BRAKE SYSTEM

SECTION BR

CONTENTS

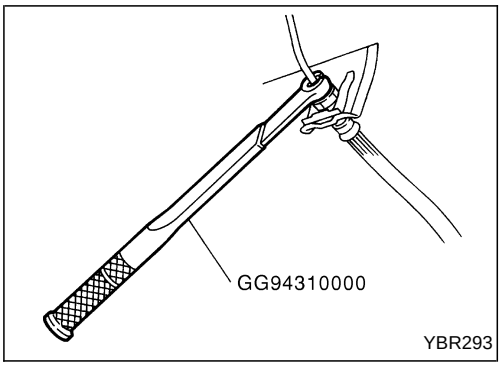
CONTENTS (Cont'd)

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

The Supplemental Restraint System “Air Bag” and “Seat Belt Pre-tensioner”, used along with a seat belt, help to reduce the risk or severity or injury to the driver and front passenger in a collision. The Supplemental Restraint System consists of an air bag module (located in the center of the steering wheel and on the instrument panel on the passenger side, where fitted), seat belt pre-tensioners, a diagnosis sensor unit, warning lamp, wiring harness and spiral cable. Information necessary to service the system safely is included in the **BT section** of this Service Manual.

WARNING:

- **To avoid rendering the SRS inoperative (which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation), all maintenance must be performed by an authorized NISSAN dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses (except “SEAT BELT-TENSIONER” connector) can be identified with yellow harness connector and with yellow harness protector or yellow insulation tape before the harness connectors.**



Precautions

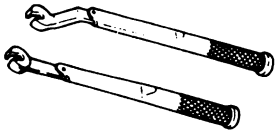
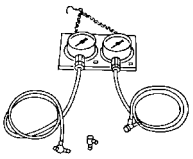
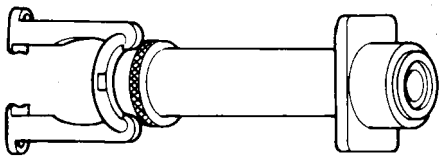
- **Use only “DOT 4” fluid from a sealed container.**
- **Never reuse drained brake fluid.**
- **Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.**
- **To clean master cylinder parts, disc brake caliper parts or wheel cylinder parts, use clean brake fluid.**
- **Never use mineral oils such as Petrol 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 speed. Refer to “Brake Burnishing Procedure”, “Check and Adjustment”, BR-5.**

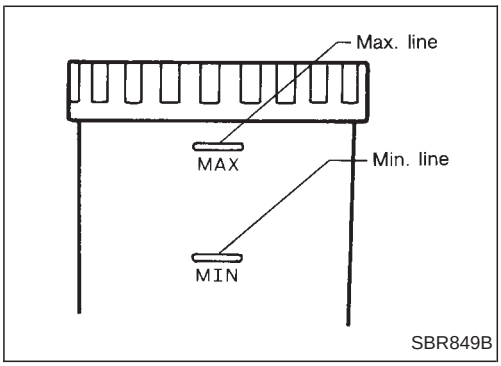
WARNING:

- **Clean brakes with a vacuum dust collector to minimize risk of health hazard from airborne materials.**
- **Avoid prolonged and repeated skin contact with brake fluid.**
- **Wear protective clothing, including impervious gloves.**
- **Where there is a risk of eye contact, eye protection should be worn — for example chemical goggles or face shield.**

Preparation

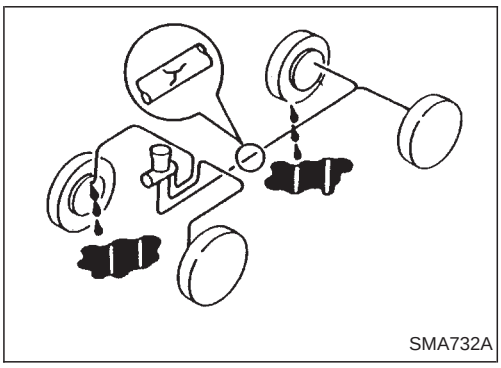
SPECIAL SERVICE TOOLS

Tool number Tool name	Description	
GG94310000 Flare nut torque wrench		Removing and installing each brake piping
KV991V0010 Brake fluid pressure gauge		Measuring brake fluid pressure
HT72480000 Rear axle shaft bearing puller		Removing rear wheel sensor rotor



Checking Brake Fluid Level

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

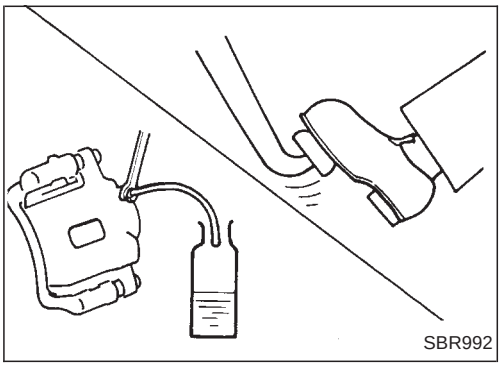


Checking Brake Line

CAUTION:

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

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



Changing Brake Fluid

CAUTION:

- **Refill with new brake fluid “DOT 4”.**
- **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. DO NOT RUB IT OFF.**

1. Connect a vinyl tube to each air bleeder valve.
2. Drain brake fluid from each air bleeder valve by depressing brake pedal.
3. Refill until new brake fluid comes out of each air bleeder valve. Use same procedure as in bleeding hydraulic system to refill brake fluid. Refer to “Bleeding Brake System”, “BRAKE HYDRAULIC LINE”, BR-8.

Brake Burnishing Procedure

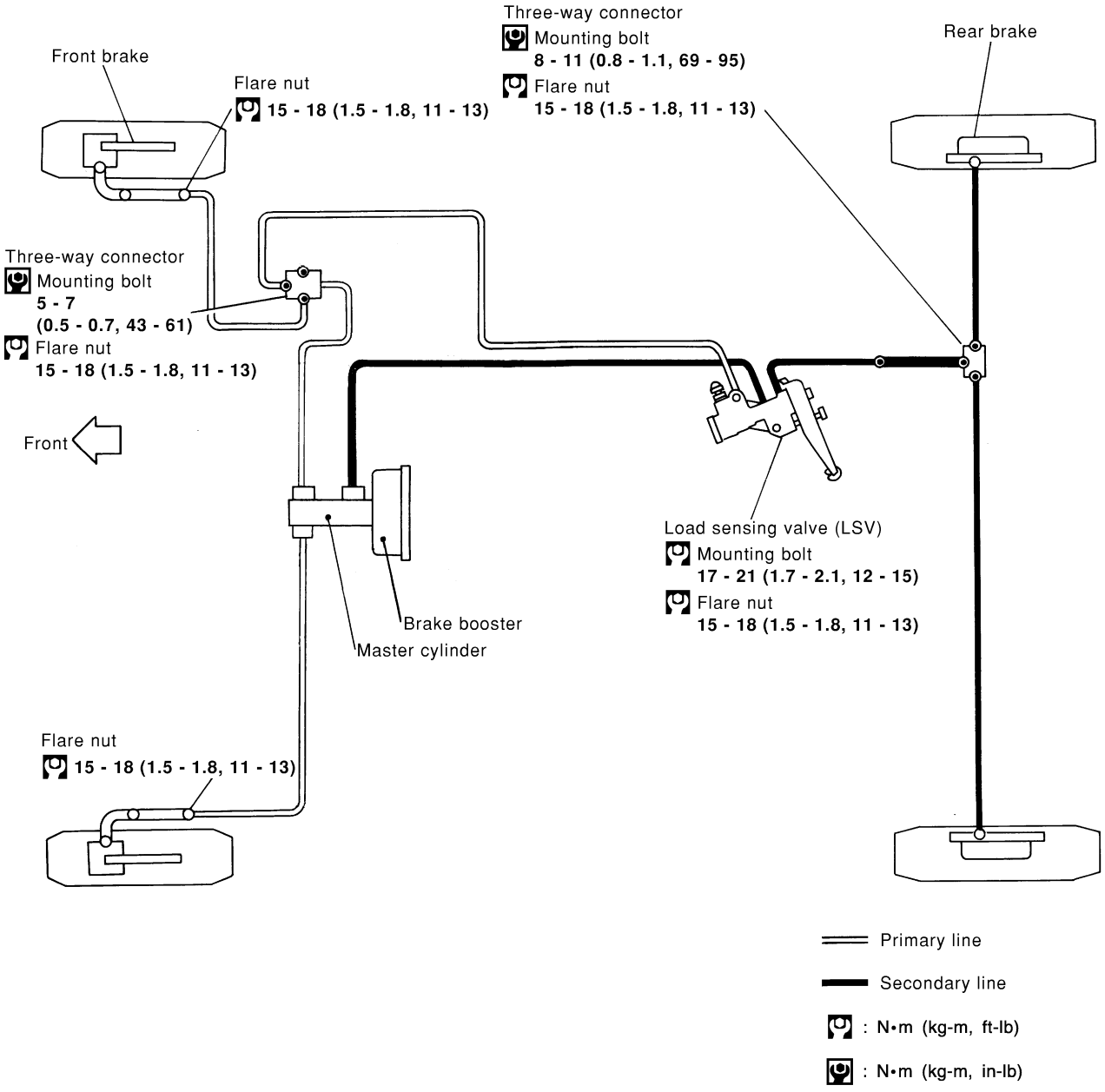
Burnish the brake contact surfaces according to the following procedure after refinishing or replacing rotors or drums, after replacing pads or linings, or if a soft pedal occurs at very low mileage.

CAUTION:

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

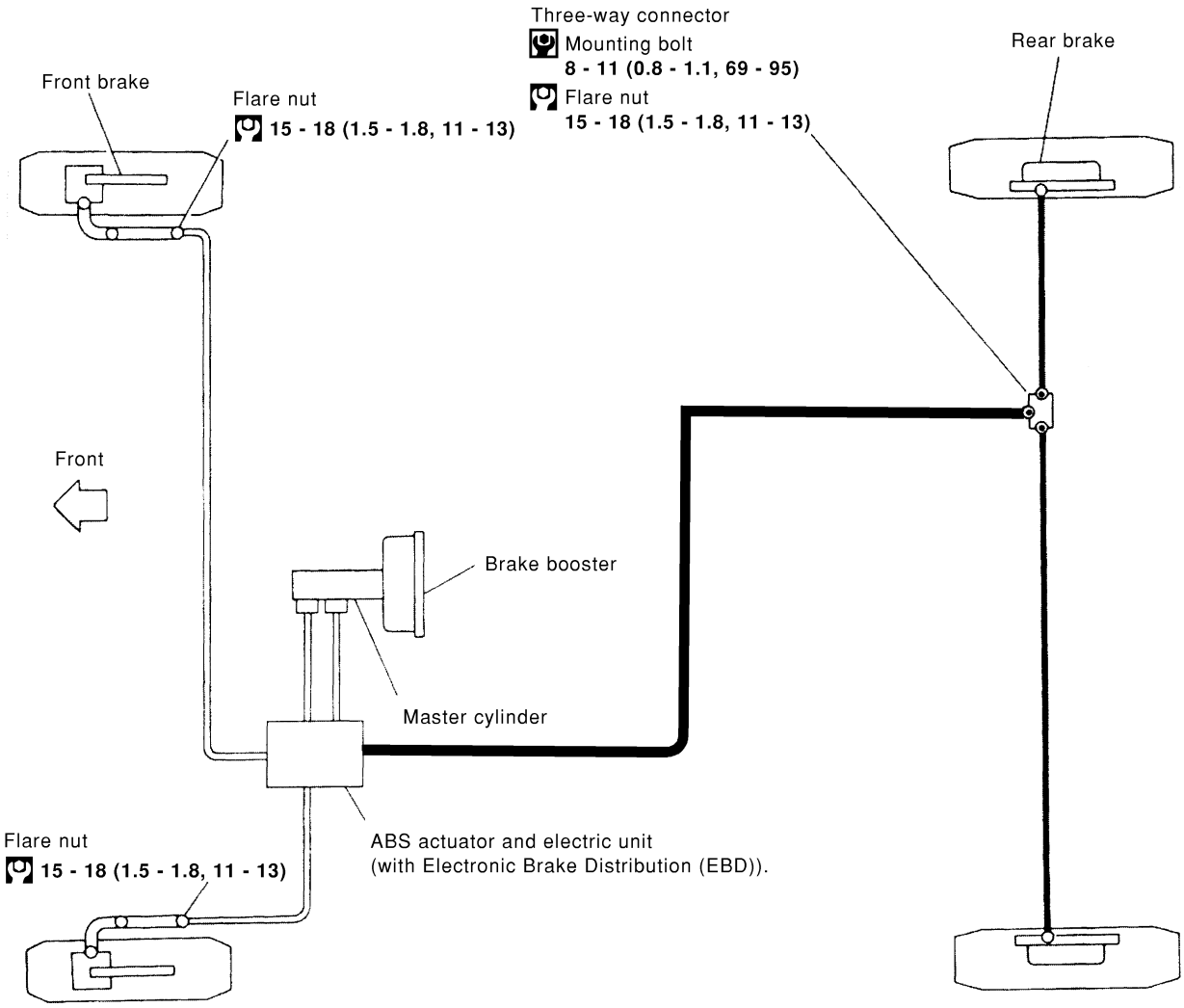
1. **Drive the vehicle on a straight smooth road at 50 km/h (31 MPH).**
2. **Use medium brake pedal/foot to bring the vehicle to a complete stop from 50 km/h (31 MPH). Adjust brake pedal/foot pressure such that vehicle stopping time equals 3 to 5 seconds.**
3. **To cool the brake system, drive the vehicle at 50 km/h (31 MPH) for 1 minute without stopping.**
4. **Repeat steps 1 to 3 for 10 times or more to complete the burnishing procedure.**

W/O ABS



YBR256

WITH ABS



Note: without load sensing valve

CAUTION:
When Brake and ABS warning lights come on simultaneously with an audible sound, drive at low speed and brake smoothly to prevent rear wheel locking.

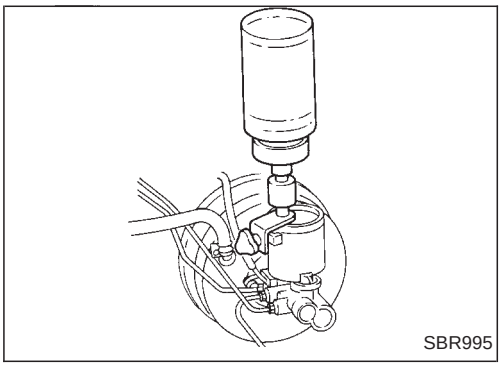
Primary line

Secondary line

: N•m (kg-m, ft-lb)

: N•m (kg-m, in-lb)

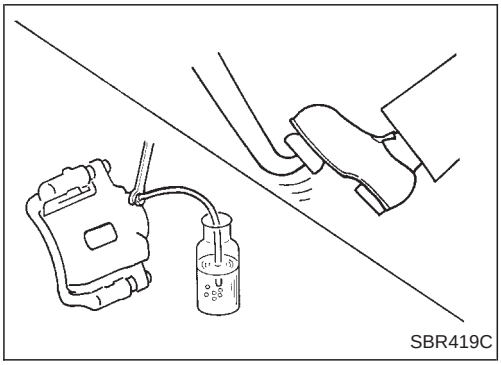
YBR257


SBR995

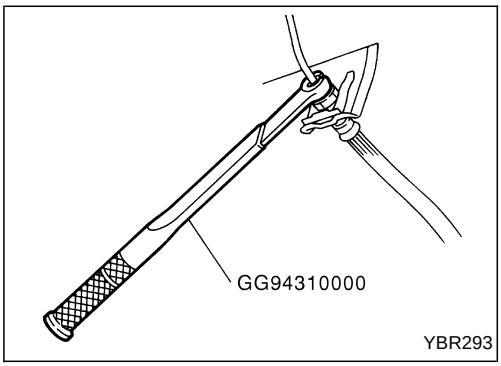
Bleeding Brake System

CAUTION:

- **Carefully monitor brake fluid level at master cylinder during bleeding operation.**
- **If master cylinder is suspected to have air inside, bleed air from master cylinder first. Refer to “Installation”, “MASTER CYLINDER”, BR-16.**
- **Fill reservoir with recommended brake fluid “DOT 4”. Make sure it is full at all the times while bleeding air out of system.**
- **Place a container under master cylinder to avoid spillage of brake fluid.**
- **For models with ABS, turn ignition switch to the OFF position and disconnect ABS fuse or battery cable.**
- **Bleed air in the following order:**
  Load Sensing Valve air bleeder (Models equipped with LSV)
  ↓
  Left rear brake
  ↓
  Right rear brake
  ↓
  Left front brake
  ↓
  Right front brake


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)



Removal

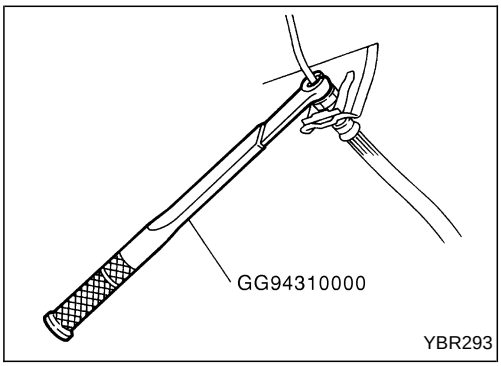
CAUTION:

- **Use suitable tool for assembly and disassembly of brake lines and hoses.**
- **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 RUB IT OFF.**
- **All hoses must be free from excessive bending, twisting and pulling.**

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

Inspection

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



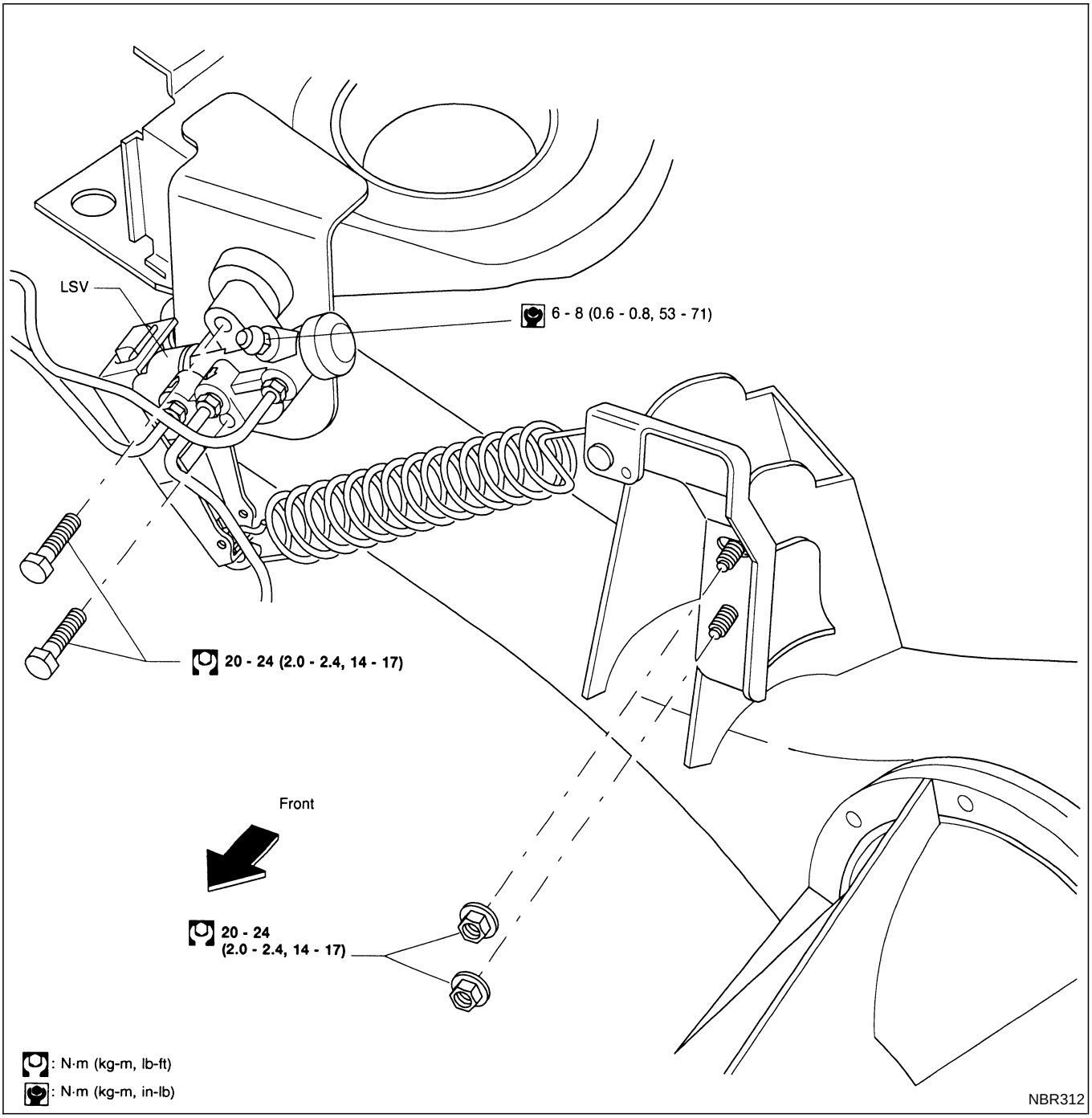
Installation

CAUTION:

- **Refill with new brake fluid “DOT 4”.**
- **Never reuse drained brake fluid.**

1. Tighten all flare nuts and connecting bolts.
   Flare nut:
   : 9 - 11 N·m (0.9 - 1.1 kg-m, 78 - 95 in-lb)
   Connecting bolt:
   : 17 - 20 N·m (1.7 - 2.0 kg-m, 12 - 14 ft-lb)
2. Refill until new brake fluid comes out of each air bleeder valve.
3. Bleed air. Refer to “Bleeding Brake System”, BR-8.

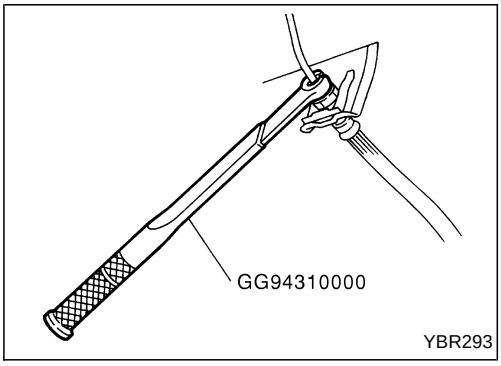
Removal and Installation



Removal

CAUTION:

- **Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately. DO NOT RUB IT OFF.**
- Remove flare nuts and LSV bolts.



Installation

CAUTION:

- **Refill with new brake fluid “DOT 4”.**
- **Never reuse drained brake fluid.**
- **Check level in brake fluid reservoir.**

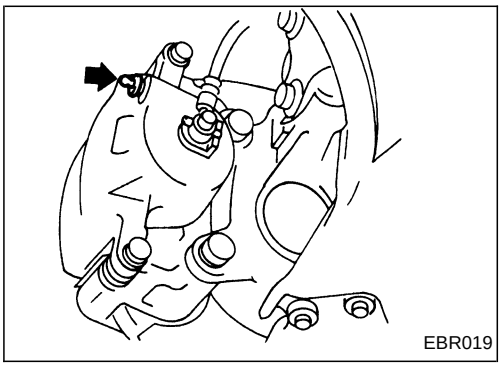
1. Tighten provisionally flare nuts.
2. Tighten LSV bolts.
   : 20 - 24 N·m (2.0 - 2.4 kg-m, 14 - 17 ft-lb)
3. Tighten flare nuts.
   : 15 - 18 N·m (1.5 - 1.8 kg-m, 11 - 13 ft-lb)
4. Bleed air. Refer to “Bleeding Brake System”, “BRAKE HYDRAULIC LINE”, BR-8.
5. Adjust load sensing valve (LSV). Refer to “Inspection and Adjustment”, “LOAD SENSING VALVE”, BR-12.

Inspection and Adjustment

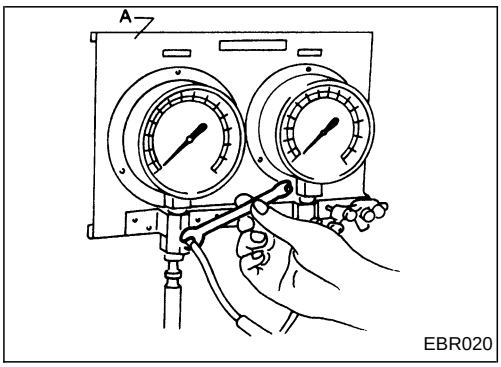
CAUTION:

- **Check level in brake fluid reservoir.**
- **Refill with recommended brake fluid “DOT 4”.**
- **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. DO NOT RUB IT OFF.**

1. Before adjusting load sensing valve spring length, check for proper installation and abnormal wear of brake pads and shoes.

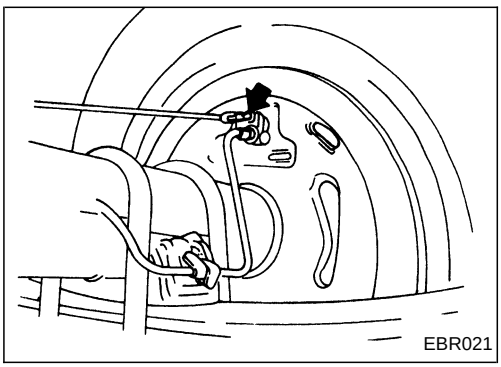

EBR019

2. Remove the air bleeder from the wheel caliper, and install a pressure gauge (A) to the bleed valve hole.



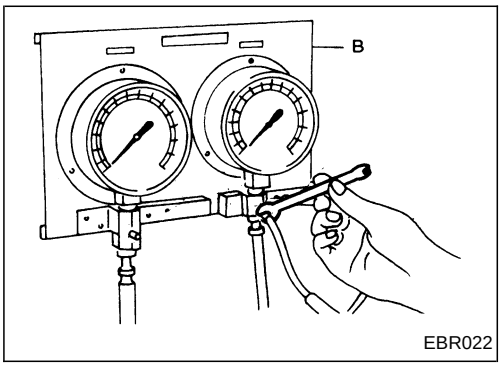
EBR020

3. Bleed the air from the front brake piping.


EBR021

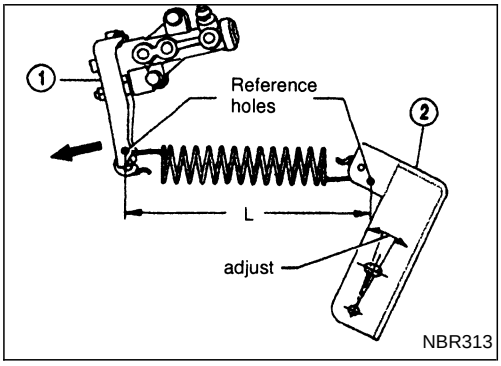
4. Remove the air bleed valve from the rear wheel cylinder, and install a pressure gauge (B) to the bleed valve hole.

Inspection and Adjustment (Cont'd)



EBR022

5. Bleed the air from the rear brake piping.



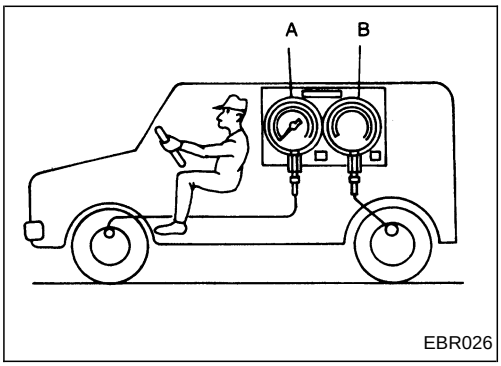
NBR313

6. To adjust the LSV correctly, proceed as follows:

a. With unladen vehicle (12 liters of fuel, radiator coolant and engine oil are full). Spare tire, hand tools and mats in designated positions. Check the length of LSV spring "L".

b. If the spring length is different from that specified, move the regulation lever (2) until the specified value is obtained. Move the LSV lever (1) until it contacts the stopper bolt and recheck the spring length.

Sensor spring length "L"
Hardtop: 201 mm (7.913 in)
Wagon: 197.5 mm (7.776 in)
NOTE: Do not disturb stopper bolt.



EBR026

c. Start the engine and run it at idling speed.

d. Slowly depress the brake pedal until an input pressure of 4,805 kPa (48.1 bar, 49 kg/cm^2, 697 psi) is obtained (at the front axle pressure gauge) and an output pressure of 1,736 - 2,501 kPa (18 - 26 bar, 17.7 - 25.5 kg/cm^2, 252 - 363 psi) is obtained (at the rear axle pressure gauge).

If the output pressure at the rear axle pressure gauge is not within the specified values, adjust LSV spring length as described under b) until the output pressure measured is within the specified range.

