	ON (Closed)	ON (Open)	Caliper and wheel cylinder brake fluid is sent to reservoir via the outlet solenoid valve. Then it is pushed up to the master cylinder by pump.
	Pressure increase	OFF (Open)	OFF (Closed)	Master cylinder brake fluid pressure is transmitted to caliper.

G SENSOR

=NEBR0150S03

The G sensor senses deceleration during braking to determine whether the vehicle is being driven on a high µ road (snow-covered road, etc). It then sends a signal to the ABS control unit.

The reed switch turns on when it is affected by the magnetic field. During sudden deceleration (braking on a high µ road), the weight moves and the magnet in the weight moves away from the reed switch. The magnetic field then diminishes and the reed switch turns off.



Removal and Installation

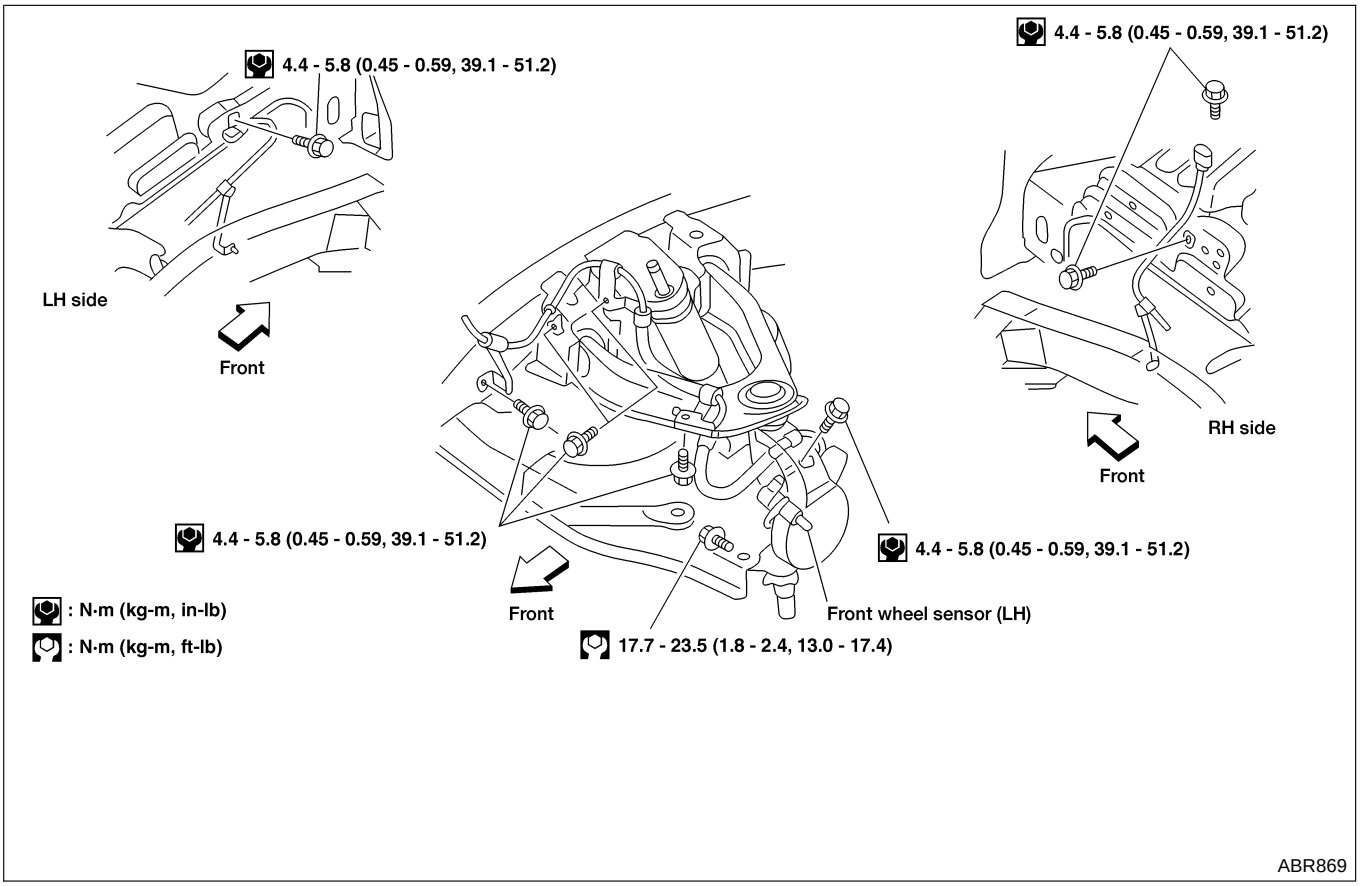
=NEBR0174

FRONT WHEEL SENSORS

NEBR0174S01

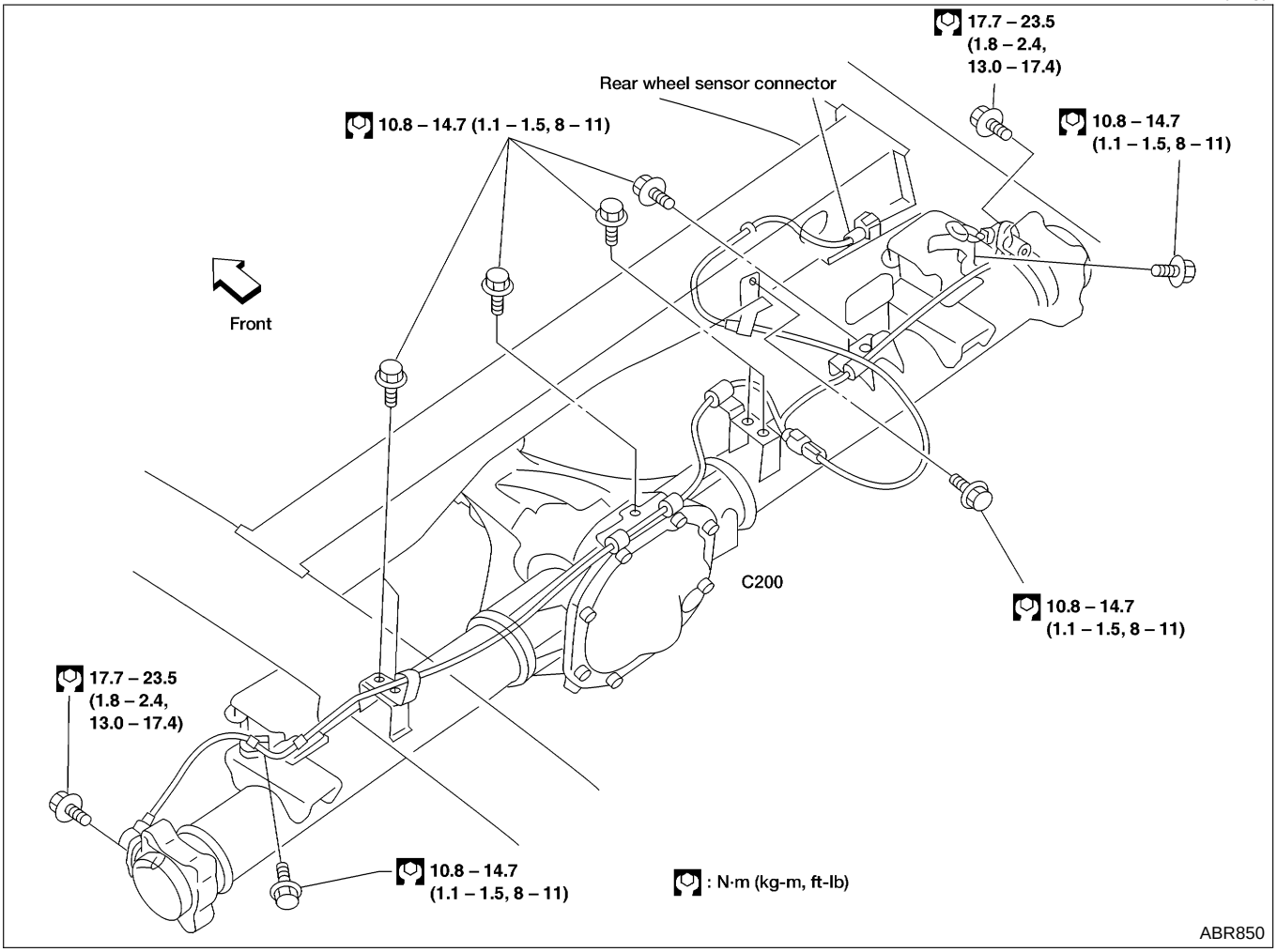
CAUTION:

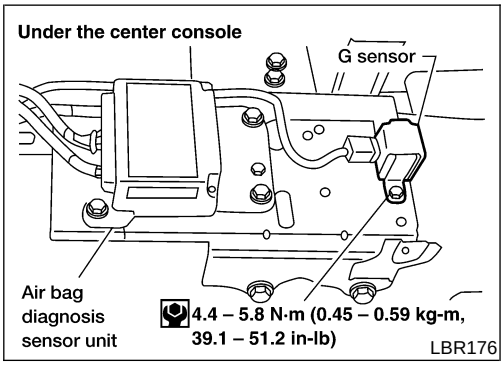
Be careful not to damage sensor edge and sensor rotor teeth. When removing the front wheel hub or rear axle shaft assembly, disconnect and remove the ABS wheel sensor from the assembly and move it away.



REAR WHEEL SENSORS

NEBR0174S02





G SENSOR

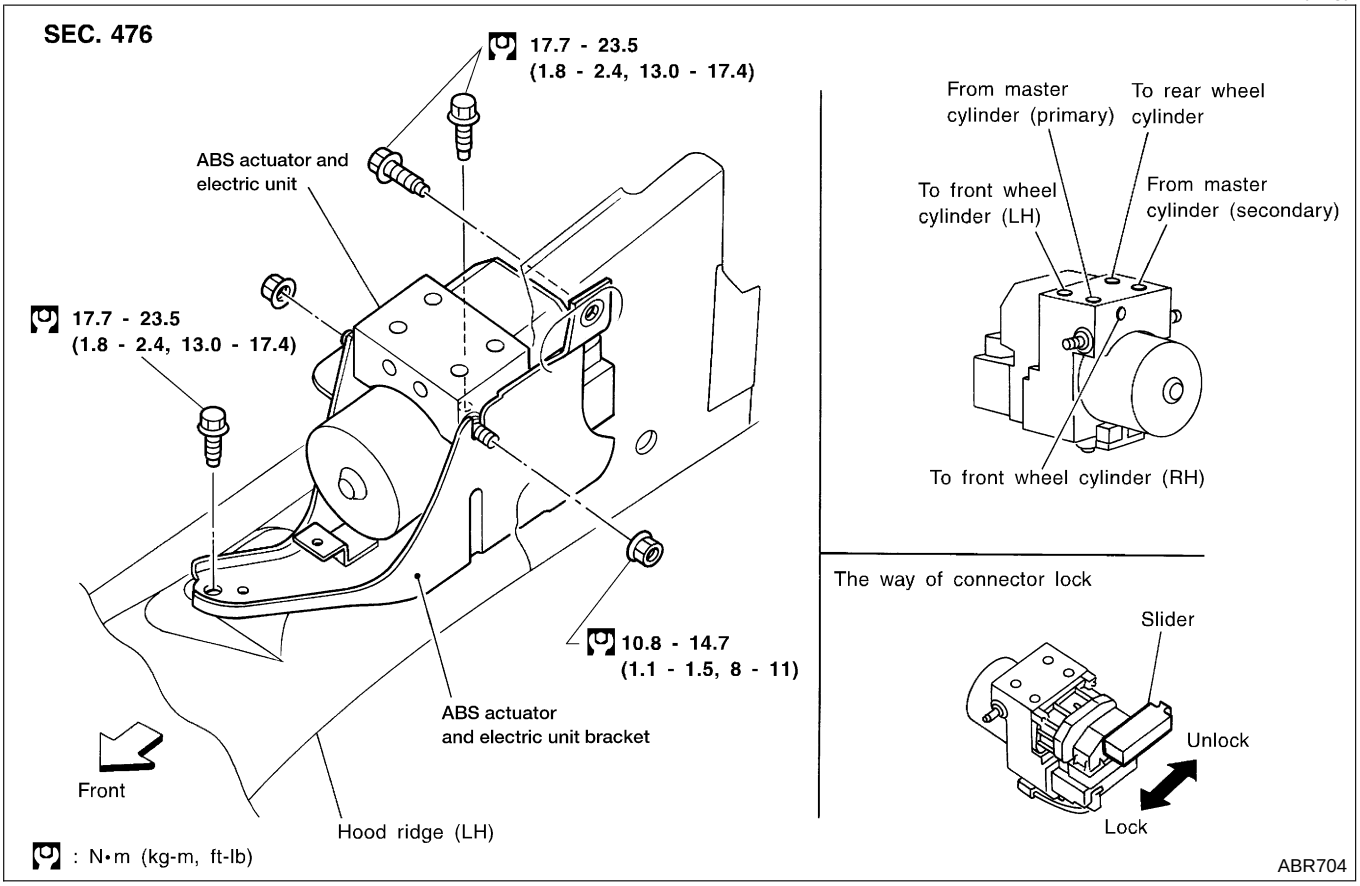
NEBR0174S03

CAUTION:

Always replace G sensor if bumped, deformed or dropped from a height of 30 cm (11.8 in) or more. Otherwise, performance characteristics of G sensor will be changed, which in turn changes ABS control performance characteristics. Install G sensor with arrow pointing toward front of vehicle.

ABS ACTUATOR AND ELECTRIC UNIT

NEBR0174S04



Removal

NEBR0174S0402

1) Disconnect battery cable.
2) Drain brake fluid. Refer to "CHANGING BRAKE FLUID", BR-8.
3) Disconnect ABS actuator and electric unit (control unit connector) and brake pipes.
4) Remove mounting bracket fixing bolts and nuts.

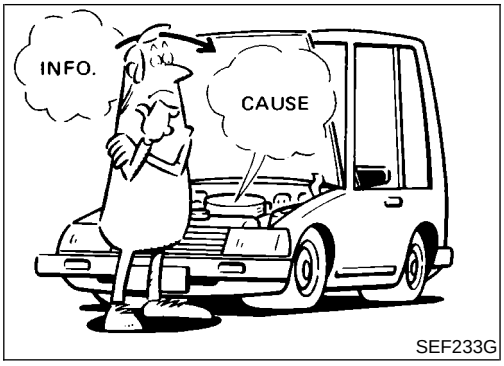
Installation

NEBR0174S0403

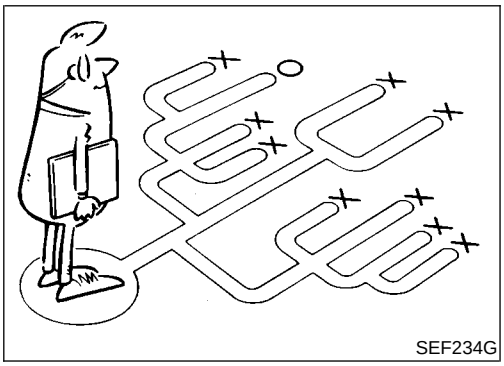
CAUTION:

After installation, refill brake fluid. Then bleed air. Refer to "Bleeding Brake System", BR-10.

