BRAKE SYSTEM

SECTION BR

CONTENTS

When you read wiring diagrams:
- **Read GI section, “HOW TO READ WIRING DIAGRAMS”.**
- **See EL section, “POWER SUPPLY ROUTING” for power distribution circuit.**
- **See EL section for NATS information and wiring diagram.**

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

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

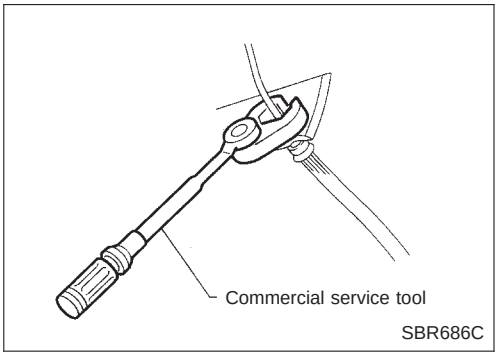
The Supplemental Restraint System such as “AIR BAG” and “SEAT BELT PRE-TENSIONER” used along with a seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. The SRS system composition which is available to NISSAN MODEL P11 is as follows (The composition varies according to the destination and optional equipment.):

- For a frontal collision
  The Supplemental Restraint System consists of driver air bag module (located in the center of the steering wheel), front passenger air bag module (located on the instrument panel on passenger side), front seat belt pre-tensioners, a diagnosis sensor unit, warning lamp, wiring harness and spiral cable.
- For a side collision
  The Supplemental Restraint System consists of front side air bag module (located in the outer side of front seat), side air bag (satellite) sensor, diagnosis sensor unit (one of components of air bags for a frontal collision), wiring harness, warning lamp (one of components of air bags for a frontal collision).

Information necessary to service the system safely is included in the **RS section** of this Service Manual.

WARNING:

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



Precautions for Brake System

- **Recommended fluid is brake fluid “DOT 4”.**
- **Never reuse drained brake fluid.**
- **Be careful not to splash brake fluid on painted areas.**
- **To clean or wash all parts of master cylinder, disc brake caliper and wheel cylinder, use clean brake fluid.**
- **Never use mineral oils such as gasoline or kerosene. They will ruin rubber parts of the hydraulic system.**
- **Use flare nut wrench when removing and installing brake tube.**
- **Always torque brake lines when installing.**
- **Burnish the brake contact surfaces after refinishing or replacing rotors, after replacing pads, or if a soft pedal occurs at very low mileage.**
  Refer to “Brake Burnishing Procedure”, “Check and Adjustment”, BR-7.

WARNING:

- **Clean brake pads with a waste cloth, then wipe with a dust collector.**

Precautions When Working On ABS

- **Use recommended tyres in combination with ABS.**
- **Install tyres or studded tyres, etc. with the same size.**
- **If different sizes of tyres, or tyres other than the ones recommended for use with the ABS, are fitted, stopping distance will increase and control and stability could deteriorate.**
- **When changing brake pads, use Nissan genuine parts.**
- **When fitting radios etc, do not position the radio unit, antenna, or antenna cables within an area of about 100 mm (3.94 in) of the control unit.**
- **When doing any work that requires electro-welding, first remove the control unit.**
- **Make sure when taking a power supply for the audio, lamps etc., not to take this from any ABS-related harness. (Refer to the electrical wiring diagrams for ABS-related harnesses)**

Wiring Diagrams and Trouble Diagnosis

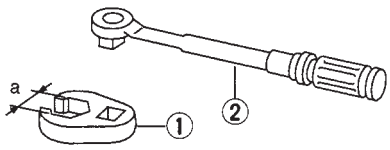
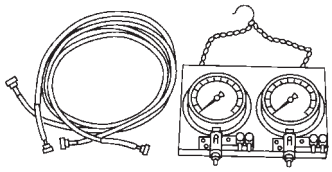
When you read wiring diagrams, refer to the following:

- ***GI-11*, "HOW TO READ WIRING DIAGRAMS"**
- ***EL-10*, "POWER SUPPLY ROUTING"**

When you perform trouble diagnosis, refer to the following:

- ***GI-35*, "HOW TO FOLLOW TEST GROUPS IN TROUBLE DIAGNOSIS"**
- ***GI-24*, "HOW TO PERFORM EFFICIENT DIAGNOSES FOR AN ELECTRICAL INCIDENT"**

Commercial Service Tools

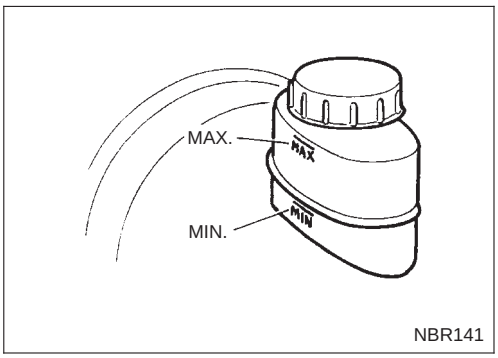
Tool name	Description	
① Flare nut crows foot ② Torque wrench	 NT360	Removing and installing each brake piping **a: 10 mm (0.39 in)**
Brake fluid pressure gauge	 NT151	Measuring brake fluid pressure

NVH Troubleshooting Chart

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

Reference page			BR-23, 26, 33	BR-23 26, 33	BR-23, 33	—	BR-31, 37, 43	BR-31, 37, 43	—	—	—	BR-31, 37	NHV in PD section	NHV in PD section	NHV in FA, RA section	NHV in FA section	NHV in FA section	NHV in FA section	NHV in ST section
Possible cause and SUSPECTED PARTS			Pads - damaged	Pads - uneven wear	Shims damaged	Rotor imbalance	Rotor damaged	Rotor runout	Rotor deformation	Rotor deflection	Rotor rust	Rotor thickness variation	PROPELLER SHAFT	DIFFERENTIAL	AXLE AND SUSPENSION	TIRES	ROAD WHEEL	AXLE SHAFT	STEERING
Symptom	BRAKE	Noise	x	x	x								x	x	x	x	x	x	x
		Shake				x							x		x	x	x	x	x
		Shimmy, Judder				x	x	x	x	x	x	x			x	x	x		x

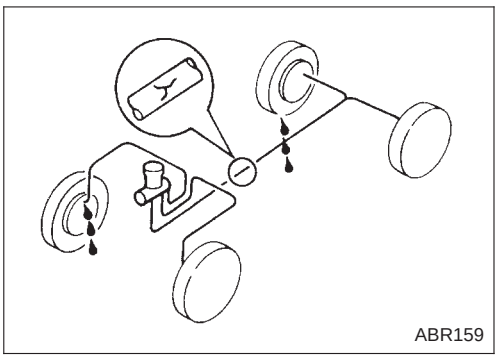
X : Applicable



NBR141

Checking Brake Fluid Level

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

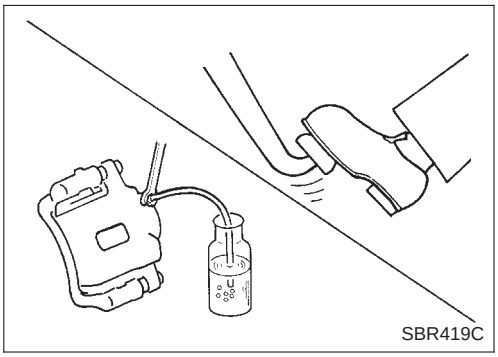

ABR159

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.


SBR419C

Changing Brake Fluid

CAUTION:

- **Refill with new brake fluid “DOT 4”.**
- **Always keep fluid level higher than minimum line on reservoir tank.**
- **Never reuse drained brake fluid.**
- **Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.**

1. Clean inside of reservoir tank, and refill with new brake fluid.
2. Connect a vinyl tube to each air bleeder valve.
3. Drain brake fluid from each air bleeder valve by depressing brake pedal while keeping reservoir level higher than minimum line by adding new brake fluid.
4. Repeat until new brake fluid comes out of each air bleeder valve.
   Use same procedure as in bleeding hydraulic system to refill brake fluid. Refer to “Bleeding Brake System”, BR-8.

Brake Burnishing Procedure

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

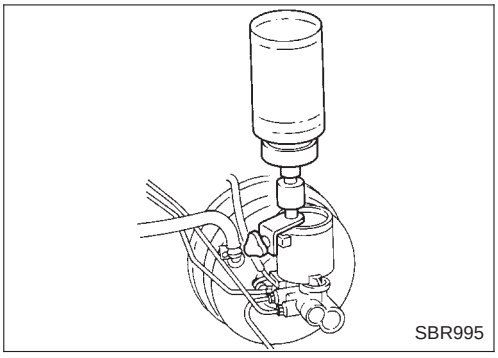
CAUTION:

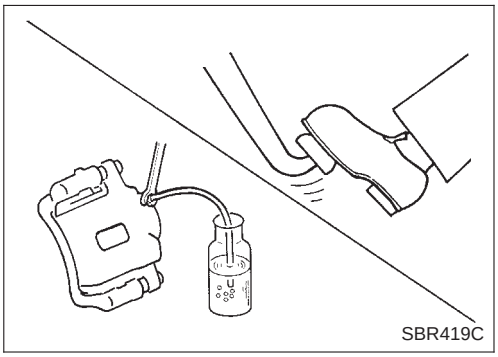
Only perform this procedure under safe road and traffic conditions. Use extreme caution.

1. Drive the vehicle on a straight smooth road at 50 km/h (31 MPH).

Brake Burnishing Procedure (Cont'd)

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


SBR995


SBR419C

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-17.**
- **Fill reservoir with new brake fluid "DOT 4". Make sure it is full at all times while bleeding air out of system.**
- **Place a container under master cylinder to avoid spillage of brake fluid.**
- **For models with ABS, turn ignition switch to the OFF position and disconnect ABS fuse or battery cable.**
- Bleed air in the following order:

  RHD models

  Left rear brake→Right front brake→Right rear brake→Left front brake

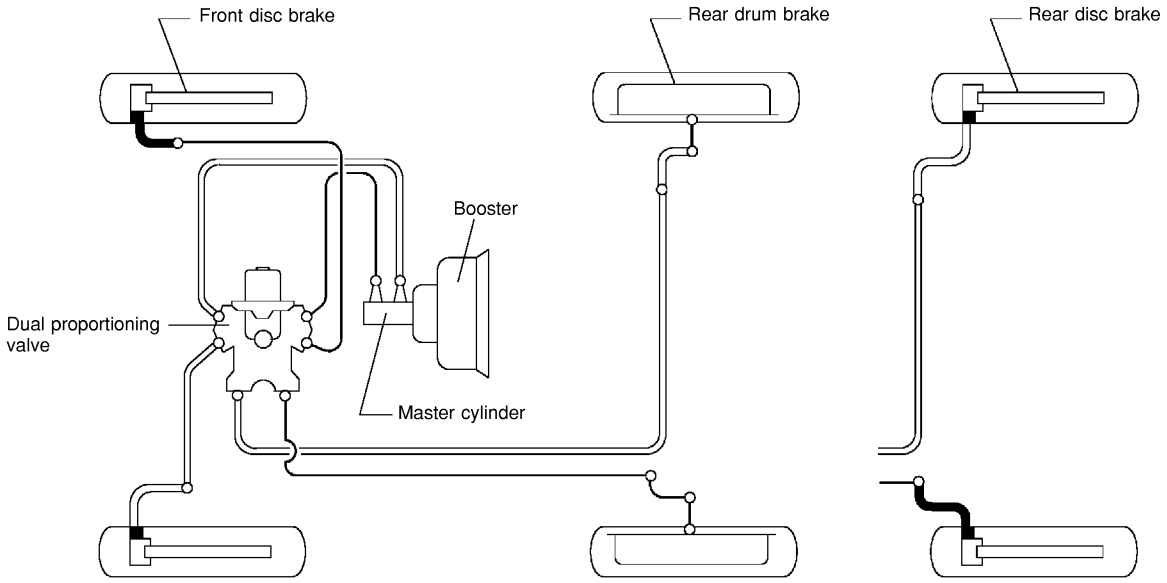
  LHD models

  Right rear brake→Left front brake→Left rear brake→Right front brake.

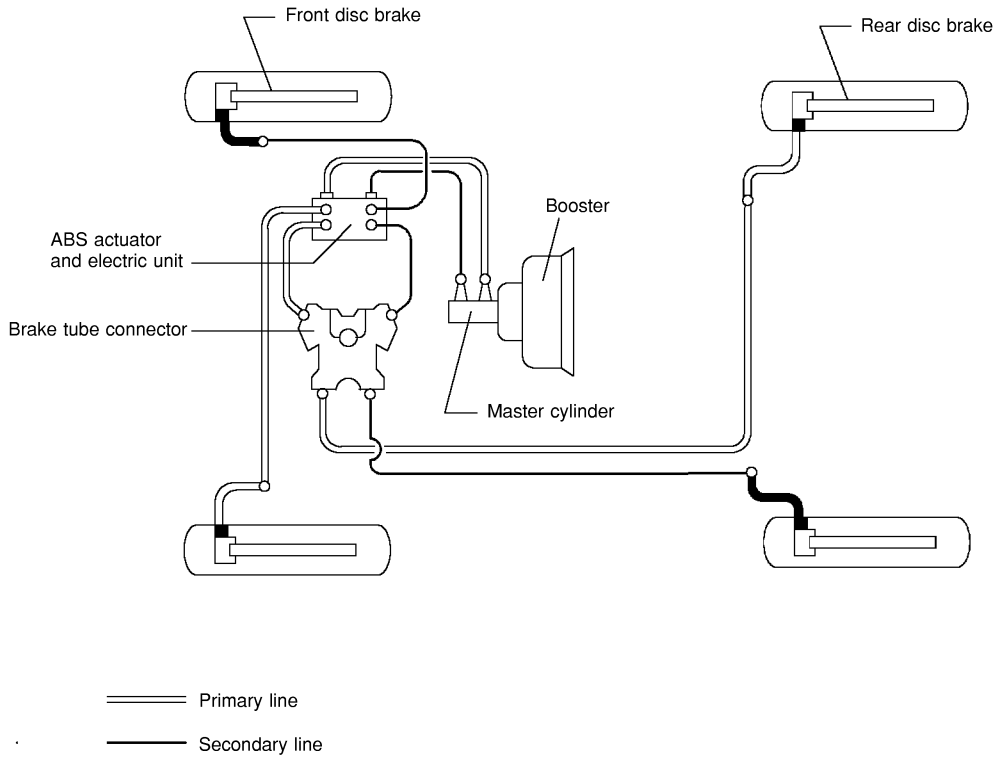
1. Connect a transparent vinyl tube to air bleeder valve.
2. Fully depress brake pedal several times.
3. With brake pedal depressed, open air bleeder valve to release air.
4. Close air bleeder valve.
5. Release brake pedal slowly.
6. Repeat steps 2. through 5. until clear brake fluid comes out of air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

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

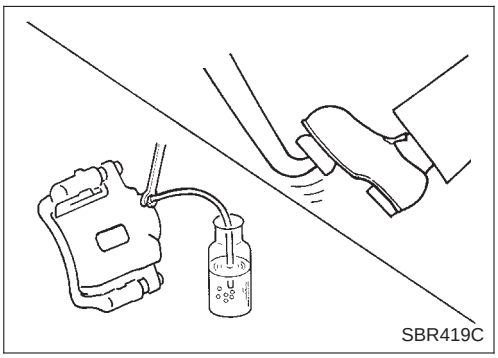
Without anti-lock brake system



With anti-lock brake system



NBR434


SBR419C

Removal

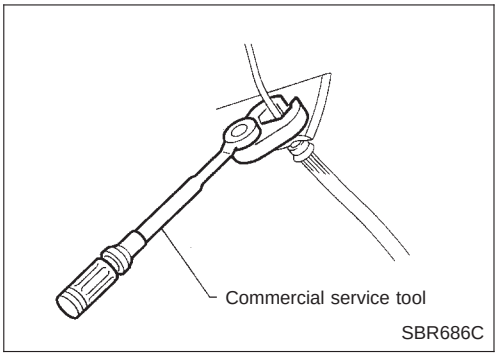
CAUTION:

- **Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.**
- **All hoses and tubes must be free from excessive bending, twisting and pulling.**
- **For rear disc caliper, care should be taken as not to let air enter the body.**

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.



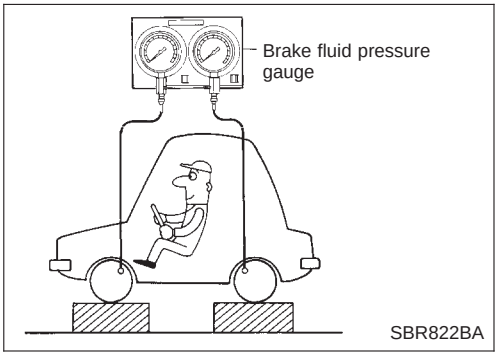
SBR686C

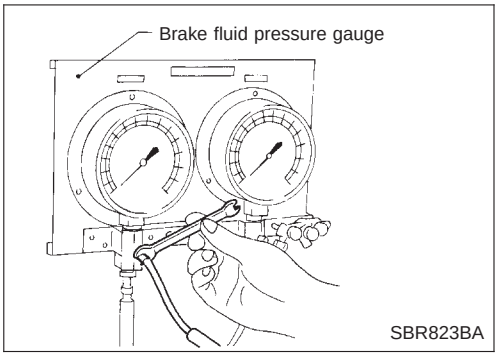
Installation

CAUTION:

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

1. Tighten all flare nuts and connecting bolts.
   Flare nut:
   : 15 - 18 N·m (1.5 - 1.8 kg-m, 11 - 13 ft-lb)
   Connecting bolt:
   : 17 - 20 N·m (1.7 - 2.0 kg-m, 12 - 14 ft-lb)
2. Refill until new brake fluid comes out of each air bleeder valve.
3. Bleed air. Refer to “Bleeding Brake System”, BR-8.





Dual Proportioning Valve

INSPECTION

CAUTION:

- **Carefully monitor brake fluid level at master cylinder.**
- **Use new brake fluid “DOT 4”.**
- **Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on paint areas, wash it away with water immediately.**
- **Depress pedal slowly when raising front brake pressure.**
- **Check rear brake pressure at least 2 seconds after front brake pressure reaches specified value.**

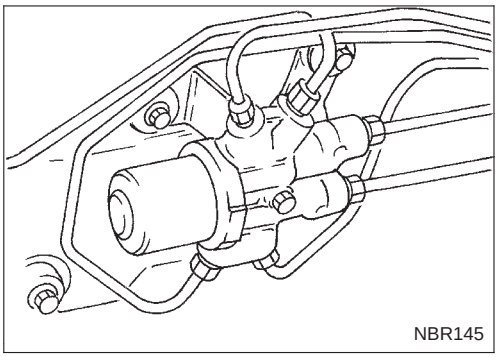
1. Connect brake fluid pressure gauge to air bleeders of front and rear brakes on either LH or RH side.
2. Bleed air from the tool.
3. Check fluid pressure by depressing brake pedal.

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

Applied pressure (Front brake)	5.39 (53.9, 55, 781.6)
Output pressure (Rear brake)	3.132 - 3.532 (31.32 - 35.32, 31.94 - 36.02, 454.3 - 512.3)

If output pressure is out of specifications, replace dual proportioning valve.

4. Bleed air after disconnecting the Tool. Refer to “Bleeding Brake System”, BR-8.



REMOVAL

CAUTION:

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

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

Dual Proportioning Valve (Cont'd)

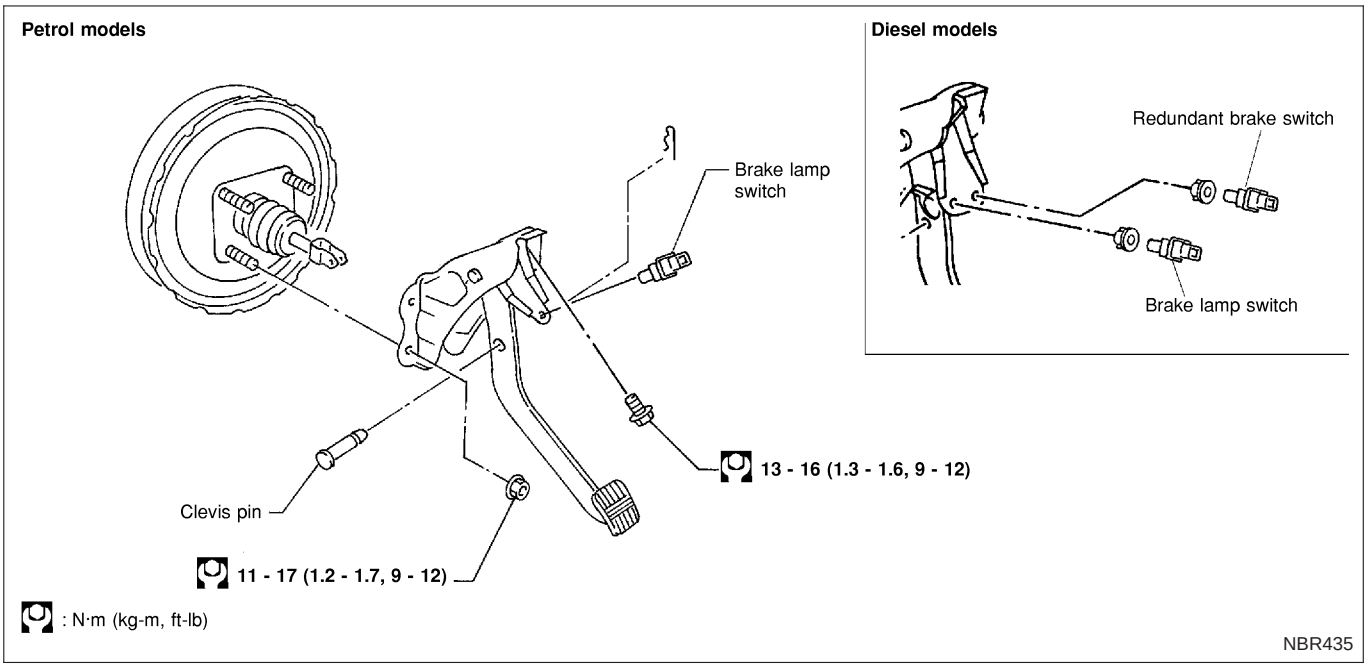
INSTALLATION

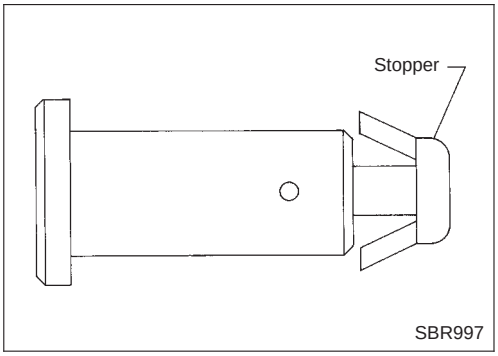
CAUTION:

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

1. Temporarily fit flare nut to proportioning valve.
2. Tighten proportioning valve mounting bolt, then tighten flare nut with wooden block placed between proportioning valve and dash panel.
   Flare nut:
   : 15 - 18 N·m (1.5 - 1.8 kg-m, 11 - 13 ft-lb)
   Mounting bolt:
   : 5.1 - 8.8 N·m (0.52 - 0.9 kg-m, 45 - 78 in-lb)
3. Refill until new brake fluid comes out of each air bleeder valve.
4. Bleed air. Refer to "Bleeding Brake System", BR-8.

Removal and Installation

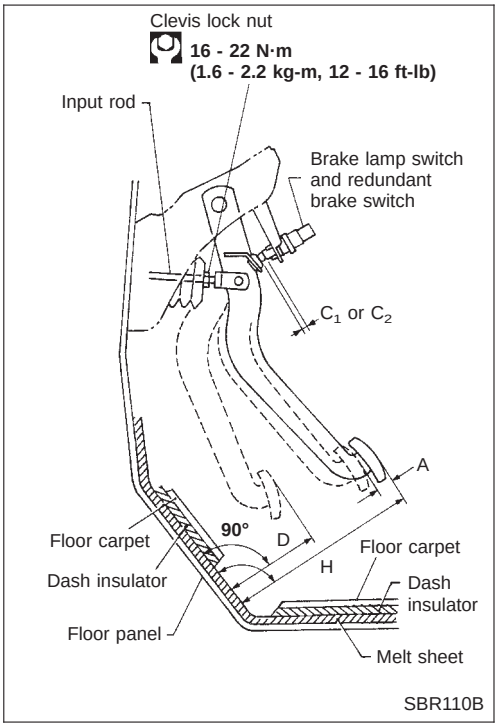




Inspection

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.

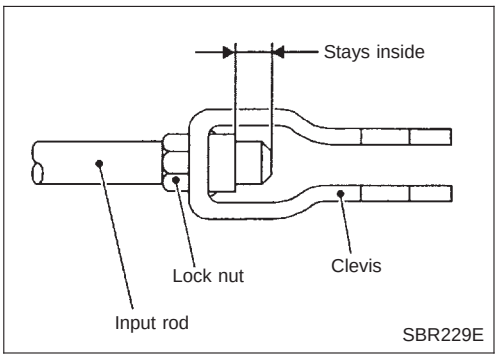
H: Free height
Refer to SDS, BR-92.

D: Depressed height
Refer to SDS, BR-92.

C_1, C_2: Clearance between pedal stopper rubber and threaded end of brake lamp switch (or redundant brake switch).
0.75 - 2.0 mm (0.03 - 0.08 in)

A: Pedal free play
1 - 3 mm (0.039 - 0.118 in)

Adjustment (Cont'd)



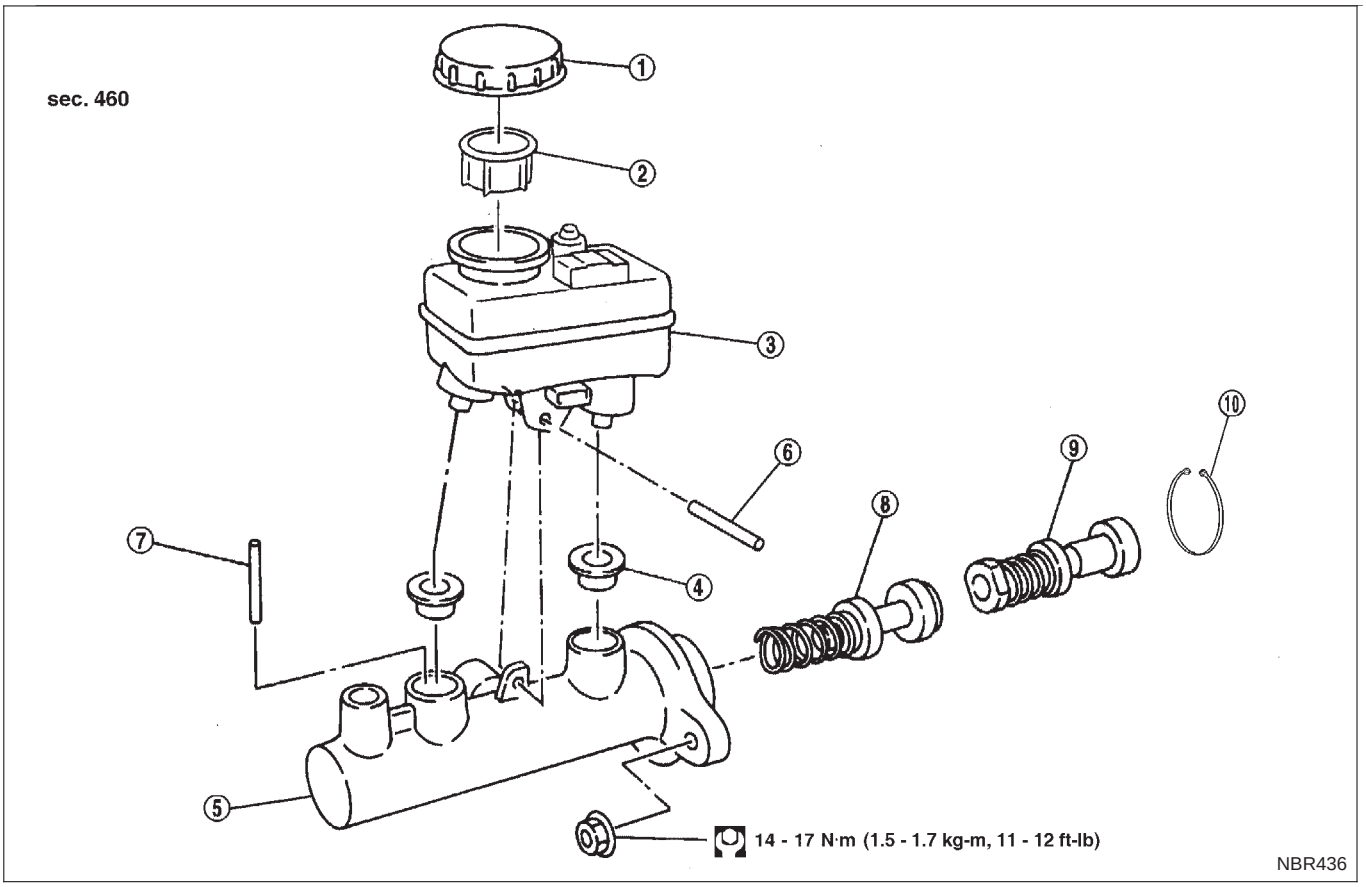
1. Loosen lock nut and adjust pedal free height by turning brake booster input rod. Then tighten lock nut.
2. Check pedal free play.

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

3. Check brake pedal's depressed height while engine is running.

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

Removal

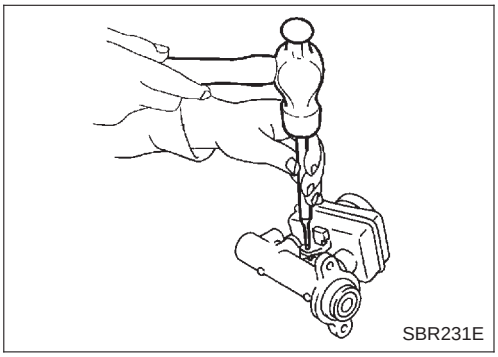


1. Reservoir cap
2. Oil filter
3. Reservoir tank
4. Seal
5. Cylinder body
6. Elastic pin
7. Piston stopper pin
8. Secondary piston assembly
9. Primary piston assembly
10. Circlip

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.