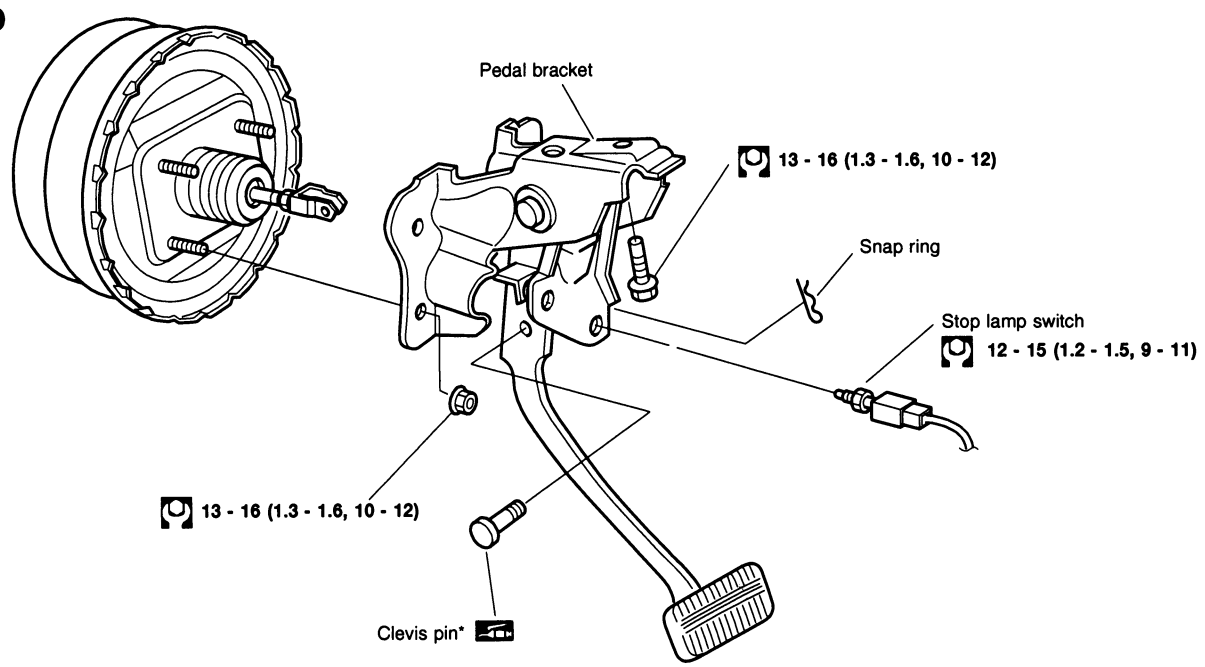
Unit: kPa (bar, kg/cm^2, psi)

Front axle*	4,805 (48.1, 49.0, 697)
Rear axle*	1,736 - 2,501 (18 - 26, 17.7 - 25.5, 252 - 363)

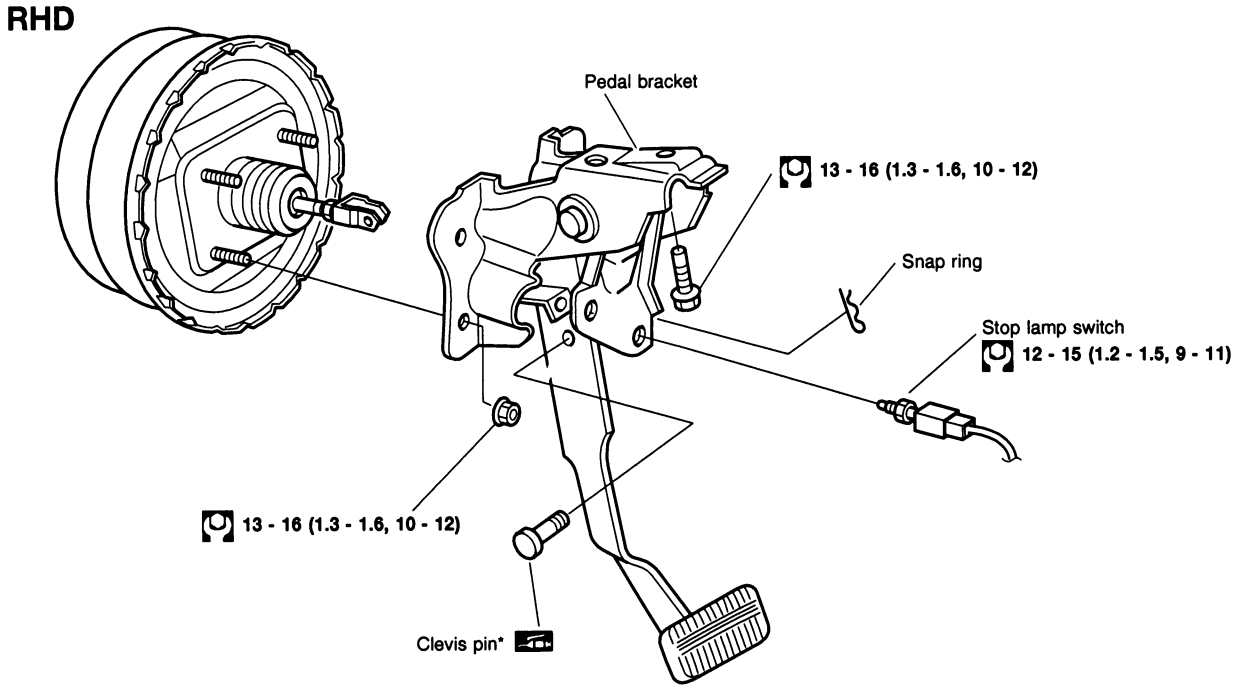
* Load conditions as indicated under 6.a, driver seat occupied.

Removal and Installation

LHD

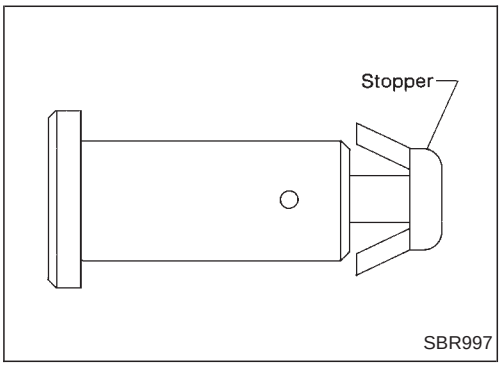


RHD



: N·m (kg-m, ft-lb)

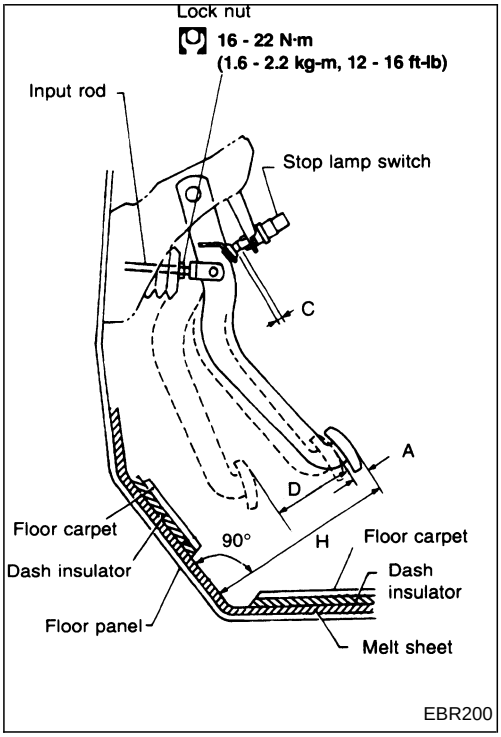
NBR269



Inspection

Check brake pedal for following items:

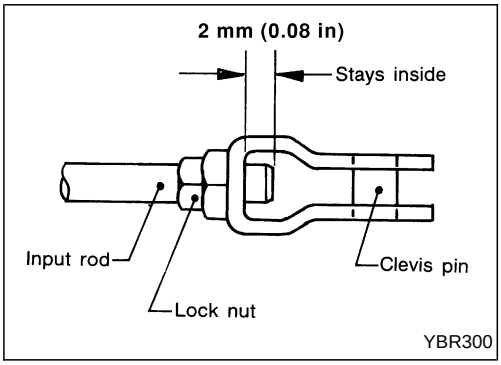
- Brake pedal bend
- Clevis pin deformation
- Crack of any welded portion
- Crack or deformation of clevis pin stopper



Adjustment

Check brake pedal free height from dash reinforcement panel.

H: Free height
Refer to SDS, BR-85.
D: Full stroke
Refer to SDS, BR-85.
C: Clearance between pedal stopper and threaded end of stop lamp switch
0.3 - 1.0 mm (0.012 - 0.039 in)
A: Pedal free play
1.0 - 3.0 mm (0.039 - 0.118 in)



If necessary, adjust brake pedal free height.

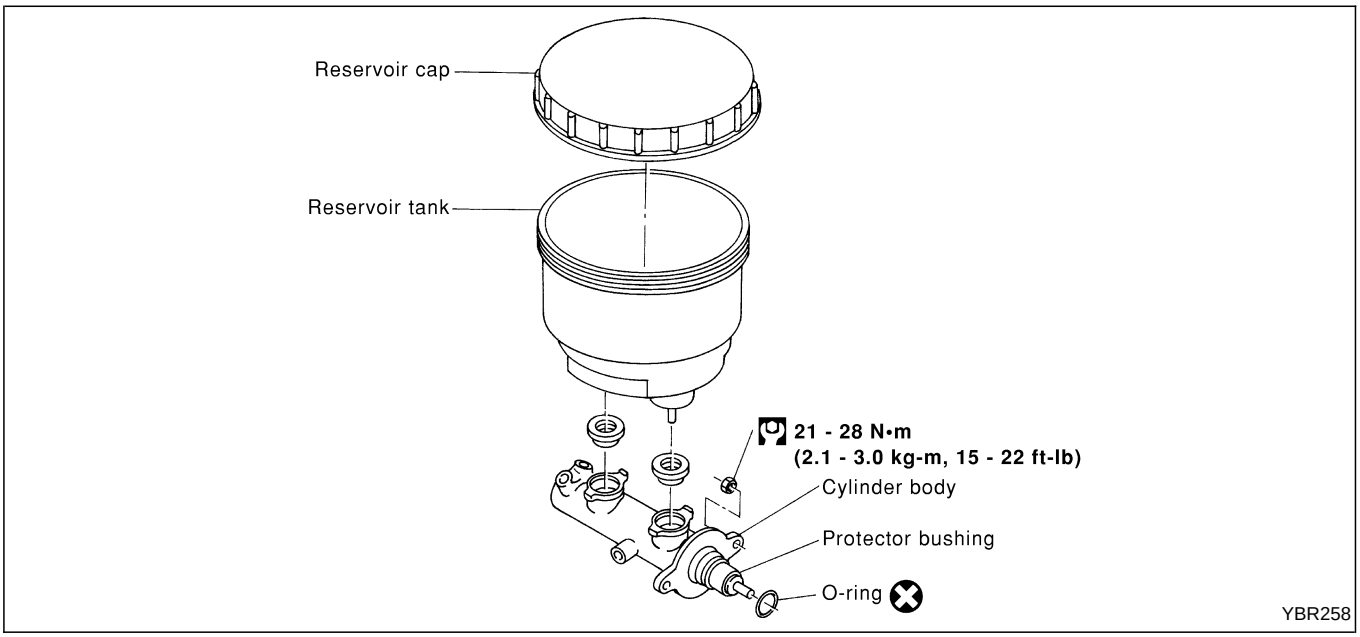
1. Loosen lock nut and adjust pedal free height by turning brake booster input rod. Then tighten lock nut.

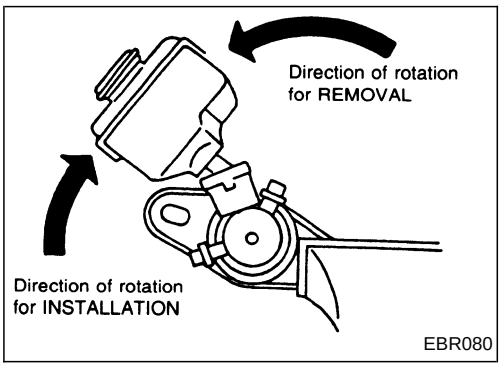
Make sure that tip of input rod stays inside of clevis as shown.

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

Make sure that stop lamps go off when pedal is released.

4. Check brake system for leaks, accumulation of air or any damage to components (master cylinder, etc.); then make necessary repairs.





Removal

CAUTION:

Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately. DO NOT RUB.

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.
5. Remove protector of master cylinder, and avoid scratching the surface of master cylinder during removal.

CAUTION:

Do not disassemble master cylinder.

NOTE:

If it is necessary to change the brake fluid reservoir, remove it as shown in the illustration on the left, while holding the seals with one hand.

It is not necessary to replace the seals if they are in a good condition.

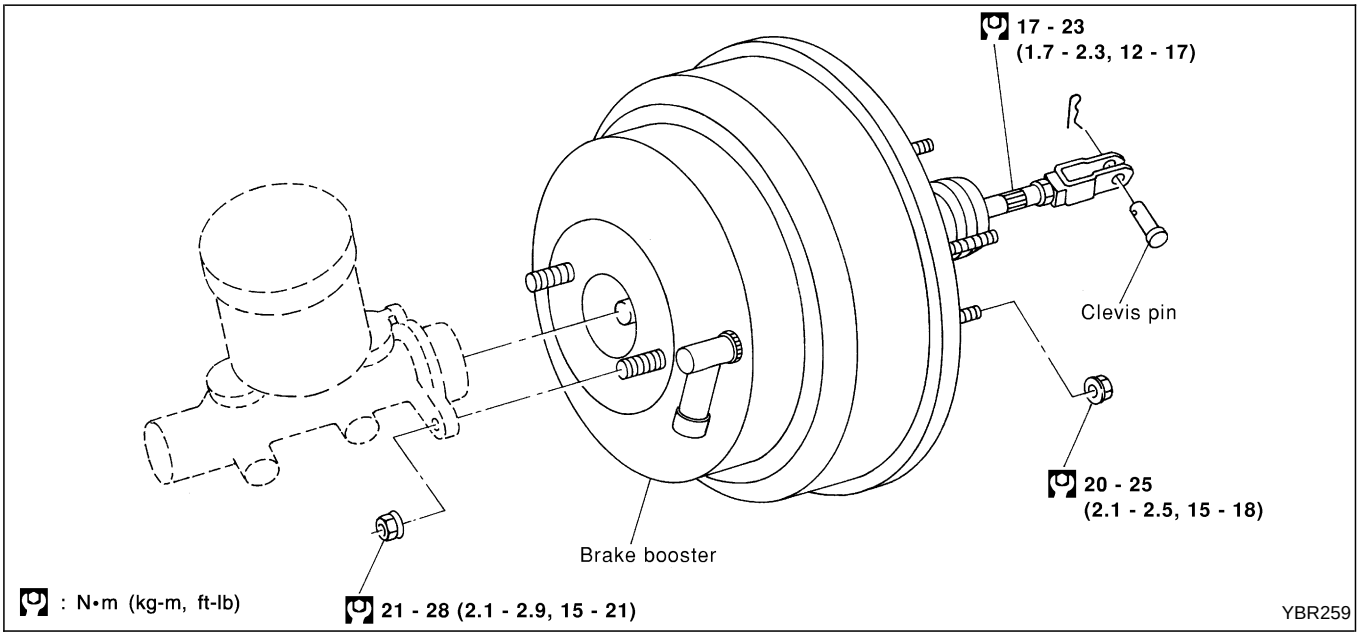
Installation

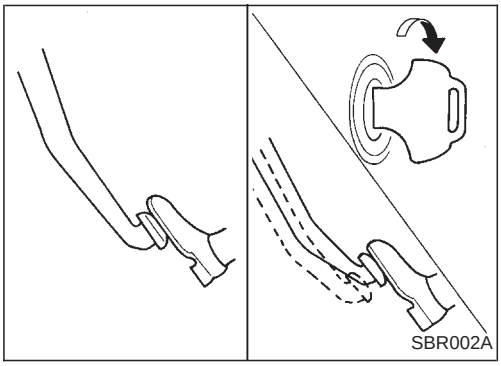
CAUTION:

- **Refill with new brake fluid “DOT 4”.**
- **Never reuse drained brake fluid.**

1. Place master cylinder onto brake booster and secure mounting nuts lightly.
2. Fit flare nuts to master cylinder.
3. Tighten mounting nuts.
   : 21 - 29 N·m (2.1 - 3.0 kg-m, 15 - 22 ft-lb)
4. Tighten flare nuts.
   : 15 - 18 N·m (1.5 - 1.8 kg-m, 11 - 13 ft-lb)
5. Bleed air. Refer to “Bleeding Brake System”, “BRAKE HYDRAULIC LINE”, BR-8.

Removal and Installation

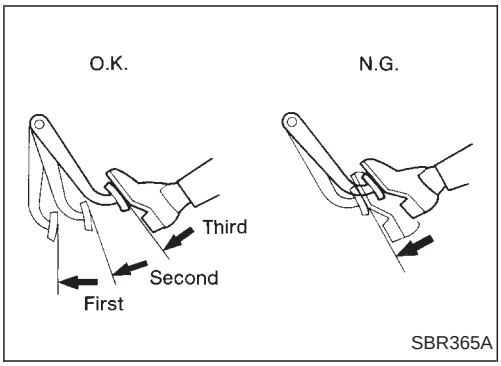




Inspection

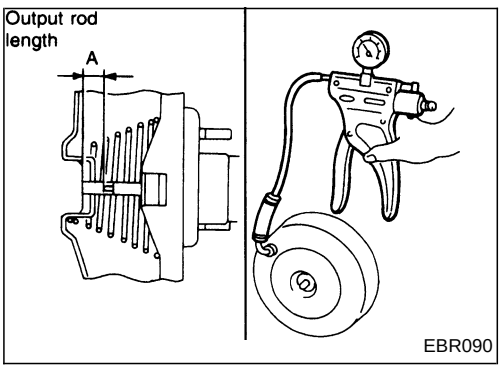
OPERATING CHECK

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



AIRTIGHT CHECK

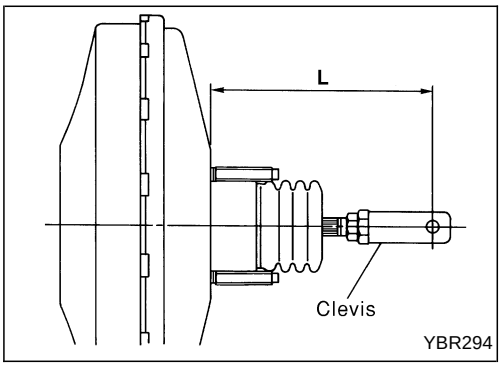
- Start engine, and stop it after one or two minutes. Depress brake pedal several times slowly. If pedal goes further down the first time and gradually rises after second or third time, booster is airtight.
- Depress brake pedal while engine is running, and stop engine with pedal depressed. If there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



OUTPUT ROD LENGTH CHECK

1. Apply vacuum of −66.7 kPa (−667 mbar, −500 mmHg, −19.69 inHg) to brake booster with a manual vacuum pump and check output rod length “A”.
   Specified length “A”:
   22.15 - 22.45 mm (0.872 - 0.884 in)
   (The length “A” in this case is the distance from end of output rod to outside of brake booster, when the specified vacuum is applied.)

Inspection (Cont'd)



2. Check output rod length "L" when brake booster doesn't work.
   Specified length "L":
   129.2 - 130.2 mm (5.09 - 5.13 in)

Installation

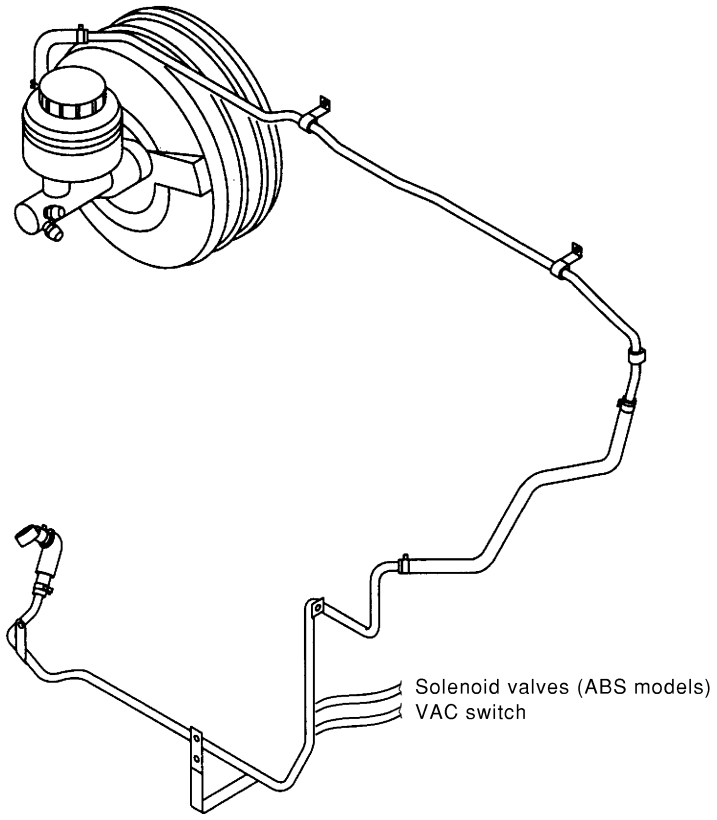
CAUTION:

- **Be careful not to deform or bend brake pipes, during installation of booster.**
- **Replace clevis pin if damaged.**
- **Refill with new brake fluid "DOT 4".**
- **Never reuse drained brake fluid.**
- **Take care not to damage brake booster mounting bolt thread when installing. Due to the acute angle of installation, the threads can be damaged on the metal surrounding the dash panel holes.**

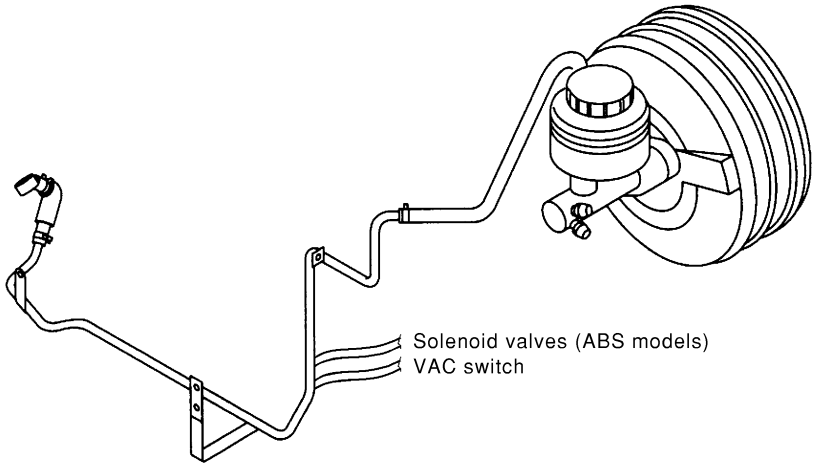
1. Before fitting booster, temporarily adjust clevis to dimension shown.
2. Fit booster, then secure mounting nuts (brake pedal bracket to brake booster) lightly. (Join brake booster and brake pedal bracket to the front end of the vehicle interior).
3. Connect brake pedal and booster input rod with clevis pin.
4. Secure mounting nuts.
   : 20 - 25 N·m (1.3 - 1.6 kg-m, 10 - 12 ft-lb)
5. Install master cylinder. Refer to "Installation", "MASTER CYLINDER", BR-16.
6. Bleed air. Refer to "Bleeding Brake System", "BRAKE HYDRAULIC LINE", BR-8.

Removal and Installation

TD27Ti Engine
RHD



LHD

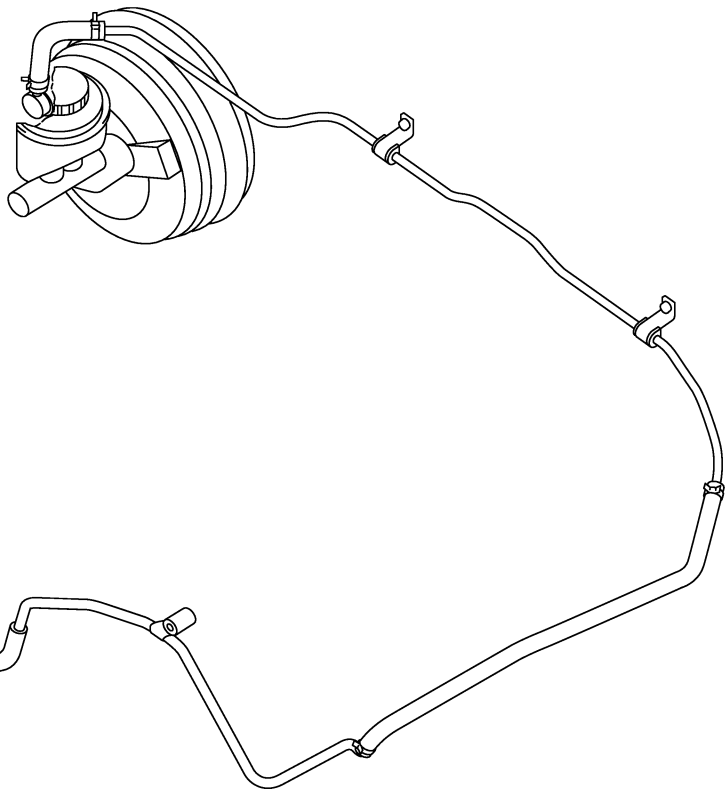


YBR260

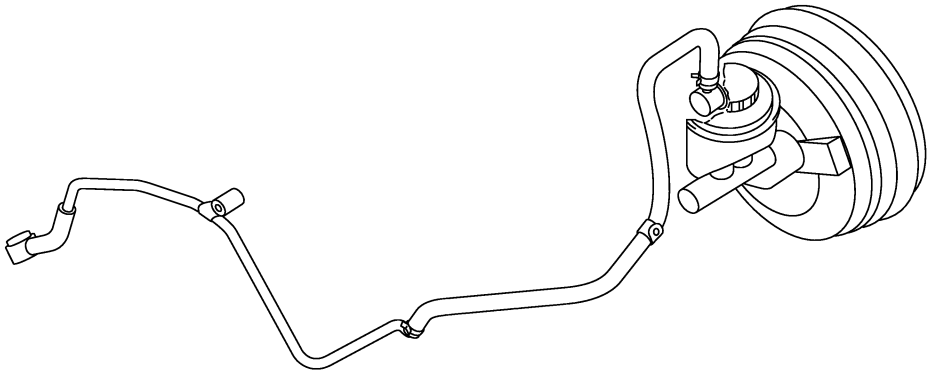
Removal and Installation (Cont'd)

ZD30DDTi Engine

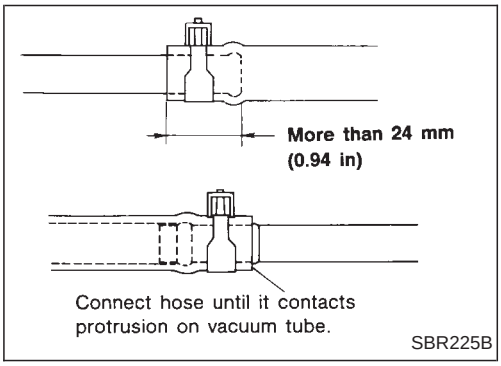
RHD



LHD



YBR292



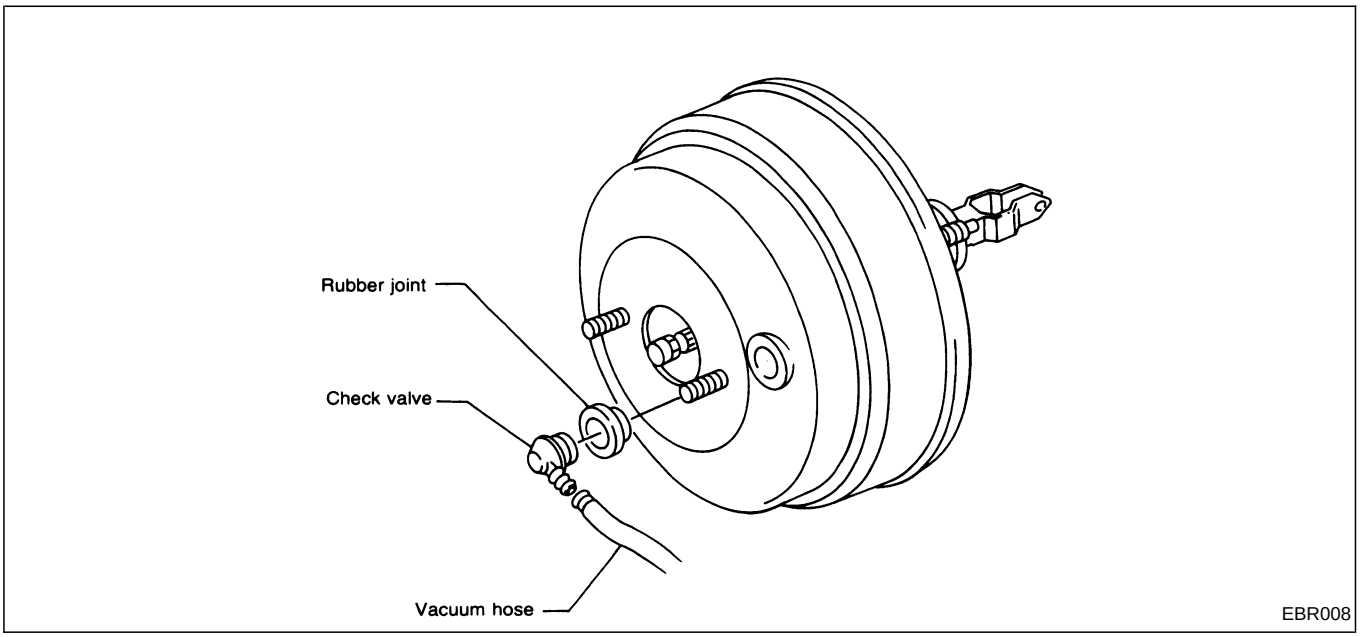
SBR225B

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 over a length of min. 24 mm (0.94 in) as shown.**

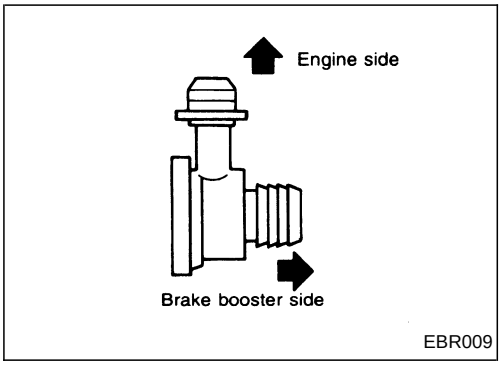
Take care to main vacuum hoses in their original direction and position.



Inspection

HOSES AND CONNECTORS

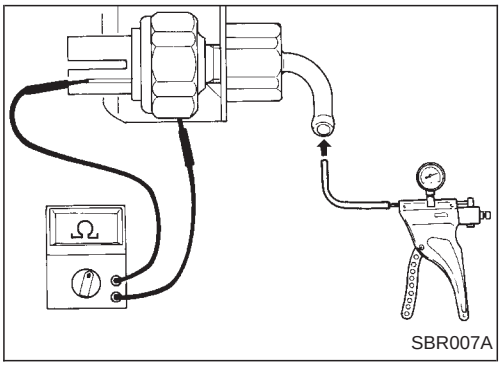
- Check condition of vacuum hoses and connectors.
- Check vacuum hoses and check valve for air tightness.



CHECK VALVE

- Check vacuum with a manual vacuum pump.