1) Connect brake pipes temporarily.
2) Tighten fixing bolts and nuts.
3) Tighten brake pipes.
4) Connect connector and battery cable.



SEF233G


SEF234G

How to Perform Trouble Diagnoses for Quick and Accurate Repair

NEBR0176

INTRODUCTION

NEBR0176S01

The ABS system has an electronic control unit to control major functions. The control unit accepts input signals from sensors and instantly drives the 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 booster lines, lack of brake fluid, or other problems with the brake system.

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

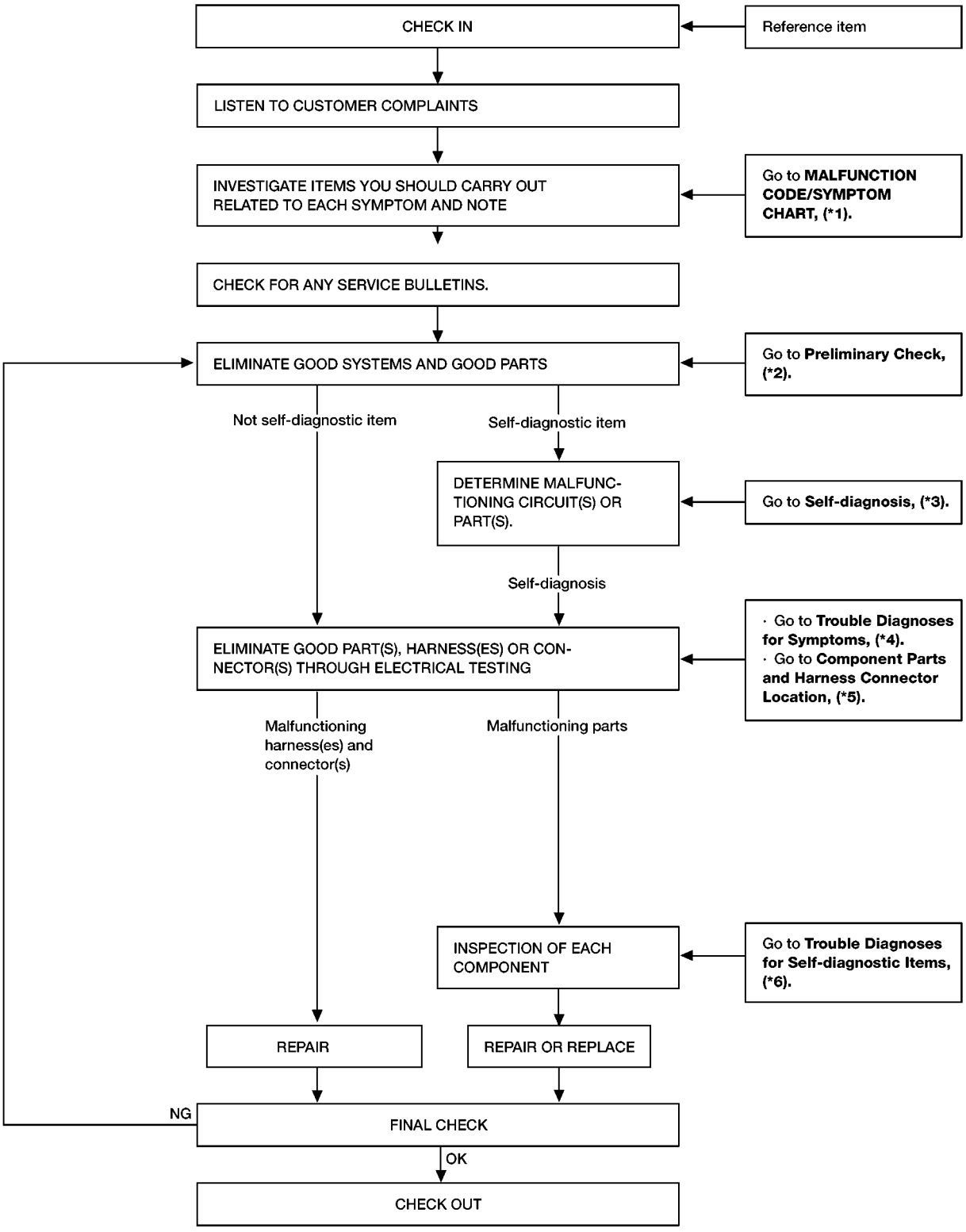
A visual check only may not find the cause of the problems, so a road test should be performed.

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 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 ABS controlled vehicle.

Also check related service bulletins for information.

WORK FLOW

NEBR0176S02



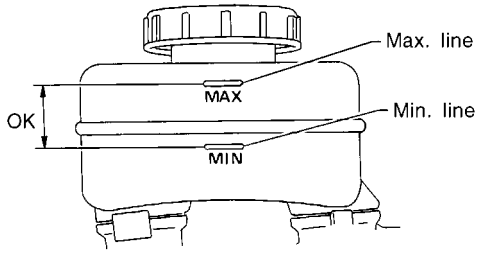
ABR839

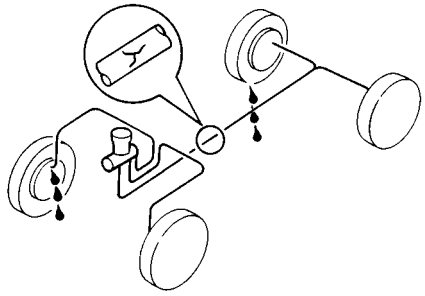
*1: BR-93
*2: BR-75
*3: BR-84
*4: BR-107 - 113
*5: BR-78
*6: BR-94 - 113

Preliminary Check

NEBR0177

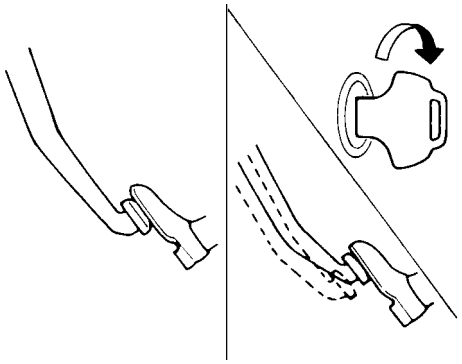
1	CHECK BRAKE FLUID	
Check brake fluid for contamination. **Has brake fluid been contaminated?**		
Yes	▶	Replace. GO TO 2.
No	▶	GO TO 2.

2	CHECK BRAKE FLUID LEVEL	
Check brake fluid level in reservoir tank. Low fluid level may indicate brake pad wear or leakage from brake line.  SBR451D **Is brake fluid filled between MAX and MIN lines on reservoir tank ?**		
Yes	▶	GO TO 3.
No	▶	Fill up brake fluid. GO TO 3.

3	CHECK BRAKE LINE	
Check brake line for leakage.  SBR389C **Is leakage present at or around brake lines, tubes or hoses or are any of these parts cracked or damaged?**		
Yes	▶	Repair. GO TO 4.
No	▶	GO TO 4.

4	CHECK BRAKE BOOSTER OPERATION

Check brake booster for operation and air tightness.
Refer to "ON-VEHICLE SERVICE", "Brake Booster", BR-21.



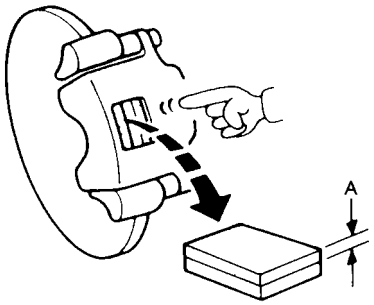
SBR058C

Is brake booster airtight and functioning properly?

Yes	▶	GO TO 5.
No	▶	Replace. GO TO 5.

5	CHECK BRAKE PAD AND ROTOR

Check brake pad and rotor.
Refer to BR-24, 26.



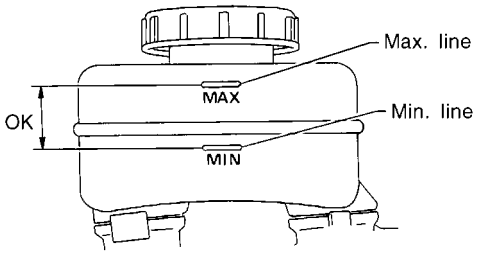
SBR059C

Are brake pads and rotors functioning properly?

Yes	▶	GO TO 6.
No	▶	Replace.

6	RECHECK BRAKE FLUID LEVEL

Check brake fluid level in reservoir tank again.



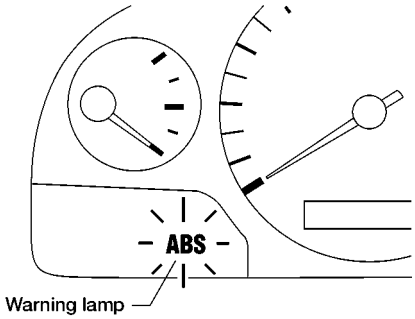
SBR451D

Is brake fluid filled between MAX and MIN lines on reservoir tank ?

Yes	▶	GO TO 7.
No	▶	Fill up brake fluid.

7	CHECK WARNING LAMP ACTIVATION

Check warning lamp activation.



ABR838

Does warning lamp turn on when ignition switch is turned ON?

Yes	▶	GO TO 8.
No	▶	Check fuse, warning lamp bulb and warning lamp circuit.

8	CHECK WARNING LAMP DEACTIVATION

Check warning lamp for deactivation after engine is started.

Does warning lamp turn off when engine is started?

Yes	▶	GO TO 9.
No	▶	Go to Self-diagnosis, BR-84.

9	DRIVE VEHICLE

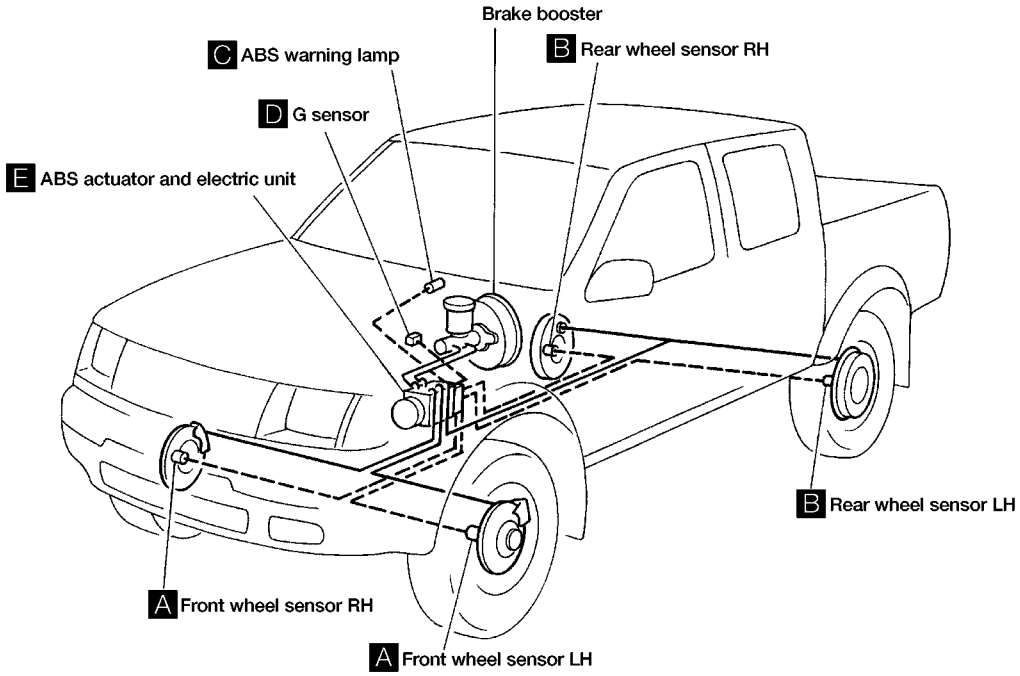
Drive vehicle at speeds over 30 km/h (19 MPH) for at least one minute.

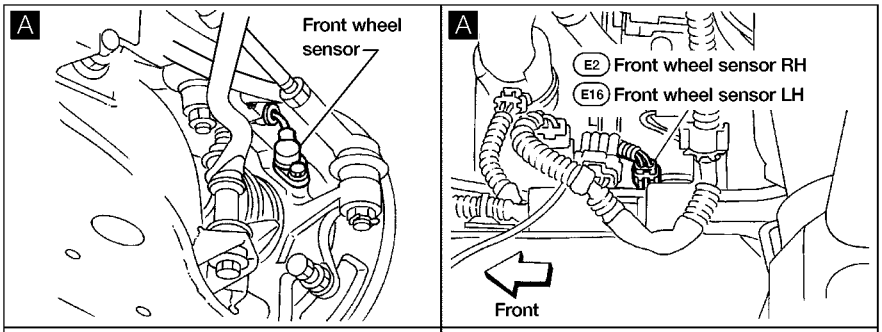
Does warning lamp remain off after vehicle has been driven at 30 km/h (19 MPH) for at least one minute?

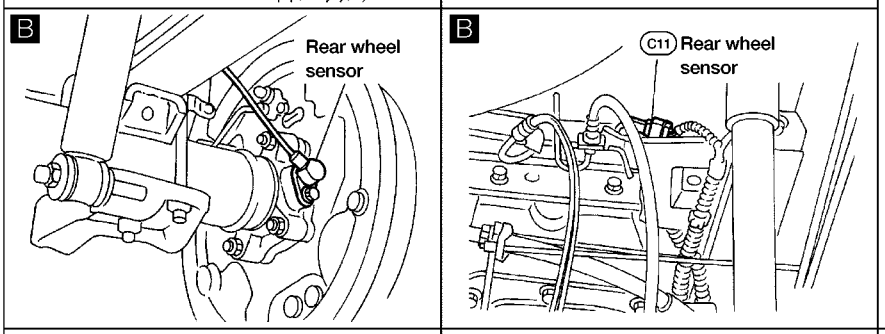
Yes	▶	**INSPECTION END**
No	▶	Go to Self-diagnosis, BR-84.