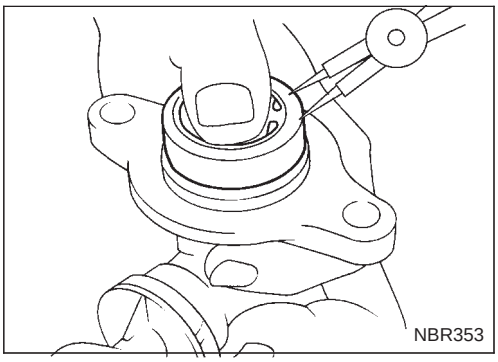
1. Disconnect fluid level connector.
2. Connect a vinyl tube to air bleeder valve.
3. Drain brake fluid from each air bleeder valve, depressing brake pedal to empty fluid from master cylinder.
4. Remove brake pipe flare nuts.
5. Remove master cylinder mounting nuts.



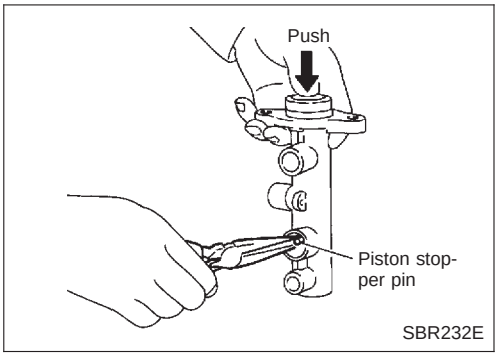
Disassembly

1. Drive out elastic pin from cylinder body.
2. Remove reservoir tank and seals.

Disassembly (Cont'd)



3. Remove the circlip with suitable pliers while piston is pushed into cylinder.



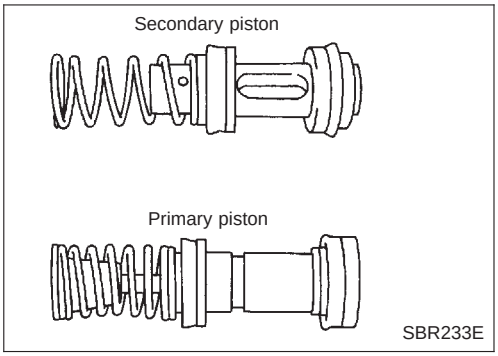
4. Remove piston stopper pin while piston is pushed into cylinder.
5. Remove piston assemblies.
   If it is difficult to remove secondary piston assembly, gradually apply compressed air through fluid outlet.

Inspection

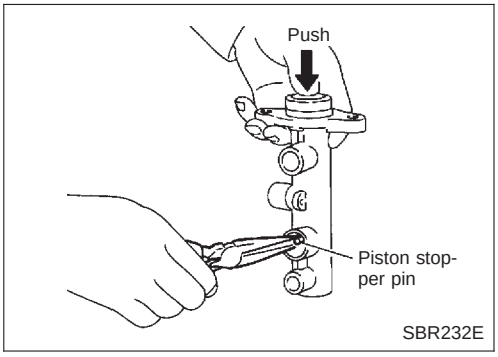
Check for the following items.
Replace any part if damaged.
Master cylinder:
- Pin holes or scratches on inner wall.

Piston:
- Deformation of or scratches on piston cups.

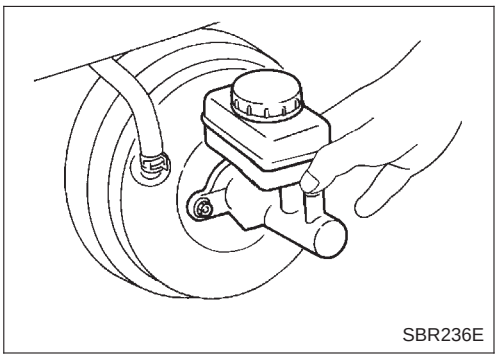
Assembly



1. Insert secondary piston assembly. Then insert primary piston assembly.
   - **Pay attention to alignment of secondary piston slit with valve stopper mounting hole of cylinder body.**



2. Install piston stopper pin while piston is pushed into cylinder. Then secure the primary and secondary piston assemblies with new circlip.
3. Push reservoir tank seals and reservoir tank into cylinder body.
4. Install elastic pin.

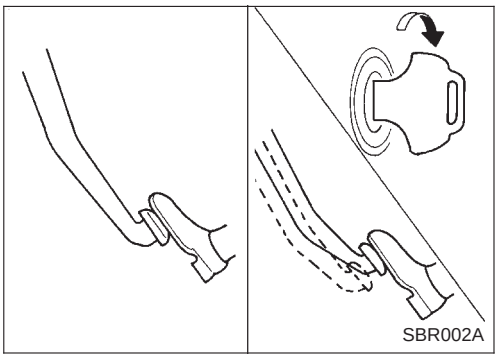

SBR236E

Installation

CAUTION:

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

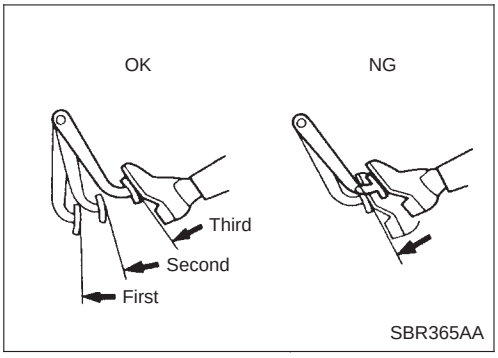
1. Place master cylinder onto brake booster and secure mounting nuts lightly.
2. Torque mounting nuts.
   : 14 - 17 N·m (1.5 - 1.7 kg-m, 11 - 12 ft-lb)
3. Fill up reservoir tank with new brake fluid.
4. Plug all ports on master cylinder with fingers to prevent air suction while releasing brake pedal.
5. Have driver depress brake pedal slowly several times until no air comes out of master cylinder.
6. Fit brake lines to master cylinder.
7. Tighten flare nuts.
   : 15 - 18 N·m (1.5 - 1.8 kg-m, 11 - 13 ft-lb)
8. Connect fluid level connector.
9. Bleed air from brake system. Refer to “Bleeding Brake System”, BR-8.



On-vehicle Service

OPERATING CHECK

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



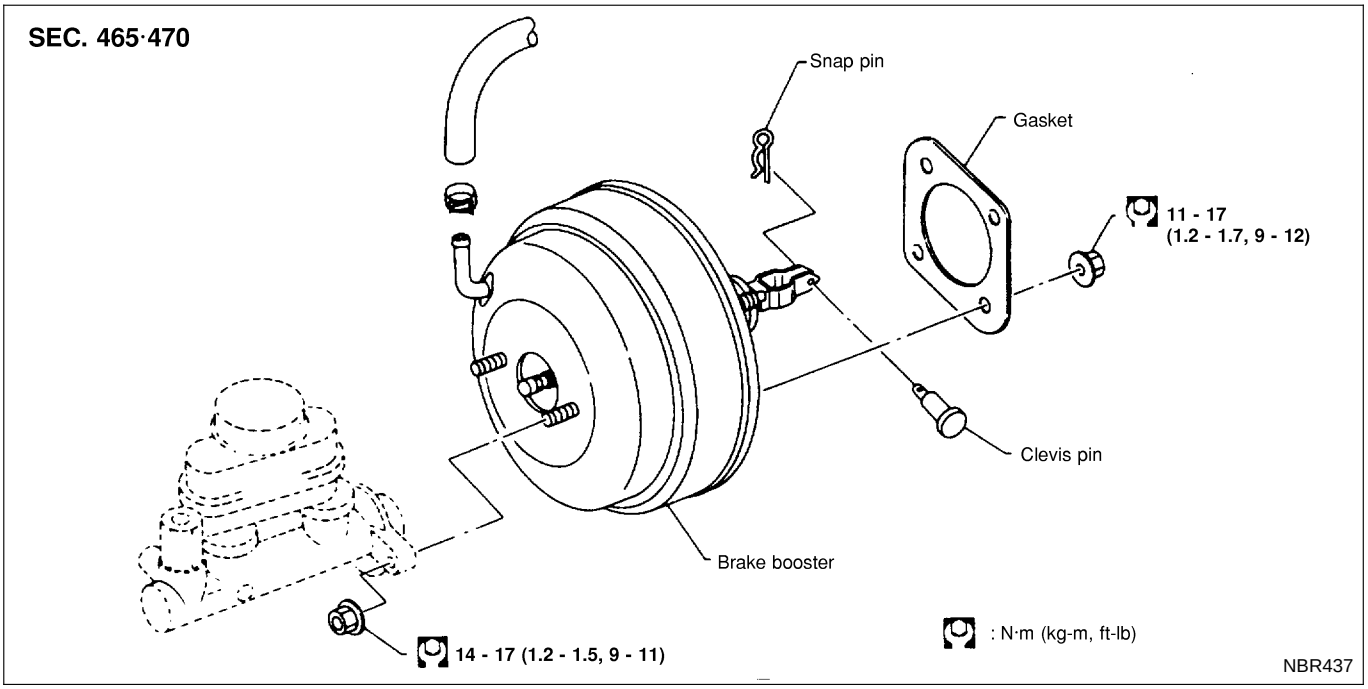
AIRTIGHT CHECK

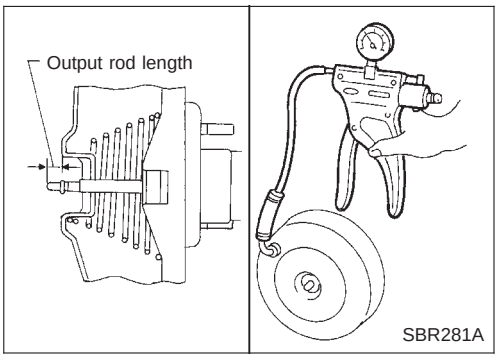
1. Start engine, and stop it after one or two minutes. Depress brake pedal several times slowly. Booster is airtight if pedal stroke is less each time.
2. Depress brake pedal while engine is running, and stop engine with pedal depressed. The pedal stroke should not change after holding pedal down for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

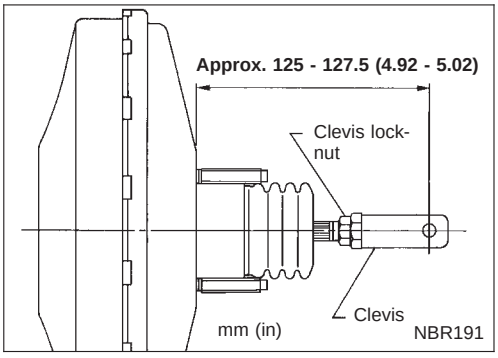
Removal

CAUTION:

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







Inspection

OUTPUT ROD LENGTH CHECK

1. Supply brake booster with vacuum of −66.7 kPa (−667 mbar, −500 mmHg, −19.69 inHg) using a hand vacuum pump.
2. Add preload of 19.6N (2.0 kg, 4.4lb) to output rod.
3. Check output rod length.

Specified length:

10.275 - 10.525 mm (0.4045 - 0.4144 in)

Installation

CAUTION:

- **Be careful not to deform or bend brake pipes during installation of booster.**
- **Replace clevis pin if damaged.**
- **Refill with new brake fluid “DOT 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 in the table.

	Adjustment mm (in)
LHD	127.5 (5.02)
RHD	125 (4.92)

2. Fit booster, then secure mounting nuts (brake pedal bracket to booster) lightly.
3. Connect brake pedal and booster input rod with clevis pin.
4. Secure mounting nuts.

Specification:

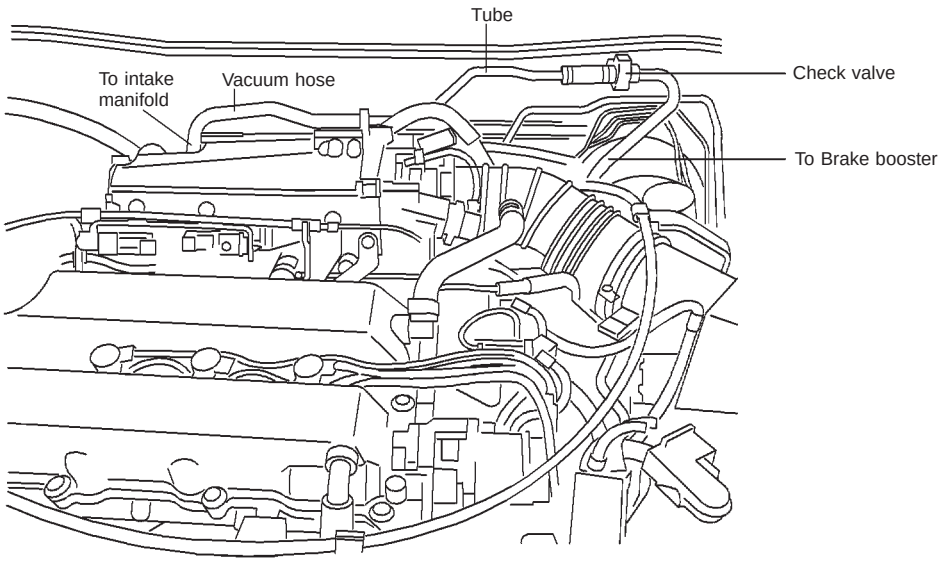
: 11 - 17 N·m (1.2 - 1.7 kg-m, 9 - 12 ft-lb)

5. Install master cylinder. Refer to BR-14.
6. Bleed air. Refer to “Bleeding Brake System”, BR-8.
7. Adjust pedal height to specification. Refer to SDS (BR-92). Retighten clevis locknut.

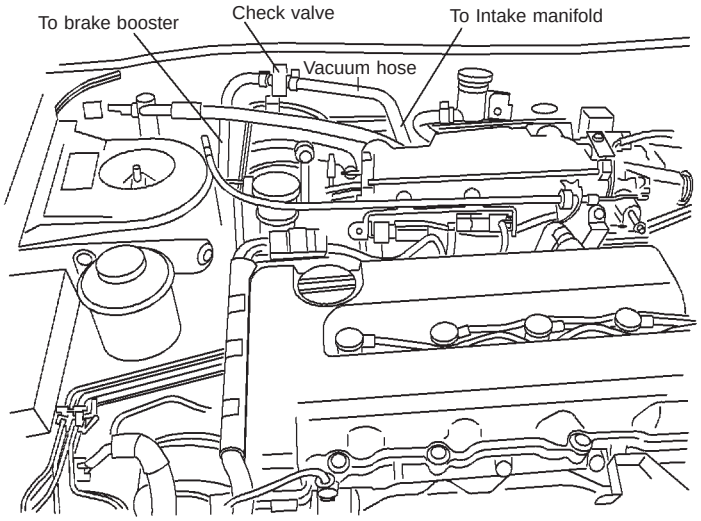
Specification:

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

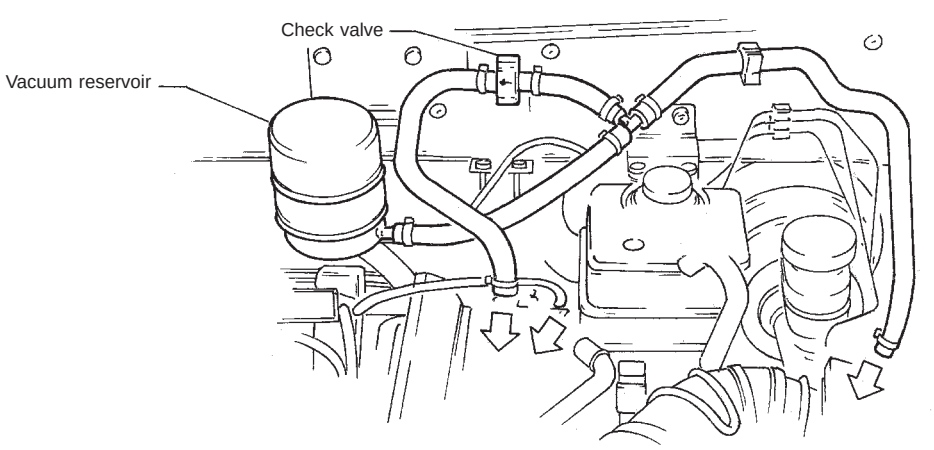
LHD Petrol models



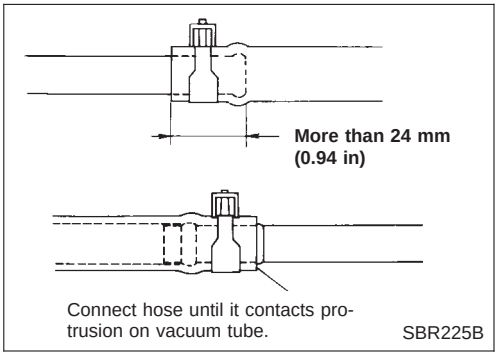
RHD Petrol models



Diesel models



NBR421

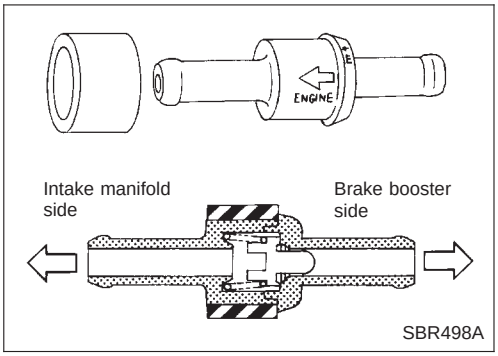


Removal and Installation

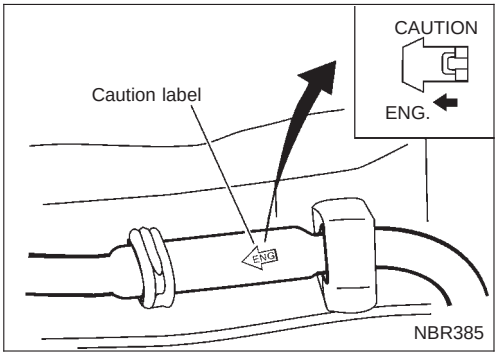
CAUTION:

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

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



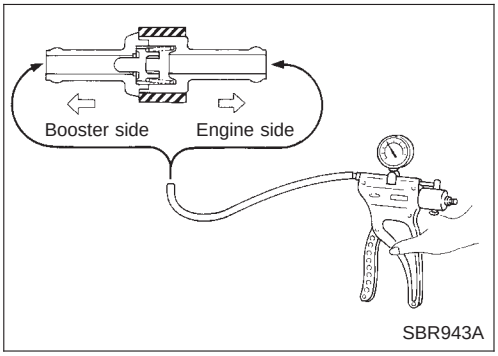
- **Install check valve, paying attention to its direction.**



Inspection

HOSES AND CONNECTORS

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

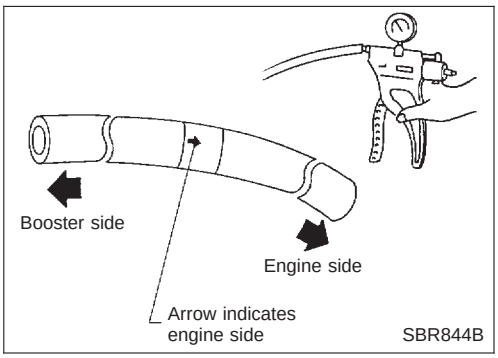


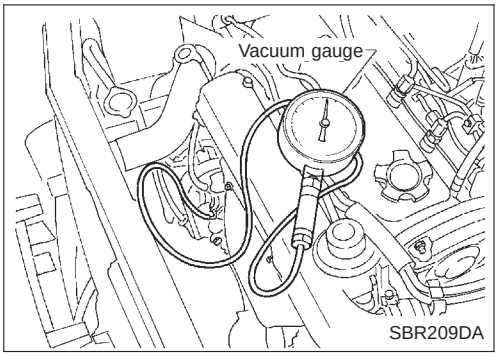
CHECK VALVE

Check vacuum with a vacuum pump.

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

Inspection (Cont'd)



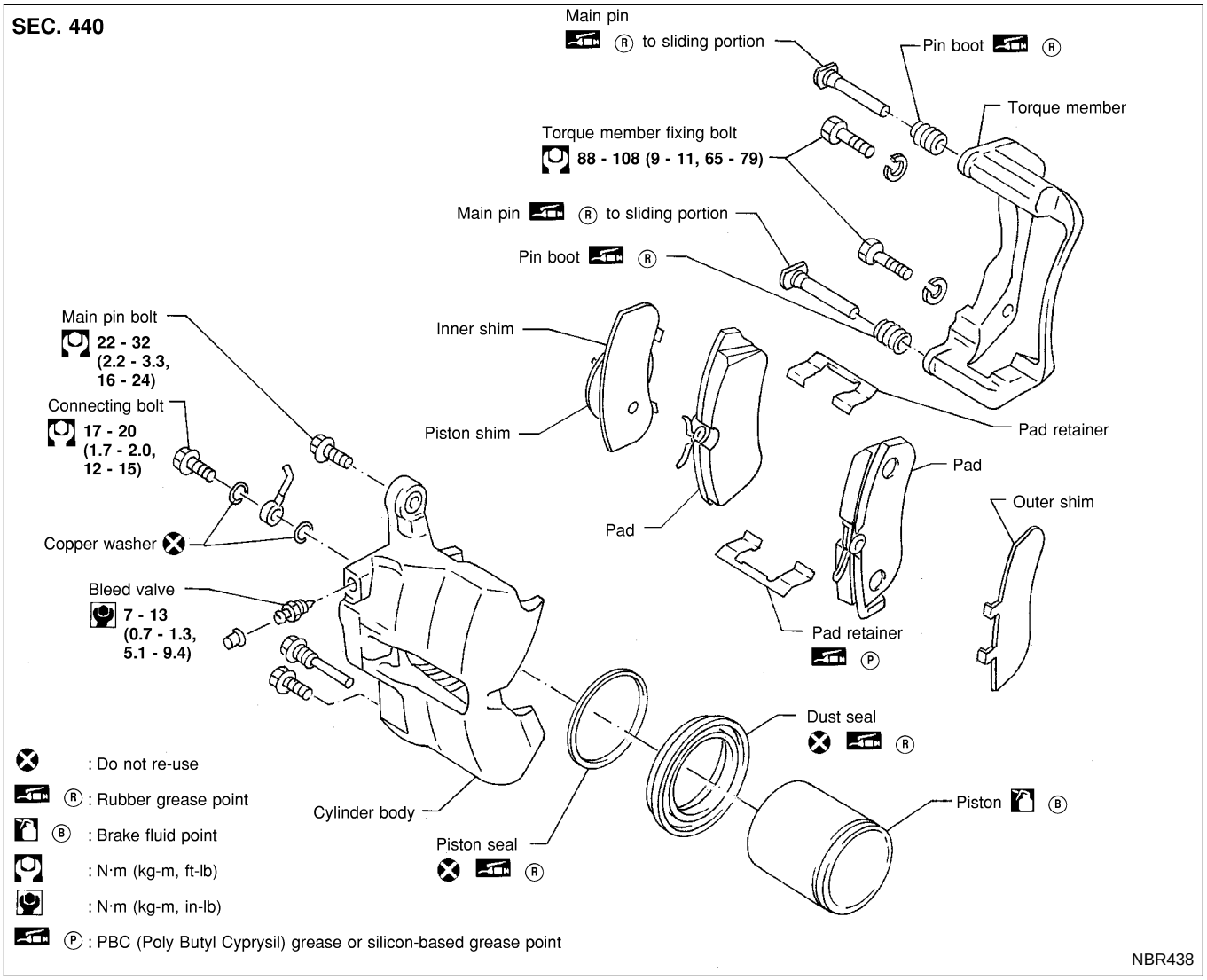


VACUUM PUMP

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

Specified vacuum:

86.6 kPa (866 mbar, 650 mmHg, 25.59 inHg) or more



Pad Replacement

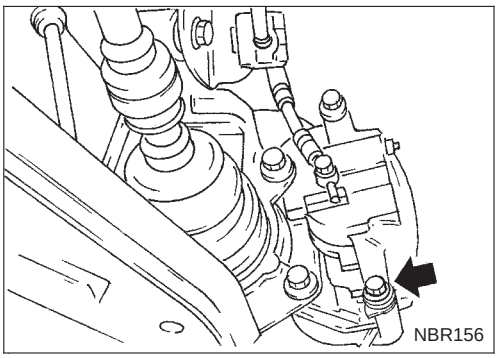
WARNING:

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

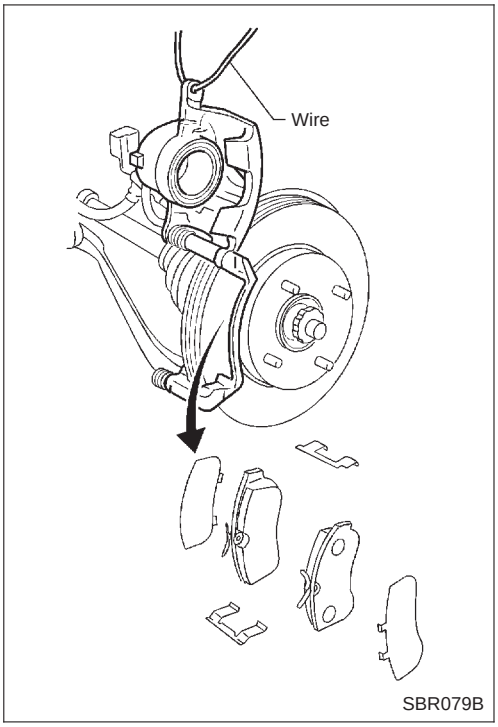
CAUTION:

- **When cylinder body is open, do not depress brake pedal because piston will pop out.**
- **Be careful not to damage piston boot or get oil on rotor. Always replace shims when replacing pads.**
- **If shims are rusted or show peeling of the rubber coat, replace them with new shims.**
- **It is not necessary to remove connecting bolt except for disassembly or replacement of caliper assembly. In this case, suspend cylinder body with wire so as not to stretch brake hose.**
- **Burnish the brake contact surfaces after refinishing or replacing rotors, after replacing pads, or if a soft pedal occurs at very low mileage.**
  Refer to “Brake Burnishing Procedure”, “CHECK AND ADJUSTMENT”, BR-7.

Pad Replacement (Cont'd)


NBR156

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



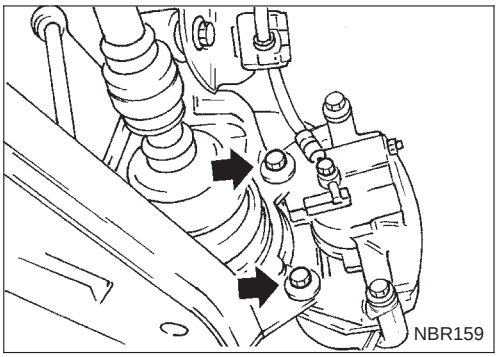
SBR079B

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

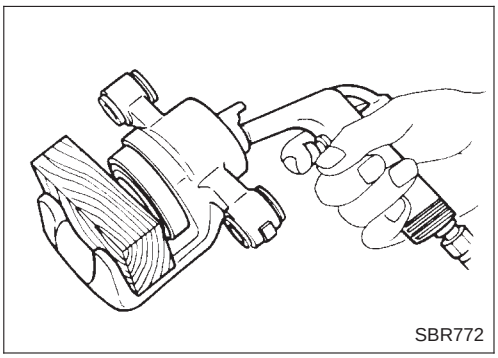
Standard pad thickness:
11 mm (0.43 in)
Pad wear limit:
2.0 mm (0.079 in)

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

Removal


NBR159

WARNING:
Clean brake pads with a vacuum dust collector to minimize the hazard of airborne materials.
CAUTION:
Suspend caliper assembly with wire so as not to stretch brake hose.
Remove torque member fixing bolts and connecting bolt.
It is not necessary to remove connecting bolt except for disassembly or replacement of caliper assembly.


SBR772

Disassembly

WARNING:

Do not place your fingers in front of piston.

CAUTION:

Do not scratch or score cylinder wall.

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

Inspection — Caliper

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 surface with a fine emery paper. Replace cylinder body if necessary.

CAUTION:

Use brake fluid to clean. Never use mineral oil.