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

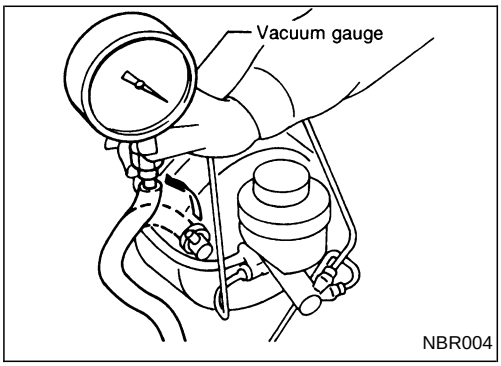


VACUUM WARNING SWITCH

Test continuity though vacuum warning switch with an ohmmeter and vacuum pump.

Vacuum	Less than 26.7 kPa (267 mbar, 200 mmHg, 7.87 inHg)	0Ω
	33.3 kPa (333 mbar, 250 mmHg, 9.84 inHg) or more	∞ Ω

Inspection (Cont'd)



VACUUM PUMP (TD27Ti ENGINE)

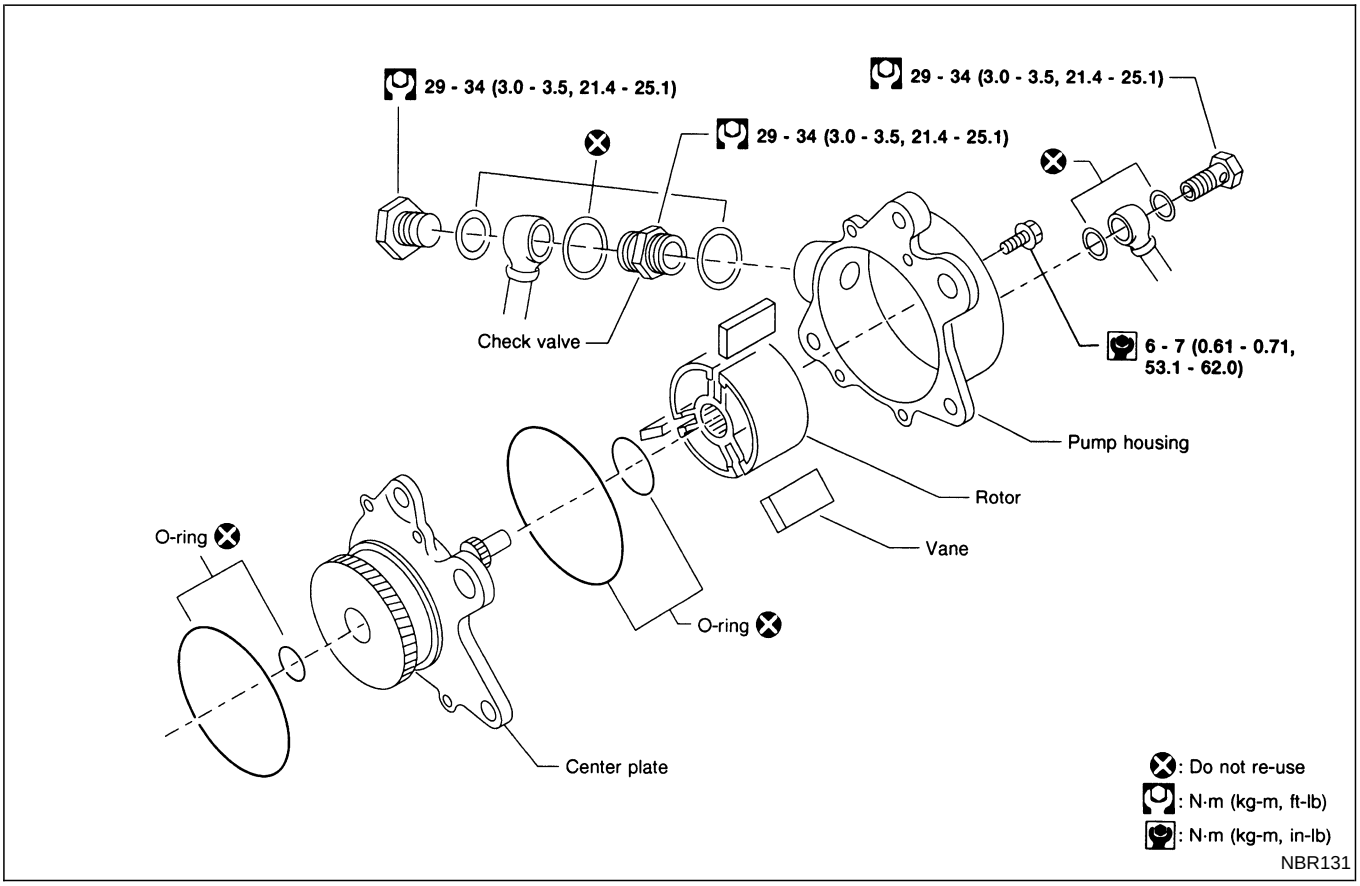
1. Install vacuum gauge.
2. Run engine at 1,000 rpm or more.
3. Check vacuum.

Specified vacuum:
93.3 kPa
(933 mbar, 700 mmHg, 27.56 inHg) or more

VACUUM PUMP (ZD30DDTi ENGINE)

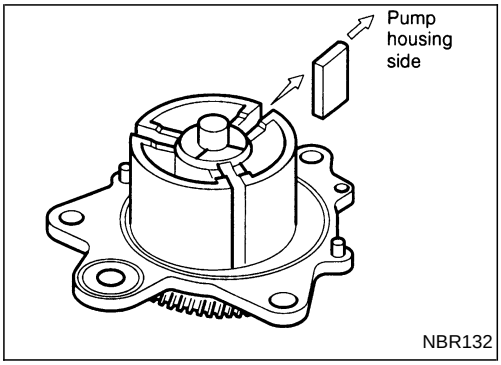
Refer to EM section, "INSPECTION" in "VACUUM PUMP — Removal and Installation".

Removal and Installation

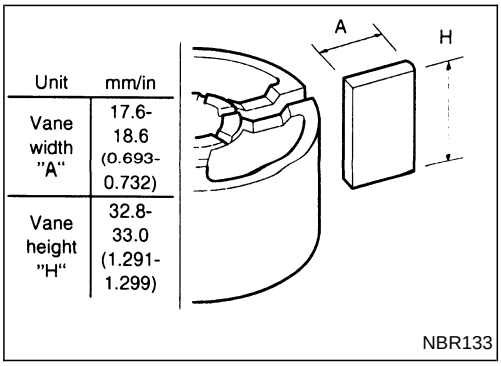


- Drain oil from vacuum pump before removal.

Manually rotate fan belt clockwise to discharge any oil which may have accumulated in vacuum pump.



- Install vane so that its round surface faces pump housing.
- After installing vacuum pump assembly, apply 5 mℓ (0.2 Imp fl oz) of engine oil into vacuum pump assembly. Then, make sure that pulley can be smoothly rotated by hand.



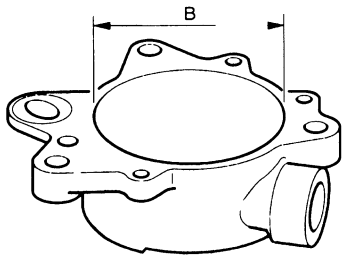
Unit	mm/in
Vane width "A"	17.6-18.6 (0.693-0.732)
Vane height "H"	32.8-33.0 (1.291-1.299)

Inspection

Clean all parts and check them as follows:

- Check for wear or scratches on mating surfaces of rotor and vacuum pump housing and on rotor and center plate. If wear or scratches are noted, replace those parts.
- Check for wear or scratches on vanes. If necessary, replace.

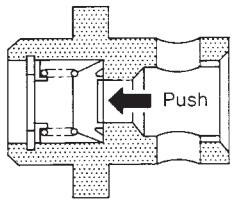
Inspection (Cont'd)



Inner diameter "B": mm (in)
69.5-69.8 (2.736-2.748)

NBR134

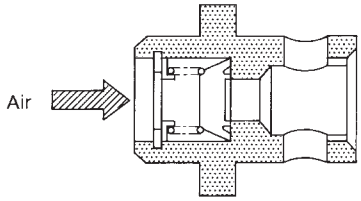
- Check inner wall of vacuum pump housing for wear. If necessary, replace.
- Check rotor shaft for wear. If necessary, replace.
- Check valve locations and copper washers for bends or deformation. If necessary, replace.



Checking valve operation

SBR194

- Check that valve operates smoothly when slightly pushed. Replace if necessary.



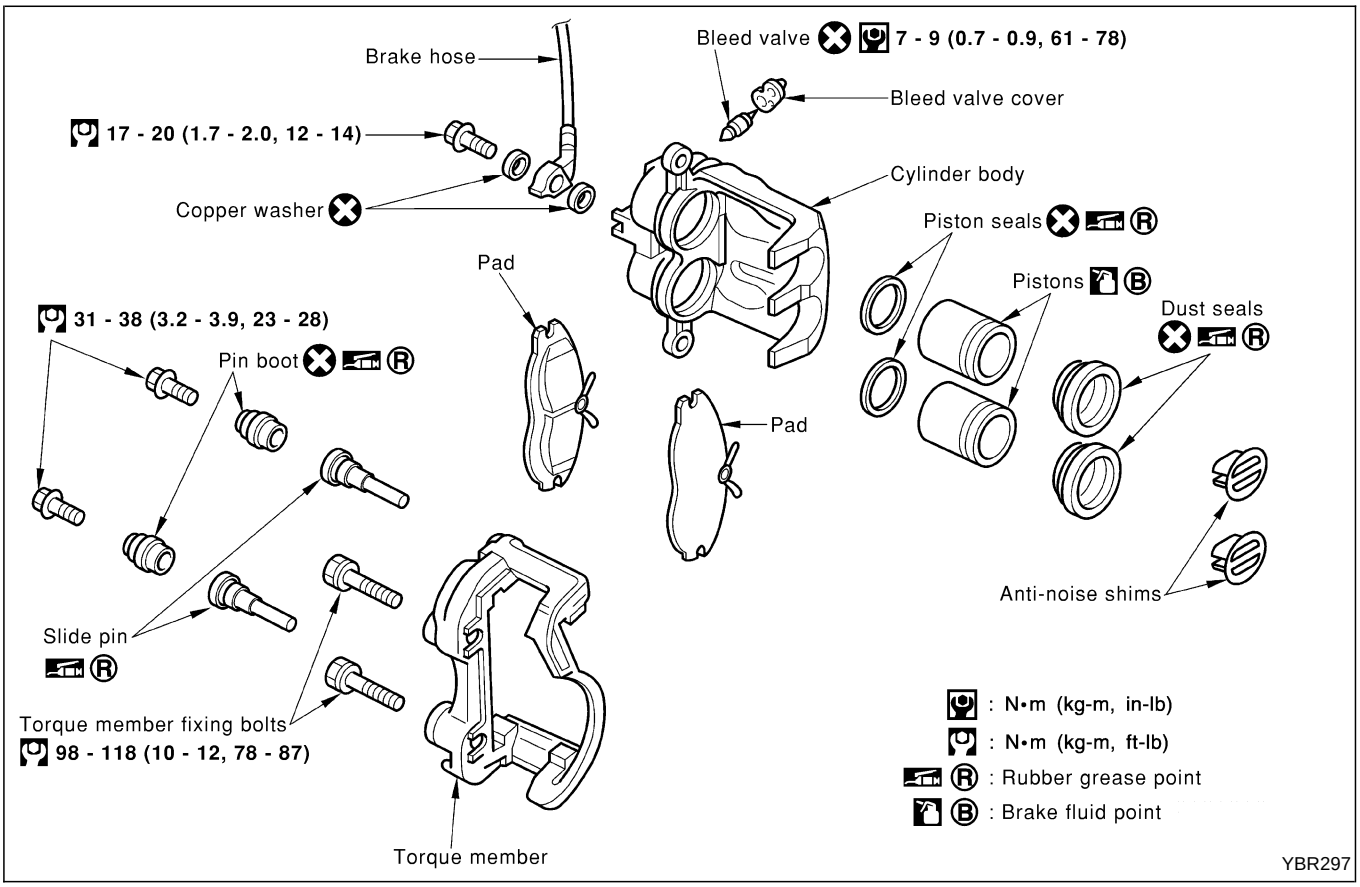
Checking air leakage of valve

SBR195

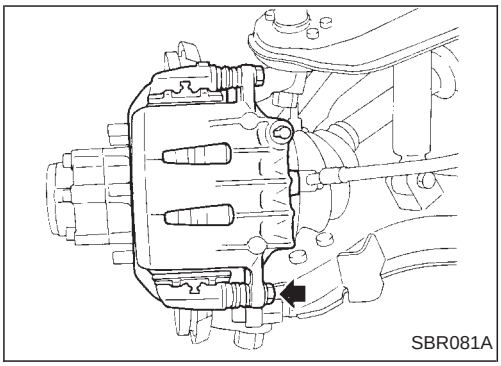
- Check for air leakage with 98 to 490 kPa (1.0 to 4.9 bar, 1 to 5 kg/cm^2, 14 to 71 psi) of air pressure.
  Replace if necessary.

Removal and Installation

Refer to EM section, “VACUUM PUMP — Removal and Installation”.



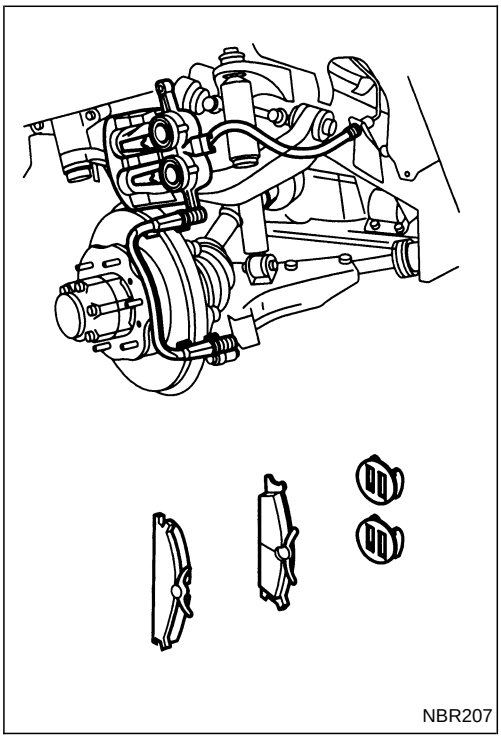
PRECAUTION:
Clean all brake assembly parts with a vacuum dust collector to prevent particles from spreading through work area.



Pad Replacement

1. Loosen brake fluid reservoir cap.
2. Remove lower pin bolt.

Pad Replacement (Cont'd)


NBR207

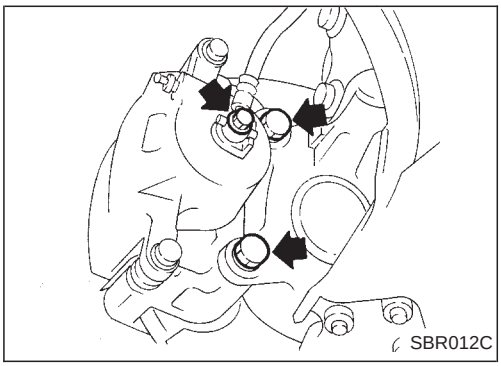
3. Swing cylinder body upward. Then remove pad and anti-noise shims.

CAUTION:

- **When cylinder body is swung up, do not depress brake pedal because piston will pop out.**
- **Ensure that brake fluid does not come into contact with dustcover and rotor.**
- **Be careful not to twist brake hoses.**

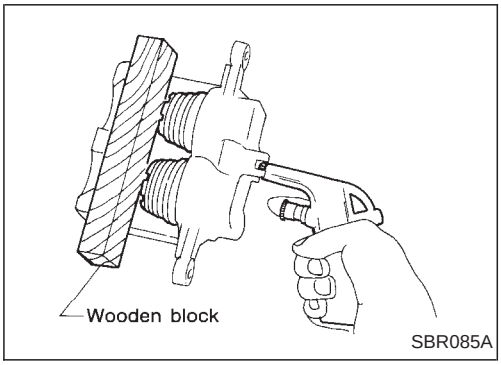
  Brake pad thickness (new):
  10 mm (0.39 in)
  Wear limit (min. thickness):
  2 mm (0.08 in)
- **After installing new brake pads, check brake fluid level at brake fluid reservoir.**

Removal


SBR012C

- Remove torque member fixing bolts and union bolt.

Disassembly



SBR085A

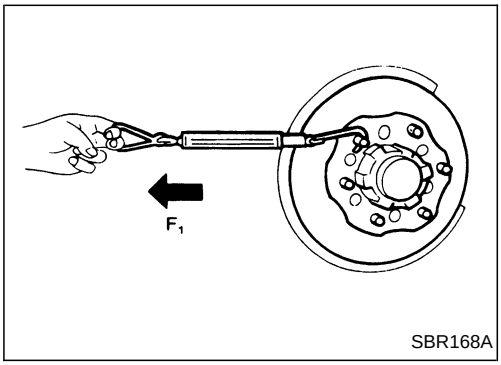
Push out piston with dust cover with compressed air.
Use a wooden block so that the 2 pistons come out evenly.

CAUTION:

- **Wear protecting clothes and safety goggles.**
- **Do not hold your fingers in front of the pistons.**
- **Be careful not to scratch piston and/or cylinder faces.**

Inspection

INSPECTION OF BRAKE DRAG FORCE

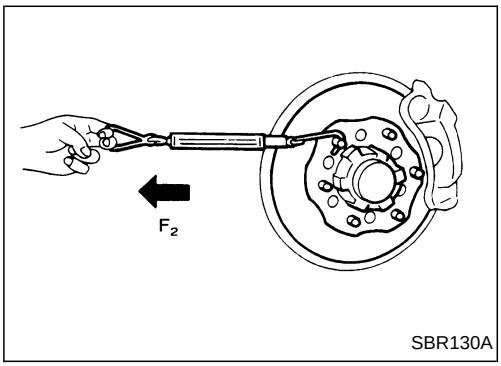


SBR168A

"Residual pair" describes the friction pressure of the disc brake shoes against the disc when the brake pedal is not applied.

1. Swing cylinder body upward.
2. Make sure that wheel bearing is adjusted properly. Refer to section FA.
3. Measure rotating force (F_1).

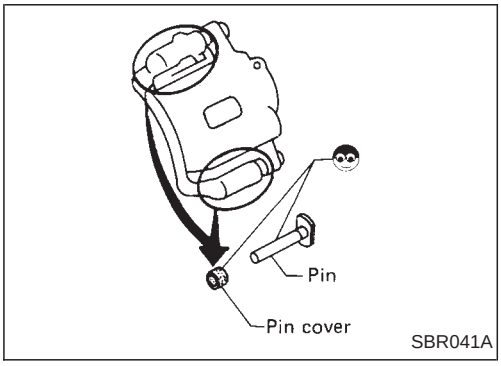
Inspection (Cont'd)



SBR130A

4. Install caliper with pads to the original position.
5. Depress brake pedal for 5 seconds.
6. Release brake pedal, rotate disc rotor 10 revolutions.
7. Measure rotating force (F_2).
8. Calculate brake drag force by subtracting F_1 from F_2.

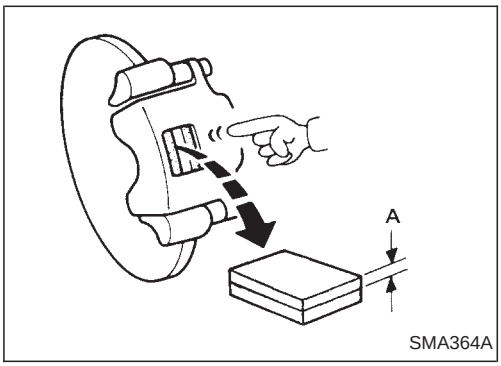
Maximum brake drag force (F_2 — F_1):
103.0 N (10.5 kg, 23.2 lb)



SBR041A

If it is not within specification, check pins and pin boots in caliper.

- **Make sure that wheel bearing is adjusted properly.**
- **Disc pads and disc rotor must be dry.**

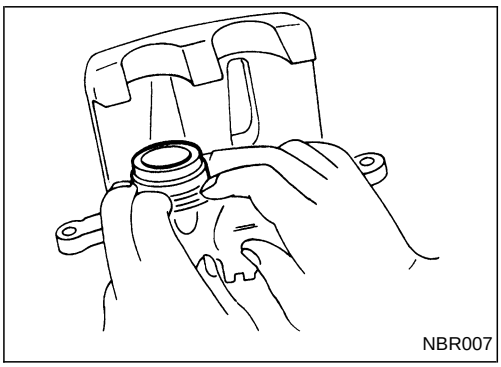


SMA364A

DISC PAD

Check disc pad for wear or damage.

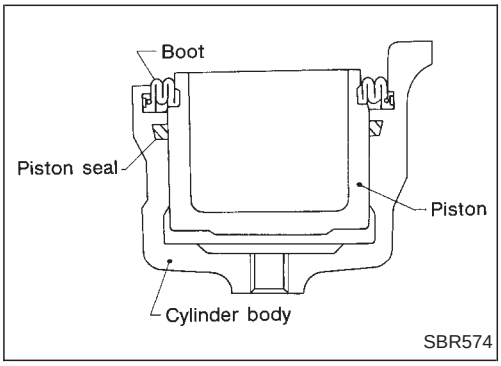
Pad wear limit (A):
2.0 mm (0.079 in)


NBR007

Assembly

Fit new piston seals.
Lightly apply clean brake fluid "DOT 4" to piston outer face.

1. Insert piston seal into groove on cylinder body.
2. Install piston into cylinder body.
3. Install piston boot and secure properly.



SBR574

Inspection

CYLINDER BODY

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

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

Inspection (Cont'd)

PISTON

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

CAUTION:

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

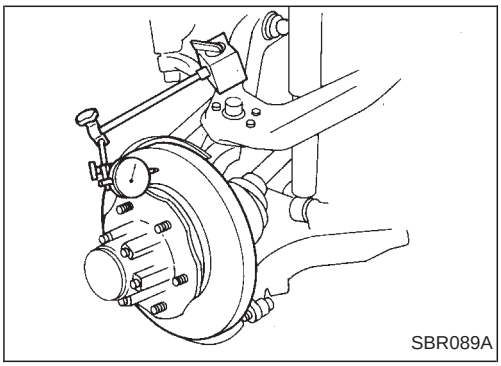
PIN, PIN BOLT AND PIN BOLT

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

ROTOR

Rubbing surface

Check rotor for roughness, cracks or chips.


SBR089A

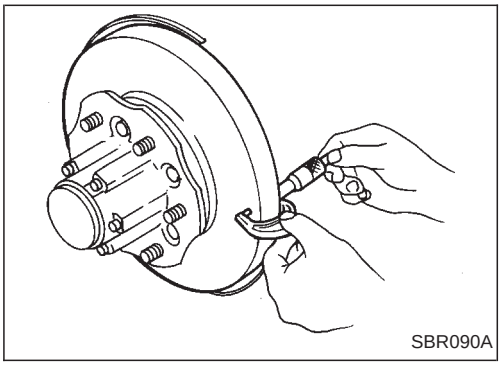
Runout

1. Secure rotor to wheel hub with at least two nuts.
2. Check runout using a dial indicator.

Make sure that wheel bearing axial end play is within the specifications before measuring. Refer to section FA.

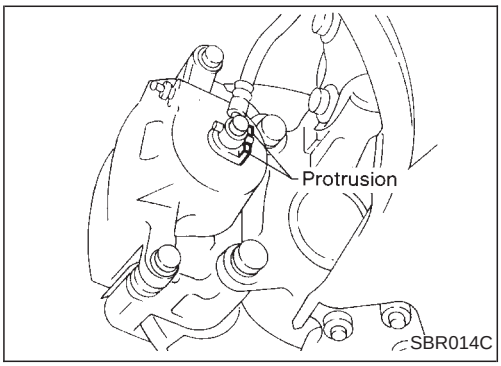
Maximum runout:
0.07 mm (0.0028 in)

3. If the runout is out of specification, find minimum runout position as follows:
   a. Remove nuts and rotor from wheel hub.
   b. Shift the rotor one hole and secure rotor to wheel hub with nuts.
   c. Measure runout.
   d. Repeat steps a. to c. so that minimum runout position can be found.
4. If the runout is still out of specification, turn rotor with on-car brake lathe.


SBR090A

Thickness

Standard thickness:
26.0 mm (1.02 in)
Minimum thickness:
24.0 mm (0.94 in)

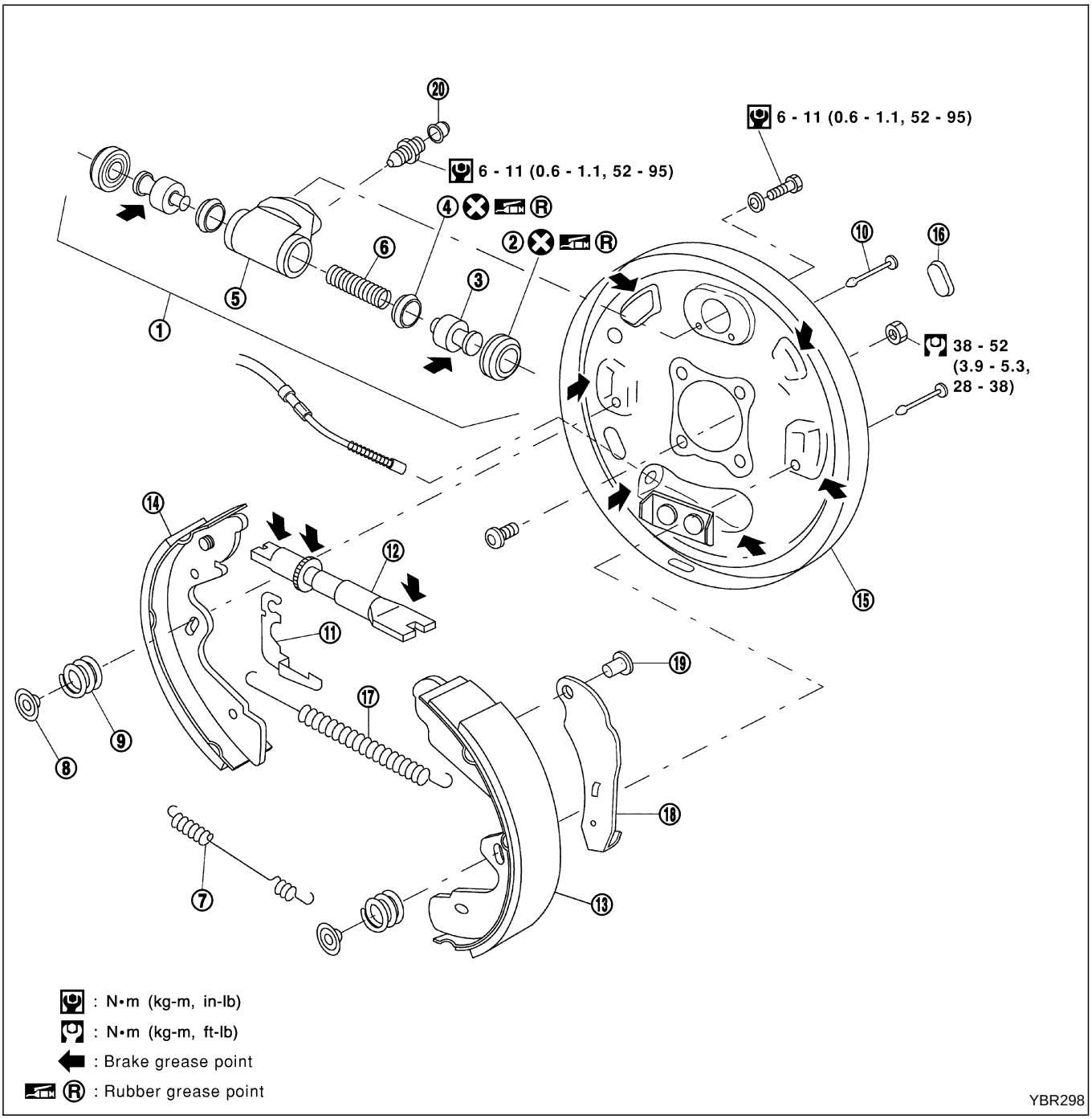


Installation

CAUTION:

- **Refill with new brake fluid “DOT 4”.**
- **Never reuse drained brake fluid.**

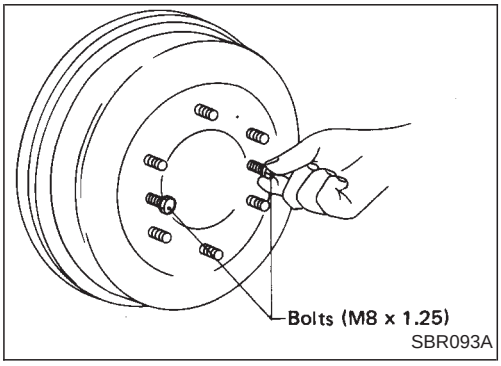
1. Install caliper assembly.
2. Install brake hose to caliper securely taking care that brake hose is not trapped between any suspension part and that hoses are not twisted.
3. Bleed air. Refer to “Bleeding Brake System”, “BRAKE HYDRAULIC LINE”, BR-8.



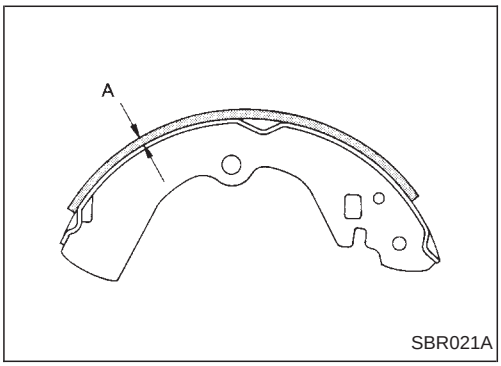
① Wheel cylinder assembly
② Boot
③ Piston
④ Piston cup
⑤ Cylinder body
⑥ Spring
⑦ Retaining shoe spring
⑧ Hold down retainer
⑨ Shoe hold-down spring
⑩ Shoe hold-down pin
⑪ Pawl
⑫ Adjuster assembly
⑬ Trailing shoe
⑭ Leading shoe
⑮ Back plate
⑯ Plug
⑰ Shoe return spring
⑱ Toggle lever
⑲ Pin
⑳ Dust cap

Removal

WARNING:
Clean brake lining with a vacuum dust collector.
CAUTION:
Make sure parking brake lever is released completely.