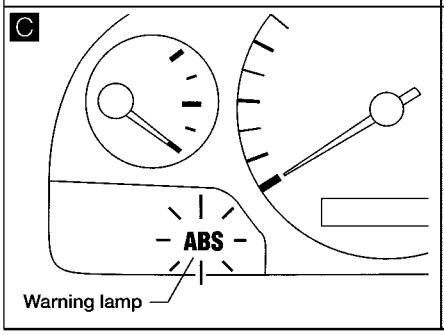
Component Parts and Harness Connector Location

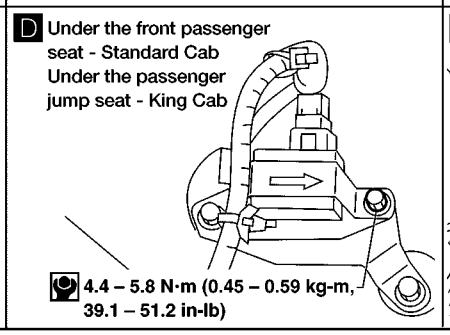
NEBR0178

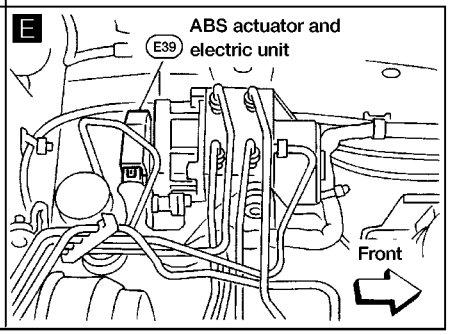








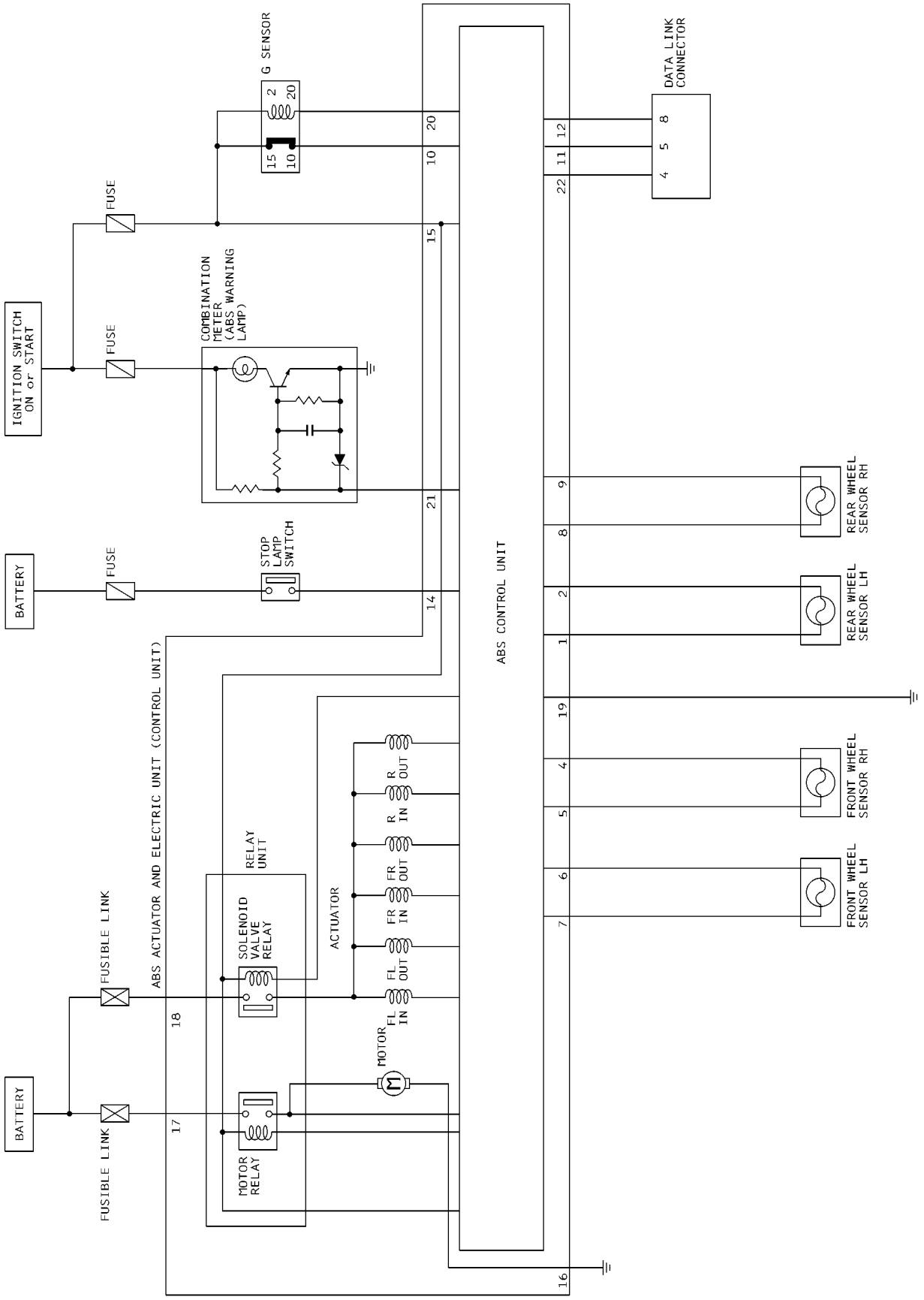




ABR851

Schematic

NEBR0152

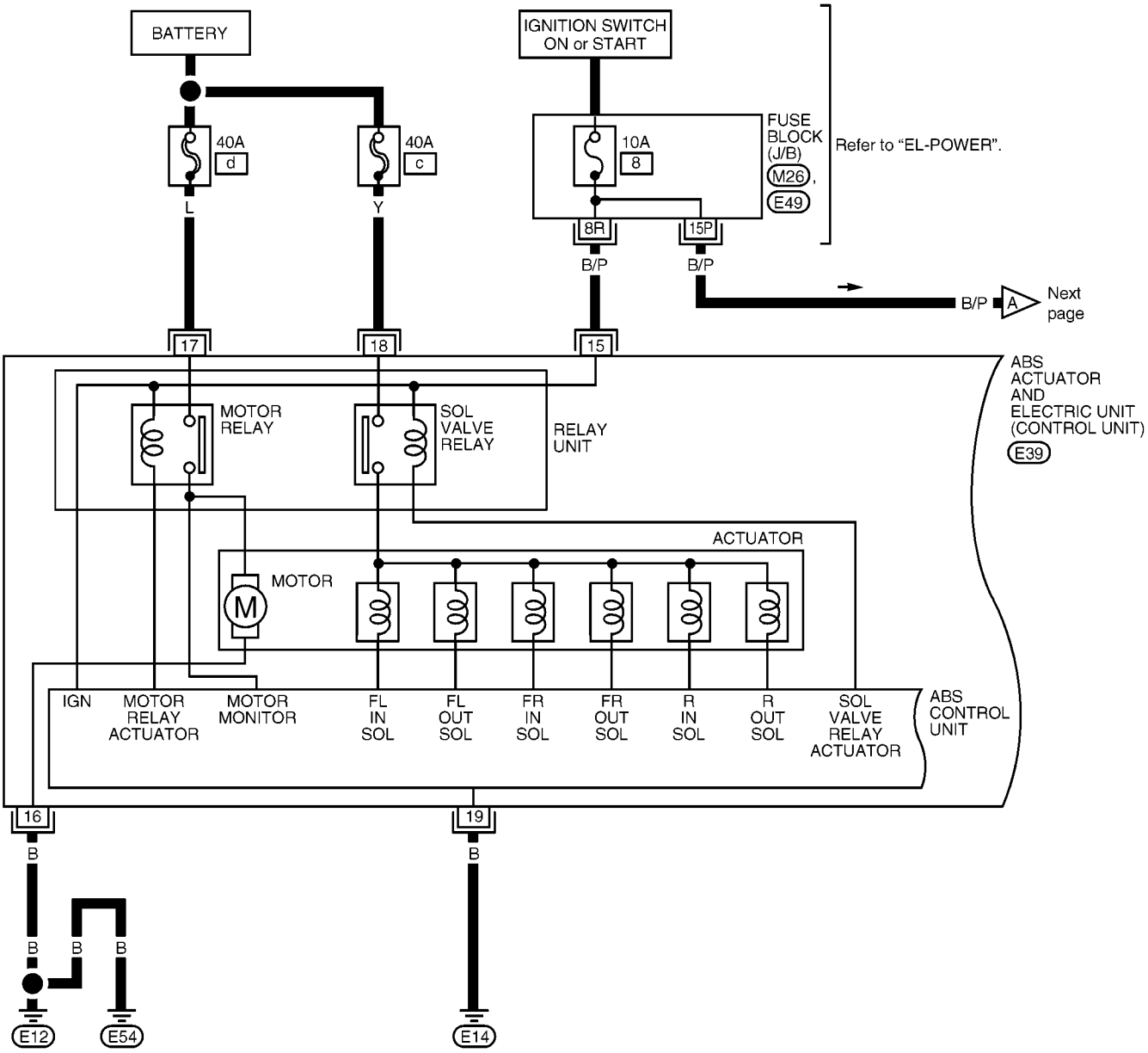


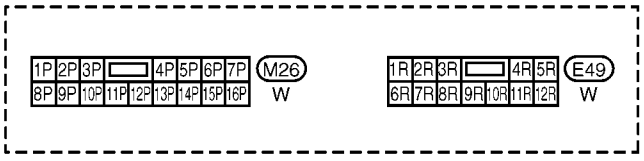
ABR833

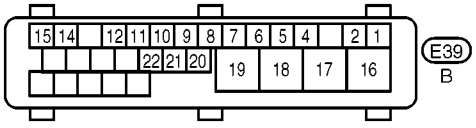
Wiring Diagram — ABS —

NEBR0153

BR-ABS-03

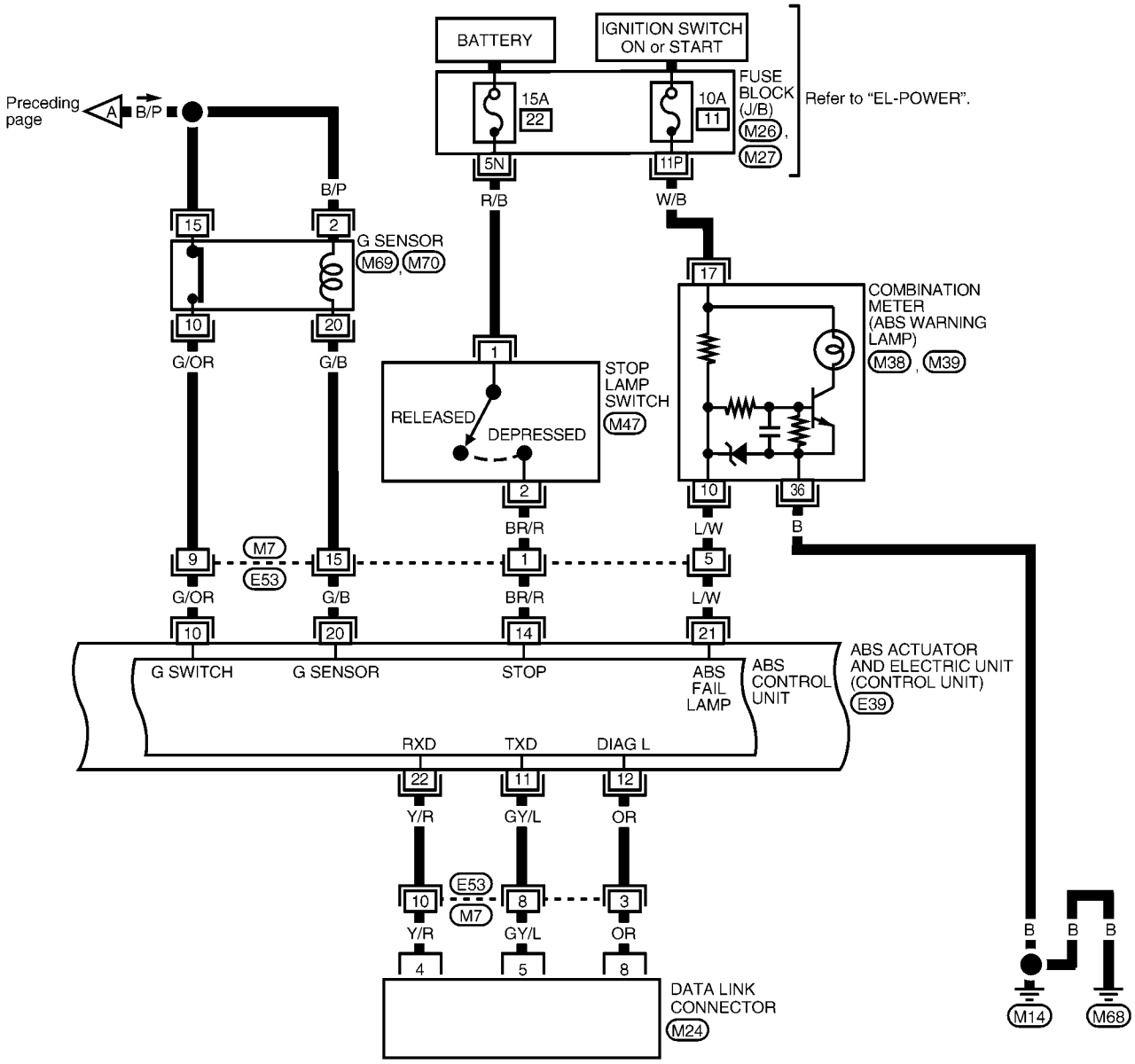


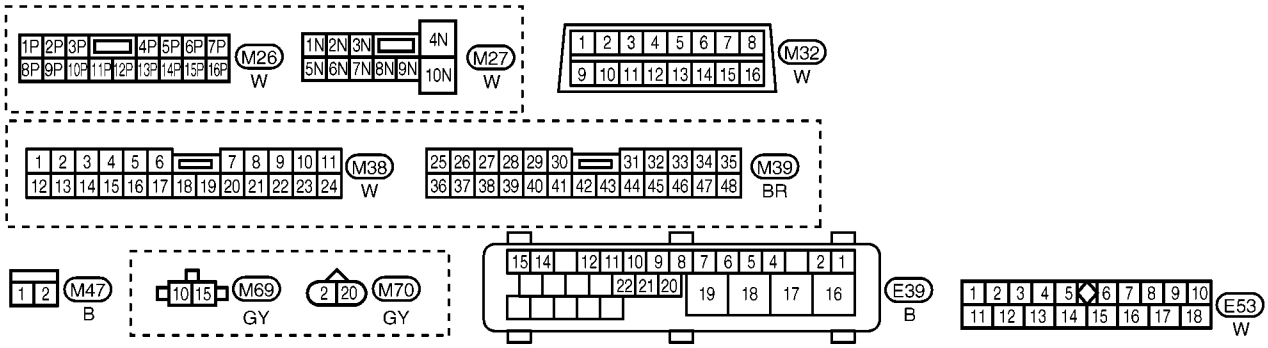




ABR834

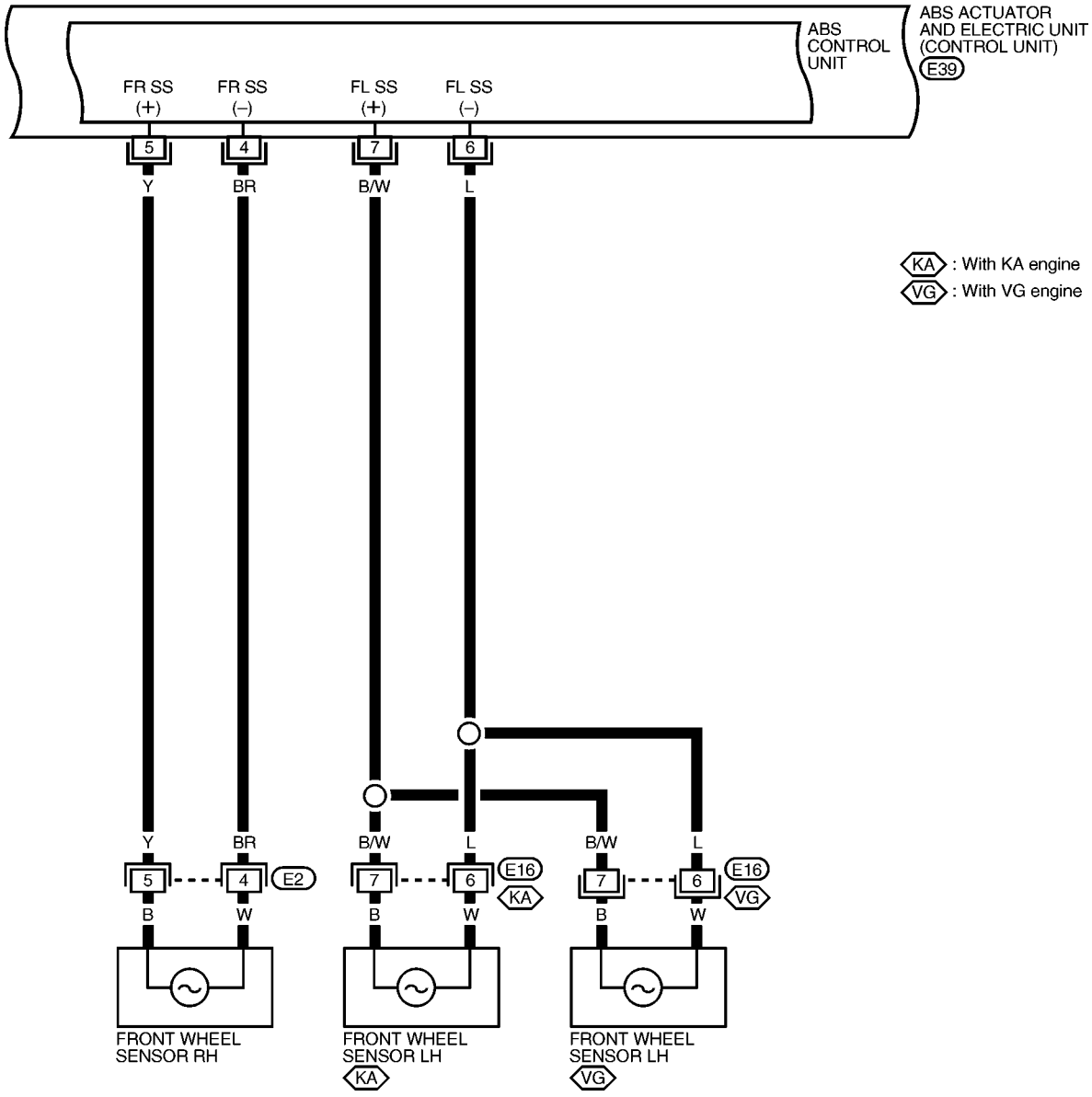
BR-ABS-04

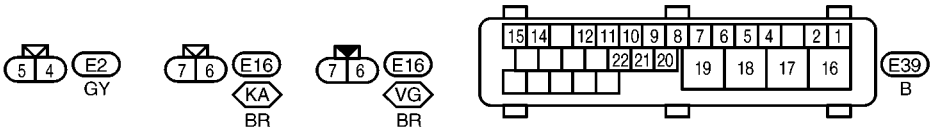




ABR835

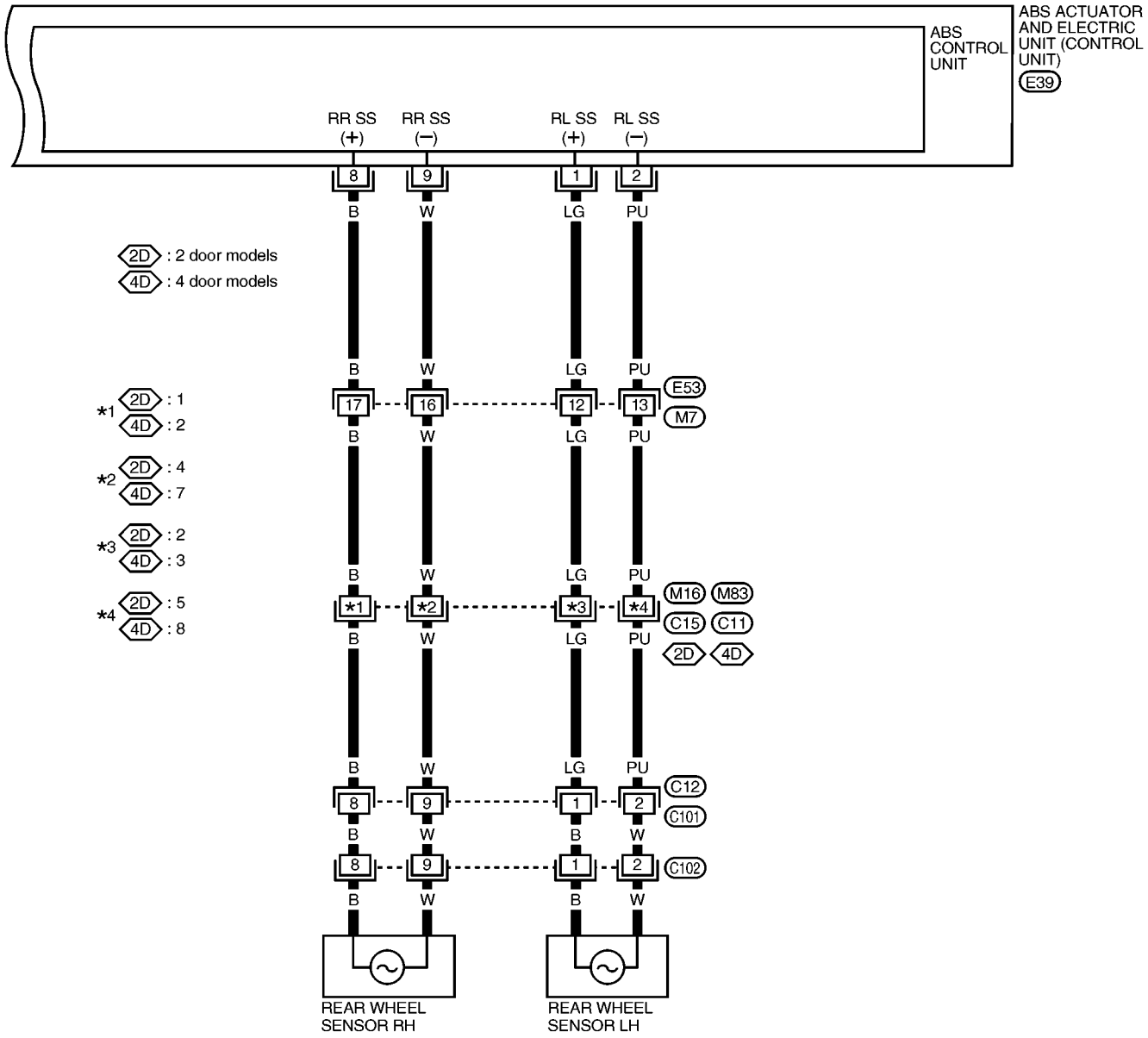
BR-ABS-05

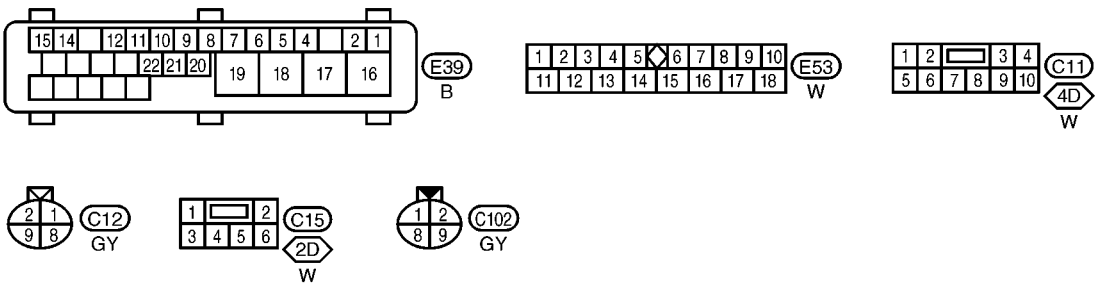




ABR836

BR-ABS-06





ABR856

Self-diagnosis

NEBR0154

FUNCTION

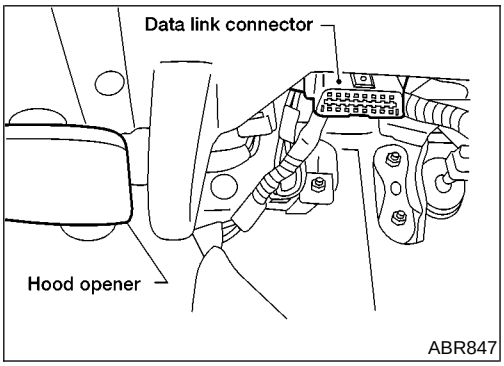
NEBR0154S01

- 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 “Data link connector”. The location of the malfunction is indicated by the warning lamp flashing.

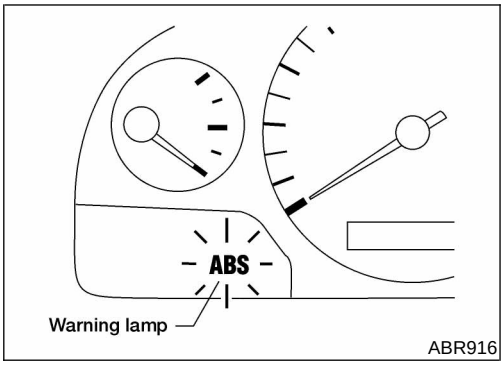
SELF-DIAGNOSIS PROCEDURE

NEBR0154S02

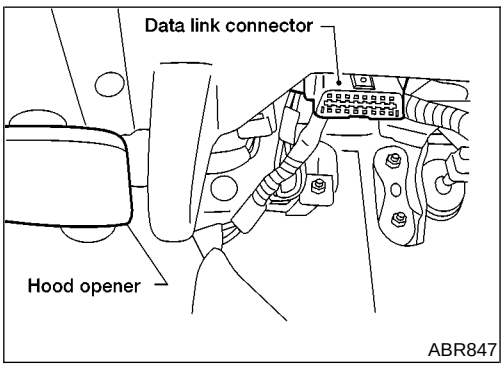
1. Drive vehicle over 30 km/h (19 MPH) for at least one minute.
2. Turn ignition switch OFF.



3. Ground terminal 8 of “Data link connector” with a suitable harness.
4. Turn ignition switch ON while grounding terminal 8.
   Do not depress brake pedal.



5. After 3.0 seconds, the warning lamp starts flashing to indicate the malfunction code No. (See NOTE.)
6. Verify the location of the malfunction with the “MALFUNCTION CODE/SYMPTOM CHART”, refer to BR-93. Then make the necessary repairs following the diagnostic procedures.
7. After the malfunctions are repaired, erase the malfunction codes stored in the control unit. Refer to BR-85.