PISTON

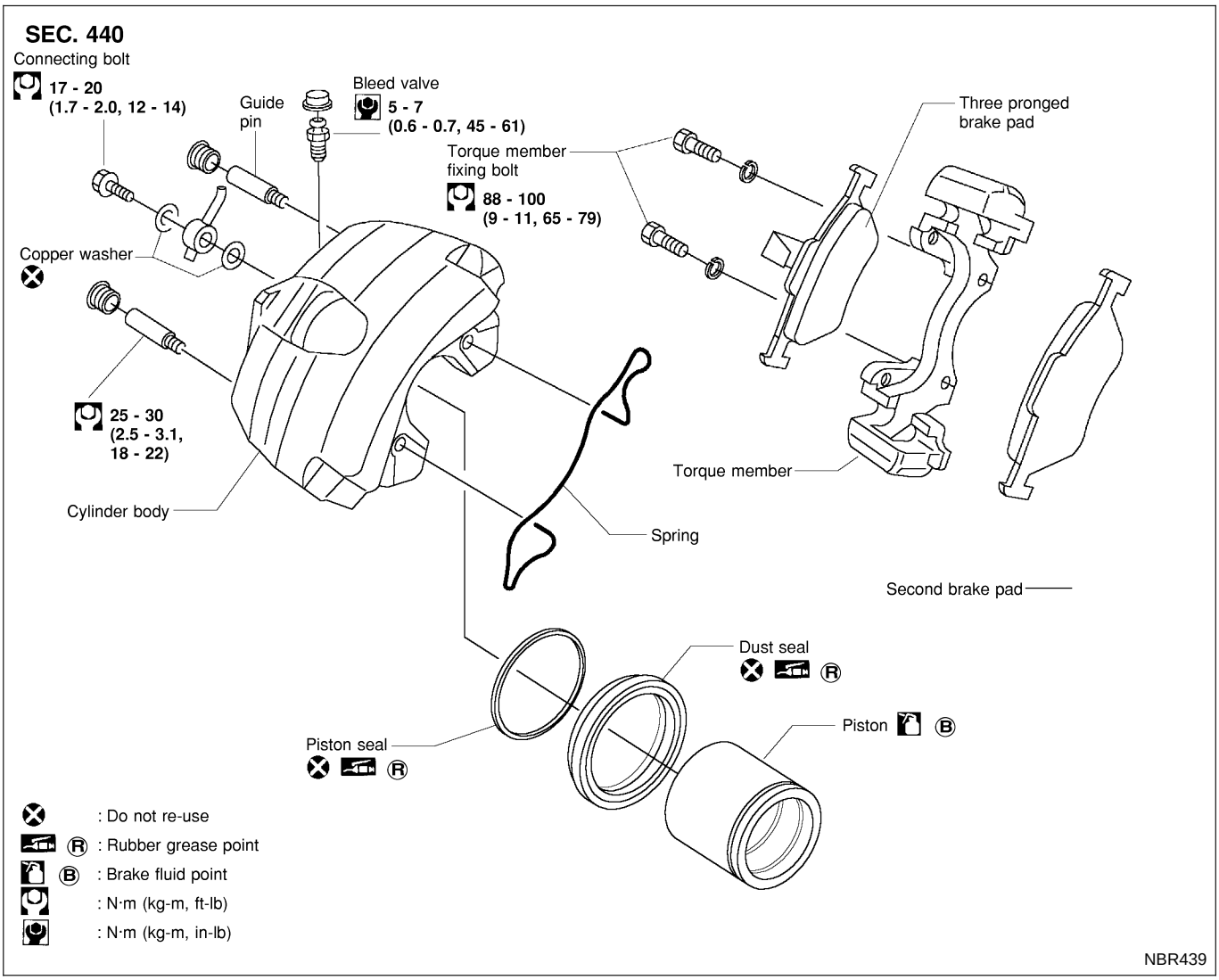
CAUTION:

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

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

SLIDE PIN, PIN BOLT AND PIN BOOT

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



Pad Replacement

WARNING:

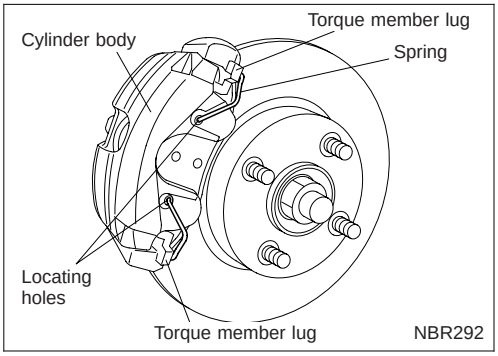
Clean brake pads with a vacuum dust collector to minimize the hazard of airborne particles or other materials.

CAUTION:

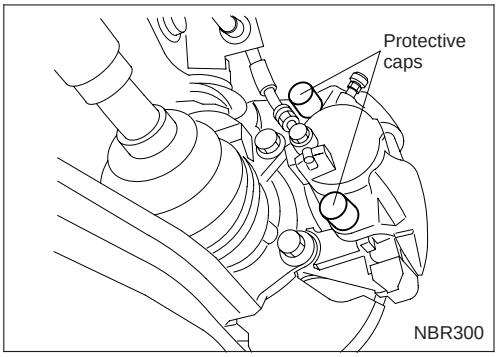
- **When cylinder body is open, do not depress brake pedal because piston will pop out.**
- **Be careful not to damage piston boot or get oil on rotor. Always replace shims when replacing pads.**
- **If shims are rusted or show peeling of the rubber coat, replace them with new shims.**
- **It is not necessary to remove connecting bolt except for disassembly or replacement of caliper assembly. In this case, suspend cylinder body with wire so as not to stretch brake hose.**
- **Burnish the brake contact surfaces after refinishing or replacing rotors, after replacing pads, or if a soft pedal occurs at very low mileage.**
  Refer to “Brake Burnishing Procedure”, “CHECK AND ADJUSTMENT”, BR-7.

Pad Replacement (Cont'd)

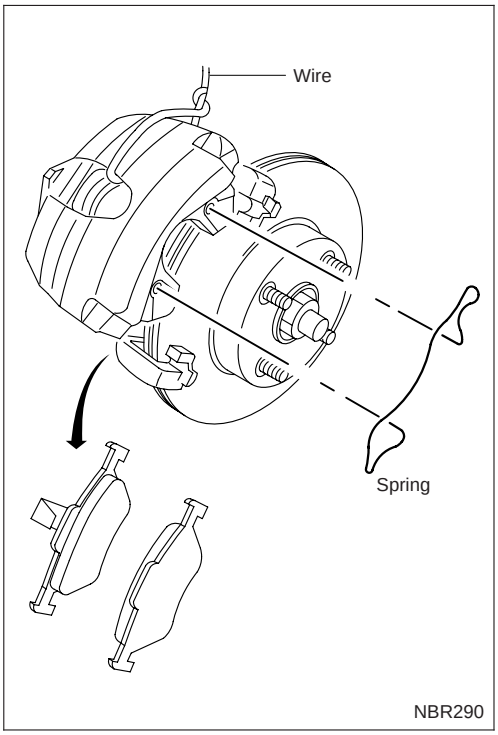
REMOVAL



1. Remove the housing retaining spring.
2. Wipe away any dirt from the guide pins between the torque member and the cylinder body.



3. Pull out the protective caps from the guide sleeves.
4. Use a 7 - mm ALLEN key to unscrew the guide pins from the torque member.
5. Partially remove the guide pins from the guide sleeve.



6. Pull the cylinder body manually towards the outer side of the vehicle so that the piston is slightly pressed back.
7. Remove the cylinder body and hang it on a wire in the wheel arch in a suitable position.

Make sure there is no strain on the brake hose piping.

8. Remove the brake pad on the piston side from the piston.
9. Remove the second brake pad from the torque member.

Pad Replacement (Cont'd)

CAUTION:

Do not use any sharp tools or cleaning agents which contains mineral oil. Damage to the installation can occur.

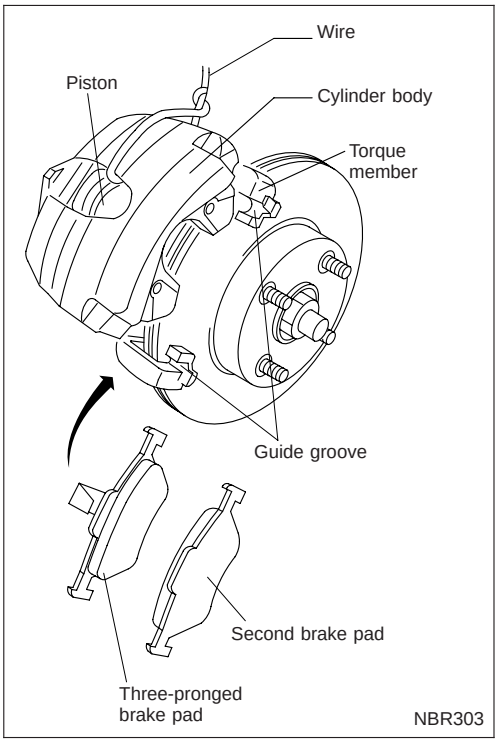
10. Clean the cylinder body and guide grooves in the torque member.
11. Check the dust cover and guide sleeves for damage.
12. Measure the amount of wear on the brake pad

    Standard pad thickness:
    11 mm (0.43 in)
    Pad wear limit:
    2.0 mm (0.079 in)

14. Press the piston fully back with a suitable tool.

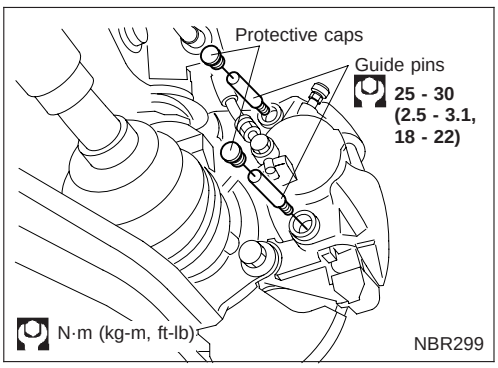
CAUTION:

Carefully monitor brake fluid level to avoid brake fluid from returning to the reservoir when pushing back the piston.



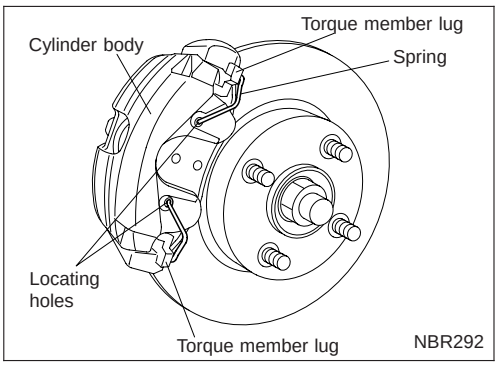
Installation

1. Install the brake pad with a three-pronged retaining spring into the piston.
2. Place the second brake pad into the guide groove of the torque member on the outer side of the brake disc.
3. Place the cylinder body with the installed brake pad over the brake disc and the second brake pad.



4. Tighten the guide pins with a 7 - mm Allen key.
5. Press back the protective caps into the guides sleeve.

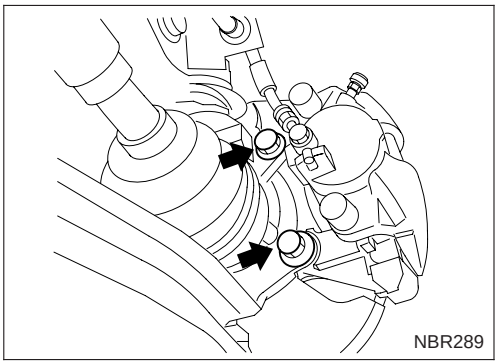
Installation (Cont'd)



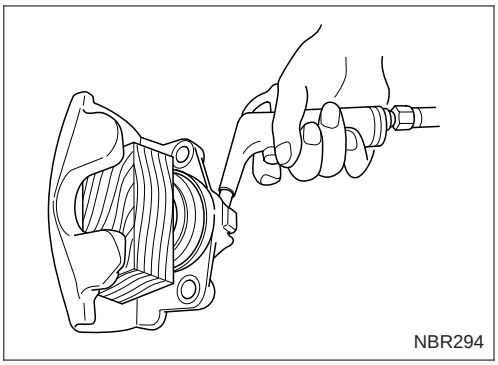
6. Check the cylinder body retaining spring for damage if the spring is defective, replace the spring.
7. Click the cylinder body retaining spring in position and make sure that:
   - The two ends of spring click correctly into the locating holes of the cylinder body.
   - The spring is in the correct position against the lugs of the torque member.

Removal

WARNING:
Clean brake pads with a vacuum dust collector to minimize the hazard of airborne materials.
CAUTION:
Suspend caliper assembly with wire to avoid stretching the brake hose.



Remove torque member fixing bolts and connecting bolt.
It is not necessary to remove connecting bolt except for disassembly or replacement of caliper assembly.



Disassembly

WARNING:
Do not place your fingers in front of piston.
CAUTION:
Do not scratch or score cylinder wall.
1. Push out piston with dust seal with compressed air.
2. Remove piston seal with a suitable tool.

Inspection — Caliper

CYLINDER BODY

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

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

Inspection — Caliper (Cont'd)

PISTON

CAUTION:

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

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

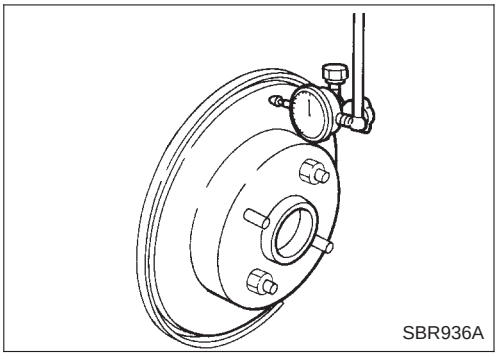
GUIDE PIN, BOLT, AND RETAINING SPRING

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

Inspection — Rotor

RUBBING SURFACE

Check rotor for roughness, cracks or chips.


SBR936A

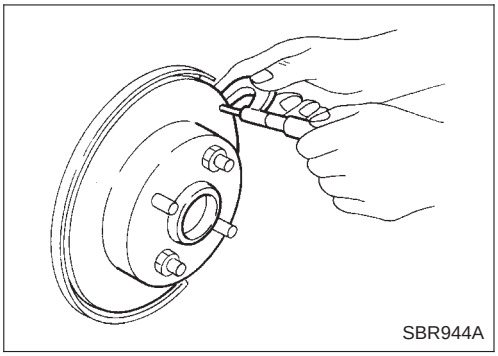
RUNOUT

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

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

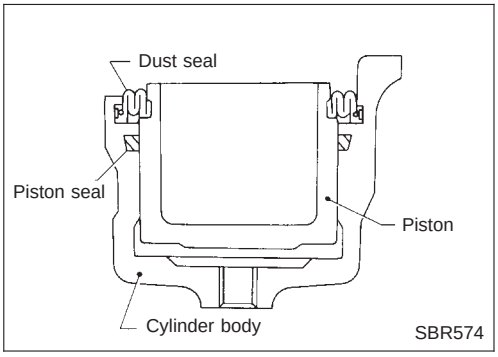
Maximum runout:
0.07 mm (0.0028 in)

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 tho wheel hub with nuts.
   c. Measure runout.
   d. Repeat steps a. to c. so minimum runout position can be found.
4. If the runout is still out of specification, turn rotor with on-car brake lathe (“MAD, DL-8700”, “AMMCO 700 and 705” or equivalent).


SBR944A

THICKNESS

Rotor repair limit:
Standard thickness
22 mm (0.87 in)
Minimum thickness
20.0 mm (0.787 in)
Thickness variation (At least 8 positions)
Maximum 0.02 mm (0.0008 in)

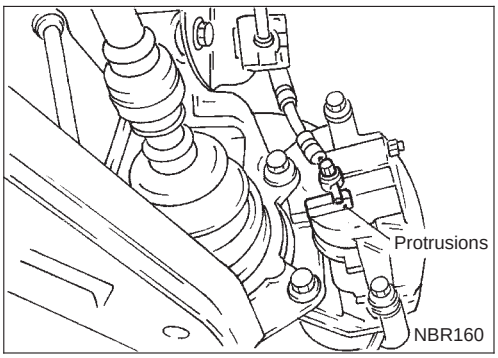


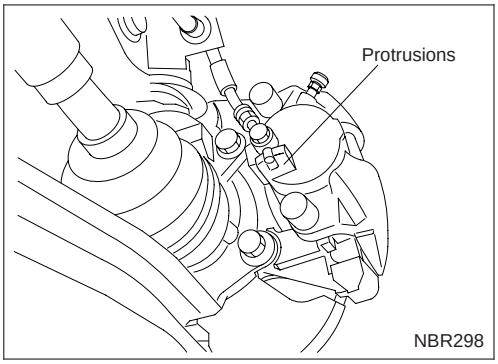
SBR574

Assembly

CAUTION:
Always use new piston seal.

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





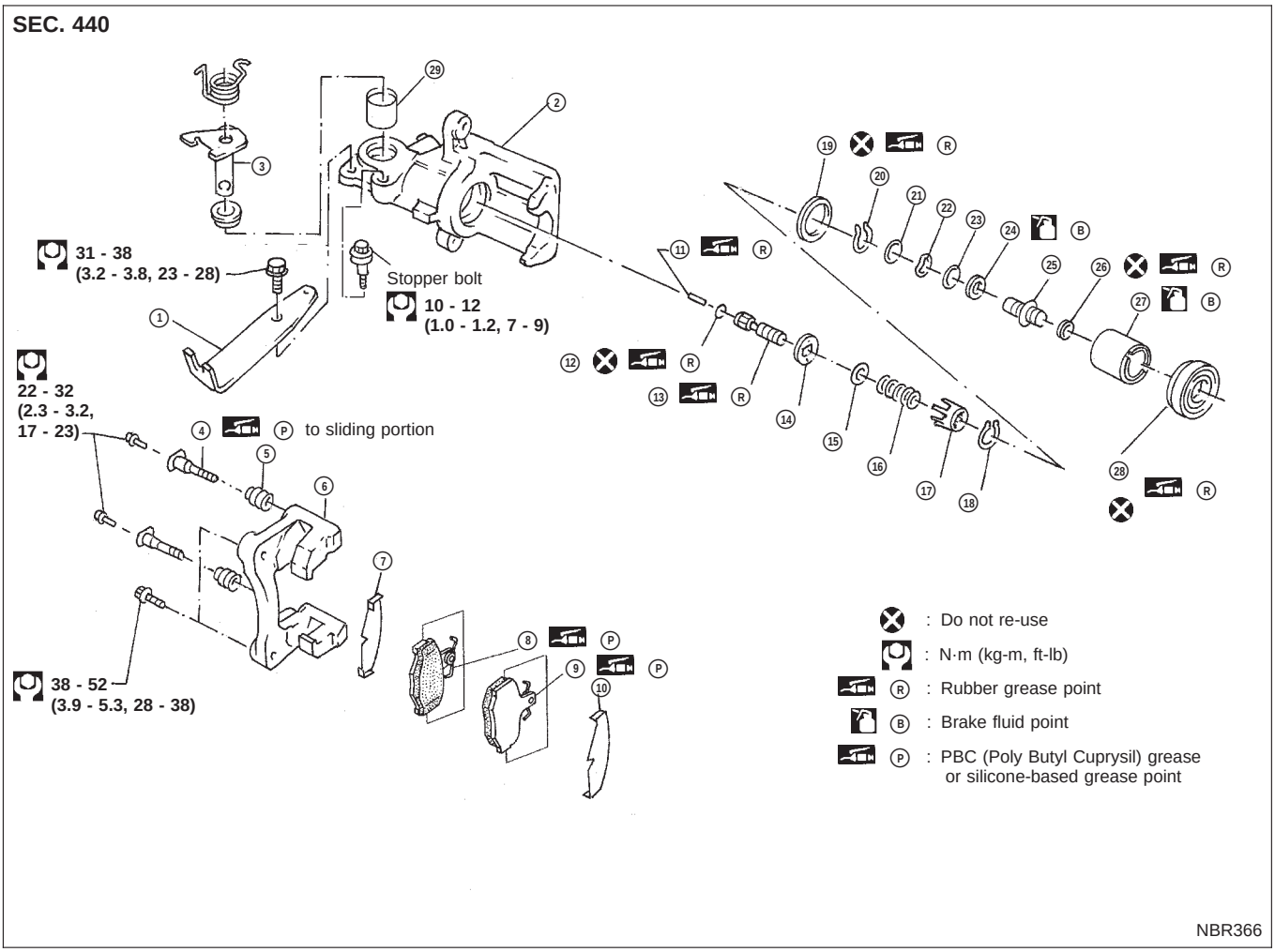
Installation

CAUTION:

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

1. Install brake hose to caliper securely.
2. Install all parts and secure all bolts.
3. Bleed air. Refer to “Bleeding Brake System” BR-8.

Component



1. Cable guide
2. Cylinder
3. Toggle lever
4. Pin
5. Pin boot
6. Torque member
7. Inner shim
8. Inner pad
9. Outer pad
10. Outer shim
11. Strut
12. O-ring
13. Push rod
14. Key plate
15. Retaining washer
16. Spring
17. Spring cover
18. Snap ring B
19. Piston seal
20. Snap ring A
21. Washer
22. Wave washer
23. Washer
24. Bearing
25. Adjuster
26. Cup
27. Piston
28. Piston boot
29. Sleeve

Pad Replacement

WARNING:

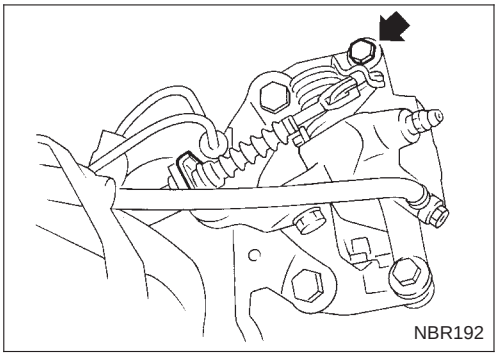
Clean brake pads with a vacuum dust collector to minimize the hazard of airborne particles or other materials.

CAUTION:

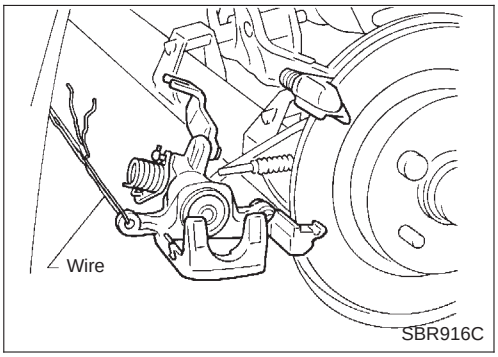
- **When cylinder body is open, do not depress brake pedal because piston will pop out.**
- **Be careful not to damage piston boot or get oil on rotor. Always replace shims in replacing pads.**
- **If shims are rusted or show peeling of rubber coat, replace them with new shims.**

Pad Replacement (Cont'd)

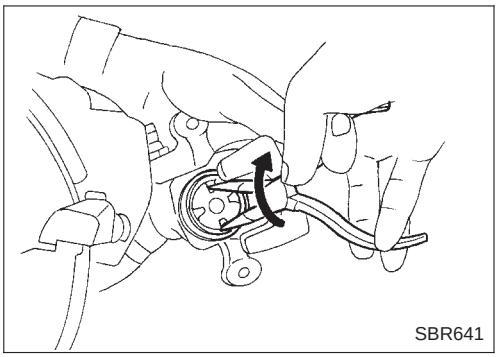
- **It is not necessary to remove connecting bolt except for disassembly or replacement of caliper assembly. In this case, suspend cylinder body with wire so as not to stretch brake hose.**
- **Burnish the brake contact surfaces after refinishing or replacing rotors, after replacing pads, or if a soft pedal occurs at very low mileage.**
  Refer to "Brake Burnishing Procedure", "CHECK AND ADJUSTMENT", BR-7.


NBR192

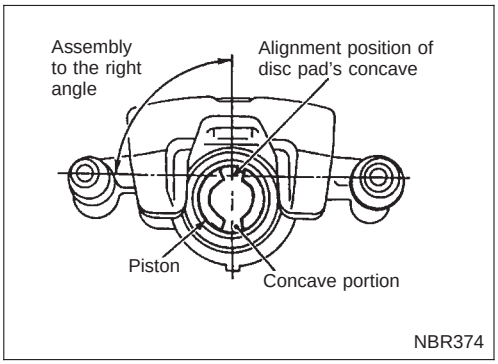
1. Remove master cylinder reservoir cap.
2. Remove brake cable mounting bolt and lock spring.
3. Release parking brake control lever, then disconnect cable from the caliper.
4. Remove upper pin bolt.
5. Open cylinder body downward. Then remove pads inner and outer shims.
   Standard pad thickness:
   9.3 mm (0.366 in)
   Pad wear limit:
   2.0 mm (0.079 in)



SBR916C


SBR641

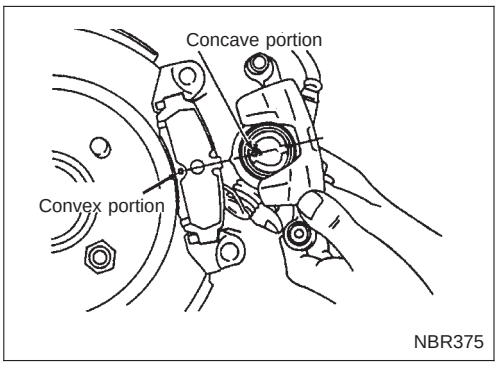
6. When installing new pads, push piston into cylinder body by gently turning piston clockwise, as shown.
   Carefully monitor brake fluid level because brake fluid will return to reservoir when pushing back piston.



NBR374

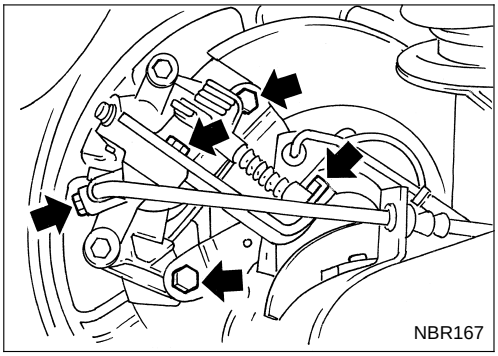
7. Adjust the piston to the right angle as shown in the figure.

Pad Replacement (Cont'd)



8. As shown in the figure, align the piston's concave to the pad's convex, then install the cylinder body to the torque member.
9. Install brake cable, brake cable mounting bolt, lock spring and master cylinder reservoir cap.

Removal



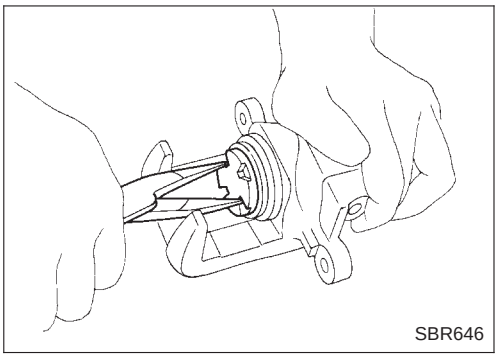
WARNING:

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

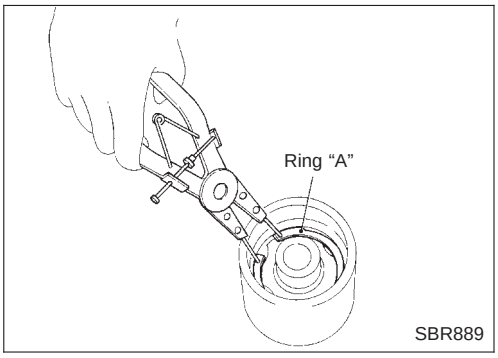
1. Remove brake cable mounting bolt and lock spring.
2. Release parking brake control lever, then disconnect cable from the caliper.
3. Remove torque member fixing bolts and connecting bolt.

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

Disassembly

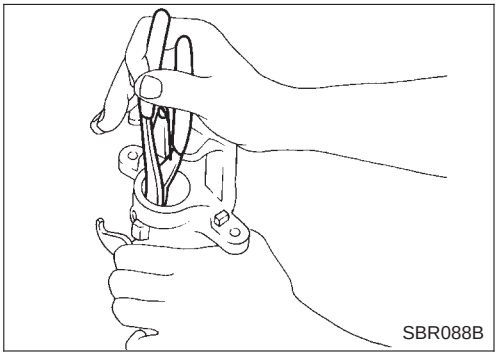


1. Remove piston by turning it counterclockwise with long nose pliers or suitable tool.

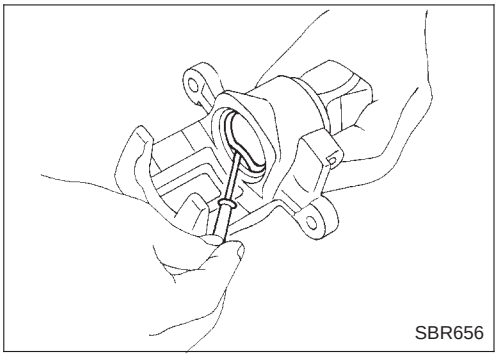


2. Pry off snap ring A from piston with suitable pliers and remove adjusting nut.

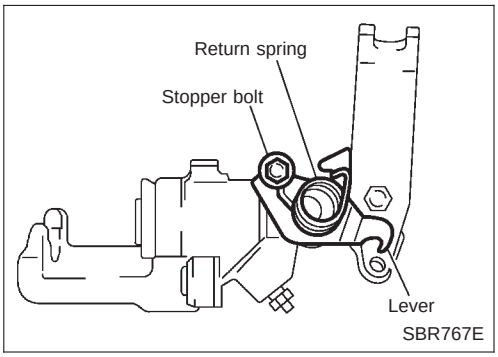
Disassembly (Cont'd)


SBR088B

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


SBR656

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



SBR767E

4. Remove return spring, toggle lever and cable guide.

Inspection

Caliper

CAUTION:

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

Cylinder Body

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

Torque Member

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

Piston

CAUTION:

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

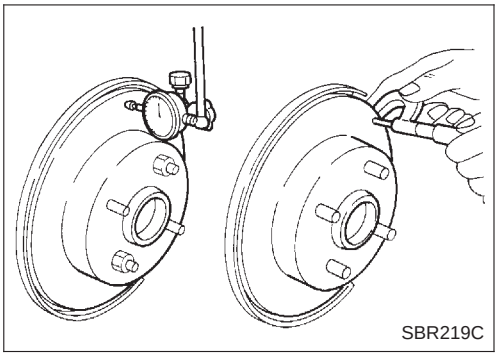
Check piston for score, rust, wear, damage or presence of foreign materials.

Replace if any of the above conditions are observed.

Inspection (Cont'd)

Pin and Pin Boot

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


SBR219C

Rotor

Rubbing Surface

Check rotor for roughness, cracks or chips.

Runout

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

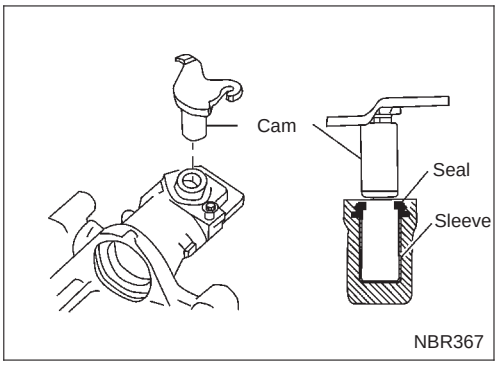
Make sure that axial end play is within the specifications before measuring. Refer to RA section ("REAR WHEEL BEARING", "On-vehicle Service").