1. Release parking brake lever fully, then remove drum.
If drum is hard to remove, screw two bolts in the provided holes of the drum and tighten them gradually.
If the drum cannot be removed after carrying out this operation, refer to “Inspection”, “PARKING BRAKE CONTROL”, BR-35.

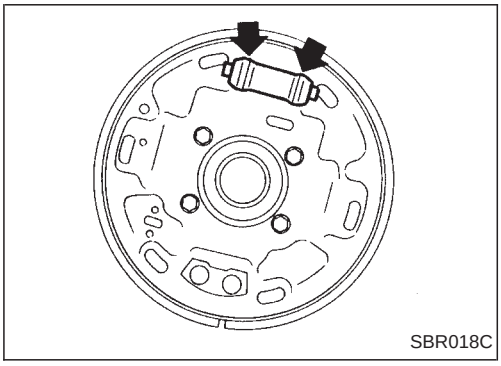


SBR021A

Shoe Replacement

When installing new shoes, springs should be changed as well. Check lining thickness.

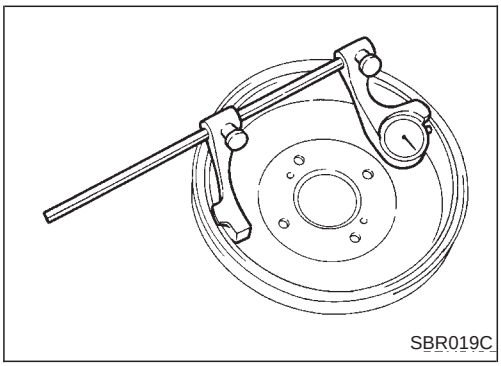
Standard lining thickness:
Trailing: 3.95 mm (0.156 in)
Leading: 8.95 mm (0.352 in)
Lining wear limit (A):
1.52 mm (0.0598 in)


SBR018C

Inspection

WHEEL CYLINDER

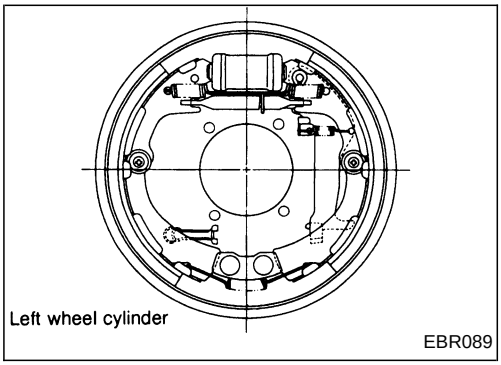
- Check wheel cylinder for leakage.
- Check for wear, damage and loose conditions. Replace if any such condition exists.


SBR019C

DRUM

Maximum inner diameter:
282 mm (11.10 in)
Out of roundness:
0.05 mm (0.019 in) or less

- Contact surface should be fine finished with No. 120 to 150 emery paper.
- If any scratches or wear are detected, adjust the alignment of the drum.
- After brake drum has been completely reconditioned or replaced, check drum and shoes for proper contact pattern.



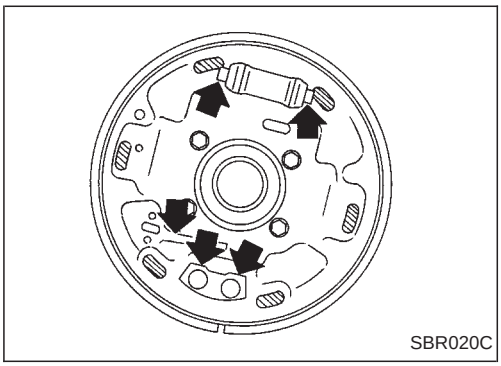
EBR089

Installation

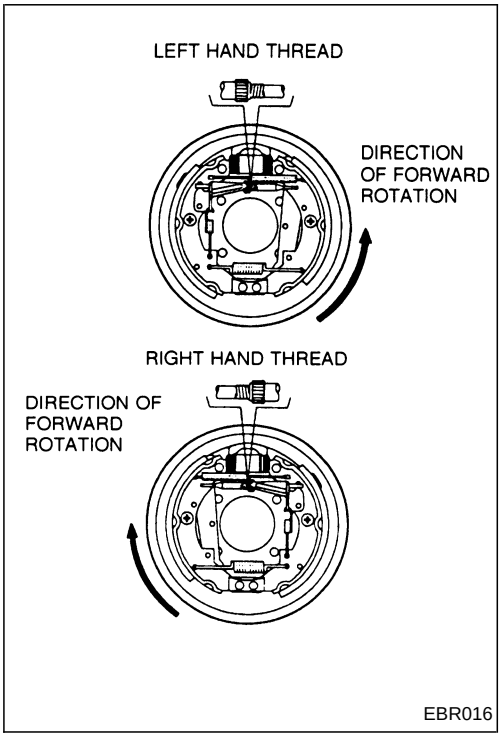
Always perform shoe clearance adjustment. Refer to “Adjustment”, “PARKING BRAKE CONTROL”, BR-35.

1. Fit adjuster assembly.

Installation (Cont'd)


SBR020C

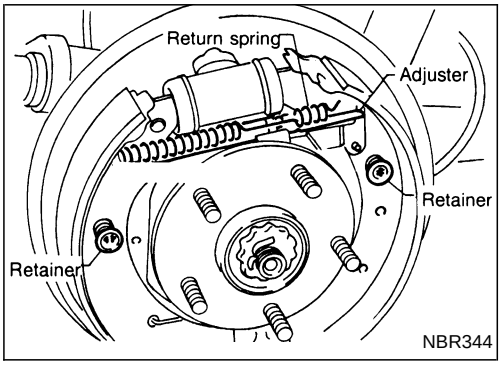
2. Apply brake grease to the contact areas shown at left.



EBR016

3. Shorten adjuster by rotating it, so that shoe outer diameter is 279 - 279.5 mm (10.98 - 11 in).

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

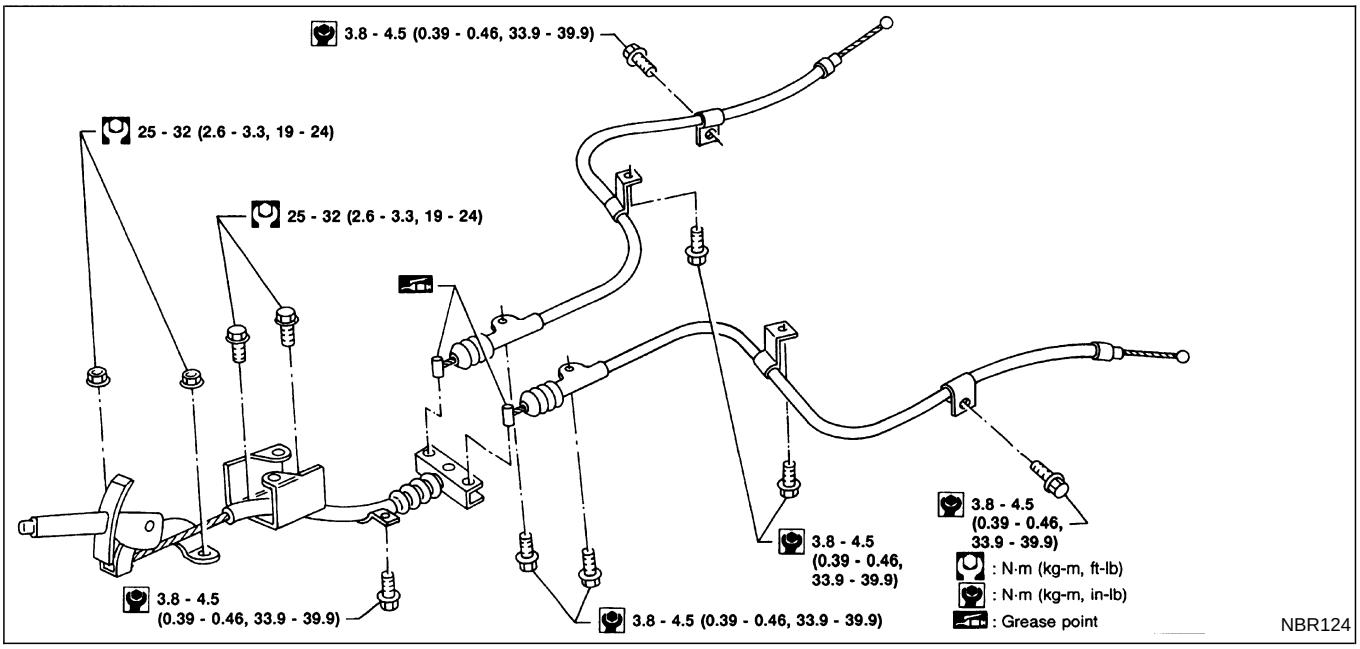


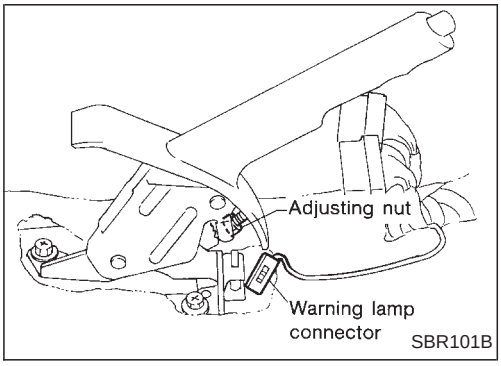
NBR344

4. Connect parking brake cable to toggle lever.
5. Install all parts.
6. Check all parts are installed properly.

Pay attention to direction of adjuster assembly.

7. Install brake drum.
8. When installing new wheel cylinder or overhauling wheel cylinder, bleed air. Refer to "Bleeding Brake System", "BRAKE HYDRAULIC LINE", BR-8.
9. At completion, apply brake pressure by pressing the brake pedal approximately 20 times at half stroke.



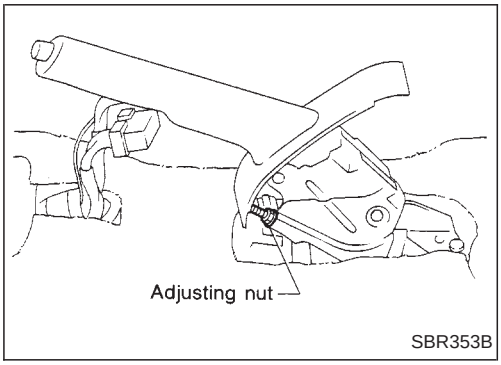


Removal and Installation

1. To remove parking brake cable, first remove center console.
2. Disconnect warning lamp connector.
3. Remove bolts, slacken off and remove adjusting nut.

Inspection

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



Adjustment

1. Adjust clearance between shoe and drum as follows:

a. Release parking brake lever and loosen adjusting nut.
b. Depress brake pedal fully at least 10 times with engine running.

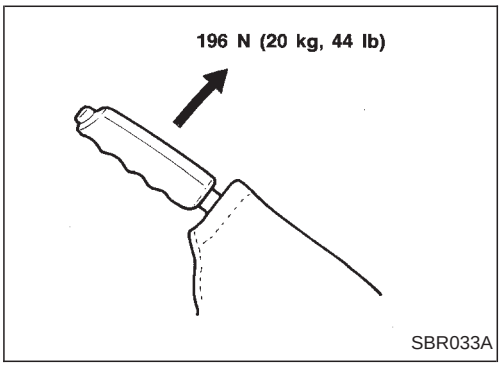
2. Apply the handbrake, allowing the handbrake grip to move 6 notches. You can adjust the handbrake travel by using the adjusting nut. To complete this adjustment, you will need a dynamo meter to check the amount of load required to move from 9 to 10 notches. If the load exceeds 20 kg, the cable will have to be loosened with the help of the adjusting nut.

Number of notches:

9 - 10

If the load is less than 20 kg, the cable should be tightened.

Adjustment (Cont'd)



3. Apply the handbrake, using the specified pressure. Check the travel to see that the handbrake is working smoothly.

4. Bend parking brake warning lamp switch plate so that brake warning lamp comes on when parking brake lever is pulled "A" notches.
   Number of "A" notches: 1 or less

Purpose

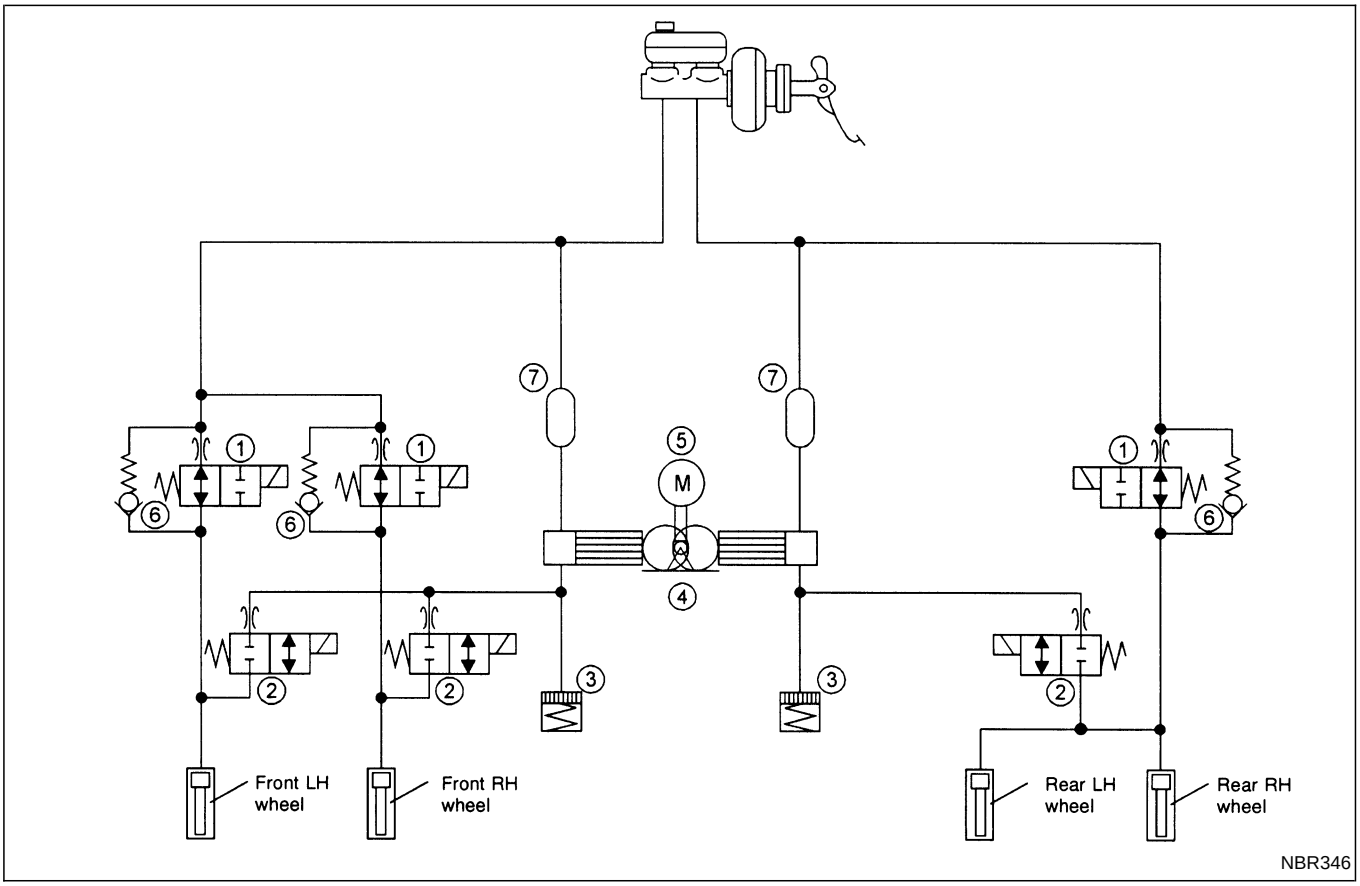
The Anti-lock Brake System (ABS) with an integrated Electronic Brake force Distribution (EBD) system consists of electronic and hydraulic components. It allows you to control the braking force so that wheel lock can be avoided during braking.

The advantages of ABS with EBD
1) Better tracking performance through improved steering wheel control.
2) Improved maneuverability and safer vehicle control.
3) Improved vehicle stability by preventing flat spins.
4) Shorter stopping distance and optimal utilisation of the rear brakes under many different circumstances.

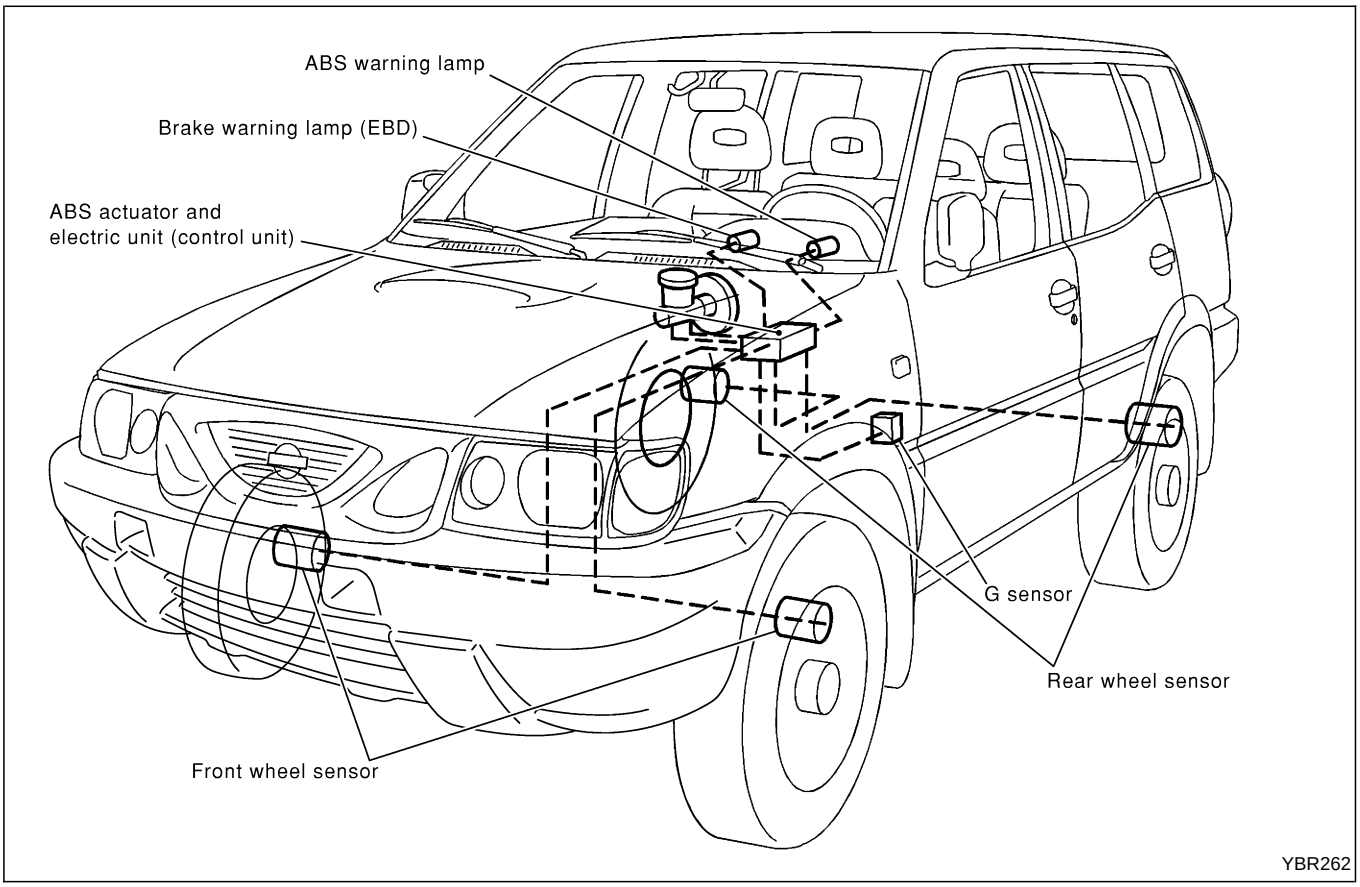
Operation

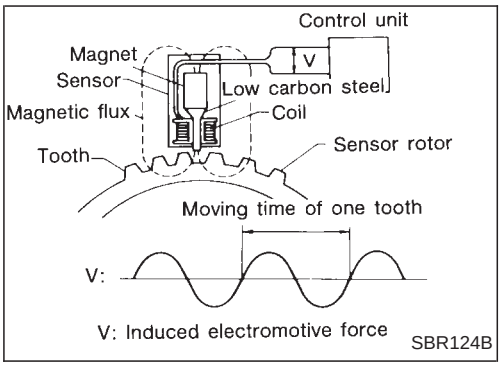
- ABS with EBD has self-test capabilities. The ABS warning lamp is illuminated for 1 second each time the ignition switch is turned “ON”. After the engine is started, the ABS warning lamp turns off. An ABS self-test is performed the first time the vehicle reaches 6 km/h (4 MPH) to ensure the system is operational. A mechanical noise may be heard as the ABS performs this self-test and is a normal part of the self-test feature. If a malfunction is detected during this check, the ABS warning lamp will stay on.
  During the self-test, it also performs a EBD check when it detects a failure the ABS warning light will go on simultaneously with the brake warning light and an audible sound will sound constantly.
- EBD system will only operate when the ABS is not in active status and it uses the inlet valves of ABS control unit to limit the pressure to the rear wheels when they tend to go into slip.
- When the vehicle speed is less than 10 km/h (6 MPH) the ABS system does not operate.
- While driving, a mechanical noise may be heard during ABS operation, this is a normal system condition.

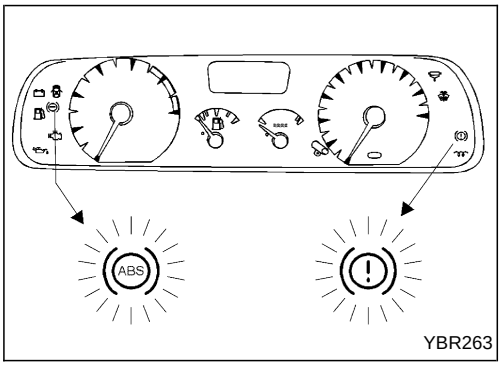
ABS Hydraulic Circuit



① Inlet solenoid valve
② Outlet solenoid valve
③ Reservoir
④ Pump
⑤ Motor
⑥ By pass check valve
⑦ Damper







System Description

Sensor

The sensor unit consists of a gear-shaped sensor rotor and a sensor element. The element contains a bar magnet around which a coil is wound. The sensor is installed on the back of the brake rotor and the rear brake drum.
As the wheel rotates, the sensor generates a sine-wave pattern. The frequency and voltage increase(s) as the rotating speed increases.

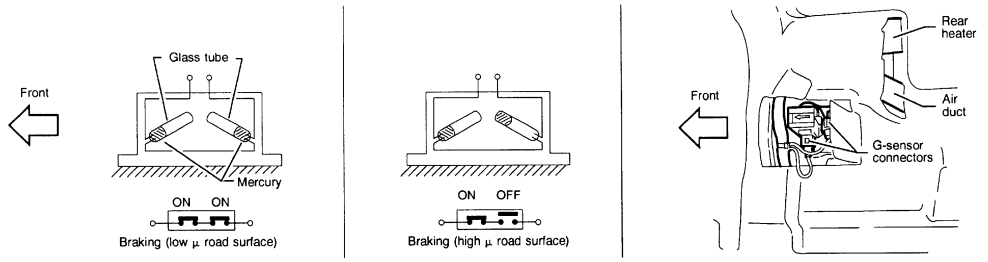
Control unit

The control unit computes the wheel rotating speed by the signal current sent from the sensor. Then it supplies a DC current to the actuator solenoid valve. It also controls ON-OFF operation of the valve relay and rotor relay. If any electrical malfunction should be detected in the ABS or EBD system, the control unit causes the warning lamp(s) to light up, combined with an audible sound.
In this condition, the ABS or EBD will be deactivated by the control unit, and the vehicle's brake system reverts to normal operation. (Fail-safe mode)

System Description (Cont'd)

G SENSOR

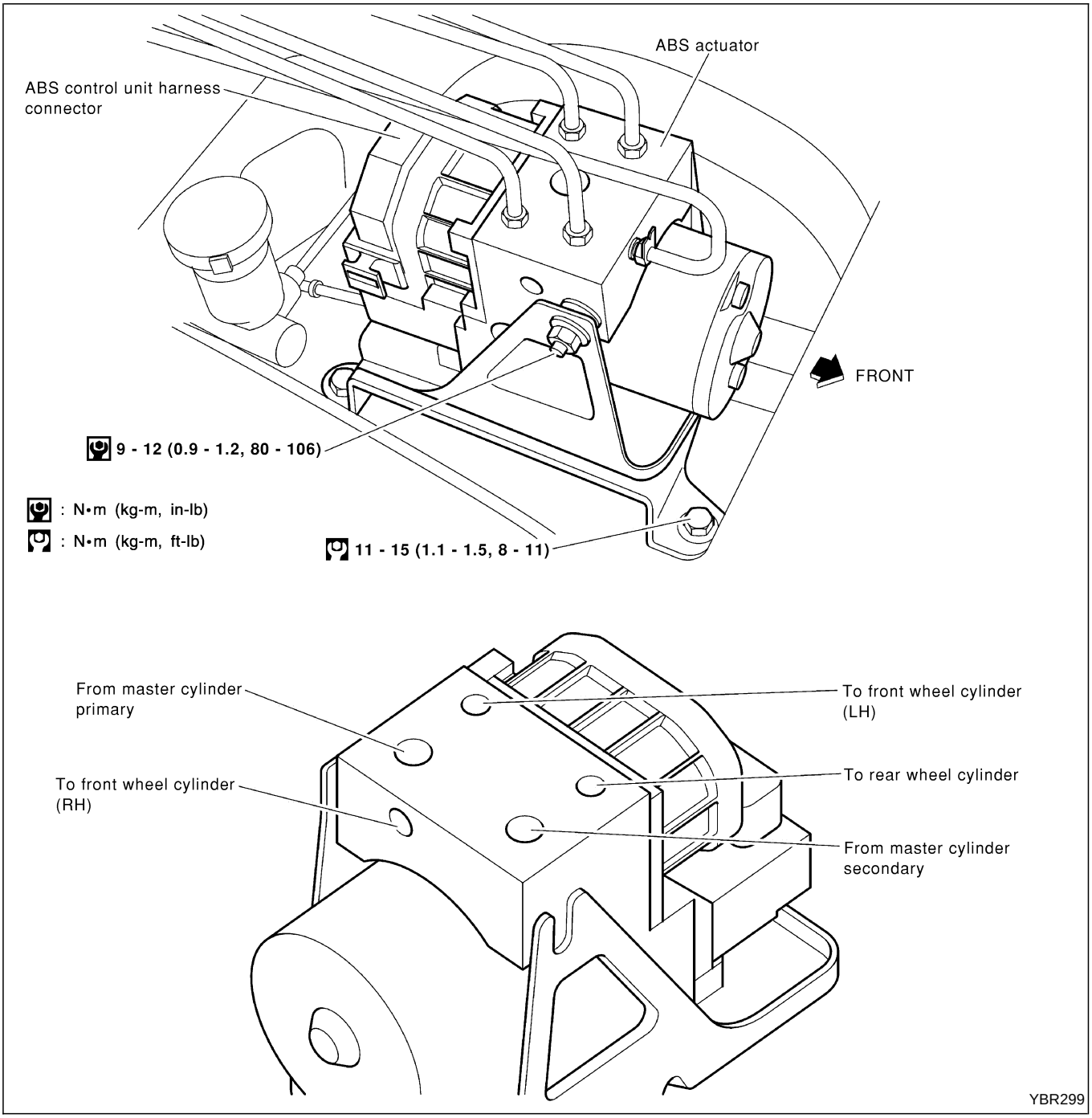
The G sensor analyses deceleration during braking to determine whether the vehicle is being driven on a road with low surface resistance (μ) (snow-covered road, etc.). The ABS control unit uses the signal from the deceleration sensor to compensate for road surface conditions when controlling the braking operation.



NBR136

System Description (Cont'd)

ACTUATOR AND ELECTRIC UNIT



The actuator and electric 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

These components control the hydraulic circuit. The ABS control unit directs the actuator to increase, hold or decrease hydraulic pressure to all or individual wheels. The ABS actuator and electric unit cannot be disassembled and has to be serviced as an assembly.

System Description (Cont'd)

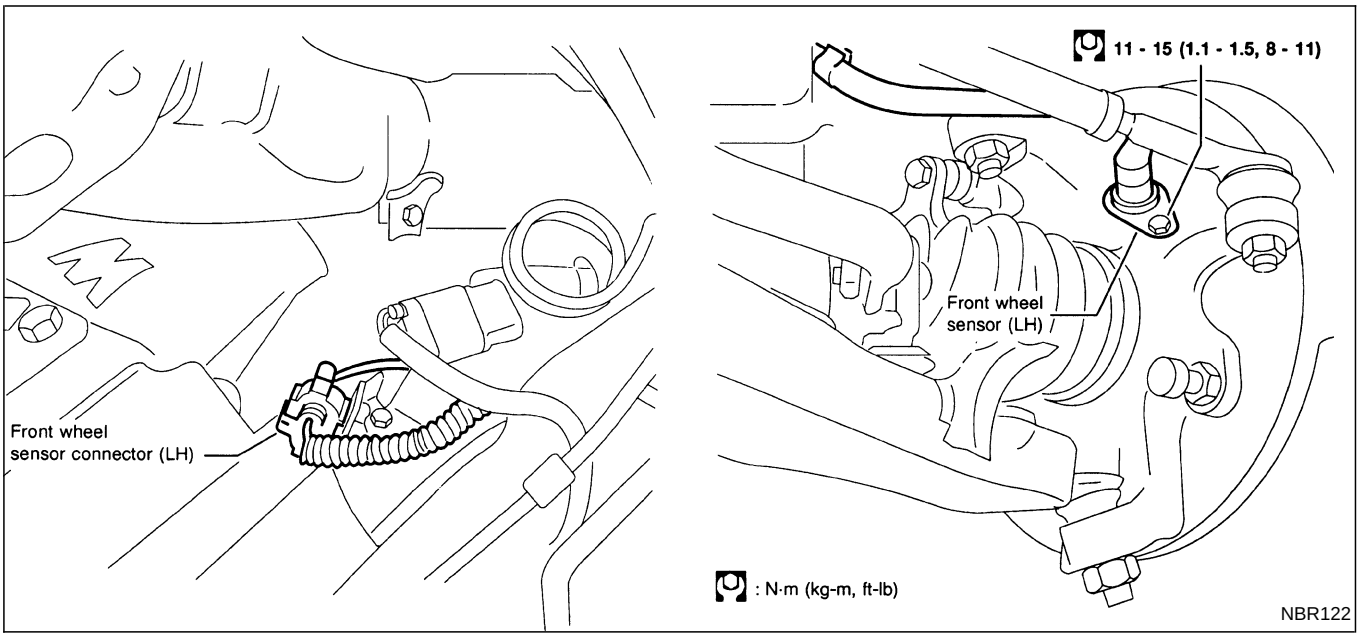
ABS actuator operation

		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 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.