8. Rerun the self-diagnostic results mode to verify that the malfunction codes have been erased.



9. Disconnect the check terminal from the ground. The self-diagnostic results mode is now complete.
10. Check warning lamp for deactivation after driving vehicle over 30 km/h (19 MPH) for at least one minute.
11. After making certain that warning lamp does not come on, test the ABS in a safe area to verify that it functions properly.

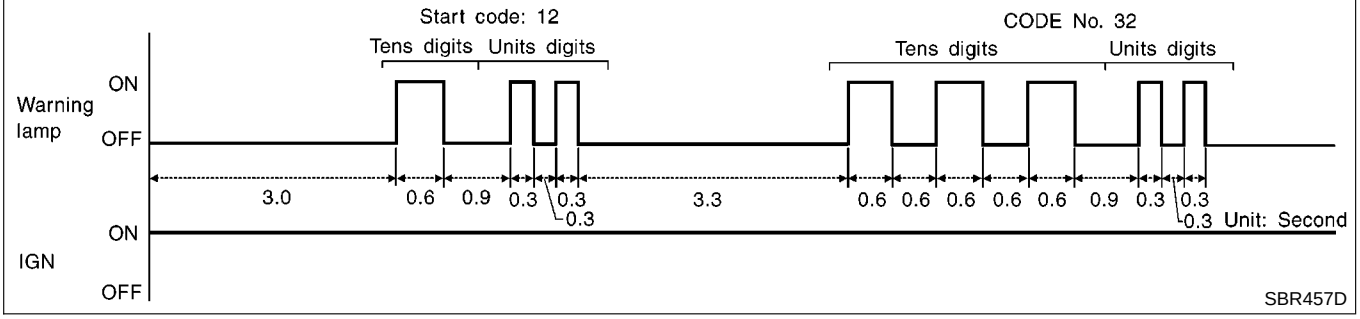
NOTE:
The indication terminates after 5 minutes.
However, when the ignition switch is turned from OFF to ON, the indication starts flashing again.

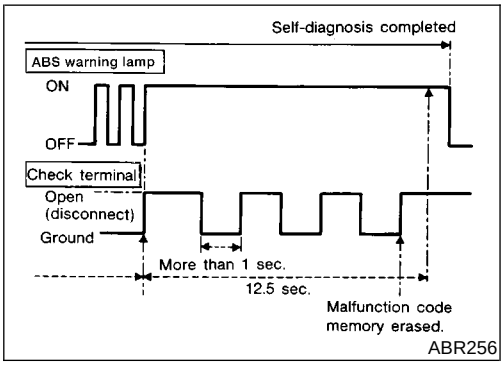
HOW TO READ SELF-DIAGNOSTIC RESULTS (MALFUNCTION CODES)

=NEBR0154S03

1. Determine the code No. by counting the number of times the warning lamp flashes on and off.
2. When several malfunctions occur at one time, up to three code numbers can be stored; the latest malfunction will be indicated first.
3. The indication begins with the start code 12. After that a maximum of three code numbers appear in the order of the latest one first. The indication then returns to the start code 12 to repeat (the indication will stay on for five minutes at the most).
4. The malfunction code is given in the "MALFUNCTION CODE/ SYMPTOM CHART", refer to BR-93.

Example: Code No. 32 REAR SENSOR SHORT-CIRCUIT





HOW TO ERASE SELF-DIAGNOSTIC RESULTS (MALFUNCTION CODES)

NEBR0154S04

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 1 second. The ABS warning lamp goes out after the erase operation has been completed.
3. Perform self-diagnosis again. Refer to BR-84. Only the start code should appear, no malfunction codes.