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

Maximum runout:
0.07 mm (0.0028 in)

Thickness

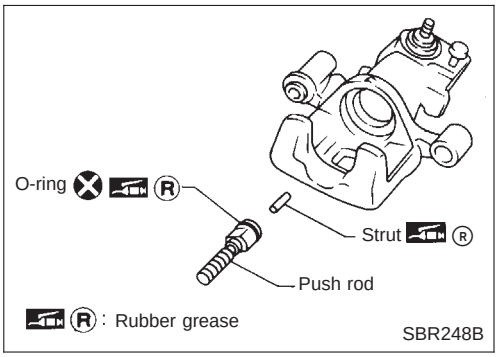
Rotor repair limit:
Standard thickness
10 mm (0.39 in)
Minimum thickness
9 mm (0.35 in)
Thickness variation (At least 8 portions)
Maximum 0.02 mm (0.0008 in)



NBR367

Assembly

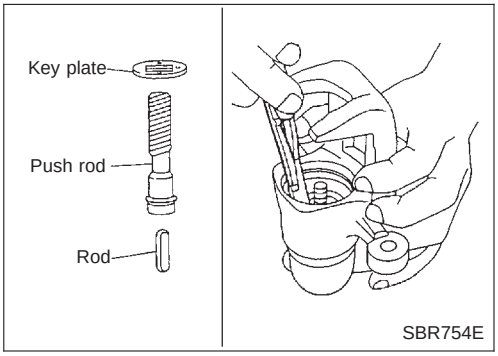
1. Insert cam with depression facing towards open end of cylinder.



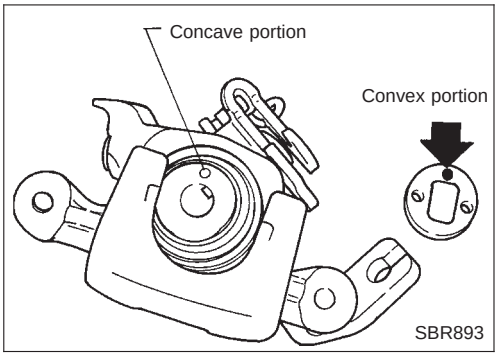
SBR248B

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

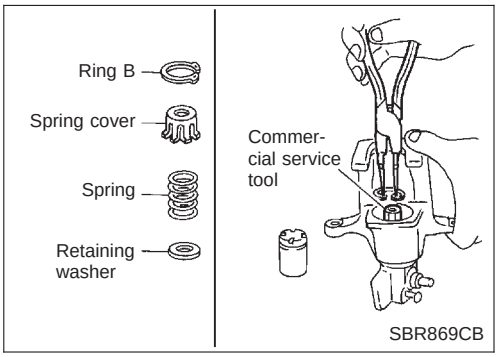
Assembly (Cont'd)



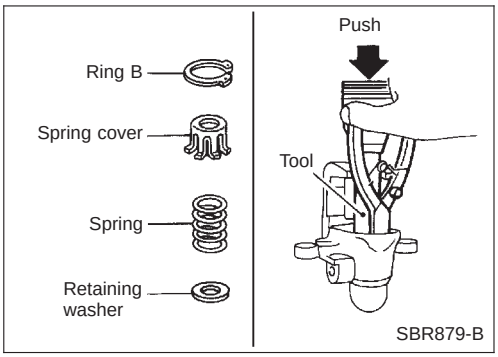
3. Install rod, push rod and key plate.

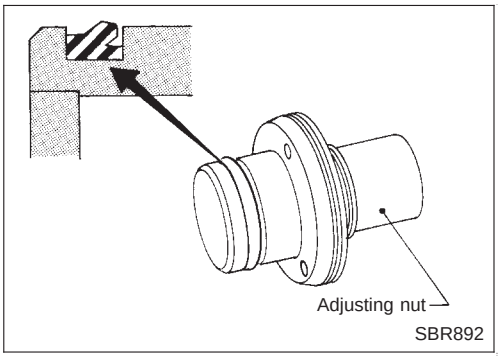


4. Fit push rod into square hole in key plate. Also match convex portion of key plate with concave portion of cylinder.



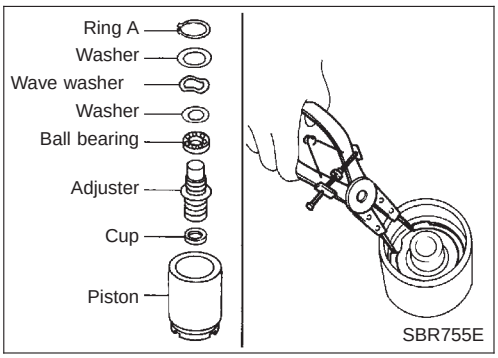
5. Install retaining washer, spring, spring cover and snap ring B with suitable press and drift.



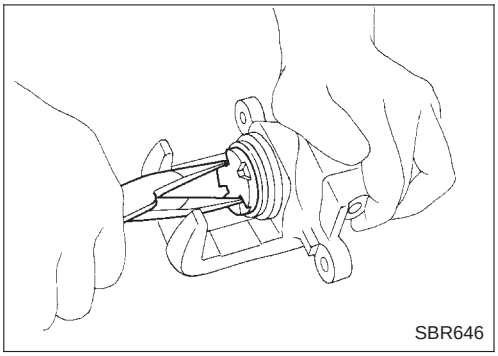


6. Install cup in the specified direction.

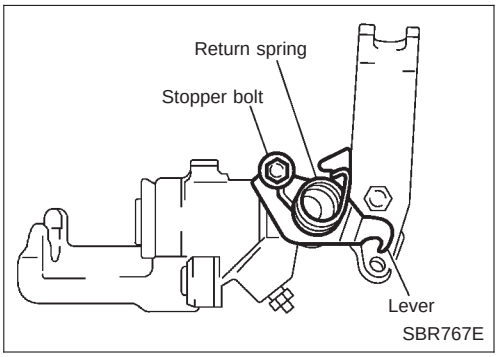
Assembly (Cont'd)



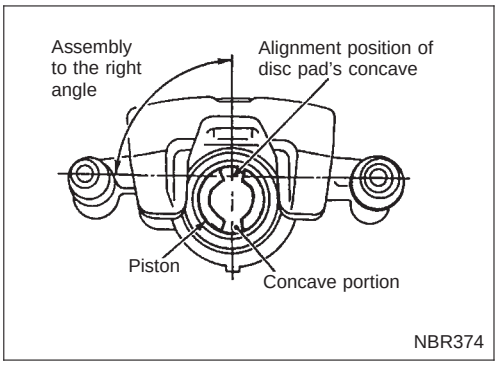
7. Install cup adjuster, bearing, washers and snap ring A with a suitable tool.



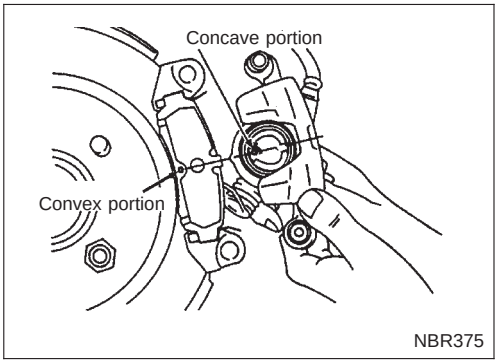
8. Insert piston seal into groove on cylinder body.
9. With piston boot fitted to piston, insert piston boot into groove on cylinder body and fit piston by turning it clockwise with long nose pliers, or suitable tool.



10. Fit toggle lever, return spring and cable guide.



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



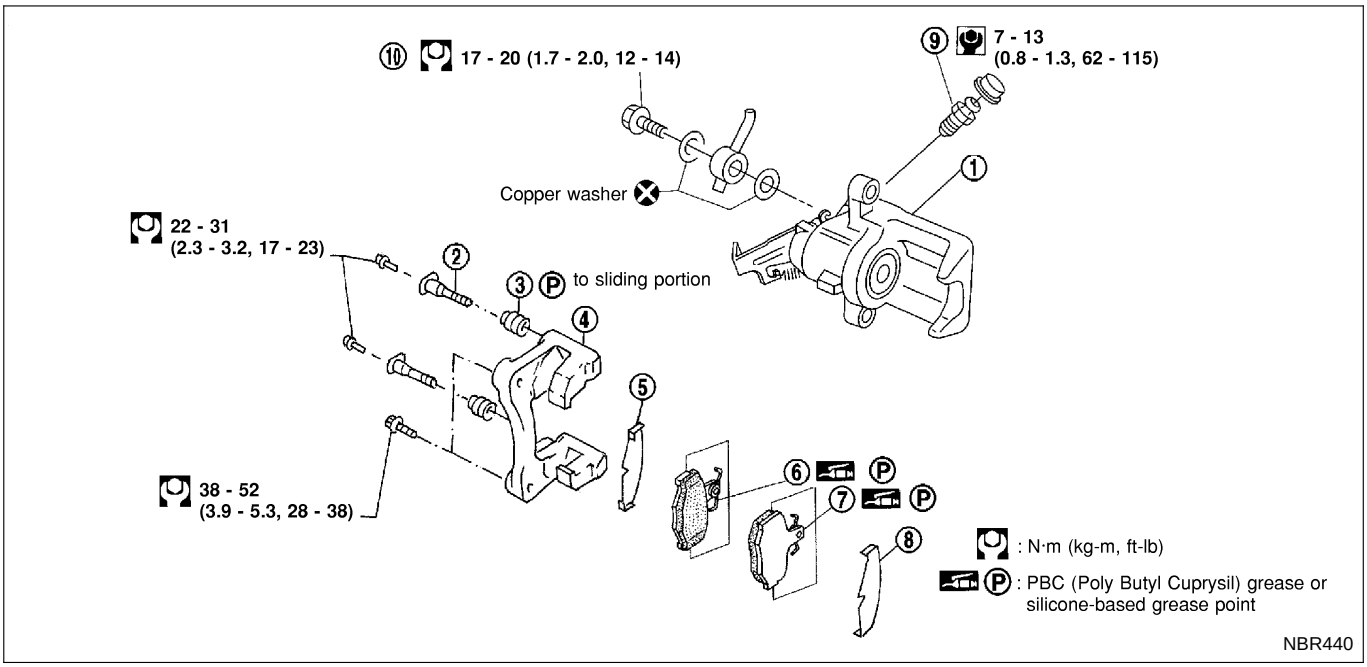
Installation

CAUTION:

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

1. Install caliper assembly.
- As shown in the figure, align the piston's concave to the pad's convex, then install the cylinder body to the torque member.
2. Install brake hose to caliper securely.
3. Install all parts and secure all bolts.
4. Bleed air. Refer to "Bleeding Brake System", BR-8

Component



1. Cylinder body
2. Pin
3. Pin boot
4. Torque member
5. Inner shim
6. Inner pad
7. OUter pad
8. Outer shim
9. Bleed valve
10. Connecting bolt

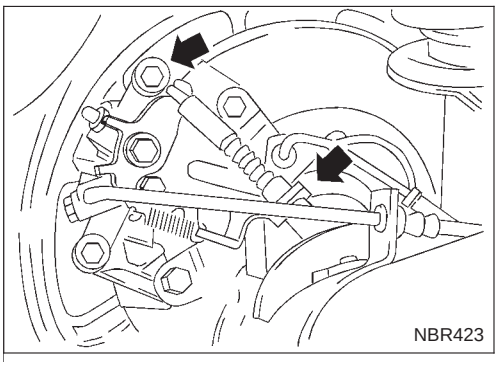
NOTE:
The cylinder body cannot be disassembled.

Pad Replacement

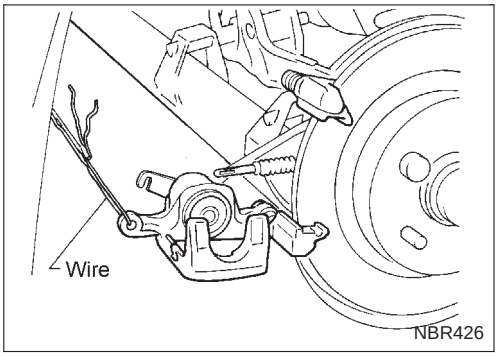
WARNING:
Clean brake pads with a vacuum dust collector to minimize the hazard of airborne particles or other materials.
CAUTION:

- **When cylinder body is open, do not depress brake pedal because piston will pop out.**
- **Be careful not to damage piston boot or get oil on rotor. Always replace shims in replacing pads.**
- **If shims are rusted or show peeling of rubber coat, replace them with new shims.**
- **It is not necessary to remove connecting bolt except for replacement of caliper assembly. In this case, suspend cylinder body with wire so as not to stretch brake hose.**
- **Burnish the brake contact surfaces after refinishing or replacing rotors, after replacing pads, or if a soft pedal occurs at very low mileage.**
  Refer to “Brake Burnishing Procedure”, “ON-VEHICLE SERVICE”, BR-7.

Pad Replacement (Cont'd)

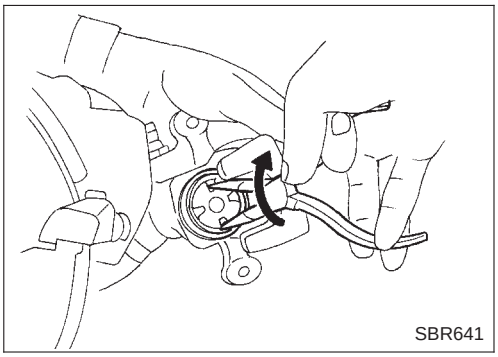

NBR423

1. Remove master cylinder reservoir cap.
2. Remove brake cable lock spring.
3. Release parking brake control lever, then disconnect cable from the caliper.
4. Remove upper pin bolt.

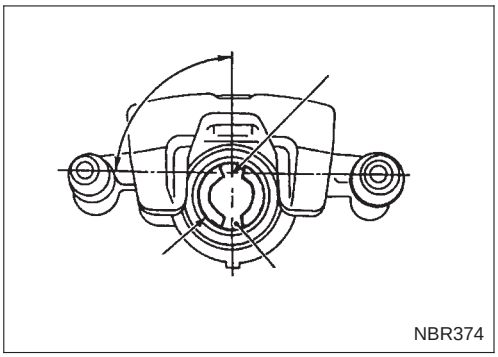


NBR426

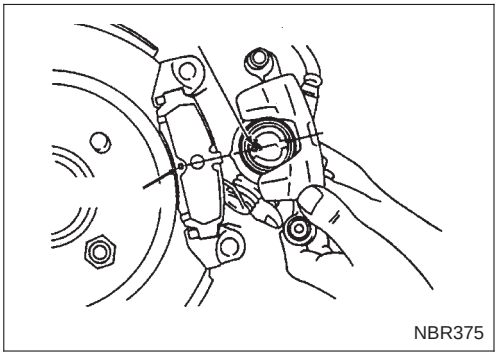
5. Open cylinder body downward. Then remove pad inner and outer shims.
   Standard pad thickness:
   9.3 mm (0.366 in)
   Pad wear limit:
   2.0 mm (0.079 in)


SBR641

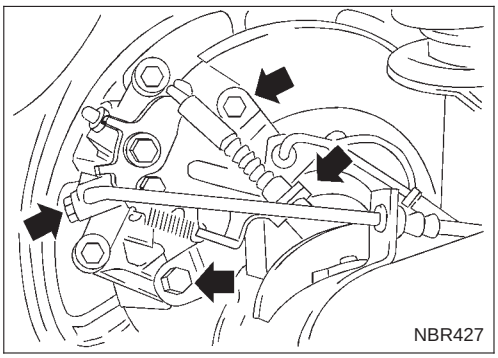
6. When installing new pads, push piston into cylinder body by gently turning piston clockwise, as shown.
   Carefully monitor brake fluid level because brake fluid will return to reservoir when pushing back piston.


NBR374

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


NBR375

8. As shown in the figure, align the piston's concave to the pad's convex, then install the cylinder body to the torque member.
9. Install brake cable, brake cable mounting bolt, lock spring and master cylinder reservoir cap.



Removal

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

1. Remove brake cable lock spring.
2. Release parking brake control lever, then disconnect cable from the caliper.
3. Remove torque member fixing bolts and connecting bolt.
4. Remove brake hose connecting bolt.
5. Plug off the brake hose and cylinder body to prevent air entering the system.

CAUTION:
Care should be taken as not to let:

- **Air enter the cylinder body and brake hose.**
- **Brake fluid spill from the cylinder body and brake hose.**

Disassembly

Remove pin bolts and pins.
NOTE:
Cylinder body can not be disassembled.

Inspection

CALIPER

CAUTION:
Do not drain any brake fluid from cylinder body. Cylinder body can not be disassembled.

Cylinder Body

Check cylinder body for score, rust, wear, damage or presence of foreign materials. If any of the above conditions are observed, replace cylinder body.

Torque Member

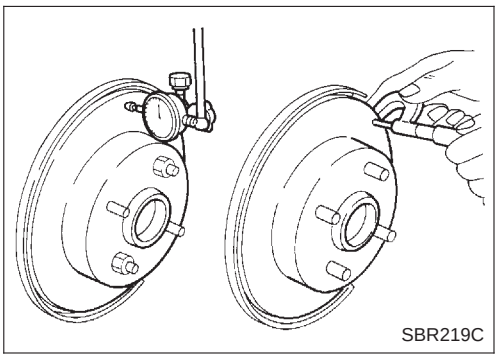
Check for wear, cracks or other damage. Replace if necessary.

Pin and Pin Boot

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

Inspection (Cont'd)

ROTOR


SBR219C

Rubbing Surface

Check rotor for roughness, cracks or chips.

Runout

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

Make sure that axial end play is within the specifications before measuring. Refer to AX section ("REAR WHEEL BEARING", "On-vehicle Service").

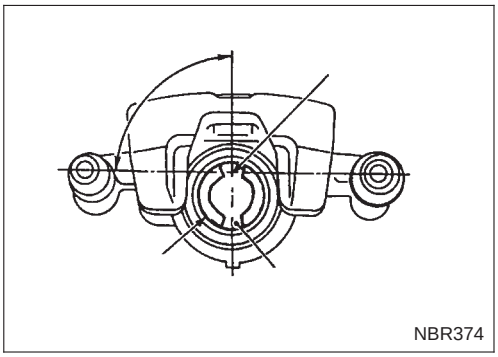
3. Change relative positions of rotor and wheel hub so that runout is minimized.

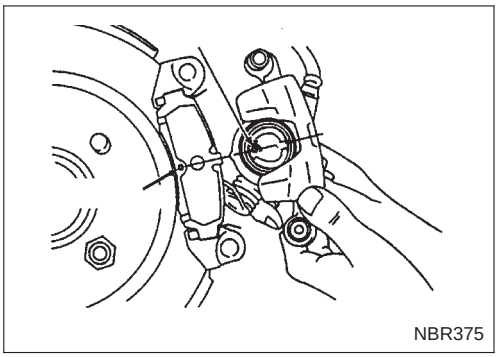
Maximum runout:
0.07 mm (0.0028 in)

Thickness

Rotor repair limit:
Standard thickness
10 mm (0.39 in)
Minimum thickness
9 mm (0.35 in)
Thickness variation (At least 8 portions)
Maximum 0.02 mm (0.0008 in)

Installation


NBR374


NBR375

CAUTION:

- **Refill with new brake fluid "DOT 4".**
- **Never reuse drained brake fluid.**
- **Do not drain (factory) filled brake fluid from (new) caliper assemblies.**

1. Install caliper assembly.

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

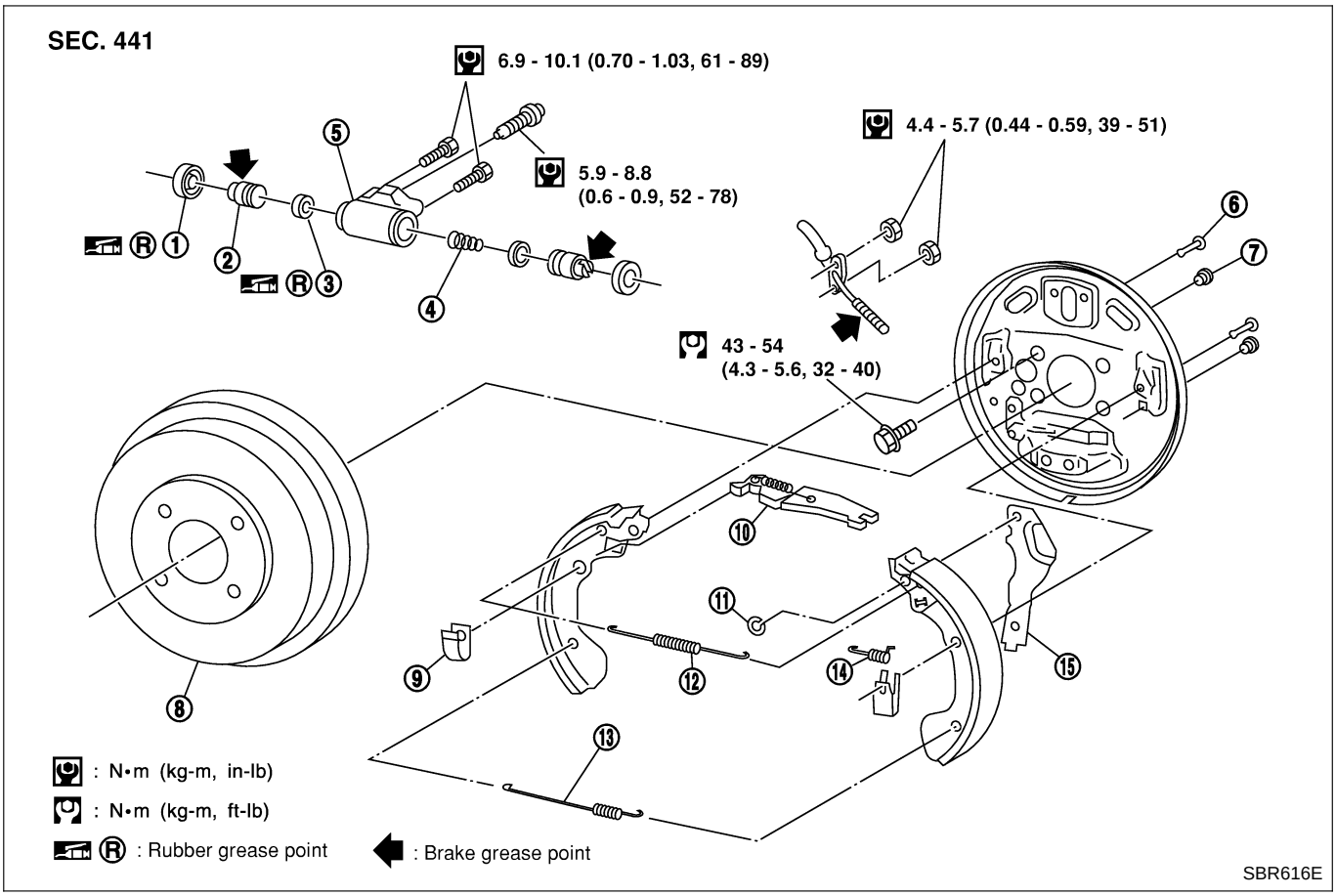
2. Remove the plug from the cylinder body and brake hose.

CAUTION:
Care should be taken as not to let:

- **Air enter the cylinder body and brake hose.**
- **Brake fluid spill from the cylinder body and brake hose.**

3. Install brake hose to caliper securely.
4. Install all parts and secure all bolts.
5. Bleed air. Refer to "Bleeding Brake System", BR-8.

Components

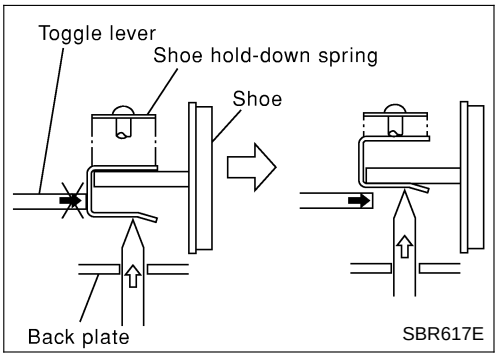


1. Boot
2. Piston
3. Piston cap
4. Spring
5. Wheel cylinder
6. Shoe hold-down pin
7. Plug
8. Brake drum
9. Shoe hold-down spring
10. Adjuster
11. Retainer ring
12. Return spring (Upper)
13. Return spring (Lower)
14. Spring
15. Toggle lever

Removal

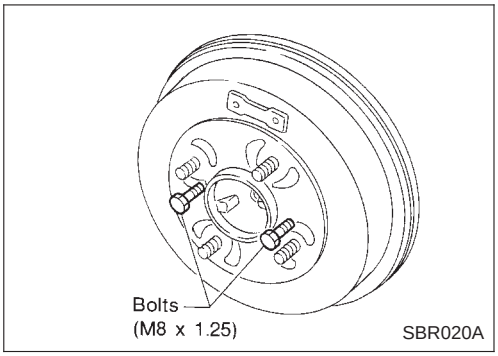
WARNING:
Clean brake lining with a vacuum dust collector to minimize the hazard of airborne materials.
CAUTION:
Make sure parking brake lever is completely released.

Removal (Cont'd)

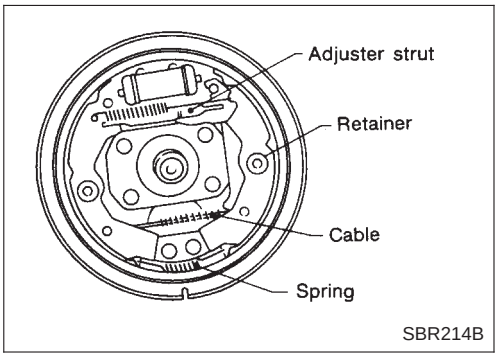


1. Release parking brake lever fully, then remove drum.
   If drum is hard to remove, the following procedures should be carried out.

a. Remove plug. To make shoe clearance, push shoe hold-down spring to free toggle lever.

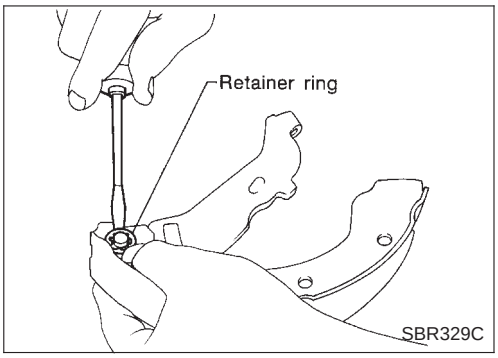


b. Install two bolts as shown. Tighten the two bolts gradually.

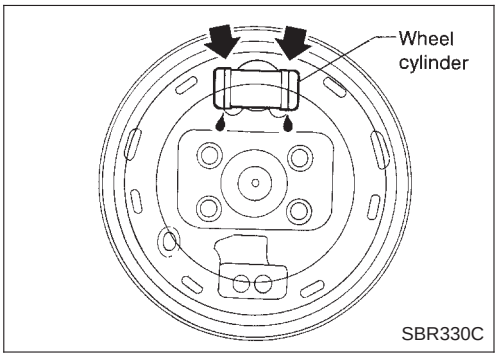


2. After removing retainer, remove spring by rotating shoes.
- **Be careful not to damage wheel cylinder piston boots.**
- **Be careful not to damage parking brake cable when separating it.**

3. Remove adjuster.
4. Disconnect parking brake cable from toggle lever.

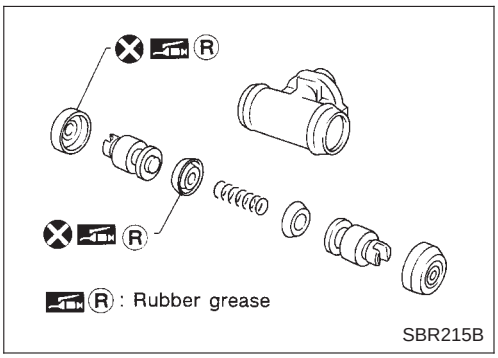


5. Remove retainer ring with a suitable tool. Then separate toggle lever and brake shoe.



Inspection — Wheel Cylinder

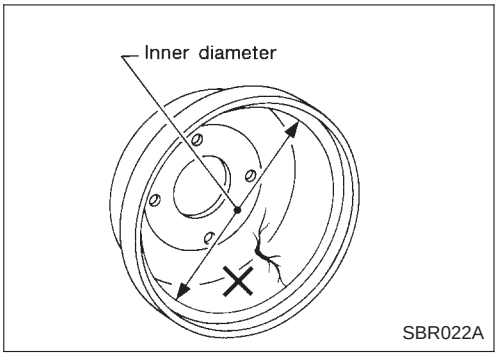
- Check wheel cylinder for leakage.
- Check for wear, damage and loose conditions. Replace if any such condition exists.



SBR215B

Wheel Cylinder Overhaul

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

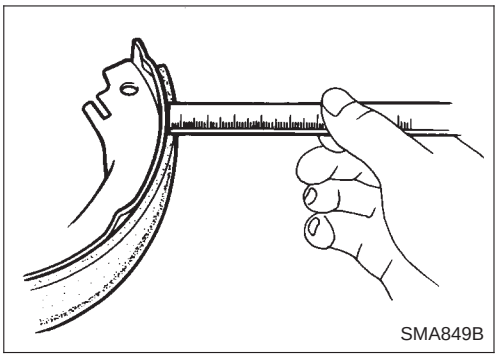


SBR022A

Inspection — Drum

Maximum inner diameter:
204.5 mm (8.05 in)
Maximum out-of-round:
0.03 mm (0.0012 in)

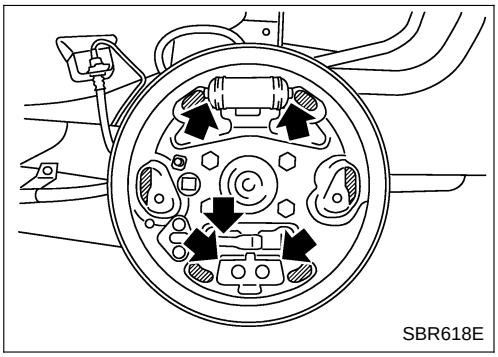
- Contact surface should be fine finished with No. 120 to 150 emery paper.
- Using a drum lathe, resurface brake drum if it shows scoring, partial wear or stepped wear.
- After brake drum has been completely reconditioned or replaced, check drum and shoes for proper contact pattern.