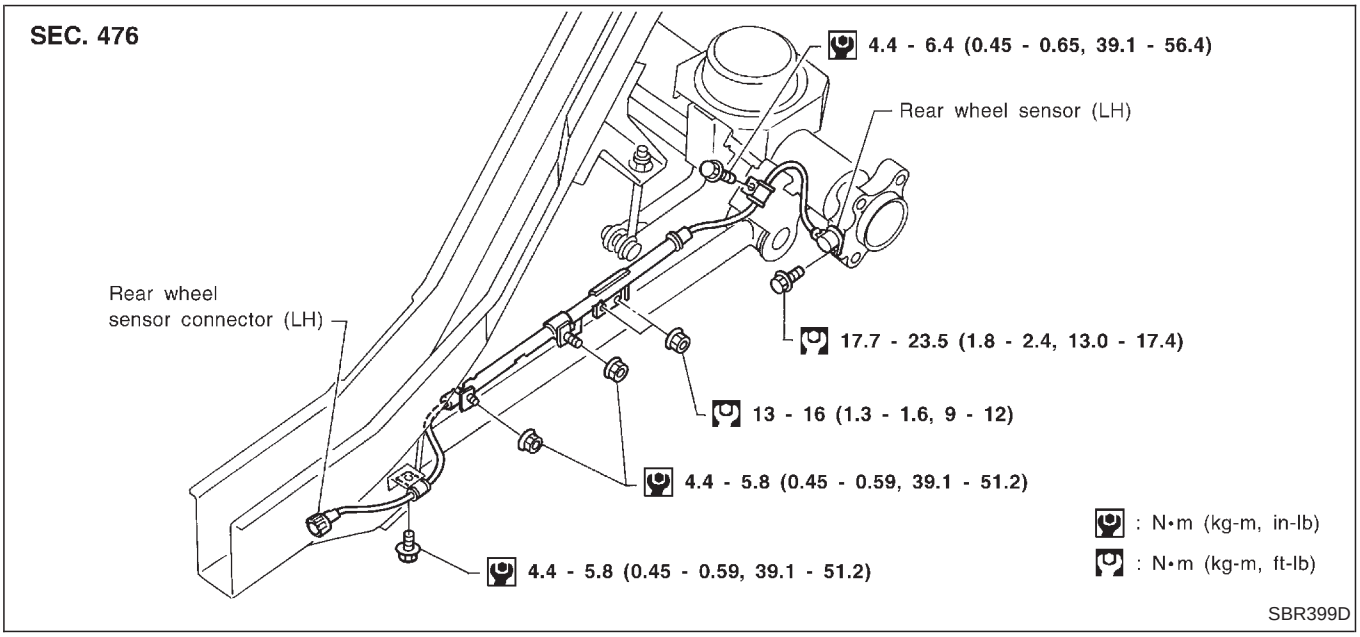
Removal and Installation

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

FRONT WHEEL SENSOR

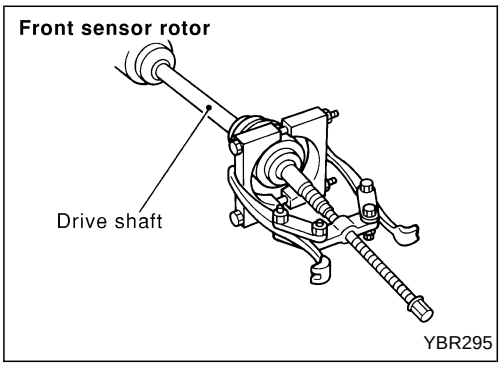


REAR WHEEL SENSOR



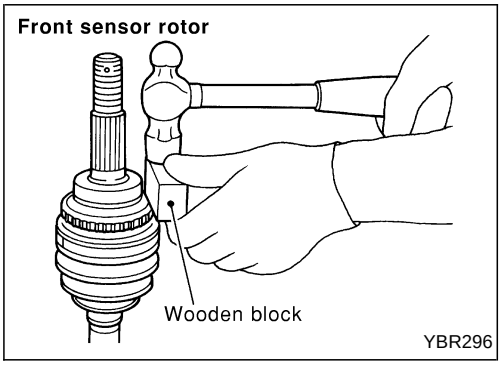
Removal and Installation (Cont'd)

FRONT SENSOR ROTOR



Removal

1. Remove the drive shaft and rear wheel hub. Refer to "Front axle — drive shaft" in FA section and "Rear axle" in RA section.
2. Remove the sensor rotor using suitable puller, drift and bearing replacer.



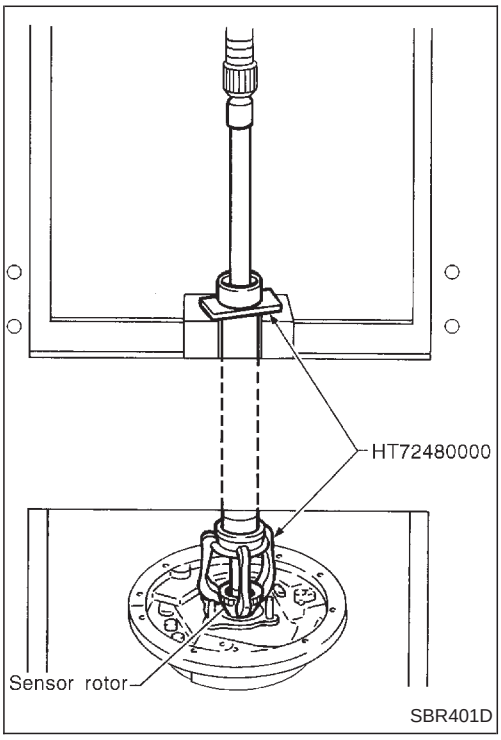
Installation

Install the sensor rotor. For front sensor rotor, use hammer and wooden block. For rear sensor rotor, use suitable drift and press.

- Always replace sensor rotor with new one.

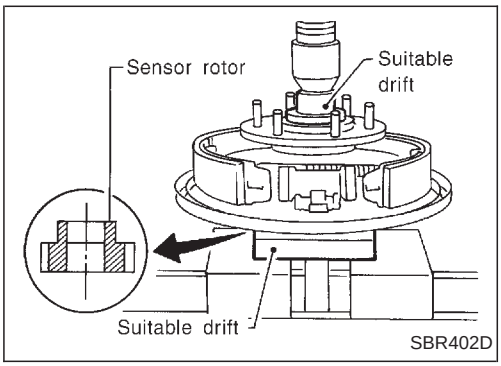
Removal and Installation (Cont'd)

REAR SENSOR ROTOR



Removal

- Remove the sensor rotor using Tool.

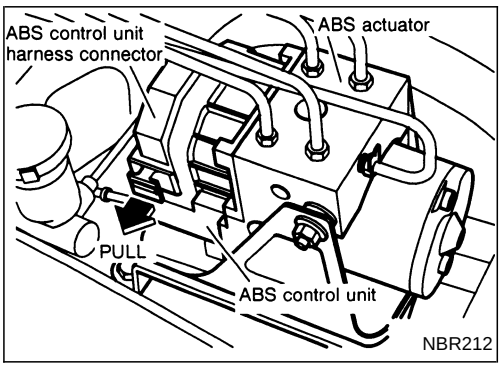


Installation

Install the sensor rotor using suitable drift and press.

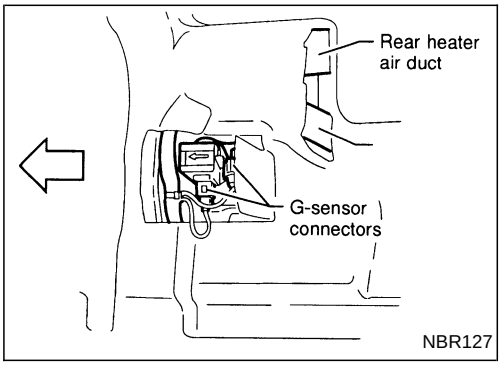
- Always replace sensor rotor with new one.
- Pay attention to the direction of front sensor rotor as shown in figure.

CONTROL UNIT



Location: Built-in ABS actuator.
When disconnecting the harness connector, pull the lever as shown in figure.

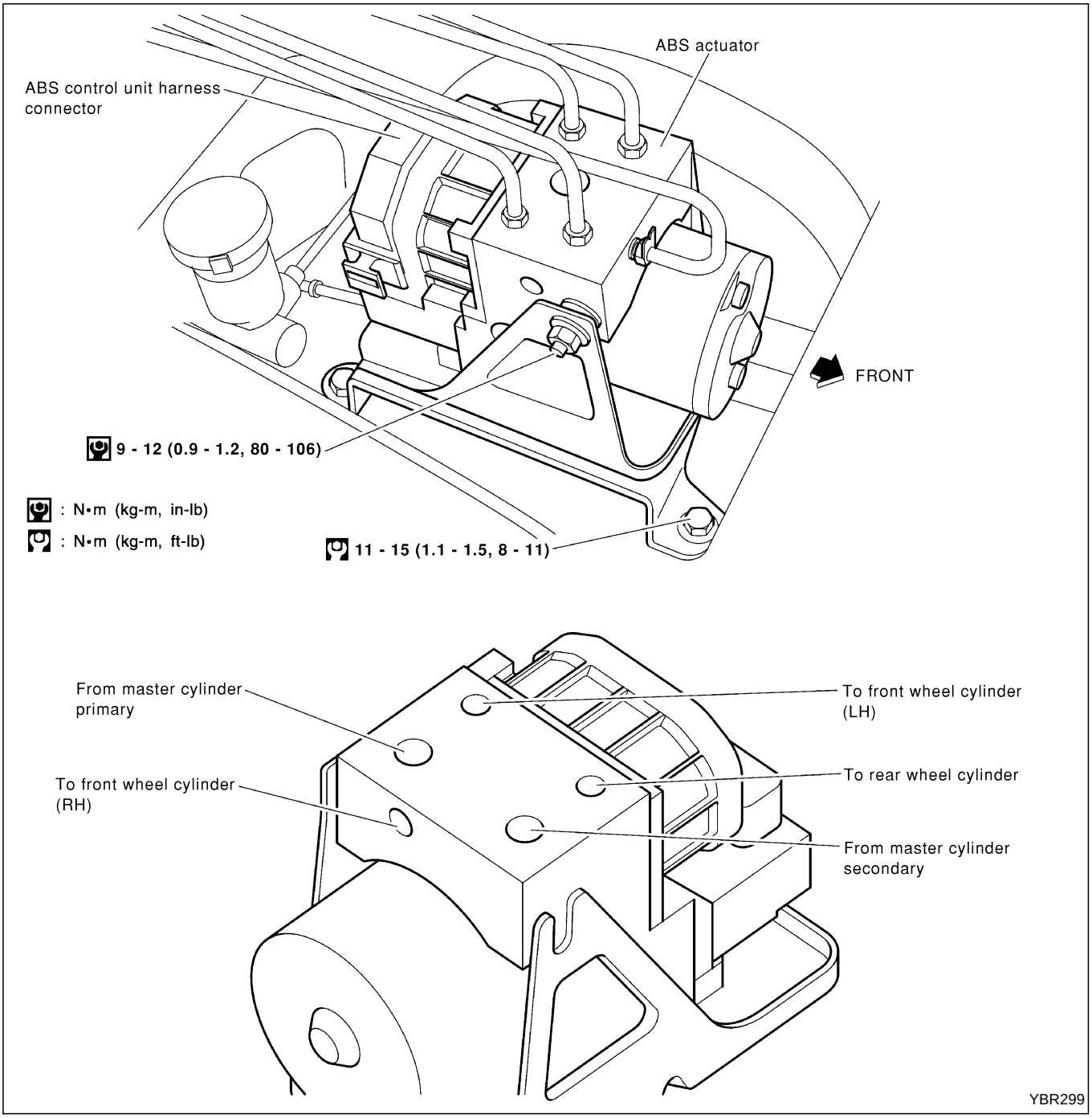
G SENSOR



Always replace G sensor if bumped or dropped. Otherwise, performance characteristics of G sensor will be changed, which in turn alters ABS control performance characteristics.

Removal and Installation (Cont'd)

ACTUATOR



Removal

1. Disconnect battery cable.
2. Drain brake fluid. Refer to BR-5.
3. Unlock the slider then disconnect the electrical harness connectors from ABS control unit.
4. Identify each brake pipe with corresponding actuator port hole and mark them accordingly.
5. Disconnect brake pipes and move them away from actuator. Do not force brake pipes so as to kink them or bend them excessively.
   Ensure that brake fluid does not come into contact with any parts.

Removal and Installation (Cont'd)

6. Loosen/remove mounting nuts between actuator and bracket.

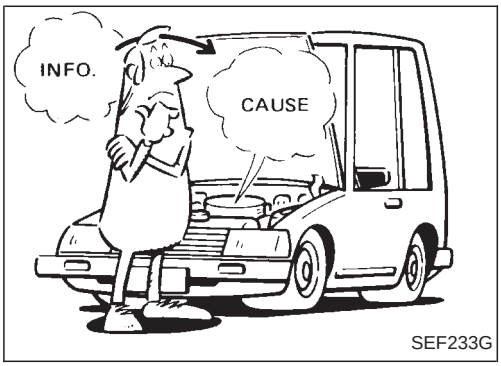
Installation

CAUTION:

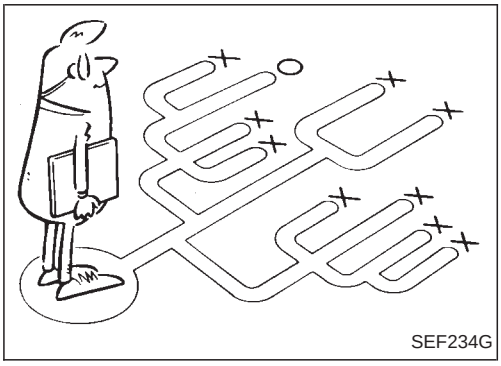
After installation, pay attention to the following points:

- **Refill brake fluid and bleed air. Refer to "CHECK AND ADJUSTMENT", BR-5 and "Bleeding Brake System", "BRAKE HYDRAULIC LINE", BR-8, respectively.**

1. Install actuator on bracket without tightening fixings.
2. Assemble brake tubes to actuator without tightening tube nuts. Ensure that correct tubes are connected to each port.
3. Fully tighten actuator and bracket fixings to specified torque.
4. Fully tighten flare nuts to specified torque, BR-9.
5. Secure ABS control unit harness connector and battery cable.



SEF233G


SEF234G

How to Perform Trouble Diagnoses for Quick and Accurate Repair

INTRODUCTION

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

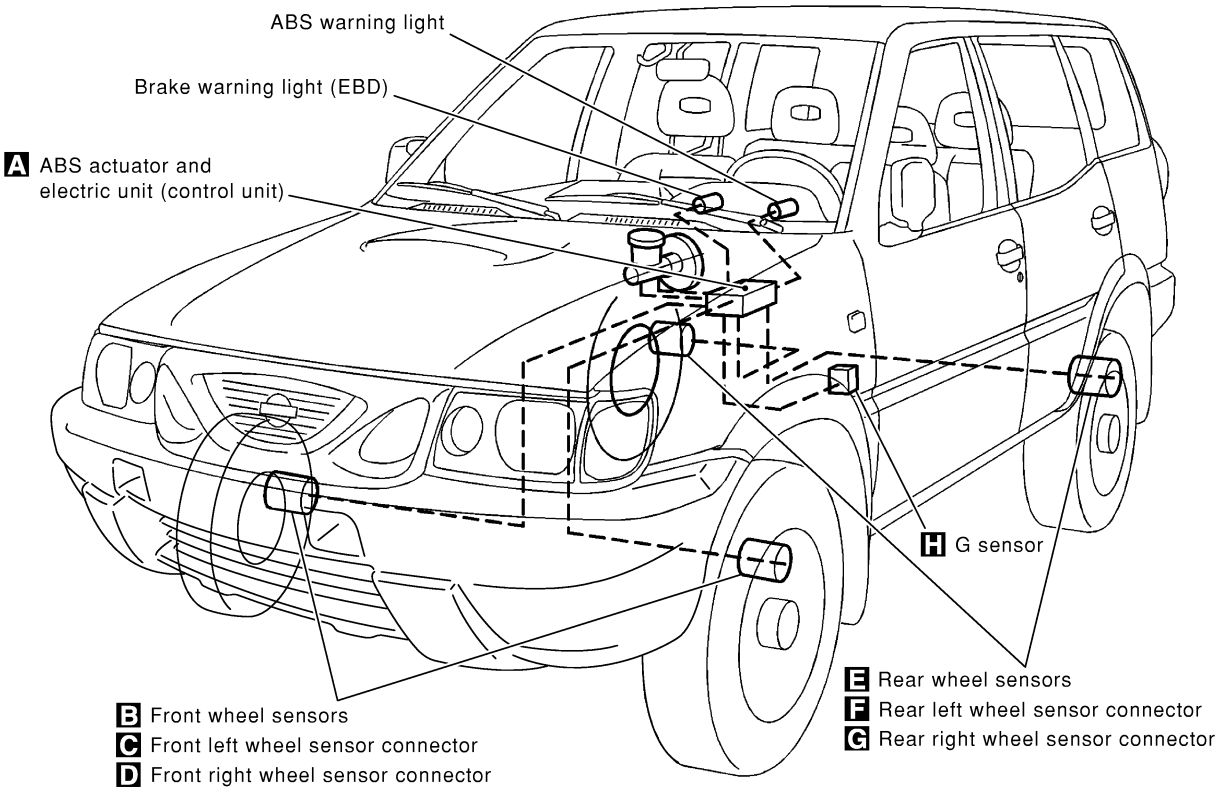
It is much more difficult to diagnose a problem that occurs intermittently rather than catastrophically. Most intermittent problems are caused by poor electric connections or faulty wiring. In this case, careful checking of suspicious circuits may help prevent the replacement of good parts.

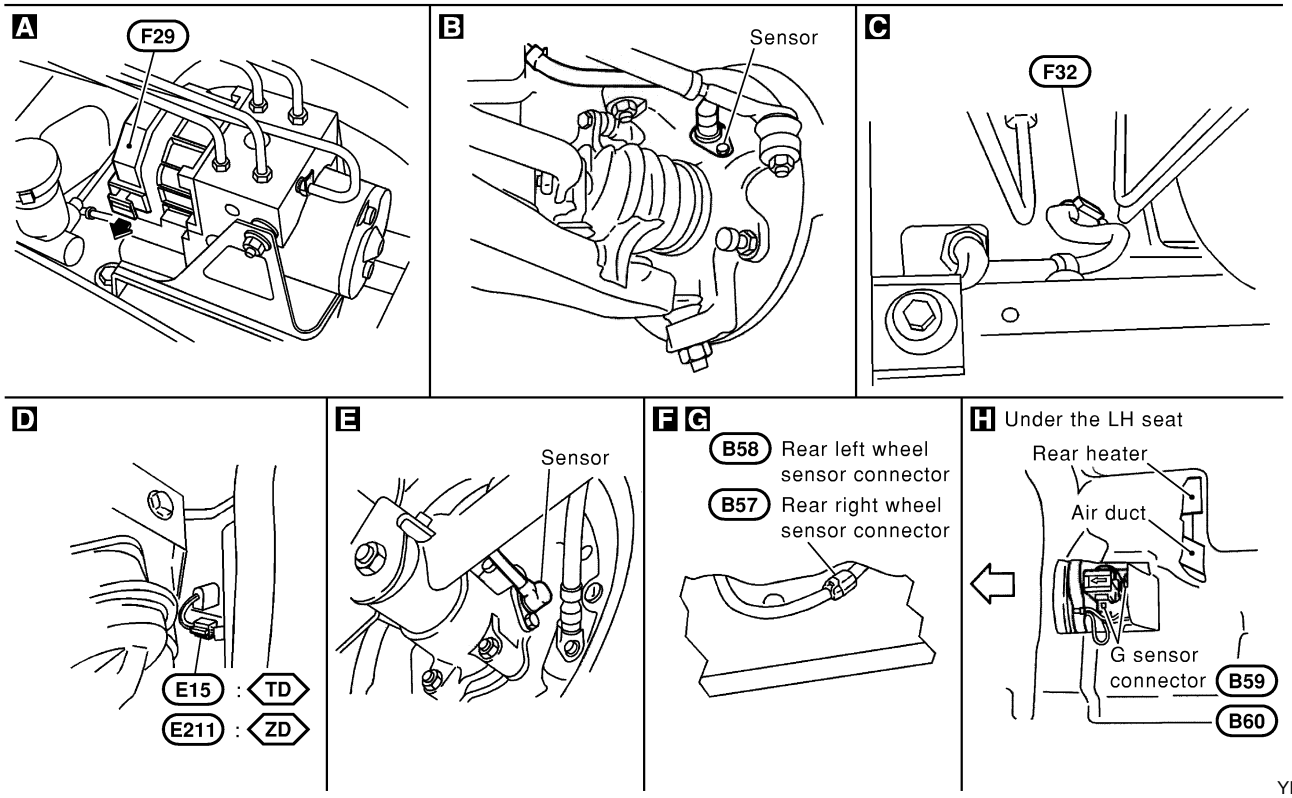
A visual check may not be sufficient to determine the cause of the problems, so a road test should also be conducted.

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.

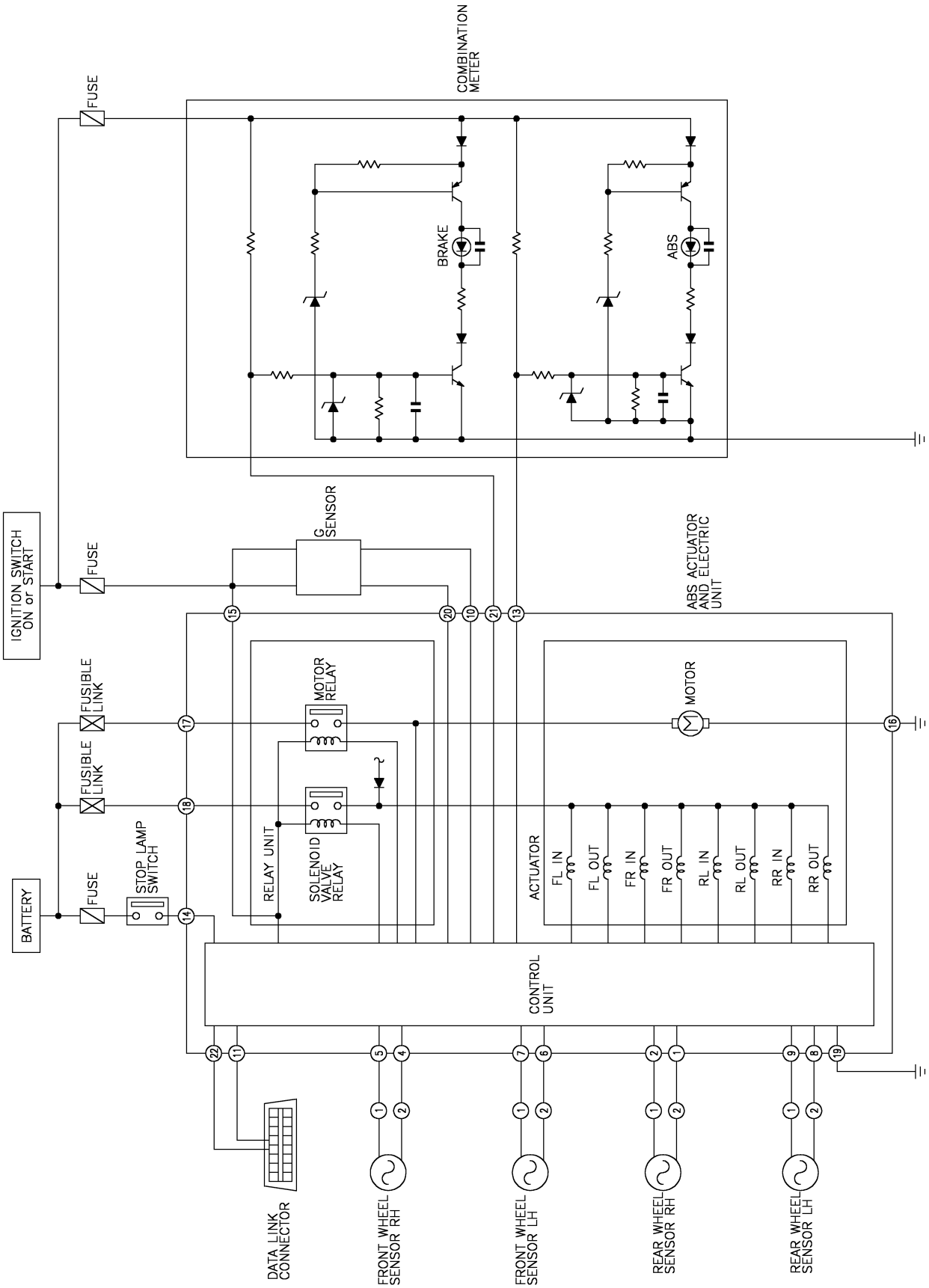
Component Parts and Harness Connector Location





YBR264

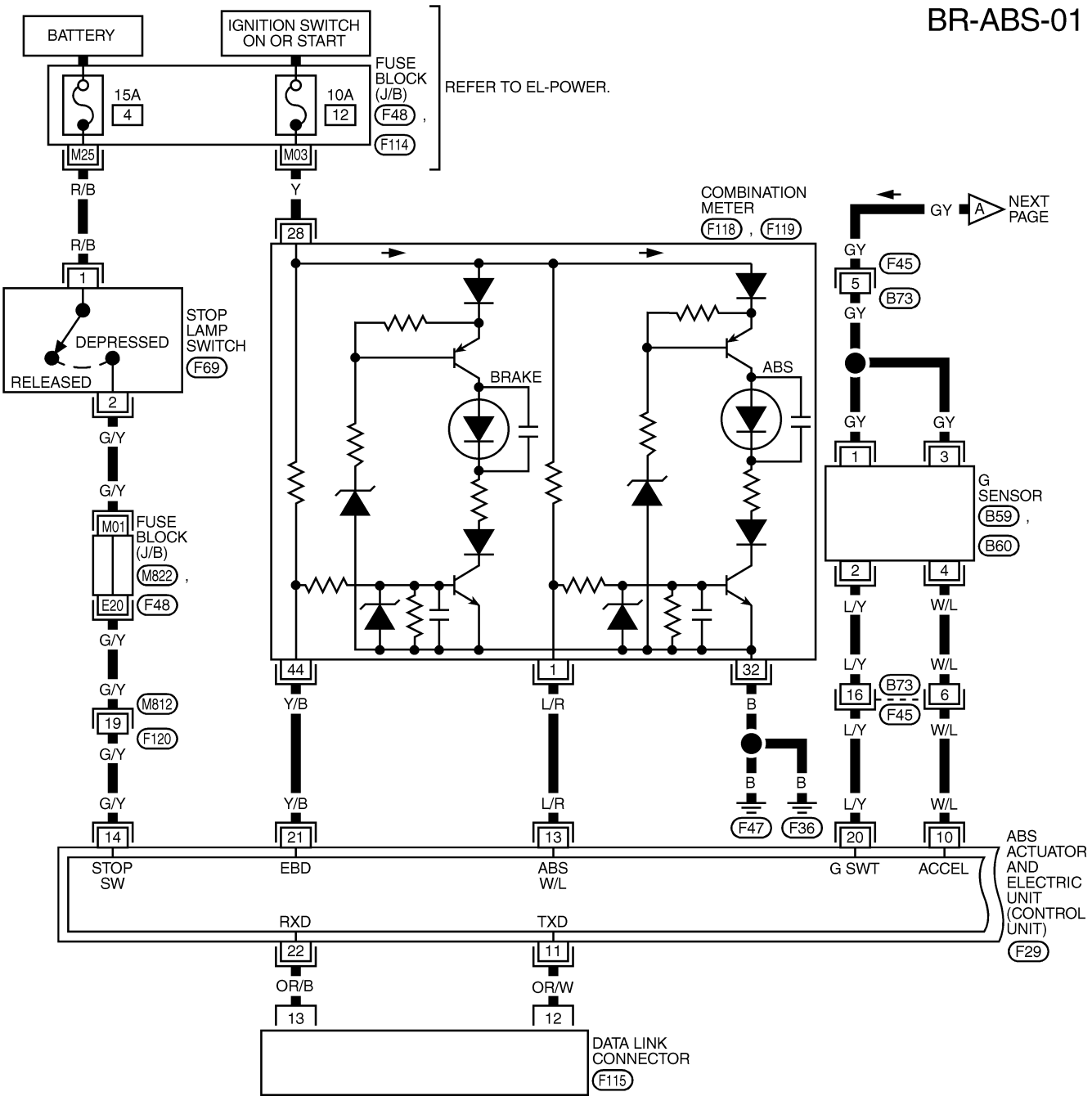
Circuit Diagram for Quick Pinpoint Check