CONSULT-II

=NEBR0155

CONSULT-II APPLICATION TO ABS

NEBR0155S01

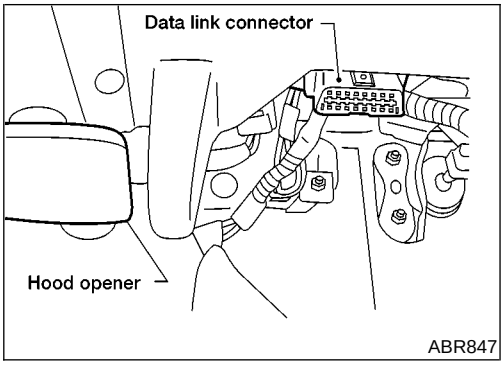
ITEM	SELF-DIAGNOSTIC RESULTS	DATA MONITOR	ACTIVE TEST
Front right wheel sensor	X	X	—
Front left wheel sensor	X	X	—
Rear right wheel sensor	X	X	—
Rear left wheel sensor	X	X	—
G switch (G sensor)	X	X	X
ABS sensor	X	—	—
Stop lamp switch	—	×	—
Front right inlet solenoid valve	X	X	X
Front right outlet solenoid valve	X	X	X
Front left inlet solenoid valve	X	X	X
Front left outlet solenoid valve	X	X	X
Rear inlet solenoid valve	X	X	X
Rear 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	—
ABS operating signal	—	X	X

X : Applicable
—: Not applicable

ECU (ABS CONTROL UNIT) PART NUMBER MODE

NEBR0155S02

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



ABR847

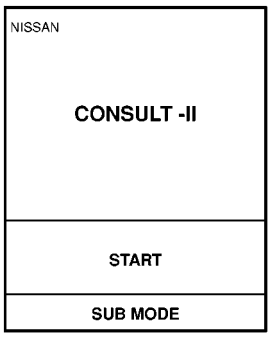
CONSULT-II Inspection Procedure

=NEBR0156

SELF-DIAGNOSIS PROCEDURE

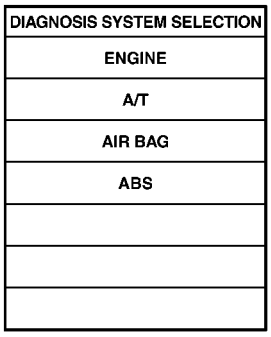
NEBR0156S01

1. Turn ignition switch OFF.
2. Connect CONSULT-II to Data link connector.
3. Start engine.
4. Drive vehicle over 30 km/h (19 MPH) for at least one minute.



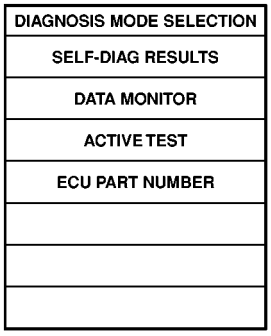
PBR455D

5. Stop vehicle with engine running and touch “START” on CONSULT-II screen.



PBR385C

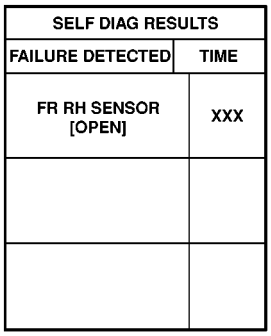
6. Touch “ABS”.



PST412B

7. Touch “SELF-DIAG RESULTS”.
- The screen shows the detected malfunction and how many times the ignition switch has been turned ON since the malfunction.

8. Make the necessary repairs following the diagnostic procedures.



PBR950C

9. After the malfunctions are repaired, erase the self-diagnostic results stored in the control unit by touching “ERASE”.
10. Check warning lamp for deactivation after driving vehicle over 30 km/h (19 MPH) for at least one minute.
11. Test the ABS in a safe area to verify that it functions properly.

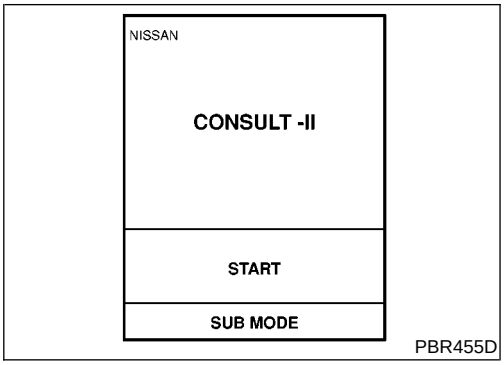
NOTE:
“SELF-DIAG RESULTS” screen shows the detected malfunction and how many times the ignition switch has been turned since the malfunction.

SELF-DIAGNOSTIC RESULTS MODE

NEBR0156S02

Diagnostic item	Diagnostic item is detected when ...	Reference Page
FR RH SENSOR★ [OPEN]	● Circuit for front right wheel sensor is open. (An abnormally high input voltage is entered.)	BR-94
FR LH SENSOR★ [OPEN]	● Circuit for front left wheel sensor is open. (An abnormally high input voltage is entered.)	BR-94
RR RH SENSOR★ [OPEN]	● Circuit for rear right sensor is open. (An abnormally high input voltage is entered.)	BR-94
RR LH SENSOR★ [OPEN]	● Circuit for rear left sensor is open. (An abnormally high input voltage is entered.)	BR-94
FR RH SENSOR★ [SHORT]	● Circuit for front right wheel sensor is shorted. (An abnormally low input voltage is entered.)	BR-94
FR LH SENSOR★ [SHORT]	● Circuit for front left wheel sensor is shorted. (An abnormally low input voltage is entered.)	BR-94
RR RH SENSOR★ [SHORT]	● Circuit for rear right sensor is shorted. (An abnormally low input voltage is entered.)	BR-94
RR LH SENSOR★ [SHORT]	● Circuit for rear left sensor is shorted. (An abnormally low input voltage is entered.)	BR-94
ABS SENSOR★ [ABNORMAL SIGNAL]	● Teeth damage on sensor rotor or improper installation of wheel sensor. (Abnormal wheel sensor signal is entered.)	BR-94
FR RH IN ABS SOL [OPEN, SHORT]	● Circuit for front right inlet solenoid valve is open. (An abnormally low output voltage is entered.)	BR-96
FR LH IN ABS SOL [OPEN, SHORT]	● Circuit for front left inlet solenoid valve is open. (An abnormally low output voltage is entered.)	BR-96
FR RH OUT ABS SOL [OPEN, SHORT]	● Circuit for front right outlet solenoid valve is open. (An abnormally low output voltage is entered.)	BR-96
FR LH OUT ABS SOL [OPEN, SHORT]	● Circuit for front left outlet solenoid valve is open. (An abnormally low output voltage is entered.)	BR-96
RR IN ABS SOL [OPEN, SHORT]	● Circuit for rear right inlet solenoid valve is shorted. (An abnormally high output voltage is entered.)	BR-96
RR OUT ABS SOL [OPEN, SHORT]	● Circuit for rear left inlet solenoid valve is shorted. (An abnormally high output voltage is entered.)	BR-96
ABS ACTUATOR RELAY [ABNORMAL]	● Actuator solenoid valve relay is ON, even if control unit sends off signal. ● Actuator solenoid valve relay is OFF, even if control unit sends on signal.	BR-96
ABS MOTOR RELAY [ABNORMAL]	● Circuit for ABS motor relay is open or shorted. ● Circuit for actuator motor is open or shorted. ● Actuator motor relay is stuck.	BR-98
BATTERY VOLT [VB-LOW]	● Power source voltage supplied to ABS control unit is abnormally low.	BR-100
CONTROL UNIT	● Function of calculation in ABS control unit has failed.	BR-106
G SENSOR★ [ABNORMAL]	● G sensor circuit is open or shorted.	BR-102

★: 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-84. Check to ensure that the ABS warning lamp goes out while the vehicle is being driven.

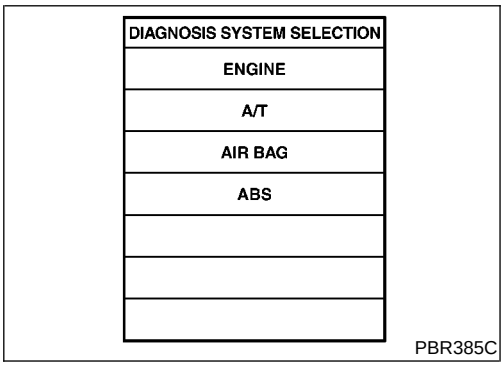


PBR455D

DATA MONITOR PROCEDURE

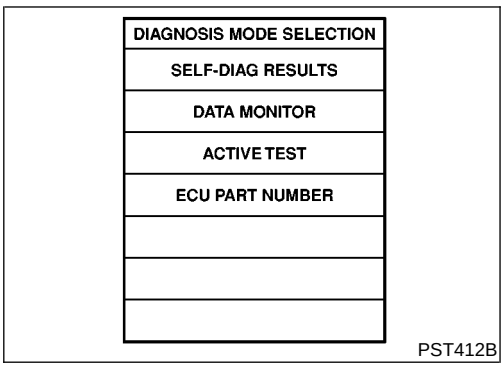
NEBR0156S03

1. Turn ignition switch OFF.
2. Connect CONSULT-II to Data link connector.
3. Turn ignition switch ON.
4. Touch "START" on CONSULT-II screen.



PBR385C

5. Touch "ABS".



PST412B

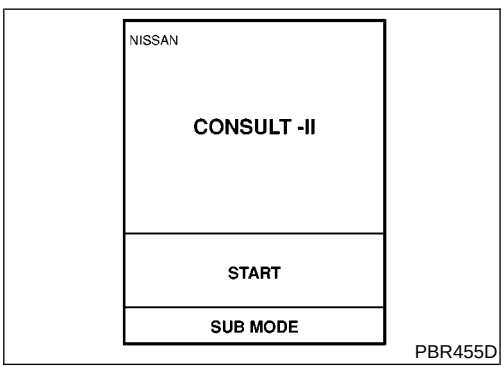
6. Touch "DATA MONITOR".

ACTIVE TEST PROCEDURE

NEBR0156S04

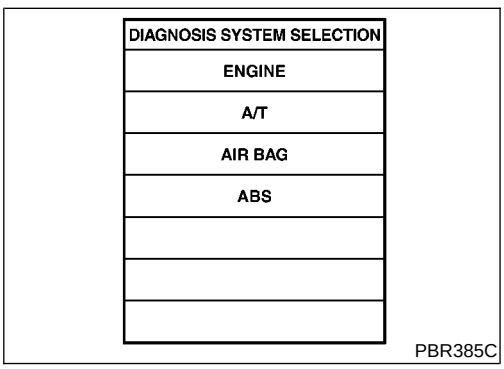
- When conducting Active test, vehicle must be stationary.
- When ABS warning lamp stays on, never conduct Active test.

1. Turn ignition switch OFF.
2. Connect CONSULT-II to Data link connector.
3. Start engine.
4. Touch "START" on CONSULT-II screen.

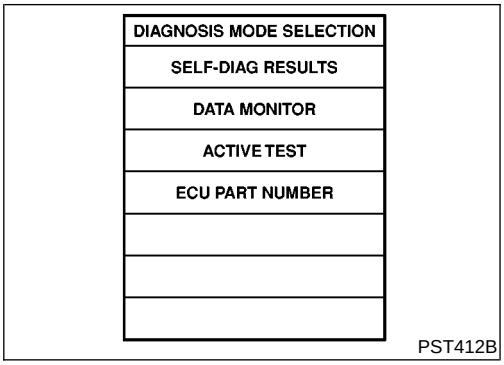


PBR455D

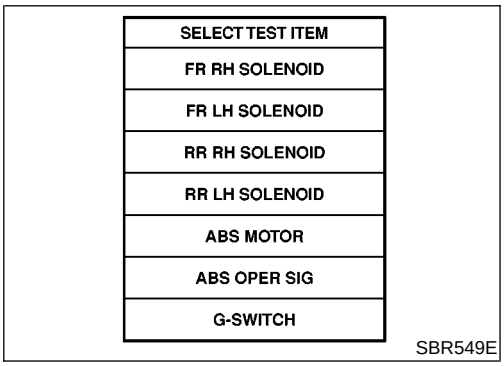
5. Touch "ABS".



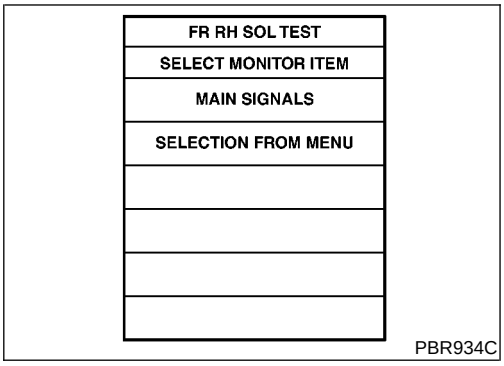
PBR385C



6. Touch "ACTIVE TEST".



7. Select active test item by touching screen.



8. Touch "START".
9. Carry out the active test by touching screen key.

DATA MONITOR MODE

=NEBR0156S05

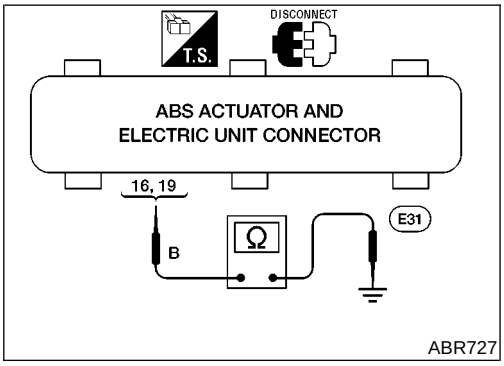
MONITOR ITEM	CONDITION	SPECIFICATION
FR RH SENSOR FR LH SENSOR RR RH SENSOR RR LH SENSOR	Drive vehicle. (Each wheel is rotating.)	Wheel speed signal (Almost the same speed as speedometer.)
STOP LAMP SWITCH	Brake is depressed.	Depress the pedal: ON Release the pedal: OFF
G SWITCH	Vehicle is driven. Vehicle is stopped Brake is applied.	During sudden braking while driving on high μ roads (asphalt roads, etc.): ON While vehicle is stopped or during constant-speed driving: OFF
FR RH IN SOL FR RH OUT SOL FR LH IN SOL FR LH OUT SOL RR IN SOL RR OUT SOL	1. Drive vehicle at speeds over 30 km/h (19 MPH) for at least 1 minute. 2. Engine is running.	Operating conditions for each solenoid valve are indicated. ABS is not operating: OFF
MOTOR RELAY		ABS is not operating: OFF ABS is operating: ON
ACTUATOR RELAY	Ignition switch is ON or engine is running.	Ignition switch ON (Engine stops): OFF Engine running: ON
WARNING LAMP		ABS warning lamp is turned on: ON ABS warning lamp is turned off: OFF
BATTERY VOLT		Power supply voltage for control unit

ACTIVE TEST MODE

=NEBR0156S06

TEST ITEM	CONDITION	JUDGEMENT		
FR RH SOLENOID FR LH SOLENOID RR SOLENOID		Brake fluid pressure control operation		
	Engine is running.		IN SOL	OUT SOL
		UP (Increase):	OFF	OFF
		KEEP (Hold):	ON	OFF
		DOWN (Decrease):	ON	ON
ABS MOTOR		ABS actuator motor ON: Motor runs (ABS motor relay ON) OFF: Motor stops (ABS motor relay OFF)		
ABS OPER SIG	Ignition switch is ON.	G SWITCH (G SENSOR) ON: Set G SWITCH MONITOR "ON" (G switch is closed) OFF: Set G SWITCH MONITOR "OFF" (G switch circuit is open)		
G SWITCH	Ignition switch is ON.	G SWITCH (G SENSOR), ON : Set G SWITCH MONITOR "ON" (G switch circuit is closed.) OFF: Set G SWITCH MONITOR "OFF" (G switch circuit is open.)		