SMA849B

Inspection — Lining

Check lining thickness.

Standard lining thickness:
4.5 mm (0.177 in)
Lining wear limit:
1.5 mm (0.059 in)

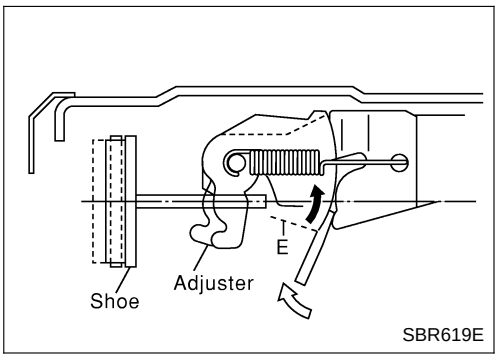

SBR618E

Installation

- **Always perform shoe clearance adjustment. Refer to BR-49.**
- **Burnish the brake contact surfaces after refinishing or replacing drums or rotors, after replacing pads or linings, or if a soft pedal occurs at very low mileage. Refer to “Brake Burnishing Procedure”, “ON-VEHICLE SERVICE”, BR-7.**

1. Fit toggle lever to brake shoe with retainer ring.
2. Apply brake grease to the contact areas shown at left.

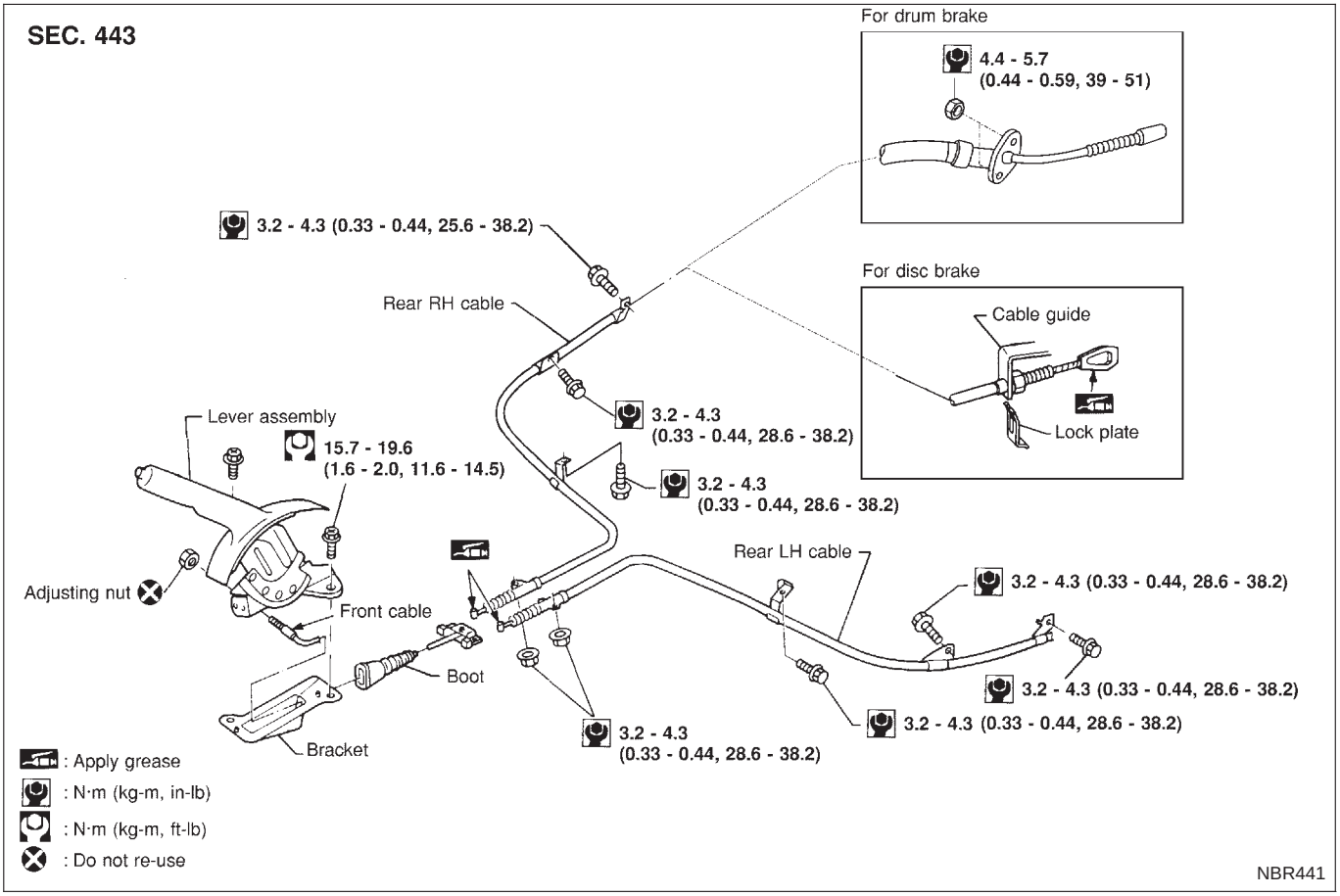
Installation (Cont'd)

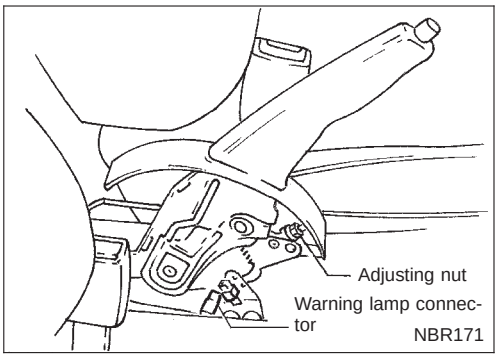


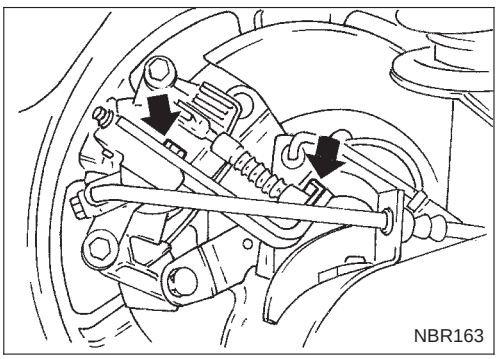
3. Shorten adjuster by rotating it.

● To tighten loosened brake shoes, first, insert a screw driver in the direction shown in the left. Then, move the adjuster in the direction shown by the arrow while disengaging the tooth contact. Never tap the area E.

4. Connect parking brake cable to toggle lever.
5. Install all parts.
   Be careful not to damage wheel cylinder piston boots.
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", BR-8.
9. Adjust parking brake. Refer to BR-49.







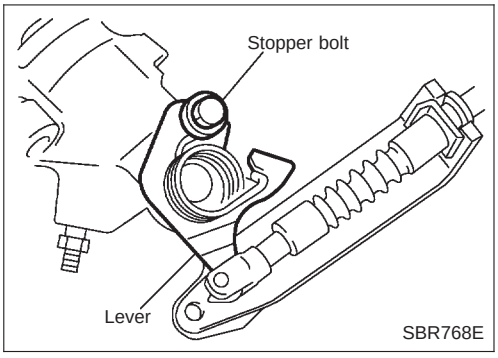
Removal and Installation

1. To remove parking brake cable, first remove center console.
2. Disconnect warning lamp connector.
3. Remove adjusting nut.
4. Remove bolts and nuts securing parking brake cable.
5. Remove parking brake device.

6. Remove cable mounting bracket and lock plate (disc brake only).
   For drum brake models, refer to “Removal”, “REAR DRUM BRAKE”, BR-44.

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 found deformed or damaged, replace the parts.



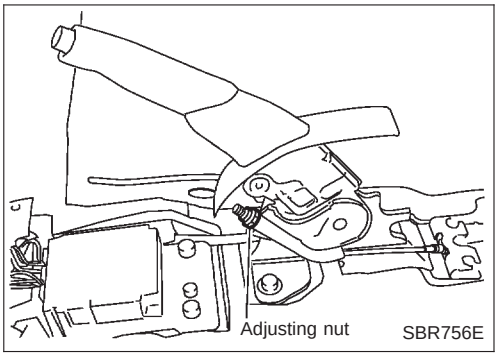
Adjustment

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

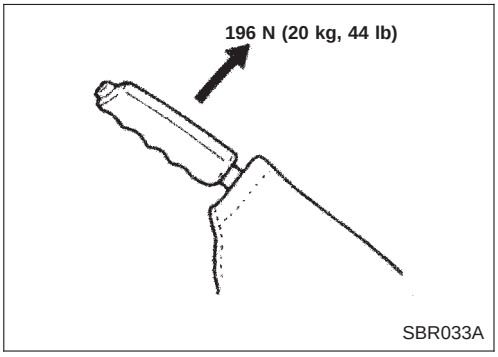
- Make sure the toggle lever of the rear disc brakes returns to stopper, when the parking lever is released.
- There is no drag when parking brake lever is released.
- Vehicle is unladen.

1. Adjust clearance between shoe and drum or pad and rotor as follows:

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



2. Pull control lever 10 times or more to make a lever stroke of 203.5 mm (8.01 in). At 6 - 8 notches, adjust the parking brake cable by turning the adjusting nut.



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

Number of notches
6 - 8

4. Bend warning lamp switch plate to ensure:

- Warning lamp comes on when lever is lifted “A” notches.
- Warning lamp goes out when lever is fully released.

Number of “A” notches: 1

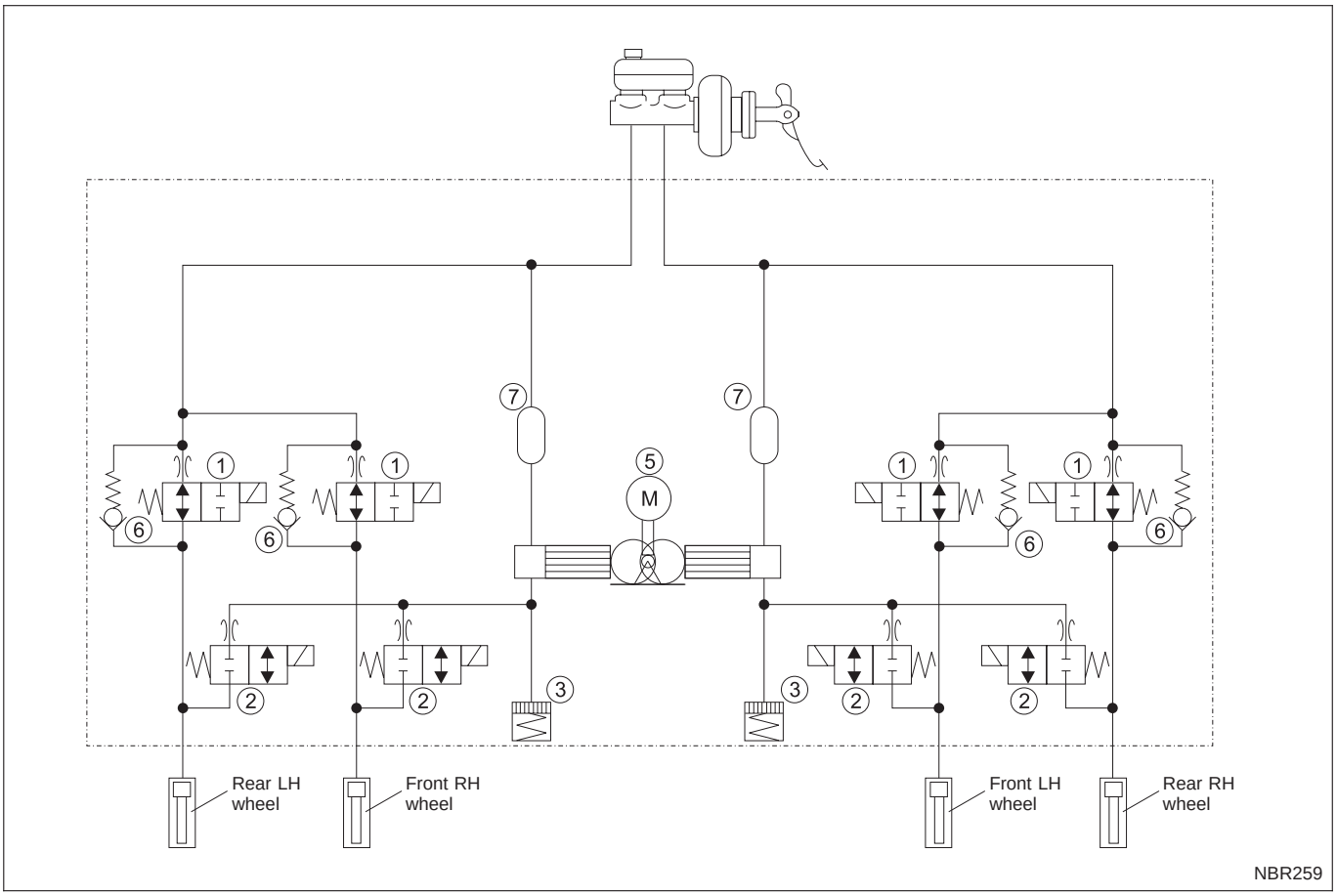
Purpose

The Anti-Lock Brake System (ABS) consists of electronic and hydraulic components. It allows for control of braking force so that locking of the wheels can be avoided.
The ABS:
1) Provides improved steering control during braking (by preventing front wheel lock).
2) Provides improved vehicle stability and skid prevention during braking (by avoiding rear wheel lock).

Operation

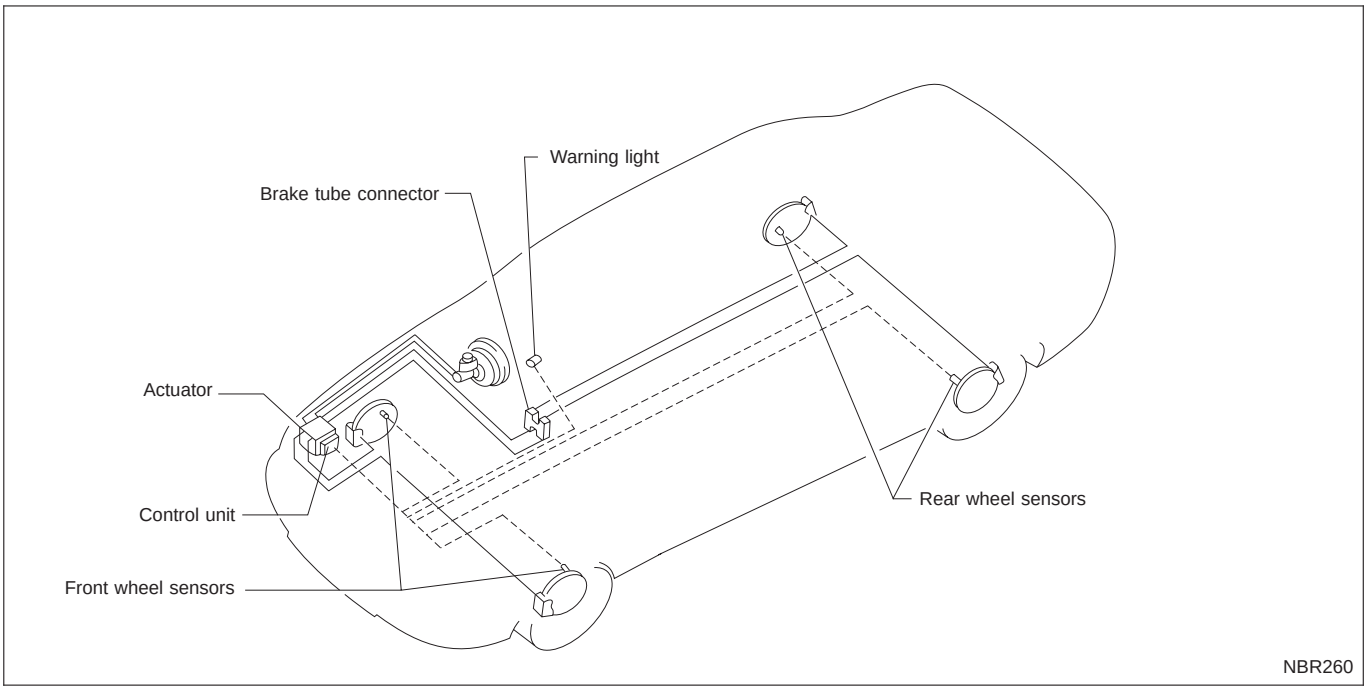
- When the vehicle speed is less than 10 km/h (6 mph) this system does not work.
- The Anti-Lock Brake System (ABS) has self-test capabilities. The system turns on the ABS warning light for 1 second after turning the ignition switch to the “ON” position. The system performs another test the first time the vehicle reaches 6 km/h (4 mph). A mechanical noise may be heard as the ABS performs a self-test. This is a normal part of the self-test feature. If a malfunction is found during this check, the ABS warning light will come on.
- During ABS operation, a mechanical noise may be heard. This is a normal operating condition.

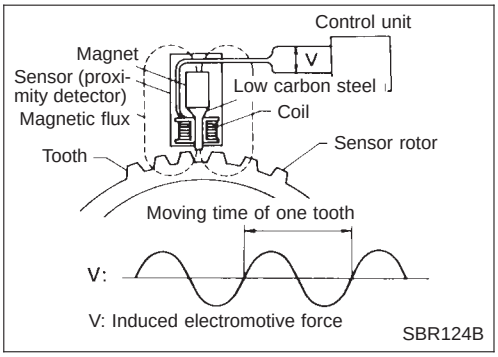
ABS Hydraulic Circuit

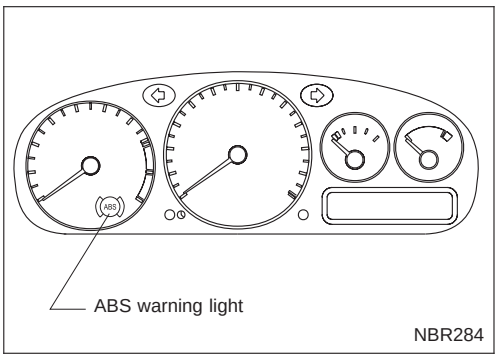


① Inlet solenoid valve
② Outlet solenoid valve
③ Reservoir
④ Pump
⑤ Motor
⑥ Bypass check valve
⑦ Damper

System Components







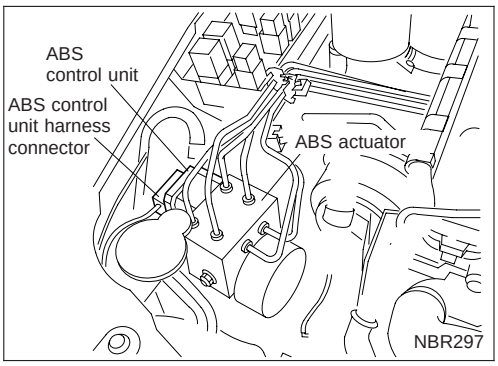
System Description

SENSOR

The sensor unit consists of a gear-shaped sensor rotor and an electro-magnetic proximity detector. The proximity detector (“pick-up”) contains a bar magnet around which a coil is wound. The detector is installed on the back side of the brake rotor. An alternating voltage is generated in the coil of the proximity detector as each tooth of the rotor cuts the magnetic field of the detector core. The frequency and amplitude of the voltage increases in proportion to the rotational speed of the rotor.

CONTROL UNIT

The control unit determines the wheel rotating speed from the signal sent from the sensor, a corresponding control signal is then output from the control unit in the form of a DC current to the actuator solenoid valve. The ABS control unit also controls ON-OFF operation of the valve relay and motor relay. If any electrical malfunction should be detected in the system, the control unit causes the warning lamp to light up. In this condition, the ABS will be deactivated by the control unit, and the vehicle’s brake system reverts to normal operation.



System Description (Cont'd)

ABS ACTUATOR AND ELECTRIC UNIT

The ABS actuator and electric unit contains:

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

This component controls the hydraulic circuit and increases, holds or decreases hydraulic pressure to all or individual wheels. The ABS actuator and electric unit can not be disassembled and has to be serviced as an assembly.

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

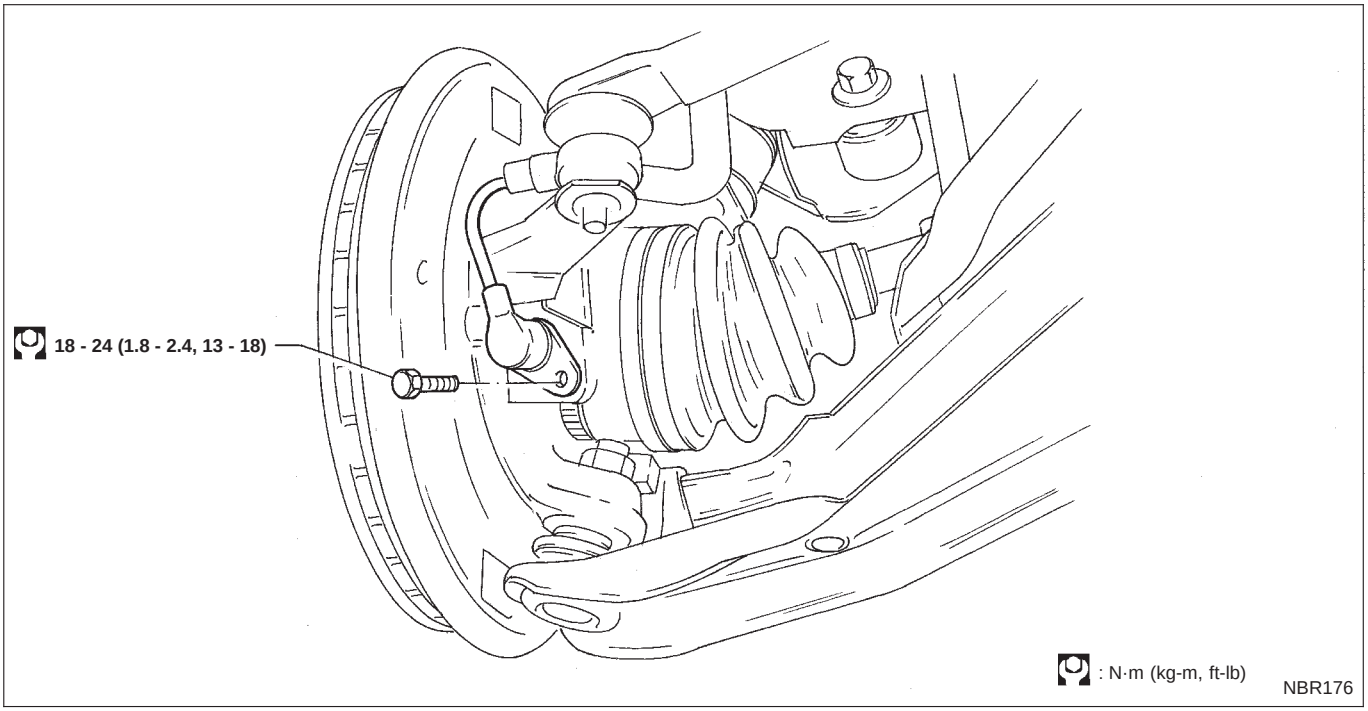
Removal and Installation

CAUTION:

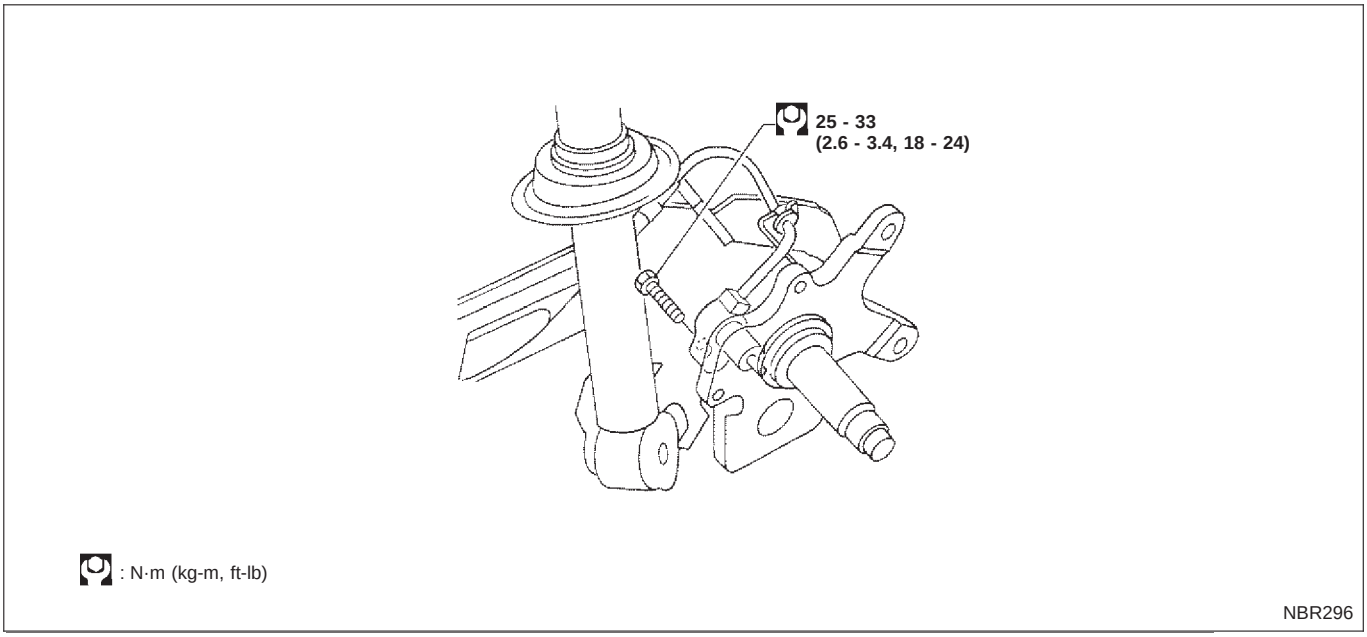
Be careful not to damage sensor edge and sensor rotor teeth.

When removing the front or rear wheel hub assembly, disconnect the ABS wheel sensor from the assembly and move it away. Failure to do so may result in damage to the sensor or wiring making it inoperative.

FRONT WHEEL SENSOR

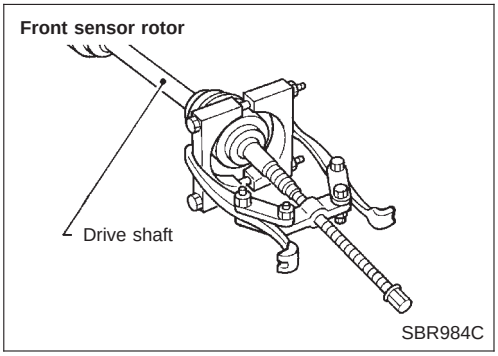


REAR WHEEL SENSOR



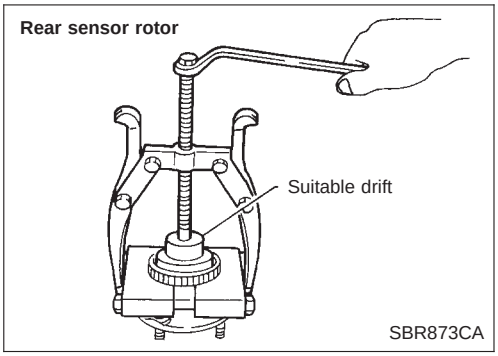
Removal and Installation (Cont'd)

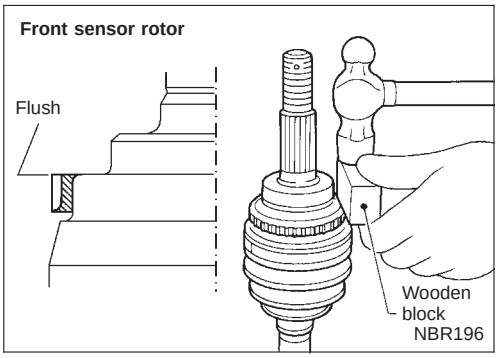
SENSOR ROTOR



Removal

1. Remove the drive shaft and rear wheel hub. Refer to FA, RA section ("Drive Shaft", FRONT AXLE" and "Wheel Hub", REAR AXLE").
2. Remove the sensor rotor using suitable puller, drift and bearing replacer.

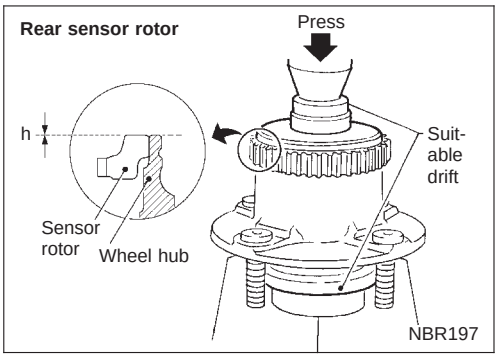




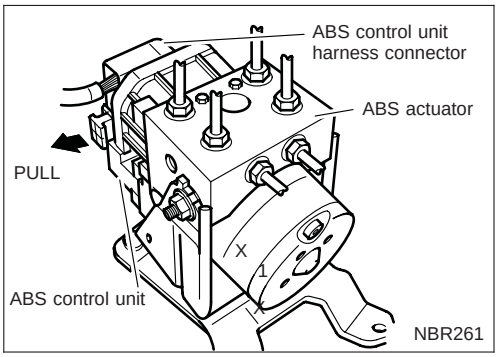
Installation

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.
- Ensure sensor rotor is completely flush with surface indicated on drive shaft.