YBR244

Wiring Diagram — ABS —

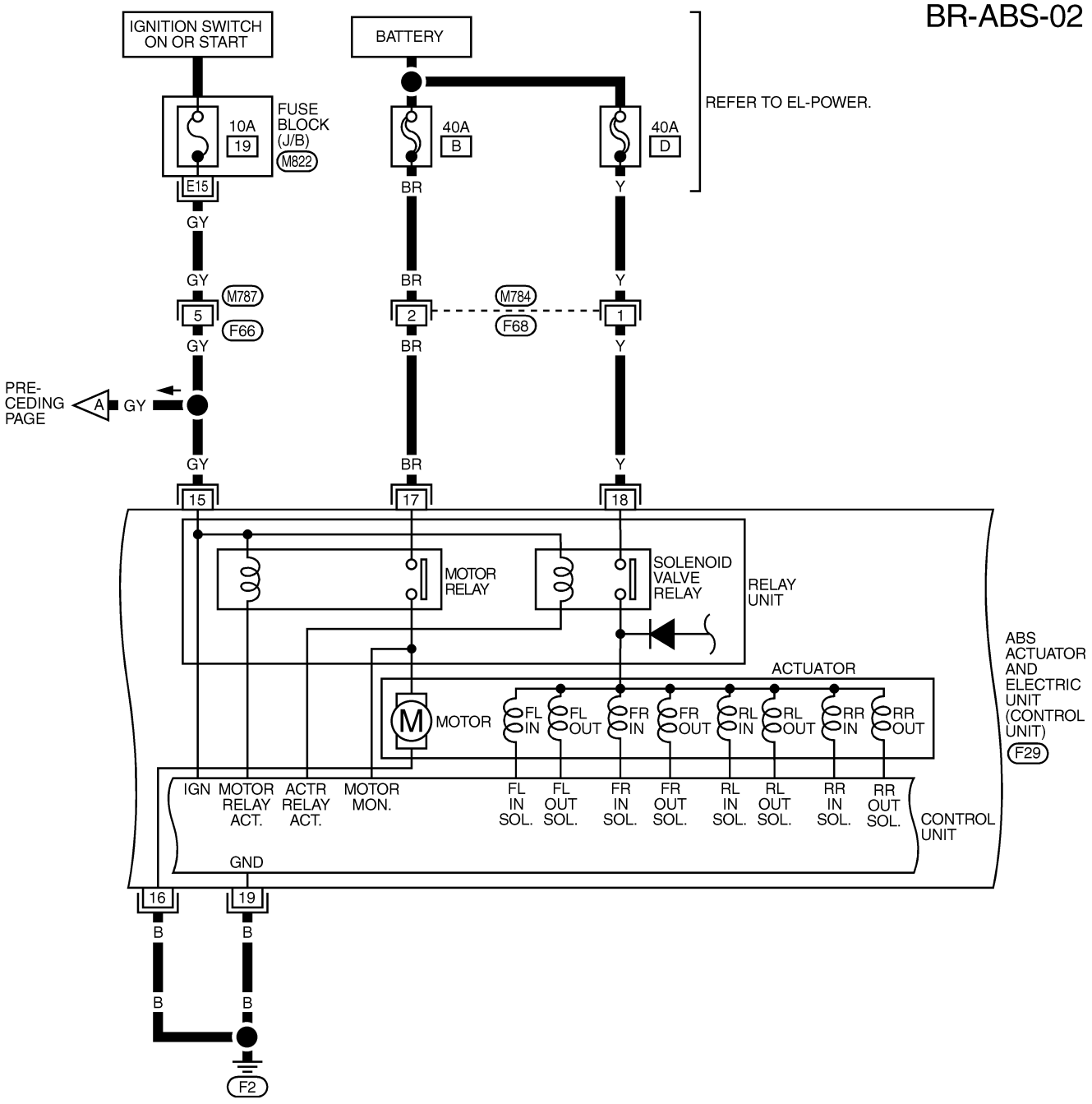
LHD MODELS

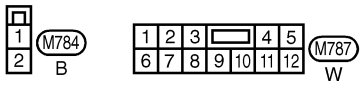


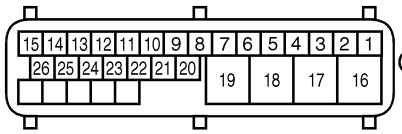
YBR245

Wiring Diagram — ABS — (Cont'd)

BR-ABS-02





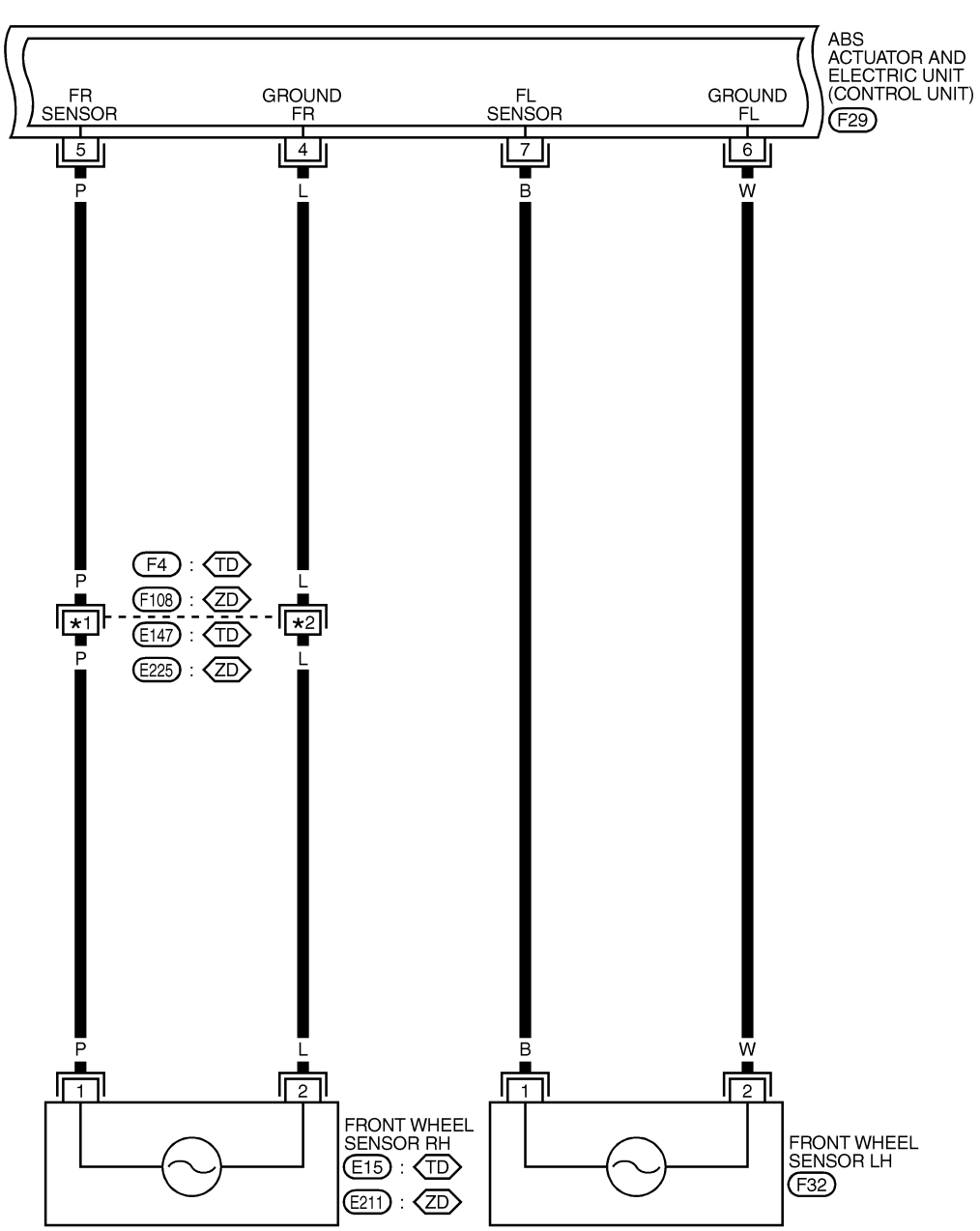


REFER TO THE FOLLOWING.
M822 -FUSE BLOCK-JUNCTION BOX (J/B)

YBR246

Wiring Diagram — ABS — (Cont'd)

BR-ABS-03

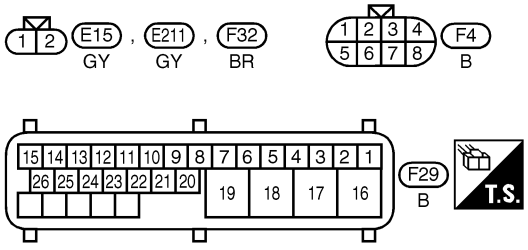


TD : TD27Ti ENGINE MODELS

ZD : ZD30DDTi ENGINE MODELS

*1 2 : TD
11 : ZD

*2 6 : TD
12 : ZD

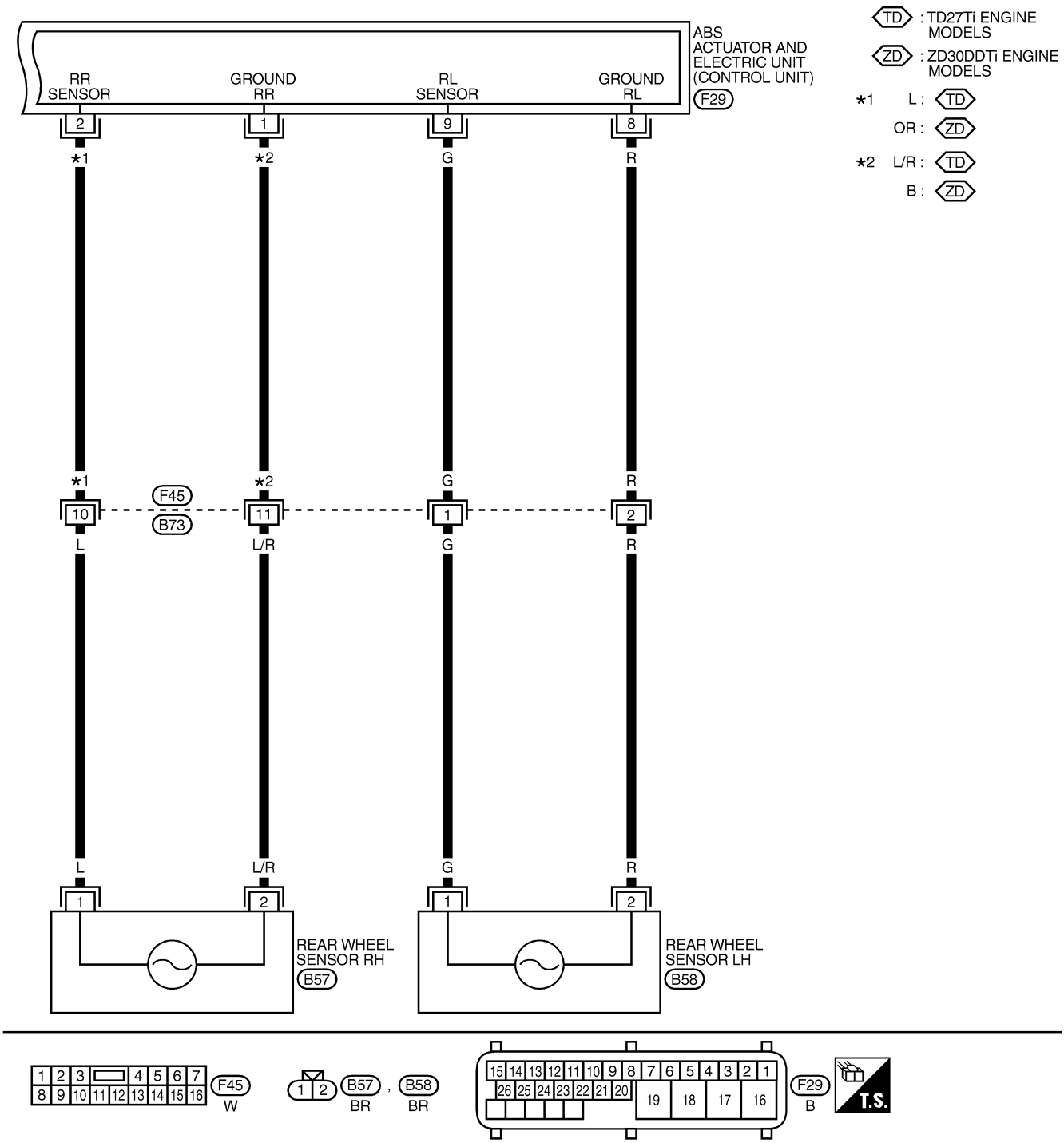


REFER TO THE FOLLOWING.
F108 -SUPER MULTIPLE JUNCTION (SMJ)

YBR247

Wiring Diagram — ABS — (Cont'd)

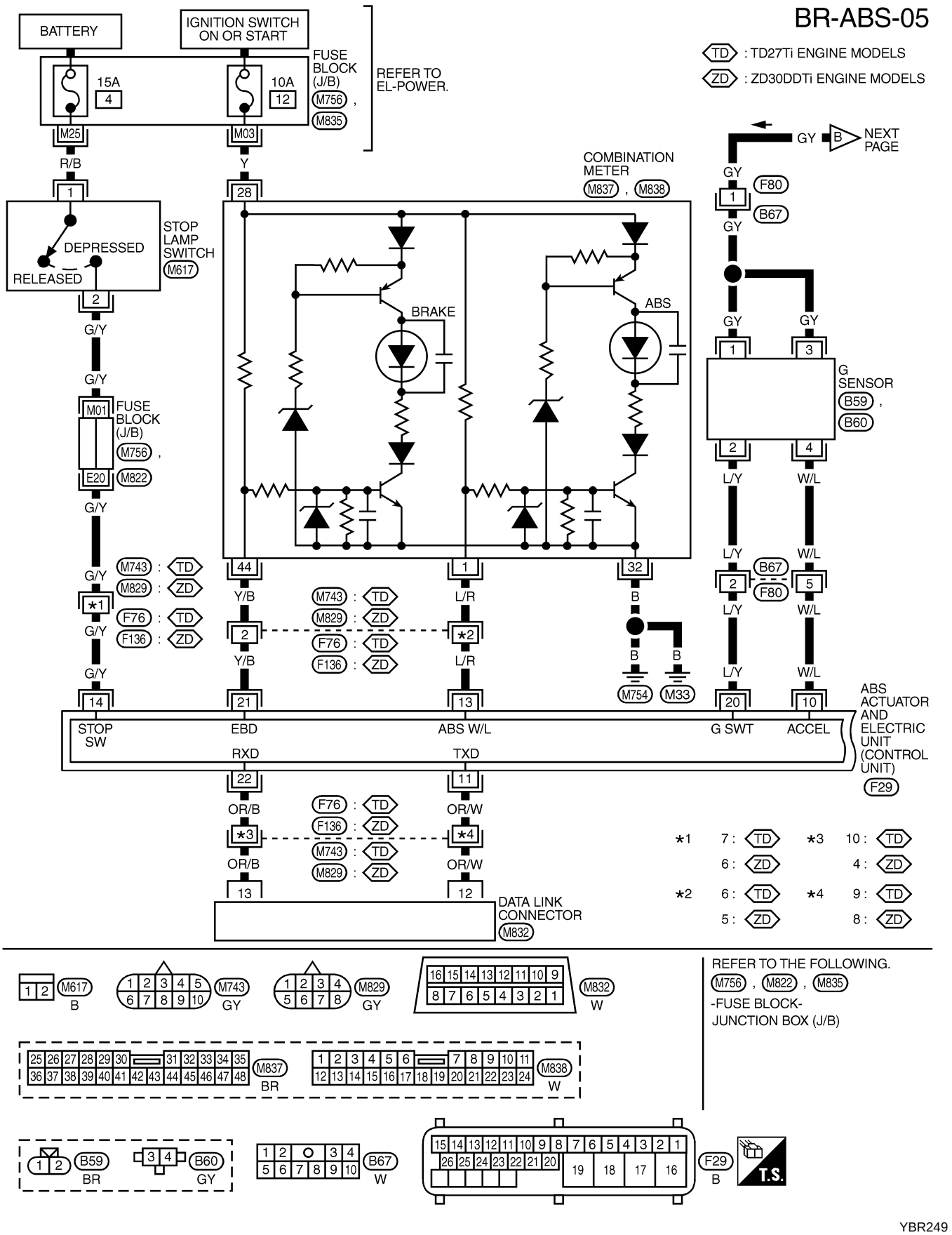
BR-ABS-04



YBR248

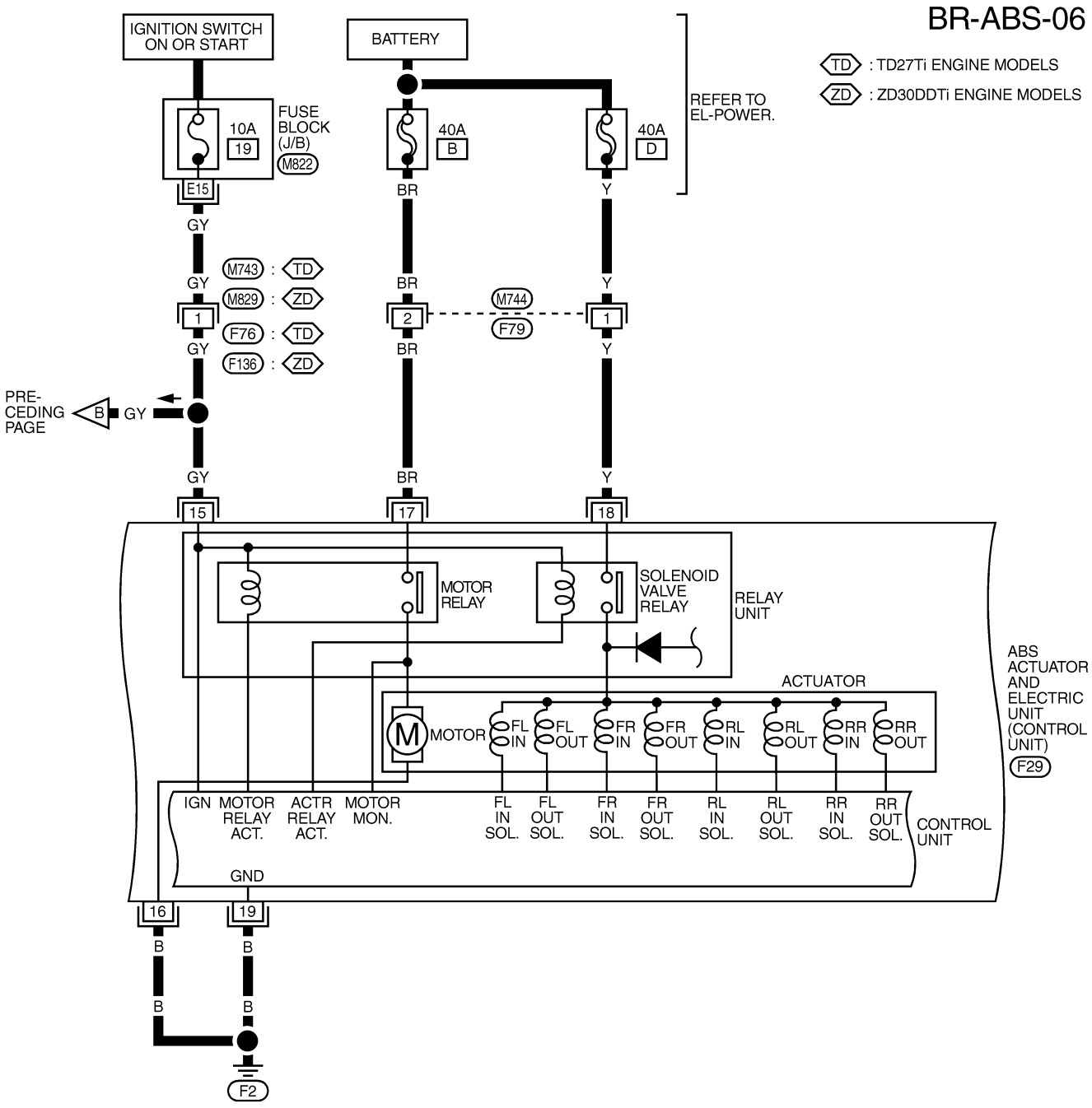
Wiring Diagram — ABS — (Cont'd)

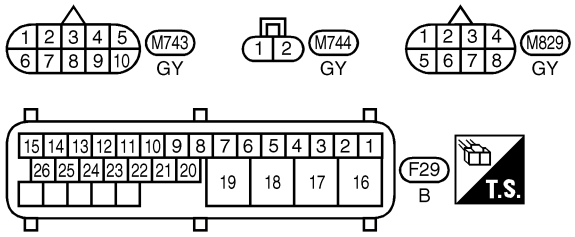
RHD MODELS



YBR249

Wiring Diagram — ABS — (Cont'd)



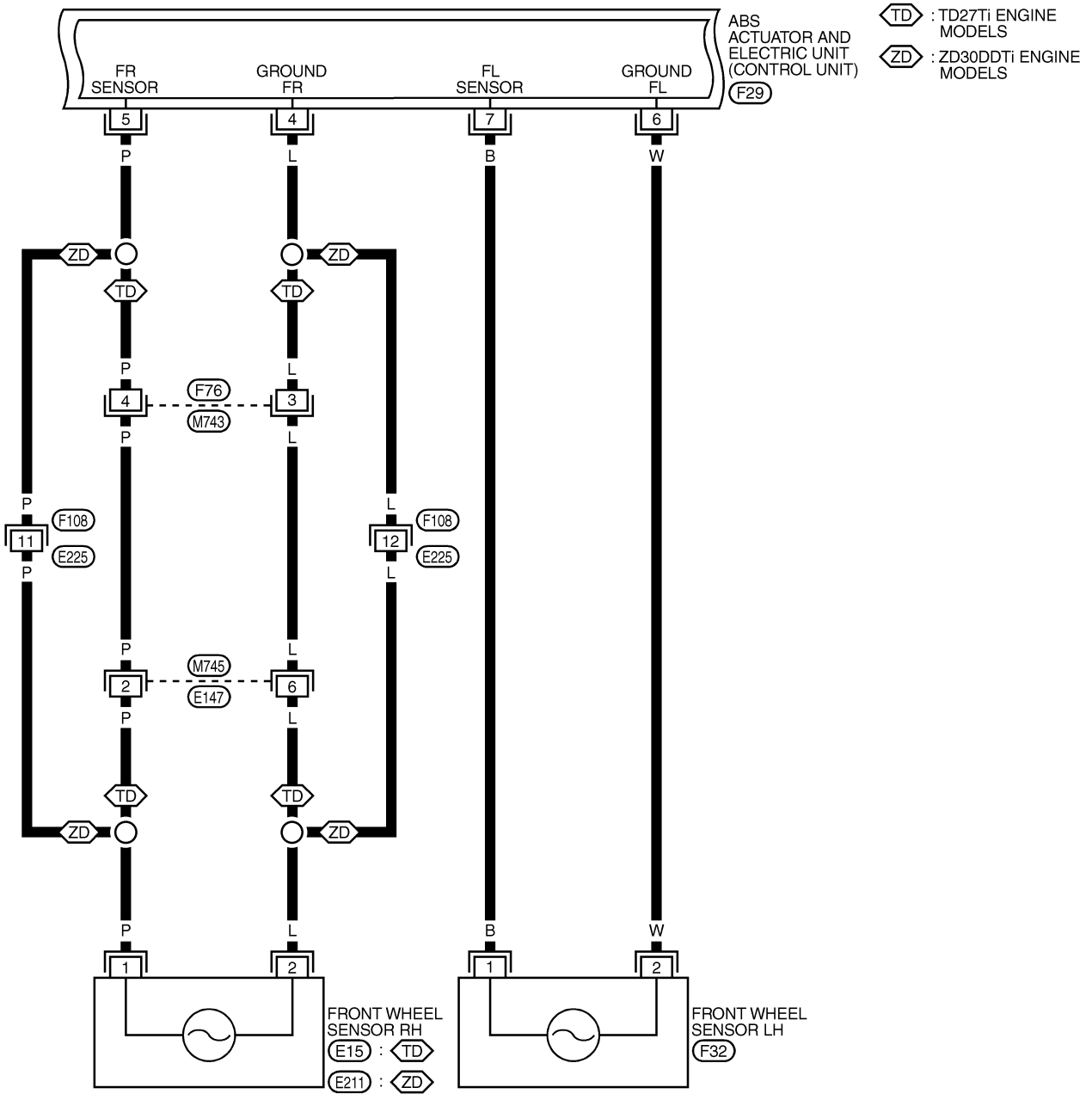


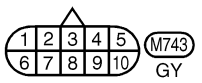
REFER TO THE FOLLOWING.
M822 -FUSE BLOCK-
JUNCTION BOX (J/B)

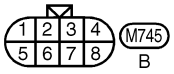
YBR250

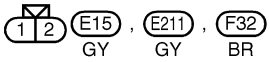
Wiring Diagram — ABS — (Cont'd)

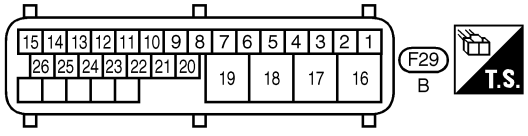
BR-ABS-07









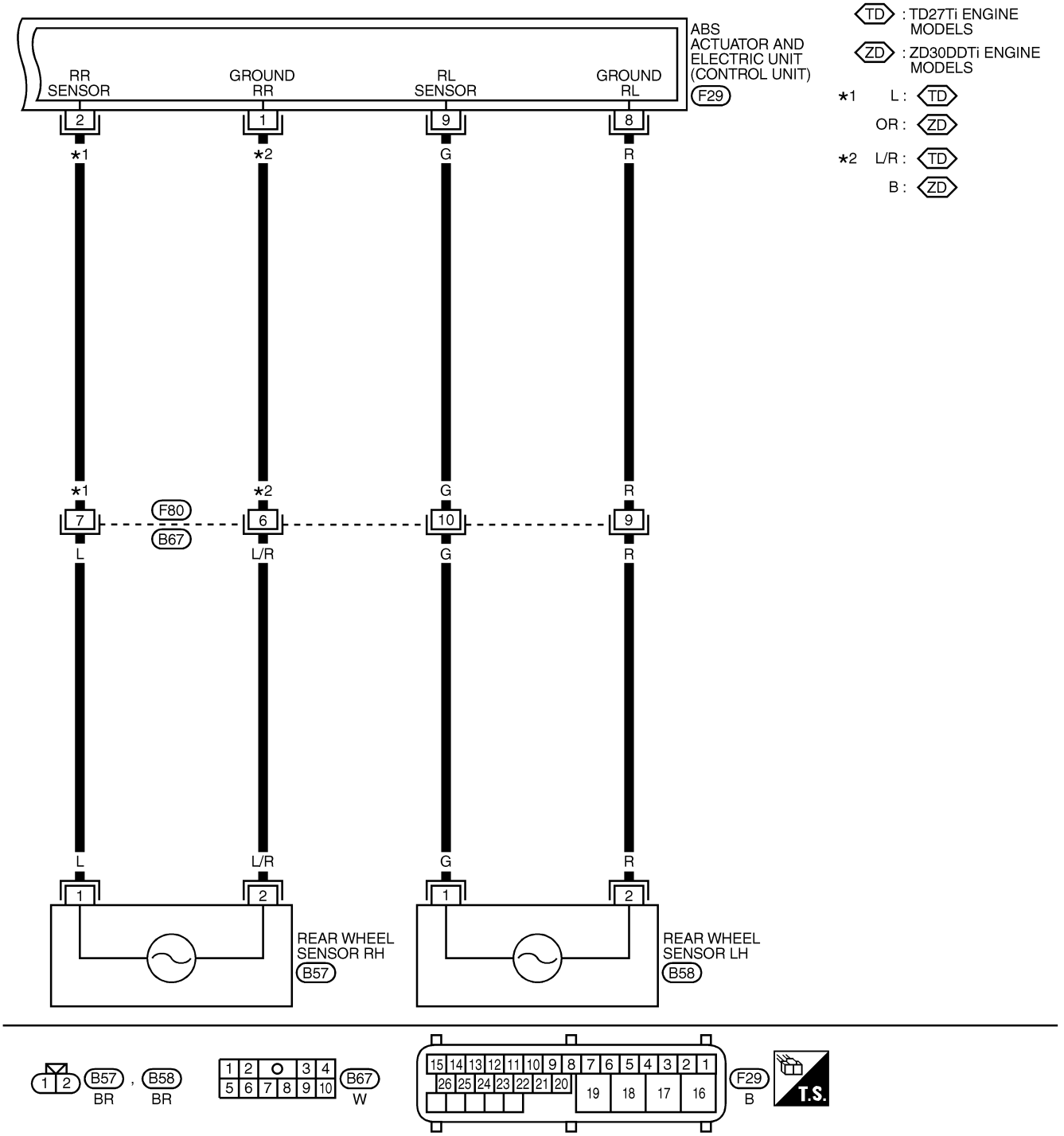


REFER TO THE FOLLOWING.
F108 -SUPER MULTIPLE JUNCTION (SMJ)

YBR251

Wiring Diagram — ABS — (Cont'd)

BR-ABS-08



YBR252

CONSULT-II

CONSULT-II APPLICATION TO ABS

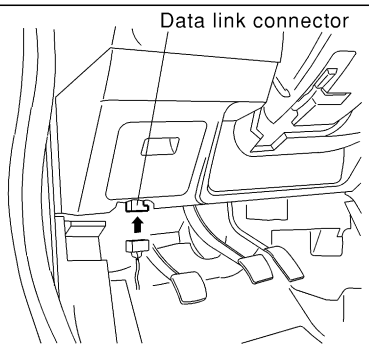
ITEM	SELF-DIAGNOSTIC RESULTS	DATA MONITOR	ACTIVE TEST
Front right wheel sensor	X	X	—
Front left wheel sensor	X	X	—
Rear right wheel sensor	X	X	—
Rear left wheel sensor	X	X	—
G switch (G sensor)	X	X	X
Stop lamp switch	—	X	—
Front right inlet solenoid valve	X	X	X
Front right outlet solenoid valve	X	X	X
Front left inlet solenoid valve	X	X	X
Front left outlet solenoid valve	X	X	X
Rear 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	—
Brake warning lamp	—	X	—
Battery voltage	X	X	—
ABS Operating Signal	—	—	—

X: Applicable
—: Not applicable

ECU (ABS control unit) part number mode

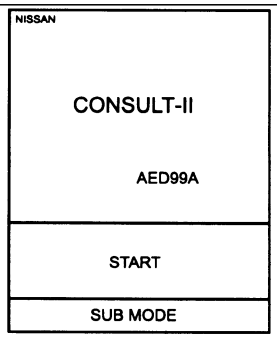
Ignore the ECU part number displayed in the ECU PART NUMBER MODE. Refer to parts catalog to order the ECU.