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



Ground Circuit Check

NEBR0179

ABS ACTUATOR AND ELECTRIC UNIT GROUND

NEBR0179S01

- Check resistance between ABS actuator and electric unit connector terminals (16, 19) and ground.

  Resistance: approximately 0Ω

Malfunction Code/Symptom Chart

NEBR0191S01

Code No. (No. of warning lamp flashes)	Malfunctioning part	Reference Page
45	Actuator front left outlet solenoid valve	BR-96
46	Actuator front left inlet solenoid valve	BR-96
41	Actuator front right outlet solenoid valve	BR-96
42	Actuator front right inlet solenoid valve	BR-96
55	Actuator rear left outlet solenoid valve	BR-96
56	Actuator rear left inlet solenoid valve	BR-96
25 ★1	Front left sensor (open-circuit)	BR-94
26 ★1	Front left sensor (short-circuit)	BR-94
21 ★1	Front right sensor (open-circuit)	BR-94
22 ★1	Front right sensor (short-circuit)	BR-94
31 ★1	Rear right sensor (open-circuit)	BR-94
32 ★1	Rear right sensor (short-circuit)	BR-94
35 ★1	Rear left sensor (open-circuit)	BR-94
36 ★1	Rear left sensor (short-circuit)	BR-94
18 ★1	Sensor rotor	BR-94
17	G sensor and circuit	BR-105
61 ★3	Actuator motor or motor relay	BR-98
63	Solenoid valve relay	BR-96
57 ★2	Power supply (Low voltage)	BR-100
71	Control unit	BR-106
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	BR-113
Warning lamp does not come on When ignition switch is turned ON.	Fuse, warning lamp bulb or warning lamp circuit Control unit	BR-111
Pedal vibration and noise	—	BR-110
Long stopping distance	—	BR-109
Unexpected pedal action	—	BR-108
ABS does not work	—	BR-109
ABS works frequently	—	BR-107

★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-84. 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.

Wheel Sensor or Rotor

NEBR0184

MALFUNCTION CODE NO. 21, 22, 25, 26, 31, 32, 35, 36 OR 18

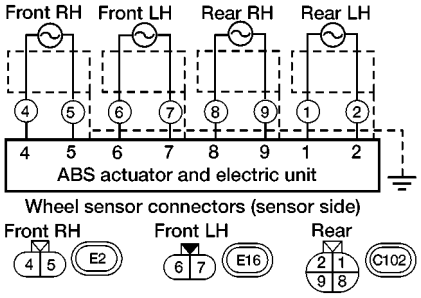
NEBR0184S01

NOTE:

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

1	INSPECTION START

Wheel sensor inspection



ABR840

▶ GO TO 2.

2	CHECK CONNECTOR

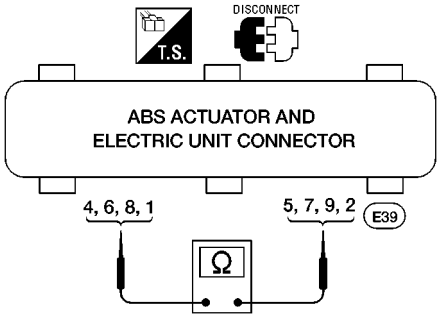
1. Disconnect connectors from ABS actuator and electric unit and wheel sensor of malfunction code No. Check terminals for damage or loose connection. Then reconnect connectors.
2. Carry out self-diagnosis again.

Does warning lamp activate again?

Yes	▶	GO TO 3.
No	▶	**INSPECTION END**

3	CHECK WHEEL SENSOR ELECTRICAL

1. Disconnect ABS actuator and electric unit connector.
2. Check resistance between ABS actuator and electric unit connector E39 terminals.
   Code No. 21 or 22 (Front RH wheel)
   Terminals 4 and 5
   Code No. 25 or 26 (Front LH wheel)
   Terminals 6 and 7
   Code No. 31 or 32 (Rear RH wheel)
   Terminals 8 and 9
   Code No. 35 or 36 (Rear LH wheel)
   Terminals 1 and 2



ABR642

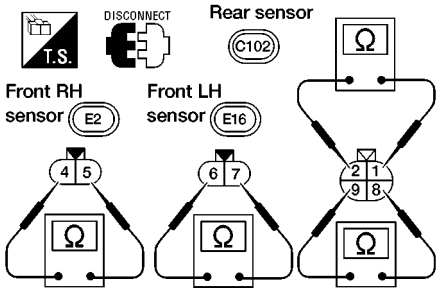
Resistance:
Front 1.28 - 1.92 kΩ
Rear 1.28 - 1.92 kΩ

Are front and rear resistance values 1.28 - 1.92 kΩ?

Yes	▶	GO TO 5.
No	▶	GO TO 4.

4	CHECK WHEEL SENSOR

Check each sensor for resistance.



ABR643

Resistance:
Front 1.28 - 1.92 kΩ
Rear 1.28 - 1.92 kΩ

Are front and rear sensor resistance values 1.28 - 1.92 kΩ?

Yes	▶	**Check the following.** If NG, repair harness or connectors. ● Harness connectors E2, E16, E39, E53, C11, C12, C102 ● Harness for open or short between wheel sensor connectors and ABS actuator and electric unit
No	▶	Replace wheel sensor.

5	CHECK TIRE	
Check for inflation pressure, wear and size of each tire. (See NOTE) **Are tire pressure and size correct and is tire wear within specifications?**		
Yes	▶	GO TO 6.
No	▶	Adjust tire pressure or replace tire(s). (See NOTE)

6	CHECK WHEEL BEARING	
Check wheel bearing axial end play. (See NOTE) **Is wheel bearing axial end play within specifications? Refer to "FRONT AXLE" and "REAR AXLE", *AX-4* and *AX-26*.**		
Yes	▶	GO TO 7.
No	▶	Check wheel bearing. Refer to "On-vehicle Service", "FRONT AXLE", ***AX-3*** and "REAR AXLE", ***AX-24***.

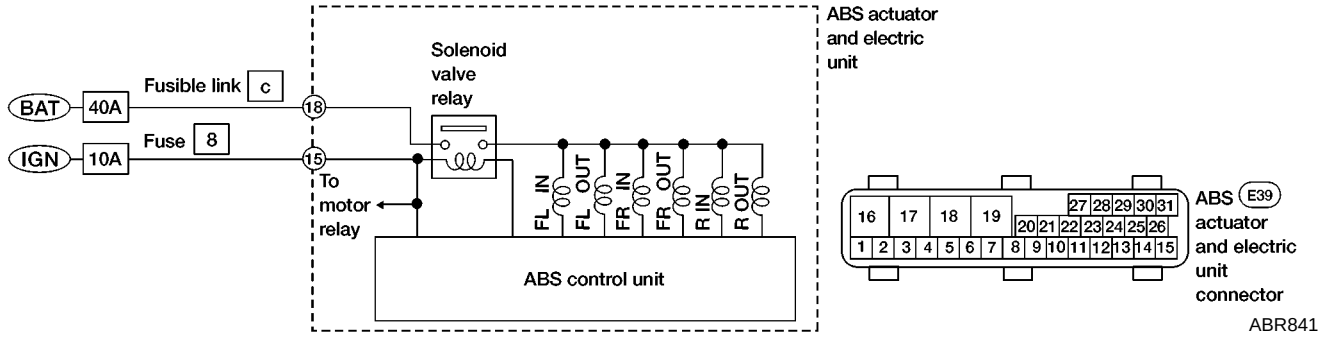
7	CHECK SENSOR ROTOR	
Check sensor rotor for teeth damage. (See NOTE) **Is sensor rotor free from damage?**		
Yes	▶	Check ABS actuator and electric unit pin terminals for damage or the connection of ABS actuator and electric unit harness connector. Reconnect ABS actuator and electric unit harness connector. Then retest.
No	▶	Replace sensor rotor. (See NOTE)

ABS Actuator Solenoid Valve and Solenoid Valve Relay

NEBR0185

MALFUNCTION CODE NO. 41, 42, 45, 46, 55, 56 OR 63

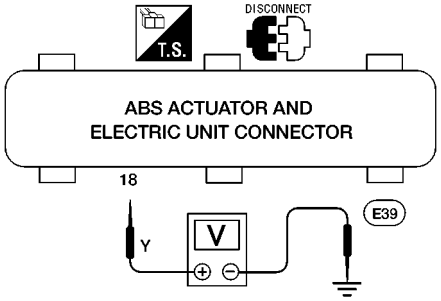
NEBR0185S01

1	INSPECTION START	
Solenoid valve relay inspection  		
	▶	GO TO 2.

2	CHECK FUSE	
Check 20A fuse 41. For fuse layout, refer to "POWER SUPPLY ROUTING", ***EL-8***. **Is fusible link OK?**		
Yes	▶	GO TO 3.
No	▶	GO TO 6.

3	CHECK CONNECTOR	
1. Disconnect connector from ABS actuator and electric unit. Check terminals for damage or loose connection. Then reconnect connector. 2. Carry out self-diagnosis again. **Does warning lamp activate again?**		
Yes	▶	GO TO 4.
No	▶	**INSPECTION END**

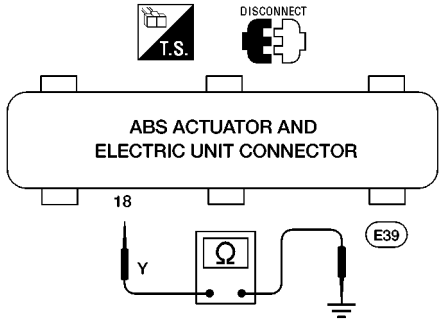
4	CHECK ABS ACTUATOR AND ELECTRIC UNIT GROUND CIRCUIT	
Refer to "ABS ACTUATOR AND ELECTRIC UNIT GROUND", BR-92. **Is ground circuit OK?**		
Yes	▶	GO TO 5.
No	▶	Repair harness or connector.

5	CHECK SOLENOID VALVE POWER SUPPLY CIRCUIT	
1. Disconnect ABS actuator and electric unit connector. 2. Check voltage between ABS actuator and electric unit connector E39 (body side) terminal 18 and ground.  ABR646 **Does battery voltage exist?**		
Yes	▶	Replace ABS actuator and electric unit.
No	▶	**Check the following.** If NG, repair harness or connectors. ● Harness connector E39 ● Harness for open or short between ABS actuator and electric unit and fuse

6	REPLACE FUSE	
Replace fuse. **Does the fuse blow out when ignition switch is turned ON?**		
Yes	▶	GO TO 7.
No	▶	**INSPECTION END**

7	CHECK SOLENOID VALVE RELAY POWER SUPPLY CIRCUIT FOR SHORT

1. Disconnect battery cable and ABS actuator and electric unit connector.
2. Check continuity between ABS actuator and electric unit connector E39 (body side) terminal 18 and ground.



ABR647

Continuity should not exist.

Does continuity exist?

Yes	▶	**Check the following.** If NG, repair harness or connector. ● Harness connector E39 ● Harness for open or short between ABS actuator and electric unit and fuse
No	▶	Replace ABS actuator and electric unit.

Motor Relay or Motor

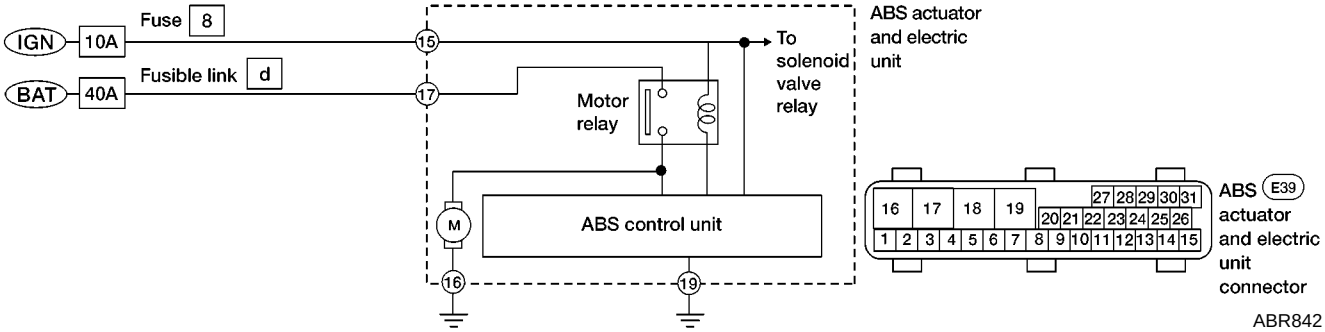
NEBR0186

MALFUNCTION CODE NO. 61

NEBR0186S01

1	INSPECTION START

ABS motor relay inspection



ABR842

	▶	GO TO 2.

2	CHECK FUSIBLE LINK

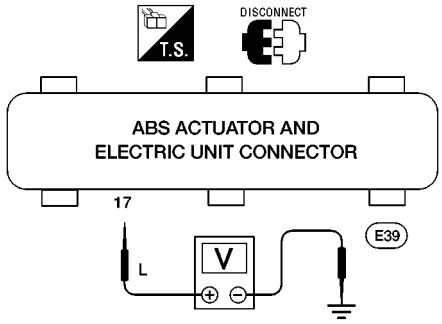
Check 40A fusible link **d**. For fusible link layout, refer to "POWER SUPPLY ROUTING", ***EL-8***.

Is fusible link OK?

Yes	▶	GO TO 3.
No	▶	GO TO 6.

3	CHECK CONNECTOR	
1. Disconnect ABS actuator and electric unit connector. Check terminals for damage or loose connection. Then reconnect connector. 2. Carry out self-diagnosis again. **Does warning lamp activate again?**		
Yes	▶	GO TO 4.
No	▶	**INSPECTION END**

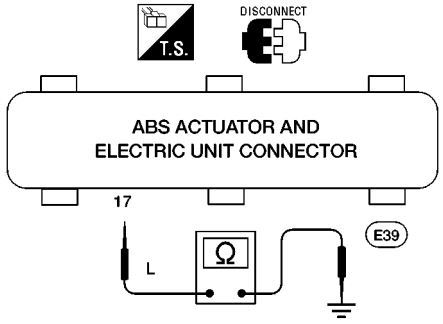
4	CHECK ABS ACTUATOR AND ELECTRIC UNIT GROUND CIRCUIT	
Refer to "ABS ACTUATOR AND ELECTRIC UNIT GROUND", BR-92. **Is ground circuit OK?**		
Yes	▶	GO TO 5.
No	▶	Repair harness or connector.