- Pay attention to the flush position of rear sensor rotor as shown in figure.
  h: −0.3 to +0.3 mm (−0.012 to +0.012 in)

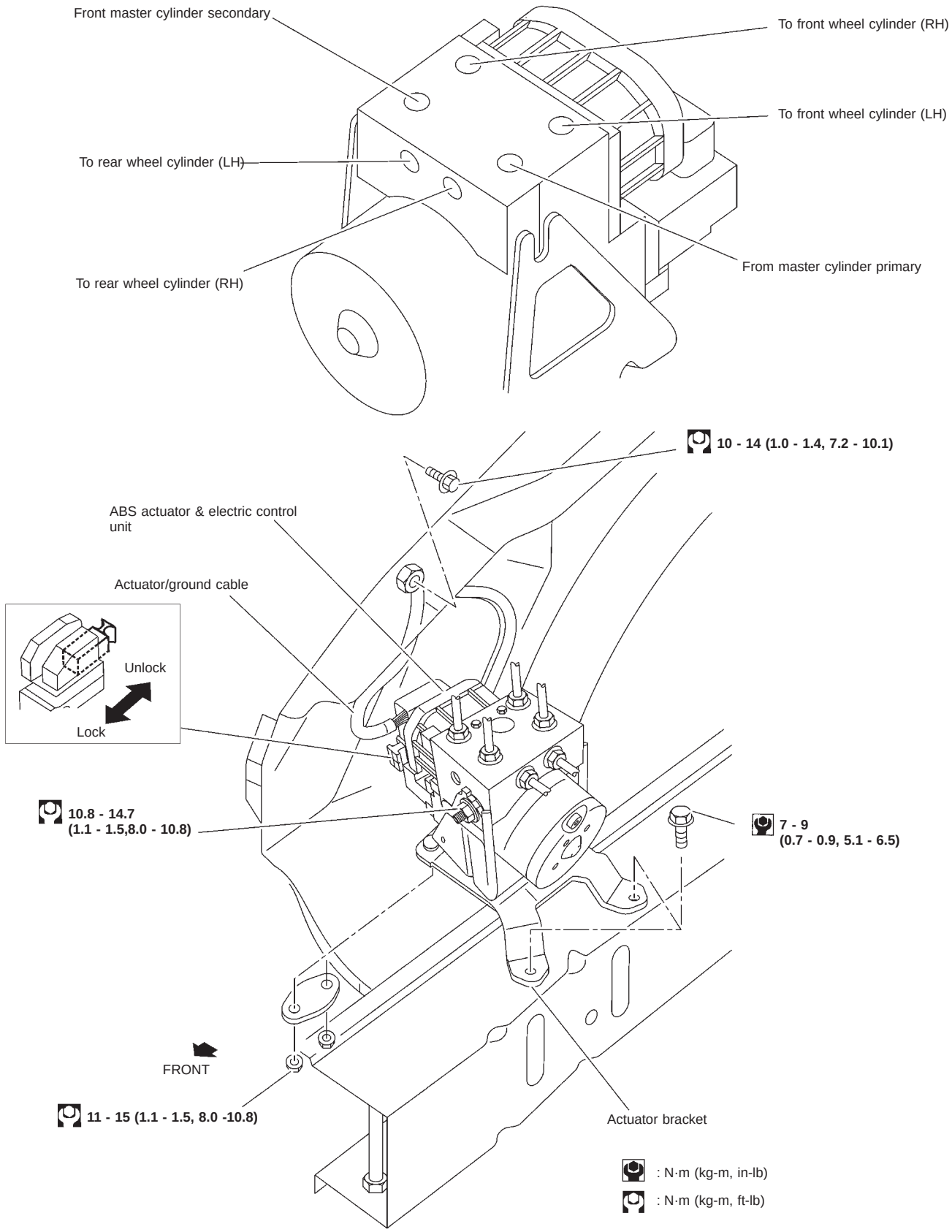


CONTROL UNIT

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

Removal and Installation (Cont'd)

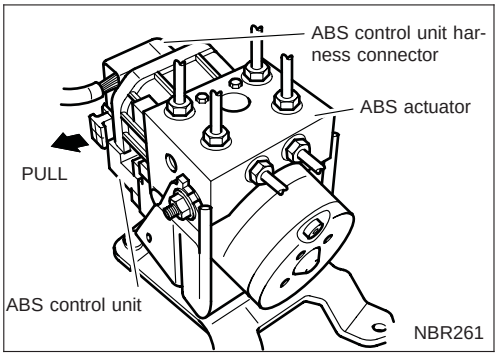
ABS ACTUATOR



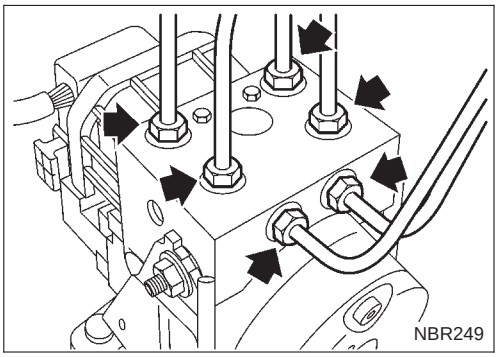
NBR262

Removal and Installation (Cont'd)

1. Disconnect battery cable.
2. Drain brake fluid. Refer to BR-7



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.

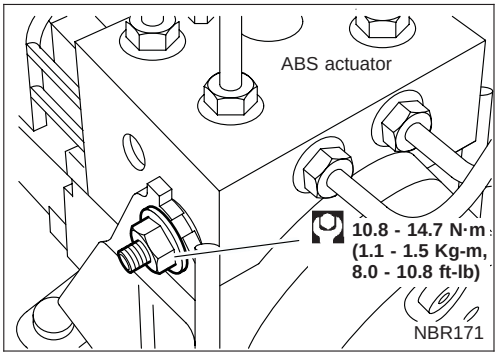


5. Disconnect brake pipes and move them away from actuator. Do not force brake pipes so as to kink them or bend them excessively.
   Ensure that brake fluid does not come into contact with any parts.
6. Loosen/remove mounting nuts between actuator and bracket.

CAUTION:

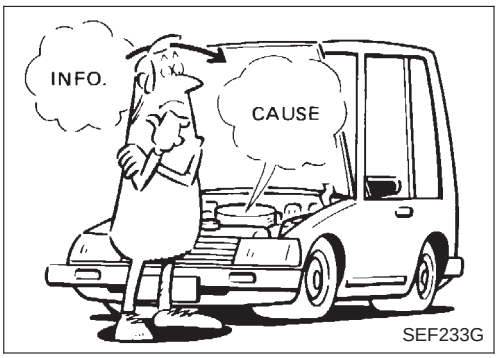
After installation, pay attention to the following points:

- **Refill brake fluid and bleed air. Refer to "CHECK AND ADJUSTMENT", BR-7 and "BLEEDING BRAKE SYSTEM", BR-8, respectively.**

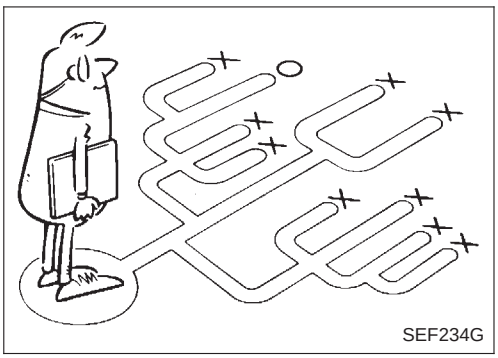


- The installation procedure is as follows:

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-10.
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 braking functions. The control unit accepts input signals from sensors and utilises the data to instantly drive the actuators. It is essential that both input and output signals are correct and stable. It is also important to check for conventional problems: such as air leaks in booster lines, lack of brake fluid, or other problems with the brake system.

It is much more difficult to diagnose a problem that occurs intermittently rather than 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 unnecessary replacement of good parts.

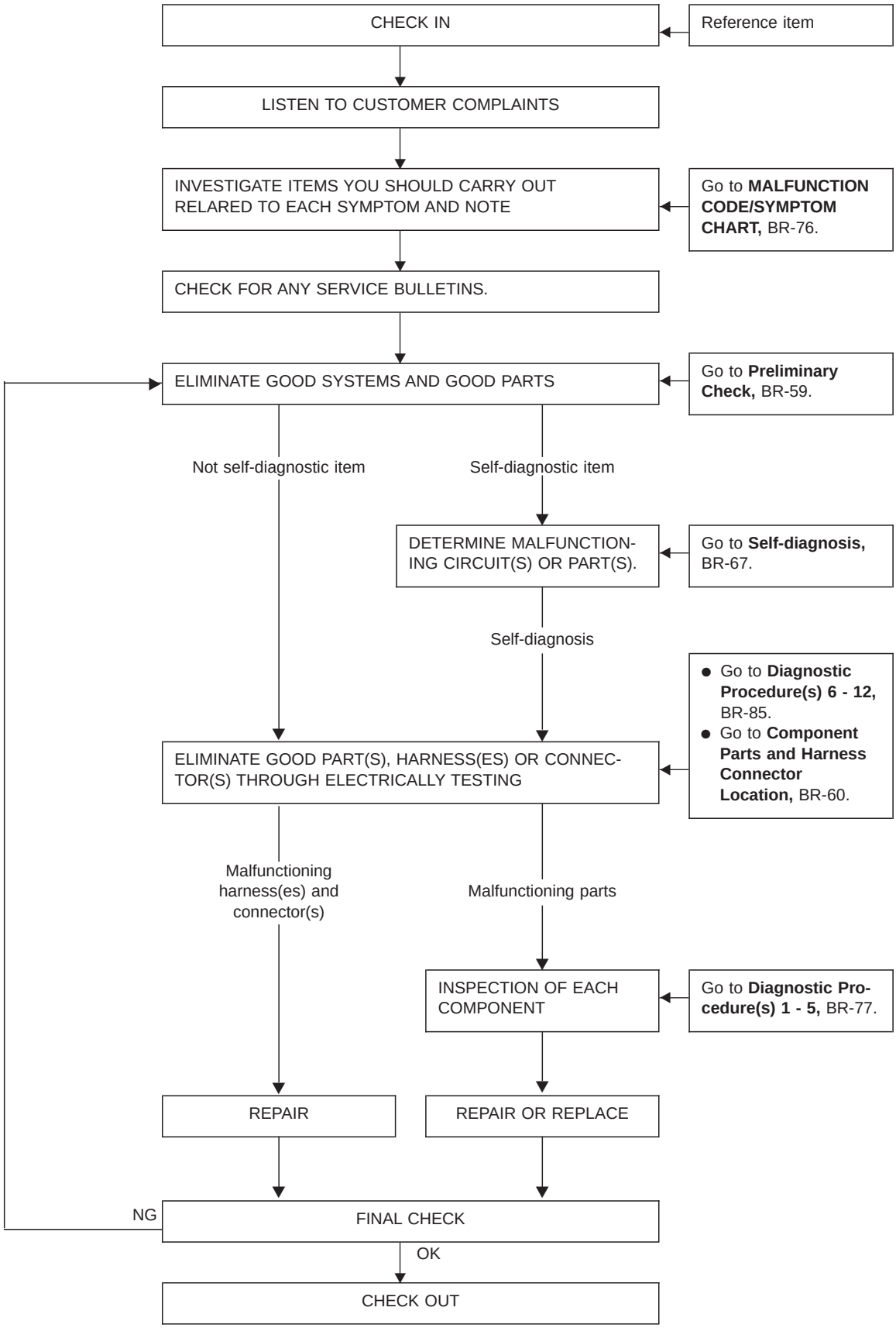
A visual check may not be sufficient to find the cause of the problems, so a road test should also be performed.

Before undertaking actual checks, take just a few minutes to talk with a customer who approaches with a 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.

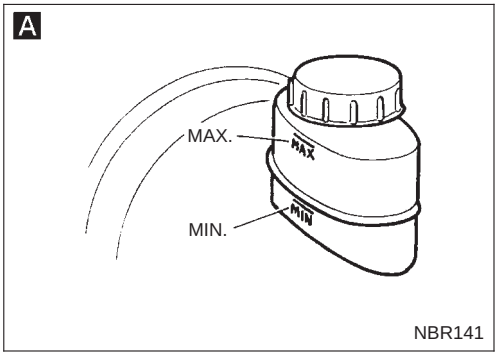
How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd)

WORK FLOW



Preliminary Check

A

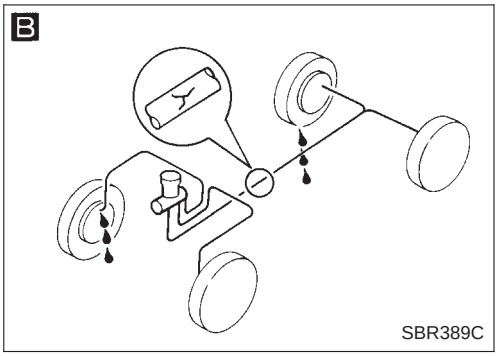


NBR141

Check brake fluid level in reservoir tank.

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

B


SBR389C

Check brake line for leakage. NG → Repair.

OK

C

Check brake booster for operation and air tightness. Refer to BR-18. NG → Replace.

OK

D

Check brake pads and rotor. Refer to BR-23, 26, 33. NG → Replace.

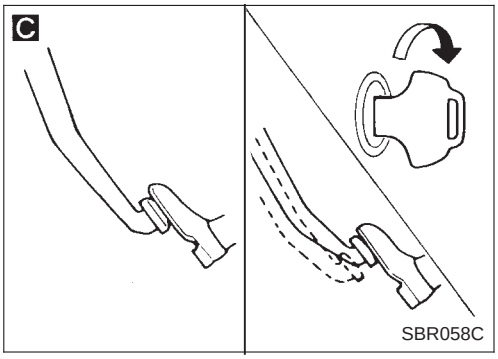
OK

A

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

OK

C


SBR058C

E

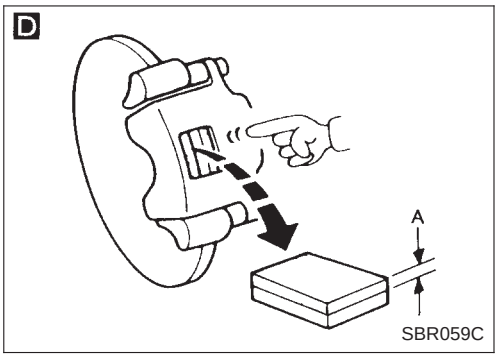
Check warning lamp activation. When ignition switch is turned on, warning lamp turns on. NG → Check fuse, warning lamp bulb and warning lamp circuit.

OK

Check warning lamp for deactivation. When ignition switch is turned on, warning lamp turns on, then deactivates after 1 second. NG → Go to Self-diagnosis, BR-67 and BR-70.

OK

D



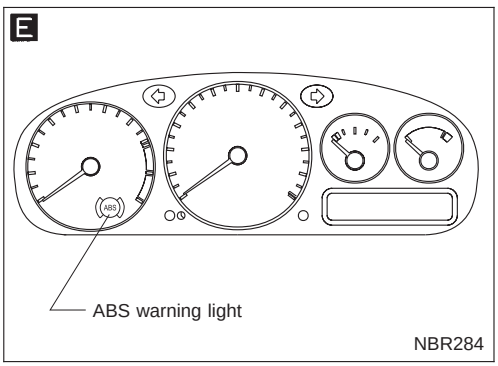
SBR059C

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

Ensure warning lamp remains off while driving. NG → Go to Self-diagnosis, BR-67 and BR-70.

OK

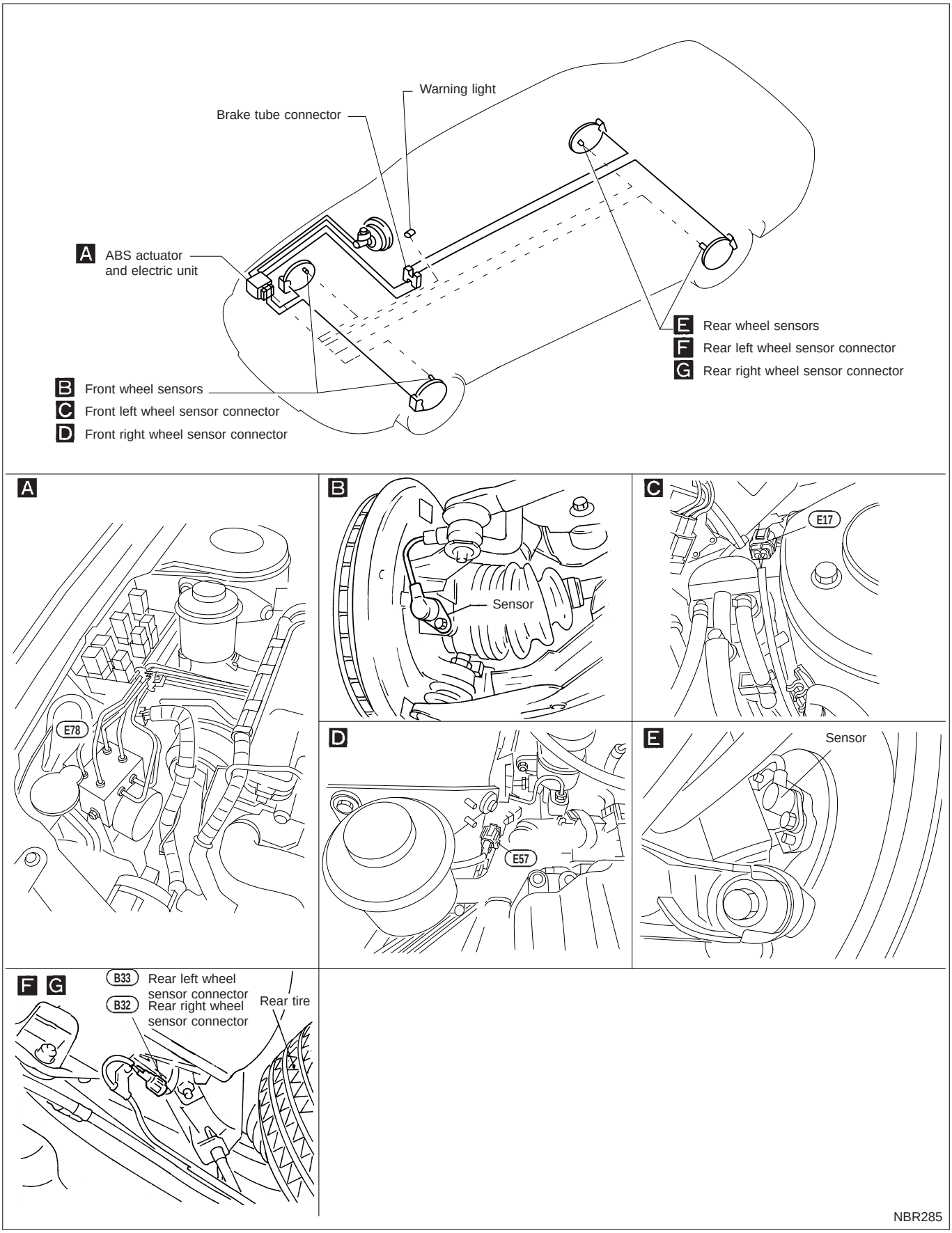
E



NBR284

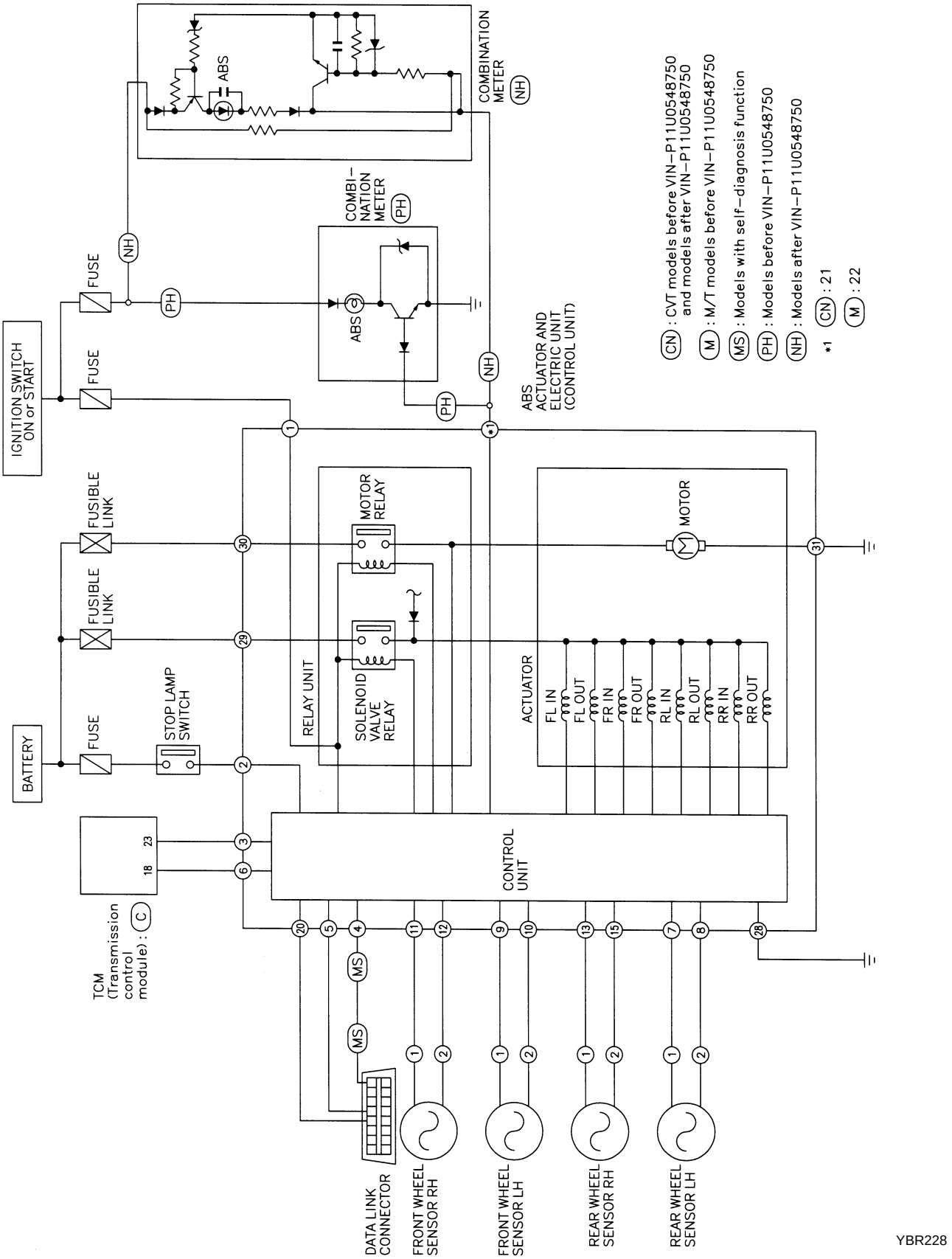
END

Component Parts and Harness Connector Location



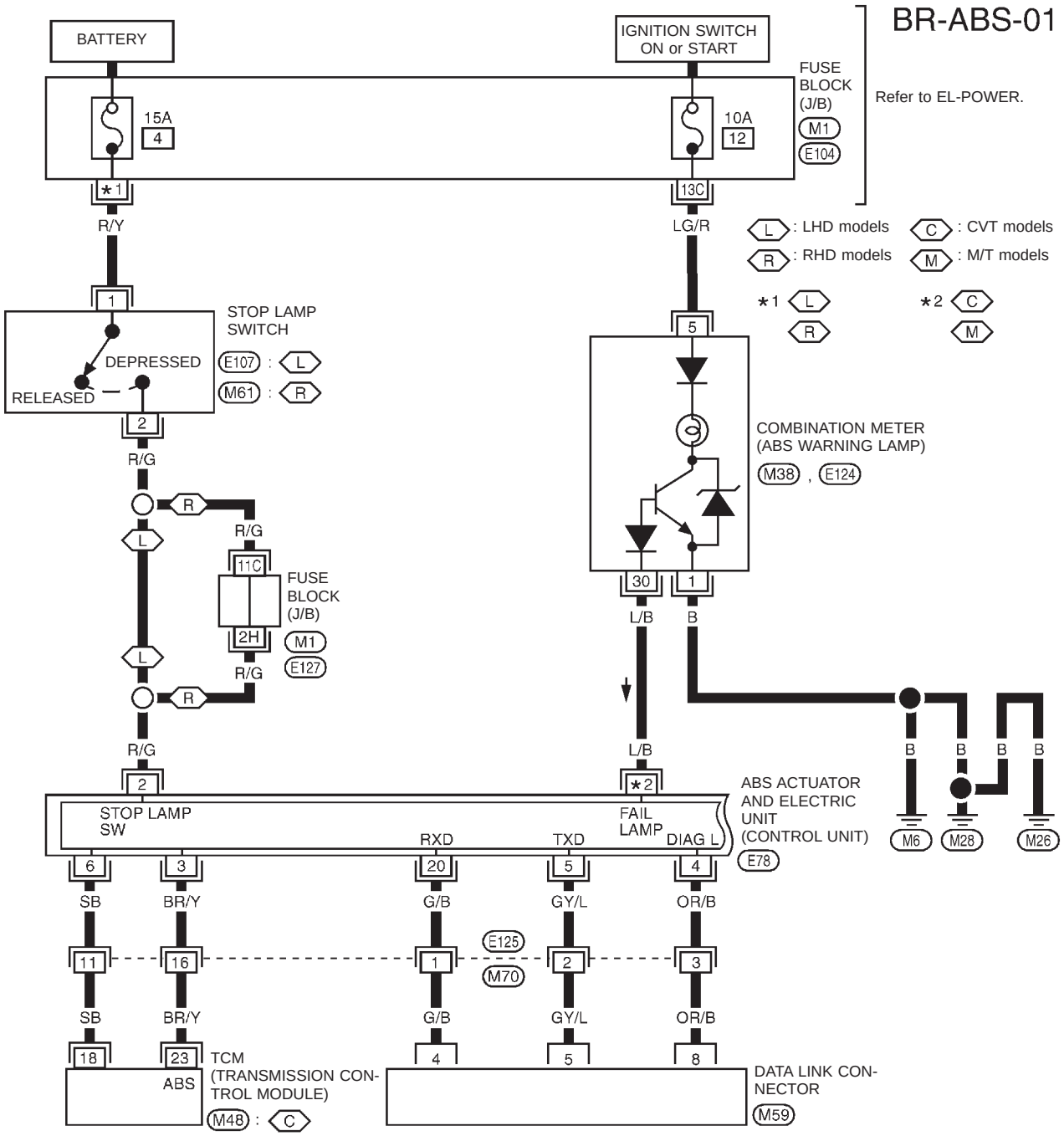
NBR285

Circuit Diagram for Quick Pinpoint Check



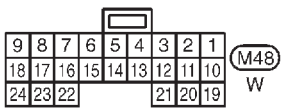
Wiring Diagram — ABS —

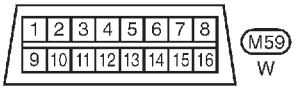
MODELS WITH SELF-DIAGNOSIS FUNCTION

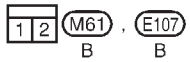


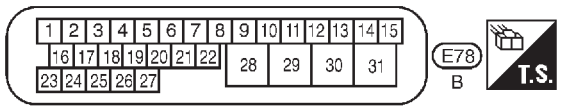
Refer to las page (Foldout page).