A



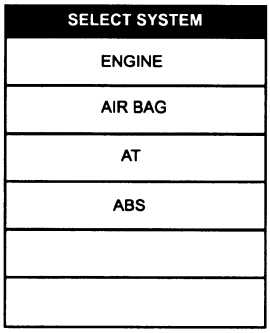
YBR265

B



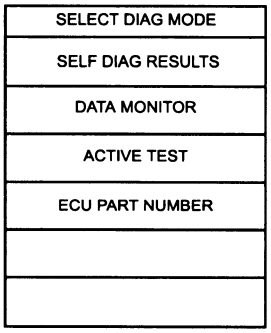
C2NCS01

C



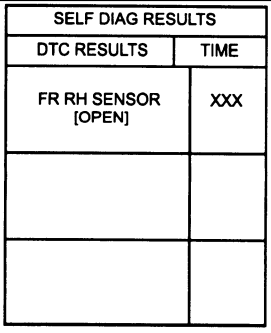
C2SSE01

D



C2SDM01

E



C2SDR01

CONSULT-II Inspection Procedure

SELF-DIAGNOSIS PROCEDURE

A

1) Turn ignition switch to OFF position.
2) Connect CONSULT-II to Data Link Connector.

↓

1) Start engine.
2) Drive vehicle over 30 km/h (19 MPH) for at least one minute.

↓

B 1) Stop vehicle with engine running and touch “START” on CONSULT-II screen.
C 2) Touch “ABS”.
D 3) Touch “SELF-DIAG RESULTS”.
- The screen shows the detected malfunction and how many times the ignition switch has been turned since the malfunction.

↓

Make the necessary repairs following the diagnostic procedures.

↓

E

After the malfunctions are repaired, erase the self-diagnostic results stored in the control unit by touching “ERASE”.

↓

Check warning lamp(s) for deactivation after driving vehicle over 30 km/h (19 MPH) for at least one minute.

↓

Test the ABS system in a safe area to verify that it functions properly.

↓

END

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

CONSULT-II Inspection Procedure (Cont'd)

SELF-DIAGNOSTIC RESULTS MODE

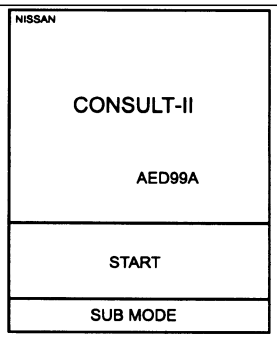
Diagnostic item	Diagnostic item is detected when . . .	Diagnostic procedure
FR RH SENSOR★ [OPEN]	● Circuit for front right wheel sensor is open. (An abnormally high input voltage is entered.)	4
FR LH SENSOR★ [OPEN]	● Circuit for front left wheel sensor is open. (An abnormally high input voltage is entered.)	4
RR RH SENSOR★ [OPEN]	● Circuit for rear right sensor is open. (An abnormally high input voltage is entered.)	4
RR LH SENSOR★ [OPEN]	● Circuit for rear left sensor is open. (An abnormally high input voltage is entered.)	4
FR RH SENSOR★ [SHORT]	● Circuit for front right wheel sensor is shorted. (An abnormally low input voltage is entered.)	4
FR LH SENSOR★ [SHORT]	● Circuit for front left wheel sensor is shorted. (An abnormally low input voltage is entered.)	4
RR RH SENSOR★ [SHORT]	● Circuit for rear right sensor is shorted. (An abnormally low input voltage is entered.)	4
RR LH SENSOR★ [SHORT]	● Circuit for rear left sensor is shorted. (An abnormally low input voltage is entered.)	4
ABS SENSOR★ [ABNORMAL SIGNAL]	● Teeth damage on sensor rotor or misalignment of wheel sensor. (Abnormal wheel sensor signal is entered.)	4
FR RH IN ABS SOL [OPEN, SHORT]	● Circuit for front right inlet solenoid valve is open or shorted. (An abnormally low output voltage is entered.)	3
FR LH IN ABS SOL [OPEN, SHORT]	● Circuit for front left inlet solenoid valve is open or shorted. (An abnormally low output voltage is entered.)	3
FR RH OUT ABS SOL [OPEN, SHORT]	● Circuit for front right outlet solenoid valve is open or shorted. (An abnormally low output voltage is entered.)	3
FR LH OUT ABS SOL [OPEN, SHORT]	● Circuit for front left outlet solenoid valve is open or shorted. (An abnormally low output voltage is entered.)	3
RR IN ABS SOL [OPEN, SHORT]	● Circuit for rear right outlet solenoid valve is open or shorted. (An abnormally high output voltage is entered.)	3
RR OUT ABS SOL [OPEN, SHORT]	● Circuit for rear left outlet solenoid valve is open or shorted. (An abnormally high output voltage is entered.)	3
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.	6
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.	5
BATTERY VOLT [VB-LOW]	● Power source voltage supplied to ABS control unit is abnormally low.	7
CONTROL UNIT	● Function of calculation in ABS control unit has failed.	9
G-SENSOR [ABNORMAL]	● G sensor is open.	8

★ If a tire slips on rough roads for more than 10 seconds, the ABS warning lamp may come on. In this case, the malfunctioning code regarding the wheel sensors may be memorized. Turn off the ignition switch, restart the engine and drive the vehicle at speeds above 30 km/h (19 MPH).

CONSULT-II Inspection Procedure (Cont'd)

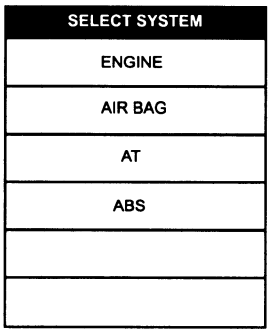
DATA MONITOR PROCEDURE

A



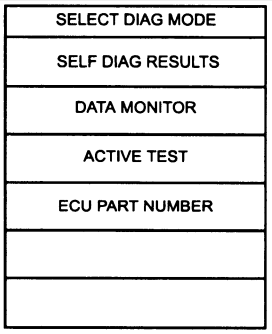
C2NCS01

B



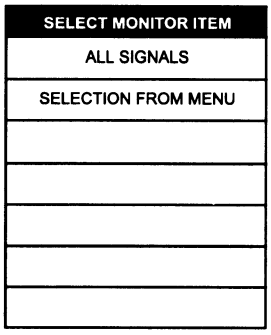
C2SSE01

C



C2SDM01

D



C2SMI01

1) Turn ignition switch to the OFF position.
2) Connect CONSULT-II to Data Link Connector.
3) Turn ignition switch to the ON position.

↓

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

↓

D 1) Select "SELECT MONITOR ITEM".

↓

Carry out the monitor test under the condition as described in page BR-62.

CONSULT-II Inspection Procedure (Cont'd)

DATA MONITOR MODE

MONITOR ITEM	CONDITION	SPECIFICATION
FR RH SENSOR FR LH SENSOR REAR RH SENSOR REAR LH SENSOR	Drive vehicle. (Each wheel is rotating.)	Wheel speed signal Almost the same speed as speedometer.
STOP LAMP SW	Brake is depressed.	Depress the pedal: ON Release the pedal: OFF
G-SWITCH	Vehicle is driven. Vehicle is stopped. Brake is applied.	When driving or stopping vehicle with a force of less than 0.3G: ON When driving or stopping vehicle with a force of 0.3G or more: 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 one 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 set to the "ON" position or engine is running.	Ignition switch in the "ON" position (Engine stops): OFF Engine running: ON
WARNING LAMP		Warning lamp is turned on: ON Warning lamp is turned off: OFF
BATTERY VOLT		Power supply voltage for control unit

CONSULT-II Inspection Procedure (Cont'd)

ACTIVE TEST PROCEDURE

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

1) Turn ignition switch to the "LOCK" position.
2) Connect CONSULT-II to Data Link Connector.
3) Start engine.

↓

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

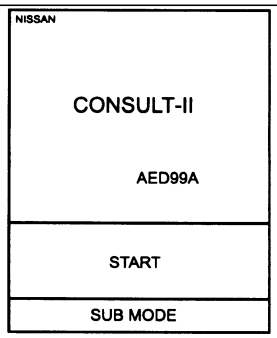
↓

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

↓

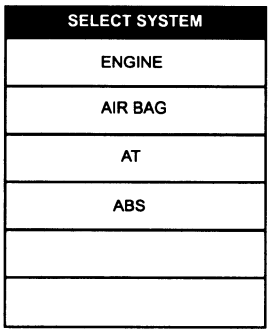
Carry out the active test by touching screen key.

A



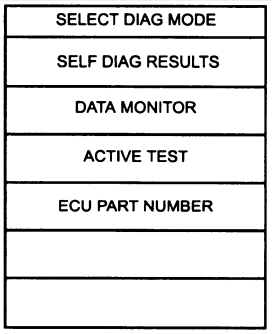
C2NCS01

B



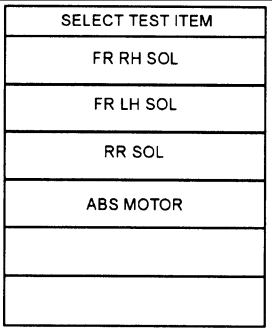
C2SSE01

C



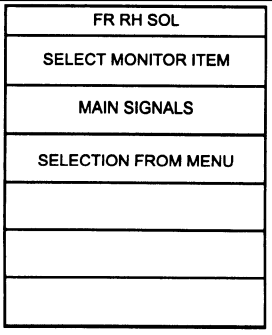
C2SDM01

D



C2STI01

E



C2FRS01

CONSULT-II Inspection Procedure (Cont'd)

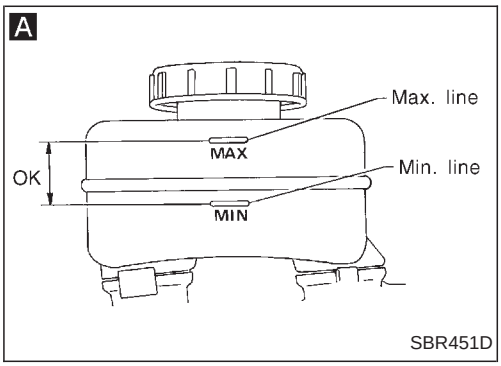
ACTIVE TEST MODE

TEST ITEM	CONDITION	JUDGEMENT
FR RH SOLENOID FR LH SOLENOID RR SOLENOID	Engine is running.	Brake fluid pressure control operation IN SOL / OUT SOL UP (Increase): OFF / OFF KEEP (Hold): ON / OFF DOWN (Decrease): ON / ON
ABS MOTOR		ABS actuator motor ON: Motor runs (ABS motor relay ON) OFF: Motor stops (ABS motor relay OFF)
G-SWITCH	Ignition switch is ON or engine is running.	Check G-switch circuit OFF: G-switch OFF ON: G-switch ON

Note: Active test will automatically stop ten seconds after the test starts. (LIMIT SIGNAL monitor shows ON.)

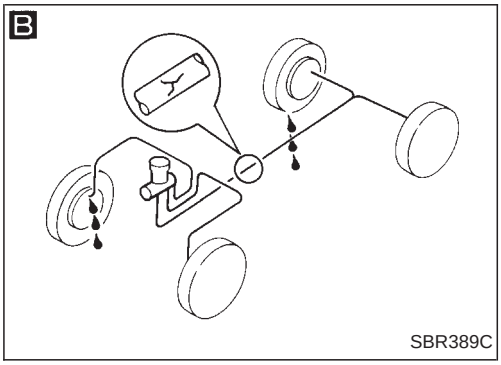
Preliminary Check

A

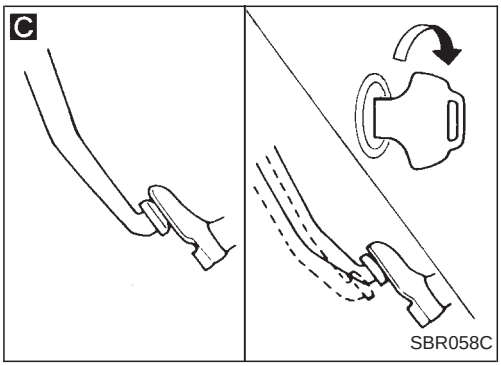


SBR451D

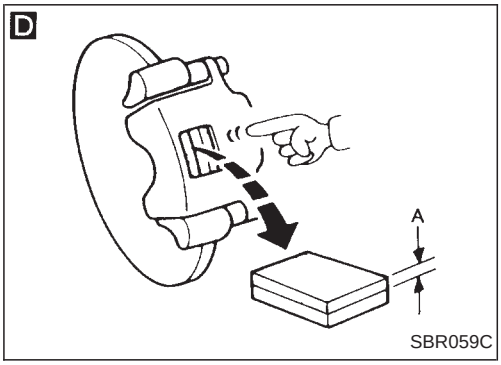
B


SBR389C

C

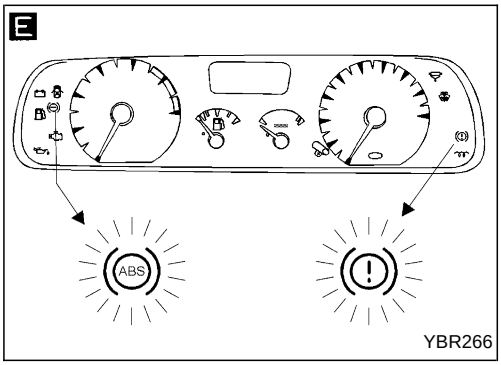

SBR058C

D



SBR059C

E



YBR266

A

Check brake fluid level in reservoir tank.

Low fluid level may indicate brake pad wear or leakage from brake line.

B

Check brake line for leakage. — NG → Repair.

OK

C

Check brake booster for operation and air tightness. Refer to BR-14. — NG → Replace.

OK

D

Check brake pads, rotor and drums. — NG → Replace.

OK

A

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

OK

E

Check warning lamp(s) or warning sound activation.
When ignition switch is turned on, warning lamp(s) turn(s) on. — NG → Check fuse, warning lamp bulb and warning lamp circuit.

OK

Check warning lamp(s) for deactivation after engine is started. — NG → Go to Self-diagnosis, BR-59.

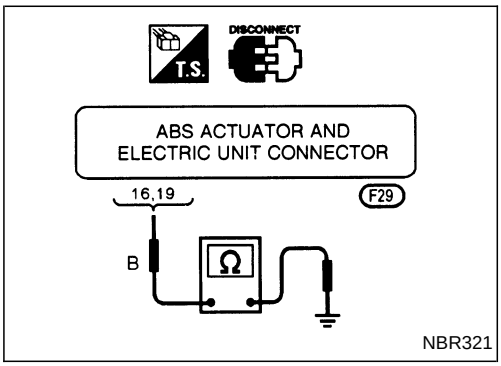
OK

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

Ensure warning lamp(s) remain(s) off while driving. — NG → Go to Self-diagnosis, BR-59.

OK

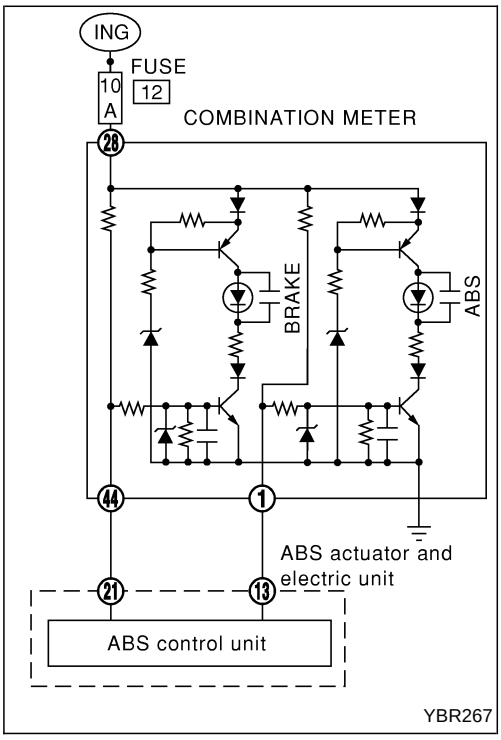
END

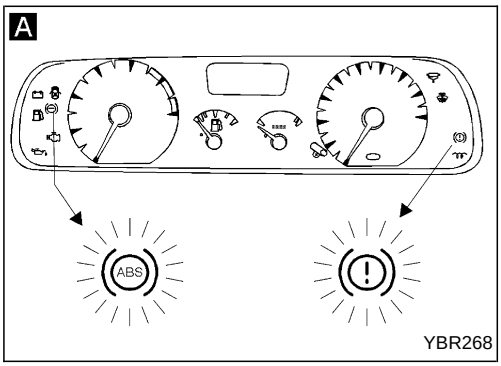


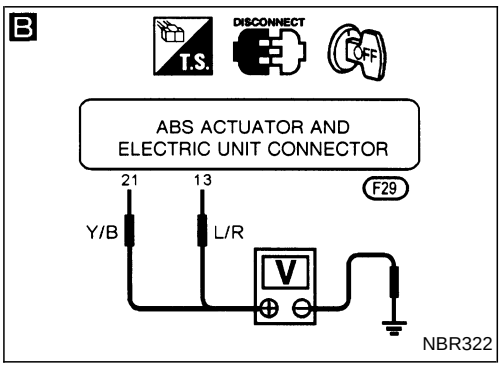
Ground Circuit Check

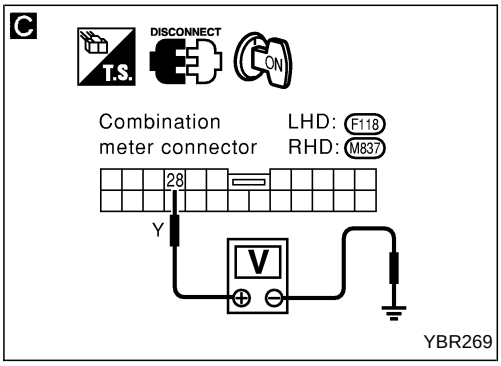
ABS CONTROL UNIT GROUND

- Check resistance between ABS actuator and electric unit connector terminals and ground.
  Resistance: approximately 0Ω









Diagnostic Procedure 1 (Not self-diagnostic item)

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

CHECK FUSE
Check 10A fuse 12 . For fuse layout, refer to POWER SUPPLY ROUTING EL section.

NG → Replace fuse.

OK ↓

A

CHECK ABS (and BRAKE) WARNING LAMP(S) ACTIVATE
Disconnect ABS actuator and electric unit connector.
Does the warning lamp(s) activate?

Yes → Ⓐ (Go to next page.)

No ↓

B

CHECK HARNESS FOR SHORT.
1. Disconnect ABS connector and electric unit connector.
2. Check voltage between ABS actuator and electric unit connector F29 (body side) terminals 21, 13 and ground.

Battery voltage should not exist.

NG → Repair harness or connector.

OK ↓

C

Check voltage between combination connector LHD: F118, RHD: M837 terminal 28 and ground.
Battery Voltage should exist.

NG → Replace harness or connector.

OK ↓

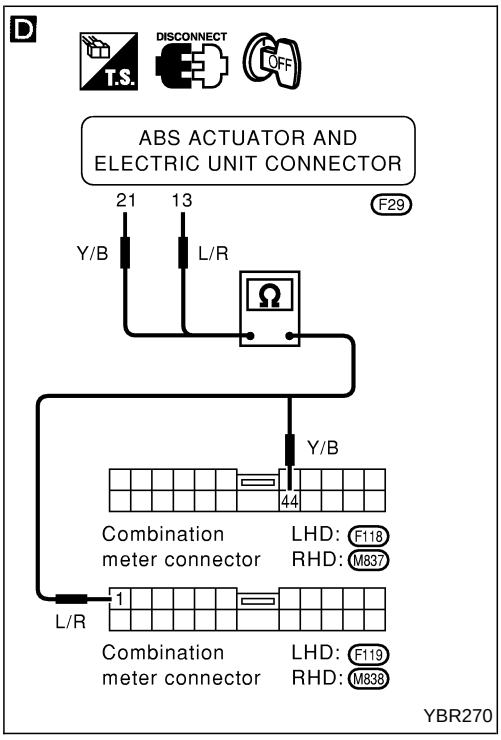
CHECK WARNING LAMP(S)
1. Turn ignition switch to “OFF” position.
2. Check ABS (and Brake) warning lamp(s).

NG → Replace bulb(s).

OK ↓

Ⓐ

Diagnostic Procedure 1 (Not self-diagnostic item) (Cont'd)



Ⓐ

D

CHECK HARNESS FOR SHORT.

1. Disconnect combination meter connector LHD: F118 and F119, or RHD: M837 and M838.
2. Check continuity between ABS actuator and electric unit connector F29 and combination meter connector LHD: F118 and F119, or RHD: M837 and M838.

	F29	LHD: F119 RHD: M838	LHD: F118 RHD: M837	Continuity
Terminal	⑬	①	—	Yes
Terminal	㉑	—	㊹	Yes

NG → Replace harness or connector(s).

OK ↓

Check combination meter

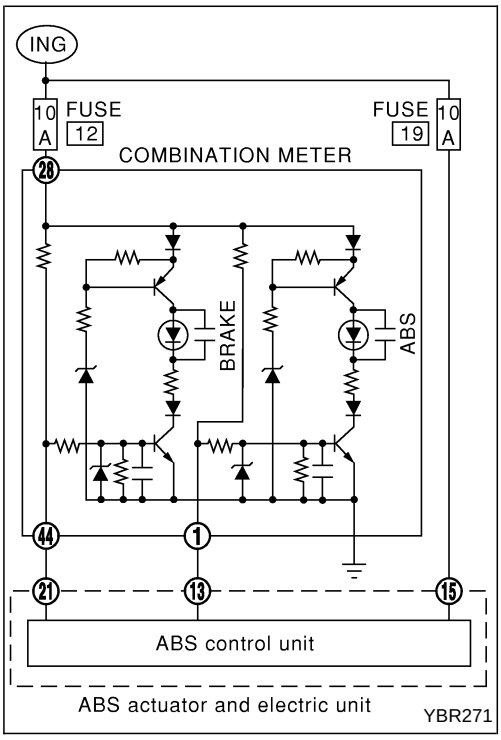
NG ↓

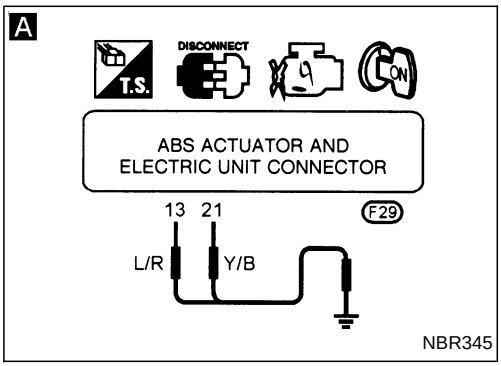
CHECK HARNESS CONNECTOR.
Check ABS actuator and electric unit pin terminals for damage or connection of ABS actuator and electric unit harness connector. Reconnect ABS actuator and electric unit harness connector. Then retest.

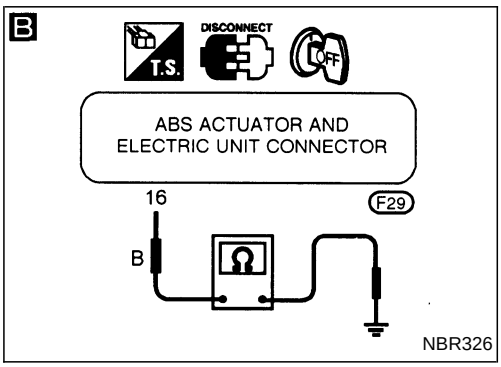
OK → Inspection end

↓

REPLACE.
Replace ABS actuator and electric unit.







Diagnostic Procedure 2 (Warning lamp stays on when ignition switch is turned ON)

CHECK FUSE.
Check 10A fuse 19 . For fuse layout, refer to POWER SUPPLY ROUTING in EL section.

NG → Ⓐ (Go to next page.)

OK ↓

A

CHECK WARNING LAMP.
1. Disconnect ABS actuator and electric unit connector.
2. Connect suitable wire between ABS actuator and electric unit harness connector F29 terminals 13, 21 and ground.
Warning lamp should not activate.

NG → Ⓑ (Go to next page.)

OK ↓

CHECK HARNESS CONNECTOR.
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.

OK → Inspection end

NG ↓

B

CHECK ABS MOTOR GROUND.
1. Turn ignition switch OFF.
2. Disconnect ABS actuator and electric unit connector.
3. Check continuity between ABS actuator and electric unit connector F29 (body side) terminal 16 and ground.
Continuity should exist.

NG → Check the following.
- Harness connector F29
- Harness for open or short between ABS actuator and electric unit and ground

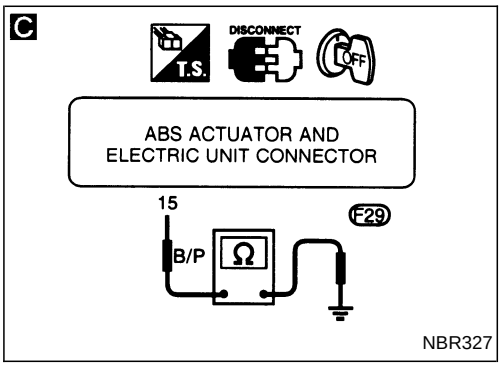
If NG, repair harness or connector.

OK ↓

REPLACE.
Replace ABS actuator and electric unit.

Diagnostic Procedure 2 (Warning lamp stays on when ignition switch is turned ON) (Cont'd)

C



Ⓐ

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

No → Inspection end

Yes ↓

C

CHECK ABS ACTUATOR AND ELECTRIC UNIT POWER SUPPLY CIRCUIT FOR SHORT.
1. Disconnect battery cable and ABS actuator and electric unit connector (F29).
2. Check continuity between ABS actuator and electric unit connector (F29) body side terminal (15) and ground.
Continuity should not exist.

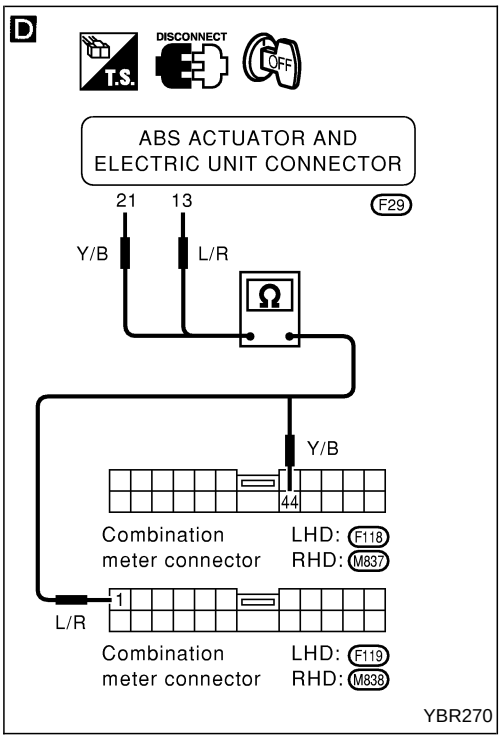
NG →
Check the following.
- Harness connector (F29)
- Harness for open or short between ABS actuator and electric unit and fuse

If NG, repair harness or connector.

OK ↓

REPLACE.
Replace ABS actuator and electric unit.

D



Ⓑ

D

CHECK ABS WARNING LAMP CONTROL CIRCUIT.
1. Disconnect combination meter connector LHD: (F118) and (F119), or RHD: (M837) and (M838).
2. Check continuity between ABS actuator and electric unit connector (F29) (body side) terminal and combination meter connector LHD: (F118) and (F119), or RHD: (M837) and (M838).

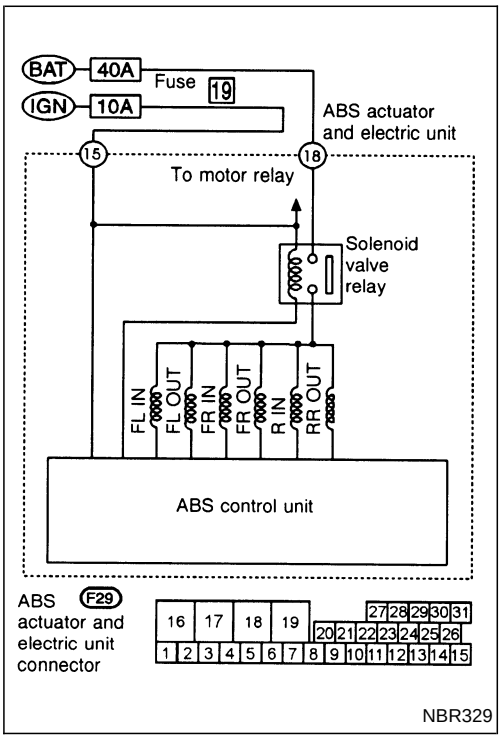
	F29	LHD: (F119) RHD: (M838)	LHD: (F118) RHD: (M837)	Continuity
Terminal	(13)	(1)	—	Yes
Terminal	(21)	—	(44)	Yes

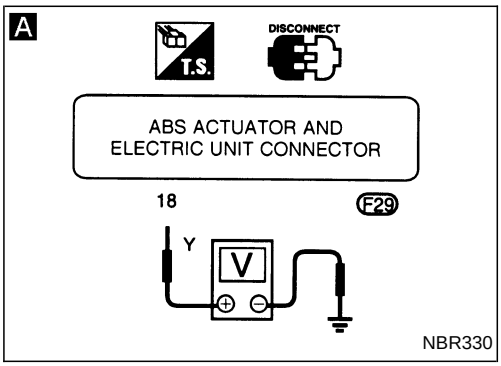
NG →
Check the following.
- Harness connectors LHD: (F118) and (F119), or RHD: (M837) and (M838) and (F29)
- Harness for open or short between ABS actuator and electric unit and combination meter

If NG, repair harness or connectors.

OK ↓

CHECK COMBINATION METER.
Check combination meter. Refer to WARNING LAMPS in EL section.





Diagnostic Procedure 3 (ABS actuator solenoid valve and solenoid valve relay)

Malfunction code Nos. 41, 42, 45, 46, 55, 56, 63

CHECK FUSIBLE LINK.
Check 40A. For fusible link layout, refer to POWER SUPPLY ROUTING in EL section.

NG → Ⓐ (Go to next page.)

OK ↓

CHECK FUSE.
Check 10A fuse 19 . For fuse layout, refer to POWER SUPPLY ROUTING in EL section.

NG → Ⓑ (Go to next page.)