5	CHECK MOTOR RELAY POWER SUPPLY CIRCUIT	
1. Disconnect ABS actuator and electric unit connector. 2. Check voltage between ABS actuator and electric unit connector E39 terminal 17 and ground.  ABR649 **Does battery voltage exist?**		
Yes	▶	Replace ABS actuator and electric unit.
No	▶	**Check the following.** If NG, repair harness or connector. ● Harness connector E39 ● Harness for open or short between ABS actuator and electric unit and fusible link

6	REPLACE FUSIBLE LINK	
Replace fusible link. **Does the fusible link blow out when ignition switch is turned ON?**		
Yes	▶	GO TO 7.
No	▶	**INSPECTION END**

7	CHECK ABS ACTUATOR MOTOR POWER SUPPLY CIRCUIT FOR SHORT

1. Disconnect battery cable and ABS actuator and electric unit connector.
2. Check continuity between ABS actuator and electric unit connector E39 terminal 17 and ground.



ABR650

Continuity should not exist.

Does continuity exist?

Yes	▶	**Check the following.** If NG, repair harness or connector. ● Harness connector E39 ● Harness for open or short between ABS actuator and electric unit and fusible link
No	▶	Replace ABS actuator and electric unit.

Low Voltage

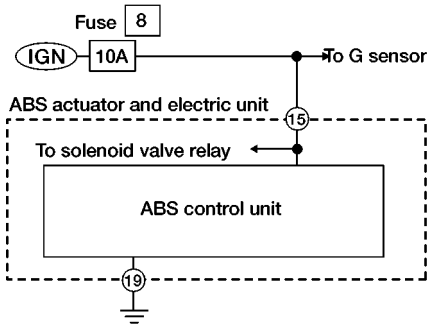
NEBR0187

MALFUNCTION CODE NO. 57

NEBR0187S01

1	INSPECTION START

ABS actuator and electric unit power supply and ground circuit inspection



ABR651

	▶	GO TO 2.

2	CHECK FUSE

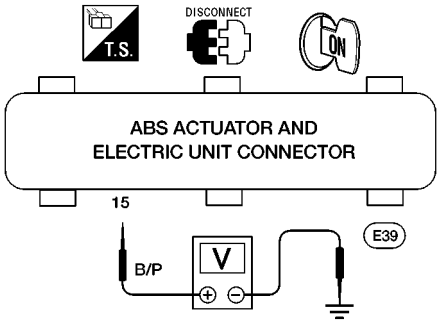
Check 10A fuse No. 8. For fuse layout, refer to "POWER SUPPLY ROUTING", ***EL-8***.

Is fuse OK?

Yes	▶	GO TO 3.
No	▶	GO TO 6.

3	CHECK CONNECTOR	
1. Disconnect ABS actuator and electric unit connector. Check terminals for damage or loose connections. Then reconnect connector. 2. Carry out self-diagnosis again. **Does warning lamp activate again?**		
Yes	▶	GO TO 4.
No	▶	**INSPECTION END**

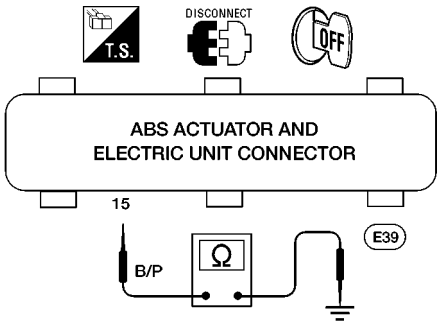
4	CHECK ABS ACTUATOR AND ELECTRIC UNIT GROUND CIRCUIT	
Refer to "ABS ACTUATOR AND ELECTRIC UNIT GROUND, BR-92. **Is ground circuit OK?**		
Yes	▶	GO TO 5.
No	▶	Repair harness or connector.

5	CHECK ABS ACTUATOR AND ELECTRIC UNIT POWER SUPPLY CIRCUIT	
1. Disconnect ABS actuator and electric unit connector. 2. Check voltage between ABS actuator and electric unit connector E39 terminal 15 and ground.  ABR652 **Does battery voltage exist when ignition switch is turned ON?**		
Yes	▶	Replace ABS actuator and electric unit.
No	▶	**Check the following.** If NG, repair harness or connector. ● Harness connector E39 ● Harness for open or short between ABS actuator and electric unit and fuse

6	REPLACE FUSE	
Replace fuse. **Does the fuse blow out when ignition switch is turned ON?**		
Yes	▶	GO TO 7.
No	▶	**INSPECTION END**

7	CHECK ABS ACTUATOR AND ELECTRIC UNIT POWER SUPPLY CIRCUIT FOR SHORT

1. Disconnect battery cable and ABS actuator and electric unit connector.
2. Check continuity between ABS actuator and electric unit connector E39 terminal 15 and ground.



ABR775

Continuity should not exist.

Does continuity exist?

Yes	▶	**Check the following.** If NG, repair harness or connector. ● Harness connector E39 ● Harness for open or short between ABS actuator and electric unit and fuse
No	▶	Replace ABS actuator and electric unit.

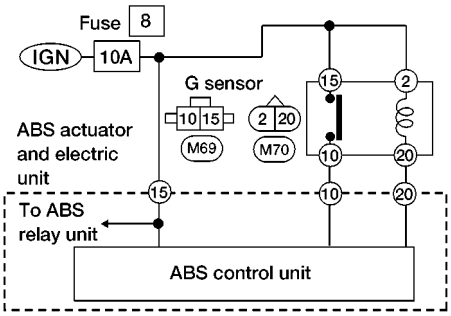
G Sensor

NEBR0188

MALFUNCTION CODE NO. 17

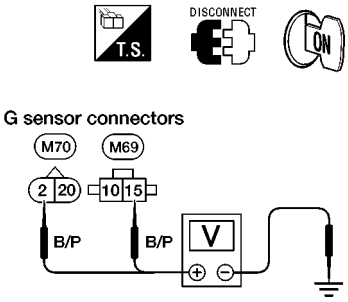
NEBR0188S01

1	CHECK G SENSOR POWER SUPPLY



ABR653

1. Disconnect G sensor connectors.
2. Turn ignition switch to ON.
3. Check voltage between G sensor harness connectors M69, M70 terminals (2, 15) and ground.



ABR654

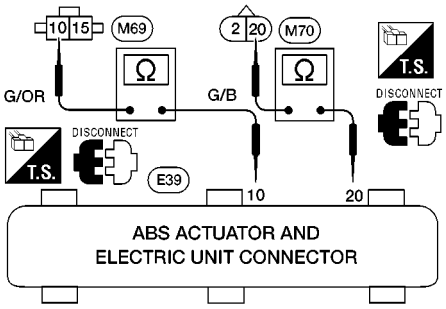
Battery voltage should exist.

OK or NG

OK	▶	GO TO 2.
NG	▶	GO TO 4.

2	CHECK G SENSOR CIRCUITS

1. Disconnect ABS actuator and electric unit connector and G sensor connectors.
2. Check continuity between ABS actuator and electric unit connector E39 terminals (10, 20) and G sensor connectors M69, M70 terminals (10, 20).



ABR655

Continuity should exist.

OK or NG

OK	▶	GO TO 3.
NG	▶	**Check the following.** If NG, repair harness or connector. ● Harness connectors M69, M70, E39 ● Harness for open or short between ABS actuator and electric unit and G sensor.

3	CHECK G SENSOR

Refer to G SENSOR in "Electrical Components Inspection", BR-105.

OK or NG

OK	▶	Replace ABS actuator and electric unit (control unit).
NG	▶	Replace G sensor.

4	CHECK FUSE

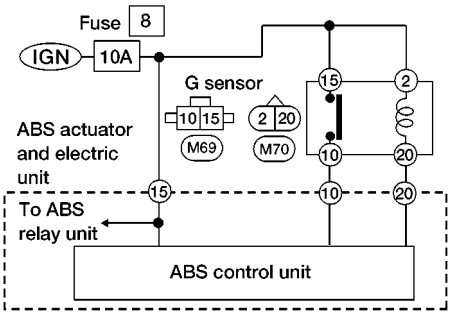
Check 10A fuse No. 8. For fuse layout, refer to "POWER SUPPLY ROUTING", ***EL-8***.

Is fuse OK?

Yes	▶	GO TO 5.
No	▶	GO TO 6.

5	CHECK G SENSOR POWER SUPPLY CIRCUIT

1. Disconnect battery ground cable connection.
2. Check continuity between G sensor connectors M69, M70 terminals (2, 15) and fuse block connector M26, terminal 15P, refer to "POWER SUPPLY ROUTING", ***EL-8***.



ABR653

Continuity should exist.

OK or NG

OK	▶	**Check the following.** If NG, repair harness or connector. ● Harness connectors M26, M69, M70 ● Harness for open or short between G sensor and fuse block, refer to "POWER SUPPLY ROUTING", ***EL-8***.
NG	▶	Replace ABS actuator and electric unit (control unit).

6	REPLACE FUSE

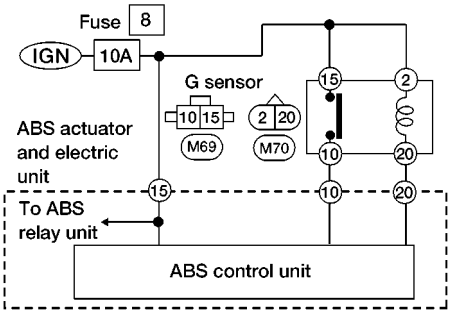
Replace fuse.

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

Yes	▶	GO TO 7.
No	▶	**INSPECTION END**

7	CHECK ABS ACTUATOR AND ELECTRIC UNIT POWER SUPPLY CIRCUIT FOR SHORT

1. Disconnect battery cable and ABS actuator and electric unit connector.
2. Check continuity between G sensor harness connectors M69, M70 terminals (2, 15) and ground.



ABR653

Continuity should not exist.

Does continuity exist?

Yes	▶	**Check the following.** If NG, repair harness or connector. ● Harness connector E39 ● Harness for open or short between ABS actuator and electric unit and fuse No. 8
No	▶	Replace ABS actuator and electric unit.

Electrical Component Inspection

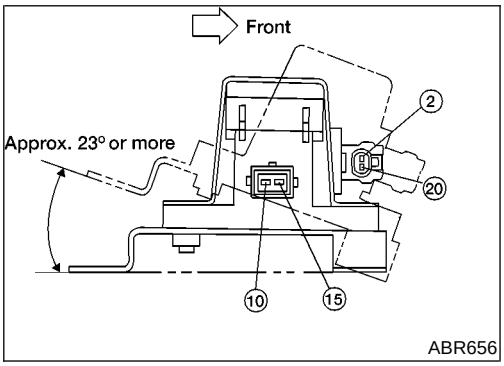
NEBR0183

G SENSOR

NEBR0183S01

CAUTION:

The G sensor is easily damaged if it sustains and impact. Be careful not to drop or bump it.



1) Measure resistance between terminals 10 and 15 of G sensor unit connector.

G sensor condition	Resistance between terminals 10 and 15	G sensor switch condition
Installed in vehicle	1.4 - 1.6 kΩ	ON
Tilted as shown in figure	4.7 - 5.5 kΩ	OFF

2) Measure resistance between terminals 2 and 20 of the G sensor unit connector.

Resistance	70 - 124Ω

Control Unit

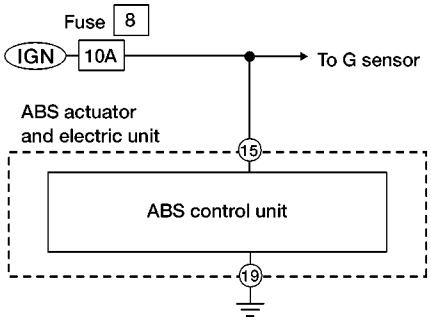
=NEBR0189

MALFUNCTION CODE NO. 71

NEBR0189S01

1	INSPECTION START

ABS actuator and electric unit power supply and ground circuit inspection



ABR657

▶	GO TO 2.

2	CHECK CONNECTOR

1. Disconnect ABS actuator and electric unit connector.
   Check terminals for damage or loose connection. Then reconnect connector.
2. Carry out self-diagnosis again.

Does warning lamp activate again?

Yes	▶	GO TO 3.
No	▶	**INSPECTION END**

3	CHECK ABS ACTUATOR AND ELECTRIC UNIT POWER SUPPLY CIRCUIT

Check voltage. Refer to “CHECK ABS ACTUATOR AND ELECTRIC UNIT POWER SUPPLY CIRCUIT” in “LOW VOLTAGE”, “Malfunction code 57”, BR-100.

Does battery voltage exist when ignition switch is turned ON?

Yes	▶	GO TO 4.
No	▶	Repair.

4	CHECK WARNING LAMP INDICATION

Does warning lamp indicate code No. 71 again?

Yes or No

Yes	▶	Replace ABS actuator and electric unit.
No	▶	Inspect the system according to the code No.

1. ABS Works Frequently

NEBR0192

1	CHECK BRAKE FLUID PRESSURE	
Check brake fluid pressure distribution. Refer to “INSPECTION”, “Proportioning Valve (2WD)”, BR-13. **Is brake fluid pressure distribution normal?**		
Yes	▶	GO TO 2.
No	▶	Repair. Then perform Preliminary Check. Refer to BR-75.

2	CHECK WHEEL SENSOR	
1. Check wheel sensor connector for terminal damage or loose connections. 2. Perform wheel sensor mechanical check. Refer to “TROUBLE DIAGNOSES FOR SELF-DIAGNOSTIC ITEMS” in “Wheel Sensor or Rotor”, BR-94. **Is wheel sensor mechanism OK?**		
Yes	▶	GO TO 3.
No	▶	Repair.

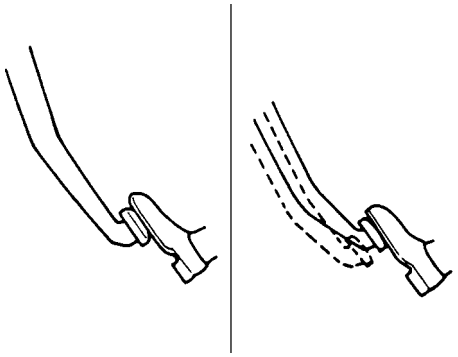
3	CHECK FRONT AXLE	
Check front axles for excessive looseness. Refer to “Front Wheel Bearing”, “ON-VEHICLE SERVICE”, ***AX-4***. **Is front axle installed properly?**		
Yes	▶	Go to “3. CHECK WARNING LAMP INDICATION” in “2. Unexpected Pedal Action”, BR-108.
No	▶	Repair.