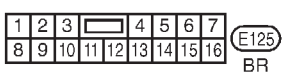
M1
E104
E127







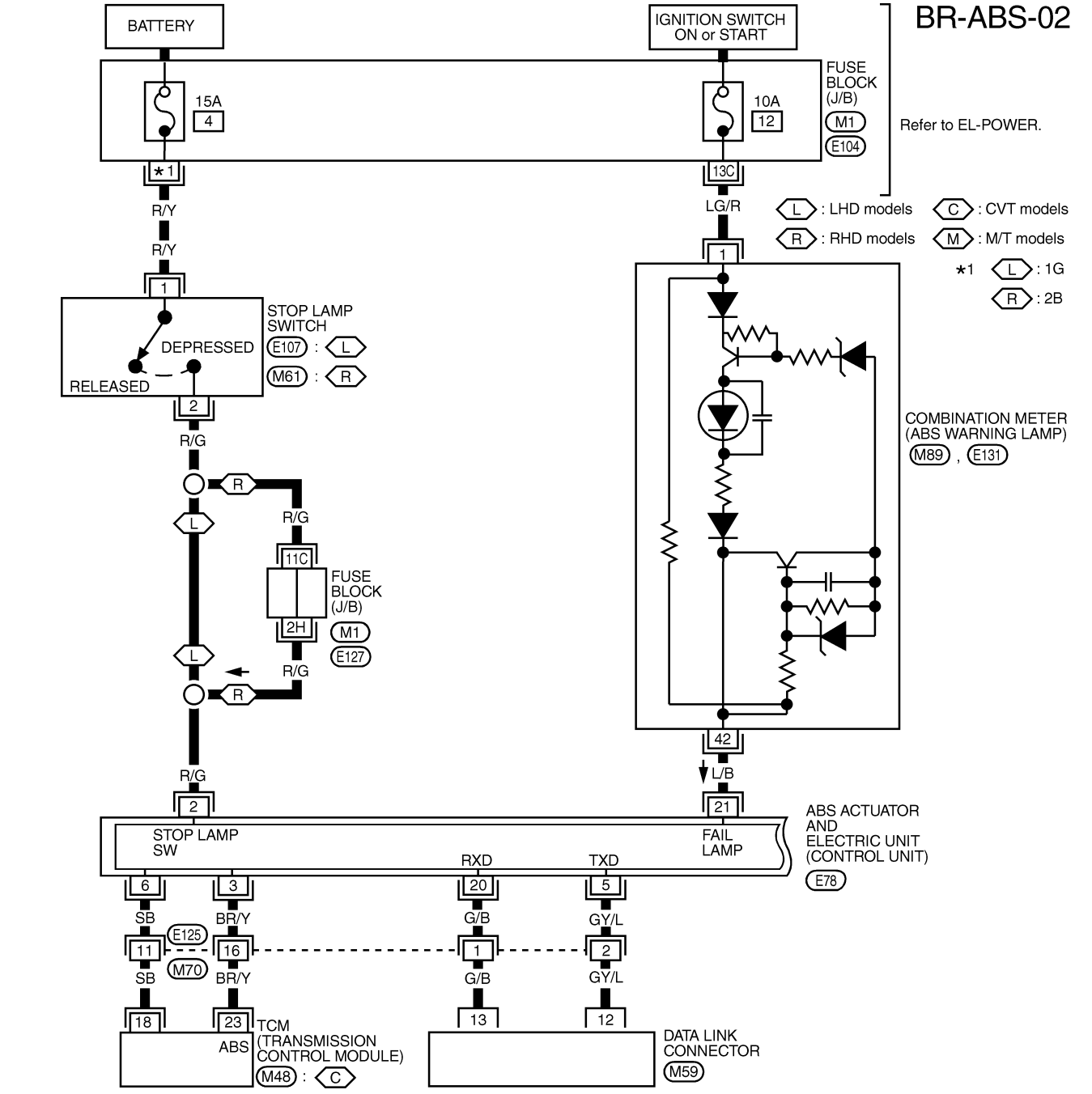


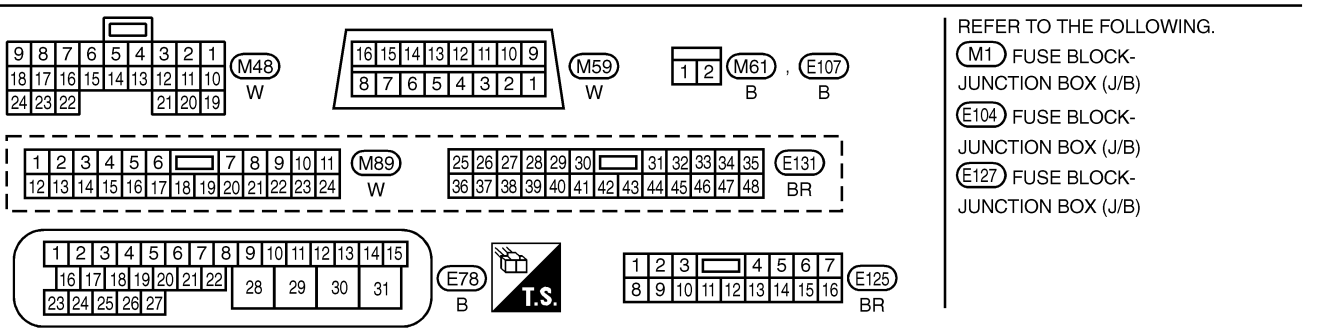


YBR208

Wiring Diagram — ABS — (Cont'd)

MODELS WITHOUT SELF-DIAGNOSIS FUNCTION





REFER TO THE FOLLOWING.

M1 FUSE BLOCK-JUNCTION BOX (J/B)

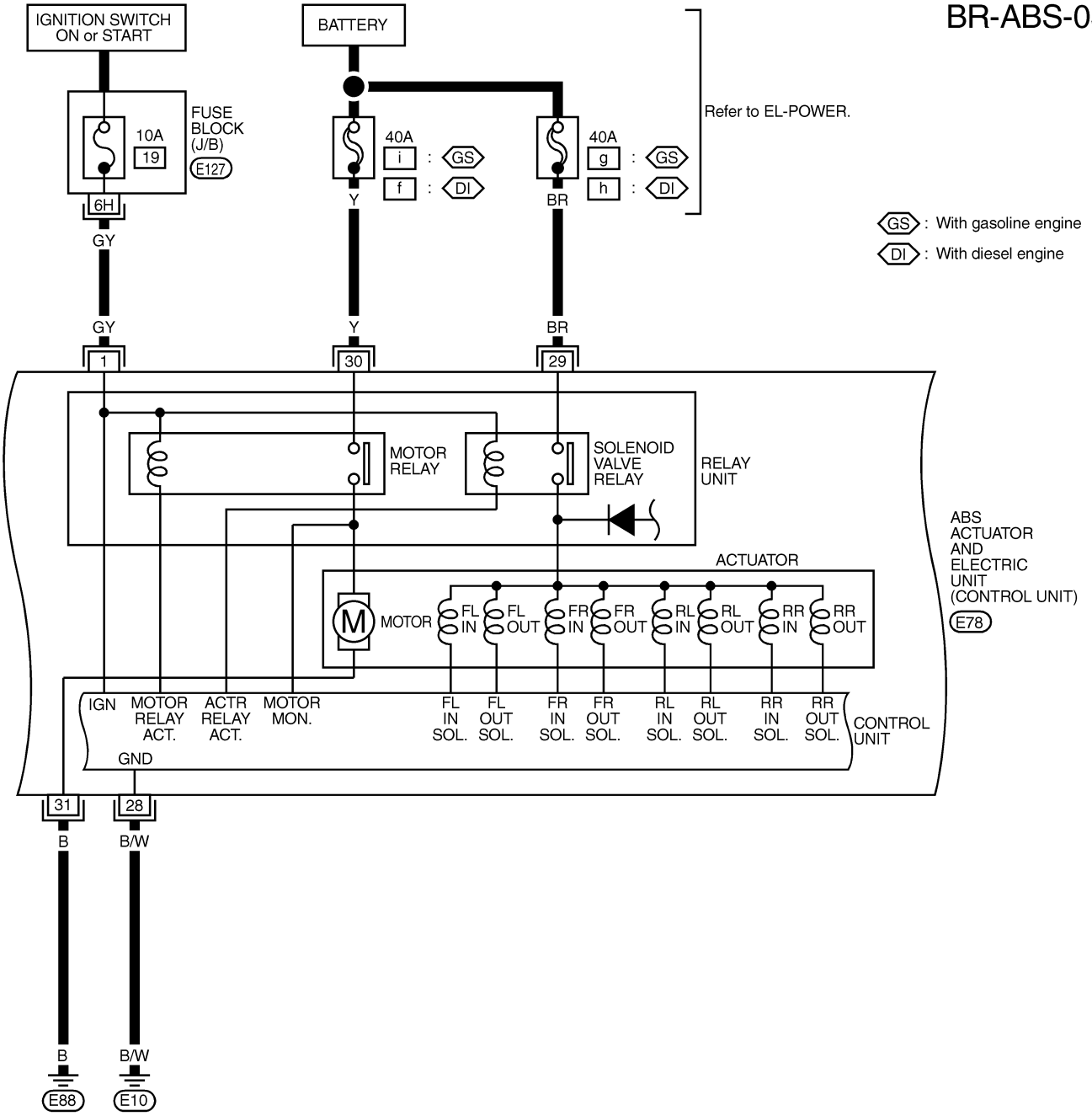
E104 FUSE BLOCK-JUNCTION BOX (J/B)

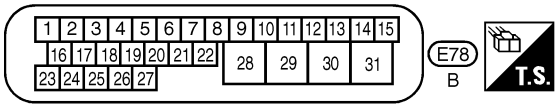
E127 FUSE BLOCK-JUNCTION BOX (J/B)

YBR229

Wiring Diagram — ABS — (Cont'd)

BR-ABS-03



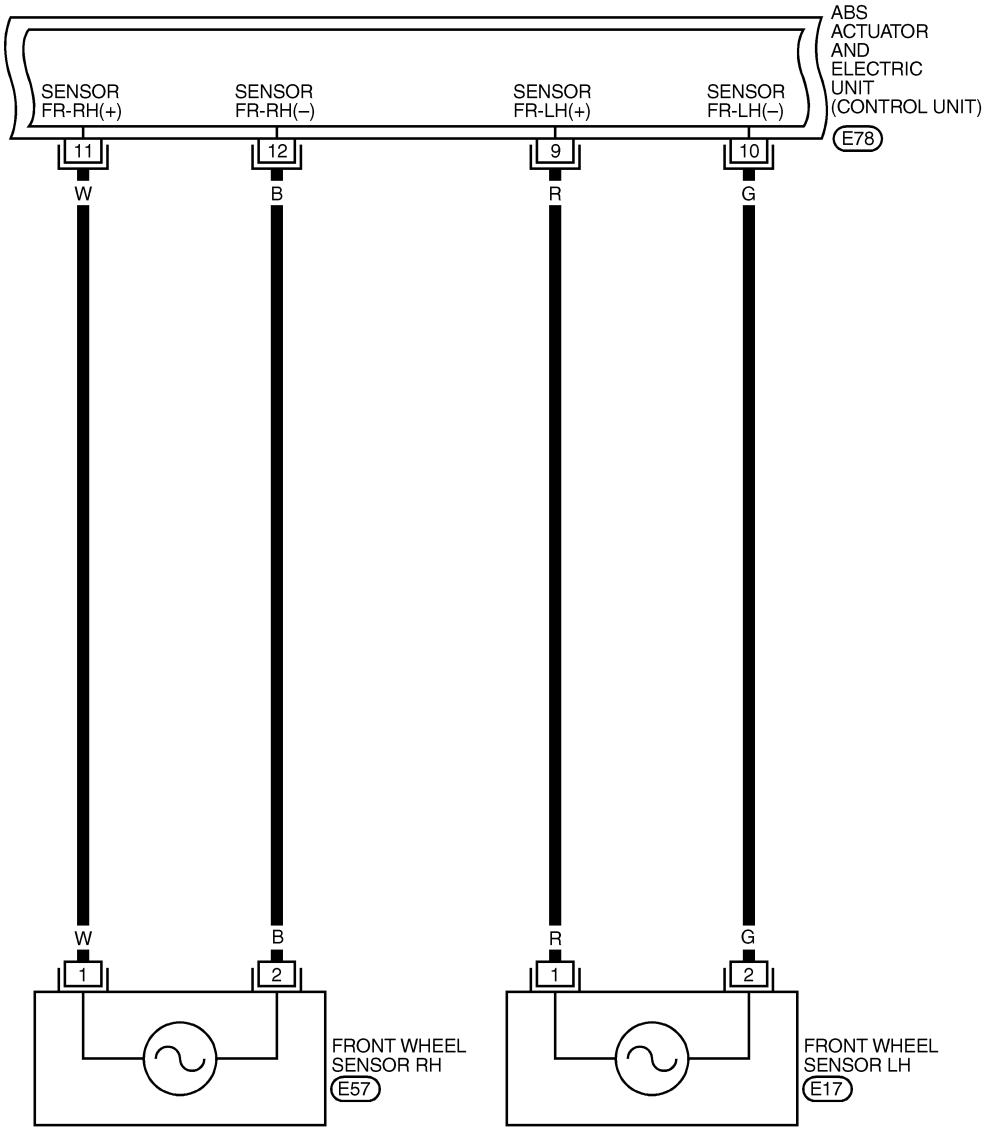


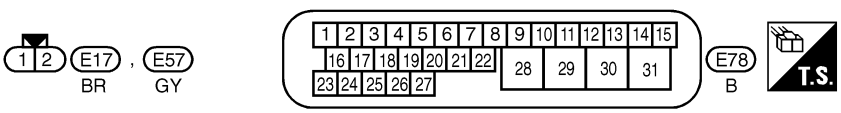
REFER TO THE FOLLOWING.
E127 FUSE BLOCK-JUNCTION BOX (J/B)

YBR230

Wiring Diagram — ABS — (Cont'd)

BR-ABS-04

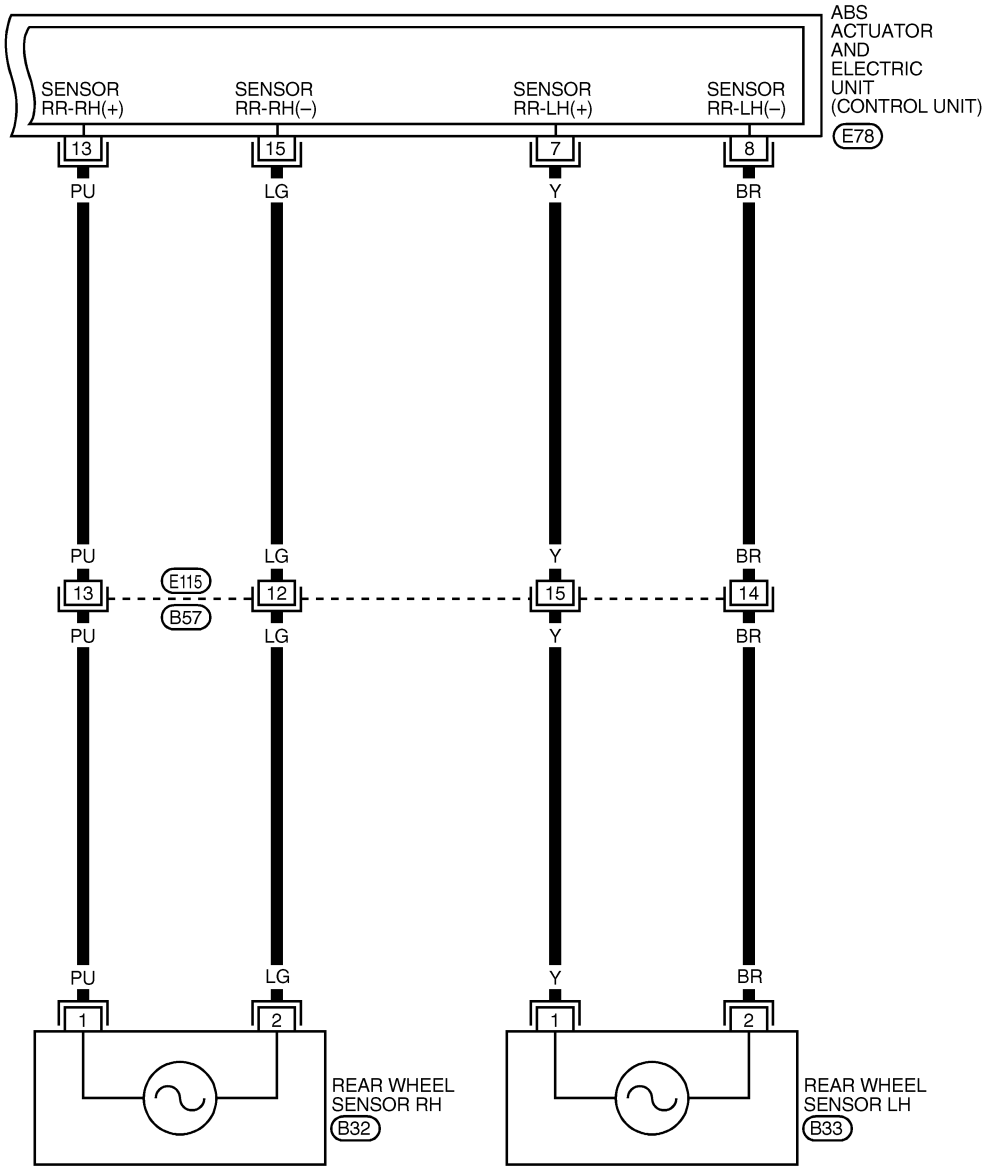


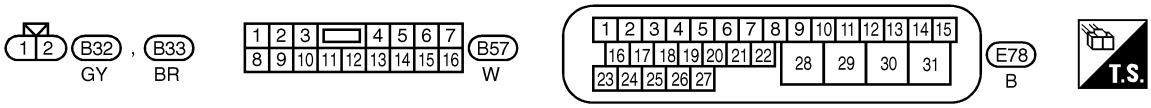


YBR231

Wiring Diagram — ABS — (Cont'd)

BR-ABS-05





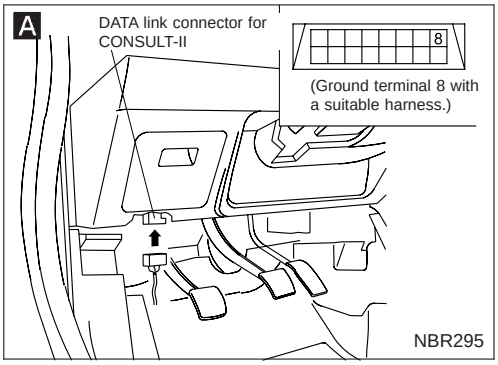
YBR232

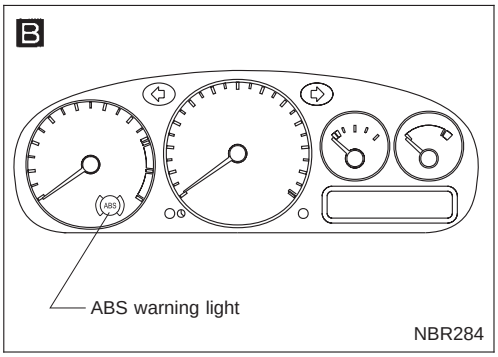
Self-diagnosis (Only models with data link connector terminal No. 8)

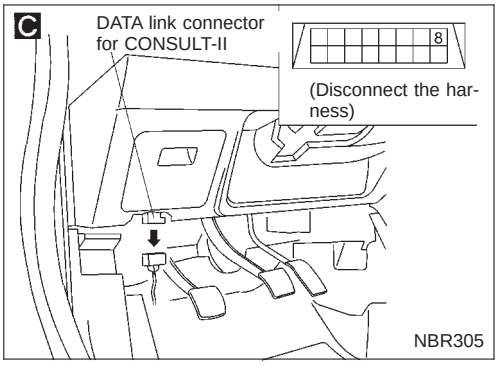
FUNCTION

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

SELF-DIAGNOSIS PROCEDURE







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

↓

Turn ignition switch to the “LOCK” position.

↓

A

Ground terminal “8” of “DATA LINK CONNECTOR for CONSULT-II” with a suitable harness.

↓

Turn ignition switch to “ON” position while grounding terminal “8”.
Do not depress brake pedal.

↓

B

After 3.0 seconds, the warning lamp starts flashing to indicate the malfunction code No. (See NOTE.)

↓

Verify the location of the malfunction with the malfunction code chart. Refer to BR-69. Then make the necessary repairs following the diagnostic procedures.

↓

After the malfunctions are repaired, erase the malfunction codes stored in the control unit. Refer to BR-68.

↓

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

↓

C

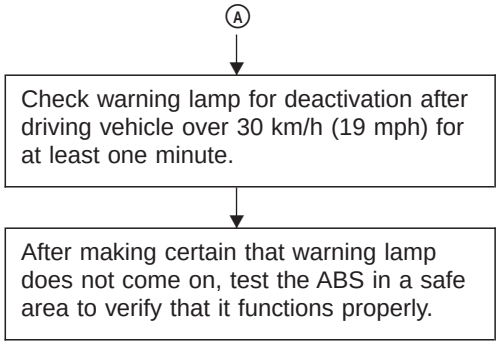
Disconnect the check terminal from the ground. The self-diagnostic results mode is now complete.

↓

Ⓐ

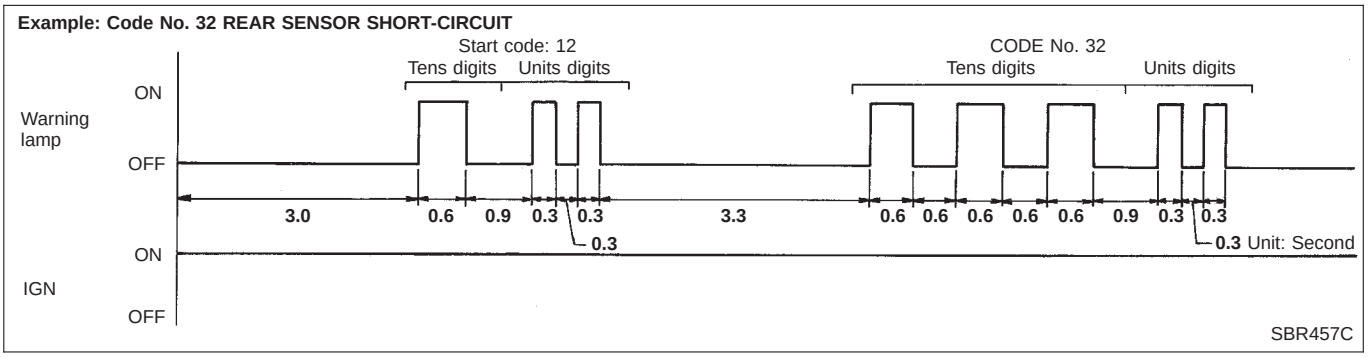
NOTE: The indication terminates after five minutes. However, when the ignition switch is turned from off to on, the indication starts flashing again.

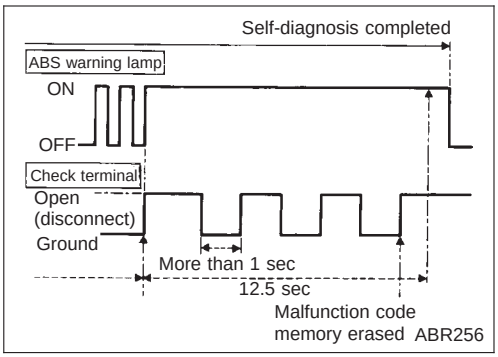
Self-diagnosis (Only models with data link connector terminal No. 8) (Cont'd)



HOW TO READ SELF-DIAGNOSTIC RESULTS (Malfunction codes)

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





HOW TO ERASE SELF-DIAGNOSTIC RESULTS (Malfunction codes)

1. Disconnect the check terminal from ground (ABS warning lamp will stay lit).
2. Within 12.5 seconds, ground the check terminal 3 times. Each terminal ground must last more than 1 second. The ABS warning lamp goes out after the erase operation has been completed.
3. Perform self-diagnosis again. Refer to BR-67. Only the start-code should appear, no malfunction codes.

CONSULT-II

CONSULT-II APPLICATION TO ABS

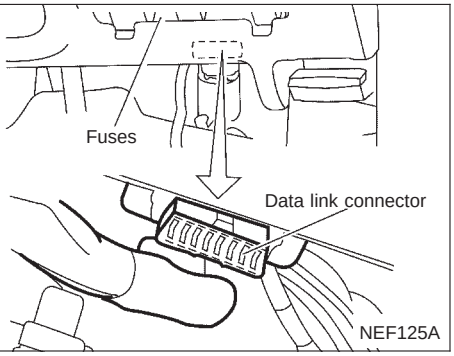
ITEM	SELF-DIAGNOSTIC RESULTS	DATA MONITOR	ACTIVE TEST
Front right wheel sensor	X	X	—
Front left wheel sensor	X	X	—
Rear right wheel sensor	X	X	—
Rear left wheel sensor	X	X	—
Stop lamp switch	—	X	—
Front right inlet solenoid valve	X	X	X
Front right outlet solenoid valve	X	X	X
Front left inlet solenoid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

X: Applicable
—: Not applicable

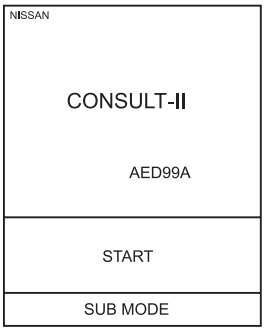
ECU part number mode

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

A

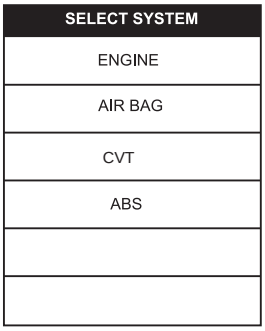


B



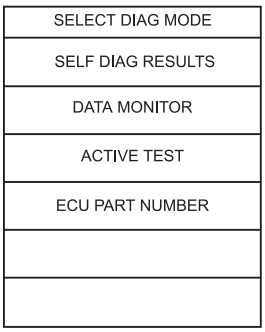
C2NCS01

C



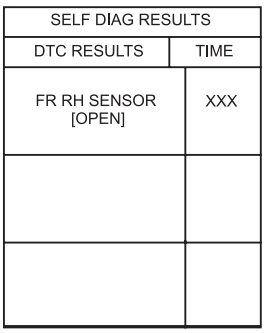
C2SSE01

D



C2SDM01

E



C2SDR01

CONSULT-II Inspection Procedure

SELF-DIAGNOSIS PROCEDURE

A

1) Turn ignition switch to the “LOCK” 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.**

↓

MALFUNCTION REPAIR

Make the necessary repairs following the diagnostic procedures.

↓

E

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

↓

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

↓

End

Note: “SELF-DIAG RESULTS” screen shows the detected malfunction and the times of ignition switch on and off after it occurred.

CONSULT-II Inspection Procedure (Cont'd)

SELF-DIAGNOSTIC RESULTS MODE

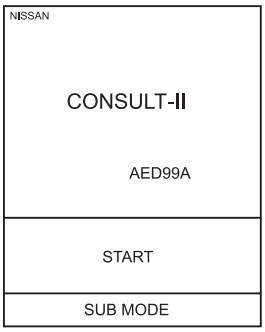
Diagnostic item	Diagnostic item is detected when . . .	Diagnostic procedure
FR RH SENSOR★ [OPEN]	● Circuit for front right wheel sensor is open. (An abnormally high input voltage is entered.)	1
FR LH SENSOR★ [OPEN]	● Circuit for front left wheel sensor is open. (An abnormally high input voltage is entered.)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

★: If one or more wheels spin on a rough or slippery road for 40 seconds or more, the ABS warning lamp will illuminate. This does not indicate a malfunction. Only in the case of the short-circuit after repair the ABS warning lamp also illuminates when the ignition switch is turned "ON". In this case, drive the vehicle at speeds greater than 30 km/h (19 MPH) for approximately 1 minute as specified in "SELF-DIAGNOSIS PROCEDURE", BR-70. Check to ensure that the ABS warning lamp goes out while the vehicle is being driven.

CONSULT-II Inspection Procedure (Cont'd)

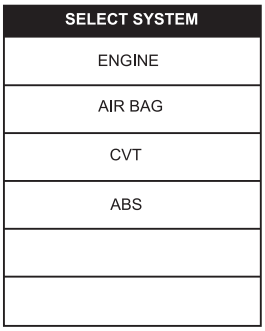
DATA MONITOR PROCEDURE

A



C2NCS01

B



C2SSE01

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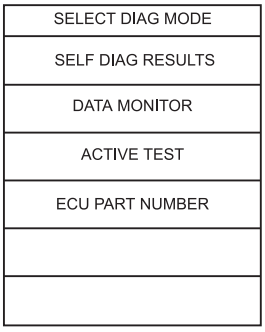
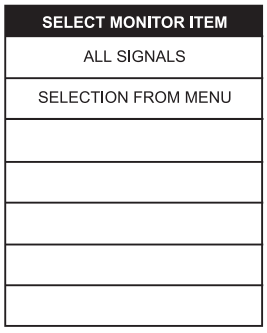


C2SDM01

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-73.

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
FR RH IN SOL FR RH OUT SOL FR LH IN SOL FR LH OUT SOL RR RH IN SOL RR RH OUT SOL RR LH IN SOL RR LH OUT SOL	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".

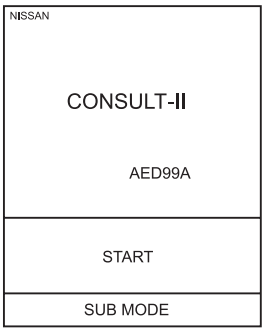
↓

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

↓

Carry out the active test by touching screen key.