OK ↓

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?

No → Inspection end

Yes ↓

CHECK ABS ACTUATOR AND ELECTRIC UNIT GROUND CIRCUIT.
Refer to ABS ACTUATOR AND ELECTRIC UNIT GROUND in Ground Circuit Check, BR-66.

NG → Repair harness and connector.

OK ↓

A

CHECK SOLENOID VALVE RELAY POWER SUPPLY CIRCUIT.
1. Disconnect ABS actuator and electric unit connector.
2. Check voltage between ABS actuator and electric unit connector F29 (body side) terminal 18 and ground.
Battery voltage should exist.

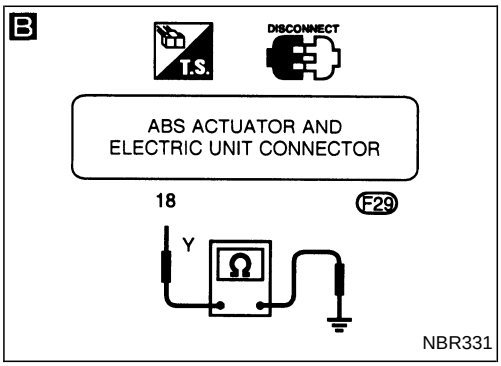
NG → Check the following.
- Harness connector F29, LHD: F68 and M784, or RHD: F79 and M744
- Harness for open or short between ABS actuator and electric unit and fusible link

If NG, repair harness or connector.

OK ↓

REPLACE.
Replace ABS actuator and electric unit.

Diagnostic Procedure 3 (ABS actuator solenoid valve and solenoid valve relay) (Cont'd)



Ⓐ

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

No → Inspection end

Yes ↓

B

CHECK SOLENOID VALVE RELAY POWER SUPPLY CIRCUIT.

1. Disconnect battery cable and ABS actuator and electric unit connector.
2. Check continuity between ABS actuator and electric unit connector F29 (body side) terminal 18 and ground.
   Continuity should not exist.

NG →
Check the following
- Harness connector F29, LHD: F68 and M784, or RHD: F79 and M744
- Harness for open or short between ABS actuator and electric unit and fusible link

If NG, repair harness or connector.

OK ↓

REPLACE.
Replace ABS actuator and electric unit.

Ⓑ

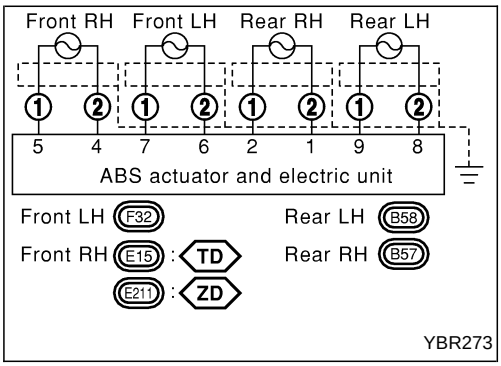
REPLACE.
Replace fuse.
Does the fuse blow out when ignition switch is turned ON?

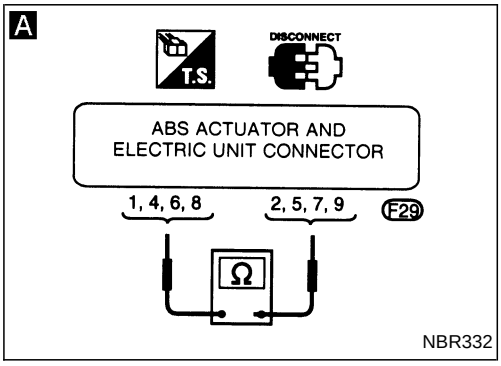
Yes →
Check the following.
- Harness connector F29, M822, LHD: F66 and M787, or RHD: F76: TD, F136: ZD, M743: TD and M829: ZD
- Harness for open or short between ABS actuator and electric unit and fuse

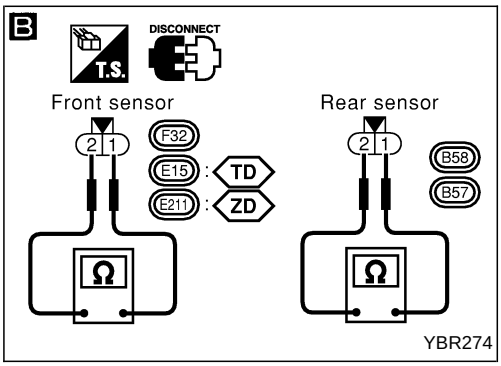
If NG, repair harness or connector.

No ↓

END
Inspection end







Diagnostic Procedure 4 (Wheel sensor or rotor)

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

INSPECTION STARTS
1. Disconnect connectors from ABS actuator and electric unit and wheel sensor of malfunction code No. Check terminals for damage or loose connections. Then reconnect connectors.
2. Carry out self-diagnosis again.
   Does warning lamp activate again?

No → Inspection end

Yes ↓

A

CHECK WHEEL SENSOR ELECTRICAL.
1. Disconnect ABS actuator and electric unit connector.
2. Check resistance between ABS actuator and electric unit connector F29 (body side) terminals.
   Code No. 21 or 22 (Front RH wheel)
   Terminals ⑤ and ④
   Code No. 25 or 26 (Front LH wheel)
   Terminals ⑦ and ⑥
   Code No. 31 or 32 (Rear RH wheel)
   Terminals ② and ①
   Code No. 35 or 36 (Rear LH wheel)
   Terminals ⑨ and ⑧
   Resistance: Front 0.9 - 1.1 kΩ
   Rear 1.44 - 1.76 kΩ

OK → Ⓐ (Go to next page.)

NG ↓

B

CHECK WHEEL SENSOR.
Check each sensor for resistance.
Resistance: Front 0.9 - 1.1 kΩ
Rear 1.44 - 1.76 kΩ

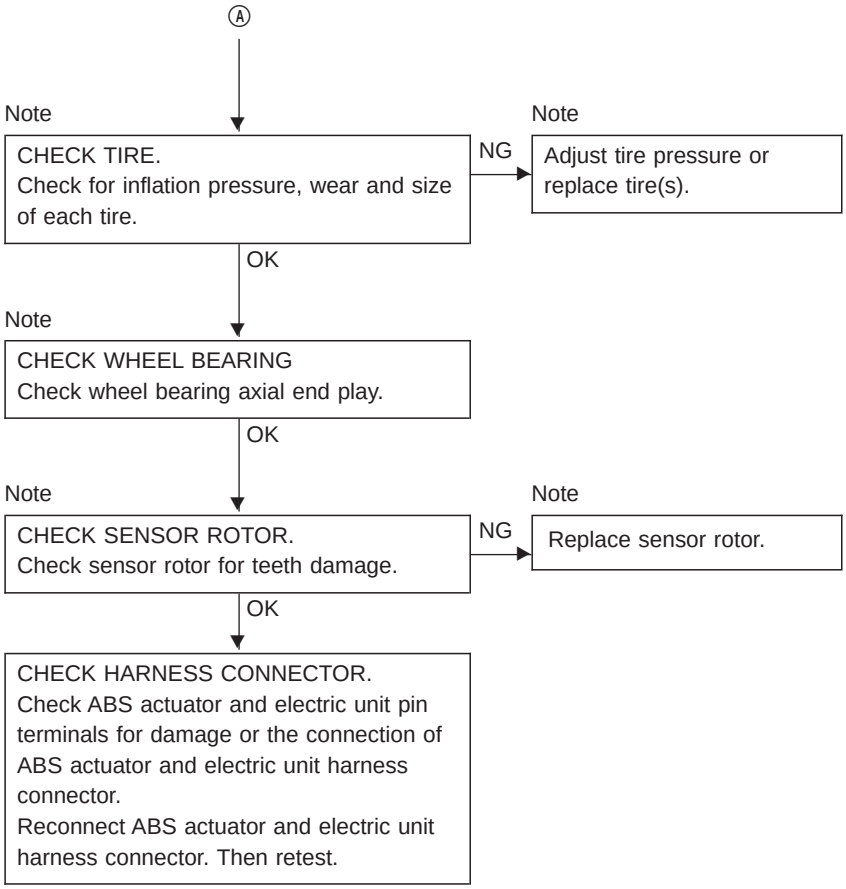
OK → Check the following.
- Harness connectors F29, B57, B58, E15 : TD, E211 : ZD and F32
- Harness for open or short between wheel sensor connectors and ABS actuator and electric unit

If NG, repair harness or connectors.

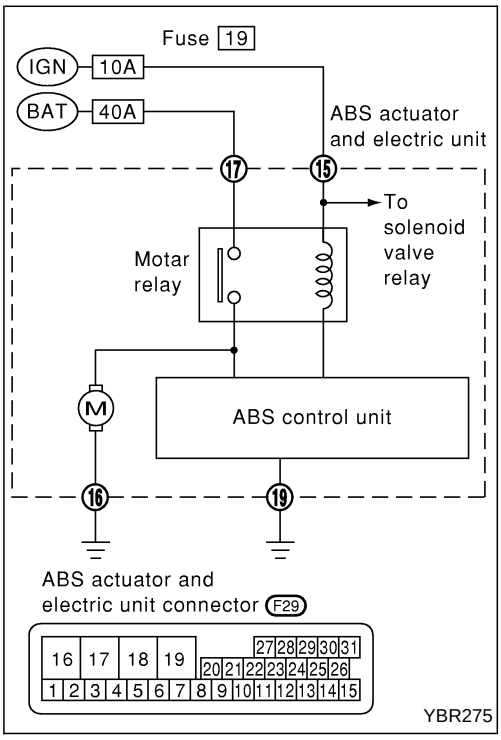
NG ↓

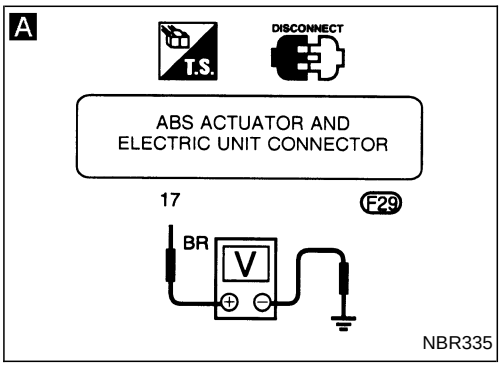
REPLACE.
Replace wheel sensor.

Diagnostic Procedure 4 (Wheel sensor or rotor) (Cont'd)



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





Diagnostic Procedure 5 (Motor Relay or motor)

Malfunction code No. 61

CHECK FUSIBLE LINK.
Check 40A. For fusible link layout, refer to POWER SUPPLY ROUTING in EL section.
NG → Ⓐ (Go to next page.)
OK ↓

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?

No → Inspection end
Yes ↓

A

CHECK MOTOR RELAY POWER SUPPLY CIRCUIT.
1. Disconnect ABS actuator and electric unit connector.
2. Check voltage between ABS actuator and electric unit connector F29 (body side) terminal ⑰ and ground.
Battery voltage should exist.

NG → Check the following.
- Harness connector F29, LHD: F68 and M784, or RHD: F79 and M744
- Harness for open or short between ABS actuator and electric unit and fusible link.

If NG, repair harness or connector.

OK ↓

CHECK ABS ACTUATOR AND ELECTRIC UNIT GROUND.
Refer to ABS ACTUATOR AND ELECTRIC UNIT GROUND in Ground Circuit Check, BR-66.

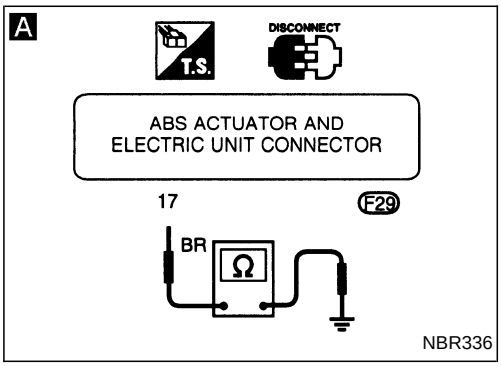
NG → Repair harness and terminals.

OK ↓

REPLACE.
Replace ABS actuator and electric unit.

Diagnostic Procedure 5 (Motor Relay or motor) (Cont'd)

A



Ⓐ

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

No → Inspection end

Yes

B

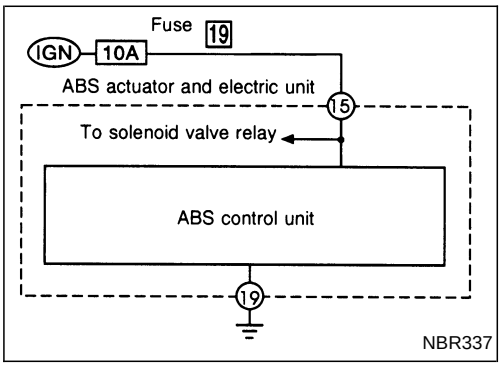
CHECK ABS ACTUATOR MOTOR POWER SUPPLY CIRCUIT.
1. Disconnect battery cable and ABS actuator and electric unit connector (F29).
2. Check continuity between ABS actuator and electric unit connector (F29) (body side) terminal ⑰ and ground.
   Continuity should not exist.

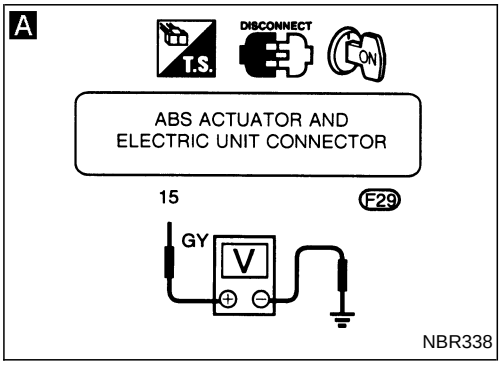
NG → Check the following
- Harness connector (F29), LHD: (F68) and (M784), or RHD: (F79) and (M744)
- Harness for open or short between ABS actuator and electric unit and fusible link

If NG, repair harness or connector.

OK

CHECK HARNESS CONNECTOR.
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.





Diagnostic Procedure 7 (Low voltage)

Malfunction code No. 57

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?

No → Inspection end

Yes ↓

A

CHECK ABS CONTROL UNIT POWER SUPPLY CIRCUIT
1. Disconnect ABS actuator and electric unit connector.
2. Check voltage between ABS actuator and electric unit connector F29 terminal 15 and ground.
Battery voltage should exist when ignition switch is turned ON.

NG → Ⓐ (See below.)

OK ↓

CHECK ABS CONTROL UNIT GROUND
Refer to ABS ACTUATOR AND ELECTRIC UNIT GROUND in Ground Circuit Check, BR-66.

NG → Repair harness and connector.

OK ↓

CHECK HARNESS CONNECTOR.
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.

NG → Replace
Replace ABS actuator and electric unit

Ⓐ ↓

CHECK FUSE.
Check 10A fuse 19 . For fuse layout, refer to POWER SUPPLY ROUTING in EL section.

NG → Replace fuse.

OK ↓

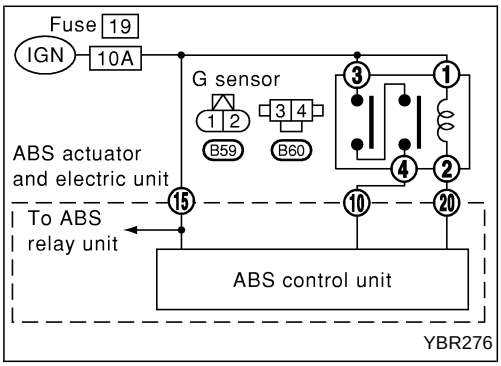
CHECK ABS CONTROL UNIT POWER SUPPLY CIRCUIT
Check continuity between fuse and ABS actuator and electric unit connector F29 (body side) terminal 15.

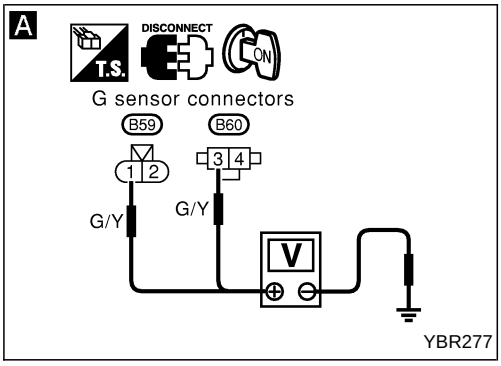
NG → Check the following:
- Harness connector F29, M822, LHD: F66 and M787, or RHD: F76: TD, F136: ZD, M743: ZD and M829: ZD
- Harness for open or short between ABS actuator and electric unit and fuse

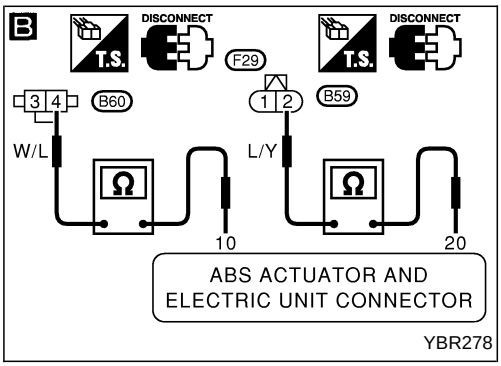
If NG, repair harness or connector.

OK ↓

Check battery. Refer to BATTERY in EL section.







Diagnostic Procedure 8 (G sensor)

Malfunction code No. 17

CHECK G SENSOR POWER SUPPLY CIRCUIT.
Check 10A fuse 19 . For fuse layout, refer to POWER SUPPLY ROUTING in EL section.

NG → Replace fuse.

OK ↓

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?

No → Inspection end

Yes ↓

CHECK G SENSOR.
Refer to G SENSOR in Electrical Components Inspection, BR-83

NG → Replace G sensor.

OK ↓

A

CHECK G SENSOR POWER SUPPLY CIRCUIT.
1. Disconnect G sensor connectors.
2. Check voltage between G sensor connector terminals ① (B59), ③ (B60) and ground.
Battery voltage should exist.

NG → Check the following.
- Harness connectors B59, B60, LHD: B73, RHD: B67, LHD: F66, RHD: F76: TD, RHD: F136: ZD, LHD: M787, RHD: M743: TD, RHD: M829: ZD, LHD: F45, RHD: F80 and M822
- Harness for open or short between G sensor and ABS actuator and electric unit

If NG, repair harness or connectors.

OK ↓

B

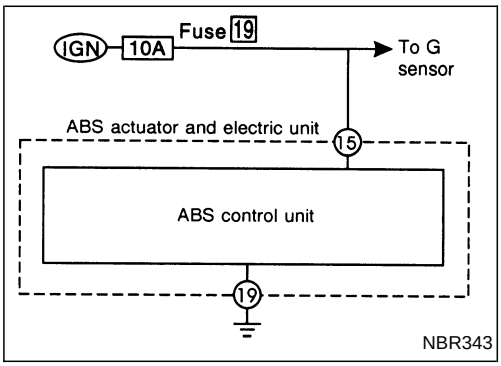
CHECK G SENSOR GROUND.
1. Disconnect ABS actuator and electric unit connector and G sensor connectors.
2. Check continuity between ABS actuator and electric unit connector F29 (body side) terminals ⑳, ⑩ and G sensor connectors (body side) terminals ② (B59), ④ (B60).
Continuity should exist.

NG → Check the following.
- Harness connectors B59, B60, LHD: B73, RHD: B67, F29, LHD: F45 and RHD: F80
- Harness for open or short between G sensor and ABS actuator and electric unit

If NG, repair harness or connectors.

OK ↓

CHECK HARNESS CONNECTOR.
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.



Diagnostic Procedure 9 (Control unit)

Malfunctioning code No. 71

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?

No → Inspection end

Yes ↓

CHECK ABS ACTUATOR AND ELECTRIC UNIT POWER SUPPLY CIRCUIT
Check voltage. Refer to A in Diagnostic Procedure 7, BR-77.

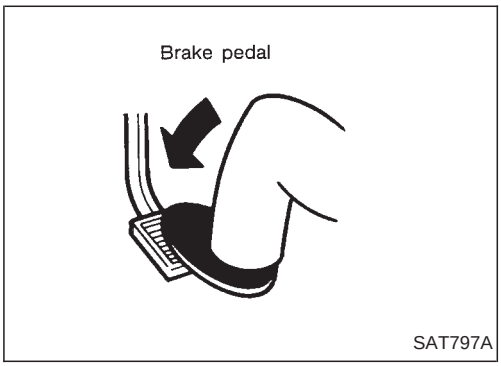
↓

CHECK SELF-DIAGNOSTIC RESULTS
Does warning lamp indicate code No. 71 again?

Yes → Replace ABS actuator and electric unit.

No ↓

INSPECTION
Inspect the system according to the code No.



Diagnostic Procedure 10 (Pedal vibration and noise)

INSPECTION START
1. Apply brake.
2. Start engine.
3. Does the symptom appear only when engine is started?

Yes → Carry out self-diagnosis. Refer to BR-59.

No ↓

CHECK IF SYMPTOM APPEARS.
Does the symptom appear when electrical equipment switches (such as headlamp) are operated?

No → Go to B in Diagnostic Procedure 12, BR-81.

Yes ↓

CHECK WHEEL SENSOR.
Check wheel sensor shield ground. For location of shield ground, refer to wiring diagram and “HARNESS LAYOUT” in EL section.

NG → Repair wheel sensor.

OK ↓

CHECK HARNESS CONNECTOR.
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.

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

Diagnostic Procedure 11 (Long stopping distance)

CHECK ABS PERFORMANCE
Disconnect ABS actuator and electric unit connector and check whether stopping distance is still long.

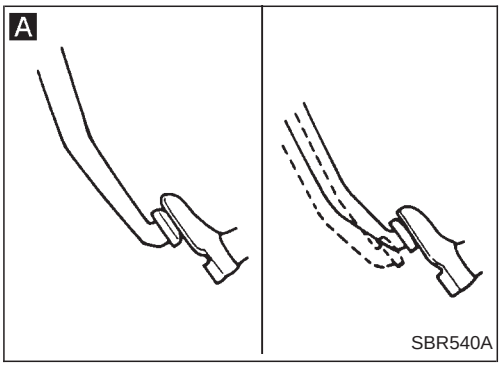
No → Go to B in Diagnostic Procedure 12, BR-81.

Yes ↓

Perform Preliminary Check and air bleeding.

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

A



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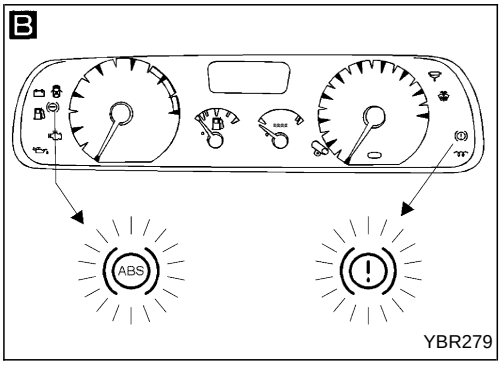
B



YBR279

Diagnostic Procedure 12 (Unexpected pedal action)

A

CHECK BRAKE PEDAL STROKE.
Check brake pedal stroke. Is stroke excessively large?

Yes → Perform Preliminary Check, refer to BR-65.

No ↓

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

No → Perform Preliminary Check, refer to BR-65.

Yes ↓

B

CHECK WARNING LAMP ACTIVATE.
Ensure warning lamp remains off while driving.

NG → Carry out self-diagnosis. Refer to BR-59.

OK ↓

CHECK WHEEL SENSOR.
1. Check wheel sensor connector for terminal damage or loose connection.
2. Perform wheel sensor mechanical check.
   Refer to Diagnostic Procedure 4, BR-73.

NG → Repair.

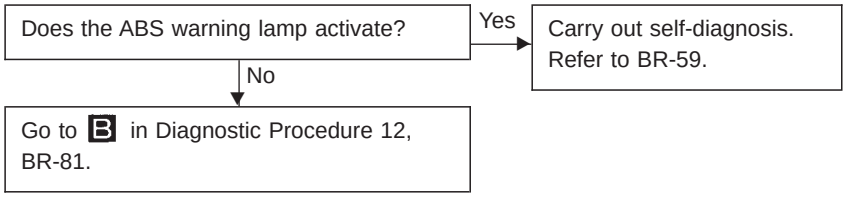
OK ↓

CHECK HARNESS CONNECTOR.
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.

CAUTION: Drive at low speed and brake smoothly to prevent rear wheels locking.

Diagnostic Procedure 13

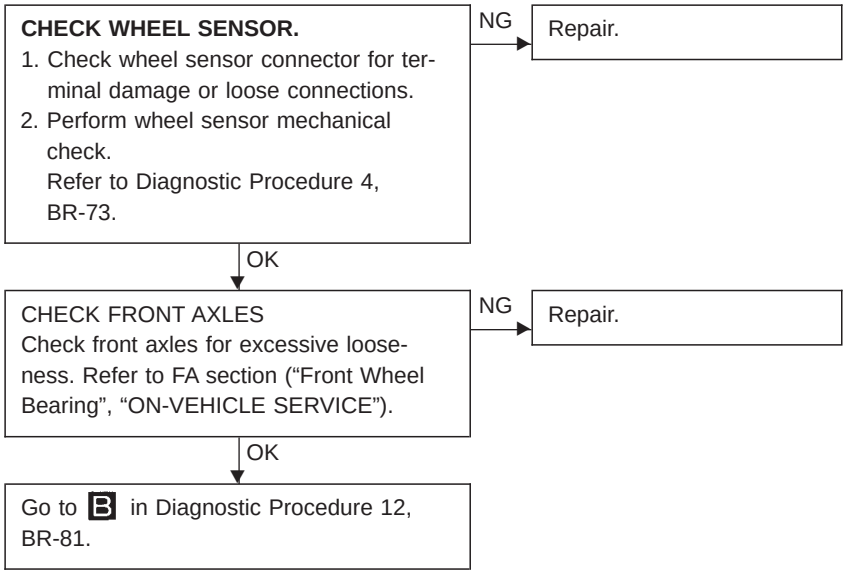
SYMPTOM: ABS does not work.

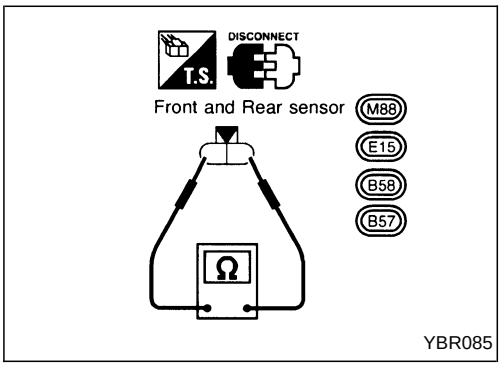


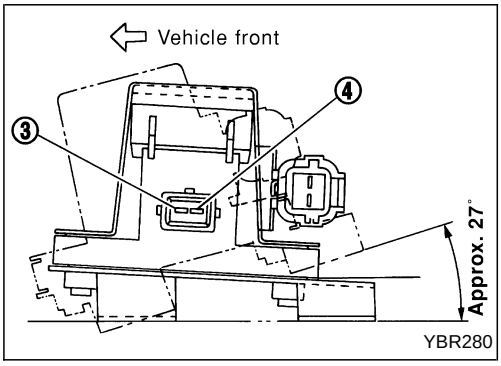
Note: ABS does not work when vehicle speed is under 10 km/h (6 MPH).

Diagnostic Procedure 14

SYMPTOM: ABS works frequently.







Electrical Components Inspection

WHEEL SENSOR

Check resistance for each sensor.

Resistance:

Front 0.9 - 1.1 kΩ

Rear 1.44 - 1.76 kΩ

G SENSOR

Condition	Resistance between terminals ③ and ④	Continuity
Installed in vehicle	Approx. 1.5 kΩ	Yes
Tilted as shown in figure	Approx. 5.1 kΩ	No

General Specifications

Applied model	Wagon (LWB)	Hard Top (SWB)	Wagon (LWB)	Hard Top (SWB)
	Without ABS		With ABS	
Front brake	LD28VA			
Brake model				
Cylinder bore diameter mm (in)	43 (1.69)			
Pad length x width x thickness mm (in)	144.85 x 48.5 x 15.5 (5.70 x 1.90 x 0.61)			
Rotor outer diameter x thickness mm (in)	27.7 x 26.1 (10.91 x 1.02)			
Drum brake	LT28			
Brake model				
Cylinder bore diameter mm (in)	23.8 (0.94)	22.0 (0.87)		20.6 (0.81)
Lining mm (in) Length x width x thickness Leading	111 x 55 x 8.95 (4.37 x 2.17 x 0.35)			
Trailing	114 x 55 x 3.95 (4.49 x 2.17 x 0.16)			
Drum inner mm (in)				
Diameter	280 (11.02)			
Master cylinder mm (in)				
Cylinder bore diameter	25.4 (1.0)			
Control valve				
Valve model	Load Sensing Valve		—	
Split point [kPa (bar, kg/cm^2, psi)] x reducing ratio	Variable x 0.23	Variable x 0.15	—	
Brake booster				
Booster model	Lucas LSC 115 (8″ + 9″)			
Diaphragm diameter mm (in)	Primary: 203.2 (8) Secondary: 228.6 (9)			
Specified brake fluid	DOT 4			

Inspection and Adjustment

DISC BRAKE

Unit: mm (in)

Brake model	LD28VA
Pad wear limit	
Minimum thickness	2.0 (0.079)
Rotor repair limit	
Minimum thickness	24.0 (0.94)

DRUM BRAKE

Unit: mm (in)

Lining wear limit	
Minimum thickness	1.52 (0.06)
Drum repair limit	
Maximum inner diameter	280.5 (11.04)
Out-of-roundness	0.05 (0.0020) or less

BRAKE PEDAL

Unit: mm (in)

	RHD	LHD
Free pedal height (H)	196 - 206 (7.7 - 8.1)	210 - 220 (8.3 - 8.7)
Full stroke (D)	137.7 - 148.7 (5.42 - 5.85)	142.5 - 152.5 (5.61 - 6.0)
Clearance between pedal stopper and threaded end of stop lamp switch (C)	0.3 - 1.0 (0.012 - 0.039)	
Pedal free play at clevis (A)	1 - 3 (0.039 - 0.118)	

PARKING BRAKE

Item \ Control type	Center lever
Number of notches [under force of 196 N (20 kg, 44 lb)]	9 - 10
Number of notches (when warning switch comes on)	1

NOTES