2. Unexpected Pedal Action

=NEBR0193

1	CHECK BRAKE PEDAL STROKE

Check brake pedal stroke.



SBR540A

Is brake pedal stroke excessively large?

Yes	▶	Perform “PRELIMINARY CHECK”, refer to BR-75.
No	▶	GO TO 2.

2	CHECK MECHANICAL BRAKE SYSTEM PERFORMANCE

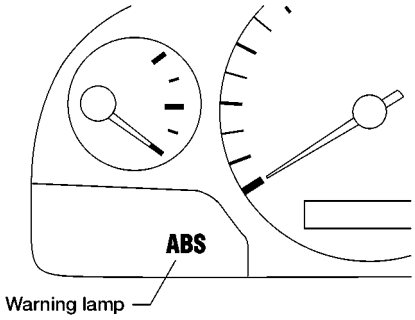
Disconnect ABS actuator and electric unit connector and check whether brake is effective.

Does brake system function properly when brake pedal is depressed?

Yes	▶	GO TO 3.
No	▶	Perform “PRELIMINARY CHECK”, refer to BR-75.

3	CHECK WARNING LAMP INDICATION

Ensure warning lamp remains off while driving.



ABR837

Is warning lamp turned off?

Yes	▶	GO TO 4.
No	▶	Perform “SELF-DIAGNOSIS”, refer to BR-84.

4	CHECK WHEEL SENSOR	
1. Check wheel sensor connector for terminal damage or loose connection. 2. Perform wheel sensor mechanical check. Refer to "7. CHECK SENSOR ROTOR" in "DIAGNOSTIC PROCEDURE", "Wheel Sensor or Rotor", BR-94. **Is wheel sensor mechanism OK?**		
Yes	▶	Check ABS actuator and electric unit pin terminals for damage or the connection of ABS actuator and electric unit harness connector. Reconnect ABS actuator and electric unit harness connector. Then retest.
No	▶	Repair.

3. Long Stopping Distance

NEBR0194

1	CHECK MECHANICAL BRAKE SYSTEM PERFORMANCE	
Disconnect ABS actuator and electric unit connector and check whether stopping distance is still long. **Does brake system function properly when brake pedal is depressed?**		
Yes	▶	Perform Preliminary Check and air bleeding (if necessary).
No	▶	Go to "3. CHECK WARNING LAMP INDICATION" in "2. Unexpected Pedal Action", BR-108.

NOTE:
Stopping distance may be longer for vehicles without ABS when road condition is slippery.

4. ABS Does Not Work

NEBR0195

1	CHECK WARNING LAMP INDICATION	
Does the ABS warning lamp activate? **Yes or No**		
Yes	▶	Carry out self-diagnosis. Refer to BR-84, 87.
No	▶	Go to "3. CHECK WARNING LAMP INDICATION" in "2. Unexpected Pedal Action", BR-108.

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

5. Pedal Vibration and Noise

=NEBR0196

1	INSPECTION START
Pedal vibration and noise inspection Brake pedal  SAT797A	
▶	GO TO 2.

2	CHECK SYMPTOM
1. Apply brake. 2. Start engine. **Does the symptom appear only when engine is started?**	
Yes ▶	Carry out self-diagnosis. Refer to BR-84, 87.
No ▶	Go to “3. CHECK WARNING LAMP INDICATION” in “2. Unexpected Pedal Action”, BR-108.

NOTE:
ABS may operate and cause vibration under any of the following conditions.

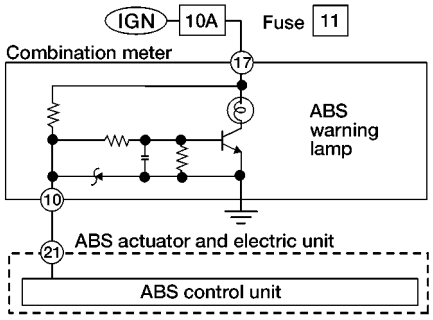
- Applying brake gradually when shifting or operating clutch.
- Low friction (slippery) road.
- High speed cornering.
- Driving over bumps and pot holes.
- Engine speed is over 5,000 rpm with vehicle stopped.

6. Warning Lamp Does Not Come On When Ignition Switch Is Turned ON

NEBR0197

1	INSPECTION START

Warning lamp circuit inspection

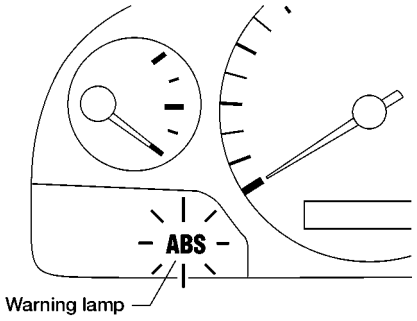


ABR843

	▶	GO TO 2.

2	CHECK FUSE	
Check 10A fuse No. 11. For fuse layout, refer to “POWER SUPPLY ROUTING”, ***EL-8***.		
Is fuse OK?		
Yes	▶	GO TO 3.
No	▶	Replace fuse.

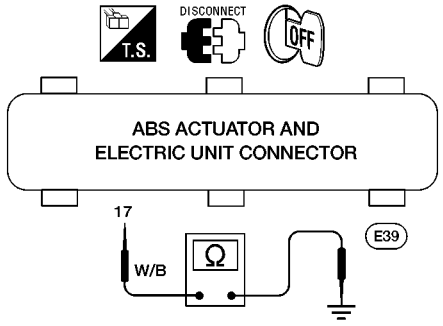
3	CHECK WARNING LAMP ACTIVATE	
Disconnect ABS actuator and electric unit connector.		
Does the warning lamp activate?		
Yes	▶	Replace ABS actuator and electric unit.
No	▶	GO TO 4.



ABR838

4	CHECK HARNESS FOR SHORT

1. Disconnect ABS actuator and electric unit connector E39 and combination meter connector M38.
2. Check continuity between ABS actuator and electric unit connector E39 terminal 17 and ground.



ABR844

Continuity should not exist.

Does continuity exist?

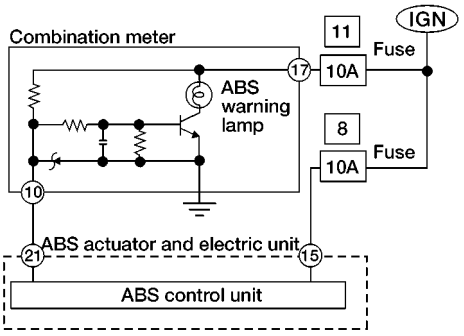
Yes	▶	Repair harness or connectors.
No	▶	**Check combination meter.** Refer to "WARNING LAMPS", ***EL-80***.

7. Warning Lamp Stays On When Ignition Switch Is Turned On

=NEBR0198

1	INSPECTION START

ABS control unit inspection



ABR845

	▶	GO TO 2.

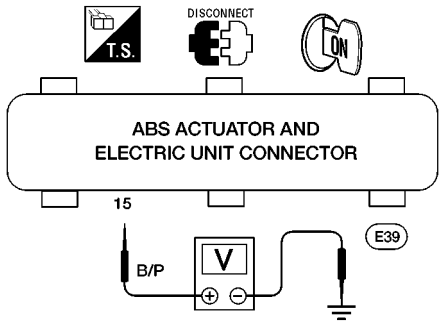
2	CHECK FUSE	
Check 10A fuse No. 8. For fuse layout, refer to “POWER SUPPLY ROUTING”, ***EL-8***.		
Is fuse OK?		
Yes	▶	GO TO 3.
No	▶	GO TO 8.

3	CHECK HARNESS CONNECTOR	
Check ABS actuator and electric unit pin terminals for damage or bad connection of ABS actuator and electric unit harness connector. Reconnect ABS actuator and electric unit harness connector. Then retest.		
Does warning lamp stay on when ignition switch is turned ON?		
Yes	▶	GO TO 4.
No	▶	**INSPECTION END**

4	CHECK ABS ACTUATOR AND ELECTRIC UNIT GROUND CIRCUIT	
Refer to “ABS ACTUATOR AND ELECTRIC UNIT GROUND” in “Ground Circuit Check”, BR-92.		
Is ground circuit OK?		
Yes	▶	GO TO 5.
No	▶	Repair harness or connector.

5	CHECK ABS ACTUATOR AND ELECTRIC UNIT POWER SUPPLY CIRCUIT

1. Disconnect ABS actuator and electric unit connector.
2. Check voltage between ABS actuator and electric unit connector E39 terminal 15 and ground.



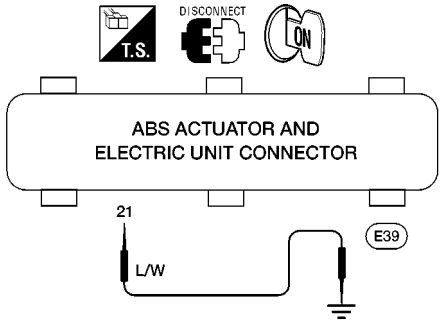
ABR652

Does battery voltage exist when ignition switch is turned ON?

Yes	▶	GO TO 6.
No	▶	**Check the following.** If NG, repair harness or connector. ● Harness connector E39 ● Harness for open or short between ABS actuator and electric unit and fuse No. 8

6	CHECK WARNING LAMP

1. Disconnect ABS actuator and electric unit connector.
2. Connect suitable wire between ABS actuator and electric unit connector E39 terminal 21 and ground.



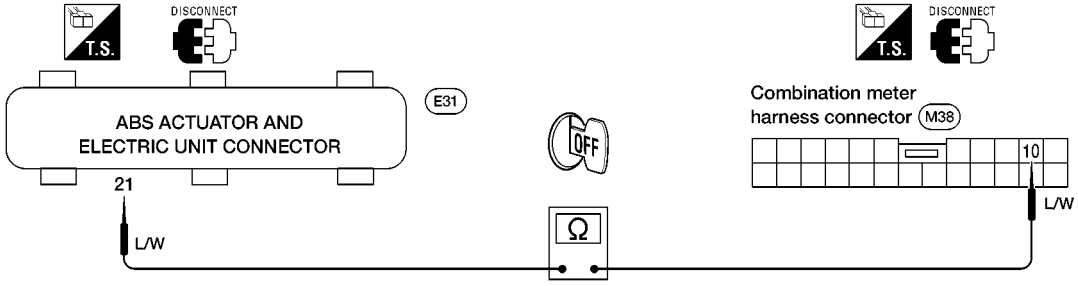
ABR852

Does the warning lamp deactivate?

Yes	▶	Replace ABS actuator and electric unit.
No	▶	GO TO 7.

7	CHECK ABS WARNING LAMP CONTROL CIRCUIT FOR OPEN

1. Disconnect combination meter connector M38.
2. Check continuity between combination meter harness connector M38 terminal 10 and ABS actuator and electric unit harness connector E39 terminal 21.



ABR846

Continuity should exist.

Does continuity exist?

Yes	▶	**Check combination meter.** Refer to "WARNING LAMPS", ***EL-80***.
No	▶	**Check the following.** If NG, repair harness or connector. ● Harness connectors M38, E39 ● Harness for open or short between ABS actuator and electric unit and fuse No. 11

8	REPLACE FUSE

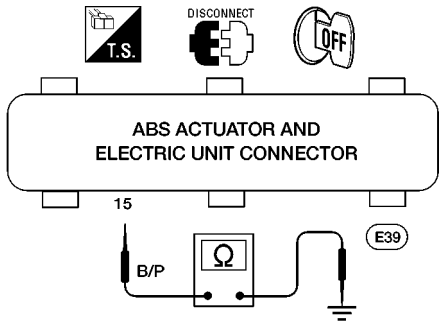
Replace fuse.

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

Yes	▶	GO TO 9.
No	▶	**INSPECTION END**

9	CHECK ABS ACTUATOR AND ELECTRIC UNIT POWER SUPPLY CIRCUIT FOR SHORT

1. Disconnect battery cable and ABS actuator and electric unit connector.
2. Check continuity between ABS actuator and electric unit harness connector E39 terminal 15 and ground.



ABR775

Continuity should not exist.

Does continuity exist?

Yes	▶	**Check the following.** If NG, repair harness or connector. ● Harness connector E39 ● Harness for open or short between ABS actuator and electric unit and fuse No. 8
No	▶	Replace ABS actuator and electric unit.

General Specifications

NEBR0080

Unit: mm (in)

Applied model		2WD – I-4	4WD – 2WD V-6
Front brake	Brake model	CL28VD	
	Cylinder bore diameter × number of pistons	42.8 (1.685) x 2	
	Pad Length × width × thickness	146.6 x 48.5 x 10 (5.77 x 1.909 x 0.39)	
	Rotor outer diameter × thickness	260 x 26 (10.2 x 1.02)	277 x 26 (10.9 x 1.02)
Rear brake	Brake model	LT26B	LT30A
	Cylinder bore diameter	22.22 (7/8)	20.64 (13/16)
	Lining length × width × thickness	249.6 x 50 x 5.5 (9.83 x 1.97 x 0.217	296 × 50 × 6.1 (11.65 × 1.97 × 0.240)
	Drum inner diameter	260.0 (10.23)	295.0 (11.61)
Master cylinder	Bore diameter	25.40 (1)	
Control valve	Valve model	Linkage type load sensing valve	Proportioning valve within master cylinder
	Split point kPa (kg/cm^2, psi) × reducing ratio	(Variable) x 0.23	2,452 (25,356) × 0.3
Brake booster	Booster model	M195T	M230t
	Diaphragm diameter	Pri: 205 (8.07) Sec: 180 (7.09)	Pri: 230 (9.06) Sec: 230 (9.06)
Recommended brake fluid		DOT 3	

Disc Brake

NEBR0081

Unit: mm (in)

Brake model		CL28VD
Pad wear limit	Minimum thickness	2.0 (0.079)
Rotor repair limit	Minimum thickness	24.0 (0.945)

Drum Brake

NEBR0082

Unit: mm (in)

Brake model		LT26B	LT30A
Lining wear limit	Minimum thickness	1.5 (0.059)	
Drum repair limit	Maximum inner diameter	261.5 (10.30)	296.5 (11.67)
	Out-of-round limit	0.03 (0.0012)	

Brake Pedal

NEBR0083

Unit: mm (in)

Transmission		M/T	A/T
Free height “H”*		191 - 201 (7.52 - 7.91)	201 - 211 (7.91 - 8.31)
Depressed height “D” [under force of 490 N (50 kg, 110 lb) with engine running]		105 (4.13)	115 (4.53)
Clearance “C” between pedal stopper and threaded end of stop lamp switch or ASCD switch		0.3 - 1.0 (0.012 - 0.039)	
Pedal free play	At pedal pad	1.0 - 3.0 (0.039 - 0.118)	

*: Measured from surface of metal floor to pedal pad

Parking Brake Control

NEBR0084
Unit: notch

Control Type	Stick lever
Lever stroke [under force of 196 N (20 kg, 44 lb)]	10 - 12
Lever stroke when warning switch comes on	1

NOTES