A



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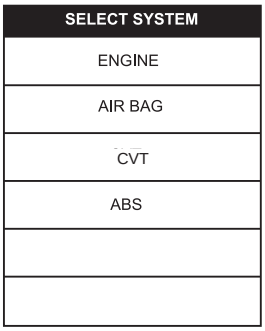

C2SSE01

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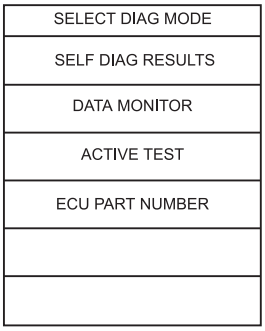
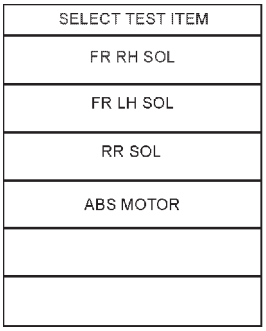


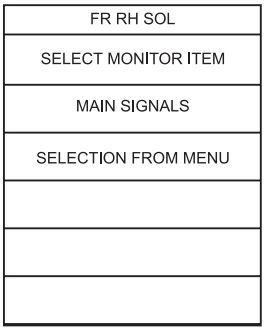
C2SDM01

D



C2STI01

E



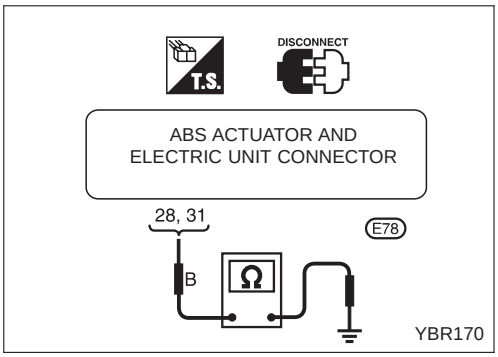
C2FRS01

CONSULT-II Inspection Procedure (Cont'd)

ACTIVE TEST MODE

TEST ITEM	CONDITION	JUDGEMENT
FR RH SOLENOID FR LH SOLENOID RR RH SOLENOID RR LH 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)

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



Ground Circuit Check

ABS ACTUATOR AND ELECTRIC UNIT GROUND

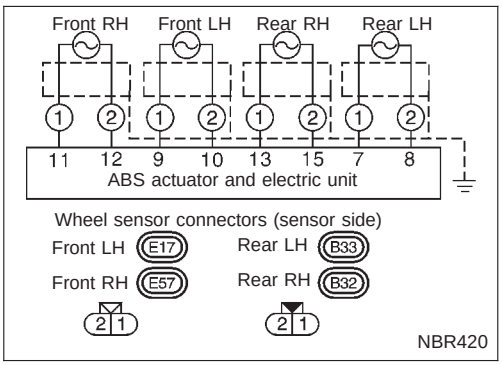
- Check resistance between ABS actuator and electric unit connector terminals and ground.
  Resistance: approximately 0Ω

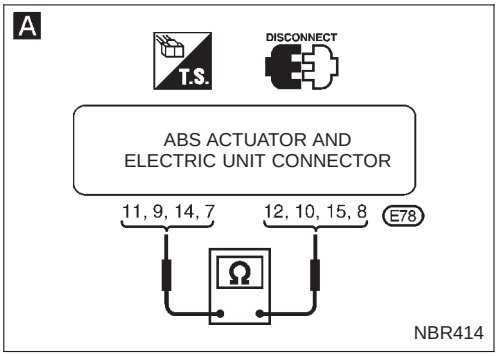
Malfunction Code/Symptom Chart

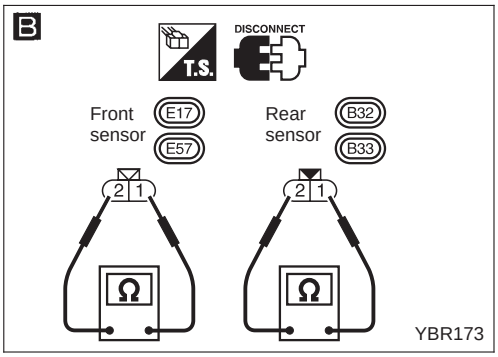
MODELS WITH SELF-DIAGNOSIS FUNCTION

Code No. (No. of LED flashes)	Malfunctioning part	Reference page
12	Self-diagnosis could not detect any malfunctions.	—
18	Sensor rotor	BR-77
21	Front right sensor (open-circuit)	BR-77
22	Front right sensor (short-circuit)	BR-77
25	Front left sensor (open-circuit)	BR-77
26	Front left sensor (short-circuit)	BR-77
31	Rear right sensor (open-circuit)	BR-77
32	Rear right sensor (short-circuit)	BR-77
35	Rear left sensor (open-circuit)	BR-77
36	Rear left sensor (short-circuit)	BR-77
41	Actuator front right outlet solenoid valve	BR-79
42	Actuator front right inlet solenoid valve	BR-79
45	Actuator front left outlet solenoid valve	BR-79
46	Actuator front left inlet solenoid valve	BR-79
51	Actuator rear right outlet solenoid valve	BR-79
52	Actuator rear right inlet solenoid valve	BR-79
55	Actuator rear left outlet solenoid valve	BR-79
56	Actuator rear left inlet solenoid valve	BR-79
57*	Power supply (Low voltage)	BR-83
61	Actuator motor or motor relay	BR-81
63	Solenoid valve relay	BR-79
71	Control unit	BR-84
ABS warning lamp stays on when ignition switch is turned on.	Control unit power supply circuit Warning lamp bulb circuit Control unit or control unit connector Solenoid valve relay stuck Power supply for solenoid valve relay coil	BR-90
ABS warning lamp stays on, during self-diagnosis.	Control unit	—
ABS warning lamp does not come on when ignition switch is turned on.	Fuse, warning lamp bulb or warning lamp circuit Control unit	BR-88
ABS warning lamp does not come on during self-diagnosis.	Control unit	—
Pedal vibration and noise	—	BR-87
Long stopping distance	—	BR-86
Unexpected pedal action	—	BR-86
ABS does not work.	—	BR-87
ABS works frequently.	—	BR-85

*: Under voltage that is too low, the control unit disable the ABS. It does not set the ABS in fail-safe condition. Instead, the ABS becomes a conventional brake system. After the power supply has resumed, the warning lamp goes off, making it possible for the ABS to be re-engaged.







Diagnostic Procedure 1 (Wheel sensor or rotor)

(Malfunction code No. 21, 22, 25, 26, 31, 32, 35, 36 or 18 for models with self-diagnosis function)

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 (E78) (body side) terminals.
   Code No. 21 or 22 (Front RH wheel)
   Terminals (11) and (12)
   Code No. 25 or 26 (Front LH wheel)
   Terminals (9) and (10)
   Code No. 31 or 32 (Rear RH wheel)
   Terminals (13) and (15)
   Code No. 35 or 36 (Rear LH wheel)
   Terminals (7) and (8)
   Resistance: Front 1.44 - 1.76 kΩ
   Rear 1.44 - 1.76 kΩ

OK → (A) (Go to next page.)

NG ↓

B

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

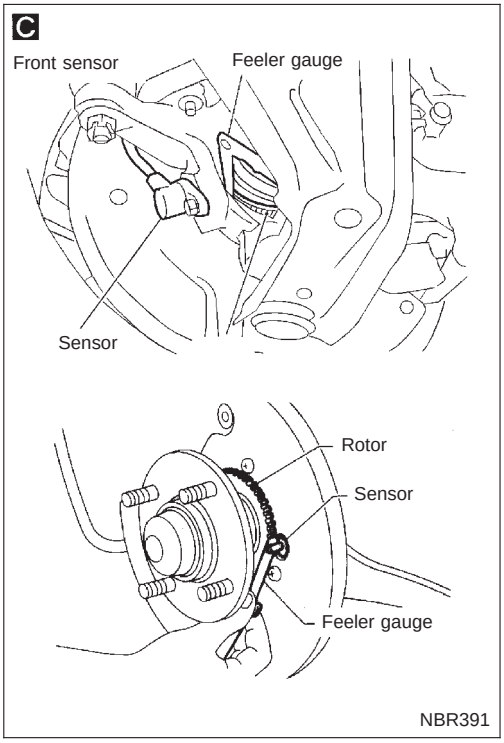
OK → Check the following.
- Harness connectors (E78)
- Harness for open or short between wheel sensor connectors and ABS actuator and electric unit

If NG, repair harness or connectors.

NG ↓

REPLACE.
Replace wheel sensor.

Diagnostic Procedure 1 (Wheel sensor or rotor) (Cont'd)



Ⓐ

Note

CHECK TYRE.
Check for inflation pressure, wear and size of each tyre.

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

OK ↓

C Note

CHECK WHEEL BEARING
Check wheel bearing axial end play and clearance between sensor and rotor.
Clearance
Front
0.1 - 1.1 mm (0.004 - 0.043 in)
Rear
0.536 - 1.551 mm (0.021 - 0.061 in)

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

OK ↓

Note

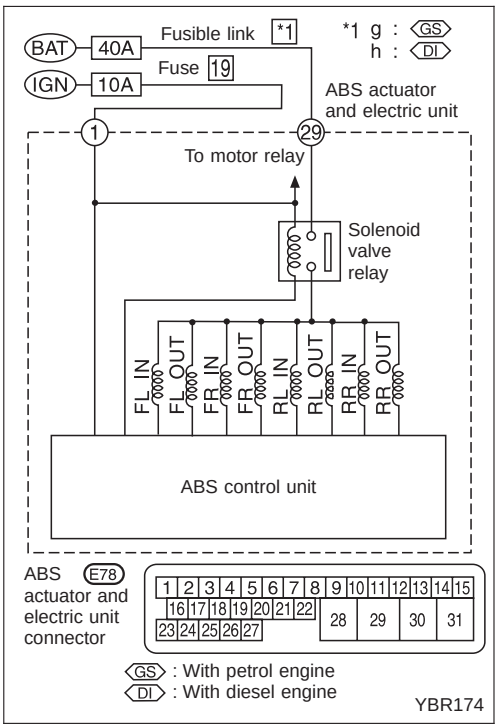
CHECK SENSOR ROTOR.
Check sensor rotor for teeth damage.

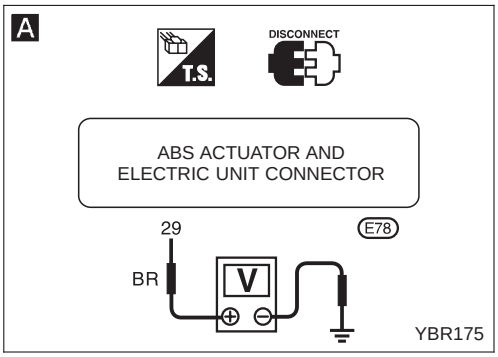
NG → Note: Replace sensor rotor.

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





Diagnostic Procedure 2 (ABS actuator solenoid valve and solenoid valve relay)

(Malfunction code Nos. 41, 42, 45, 46, 51, 52, 55, 56, 63 for models with self-diagnosis function)

CHECK FUSIBLE LINK.
Check 40A fusible link g (petrol engine), fusible link h (diesel engine).
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-75.

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 E78 (body side) terminal 29 and ground.
Battery voltage should exist.

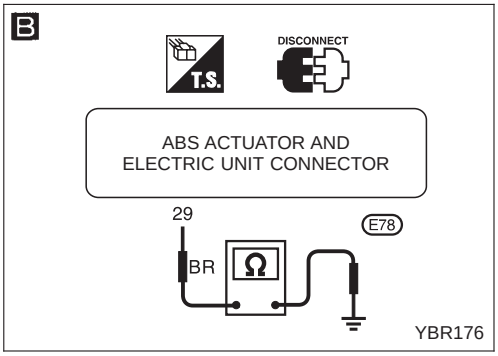
NG → Check the following.
- Harness connector E78
- Harness for open or short between ABS actuator and electric unit and fusible link

If NG, repair harness or connector.

OK ↓

REPLACE.
Replace ABS actuator and electric unit.

Diagnostic Procedure 2 (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 E78 (body side) terminal 29 and ground.
   Continuity should not exist.

NG → Check the following
- Harness connector E78
- 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.

Ⓑ

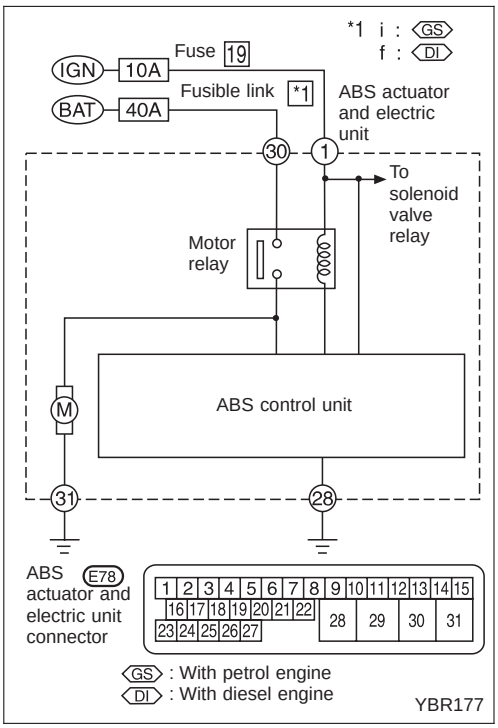
REPLACE.
Replace fuse.
Does the fuse blow out when ignition switch is turned ON?

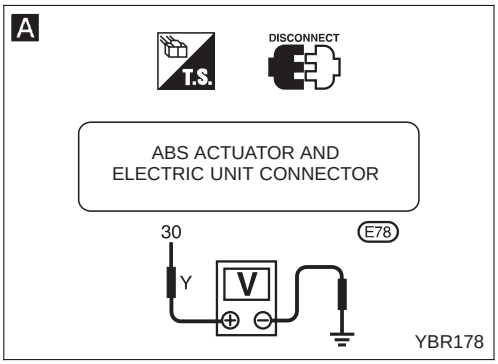
Yes → Check the following.
- Harness connector E78
- Harness for open or short between ABS actuator and electric unit and fuse

If NG, repair harness or connector.

No ↓

END
Inspection end





Diagnostic Procedure 3 (Motor Relay or motor)

(Malfunction code No. 61 for models with self-diagnosis function)

CHECK FUSIBLE LINK.
Check 40A fusible link i (Petrol engine), fusible link f (diesel engine).
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 E78 (body side) terminal 30 and ground.

Battery voltage should exist.

NG → Check the following.
- Harness connector E78
- Harness for open or short between ABS actuator and electric unit and fusible link.

If NG, repair harness or connector.

OK ↓

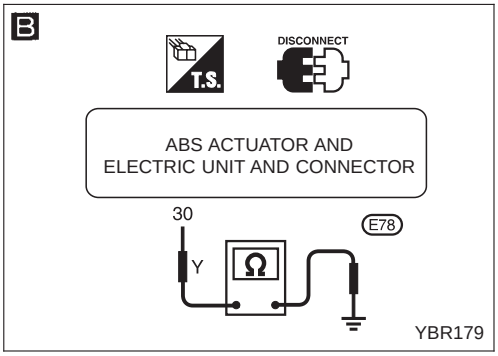
CHECK ABS ACTUATOR AND ELECTRIC UNIT GROUND.
Refer to ABS ACTUATOR AND ELECTRIC UNIT GROUND in Ground Circuit Check, BR-75.

NG → Repair harness and terminals.

OK ↓

REPLACE.
Replace ABS actuator and electric unit.

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



Ⓐ

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

No → Inspection end

OK ↓

B

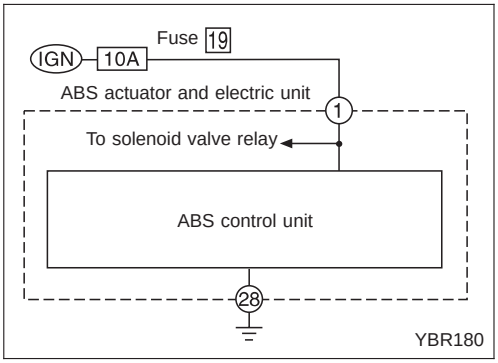
CHECK ABS ACTUATOR MOTOR POWER SUPPLY CIRCUIT.
1. Disconnect battery cable and ABS actuator and electric unit connector (E78).
2. Check continuity between ABS actuator and electric unit connector (E78) (body side) terminal (30) and ground.
   Continuity should not exist.

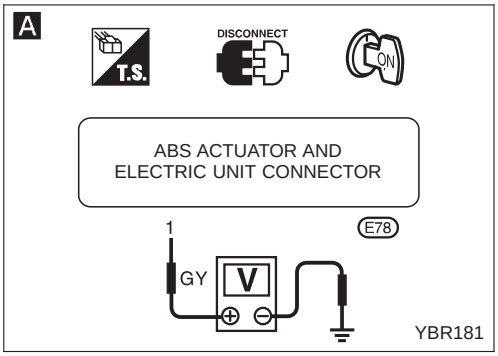
NG → Check the following
- Harness connector (E78)
- Harness for open or short between ABS actuator and electric unit and fusible link

If NG, repair harness ro 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 4 (Low voltage)

(Malfunction code No. 57 for models with self-diagnosis function)

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 E78 terminal 1 and ground.
Battery voltage should exist when ignition switch is turned ON.

NG → A (See below.)

OK ↓

CHECK ABS CONTROL UNIT GROUND
Refer to ABS ACTUATOR AND ELECTRIC UNIT GROUND in Ground Circuit Check, BR-75.

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.

A ↓

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

NG → Replace fuse.

OK ↓

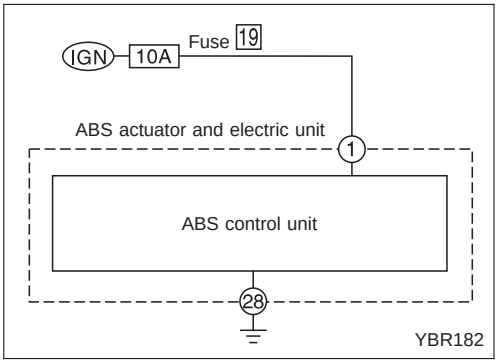
CHECK ABS CONTROL UNIT POWER SUPPLY CIRCUIT
Check continuity between fuse and ABS actuator and electric unit connector E78 (body side) terminal 1 .

NG → Check the following:
- Harness connector E78
- 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 5 (Control unit)

(Malfunctioning code No. 71 for models with self-diagnosis function)

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 ↓

ABS CONTROL UNIT POWER SUPPLY CHECK
Check voltage. Refer to A in Diagnostic Procedure 4, BR-83.

↓

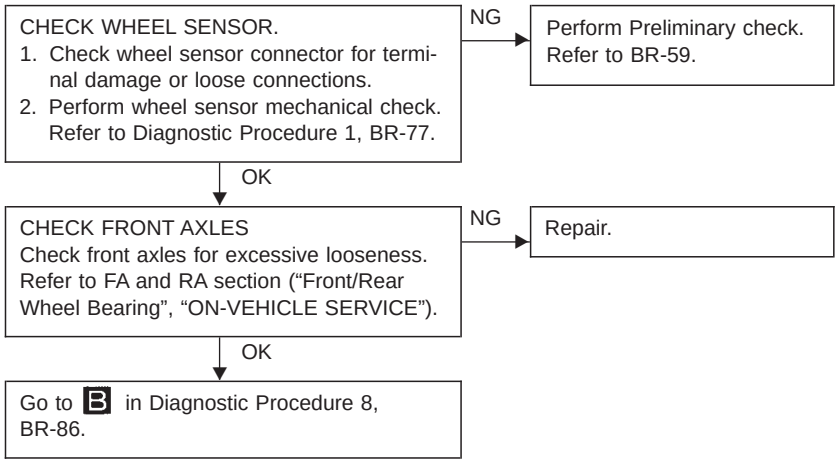
CHECK SELF-DIAGNOSTIC RESULTS
Does warning lamp indicate code No. 71 again?

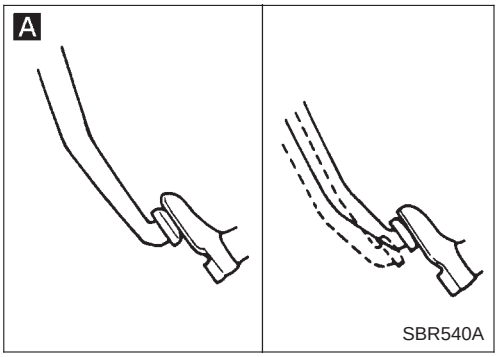
Yes → Replace ABS actuator and electric unit.

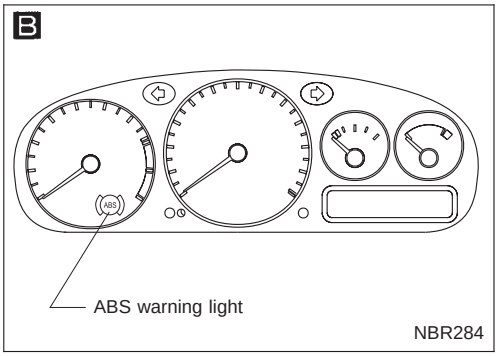
No ↓

INSPECTION
Inspect the system according to the code No.

Diagnostic Procedure 6 (ABS works frequently)







Diagnostic Procedure 7 (Unexpected pedal action)

A

CHECK BRAKE PEDAL STROKE.
Check brake pedal stroke. Is stroke excessively large?
- Yes → Perform Preliminary Check, refer to BR-59.
- No ↓

CHECK BRAKE PERFORMANCE
Disconnect ABS actuator and electric unit connector and check whether brake is effective.
- No → Perform Preliminary Check, refer to BR-59.
- Yes ↓

B

CHECK WARNING LAMP ACTIVATE.
Ensure warning lamp remains off while driving.
- NG → Carry out self-diagnosis. Refer to BR-67.
- 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 1, BR-77.

- NG → Repair.
- OK ↓

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

Diagnostic Procedure 8 (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 7, BR-86.
- Yes ↓

Perform Preliminary Check and air bleeding.

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

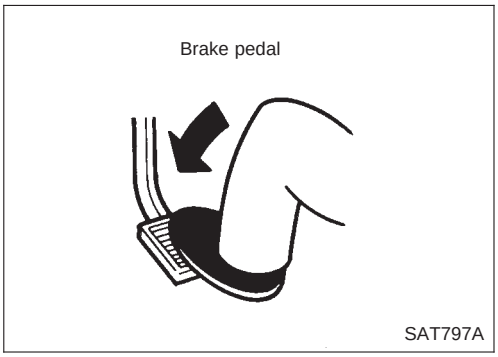
Diagnostic Procedure 9 (ABS does not work.)

CHECK WARNING LAMP ACTIVATE.
Does the ABS warning lamp activate?

Yes → Carry out self-diagnosis. Refer to BR-67.

No → Go to B in Diagnostic Procedure 7, BR-86.

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



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-67.

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 7, BR-86.

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

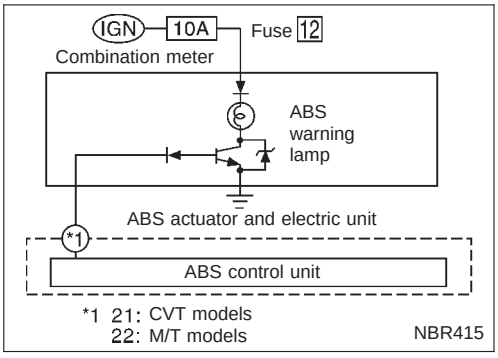
NG → Repair wheel sensor.

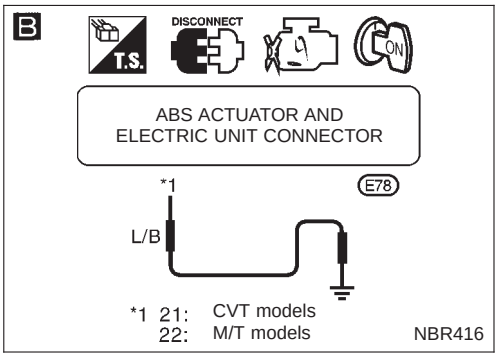
OK → CHECK HARNESS CONNECTOR.
Check ABS actuator and electric unit pin terminals for damage or the connection of ABS actuator and electric unit harness connector.
Reconnect ABS actuator and electric unit harness connector. Then retest.

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

Diagnostic Procedure 10 (Pedal vibration and noise) (Cont'd)

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





Diagnostic Procedure 11 (ABS 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 in EL section.

NG → Replace fuse.

OK ↓

A

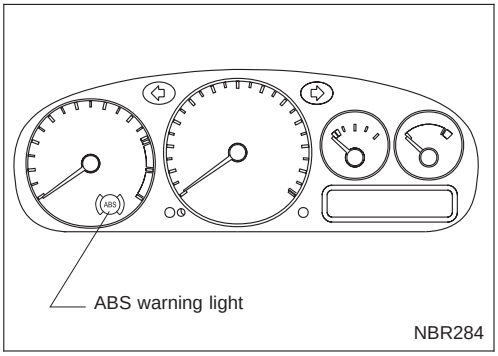
CHECK ABS CONTROL UNIT POWER SUPPLY CIRCUIT.
1. Install 10A fuse.
2. Disconnect ABS actuator and electric unit connector.
3. Check voltage between control unit connector terminal 21, 22 and ground after turning ignition switch "ON".

No → Ⓐ (Go to next page.)

Yes ↓

Ⓑ (Go to next page.)

Diagnostic Procedure 11 (ABS Warning lamp does not come on when ignition switch is turned ON) (Cont'd)



Ⓐ

B

CHECK WARNING LAMP INDICATION.
Disconnect ABS actuator and electric unit connector.
Does the warning lamp activate?

NG → Ⓑ (See below)

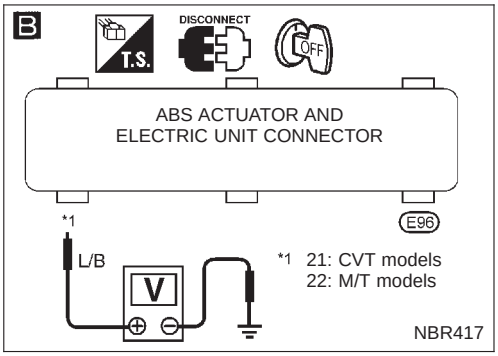
Yes

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.

OK

Inspection end.



Ⓑ

C

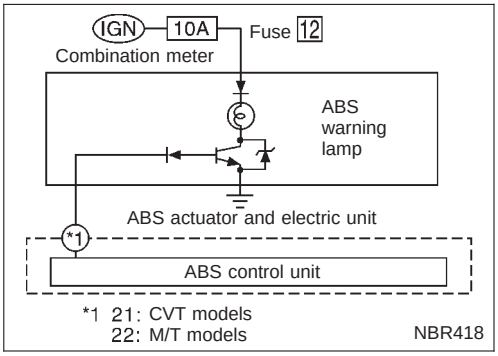
CHECK HARNESS FOR SHORT.
1. Disconnect ABS actuator and electric unit connector.
2. Check voltage between ABS actuator and electric unit connector (body side) terminal 21, 22, and ground.

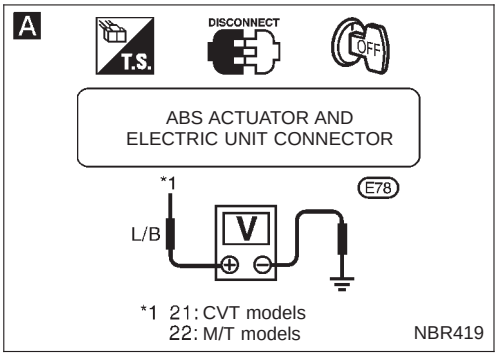
Battery voltage should not exist.

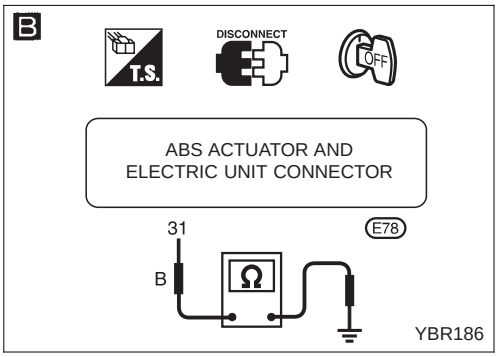
NG → Repair harness or connector between fuse and ABS actuator and electric unit connector terminal.

OK

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







Diagnostic Procedure 12 (Warning lamp stays on when ignition switch is turned ON)

A

CHECK WARNING LAMP.
1. Disconnect ABS actuator and electric unit connector.
2. Connect suitable wire between ABS actuator and electric unit connector E78 (body side) terminal 6 , 22 and ground.

Warning lamp should not activate.

NG → Repair combination meter.
Check the following
- Harness connector E78
- Harness for open or short between ABS actuator and electric unit and fusible link

If NG, repair harness ro 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.

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 E78 (body side) terminal 31 and ground.

Continuity should exist.

NG → Check the following
- Harness connector E78
- Harness for open or short between ABS actuator and electric unit and fusible link

If NG, repair harness ro connector

OK ↓

REPLACE.
Replace ABS actuator and electric unit.

General Specifications

Unit: mm (in)

Applied model	QG16DE, QG18DE and CD20T		QG16DE, QG18DE and CD20T	SR20DE	
	For LHD models (except Wagon)		For RHD models & Wagon models (LHD/RHD)	CVT models	M/T models
	Without ABS		With ABS (optional for LHD models)	With ABS	
Front brake	CL25VG		CL25VBG		FN3-57/22
Brake model	disc brake		disc brake		disc brake
Cylinder bore diameter	57.2 (2.252)				
Pad length × width × thickness	109 x 50.1 x 11 (94.29 x 1.97 x 0.43)		109 x 50.1 x 11 (4.29 x 1.97 x 0.43)		112 x 56.2 x 11 (4.41 x 2.21 x 0.43)
Rotor outer diameter × thickness	257 × 22 (10.12 × 0.87)		280 × 22 (11.04 × 0.87)		
Rear brake	CL9HCG	LT20N	CL9HDG		CL11HEG
Brake model	disc brake	drum brake	disc brake		disc brake
Cylinder bore diameter	34.4 (1.354)	17.46 (0.6874)	34.4 (1.354)		38.2 (1.504)
Lining or pad length × width × thickness	79.8 x 38.5 x 9.3 (3.14 x 1.52 x 0.37)	195 x 35 x 4.5 (7.68 x 1.38 x 0.18)	79.8 x 38.5 x 9.3 (3.14 x 1.52 x 0.37)		
Drum inner diameter or rotor outer Diameter × thickness	258 x 10 (10.2 x 0.39)	203.2 (8.00)	278 x 10 (10.9 × 0.39)		258 x 10 (10.2 x 0.39)
Master cylinder Cylinder bore diameter	23.81 (0.94)				
Control valve					
Valve model	Dual proportioning valve		—		
Split point [kPa (bar, kg/cm^2, psi)] × reducing ratio	1.96 (0.0196, 0.0200, 0.284) x 0.4		—		
Brake booster					
Booster model	BJKCE				
Diaphragm diameter	Primary: 205 (8.1) Secondary: 180 (7.1)				
Specified brake fluid	DOT 4				

Inspection and Adjustment

DISC BRAKE

Unit: mm (in)

	CL25VG	CL25VBG	FN3-57/22	CL9HCG	CL9HDG	CL11HEG
Pad wear limit Minimum thickness	2.0 (0.079)					
Rotor repair limit Minimum thickness	20.0 (0.787)	20.0 (0.787)	20.0 (0.787)	9.0 (0.354)	9.0 (0.354)	9.0 (0.354)
Maximum runout	0.07 (0.0028)					
Maximum thickness variation	0.02 (0.0008)					

DRUM BRAKE

Unit: mm (in)

Brake model		LT20N
Lining wear limit	Minimum thickness	1.5 (0.059)
Drum repair limit	Maximum inner diameter	204.5 (8.051)
	Maximum out-of-round	0.03 (0.0012)

BRAKE PEDAL

Unit: mm (in)

Applied model		RHD	LHD
Free height M/T		160 - 170 (6.30 - 6.69)	151 - 161 (5.94 - 6.34)
CVT		169 - 179 (6.65 - 7.05)	160 - 170 (6.30 - 6.69)
Depressed height [under force of 490 N (50 kg, 110 lb) with engine running]	M/T	80 - 90 (3.15 - 3.54)	71 - 81 (2.80 - 3.19)
	CVT	89 - 99 (3.50 - 3.90)	80 - 91 (3.15 - 3.54)

PARKING BRAKE CONTROL

Control type	Center lever
Number of notches [under force of 196 N (20 kg, 44 lb)]	6 - 8
Number of notches when warning switch comes on	1